屋宇署
BUILDINGS DEPARTMENT

Code of Practice for Dead and Imposed Loads 2011

Code of Practice for Dead and Imposed Loads

2011

FOREWORD

This Code of Practice ("Code") provides guidelines on determination of dead loads and minimum imposed loads for design of building, building works, street and street works. Floor uses and corresponding minimum imposed loads stipulated in the Building (Construction) Regulations are also included in the tables in Section 3 of this Code for easy reference.

Although provisions in this Code are not statutory save those that are quoted from the Building (Construction) Regulations, compliance with the requirements of this Code is deemed to satisfy the relevant provisions of the Buildings Ordinance and the related regulations.

This Code was finalized by a Review Committee, and was prepared by the Buildings Department on the basis of the consultancy study on the Minimum Design Loads for Buildings and Streets conducted by the consultant C M Wong & Associates Ltd commissioned by the Buildings Department and overseen by a Steering Committee with members from the academia, professional institutions and relevant Government departments.

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The contribution and the effort given by members of the Steering Committee and the Review Committee are sincerely acknowledged.

Buildings Department
2011

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1 GENERAL

1.1 Scope

1.1.1 This Code specifies the dead and imposed loads for building, street, building works and street works in Hong Kong.

1.1.2 Where the imposed loads for specific uses are not prescribed in the Building (Construction) Regulations or Section 3 of this Code, the imposed loads to be adopted for design must be based on reliable information or data or as described in Section 4, and subject to the acceptance of the Building Authority.

1.1.2.1 Examples of reliable information are:

(a) The "Port Works Design Manual" published by the Civil Engineering Development Department for loading on marine structures; and

(b) The "Structures Design Manual for Highways and Railways" published by the Highways Department for loading on highway and railway structures.

1.1.2.2 Examples of reliable data are:

(a) research results from recognized academic institutions;

(b) reference from international standards or codes of practice;

(c) reports from accredited testing laboratories; and

(d) technical literatures from suppliers/manufacturers.

1.1.3 All values of loads given in this Code are unfactored values and may be taken as characteristic loads when carrying out design using limit state method.

1.1.4 Construction loads are not covered by this Code and the designer should consider the relevant construction loads and effect thereof as part of their design.

1.2 Symbols

q_k uniformly distributed load in kPa

Q_k concentrated load in kN, or line load in kN/m, as appropriate

M gross mass of the heaviest vehicle to be accommodated in kg

ν velocity of the vehicle normal to the barrier in m/s

δ_c deformation of the vehicle in mm

δ_b deflection of the barrier in mm

γ factor in determining the horizontal imposed loads on barriers located at the lower end of straight ramp

2 DEAD LOADS

2.1 General

2.1.1 Dead loads shall include self-weight of all items of permanent nature that will act continuously throughout the service life of the building, street, building works, street works, and the variations of its magnitude with time are insignificant. It shall be taken to include but not limited to the following:

(a) the structure;
(b) all other structural elements that are affixed to the structure (e.g. windows, claddings and other forms of permanent construction);
(c) non-structural elements (e.g. finishes, roofings, surfacing and coverings, linings, kerbs, suspended ceilings, insulation, earth and ballast);
(d) permanent equipment including fixtures and fittings (e.g. permanently fixed wiring and reticulated services);
(e) partitions the positions of which are indicated on the building plans submitted to the Buildings Department ("BD") for approval; and
(f) soil fill, waterproofing and drainage system for gardening, greenery or planting.

2.1.2 The weights of tanks and other receptacles shall be considered as dead loads. The contents of tanks and receptacles shall be considered as imposed loads.

2.1.3 When there is doubt to the permanency of loads, such loads should be treated as imposed loads while reduction of which under clause 3.7 should not be taken on beams and vertical members.

2.2 Determination of Dead Loads

2.2.1 *General*

2.2.1.1 Dead loads shall be calculated from the design or known dimensions of the structures and the density of the materials used. The density of some common materials is given in Appendix A for reference. For materials not included in Appendix A, the determination of their density shall be based on reliable data. Some common items for assessment of dead loads are described in more details in clause 2.2.2 to 2.2.5.

2.2.2 *Partitions*

2.2.2.1 Partitions indicated on the building plans submitted to BD for approval are considered as permanent partitions. Their weight shall be considered as dead loads and calculated according to the layout shown on the building plans.

2.2.2.2 Where partitions are envisaged but the location of which are not indicated on the building plans, the weights of these partitions shall be considered as imposed loads and to be calculated in accordance with clause 3.6.

2.2.3 *Roofings*

2.2.3.1 The weight of roofings such as waterproofing membrane, protective screeding, and tiles shall be calculated from the weight of the component materials and their geometry such as the thickness and area.

2.2.3.2 Where a roof is to be provided with greenery, the weight of soil, waterproofing and drainage system, and plants for greenery shall be taken as dead loads.

2.2.4 *Claddings and Finishes*

2.2.4.1 Claddings shall include aluminium or metal cladding, polished granite slabs or limestone cladding, marble facing and their fixings. Finishes shall include in-situ finishes (e.g. plaster, screeds), pre-fabricated wall-panel finishes, suspended ceilings, timber and other floor finishes.

2.2.5 *Niches in Columbaria*

2.2.5.1 The weight of niches in columbaria shall be determined according to the material used for the construction of niches and the weight of the urns. For lightweight niches, such as niches made of wood or lightweight metals, the weight shall be not less than 2.0 kN/m length for each metre height. For heavy weight niches, such as niches made of concrete, the weight shall be not less than 4.5 kN/m length for each metre height.

3 IMPOSED LOADS

3.1 General

3.1.1 Under the Building (Construction) Regulations, the imposed load on any building, street, building works or street works shall be the greatest applied load likely to arise from their intended use or purpose during the service life of the building, street, building works or street works (including forces exerted by the adjacent ground but excluding dead loads and wind loads).

3.1.2 The values of imposed loads are categorized and given in this Section according to specific use of the related floor or structure, and they shall be considered as the minimum values to be adopted in design. Where higher values are anticipated or considered more appropriate, based on knowledge of the intended use of the floor or the intended installation of equipment, machinery or displayed items, they shall be considered in determining the imposed loads on the floor.

3.1.3 The imposed loads as given in clause 3.2 to 3.5 shall be:

(a) a uniformly distributed load, q_k, in kPa; or
(b) a concentrated load or line load, Q_k, in kN or kN/m, as appropriate;

whichever shall produce the most adverse effect.

3.1.4 The uniformly distributed load, q_k, and the concentrated load or line load, Q_k, shall be considered separately.

3.1.5 The uniformly distributed load, q_k, shall be applied to one or more areas such that the most adverse effect will be produced for the design parameter under consideration.

3.1.6 The concentrated load or line load, Q_k, shall be applied in a position that will produce the most adverse effect for the design parameter under consideration. The concentrated load shall be assumed to be uniformly distributed over a contact area as specified in this Code. The line load shall be applied in the manner as specified in this Code.

3.1.7 Reduction of distributed imposed loads in accordance with clause 3.7 may be applied as appropriate.

3.1.8 Allowance for partitions (where positions of which are not indicated on building plan) and horizontal imposed loads as specified in clause 3.6 and 3.8 respectively shall be considered as appropriate.

3.1.9 Floor uses are categorized into eight classes as shown in Table 3.1

3.2 Class 1 to 5: Imposed Loads for Domestic, Office, Social, Commercial, Administration and Industrial Floor Uses

3.2.1 Imposed loads with examples of specific use for Class 1 to 5 are given in Table 3.2.

3.2.2 The concentrated loads Q_k given in Table 3.2 shall be applied on plan over any square with a 50 mm side.

Table 3.1
Classification of Floor Uses

Class	Use
1	Floors for domestic use and residential activities
2	Floors for offices and other non-industrial work places
3	Floors where people may congregate
4	Floors for shopping purposes
5	Floors for storage, equipment, plant and industrial use
6	Areas for vehicular traffic
7	Roofs
8	Affiliated building elements

Table 3.2
Minimum Imposed Loads

Class	Use	Examples of Specific Use	q_k (kPa)	Q_k (kN)
1	Floors for domestic use and residential activities	Domestic uses	2.0	2.0
		Dormitories	2.0	2.0
		Private sitting rooms, bedrooms and toilet rooms in hotels, motels and guesthouses	2.0	2.0
		Wards, bedrooms and toilet rooms in hospitals, nursing homes and residential care homes for elderly persons	2.0	2.0
		Bathrooms (load from Jacuzzi in bathrooms shall be assessed separately and on individual basis) [1]	2.0	2.0
		Pantries[1]	2.0	2.0
		Kitchens[1]	2.0	2.0
2	Floors for offices and other non-industrial work places	Medical consulting or treatment rooms	2.5	3.0
		Hospital operating theatres and X-ray rooms	2.5	3.0
		Laboratories	3.0	4.5
		Light workrooms with neither central power-driven machines nor storage	3.0	4.5
		Offices for general use	3.0	4.5
		Rooms for lightweight electrical and electronic installations	3.0	4.5
		Rooms for meters and not for storage[1]	3.0	4.5
		Pantries[1]	3.0	4.5
		Banking halls	4.0	4.5
		Kitchens and laundries not in domestic buildings	4.0	4.5
		Projection rooms[1]	5.0	4.5

Table 3.2 (continued)

Class	Use	Examples of Specific Use	q_k (kPa)	Q_k (kN)
3	Floors where people may congregate	*3A: Floors with tables*		
		Childcare centers and kindergartens	2.5	3.0
		Classrooms, lecture rooms, tutorial rooms, computer rooms	3.0	4.5
		Internet computer services centres[1]	3.0	4.5
		Leisure, recreational and amusement areas that cannot be used for assembly purposes (e.g. private clubs with cubicles and restricted number of patrons)	3.0	4.5
		Massage rooms[1], sauna rooms[1], bath houses (load from water pools and fountains, if any, to be assessed separately) [1]	3.0	4.5
		Reading rooms without book storage	3.0	4.5
		Cafes[1], mahjong parlours[1], amusement games centres[1]	4.0	4.5
		Restaurants, night-clubs, lounges, bars, canteens, fast food shops and dining rooms not in domestic premises.	4.0	4.5
		3B: Floors with fixed seating (seating is regarded as fixed if the removal of the seating and the use of the relevant space for other purposes are unlikely to occur)		
		Assembly areas with fixed seating	4.0	4.5
		Chapels, churches and places of worship with fixed seating	4.0	4.5
		Concert halls[1]	5.0	4.5
		Conference rooms[1], waiting rooms[1]	5.0	4.5
		Grandstands (refer to clause 3.8.2 for additional loads)	5.0	4.5
		Public halls, theatres, cinemas	5.0	4.5
		3C: Floors without obstacles for moving people		
		Columbaria (areas other than for niches) [1]	4.0	4.5
		Art galleries and museums	5.0	4.5
		Assembly areas without fixed seating, refuge floors	5.0	4.5
		Footbridges between buildings, footpaths, terraces, plazas, areas used for pedestrian traffic	5.0	4.5
		Open areas in gardens (including short grass turf suitable for foot traffic) [1]	5.0	4.5

Table 3.2 (continued)

Class	Use	Examples of Specific Use	q_k (kPa)	Q_k (kN)
3	Floors where people may congregate	*3D: Floors with possible physical activities*		
		Billiard rooms and bowling alleys	3.0	4.5
		Dance practice rooms	3.0	4.5
		Dance halls, karaoke establishments, discotheques, gymnasia	5.0	4.5
		Ice rinks (weight of ice shall be assessed separately) [1], ball courts[1], golf driving ranges [1]	5.0	4.5
		Stages, television studios used as stages	7.5	9.0
4	Floors for shopping purposes	Department stores, supermarkets, markets, shops for display and sale of merchandise[2]	5.0	4.5
5	Floors for storage, equipment, plant and industrial uses[3]	Library rooms with book storage (excluding library stack rooms)	5.0	4.5
		Offices for storage and normal filing purposes	5.0	4.5
		Refuse storage[1]	2.5 for each metre of storage height[3]	To be determined according to the weight of storage material, but not less than 9.0
		Stack rooms in book stores and libraries	3.5 for each metre of storage height[3] but not less than 10.0	To be determined according to the weight of storage material, but not less than 9.0
		Cold storage	5.0 for each metre of storage height[3] but not less than 15.0	To be determined according to the weight of storage material, but not less than 9.0
		Paper storage in printing plants	8.0 for each metre of storage height[3]	To be determined according to the weight of storage material, but not less than 9.0

Table 3.2 (continued)

Class	Use	Examples of Specific Use	q_k (kPa)	Q_k (kN)
5	Floors for storage, equipment, plant and industrial uses	Battery rooms and uninterruptible power supply rooms	10.0 for each metre of storage height[3]	To be determined according to the weight of storage material, but not less than 9.0
		General storage other than those specified in this class, including storage in warehouses	2.5 for each metre of storage height[3]	To be determined according to the weight of storage material, but not less than 9.0
		Plant rooms, boiler rooms, fan rooms, motor rooms and the like	7.5	9.0
		Workshops, factories and other buildings or parts of buildings of similar category for industrial use –		
		(a) for light weight loads	5.0	9.0
		(b) for medium weight loads	7.5	9.0
		(c) for heavy weight loads	10.0	9.0
		(d) for printing plants	12.5	9.0

Notes: 1 Specific uses that are not specified in the Building (Construction) Regulations.

2 For stacking or storage area, reference shall be made to the appropriate example of specific use and the corresponding imposed load given in Class 5.

3 Storage height in Class 5 shall be the height of the space between the following: the floor, and a physical constraint to the height of storage formed by a ceiling, soffit of a floor, roof or other obstruction.

3.3 Class 6: Imposed Loads for Vehicular Traffic and Parking Areas

3.3.1 Areas for vehicular traffic and parking (such as carriageways, floors, driveways, ramps, carparking, garages, loading and unloading bay) are further categorized into five sub-classes according to the gross weight of the heaviest vehicle running on the areas. The categorization is in accordance with the Road Traffic (Construction and Maintenance of Vehicles) Regulations (Cap. 374A) and the sub-classes are shown in Table 3.3.

Table 3.3
Classification of Vehicular Traffic and Parking Areas

Class		Specific Use	Examples of Vehicles
6	6A	Areas accessible to vehicles not exceeding 3,000 kg gross weight	Private cars, taxies, van-type light goods vehicles, motor cycles
	6B	Areas accessible to vehicles not exceeding 5,500 kg gross weight	Light goods vehicles, light buses (not exceeding 16 passengers)
	6C	Areas accessible to vehicles not exceeding 24,000 kg gross weight	Medium goods vehicles, single-decked buses, double-decked buses, coaches
	6D	Areas accessible to vehicles not exceeding 30,000 kg gross weight	Fire engines, refuse collection vehicles, rigid heavy goods vehicles
	6E	Areas accessible to vehicles other than Class 6A, 6B, 6C or 6D above	Articulated heavy goods vehicles

3.3.2 Loading and unloading areas including the driveway that lead to these areas are classified as Class 6B, 6C or 6D depending on the type of vehicular use for the subject area.

3.3.3 Areas accessible to fire engines shall, in addition, be checked for the effect due to a concentrated load of 230 kN uniformly distributed on plan over an area of 950 mm x 750 mm.

3.3.4 Imposed loads for areas for vehicular traffic and parking are given in Table 3.4 to 3.6.

3.3.5 *Vehicular Traffic and Parking Area Class 6A*

3.3.5.1 Imposed loads for Area Class 6A are given in Table 3.4.

Table 3.4
Minimum Imposed Loads for Area Class 6A

Class	q_k (kPa)	Q_k (kN)
6A	3.0	20.0

3.3.5.2 In Table 3.4, the concentrated load, Q_k, shall be applied on plan over any square with a 200 mm side.

3.3.5.3 Where provision for double-deck parking is required for Area Class 6A, the uniformly distributed load, q_k, shall be twice the value given in Table 3.4.

3.3.6 *Vehicular Traffic and Parking Area Class 6B, 6C and 6D*

3.3.6.1 Imposed loads for Area Class 6B, 6C and 6D are given in Table 3.5 and Table 3.6.

Table 3.5
Minimum Imposed Loads for Area Class 6B, 6C and 6D

Class	q_k (kPa)	Q_k (kN)
6B	See Table 3.6	30.0
6C	See Table 3.6	60.0
6D	See Table 3.6	80.0

Table 3.6
Minimum Uniformly Distributed Load, q_k (kPa), for Area Class 6B, 6C and 6D

Loaded Length L (m)	Class 6B	Class 6C	Class 6D
0 to 5	13.9	34.7	46.6
6	11.4	29.9	39.4
7	9.7	26.6	34.4
8	8.6	24.0	30.6
9	7.7	22.0	27.8
10	7.0	20.5	25.5
12	6.0	17.9	21.9
14	5.3	16.0	19.4
16	4.8	14.6	17.6
18	4.4	13.5	16.2
20	4.1	12.6	15.1
25	3.6	11.0	13.1
30	3.2	9.9	11.8
35	3.2	9.1	10.9
40	3.2	8.5	10.2
45	3.2	8.0	9.6
50 or above	3.2	7.6	9.2

Note: Uniformly distributed load for intermediate loaded length can be obtained either by linear interpolation using the values in Table 3.6 or from the loading curves shown in Appendix C.

3.3.6.2 The loaded length of the structural member under consideration shall be the shorter side of the loaded area. It shall also be the full base length of the adverse area. Where there is more than one adverse area, for example in the case of continuous construction, the maximum effect shall be determined by consideration of the adverse area or combination of adverse areas using the load appropriate to the full base length or the sum of the full base lengths of any combination of the adverse areas selected. Examples of loaded length for different structural design parameters are shown in Appendix B. Exception to the above is at area where the direction of traffic will not be changed (except for reverse flow) during the life of the structure because of physical constraint (e.g. access ramp). In such exceptional case, the loaded length can be measured along the direction of traffic.

3.3.6.3 In Table 3.5, the concentrated load, Q_k, for Area Class 6B shall be applied on plan over any square with a 200 mm side. The concentrated load, Q_k, for Area Class 6C and 6D shall be applied on plan over any square with a 300 mm side.

3.3.7 *Vehicular Traffic and Parking Area Class 6E*

Imposed loads for Area Class 6E shall be the appropriate highway loading in accordance with the latest edition of the "Structures Design Manual for Highways and Railways (SDM)" published by the Highways Department. The appropriate highway loading may be HA or HB loading depending on the intended use. If the structure is not designed for HB loading then HA loading derived from the SDM with the following modifications are considered acceptable:

(a) for the purpose of transforming the loading intensity per lane, as shown in Figure 3, Table 17 of the SDM, to uniformly distributed load, a notional lane width of 3 m shall be adopted;

(b) the knife edge load shall be taken as 40 kN/m applied in the direction perpendicular to the loaded length;

(c) the uniformly distributed load and the knife edge load shall act together at the position that will produce the most adverse effect;

(d) all notional lanes that will produce most adverse effect shall be fully loaded;

(e) the single wheel load of 100 kN shall be applied on plan over any square with a 300 mm side, and in a position that will produce the most adverse effect, and shall be assessed separately from the uniformly distributed imposed and knife edge load; and

(f) the secondary imposed loads arising from vehicles, like centrifugal, traction, braking and skidding loads from vehicular traffic need not be considered in the design of car parking structures.

3.4 Class 7: Imposed Loads for Roofs

3.4.1 Roofs including canopies are further categorized into four sub-classes according to their specific uses as shown in Table 3.7.

Table 3.7
Classification of Roofs and Canopies

Class		Specific Use
7	7A	Inaccessible roofs and flat roofs (where no access is provided to the roof except such access as may be necessary for maintenance work only)
	7B	Accessible roofs (where access is provided in addition to such access as may be necessary for maintenance work only) or for use of Class 1 to 6
	7C	Accessible flat roofs or for use of Class 1 to 6[1]
	7D	Canopies[1]

Note : 1 Specific uses that are not specified in the Building (Construction) Regulations.

3.4.2 The imposed loads for Class 7A, 7B, 7C and 7D are given in Table 3.8.

3.4.3 The concentrated load, Q_k, shall be applied on plan over any square with a 50 mm side.

Table 3.8
Minimum Imposed Loads on Roofs and Canopies

Class	Roof Slope	q_k (kPa)	Q_k (kN)
7A	Of or less than 5º	2.0	1.5
	Greater than 5º but of or less than 20º	0.75	
	Of 40º or greater	0	
7B	Of or less than 20º	As given in Table 3.2, 3.4 and 3.5 according to the specific use but q_k not less than 2.0 kPa and Q_k not less than 1.5 kN	
	Of 40º or greater	0	0
7C	Not applicable	As given in Table 3.2, 3.4 and 3.5 according to the specific use but q_k not less than 2.0 kPa and Q_k not less than 1.5 kN	
7D	Not Applicable	2.0	1.5

Notes : 1 For roof slopes greater than 20º but less than 40º, the value of q_k may be determined by linear interpolation.

2 For Class 7D where canopies are constructed of lightweight materials such as glass or metal sheet, the uniformly distributed load, q_k, may be reduced to 0.75 kPa.

3.4.4 Where bottom chords of roof trusses, joists and hangers for ceiling, ribs of skylights, frames and coverings of ceiling access hatches and any similar structure are required to support the force imposed by people for any purpose, they shall be designed to support a concentrated load of 1.5 kN acting at a position that will produce the most adverse effect. Such concentrated load shall be considered together with the appropriate loads given in Table 3.8

3.5 Class 8: Imposed Loads for Affiliated Building Elements

3.5.1 Imposed loads with examples of specific use for affiliated building elements are given in Table 3.9.

3.5.2 The concentrated load, Q_k, shall be applied on plan over any square with a 50 mm side unless otherwise stated.

Table 3.9
Minimum Imposed Loads on Affiliated Building Elements

Class	Examples of Specific Use	q_k (kPa)	Q_k (kN)
8	Projecting window sills[1]	2.0	2.0
	Projecting window hoods and air conditioner hoods (lower and upper slabs) [1]	-	1.5 kN/m run applied along the outer edge
	Utility platforms	Same as the floors to which they give access but not less than 4.0	2.0 kN/m run applied along the outer edge
	Balconies	Same as the floors to which they give access but not less than 3.0	2.0 kN/m run applied along the outer edge
	Stairs, landings and corridors	Same as the floors to which they give access but not less than 3.0 and not more than 5.0	4.5
	Maintenance catwalks[1]	-	1.0 at 1 m centres

Note: 1 Specific uses that are not specified in the Building (Construction) Regulations.

3.6 Partitions (positions of which are not indicated on building plan)

3.6.1 Where a building is to support partitions but the position of the partitions is not indicated on the building plans submitted to BD for approval, the weight of such partitions shall be regarded as imposed distributed load applied uniformly on plan and shall, in addition to other imposed loads, be:

(a) not less than 1/3 of the weight per metre length of the partitions uniformly distributed per square metre; and

(b) not less than 1 kPa if the floor is used for office purposes.

3.7 Reduction of Distributed Imposed Loads on Beams and Vertical Members

3.7.1 The following loads do not qualify for reduction in distributed imposed loads:

(a) floor loads from plant or machinery which are specifically allowed for;
(b) floor loads less than 7.5 kPa in factories and workshops (see clause 3.7.3.2);
(c) floor loads from vehicles;
(d) floor loads from storage and filing in offices;
(e) forces produced by dynamic effects;
(f) floor loads from storage;
(g) floor loads from partitions (the position of which are not indicated on building plan); or
(h) floor loads determined as imposed loads due to its uncertainty of permanency as described in clause 2.1.3.

3.7.2 *Reduction of Total Distributed Imposed Loads on Beams*

3.7.2.1 The total distributed imposed loads on beams may be reduced by the percentage given in Table 3.10, except as provided in clause 3.7.1.

Table 3.10
Reduction of Total Distributed Imposed Loads on Beams

Floor Area Supported by Single Span of Beam (m^2)	Percentage Reduction of Total Distributed Imposed Load
Less than 45	0
45	5
90	10
135	15
180	20 maximum

Note: Reduction for intermediate area size may be calculated by linear interpolation except for floor area less than 45 m^2 where no interpolation is allowed.

3.7.2.2 The reduction of total distributed imposed loads on beams shall be applicable only to the design of the beams under consideration. The reduced imposed loads on beams shall not be applicable to the design of vertical members supporting the beams.

3.7.3 *Reduction of Total Distributed Imposed Loads on Vertical Members*

3.7.3.1 The total distributed imposed loads on every floor carried by a vertical member may be reduced by the percentage given in Table 3.11, except as provided in clause 3.7.1 and 3.7.3.2.

Table 3.11
Reduction of Total Distributed Imposed Loads on Vertical Members

Number of floors (including the roof) with loads qualifying for reduction carried by the member under consideration	Percentage reduction of total distributed imposed load on all floors (including roof) carried by the member under consideration
1	0
2	5
3	10
4	15
5	20
6	25
7	30
8	35
Over 8	40 maximum

3.7.3.2 For floors for workshops, factories under Class 5 of Table 3.2 with distributed imposed load not less than 7.5 kPa on every floor, the total distributed imposed load on every floor carried by a vertical member may be reduced by the percentage given in Table 3.12, except as provided in clause 3.7.1.

Table 3.12
Reduction of Total Distributed Imposed Loads on Floors for Workshops, Factories under Class 5 of Table 3.2 with Distributed Imposed Load of not less than 7.5 kPa

Number of floors (including the roof) with imposed loads qualifying for reduction carried by the member under consideration	Percentage reduction of total distributed imposed load on all floors (including roof) carried by the member under consideration
1	0
2	10
3	20
Over 3	25 maximum

Note: In no case can the reduced imposed load at each floor be less than 7.5 kPa.

3.8 Horizontal Imposed Loads on Protective Barriers

3.8.1 *Horizontal Imposed Loads on Protective Barriers to Restrict or Control Movement of Persons*

3.8.1.1 Partition walls, glass walls, curtain walls, lightweight structures and barriers installed to restrict or control the movement of persons shall be designed to resist the minimum horizontal imposed loads given in Table 3.13 when separately applied or the wind load (where applicable), whichever shall produce the most adverse effect.

Table 3.13
Minimum Horizontal Imposed Loads on Protective Barriers

to Restrict or Control Movement of Persons

Category	Line Load to be applied at a height of 1.1m above the floor level (kN/m)	Uniformly distributed load to be applied on the infill between floor and top rail (kPa)	Concentrated load to be applied on any part of the infill between floor and top rail (kN)
Areas where congregation of people is not expected	**0.75**	**1.0**	**0.5**
Areas where people may congregate but overcrowding is not expected	**1.5**	**1.5**	**1.5**
Areas susceptible to overcrowding	**3.0**	**1.5**	**1.5**

3.8.1.2 Examples of areas where congregation of people is not expected are domestic uses, offices, stairs and landings.

3.8.1.3 Examples of areas where people may congregate but overcrowding is not expected are areas with fixed seating or tables; balconies; utility platforms; edges of roofs; and footbridges or footpaths not greater than 3 m wide.

3.8.1.4 Examples of areas susceptible to overcrowding are theatres; cinemas; discotheques; bars; shopping areas; assembly areas; and footbridges or footpaths greater than 3 m wide.

3.8.2 Horizontal Imposed Loads on Grandstands Due to Crowd Movement

3.8.2.1 Grandstands, stadiums, assembly platforms, reviewing stands, and similar, shall be designed to withstand minimum horizontal imposed loads due to crowd movement as follows:

(a) for platforms with seats, the following separate load cases (not applied simultaneously), applied at floor level at each row of seats:-

(i) 0.35 kN/m of seating along the line of seats; or
(ii) 0.15 kN/m of seating perpendicular to the line of the seats.

(b) for platforms without seats, 0.25 kPa of plan area applied in any direction.

3.8.3 Horizontal Impact Force on Vehicle Barriers

3.8.3.1 Barriers subject to vehicle impact must be designed to withstand the greatest impact force anticipated subject to the following minimum requirement of horizontal impact force, F (in kN), given by:

$$F = \frac{0.5\, M\, v^2}{\delta_c + \delta_b}$$

where

M is the gross mass of the heaviest vehicle to be accommodated (in kg);
v is the velocity of the vehicle normal to the barrier (in m/s);
δ_c is the deformation of the vehicle (in mm); and
δ_b is the deflection of the barrier (in mm).

The values of M, v, δ_c and δ_b, except provided in clause 3.8.3.2, are given in Table 3.14.

Table 3.14
Design Values for Determination of Horizontal Impact Force on Vehicle Barriers

Class	M (kg)	v (m/s)	δ_c (mm)	δ_b (mm)
6A	3,000	3.0	100 mm (unless better evidence is provided)	δ_b = actual deflection for flexible barriers δ_b = 0 for rigid barriers
6B	5,500	2.5		
6C	24,000	1.5		
6D	30,000			
6E	To be determined in accordance with the Road Traffic (Construction and Maintenance of Vehicles) Regulations			

3.8.3.2 The velocities given in Table 3.14 should be increased if the barriers are located at the lower end of a straight ramp, which exceeds 10 m in length. Such increase in velocities shall result in the horizontal impact force, F, being increased by a factor, γ. The values of γ are given in Table 3.15.

Table 3.15
Values of Factor γ for Determination of Horizontal Impact Force on Barriers Located at the Lower End of Straight Ramp

Length of Ramp (m)	Factor γ
<10	1.0
10 - 20	Linear interpolation between 1.0 and 2.0
> 20	2.0

3.8.3.3 The horizontal impact force, *F*, determined in clause 3.8.3.1, shall act at bumper height, in the direction normal to and uniformly distributed over any length of 1.5 m of the barrier. Values given in Table 3.16 are the design bumper height for each class of vehicles.

Table 3.16
Design Bumper Height for Each Class of Vehicles

Class	Bumper Height above Floor Level (mm)
6A	600
6B	800
6C	1200
6D	
6E	

3.8.3.4 For barriers alongside an access ramp, the vehicle impact will be oblique. The horizontal impact force, *F*, in such case will be half the values obtained in clause 3.8.3.1 or clause 3.8.3.2, whichever as appropriate. The direction of the horizontal impact force, *F*, for design purpose, is taken as normal to and uniformly distributed over any length of 1.5 m of the barrier at the design bumper height in accordance with clause 3.8.3.3.

3.9 Surcharges and Lateral Loads on Earth Retaining Structures

3.9.1 Surcharge loads applied to slopes and earth retaining structures are given in Table 3.17.

Table 3.17
Minimum Surcharges on Slopes and Earth Retaining Structures

Category		Surcharge Load (kPa)
Highways and Roads	Public Roads	20
	Private Roads	10
Footpaths isolated from roads, cycle tracks and play areas		5

3.9.2 In assessing surcharges from buildings with shallow foundations, where the actual loads can be derived from available records, the actual surcharge loads should be used for design. If no records are available, the surcharges shall be assessed with respect to the existing uses and the structural forms with a minimum value of 10 kPa per storey.

3.9.3 Surcharge loads other than those given in Table 3.17 are to be considered, where applicable, in the building design.

3.9.4 Designer must also consider the effect of lateral loads due to earth retaining actions, including where applicable, impact loads from landslide debris, using established soil mechanics principles. Reference can be made to the GEOGUIDE 1 “GUIDE TO RETAINING WALL DESIGN” published by the Geotechnical Engineering Office.

3.10 Dynamic Loads

3.10.1 The imposed loads given in this Code have allowed for small dynamic effects and should be sufficient for most structures without the need for further dynamic checks. However they do not cover the special type of loading conditions, for example, caused by the rhythmical and synchronized movement of crowds or the operation of some types of machinery. Where necessary, the designer should make reference to specialist literature for design of these types of dynamic effect.

3.10.2 For workshops, factories and other buildings for industrial use and where no specific information on machinery is available, the buildings or part of the buildings should be designed for the following additional imposed loads:

(a) for the purpose of determining the design of slabs and beams only, a vertical uniformly distributed load of 2.5 kPa; and

(b) for the purpose of determining the design of structural frames and foundations, an additional horizontal force (which may be assumed not to act together with the wind load) of 10% of the vertical imposed load specified in (a) above acting simultaneously on the N number of floors which will produce the most adverse effects, where N is a whole number not less than 0.2 times the total number of floors subject to dynamic effects.

4 IMPOSED LOADS NOT PRESCRIBED IN THIS CODE

4.1 General

4.1.1 Where imposed loads for specific uses are not prescribed in this Code and other sources of reliable information or data about the specific uses are not available, performance based approach as a means to establishing the design imposed loads for the specific uses may be adopted, subject to the acceptance of the Building Authority.

4.2 Approaches

4.2.1 In using the performance based approach, the imposed load to be adopted for design should have regard to the greatest applied load likely to arise during the service life of the building, street, building works or street works for the intended use and shall be determined from:

(a) measured load information together with a probability-based analysis with the design imposed load not more than 5 percent probability of the design imposed load being exceeded during the service life;

or

(b) an assessment of the imposed load for the intended use resulting from:
  (i) assembly of people;
  (ii) accumulation of equipment and furnishings; and
  (iii) storage of materials.

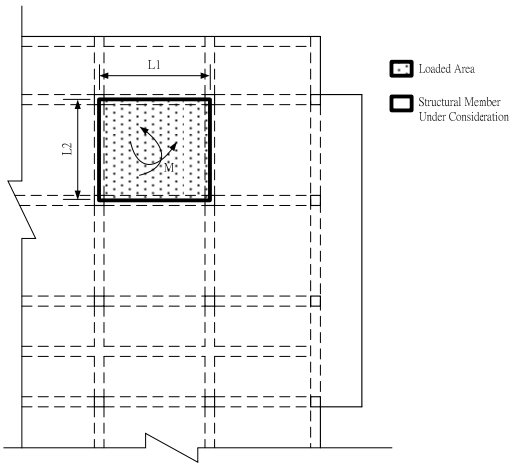
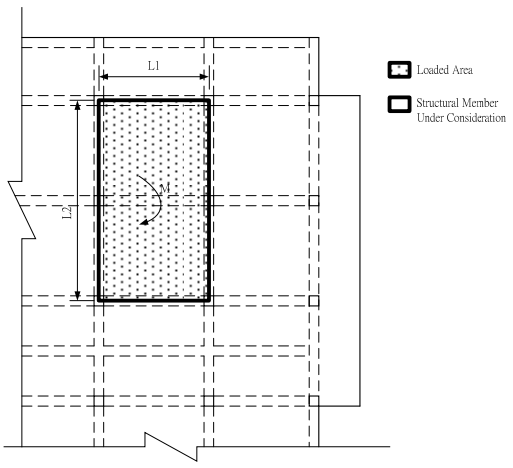
Appendix A

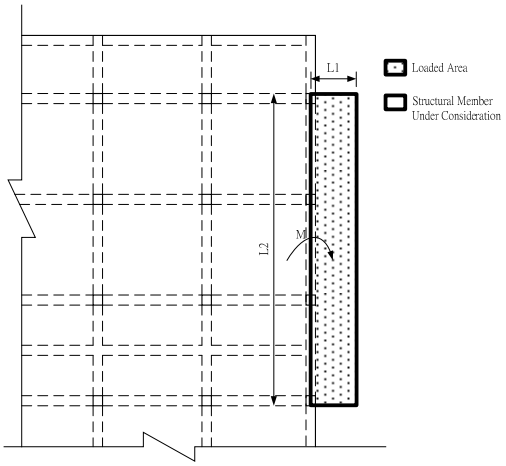
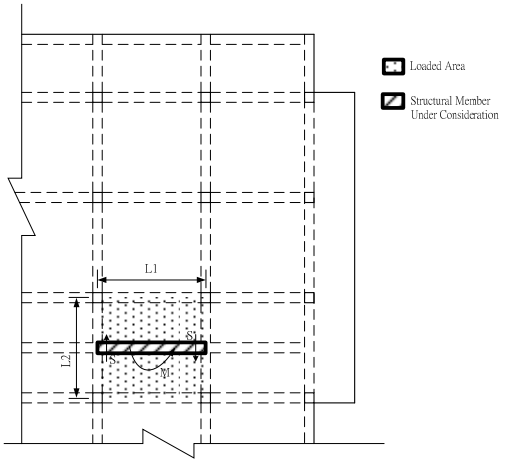
Density of Materials

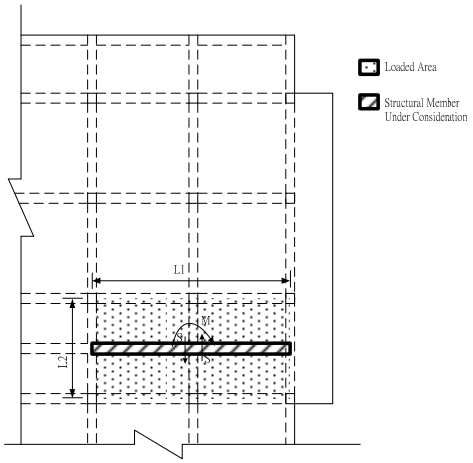
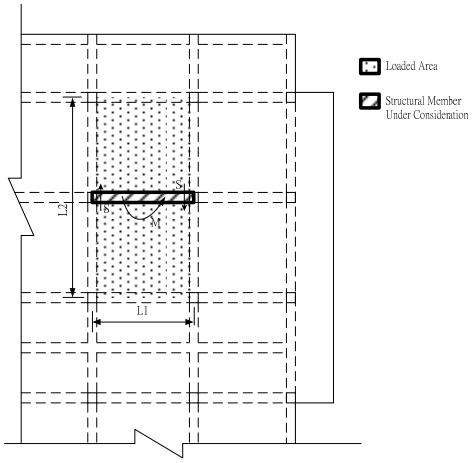
Materials		Density (kN/m³)
Concrete (normal weight aggregate, with or without PFA)	Plain	23.6
	Reinforced	24.5
	Prestressed	24.5
Brick and block work	Brick work	21.7
	Concrete blocks	20.6
Metals	Aluminium	27.2
	Brass	83.3
	Bronze	87.7
	Copper	87.7
	Iron (cast)	70.7
	Iron (wrought)	75.4
	Lead	111.0
	Steel	77.0
	Zinc	70.0
Mortar	Cement mortar	23
	Gypsum mortar	18
	Lime-cement mortar	20
	Lime mortar	18
Natural stone	Granite	29
	Marble	27
	Basalt	30
	Sandstone	25
	Slate	28
Wood	Timber	Refer to suppliers specifications
	Hardboard	11
	Chipboard	8
	Plywood	6
	Blockboard	5
	Wood-wool	6
Other materials	Glass	26
	Soil	20
	Acrylic sheet	12
	Asphaltic concrete	25
	Mastic asphalt	18
	Hot rolled asphalt	23

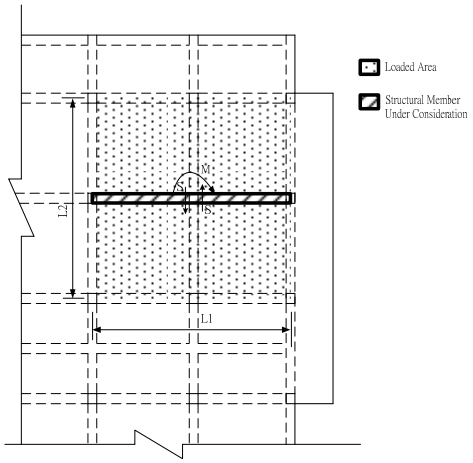
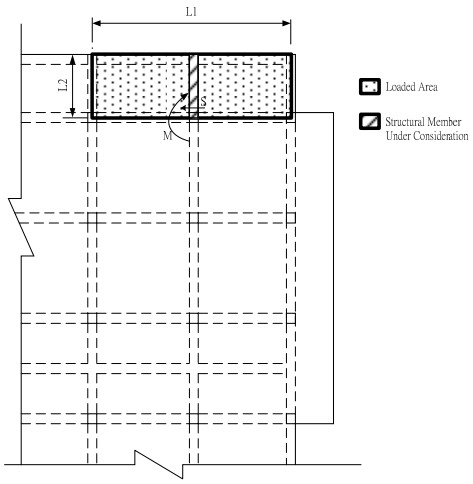
Appendix B

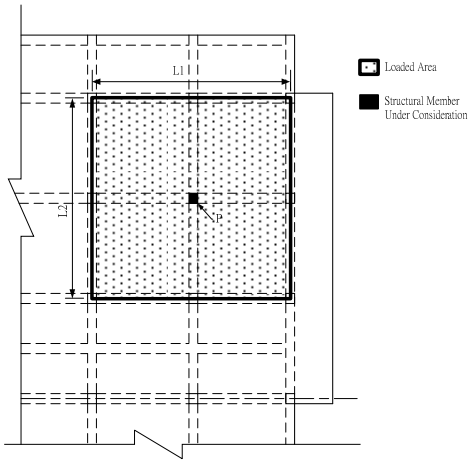
Examples of Loaded Length for Different Structural Design Parameters for Area Class 6B, 6C and 6D

Design Parameter	Loaded Area / Loaded Length
1. Mid-span Moment (M) of Slab	 Loaded Length = The Shorter of L1 or L2
2. Support Moment (M) of Slab	 Loaded Length = The Shorter of L1 or L2

Design Parameter	Loaded Area / Loaded Length
3. Support Moment (M) of Cantilevered Slab	 Loaded Length = The Shorter of L1 or L2
4. Mid-span Moment (M)/Shear (S) of Secondary Beam	 Loaded Length = The Shorter of L1 or L2

Design Parameter	Loaded Area / Loaded Length
5. Support Moment (M)/ Shear (S) of Secondary Beam	 Loaded Length = The Shorter of L1 or L2
6. Mid-span Moment (M)/ Shear (S) of Main Beam	 Loaded Length = The Shorter of L1 or L2

Design Parameter	Loaded Area / Loaded Length
7. Support Moment (M)/ Shear (S) of Main Beam	 Loaded Length = The Shorter of L1 or L2
8. Support Moment (M)/ Shear (S) of Cantilevered Beam	 Loaded Length = The Shorter of L1 or L2

Design Parameter	Loaded Area / Loaded Length
9. Axial Load (P) of Column	 Loaded Length = The Shorter of L1 or L2

Appendix C

Loading Curves for Area Class 6B, 6C and 6D

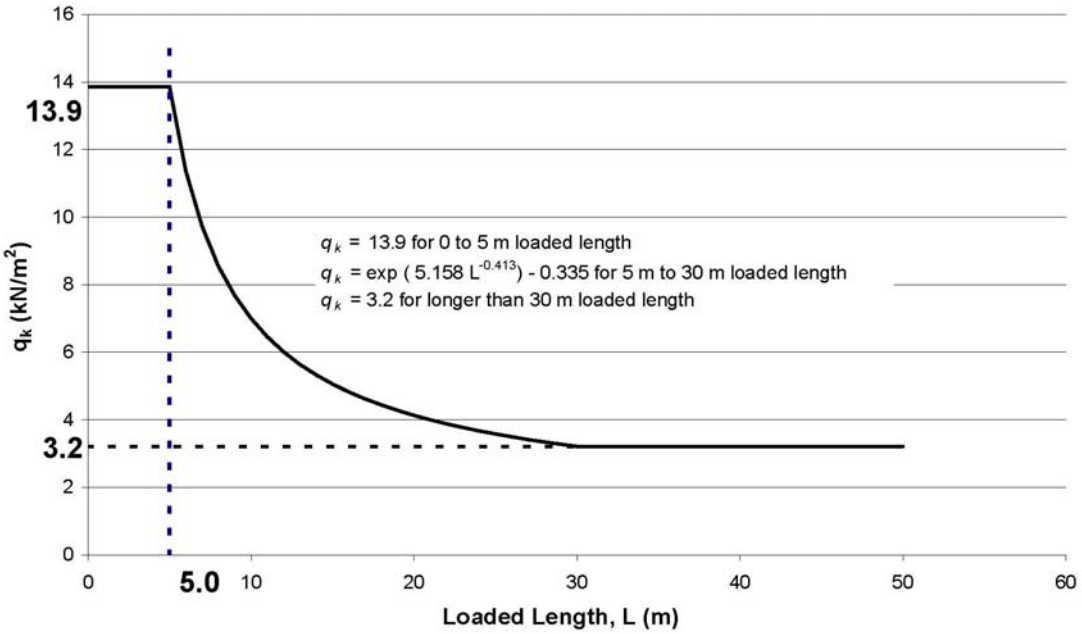


Figure C1: Loading Curve for Area Class 6B

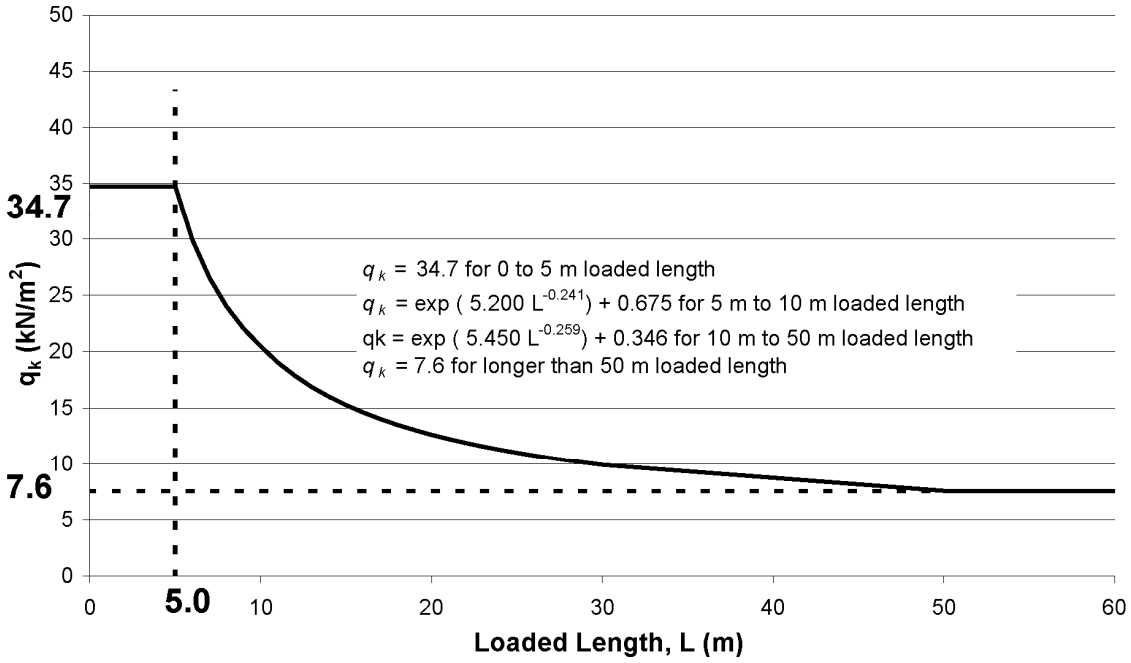


Figure C2: Loading Curve for Area Class 6C

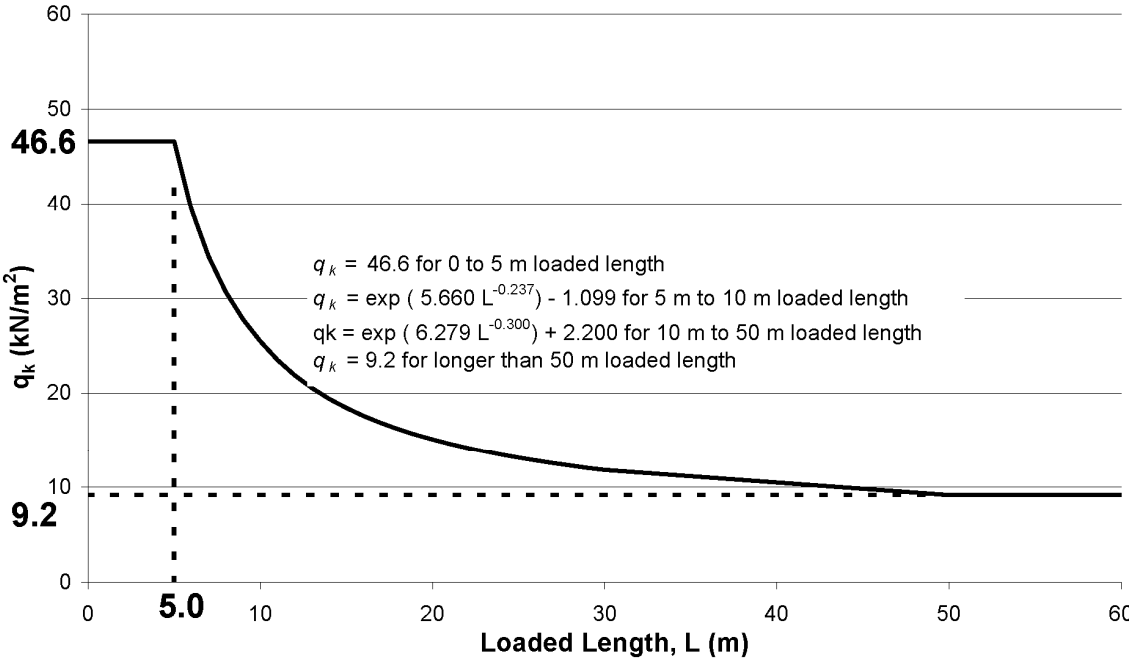


Figure C3: Loading Curve for Area Class 6D