PHILIPPINE GREEN BUILDING CODE
USER GUIDE

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CONTENTS

MESSAGE FROM THE DPWH SECRETARY

REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
OFFICE OF THE SECRETARY
MANILA

The timely implementation of the Philippine Green Building Code (GB Code) is a product of collective efforts of the Department of Public Works and Highways (DPWH, as the engineering and construction arm of the country), the private sector, and other stakeholders of the building industry to promote and contribute to climate change mitigation and adaption.

To reduce the country's carbon emissions, the Department of Public Works and Highways worked with the International Finance Corporation, a member of the World Bank Group and various professional organizations, to craft regulation for sustainable buildings in the Philippines.

A referral code to the National Building Code of the Philippines, the GB Code focuses on minimizing the impact of buildings to health and environment throughout the building's life cycle through resource management efficiency. It requires compliance to green measures by hotels, malls, offices, residential condominiums, schools, hospitals, and mixed occupancy buildings that fall under a certain minimum gross floor area.

The aspects of energy efficiency, water and wastewater management, materials sustainability, solid waste management, site sustainability, and indoor environmental quality among buildings are encapsulated in the GB Code.

We hope to help the stakeholders of the Philippine Green Building Code in understanding its concepts through this User Guide.

DPWH shares this achievement with all the stakeholders and would-be stakeholders of Green Building and together, let us help improve the life of every Filipino through Green Building.

ROGELIO L. SINGSON
SECRETARY

MESSAGE FROM THE DPWH ASSISTANT SECRETARY

When DPWH and partners met with stakeholders in the nationwide consultations on the Philippine Green Building Code, we heard from many the need for a guidance document for implementing the Code. Early on, people made us understand that it is not just the GB Code that was needed, but equally important is a technical manual to aid in its implementation. Understandably so, because green building is a growing practice with varying appreciation in the Philippines.

With this user guide, we hope to help building officials, architects, engineers, designers, and other practitioners in implementing the GB Code to design and construct resource efficient and sustainable structures. The guide covers the following green building aspects: energy efficiency, water efficiency, material sustainability, solid waste management, site sustainability, and indoor environmental quality. For each area, the guide cites the applicable Green Building Code provisions, explains the technical specifications, and provides examples and illustrations, as needed.

Our sincere thanks to the International Finance Corporation (IFC) and the members of the Green Building project team for the collaboration and pooling together of expertise to make this guide possible. We hope to continue to enrich this document as we promote green building practice in the country.

GILBERTO S. REYES
PROJECT LEADER
GREEN BUILDING

INTRODUCTION

BACKGROUND

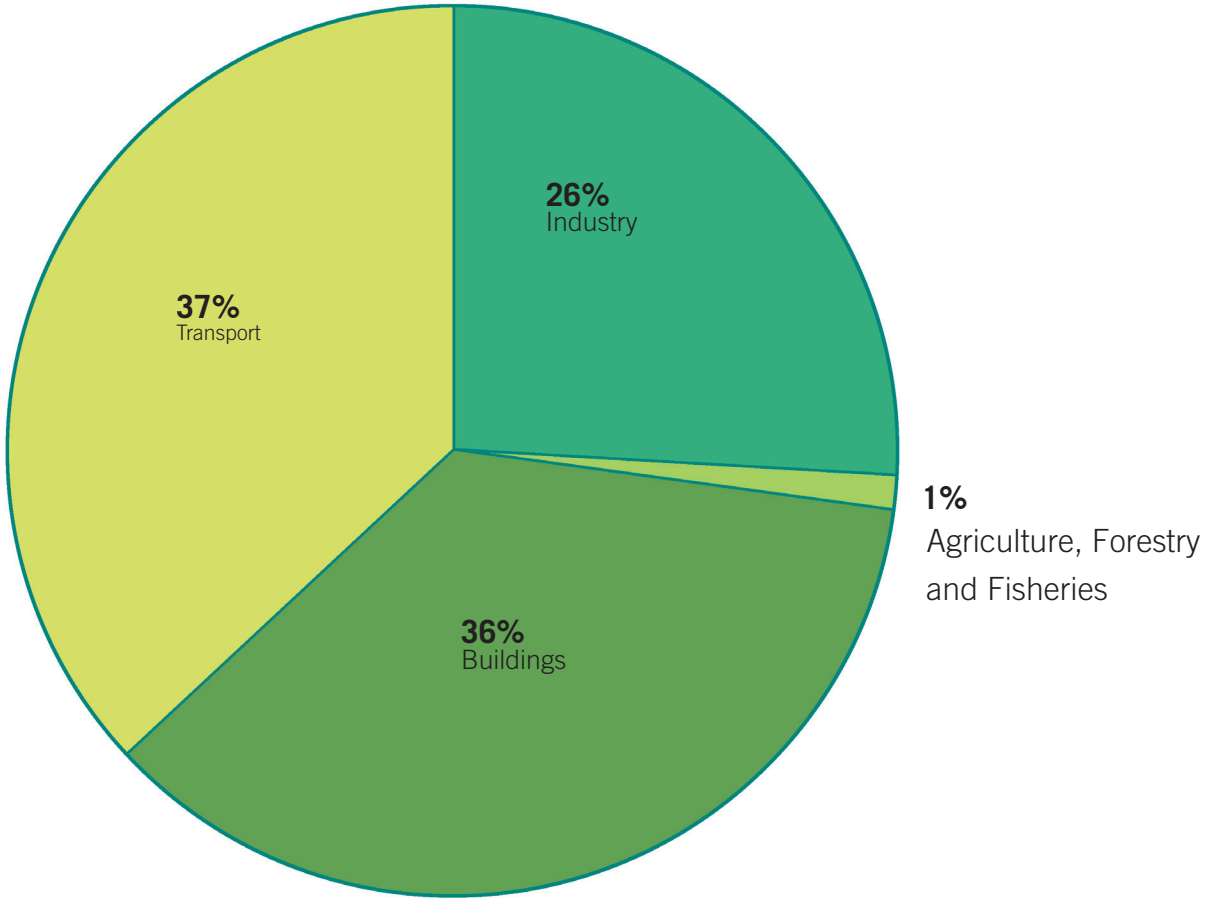
BUILDING DEMAND

There is a strong demand for buildings in the Philippines as shown by a positive property development and business and construction outlook. The construction industry rides on a 9.53% GDP (at current prices) annual average growth from 1998 to 2014. There is a perception of investor confidence as the construction and manufacturing sectors account for a significant contribution to the increase in GDP. Data from the National Statistics Office[1] show the significant contribution of Renting, Retails and Business activities to economic activity. Annual average inflation rate is below Philippine Statistics Authority estimates of 5%[2]. Due to these favorable economic conditions, the building industry is expected to continue to grow in succeeding years, and support for infrastructure is needed to sustain this economic growth.

ENERGY USE AND CLIMATE CHANGE

Buildings account for 36% of national energy consumption. Energy demand is directly proportional to building demand. The growth of buildings puts a stress on the country's energy supply. In addition, though the Philippines is a low emitter of Greenhouse Gases (GHG), building developments in the future are expected to increase the level of GHG emissions as demand for electricity shoots up. About 0.53 tons of CO2 equivalent (Manila grid) is emitted to generate one kilowatt of electricity.

ENERGY CONSUMPTION BY SECTOR, DOE 2010 DATA



According to the World Meteorological Organization (WMO), carbon dioxide emission accounts for 80% of global warming. In its 5th Assessment Report, the Intergovernmental Panel on Climate Change (IPCC) foresees that by the end of the century, there will have been an increase in world temperature by 4.6 degrees if "business-as-usual" activities continue. Thus, world leaders sent a global call for mitigation actions.

GREEN BUILDING

Green building is the low-hanging fruit for GHG mitigation actions. Green Building (GB) is the practice of adopting resource efficiency measures in building design, construction and operations while minimizing the negative impact of buildings on human health and the environment. Green building also reduces operating costs, enhances economic returns for the building owner and user, promotes good health and well-being for the building occupants, and encourages community participation, as well as protection and sustainability in the environment.

In the Philippines, green building practice is emerging. Voluntary groups such as the US Green Building Council (USGBC), the Philippine Green Building Initiative (PGBI), and the Philippine Green Building Council (PGBC) have paved the way in generating awareness of green building through their respective green building voluntary certification systems. However, much remains to be done with the number of certified green buildings. Since the introduction of GB in the Philippine market in 2009, GB take up is still less than 0.01% of the total number of new buildings.

One reason for the slow uptake of green building is the perceived high cost of getting assessments and certifications, as well as the complicated requirements that only big developers can comply with. This gave rise to the general perception that green buildings are expensive and cater only to big developments Thus, in the hope of catalyzing market transformation, government took the "mandatory" track with minimum and simple measures.

CODE DEVELOPMENT AND IMPLEMENTATION

The Philippine Green Building Code ("GB Code") was signed by DPWH Secretary Rogelio L. Singson on June 22, 2015 and became effective within 15 days after its complete publication in a newspaper of general circulation, as required by law. The GB Code focuses on six aspects and some 25 measures to promote resource efficiency in Energy and Water, Solid Waste Management, Indoor Environmental Quality, Material Sustainability, and Site Sustainability. The GB Code is a referral code of the National Building Code of the Philippines (PD 1096).

The Green Building Code aims to improve the efficiency of building performance through environmental design and resource management standards that will save operational costs and result in healthier

buildings. This approach is expected to reduce GHG emissions responsible for climate change, without a significant increase in capital cost. The GB Code provides a set of regulations setting minimum standards for compliance and is not intended to rate buildings.

The development of the GB Code was guided by building trends survey, market cost analysis, energy modelling, and sensitivity analysis conducted by local and international technical consultants under the supervision and direction of the Department of Public Works and Highways and the International Finance Corporation of the World Bank Group. The green building measures were selected based on the following criteria:

1) FEASIBILITY-Is this measure/technology well understood and commonly available in the country?
2) IMPACT-Does this measure provide sufficient financial, social or environmental benefit?
3) AFFORDABILITY-How much does it cost to include this measure? How soon does it pay back the investment?

Generally, no measure with a simple payback of more than 5 years has been included in the requirements.

HOW TO USE THIS GUIDE

This Green Building Code User Guide supports the implementation of the GB Code. It is intended as an easy reference for government regulators, building proponents or developers, design professionals, contractors, building officials, and other stakeholders in the implementation of the Green Building Code.

This Guide provides basic information on the green building measures, as well as practical examples and applications. Specifically, this Guide contains references and guidelines for design and construction application and documentation, as well as resources and study materials.

This document is divided into 7 sections:

- Permitting Process
- Energy Efficiency
- Water Efficiency
- Material Sustainability
- Solid Waste Management
- Site Sustainability
- Indoor Environmental Quality

The GB Code is applicable to buildings of certain typology and total gross floor area, as shown in Table 1 below.

TABLE 1. MINIMUM TOTAL GROSS FLOOR AREA (TGFA) FOR BUILDING USE/OCCUPANCY

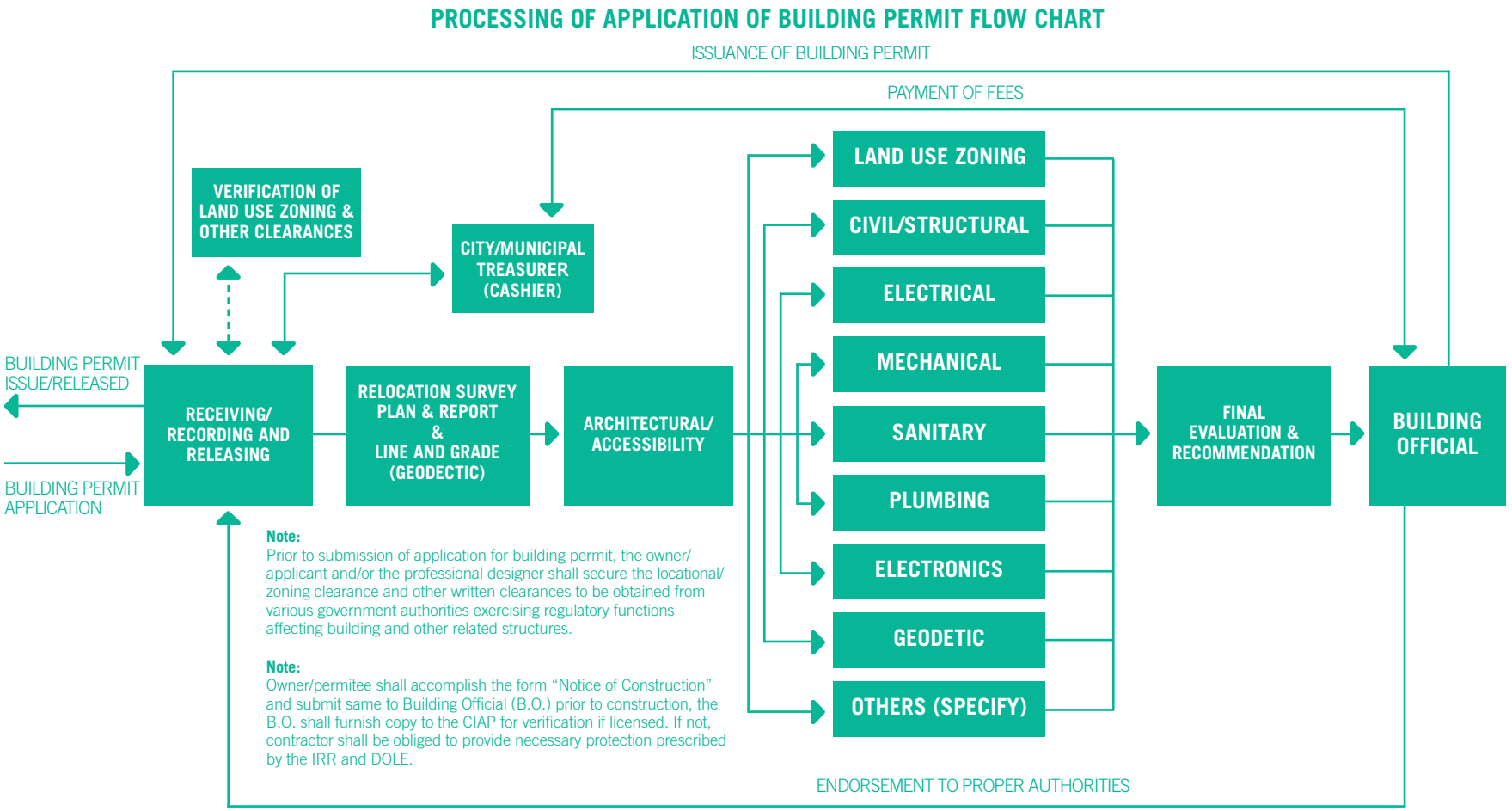
USE/OCCUPANCY CLASSIFICATION OF ANY JURISDICTION	TGFA AS DEFINED BY NBC
Residential Dwelling: Condominium	20,000 sqm
Hotel/Resort	10,000 sqm
Educational: School	10,000 sqm
Institutional: Hospital	10,000 sqm
Business: Office	10,000 sqm
Mercantile: Mall	15,000 sqm
Mixed Occupancy	10,000 sqm

SOURCE: Philippine Green Building Code

PERMITTING PROCESS

GREEN BUILDING

The Green Building Code follows the process flow of the National Building Code, as shown below.



BUILDING PERMIT APPLICATION PROCESS

(NATIONAL BUILDING CODE OF THE PHILIPPINES)

When a project proponent files an application for a building permit, he must go through the following steps:

1 PROJECT PROPONENT APPLICATION

1) Get Requirement Check List and Application Forms from the Office of the Building Official.
2) Accomplish prescribed application form from the Office of the Local Building Official and file the prescribed application forms, together with:
   - Location of proposed structure and description of the work to be covered.
   - Certified true copy of Original Certificate of Title/Transfer Certificate of Title
   - Tax declaration
   - Current real property tax receipt
   - Five sets of survey plans, design plans, specifications, and other documents prepared, signed and sealed over the printed names of the duly licensed and registered professionals.

2 OBO EVALUATION AND PROCESSING

- When satisfied that all plans, specifications and other documents are in order, the Building Official gives due course to the application.
- Building Official evaluates and ensures that plans conform with approved Green Building standards and requirements on zoning and land use, lines and grades, structural design, sanitary and sewerage, environmental health, electrical, mechanical, electronics, and fire safety requirements as well as with other rules and regulations promulgated in accordance with the provisions of PD 1096.

3 TREASURER PAYMENT OF FEES

- Applicant pays the prescribed assessment building permit fees at the City/Municipal Treasurer (Cashier)

4 OBO APPROVAL

- Upon complying with all the minimum standards of plans based on all pertinent rules and regulations of the GB Code and other referral codes with respect to specific disciplines, Building Official approves the building permit application.
- Building Official, within 15 days from payment of the required fees by the applicant, issues the building permit applied for.

5 OBO ISSUANCE

Building Official releases the building permit and documents to the applicant after presentation of the official receipt.

A. ENERGY EFFICIENCY

The building sector accounts for 36% of the national energy consumption (2010). About 50% to 70% of building energy is used for mechanical systems such as air-conditioning and ventilation systems. The GB Code requires the adoption of efficient practices, designs, methods, and technology that can reduce energy consumption resulting in cost savings, reduced energy consumption, and reduced GHG emissions.

Energy efficient practices and technology can contribute to achieving green building objectives.

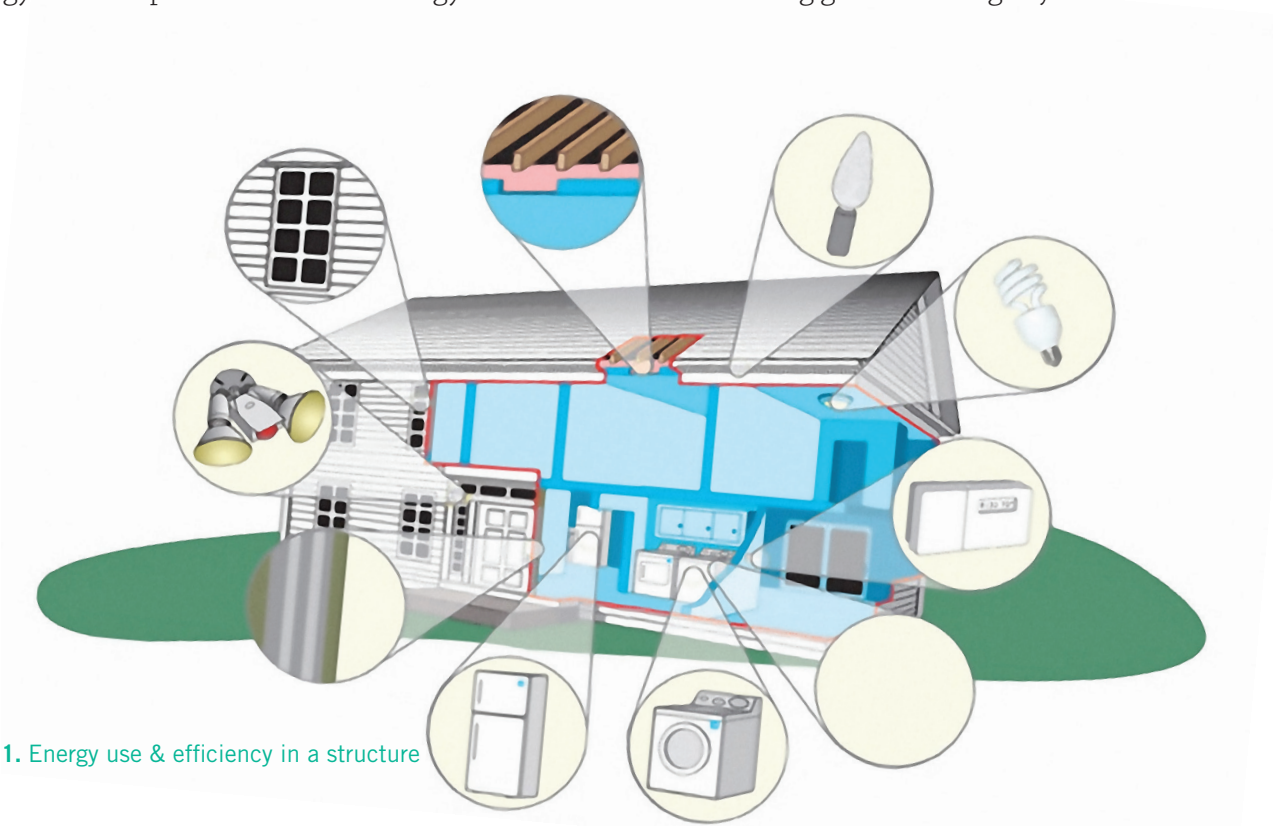


FIGURE 1. Energy use & efficiency in a structure

A.1. BUILDING ENVELOPE

Building envelope physically separates the indoor and outdoor environments. It encompasses the entire exterior surface of a building, including walls, roof, doors, and windows, which enclose, or envelope, the interior spaces. It is composed of layers of building materials that protect interior spaces from changes in outdoor weather and climate conditions.

Some elements of a building envelope include:

FIGURE 2: Elements of a building envelope

ROOF – covering of the top of a building to protect against sunlight, wind, rain, and extreme temperature.

EXTERIOR WALLS – structural element used to enclose a building construction to form the envelope of a building.

DEMISING WALL – an interior wall or partition used to subdivide one space from one another or from the common spaces.

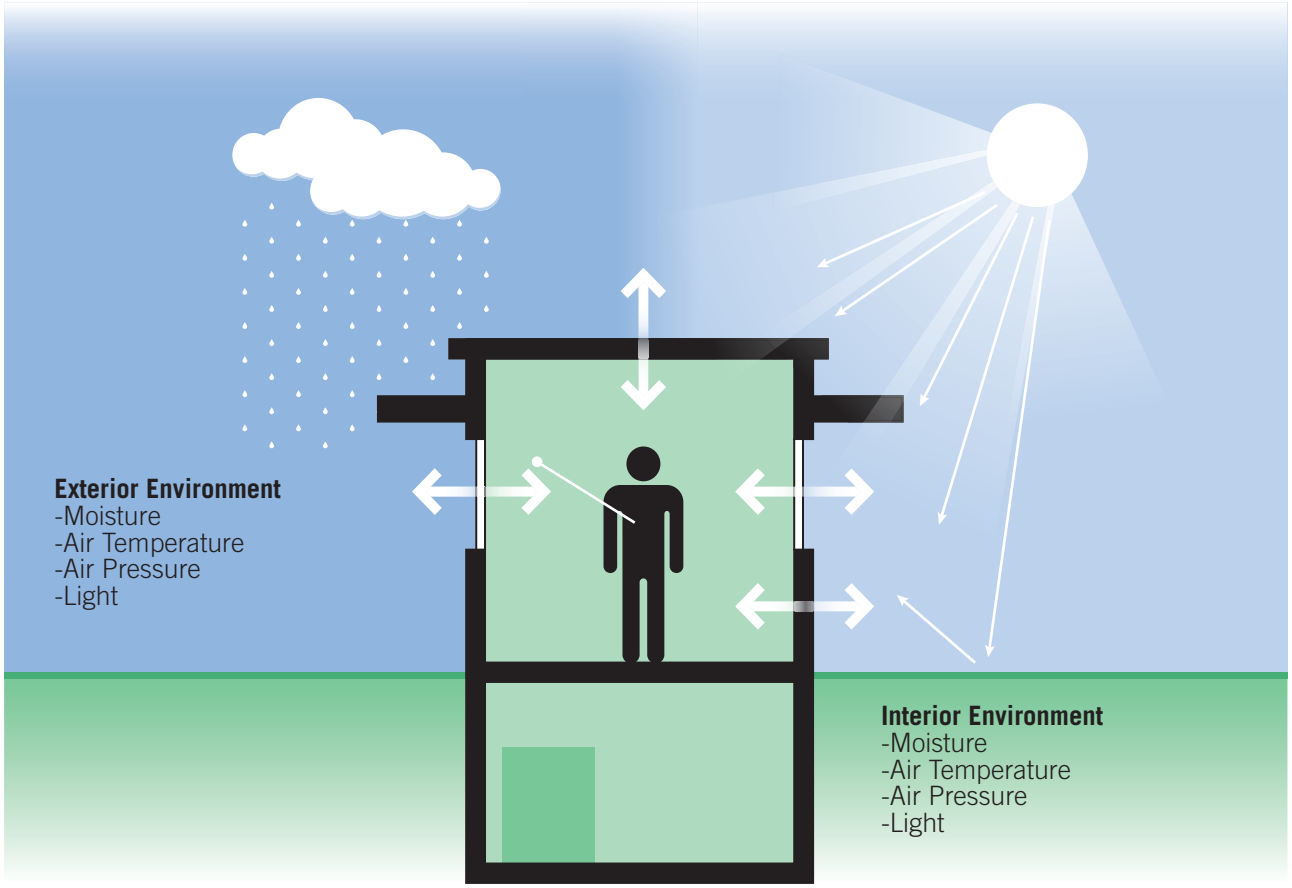
WINDOW – opening in the wall of a building for the admission of light and air that is usually closed by casements or sashes containing glass panel and capable of being closed or shut.

SOFFIT – connecting the top of an exterior wall to a projecting eave.

SKYLIGHT – roof opening covered with translucent or transparent glass or plastic designed to admit daylight.

The following illustrates how a building envelope acts as a barrier between outdoor and indoor conditions.

FIGURE 3: Building Envelope interface with exterior and interior environments



A.1.1. AIR TIGHTNESS AND MOISTURE PROTECTION

CODE REFERENCE 10.1.1D: REQUIRED MEASURES

10.1.1d.1. Complete gaskets, weather-stripping, door bottom sweeps and seals within and around window and door assemblies; and

10.1.1d.2. Provide moisture protection on the surface of the external façade to reduce vapor or moisture migration from external spaces.

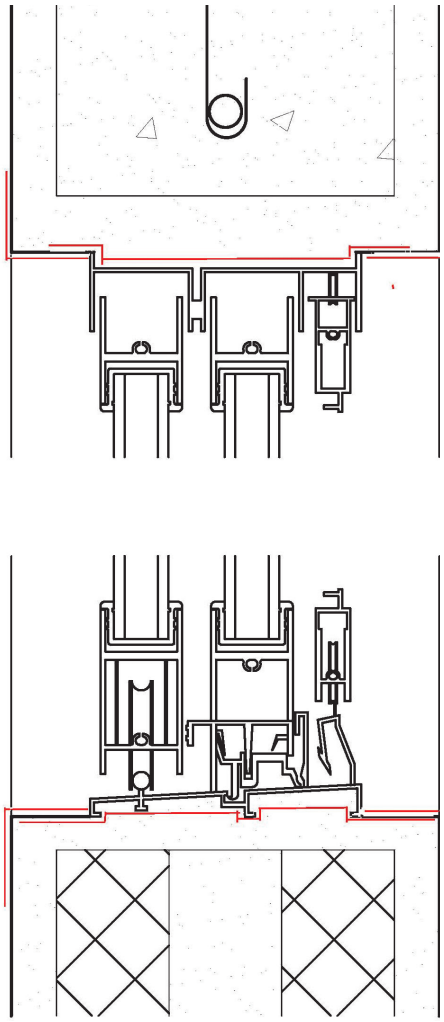


FIGURE 4: Vulnerable points for air and water-tight sealing (red line)

APPLICABILITY AND EXEMPTIONS

This requirement is applied to all building occupancies as indicated in Table 1.

Buildings and spaces without installed air-conditioning systems are exempt from this requirement.

RATIONALE

As the country's humidity levels are high, the unwanted air infiltration and moisture ingress into indoor spaces can put additional load on the air-conditioning system and cause detrimental impact on air quality. Thus, buildings must be planned, designed, and constructed with enough detail and quality to ensure maximum air tightness. The implementation of these measures requires only increased attention to the construction details and it can be implemented at practically no cost.[3] Details should precisely include joints, including service entry joints, windows, and doors. Vapor barrier, a material that has a permeance of one perm or less, can also be installed. It prevents the entry of moisture through the walls and provides resistance to the transmission of water vapor from the outside to the inside of the building, which can burden the air-conditioning system operations.

DESIGN APPLICATION

1) SEALED WINDOW AND DOOR ASSEMBLIES: sealed by a continuous membrane along the joints between wall and window and door frames. Window and door assemblies should be complete with weather stripping and gaskets around the frames.

Doors and windows are the first line of defense against humidity and moisture.

FIGURE 5: Different types of doors and windows weather stripping

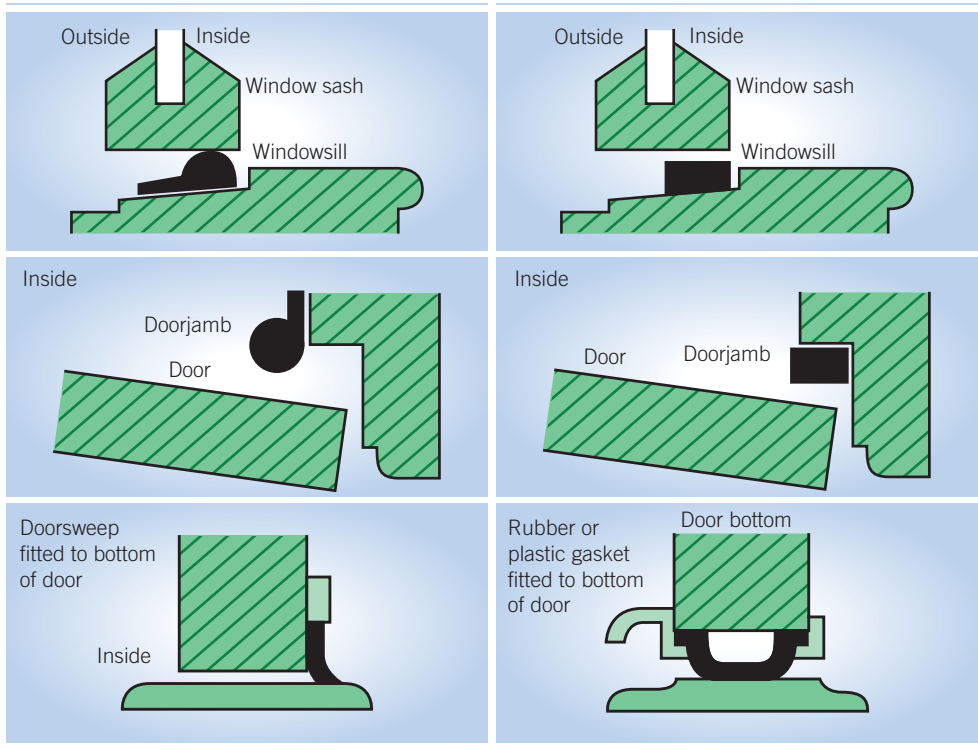


FIGURE 6: Installation of air tightness of different weather stripping for flooring and door frames

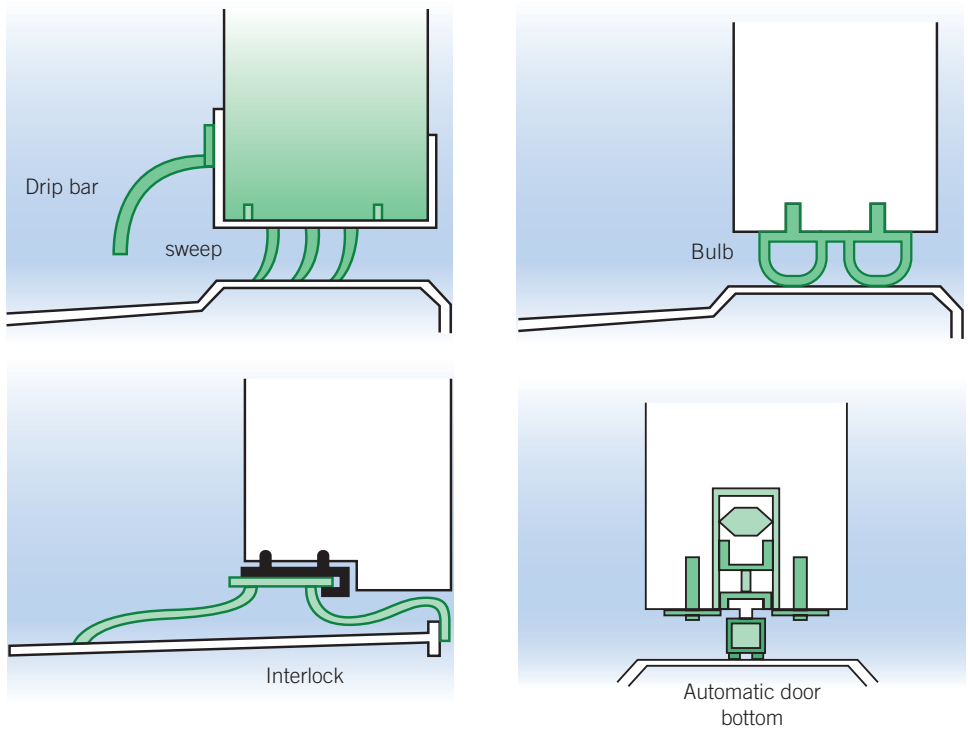


FIGURE 7: Window assembly with sealant installation all-around and between glass panels and frames.

FIGURE 8: Window frame fully sealed with gasket and weather stripping all around.

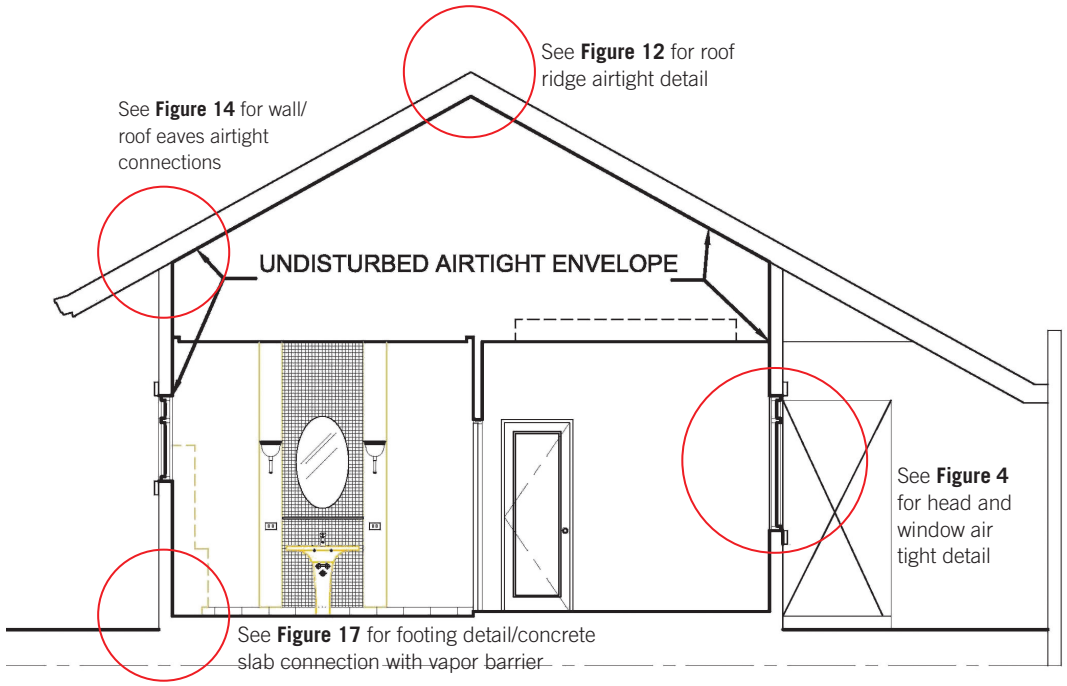
2) SEALED UTILITY SERVICES: Electrical, plumbing and mechanical piping, conduit or ducting penetrating through walls, floor, and ceiling should be sealed to reduce air leakage. Joints in the membrane should be caulked, lapped, and sealed or taped.

FIGURE 9: Duct penetration through wall ready to receive sealing material. This is to prevent transfer of air and moisture between spaces.

3) SEALED WALL, ROOFING, CEILING, AND FLOOR: tightly sealed with continuous water barrier or retarder, joint flashing, capping, sealants, and fillers.

a. WALL – sealed with the application of vapor/moisture barrier
b. ROOF – sealed with complete ridge roll, flashing, valley and joint terminations
c. CEILING – joints and openings sealed with tape
d. FLOOR – floor surfaces, joints and terminations sealed with the application of water barrier, joint fillers, or air tightness tape. Waterproofing membrane over exposed roof or deck slabs while water barrier sheathing under exposed floor slabs on fill.

FIGURE 10: Air tightness in a building envelope



ROOF

The roof shields a structure from harsh elements from sunshine to rain, so it is important to seal off and reinforce it.

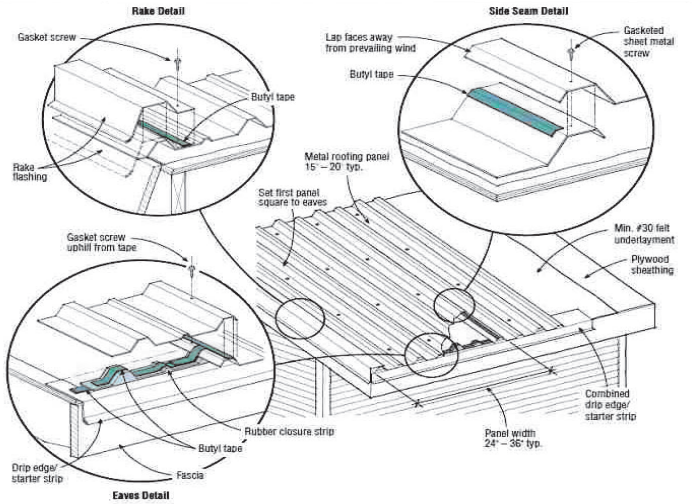


FIGURE 11: Metal roof edge flashing with rubber closure strips to seal ends, valleys and joint terminations for airtightness

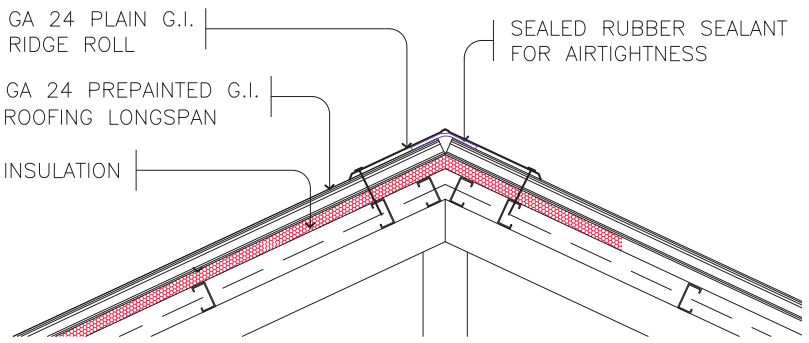


FIGURE 12: Air tightness at roof ridge

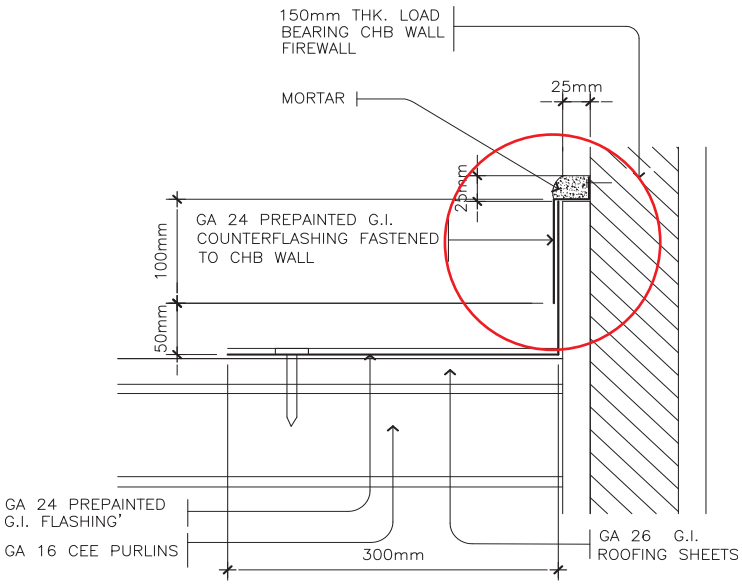


FIGURE 13: Wall to roof flashing for airtight closure

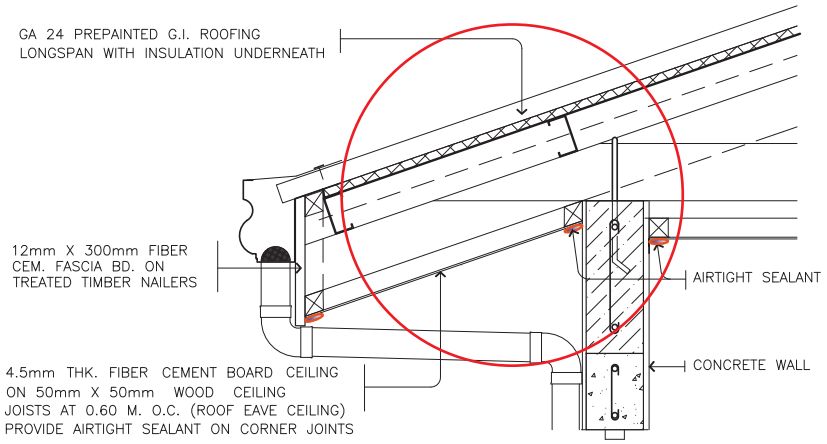


FIGURE 14: Airtightness at wall and roof eaves

WALL

The role of walls to act as moisture barrier are detailed in the illustrations below.

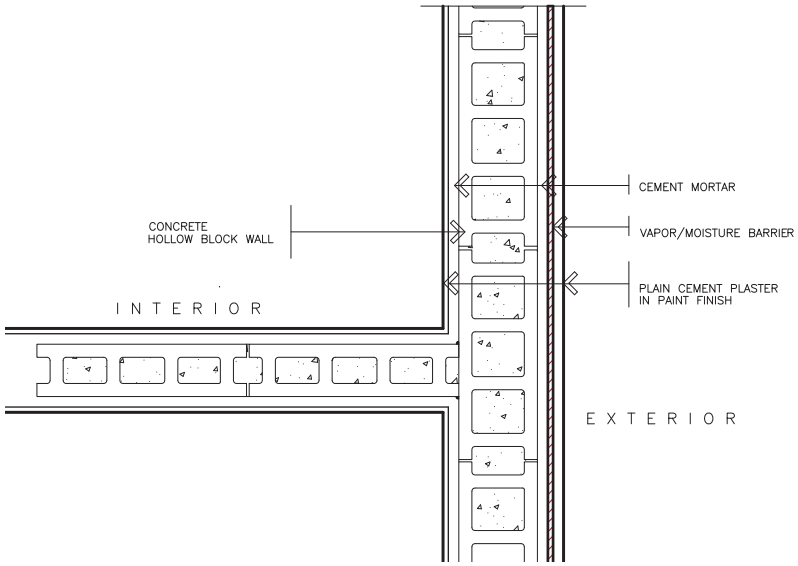


FIGURE 15: Application of moisture barrier on exterior wall

FIGURE 16: Concrete wall in paint finish with moisture barrier properties

FLOOR

When it comes to moisture seepage, it is also important for floors to be treated and reinforced.

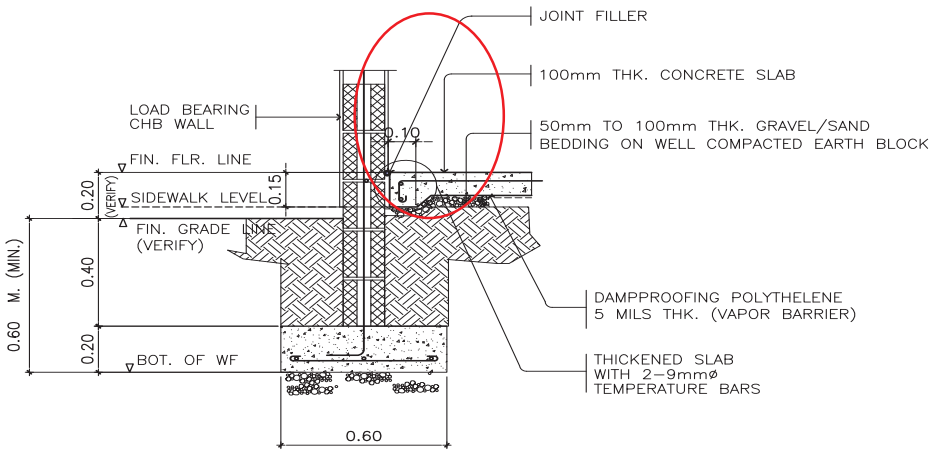


FIGURE 17: Wall footing detail showing application of joint filler between wall and edge of concrete slab, and the application of damp proofing below slab to prevent moisture seepage, and gravel bed to allow the draining of water.

FIGURE 18: Roofdeck sealed with waterproofing membrane

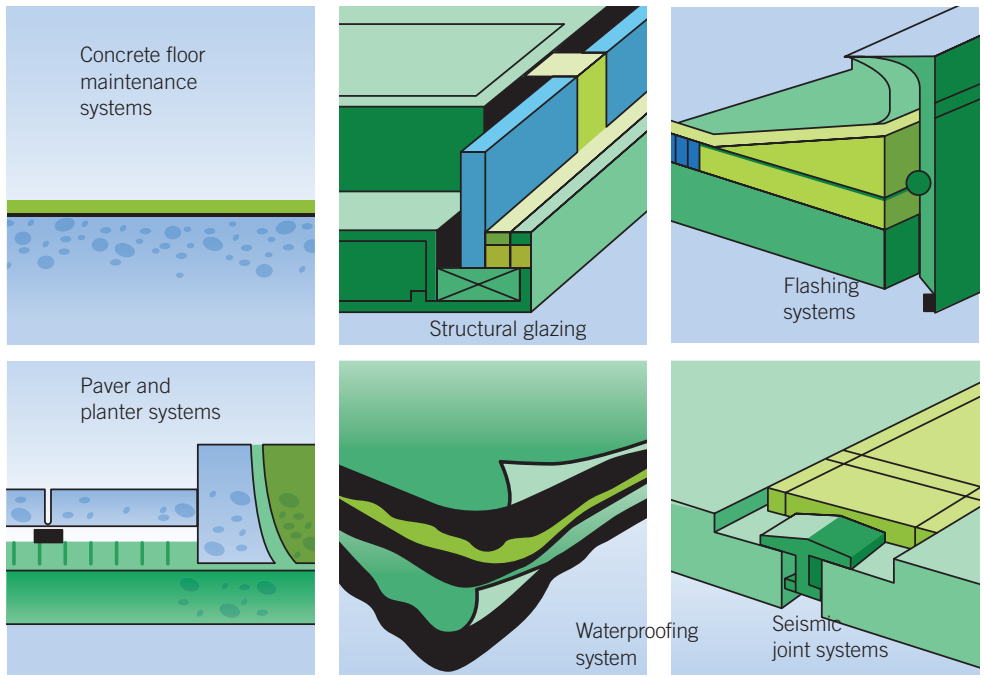


FIGURE 19: Treatment of joints in the building envelope to avoid air leakage and moisture penetration

DESIGN DOCUMENTATION

Documents about the following are needed for the issuance of a building permit:

a. Bay wall sections
b. Enlarged details of building envelope, including the following:
   - Sealed window and door assemblies
   - Sealed utility services
   - Sealed wall, roof, ceiling and floor
c. Building elevations and sections
d. Water/vapor barrier, water proofing membrane, joint fillers and sealants
e. Fillers, air tightness tape, weather stripping, gaskets, door bottom sweeps, flashing and other sealing devices

CONSTRUCTION DOCUMENTATION

The following documents are needed for the issuance of an occupancy permit:

a. Shop drawings and as-built drawings of the actual completed system
b. Ocular inspection report of the completed building envelope system with reference to the building permit plans
c. Brochures and product labels
d. Technical specifications from manufacturers for airtight/vapor barrier and sealing products

A.1.2. GLASS PROPERTIES

CODE REFERENCE 10.1.2: REQUIRED MEASURES

Window-to-wall ratio (WWR) shall be balanced with solar heat gain coefficient (SHGC) of the glass to maintain flexibility in design. To describe, the higher the designed building WWR, the lower the required SHGC of glass windows shall be, and vise-versa. The building owner has the option to apply windows with low SHGC for a building with low WWR.

10.1.2.1. The size of the opening (with or without glass) shall be in accordance with the National Building Code of the Philippines

For each WWR value, the SHGC and visible light transmittance (VLT) shall be in accordance with Table 2.

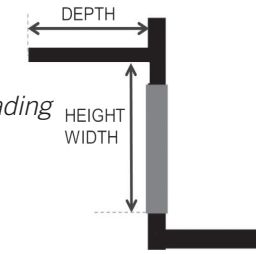
The SHGC requirement in Table 2 can be adjusted if sun breakers are provided in the windows:

- A sun breaker, or any shading device, plays a very important role in reducing solar heat gain,
- Prevents solar radiation before it enters the building,
- Reduces the cooling loads inside buildings.

External shading has the additional positive effect of improving the internal comfort on occupants. This must be applied only to windows to be shaded.

SHGC limits can be adjusted by multiplying it with the correction factors summarized in the following tables, using the formula:

$$SHGCadj = f \times SHGC$$



where:

SHGCadj	*is the adjusted solar heat gain coefficient limit for windows with external shading*
SHGC	*is the solar heat gain coefficient of the glass*
f	*is the SHGC correction factor for the external shading*
f=	*Overhang Depth (D)/Height from window sill to bottom of overhang (H)*

TABLE 2. SHGC AND VLT FOR DIFFERENT WWR

WWR	MAXIMUM SHGC	MINIMUM VLT
10	0.80	0.80
20	0.70	0.70
30	0.60	0.70
40	0.45	0.60
50	0.44	0.55
60	0.37	0.50
70	0.31	0.45
80	0.27	0.40
90	0.24	0.35

CODE REFERENCE 10.1.2: REQUIRED MEASURES

10.1.2.2. For intermediate values of D/H or D/W the lower figure of correction factor should be used as stated in Tables 3 and 4.

10.1.2.3. D is the depth of the shading device as projected from the building exterior wall. H or W is the height or distance of the bottom sill of the window from the bottom of the shading device.

10.1.2.4. Shading that is not attached to windows or placed on a wall with no window should not be counted.

TABLE 3. CORRECTION FACTOR FOR EACH HORIZONTAL OVERHANG SHADING PROJECTION

D/H	CORRECTION FACTOR
0.1	1.03
0.5	1.06
1	1.08

TABLE 4.CORRECTION FACTOR FOR EACH VERTICAL FIN SHADING PROJECTION

D/W	CORRECTION FACTOR
0.1	1.04
0.5	1.12
1	1.17

APPLICABILITY AND EXEMPTIONS

This requirement is applied to all building occupancies as indicated in Table 1.

There are no exemptions from this requirement.

RATIONALE

Compared to wall assemblies, window glazing transfers more heat and hence, it is ideal for reducing the amount of glazing with respect to the wall in order to reduce internal heat gains.

The requirement of WWR needs to be balanced with the amount of daylight coming through the glazed area.

FIGURE 20: Completed building showing the application of sun breakers over the windows

SHGC is used to determine the amount of solar heat admitted through the glass divided by the total solar radiation incident on the glass.

Visible Light Transmittance (VLT) is used to determine the amount of light transmitted through the glass.

DESIGN APPLICATION

1) WINDOW-TO-WALL RATIO (WWR) – determine the proposed WWR

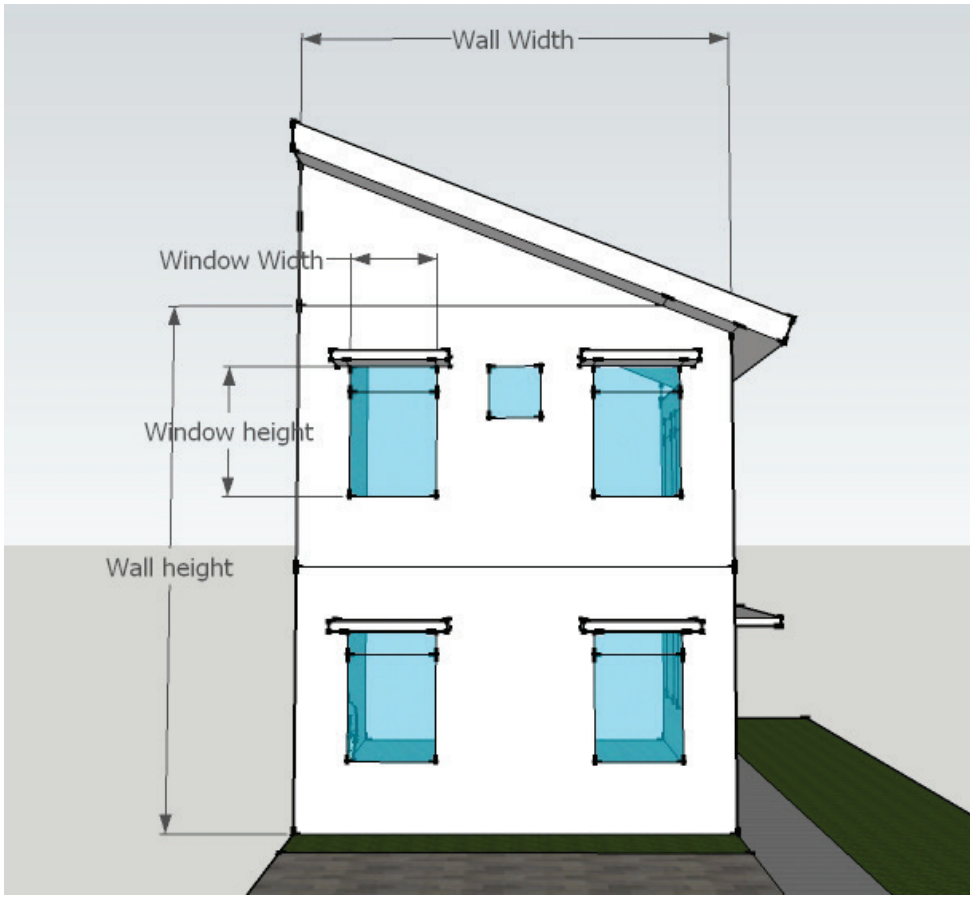


FIGURE 21: Building sketch showing relationship between window area and wall area

$$\text{WINDOW-TO-WALL RATIO} = \frac{\text{[NET GLAZING AREA] (total window area including frames)}}{\text{[GROSS WALL AREA] (Width of total wall area x height from ground floor to bottom of roof eaves)}}$$

The WWR is the ratio of vertical fenestration area to gross exterior or wall area. The fenestration area is the rough opening, i.e., it includes the frame, sash, and other non-glazed window components. The gross exterior wall is measured horizontally from the exterior surface; it is measured vertically from the ground floor to the bottom of the roof.[4]

For curtain wall systems, components that are opaque (e.g. aluminum composite panels, glass components with opaque finish or back pans), are not to be considered glazed components and therefore, not part of the "net glazing area".

2) DETERMINING SHGC AND VLT

TABLE 5. SHGC CALCULATION FORM *(SHGC Calculator in DPWH website)*

BUILDING ELEVATIONS (a)	GROSS WALL AREA (SQ.M) (b)	NET GLAZING AREA (SQ.M) (c)	WWR (%) (d)	REQUIRED SHGC (e)	CORRECTION FACTOR (F) (f)	ADJUSTED SHGC (SHGC *adj*) (g)
North	Total wall width (W) in meters x wall height (H) in meters	Total window (window W x H)	Summary of window area (c) ÷ Summary of wall area (b) x 100	Using the computed WWR, refer to Table 2 for the required SHGC	Overhang depth (D) ÷ Height (H) from window sill to bottom of overhang	F x SHGC (f x e)
East	Total wall W x H	Total window (window W x H)				
South	Total wall W x H	Total window (window W x H)				
West	Total wall W x H	Total window (window W x H)				
Total	Summary of wall area	Summary of window area				

Lower heat levels indoors are highly dependent on the Solar Heat Gain Coefficient and Visible Light Transmittance, as seen below.

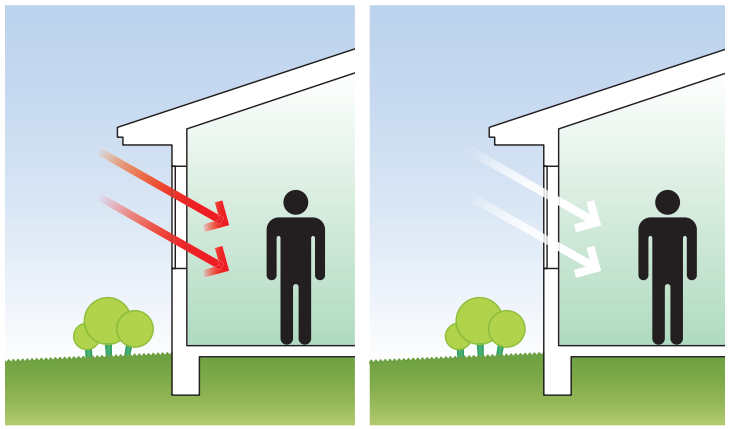


FIGURE 22: Solar Heat Gain Coefficient (SHGC) and Visible Light Transmittance (VLT)

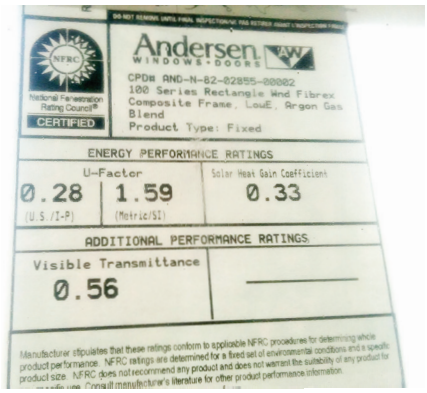


FIGURE 23: Window performance label showing results of SHGC and VLT

3) APPLICATION OF OVERHANGS OR SUN BREAKERS – can also be done to comply with the required SHGC. Using sun breakers such as horizontal louvers or baffles (multiple horizontal shading devices), for example, computing the shading factor will sum up the depth (D) and height (H) of each louver equivalent to a singular overhang. The correction factor (f) can be computed through this, and the same formula used in computing for the adjusted SHGC.

SHADING DEVICES[5]

When it comes to blocking out direct rays, there are many options.

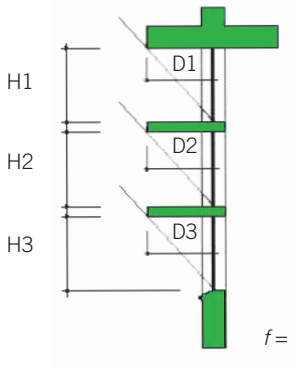
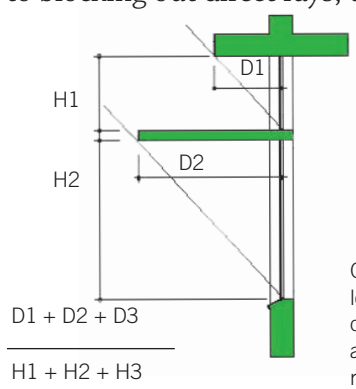
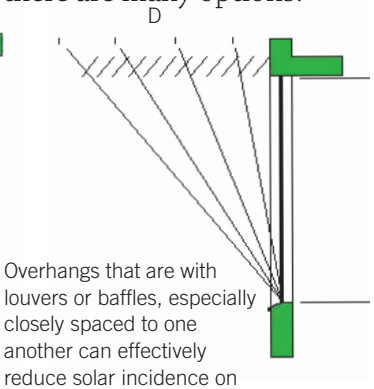


FIGURE 24: Horizontal sun breaks



$$f = \frac{D1 + D2 + D3}{H1 + H2 + H3}$$

Where H is the window height, and D is the sun break or overhang depth



Overhangs that are with louvers or baffles, especially closely spaced to one another can effectively reduce solar incidence on the window glass.

DESIGN DOCUMENTATION

The following documents are needed for the building permit application:

a. Architectural Basic Plans - showing in particular the Window ID tags
b. Building Elevations – to serve as basis in calculating WWR
c. Building Sections – to serve as basis in calculating shading factors
d. SHGC Calculation Form Table 5 to be included in the sheet of building elevations
e. Window Schedule and Elevations – to reflect reference to window ID tags, dimensions, and type of glass to be used
f. Window and Glass Specification – SHGC and VLT

CONSTRUCTION DOCUMENTATION

The following documents are needed for the issuance of an occupancy certificate:

a. Ocular inspection report of the completed building envelope system with reference to the building permit plans, including the design application documents
b. Product labels/Nameplate labels
c. Brochures
d. Technical specifications from manufacturers for window and glass products
e. Shop drawings/as-built drawings of actual systems installed.

A.1.3. NATURAL VENTILATION

CODE REFERENCE 10.2: REQUIRED MEASURES

10.2.1. Operable window or balcony door shall be provided in regularly occupied spaces. The size of the opening shall be equal to at least 10% of the floor area of regularly occupied spaces.

10.2.2. All operable windows shall be provided with safety features for protection against strong winds, water penetration, and protection for building occupants including child safety and security.

APPLICABILITY AND EXEMPTIONS

This requirement is applied to all building occupancies as indicated in Table 1.

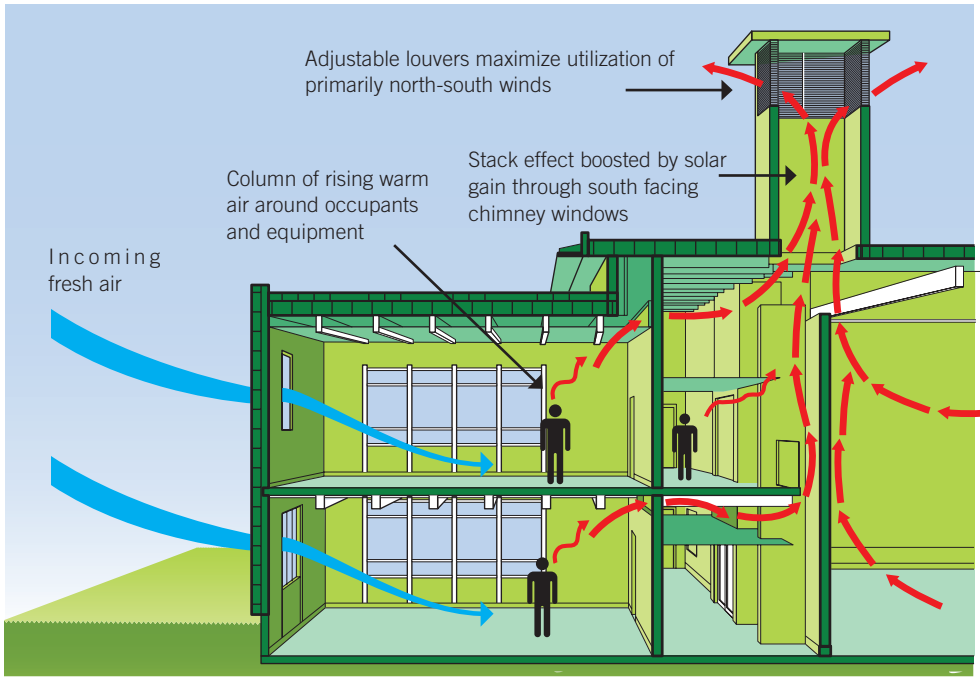
There are no exemptions from this requirement.

RATIONALE

This measure will give building occupants the flexibility and opportunity to use natural ventilation for free cooling and fresh air in regularly occupied spaces. This measure will limit the tendency to create glass-sealed box type buildings. Size of each room and space shall be consistent with the occupancy load of the National Building Code of the Philippines.

The flow of air into, around, and out of indoor areas is important to ensure a healthy living space for occupants.

FIGURE 25: Natural ventilation in a building.



FIXED WINDOW
0% fresh air

AWNING/PROJECTED WINDOW
12%-30% fresh air depending on wind direction

SLIDING WINDOW
40% maximum fresh air

ALTAIR LOUVER
90% fresh air regardless of wind direction

FIGURE 26: Different types of windows with the allowed average amount of air into the building

DESIGN APPLICATION

1) OPERABLE WINDOWS – provide operable windows equivalent to at least 10% of the room space floor area
2) REQUIRED AREA FOR OPERABLE WINDOW OPENINGS – computed through the use of Table 6

TABLE 6. OPERABLE WINDOW AREA COMPUTATION *(SHGC Calculator in DPWH website)*

FREQUENTLY OCCUPIED BUILDING SPACE (a)	FLOOR AREA (SQ.M) (b)	REQUIRED OPERABLE WINDOW AREA (MIN. 10% OF FLOOR AREA) (SQ.M) (c)	DESIGNED OPERABLE WINDOW AREA (SQ.M) (d)
Building room space #1	Design specified	Room space floor area #1 (b) × 0.10	Designer specified [Total openable window (W) x length (L)]
Building room space #2	Design specified	Room space floor area #2 (b) × 0.10	Designer specified [Total openable window (W) x length (L)]
Building room space N...	Design specified	Room space floor area N (b) × 0.10	Designer specified [Total openable window (W) x length (L)]

3) SAFETY FEATURES – as necessary, provide safety features for operable windows and balcony doors.

For each frequently occupied room space, compute for the floor area. The 10% of this floor area should be the minimum required operable window area for the room space. Compare this value with the designed operable window area. Designed operable window area should be equal to or more than 10% of the GB Code minimum requirement.

Well-planned placement of windows and doors can maximize the natural flow of air and sunlight.

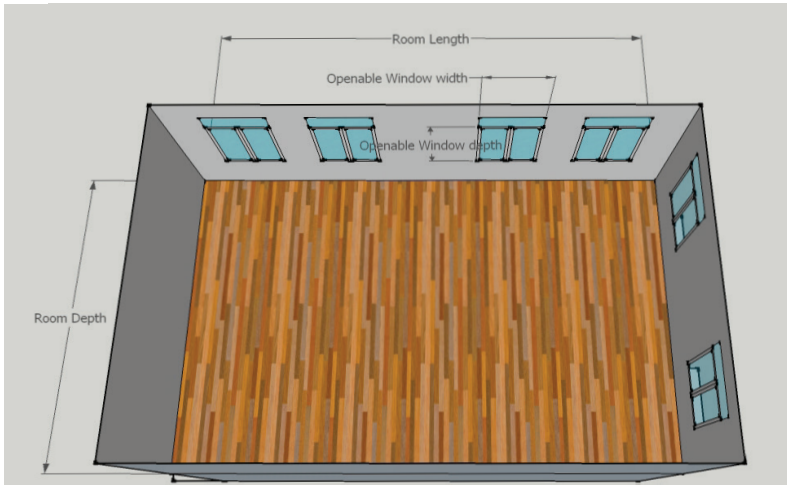


FIGURE 27: Building room space sketch showing room measurements as basis for operable window area computation

DESIGN DOCUMENTATION

The following documents are needed for the building permit application:

a. Architectural Floor Plans – showing location of windows with window ID tags among building spaces
b. Building Elevations – showing extent of windows and location of operable windows with window ID tags
c. Building Sections – showing vertical location of operable windows with window id tags
d. Window Schedules & Elevations – showing detailed application of operable windows
e. Window Details – showing details of operable windows and safety features
f. Operable window area computation. Table 6 to be included in the first sheet of the window schedule.

SAMPLE OF OPERABLE WINDOWS

Operable windows give you the convenience of being able to adapt the building environment depending on the weather.

FIGURE 28: Building elevation showing operable windows with window ID tag

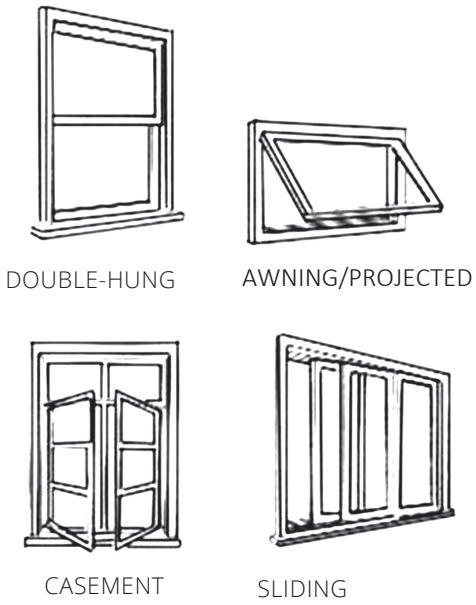


FIGURE 29: Different types of operable windows

CONSTRUCTION DOCUMENTATION

The following documents are needed for the issuance of an occupancy certificate:

a. Ocular inspection report of the completed building envelope system with reference to the building permit plans including the design application documents
b. Product labels/Nameplate labels
c. Brochures
d. Technical specifications from manufacturers for window products
e. Shop drawings/as-built drawings of actual systems installed

A.1.4. BUILDING ENVELOPE COLOR

CODE REFERENCE 10.3: REQUIRED MEASURES

10.3.1. Metal roof surfaces shall either be colored white or have a minimum SRI of 70.

TABLE 7. SOLAR REFLECTANCE INDEX (SRI) VALUES OF BASIC COLOR COATINGS[6]

METAL SURFACE	SRI
Reflective white	86 to 92
Basic white	80 to 88
Beige/Tan	74 to 80
Dark brown	0 to 33
Light to medium brown	45 to 56
Light to medium grey	39 to 63
Dark grey	0 to 41
Blue	23 to 30
Light to medium blue	35 to 38
Red	28 to 36
Terracotta red	38 to 40
Green	25 to 32
Light to medium green	30 to 48

APPLICABILITY AND EXEMPTIONS

This requirement is applied to all building occupancies as indicated in Table 1.

There are no exemptions from this requirement.

RATIONALE

Light- colored building envelope, especially the roof areas which are the most vulnerable, can reduce heat transfer from the outside to the inside of the building by having surfaces with a high Solar Reflectance Index (SRI).

DESIGN APPLICATION

1) BUILDING METAL ROOF SURFACE, COLORED OR WHITE, OR
2) BUILDING METAL ROOF SURFACE WITH A MINIMUM SRI OF 70

When it comes to absorbing heat, colors matter. Lighter colors are better for buildings to remain cooler.

FIGURE 30: Roof with light color finish

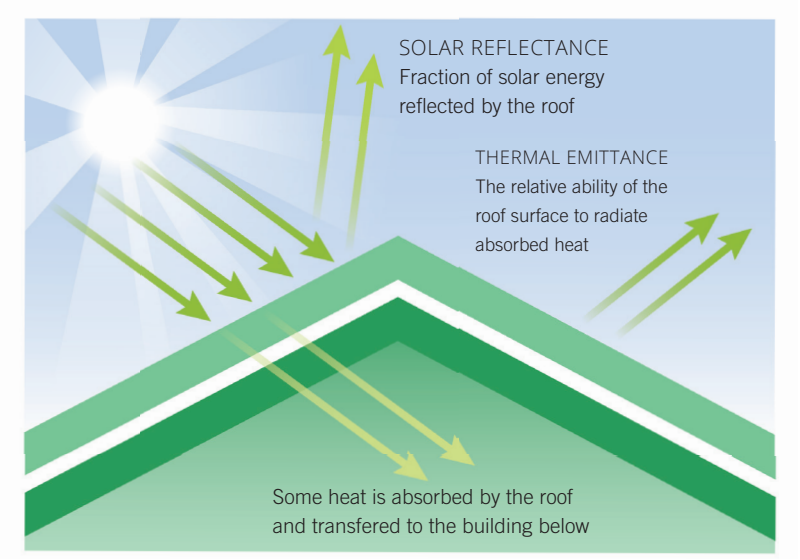


FIGURE 31: Reflectance of solar radiation by roofing materials

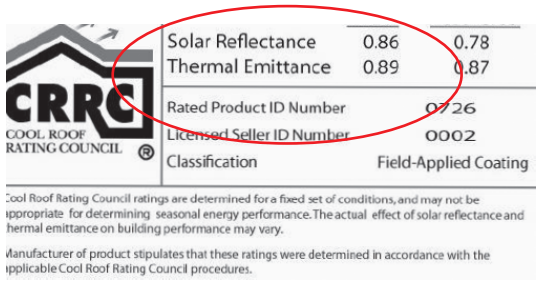


FIGURE 32: Sample of Cool Roof Rating Council (CRRC) roofing thermal performance product certification and labelling. CRRC is a third party certification and labelling organization for roof products in North America.

DESIGN DOCUMENTATION

The following documents are needed for the building permit application:

a. Roof plan – showing the specification callout including the color of the roof and SRI Value
b. Technical Specifications – describing the detailed specifications of the roofing product & color with manufacturer information on SRI value certification

CONSTRUCTION DOCUMENTATION

The following documents are needed for the issuance of an occupancy certificate:

a. Ocular inspection report of the completed building envelope system with reference to the building permit plans, including roof color specifications and SRI value
b. Product labels/Nameplate labels
c. Brochures
d. Technical specifications from manufacturers for building roofing color product
e. Shop drawings/as-built plans of actual system installed

A.1.5. ROOF INSULATION

CODE REFERENCE 10.1.5: REQUIRED MEASURES

Buildings shall be provided with roof insulation so that the average thermal resistance value (R-Value) of the roof is at least R-8.

TABLE 8. R-VALUE OF COMMON ROOF INSULATION[7]

INSULATION	R-VALUE/INCH (25.4 MM)
Polyisocyanurate	5.6 to 8.0
Polyurethane	5.6 to 6.5
Closed cell spray foam	5.5 to 6.0
Phenolic foam	4.8
Urea formaldehyde foam	4.6
Plastic fiber	4.3
Mineral fiber	4.2 to 4.5
Cementitious foam	3.9
Polystyrene	3.8 to 5.0
Fiberglass	3.7
Rockwool	3.7
Rigid foam	3.6 to 6.7
Cellulose	3.6 to 3.8
Open cell spray foam	3.6
Sheep's wool	3.5
Hemp	3.5
Cotton	3.4
Loose cellulose	3.0 to 3.7
Mineral wool	2.8 to 3.7
Straw	2.4 to 3.0
Vermiculite/Perlite	2.4
Reflective bubble foil	1 to 1.1

TABLE 9. INSULATING VALUES OF SOME COMMON CONSTRUCTION MATERIALS

INSULATION	R-VALUE (1/C) *Inverse of Conductance*	R-VALUE PER 25.4 MM THICK (1/K)
Metal Roof	0.04	
Aluminum Alloy	0.01	
Plastic Roof		
Cement Tile Roof	0.21	
Clay Tile - 3-inch (1 Cell Deep)	0.8	
Asphalt Shingles	0.44	
Asphalt		0.12 to 0.34
Straw Thatch		2.04
Fiberboard - 1/2 inch	1.32	
Plywood - 1/2 inch	0.62	
Plywood - 3/4 inch	0.94	
Concrete (Sand, Gravel) 140 lb./cu. ft.		0.05 to 0.11
Concrete (Sand, Gravel) 80 lb./cu. ft.		0.24 to 0.30
Cement Mortar		0.10
Stone		0.01
Marble/Granite/Limestone		0.03 to 0.12
Ceramic Tile - 1 inch	0.08	
Stone Tile - 1 inch	0.05	
Air Space up to 4 inches	1	
Inside Surface Air Film	0.61	
Exterior Surface Air Film	0.17	
Membrane	0.06 to 0.12	
Soil (with 20% Moisture Content)		0.25 to 1.0
Sand - 1/2 inch	0.1	

APPLICABILITY AND EXEMPTIONS

This requirement is applied to all building occupancies as indicated in Table 1.

There are no exemptions from this requirement.

RATIONALE

Insulation can help reduce heat gain in a building through the building envelope. This improves thermal comfort and acoustic quality, and reduces the load on the air conditioning system.

DESIGN APPLICATION

1) INSULATED BUILDING ROOF – through the application of roof insulation or built-up roof system with minimum R-8 thermal resistance value.

Proper and appropriate insulation keeps the heat indoors at a minimum level.

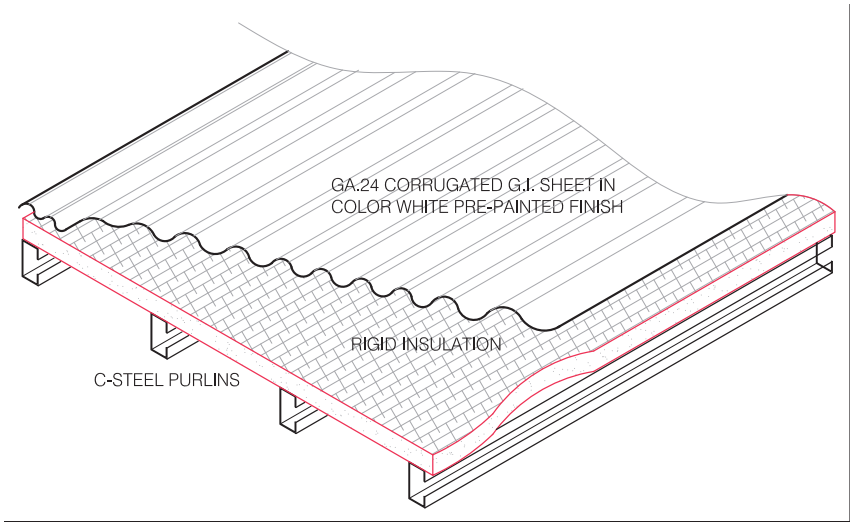


FIGURE 33: Detail of roof with insulation under the metal sheet

FIGURE 34: Mineral wool insulation installed under metal roof

DESIGN DOCUMENTATION

Documents needed for the building permit application are the following:

a. Roof plan showing callout of insulating material used and/or short specifications of roofing system
b. Building Sections showing application of insulating material plus callout of insulating material used
c. Technical Specifications including insulating material specifications and manufacturer certification details
d. Product label and brochures of insulating material indicating R-value, Table 8
e. Building roof system insulating computation Table 9 to be included in Roof plan sheet

TABLE 10. BUILDING COMPONENT R-VALUE COMPUTATION TABLE
(Thermal Resistance Calculator in DPWH website)

BUILDING ROOF/ DECK COMPONENT (a)	R-VALUE 1/C OF THE MATERIAL (b)	R-VALUE PER 25.4 MM (c)	TOTAL INSULATING VALUE (d)
Component #1	Component #1 R-value	Component #1 R-value/25.4 mm thickness x applied thickness	
Component #2	Component #2 R-value	Component #2 R-value/25.4 mm thickness x applied thickness	
Component #3	Component #3 R-value	Component #3 R-value/25.4 mm thickness x applied thickness	
Component N...	Component N.. R-value	Component N... R-value/25.4 mm thickness x applied thickness	
TOTAL	Total sum of R-value	Total sum of R-value	Total sum (b) + (c)

Identify and tabulate the roofing materials (whether single roof or built-up roof assembly). Per roof material, fill-in the specified R-value of the material (1/C) or through the rated R-value per thickness. The R-value information can be extracted from product technical brochures and specifications and certifications. The ASHRAE Fundamentals Handbook is also one reference for this kind of information. After tabulating all the values, they can be summed up to calculate the total R-value of the roof.

TABLE 11. SAMPLE R-VALUE COMPUTATION OF A REINFORCED CONCRETE ROOF DECK

BUILDING ROOF/DECK COMPONENT	R-VALUE I/C	R-VALUE PER 25.4 MM	TOTAL INSULATING VALUE
2 in. Cement Mortar		0.01	0.02
Membrane	0.06		0.06
5 in. RC Slab		0.08	0.40
1 in. Plaster		0.10	0.10
Inside Surface Air Film		0.61	0.61
Component # 6			
Total			1.19

CONSTRUCTION DOCUMENTATION

The following documents are needed for the issuance of an occupancy certificate:

a. Ocular inspection report of the completed building envelope system with reference to the building permit plans, including roof plan and insulation specifications and Building Component R-Value Computation - Table 8
b. Product labels/Nameplate labels
c. Brochures
d. Technical specifications from manufacturers for roof insulation products
e. Shop drawings/as-built drawings of actual roof insulation system

A.2. MECHANICAL SYSTEMS

Mechanical systems require the use of efficient machinery and equipment. Efficiency is usually expressed as the ratio of the power delivered by a mechanical system to the power supplied to it. Because of friction, this efficiency is always less than one.[8]

An efficient mechanical system, specifically for air-conditioning of room spaces, reduces energy consumption while maintaining occupant comfort. Goals are achieved by:[9]

a) Maximizing equipment efficiency at design conditions and during part load operation,
b) Minimizing distribution losses of heating and cooling energy,
c) Optimizing system control to minimize unnecessary operation.

The following are elements of an efficient cooling system.

WATER-COOLED CHILLED WATER COOLING SYSTEM – employs water as the condensing medium and uses pumps to circulate the water through the condenser and out to a cooling tower that ejects the heat to the atmosphere.

AIR HANDLING UNIT – delivers cooled air inside the building

CHILLED WATER PIPES – convey cooled water supplied to AHUs

PUMPS – help circulate water within the chilled water system

DIRECT EXPANSION (DX) – air-conditioning system uses refrigerants as cooling medium. This system includes energy efficient systems such as the variable refrigerant flow (VRF) and inverter type air-con units.

WINDOW and SPLIT TYPE AIR-CONDITIONING UNITS

FIGURE 35: Elements of an efficient cooling system

A.2.1. AIR-CONDITIONING EQUIPMENT

CODE REFERENCE 10.5.1: REQUIRED MEASURES

The cooling equipment shall meet or exceed the minimum efficiency requirement of the 2010 PSVARE Standards for Energy of Buildings as indicated in Tables 12 and Table 13.

TABLE 12. ELECTRICALLY-OPERATED UNITARY AIR CONDITIONERS AND CONDENSING UNITS

EQUIPMENT TYPE	SIZE CATEGORY (IN BTU/H)	SIZE CATEGORY (IN KJ/H)	SUB-CATEGORY OR RATING CONDITIONS	MINIMUM EFFICIENCY	TEST PROCEDURE
Air conditioners, air-cooled	<65,000	<68,585	Split systems	14.0 SEER 12.0 EER	AHRI 210/240; PNS ISO 5151:2014; PNS ISO 16358-1
			Single packaged	14.0 SEER 11.6 EER	
Through-the-wall, air-cooled	<30,000	<31,655	Split systems	12.0 SEER	AHRI 210/240; PNS ISO 5151:2014; PNS ISO 16358-1
			Single packaged	12.0 SEER	
Small-duct high velocity, air-cooled	<65,000	<68,585	Split systems	10.0 SEER	AHRI 210/240; PNS ISO 5151:2014; PNS ISO 16358-1
Air conditioners, air-cooled	≥65,000 &	≥68,585 &	Split systems and single packaged	11.5 EER	AHRI 340/360; PNS ISO 5151:2014; PNS ISO 16358-1
	<135,000	<142,447		11.3 EER	
	≥135,000 &	≥142,447		11.5 EER	
	<240,000	<253,238		11.3 EER	
	≥240,000 &	≥253,238 &		10.0 EER	
	<760,000	<801,922		9.8 EER	
	≥760,000	≥801,922		9.7 EER	
				9.5 EER	
Air conditioners, water and evaporatively cooled	<65,000	<68,585	Split systems and single packaged	14.0 EER	AHRI 210/240; PNS ISO 5151:2014; PNS ISO 16358-1
				14.0 EER	AHRI 340/360; PNS ISO 5151:2014; PNS ISO 16358-1
	≥65,000 & 135,000	≥68,585 & 142,447		13.8 EER	
	≥135,000 &	≥142,447 &		14.0 EER	
	240,000	253,238		13.8 EER	
	≥ 240,000	≥ 253,238		14.0 EER	
				13.8 EER	

TABLE 13. WATER CHILLING PACKAGES - MINIMUM EFFICIENCY REQUIREMENTS

EQUIPMENT TYPE	SIZE CATEGORY		MINIMUM EFFICIENCY FULL LOAD	TEST PROCEDURES
Air-cooled chillers with condenser, electrically operated	< 150 tons	EER	10	AHRI 550/590
	≥150 tons	EER	10	
Air-cooled chillers without condenser, electrically operated	All capacities	EER	Condenserless units shall be rated with matched condensers	AHRI 550/590
Water-cooled, electrically operated, positive	All capacities	Kw/ton	Reciprocating units required to comply with water-cooled positive displacement requirements	AHRI 550/590
Water-cooled, electrically operated, positive displacement	< 75 tons	Kw/ton	0.78	AHRI 550/590
	≥ 75 tons and < 150 tons	Kw/ton	0.775	
	≥ 150 tons and < 300 tons	Kw/ton	0.68	
	≥ 300 tons	Kw/ton	0.62	
Water-cooled, electrically operated, centrifugal	< 150 tons	Kw/ton	0.634	AHRI 550/590
	≥ 150 tons and < 300 tons	Kw/ton	0.634	
	≥ 300 tons and < 600 tons	Kw/ton	0.576	
	≥ 600 tons	Kw/ton	0.57	
Air-cooled absorption single effect	All capacities	COP	0.6	AHRI 560
Water-cooled absorption single effect	All capacities	COP	0.6	
Absorption double effect indirect-fired	All capacities	COP	1	
Absorption double effect direct-fired	All capacities	COP	1	

APPLICABILITY AND EXEMPTIONS

This requirement is applied to all building occupancies as indicated in Table 1.

RATIONALE

Air-conditioning typically accounts for more than 50% of total electricity costs in a centrally air-conditioned building. Hence, the efficiency of an air-conditioning system is of prime importance. The heart of the air-conditioning system is the cooling system—typically chillers in large buildings. Hence, it is important to procure an efficient cooling system.

DESIGN APPLICATION

1) EFFICIENT AIR-CONDITIONING EQUIPMENT – meets or exceeds the minimum efficiency requirements in EER, COP or kW/Ton for all air-conditioning equipment

DESIGN DOCUMENTATION

Documents needed for the building permit application:

a. Equipment Schedule – showing the different properties of the cooling equipment, including the efficiency rating, represented by EER, kW/ton or COP
b. Air-conditioning and Ventilation Layout – schematic diagrams showing the location of the cooling equipment with their equipment ID tag
c. Technical specifications – details the technical make-up or specifications of the cooling equipment to be used, including expected efficiency rating

You will find the following indications as part of an efficient air-conditioning equipment.

FIGURE 36: Airconditioning System[10]

ENERGY EFFICIENCY RATIO (EER)

ING CAPACITY (MIN)												
FAN COIL UNITS												
TION	QTY	GRAND TOTAL HEAT CAP. WATTS(BTU/H)	SH CAPACITY WATTS(BTU/H)	SUPPLY AIR L/S (CFM)	ENT. DB °C (°F)	ENT. WB °C (°F)	EVAP FAN EXT.SP	EVAP FAN FAN POWER	ENERGY EFFICIENCY RATIO (EER)	ELECTRICAL CHARACTERISTICS VOLTS	ELECTRICAL CHARACTERISTICS PHASE	ELECTRICAL CHARACTERISTICS HERTZ
	–	–	–	–	–	–	–	–	–	–	–	–

FIGURE 37: Schedule of airconditioning equipment showing efficiency ratings for cooling equipment of motor efficiencies for fans and pumps[11]

COEFFICIENT OF PERFORMANCE (COP) MIN.

WATER COOLED CHILLERS:

UNIT DESIGNATION	QTY.	LOCATION	COOLING CAPACITY (KW/TR)	TYPE	C O P (MIN.)	REFRIGERANT	CONDENSER DATA WATER FLOW (LPS)	CONDENSER DATA ECOWT (°C)	CONDENSER DATA LCOWT (°C)	CONDENSER DATA NO. OF PASS	CONDENSER DATA FOULING FACTOR (m2–°C/kW)

MIN. PUMP EFFICIENCY (%)MIN.

WATER PUMPS:

UNIT DESIGNATION	QTY	LOCATION	SERVICE	TYPE	WATER FLOW RATE (L/S)	TOTAL DYNAMIC HEAD (m. w.g.)	PUMP SPEED RPM	MIN. PUMP EFFICIENCY %	DRIVE MOTOR (KW)	ELECTRICAL CHARACTERISTICS VOLTS	ELECTRICAL CHARACTERISTICS PHASE	ELECTRICAL CHARACTERISTICS HERTZ

MIN. FAN MOTOR EFFICIENCY (%)

COOLING TOWERS:

UNIT DESIGNATION	QTY	LOCATION	COOLING WATER FLOW RATE (L/S)	ENTERING WATER TEMP. (°C)	LEAVING WATER TEMP. (°C)	AMBIENT WET–BULB TEMP (°C)	MIN. FAN MOTOR EFFICIENCY (%)	FAN MOTOR (KW)	ELECTRICAL CHARACTERISTICS VOLTS	ELECTRICAL CHARACTERISTICS PHASE	ELECTRICAL CHARACTERISTICS HERTZ

ENERGY EFFICIENCY RATIO (EER)

AIR-COOLED CONDENSING UNITS:

UNIT DESIGNATION	QTY	COOLING CAPACITY (W)	AIR ENTERING CONDENSER TEMPERATURE (°C)	SATURATED SUCTION TEMPERATURE (°C)	COMPRESSOR POWER INPUT (KW)	CONDENSER FAN (W)	ENERGY EFFICIENCY RATIO (EER)	ELECTRICAL CHARACTERISTICS VOLTS	ELECTRICAL CHARACTERISTICS PHASE	ELECTRICAL CHARACTERISTICS HERTZ

MIN. FAN MOTOR EFFICIENCY (%)

VENTILATING FANS :

UNIT DESIGNATION	QTY	AREA SERVED	TYPE	AIR FLOW RATE (L/S)	TOTAL STATIC PRESSURE (Pa)	MIN. FAN MOTOR EFFICIENCY (%)	FAN MOTOR (W)	ELECTRICAL CHARACTERISTICS VOLTS	ELECTRICAL CHARACTERISTICS PHASE	ELECTRICAL CHARACTERISTICS HERTZ

CONSTRUCTION DOCUMENTATION

The following documents are needed for the issuance of an occupancy certificate:

a. Ocular inspection report of the completed mechanical system with reference to the building permit plans including the Equipment Schedule showing efficiency ratings
b. Product labels
c. Equipment nameplate rating
d. Brochures
e. Technical specifications from the manufacturer of air-conditioning equipment

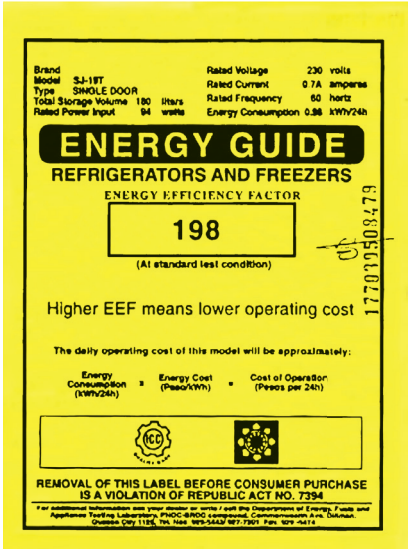


FIGURE 38: Sample of an energy guide label for an air conditioning unit indicating the EER

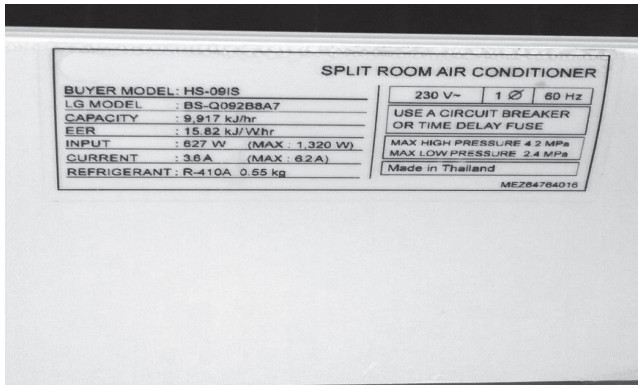


FIGURE 39: Sample of a nameplate rating for a split type air conditioning unit

A.2.2. WATER HEATING SYSTEM

CODE REFERENCE 10.5.2: REQUIRED MEASURES

Applicable buildings shall comply with the minimum performance requirements for water heating in the 2010 PSVARE Standards, as shown in Table 14.

TABLE 14. MINIMUM PERFORMANCE REQUIREMENTS FOR WATER HEATING EQUIPMENT

EQUIPMENT TYPE	SIZE CATEGORY (INPUT)		SUBCATEGORY OR RATING CONDITION		PERFORMANCE REQUIRED		TEST PROCEDURE
	I-P	SI	I-P	SI	I-P	SI	
Electric Water Heaters	12 kW	12 kW	Resistance ≥ 20 gal	Res ≥ 76 L	EF ≥ 0.97 - 0.00132V	EF ≥ 0.97 - 0.00132V	DOE 10 CFR Part 430
	> 12 kW	> 12 kW	Resistance ≥ 20 gal	Res ≥ 76 L	SL ≤ 20 + 35√V, Btu/h		ANSI Z21.10.3
	All sizes	All sizes	Heat Pump	Heat Pump	EF ≥ 2.0	EF ≥ 2.0	DOE 10 CFR Part 430
Gas Storage Water Heaters	≤ 75,000 Btu/h	≤ 22 kW	≥ 20 gal	≥ 76 L	EF ≥ 0.67	EF ≥ 0.67	DOE 10 CFR Part 430
	> 75,000 Btu/h	> 22 kW	< 4,000 (Btu/h)/gal	< 0.31 kw/L	E ≥ 80% and SL ≤ (Q/800 + 110√V), Btu/h		ANSI Z21.10.3
Gas Instantaneous Water Heaters	> 50,000 Btu/h and < 200,000 Btu/h	> 15 kW and < 58kW	≥ 4,000 (Btu/h)/gal and < 2 gal	≥ 0.31 kw/L and 7.57 L	EF ≥ 0.82	EF ≥ 0.82	DOE 10 CFR Part 430
	≤ 200,000 Btu/h	≤ 58 kW	≥ 4,000 (Btu/h)/gal and < 10 gal	≥ 0.31 kw/L and 37.85 L	E ≥ 80%	E ≥ 80%	ANSI Z21.10.3
	≥ 200,000 Btu/h	≥ 58 kW	4000 (Btu/h)/gal and ≥ 10 gal	0.31 kw/L and≥ 37.85 L	E ≥ 80% and SL ≤ (Q/800 + 110√V), Btu/h		
Oil Storage Water Heaters	≤ 105,000 Btu/h	≤ 31 kW	≥ 20 gal	≥ 76 L	EF ≥ 0.59 - 0.0019V	EF ≥ 0.59 - 0.0019V	DOE 10 CFR Part 430
	> 105,000 Btu/h	>31 kW	< 4,000 (Btu/h)/gal	< 0.31 kw/L	E ≥ 78% and SL ≤ (Q/800 + 110√V), Btu/h		
Oil Instantaneous Water Heaters	≤ 210,000 Btu/h	≤ 62 kW	≥ 4,000 (Btu/h)/gal and < 2 gal	≥ 0.31 kw/L and <7.87 L	EF ≥ 0.59 - 0.0019V	EF ≥ 0.59 - 0.0019V	
	> 210,000 Btu/h	> 62 kW	≥ 4,000 (Btu/h)/gal and < 10 gal	≥ 0.31 kw/L and <37.85 L	E ≥ 80%	E ≥ 80%	ANSI Z21.10.3
	> 210,000 Btu/h	> 62 kW	≥ 4,000 (Btu/h)/gal and ≥10 gal	≥ 0.31 kw/L and ≥37.85 L	E ≥ 78% and SL ≤ (Q/800 + 110√V), Btu/h		
Hot-water supply boilers, gas and oil	300,000 Btu/h and < 12,500,000 Btu/h	88 kW and < 3664 kW	≥ 4,000 (Btu/h)/gal and < 10 gal	≥ 0.31 kw/L and <37.85 L	E ≥ 80%	E ≥ 80%	ANSI Z21.10.3
Hot-water supply boilers, gas			≥ 4,000 (Btu/h)/gal and ≥10 gal	≥ 0.31 kw/L and ≥37.85 L	E ≥ 80% and SL ≤ (Q/800 + 110√V), Btu/h		
Hot-water supply boilers, oil			≥ 4,000 (Btu/h)/gal and ≥10 gal	≥ 0.31 kw/L and ≥37.85 L	E ≥ 78% and SL ≤ (Q/800 + 110√V), Btu/h		
Pool heaters oil and gas	All sizes	All sizes			E ≥ 78%	E ≥ 78%	ASHRAE 146
Heat pump pool heaters	All sizes	All sizes			≥ 4.0 COP	≥ 4.0 COP	ASHRAE 146
Unfired storage tanks	All sizes	All sizes			≥ R-12.5	≥ R-12.5	none

APPLICABILITY AND EXEMPTIONS

This requirement is applied to all building occupancies as indicated in Table 1.

Buildings with no water heating systems and buildings using solar water heating and/or heat pump for water are exempt.

RATIONALE

The use of energy-efficient water heating systems in buildings, by observing minimum power performance requirements, will help reduce energy consumption.

DESIGN APPLICATION

EFFICIENT WATER HEATER – meets or exceeds minimum performance requirements for water heating equipment

Following are a few examples of types of efficient water heaters commercially available.

FIGURE 40: Instantaneous water heaters

FIGURE 41: A typical storage-type water heater

DESIGN DOCUMENTATION

The following documents are needed for the building permit application:

a. Equipment schedule – showing water heating equipment, its properties and capacities, and efficiency rating
b. Plumbing and electrical power layout – showing location of water heating equipment and callout of capacities
c. Technical specifications – indicating full details and performance on the designed water heating equipment, including performance efficiency requirement

CONSTRUCTION DOCUMENTATION

The following documents are needed for the issuance of an occupancy certificate:

a. Ocular inspection report of the completed water heating system with reference to the building permit plans, including equipment schedule reflecting water heating equipment capacities, performance rating, layout
b. Product labels
c. Nameplate rating
d. Brochures
e. Technical specifications from manufacturer of water heating systems

A.2.3. VARIABLE SPEED DRIVES AND HIGH EFFICIENCY MOTORS

CODE REFERENCE 10.5.3: REQUIRED MEASURES

1.1.1.1. All motors for mechanical equipment over 5 kW shall be provided with variable speed drive and high efficiency motors in accordance with Table 15.

1.1.1.2. All motors of cooling towers shall be provided with variable speed drive and high efficiency motors as indicated in Table 15.

1.1.1.3. All motors for domestic pumps shall have high efficiency motors as indicated in Table 15.[12]

TABLE 15. MINIMUM MOTOR EFFICIENCIES (%)

NUMBER OF POLES =====>		2	4	6	2	4	6
SYNCHRONOUS SPEED (RPM) =====>		3600	1800	1200	3600	1800	1200
MOTOR HORSEPOWER		OPEN MOTORS			ENCLOSED MOTORS		
IP	SI						
(HP)	(KW)						
1	0.75	77.0	85.5	82.5	77.0	85.5	82.5
1.5	1.10	84.0	86.5	86.5	84.0	86.5	87.5
2	1.50	85.5	86.5	87.5	85.5	86.5	88.5
3	2.20	85.5	89.5	88.5	86.5	89.5	89.5
5	4.00	86.5	89.5	89.5	88.5	89.5	89.5
7.5	5.50	88.5	91.0	90.2	89.5	91.7	91.0
10	7.50	89.5	91.7	91.7	90.2	91.7	91.0
15	11.00	90.2	93.0	91.7	91.0	92.4	91.7
20	15.00	91.0	93.0	92.4	91.0	93.0	91.7
25	18.50	91.7	93.6	93.0	91.7	93.6	93.0
30	22.00	91.7	94.1	93.6	91.7	93.6	93.0
40	30.00	92.4	94.1	94.1	92.4	94.1	94.1
50	37.00	92.0	94.5	94.1	93.0	94.5	94.1
60	45.00	93.6	95.0	94.5	93.6	95.0	94.5
75	55.00	93.6	95.0	94.5	93.6	95.4	94.5
100	75.00	93.6	95.4	95.0	94.1	95.4	95.0
125	90.00	94.1	95.4	95.0	95.0	95.4	95.0
150	110.00	94.1	95.8	95.4	95.0	95.8	95.8
200	150.00	95.0	95.8	95.4	95.4	96.2	95.8
250	185.00	95.0	95.8	95.4	95.8	95.6	95.8
300	225.00	95.4	95.8	95.4	95.8	96.2	95.8
350	260.00	95.4	95.8	95.4	95.8	96.2	95.8
400	300.00	95.8	95.8	95.8	95.8	96.2	95.8
450	335.00	95.8	96.2	96.2	95.8	96.2	95.8
500	375.00	95.8	96.2	96.2	95.8	96.2	95.8

SOURCE: 2010 PSVARE Standards

APPLICABILITY AND EXEMPTIONS

This requirement is applied to all building occupancies as indicated in Table 1.

Kitchen ventilation fans are exempt from this requirement. Non-centralized air-conditioning systems in buildings are not required to employ variable speed controllers.

RATIONALE

Variable Speed Drive (VSD) describes the equipment used to control the speed of machinery by adjusting the frequency of the motor that is operated. Where process conditions demand adjustment of flow from a pump or fan, varying the speed of the drive may save more energy compared with other techniques for flow control.[13]

DESIGN APPLICATION

1) VSD AND HIGH EFFICIENCY MOTORS FOR MECHANICAL EQUIPMENT MORE THAN 5 KW – meet or exceed the minimum motor efficiencies in Table 15
2) VSD AND HIGH EFFICIENCY MOTORS FOR COOLING TOWERS
3) HIGH EFFICIENCY MOTORS FOR DOMESTIC PUMP – meet or exceed the minimum motor efficiencies in Table 15

Maximize energy efficiency with a VSD-equipped system, some examples follow.

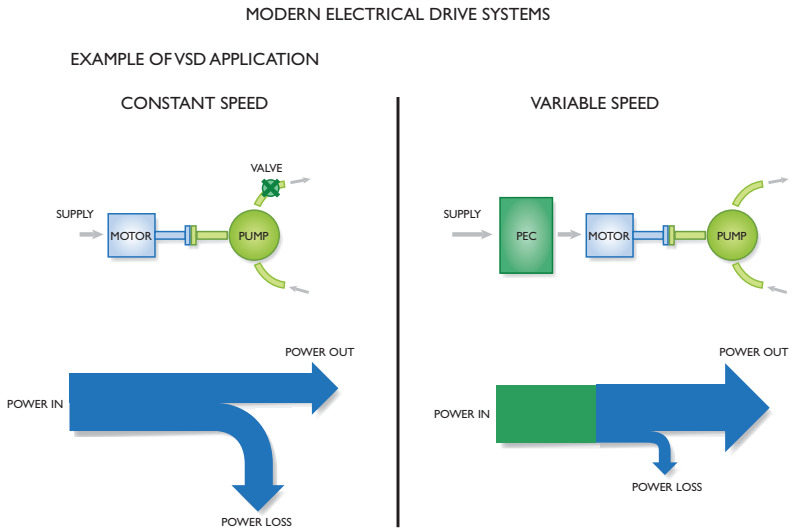


FIGURE 42: Pump operations with VSD

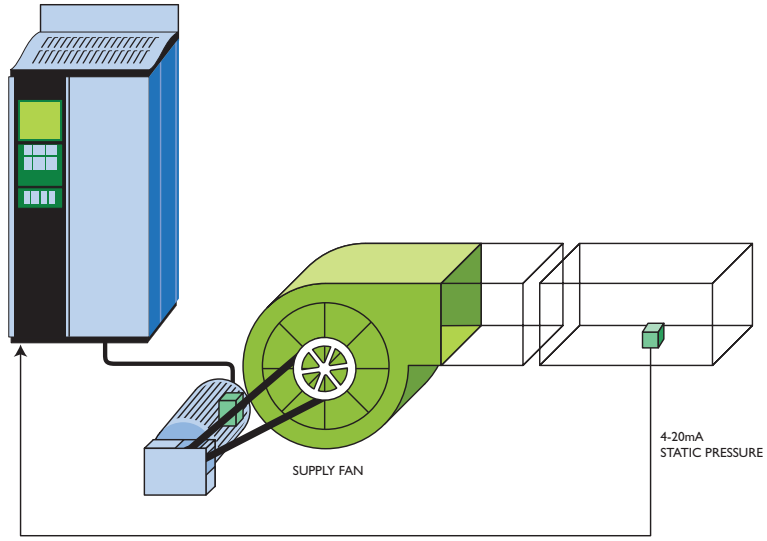


FIGURE 43: Fan motor connected to VSD

DESIGN DOCUMENTATION

The following documents are needed for the building permit application:

a. Equipment schedule – showing VSD, pump and fan motor equipment, their capacities and efficiency rating
b. Plumbing, electrical power layout and schematic diagram – showing location of water heating equipment and callout of capacities
c. Technical specifications – indicating full details and performance of the design of VSD, including performance efficiency requirement

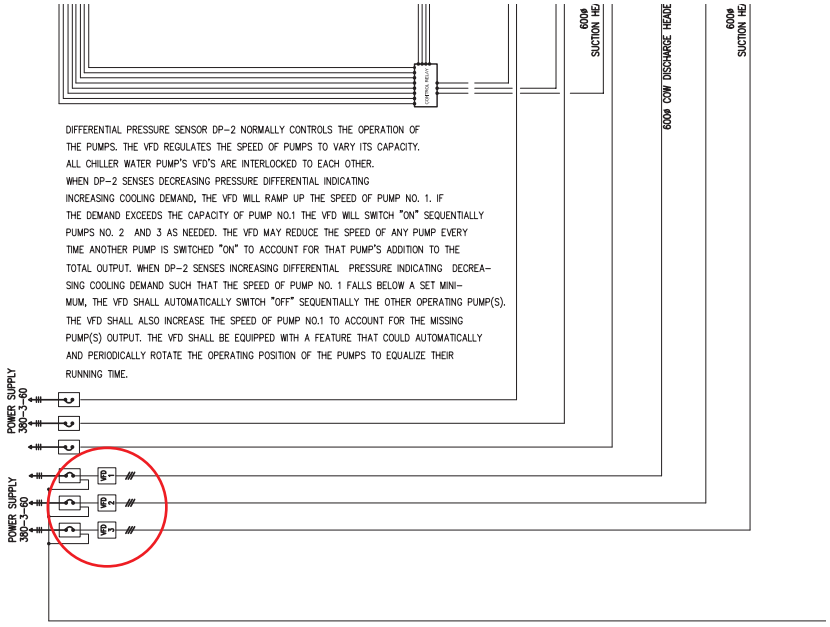


FIGURE 44: Partial schematic diagram showing application of VSD in water-cooled chilled water cooling system. Also note below the diagram description of VSD control and function.

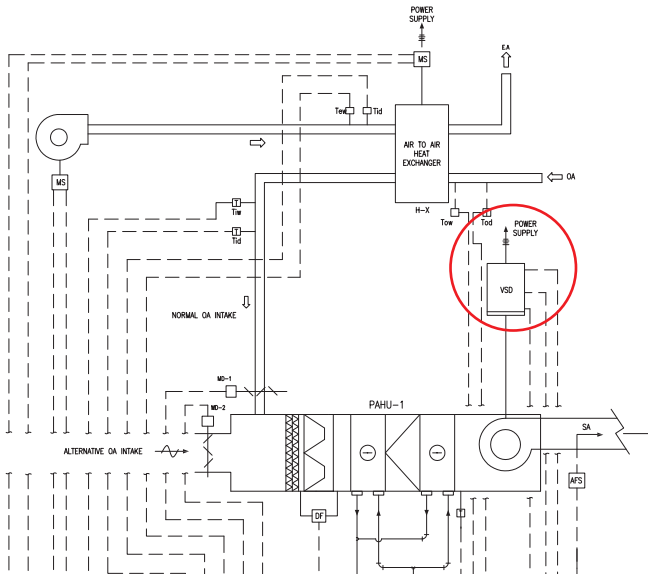


FIGURE 45: Partial schematic diagram showing application of VSD in an air-handling system. Note the incorporation of VSD, connected to the AHU fan motor, which should also be highly efficient.

CONSTRUCTION DOCUMENTATION

The following documents are needed for the issuance of an occupancy certificate:

a. Ocular inspection report of the installed VSD and highly efficient motors with reference to the building permit plans, including:
   - equipment schedule
   - performance rating
   - schematic diagram
b. Product labels
c. Nameplate rating
d. Brochures
e. Technical specifications from manufacturer of Variable Speed Drive
f. Shop drawings/as-built drawings of actual VSD system

A.2.4. ENTHALPY RECOVERY OF EXHAUST AIR

CODE REFERENCE 10.5.4: REQUIRED MEASURES

All buildings with centralized air supply system shall use enthalpy recovery wheels with efficiency of at least 60% of 90% exhaust air.

APPLICABILITY AND EXEMPTIONS

This requirement is applied to all building occupancies as indicated in Table 1.

Buildings without centralized cooling systems are exempt.

RATIONALE

When buildings have outside air or fresh air supply and they extract through mechanical means, heat exchangers can use the air extracted from the building areas to pre-condition the incoming outdoor air. This process exploits the fact that the extracted air is usually already conditioned and therefore, colder and drier.

Enthalpy recovery is the process of recovering some energy from the building exhaust air stream to pre-condition the fresh air intake.

DESIGN APPLICATION

1) ENTHALPY RECOVERY WHEEL – for centralized air supply systems which meet or exceed efficiency of at least 60% of 90% of exhaust air

The illustrations below show how enthalpy saves energy while helping circulate air.

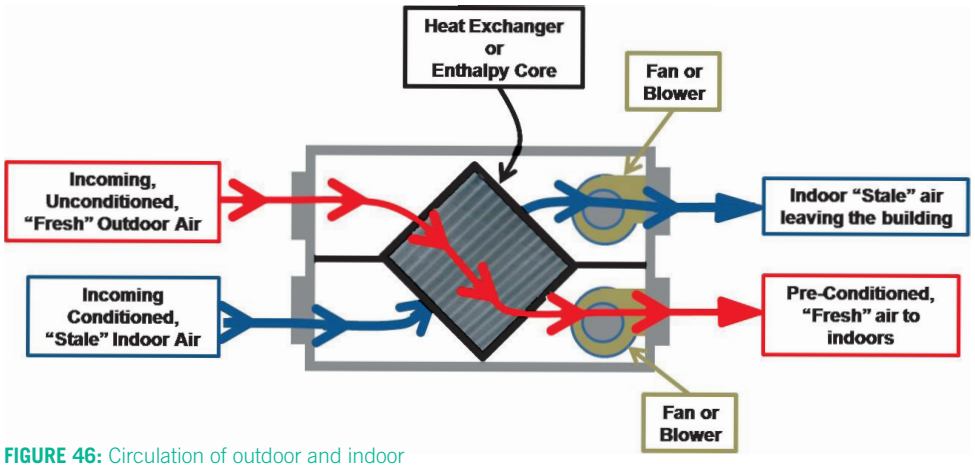


FIGURE 46: Circulation of outdoor and indoor air in enthalpy recovery ventilation unit

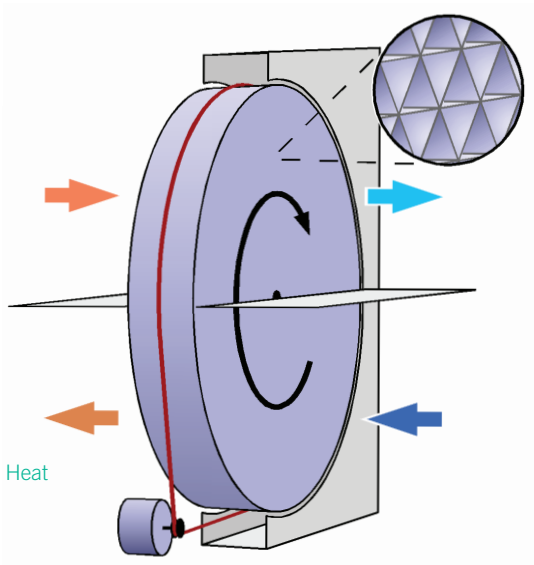


FIGURE 47: Enthalpy or Heat Recovery wheel

DESIGN DOCUMENTATION

The following documents are needed for the building permit application:

a. Equipment schedule – showing heat wheel or energy recovery (ERV) equipment, its properties and capacities, and efficiency rating
b. Mechanical equipment layout and schematic diagram – showing location and capacities
c. Technical specifications – indicating full details and performance of the equipment, including performance efficiency requirement

CONSTRUCTION DOCUMENTATION

The following documents are needed for the issuance of an occupancy certificate:

a. Ocular inspection report of the installed heat wheel or ERV with reference to the building permit plans, including equipment schedule, schematic diagram, layout of equipment (including capacities and performance rating), schematic diagram
b. Product labels
c. Nameplate rating
d. Brochures
e. Technical specifications from manufacturer of enthalpy recovery of exhaust air
f. Shop drawings/as-built drawings of enthalpy recovery of exhaust air

A.3. ELECTRICAL SYSTEMS

Electrical system is a facility composed of one or more pieces of equipment connected to or part of a structure and designed to provide electrical power for lighting, mechanical, heating, water and sewage systems.[14]

FIGURE 48: Electrical System

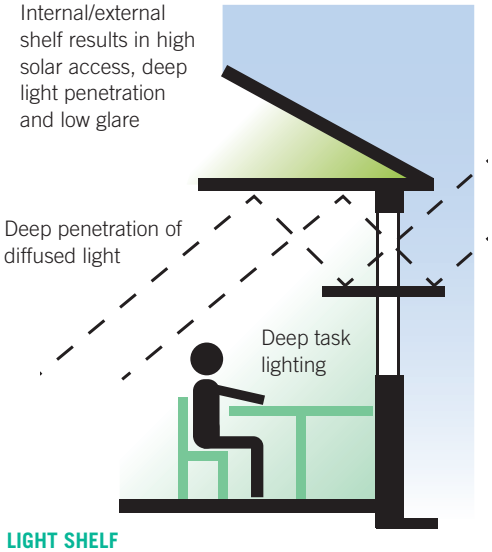
A.3.1. DAYLIGHT PROVISION

CODE REFERENCE 10.6.1: REQUIRED MEASURES

Window opening area of at least 10% of the room space floor area as per National Building Code of the Philippines. All regularly occupied spaces inside the building shall have a view of any combination of the following features that can allow daylight into the room space.

WINDOWS

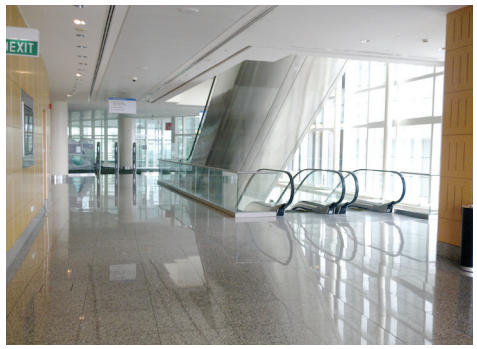
SKYLIGHT



LIGHT SHELF

CLERESTOREY

LIGHT MONITOR/LIGHT SCOOP



DAYLIT COMMON SPACE THROUGH VERTICAL GLAZING

FIGURE 49: All regularly occupied spaces inside the building shall have a view of any combination of the features that can allow daylight into the room space.

APPLICABILITY AND EXEMPTIONS

This requirement is applied to all building occupancies as indicated in Table 1.

Interior spaces without direct access to the outside (through perimeter windows) can use other architectural strategies such as low partitions, glass partitions, atriums, clerestorey, skylights or even "solar tube" devices in order to bring in daylight.

For residential condominiums, this requirement applies only to common spaces (such as lobbies, corridors, stairs, etc.) and does not apply to individual dwelling units.

Spaces where daylight access hinders its intended function are exempt from this provision with justification for exemption to be submitted with the building permit application.

RATIONALE

Building should be planned and designed to maximize the use of natural light to reduce the use of artificial illumination.

Daylighting is the admission of natural light from the sun, inside the building, thru fenestration like skylights and windows. It reduces the need for electric lighting power and therefore, saves energy. Daylight gives better color balance and aesthetic quality to the interior of the building. Daylighting also improves indoor environmental quality.

DESIGN APPLICATION

1) WINDOWS – meet or exceed the required window opening area of at least 10% of the room space floor area as per National Building Code.
2) LIGHT SHELF, CLERESTOREY, SKYLIGHT, LIGHT MONITOR/SCOOP, OTHER DEVICES – use any or a combination of these daylight provisions to comply with the requirement.

DESIGN DOCUMENTATION

The following documents are needed for the building permit application:

a. Architectural Floor Plan or Roof Plan – showing location of daylighting provisions
b. Building Elevations – showing daylighting provisions such as windows
c. Building Sections – showing daylighting provisions such as windows, light monitors, clerestorey, scoops, lightshelves, atrium, skylights, etc.
d. Daylight Provisions Details – detailed drawings of daylighting provisions
e. Calculations to show that window openings equivalent to at least 10% of floor space have been provided for all regularly occupied spaces.

A.3.2. DAYLIGHT CONTROLLED LIGHTING SYSTEM

CONSTRUCTION DOCUMENTATION

The following documents are needed for the issuance of an occupancy certificate:

a. Ocular inspection and verification of the completed daylight provisions with reference to the building permit plans
b. Product labels/Nameplate labels
c. Brochures
d. Technical specifications from manufacturers of daylight provisions
e. Shop drawings/as-built drawings of daylight provisions

CODE REFERENCE 10.6.2: REQUIRED MEASURES

10.6.2.1. Lighting fixtures within the daylight zone shall be controlled with photoelectric sensors with an auto on-off basis or continual dimming. The photoelectric sensor shall be located approximately at half (½) the depth of daylight zone.

10.6.2.2. If occupancy sensors are installed in the daylight zone, the occupancy sensor shall override the photoelectric sensor during non-occupancy period.

APPLICABILITY AND EXEMPTIONS

This requirement is applied to all building occupancies as indicated in Table 1.

For residential condominiums, this applies only to common indoor areas with access to daylight.

Installed lighting fixtures within the day-lit zones are exempt from using photoelectric sensor if this hinders its intended functions, with justification for exemption to be submitted with the building permit application.

RATIONALE

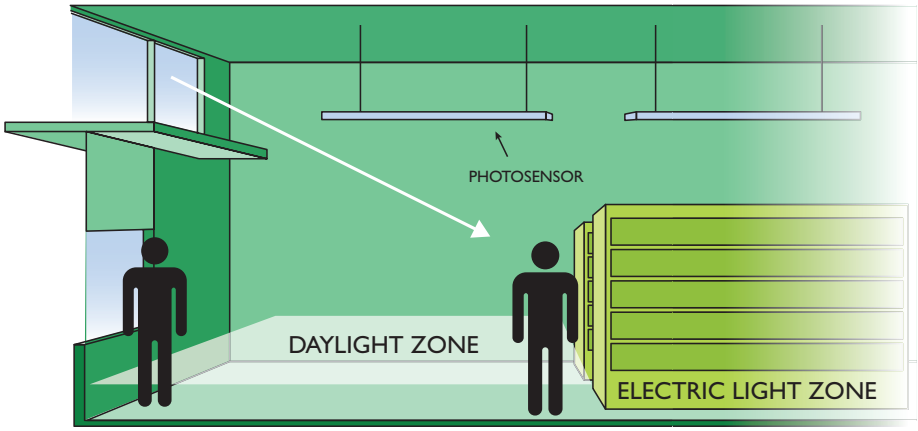
Building interior perimeter zones exposed to daylight generally do not require artificial lighting during the day. However, sub-optimal design and operation of the building results in use of artificial lighting when not required.

Photoelectric sensors connected to luminaires help in dimming or switching off lamps that do not need to be used due to the presence of adequate daylight.

DESIGN APPLICATION

1) DAYLIGHT SENSOR OR PHOTOSENSOR IN LIGHTING SYSTEM – for use with lighting control systems in day-lit zones

FIGURE 50: Daylight zone and the use of photosensors



DESIGN DOCUMENTATION

Documents needed for the building permit application are the following:

a. Architectural reflected ceiling plan showing location of lights, and photosensors
b. Electrical lighting and switching circuitry layout showing inclusion of photosensors, daylight controller, and accessories
c. Lighting control diagram showing inclusion of photosensor and daylight controller system
d. Technical specifications from the manufacturers of daylight controlled lighting systems

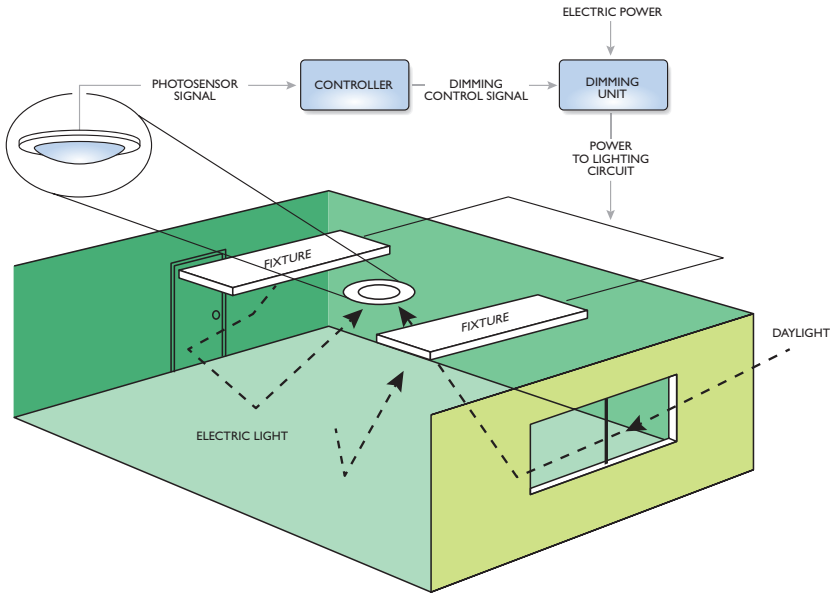


FIGURE 51: Daylighting control system

CONSTRUCTION DOCUMENTATION

The following documents are needed for the issuance of an occupancy certificate:

a. Ocular inspection and verification report of the completed daylight controlled lighting system with reference to the building permit plans, including electrical plans showing application of daylight control system
b. Product labels/Nameplate labels
c. Brochures
d. Technical specifications from manufacturers of daylight controlled lighting products
e. Shop drawings of actual daylight controlled lighting system

FIGURE 52: Ceiling-mounted daylight control sensor

A.3.3. LIGHTING POWER DENSITY

CODE REFERENCE 10.6.3: REQUIRED MEASURES

All applicable building types shall comply with the lighting power density (LPD) limits in the 2010 PSVARE Standards, as shown in Table 16 and 18.

TABLE 16. MAXIMUM LPD REQUIREMENTS

BUILDING TYPE	BUILDING AVERAGE LPD (W/m^2)
Residential Dwelling: Condominium	10.8
Hotel/Resort	10.8
Educational: School	12.9
Institutional: Hospital	12.9
Business: Office	10.8
Mercantile: Mall	16.1 (excluding accent lighting)

SOURCE: 2010 PSVARE Standard[15]

Above requirement excludes parking and exterior lighting (see Table 17).

TABLE 17. MAXIMUM ALLOWED LPD

OTHER USES	AVERAGE LPD
Covered parking	3.2 W/m2
Open and outdoor parking	1.6 W/m2
Exterior façade	2.15 W/m2
Active entrance (pedestrian conveyance)	98.4 W/linear meter
Inactive entrance (normally locked/inactive use)	65.6 W/linear meter

SOURCE: ASHARAE/IESNA 90.1

APPLICABILITY AND EXEMPTIONS

This requirement is applied to all building occupancies as indicated in Table 1.

There are no exceptions to this provision.

RATIONALE

Limiting LPD will encourage the use of efficient lighting fixtures and reduce the lighting and cooling load in buildings. The maximum allowed LPD for each space type is specified in Table 16 and 18. (The IIEE Manual on the Practice of Efficient Lighting System can be a reference for the design of building lighting systems.)

Lighting power density is defined as the total amount of lighting power, in watts, provided to a given floor area, in square feet or square meter.

DESIGN APPLICATION

1) BUILDING LPD IS WITHIN MAXIMUM LPD REQUIREMENTS – determined through the computation of total building lighting wattage divided by total building gross floor area. Use computation table.

TABLE 18. LPD COMPUTATION TABLE *(LPD calculator in DPWH website)*

BUILDING SPACE (A)	GROSS FLOOR AREA (GFA) (SQ.M) (B)	DESIGNED TOTAL LIGHTING POWER WATTAGE (W) (C)
Building space/floor 1	GFA of Bldg Space/Floor #1	Total lighting power wattage of Bldg Space/Floor #1
Building space/floor 2	GFA of Bldg Space/Floor #2	Total lighting power wattage of Bldg Space/Floor #2
Building space/floor N...	GFA of Bldg Space/Floor N...	Total lighting power wattage of Bldg Space/Floor N...
TOTAL	*Total sum of Building GFA*	*Total sum Lighting Power Wattage*
DESIGNED BUILDING LPD	Total sum (c) ÷ Total sum (*b*) *W/Sq M*	
GB CODE REQUIRED LPD	*Refer to GB Code Requirement Per Building Occupancy*	

Tabulate each building space or floor with their calculated gross floor area and lighting power wattage. Sum up the total GFA and lighting power wattage. Then compute for the building designed LPD, comparing it with the GB Code required LPD, per building occupancy. Building designed LPD should be equal or lower than the GB Code requirement.

This shall be the same procedure for building exterior spaces such as at entrances, building facade, covered and open parking spaces where there are specific GB Code LPD requirements.

DESIGN DOCUMENTATION

The following documents are needed for the building permit application:

a. Architectural reflected ceiling plan showing location of lights, and type of lamp with wattage under the LEGEND box
b. Electrical lighting layout showing location of all permanent and portable lighting fixtures as well as their specific type and wattage under the LEGEND box
c. Building Lighting Power Density Computation Table 18, to be included in the electrical plans
d. Technical specifications of lighting equipment from manufacturers

Energy-efficient lighting options are now widely available in the market.

FIGURE 53: Different types of TFL, CFL, and LED energy-saving lamps

LEGEND: POWER & LIGHTING: (TYPICAL LEGEND LIGHTING)

DUPLEX RECEPTACLE OUTLET, 15A, 240/ 120V, PARALLEL/ROUND SLOT, GROUNDING TYPE,
NOTE :
C - COUNTER TOP RECEPTACLE OUTLET (GFCI)
HF - HI-FI RECEPTACLE OUTLET

REFRIGERATOR RECEPTACLE OUTLET 20A, 240V PARALLEL SLOT, GROUNDING TYPE

WATER HEATER RECEPTACLE OUTLET 20A, 240V PARALLEL SLOT, GROUNDING TYPE

WEATHERPROOF RECEPTACLE OUTLET 15A, 240V/ 120V PARALLEL ROUND SLOT, GROUNDING TYPE

RANGE RECEPTACLE OUTLET

WASHING MACHINE RECEPTACLE OUTLET

ICE CREAM MAKER RECEPTACLE OUTLET

SINGLE RECEPTACLE OUTLET, 15A, 240/ 120V, PARALLEL/ROUND SLOT GROUNDING TYPE,
NOTE :
EX - EXTRACTOR FAN OUTLET
EF - EXHAUST FAN OUTLET
SH - SHAVER

DRYER RECEPTACLE OUTLET

SPECIAL PURPOSE RECEPTACLE OUTLET

BOX TYPE FLUORESCENT FIXTURES, WITH 4 X 20 WATTS FLUORESCENT TUBE AND 220 VOLT, 60 HZ HPF BALLAST

WALL BRACKET FIXTURE WITH 100 WATT, 220 VOLT, 60HZ BULB

DOWNLIGHT WITH 100 WATT, 220 VOLT, 60HZ BULB

RECESSED TYPE FLUORESCENT FIXTURE WITH 2 X 40 WATT FLUORESCENT TUBE, AND 220 VOLT, 60HZ, HPF BALLAST

RECESSED TYPE FLUORESCENT FIXTURE WITH 1 X 40 WATT FLUORESCENT TUBE, AND 220 VOLT, 60HZ, HPF BALLAST

RECESSED TYPE FLUORESCENT FIXTURE WITH 1 X 20 WATT FLUORESCENT TUBE, AND 220 VOLT, 60HZ, HPF BALLAST

SURFACE MOUNTED FLUORESCENT FIXTURE WITH 2 X 40 WATT FLUORESCENT TUBE, AND 220 VOLT, 60HZ, HPF BALLAST

SURFACE MOUNTED FLUORESCENT FIXTURE WITH 1 X 40 WATT FLUORESCENT TUBE, AND 220 VOLT, 60HZ, HPF BALLAST

TABLE LAMP WITH 100 WATTS, 220 VOLT, 60HZ BULB

CHANDELIER WITH 8 X 40 WATT, 220 VOLT, 60HZ BULB

CHANDELIER WITH 25 X 25 WATT, 220 VOLT, 60HZ BULB

FIGURE 54: Sample power and lighting Legend Box

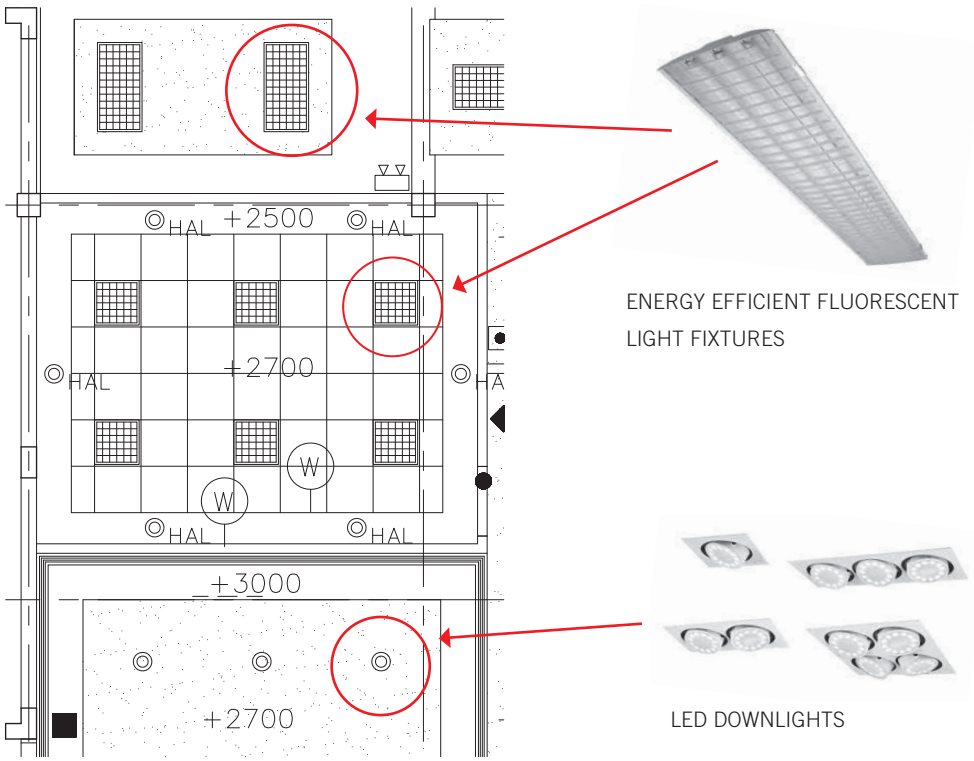
CONSTRUCTION DOCUMENTATION

The following documents are needed for the issuance of an occupancy certificate:

a. Ocular inspection and verification of the completed lighting system with reference to the building permit plans, including architectural and electrical plans showing lighting layout
b. Verification of total count of light fixtures and total wattage of the building results, which shall be compared with the submitted LPD computation table as part of the building permit application, and with the prescribed LPD for the building use
c. Product labels/Nameplate labels
d. Brochures
e. Technical specifications from manufacturers of light fixtures
f. Shop drawings/as-built plan of actual lighting power density installed

REFLECTED CEILING PLAN SHOWING LOCATION OF LIGHT FIXTURES

FIGURE 55: Architectural reflected ceiling plan with lighting layout



A.3.4. OCCUPANCY SENSORS

CODE REFERENCE 10.3.4: REQUIRED MEASURES

10.3.4.1. In order to limit the use of electricity in the unoccupied areas of buildings, occupancy sensors linked to lighting (except for emergency and security lighting) shall be installed in areas with variable occupancy such as corridors, private offices, storage rooms, common toilets, meeting rooms, stairways, other similar areas.

10.3.4.2. For covered car parks: minimum of 60% of the lighting must be controlled by the occupancy sensors.

FIGURE 56: An occupancy sensor mounted on the ceiling of a conference room

APPLICABILITY AND EXEMPTIONS

This requirement is applied to all building occupancies as indicated in Table 1, except for hospitals and malls.

Provisions for emergency and security lighting are exempted from this requirement.

RATIONALE

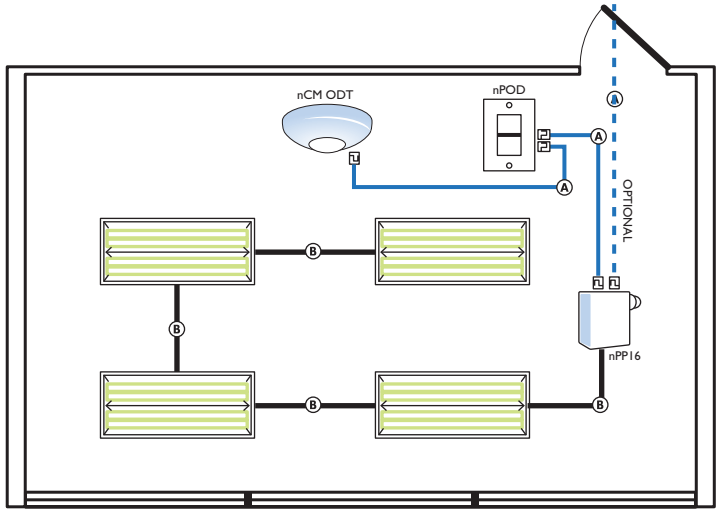
Occupancy sensors are switching devices that respond to the presence and absence of people in the sensor's field of view and enable lights to switch on or off accordingly. The system consists of a motion detector, an electronic control unit, and a controllable switch (relay).[16]

DESIGN APPLICATION

1) OCCUPANCY SENSOR IN LIGHTING SYSTEM – for use with lighting control systems in areas with variable occupancies. This is to be confirmed through the use of the Occupancy Sensing System Confirmation, Table 19.
2) OCCUPANCY SENSOR IN COVERED PARKING LIGHTING SYSTEM – at least 60% of the lighting must be controlled by occupancy sensor.

Occupancy sensors make sure that electrical light is used in a room only when necessary. Examples follow.

FIGURE 57: Single-level control layout in a small room



DESIGN DOCUMENTATION

The following documents are needed for the building permit application:

a. Architectural reflected ceiling plan showing location of occupancy sensors
b. Electrical lighting layout showing location of occupancy sensors and other related systems equipment
c. Occupancy Sensing System Confirmation - Table 19, to be included in the electrical plans
d. Technical specifications

TABLE19. USE OF OCCUPANCY SENSING SYSTEM CONFIRMATION TABLE

UNOCCUPIED BUILDING SPACE	USE OF OCCUPANCY SENSORS		REMARKS
	YES	NO	
Building space/floor #1			
Building space/floor #2			
Building space/floor N...			
Building space/floor 5			
COVERED PARKING SPACES	TOTAL LIGHTING WATTAGE (W)	TOTAL LIGHTING WATTAGE CONTROLLED BY SENSORS (W)	REMARKS
Parking space #1			
Parking space #2			
Parking space N...			

CONSTRUCTION DOCUMENTATION

The following documents are needed for the issuance of an occupancy certificate:

a. Ocular inspection and verification report of the completed lighting system with reference to the building permit plans, including architectural and electrical plans showing application of occupancy sensors
b. Verification report of application of occupancy sensors in the building, results of which shall be compared with the submitted occupancy sensing system confirmation table as part of the building permit application
c. Product labels
d. Brochures
e. Technical specifications from manufacturers of the sensing system products
f. Shop drawings/as-built plan of actual system installed

A.3.5. ELEVATORS AND ESCALATORS/ MOVING RAMPS AND WALKWAYS

CODE REFERENCE 10.6.5: REQUIRED MEASURES

Applicable buildings shall comply with the following:

10.6.5.1. Escalators/Moving Ramps/Walkways

- Escalators/Moving Ramps/Walkways shall be fitted with automated controls to reduce to a slower speed when no activity has been detected for a maximum period of one and a half (1-1/2) minutes and duration may be adjusted depending on the demand.
- The escalator/moving ramp/walkway shall automatically be put on standby mode when no activity has been detected for a maximum period of 5 minutes and duration may be adjusted depending on the demand.
- These escalators/moving ramps/walkways shall be designed with energy efficient soft start technology. Activation of reduced speed, power off and power on modes shall be done through sensors installed in the top or bottom landing areas.

10.6.5.2. Elevators

- Elevators shall be provided with controls to reduce the energy demand. To meet this requirement, the following features must be incorporated:
  - Use of Alternating Current (AC) Variable Voltage and Variable Frequency (VVVF) drives on non-hydraulic elevators
  - Use of energy efficient lighting and display lighting in the elevator car shall have an average lamp efficacy, across all fittings in the car, of more than 55 lumens/watt
  - Lighting shall switch off after the elevator has been inactive for a maximum period of 5 minutes
  - The elevators shall operate in a stand-by condition during off-peak periods.

APPLICABILITY AND EXEMPTIONS

This requirement is applied to all building occupancies as indicated in Table 1.

There are no exceptions to this provision.

RATIONALE

Escalators/Moving Ramp/Walkway must be fitted with controls to automatically reduce speed or stop when no traffic is detected. Elevators must be fitted with mechanisms that reduce energy demand.

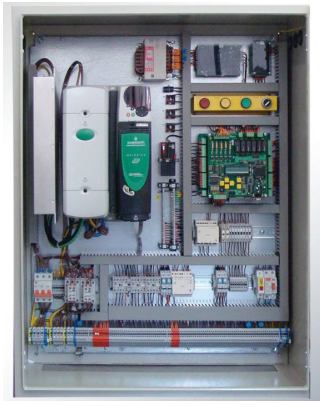
Lifts and elevators, moving ramps and walkways are systems that give comfort to people travelling in vertical mobility in the building.

DESIGN APPLICATION

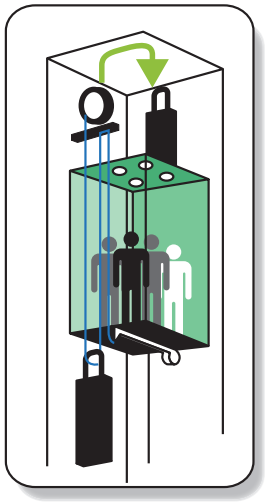
1) ESCALATORS, RAMPS, MOVING RAMPS, WALKWAYS WITH AUTOMATIC CONTROLS – specified with sensing devices, control system, and soft start technology that can regulate speed.
2) ELEVATORS – specified with:
   a) Alternating Current Variable Voltage and Variable Frequency (VVVF) drives on non-hydraulic elevators;
   b) Efficient car and display lighting with average lamp efficacy of 55 lumens per watt, such as highly compact fluorescent lamp (CFL), light-emitting diode (LED), and tubular T5 lamps;
   c) Automatic lighting switch off after 5 minutes of inactive use;
   d) Stand-by operations during off peak periods.

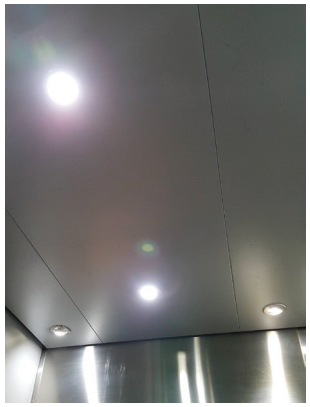
ELEVATOR SYSTEMS

Various elements work together to make mobility equipment energy efficient, as illustrated below.



VVVF Controller





LED lamps

FIGURE 58: An elevator system showing the VVVF controller and efficient use of LED lamps

ESCALATOR

FIGURE 59: Escalator showing the placement of sensors used to detect passengers

ELEVATOR SYSTEMS

FIGURE 60: A moving walkway

DESIGN DOCUMENTATION

The following documents are needed for the building permit application:

a. Architectural Floor Plan – showing location of elevators, escalators, moving ramps and walkways
b. Building Sections – showing height and vertical location of the elevators, escalators, moving ramps and walkways
c. Technical Specifications of Elevators, Escalators, Moving Ramps and Walkways with operational details and procedures, including lamp type and lamp controls in the elevators
d. Mechanical Equipment Schedule – showing description of operation of elevators, escalators, moving ramps and walkways
e. Electrical Power Load Schedule

CONSTRUCTION DOCUMENTATION

The following documents are needed for the issuance of an occupancy certificate:

a. Ocular inspection and verification report of the completed system with reference to the building permit plans
b. Product labels
c. Nameplate labels
d. Brochures
e. Technical specifications from manufacturers of elevators and escalators/moving ramps and walkways systems
f. Shop drawings/as-built plans of actual system installation

A.3.6. TRANSFORMER

CODE REFERENCE 10.6.6: REQUIRED MEASURES

Transformers that are part of the building electrical system shall have efficiencies not lower than 98% as prescribed in the DOE Guidelines on Energy Conserving Design of Buildings.

APPLICABILITY AND EXEMPTIONS

This requirement is applied to all building occupancies, with own transformer, as indicated in Table 1.

There are no exceptions to this provision.

RATIONALE

Transformers are devices used in electrical circuits to change the voltage of electricity flowing in the circuit. Transformers can be used either to increase the voltage (called "stepping up") or decrease the voltage ("step down").[17]

DESIGN APPLICATION

1) TRANSFORMER EQUIPMENT SPECIFIED WITH NO LESS THAN 98% PERFORMANCE EFFICIENCY.

Following are different types of transformers.

VOLTAGE TRANSFORMER

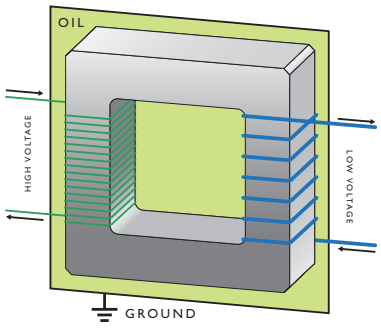


FIGURE 61: Voltage transformer in electric circuit

GENERAL PURPOSE TRANSFORMER

FIGURE 62: A general purpose transformer

DRY-TYPE TRANSFORMER

FIGURE 63: A three phase dry-type transformer

DESIGN DOCUMENTATION

The following documents are needed for the building permit application:

a. Electrical Power Single Line Diagram showing location and rating of the transformer
b. Electrical Power Distribution Layout showing location and rating of the transformer
c. Technical Specifications of Transformer Equipment

CONSTRUCTION DOCUMENTATION

The following documents are needed for the issuance of an occupancy certificate:

a. Ocular inspection report of the completed system with reference to the building permit plans
b. Product labels/Nameplate rating
c. Brochures
d. Technical specifications from manufacturers of the transformer
e. Shop drawings of actual transformer installation
f. Shop drawings/as-built plans of actual system installation

A.3.7. OVERHEAD WATER STORAGE

CODE REFERENCE 10.6.7: REQUIRED MEASURES

Applicable buildings shall include in the water distribution system the integration of overhead or elevated water tanks that will facilitate the distribution of potable and/or non-potable water into the building spaces, without compromising the required water volume and pressure based on demand and the Plumbing Code of the Philippines.

APPLICABILITY AND EXEMPTIONS

This requirement is applied to all building occupancies as indicated in Table 1.

Buildings below 10 storeys high are exempt from this provision.

RATIONALE

To reduce dependence on motorized systems to supply and distribute potable or non-potable water within the building, and thus, help reduce energy consumption, overhead water storage systems are used. The system relies mostly on elevation and gravity to distribute water within the building.

DESIGN APPLICATION

1) PROVISION OF OVERHEAD WATER STORAGE TANK ON TOP OF BUILDINGS AT LEAST 10 STORIES HIGH.

OVERHEAD WATER STORAGE

FIGURE 64: Vertical overhead water tank for roof deck installations

DESIGN DOCUMENTATION

The following documents are needed for the building permit application:

a. Water Distribution Layout Plan – showing location and capacity callout of water tank
b. Single Line or Schematic Diagram – showing provision of water tank with capacity callout
c. Water tank details
d. Technical specifications of the water tank

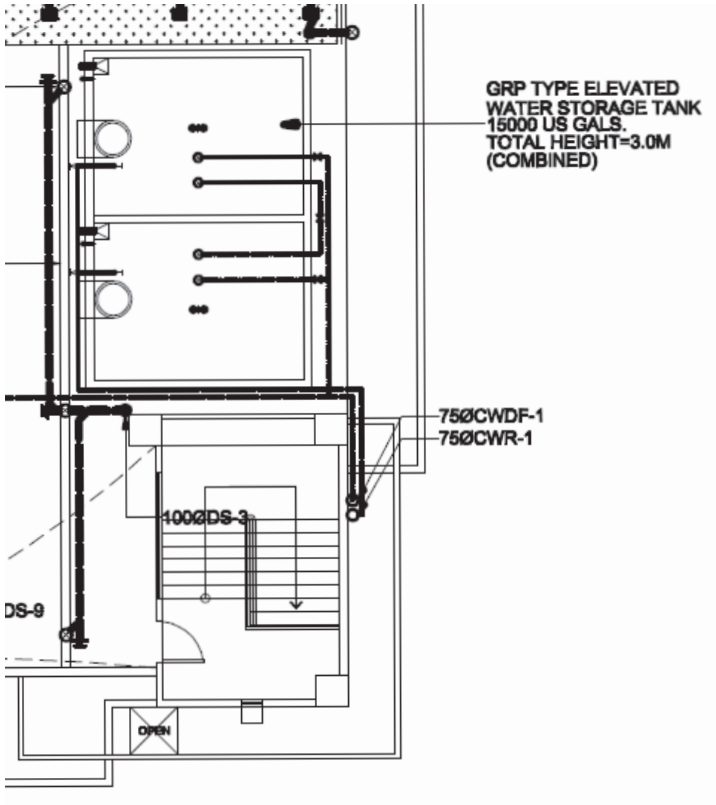


FIGURE 65: Partial roof plan showing location of overhead water tank

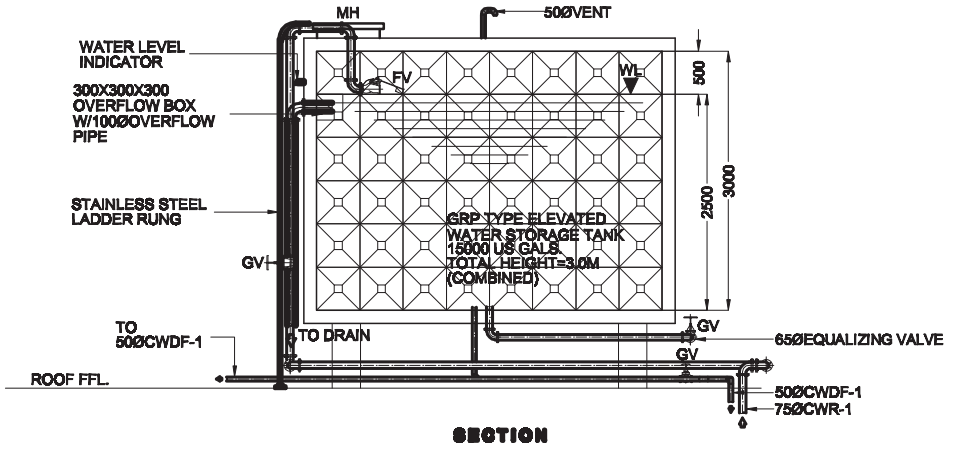


FIGURE 66: Overhead water tank detail

CONSTRUCTION DOCUMENTATION

The following documents are needed for the issuance of an occupancy certificate:

a. Ocular inspection and verification report of the completed system with reference to the building permit plans, including single line water distribution diagram, water distribution plan, water tank details, technical specifications
b. Product labels
c. Brochures
d. Technical specifications from manufacturers of the product
e. Shop drawing/as-built plan of actual system product installation

B. WATER EFFICIENCY

Water efficiency reduces water costs and ensures sustainable freshwater and potable water supply for building owners and occupants. This can be done by minimizing the amount of potable water used in domestic and commercial buildings, encouraging the recycling and reuse of water when possible, and capturing rain water.

Though it may seem as if it has abundant water resources, the country faces the threat of water scarcity. This is due to various factors: poor urban planning, water management, and water supply investments; effects of climate change; and deforestation—all contribute to the lack of recharging the aquifers.

According to the WMO report at the Budapest Water Summit in October 2014, only 2% of the world's water resources is made up of freshwater. It is projected that by year 2030, 40% of the world's population will suffer from water shortages.

FIGURE 67: Angat Dam freshwater reservoir shows eroded banks that indicate critical low freshwater level.

WATER USE IN COMMERCIAL BUILDINGS – used for cleaning, personal hygiene, recreation, landscaping, and air conditioning (HVAC) systems.

WATER USE IN HOMES – used in the kitchen, laundry, bathroom, outdoors, and for cleaning.

FIGURE 68: Common water uses in commercial buildings and homes

Increasing water demand is evident in a number of regions and key urban centers experiencing water stress (NWRB 1998). These include Metro Manila, Metro Cebu, Davao, Baguio, Cagayan de Oro, Bacolod, Angeles, Iloilo, and Zamboanga. These highly urbanized cities rely mostly on groundwater for water supply. Rapid and uncontrolled urban development has reduced aquifer and has allowed saltwater intrusion and possible land subsidence.

Freshwater supply in the Philippines comes from both surface-water and groundwater. According to the Investment Needs for Resource Assessment Capability in the Philippines of the NWRB in August 2012, total potential resource in the country is estimated at 145,990 million cubic meters, where 86% is from surface-water while the rest is from groundwater. In 1996, the agricultural sector demand for groundwater freshwater supply was 85%, while the industrial and domestic sector demand was 15%. Average annual groundwater potential was able to supply only 67% of the demand for groundwater in 1996. Because of growing demand, groundwater potential is estimated to supply only 23 to 32% of groundwater demand by 2025. [18]

In the Philippine Green Building Code, the Water Efficiency section requires the adoption of efficient water-use practices, designs, methods, and technology in buildings. They can reduce water consumption, resulting in cost savings, and allowing freshwater conservation, through three areas:

a) WATER EFFICIENT FIXTURES
b) RAINWATER HARVESTING
c) WATER RECYCLING

B.1. WATER FIXTURES

CODE REFERENCE 11.1: REQUIRED MEASURES

Applicable buildings shall comply with the allowable maximum flow rates for water fixtures as shown in Table 20.

TABLE 20. WATER FIXTURE PERFORMANCE REQUIREMENTS[19]

TYPE OF FIXTURES	MAXIMUM FLOW RATE	
Dual Flush Water Closet	≤6 full 3 low	liters/flushing cycle
Single Flush Water Closet	4.9	liters/flushing cycle
Shower	≤9 (80PSi)	liters/min at 551.6 kPa
Urinals	≤1	liters/flushing cycle
Lavatory Taps	≤4.8 (60PSi)	liters/min at 417.7 kPa
Kitchen Faucets	≤4.8 (60PSi)	liters/min at 417.7 kPa
Handheld Bidet Sprays	≤4.8 (60PSi)	liters/min at 417.7 kPa

APPLICABILITY AND EXEMPTIONS

This requirement is applied to all building occupancies as indicated in Table 1.

There are no exceptions to this provision.

RATIONALE

Efficient water fixtures include faucets, showerheads, and water closets that use less water to clean as effectively as standard models. Use of efficient plumbing fixtures, sensors, auto control valves, aerators, flow control and pressure-reducing devices, wherever possible, can result in significant reduction in water consumption.

DESIGN APPLICATION

1) Specified water fixture compliant with maximum flow rate requirements as per Table 20.

Different equipment are designed to make use of water more efficient. Some examples follow.

FIGURE 69. Water efficient kitchen tap with aerator

FIGURE 70. Showerhead with aerator

FIGURE 71. Shower head with adjustable water spray

FIGURE 72. Water efficient water closet with dual-flush and water efficient hand spray bidet

DESIGN DOCUMENTATION

The following documents are needed for the building permit application:

a. Water Distribution Layout plan – showing location of water efficient fixtures with identification callout and LEGEND box
b. Water Distribution Isometries – showing location of water efficient fixtures with identification callout and LEGEND box
c. Water Efficient Fixtures Use Confirmation Table 20, to be included in the plumbing plans
d. Technical specifications of the water efficient fixtures used

TABLE 21. WATER-EFFICIENT FIXTURE USE CONFIRMATION TABLE

WATER FIXTURE	BUILDING SPACE	MAXIMUM FLOW RATE	
		GB Code Reqt	Proposed Flow Rate
Dual flush water closet			
Single flush water closet			
Shower			
Urinals			
Lavatory taps			
Kitchen faucets			
Handheld bidet sprays			

Following are detailed drawings of water distribution systems.

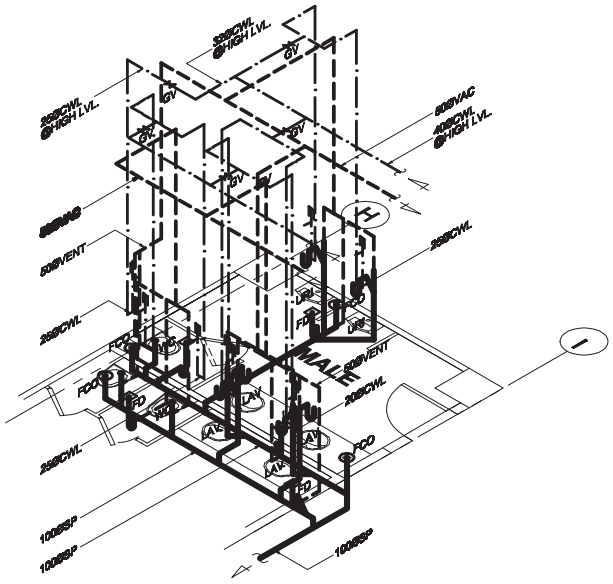


FIGURE 73: Isometric drawing of a water distribution system for a toilet

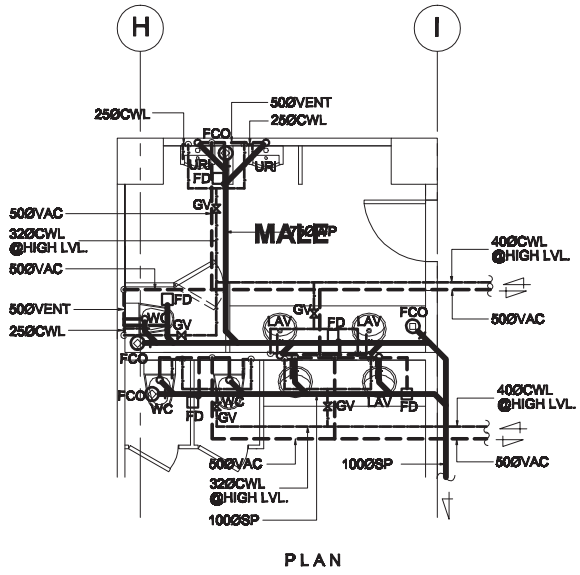


FIGURE 74: Detailed water distribution system in plan form

CONSTRUCTION DOCUMENTATION

The following documents are needed for the issuance of an occupancy certificate:

a. Ocular inspection and verification of the completed system with reference to the building permit plans, including water distribution layout, isometries, LEGEND box indicating types of fixtures used and their capacities, water-efficient fixture use confirmation table, technical specifications
b. Product labels/Nameplate label
c. Brochures
d. Technical specifications from manufacturers of the product
e. Shop drawing/as-built plan of actual system product installation

B.2. RAINWATER HARVESTING

CODE REFERENCE 11.2.1: REQUIRED MEASURES

11.2.1.1. Minimum storage tanks size (in cu.m) shall be calculated by dividing the building footprint area (square meters) by 75.

11.2.1.2. Collected water shall be used for non-potable purposes such as toilet flushing, irrigation, and cooling towers.

APPLICABILITY AND EXEMPTIONS

This requirement is applied to all building occupancies as indicated in Table 1.

There are no exceptions to this provision.

RATIONALE

Rainwater harvesting has been used throughout history as a water conservation measure, particularly in regions where other water resources are scarce or difficult to access. It is one of the purest sources of water available. Rainwater from roofs and hardscape must be collected and reused for non-potable purposes.

DESIGN APPLICATION

1) Provision of rainwater harvesting water tank that is compliant with the minimum required volume capacity.
2) Provision of rain water collection and distribution system for toilet flushing, irrigation, and cooling tower make-up use.

Illustrations of rainwater harvesting system and collection containers follow.

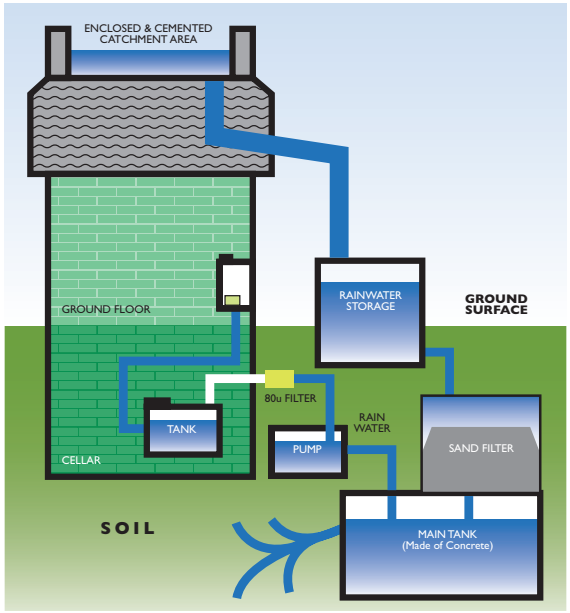


FIGURE 75: How rainwater harvesting works

FIGURE 76: Modular and pre-fabricated tanks

FIGURE 77: Modular type storage tank for rainwater collection directly beneath roof area. Rainwater collecting tank is fed directly via downspouts from roof gutter.

DESIGN DOCUMENTATION

The following documents are needed for the building permit application:

a. Stormwater drainage layout plan – showing location of rainwater harvesting storage tank with callout of capacities
b. Stormwater drainage isometries – showing location of rainwater harvesting storage tank with callout of capacities
c. Rainwater harvesting storage tank details
d. Rainwater Harvesting Storage Tank Computation Table 22, to be included in the plumbing drawings plans
e. Technical specifications of the rainwater harvesting storage tank

TABLE 22. RAINWATER HARVESTING STORAGE TANK COMPUTATION TABLE
(Rainwater harvesting storage tank calculator in DPWH website)

BUILDING FOOTPRINT AREA (SQ.M.) (a)	COMPUTED MIN. STORAGE TANK REQT. (CU.M.) (b)	DESIGNED STORAGE TANK VOL. (CU.M.) (c)	LOCATION OF STORAGE TANK (d)	MATERIAL OF STORAGE TANK (d)
Building footprint length (L) × width (W)	Bldg footprint area (a) ÷ 75	Building footprint length (L) × width (W)	Designer specified	Designer specified

Compute for the building footprint area, which is usually the ground floor area. Then, divide this by 75 to compute for the minimum required rainwater harvesting storage tank volume in cubic meters. Compare the computed minimum requirement with the proposed rainwater harvesting storage tank. The proposed design should be equal or more than the required minimum in the GB Code.

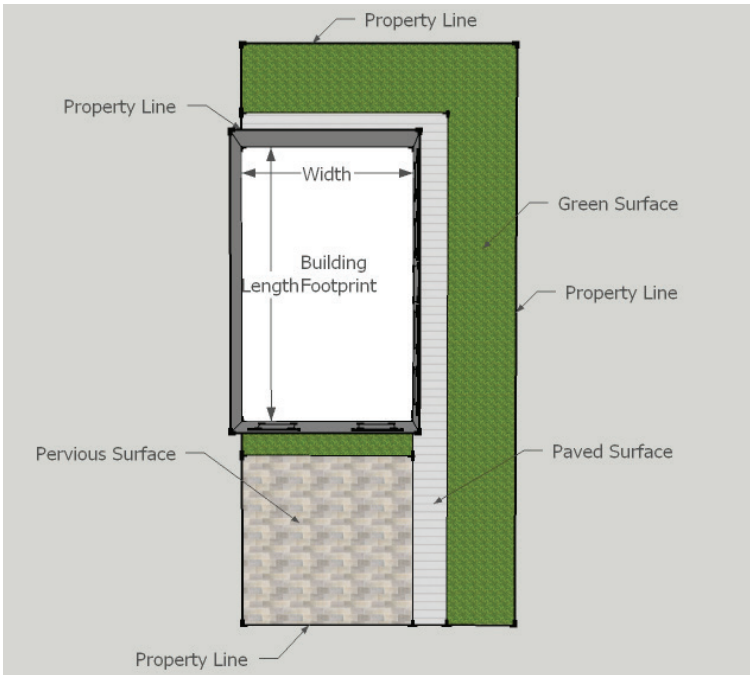


FIGURE 78: Building footprint measurement for rainwater collecting storage computation

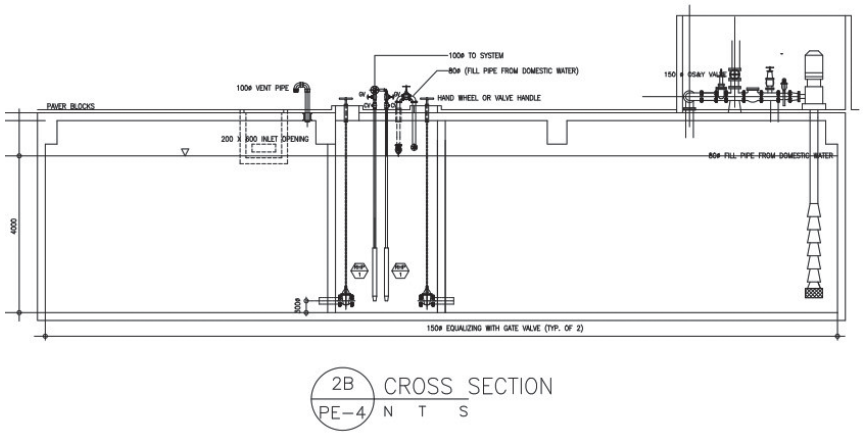


FIGURE 79: Cross section of a rainwater harvesting collecting tank

CONSTRUCTION DOCUMENTATION

The following documents are needed for the issuance of an occupancy certificate:

a. Ocular inspection and verification report of the completed rainwater harvesting system with reference to the building permit plans, including detailed plans, sections, storage tank details, and rainwater storage tank computation table
b. Product labels
c. Brochures
d. Technical specifications from manufacturers of rainwater harvesting tank
e. Shop Drawings/as-built plan of actual installed system

B.3. WATER RECYCLING

CODE REFERENCE 11.2.2: REQUIRED MEASURES

The recycled water produced on site shall be reused for non-potable purposes such as toilet flushing, irrigation and cooling towers, through a distinct and separate piping system from the potable water supply system.

APPLICABILITY AND EXEMPTIONS

This requirement is applied to all building occupancies as indicated in Table 1.

Buildings with no dedicated sewage treatment plant (STP) are exempted from this requirement.

RATIONALE

Recycled water from STP shall be reused for non-potable purposes.

DESIGN APPLICATION

1) Buildings with STP shall have provision for a separate recycled water filtration and distribution system for non-potable purposes such as toilet flushing, irrigation and cooling tower make-up use.

Recycled water must undergo treatment before use, as shown below.

FIGURE 80: Prefabricated water treatment plant

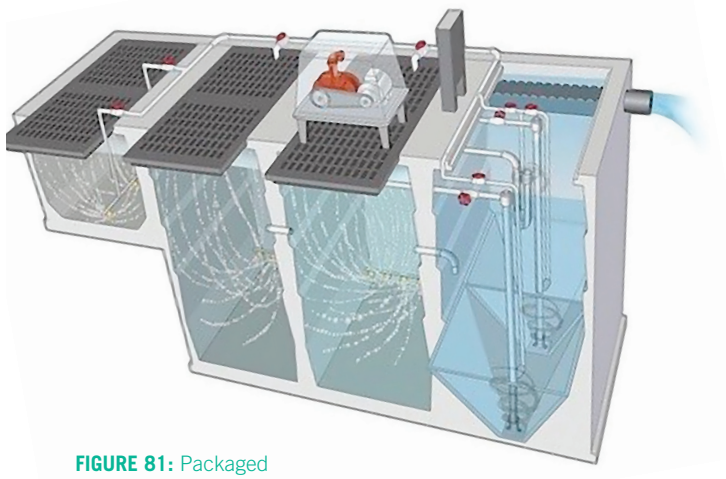


FIGURE 81: Packaged Sewage Treatment plant

DESIGN DOCUMENTATION

The following documents are needed for the building permit application:

a. Sewage system plan – showing location of sewage treatment plant (STP) or wastewater treatment plant including inlet for wastewater and outlet for recycled water distribution, with callout of capacities
b. Sewage system isometries – showing location of STP with callout of capacities
c. STP details
d. Technical specifications of STP with narrative on treatment and recycling operations

CONSTRUCTION DOCUMENTATION

The following documents are needed for the issuance of an occupancy certificate:

a. Ocular inspection and verification report of the STP and water recycling system with reference to the building permit plans
b. Product labels
c. Brochures
d. Technical specifications from manufacturers for STP installation
e. Shop Drawings/as-built plans of actual installed systems

C. MATERIAL SUSTAINABILITY

Material sustainability refers to all matters related to resource efficiency in material selection and use with the least impact on the environment.

Material sustainability is the use of non-toxic products with low VOC in buildings.

FIGURE 82: Material sustainability, through raw material extraction; product fabrication; transportation which cover the use of energy and fuel; and, conservation of raw materials through the re-use and recycling of materials and rapidly renewable materials.

C.1. NON-TOXIC MATERIALS

CODE REFERENCE 12.1: REQUIRED MEASURES

Building shall comply with the minimum standards, documents & certifications.

12.1.1. Paints, coatings, adhesives and sealants used indoors or non-ventilated areas shall not contain volatile organic compounds (VOC) or should be within levels tolerable to humans as specified in the table of VOC limits.

12.1.2. Composite wood shall not have urea formaldehyde content.

12.1.3. All other materials containing chemicals used in construction shall not compromise the health and safety of the workers and occupants of the building.

12.1.4. Specifications shall comply with the allowable VOC limits, as stated in Table 23 below with material safety data sheet (MSDS) from manufacturer.

TABLE 23. VOC LIMIT

APPLICATION/PRODUCT TYPE	VOC LIMIT (G/L LESS WATER)
Flat paint	50
Non-flat paint	150
Anti-rust paint	250
Lacquer (clear wood finish)	550
Sanding Sealer (clear wood finish)	350
Varnish (clear wood finish)	350
Floor coating	100
Shellac (clear)	730
Shellac (pigmented)	550
Stain	250
Faux Finish Coating	350
Architectural sealant	250
Non-membrane roof sealant	300
Single ply roof membrane	450
Waterproofing sealer	250

APPLICATION/PRODUCT TYPE	VOC LIMIT (G/L LESS WATER)
Waterproofing sealer (concrete/masonry)	400
All other sealers	200
Indoor adhesive	50
Wood flooring adhesive	100
Subfloor adhesive	50
Ceramic tile adhesive	65
Contact adhesive	80
Drywall panel adhesive	50
Multipurpose construction adhesive	70
Structural glazing adhesive	100
Special purpose contact adhesive	250
PVC welding	510
Concrete curing compound	350
Wood preservative	350

APPLICABILITY AND EXEMPTIONS

This requirement is applied to all building occupancies as indicated in Table 1.

There are no exceptions to this provision.

RATIONALE

Non-toxic building materials, or materials should not use chemicals that may cause sick building syndrome (SBS) and eventually lead to building related illness (BRI).

DESIGN APPLICATION

1) Paints, coatings, adhesives, and sealant used in ventilating areas or indoors shall be specified with no VOC or with VOC level within maximum allowable content as indicated in Table 22.
2) Composite wood used shall be specified with no urea formaldehyde content.
3) All other building materials specified in the design shall not contain harmful materials.

For the sake of the health of the occupants of a building, VOC levels must be checked on items like below.

FIGURE 83: Certain building materials like paint coatings, sealants, adhesives, membranes, and even fibrous materials like carpet contain certain levels of volatile organic compounds or VOCs.

DESIGN DOCUMENTATION

The following documents are needed for the building permit application:

a. Room Finish Schedule – This is usually in a table or LEGEND box form, either in the basic architectural plans or a dedicated drawing sheet for room finishes. This shall include finishes for ceiling, walls and floor, showing the materials used in the design with reference to the table of VOC limits. These are usually identified through ID tags reflected in the architectural floor plans.
b. Architectural floor plans, elevations and sections – should reflect ID tags for finishes of floor, wall and ceiling
c. Technical specifications of the applicable materials, indicating compliance with the requirement
d. Non-toxic Materials Confirmation Table 24

TABLE 24. CONFIRMATION ON NON-TOXIC MATERIALS USE WITH VOC LIMITS

APPLICATION/PRODUCT TYPE	MATERIAL USED? YES/NO (Y/N)	VOC LIMIT (G/L LESS WATER)	DESIGN SPECIFIED VOC LIMIT (G/L LESS WATER)
Flat paint		50	
Non-flat paint		150	
Anti-rust paint		250	
Lacquer (clear wood finish)		550	
Sanding Sealer (clear wood finish)		350	
Varnish (clear wood finish)		350	
Floor coating		100	
Shellac (clear)		730	
Shellac (pigmented)		550	
Stain		250	
Faux Finish Coating		350	
Architectural sealant		250	
Non-membrane roof sealant		300	
Single ply roof membrane		450	
Waterproofing sealer		250	
Waterproofing sealer (concrete/masonry)		400	
All other sealers		200	
Indoor adhesive		50	
Wood flooring adhesive		100	
Subfloor adhesive		50	
Ceramic tile adhesive		65	
Contact adhesive		80	
Drywall panel adhesive		50	
Multipurpose construction adhesive		70	
Structural glazing adhesive		100	
Special purpose contact adhesive		250	
PVC welding		510	
Concrete curing compound		350	
Wood preservative		350	

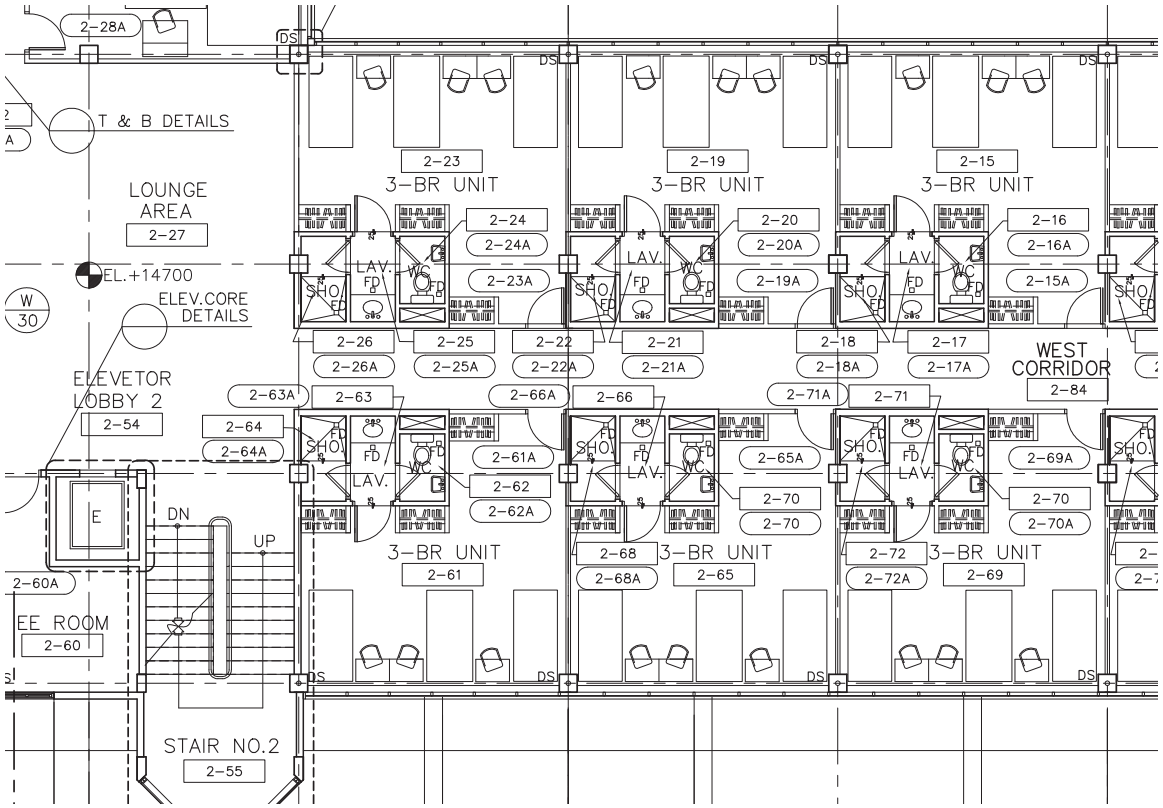


FIGURE 84: Partial floor plan of a building showing room identification tags, which are referenced to a Room Finish Schedule document

Actual samples of room finish schedules follow.

ROOM NUMBER	ROOM NAME	FLOOR MATERIAL	BASE MATERIAL	WALLS								CEILING		
				NORTH		EAST		SOUTH		WEST		MAT.	FIN.	HEIGHT
				MAT.	FIN.	MAT.	FIN.	MAT.	FIN.	MAT.	FIN.			
2–55	STAIR NO. 2	VFT	MSTN	CONC/CMU	MSTN	–	–	CONC/CMU	MSTN	GL	GL	ES	TPD	–
2–56	CHAPEL	CPT	TPD	CONC/CMU/GL	MSTN/GL	CMU	TPD	CONC/CMU/GL	TPD/GL	CMU	TPD	FCM	TPD	–
2–57	SPIRITUAL DIRECTOR'S RM	WPD	WD	CONC/CMU/GL	PTD/GL	CMU	PTD	GYP/CMU	PTD	CONC/CMU/GL	PTD/GL	GYP/ES	TPD/TPD	2500/ –
2–58	T&B	VCT	CTG	CMU	CTG	CMU	CTG	CMU	CTG	CMU	CTG	FCM	PTD	2500
2–59	ANTE ROOM	WPD	WD	GYP/CMU	PTD	CMU	PTD	CONC/CMU/GL	PTD	CONC/CMU/GL	PTD/GL	GYP/ES	TPD/TPD	2500/ –
2–60	ELECTRICAL RM	DCON	PTD	CONC/CMU	PTD	CMU	PTD	CONC/CMU	PTD	GL / CONC	GL / PTD	ES	PTD	–
2–61	3–BED UNIT	WPD	WD	CONC/CMU	PTD	GYP/CMU	PTD	GYP/CONC	PTD	CONC/CMU/GL	PTD/GL	GYP/ES	TPD/TPD	2500/ –
2–62	WC	VCT	CTG	CMU	CTG	CMU	CTG	CMU	CTG	CMU	CTG	FCM	PTD	2500
2–63	LAV	VCT	CTG	CMU	CTG	CMU	CTG	CMU	CTG	CMU	CTG	FCM	PTD	2500
2–64	SHOWER	VCT	CTG	CMU	CTG	CMU	CTG	CMU	CTG	CMU	CTG	FCM	PTD	2500
2–65	3–BED UNIT	WPD	WD	GYP/CONC	PTD	GYP/CMU	PTD	GYP/CONC	PTD	CONC/CMU/GL	PTD/GL	GYP/ES	TPD/TPD	2500/ –
2–66	WC	VCT	CTG	CMU	CTG	CMU	CTG	CMU	CTG	CMU	CTG	FCM	PTD	2500
2–67	LAV	VCT	CTG	CMU	CTG	CMU	CTG	CMU	CTG	CMU	CTG	FCM	PTD	2500
2–68	SHOWER	VCT	CTG	CMU	CTG	CMU	CTG	CMU	CTG	CMU	CTG	FCM	PTD	2500
2–69	3–BED UNIT	WPD	WD	GYP/CONC	PTD	GYP/CMU	PTD	GYP/CONC	PTD	CONC/CMU/GL	PTD/GL	GYP/ES	TPD/TPD	2500/ –
2–70	WC	VCT	CTG	CMU	CTG	CMU	CTG	CMU	CTG	CMU	CTG	FCM	PTD	2500
2–71	LAV	VCT	CTG	CMU	CTG	CMU	CTG	CMU	CTG	CMU	CTG	FCM	PTD	2500
2–72	SHOWER	VCT	CTG	CMU	CTG	CMU	CTG	CMU	CTG	CMU	CTG	FCM	PTD	2500
2–73	3–BED UNIT	WPD	WD	GYP/CONC	PTD	GYP/CMU	PTD	GYP/CONC	PTD	CONC/CMU/GL	PTD/GL	GYP/ES	TPD/TPD	2500/ –
2–74	WC	VCT	CTG	CMU	CTG	CMU	CTG	CMU	CTG	CMU	CTG	FCM	PTD	2500
2–75	LAV	VCT	CTG	CMU	CTG	CMU	CTG	CMU	CTG	CMU	CTG	FCM	PTD	2500
2–76	SHOWER	VCT	CTG	CMU	CTG	CMU	CTG	CMU	CTG	CMU	CTG	FCM	PTD	2500
2–77	ANTE ROOM	WPD	WD	GYP/CONC	PTD	GYP/CMU	PTD	GYP/CMU	PTD	CONC/CMU/GL	PTD/GL	GYP/ES	TPD/TPD	2500/ –
2–78	VICE RECTOR'S ROOM	WPD	WD	GYP/CONC	PTD	CMU	PTD	CONC/CMU	PTD	CONC/CMU/GL	PTD/GL	GYP/ES	TPD/TPD	2500/ –
2–79	T&B	VCT	CTG	CMU	CTG	CMU	CTG	CMU	CTG	CMU	CTG	FCM	PTD	2500
2–80	STAIR NO. 1	VFT	MSTN	CONC/CMU	MSTN	–	–	CONC/CMU	MSTN	CONC/CMU	MSTN	ES	TPD	–
2–81	UTILITY RM	DCON	PTD	CONC/CMU	PTD	CONC/CMU	PTD	CONC/CMU	PTD	CONC/CMU	PTD	ES	PTD	–
2–82	ELEVATOR LOBBY 2	VFT	MSTN	GYP	TPD	GYP/GL	TPF/GL	GYP	TPD	CONC/CMU	MSTN	MFT / GYP	MFT / TPD	2500
2–83	SOUTH CORRIDOR	VFT	MSTN	CONC/GYP	TPD	CMU	TPD	GYP	TPD	–	–	MFT / GYP	MFT / TPD	2500
2–84	NORTH CORRIDOR	VFT	MSTN	–	–	CMU	TPD	–	–	CMU	TPD	MFT / GYP	MFT / TPD	2500
2–85	ROOF DECK 1	PAV	PTD	CONC/CMU	PTD	CONC/CMU	PTD	CONC/CMU	PTD	CONC/CMU	PTD	–	–	–
2–86	ROOF DECK 2	PAV	PTD	CONC/CMU	PTD	CONC/CMU	PTD	CONC/CMU	PTD	CONC/CMU	PTD	–	–	–

FIGURE 85: Partial Room Finish Schedule showing material finish to floor, walls and ceiling. These specified materials shall be referenced to the material specifications where material components covered by the GB Code should comply with the VOC limits.

CONSTRUCTION DOCUMENTATION

The following documents are needed for the issuance of an occupancy certificate:

a. Ocular inspection and verification report of the non-toxic materials applied with reference to the building permit plans
b. Product labels/Nameplate label
c. Material Safety Data Sheet (MSDS)
d. Brochures
e. Technical specifications from manufacturers of non-toxic materials
f. Shop Drawings/as-built plan showing actual applied materials

D. SOLID WASTE MANAGEMENT

Efficient waste management requires the adoption of efficient waste management practices. This supports the principles of RA 9003 or the Solid Waste Management Act, which aims, among others, to:

a) Ensure the protection of the public health and environment;
b) Utilize environmentally-sound methods that maximize the utilization of valuable resources and encourage resource conservation and recovery;
c) Set guidelines and targets for solid waste avoidance and volume reduction through source reduction and waste minimization measures, including composting, recycling, re-use, recovery, green charcoal process, and others, before collection, treatment and disposal in appropriate and environmentally-sound solid waste management facilities in accordance with ecologically sustainable development principles;
d) Ensure the proper segregation, collection, transport, storage, treatment and disposal of solid waste through the formulation and adoption of the best environmental practice in ecological waste management, excluding incineration.

Solid waste management can bring about reduction in the volume of waste being conveyed to sanitary landfills. In recent years, the availability of sanitary landfills has always been difficult, serving especially the National Capital Region (NCR). Solid waste management also allows the collection and build-up of waste resources that can be available to produce materials with recycled content, or materials that can be reused. This also helps in reducing extraction of new raw materials and the need to manufacture new products that consume a lot of energy.

This code requirement will help support national compliance to various environment-related laws, such as Republic Act No. 9003, the Solid Waste Management Act, an act which requires, among others, segregation of solid waste; Republic Act No. 8749, the Clean Air Act, and Republic Act No. 9729 or the Climate Change Act, which espouses sustainable development, as one of its core principles.

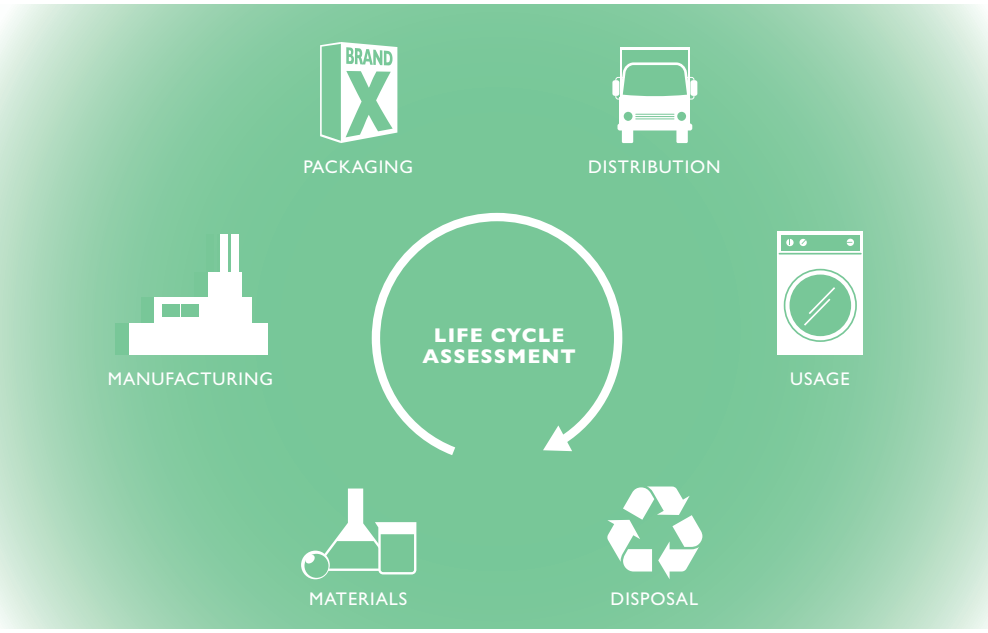


FIGURE 86: Material life cycle starting from materials, manufacturing, packaging, distribution, usage, to disposal

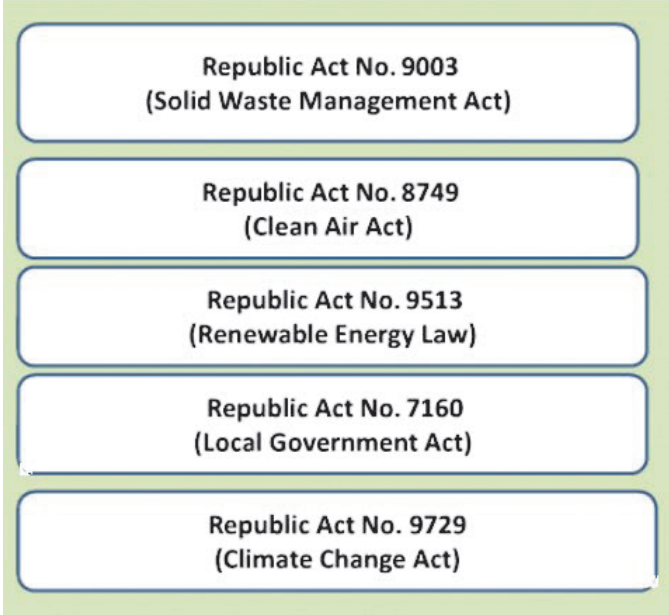


FIGURE 87: Relevant national policies affected by solid waste management

D.1. MATERIALS RECOVERY FACILITY (MRF)

CODE REFERENCE 13.1: REQUIRED MEASURES

13.1.1. Buildings shall be provided with a minimum area for MRF as specified in Table 25.

13.1.2. MRF shall be fully enclosed and easily accessible from within the building and from the outside for easy collection of waste.

13.1.3. Solid waste containers shall be provided for at least four (4) types of wastes:

- compostable (biodegradable)
- non-recyclable (to be disposed off in the landfill)
- recyclable (paper, cardboard, plastic, metal, wood, etc.)
- special waste

13.1.4. For hospitals, isolated bins for hazardous wastes shall be provided to avoid contamination.

TABLE 25. MRF MINIMUM DAILY STORAGE SPACE REQUIREMENT[20]

USE/OCCUPANCY	REQUIREMENT
Residential Dwelling: Condominium	1.0 sqm waste storage space per 2,500 sqm TGFA + 50% circulation space
Hotel/Resort	1.0 sqm waste storage space per 2,500 sqm TGFA + 50% circulation space
Educational: School	1.0 sqm waste storage space per 300 sqm TGFA + 50% circulation space
Institutional: Hospital	1.0 sqm waste storage space per 1,250 sqm TGFA + 50% circulation space
Business: Office	1.0 sqm waste storage space per 1,400 sqm TGFA + 50% circulation space
Mercantile: Mall	1.0 sqm waste storage space per 400 sqm TGFA + 50% circulation space

SOURCE: Required spaces generated from DENR (EMB Report on Solid Waste Generation) statistics on national waste generation, and space requirements from the NBC

APPLICABILITY AND EXEMPTIONS

This requirement is applied to all building occupancies as indicated in Table 1.

There are no exceptions to this provision.

RATIONALE

MRF shall be provided for the collection and segregation of solid waste materials. MRF is a solid waste management facility that provides for the extraction from solid waste of recyclable materials, materials suitable for use as a fuel or soil amendment, or any combination of those materials.

For buildings, an MRF serves as storage of solid waste materials and their segregation. It is a temporary storage facility for the segregated materials until they are conveyed to the proper disposal facilities such as recycling facilities, another building site, or sanitary landfills.

DESIGN APPLICATION

1) Enclosed and easily accessible MRF with floor area as per Table 26.
2) Solid waste containers for compostable, non-recyclable, recyclable, and special wastes.
3) Hazardous waste container for hospitals.

Examples of Materials Recovery Facilities follow.

FIGURE 88: An MRF in Pampanga province showing the compartmentalization and segregation of solid waste

DESIGN DOCUMENTATION

The following documents are needed for the building permit application:

a. Architectural floor plans, elevations and sections – showing location of MRF
b. Technical specifications for the MRF
c. MRF floor area Computation - Table 26 – to be included in the architectural plans

TABLE 26. MRF FLOOR AREA COMPUTATION TABLE *(MRF floor area calculator in DPWH website)*

BUILDING OCCUPANCY (a)	BUILDING TGFA (SQ.M.) (b)	CODE SPACE REQ'T(MRF SQM/ REQD AREA PER TGFA + 50% CIRCULATION SPACE) (c)	COMPUTED REQD MRF FLOOR AREA (SQ.M.) (d)	DESIGNED MRF PROVISION (SQ.M.) (e)
Specify building occupancy	Building TGFA	Refer to Table 25	[(storage space requirement) x (b)] + [[(storage space requirement × (b)]÷2]	Designer specified

Depending on the building occupancy, refer to Table 25 to determine the required minimum MRF storage space requirement. Multiply this with the TGFA of the building to determine the required MRF floor space. Then add 50% of the determined MRF storage space for circulation. This will complete the minimum required total MRF floor space.

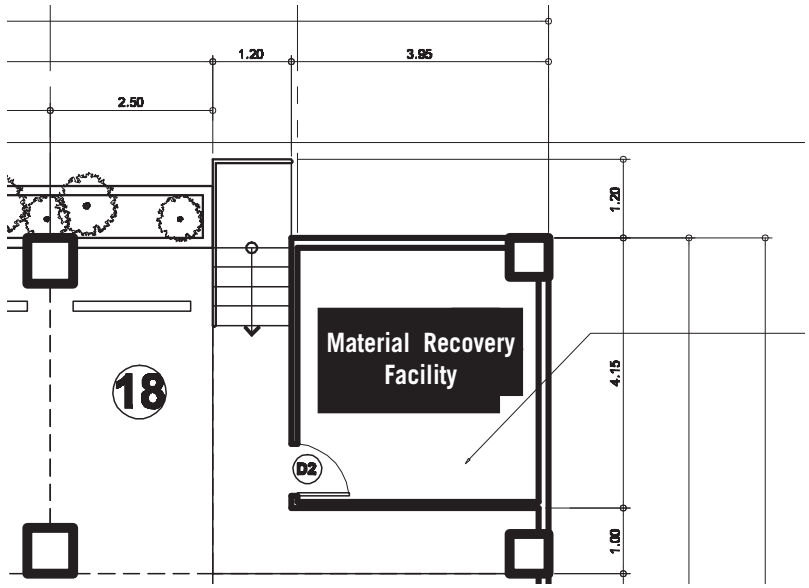


FIGURE 89: Partial building floor plan showing provision of MRF.

CONSTRUCTION DOCUMENTATION

The following documents are needed for the issuance of an occupancy certificate:

a. Ocular inspection and verification report of the provision of a dedicated MRF with reference to the building permit plans including:
   - floor plan
   - MRF Area Computation table

b. Shop Drawings/as-built plants of actual installed systems

E. SITE SUSTAINABILITY

Site sustainability requires the adoption of design, construction and operation practices that minimize the impact of buildings on ecosystems and water resources.

Sites should be selected by determining which would pose the least environmental threat if construction were to take place. Pollution prevention, including controlling soil erosion, waterway sedimentation, and airborne dust generation are important factors to be considered. Sites should also be closer to urban development where supporting infrastructure is available; this will preserve green spaces and wildlife areas.

Biodiversity can be promoted by complying with the required minimum open space in the new building complexes. Another factor is the water management systems that take into account the natural environment design for storm-water systems to ensure proper management of water. Reduction of the heat island effects from roofs and parking lots as well as the reduction of light pollution should also be taken into account to promote sustainability.[21]

E.1. SITE/GROUND PREPARATION AND EARTHWORKS

CODE REFERENCE 14.1: REQUIRED MEASURES

Measures for site protection shall be in place before the start of construction.

14.1.1. Building site erosion and sedimentation control plan that outlines measures to be applied to prevent soil that can run-off to natural bodies of water, causing water pollution.

14.1.2. Additional measures to mitigate the effect of pollution and safety on construction conforming to Rule XI of the NBC.

14.1.3. Storm water collection management plan.

14.1.4. Structures or facilities for storm water collection.

APPLICABILITY AND EXEMPTIONS

This requirement is applied to all building occupancies as indicated in Table 1.

There are no exceptions to this provision.

RATIONALE

Site clearing, grading, and excavation shall be planned at the start of construction. This is to mitigate pollution caused by erosion and sedimentation, taking into consideration existing endemic foliage as regulated by the DENR.

All existing utilities and water bodies and waterways shall be protected and shall not be disturbed.

DESIGN APPLICATION

1) Site erosion and sedimentation control strategies and facilities during construction activities.
2) Pollution reduction and control measures during construction activities.
3) Safety and hazard prevention practices during construction activities.
4) Storm water collection and management facilities within the project site.

DESIGN DOCUMENTATION

The following documents are needed for the building permit application:

a. Site Erosion and Sediment Control Plan – showing strategies to prevent and control erosion and storm water run-off. Strategies shall be identified in the plan through indications and call-outs.
b. Technical specifications in support of the site erosion and control plan.

Following are some elements of a well-planned excavation and construction site.

Erosion and sedimentation control

Hazard prevention during construction activities

Safety signage at construction site

For sediment filtering at drainage way

Safety measures on site

Gravel bed on construction site to help scrape-off dirt from vehicular tires before entering public street

FIGURE 90: Elements of a well-planned excavation and construction site

FIGURE 91: Gabion used for erosion control

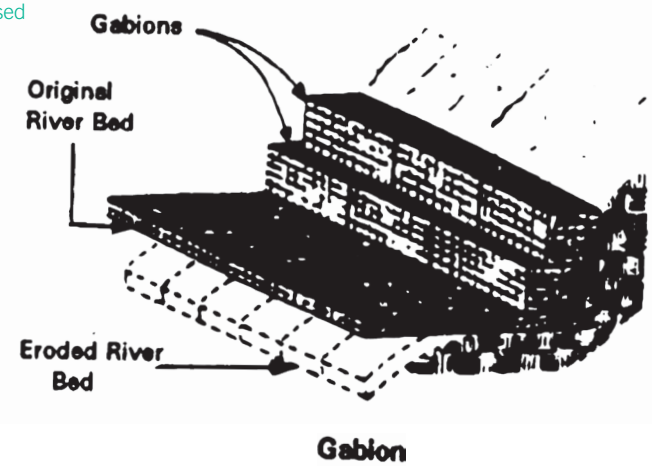


FIGURE 92: Riprap used for slope protection

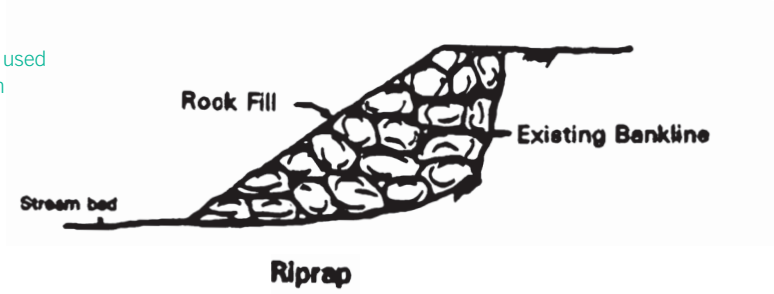
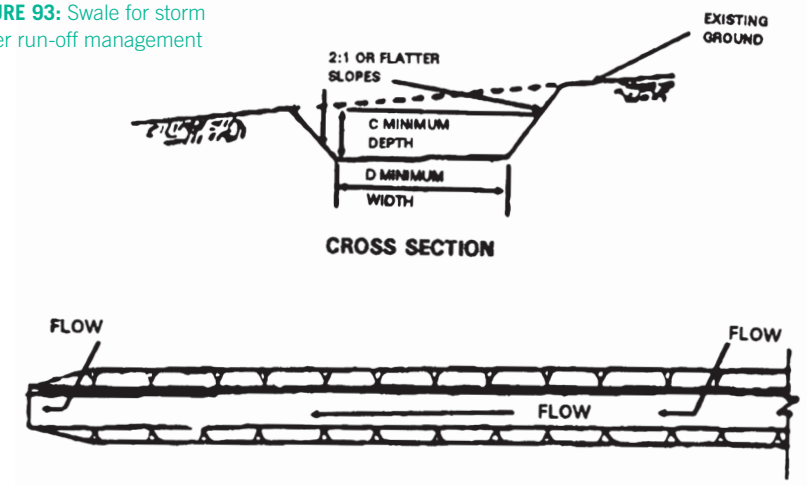


FIGURE 93: Swale for storm water run-off management



CONSTRUCTION DOCUMENTATION

The following documents are needed for the issuance of an occupancy certificate:

a. Ocular inspection and verification report during site clearing, grading, excavation, and structural foundation activities, with reference to the submitted building permit plans, which includes the Site Erosion and Sedimentation Control Plan
b. Ocular inspection and verification after building construction with focus on stormwater run-off management and adjacent sites protection, with reference to the submitted building permit plans
c. Shop Drawings/as-built plans of actual installed systems

E.2. OPEN SPACE UTILIZATION

CODE REFERENCE 14.2: REQUIRED MEASURES

A minimum of 50% of the required unpaved surface area (USA) shall be vegetated with indigenous and adaptable species.

APPLICABILITY AND EXEMPTIONS

This requirement is applied to all building occupancies as indicated in Table 1.

There are no exceptions to this provision.

RATIONALE

The inclusion of green areas or landscaped areas for indigenous or adaptable species of grass, shrubs, and trees will help provide more permeable surface for the building development's open space, allow the re-charging of natural ground water reservoir; control storm water surface run-off; cool the building surroundings; and provide indoor to outdoor connectivity for the building occupants.

DESIGN APPLICATION

1) Required USA of project site, at least 50% of which is with vegetation.

Here are some examples of how unpaved surfaces can become homes to green patches.

FIGURE 94: Unpaved surface as vegetable garden

FIGURE 95: Parking area with predominantly unpaved surface to allow vegetation to thrive

DESIGN DOCUMENTATION

The following documents are needed for the building permit application:

a. Site Development Plan – showing provision of at least 50% more than the required unpaved surface area with indications or specifications callout
b. Technical specifications of the vegetation to be used
c. Unpaved Surface Area Computation, Table 27

TABLE 27. MINIMUM FRESH AIR RATE (HOTEL/RESORT AND RESIDENTIAL/CONDOMINIUM)

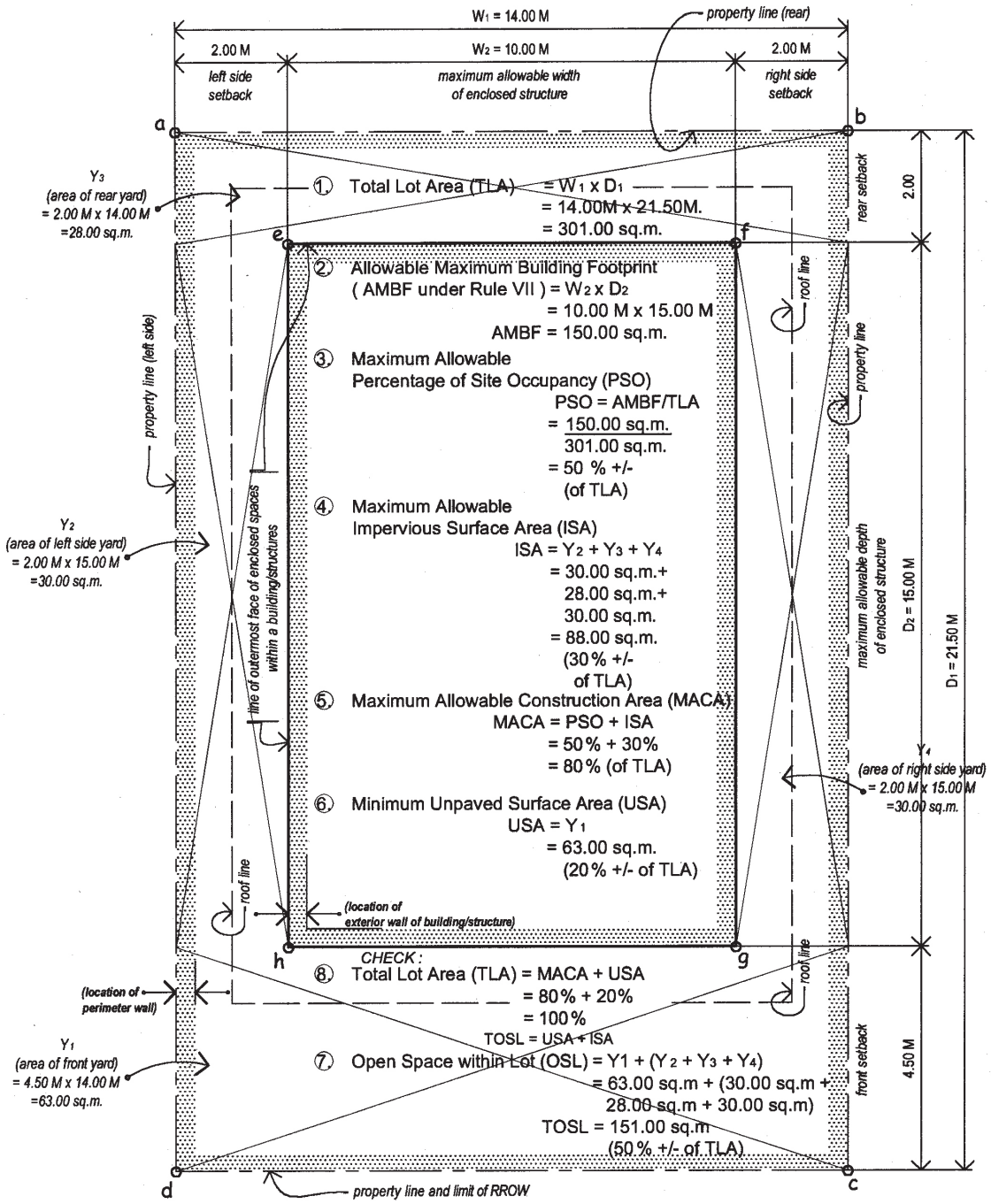
OCCUPANCY CATEGORY	PEOPLE OUTDOOR AIR RATE		AREA OUTDOOR AIR RATE		MAX. DEFAULT OCCUPANCY DENSITY
	(CFM/PERSON)	(CMH/PERSON)	(CFM/SQ FT)	(CMH/SQ.M)	(PEOPLE/1,000 SQ FT (90 SQ M))
HOTEL/RESORT AND RESIDENTIAL DWELLING: CONDOMINIUM					
Bedroom/living room	5	8.5	0.06	0.1968	10
Lobbies/pre-function	7.5	12.75	0.06	0.1968	30
Common corridors	-		0.06	0.1968	-
Multi-purpose assembly	5	8.5	0.06	0.1968	120
Laundry rooms, central	5	8.5	-0.12	0.3936	10
Laundry rooms within dwelling rooms	5	8.5	0.12	0.3936	10
OFFICE BUILDINGS					
Office spaces	5	8.5	0.06	0.1968	5
Reception areas	5	8.5	0.06	0.1968	30
Telephone/data entry	5	8.5	0.06	0.1968	60
Main entry lobbies	5	8.5	0.06	0.1968	10
Bank vaults/safe deposit	5	8.5	0.06	0.1968	5
MERCANTILE: MALL					
Sales area	7.5	12.75	0.12	0.3936	15
Mall common areas	7.5	12.75	0.06	0.1968	40
Barbershop	7.5	12.75	0.06	0.1968	25
Beauty and nail salons	20	34	0.12	0.3936	25
Petshops (animal areas)	7.5	12.75	0.18	0.5904	10
Supemarket	7.5	12.75	0.06	0.1968	8
Laundries	7.5	12.75	0.06	0.1968	20
Photo studios	5	8.5	0.12	0.3936	10
Pharmacy (prep area)	5	8.5	0.18	0.5904	10
Computer (not printing)	5	8.5	0.06	0.1968	4
Restaurant dining rooms	7.5	12.75	0.18	0.5904	70
Cafeteria/fast food dining	7.5	12.75	0.18	0.5904	100
Bars, cocktail lounges	7.5	12.75	0.18	0.5904	100
EDUCATIONAL: SCHOOL					
Day care (through age 4)	10	17	0.18	0.5904	25
Classrooms (ages 5-8)	10	17	0.12	0.3936	25
Classrooms (ages 9 plus)	10	17	0.12	0.3936	35
Lecture classroom	7.5	12.75	0.06	0.1968	65
Lecture hall (fixed seats)	7.5	12.75	0.06	0.1968	150
Art classroom	10	17	0.18	0.5904	20
Science laboratories	10	17	0.18	0.5904	25
Wood/metalshop	10	17	0.18	0.5904	20
Computer lab	10	17	0.12	0.3936	25
Media center	10	17	0.12	0.3936	25
Music/theater/dance	10	17	0.06	0.1968	35
Multi-use assembly	7.5	12.75	0.06	0.1968	100
University/College laboratories	10	17	0.18	0.5904	25
Sports arena (play area)	-		0.3	0.984	-
Gym, stadium (play area)	-		0.3	0.984	-
Spectator area	7.5	12.75	0.06	0.1968	150
Swimming (pool & deck)	-		0.48	1.5744	-

TABLE 28. UNPAVED SURFACE AREA COMPUTATION TABLE

BUILDING OCCUPANCY (a)	TOTAL LOT AREA (SQ.M.) (b)	NBC REQ'D TOSL (SQ.M.) (c)	DESIGNED TOTAL OPEN SPACE (SQ.M.) (d)	NBC REQ'D MIN. USA (SQ M) (e)	GB CODE REQ'D MIN. USA W/ VEGETATION (SQ M) (f)	DESIGNED USA W/VEGETATION (SQ M) (g)
Specify building occupancy	Specify Total Lot Area (TLA)	Refer to Table VIII.1 of Rule VIII of the National Building Code TLA x % of TLA (Reqd TOSL)	Designer specified	Refer to Table VIII.1 of Rule VIII of the National Building Code [TLA (b) x % of TLA (Reqd USA)]	NBC Reqd Min. USA (e) × 0.5	Designer specified

Depending on the building occupancy, refer to Table VIII.1 under Rule VIII Light and Ventilation of the National Building Code, to determine the NBC-required total open spaces within lot (TOSL) and unpaved surface area (USA). To get the GB Code-required USA with vegetation, compute for 50% of the NBC-required USA. The resulting computation should then be compared with the designer-specified vegetated USA of the building lot.

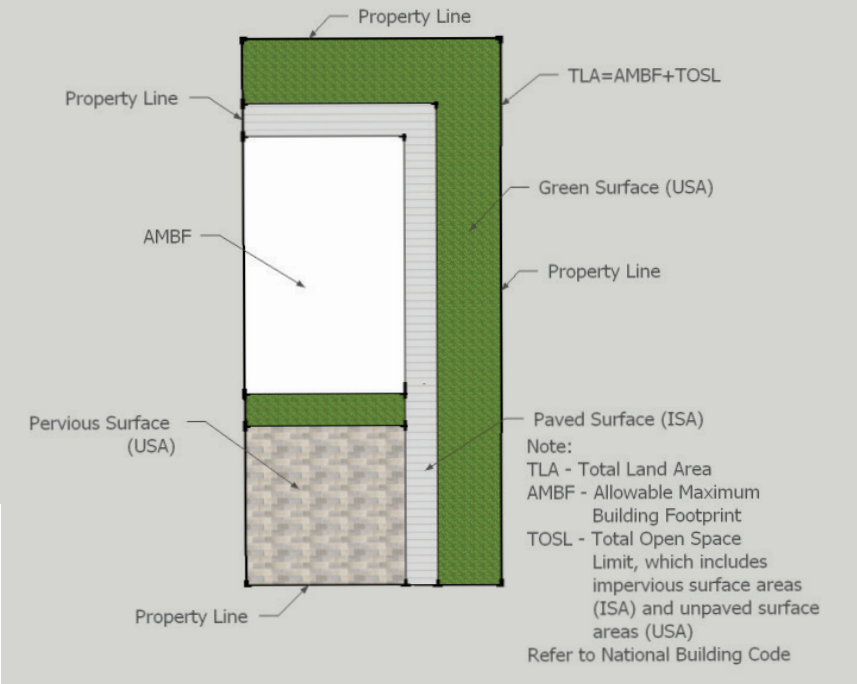
FIGURE 96: Unpaved surface area with vegetated portions



Maximum Allowable PSO/ISA, MACA, Minimum USA, OSL and AMBF for a Residential 1 (R-1) Lot (Single-Detached Dwelling Unit)

FIGURE 97: Minimum requirements for total open space within lot (TOSL) (Reference from National Building Code Rule VIII-Light & Ventilation)

FIGURE 98: Shaded part of the 50% unpaved surface areas (USA) required for vegetation in GB Code



CONSTRUCTION DOCUMENTATION

The following documents are needed for the issuance of an occupancy certificate:

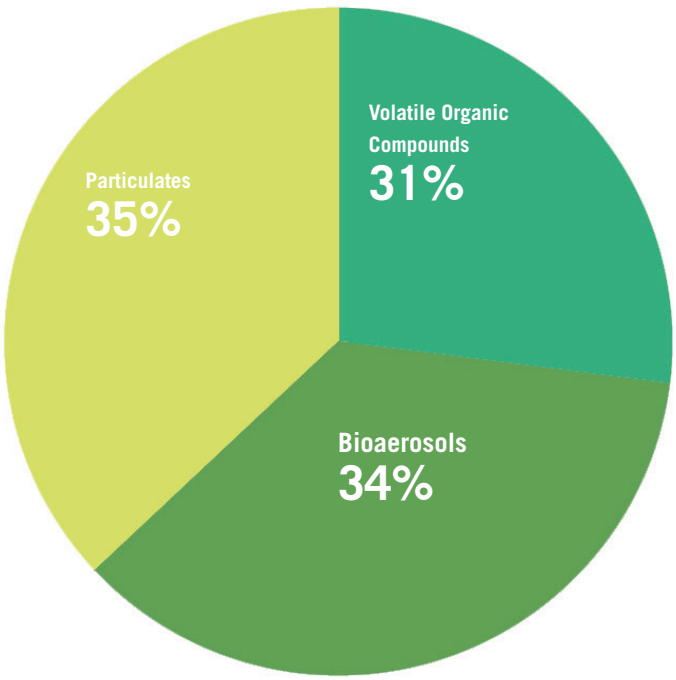
a. Ocular inspection and verification report after completion of building construction, with reference to the submitted building permit plans which include the Site Development Plan and USA computation table
b. Specifications of vegetation used
c. Shop Drawings/as-built plan of actual site development

F. INDOOR ENVIRONMENTAL QUALITY

Indoor environmental quality (IEQ) requires the adoption of efficient design and operation practices that take into consideration the building environment , and that aim to improve occupant health, productivity, and safety.

Understanding the sources of indoor environmental contaminants and controlling them can often help prevent or resolve building-related worker symptoms. Practical guidance for improving and maintaining the indoor environment is available.

FIGURE 99: Composition of pollutants in air



Below are some ways to improve indoor air quality.

FIGURE 100: Following are some ways to improve indoor air quality.

Building indoors that should support IEQ, daylighting, good indoor air quality

Ventilating fan provides fresh air

Window to let in natural air

Air filters remove dust from the air that passes through them.

F.1. MINIMUM FRESH AIR RATES

CODE REFERENCE 15.1: REQUIRED MEASURES

Building shall comply with the minimum fresh air rates provided in the latest PSVARE standard, through the following: Table 28 and Table 29.

TABLE 29. MINIMUM FRESH AIR RATE (GENERAL/PUBLIC ASSEMBLY SPACES)

OCCUPANCY CATEGORY	PEOPLE OUTDOOR AIR RATE		AREA OUTDOOR AIR RATE		MAX. DEFAULT OCCUPANCY DENSITY
	(CFM/ PERSON)	(CMH/ PERSON)	(CFM/SQ FT)	(CMH/SQ.M)	(PEOPLE/1,000 SQ FT {90 SQ M})
GENERAL					
Conference/meeting	5	8.5	0.06	0.1968	50
Corridors	-		0.06	0.1968	-
Storage rooms	-		1.12	3.6736	-
Break room	5	8.5	0.06	0.1968	25
Coffee room	5	8.5	0.06	0.1968	20
Disco/dance floors	20	34	0.06	0.1968	100
Health club (aerobics room)	20	34	0.06	0.1968	40
Health club (weights room)	20	34	0.06	0.1968	10
Bowling gallery (seating)	10	17	0.12	0.3936	40
Gambling casino	7.5	12.75	0.18	0.5904	120
Game arcades	7.5	12.75	0.18	0.5904	20
Stages, Studios	10	17	0.06	0.1968	70
PUBLIC ASSEMBLY SPACES					
Auditorium seating areas	5	8.5	0.06	0.1968	150
Places of religious worship	5	8.5	0.06	0.1968	120
Courtrooms	5	8.5	0.06	3.6736	70
Legislative chambers	5	8.5	0.06	0.1968	50
Libraries	5	8.5	0.12	0.1968	10
Lobbies	5	8.5	0.06	0.1968	150
Museums (children's)	7.5	12.75	0.12	0.1968	40
Museums/galleries	7.5	12.75	0.06	0.1968	40

APPLICABILITY AND EXEMPTIONS

This requirement is applied to all building occupancies as indicated in Table 1.

There are no exceptions to this provision.

RATIONALE

The building indoor environment can contain more contaminants many times over than the outside. Various studies have shown that indoor air contaminants can cause health disorders, such as sick building syndrome (SBS) and building related illness (BRI). The introduction and application of minimum fresh air rates will maintain acceptable indoor air quality through the constant replacement of indoor air in buildings.

DESIGN APPLICATION

Outside supply air (OSA) and exhaust air ventilation system of the building conforming to minimum ventilation requirements of PSVARE Standard.

DESIGN DOCUMENTATION

The following documents are needed for the building permit application:

a. Equipment Schedule – showing the equipment used for ventilation indicating capacities and air flow.
b. Air-conditioning and Ventilation layout – showing location of air-conditioning and ventilation equipment with the ID callout that is referenced to the Equipment Schedule.
c. Required Ventilation Rates Computation Table 30.
d. Technical Specifications of the equipment used.

TABLE 30. MINIMUM VENTILATION RATES COMPUTATION TABLE

REQUIRED MINIMUM VENTILATION RATES COMPUTATION TABLE									
ROOM PARAMETERS				2010 PSVARE STANDARD		REQUIREMENT			EQUIPMENT
SPACE	ROOM/SPACE DESIGNATION	SPACE FLOOR AREA (SQ. M.)	SPACE OCCUPANCY (PERSON)	AREA OUTDOOR AIRFLOW RATE (CMH./SQ. M.)	PEOPLE OUTDOOR AIRFLOW RATE (CMH./SQ. M.)	DESIGNED AREA OUTDOOR AIRFLOW (CMH./SQ. M.)	DESIGNED PEOPLE OUTDOOR AIRFLOW (CMH./SQ. M.)	DESIGNED TOTAL AIRFLOW (CMH./SQ. M.)	SCHEDULE DESIGNATION(S)
		X	Y	Ao	Po	(X x Ao)	(Y x Po)	(X x Ao)+ (Y x Po)	
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									

EQUIPMENT DESIGNATION IN AIR CONDITIONING & VENTILATION LAYOUT

Air conditioning and ventilation layouts should reflect the location of the equipment with their identifying tags or designations. These tags or designations are coordinated in the Equipment Schedule and in the required ventilation rates computation table.

CONSTRUCTION APPLICATION

The following documents are needed for the issuance of an occupancy certificate:

a. Ocular inspection and verification report after completion of building construction, with reference to the submitted building permit plans, include equipment schedule, air-conditioning, ventilation system layout
b. Brochure of equipment used
c. Nameplate label/product label of equipment used
d. Specifications from manufacturer
e. Shop Drawings/as-built plans of actual installed systems

F.2. DESIGNATED SMOKING AREA

CODE REFERENCE 15.2: REQUIRED MEASURES

15.2.1. If smoking is banned within the building and property premises, "NO SMOKING" signs in compliance with RA 9514 (Fire Code of the Philippines 2008), shall be posted in conspicuous areas of the building and property premises to remind building occupants of the policy.

15.2.2. If smoking is only allowed outdoors, designated smoking areas shall be naturally ventilated, outside of the building shell and away from building entrances, windows and outside supply air (OSA) intakes by at least ten (10) meters.

15.2.3. If smoking is allowed indoors, designated smoking areas shall be provided, partitioned from the rest of the indoor areas. Partitions shall be from floor to soffit of the next floor or roof structure. Enclosed smoking areas shall be equipped with adequate exhaust system with exhaust rate in accordance with the latest PSVARE standards. Exhaust shall directly vent out to the outside of the building and away from any building openings or air intakes.

15.2.4. Doors and windows of enclosed smoking area shall always be closed and well-sealed. Negative pressure within is recommended to prevent smoke infiltration to adjacent spaces.

APPLICABILITY AND EXEMPTIONS

This requirement is applied to all building occupancies as indicated in Table 1.

Buildings with a general policy "no smoking" within building premises may be exempted from having designated smoking areas.

RATIONALE

Environmental Tobacco Smoke (ETS) is one of the leading causes of respiratory illnesses in building occupants. RA 9211, the Tobacco Regulations Act, restricts tobacco smoking in public spaces and the prescription of designated smoking areas inside buildings.

DESIGN APPLICATION

1) NO SMOKING policy signage posted in the building, complying with RA 9514;
2) Designated smoking area outdoors are naturally ventilated and located at least 10 meters away from the building entrances, windows and OSA intakes;

3) Designated smoking area indoors are fully partitioned from the rest of the indoor areas and with proper exhaust system in accordance with PSVARE standards;
4) Enclosed smoking areas indoors have dedicated exhaust system, negative pressure, that directly vents outside, away from any building openings and intakes;
5) Enclosed smoking areas have well-sealed doors and windows.

Examples of well-marked smoking and no-smoking areas follow.

FIGURE 101: A "no smoking" signage

FIGURE 102: Designated smoking areas and "no smoking" areas

DESIGN DOCUMENTATION

The following documents are needed for the issuance of an occupancy certificate:

a. Architectural floor plans and/or site development plan showing designated smoking area, complete with distances.
b. Architectural detailed elevation & section of indoor smoking area.
c. Ventilation system for indoor smoking area in mechanical plans.
d. For a building without a general "No Smoking" policy, floor plans showing location of "No Smoking" signage.
e. Detail and location of signages for designated smoking areas.

CONSTRUCTION APPLICATION

Ocular inspection and verification report is needed for the issuance of an occupancy certificate:

Below are some examples of well-appointed smoking areas.

INDOOR SMOKING AREA

FIGURE 103: Indoor smoking lounge

OUTDOOR SMOKING AREA

FIGURE 104: Enclosed outdoor smoking area

GLOSSARY

Accredited Professional Organizations (APO) - professional organizations accredited by the Professional Regulatory Commission

Addition - any new construction that increases the height and/or floor area of existing buildings/structures

Air Conditioning - the process of treating air so as to control simultaneously its temperature, humidity, cleanliness, and distribution to meet the requirements of conditioned space

Air tightness - the fundamental building property that affects infiltration (the uncontrolled inward leakage of outdoor air through cracks, interstices or other unintentional openings of a building, caused by pressure effects of the wind and/or stack effect).

Alteration - works in buildings/structures involving changes in the materials used, partitioning, location/size of openings, structural parts, existing utilities and equipment but do not increase the building height and/or floor area

American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) - global society founded in 1894, advancing human well-being through sustainable technology for the built environment with focus on building systems, energy efficiency, indoor air quality, refrigeration, and sustainability within the industry

Applicable Provision - any requirement that relates to a given condition

British thermal unit (BTU) - amount of heat energy needed to raise the temperature of one pound of water by one degree Fahrenheit

Building envelope - the ensemble of exterior and diminishing partitions of a building that enclose conditioned space.

Building Official - the Executive Officer of the Office of Building Official appointed by the Secretary

Building Permit - document issued by the Building Official (BO) to an owner/applicant to proceed with the construction, installation, addition, alteration, renovation, conversion, repair, moving, demolition or other work activity of a specific project/ building/structure or portions thereof after the accompanying principal plans, specifications and other pertinent documents with the duly notarized application are found satisfactory and substantially conforming with the NBC and its Implementing Rules and Regulations (IRR)

Building Related Illness (BRI) - diagnosable illness whose cause and symptoms can be directly attributed to a specific pollutant source within a building

Business-as-usual (BAU) - an unchanging state of affairs despite difficulties or disturbances

Car, elevator - the load-carrying unit including its platform, enclosure and door or gate

Clerestory - high windows above eye level

Climate Change - refers to any significant change in measures of climate, such as temperature, precipitation, or wind, lasting for an extended period

Coefficient of Performance (COP) - ratio of heating or cooling provided to electrical energy consumed, where higher COPs equate to lower operating costs

Compostable waste - mixture of various organic substances that can be placed into a composition of decaying biodegradable materials, which eventually turns into a nutrient-rich material, used for fertilizing soil

Construction - all on-site work done in the site preparation, excavation, foundation, assembly of all the components and installation of utilities, machineries and equipment of buildings/ structures

Conversion - change in the use or occupancy of buildings/structures or any portion/s thereof, which has different requirements

Cool Roof Rating Council (CRRC) - a not-for-profit organization designated as the Supervisory Entity with responsibility to rate and label the reflectance and emittance of roof products.

Daylight - the natural light of day, which is a combination of all direct and indirect sunlight during daytime

Daylight Zone - area substantially illuminated by daylight and consistently receiving significant quantities of sunlight during the day (ASHRAE/IES 90.1-2010 energy standard)

Demolition - systematic dismantling or destruction of a building/ structure, in whole or in part

Department - Department of Public Works and Highways

Department of Energy (DOE) - the executive department of the Philippine government responsible for preparing, integrating, coordinating, supervising, and controlling all plans, programs, projects, and activities of the government relative to energy exploration, development, utilization, distribution, and conservation

Department of Environment and Natural Resources (DENR) - the main department of the Philippine government responsible for supervising and managing the different programs and implementing rules governing the use and development of the country's natural resources

Department of Public Works and Highways (DPWH) - executive department of the Philippine government that functions as the engineering and construction arm of the Government, tasked to continuously develop its technology for the purpose of ensuring the safety of all infrastructure facilities and securing for all public works and highways the highest efficiency and quality in construction

Department of Trade and Industry (DTI) - the executive department of the Philippine government tasked to expand Philippine trade, industries, and investments as the means to generate jobs and raise incomes for Filipinos

Door assembly - unit composed of a group of parts or components that make up a closure for an opening to control passageway through a wall, and which consists of the following parts: door; hinges; locking device or devices; operation contacts (such as handles, knobs, push plates); miscellaneous hardware and closures; the frame, including the head, threshold and jambs plus the anchorage devices

Elevator - a hoisting and lowering mechanism other than a dumbwaiter or freight elevator, which is designed to carry passanger or authorized personnel, in a protected enclosure (elevator car) that moves along fixed guides in a vertical direction serving two or more fixed landings/floors on a hoistway

Energy Efficiency Ratio (EER) - energy efficiency rating for room air conditioners, which lists how many Btu per hour are used for each watt of power it draws

Energy Recovery - includes any technique or method of minimizing the input of energy to an overall system by the exchange of energy from one sub-system of the overall system with another

Enthalpy Recovery Wheel - an energy recovery device that transfers outgoing temperature and humidity to the incoming outdoor air

Environmental Tobacco Smoke (ETS) - secondhand smoke consisting of airborne particles emitted from the burning end of cigarettes, pipes, and cigars, exhaled by smokers containing about 4,000 compounds, up to 50 of which are known to cause cancer

Escalator - a power driven, inclined, continuous stairway for raising or lowering passengers

Government Agency - refers to any of the various units of the government including a department, bureau, office, instrumentality, or government owned or controlled corporation

Greenhouse Gas (GHG) - gas in the atmosphere that absorbs and emits radiation within the thermal infrared range. This process is the fundamental cause of the greenhouse effect.

Harmonics - increased heating in equipment and conductors, the reduction of which is desirable

Hazardous - anything that involves risk or danger to the safety and welfare of the public

Heat Island Effect (HIE) - describes built up areas that are hotter than nearby rural areas

Heating, Ventilating and Air Conditioning (HVAC) - system that helps maintain good indoor air quality through adequate ventilation with filtration and provide thermal comfort

Implementing Rules and Regulations (IRR) - rules and regulations necessary in the implementation of the provisions of the GB Code

Indoor Environmental Quality (IEQ) - condition inside the building that includes air quality, access to daylight and views, pleasant acoustic conditions, and occupant control over lighting and thermal comfort

Institute of Electronics and Communications Engineers of the Philippines (IECEP) - an organization that offers assistance to the Electronics Engineers and the general public; the expert professional services in the electronics, communications and allied engineering. It is an organization that supports electronics and communications development in the Philippines

Institute of Integrated Electrical Engineers (IIEE) - the accredited organization of electrical engineers that aims to instill excellence among and to contribute to the development of electrical engineers in the Philippines

Joint - a space between the adjacent surfaces of two bodies joined and held together

Light Monitor - raised structure running along the ridge of a double-pitched roof, with its own roof running parallel with the main roof

Light Scoop - south-facing skylight that uses tilted panels of transparent glass to strategically bring daylight into an interior space

Light Shelf - a horizontal surface that reflects daylight deep into a building, placed above eye-level with high-reflectance upper surfaces, which reflect daylight onto the ceiling and deeper into the space

Lighting Power Density (LPD) - amount of electric lighting, usually measured in watts per square foot, used to illuminate a given space

Materials Recovery Facility (MRF) - a facility designed to receive, sort, process, and store compostable and recyclable materials efficiently and in an environmentally sound manner

Material Safety Data Sheet (MSDS) - data providing procedures for handling or working with a material or product in a safe manner. The data sheet includes information such as physical data, toxicity, health effects, first aid, reactivity, storage, disposal, protective equipment and spill handling procedures.

Moving Ramp/Walkway - a type of horizontal passenger-carrying device on which passengers stand or walk, with its surface remaining parallel to its direction of motion is uninterrupted

National Building Code (NBC) - P.D. 1096 is a uniform building code in the Philippines that embodies up-to-date and modern technical knowledge on building design, construction, use, occupancy, and maintenance

National Economic and Development Authority (NEDA) - an independent cabinet-level agency of the Philippine government responsible for economic development and planning

Non-recyclable waste - waste that cannot be processed or treated for reuse in some other form

Office of the Building Official (OBO) - the Office authorized to enforce the provisions of NBC and its IRR, as well as the orders and decisions made pursuant thereto

Operable Window - a window unit with one or more sections that can be opened for ventilation

Outside Supply Air (OSA) - air containing at least the minimum volume of outside air filtered and conditioned to the required temperature and humidity

Parking, Covered - parking under roof that does not contribute to the heat island effect

Parking, Open - parking structure with wall openings open to the atmosphere, distributed over 40 percent of the building perimeter or uniformly over two opposing sides to provide ventilation

Philippine Association of Building Officials (PABO) - association of building officials in the Philippines

Philippine Institute of Civil Engineers (PICE) - a professional organization for civil engineers in the Philippines formed by merging two separate organizations of civil engineers: one group working in government and the other group working in the private sector

Philippine Institute of Environmental Planners (PIEP) - a national organization of professionally trained planners who pursue an advancement in the study of environmental planning in the best interest of the nation

Philippine National Standards (PNS) - documents established by consensus through technical committees and approved by the Department of Trade and Industry - Bureau of Product Standards to ensure desirable characteristics of products and services such as quality, environmental friendliness, safety, reliability, efficiency, and interchangeability

Philippine Society of Mechanical Engineers (PSME) - the organization of mechanical engineers in the Philippines uniting and enjoining the mechanical engineers in the pursuit of further professional growth and to upliftment of the profession

Philippine Society of Sanitary Engineers (PSSE) - the only professional organization of sanitary engineers in the Philippines accredited by the Professional Regulation Commission and soon to be renamed the Philippine Society of Environmental and Sanitary Engineers, Inc. (PSEnSE)

Philippine Society of Ventilating Air-Conditioning and Refrigerating Engineers (PSVARE) - a duly registered non-stock, non-profit organization, the members of which are consultants, contractors, manufacturers, and suppliers involved in the practice of air conditioning, ventilation, and refrigeration systems

Photoelectric Sensor - a device used to detect the distance, absence, or presence of an object by using a light transmitter, often infrared, and a photoelectric receiver

R-Value - resistance value or the capacity to resist heat loss or its thermal resistance

Recyclable waste - an item or material capable of being used again

Regularly Occupied Space - areas where one or more individuals normally spend time (more than one hour per person per day on average) seated or standing, as they work, study, or perform other focused activities inside a building

Relative solar heat gain (RSHG) - is the ratio of solar heat gain through fenestration product (corrected for external shading) to the incident solar radiation. Solar heat gain includes directly transmitted solar heat and absorbed solar radiation, which is then reradiated, conducted or convected into space.

Renovation - any physical change made on buildings/structures to increase their value or quality, or to improve their aesthetics

Repair - remedial work done on any damaged or deteriorated portion/s of a building/structure to restore to its original condition

Seasonal Energy Efficiency Ratio (SEER) - energy efficiency rating for central air conditioners

Secretary - head or chief executive officer of the DPWH

Sewage Treatment Plant (STP) - an industrial structure designed to remove biological or chemical waste products from water, thereby permitting the treated water to be used for other purposes

Sick Building Syndrome (SBS) - a condition where occupants experience acute health and/or comfort effects, which appear to be linked to time spent in a building but where no specific illness or cause can be identified

Smoking Area - a designated area in which smoking is permitted

Solar Heat Gain Coefficient (SHGC) - fraction of solar gain admitted through a window, expressed as a number between 0 and 1

Solar Reflectance Index (SRI) - a measure of a material's ability to reflect heat, with white or light colors having high reflectance and dark or black surfaces with low or little reflectance, thereby having higher temperatures

Special Waste - a class of waste that has unique regulatory requirements and with potential environmental impact that needs to be managed to minimize the risk of harm to the environment and human health

Storey - portion of a building/structure included between the uppermost surface (or finish level) of any floor and the uppermost surface (or finish level) of the next floor above or below it. If the uppermost surface (or finish level) of a floor/level above the uppermost surface (or finish level) of a basement, cellar or unused under-floor space is more than 3.60 meters above established grade at any point, such basement, cellar or unused under-floor space shall be considered a storey.

Sun breaker - feature of a building commonly used as external shading devices, which reduces heat gain within that building by deflecting solar rays to reduce energy cooling loads

Total Gross Floor Area (TGFA) - the total floor space within the main auxiliary buildings primarily consisting of the GFA and all other enclosed support areas, together with all other usable horizontal areas/surfaces above and below established grade level that are all physically attached to the building/s, and which shall consist of the following: covered areas used for parking and driveways, services and utilities.

Total Open Space within Lot (TOSL) - the total open space required for each type of use

Toxic Materials - substances that may cause harm to an individual if they enter the body through inhalation, skin contact, or ingestion

U-Value - how well a building element conducts heat, measuring the rate of heat transfer through a building element over a given area, under standardized conditions

United Architects of the Philippines (UAP) - the integrated and accredited professional organization of architects in the Philippines

Unpaved Surface Area (USA) - the portion of the lot that shall remain unpaved and reserved for softscaping/planting; expressed as a percentage (%) of the Total Lot Area or TLA and may be combined with the ISA to satisfy the Total Open Space within Lot (TOSL), i.e., the total open space requirement for each type of use or occupancy

Urea formaldehyde - combination of urea and formaldehyde used in some glues and adhesives, particularly in composite wood products, emitting formaldehyde at room temperature, which is a toxic and possibly carcinogenic gas

Vapor barrier - a material that has a permeance of one perm or less and that provides resistance to the transmission of water vapor

Variable Speed Drive (VSD) - a piece of equipment that regulates the speed and rotational force, or torque output, of an electric motor

Variable-Voltage and Variable-Frequency (VVVF) - employs frequency inverter technology that regulates input voltage and frequency throughout the journey, drawing much less current during acceleration and deceleration

Ventilation - process of supplying or removing air by natural or mechanical means to or from any space

Visible Transmittance (VT) - the ratio of total transmitted light to total incident light with the higher value allowing more incident light to pass through the glazing

Volatile Organic Compound (VOC) - organic chemicals with high vapor pressure at ordinary room temperature, and which are dangerous to human health or cause harm to the environment

Weather-Stripping - narrow piece of material, such as plastic, rubber, felt, or metal, installed around doors and windows to protect an interior from external extremes in temperature

Window assembly - a unit that includes a window and the anchorage between the window and the wall

Window-to-Wall Ratio (WWR) - ratio of the total area of a building facade, which is occupied by windows (glass area and frame)

INDEX

GLASS LIBRARY

WINDOW / DOOR	Glass		Gap Thickness		Gap	Center Glass U-Value		Solar Heat Gain Coefficient	Shading Coefficient	Visible Transmit-tance
	Type Code	# Panes	IP (in)	SI (mm)	Gas Fill	IP (BTU / sqft-h-°F)	SI (W / sqm-°C)	SHGC	SC	Tvis
Single Clear	1000	1	n/a	n/a	n/a	1.11	6.30	0.86	1	0.9
Single Tint Bronze	1200	1	n/a	n/a	n/a	1.11	6.30	0.73	0.84	0.69
Single Tint Green	1202	1	n/a	n/a	n/a	1.11	6.30	0.72	0.83	0.82
Single Tint Grey	1204	1	n/a	n/a	n/a	1.11	6.30	0.71	0.83	0.61
Single Low Iron	1003	1	n/a	n/a	n/a	1.1	6.25	0.90	1.04	0.91
Single Ref-D Clear	1417	1	n/a	n/a	n/a	1.08	6.13	0.50	0.58	0.33
Single Ref-D Tint	1418	1	n/a	n/a	n/a	1.08	6.13	0.46	0.53	0.25
Single Ref-B Clear-H	1407	1	n/a	n/a	n/a	0.97	5.51	0.39	0.45	0.3
Single Ref-B Tint-H	1410	1	n/a	n/a	n/a	0.97	5.51	0.34	0.4	0.18
Single Ref-B Clear-L	1406	1	n/a	n/a	n/a	0.96	5.45	0.31	0.35	0.2
Single Ref-A Clear-L	1402	1	n/a	n/a	n/a	0.95	5.39	0.31	0.36	0.2
Single Ref-C Clear-H	1413	1	n/a	n/a	n/a	0.94	5.34	0.35	0.41	0.22
Single Ref-C Tint-H	1416	1	n/a	n/a	n/a	0.94	5.34	0.31	0.37	0.13
Single Ref-A Tint-H	1405	1	n/a	n/a	n/a	0.93	5.28	0.29	0.34	0.1
Single Ref-C Clear-M	1412	1	n/a	n/a	n/a	0.92	5.22	0.32	0.37	0.19
Single Ref-C Tint-M	1415	1	n/a	n/a	n/a	0.92	5.22	0.29	0.34	0.11
Single Ref-A Clear-L	1401	1	n/a	n/a	n/a	0.9	5.11	0.25	0.29	0.14
Single Ref-A Tint-M	1404	1	n/a	n/a	n/a	0.9	5.11	0.25	0.29	0.09
Single Ref-B Tint-M	1409	1	n/a	n/a	n/a	0.89	5.05	0.28	0.33	0.13
Single Low-E Clear (e2=.4)	1600	1	n/a	n/a	n/a	0.88	5.00	0.78	0.91	0.85
Single Ref-C Clear-L	1411	1	n/a	n/a	n/a	0.88	5.00	0.25	0.29	0.13
Single Ref-C Tint-L	1414	1	n/a	n/a	n/a	0.88	5.00	0.25	0.29	0.08
Single Ref-B Tint-L	1408	1	n/a	n/a	n/a	0.87	4.94	0.23	0.26	0.05
Single Ref-A Tint-L	1403	1	n/a	n/a	n/a	0.87	4.94	0.22	0.26	0.05
Single Ref-A Clear-L	1400	1	n/a	n/a	n/a	0.86	4.88	0.19	0.23	0.08
Single Low-E Clear (e2=.2)	1601	1	n/a	n/a	n/a	0.76	4.32	0.77	0.89	0.82

WINDOW / DOOR	Glass		Gap Thickness		Gap	Center Glass U-Value		Solar Heat Gain Coefficient	Shading Coefficient	Visible Transmit-tance
	Type Code	# Panes	IP (in)	SI (mm)	Gas Fill	IP (BTU / sqft-h-°F)	SI (W / sqm-°C)	SHGC	SC	Tvis
Double Low Iron	2006	2	0.25	6.35	Air	0.57	3.24	0.83	0.96	0.84
Double Clear	2000	2	0.25	6.35	Air	0.57	3.24	0.76	0.88	0.81
Double Tint Grey	2212	2	0.25	6.35	Air	0.57	3.24	0.61	0.71	0.55
Double Low Iron	2009	2	0.25	6.35	Air	0.56	3.18	0.82	0.95	0.83
Double Ref-D Clear	2460	2	0.25	6.35	Air	0.56	3.18	0.42	0.49	0.31
Double Ref-D Tint	2470	2	0.25	6.35	Air	0.56	3.18	0.35	0.41	0.23
Double Ref-B Clear-H	2426	2	0.25	6.35	Air	0.53	3.01	0.30	0.35	0.27
Double Ref-B Tint-H	2436	2	0.25	6.35	Air	0.53	3.01	0.25	0.29	0.16
Double Ref-C Clear-H	2446	2	0.25	6.35	Air	0.52	2.95	0.27	0.32	0.2
Double Ref-A Clear-H	2406	2	0.25	6.35	Air	0.52	2.95	0.23	0.27	0.18
Double Ref-B Clear-L	2420	2	0.25	6.35	Air	0.52	2.95	0.23	0.27	0.18
Double Ref-D Tint-H	2456	2	0.25	6.35	Air	0.52	2.95	0.23	0.26	0.12
Double Ref-C Clear-M	2443	2	0.25	6.35	Air	0.51	2.90	0.24	0.28	0.17
Double Ref-A Tint-H	2416	2	0.25	6.35	Air	0.51	2.90	0.21	0.24	0.09
Double Ref-C Tint-M	2453	2	0.25	6.35	Air	0.51	2.90	0.21	0.24	0.1
Double Low-E (e3=.4) Clear	2600	2	0.25	6.35	Air	0.5	2.84	0.72	0.84	0.77
Double Ref-B Tint-M	2433	2	0.25	6.35	Air	0.5	2.84	0.20	0.24	0.12
Double Ref-A Clear-M	2403	2	0.25	6.35	Air	0.5	2.84	0.19	0.22	0.13
Double Ref-C Clear-L	2440	2	0.25	6.35	Air	0.5	2.84	0.19	0.22	0.12
Double Ref-C Tint-L	2450	2	0.25	6.35	Air	0.5	2.84	0.18	0.21	0.07
Double Ref-A Tint-M	2413	2	0.25	6.35	Air	0.5	2.84	0.17	0.2	0.08
Double Low Iron	2007	2	0.50	12.70	Air	0.49	2.78	0.83	0.96	0.84
Double Low Iron	2010	2	0.50	12.70	Air	0.49	2.78	0.82	0.95	0.83
Double Clear	2001	2	0.50	12.70	Air	0.49	2.78	0.76	0.89	0.81
Double Tint Bronze	2201	2	0.50	12.70	Air	0.49	2.78	0.62	0.72	0.62
Double Tint Green	2207	2	0.50	12.70	Air	0.49	2.78	0.61	0.71	0.74
Double Tint Grey	2213	2	0.50	12.70	Air	0.49	2.78	0.61	0.71	0.55
Double Ref-A Tint-L	2410	2	0.25	6.35	Air	0.49	2.78	0.15	0.18	0.05
Double Ref-B Tint-L	2430	2	0.25	6.35	Air	0.49	2.78	0.15	0.18	0.05
Double Ref-A Clear-L	2400	2	0.25	6.35	Air	0.49	2.78	0.14	0.17	0.07
Double Clear	2004	2	0.50	12.70	Air	0.48	2.73	0.70	0.81	0.78
Double Tint Bronze	2204	2	0.50	12.70	Air	0.48	2.73	0.49	0.57	0.47
Double Tint Green	2210	2	0.50	12.70	Air	0.48	2.73	0.49	0.57	0.66
Double Tint Blue	2219	2	0.50	12.70	Air	0.48	2.73	0.49	0.57	0.5
Double Tint Grey	2216	2	0.50	12.70	Air	0.48	2.73	0.47	0.54	0.38
Double Ref-D Clear	2461	2	0.50	12.70	Air	0.48	2.73	0.42	0.49	0.31
Double Ref-D Tint	2471	2	0.50	12.70	Air	0.48	2.73	0.35	0.4	0.23

WINDOW / DOOR	Glass		Gap Thickness		Gap	Center Glass U-Value		Solar Heat Gain Coefficient	Shading Coefficient	Visible Transmittance
	Type Code	# Panes	IP (in)	SI (mm)	Gas Fill	IP (BTU / sqft-h-°F)	SI (W / sqm-°C)	SHGC	SC	Tvis
Double Low Iron	2008	2	0.50	12.70	Argon	0.46	2.61	0.83	0.96	0.84
Double Clear	2002	2	0.50	12.70	Argon	0.46	2.61	0.76	0.89	0.81
Double Low-E (e3=.2) Clear	2610	2	0.25	6.35	Air	0.46	2.61	0.72	0.84	0.74
Double Tint Bronze	2202	2	0.50	12.70	Argon	0.46	2.61	0.62	0.72	0.62
Double Tint Green	2208	2	0.50	12.70	Argon	0.46	2.61	0.61	0.71	0.74
Double Tint Grey	2214	2	0.50	12.70	Argon	0.46	2.61	0.61	0.7	0.55
Double Low Iron	2011	2	0.50	12.70	Argon	0.45	2.56	0.82	0.95	0.83
Double Clear	2005	2	0.50	12.70	Argon	0.45	2.56	0.70	0.81	0.78
Double Low-E (e3=.2) Clear	2613	2	0.25	6.35	Air	0.45	2.56	0.66	0.77	0.72
Double Tint Bronze	2205	2	0.50	12.70	Argon	0.45	2.56	0.49	0.56	0.47
Double Tint Green	2211	2	0.50	12.70	Argon	0.45	2.56	0.49	0.57	0.66
Double Tint Blue	2220	2	0.50	12.70	Argon	0.45	2.56	0.49	0.56	0.5
Double Tint Grey	2217	2	0.50	12.70	Argon	0.45	2.56	0.47	0.54	0.38
Double Ref-D Clear	2462	2	0.50	12.70	Argon	0.45	2.56	0.42	0.49	0.31
Double Ref-D Tint	2472	2	0.50	12.70	Argon	0.45	2.56	0.34	0.4	0.23
Double Low-E (e3=.1) Clear	2640	2	0.25	6.35	Air	0.44	2.50	0.63	0.74	0.77
Double Low-E (e2=.1) Clear	2630	2	0.25	6.35	Air	0.44	2.50	0.60	0.69	0.77
Double Ref-B Clear-H	2427	2	0.50	12.70	Air	0.44	2.50	0.29	0.34	0.27
Double Ref-B Tint-H	2437	2	0.50	12.70	Air	0.44	2.50	0.23	0.27	0.16
Double Ref-A Clear-H	2407	2	0.50	12.70	Air	0.44	2.50	0.22	0.26	0.18
Double Ref-B Clear-L	2421	2	0.50	12.70	Air	0.44	2.50	0.22	0.25	0.18
Double Electrochromic Absorbing Bleached/ Colored, 6.3-mm Gap	2800	2	0.25	6.35	Air	0.43	2.44	0.73	0.85	0.76
Double Electrochromic Reflecting Bleached/ Colored, 6.3-mm Gap	2820	2	0.25	6.35	Air	0.43	2.44	0.63	0.73	0.73
Double Low-E (e2=.1) Clear	2633	2	0.25	6.35	Air	0.43	2.44	0.56	0.65	0.75
Double Low-E (e2=.1) Tint	2636	2	0.25	6.35	Air	0.43	2.44	0.39	0.45	0.44
Double Ref-C Clear-H	2447	2	0.50	12.70	Air	0.43	2.44	0.26	0.3	0.2
Double Ref-D Tint-H	2457	2	0.50	12.70	Air	0.43	2.44	0.21	0.24	0.12
Double Ref-A Tint-H	2417	2	0.50	12.70	Air	0.43	2.44	0.19	0.22	0.09
Double Electrochromic Absorbing Bleached/ Colored, 6.3-mm Gap	2801	2	0.25	6.35	Air	0.43	2.44	0.18	0.21	0.12
Double Electrochromic Reflecting Bleached/ Colored, 6.3-mm Gap	2821	2	0.25	6.35	Air	0.43	2.44	0.17	0.2	0.14
Double Low-E (e2=.04) Clear	2660	2	0.25	6.35	Air	0.42	2.38	0.44	0.51	0.7

WINDOW / DOOR	Glass		Gap Thickness		Gap	Center Glass U-Value		Solar Heat Gain Coefficient	Shading Coefficient	Visible Transmit-tance
	Type Code	# Panes	IP (in)	SI (mm)	Gas Fill	IP (BTU / sqft-h-°F)	SI (W / sqm-°C)	SHGC	SC	Tvis
Double Low-E (e3=.04) Clear	2663	2	0.25	6.35	Air	0.42	2.38	0.42	0.49	0.68
Double Low-E (e2=.04) Tint	2666	2	0.25	6.35	Air	0.42	2.38	0.31	0.35	0.41
Double Ref-C Clear-M	2444	2	0.50	12.70	Air	0.42	2.38	0.23	0.27	0.17
Double Ref-C Tint-M	2454	2	0.50	12.70	Air	0.42	2.38	0.19	0.22	0.1
Double Low-E (e3=.4) Clear	2601	2	0.50	12.70	Air	0.41	2.33	0.73	0.85	0.77
Double Low-E (e2=.029) Electrochromic Reflecting Bleached/ Colored, 6.3-mm Gap	2860	2	0.25	6.35	Air	0.41	2.33	0.46	0.54	0.64
Double Low-E (e2=.029) Electrochromic Absorbing Bleached/ Colored, 6.3-mm Gap	2840	2	0.25	6.35	Air	0.41	2.33	0.44	0.51	0.66
Double Ref-B Clear-H	2428	2	0.50	12.70	Argon	0.41	2.33	0.29	0.34	0.27
Double Ref-B Tint-H	2438	2	0.50	12.70	Argon	0.41	2.33	0.23	0.27	0.16
Double Ref-B Tint-M	2434	2	0.50	12.70	Air	0.41	2.33	0.19	0.22	0.12
Double Ref-C Clear-L	2441	2	0.50	12.70	Air	0.41	2.33	0.18	0.2	0.12
Double Ref-A Clear-M	2404	2	0.50	12.70	Air	0.41	2.33	0.17	0.2	0.13
Double Ref-C Tint-L	2451	2	0.50	12.70	Air	0.41	2.33	0.16	0.19	0.07
Double Low-E (e2=.029) Electrochromic Absorbing Bleached/ Colored, 6.3-mm Gap	2841	2	0.25	6.35	Air	0.41	2.33	0.16	0.18	0.1
Double Low-E (e2=.029) Electrochromic Reflecting Bleached/ Colored, 6.3-mm Gap	2861	2	0.25	6.35	Air	0.41	2.33	0.16	0.18	0.12
Double Ref-A Tint-M	2414	2	0.50	12.70	Air	0.41	2.33	0.15	0.18	0.08
Double Ref-A Clear-H	2408	2	0.50	12.70	Argon	0.4	2.27	0.22	0.25	0.18
Double Ref-B Clear-L	2422	2	0.50	12.70	Argon	0.4	2.27	0.21	0.25	0.18
Double Ref-B Tint-L	2431	2	0.50	12.70	Air	0.4	2.27	0.14	0.16	0.05
Double Ref-A Clear-L	2401	2	0.50	12.70	Air	0.4	2.27	0.13	0.15	0.07
Double Ref-A Tint-L	2411	2	0.50	12.70	Air	0.4	2.27	0.13	0.15	0.05
Triple Clear	3001	3	0.25	6.35	Air	0.39	2.21	0.68	0.79	0.74
Double Ref-C Clear-H	2448	2	0.50	12.70	Argon	0.39	2.21	0.26	0.3	0.2
Double Ref-D Tint-H	2458	2	0.50	12.70	Argon	0.39	2.21	0.20	0.24	0.12
Double Ref-A Tint-H	2418	2	0.50	12.70	Argon	0.39	2.21	0.19	0.21	0.09
Double Ref-C Clear-M	2445	2	0.50	12.70	Argon	0.38	2.16	0.23	0.26	0.17

WINDOW / DOOR	Glass		Gap Thickness		Gap	Center Glass U-Value		Solar Heat Gain Coefficient	Shading Coefficient	Visible Transmit-tance
	Type Code	# Panes	IP (in)	SI (mm)	Gas Fill	IP (BTU / sqft-h-°F)	SI (W / sqm-°C)	SHGC	SC	Tvis
Double Ref-C Tint-M	2455	2	0.50	12.70	Argon	0.38	2.16	0.19	0.21	0.1
Double Ref-A Clear-M	2405	2	0.50	12.70	Argon	0.38	2.16	0.17	0.2	0.13
Double Ref-A Tint-M	2415	2	0.50	12.70	Argon	0.38	2.16	0.15	0.17	0.08
Double Ref-B Tint-M	2435	2	0.50	12.70	Argon	0.37	2.10	0.18	0.21	0.12
Double Low-E (e3=.4) Clear	2602	2	0.50	12.70	Argon	0.36	2.04	0.73	0.85	0.77
Double Ref-C Clear-L	2442	2	0.50	12.70	Argon	0.36	2.04	0.17	0.2	0.12
Double Ref-C Tint-L	2452	2	0.50	12.70	Argon	0.36	2.04	0.15	0.18	0.07
Double Ref-A Tint-L	2412	2	0.50	12.70	Argon	0.36	2.04	0.13	0.15	0.05
Double Ref-B Tint-L	2432	2	0.50	12.70	Argon	0.36	2.04	0.13	0.15	0.05
Double Ref-A Clear-L	2402	2	0.50	12.70	Argon	0.36	2.04	0.12	0.14	0.07
Double Low-E (e3=.2) Clear	2611	2	0.50	12.70	Air	0.35	1.99	0.73	0.85	0.74
Double Low-E (e3=.2) Clear	2614	2	0.50	12.70	Air	0.35	1.99	0.67	0.78	0.72
Double Low-E (e3=.04) Clear	2664	2	0.50	12.70	Air	0.29	1.65	0.42	0.48	0.68
Double Low-E (e2=.04) Tint	2667	2	0.50	12.70	Air	0.29	1.65	0.29	0.33	0.41
Double Low-E (e2=.029) Electrochromic Reflecting Bleached/Colored, 12.7-mm Gap	2863	2	0.50	12.70	Air	0.29	1.65	0.14	0.16	0.12
Double Low-E (e2=.029) Electrochromic Absorbing Bleached/Colored, 12.7-mm Gap	2843	2	0.50	12.70	Air	0.29	1.65	0.13	0.15	0.1
Triple Low-E (e2=e5=.1) Clear	3621	3	0.25	6.35	Air	0.27	1.53	0.47	0.54	0.66
Double Electrochromic Absorbing Bleached/Colored, 12.7-mm Gap, Argon	2804	2	0.50	12.70	Argon	0.26	1.48	0.74	0.86	0.76
Double Low-E (e3=.1) Clear	2642	2	0.50	12.70	Argon	0.26	1.48	0.65	0.75	0.77
Double Electrochromic Reflecting Bleached/Colored, 12.7-mm Gap, Argon	2824	2	0.50	12.70	Argon	0.26	1.48	0.64	0.74	0.73
Double Low-E (e2=.1) Clear	2632	2	0.50	12.70	Argon	0.26	1.48	0.59	0.69	0.77
Double Low-E (e2=.1) Clear	2635	2	0.50	12.70	Argon	0.26	1.48	0.56	0.66	0.75
Double Low-E (e2=.1) Tint	2638	2	0.50	12.70	Argon	0.26	1.48	0.37	0.43	0.44
Double Electrochromic Absorbing Bleached/Colored, 12.7-mm Gap, Argon	2805	2	0.50	12.70	Argon	0.26	1.48	0.15	0.18	0.12

WINDOW / DOOR	Glass		Gap Thickness		Gap	Center Glass U-Value		Solar Heat Gain Coefficient	Shading Coefficient	Visible Transmit-tance
	Type Code	# Panes	IP (in)	SI (mm)	Gas Fill	IP (BTU / sqft-h-°F)	SI (W / sqm-°C)	SHGC	SC	Tvis
Double Electrochromic Reflecting Bleached/ Colored, 12.7-mm Gap, Argon	2825	2	0.50	12.70	Argon	0.26	1.48	0.15	0.16	0.14
Double Low-E (e2=.04) Clear	2662	2	0.50	12.70	Argon	0.24	1.36	0.43	0.5	0.7
Triple Low-E (e5=.1) Clear	3602	3	0.50	12.70	Air	0.23	1.31	0.58	0.67	0.7
Triple Low-E Film (88) Clear	3642	3	0.50	12.70	Air	0.23	1.31	0.57	0.67	0.71
Double Low-E (e2=.029) Electrochromic Absorbing Bleached/Colored, 12.7-mm Gap, Argon	2844	2	0.50	12.70	Argon	0.23	1.31	0.52	0.6	0.66
Double Low-E (e2=.029) Electrochromic Reflecting Bleached/Colored, 12.7-mm Gap, Argon	2864	2	0.50	12.70	Argon	0.23	1.31	0.48	0.56	0.64
Double Low-E (e3=.04) Clear	2665	2	0.50	12.70	Argon	0.23	1.31	0.42	0.48	0.68
Double Low-E (e2=.04) Tint	2668	2	0.50	12.70	Argon	0.23	1.31	0.28	0.32	0.41
Double Low-E (e2=.029) Electrochromic Reflecting Bleached/Colored, 12.7-mm Gap, Argon	2865	2	0.50	12.70	Argon	0.23	1.31	0.13	0.15	0.12
Double Low-E (e2=.029) Electrochromic Absorbing Bleached/Colored, 12.7-mm Gap, Argon	2845	2	0.50	12.70	Argon	0.23	1.31	0.12	0.14	0.1
Triple Low-E Film (77) Clear	3652	3	0.50	12.70	Air	0.22	1.25	0.47	0.54	0.64
Triple Low-E Film (66) Clear	3662	3	0.50	12.70	Air	0.22	1.25	0.36	0.42	0.54
Triple Low-E Film (55) Clear	3672	3	0.50	12.70	Air	0.22	1.25	0.31	0.36	0.45
Triple Low-E Film (66) Tint	3664	3	0.50	12.70	Air	0.22	1.25	0.25	0.29	0.32
Triple Low-E Film (55) Tint	3674	3	0.50	12.70	Air	0.22	1.25	0.22	0.25	0.27
Triple Low-E Film (44) Tint	3682	3	0.50	12.70	Air	0.21	1.19	0.19	0.22	0.22
Triple Low-E Film (33) Tint	3692	3	0.50	12.70	Air	0.21	1.19	0.15	0.17	0.17
Triple Low-E (e5=.1) Clear	3603	3	0.50	12.70	Argon	0.19	1.08	0.58	0.67	0.7
Triple Low-E (e2=e5=.1) Clear	3622	3	0.50	12.70	Air	0.17	0.97	0.47	0.55	0.66
Triple Low-E (e2=e5=.1) Clear	3623	3	0.50	12.70	Argon	0.14	0.79	0.47	0.55	0.66
Quadruple, Two Low-E Glass, Two Low-E Film, Clear. Krypton	4651	4	0.31	7.87	Krypton	0.12	0.68	0.45	0.52	0.62

SOURCE: US Department of Energy

ENDNOTES

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Figure 1 October 2015, www.bayvoice.net/wp-content/uploads/2015/01/02.jpg

Figure 3 From Ar. Marie Ann Medenilla.

Figure 6 Photos by Ar. Mel Punsalan, Nov. 2015.

Figure 7 Photos by Ar. Mel Punsalan, Nov. 2015.

Figure 8 Photos by Ar. Mel Punsalan, Nov. 2015.

Figure 9 From Ar. Marie Ann Medenilla.

Figure 10 May 2015, Flashing & Sealing Specifications for Exposed Fastener Metal Roof Systems. Retrieved August 12, 2016, from http://inspectapedia.com/BestPractices/Metal_Roof_Flashing.php

Figure 11 From Ar. Marie Ann Medenilla.

Figure 12 From Ar. Marie Ann Medenilla.

Figure 13 From Ar. Marie Ann Medenilla.

Figure 14 From Ar. Marie Ann Medenilla.

Figure 15 Photos by Ar. Mel Punsalan, July 2014.

Figure 16 From Ar. Marie Ann Medenilla.

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Figure 19 Photos from the file of PGBI.

Figure 20 From Ar. Mel Punsalan.

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Figure 23 Philippine Green Building Seminar 2012.

Figure 26 From Ar. Mel Punsalan.

Figure 27 From Ar. Marie Ann Medenilla

Figure 28 May 2015, www.edgearchitectural.com.au/wp-content/uploads/2014/11/PD-PC-WindowDesignBreezeCollection-01_fmt.png

Figure 29 Photos by Ar. Mel Punsalan, July 2014.

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Figure 38 From Ar. Marie Ann Medenilla.

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Figure 43 From Mechanical Engineering firm (name withheld upon request) crop of the picture.

Figure 44 April 2015,basc.pnnl.gov/sites/default/files/images/HVAC515_whlbldgvent5_DS_1-10-13.jpg

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Figure 61 File copy from Ar. Marie Ann Medenilla.

Figure 62 From Mechanical Engineering firm (name withheld upon request) crop of the picture.

Figure 63 From Mechanical Engineering firm (name withheld upon request) crop of the picture.

Figure 64 https://www.flickr.com/photos/19804650@N00/5260222336.

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Figure 89 Photos by Ar. Mel Punsalan, July 2014.

Figure 90 From Ar. Marie Ann Medenilla

Figure 91 From Ar. Marie Ann Medenilla.

Figure 92 Minimum Requirements for Total Open Space within lot (TOSL)
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Figure 93 File copy from Ar. Mel Punsalan.

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TABLES

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DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS SUSTAINABLE BUILDING REGULATION PROJECT TEAM FOR THE DEVELOPMENT OF THE PHILIPPINE GREEN BUILDING CODE

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OTHER RESOURCE PERSONS:

Engr. Agustin S. Torres, Department of Building Official, Quezon City

Ar. Elmor V. Vita, City Building Official, Parañaque City

Ar. Edison Ching M. Padilla, Building Official, Valenzuela City

INTERNATIONAL FINANCE CORPORATION - WORLD BANK GROUP

Hans Shrader

Maria Teresita G. Lacerna

Autif Sayyed

Engr. Ramon D. Aguilos

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Moira Enerva

Pablo Izquierdo

Ommid Saberi

PHILIPPINE GREEN BUILDING INITIATIVE

Engr. Laurentino R. Punsalan

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PHILIPPINE GREEN BUILDING CODE

June 2015
A Referral Code of the
NATIONAL BUILDING CODE OF THE PHILIPPINES
(P.D. 1096)

CONTENTS

CHAPTER I. GENERAL PROVISIONS

SECTION 1. TITLE

This document shall be known as the "Philippine Green Building Code" hereinafter referred to as the "GB Code".

SECTION 2. POLICY

The state shall protect and advance the right of the people to a balanced and healthful ecology in accord with the rhythm and harmony of nature against harmful effects of climate change. It shall safeguard the environment, property, public health, in the interest of the common good and general welfare consistent with the principles of sound environmental management and control; and for this purpose, prescribe acceptable set of standards and requirements for relevant buildings to regulate their location, site, planning, design, quality of material, construction, use, occupancy, operation and maintenance.

SECTION 3. OBJECTIVES

The GB Code seeks to improve the efficiency of building performance through a framework of acceptable set of standards that will enhance sound environmental and resource management that will counter the harmful gases responsible for the adverse effects of climate change, throughout the building's life-cycle including efficient use of resources, site selection, planning, design, construction, use, occupancy, operation and maintenance, without significant increase in cost. This GB Code is a set of regulations setting minimum standards for compliance and not intended to rate buildings.

SECTION 4. PRINCIPLES

4.1 The technical professionals, developers, contractors, property managers and building owners involved in the planning, design, construction and management of buildings have the opportunity and responsibility to help government address the adverse effects of climate change by ensuring that buildings are planned, designed, constructed, operated and maintained to the required efficiency level.

4.2 Resources must be used efficiently to equitably meet the developmental and environmental needs of the present and future generations.

4.3 Occupants of green buildings will benefit from improved indoor environmental quality, which promotes higher productivity and better comfort.

SECTION 5. DEFINITION OF TERMS

The words, terms and phrases as used in this GB Code shall have the meaning or definition as indicated in the National Building Code (NBC) and Annex 1.

SECTION 6. GREEN BUILDING CONCEPT

Green building is the practice of adopting measures that promote resource management efficiency and site sustainability while minimizing the negative impact of buildings on human health and the environment. This practice complements the conventional building design concerns of economy, durability, serviceability and comfort.

SECTION 7. APPROACH

The GB Code adopts a staggered or incremental approach and is subject to periodic review by the Secretary of the Department of Public Works and Highways (DPWH), through the National Building Code Development Office (NBCDO), to modify or include new aspects and emerging efficient technologies and expand the coverage to other building use/occupancy or replace outmoded measures.

SECTION 8. BUILDING USE/OCCUPANCY COVERAGE AND APPLICATION

8.1 The provisions of the GB Code shall apply to all new construction and/or with alteration of buildings in the following classification with the required minimum Total Gross Floor Areas (TGFA) as indicated in Table 1 below:

TABLE 1. MINIMUM TGFA FOR BUILDING USE / OCCUPANCY

USE/OCCUPANCY CLASSIFICATION OF ANY JURISDICTION	TGFA AS DEFINED BY NBC
Residential Dwelling: Condominium[1]	20,000 sqm
Hotel / Resort	10,000 sqm
Educational: School	10,000 sqm
Institutional: Hospital	10,000 sqm
Business: Office	10,000 sqm
Mercantile: Mall	15,000 sqm
Mixed Occupancy[2]	10,000 sqm

Sources: NBC, Baseline Studies, IFC Philippine Green Building Code Project, May 2013

1 For Residential Dwelling: Condominium, the TGFA is the sum of the dwelling areas, common and accessory areas within the building.

2 The areas for Mixed Occupancy classification shall have a total aggregate area equal to the TGFA

8.2 GB Code does not apply to existing buildings of the above use/occupancy classification constructed before the effectivity of the GB Code.

8.3 When alterations, additions, conversions and renovations of existing buildings constructed after the effectivity of the GB code, which reached the TGFA as indicated in Table 1 are to be made, the whole building shall be subject to the applicable provisions of the GB Code.

8.4 A building of mixed occupancy with combination of classification as indicated in Table 1, shall use appropriate measures applicable to each classification.

CHAPTER II. GREEN BUILDING REQUIREMENTS

SECTION 9. PERFORMANCE STANDARDS

The GB Code shall be subject to the following performance standards:

9.1 Energy Efficiency
9.2 Water Efficiency
9.3 Material Sustainability
9.4 Solid Waste Management
9.5 Site Sustainability
9.6 Indoor Environmental Quality

SECTION 10. ENERGY EFFICIENCY

Energy efficiency requires the adoption of efficient practices, designs, methods and technologies that reduce energy consumption resulting in cost savings.

10.1 BUILDING ENVELOPE

10.1.1 Air Tightness and Moisture Protection

a. General

As the humidity levels are very high in the Philippines, the unwanted infiltration and humidity ingress into the spaces can cause additional load on the air conditioning system and a detrimental impact on air quality. Buildings must be planned and designed with specific details to ensure that air tightness is maximized. Details should precisely include joints, service entry points, windows and doors. The implementation of these measures requires only increased attention to the construction details and it can be implemented at practically no cost.

b. Applicability

This measure applies to all building occupancies as indicated in Table 1.

c. Requirements

Buildings shall be planned and designed with:

i. Complete gaskets, weather-stripping, door bottom sweeps and seals within and around window and door assemblies

ii. Moisture protection on the surface of the external façade to reduce vapor or moisture migration from external spaces

d. Exceptions

Buildings and spaces without provisions for air conditioning systems are exempt.

10.1.2 Glass Properties

a. General

Compared to wall assemblies, glazing transfers more heat and hence, it is ideal to reduce the amount of glazing with respect to the wall in order to reduce internal heat gains.

The requirement of Window to Wall Ratio (WWR) needs to be balanced with the amount of daylight coming through the glazed area.

Solar Heat Gain Coefficient (SHGC) is used to determine the amount of solar heat admitted through the glass divided by the total solar radiation incident on the glass.

Visible Light Transmittance (VLT) is used to determine the amount of light transmitted through the glass.

b. Applicability

This measure applies to all building occupancies as indicated in Table 1.

c. Requirements

WWR shall be balanced with SHGC to maintain flexibility in design. To further describe, the higher the designed building WWR, the lower the required SHGC in glass windows shall be and vise-versa. This does not, however, remove the option for building owners to apply windows with low SHGC for building with low WWR.

i. The size of the opening (with or without glass) shall be in accordance with the NBC.

For each WWR value, the SHGC and VLT shall be in accordance with Table 2.

TABLE 2. SHGC AND VLT FOR DIFFERENT WWR

WWR	MAXIMUM SHGC	MAXIMUM VLT
10	0.80	0.80
20	0.70	0.70
30	0.60	0.70
40	0.45	0.60
50	0.44	0.55
60	0.37	0.50
70	0.31	0.45
80	0.27	0.40
90	0.24	0.35

Source: Prescribed Requirements, IFC Philippine Green Building Code Project, May 2013

The SHGC requirement in Table 2 can be adjusted if sun breakers are provided in the windows. Sun breaker plays a very important role in reducing solar heat gain as it stops the solar radiation before it enters the building and doing so reduces the cooling loads considerably. External shading has the additional positive effect of improving the internal comfort cutting part of the direct radiation on occupants. This must be applied only to windows that are shaded.

SHGC limits can be adjusted by multiplying it with the correction factors summarized in the following tables, using the formula:

$$SHGCadj = f \times SHGC$$

where:

SHGCadj	is the adjusted solar heat gain coefficient limit for windows with external shading
SHGC	is the solar heat gain coefficient
f	is the SHGC correction factor for the external shading

ii. For intermediate values of D/H or D/W, the lower figure of correction factor should be used as stated in Tables 3 and 4.

iii. D is the depth of the shading device as projected from the building exterior wall and H or W is the height or distance of the bottom sill of the window from the bottom of the shading device as shown in Figure 1.

iv. Shading not attached to windows or placed on a wall with no window should not be counted.

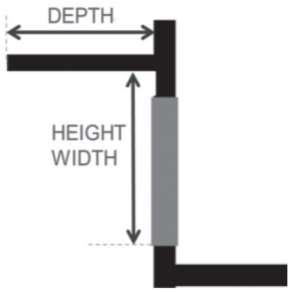

Figure 1. Schematic representation of a window and related horizontal overhang or vertical fin

TABLE 3. CORRECTION FACTOR FOR EACH HORIZONTAL OVERHANG SHADING PROJECTION

D/H	CORRECTION FACTOR
0.1	1.03
0.5	1.06
1	1.08

TABLE 4. CORRECTION FACTOR FOR EACH VERTICAL FIN SHADING PROJECTION

D/W	CORRECTION FACTOR
0.1	1.04
0.5	1.12
1	1.17

Source: Prescribed Requirements, IFC Philippine Green Building Code Project, May 2013

For glass products, see Annex 1 Glass Library.

d. Exceptions

There are no exceptions to this provision.

10.2 NATURAL VENTILATION

a. General

This measure will give building occupants the flexibility and opportunity to use natural ventilation for free cooling and fresh air in regularly occupied spaces. This measure will limit the tendency to create glass-sealed box-type buildings. Size of each room and space shall be consistent with the occupancy load of the NBC.

b. Applicability

This measure applies to all building occupancies as indicated in Table 1.

c. Requirements

i. Operable windows or balcony door shall be provided in regularly occupied spaces. The size of the opening shall be equal to at least ten percent (10%) of the floor area of regularly occupied spaces.

ii. All operable windows shall be provided with safety features for protection against strong winds, water penetration and protection for building occupants including child safety and security.

d. Exceptions

There are no exceptions to this provision.

10.3 BUILDING ENVELOPE COLOR

a. General

Light-colored building envelope, especially the roof areas which are the most vulnerable, can reduce heat transfer from the outside to the inside of the building by having surfaces with high Solar Reflectance Index (SRI).

b. Applicability

This measure applies to all building occupancies as indicated in Table 1.

c. Requirements

i. Building metal roof surfaces shall either be colored white or have a minimum SRI of 70. *See Table 5.*

TABLE 5. SOLAR REFLECTANCE INDEX VALUES OF BASIC COLORED COATINGS

METAL SURFACE	SRI
Reflective white	86 to 92
Basic white	80 to 88
Beige / Tan	74 to 80
Dark brown	0 to 33
Light to medium brown	45 to 56
Light to medium grey	39 to 63
Dark grey	0 to 41
Blue	23 to 30
Light to medium blue	35 to 38
Red	28 to 36
Terravotta red	38 to 40
Green	25 to 32
Light to medium green	30 to 48

Source: PPG Cool Color Series - www.coolcolorsdatabase.ppg.com as rated by the Cool Roof Rating Council, US

d. Exceptions. There are no exceptions to this provision.

10.4 ROOF INSULATION

a. General

Insulation can help reduce heat gain in a building, thus, improving thermal comfort, acoustic quality and reducing the load on the air conditioning system.

b. Applicability

This measure applies to all building occupancies as indicated in Table 1.

c. Requirements

Buildings shall be provided with roof insulation so that the average thermal resistance value (R-Value) of the roof is at least R-8. See Annex 4 (Insulation R-Value).

For Insulating Values of Common Building Materials, see Annex 2

TABLE 6. R-VALUE OF COMMON ROOF INSULATION

INSULATION	R-VALUE/INCH (25.4MM)
Polyisocyanurate	5.6 to 8.0
Polyurethane	5.6 to 6.5
Closed cell spray foam	5.5 to 6.0
Phenolic foam	4.8
Urea formaldehyde foam	4.6
Plastic fiber	4.3
Mineral fiber	4.2 to 4.5
Cementitious foam	3.9
Polystyrene	3.8 to 5.0
Fiberglass	3.7
Rockwool	3.7
Rigid foam	3.6 to 6.7
Cellulose	3.6 to 3.8
Open cell spray foam	3.6
Sheep's wool	3.5
Hemp	3.5
Cotton	3.4
Loose cellulose	3.0 to 3.7
Mineral wool	2.8 to 3.7
Straw	2.4 to 3.0
Vermiculite/Perlite	2.4
Reflective bubble foil	1 to 1.1

Source: U.S. Department of Energy – Insulation Materials

d. Exceptions. There are no exceptions to this provision.

10.5 MECHANICAL SYSTEMS

10.5.1 Air Conditioning System

a. General

Air conditioning typically accounts for more than fifty percent (50%) of total electricity costs in a centrally air conditioned building. Hence, the efficiency of an air conditioning system is of prime importance. The heart of the air conditioning system is the cooling system, typically chillers in large buildings, and it is important to procure an efficient cooling system.

b. Applicability

This measure applies to all building occupancies as indicated in Table 1.

c. Requirements

The cooling equipment shall meet or exceed the minimum efficiency requirements as indicated in Tables 7 and 8.

TABLE 7. ELECTRICALLY OPERATED UNITARY AIR CONDITIONERS AND CONDENSING UNITS

EQUIPMENT TYPE	SIZE CATEGORY		SUB-CATEGORY OR RATING CONDITIONS	MINIMUM EFFICENCY	TEST PROCEDURE
	(IN BTU/H)	(IN KJ/H)			
Air conditioners, air-cooled	< 65,000	< 68,585	Split systems	14.0 SEER 12.0 SEER	AHRI 210/240; PNS ISO 5151:2014; PNS ISO 16358-1
			Single packaged	14.0 SEER 11.6 SEER	
Through-the-wall, air-cooled	< 30,000	< 31,655	Split systems	12.0 SEER	AHRI 210/240; PNS ISO 5151:2014; PNS ISO 16358-1
			Single packaged	12.0 SEER	
Small-duct high velocity, air-cooled	< 65,000	< 68,585	Split systems	10.0 SEER	AHRI 210/240; PNS ISO 5151:2014; PNS ISO 16358-1
Air conditioners, air-cooled	≥ 65,000	≥ 68,585 &	Split systems and single packaged	11.5 SEER	AHRI 340/360; PNS ISO 5151:2014; PNS ISO 16358-1
	< 135,000	< 142,447		11.3 SEER	
	≥ 135,000 &	≥142,447		11.5 SEER	
	< 240,000	< 253,238		11.3 SEER	
	≥ 240,000	≥ 253,238 &		10.0 SEER	
	< 760,000	< 801,922		9.8 SEER	
	≥ 760,000	≥ 801,922		9.7 SEER	
				9.5 SEER	
Air conditioners, water and evaporative cooled	< 65,000	< 68,585	Split systems and single packaged	14.0 SEER	AHRI 210/240; PNS ISO 5151:2014; PNS ISO 16358-1
				14.0 SEER	
	≥ 65,000 & 135,000	≥ 68,585 & 142,447		13.8 SEER	
	≥ 135,000 &	≥ 142,447 &		13.8 SEER	AHRI 340/360; PNS ISO 5151:2014; PNS
	240,000	253,238		13.8 SEER	
	≥ 240,000	≥ 253,238		14.0 SEER	
				13.8 SEER	

Source: 2010 PSVARE Standards

TABLE 8. WATER CHILLER PACKAGES – MINIMUM EFFICIENCY REQUIREMENTS

EQUIPMENT TYPE	SIZE CATEGORY	MINIMUM EFFICIENCY	TEST PROCEDURE
		FULL LOAD	
Air-cooled chillers with, condenser, electrically operated	< 150 tons EER	10	AHRI 550/590
	≥ 150 tons EER	10	
Air-cooled chillers without condenser, electrically operated	All capacities EER	Condenserless units shall be rated with matched condensers	AHRI 550/590
Water-cooled, electrically operated, positive	All capacities Kw/ton	Reciprocating units required to comply with water-cooled positive displacement requirements	AHRI 550/590
Water-cooled, Electrically operated, positive displacement	< 75,000 Kw/ton	0.78	AHRI 550/590
	≥ 75,000 tons and <150 tons Kw/ton	0.775	
	≥ 150,000 tons and <300 tons Kw/ton	0.68	
	≥ 300,000 tons Kw/ton	0.62	
Water-cooled electrically operated, centrifugal	< 150 tons Kw/ton	Split systems and single packaged	AHRI 550/590
	≥ 150 tons and < 300 tons Kw/ton		
	≥ 300 tons and < 600 tons Kw/ton		
	≥ 600 tons Kw/ton		
Air-cooled absorption single effect	All capacities COP	0.6	AHRI 560
Water-cooled absorption single effect	All capacities COP	0.6	
Absorption double effect indirect-fired	All capacities COP	1	
	All capacities COP	1	

Source: 2010 PSVARE Standards

d. Exceptions

Buildings with no air-conditioning systems are exempt.

10.5.2 Water Heating System

a. General

The use of energy-efficient water heating systems in buildings, by observing minimum power performance requirements, will help reduce energy consumption due to heating of water.

b. Applicability

This measure applies to all building occupancies as indicated in Table 1.

c. Requirements.

Applicable buildings shall comply with the minimum performance requirements for water heating in the 2010 PSVARE Standards, as shown in Table 9.

d. Exceptions

Buildings with no water heating systems and buildings using solar water heating and/or heat pump for water heating are exempt.

TABLE 9. MINIMUM PERFORMANCE REQUIREMENTS FOR WATER HEATING EQUIPMENT

EQUIPMENT TYPE	SIZE CATEGORY (INPUT)		SUBCATEGORY OR RATING CONDITION		PERFORMANCE REQUIRED		TEST PROCEDURE
	I-P	SI	I-P	SI	I-P	SI	
Electric Water Heaters	12 kW	12 kW	Resistance ≥ 20 gal	Res ≥ 76 L	EF ≥ 0.97 - 0.00132V	EF ≥ 0.97 - 0.00132V	DOE 10 CFR Part 340
	> 12 kW	> 12 kW	Resistance ≥ 20 gal	Res ≥ 76 L	SL ≤ 20 + 35√V, Btu/h		ANSI Z21.10.3
	All sizes	All sizes	Heat Pump	Heat Pump		EF ≥ 2.0	DOE 10 CFR Part 340
Gas Storage Water Heaters	≤ 75,000 Btu/h	≤ 22 kW	≥ 20 gal	≥ 76 L	EF ≥ 0.67	EF ≥ 0.67	DOE 10 CFR Part 340
	> 75,000 Btu/h	> 22 kW	< 4,000 (Btu/h)/ gal	< 0.31 kw/L	E ≥ 80% and SL ≤ (Q/800 + 110√V), Btu/h		ANSI Z21.10.3
Gas Instantaneous Water Heaters	> 50,000 Btu/h and < 200,000 Btu/h	> 15 kW and < 58 kW	≥ 4,000 (Btu/h)/ gal and < 2 gal	≥ 0.31 kw/L and 7.57 L	EF ≥ 0.82	EF ≥ 0.82	DOE 10 CFR Part 340
	≤ 200,000 Btu/h	≤ 58 kW	≥ 4,000 (Btu/h)/ gal and <10 gal	≥ 0.31 kw/L and 37.85 L	E ≥ 80%	E ≥ 80%	ANSI Z21.10.3
	≥ 200,000 Btu/h	≥ 58 kW	4000 (Btu/h)/gal and ≥ 10 gal	0.31 kw/L and ≥ 37.85 L	E ≥ 80% and SL ≤ (Q/800 + 110√V), Btu/h		
Oil Storage Water Heaters	≤ 105,000 Btu/h	≤ 31 kW	≥ 20 gal	≥ 76 L	EF ≥ 0.59 - 0.0019V		DOE 10 CFR Part 340
	> 105,000 Btu/h	> 31 kW	< 4000 (Btu/h)/ gal	< 0.31 kw/L			
Oil Instantaneous Water Heaters	≤ 210,000 Btu/h	≤ 62 kW	≥ 4,000 (Btu/h)/ gal and < 2 gal	≥ 0.31 kw/L and < 7.87 L	EF ≥ 0.59 - 0.0019V	EF ≥ 0.59 - 0.0019V	
	> 210,000 Btu/h	> 62 kW	≥ 4,000 (Btu/h)/ gal and < 10 gal	≥ 0.31 kw/L and < 37.85 L	E ≥ 80%	E ≥ 80%	ANSI Z21.10.3
	> 210,000 Btu/h	> 62 kW	≥ 4,000 (Btu/h)/ gal and ≥ 10 gal	≥ 0.31 kw/L and ≥ 37.85 L	E ≥ 78% and SL ≤ (Q/800 + 110√V), Btu/h		
Oil Instantaneous Water Heaters	300,000 Btu/h and < 12,500,000 Btu/h	88 kW and < 3664 kW	≥ 4,000 (Btu/h)/ gal and < 10 gal	≥ 0.31 kw/L and < 37.85 L	E ≥ 80%	E ≥ 80%	ANSI Z21.10.3
Hot-water supply boilers, gas			≥ 4,000 (Btu/h)/ gal and ≥ 10 gal	≥ 0.31 kw/L and ≥ 37.85 L	E ≥ 80% and SL ≤ (Q/800 + 110√V), Btu/h		
Hot-water supply boilers, gas			≥ 4,000 (Btu/h)/ gal and ≥ 10 gal	≥ 0.31 kw/L and ≥ 37.85 L	E ≥ 78% and SL ≤ (Q/800 + 110√V), Btu/h		
Pool heaters oil and gas	All sizes	All sizes			E ≥ 78%	E ≥ 78%	ASHRAE 146
Heat pump pool heaters	All sizes	All sizes			≥ 4.0	≥ 4.0 COP	ASHRAE 146
Unfired storage tanks	All sizes	All sizes			≥ R-12.5	≥ R-12.5	none

Source: 2010 PSVARE Standards

10.5.3. Variable Speed Drives and High Efficiency Motors

a. General

Variable Speed Drive (VSD) describes the equipment used to control the speed of machinery by changing the frequency of the motor that is being operated. Where process conditions demand adjustment of flow from a pump or fan, varying the speed of the drive may save energy compared with other techniques for flow control.

b. Applicability

This measure applies to all building occupancies as indicated in Table 1.

c. Requirements

i. All motors for mechanical equipment over five (5) kW shall be provided with variable speed drive and high efficiency motors in accordance with Table 10.

ii. All motors of cooling towers shall be provided with variable speed drive and high efficiency motors.

iii. All motors for domestic pumps shall have high efficiency motors as indicated in Table 10.

d. Exceptions

Kitchen ventilation fans are exempt from this requirement. Noncentralized air-conditioning systems in buildings are not required to employ variable speed controllers.

TABLE 10. MOTOR EFFICIENCIES

NUMBER OF POLES ====>		2	4	6	2	4	6
SYNCHRONOUS SPEED (RPM) ====>		3600	1800	1200	3600	1800	1200
MOTOR HORSEPOWER		OPEN MOTORS			ENCLOSED MOTORS		
IP	SI						
(HP)	(KW)						
1	0.75	77.0	85.5	82.5	77.0	85.5	82.5
1.5	1.10	84.0	86.5	86.5	84.0	86.5	87.5
2	1.50	85.5	86.5	87.5	85.5	86.5	87.5
3	2.20	85.5	89.5	88.5	86.5	89.5	89.5
5	4.00	86.5	89.5	89.5	88.5	89.5	89.5
7.5	5.50	88.5	91.0	90.2	89.5	91.7	91.0
10	7.50	89.5	91.7	91.7	90.2	91.7	91.0
15	11.00	90.2	93.0	91.7	91.0	92.4	91.7
20	15.00	91.0	93.0	92.4	91.0	93.0	91.7
25	18.5	91.7	93.6	93.0	91.7	93.6	93.0
30	22.00	91.7	94.1	93.6	91.7	93.6	93.0
40	30.0/0	92.4	94.1	94.1	92.4	94.1	94.1
50	37.00	92.0	94.5	94.1	93.0	94.5	94.1
60	45.00	93.6	95.0	94.5	93.6	95.0	94.5
75	55.00	93.6	95.0	94.5	93.6	95.4	94.5
100	75.00	93.6	95.4	95.0	94.1	95.4	95.0
125	90.00	94.1	95.4	95.0	95.0	95.4	95.0
150	110.00	94.1	95.8	95.4	95.0	95.8	95.8
200	150.00	95.0	95.8	95.4	95.4	96.2	95.8
250	185.00	95.0	95.8	95.4	95.8	95.6	95.8
300	225.00	95.4	95.8	95.4	95.8	96.2	95.8
350	260.00	95.4	95.8	95.4	95.8	96.2	95.8
400	300.00	95.8	95.8	95.8	95.8	96.2	95.8
450	335.00	95.8	96.2	96.2	95.8	96.2	95.8
500	375.00	95.8	96.2	96.2	95.8	96.2	95.8

Source: 2010 PSVARE Standards

10.5.4. Enthalpy Recovery of Exhaust Air

a. General

When buildings have outside air or fresh air supply and extract system through mechanical means, using heat exchangers can use the air extracted from the building areas to pre-condition the incoming outdoor air. This process exploits the fact that the extract air is usually already conditioned and therefore, colder and drier.

b. Applicability

This measure applies to all building occupancies as indicated in Table 1.

c. Requirements

All buildings with centralized air supply system shall use enthalpy recovery wheels with efficiency of at least sixty percent (60%) of ninety percent (90%) exhaust air.

d. Exceptions

Buildings without centralized cooling systems are exempt.

10.6 ELECTRICAL SYSTEMS

10.6.1 Daylight Provision

a. General

Building should be planned and designed to maximize the use of natural light so to reduce the use of artificial illumination.

b. Applicability

This measure applies to all building occupancies as indicated in Table 1. For residential condominiums, it does not apply to individual dwelling units.

c. Requirements

All regularly occupied spaces inside the building shall have a view of any combination of the following features that can allow daylight into the room space:

i. Window

ii. Light shelf

iii. Clerestory

iv. Skylight

v. Light monitor/light scoop

vi. Other devices that can allow daylight inside

d. Exceptions

Spaces where daylight access hinders its intended function are exempt from this provision with justification for exemption.

10.6.2 Daylight-Controlled Lighting System

a. General

Building interior perimeter zones exposed to daylight generally do not require artificial lighting during the day. However, sub-optimal design and operation of the building results in use of artificial lighting when not required.

Photoelectric sensors connected to luminaires help in dimming or switching off lamps that do not require to be operated due to presence of adequate daylight.

b. Applicability

This measure applies to all building occupancies as stated in Table 1. For residential condominiums, this applies only to common indoor areas with access to daylight.

c. Requirements

Applicable buildings shall comply with the following:

i. Lighting fixtures within the daylight zone shall be controlled with photoelectric sensors with an auto on-off basis or continual dimming. The photoelectric sensor shall be located approximately at half (½) the depth of daylight zone.

ii. If occupancy sensors are installed in the daylight zone, the occupancy sensor shall override the photoelectric sensor during non-occupancy period.

d. Exceptions

Installed lighting fixtures within the day-lit zones are exempt from using photoelectric sensor if this hinders its intended function, with justification for exemption.

10.6.3 Lighting Power Density (LPD)

a. General

Limitation of LPD will help to design the lighting system in the most efficient way and reduce the lighting and cooling load in the buildings.[3] The maximum allowed LPD for each space type is specified in Table 11.

b. Applicability

This measure applies to all building occupancies as indicated in Table 1.

c. Requirements

All applicable building types shall comply with the LPD limits in the 2010 PSVARE Standards, as shown in Table 11.

3 The IIEE Manual on the Practice of Efficient Lighting System can be a reference for the design of building lighting systems.

TABLE 11. MAXIMUM ALLOWED LPD[4]

USE/OCCUPANCY CLASSIFICATION	BUILDING AVERAGE LPD (W/M^2)
Residential Dwelling: Condominium	10.8
Hotel/Resort	10.8
Educational: School	12.9
Institutional: Hospital	12.9
Business: Office	10.8
Mercantile: Mall	16.1 (excluding accent lighting)

Source: 2010 PSVARE Standards

4 Above requirement excludes parking and exterior lighting (see Table 12)

TABLE 12. MAXIMUM ALLOWED LPD[4]

OTHER USES	AVERAGE LPD
Covered Parking	3.2 W/m2
Open and outdoor parking	1.6 W/m2
Exterior Facade	2.15 W/m2
Active entrance (pedestrian conveyance)	98.4 W/linear meter
Inactive entrance (normally locked/inactive use	65.6 W/linear meter

Source: 2010 PSVARE Standards

d. Exceptions

There are no exceptions to this provision.

10.6.4 Occupancy Sensors for Lighting Control

a. General

Occupancy sensors linked to lighting shall be installed in areas with variable occupancy.

b. Applicability

This measure applies to all building occupancies as indicated in Table 1, except for hospitals and malls.

c. Requirements

Applicable buildings shall comply with the following:

i. In order to limit the use of electricity in unoccupied areas of buildings, occupancy sensors linked to lighting (except for emergency and security lighting) shall be installed in the following areas with variable occupancy:

- corridors
- private offices
- storage rooms
- common toilets
- meeting rooms
- stairways
- other similar areas

ii. For covered car parks: minimum of sixty per cent (60%) of the lighting must be controlled by the occupancy sensors.

d. Exceptions

Provisions for emergency and security lighting are exempted from this requirement.

10.6.5 Elevators and Escalators/Moving Ramps/Walkways

a. General

Escalators/Moving Ramp/Walkway must be fitted with controls to automatically reduce speed or stop when no traffic is detected. Elevators must be fitted with mechanisms to reduce energy demand.

b. Applicability

This measure applies to all building occupancies as indicated in Table 1.

c. Requirements

Applicable buildings shall comply with the following:

i. Escalators/Moving Ramps/Walkways

• Escalators/Moving Ramps/Walkways shall be fitted with automated controls to reduce to a slower speed when no activity has been detected for a maximum period of one and a half (1-1/2) minutes and duration may be adjusted depending on the demand.

• The escalator/moving ramp/walkway shall automatically be put on a standby mode when no activity has been detected for a maximum period of five (5) minutes and duration may be adjusted depending on the demand.

• These escalators/moving ramps/walkways shall be designed with energy efficient soft start technology. Activation of reduced speed, power off and power on modes shall be done through sensors installed in the top or bottom landing areas.

ii. Elevators

• Elevators shall be provided with controls to reduce the energy demand. To meet this requirement, the following features must be incorporated:

- Use of Alternating Current (AC) Variable Voltage and Variable Frequency (VVVF) drives on non-hydraulic elevators

- Use of energy efficient lighting and display lighting in the elevator car shall have an average lamp efficacy, across all fittings in the car, of more than 55 lumens/watt

- Lighting shall switch off after the elevator has been inactive for a maximum period of five (5) minutes

- The elevators shall operate in a stand-by condition during off-peak periods

d. Exceptions

There are no exceptions to this provision.

10.6.6 Transformer

a. General

The transformer shall be tested in accordance with relevant Philippine National Standards (PNS) at test conditions of full load, free of harmonics and at unity power factor.

b. Applicability

This measure applies to all building occupancies, with own transformer, as indicated in Table 1.

c. Requirements

Transformers that are part of the building electrical system shall have efficiencies not lower than 98%, as prescribed in the DOE Guidelines on Energy Conserving Design of Buildings.

d. Exceptions

There are no exceptions to this provision.

10.6.7 Overhead or Elevated Water Storage

a. General

To reduce dependence on motorized systems to supply and distribute potable or non-potable water within the building, thus help reduce energy consumption, overhead or elevated water storage systems are used, provided there is a twenty percent (20%) fire reserve over and above the average daily demand supply. The system relies mostly on elevation and gravity to distribute water within the building.

b. Applicability

This measure applies to all building occupancies as indicated in Table 1.

c. Requirements

Applicable buildings shall include in the water distribution system the integration of overhead or elevated water tanks that will facilitate the distribution of potable and/or non-potable water into the building spaces, without compromising the required water volume and pressure based on demand and the Plumbing Code of the Philippines.

d. Exceptions

Buildings below ten (10) storeys high are exempt from this provision.

SECTION 11. WATER EFFICIENCY

Water efficiency requires the adoption of efficient practices, plans, designs, materials, fixtures, equipment and methods that reduce water consumption resulting in cost savings.

11.1 WATER FIXTURES

a. General

Efficient water fixtures include faucets, showerheads and water closets that use less water in order to perform the same function of cleaning as effectively as standard models. Water efficiency is an important aspect, especially as fresh water resources start getting depleted at a rate faster than they are replenished. Use of efficient plumbing fixtures, sensors, auto control valves, aerators, flow control and pressure-reducing devices, wherever possible, can result in significant reduction in water consumption.

b. Applicability

This measure applies to all building occupancies as indicated in Table 1.

c. Requirements

Applicable buildings shall comply with the requirements as shown in Table 13.

d. Exceptions.

There are no exceptions to this provision.

TABLE 13. WATER FIXTURE PERFORMANCE REQUIREMENTS

TYPE OF FIXTURES	MAXIMUM FLOW RATE	
Dual Flush Water Closet	≤ 6 full 3 low	liters/flushing cycle
Single Flush Water Closet	4.9	liters/flushing cycle
Shower	≤ 9 (80PSi)	liters/min at 551.6 kPa
Urinals	≤ 1	liters/flushing cycle
Lavatory taps	≤ 4.8 (60PSi)	liters/min at 417.7 kPa
Kitchen faucets	≤ 4.8 (60PSi)	liters/min at 417.7 kPa
Handheld bidet sprays	≤ 4.8 (60PSi)	liters/min at 417.7 kPa

Source: Prescribed Requirements, IFC Philippine Green Building Code Project, May 2013

11.2 WATER MANAGEMENT

11.2.1 Rainwater Harvesting

a. General

Rainwater is one of the purest sources of water available. Rainwater from roofs and hardscape must be collected and reused for nonpotable purposes.

b. Applicability

This measure applies to all building occupancies as indicated in Table 1.

c. Requirements

i. Minimum storage tanks size (in cu.m) shall be calculated by dividing the building footprint area by 75.

ii. Collected water shall be used for non-potable purposes such as toilet flushing, irrigation and cooling towers.

d. Exceptions

There are no exceptions to this provision.

11.2.2 Water Recycling

a. General

Recycled water from Sewage Treatment Plants (STP) shall be reused for non-potable purposes.

b. Applicability

This measure applies to all building occupancies as indicated in Table 1.

c. Requirements

The recycled water produced on site shall be reused for non-potable purposes, such as toilet flushing, irrigation and cooling towers, through a distinct and separate piping system from the potable water supply system.

d. Exceptions

Buildings with no dedicated STP are exempted from this requirement.

SECTION 12. MATERIAL SUSTAINABILITY

Material Sustainability governs all matters related to resource efficiency and material selection and use with the least impact on the environment.

12.1 Non-toxic Materials

a. General

Non-Toxic building materials refer to building materials without hazardous or toxic chemicals that could cause Sick Building Syndrome (SBS) and eventually lead to Building Related Illness (BRI).

b. Applicability

This measure applies to all building occupancies as indicated in Table 1.

c. Requirements

i. Paints, coatings, adhesives and sealants used indoors or in non-ventilated areas shall not contain Volatile Organic Compounds (VOC) or should be within levels tolerable to humans as specified in Table 14.

ii. Composite wood shall not have urea formaldehyde content.

iii. All other materials containing chemicals used in construction shall not compromise and be deleterious to the health and safety of the workers and occupants of the building.

iv. Specifications shall comply with the allowable VOC limits, as stated in Table 14, with Material Safety Data Sheet (MSDS) from supplier and other certification, to justify the compliance of the material.

d. Exceptions

There are no exceptions to this provision.

TABLE 14. VOC LIMITS

APPLICATION/PRODUCT TYPE	MAXIMUM VOC LIMIT (G/L LESS WATER)
Flat paint	50
Non-flat paint	150
Anti-rust paint	250
Lacquer (clear wood finish)	550
Sanding Sealer (clear wood finish)	350
Varnish (clear wood finish)	350
Floor coating	100
Shellac (clear)	730
Shellac (pigmented)	550
Stain	250
Faux Finish Coating	350
Architectural sealant	250
Non-membrane roof sealant	300
Single ply roof membrane	450
Waterproofing sealer	250
Waterproofing sealer (concrete/ masonry)	400
All other sealers	200
Indoor adhesive	50
Wood flooring adhesive	100
Subfloor adhesive	50
Ceramic tile adhesive	65
Contact adhesive	80
Drywall panel adhesive	50
Multipurpose construction adhesive	70
Structural glazing adhesive	100
Special purpose contact adhesive	250
PVC welding	510
Concrete curing compound	350
Wood preservative	350

VOC levels are measured in grams of VOC per liter of material

Source: USGBC LEED Addenda # 100000419, 14 April 2010

SECTION 13. SOLID WASTE MANAGEMENT

Efficient waste management requires the adoption of efficient waste management practices and use of eco-friendly materials.

13.1 Materials Recovery Facility (MRF)

a. General

MRF shall be provided for the collection and segregation of solid waste materials

b. Applicability

This measure applies to all building occupancies as indicated in Table 1.

c. Requirements

i. Buildings shall be provided with a minimum area for MRF as specified in Table 15.

ii. MRF shall be fully enclosed and easily accessible from within the building, and from the outside for easy collection of waste.

iii. Solid waste containers shall be provided for at least four (4) types of wastes:
- compostable (biodegradable)
- non-recyclable (to be disposed of in the landfill)
- recyclable (paper, cardboard, plastic, metal, wood, etc.)
- special waste

iv. For hospitals, isolated bins for hazardous wastes shall be provided to avoid contamination.

d. Exceptions

There are no exceptions to this provision.

TABLE 15. MRF MINIMUM DAILY STORAGE SPACE REQUIREMENTS

USE/OCCUPANCY	REQUIREMENT
Residential Dwelling: Condominium	1.0 sqm waste storage space per 2,500 sqm TGFA + 50% circulation space
Hotel/Resort	1.0 sqm waste storage space per 2,500 sqm TGFA + 50% circulation space
Educational: School	1.0 sqm waste storage space per 300 sqm TGFA + 50% circulation space
Institutional: Hospital	1.0 sqm waste storage space per 1,250 sqm TGFA + 50% circulation space
Business: Office	1.0 sqm waste storage space per 1,400 sqm TGFA + 50% circulation space
Mercantile: Mall	1.0 sqm waste storage space per 400 sqm TGFA + 50% circulation space

Source: DENR (EMB Report on Solid Waste Generation) and NBC

SECTION 14. SITE SUSTAINABILITY

Site sustainability requires the adoption of planning, design, construction and operation practices that minimize the adverse impact of buildings on ecosystems and water resources.

14.1 Site Ground Preparation and Earthworks

a. General

Site clearing, grading and excavation shall be planned at the start of construction to mitigate pollution caused by erosion and sedimentation, taking into consideration existing endemic foliage, as regulated by the DENR.

All existing utilities and water bodies and waterways shall be protected and shall not be disturbed.

b. Applicability

This measure applies to all building occupancies as indicated in Table 1.

c. Requirements

Measures for site protection shall be in place before the start of construction.

i. Building site erosion and sedimentation control plan that outlines measures to be applied to prevent soil that can run-off at the natural bodies of water, causing water pollution.

ii. Additional measures to mitigate the effect of pollution and safety on construction conforming to Rule XI of the NBC

iii. Storm water collection management plan

iv. Structures or facilities for storm water collection

d. Exceptions

There are no exceptions to this provision.

14.2 Open Space Utilization

a. General

The inclusion of green areas or landscaped areas for indigenous or adaptable species of grass, shrubs and trees will help in providing more permeable surface for the building development's open space and thus, allow the re-charging of natural ground water reservoir, control storm water surface run-off, cool the building surroundings and provide indoor to outdoor connectivity for the building occupants.

b. Applicability

This measure applies to all building occupancies as indicated in Table 1.

c. Requirements

A minimum of fifty percent (50%) of the required Unpaved Surface Area (USA), as required in Rule VII and VIII of the NBC, shall be vegetated with indigenous and adaptable species.

d. Exceptions

There are no exceptions to this provision.

SECTION 15. INDOOR ENVIRONMENTAL QUALITY

Indoor Environmental Quality requires the adoption of efficient design and operation practices that take into consideration the building environment to improve occupant health, productivity and safety.

15.1 Minimum Fresh Air Rates

a. General

The building indoor environment can contain more contaminants many times over than the outside. Various studies have shown that indoor air contaminants can cause health disorders, through symptoms of SBS and BRI. The introduction and application of minimum fresh air rates will maintain acceptable indoor air quality thru the constant replacement of indoor air in buildings.

b. Applicability

This measure applies to all building occupancies as indicated in Table 1.

c. Requirements

Compliance to the minimum fresh air rates provided in the latest Philippine Society of Ventilating, Air-Conditioning and Refrigerating Engineers (PSVARE) Standards. See Table 16.

d. Exceptions

There are no exceptions to this provision.

TABLE 16. MINIMUM VENTILATION RATES IN BREATHING ZONE

OCCUPANCY CATEGORY	PEOPLE OUTDOOR AIR RATE		AREA OUTDOOR AIR RATE		MAX. DEFAULT OCCUPANCY
	(CFM/PERSON)	(CMH/PERSON)	(CFM/SQFT)	(CMH/SQM)	(PEOPLE/1,000 SQFT(90SQM))
Hotel/Resort and Residential Dwelling: Condominium					
Bedroom/Living Room	5	8.5	0.06	0.1968	10
Lobbies/Pre-function	7.5	12.75	0.06	0.1968	30
Common Corridors	-		0.06	0.1968	-
Multi-purpose Assembly	5	8.5	0.06	0.1968	120
Laundry Rooms, Central	5	8.5	-0.12	0.3936	10
Laundry Rooms within Dwelling Rooms	5	8.5	0.12	0.3936	10
Office Buildings					
Office Spaces	5	8.5	0.06	0.1968	5
Reception ares	5	8.5	0.06	0.1968	30
Telephone/data entry	5	8.5	0.06	0.1968	60
Main Entry Lobbies	5	8.5	0.06	0.1968	10
Bank vaults/safe deposit	5	8.5	0.06	0.1968	5
Mercantile: Mall					
Sales area	7.5	12.75	0.12	0.3936	15
Mall common areas	7.5	12.75	0.06	0.1968	40
Barbershop	7.5	12.75	0.06	0.1968	25
Beauty and Nail salons	20	34	0.12	0.3936	25
Pet shops (animal areas)	7.5	12.75	0.18	0.5904	10
Supermarket	7.5	12.75	0.06	0.1968	8
Laundries	7.5	12.75	0.06	0.1968	20
Photo Studios	5	8.5	0.12	0.3936	10
Pharmacy (prep area)	5	8.5	0.18	0.5904	10
Computer (not printing)	5	8.5	0.06	0.1968	4
Restaurant dining rooms	7.5	12.75	0.18	0.5904	70
Cafeteria/fast food dining	7.5	12.75	0.18	0.5904	100
Bars, cocktail lounges	7.5	12.75	0.18	0.5904	100
Educational: School					
Day Care (through age 4)	10	17	0.18	0.5904	25
Classrooms (ages 5-8)	10	17	0.12	0.3936	25
Classrooms (ages 9 plus)	10	17	0.12	0.3936	35
Lecture classroom	7.5	12.75	0.06	0.1968	65
Lecture Hall (fixed seats)	7.5	12.75	0.06	0.1968	150
Art classroom	10	17	0.18	0.5904	20
Science laboratories	10	17	0.18	0.5904	25
Wood/metal shop	10	17	0.18	0.5904	20
Computer lab	10	17	0.12	0.3936	25

TABLE 16. MINIMUM VENTILATION RATES IN BREATHING ZONE

OCCUPANCY CATEGORY	PEOPLE OUTDOOR AIR RATE		AREA OUTDOOR AIR RATE		MAX. DEFAULT OCCUPANCY
	(CFM/PERSON)	(CMH/PERSON)	(CFM/SQFT)	(CMH/SQM)	(PEOPLE/1,000 SQFT(90SQM))
Educational: School					
Media Center	10	17	0.12	0.3936	25
Music/theater/dance	10	17	0.06	0.1968	35
Multi-use assembly	7.5	12.75	0.06	0.1968	100
University/College Laboratories	10	17	0.18	0.5904	25
Sports Arena (play area)	-		0.3	0.984	-
Gym, stadium (play area)	-		0.3	0.984	-
Spectator area	7.5	12.75	0.06	0.1968	150
Swimming (pool & deck)	-		0.48	1.5744	-
General					
Conference/meeting	5	8.5	0.06	0.1968	50
Corridors	-		0.06	0.1968	-
Storage room	-		1.12	3.6736	-
Break room	5	8.5	0.06	0.1968	25
Coffee room	5	8.5	0.06	0.1968	20
Disco/dance floors	20	34	0.06	0.1968	100
Health club (aerobics room)	20	34	0.06	0.1968	40
Health club (weights room)	20	34	0.06	0.1968	10
Bowling gallery (seating)	10	17	0.12	0.3936	40
Gambling casino	7.5	12.75	0.18	0.5904	120
Game arcades	7.5	12.75	0.18	0.5904	20
Stages, Studios	10	17	0.06	0.1968	70
Public Assembly Spaces					
Auditorium seating areas	5	8.5	0.06	0.1968	150
Places of religious worship	5	8.5	0.06	0.1968	120
Courtrooms	5	8.5	0.06	3.6736	70
Legislative chambers	5	8.5	0.06	0.1968	50
Libraries	5	8.5	0.12	0.1968	10
Lobbies	5	8.5	0.06	0.1968	150
Museums (children's)	7.5	12.75	0.12	0.1968	40
Museums/galleries	7.5	12.75	0.06	0.1968	40

Source: 2010 PSVARE Standards

15.2 Designated Smoking Area

a. General

Environmental Tobacco Smoke (ETS) is one of the leading causes of respiratory illnesses in building occupants. RA 9211, the Tobacco Regulations Act, restricts tobacco smoking in public spaces and the prescription of designated smoking areas inside buildings.

b. Applicability

This measure applies to all buildings occupancies as indicated in Table 1.

c. Requirements

i. If smoking is banned within the building and property premises, "NO SMOKING" signs in compliance with the RA 9514 (Fire Code of the Philippines 2008), shall be posted in conspicuous areas of the building and property premises to remind building occupants of the policy.

ii. If smoking is only allowed outdoors, designated smoking areas shall be naturally ventilated, outside of the building shell and away from building entrances, windows and outside supply air (OSA) intakes by at least ten (10) meters.

iii. If smoking is allowed indoors, designated smoking areas shall be provided, partitioned from the rest of the indoor areas. Partitions shall be from floor to soffit of the next floor or roof structure. Enclosed smoking areas shall be equipped with adequate exhaust system with exhaust rate in accordance with the latest PSVARE Standards. Exhaust shall directly vent out to the outside of the building and away from any building openings or air intakes.

iv. Doors and windows of enclosed smoking area shall always be closed and well sealed. Negative pressure within is recommended to prevent smoke infiltration to adjacent spaces.

d. Exceptions

Buildings with a general policy of "no smoking" within building premises may be exempted from having designated smoking areas.

CHAPTER III. INSTITUTIONAL ARRANGEMENTS

SECTION 16. OFFICE OF THE NATIONAL BUILDING OFFICIAL

The Secretary of the Department of Public Works and Highways (DPWH), as the concurrent National Building Official, pursuant to Section 203 of the NBC, through the NBCDO, shall regularly review the GB Code not to exceed three (3) years from the date of effectivity and every three (3) years thereafter.

For this purpose, the NBCDO shall convene the Technical Working Group (TWG) to review and update the GB Code implementation vis-à-vis current and emerging trends in the industry and make recommendations for reform.

The NBCDO shall serve as the center for the development and promotion of green buildings in the Philippines. As such, it shall be the repository of resource materials relating to green buildings. It shall also be responsible for developing modules and providing green building training.

SECTION 17. TECHNICAL STAFF

The Secretary is hereby authorized to constitute and provide in his department a professional staff composed of highly qualified architects, engineers and technicians who possess diversified and professional experience in the fields of green building planning, design and construction.

SECTION 18. PROFESSIONAL AND TECHNICAL ASSISTANCE

The Executive Director of NBCDO shall chair the Technical Working Group (TWG) and may make arrangements with the Secretary for compensation of the services of the TWG. He may also engage and compensate, within appropriations available thereof, the services of such number of consultants, experts and advisers on full or part-time basis as may be necessary, coming from any concerned government agency or private business, Accredited Professional Organizations (APO) and other associations to carry out the provisions of the GB Code. The members are the duly authorized representatives from the following:

18.1 CCC (Climate Change Commission)

18.2 DENR (Department of Environment and Natural Resources)

18.3 DILG (Department of Interior and Local Government)

18.4 DOE (Department of Energy)

18.5 DOST (Department of Science and Technology)
18.6 DTI (Department of Trade and Industry)
18.7 GEP (Geodetic Engineers of the Philippines)
18.8 IECEP (Institute of Electronics Engineers of the Philippines)
18.9 IIEE (Institute of Integrated Electrical Engineers)
18.10 PALA (Philippine Association of Landscape Architects)
18.11 PICE (Philippine Institute of Civil Engineers)
18.12 PIEP (Philippine Institute of Environmental Planners)
18.13 PIID (Philippine Institute of Interior Designers)
18.14 PSME (Philippine Society of Mechanical Engineers)
18.15 PSSE (Philippine Society of Sanitary Engineers)
18.16 UAP (United Architects of the Philippines)
18.17 BOMAP (Building Owners and Managers Association of the Philippines)
18.18 PABA (Philippine Association of Building Administrators)
18.19 PABO (Philippine Association of the Building Officials)

CHAPTER IV. CERTIFICATION PROCESS

SECTION 19. GREEN BUILDING PERMIT PROCESS

The Office of the Building Official shall review the building permit application for Green Buildings as prepared by the design professionals in compliance with the requirements of the GB Code and the various referral codes, in accordance with Rule 3 of the NBC.

CHAPTER V. FINAL PROVISIONS

SECTION 20. SEPARABILITY CLAUSE

Should any part or provision of the GB Code be held unconstitutional or invalid by a competent court, the other parts or provisions hereof which are not affected thereby shall continue to be in full force and effect.

SECTION 21. EFFECTIVITY

This GB Code shall take effect fifteen (15) days after its publication once a week for three (3) consecutive weeks in a newspaper of general circulation.

SECTION 22. TRANSITORY PROVISION

Those projects with building designs and plans that have already been prepared and signed by all duly licensed design professionals shall be exempt from the coverage, provided that the request for exemption shall be filed with the Office of the Building Official within 30 days after the effectivity of this Code.

ANNEX 1
GLASS LIBRARY

WINDOR/DOOR	GLASS		GAP THICKNESS		GAP	CENTER GLASS U-VALUE		SOLAR HEAT GAIN COEFFICIENT	SHADING COEFFICIENT	VISIBLE TRANSMITTANCE
	TYPE CODE	# PANES	IP (IN)	SI (MM)	GAS FILL	IP (BTU/ SQFT-H-^{0}F)	SI (W/ SQM-^{0}C)	SHGC	SC	TVIS
Single Clear	1000	1	n/a	n/a	n/a	1.11	6.30	0.86	1	0.9
Single Tint Bronze	1200	1	n/a	n/a	n/a	1.11	6.30	0.73	0.84	0.69
Single Tint Green	1202	1	n/a	n/a	n/a	1.11	6.30	0.72	0.83	0.82
Single Tint Grey	1204	1	n/a	n/a	n/a	1.11	6.30	0.71	0.83	0.61
Single Low Iron	1003	1	n/a	n/a	n/a	1.1	6.25	0.90	1.04	0.91
Single Ref-D Clear	1417	1	n/a	n/a	n/a	1.08	6.13	0.50	0.58	0.33
Single Ref-D Tint	1418	1	n/a	n/a	n/a	1.08	6.13	0.46	0.53	0.25
Single Ref-B Clear-H	1407	1	n/a	n/a	n/a	0.97	5.51	0.39	0.45	0.3
Single Ref-B Tint-H	1410	1	n/a	n/a	n/a	0.97	5.51	0.34	0.4	0.18
Single Ref-B Clear-L	1406	1	n/a	n/a	n/a	0.96	5.45	0.31	0.35	0.2
Single Ref-A Clear-L	1402	1	n/a	n/a	n/a	0.95	5.39	0.31	0.36	0.2
Single Ref-C Clear-H	1413	1	n/a	n/a	n/a	0.94	5.34	0.35	0.41	0.22
Single Ref-C Tint-H	1416	1	n/a	n/a	n/a	0.94	5.34	0.31	0.37	0.13
Single Ref-A Tint-H	1405	1	n/a	n/a	n/a	0.93	5.28	0.29	0.34	0.1
Single Ref-C Clear-M	1412	1	n/a	n/a	n/a	0.92	5.22	0.32	0.37	0.19
Single Ref-C Tint-M	1415	1	n/a	n/a	n/a	0.92	5.22	0.29	0.34	0.11
Single Ref-A Clear-L	1401	1	n/a	n/a	n/a	0.9	5.11	0.25	0.29	0.14
Single Ref-A Tint-M	1404	1	n/a	n/a	n/a	0.9	5.11	0.25	0.29	0.09
Single Ref-B Tint-M	1409	1	n/a	n/a	n/a	0.89	5.05	0.28	0.33	0.13
Single Low-E Clear (e2=.4)	1600	1	n/a	n/a	n/a	0.88	5.00	0.78	0.91	0.85
Single Ref-C Clear-L	1411	1	n/a	n/a	n/a	0.88	5.00	0.25	0.29	0.13
Single Ref-C Tint-L	1414	1	n/a	n/a	n/a	0.88	5.00	0.25	0.29	0.08
Single Ref-B Tint-L	1408	1	n/a	n/a	n/a	0.87	4.94	0.23	0.26	0.05
Single Ref-A Tint-L	1403	1	n/a	n/a	n/a	0.87	4.94	0.22	0.26	0.05
Single Ref-A Clear-L	1400	1	n/a	n/a	n/a	0.86	4.88	0.19	0.23	0.08
Single Low-E Clear (e2=.2)	1601	1	n/a	n/a	n/a	0.76	4.32	0.77	0.89	0.82
Double Low Iron	2006	2	0.25	6.35	Air	0.57	3.24	0.83	0.96	0.84
Double Clear	2000	2	0.25	6.35	Air	0.57	3.24	0.76	0.88	0.81
Double Tint Bronze	2200	2	0.25	6.35	Air	0.57	3.24	0.62	0.72	0.62
Double Tint Green	2206	2	0.25	6.35	Air	0.57	3.24	0.62	0.72	0.74
Double Tint Grey	2212	2	0.25	6.35	Air	0.57	3.24	0.61	0.71	0.55
Double Low Iron	2009	2	0.25	6.35	Air	0.56	3.18	0.82	0.95	0.83
Double Ref-D Clear	2460	2	0.25	6.35	Air	0.56	3.18	0.42	0.49	0.31
Double Ref-D Tint	2470	2	0.25	6.35	Air	0.56	3.18	0.35	0.41	0.23
Double Ref-B Clear-H	2426	2	0.25	6.35	Air	0.53	3.01	0.30	0.35	0.27
Double Ref-B Tint-H	2436	2	0.25	6.35	Air	0.53	3.01	0.25	0.29	0.16
Double Ref-C Clear-H	2446	2	0.25	6.35	Air	0.52	2.95	0.27	0.32	0.2
Double Ref-A Clear-H	2406	2	0.25	6.35	Air	0.52	2.95	0.23	0.27	0.18

WINDOR/DOOR	GLASS		GAP THICKNESS		GAP	CENTER GLASS U-VALUE		SOLAR HEAT GAIN COEFFICIENT	SHADING COEFFICIENT	VISIBLE TRANSMITTANCE
	TYPE CODE	# PANES	IP (IN)	SI (MM)	GAS FILL	IP (BTU/ SQFT-H-^{0}F)	SI (W/ SQM-^{0}C)	SHGC	SC	TVIS
Double Ref-B Clear-L	2420	2	0.25	6.35	Air	0.52	2.95	0.23	0.27	0.18
Double Ref-D Tint-H	2456	2	0.25	6.35	Air	0.52	2.95	0.23	0.26	0.12
Double Ref-C Clear-M	2443	2	0.25	6.35	Air	0.51	2.90	0.24	0.28	0.17
Double Ref-A Tint-H	2416	2	0.25	6.35	Air	0.51	2.90	0.21	0.24	0.09
Double Ref-C Tint-M	2453	2	0.25	6.35	Air	0.51	2.90	0.2	0.24	0.1
Double Low-E (e3=.4) Clear	2600	2	0.25	6.35	Air	0.5	2.84	0.72	0.84	0.77
Double Ref-B Tint-M	2433	2	0.25	6.25	Air	0.5	2.84	0.20	0.24	0.12
Double Ref-A Clear-M	2403	2	0.25	6.35	Air	0.5	2.84	0.19	0.22	0.13
Double Ref-C Clear-L	2440	2	0.25	6.35	Air	0.5	2.84	0.19	0.22	0.12
Double Ref-C Tint-L	2450	2	0.25	6.35	Air	0.5	2.84	0.18	0.21	0.07
Double Ref-A Tint-M	2413	2	0.25	6.35	Air	0.5	2.84	0.17	0.2	0.08
Double Low Iron	2007	2	0.50	12.70	Air	0.49	2.78	0.83	0.96	0.84
Double Low Iron	2010	2	0.50	12.70	Air	0.49	2.78	0.82	0.95	0.83
Double Clear	2001	2	0.50	12.70	Air	0.49	2.78	0.76	0.89	0.81
Double Tint Bronze	2201	2	0.50	12.70	Air	0.49	2.78	0.62	0.72	0.62
Double Tint Green	2207	2	0.50	12.70	Air	0.49	2.78	0.61	0.71	0.74
Double Tint Grey	2213	2	0.50	12.70	Air	0.49	2.78	0.61	0.71	0.55
Double Ref-A Tint-L	2410	2	0.25	6.35	Air	0.49	2.78	0.15	0.18	0.05
Double Ref-B Tint-L	2430	2	0.25	6.35	Air	0.49	2.78	0.15	0.18	0.05
Double Ref-A Clear-L	2400	2	0.25	6.25	Air	0.49	2.78	0.14	0.17	0.07
Double Clear	2004	2	0.50	12.70	Air	0.48	2.73	0.70	0.81	0.78
Double Tint Bronze	2204	2	0.50	12.70	Air	0.48	2.73	0.49	0.57	0.47
Double Tint Green	2210	2	0.50	12.70	Air	0.48	2.73	0.49	0.57	0.66
Double Tint Blue	2219	2	0.50	12.70	Air	0.48	2.73	0.49	0.57	0.5
Double Tint Grey	2216	2	0.50	12.70	Air	0.48	2.73	0.47	0.54	0.38
Double Ref-D Clear	2461	2	0.50	12.70	Air	0.48	2.73	0.42	0.49	0.31
Double Ref-D Tint	2471	2	0.50	12.70	Air	0.48	2.73	0.35	0.4	0.23
Double Low Iron	2008	2	0.50	12.70	Argon	0.46	2.61	0.83	0.96	0.84
Double Clear	2002	2	0.50	12.70	Argon	0.46	2.61	0.76	0.89	0.81
Double Low-E (e3=.2) Clear	2610	2	0.25	6.35	Air	0.46	2.61	0.72	0.84	0.74
Double Tint Bronze	2202	2	0.50	12.70	Argon	0.46	2.61	0.62	0.72	0.62
Double Tint Green	2208	2	0.50	12.70	Argon	0.46	2.61	0.61	0.71	0.74
Double Tint Grey	2214	2	0.50	12.70	Argon	0.46	2.61	0.61	0.7	0.55
Double Low Iron	2011	2	0.50	12.70	Argon	0.45	2.56	0.82	0.95	0.83
Double Clear	2005	2	0.50	12.70	Argon	0.45	2.56	0.70	0.81	0.78
Double Low-E (e3=.2) Clear	2613	2	0.25	6.35	Air	0.45	2.56	0.66	0.77	0.72
Double Tint Bronze	2205	2	0.50	12.70	Argon	0.45	2.56	0.49	0.56	0.47
Double Tint Green	2211	2	0.50	12.70	Argon	0.45	2.56	0.49	0.57	0.66

WINDOR/DOOR	GLASS		GAP THICKNESS		GAP	CENTER GLASS U-VALUE		SOLAR HEAT GAIN COEFFICIENT	SHADING COEFFICIENT	VISIBLE TRANSMITTANCE
	TYPE CODE	# PANES	IP (IN)	SI (MM)	GAS FILL	IP (BTU/ SQFT-H-^{0}F)	SI (W/ SQM-^{0}C)	SHGC	SC	TVIS
Double Tint Blue	2220	2	0.50	12.70	Argon	0.45	2.56	0.49	0.56	0.5
Double Tint Grey	2217	2	0.50	12.70	Argon	0.45	2.56	0.47	0.54	0.38
Double Ref-D Clear	2462	2	0.50	12.70	Argon	0.45	2.56	0.42	0.49	0.31
Double Ref-D Tint	2472	2	0.50	12.70	Argon	0.45	2.56	0.34	0.4	0.23
Double Ref-C Tint-M	2453	2	0.25	6.35	Air	0.51	2.90	0.2	0.24	0.1
Double Low-E (e3=.1) Clear	2640	2	0.25	6.35	Air	0.44	2.50	0.63	0.74	0.77
Double Low-E (e2=.1) Clear	2630	2	0.25	6.35	Air	0.44	2.50	0.60	0.69	0.77
Double Ref-B Clear-H	2427	2	0.50	12.70	Air	0.44	2.50	0.29	0.34	0.27
Double Ref-B Tint-H	2437	2	0.50	12.70	Air	0.44	2.50	0.23	0.27	0.16
Double Ref-A Clear H	2407	2	0.50	12.70	Air	0.44	2.50	0.22	0.26	0.18
Double Ref-B Clear-L	2421	2	0.50	12.70	Air	0.44	2.50	0.22	0.25	0.18
Double Electrochromic Absorbing Bleached/ Colored, 6.3-mm Gap	2800	2	0.25	6.35	Air	0.43	2.44	0.73	0.85	0.76
Double Electrochromic Reflecting Bleached/ Colored, 6.3-mm Gap	2820	2	0.25	6.35	Air	0.43	2.44	0.63	0.73	0.73
Double Low-E (e2=.1) Clear	2633	2	0.25	6.35	Air	0.43	2.44	0.56	0.65	0.75
Double Low-E (e2=.1) Tint	2636	2	0.25	6.35	Air	0.43	2.44	0.39	0.45	0.44
Double Ref-C Clear-H	2447	2	0.50	12.70	Air	0.43	2.44	0.26	0.3	0.2
Double Ref-D Tint-H	2457	2	0.50	12.70	Air	0.43	2.44	0.21	0.24	0.12
Double Ref-A Tint-H	2417	2	0.50	12.70	Air	0.43	2.44	0.19	0.22	0.09
Double Electrochromic Absorbing Bleached/ Colored, 6.3-mm Gap	2801	2	0.25	6.35	Air	0.43	2.44	0.18	0.21	0.12
Double Electrochromic Reflecting Bleached/ Colored, 6.3-mm Gap	2821	2	0.25	6.35	Air	0.43	2.44	0.17	0.2	0.14
Double Low-E (e2=.04) Clear	2660	2	0.25	6.35	Air	0.42	2.38	0.44	0.51	0.7
Double Low-E (e3=.04) Clear	2663	2	0.25	6.35	Air	0.42	2.38	0.42	0.49	0.68
Double Low-E (e2=.04) Tint	2666	2	0.25	6.35	Air	0.42	2.38	0.31	0.35	0.41
Double Ref-C Clear-M	2444	2	0.50	12.70	Air	0.42	2.38	0.23	0.27	0.17
Double Ref-C Tint-M	2454	2	0.50	12.70	Air	0.42	2.38	0.19	0.22	0.1
Double Low-E (e3=.4) Clear	2601	2	0.50	12.70	Air	0.41	2.33	0.73	0.85	0.77
Double Low-E (e2=.029) Electrochromic Reflecting Bleached/Colored, 6.3-mm Gap	2860	2	0.25	6.35	Air	0.41	2.33	0.46	0.54	0.64

WINDOR/DOOR	GLASS		GAP THICKNESS		GAP	CENTER GLASS U-VALUE		SOLAR HEAT GAIN COEFFICIENT	SHADING COEFFICIENT	VISIBLE TRANSMITTANCE
	TYPE CODE	# PANES	IP (IN)	SI (MM)	GAS FILL	IP (BTU/ SQFT-H-°F)	SI (W/ SQM-°C)	SHGC	SC	TVIS
Double Low-E (e2=.029) Electrochromic Absorbing Bleached/Colored, 6.3-mm Gap	2840	2	0.25	6.35	Air	0.41	2.33	0.44	0.51	0.66
Double Ref-B Clear-H	2428	2	0.50	12.70	Argon	0.41	2.33	0.29	0.34	0.27
Double Ref-B Tint-H	2438	2	0.50	12.70	Argon	0.41	2.33	0.23	0.27	0.16
Double Ref-B Tint-M	2434	2	0.50	12.70	Air	0.41	2.33	0.19	0.22	0.12
Double Ref-C Clear-L	2441	2	0.50	12.70	Air	0.41	2.33	0.18	0.2	0.12
Double Ref-A Clear-M	2404	2	0.50	12.70	Air	0.41	2.33	0.17	0.2	0.13
Double Ref-C Tint-L	2451	2	0.50	12.70	Air	0.41	2.33	0.16	0.19	0.07
Double Low-E (e2=.029) Electrochromic Absorbing Bleached/Colored, 6.3-mm Gap	2841	2	0.25	6.35	Air	0.41	2.33	0.16	0.18	0.1
Double Low-E (e2=.029) Electrochromic Reflecting Bleached/Colored, 6.3-mm Gap	2861	2	0.25	6.35	Air	0.41	2.33	0.16	0.18	0.12
Double Ref-A Tint-M	2414	2	0.50	12.70	Air	0.41	2.33	0.15	0.18	0.08
Double Ref-A Clear-H	2408	2	0.50	12.70	Argon	0.4	2.27	0.22	0.25	0.18
Double Ref-B Clear-L	2422	2	0.50	12.70	Argon	0.4	2.27	0.21	0.25	0.18
Double Ref-B Tint-L	2431	2	0.50	12.70	Air	0.4	2.27	0.14	0.16	0.05
Double Ref-A Clear-L	2401	2	0.50	12.70	Air	0.4	2.27	0.13	0.15	0.07
Double Ref-A Tint-L	2411	2	0.50	12.70	Air	0.4	2.27	0.13	0.15	0.05
Triple Clear	3001	3	0.25	5.35	Air	0.39	2.21	0.68	0.79	0.74
Double Ref-C Clear-H	2448	2	0.50	12.70	Argon	0.39	2.21	0.26	0.3	0.2
Double Ref-D Tint-H	2458	2	0.50	12.70	Argon	0.39	2.21	0.20	0.24	0.12
Double Ref-A Tint-H	2418	2	0.50	12.70	Argon	0.39	2.21	0.19	0.21	0.09
Double Ref-C Clear-M	2445	2	0.50	12.70	Argon	0.38	2.16	0.23	0.26	0.17
Double Ref-C Tint-M	2455	2	0.50	12.70	Argon	0.38	2.16	0.19	0.21	0.1
Double Ref-A Clear-M	2405	2	0.50	12.70	Argon	0.38	2.16	0.17	0.2	0.13
Double Ref-A Tint-M	2415	2	0.50	12.70	Argon	0.38	2.16	0.15	0.17	0.08
Double Ref-B Tint-M	2435	2	0.50	12.70	Argon	0.37	2.10	0.18	0.21	0.12
Double Low-E (e3=.4) Clear	2602	2	0.50	12.70	Argon	0.36	2.04	0.73	0.85	0.77
Double Ref-C Clear-L	2442	2	0.50	12.70	Argon	0.36	2.04	0.17	0.2	0.12
Double Ref-C Tint-L	2452	2	0.50	12.70	Argon	0.36	2.04	0.15	0.18	0.07
Double Ref-A Tint-L	2412	2	0.50	12.70	Argon	0.36	2.04	0.13	0.15	0.05
Double Ref-B Tint-L	2432	2	0.50	12.70	Argon	0.36	2.04	0.13	0.15	0.05
Double Ref-A Clear-L	2402	2	0.50	12.70	Argon	0.36	2.04	0.12	0.14	0.07
Double Low-E (e3=.2) Clear	2611	2	0.50	12.70	Air	0.35	1.99	0.73	0.85	0.74
Double Low-E (e3=.2) Clear	2614	2	0.50	12.70	Air	0.35	1.99	0.67	0.78	0.72

WINDOR/DOOR	GLASS		GAP THICKNESS		GAP	CENTER GLASS U-VALUE		SOLAR HEAT GAIN COEFFICIENT	SHADING COEFFICIENT	VISIBLE TRANSMITTANCE
	TYPE CODE	# PANES	IP (IN)	SI (MM)	GAS FILL	IP (BTU/ SQFT-H-^{0}F)	SI (W/ SQM-^{0}C)	SHGC	SC	TVIS
Triple Clear	3002	3	0.50	12.70	Air	0.32	1.82	0.68	0.79	0.74
Double Low-E (e2=.1) Clear	2641	2	0.50	12.70	AIr	0.32	1.82	0.64	0.75	0.77
Double Low-E (e2=.1) Clear	2631	2	0.50	12.70	Air	0.32	1.82	0.60	0.69	0.77
Triple Low-E (e5=.1) Clear	3601	3	0.25	6.35	Air	0.32	1.82	0.57	0.67	0.7
Triple Low-E Film (88) Clear	3641	3	0.25	6.35	Air	0.32	1.82	0.57	0.66	0.71
Triple Low-E Film (77) Clear	3651	3	0.25	6.35	Air	0.32	1.82	0.46	0.53	0.64
Double Electrochromic Absorbing Bleached/ Colored, 12.7-mm Gap	2802	2	0.50	12.70	Air	0.31	1.76	0.74	0.86	0.76
Double Electrochromic Reflecting Bleached/ Colored, 12.7-mm Gap	2822	2	0.50	12.70	Air	0.31	1.76	0.64	0.74	0.73
Double Low-E (e2=.1) Clear	2634	2	0.50	12.70	Air	0.31	1.76	0.56	0.65	0.75
Double Low-E (e2=.1) Tint	2637	2	0.50	12.70	Air	0.31	1.76	0.37	0.43	0.44
Triple Low-E Film (66) Clear	3661	3	0.25	6.35	Air	0.31	1.76	0.35	0.41	0.54
Triple Low-E Film (55) Clear	3671	3	0.25	6.35	Air	0.31	1.76	0.30	0.35	0.45
Triple Low-E Film (66) Tint	3663	3	0.25	6.35	Air	0.31	1.76	0.26	0.3	0.32
Triple Low-E Film (55) Tint	3673	3	0.25	6.35	Air	0.31	1.76	0.23	0.26	0.27
Double Electrochromic Absorbing Bleached/ Colored, 12.7-mm Gap	2803	2	0.50	12.70	Air	0.31	1.76	0.20	0.19	0.12
Triple Low-E Film (44) Tint	3681	3	0.25	6.35	Air	0.31	1.76	0.20	0.23	0.22
Triple Low-E Film (33) Tint	3691	3	0.25	6.35	Air	0.31	1.76	0.16	0.19	0.17
Double Electrochromic Reflecting Bleached/ Colored, 12.7-mm Gap	2823	2	0.50	12.70	Air	0.31	1.76	0.15	0.17	0.14
Double Low-E (e3=.2) Clear	2612	2	0.50	12.70	Argon	0.3	1.70	0.74	0.86	0.74
Double Low-E (e2=.04) Clear	2661	2	0.50	12.70	Air	0.3	1.70	0.44	0.51	0.7
Double Low-E (e3=.2) Clear	2615	2	0.50	12.70	Argon	0.29	1.70	0.68	0.79	0.72
Triple Clear	3002	3	0.50	12.70	Argon	0.29	1.65	0.68	0.79	0.74
Double Low-E (e2=.029) Electrochromic Absorbing Bleached/Colored, 12.7-mm Gap	2842	2	0.50	12.70	Air	0.29	1.65	0.51	0.59	0.66
Double Low-E (e2=.029) Electrochromic Reflecting Bleached/Colored, 12.7-mm Gap	2862	2	0.50	12.70	Air	0.29	1.65	0.47	0.55	0.64

WINDOR/DOOR	GLASS		GAP THICKNESS		GAP	CENTER GLASS U-VALUE		SOLAR HEAT GAIN COEFFICIENT	SHADING COEFFICIENT	VISIBLE TRANSMITTANCE
	TYPE CODE	# PANES	IP (IN)	SI (MM)	GAS FILL	IP (BTU/ SQFT-H-°F)	SI (W/ SQM-°C)	SHGC	SC	TVIS
Double Low-E (e3=.04) Clear	2664	2	0.50	12.70	Air	0.29	1.65	0.42	0.48	0.68
Double Low-E (e2=.04) Tint	2667	2	0.50	12.70	Air	0.29	1.65	0.29	0.33	0.41
Double Low-E (e2=.029) Electrochromic Reflecting Bleached/Colored, 12.7-mm Gap	2863	2	0.50	12.70	Air	0.29	1.65	0.14	0.16	0.12
Double Low-E (e2=.029) Electrochromic Absorbing Bleached/Colored, 12.7-mm Gap	2843	2	0.50	12.70	Air	0.29	1.65	0.13	0.15	0.1
Triple Low-E (e2=e5=.1) Clear	3621	3	0.25	6.35	Air	0.27	1.53	0.47	0.54	0.66
Double Electrochromic Absorbing Bleached/Colored, 12.7-mm Gap, Argon	2804	2	0.50	12.70	Argon	0.26	1.48	0.74	0.86	0.76
Double Low-E (e3=.1) Clear	2642	2	0.50	12.70	Argon	0.26	1.48	0.65	0.75	0.77
Double Electrochromic Reflecting Bleached/ Colored, 12.7-mm Gap, Argon	2824	2	0.50	12.70	Argon	0.26	1.48	0.64	0.74	0.73
Double Low-E (e2=.1) Clear	2632	2	0.50	12.70	Argon	0.26	1.48	0.59	0.69	0.77
Double Low-E (e2=.1) Clear	2635	2	0.50	12.70	Argon	0.26	1.48	0.56	0.66	0.75
Double Low-E (e2=.1) Tint	2638	2	0.50	12.70	Argon	0.26	1.48	0.37	0.43	0.44
Double Electrochromic Absorbing Bleached/Colored, 12.7-mm Gap, Argon	2805	2	0.50	12.70	Argon	0.26	1.48	0.15	0.18	0.12
Double Electrochromic Reflecting Bleached/ Colored, 12.7-mm Gap, Argon	2825	2	0.50	12.70	Argon	0.26	1.48	0.15	0.16	0.14
Double Low-E (e2=.04) Clear	2662	2	0.50	12.70	Argon	0.24	1.36	0.43	0.5	0.7
Triple Low-E (e5=.1) Clear	3602	3	0.50	12.70	Air	0.23	1.31	0.58	0.67	0.7
Triple Low-E Film (88) Clear	3642	3	0.50	12.70	Air	0.23	1.31	0.57	0.67	0.71
Double Low-E (e2=.029) Electrochromic Absorbing Bleached/Colored, 12.7-mm Gap, Argon	2844	2	0.50	12.70	Argon	0.23	1.31	0.52	0.6	0.66
Double Low-E (e2=.029) Electrochromic Reflecting Bleached/Colored, 12.7-mm Gap, Argon	2864	2	0.50	12.70	Argon	0.23	1.31	0.48	0.56	0.64
Double Low-E (e3=.04) Clear	2665	2	0.50	12.70	Argon	0.23	1.31	0.42	0.48	0.68

WINDOR/DOOR	GLASS		GAP THICKNESS		GAP	CENTER GLASS U-VALUE		SOLAR HEAT GAIN COEFFICIENT	SHADING COEFFICIENT	VISIBLE TRANSMITTANCE
	TYPE CODE	# PANES	IP (IN)	SI (MM)	GAS FILL	IP (BTU/ SQFT-H-^{o}F)	SI (W/ SQM-^{o}C)	SHGC	SC	TVIS
Double Low-E (e2=.04) Tint	2668	2	0.50	12.70	Argon	0.23	1.31	0.28	0.32	0.41
Double Low-E (e2=.029) Electrochromic Reflecting Bleached/Colored, 12.7-mm Gap, Argon	2865	2	0.50	12.70	Argon	0.23	1.31	0.13	0.15	0.12
Double Low-E (e2=.029) Electrochromic Absorbing Bleached/Colored, 12.7-mm Gap, Argon	2845	2	0.50	12.70	Argon	0.23	1.31	0.12	0.14	0.1
Triple Low-E Film (77) Clear	3652	3	0.50	12.70	Air	0.22	1.25	0.47	0.54	0.64
Triple Low-E Film (66) Clear	3662	3	0.50	12.70	Air	0.22	1.25	0.36	0.42	0.54
Triple Low-E Film (55) Clear	3672	3	0.50	12.70	Air	0.22	1.25	0.31	0.36	0.45
Triple Low-E Film (66) Tint	3664	3	0.50	12.70	Air	0.22	1.25	0.25	0.29	0.32
Triple Low-E Film (55) Tint	3674	3	0.50	12.70	Air	0.22	1.25	0.22	0.25	0.27
Triple Low-E Film (44) Tint	3682	3	0.50	12.70	Air	0.21	1.19	0.19	0.22	0.22
Triple Low-E Film (33) Tint	3692	3	0.50	12.70	Air	0.21	1.19	0.15	0.17	0.17
Triple Low-E (e5=.1) Clear	3603	3	0.50	12.70	Argon	0.19	1.08	0.58	0.67	0.7
Triple Low-E (e2=e5=.1) Clear	3622	3	0.50	12.70	Air	0.17	0.97	0.47	0.55	0.66
Triple Low-E (e2=e5=.1) Clear	3623	3	0.50	12.70	Argon	0.14	0.79	0.47	0.55	0.66
Quadruple, Two Low-E Glass, Two Low-E Film, Clear, Krypton	4651	4	0.31	7.87	Krypton	0.12	0.68	0.45	0.52	0.62

Source: US Department of Energy

ANNEX 2 INSULATING VALUES OF COMMON BUILDING MATERIALS

MATERIAL	R-VALUE (1/C)		R-VALUE PER INCH (1/K)	
	SQFT-HR DEG F/BTU	SQM DEG C/W	SQFT-HR DEG F/BTU	SQM DEG C/W
Metal roof	0.04	0.00704		
Aluminum alloy	0.01	0.00176		
Plastic roof				
Cement tile roof	0.21	0.03698		
Clay tile - 3 inch [75mm] (1 cell deep)	0.8	0.14088		
Asphalt shingles	0.44	0.07748		
Asphalt			0.12 - 0.34	0.02113 to 0.05987
Straw thatch			2.04	0.35924
Fiberboard - 1/2 inch [12.5mm]	1.32	0.23245		
Plywood - 1/2 inch [12.5mm]	0.62	0.10918		
Plywood - 3/4 inch [18.75mm]	0.94	0.16553		
Concrete (sand. gravel) 140 lb/cu ft [2246 kg/cu m]			0.05 - 0.11	0.00881 to 0.01937
Concrete (sand. gravel) 80 lb/cu ft [1283 kg/cu m]			0.24 - 0.30	0.04226 to 0.05283
Cement mortar			0.10	0.01761
Stone			0.01	0.00176
Marble/granite, limestone			0.03 - 0.12	0.00528 to 0.02113
Ceramic tile - 1 inch [25mm]	0.08	0.01409		
Stone tile - 1 inch [25mm]	0.05	0.00881		
Air space up to 4 inches [100mm]	1	0.1761		
Inside surface air film	0.61	0.10742		
Exterior surface air film	0.17	0.02994		
Membrane	0.06 - 0.12	0.01057 to 0.02113		
Soil (with 20% moisture content)			0.25 - 1.0	0.04403 to 0.17610
Sand - 1/2 inch [12.5mm]	0.1	0.01761		

Source: 2013 ASHRAE Handbook of Fundamentals / 1958 ASHAE Guide / www.inspectApedia.com

ANNEX 3 PHILIPPINE GREEN BUILDING CODE ACTIVITIES

Philippine Green Building Code Multistakeholder Consultations

Baguio City (Regions I, CAR)
November 3-7, 2014

Tagaytay City (Regions IV-A, IV-B, V)
December 11, 2014

Head Office (NCR)
January 21, 2015

Davao City (Regions IX, XI, XIII)
January 30, 2015

Cebu City (Regions VI, VII, VIII)
February 10, 2015

Cagayan de Oro (Regions X, XII)
February 24, 2015

Balanga, Bataan (Regions II, III)
March 10-11, 2015

Philippine Green Building Code Writeshop (Clark, Pampanga)
April 27-28, 2015

Philippine Green Building Code Launching
"Green Breakthroughs 2015"
June 25, 2015, Philippine Trade Training Center

Philippine Green Building Code Training of Trainers

Regions I, IV-B and CAR

Regions III, IV-A

Regions V, VII, VIII, IX, X, XI, XII, XIII, and other agencies

NCR

Other Philippine GB Code Meetings/Activities

Green building is the practice of adopting sustainable features and measures in the design, construction, operation and management of a structure. It significantly improves energy, water, materials and resource efficiency. It also reduces the building's impact on human health and the environment.

GREEN BUILDING PHILIPPINES

Green Building for Climate Change Adaptation and Mitigation
It improves resource efficiency and significantly reduces the emission of greenhouse gases that cause global warming and climate change.

Green Building for Better Business
Operational savings quickly recover capital costs, innovative products stimulate job creation, renewable energies reduce demand for fossil fuels, and less dependence on oil imports leads to energy security.

Green Building Policies and Laws to Promote Market Transformation and Competitiveness
Laws, policies, regulations, and programs on green building help provide a framework for a business environment that is cost-efficient, environment-friendly, and competitive.

GREEN BUILDING PHILIPPINES

ABOUT THE INTERNATIONAL FINANCE CORPORATION (IFC)

IFC, a member of the World Bank Group, is the largest global development institution focused on the private sector in emerging markets. Working with 2,000 businesses worldwide, we use our six decades of experience to create opportunity where it's needed most.

In FY16, our long-term investments in developing countries rose to nearly $19 billion, leveraging our capital, expertise and influence to help the private sector end extreme poverty and boost shared prosperity.

For more information, visit www.ifc.org.

HOW IFC HELPS

IFC provides technical advice to the Philippine national and local governments in developing green building policies and regulations.

IFC also works with the private sector in promoting and implementing green building practice. The sector has a central role as it provides the capital, supplies building materials, designs, constructs and operates buildings.

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23rd Floor One Global Place, 5th Avenue & 25th Street Bonifacio Global City,
Taguig City, Philippines
Tel: **+632-465-2700** • website: **www.ifc.org**

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Excellence In Design For Greater Efficiencies

Edge

EDGE or **Excellence in Design for Greater Efficiencies** is a green building certification system for emerging markets. It is a measureable way for builders to optimize their designs, leading to a more investment-worthy and marketable product. By keeping certification fast and inexpensive, EDGE keeps pace with the momentum that developers need to stay at the forefront of the green building trend.

The EDGE software shows within minutes how committing to a few practical energy and water-saving options improves building performance at little or no cost. The numbers are brought to the forefront to reveal the most economically viable path to building green.

EDGE focuses the certification process on technical aspects that yield meaningful results. This makes it easier for developers to build a portfolio of innovation that attracts new customers and boosts brand equity. For more information, visit **www.edgebuildings.com**.

EDGE projects in the Philippines are certified by the Philippine Green Building Initiative (PGBI), a non-profit group of professional associations that promotes energy-efficient and environment-friendly design and construction.

PHILIPPINE GREEN BUILDING INITIATIVE

green

Architectural Center Club (ACCI), 6082, R. Palma St.,
Rockwell, Makati, Metro Manila, Philippines
Tel: **+632-225-0666** • Mobile: **+63 928-797-4977**
email: **secretariat@greenbuilding.ph**
website: **greenbuildingph.wordpress.com**