Jordanian National Building Codes

Introductory Summary

The development process of Jordan's national building codes goes back to 1980 when the Jordanian National Building Council (JNBC) was formed by the Prime Minister when His Majesty late King Al-Hussein's put orders to look at preparing Building Codes and National Building Law to insure the safety of buildings. An agreement was then signed between the Council and the Royal Scientific Society (RSS) whereby the Construction and Sustainable Buildings Center (CSBC) of the Society prepares volumes of the Jordan National Building Codes.

The Jordanian Building Codes Committee released many Jordanian Building Codes of Practice according to the Jordanian National Building Law no. 13 issued 1989. These codes aim to regulate the works of building studies, design and construction by setting sound, uniform and binding regulations, rules and engineering principles, in order to facilitate following up building works and enable specialists to do their work in a correct complete manner.

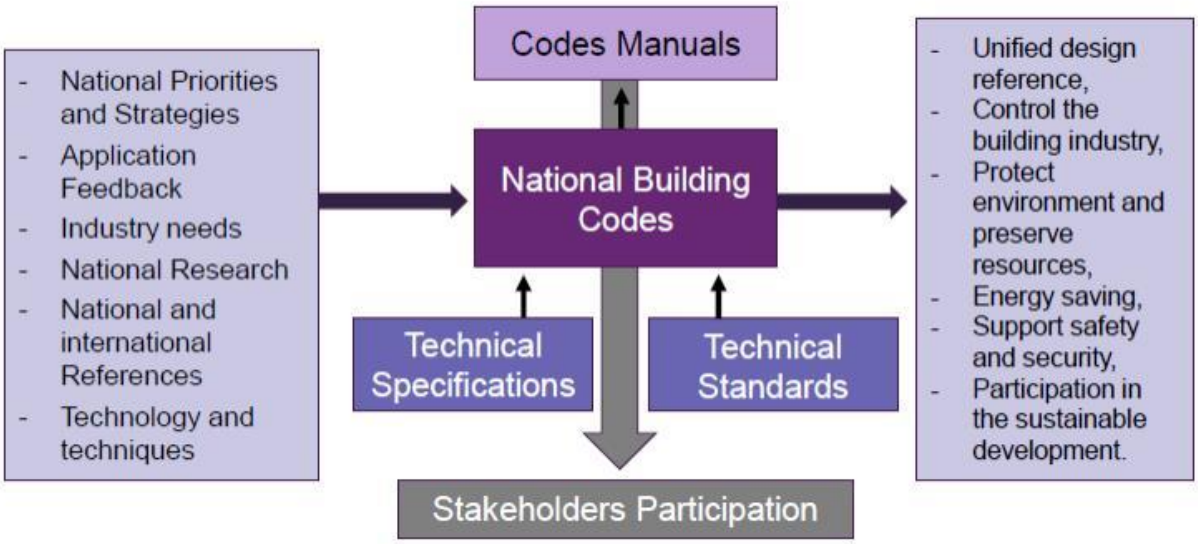
Today, National building codes and guidelines are prepared and updated in accordance with the agreement signed between the Ministry of Public Works and Housing and the Royal Scientific Society through the Building Codes Division of the Construction and Sustainable Buildings Center.

Building Codes … Development:

RSS and the JNBC have started the process of preparing and issuing manuals for the national building codes to clarify the concepts contained in the codes and to facilitate the application.



Building Codes Compatibility:



Building codes specify minimum standards for the construction of buildings. The codes themselves are not legally binding. They serve, rather, as "models" for legal jurisdictions to utilize when developing statutes and regulations.

The main purpose of building codes are to protect public health, safety and general welfare as they relate to the construction and occupancy of buildings and structures. The building code becomes law of a particular jurisdiction when formally enacted by the appropriate governmental or private authority.

How to use the code

Principles followed in the classification and numbering of the Jordanian national building codes.

1. The codes had been divided according to the subject of concern into several codes with different titles. Each code was given a serial number that distinguishes it from the other codes.

2. Each code has been divided into several sections (chapters), each given a serial number within the code that distinguishes it from other sections.

3. Each section within each particular code has been divided in a sequential order into the following:

Article: Denoted by two different numbers separated by a sign (/). The number on the right represents the number of the section (chapter) from which this article is branched, while the number to the left represents the number of the article itself.

Clause: Denoted by three different numbers, each of which is separated by a sign (/). The number on the right represents the section number, the middle number represents the article number from which this item is branched, while the number on the left represents the clause or item number itself.

Sub-clause: Denoted by an alphabetical letter placed in parentheses and branched of the clause, and can be referred to using the symbol of the clause (item) and the symbol of the sub-item itself.

Paragraph: Denoted by a number placed in parentheses. The paragraph is a branch of the sub-clause and refers to it by mentioning the number of the paragraph itself and the symbol of the sub-item belonging to it.

Following is an introductory brief about required for architectural design.

Jordanian Building Codes of Practice

CODE OF SPACE REQUIREMENTS IN BUILDING

(1993 Edition)

1. Overview:

This code aims to clarify the minimum dimensions that must be provided in buildings in general to suit the purposes for which they are designed, and the nature of their use after construction, taking into consideration the requirements of functional needs, operation, public health, and public safety. The purpose is not to be a guide for the design engineer to the desirable dimensions or the preferred standards to follow in the design, nor to be an aid to visualizing the spaces in the buildings and how they are used. Rather, it is only an indication of the minimum dimensions and standards that may not be exceeded, and the instructions must be looked at Contained therein in this sense.

Although the requirements for space in buildings - in general - are similar in all building systems of the countries of the world, there are considerations that may lead to changes depending on the special circumstances, such as the climate, habits, use method, and the composition of the human body, so care must be taken to note these things and take care when applying the terms of the code, as they are not used in other than the circumstances for which they were established.

2. Scope:

This code deals with spaces enclosed under a roof, whether they are surrounded by walls or not, as well as the spaces that are not roofed and confined within walls, if they are used permanently or semi-permanently, and for the purposes of building uses stipulated in this code. In addition to the above, this code deals in a limited way, with the vacancy requirements for special external works that are directly related to buildings and the nature of their use, such as corridors, external stairs and parking lots.

In case that some of the provisions of this code conflict with other official instructions and regulations, such as what municipalities establish in terms of building regulations, or what may come in other building codes, the adopted case is what provides the largest void when stipulating the lower limits, and what provides the smaller space when stipulating the upper limit.

3. Basic Definitions:

Step, landing or slope nose: The straight line forming the free end of any of them.

Landing: Any flat surface that connects between a step or a group of steps and between a step or a group of other steps, or between a step or a group of steps and between a flat or inclined surface, and does not form part of this surface.

Slope line (Pitch line): The imaginary straight line that connects the noses of the steps in a single flight, as it means the straight line that forms the face of the ramp or any part of it.

Staircase: Any space designated for movement that provides a path for transportation, consisting of successive flat surfaces whose levels vary gradually, and the angle of inclination does not exceed 50 degrees, and it includes landings, galleries and balconies that are part of this space.

Common staircase: Every staircase that provides an exit or movement for more than one apartment or for more than ten people.

Escape staircase: Every stairway that is part of a way to escape according to the requirements of public safety and fire prevention.

Special staircase: Every staircase located within a single housing unit or part of a building whose number of occupants does not exceed ten persons and its use is limited to the occupants of the housing unit or that part of the building.

Escalator: Every staircase whose steps can be moved automatically and be a useful means of moving from a certain level to a different level from it, whether in the case of its movement or its stillness.

Corridor: The movement space located between the building entrance and any utility space whose location comes directly after the entrance, and the width of that movement space is less than 40% of its length.

Lobby: The void of movement located between the entrance of the building and any utility space that comes after the entrance if its width is more than 40% of its length.

The hallway: A passage located in front of one row of rooms or one row of apartment entrances, and it is open to a yard or external space.

Inclination angle (Pitch): The angle between the slope of a stairway or ramp and the horizontal line.

Glide: Every space designated for movement that secures a downward transition path by sliding over an inclined surface fixed within that space.

Ladder: Every space designated for movement that provides a transport path consisting of bars or parallel and successive flat surfaces whose levels vary gradually and their angle of inclination exceeds 50 degrees.

Flight: The consecutive set of steps that cannot be obstructed with landing.

The space for fixed and movable objects in special cases: The space that is most often occupied by objects that remain in their position and that are not transferred except in special cases.

Space for practicing activities: The space that is most often exploited in specific works of a productive, entertaining, life or other, and it is called a positive space.

Space for movement: The space that is most often used for the purposes of movement or exit, and it is called the negative space**.**

Dead space: Space that cannot be assigned to any of the mentioned purposes.

Total rise: The vertical distance between the landing, and the surface that comes directly below it.

Elevator: Every space designated for movement that provides a path for vertical travel with automatic devices.

Ramp: A path with a sloping surface.

Tread: The horizontal distance between the nose of the step and the nose of the step or the numerator that follows it, it is the upper surface of the step.

4. Subjects covered in the code:

The code includes 7 sections (chapters) arranged in a sequentially, but integrative manner. Each section covers a specific subject or topic with full details and explanations. Together, all the sections provide for a full understanding of the space requirements to be taken during the design process. The sections included in the code are as follows:

Section 1: General

The section comprises 5 articles. It provides an overview of the code, highlighting its main objectives and scope of work. Additionally, it clarifies the basic terminologies and definitions, building classifications and general terms to be used in the code.

Section 2: Components of Interior space

The section comprises 5 articles. It includes an overview about the interior space, a clarification bout interior space definition, space limits, space components, space usability and a definition of the standards for the interior space requirements.

Section 3: Types of Spaces in the Buildings

The section includes 3 articles covering the types of spaces in buildings. Starting from the division of spaces, the total and net space, the division of the spaces in terms of their location on the floors of the building.

Section 4: Entrances and Exit Ways

The section comprises 3 main articles. It deals with the requirements that must be existed at the entrances and exits and the traffic spaces designated for access in the buildings according to their use, in order to verify that the requirements of the space sufficient to facilitate movement upon entry and exit from the buildings, and continuous and reliable connection - to and from - to the street or a vacuum that leads to the street, taking into account the requirements of fire prevention and public safety.

Section 5: Water Cycles (WC)

The section includes 4 articles with number of detailed clauses and sub-items that basically covers the requirements that must be existed in toilets in terms of the size, the spaces allocated for sanitary parts and equipment, the spaces needed for use, and the spaces for movement within the spaces designated for the toilets, and it also deals with the spaces of these courses, and the types and numbers that must be provided in any building according to the nature and size of its use.

Section 6: Buildings of Nonresidential Uses

The section comprises 11 articles with detailed clauses and sub-items which include detailed drawings. Subjects covered in this section include the minimum dimensions of spaces in nonresidential buildings which differ depending on the variety of use of these buil, - different uses were mentioned in section1 of this code. The dimensions based on specific variables which may be some of them differ from one use to another. Such as; number of people expected to be gathered at one time in these buildings, the type of activities practiced by the gathering, occupancy period, the size of used furniture and equipment, required space for movement around these furniture and finally public safety requirements.

Section 7: Residential Buildings

The section comprises 7 articles deal with the requirements of space in residential buildings, which include parts of buildings that are used for the purposes of regular housing or for the purposes of temporary housing, and buildings or parts of buildings that provide places or equipment for housing individuals or families, whether permanent or temporary. These types include; clustered housing, apartments, detached houses, semi-detached houses, connected residential houses, homes that are used quarterly or for vacations and recreation, elderly houses, places of tourism and recreational accommodations, student dormitories, dorms for doctors and nurses in hospitals and outside them, places of residence for guard staff and gatekeepers in different buildings and spaces designated to house soldiers in camps, police men in police stations, and more.

Jordanian Building Codes of Practice

CITY AESTHETIC CODE

(1990 Edition)

1. Overview:

This code aims to provide recommendations to city administrators to beautify the city and reduce its distortion. In most of its chapters, it provides many suggestions and alternatives that help in beautifying the built environment. Therefore it leaves the way open for the city administration to implement its planning policies within a general framework that takes into account the local laws and regulations and the available capabilities.

2. Scope:

This code deals with different topics related to the city's beauty, including land organization, beauty of the local environment, natural and coordinated sites, parks, public and private parks, monuments, archaeological sites, heritage buildings, public services, commercial and media advertisements and maintenance.

The code does not cover subjects related to building and organization system, traffic engineering regulations and rules, general safety instructions and conditions for shelters and escape stairs, laws for antiquities, environmental protection laws, and advertising laws and regulations. Authorities related to these laws and regulations are in charge of implementing their provisions.

3. Basic Definitions:

Organizational uses of land and buildings: Planned uses of lands and buildings according to the regulatory provisions related to them or according to the organizational plans approved or approved by the competent official authorities.

Public buildings: Buildings or parts of the buildings that general citizens are allowed to use and usually accommodate at least fifty people, such as official and semi-official government buildings, places of worship, hospitals, schools, public and private office buildings, commercial buildings, clubs, hotels, etc.

Private buildings: Buildings or parts of buildings that are privately owned and which the public is not allowed using.

Heritage buildings: Buildings of heritage value in terms of their construction or use patterns, or their relationship to public figures or important national or religious events, or those that have been defined as heritage buildings within their own regulations and laws or by a decision from the concerned authorities.

Public parks: Parks that the general public is allowed to use.

Private gardens: Parks attached to private buildings or public buildings, which the public is not allowed to use.

Vacant land: Land that is not used for any purpose.

Residential uses of land: The residential uses determined for the lands in accordance with the regulatory provisions related to it or specified on the approved organizational plans, where these lands are used for the purposes of establishing residential buildings on them in light of the housing categories determined for them.

Technical and aesthetic elements: A group of elements that give the city additional beauty, such as memorial monuments, murals, sculptures and water elements, in addition to natural beauty elements such as plants, rocks, and others.

Natural and landscaped sites: Plots of lands on which construction is prohibited or vacant, or those that are organically linked to streets or organized lands, and include squares, squares and islands. It is considered an essential part of the city's fabric.

Basin of the tree or plant: A pit of specific dimensions filled with agricultural soil, intended for planting trees and plants.

Squares: Areas of paved or semi-graded lands of public or private ownership and used for various purposes, and there are no facilities or buildings on them.

Fence: Any wall or barrier of constructional or natural material erected on the boundaries of a piece of land to separate it from its vicinity, for the purpose of delimiting it.

Protection barrier: Any wall or barrier of constructional or natural material erected on the boundaries of a street, plot of land, or stairway with the aim of protecting pedestrians, vehicles, or users of the street, plot or stairs.

Kiosks: They are those temporary or permanent establishments that are built within streets, squares and vacant lands with the aim of using them for commercial, charitable or informational purposes after the approval of the competent official authorities.

Streets and roads: Any road, street, alley, lane, path, crossing, carriage way, walkway, square, square, private or public bridge, blocked or untouchable, existing or proposed to be constructed under any project or reconstruction plan. These streets and roads include the following elements: trenches, canals, canyons, streams, and ferries Sidewalks, islands, roundabouts, squares, squares, trees and bushes on the side of the road, protective walls, fences, fences, handrails and traffic lights.

Pedestrian walkway: A regulatory road designated for pedestrians only, and vehicles are not permitted to be used except in emergency and in necessary cases. It can be implemented in the form of stairs if the topography of the site requires that.

Pedestrian crossing: That part of the traffic lane in which the priority of passage is for pedestrians and not for means of transport, and pedestrians use it to move from one side of the street to the other. This walkway shall be equipped with traffic signs or traffic lights.

Street goods: All the aesthetic, functional and service elements found in the streets, such as bus stops, traffic lights, traffic signs, guide signs, kiosks, umbrellas, seats, advertising and advertising elements, lighting units, fountains, art formations, wall paintings, etc.

Fields / Arenas: Parts of the land located within the traffic lanes, and are used by traffic at the intersection of any number of streets.

Sidewalks: Part of the pedestrian street that separates the traffic lanes from the lands adjacent to the street, and it also includes the islands that mediate the streets or separate them from the service roads.

Inner boundary of the berth: The border that separates the street from the sidewalk.

Altimeter structures: Frames that precede bridges and tunnels, and are used to determine the maximum height of the truck that is allowed to cross into the tunnel or from the bottom of the bridge.

Slopes for the traffic of cars and pedestrians: The inclinations that are placed on sidewalks or entrances to enable cars to use these sidewalks and inputs in emergency situations.

Islands: Part that is located within or in the middle of street intersections, and these islands are established for traffic, cosmetic or other purposes.

Public parking: They are those public or private lands or the parts of the streets designated for permanent parking lots (such as starting stops) for buses and public cars, including parachutes, buildings, services and the like.

General stations: Lands, parts of lands or parts of streets designated for stopping stations for loading and unloading on bus lines and public cars, and what may be included in the umbrellas for passengers.

Weather protective elements: Projections of buildings located above the level of the ground floor, as well as canopies of all kinds and covered corridors.

Commercial advertisements: Advertisements or banners that are placed for the purpose of identification

Informational ads: They are those advertisements or indicative, welcoming or ceremonial signs with social, cultural or national goals, which the competent official authorities allow to set them for the aforementioned goals or the like, whether these subsidies or the signs are permanent or temporary

Recycle bin: A small garbage container [about one liter capacity] intended for use by pedestrians in streets and squares and parks and others.

The container house: The garbage container allocated to one housing unit.

Street container: A garbage container designated for more than one housing unit, and has a designated place on the street.

Impact: Any movable or immovable thing created, made, engraved, written, constructed, discovered, or modified by a person a year before the birth of including caves, carvings, coins, pottery, manuscripts and all kinds of artefacts that indicate the emergence and development of the sciences, arts, crafts, religions and traditions of previous civilizations, or any part added to that thing or rebuilt after that date.

4. Subjects covered in the code:

The code includes 9 sections (chapters) arranged in a sequence, but in an integrative manner. Each section covers a specific topic or topic with full details and explanations to provide a complete understanding of all aspects of a city aesthetic that must be considered during the design process. The sections listed in the code are as follows:

Section 1: General

The section consists of four topics that provide an overview of coding, highlighting its main objectives and scope of work. In addition, it explains the basic terms, definitions, and symbols used in the code.

Section 2: The Beauty of the Local Environment

This section consists of six topics, as it deals with the beauty of the local environment in terms of streets, squares, parking lots, pedestrian paths and public stairs, sidewalks, buildings, road facilities, trees, plants, parks and forest lands.

Section 3: Organizational Uses of Lands and their Aesthetic Elements

This section consists of four topics, as it deals with the different uses of lands and their aesthetic elements, such as residential uses, commercial uses, industrial and crafts uses, and uses of environmental services.

Section 4: Archaeological Buildings and Sites

This section consists of seven topics, as it deals with a general definition of archaeological buildings and sites, and then deals with the criteria for identifying heritage sites and buildings, then protecting archaeological buildings and sites, then reviving heritage sites and buildings, then heritage streets and markets, then the method of identifying heritage sites and buildings, then methods protection and revival.

Section 5: Antiquities and Archaeological Sites

This section consists of two topics, as it deals with the protection of antiquities and archaeological sites, and the beauty of these monuments and archaeological sites.

Section 6: Commercial and Informational Advertisements

This section has two topics, dealing with commercial and road advertisements.

Section 7: Natural and Coordinated Sites

This section covers five topics, as it deals with the aesthetics of the city in natural sites such as unconstructed slopes, streams of torrents, afforestation and wooded areas, areas of quarries and closed quarries, retaining walls and cladding their melanin.

Section 8: Public and Private Parks and Gardens.

This section consists of four topics, as this chapter deals with the types of parks and gardens, such as children's playgrounds, local, municipal and regional parks, large city parks, special parks and open spaces. Then it deals with the elements of public gardens such as entrances and exits, fences, parking lots, means of recreation, trees and plants, public services and sanitation, garden baggage, aesthetic elements in gardens, general cultural means in parks, lighting of gardens, pathways in gardens, and cleanliness of gardens.

The section also deals with the elements of private gardens such as cultivated areas, trees and plants, and aesthetic elements in them. It additionally clarifies the studies that must be done for the design of gardens and parks, including preliminary, preliminary and detailed studies.

Section 9: Maintenance.

This section consists of three topics, as it deals with a general definition of the concept of maintenance, then surveying and investigating and presenting the investigation model, then it deals with various maintenance work, its definition and classification of these works, and the requirements of maintenance, and then the types of maintenance such as maintenance of roads, sidewalks and islands, real estate, sites and equipment And the maintenance of plants and trees.

Attached with the aesthetic code of the city are three appendices. The first displays trees and shrubs used in the cultivation of sidewalks, street islands, slope and slope plants, and annuals.

The second appendix includes the technical terms while the third appendix includes a list of sources and references, and the basis for tabulation in the codes.

Jordanian Building Codes of Practice

FIRE PROTECTION CODE

(2004 Edition)

1. Overview:

This code aims to define the requirements for designing and constructing new buildings, and to introduce modifications to existing buildings according to their typologies and occupation to ensure adequate public safety against the dangers of fire.

2. Scope:

This code includes the procedures to be taken and the conditions and obligations for the design and construction of buildings to ensure the reduction of the fire and smoke risks and downgrade panic on the lives of the building occupants.

This code determines the number, size, and organization of the exit means sufficient for the occupants of the building to exit during the crucial period of time in the event of a fire or any other emergency that threatens lives.

The code additionally addresses the quality of construction and interior finishing materials in terms of their fire resistance.

It is permissible to use new methods or devices for fire protection not mentioned in this code, provided that their equivalence with the methods and devices contained therein is proven and according to the approval of the competent official authority.

3. Basic Definitions:

Smoke-free doors: Doors act as a temporary barrier to prevent the passage of heat, smoke, and gases for a specified period. They are usually of a lighter composition than fire doors.

Fire-rated doors: Doors manufactured to resist fire for a specified period of time.

Combustion: A chemical process that produces light, heat and / or smoke.

Occupancy: The purpose of using the building or part of it.

Alarm: An audible, visual or informational signal indicating a fire or emergency that requires the building's occupants to exit from it, and a quick response by the civil defense agencies.

Smokeless staircase house: A staircase house designed to limit the spread of fire breaking out in any part of the building, such as heat, smoke, or gases, as their percentages in the stairwell do not exceed 2 hours after the outbreak of the fire than 1 percent of its volume.

Fire-resistant staircase: A fully insulated staircase with a fireproof construction for a specified period of time, equipped with fire-resistant doors, self-closing, and windows with reinforced glass.

Flammable liquid: A liquid whose absolute vapor pressure does not exceed 0.2759 N / mm2 at a temperature of 37.5 ° C. Liquids are divided in terms of their flammability and combustibility into the following categories:

First category: Liquids with a flash point of less than 37.8 ° C
Second category: Liquids with a flash point ranging between 37.8 ° C and 60.0° C
Third category: Liquids with a flash point of more than 60.0 ° C

Road / Street: A road, street or avenue designated for public use not less than 9 meters wide, where civil defense means to fight fire can pass through. Closed spaces or tunnels are not considered from the streets despite the use of transportation or pedestrians or both of them.

Occupant load: Total number of people who occupy a building or part of it together at the same time.

Severity of the contents: The relative risk for the initiation and spread of fire, the risk resulting from smoke or generated gases, the risk of the explosion, and any assets that pose an inherent risk to the occupants of the building.

External stair: A staircase with at least one side exposed to the outside.

Fire escape staircase: An uninsulated, lightweight outdoor staircase made of metal.

Isolation: To surround the place with materials that resist combustion in a manner that ensures that fire, smoke, and/or heat does not penetrate it.

Yard: An open, unedged, uninhabited space that has at least one uninhabited side.

Courtyard: It is a courtyard surrounded from all sides by the building's outer walls or by the building's exterior walls and the boundaries of the land on which the walls are permitted to be built.

Incombustible material: A substance that does not ignite, burn, or help to ignite, or flammable fumes arise from it when exposed to flame or heat during use.

Building: Any building or structure that is expected to be used for any kind of occupancy.

Explosives: Chemical compounds or mixtures that ignite due to friction, shaking, or firing, or the ignition of a part of them, generating large quantities of scorching and high-pressure gases and suddenly, which causes explosions.

Exit: Part of the means of exit separated from the rest of the building, either by construction or preparation, according to the requirements of this code to provide a protected path leading to the outlet.

Horizontal Exit: A path for passage from a building to a shelter area in another building located roughly at the same level of the path, or a path for passage through a wall or around it into a shelter area in the same building and at approximately the same level of the path.

Net floor area: The actual occupied area after deducting the wall thickness and the column crossings areas.

Dangerous Space: An area in the building used to store materials with high flammability, or explosive materials, or substances that produce smoke or toxic gases, or materials containing toxic or harmful alkalis, or acids, liquids or chemicals resulting from their use of flame or smoke, or explosion or poisoning that threatens life, or materials that split into fine particles or dust liable to explode or be used in spontaneous combustion.

Total floor area: The area located within the outer perimeter of the building walls, including the spaces of corridors, stairs, cabinets, internal wall thicknesses, and the areas of column sections.

Exit access: Is the part of the exit that leads to the exit's entrance.

Fire resistance rating: The resistance time of a material or unit made of different materials to fire when examined against fire resistance according to American Specifications (ASTM – E119), (ASTM – E152), and (ASTM – E163), or American Specifications (NFPA – 251), and (NFPA – 252), or the British Specifications (BS – 476: part 8).

Smoke detector: A device that detects visible or invisible smoke caused from burning.

Exit path: A horizontal exit path isolated from the rest of the building, which ensures that fire or smoke does not spread to it in a manner similar to the internal stairs.

Ramp: A path with a sloping surface.

Sanctuary: An area safe from fire or smoke and utterly isolated from the fire source, to which the occupants of the building resort to in the event of a fire or any other emergency situation.

Exit discharge: Part of the exit means located between the end of the exit and a public road or area of Sanctuary.

Fire window: A window made of frame, reinforced glass (wired glass), and hardware that meets fire protection requirements according to the location and purpose of its installation when examined by fire resistance test contained in the British standard specifications (BS 476: Part 8).

Automatic fire alarm system: A system that detects fire automatically and activates fire alarms.

Automatic fire-extinguishing system: A system of approved devices and tools that automatically detect fire and disperse extinguishing materials on it.

Combustible waste: Waste that ignites as soon as it is in contact with the flame or high temperatures, such as scattered paper, dry grass, dry leaves, worn-out rags, packaging materials, wooden boxes, etc.

Flash Point: The minimum temperature at which vapors are emitted from a flammable liquid in sufficient quantity, mixing with the howling, and forming a mixture when close to a flame.

Dead ends: Parts of the corridors or exit paths that do not lead to a door or exit hatch.

Way out: Safe path or paths from any location in the building to the public road that anyone can take without assistance to escape from fire or smoke.

Standard Specifications: It is permissible to adopt international standard specifications other than those stipulated in this code, such as German or Japanese specifications, provided that the specifications contained in this code are considered the minimum that must be applied.

4. Subjects covered in the code:

The code includes 17 sections (chapters) arranged in a sequentially, but integrative manner. Each section covers a specific subject or topic with full details and explanations. Together, all the sections provide for a full understanding of the fire protection considerations to be taken during the design process. The sections included in the code are as follows:

Section 1: General

The section comprises 4 articles. It provides an overview of the code, highlighting its main objectives and scope of work. Additionally, it clarifies the basic terminologies and definitions to be used in the code.

Section 2: Uses and Applications

The section comprises 4 articles. It provides some preliminary insights for the uses of buildings and types of occupation, whether new or existing buildings or facilities, and a set of considerations to be taken in that regard. The section also clarifies the set of powers of the competent authority and the documents required to be provided to obtain the approvals for safety considerations and fire prevention in design.

Section 3: Basic Considerations

The section comprises 9 articles covering basic design considerations. Subjects addressed include general site considerations and general requirements for building design and construction. The section additionally covers briefly aspects related to exists' maintenance, appearance, lighting, alarming, seclusion, and means of escape, as well as floor ventilation.

Section 4: Occupancy and Severity of Contents

The section comprises 2 main articles with number of detailed clauses defining the different types of occupancy including places of assembly, educational, health care, penal occupancies, residential, mercantile, business, industrial, storage, and multi-use facilities. Each type of occupancy is provided a definition, and a breakdown of the different building types that fall within it. The second article of the section addresses the severity of contents and severity rating.

Section 5: Means of Exit

The section comprises 11 articles with number of detailed clauses and sub-items that basically covers design considerations for exits. The first clause introduces some basic concepts related to isolation for exists, internal and external finishing, levels, and heights. Clause 2 addresses issues related to capacity of exits while clause 3 provides detailed clarifications about exit components such as doors, staircases, passages and ramps. Clauses 4 deals with required number of exists while clauses 5, 6 and 7 covers considerations about the organizing means of exit, length of paths and egresses. Clauses 8, 9, and 10 covers issues related to the lighting and signage considerations.

Section 6: Components of Fire Protection

The section comprises 6 articles with detailed clauses and sub-items. Subjects covered in the section include protection of vertical shafts, considerations for interior finishing, construction and isolation, as well as high risk occupancy. The section provides details about the fire alarm systems addressing standard specifications, fire and smoke detection and automatic alarm triggering. Likewise, the section addresses the extinguishing systems providing details about different means that range from manual fire extinguishers, fire hoses to automatic extinguishing systems and the use of automatic sprinklers. As a code for prevention, aspects related to fire detection and fighting are addressed in relation to design consideration. Details about the systems are covered in the fire detection and fire-fighting codes.

Section 7: Electrical and Mechanical Services

The section comprises 5 articles related to considerations for the provision and installation of electrical and mechanical services and the implications on architectural design. Aspects of consideration include electrical and gas networks, elevators and escalators, incinerators and waste disposal, equipment rooms, as well as fuel storage in buildings.

Section 8: Gathering places (places of assembly)

The section comprises 4 articles. Article 1 addresses primary considerations related to types of occupancy, severity of contents, building capacity and fire load. Article 2 provides details for exit including type, number and distribution of exits. Articles 3 and 4 provide further details about means of prevention and electro-mechanical services for buildings.

Sections from 9 to 15 provide detailed considerations for different occupancy and building types. Each chapter covers particular occupancy and presents further clarifications about issues to be considered when designing certain types of buildings and facilities.

Section 9: Educational Usage

The section contains 4 articles and number of clauses and sub-items. The first article presents some basic considerations regarding definitions, occupancy and severity. Article 2 addresses escape considerations covering issues related to exits, passages, egresses, requirements for fire rated doors, openings, lighting and signage. Article 3 provides details about preventive precautions and fire safety considerations, while article 4 covers the electro-mechanical services for buildings.

Section 10: Healthcare Usage

The section contains 5 articles and number of clauses and sub-items. The first article presents some basic considerations regarding definitions, occupancy and severity. Article 2 addresses escape considerations covering issues related to exits, passages, egresses, requirements for fire rated doors, openings, lighting and signage. Article 3 provides details about preventive precautions and fire safety considerations, while article 4 covers the electro-mechanical services for buildings. Section 5 provides further clarifications about the penal occupancies.

Section 11: Residential Usage

The section contains 6 articles and number of clauses and sub-items addressing considerations related to variety of housing typologies. The first article presents basic considerations regarding definitions, occupancy, severity and escape applied for all residential uses. Article 2 addresses specific aspects related to hotels and hospitality buildings, while article 3 covers apartment buildings. Articles 4,5 and 6 provides further insights about dorms, single family houses and hostels.

Section 12: Commercial Usage

The section contains 4 articles and number of clauses and sub-items. The first article presents some basic considerations regarding definitions, occupancy and severity. Article 2 addresses escape considerations covering issues related to exits, passages, egresses, requirements for fire rated doors, openings, lighting and signage. Article 3 provides details about preventive precautions and fire safety considerations, while article 4 covers the electro-mechanical services for buildings.

Section 13: Administrative and Office Usage

Same as the previous section, this section contains 4 articles and number of clauses and sub-items. The first article presents some basic considerations regarding definitions, occupancy and severity. Article 2 addresses escape considerations covering issues related to exits, passages, egresses, requirements for fire rated doors, openings, lighting and signage. Article 3 provides

details about preventive precautions and fire safety considerations, while article 4 covers the electro-mechanical services for buildings.

Section 14: Industrial Usage

Likewise, the section contains 4 articles and number of clauses and sub-items. The first article presents some basic considerations regarding definitions, occupancy and severity. Article 2 addresses escape considerations covering issues related to exits, passages, egresses, requirements for fire rated doors, openings, lighting and signage. Article 3 provides details about preventive precautions and fire safety considerations, while article 4 covers the electro-mechanical services for buildings.

Section 15: Storage Usage

Likewise, the section contains 4 articles and number of clauses and sub-items. Article 1 addresses basic considerations regarding definitions, occupancy and severity. Article 2 addresses escape considerations covering issues related to exits, passages, egresses, requirements for fire rated doors, openings, lighting and signage. Article 3 provides details about preventive precautions and fire safety considerations. Article 4 covers design considerations related to garages and parking lots.

Section 16: Operational Characteristics

This section comprises 8 articles and number of clauses and sub-items addressing issues related to the operational characteristics of facilitates and complementary actions systems. The first two articles provide information about basic considerations related construction works, furnishing, maintenance, performance and inspection. The rest of the articles provide further clarifications related to the different types of occupancy.

Section 17: Fire Resistance of Concrete

This section comprises 5 articles the first provides basic considerations related to concrete structures. Each of the other four articles tackles a structural system component starting with beams, slabs, columns and finally walls. The section presents some important information about concrete structures being the mostly used in Jordan.

Jordanian Building Codes of Practice

THE CODE OF BUILDING REQUIREMENTS FOR THE DISABLED

(2018 Edition)

1. Overview:

It is obvious that man comes at the forefront of the elements that must be focused in society because he is the basic and most precious building block in its construction. The development of society can be measured by its concern for the human, social and psychological aspects of its members. The daily life requirements and needs of the individual are required to carry out various actions and activities in the exercise of them to various physical risks that may lead to the loss of one of his limbs or senses, which is reflected in his ability to carry out his duties. There are also those who wish god to be born with a disability or to become ill that deprives them of the enjoyment of the normal life of the healthy people.

The strong family ties of our society add an important and fundamental dimension to the need for interactive integration in the care of the disabled. The ambitions of comprehensive development to which we aspire, and the challenges that stand in the face of them, call for the exploitation of all energies, not an important part of society, such as the disabled group, dependent on it, but a product that feeds it and participates in its development.

This code aims to establish the special foundations, standards, controls, and requirements that must be available in public buildings and facilities to facilitate their use by persons with disabilities.

2. Scope:

This code deals with the technical requirements that must be met in new buildings and constructions, as well as existing buildings and constructions, and the minimum requirements that must be considered to change and modify their use to facilitate the movement and service of the disabled.

The code does not mental disability: Mental disability has been excluded, as it is often associated with sensory or motor impairment. The mentally disabled needs a companion to help them meet their different life needs on a permanent basis.

3. Basic Definitions:

Disabled: Every person who suffers from total or partial deficiency in any of his senses or his physical, psychological, or mental capabilities, to the extent that limits his ability to learn, qualify or work .So that he cannot meet the requirements of his normal life in the conditions of others like him who are not disabled.

Sensory impairment: A disability that affects the sense of sight or the sense of hearing, or both.

The blind: A person who is blind in his two eyes.

Braille: It is a special writing for letters and numbers that are printed by perforation or are embossed to be read by the blind.

Deaf: A person who is hearing less in his two ears.

Mobility impairment: A total or partial inability of the movement of the hands or legs.

Wheelchair man: A person who lost movement in both legs.

Wheelchair: A chair with four wheels, which enables the disabled person to move and move from one place to another, and it is of one of the following types:

- Large front wheelchairs.
- Small front wheelchairs.
- Electrical or mechanically animated wheelchairs.

Range of motion: The space that can be occupied or accessed as a result of movement of limbs and mobility aids.

Obstructing hands: The loss of movement of the two hands or one of them.

Mental disability: A disability that affects the brain and causes a complete or partial defect in various brain functions in terms of controlling the movement of the limbs, perception, focus, etc.

Signs: The guidance boards, symbols, and shapes, whether it is a regular writing accompanied by shapes or a sound issued by a device or writing in Braille or lighting to warn the disabled or guide him and help him in facilitating his work and movement.

Ramp: A space designated for movement with a surface tilted in the direction of movement that provides a path for movement between different levels.

Angle of inclination: The angle between the slope of the stairs or ramp and the horizontal line.

Nosing: The part of a stair tread that projects beyond the riser.

Riser: The vertical dimension of the step.

Tread: The horizontal dimension of the step.

Living spaces: It is a part of the main spaces stipulated in the space requirements code in the buildings from the Jordanian National Building Codes, and it includes all the spaces designated for practicing human living activities such as bedrooms, living rooms, dining, kitchens, and related services.

4. Subjects covered in the code:

The code includes 4 sections (chapters) arranged in a sequentially, but integrative manner. Each section covers a specific subject or topic with full details and explanations. Together, all the sections provide for a full understanding of the building requirements and considerations for disabled to be taken during the design process. The sections included in the code are as follows:

Section 1: General

The section comprises 4 articles. It provides an overview of the code, highlighting its main objectives and scope of work. Additionally, it clarifies the basic terminologies and definitions to be used in the code.

Section 2: General Requirements for Building Design

The section comprises 8 articles. It provides considerations for the handicapped to be taken into account when designing architectural spaces**,** external spaces (external paths and ramps, external entrances, and car parking), interior spaces(entry halls of buildings, corridors inside residential and public buildings, stairs and living spaces), architectural elements (flooring, walls, doors and windows), health services (toilets, laundries, the bathtub and range of movement for different activities inside the bathrooms), electrical services(lighting switches, electrical sockets, distribution boards, Luminescent fixtures, lighting requirements, passenger conveyor belts, lifts ,and escalators), heating services(thermal needs of the disabled, central heating systems and local heating devices and heating control devices), and requirements for buildings for the hearing and visual impairments.

Section 3: Minimum Requirements for Rehabilitating and Designing Public Buildings

The section comprises 12 articles covering basic design considerations. Subjects addressed include general considerations and general requirements for building design and construction according to disabled usage. The section additionally covers briefly aspects related to entrances and external services, interior services, health buildings, educational buildings, religious buildings, cultural building, commercial buildings, industrial buildings, recreational and sports buildings and hotels, buildings for transportation, administrative buildings (ministries and public institutions), rehabilitation centers for the physically disabled and requirements for public buildings for the use of persons with hearing and visual impairments.

Section 4: Requirements for external components for the use of the disabled

The section comprises 4 articles covering requirements for external components for the use of the disabled. Subjects addressed include general considerations and general requirements for building design and construction according to disabled usage. The section additionally covers briefly aspects related to sidewalks of the streets, public health facilities, car parking, and public parks.

Jordanian Building Codes of Practice

NATURAL VENTILATION CODE

(1992 Edition)

1. Overview:

This code aims to define the requirements for providing natural ventilation and adequate health requirements for buildings. The code objective is to provide buildings with air flow, without air currents, with capability of control, by utilizing outside wind, temperature differences between inside and outside the building, external openings design, and the building spaces.

2. Scope:

This code studies the natural ventilation in buildings for human occupancy and providing the essential health requirements. It starts with defining the main needs for providing natural ventilation. Then it explains the required formulas for air flow and basic recommendations for the process of air distribution for the different types of buildings and how to choose between natural and mechanical ventilation. After that, the code shows the basics used in the design of natural ventilation systems. As for the mechanical ventilation systems, they are discussed in a separate code: "The Mechanical Ventilation and Air-conditioning in Buildings" Code. Then the essential health requirements are explained for the multiple building occupancies. Finally, the special requirements for toilets and cubicles are discussed.

3. Basic Definitions:

Absolute temperature: The temperature measured in relation to the absolute zero (+273).

Flow rate: The ratio between the volumetric passage rate of air through a nozzle to the nozzle area and the applied pressure difference.

Equivalent area: The area of a nozzle that has sharp edges without any obstacles where air can pass through at a specified time under a specific pressure in the same volumetric passage rate for the nozzle under study.

Gust ratio: The ratio between the maximum air velocity that lasts three seconds in an hour, to the moderate air velocity during the same period, measured at a height of 10 meters.

Input rating: The thermal energy produced from burning a certain fuel in a system depending on the total thermal value of the used fuel.

Chimney-free burning system: is the system where fuel is burnt that harmful byproducts and gases are spread inside the space, and the air needed for burning is taken from the room or the inside environment surrounding that system.

Reference static pressure: is the static pressure in the outside air away from any air flow.

Static pressure: The pressure that can be measured with a pressure instrument that moves with the flow.

Threshold limit value-time weighted average (TLV-TWA): The time calculated for the average daily work, or (40) hours of work per week, that is applied on approximately all workers repeatedly day by day without complaining.

Threshold limit value-short term exposure limit: The maximum exposure workers can endure for 15 minutes continuously without suffering from any of the following:
a. Excessive stimulation.
b. A series of chronic changes or irreversible changes.
c. Distraction to the point that leads to more accidents or weakens self-caution or lowering work efficiency considerably. In addition to that, it is not allowed to have more than four times of distraction in a day, having no less than (60) minutes between each.

Wake: The area where a turbulent air flow is started at a close distance away from a building that is exposed to wind, but from the other side that is not directly exposed to the wind.

Ventilation Importance: It is necessary to provide buildings with ventilation continuously without air flow and/or with control system. Designers should take all considerations into account when they determine the rate of ventilation needed according to the type of project.

4. Subjects covered in the code:

The code includes 5 sections (chapters) arranged in a sequentially, but integrative manner. Each section covers a specific subject or topic with full details and explanations. Together, all the sections provide for a full understanding of the natural ventilation considerations to be taken during the design process. The sections included in the code are as follows:

Section 1: General

The section comprises 4 articles. It provides an overview of the code, highlighting its main objectives and scope of work. Additionally, it clarifies the basic terminologies, definitions and symbols to be used in the code.

Section 2: General Basics of Ventilation

The section comprises 4 articles. It starts by defining the importance of providing natural ventilation. Then it explains the components of the outside air, how to minimize air pollution, proper indoor humidity, providing enough air for fuel burning systems, comfortable temperature and smoke exhaust. After that, it shows the required formulas for air flow and basic recommendations for the process of air supply and air flow for the different building occupancies and how to choose between natural and mechanical ventilation.

Section 3: Natural Ventilation

The section comprises 6 articles covering the natural ventilation. It shows the basics used in the design of natural ventilation systems. Subjects addressed include the properties of flow in nozzles and establishing differences in pressure by wind and by difference in temperature. The section additionally covers briefly aspects related to weather changes, determination of the rates of the natural ventilation in relation to wind, temperature differences or both. It also discusses other techniques for natural ventilation like having openings on one side and pressure variations.

Section 4: Definitions and Health Essentials for Different Types of Buildings

The section comprises 2 main articles with number of detailed clauses defining the different types of occupancy including public building, commercial, educational, industrial, healthcare, residential and mixed-use. The second article of the section addresses the health essentials and requirements for each of the previous building occupancy.

Section 5: Special Requirements for Toilets and Cubicles

The section comprises 6 articles. It covers the special requirements for toilets and cubicles in terms of natural and mechanical ventilation, walls and floors, net areas, doors and partitions, water fountains and special requirements for the disabled toilets.

Jordanian Building Codes of Practice

NATURAL LIGHTING CODE

(1992 Edition)

1. Overview:

This code aims to inform designers and engineers about the importance of daylight, methods of calculating it, controlling it, and using it ideally in lighting buildings to provide visual comfort to the person according to the type of activity he practices inside. This code objective is to give data for specialists and engineers and designers about the importance of daylight in design, methods for calculations, methods for control, and energy saving from using natural light instead of artificial electric lighting with regards to the energy efficient building code.

2. Scope:

This code includes definitions related to natural lighting with daylight and how to use daylight in buildings in the right way in terms of size and quality of illumination. The code deals with the basic principles of designing natural lighting through side lighting, overhead lighting, ¦and natural lighting controls, and directing buildings to benefit from daylight, and how to use glazing materials for this purpose. The code also deals with the methods of calculating natural lighting in a simple way by using special tables in relation to the conditions of the sky to be determined according to the place design consideration. It addresses the use of natural lighting calculated in the buildings and the supplementary artificial lighting to provide visual comfort to people inside the building.

3. Basic Definitions:

Glare: The sensation caused by excess in luminance beyond the limits the eye adequately adapt to. This illumination often leads to visual impairment, disturbance, or a temporary impairment of optical performance.

Illumination: The process of illumination of an object.

Illuminance: The density of the luminous stream falling on a surface, and it is equal to the luminous stream divided by the surface area when that surface is uniformly illuminated.

Quality lighting: This includes the distribution of illumination in an optical environment. It is used positively, as all the lights in that environment work in favor of visual performance, visual comfort, ease of vision, safety, and aesthetic appearance of the visible surfaces, especially those included in that environment.

Luminance: Defined in a specific direction and on a point on a real or imaginary surface as the product of the division of the stream occurring on an element of the surface that includes the point and propagating in directions confined within a cone in which the given direction contains the product of the cone's solid angle multiplied by the area of the element projected perpendicular to that direction. The luminous stream is either exiting from, passing through, or arriving at a source surface.

Regular transmission: Is the passage of the incident light stream through a surface or medium without being scattered.

Regular transmittance: Is the ratio of the uniform flow transported through a surface or medium to the flow falling on it.

Veiling Reflection: The regular reflection introduced to the irregular reflection arising from an object, which partially or completely blocks the details that you will see by reducing the contrast.

Reflectance: It is the ratio of the luminous stream reflected off a surface to the luminous stream falling on that surface.

Refraction: The change in the direction of a ray of light when it passes from one medium to another in a direction not perpendicular to the surface of that medium, and the speed of light in the second medium is different from its speed in the first medium.

Visual field: The geometric locus in space of objects or points that can be seen in a particular direction.

Color temperature of a light source: Is the temperature of the kelvin scale that describes the color accurately. It represents the temperature of a black radiating body that emits radiation with color characteristics identical to the light source's radiation characteristics in question. A black body is defined as a thermal radiator with a uniform temperature. The radiation it emits in all parts of the spectrum equals the maximum permissible that can be obtained from any thermal radiator at the same temperature.

Luminous flux: The light emitted from a light source or the light received by a surface, and its unit of measure is lumen.

Glare index: A quantitative indication helps determine the order of the annoying dazzles resulting from specific lighting installations according to the degree of noise and the permissible limit of the annoying dazzles from the lighting fixtures.

Daylight glare index: A dazzling guide helps evaluate the annoying dazzling produced by daylight coming from the windows, and it helps to define the permissible limits for the annoying dazzling of that light.

Azimuth angle: The angle of the sun's azimuth from a point is defined as the angle in the horizontal plane passing through that point, measured between the direction of the south and the projection of the sun's rays reaching the point on that plane.

Altitude angle: The altitude angle (sometimes referred to as the "solar elevation angle" describes how high the sun appears in the sky. The angle is measured between an imaginary line between the observer and the sun and the horizontal plane the observer is standing on.

Solid angle: A measure of space around a point surrounded by a conical surface whose summit is located at that point, and the area cut off from the surface of a sphere whose center is equal to that point divided by the square of the radius of that sphere. The unit of measurement is ‘Steradian’.

Shade: A screen made of an opaque or diffuse material designed to prevent the light source from being seen behind it when viewed in a direction perpendicular to it.

Visual task: The fine details for a specific object that need to be quickly and accurately perceived.

Clear sky: A sky of no more than 30 percent of its area of clouds.

Cloudy sky: A sky with a cloud cover that exceeds 70 percent of that sky.

Overcast sky: A sky with a cloud cover an area equal to 100% of that of the sky, and the sun is not visible. This causes low visibility conditions.

Ground light: Is the visible ray reflected from the surface of the earth and from the surfaces below the level of the horizon, resulting from the sun and sky lighting.

Sky light: Is the visible radiation emitted by the sun and wave by the Earth's atmosphere.

Sunlight: Is the direct visible radiation from the sun.

Sky factor: The ratio of enlightenment on a horizontal plane at a known point inside a building resulting from the light that reaches it directly from the sky (excluding direct sunlight) to the illumination resulting from an unobstructed hemisphere of the sky with uniform illumination equal to the illumination of the visible sky.

Daylight factor: The ratio of enlightenment at a point in a known plane in a space as a result of the light directly and indirectly reaching it from a known and assumed luminous sky, to the enlightenment resulting from an unobstructed hemisphere of that sky on a horizontal plane.

Visibility: The state of being perceptible by the human eye.

Lumen: Is the unit of measurement for luminous flux in the global SI system of units. One lumen is approximately equal to the amount of light put out by one birthday candle that's one foot away from you.

Skylight: Part of the building rises above the roof, and daylight passes from the roof of this skylight to shine inside the building.

4. Subjects covered in the code:

The code includes 4 sections (chapters) arranged in a sequentially, and integrative manner. Each section covers a specific subject or topic with details and explanations. Together, all the sections provide for a full understanding of the natural lighting considerations to be taken during the design process. The sections included in the code are as follows:

Section 1: General

The section includes 3 articles. It provides an overview of the code, highlighting its main objectives and scope of work. Additionally, it clarifies the basic terminologies and definitions to be used in the code.

Section 2: Daylight

The section contains 9 articles addressing architecture and the use of daylight. Topics covered in the section include justifying daylight use, meaningful use of daylight, amount and quality of daylight, energy conservation, and the use of common luminescent from daylight and artificial light. The section further discusses issues related to the efficient use of daylight in buildings and the basic considerations to be taken in that regard and building-specific factors on which the daylight that reaches that building depends. Additionally, the section provides details about the basic concepts and elements of daylight including, the sun, the sky, reflected light, earth, daylighting variability, daylight color, and dazzling from sun and sky. Overall, the section addresses the basic elements and concepts required to understand the notion of daylight and how to better utilize it in the design of buildings.

Section 3: Principles for Daylight Design

The section comprises 3 main articles addressing in details the principles of daylight design. Issues covered include the geometric shape of spaces and the basic means of lighting (direct lighting, indirect lighting, top lighting, etc..). The section also addresses the design by using multiple light sources and the basic conditions for that. Article 3 discusses controlling daylight and building orientation for the best use of daylight, in addition to the characteristics of glazing materials (transparent, reflective and translucent) and how to make the best use of such features to maintain better functionality and performance of space. It also presents number of architectural design elements used for controlling daylight including canopies, shades, draperies and blinds, vertical elements, reflecting materials, landscaping. The section provides details and guidelines

on how and where to use such elements for a better design. The text is supported with number of illustrations that make it easy to deliver the ideas for better understanding.

Section 4: Daylight Design

This section addresses in details designing for daylighting. The section comprises 4 articles. The main focus includes establishing the sky condition for design, tackling the different conditions and circumstances of sky and the implications on the possibility and efficiency of making use of daylight. This leads to the next important topic which is the daylight illumination prediction for indoor places. The article addresses standard room task illumination points; how to do the measurements and the proper calculations and use the coefficient of utilization. The article provides lots of detailed schedules and illustrations on how to do the proper calculations in response to the different conditions related to the design of space, sky and sun conditions, type of illumination and so on. Details are also provided for the combination of daylighting sources using electrical and artificial lighting, reflected ground light, graphic methods for predicting daylight, sky component, internally reflected component and the correction methods.

Jordanian Building Codes of Practice

THERMAL INSULATION CODE

(1990 Edition)

1. Overview:

Jordan recently witnessed an unprecedented construction boom. As a result, the number of buildings and facilities built and constructed annually increased significantly, accompanied by a remarkable increase in fuel consumption for generating thermal energy. For this, and to prevent waste in the national economy, it has become necessary to work on developing building methods to make the most of thermal energy by improving the thermal properties of the structural elements in addition to improving the performance of doors and windows to reduce as much as possible the leakage of thermal energy through them.

This code aims to introduce the designing engineer to the principles of optimal thermal design for buildings and methods of calculating the thermal properties of the various structural elements while specifying the minimum and maximum thermal requirements for these elements so that the engineer can always choose the best.

Although improving the properties of the thermal and non-thermal structural elements requires a lot of effort and money, but when comparing the initial cost increase with what is available over the operational life of the building, it becomes clear that this improvement reduces the final cost of the building in addition to the comfort that the occupants of these buildings feel during They use the building for the purposes for which it was built.

2. Scope:

This code deals with most of the information needed by the design engineer to perform thermal design work for buildings and structures.

3. Basic Definitions & Symbols:

Following are the basic symbols/signs used in designing for thermal insulation

A: Area (m^2)
Ao: Clear Opening Area (m^2)
Aw: Clear Wall Area (m^2)
AH: Absolute Humidity (g/kg)
C: Thermal Conductance (Watt/m^2.C^o)
Co: Cavity Thermal Conductance (Watt/m^2.C^o)
C: Specific Heat Capacity (Joule/kg.C^o)
DBT: Dry Bulb Temperature (C^o)
d: Thickness (m)
E: Emissivity

f: Surface Thermal Conductance (Watt/m^2.C^o)
K: Thermal conductivity (Watt/m.C^o)
1/K: Thermal Resistivity (m.C^o/Watt)
P: Water Vapor Permeance (g/mN.s)
Q: Heat Quantity (Joule)
q: Density of heat Flow Rate (Watt/m^2)
R**:** Thermal Resistance (m^2.C^o/Watt)
R**a:** Air to Air Thermal Resistance (m^2.C^o/Watt)
R**c:** Cavity Thermal Resistance (m^2.C^o/Watt)
R**s:** Surface Thermal Resistance (m^2.C^o/Watt)
R**si:** Inside Surface Thermal Resistance (m^2.C^o/Watt)
R**so:** Outside Surface Thermal Resistance (m^2.C^o/Watt)
RH: Relative Humidity (%)
R: Vapor Resistance (mega-newton.s/g)
t: Temperature (C^o)
tsi: Inside Surface Temperature (C^o)
tso: Outside Surface Temperature (C^o)
U: Thermal Transmittance (Watt/m^2.C^o)
Uo: Opening Thermal Transmittance (Watt/m^2.C^o)
Uw: Overall Thermal Transmittance (Watt/m2.Co)
μ: Decrement Factor
WBT: Wet Bulb Temperature (C^o)
p: Density (kg.m^3)
ϕ: Time Lag (h)
σ: Water Vapor Permeability (g.m/mega-newton.s)
1/σ: Vapor Resistivity (mega-newton.s/gm.m)

Thermal Conductivity: The thermal current (in watts) passing vertically through a unit area of the surface of a material medium of a unit length of thickness, due to a difference in temperature between its surfaces of one degree Celsius.

Thermal Resistivity: Is the inverse of the thermal conductivity.

Thermal Conductance: It is the thermal current (in watts) passing vertically through a unit area of the surface of a material medium, due to a difference in temperature between a surface of one degree Celsius. The thermal conductivity is calculated by dividing the thermal conductivity by the thickness of the material.

Thermal Resistance: Is the inverse of the thermal conductance.

Surface Thermal Conductance: It is the thermal current (in watts) passing vertically between the surface of the medium and the air in contact with it, or vice versa, through a unit area and by a difference in temperature between the surface of the middle and the air of one degree Celsius.

Surface Thermal Resistance: Is the inverse of the thermal conductance.

Cavity Thermal Conductance: Is the thermal current (in watts) that passes perpendicularly between the surface of the medium and the air in contact with it, or vice versa, across a unit area and with a difference in temperature between the surface of the medium and the air of one degree Celsius.

Cavity Thermal Resistance: Is the inverse of the thermal conductivity of the cavities

Thermal Transmittance: It is the thermal current (in watts) passing vertically through a unit area of a middle surface consisting of one or several layers due to a temperature difference between the indoor air and the outside air of one degree Celsius. Thermal transfer is also known as the total thermal conductivity (from air to air).

Air to Air Thermal Resistance: It is the sum of thermal resistances (air to air). It is the inverse of the thermal transition.

Emissivity: The ratio between the amount of thermal radiation emitted by a unit area of the surface of the material and the amount of thermal radiation emitted by a unit area of a fully radiating surface (black body) at the same temperature.

Water Vapor Permeance: The amount of water vapor passing vertically per second through a unit area of the surface of a material medium due to a difference in pressure bin surface of (Newton / square meter)

Water Vapor Permeability: It is the amount of water vapor (in grams) passing vertically per second across a unit area of the surface of a material medium whose thickness is one unit of length, due to a difference in pressure between the surfaces of (Newton / square meter).

4. Subjects covered in the code:

The code includes 8 sections (chapters) covering different aspects related to thermal insulation. Each section covers a specific subject or topic with details and explanations. Together, all the sections provide for a full understanding of the thermal insulation considerations to be taken during design. Sections included in the code are as follows:

Section 1: General

The section includes 4 articles. It provides an overview of the code, highlighting its main objectives and scope of work. Additionally, it clarifies the basic symbols, terminologies and definitions to be used in the code.

Section 2: Design Requirements

The section contains 4 articles addressing basic design considerations for thermal insulation. This includes classifications of buildings and structures, considerations for roofs and floors, and thermal transition for doors and windows depending on type and characteristics.

Section 3: Thermal Insulators

The section provides a comprehensive understanding of different thermal insulation types and properties by reviewing a group of the most efficient and widely used materials and describing their properties and methods of use. The section starts with clarifying the concept of thermal insulation and the basic design considerations in that regard. This is followed by presenting globally available thermal insulators followed by the standard specifications for thermal insulators. The section moves afterwards to discuss in details the most common thermal insulators used in Jordan including light concrete, mineral fibers and foamed plastics covering its manufacturing types, characteristics and technical specifications. This is followed by providing guidelines for the selection of the most proper type of insulation.

Section 4: Thermal Insulation Design Principles

The thermal design of the buildings aims to reduce the thermal transfer in the parts of the building, whether the transfer is from inside the building to the outside as is the case in the winter season, or the transfer is from outside the building to the inside as is the case in the summer. The thermal design also aims to ensure a healthy and comfortable environment for housing and to protect building parts from the influences of the external environment, such as wind, sunlight, rain, and snow, saving energy in summer and winter, reducing the cost of periodic maintenance resulting from heat stress in buildings, in addition to reducing the capital cost of heating and cooling equipment and its extensions. Section 4 comprises 3 main articles each including number of clauses and sub-clauses. Articles one addresses objectives and basic design principles for thermal insulations, as well as layer distribution and its relationship to thermal storage. Article two addresses the calculation of the thermal transferability for materials. This includes calculation of the thermal transferability of multi-layer elements, and calculation of the thermal transition of homogeneous elements. Article three attends designation of thermal resistors including thermal resistance of the elements' outer surfaces, thermal resistance of the inner surfaces of the elements, thermal resistance of materials, and thermal resistance of air cavities.

Section 5: Indoor Humidity in Buildings

Section 5 comprises five articles providing insight about humidity in buildings. Aspects covered include transmission of moisture by air, moisture transmission through walls and ceilings, vapor resistivity, and permeability of the coated materials to the cold side of the insulation.

Section 6: Water Vapor Barriers

The section includes 4 articles providing clarifications about materials, membranes and covering pastes and materials. Additionally it provides guidance towards the selection of the preferred location for the water vapor barrier and the basics for selecting water vapor barriers.

Section 7: Cyclic Heat Flow

The calculation of any element's thermal transition is made based on a steady-state, in which the difference between the internal and external surface temperatures is assumed to be constant. This assumption can be practically realized due to the air's high temperature during the day and the decrease in the atmosphere at night. In the hot hours of the day in summer, the direction of heat flow is from outside to inside, while at night, the flow is reversed to become from inside to outside. Since this phenomenon is repeated daily, it can be called cyclic heat flow. This section deals with aspects of heat flow covering time-lag and decrement factor and the specific heat capacity of the materials.

Section 8: Thermal Breaker and Optimum Energy Consumption

Usually, buildings and facilities are thermally designed by choosing the most critical conditions in terms of design temperatures. However, it is well known that such conditions are not constant all the time. There is a difference between the temperatures of the day and their counterparts at night, just as there is a difference in the temperatures between one day and another and one month and another. Therefore, for the sake of optimum energy consumption, it is preferable to conduct thermal design processes based on a certain percentage of the theoretical full thermal energy, which is calculated as shown in this section. The section comprises 3 main articles addressing building thermal inertia, thermal energy reduction ratios, and the period of operation of the heat supply devices.

In addition to the 8 included sections, the code provides two annexes that present basic climatic information for Jordan and some major technical terminologies.

Instructions of Codes Application

At the Design, Implementation, Supervision, Maintenance & Operation Phases and Public Safety Works and all Engineering Works in Relation thereto

Made by the National Construction Council under Clause G of Article 5 of the National Construction Law of Jordan No. 7 of 1993 and Amendments thereto

Article 1:

These instructions shall be cited "Instructions of Codes Application at the Design, Implementation, Supervision, Maintenance & Operation Phases and Public Safety Works and all Engineering Works in Relation thereto of 2004;" and they shall be published in the official gazette and come into force as of 01.01.2005.

Article 2:

The following words and expressions, wherever stated in this Law, shall have the below meanings given to them unless the context implies otherwise:

Law: the National Construction Law of Jordan No. 7 of 1993 and Amendments thereto.

Council: the National Construction Council of Jordan formed under the National Construction Law of Jordan No. 7 of 1993.

Association: Jordanian Engineers Association.

Article 3:

The provisions of these Instructions shall be applicable to the construction works taking place in the Kingdom except for the works carried out, commenced or licensed before they have come into force.

Article 4:

The technical instructions made by the Association and the amendments made thereto or instruction replacing them shall be adopted, and they shall be an integral part of these instructions and they shall be read together, as the "NATIONAL CONSTRUCTION LAW OF JORDAN NO. 19 OF 2003" phrase wherever stated in these Instructions will be replaced by the "National construction Law of Jordan No. 7 of 1993 and the amendments thereto"; and the following shall be added to them:

<u>To the general instructions:</u>

The Owner (Client) or any person he authorizes in writing shall sign the engineering service contracts and shall undertake to not make any amendments to the engineering schemes without referring to the engineering office with full compliance with the codes enacted by the National Construction Council of Jordan and the provisions of the National Construction Law of Jordan

No. 7 of 1993 and amendments thereto and the Offices & Engineering Companies Regulation No. 2 of 1985 and amendments thereto.

To the minimum requirements of the construction schemes:

All design entities are required to add the "DESIGN HAS BEEN MADE PURSUANT TO THE APPROVED CODES" phrase below the signature of each specialist in the architectural construction, electricity or mechanics.

To scheme auditing in the Association:

The scheme auditing procedures in the Association shall be as follows:

- The designing entity provides to the auditing section of the Association with one copy fulfilling all required conditions to be approved and authenticated. In addition, the "DESIGN HAS BEEN MADE PURSUANT TO CODES" phrase is added below the name of each designer as per his specialization. The technical section of the Association conducts the technical auditing of the submitted engineering schemes and make sure of their conformity with the approved codes.
- Each auditor, as per his specialization, audits his respective schemes, and after the approval of the submitted copy, the required copies of the engineering schemes will be submitted so as to be sealed by a special seal holding the name and specialization of each auditor. They will also be stamped with the "THE SCHEMES CONFORM THE CODES PERTINENT TO THIS SPECIALIZATION" phrase, and the same and all schemes copies will be signed.
- After all auditors finish and the schemes are sealed by their respective seals, the Association will fix another seal bearing the Association's name together with "THE SCHEMES CONFORM THE APPROVED CODES" phrase; and the designing entity itself will have the civil, legal and occupational responsibility in the event it makes any modification to the authenticated engineering schemes.
- No significant modification may be made to the engineering schemes with an effect on the regulations applied in the schemes except in conformity with the necessary technical requirements stated in the National Construction Codes of Jordan. Such modifications shall be approved in accordance with the procedures mentioned above, and the executive schemes shall be subsequently made at the end of the project and in accordance with the amended schemes.

To the supervision works:

- To not commence the implementation of any project by the client before he refers to the supervising entity (the supervising engineering office or the authorized relevant entitles); notifying them in writing of the intent to commence the implementation within no more than two weeks of the time specified for the commencement; and providing the said entity with the name of the contractor with whom the agreement on implementation is made, and a copy of the client's letter will be kept with the Association.
- After being notified in writing by the client of the implementation commencement date, the supervising entity shall appoint the resident engineer at the site for the projects whose areas exceed 500 m2; however, if the project area 500 m2 or less, the implementation will be made and monitored by the supervising committee and its technical divisions.

- If the supervising entity is not notified in writing by the client of the implementation commencement and with no supervision, the client will solely hold the civil and legal responsibility, and the licensing entities shall make sure of following up the same.

To the engineering supervision and management:

- A special office shall be provided at the site to the supervision section and it shall have a closet in which the following files and documents will be kept:
  - A copy of all authenticated schemes together with the construction license.
  - Daily and monthly reports.
  - Periodical meetings.
  - Sheets of visits by the engineering, contracting and supporting office.
  - Laboratory tests.
  - Exchanged correspondences of the resident engineer and contractor.
  - Building (project) elements receipt permissions.
- If the client fails to comply with the engineering office instructions or violates the relevant laws and regulations, the Association instructions and these instructions, the engineering office shall inform the Association thereof in writing so it notifies the competent licensing entity requesting it to suspend the work in the project until the violation is removed and the situation is corrected.
- If the engineering office does not inform of any violation and there is a violation, the engineering office shall be subject to all civil, legal and occupational responsibilities as a result of the violation commitments and its consequences for failing to inform thereof.
- Through its supervision section and as per its abilities, the Association shall make intensive visits to all projects that are under construction to make sure of the compliance with the aforesaid provisions; and it shall have the right to appoint resident engineers for the projects that are under construction at the client's cost if he fails to do so.

To conformity certificate:

The conformity certificate form attached to the Association instructions shall be adopted, provided that the contractor's registration number at the Jordanian Construction Contractors Association is added thereto.

To the codes application:

All licensing entities must comply with the following:

- To deal with all the correspondences issued by the Association to the licensing entities as soon as reasonably possible, especially with respect to the implementation works violations and the resident engineer in the cases notified as a lack of compliance by the client with the engineering schemes or implementation with no resident engineer or without informing the supervising office of the implementation.
- To suspend any license by blueprints, which is the procedures followed by the municipalities now due to conflict with any efforts made to upgrade the engineering work and comply with the provisions of the National Construction Law of Jordan No. 7 of 1993 and amendments thereto; and such municipalities will be held responsible for the same.

- To not license the establish buildings until the engineering schemes and laboratory tests are provided by competent entities to make sure of their constructive validity and to collect the determined fees.

Article 5:

In licensing the buildings and establishments, the Authorities / Regulatory Entities (licensing entities) comply with the following:

- No building or establishments may be built until a license is obtained from the competent authority.
- To license and building, establishment or construction works only under engineering schemes authenticated by the Engineers Association (without prejudice to the designing entity responsibility); bearing the name of the designing engineering office; and fulfilling the technical rules and requirements stated in the approved National Building Codes of Jordan, so as such schemes are issued by an entity legally authorized to design or a an engineering office registered with the Jordanian Engineers Association; signed by the competent designing engineers as per their competencies; and approved by the Jordanian Engineers Association.
- To make sure the Engineers Association and competent regulatory committees approve the modified engineering schemes before starting to implement such modifications, provided that the modifications consistent to the requirements of the National Building Codes of Jordan.
- To attach to the license application an authenticated copy of the contractual agreement and supervising contract or to pay a refundable guarantee as may be determined by licensing entity in case there is no contractual agreement and until such contract is available.
- The client shall submit to the licensing entity an application together with a contractual agreement before the commencement of the project implementation including the excavation works, and the supervising entity shall be notified thereof so the written consent is kept at the project site. The client is prohibited from commencing the implementation before obtaining the license from the competent authorities / regulatory entities.

Article 6:

The regulatory licensing entities / authorities shall follow up:

- The supervision of the engineering projects to make sure of the attendance of the supervising entity and the contractor registered with the Jordanian Construction Contractors Association, and to make sure of the availability of daily reports and laboratory tests in enforcement of the Jordanian Engineers Association Law, the Jordanian Construction Contractors Association Law and the Offices and Engineering Companies Statute in accordance with the procedures set forth below and the legal actions necessary in this concern.
- The client or contractor compliance with placing a sign at the project site before the commencement of the implementation bearing the following information:
    - Project name.
    - Project owner’s name.

- Designing engineering office name.
- Contractor's name and registration number.
- Supervising office name and resident engineer's name.
- Licenses number and date.
- Plot of land number and block number.
- Work commencement date.

- The compliance of the supervising office and/or contractor with keeping a copy of the license schemes at the site, daily reports of the work progress and copies of the laboratory tests conducted to the materials used in the work, so the same can be followed up by the Jordanian Engineers Association and/or the licensing entity or any other entity authorized to do so.
- Upon finding out any violation, the relevant associations (engineers, construction contractors) shall be informed thereof, so they make sure there is a violation and notify the licensing entities.
- When the licensing entity is informed of a violation of the law, the following information will be inspected:
    - Plot and block number.
    - License number.
    - Violating entity.
    - Violation type.
    - Required procedure.
    - Time necessary for correcting the violation.
- Within three days of the notification date, the relevant entity or its representative shall make an executive notification to correct the situations within the specified period. After the situations are corrected, the violator shall inform the Association that makes sure of the same and notifies the licensing entity to suspend the procedures.
- Subject to the procedures stated in Article 38 of Urban, Rural and Building Planning Law No. 79 of 1966 and amendments thereto, the punishments shall be applicable as stated in the National Building Law of Jordan No. 7 of 1993 and amendments thereto and the instructions enacted thereunder.

Article 7:

- The regulatory committees within Greater Amman Municipality, official and relevant entities and municipalities shall not issue buildings and establishments occupation permissions within the municipal zones and other zones unless their obtainment applications are attached to a consistent certificate issued by the supervising engineering office and approved by the Engineers Association.
- General Directorate of Civil Defense consent must be obtained before issuing the occupation permission and pursuant to the Building Regulation applicable at Amman Municipality and the other official and relevant entities and municipalities with respect to the engineering projects requiring the obtainment of such consent.

- If the violations of the given license committed by the engineering offices or contractors are repeated, the Engineers Association and/or Construction Contractors Association shall take the legal actions in accordance with the applicable laws, regulations and instructions.

Article 8:

All ministries, government departments, official public institutions, municipalities, public shareholding companies, Jordanian Engineers Association, Jordanian Construction Contractors Association and Offices & Engineering Companies Authority must adhere, in the construction works, to the approved codes in accordance with the Law and these instructions, and to take the actions necessary for this purpose. They shall also adhere to applying the provisions of Article 11 of the National Building Law of Jordan No. 7 of 1993 and amendments thereto.

Article 9:

- The offices, engineering companies and construction contractors and workers shall adhere to the approved codes in designing, supervising, implementing and maintaining these works. They must inform the relevant association of any violation of its respective rules, if any, and the association shall verify the occurrence of such violation and notify the competent regulatory authorities while complying with the provisions of Article 11 of the National Building Law of Jordan No. 7 of 1993 and amendments thereto.
- Provisions of Article 13 of the Law shall be applicable to each violator thereof.