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NATIONAL STANDARD

OF THE PEOPLE'S REPUBLIC OF CHINA

中华人民共和国国家标准

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GB 50009-2012

Load Code for the Design of Building Structures

建筑结构荷载规范

Issued on: May 28, 2012

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Chief Development Department: Ministry of Housing and Urban-Rural Development of the People's Republic of China

Approval Department: Ministry of Housing and Urban-Rural Development of the People's Republic of China

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NOTICE

This code is written in Chinese and English. The Chinese text shall be taken as the ruling one in the event of any inconsistency between the Chinese text and the English text.

Announcement of the Ministry of Housing and Urban-Rural Development of the People's Republic of China

No. 1405

Announcement on Publishing the National Standard of "Load Code for the Design of Building Structures"

"Load Code for the Design of Building Structures" has been approved as a national standard with a serial number of GB 50009−2012, and shall be implemented on October 1, 2012. Therein, Articles 3.1.2, 3.1.3, 3.2.3, 3.2.4, 5.1.1, 5.1.2, 5.3.1, 5.5.1, 5.5.2, 7.1.1, 7.1.2, 8.1.1 and 8.1.2 are compulsory provisions and must be enforced strictly. The original "Load Code for the Design of Building Structures" GB 50009−2001 (2006 Edition) shall be abolished simultaneously.

Authorized by the Research Institute of Standards and Norms of the Ministry of Housing and Urban-Rural Development of the People's Republic of China, this code is published and distributed by the China Architecture & Building Press.

Ministry of Housing and Urban-Rural Development of the People's Republic of China

May 28, 2012

Foreword

According to the requirements of the Ministry of Housing and Urban-Rural Development of the People's Republic of China—"Notice on Printing 'Development and Revision Plan of National Engineering Construction Standards and Codes in 2009'" (Jian Biao [2009] No. 88), this code is revised from the national standard "Load Code for the Design of Building Structures" GB 50009–2001 (2006 Edition) by the China Academy of Building Research jointly with the organizations concerned. During the revision process, the drafting group seriously summed up the design experience in recent years, made reference to the relevant content of the foreign codes and international standards, developed multiple monographic studies, extensively solicited for the comments of construction competent departments as well as design, research and teaching organizations nationally, and finally finalized upon review through repeated discussion, modification and trial design.

This code comprises 10 chapters and 9 appendixes with the main technical contents as follows: general provisions, terms and symbols, classification and combination of loads, permanent load, live load on floors and roofs, crane load, snow load, wind load, thermal action and accidental load.

The main technical contents in the revision of this code: 1. The provisions for adjustment coefficient of variable load considering design working life are added; 2. The accidental load combination expression is added; 3. Chapter 4 "Permanent Load" is added; 4. The characteristic values of uniformly distributed live loads on floors and roofs of partial civil buildings are adjusted and supplemented, and the provisions for the value of live load of fire engine in the design of wall, column and foundation are modified, and the live loads on railings are modified and supplemented; 5. The conditions of nonuniform snow distribution on partial roofs are supplemented; 6. The exposure factor for wind load and the peak topography correction coefficient are adjusted; 7. The shape factor of wind load and the local shape factor are supplemented and perfected, the value range of interference effect coefficient of tall building complex is supplemented, and the provisions for wind tunnel test equipment and method requirements are added; 8. The calculation expression and calculation parameter of along-wind vibration coefficient are modified, and the provisions for the calculation principle of the wind vibration of large-span roof structures are added; 9. The provisions for the calculation of equivalent wind load for across-wind and torsional vibration are added, and the provisions for the combination conditions of along-wind load and equivalent wind load for across-wind and torsional vibration are added; 10. The calculation formula and table of gust factor are modified; 11. Chapter 9 "Thermal Action" is added; 12. Chapter 10 "Accidental Load" is added; 13. Appendix B "Reduction Factor of Fire Engine Load Accounting for the Influence of Covered Soil" is added; 14. The reference snow pressure and reference wind pressure of partial cities are adjusted by counting the snow pressure and wind pressure of each meteorological station throughout the country again based on the new observed data, and the new reference snow pressure and reference wind pressure maps throughout the country are drawn; 15. The reference air temperature of each meteorological station throughout the country are given by counting based on the monthly average maximum and monthly average minimum air temperature data over the years, and the reference air temperature distribution maps throughout the country are added; 16. Appendix H "Equivalent Wind Load for Across-wind and Torsional Vibration" is added; 17. Appendix J "Acceleration of Wind Induced Along-wind and Across-wind Vibration for Tall Buildings" is added.

In this code, the provision(s) printed in bold type is (are) compulsory one(s) and must be enforced strictly.

The Ministry of Housing and Urban-Rural Development of the People's Republic of China is in charge of the administration of this code and the explanation of the compulsory provisions, and the China Academy of Building Research is responsible for the explanation of specific technical contents. During the process of implementing this code, the relevant opinions or advice, whenever necessary, can be posted or passed on to the national standard "Load Code for the Design of Building Structures" Administrative Group of China Academy of Building Research (Address: No. 30, North Third Ring East Road, Beijing, 100013, China).

Chief Development Organization: China Academy of Building Research

Participating Development Organizations:

Tongji University

China Architecture Design and Research Group

China Institute of Building Standard Design & Research

Beijing Institute of Architectural Design

CMA Public Meteorological Service Center

Harbin Institute of Technology

Dalian University of Technology

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1 General Provisions

1.0.1 This code is formulated with a view to adapting the need of the building structure design and meeting the requirements of safety and usability, economy and rationality.

1.0.2 This code is applicable to the structural design of building engineering.

1.0.3 This code is formulated in accordance with the basic principles specified in the national standard "Unified Standard for Reliability Design of Engineering Structures" GB 50153−2008.

1.0.4 The actions concerned in the building structure design shall cover direct action (load) and indirect action. This code only specifies load and thermal action, and the provisions for the relevant variable load are also applicable to the thermal action.

1.0.5 The loads concerned in the building structure design shall not only comply with this code, but also those in the current relevant ones of the nation.

2 Terms and Symbols

2.1 Terms

2.1.1 Permanent load

Load of which the value does not vary with time during the structure use period, or of which the variation may be neglected compared with the average value, or of which the variation is monotonous and trends to the limit.

2.1.2 Variable load

Load of which the value varies with time during the structure use period, and of which the variation cannot be neglected compared with the average value.

2.1.3 Accidental load

Load which does not always occur within the design working life of the structure, but its quantity value is very large once occurred and its duration is very short.

2.1.4 Representative values of a load

They are used to check the quantity value of loads adopted in the limit state in the design, such as characteristic value, combination value, frequent value and quasi-permanent value.

2.1.5 Design reference period

Time parameter which is selected to determine the representative value of variable load.

2.1.6 Characteristic value/nominal value

Basic representative value of load and characteristic value of maximum load statistical distribution within the design reference period (such as mean, mode, median or some tantile).

2.1.7 Combination value

For variable load, load value which can make the exceedance probability of the combined load effect within the design reference period consistent with the corresponding probability when this load occurs separately; or load value which can make the combined structure have a unified reliability index.

2.1.8 Frequent value

For variable load, load value that the total exceedance time is the specified smaller ratio or the exceedance frequency is the specified frequency within the design reference period.

2.1.9 Quasi-permanent value

For variable load, load value that the total exceedance time is about one half of the design reference period within the design reference period.

2.1.10 Design value of a load

Product of representative value and partial coefficient of a load.

2.1.11 Load effect

Reaction of structure or structural member caused by load, such as internal force, deformation and cracking.

2.1.12 Load combination

Provisions for various design values of loads emerging simultaneously in order to ensure structure reliability in the limit state design.

2.1.13 Fundamental combination

Combination of permanent load and variable load in calculation of limit state of bearing capacity.

2.1.14 Accidental combination

Combination of permanent load, variable load and one accidental load in calculation of limit state of bearing capacity, and combination of permanent load and variable load in checking of monolithic stability of damaged structure after accidental event occurs.

2.1.15 Characteristic/nominal combination

Combination that adopts characteristic value or combination value as the representative value of a load in calculation of limit state of normal use.

2.1.16 Frequent combination

For variable load, combination that adopts frequent value or quasi-permanent value as the representative value of a load in calculation of limit state of normal use.

2.1.17 Quasi-permanent combination

For variable load, combination that adopts quasi-permanent value as the representative value of a load in calculation of limit state of normal use.

2.1.18 Equivalent uniform live load

Discontinuously distributed actual load on floor in structural design, which is generally replaced with uniform load; the equivalent uniform live load refers to the uniform load that the load effect obtained from its structure can keep consistent with the actual load effect.

2.1.19 Tributary area

Floor area for member load calculation in consideration of uniform load reduction of members such as beam and column.

2.1.20 Dynamic coefficient

Equivalent coefficient adopted for structure or member bearing dynamic load in static design, of which the value is the ratio of maximum dynamic effect to corresponding static effect of structure or member.

2.1.21 Reference snow pressure

Reference pressure of snow load, generally determined based on the 50-year maximum value obtained through probability statistics according to the snow self-weight observation data on the local open and flat ground surface.

2.1.22 Reference wind pressure

Reference pressure of wind load, wind speed generally determined based on the 50-year maximum value obtained through probability statistics according to the 10min average wind speed observation data at 10m height on the local open and flat ground surface, and wind pressure determined reconsidering corresponding air density according to Bernoulli Formula (E.2.4).

2.1.23 Terrain roughness

Grade for describing the distribution condition of irregular obstructions above this ground where wind blows across 2km range before reaching the structure.

2.1.24 Thermal action

Action caused by temperature variation in structure or structural member.

2.1.25 Shade air temperature

Temperature measured in a standard thermometer screen and recorded at regular time by the hour.

2.1.26 Reference air temperature

Reference value of air temperature, which is determined through statistics according to the average maximum air temperature in the months with maximum temperature and the average minimum air temperature in the months with minimum temperature over the years by taking 50-year monthly average maximum air temperature and monthly average minimum air temperature.

2.1.27 Uniform temperature

Temperature which is a constant in the whole section of the structural member and leads the expansion or contraction of the structural member.

2.1.28 Initial temperature

Temperature when the structure forms an entirely-confined structural system in some particular construction stage, also called healing temperature.

2.2 Symbols

2.2.1 Representative values and combinations of loads

A_d——Characteristic value of accidental load;

C——Specified limit when the structure or member reaches the normal use requirements;

G_k——Characteristic value of permanent load;

Q_k——Characteristic value of variable load;

R_d——Design value of resistance of structural member;

S_{A_d}——Characteristic value of accidental load effect;

S_{Gk}——Characteristic value of permanent load effect;

S_{Qk}——Characteristic value of variable load effect;

S_d——Design value of load effect combination;

γ_0——Significance coefficient of structure;

γ_G——Partial coefficient of permanent load;

γ_Q——Partial coefficient of variable load;

γ_{L_j}——Adjustment coefficient of variable load considering design working life;

ψ_c——Combination value coefficient of variable load;

ψ_f——Frequent value coefficient of variable load;

ψ_q——Quasi-permanent value coefficient of variable load.

2.2.2 Snow load and wind load

$a_{D,z}$——Acceleration of along-wind vibration at z height of tall buildings (m/s^2);

$a_{L,z}$——Acceleration of across-wind vibration at z height of tall buildings (m/s^2);

B——Windward side width of structure;

B_z——Background component factor of fluctuating wind load;

C'_L——Across-wind force coefficient;

C'_T——Wind-induced torque coefficient;

C_m——Angle edge correction coefficient of across-wind force;

C_{sm}——Angle edge correction coefficient of power spectrum of across-wind force;

D——Structural plane depth (along-wind dimension) or diameter;

f_1——Natural vibration frequency of the first order of structure;

f_{T1}——Natural vibration frequency of the first order torsion of structure;

f_1^*——Reduced frequency;

f_{T1}^*——Reduced frequency of torsion;

F_{Dk}——Characteristic value of along-wind force in unit height;

F_{Lk}——Characteristic value of along-wind force in unit height;

T_{Tk}——Characteristic value of wind-reduced torque in unit height;

g——Gravity acceleration or peak factor;

H——Structure height or peak height;

I_{10}——Nominal turbulence intensity of wind at 10m height;

K_L——Correction coefficient of across-wind vibration mode;

K_T——Correction coefficient of torsional vibration mode;

R——Resonant component factor of fluctuating wind load;

R_L——Resonance factor of across-wind vibration;

R_T——Resonance factor of wind-induced torsional vibration;

Re——Reynolds number;

St——Strouhal number;

S_k——Characteristic value of snow load;

S_0——Reference snow pressure;

T_1——Natural vibration period of the first order of structure;

T_{L1}——Natural vibration period of the across-wind first order of structure;

T_{T1}——Natural vibration period of the first order of structure torsion;

ω_0——Reference wind pressure;

ω_k——Characteristic value of wind load;

ω_{Lk}——Characteristic value of wind load equivalent to across-wind vibration;

ω_{Tk}——Characteristic value of wind load equivalent to wind-induced torsional vibration;

α——Slope angle, or wind speed profile index;

β_z——Dynamic response factor at z height;

β_{gz}——Gust factor;

v_{cr}——Critical wind speed of across-wind resonance;

v_H——Wind speed at the top of structure;

μ_r——Distribution factor for roof snow load;

μ_z——Exposure factor for wind pressure;

μ_s——Shape factor of wind load;

μ_{sl}——Local shape factor of wind load;

η——Correction coefficient of wind load landform;

η_a——Fluctuation coefficient of acceleration of along-wind vibration;

ρ——Air density or snow density;

ρ_x, ρ_z——Correlation coefficient of fluctuating wind load in horizontal and vertical directions;

φ_z——Coefficient of vibration mode of structure;

ζ——Damping ratio of structure;

ζ_a——Across-wind aerodynamic damping ratio.

2.2.3 Thermal action

T_{max}, T_{min}——Monthly average maximum air temperature and monthly average minimum air temperature;

$T_{s,max}$, $T_{s,min}$——Maximum average temperature and minimum average temperature of structure;

$T_{0,max}$, $T_{0,min}$——Maximum initial temperature and minimum initial temperature of structure;

ΔT_k——Characteristic value of uniform temperature action;

α_T——Coefficient of linear expansion of materials.

2.2.4 Accidental load

A_v——Area of access plate (m^2);

K_{dc}——Dynamic coefficient for calculating equivalent uniformly distributed static load in explosion;

m——Mass of automobile or helicopter;

P_k——Characteristic value of impact load;

p_c——Maximum pressure of uniform dynamic load in explosion;

p_v——Verified breakdown pressure of access plate;

q_{ce}——Characteristic value of equivalent uniformly distributed static load in explosion;

t——Impact time;

v——Automobile speed (m/s);

V——Volume of explosion space.

3 Classification and Combination of Loads

3.1 Classification of Loads and Representative Values of Loads

3.1.1 The loads of the building structures may be classified into:

1 Permanent load, including structure self-weight, soil pressure, prestress, etc..

2 Variable load, including live load on floor, live load on roof and ash load, crane load, wind load, snow load, thermal action, etc..

3 Accidental load, including explosive force, impact force, etc..

3.1.2 In the design of building structures, the different loads shall adopt different representative values according to the following requirements:

1 For permanent load, the characteristic value shall be its representative value;

2 For variable load, the characteristic value, combination value, frequent value or quasi-permanent value shall be its representative value according to the design requirements;

3 For accidental load, its representative value shall be determined according to the use characteristics of the building structures.

3.1.3 The determination of the representative value of variable load shall adopt 50-yeardesign reference period.

3.1.4 The characteristic values of loads shall be adopted according to the requirements of each chapter of this code.

3.1.5 In the design of limit state of bearing capacity or the design of limit state of normal use according to the characteristic combination, for variable load, the combination value or characteristic value shall be its representative value according to the specified load combination. The combination value of variable load shall be the characteristic value of variable load multiplied by the load combination value coefficient.

3.1.6 In the design of limit state of normal use according to frequent combination, for variable load, the frequent value or quasi-permanent value shall be its representative value; in the design according to quasi-permanent combination, the quasi-permanent value of variable load shall be its representative value. The frequent value of variable load shall be the characteristic value of variable load multiplied by the frequent value coefficient. The quasi-permanent value of variable load shall be the characteristic value of variable load multiplied by the quasi-permanent value coefficient.

3.2 Combination of Loads

3.2.1 In the design of the building structures, load combination shall be carried out according to the limit state of bearing capacity and the limit state of normal use respectively based on the loads possibly emerging simultaneously on the structure during the use process, and the respective most unfavorable combination shall be taken for design.

3.2.2 For the limit state of bearing capacity, the effect design value of load combination shall be

calculated according to the fundamental combination or accidental combination of the loads, and the following design expression shall be adopted for design:

$$\gamma_0 S_d \leq R_d \tag{3.2.2}$$

Where γ_0——The significance coefficient of structure, shall be adopted according to the requirements of the relevant codes for the design of building structures;

S_d——The effect design value of load combination;

R_d——The design value of resistance of structural member, which shall be determined according to the requirements of the relevant codes for the design of building structures.

3.2.3 The effect design value S_d of fundamental combination of loads shall be determined from the most unfavorable effect design value in the following load combination values:

1 The effect design value controlled by variable load shall be calculated according to the following formula:

$$S_d = \sum_{j=1}^{m} \gamma_{G_j} S_{G_j k} + \gamma_{Q_1} \gamma_{L_1} S_{Q_1 k} + \sum_{i=2}^{n} \gamma_{Q_i} \gamma_{L_i} \psi_{c_i} S_{Q_i k} \tag{3.2.3-1}$$

Where γ_{G_j}——The **partial coefficient of the *j*th permanent load, shall be adopted according to Article 3.2.4 of this code;**

γ_{Q_i}——The **partial coefficient of the *i*th variable load, therein, γ_{Q_1} is the partial coefficient of dominant variable load Q_1, shall be adopted according to Article 3.2.4 of this code;**

γ_{L_i}——The **adjustment coefficient of the *i*th variable load in consideration of design working life, therein, γ_{L_1} is the adjustment coefficient of dominant variable load Q_1 in consideration of design working life;**

$S_{G_j k}$——The **load effect value calculated according to the characteristic value G_{jk} of the *j*th permanent load;**

$S_{Q_i k}$——The **load effect value calculated according to the characteristic value Q_{ik} of the *i*th variable load, therein $S_{Q_1 k}$ is the one playing the control action among all the variable load effects;**

ψ_{c_i}——The **combination value coefficient of the ith variable load Q_i;**

m——The **number of permanent loads participating in combination;**

n——**The number of variable loads participating in combination.**

2 The effect design value controlled by permanent load shall be calculated according to the following formula:

$$S_d = \sum_{j=1}^{m} \gamma_{G_j} S_{G_j k} + \sum_{i=1}^{n} \gamma_{Q_i} \gamma_{L_i} \psi_{c_i} S_{Q_i k} \tag{3.2.3-2}$$

Note: 1 The effect design values in the fundamental combination are only applicable to the conditions that both the loads and load effects are linear;

2 Where there is no obvious judgment for S_{Q_1k}, each variable load effect shall be used as S_{Q_1k} in turn, and the effect design value of the most unfavorable load combination shall be selected.

3.2.4 The partial coefficient of load of fundamental combination shall be adopted according to the following requirements:

1 The partial coefficient of permanent load shall meet the following requirements:

1) Where the permanent load effect is unfavorable to the structure, 1.2 shall be taken for the combination controlled by variable load effect and 1.35 for the combination controlled by permanent load effect;

2) Where the permanent load effect is favorable to the structure, it shall not be greater than 1.0.

2 The partial coefficient of variable load shall meet the following requirements:

1) 1.3 shall be taken for the live load of floor structure of industrial buildings, of which the characteristic value is greater than 4kN/m^2;

2) 1.4 shall be taken for other conditions.

3 For structure overturning, sliding or floating checking, the partial coefficient of the load shall meet the requirements of the relevant codes for the design of building structures.

3.2.5 The adjustment coefficient γ_L of variable load in consideration of design working life shall be adopted according to the following requirements:

1 The adjustment coefficient γ_L of live load on floors and roofs in consideration of design working life shall be adopted in accordance with those specified in Table 3.2.5.

Table 3.2.5 Adjustment Coefficient γ_L of Live Load on Floors and Roofs in Consideration of Design Working Life

Design working life of the structure (year)	5	50	100
γ_L	0.9	1.0	1.1

Note: 1 Where the design working life is not the value in this table, the adjustment coefficient γ_L may be determined according to linear interpolation;

2 For the live load with controllable characteristic value, the adjustment coefficient γ_L of the design working life shall take 1.0.

2 For snow load and wind load, the reference snow pressure and reference wind pressure shall be determined according to Article E.3.3 of this code by taking the recurrence interval as the design working life, or be adopted according to the requirements of the relevant codes.

3.2.6 The effect design value S_d of accidental combination of loads may be adopted according to the following requirements:

1 The effect design value used for the calculation of limit state of bearing capacity shall be calculated according to the following formula:

$$S_d = \sum_{j=1}^{m} S_{G_j k} + S_{A_d} + \psi_{f_1} S_{Q_1 k} + \sum_{i=2}^{n} \psi_{q_i} S_{Q_i k} \tag{3.2.6-1}$$

Where S_{A_d}——The load effect value calculated according to the characteristic value A_d of accidental load;

ψ_{f_1}——The frequent value coefficient of the first variable load;

ψ_{q_i}——The quasi-permanent value coefficient of the ith variable load.

2 The effect design value used for monolithic stability checking of damaged structure after accidental event occurs shall be calculated according to the following formula:

$$S_d = \sum_{j=1}^{m} S_{G_j k} + \psi_{f_1} S_{Q_1 k} + \sum_{i=2}^{n} \psi_{q_i} S_{Q_i k} \tag{3.2.6-2}$$

Note: The design values in combination are only applicable to the conditions that both the loads and load effects are linear.

3.2.7 The limit state of normal use shall adopt characteristic combination, frequent combination or quasi-permanent combination of loads according to the different design requirements, and shall be designed according to the following design expression:

$$S_d \leq C \tag{3.2.7}$$

Where C——The specified limit of structure or structural member reaching the normal use requirements, such as deformation, cracking, amplitude, acceleration and stress limit, which shall be adopted according to the requirements of the relevant codes for the design of the building structures.

3.2.8 The effect design value S_d of characteristic combination of loads shall be calculated according to the following formula:

$$S_d = \sum_{j=1}^{m} S_{G_j k} + S_{Q_1 k} + \sum_{i=2}^{n} \psi_{c_i} S_{Q_i k} \tag{3.2.8}$$

Note: The design values in combination are only applicable to the conditions that both the loads and load effects are linear.

3.2.9 The effect design value S_d of frequent combination of loads shall be calculated according to the following formula:

$$S_d = \sum_{j=1}^{m} S_{G_j k} + \psi_{f_1} S_{Q_1 k} + \sum_{i=2}^{n} \psi_{q_i} S_{Q_i k} \tag{3.2.9}$$

Note: The design values in combination are only applicable to the conditions that both the loads and load effects are linear.

3.2.10 The effect design value S_d of quasi-permanent combination of loads shall be calculated according to the following formula:

$$S_d = \sum_{j=1}^{m} S_{G_j k} + \sum_{i=1}^{n} \psi_{q_i} S_{Q_i k} \tag{3.2.10}$$

Note: The design values in combination are only applicable to the conditions that both the loads and load effects are linear.

4 Permanent Load

4.0.1 The permanent load shall cover the self-weight of structural member, enclosure member, surface course and decoration, fixed equipment and long-term storage, the soil pressure and water pressure, as well as other loads required to be considered according to permanent load.

4.0.2 The characteristic value of the structure self-weight may be determined through calculation according to the design dimension of the structural member and the material self-weight in unit volume.

4.0.3 The unit self-weight of the general material and member may take its average value; for the material and member with larger self-weight variation, the characteristic value of the self-weight shall take the upper limit or lower limit according to the state unfavorable or favorable to the structure. The self-weight of commonly used materials and members in unit volume may be adopted according to Appendix A of this code.

4.0.4 The self-weight of the fixed partition may be considered according to permanent load, and that of the partition whose position may be flexibly arranged shall be considered according to variable load.

5 Live Load on Floors and Roofs

5.1 Uniformly Distributed Live Loads on Floors in Civil Buildings

5.1.1 The characteristic value of uniformly distributed live load on floors in civil buildings, and the combination value coefficient, frequent value coefficient and quasi-permanent value coefficient shall not be less than those specified in Table 5.1.1.

Table 5.1.1 Characteristic Value of Uniformly Distributed Live Load on Floors in Civil Buildings, and the Combination Value Coefficient, Frequent Value Coefficient and Quasi-permanent Value Coefficient

Item	Category			Characteristic value (kN/m^2)	Combination value coefficient ψ_c	Frequent value coefficient ψ_f	Quasi-permanent value coefficient ψ_q
1	(1) Residential building, dormitory, hotel, office building, hospital ward, nursery, kindergarten			2.0	0.7	0.5	0.4
	(2) Laboratory, reading room, conference room, hospital clinics			2.0	0.7	0.6	0.5
2	Classroom, mess hall, canteen, general data archives			2.5	0.7	0.6	0.5
3	(1) Assembly hall, theater, cinema, stand with fixed seats			3.0	0.7	0.5	0.3
	(2) Public laundry			3.0	0.7	0.6	0.5
4	(1) Shop, exhibition hall, station, port, airport hall and its passenger waiting room			3.5	0.7	0.6	0.5
	(2) Stand without fixed seats			3.5	0.7	0.5	0.3
5	(1) Gymnasium, performance stage			4.0	0.7	0.6	0.5
	(2) Sports ground, dance hall			4.0	0.7	0.6	0.3
6	(1) Stack room, archives, storage room			5.0	0.9	0.9	0.8
	(2) Compact stacks			12.0	0.9	0.9	0.8
7	Fan room and elevator machine room			7.0	0.9	0.9	0.8
8	Automobile channel and passenger car parking garage	(1) One-way slab floor (with slab span not less than 2m) and two-way slab floor (with slab span not less than 3m×3m)	Passenger car	4.0	0.7	0.7	0.6
			Fire engine	35.0	0.7	0.5	0.0
		(2) Two-way slab floor (with slab span not less than 6m×6m) and flat slab floor (with column grid not less than 6m×6m)	Passenger car	2.5	0.7	0.7	0.6
			Fire engine	20.O	0.7	0.5	0.0
9	Kitchen	(1) Canteen		4.0	0.7	0.7	0.7
		(2) Others		2.0	0.7	0.6	0.5
10	Bathroom, toilet and washroom			2.5	0.7	0.6	0.5

Table 5.1.1 (continued)

Item	Category		Characteristic value (kN/m^2)	Combination value coefficient ψ_c	Frequent value coefficient ψ_f	Quasi-permanent value coefficient ψ_q
11	Corridor, hallway	(1) Dormitory, hotel, hospital ward, nursery, kindergarten, residential building	2.0	0.7	0.5	0.4
		(2) Office building, canteen, hospital clinics	2.5	0.7	0.6	0.5
		(3) Teaching building and other places with possible dense people	3.5	0.7	0.5	0.3
12	Stair	(1) Multi-storey residential building	2.0	0.7	0.5	0.4
		(2) Others	3.5	0.7	0.5	0.3
13	Balcony	(1) Places with possible dense people	3.5	0.7	0.6	0.5
		(2) Others	2.5	0.7	0.6	0.5

Note: 1 Each live load given in this table is applicable to the general use conditions; where the use load is larger, the conditions are special or there are special requirements, the live load shall be adopted according to the actual conditions;

2 For the live load of stacks in Item 6, where the bookshelf height is greater than 2m, the live load shall also be determined according to the bookshelf height per meter not less than $2.5kN/m^2$;

3 The live load of passenger car in Item 8 is only applicable to the passenger car manning less than 9 persons; the live load of fire engine is applicable to the large vehicle with a total weight of 300kN at full load; where the requirements of this table are not met, the local load of the wheels shall be converted to the equivalent uniform live load according to the equivalence principle of the structure effect;

4 The live load of fire engine in Item 8 shall be determined through linear interpolation according to the span where the slab span of the two-way slab floor is between 3m×3m~6m×6m;

5 The live load of stair in Item 12 shall also be checked according to 1.5kN concentrated load for precast stair tread;

6 Each load in this table excludes partition self-weight and secondary decoration load; the self-weight of the fixed partition shall be considered according to permanent load; where the partition position may be arranged flexibly, the self-weight of the unfixed partition shall be counted in by taking no less than 1/3 of wall weight per linear meter (kN/m) as the additional value of live load on floor, and the additional value shall not be less than $1.0kN/m^2$.

5.1.2 In the design of floor beam, wall, column and foundation, the reduction factor of characteristic value of live load on floors in Table 5.1.1 of this code shall not be less than the following requirements:

1 In the design of floor beam:

1) Where the tributary area of the floor beam in Item 1 (1) exceeds $25m^2$, 0.9 shall be taken;

2) Where the tributary area of the floor beam in Items 1 (2)~7 exceeds $50m^2$, 0.9 shall be taken;

3) 0.8 shall be taken for the secondary beam of one-way slab floor and longitudinal rib of trough slab in Item 8; 0.6 for the main beam of one-way slab floor; and 0.8 for the beam of two-way slab floor;

4) **Items 9~13 shall adopt the reduction factor same as the category of the affiliated buildings.**

2 **In the design of design wall, column and foundation:**

1) **Item 1 (1) shall be adopted in accordance with those specified in Table 5.1.2;**

2) **Items 1 (2)~7 shall adopt the reduction factor same as the floor beam;**

3) **For the passenger car in Item 8, 0.5 shall be taken for one-way slab floor and 0.8 for two-way slab floor and flat slab floor;**

4) **Items 9~13 shall adopt the reduction factor same as the category of the affiliated buildings.**

Note: The tributary area of the floor beam shall be determined according to the actual area within the range of stretching one half of the beam spacing along both sides of the beam.

Table 5.1.2 Reduction Factor of Live Load by Storey

Storey number above calculation section of wall, column and foundation	1	2~3	4~5	6~8	9~20	>20
Reduction factor of sum of live loads on each storey above calculation section	1.00 (0.90)	0.85	0.70	0.65	0.60	0.55

Note: Where the tributary area of the floor beam exceeds 25m^2, the coefficient in parentheses shall be adopted.

5.1.3 In the design of wall and column, the live load of fire engine in Item 8 of Table 5.1.1 of this code may be considered according to the actual conditions; in the design of foundation, the load of fire engine may not be considered. The live load of fire engine commonly using slab span may be adopted in accordance with Appendix B according to the reduction factor of covered soil thickness.

5.1.4 The local load on the floor structure may be converted to the equivalent uniformly distributed live load in accordance with Appendix C of this code.

5.2 Live Loads on Floors in Industrial Buildings

5.2.1 All the local loads on floors of industrial buildings, generated by equipment, pipeline, means of transport and removable partition during production use or installation overhaul shall be considered according to the actual conditions, or may be replaced with equivalent uniformly distributed live load. For the conditions that the equipment position is fixed, the structure may be calculated directly according to the fixed position, but the most unfavorable effect to the position change during equipment installation and maintenance shall be considered. The areas on the floors of industrial buildings, where more and heavier raw materials or finished products are stacked shall be considered according to the actual conditions; and the general stacking condition may be considered according to uniformly distributed live load or equivalent uniformly distributed live load.

Note: 1 The equivalent uniformly distributed live load on floors, including live load on floors for calculating secondary beam, main beam and foundation may be determined respectively in accordance with Appendix C of this code;

2 The general metalworking workshop, instrument and meter production workshop, semiconductor device workshop, cotton textile workshop, tyre preparing workshop and grain processing workshop may be adopted in accordance with Appendix D of this code, in the absence of data.

5.2.2 The operation load of equipment-free area on the floors (including working platform) of industrial buildings, including the self-weight of operating personnel, general tool, sporadic raw materials and finished products, may be considered according to a uniformly distributed live load of 2.0kN/m^2. The operation load and stacking load in the equipment area may not be considered. The live load of stair of production workshop may be adopted according to the actual conditions, but should not be less than 3.5kN/m^2. The live load of visiting corridor of production workshop may adopt 3.5kN/m^2.

5.2.3 The combination value coefficient, frequent value coefficient and quasi-permanent value coefficient of live load on floors of industrial buildings shall be adopted according to the actual conditions besides those specified in Appendix D of this code; however, in any case, the combination value and frequent value coefficient shall not be less than 0.7, and the quasi-permanent value coefficient shall not be less than 0.6.

5.3 Live Loads on Roofs

5.3.1 For the building roofs, the characteristic value of uniformly distributed live load on roofs in horizontal projection plane, and the combination value coefficient, frequent value coefficient and quasi-permanent value coefficient shall not be less than those specified in Table 5.3.1.

Table 5.3.1 Characteristic Value of Uniformly Distributed Live Load on Roofs, and Combination Value Coefficient, Frequent Value Coefficient and Quasi-permanent Value Coefficient

Item	Category	Characteristic value (kN/m^2)	Combination value coefficient ψ_c	Frequent value coefficient ψ_f	Quasi-permanent value coefficient ψ_q
1	Unaccessible roof	0.5	0.7	0.5	0.0
2	Accessible roof	2.0	0.7	0.5	0.4
3	Roof garden	3.0	0.7	0.6	0.5
4	Roof sports area	3.0	0.7	0.6	0.4

Note: 1 The unaccessible roof shall be adopted according to the actual conditions where the construction or maintenance load is large; the structures of different types shall be adopted according to the requirements of the relevant codes for design, but shall not be less than 0.3kN/m^2.

2 Where the accessible roof is doubled as other purposes, the live load on corresponding floor shall be adopted;

3 The accumulated water load caused by non-smooth roof drainage, blocking, etc. shall be prevented by taking constructional measures; if necessary, the live load on roof shall be determined according to the possible depth of the accumulated water;

4 The live load of roof garden shall not include the self-weight of materials such as earth and stone in flower garden.

5.3.2 The load of helipad on roofs shall be adopted according to the following requirements:

1 The load of helipad on roofs shall be considered according to local load, or converted to equivalent uniform live load according to local load. The characteristic value of local load shall be determined according to the actual maximum take-off weight of the helicopter; in the absence of technical data on aircraft type, the characteristic value of local load and the action area may be selected in accordance with those specified in Table 5.3.2.

Table 5.3.2 Characteristic Value and Action Area of Local Load of Helipad on Roofs

Type	Maximum take-off weight (t)	Characteristic value of local load (kN)	Action area
Light	2	20	0.20m×0.20m
Medium	4	40	0.25m×0.25m
Heavy	6	60	0.30m×0.30m

2 The characteristic value of equivalent uniform live load of helipad on roofs shall not be less than 5.0kN/m^2.

3 The combination value coefficient of load of helipad on roofs shall take 0.7; the frequent value coefficient shall take 0.6; and the quasi-permanent value coefficient shall take 0.

5.3.3 The uniformly distributed live load on unaccessible roof may not be combined simultaneously with snow load and wind load.

5.4 Ash Load on Roofs

5.4.1 In the design of plants with a mass of ash discharge during production and their adjacent buildings, for the plant roofs of machinery, metallurgy, cement, etc. with certain ash removal facilities and ensuring ash removal systems, the characteristic value of ash load on roofs in horizontal projection plane, and the combination value coefficient, frequent value coefficient and quasi-permanent value coefficient shall be adopted in accordance with those specified in Table 5.4.1-1 and Table 5.4.1-2 respectively.

Table 5.4.1-1 Characteristic Value of Ash Load on Roofs, and Combination Value Coefficient, Frequent Value Coefficient and Quasi-permanent Value Coefficient

Item	Category	Characteristic value (kN/m^2)			Combination value coefficient ψ_c	Frequent value coefficient ψ_f	Quasi-permanent value coefficient ψ_q
		Roof without wind screen	Roof with wind screen				
			Inside wind screen	Outside wind screen			
1	Machinery plant casting workshop (cupola)	0.50	0.75	0.30	0.9	0.9	0.8
2	Steelshop (oxygen blown converter)	—	0.75	0.30			
3	Manganese and ferrochrome workshop	0.75	1.00	0.30			
4	Silicon and ferrotungsten workshop	0.30	0.50	0.30			
5	Sintering chamber and primary mixing chamber	0.50	1.00	0.20			
6	Sintering plant gallery and other workshops	0.30	—	—			
7	Cement plant workshop with ash source (kiln room, grinding room, joint storage, drying room, crushing room)	1.00	—	—			
8	Cement plant workshop without ash source (air compressor station, mechanical workshop, material storage, power distribution station)	0.50	—	—			

Note: 1 The uniform ash load in this table is only applicable to roof slope α not greater than 25°; where α is greater than 45°, the ash load may not be considered; where α is within 25°~45°, the ash load may be valued through interpolation;

2 The load of ash removal facilities shall be considered separately;

3 The ash load in Items 1~4 is only applicable to the roofs within 20m radius from the chimney center; where the adjacent buildings fall into this range, the ash load of Items 1, 3 and 4 shall be adopted according to the workshop roof without wind screen, and that of Item 2 shall be adopted according to the workshop roof outside the wind screen.

Table 5.4.1-2 Characteristic Value of Ash Load on Roofs of Blast Furnace Adjacent Buildings, and Combination Value Coefficient, Frequent Value Coefficient and Quasi-permanent Value Coefficient

Blast furnace volume (m^3)	Characteristic value (kN/m^2)			Combination value coefficient ψ_c	Frequent value coefficient ψ_f	Quasi-permanent value coefficient ψ_q
	Distance from roof to blast furnace (m)					
	≤50	100	200			
<255	0.50	—	—	1.0	1.0	1.0
255~620	0.75	0.30	—			
>620	1.00	0.50	0.30			

Note: 1 Note 1 and Note 2 in Table 5.4.1-1 are also applicable to this table;

2 Where the distance from the roof of the adjacent building to the blast furnace is the median in this table, the value may be obtained through interpolation.

5.4.2 For the area on the roof where it is easy to form ash heap, in the design of roof slab and purlin, the characteristic value of ash load should be multiplied by an amplified coefficient specified below:

1 2.0 shall be taken within the distribution width two times the roof height difference at high-low span but not greater than 6.0m;

2 1.4 shall be taken within the distribution width not greater than 3.0m at the gutter.

5.4.3 The ash load shall be considered simultaneously with the larger one between the snow load and the uniformly distributed live load on unaccessible roof.

5.5 Construction and Maintenance Loads, Horizontal and Vertical Loads on Railings

5.5.1 The construction and maintenance loads shall be adopted according to the following requirements:

1 In the design of roof slab, purlin, reinforced concrete creasing, cantilever awning and precast joist, the characteristic value of construction or maintenance concentrated loads shall not be less than 1.0kN, and shall be checked at the most unfavorable position;

2 The light members or wide members shall be checked according to the actual conditions or shall be arranged with temporary facilities such as base plate and support;

3 In the calculation of bearing capacity of creasing and cantilever awning, one concentrated load shall be taken every other 1.0m along the slab width; in the checking of overturning of creasing and cantilever awning, one concentrated load shall be taken every other 2.5m~3.0m along the slab width.

5.5.2 The characteristic value of live loads on railings of stairs, stands, balconies, accessible roofs, etc. shall not be less than the following requirements:

1 For residential building, dormitory, office building, hotel, hospital, nursery and kindergarten, the horizontal loads at the top of railings shall take 1.0kN/m;

2 For school, canteen, theater, cinema, station, assembly hall, exhibition hall or stadium, the horizontal loads at the top of railings shall take 1.0kN/m and the vertical loads shall take 1.2kN/m; the horizontal and vertical loads shall be considered respectively.

5.5.3 For construction load, maintenance load and railing load, the combination value coefficient shall take 0.7; the frequent value coefficient shall take 0.5; and the quasi-permanent value coefficient shall take 0.

5.6 Dynamic Coefficient

5.6.1 The dynamic calculation in the design of building structures may be in accordance with static calculation method after the self-weight of heavy object or equipment multiplied by a dynamic coefficient, in the presence of adequate criteria.

5.6.2 The dynamic coefficient of carrying and handling heavy objects and of vehicle starting and braking may adopt 1.1~1.3; and its dynamic load only transfers to floor slab and beam.

5.6.3 The load of helicopter on roofs shall also be multiplied by a dynamic coefficient; 1.4 may be taken for the helicopter with hydraulic tyre undercarriage; and the dynamic load only transfers to floor slab and beam.

6 Crane Load

6.1 Vertical and Horizontal Crane Loads

6.1.1 The characteristic value of vertical load of crane shall adopt the maximum wheel pressure or the minimum wheel pressure of the crane.

6.1.2 The longitudinal and transverse horizontal load of crane shall be adopted according to the following requirements:

1 The characteristic value of longitudinal horizontal load of crane shall be adopted according to 10% of the sum of the maximum wheel pressures of all the brake wheels acting on the rail on one side; the action point of this load shall be located at the contact point of brake wheel and rail, and the direction shall be consistent with the rail direction.

2 The characteristic value of transverse horizontal load of crane shall take the percentage of the sum of crane carriage weight and rated lifting capacity and be multiplied by gravity acceleration; the percentage of characteristic value of transverse horizontal load of crane shall be adopted in accordance with those specified in Table 6.1.2.

Table 6.1.2 Percentage of Characteristic Value of Transverse Horizontal Load of Crane

Crane type	Rated lifting capacity (t)	Percentage (%)
Crane with flexible hook	≤10	12
	16~50	10
	≥75	8
Crane with hard hook	—	20

3 The transverse horizontal load of crane shall be halved to both ends of the bridge frame, and equally transferred to the rail by the wheels on the rail; the direction shall be vertical to the rail, and the brake conditions in positive and negative directions shall be considered.

Note: 1 The horizontal load of suspended crane shall be borne by the support system; in the design of this support system, the combination of the wind load and the horizontal load of suspended crane shall also be considered;

2 The horizontal load may not be considered for hand crane and electric hoist.

6.2 Combination of Multi-cranes

6.2.1 Where the calculated bent frame considers the vertical loads of multi-cranes, for each bent frame of single-span plant of single-layer crane, the number of cranes participating in combination should not be more than 2, and should not be more than 4 for each bent frame of multi-span plant of single-layer crane; the single-span plant of double-layer crane should be combined according to the number of upper-layer and lower-layer cranes not more than 2 respectively; the multi-span plant of double-layer crane should be combined according to the number of upper-layer and lower-layer cranes not more than 4 respectively; where the lower-layer crane is at full load, the upper-layer crane shall be calculated according to no load; where the upper-layer crane is at full load, the lower-layer crane shall not be counted in. In consideration of the horizontal loads of multi-cranes, the number of cranes participating in combination shall not be more than 2 for each bent frame of single-span or multi-span

plant.

Note: Where the condition is special, the actual conditions shall be considered.

6.2.2 In the calculation of bent frame, the characteristic value of vertical and horizontal loads of multi-cranes shall be multiplied by a reduction factor specified in Table 6.2.2.

Table 6.2.2 Reduction Factor of Load of Multi-cranes

Number of cranes participating in combination	Working class of crane	
	A1~A5	A6~A8
2	0.90	0.95
3	0.85	0.90
4	0.80	0.85

6.3 Dynamic Coefficients of Crane Loads

6.3.1 In the calculation of bearing capacity of crane beam and its connections, the vertical loads of cranes shall be multiplied by a dynamic coefficient. For the suspended crane (including electric hoist) and the crane with soft hook with working class A1~A5, the dynamic coefficient may take 1.05; for the crane with soft hook with working class A6~A8, the crane with hard hook and other special cranes, the dynamic coefficient may take 1.1.

6.4 Combination Value, Frequent Value and Quasi-permanent Value of Crane Load

6.4.1 The combination value coefficient, frequent value coefficient and quasi-permanent value coefficient of crane load may be adopted in accordance with those specified in Table 6.4.1.

Table 6.4.1 Combination Value Coefficient, Frequent Value Coefficient and Quasi-permanent Value Coefficient of Crane Load

Working class of crane		Combination value coefficient ψ_c	Frequent value coefficient ψ_f	Quasi-permanent value coefficient ψ_q
Crane with flexible hook	Working classA1~A3	0.70	0.60	O.50
	Working classA4 and A5	0.70	0.70	O.60
	Working class A6 and A7	0.70	0.70	O.70
Crane with hard hook and crane with flexible hook with working class A8		0.95	0.95	0.95

6.4.2 In the design of bent frame of plant, the crane load may not be considered in the quasi-permanent combination of loads, but the quasi-permanent value of crane load should be adopted in the design of crane beam according to the limit state of normal use.

7 Snow Load

7.1 Characteristic Value of Snow Load and Reference Snow Pressure

7.1.1 The characteristic value of snow load on roofs in horizontal projection plane shall be calculated according to the following formula:

$$S_k=\mu_r s_0 \tag{7.1.1}$$

Where S_k——The **characteristic value of snow load (kN/m^2);**

μ_r——**The distribution factor for roof snow load;**

s_0——**The reference snow pressure (kN/m^2).**

7.1.2 The reference snow pressure shall adopt the snow pressure with 50-year recurrence interval, which is determined according to the method specified in this code; for the structure sensitive to snow load, the snow pressure with 100-year recurrence interval shall be adopted.

7.1.3 The reference snow pressure of all the cities throughout the country shall be adopted according to the value with a recurrence interval *R* of 50 years in Table E.5 of Appendix E of this code. Where the reference snow pressure of a city or construction site is not given in Table E.5 of this code, the reference snow pressure shall be determined through statistical analysis according to the method specified in Appendix E of this code, in accordance with the local annual maximum snow pressure or snow depth data, and on the basis of the definition of reference snow pressure; and the analysis shall consider the influence of sample size. In the absence of local snow pressure and snow depth data, the reference snow pressure may be determined through comparative analysis on meteorological and topographic conditions according to the reference snow pressure or long-term data specified for nearby areas, or determined approximately according to Annexed Figure E.6.1 (Distribution Map of Reference Snow Pressure throughout the Country) in Appendix E of this code.

7.1.4 The snow load in mountain area shall be determined through actual investigation. In the absence of measured data, the snow load may be adopted according to the snow load value of local adjacent open and flat ground surface multiplied by a coefficient of 1.2.

7.1.5 The combination value coefficient of snow load may take 0.7; the frequent value coefficient may take 0.6; the quasi-permanent value coefficient shall take 0.5, 0.2 and 0 respectively according to Zones I, II and III of snow load; the snow load zones shall be adopted in accordance with those specified in Appendix E.5 or Annexed Figure E.6.2 of this code.

7.2 Distribution Factor for Roof Snow Load

7.2.1 The distribution factor for roof snow load shall be adopted in accordance with those specified in Table 7.2.1 according to the roof type of different categories.

7.2.2 In the design of building structures and supporting members of roofs, the snow distribution condition shall be adopted according to the following requirements:

1 The roof slab and purlin shall be adopted according to the most unfavorable condition of nonuniform snow distribution;

Table 7.2.1 Distribution Factor for Roof Snow Load

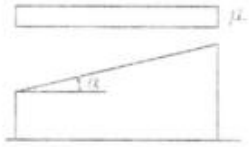
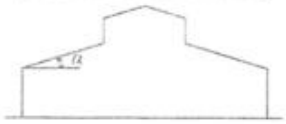
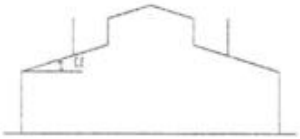
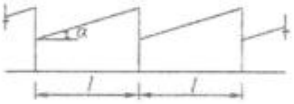
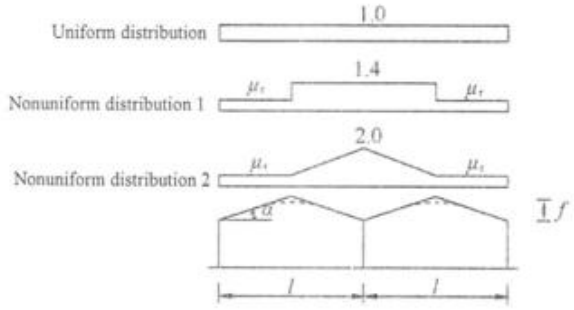
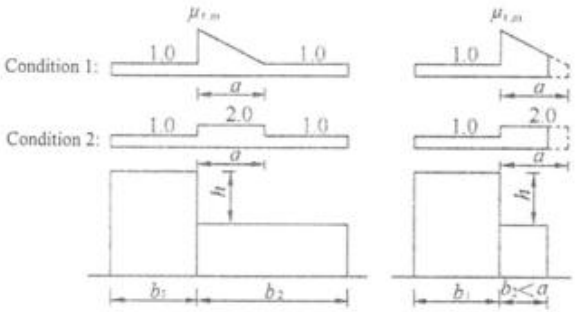
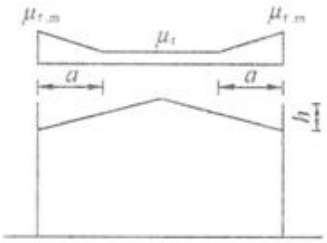
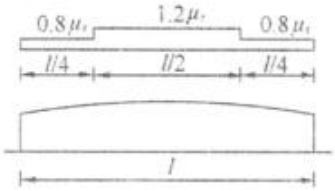
Item	Category	Roof type and snow distribution factor μ_r	Remarks
1	Single-span single-slop roof	 α ≤25° 30° 35° 40° 45° 50° 55° ≥60° μ_r 1.0 0.85 0.7 0.55 0.4 0.25 0.1 0	—
2	Single-span double-slope roof	Uniform distribution μ_r Nonuniform distribution $0.75\mu_r$ $1.25\mu_r$ 	μ_r shall be adopted according to the requirements of Item 1
3	Arched roof	Uniform distribution μ_r Nonuniform distribution $0.5\mu_{r,m}$ $\mu_{r,m}$ $l/4$ $l/4$ $l/4$ $l/4$ l_0 $\mu_r=l/(8f)$ $(0.4\leq\mu_r\leq1.0)$ 60° f l $\mu_{r,m}=0.2+10f/l(\mu_{r,m}\leq2.0)$	—
4	Sloping roof with skylight	Uniform distribution 1.0 Nonuniform distribution 1.1 0.8 1.1 	—
5	Sloping roof with skylight and wind screen	Uniform distribution 1.0 Nonuniform distribution 1.0 1.4 0.8 1.4 1.0 	—
6	Multi-span single-slope roof (serrated roof)	Uniform distribution 1.0 Nonuniform distribution 1 0.6 1.4 0.6 1.4 0.6 1.4 $l/2$ $l/2$ Nonuniform distribution 2 2.0 2.0 2.0 μ_r μ_r μ_r $l/2$ $l/2$  l l	μ_r shall be adopted according to the requirements of Item 1

Table 7.2.1 (continued)

Item	Category	Roof type and snow distribution factor μ_r	Remarks
7	Double-span double-slope or arched roof		μ_r shall be adopted according to the requirements of Item 1 or 3
8	High-low roof	 $a=2h(4\text{m}<a<8\text{m})$ $\mu_r=(b_1+b_2)/2h(2.0\leq\mu_{r,m}\leq4.0)$	—
9	Roof with parapet and other protrusion	 $a=2h$ $\mu_{r,m}=1.5h/s_0(1.0\leq\mu_{r,m}\leq2.0)$	—
10	Large-span roof (l>100m)		1 Snow distribution of Items 2 and 3 shall also be considered simultaneously; 2 μ_r shall be adopted according to the requirements of Item 1 or 3

Note: 1 For single-span double-slope roof in Item 2, the nonuniform distribution condition may be adopted only when the slope α is 20°~30°;

2 Items 4 and 5 are only applicable to the roofs of general industrial plants with slope α not greater than 25°;

3 For double-span double-slope or arched roof in Item 7, where α is not greater than 25° or f/l is not greater than 0.1, only uniform distribution condition can be adopted;

4 The distribution factor for snow load on multi-span roof may be adopted by reference to the requirements of Item 7.

2 The roof truss and arch shell shall be adopted according to the most unfavorable condition in accordance with uniform distribution and nonuniform distribution of full-span snow as well as uniform distribution of half-span snow respectively;

3 The frame and column may be adopted according to the uniform distribution of full-span snow.

8 Wind Load

8.1 Characteristic Value of Wind Load and Reference Wind Pressure

8.1.1 The characteristic value of wind load vertical to the building surface shall be determined according to the following requirements:

1 In the calculation of main load-carrying structures, the characteristic value of wind load shall be calculated according to the following formula:

$$w_k=\beta_z\mu_s\mu_z w_0 \tag{8.1.1-1}$$

Where w_k**——The characteristic value of wind load (kN/m^2);**

β_z**——The dynamic response factor at z height;**

μ_s**——The shape factor of wind load;**

μ_z**——The exposure factor for wind pressure;**

w_0**——The reference wind pressure (kN/m^2).**

2 In the calculation of enclosure structures, the characteristic value of wind load shall be calculated according to the following formula:

$$w_k=\beta_{gz}\mu_{sl}\mu_z w_0 \tag{8.1.1-2}$$

Where β_{gz}**——The gust factor at z height;**

μ_{sl}**——The local shape factor of wind load.**

8.1.2 The reference wind pressure shall adopt the wind pressure with 50-year recurrence interval, which is determined according to the method specified in this code, but shall not be less than 0.3kN/m^2. For the tall buildings, high-rise structures and other structures sensitive to wind load, the reference wind pressure value shall be increased properly, shall meet the requirements of the relevant code for the design of structures.

8.1.3 The reference wind pressure of all the cities throughout the country shall be adopted according to the value with a recurrence interval R of 50 years in Table E.5 of Appendix E of this code. Where the reference wind pressure of a city or construction site is not given in Table E.5 of this code, the reference wind pressure shall be determined through statistical analysis according to the method specified in Appendix E of this code and in accordance with the definition of reference wind pressure and the local annual maximum wind speed data; and the analysis shall consider the influence of sample size. In the absence of local wind speed data, the reference wind pressure may be determined through comparative analysis on meteorological and topographic conditions according to the reference wind pressure or long-term data specified for nearby areas, or determined approximately according to Annexed Figure E.6.3 (Distribution Map of Reference Wind Pressure throughout the Country) in Appendix E of this code.

8.1.4 The combination value coefficient, frequent value coefficient and quasi-permanent value coefficient of wind load may take 0.6, 0.4 and 0.0 respectively.

8.2 Exposure Factor for Wind Pressure

8.2.1 For the flat or slightly undulant topography, the exposure factor for wind pressure shall be determined in accordance with those specified in Table 8.2.1 according to the terrain roughness category. The terrain roughness may be classified into A, B, C and D categories: Category A refers to the offshore sea surface and sea island, coast, lakeshore and desert areas; Category B refers to open country, village, underwood, hill, villages and towns with sparse houses; Category C refers to city proper with dense building complex; Category D refers to city proper with dense building complex and taller buildings.

Table 8.2.1 Exposure Factor for Wind Pressure μ_z

Distance to ground surface or sea level (m)	Terrain roughness category			
	A	B	C	D
5	1.09	1.00	0.65	0.51
10	1.28	1.00	0.65	0.51
15	1.42	1.13	0.65	0.51
20	1.52	1.23	0.74	0.51
30	1.67	1.39	0.88	0.51
40	1.79	1.52	1.00	0.60
50	1.89	1.62	1.10	0.69
60	1.97	1.71	1.20	0.77
70	2.05	1.79	1.28	0.84
80	2.12	1.87	1.36	0.91
90	2.18	1.93	1.43	0.98
100	2.23	2.00	1.50	1.04
150	2.46	2.25	1.79	1.33
200	2.64	2.46	2.03	1.58
250	2.78	2.63	2.24	1.81
300	2.91	2.77	2.43	2.02
350	2.91	2.91	2.60	2.22
400	2.91	2.91	2.76	2.40
450	2.91	2.91	2.91	2.58
500	2.91	2.91	2.91	2.74
≥550	2.91	2.91	2.91	2.91

8.2.2 For the buildings in mountain areas, the exposure factor for wind pressure may be determined in accordance with those specified in Table 8.2.1 of this code according to the flat terrain roughness category, besides, the correction of the topographic conditions shall also be considered; and the correction coefficient η shall be adopted according to the following requirements:

1 For peak and hillside, the correction coefficient shall be adopted according to the following requirements:

1) The correction coefficient at the top B may be calculated according to the following formula:

$$\eta_B = \left[1 + \kappa \tan\alpha \left(1 - \frac{z}{2.5H}\right)\right]^2 \tag{8.2.2}$$

Where $\tan\alpha$——The slope of peak or hillside on the windward side, taking 0.3 where $\tan\alpha$ is greater than 0.3;

κ——The coefficient, taking 2.2 for peak and 1.4 for hillside;

H——The full height of peak or hillside (m);

z——The height from the calculation position of building to the building ground (m); $z=2.5H$ where $z>2.5H$.

2) The correction coefficient of other positions may take the correction coefficients η_A and η_C of positions A and C as 1 as shown in Figure 8.2.2; the correction coefficient between AB and between BC shall be determined through linear interpolation according to η.

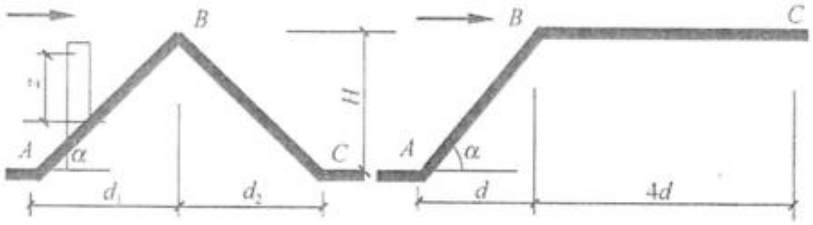


Figure 8.2.2 Diagram of Peak and Hillside

2 For blocked topography such as intramontane basin and valley, η may select 0.75~0.85.

3 For valley mouth and mountain pass consistent with the wind direction, η may select 1.20~1.50.

8.2.3 For the buildings or structures on open sea surface and sea island, the exposure factor for wind pressure may be determined in accordance with those specified in Table 8.2.1 of this code according to Category A roughness, besides, the correction coefficient given in Table 8.2.3 shall also be considered.

Table 8.2.3 Correction Coefficient η of Open Sea Surface and Sea Island

Distance from the coast (km)	η
<40	1.0
40~60	1.0~1.1
60~100	1.1~1.2

8.3 Shape Factor of Wind Load

8.3.1 The shape factor of wind load of buildings and structures may be adopted according to the following requirements:

1 Where the shape of the buildings and structures is similar to that in Table 8.3.1, the shape factor of wind load may be adopted in accordance with those specified in Table 8.3.1;

2 Where the shape of the buildings and structures is different from that in Table 8.3.1, the shape factor of wind load may be adopted according to the relevant data; in the absence of data, the shape factor of wind load should be determined through a wind tunnel test;

3 For the important buildings and structures with complex shape, the shape factor of wind load shall be determined through a wind tunnel test.

Table 8.3.1 Shape Factor of Wind Load

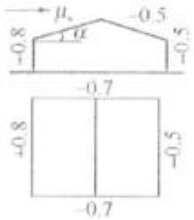
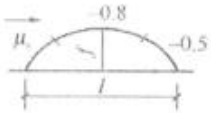
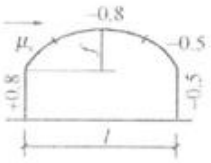
Item	Category	Shape and shape factor μ_s	Remarks
1	Closed floor double-slope roof	 α | μ_s 0° | 0.0 30° | +0.2 ≥60° | +0.8	Median shall be calculated through linear interpolation
2	Closed double-slope roof	 α | μ_s ≤15° | −0.6 30° | 0.0 ≥60° | +0.8	1 Median shall be calculated through linear interpolation; 2 Absolute value of μ_s shall be less than 0.1
3	Closed floor arched roof	 f/l | μ_s 0.1 | +0.1 0.2 | +0.2 0.5 | +0.6	Median shall be calculated through linear interpolation
4	Closed arched roof	 f/l | μ_s 0.1 | −0.8 0.2 | 0.0 0.5 | +0.6	1 Median shall be calculated through linear interpolation; 2 Absolute value of μ_s shall be less than 0.1

Table 8.3.1 (continued)

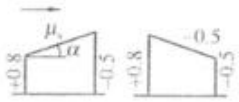
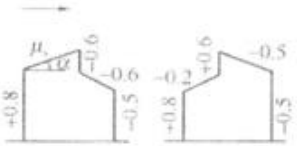
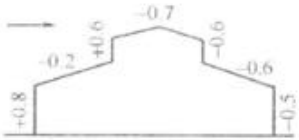
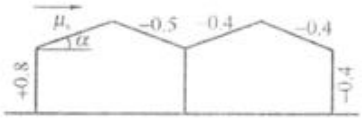
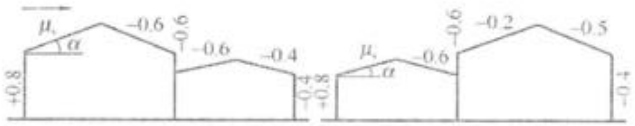
Item	Category	Shape and shape factor μ_s	Remarks
5	Closed single-slope roof		μ_s of windward slope shall be adopted according to Item 2
6	Closed high-low double-slope roof		μ_s of windward slope shall be adopted according to Item 2
7	Closed double-slope roof with skylight		Arched roof with skylight may be adopted according to this diagram
8	Closed double-span double-slope roof		μ_s of windward slope shall be adopted according to Item 2
9	Closed double-span double-slope roof with unequal height and unequal span		μ_s of windward slope shall be adopted according to Item 2

Table 8.3.1 (continued)

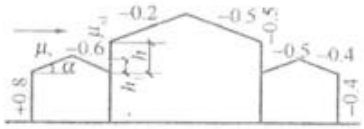
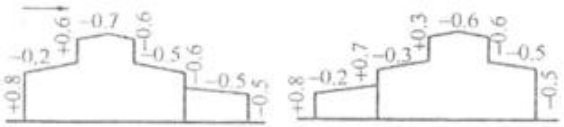
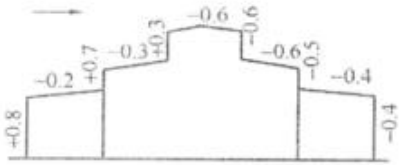
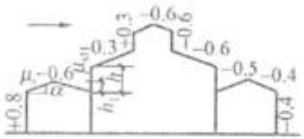
Item	Category	Shape and shape factor μ_s	Remarks
10	Closed three-span double-slope roof with unequal height and unequal span		1 μ_s of windward slope shall be adopted according to Item 2 2 μ_{sl} of windward wall at midspan upside shall be adopted according to the following formula: $\mu_{sl}=0.6\ (1-2h_1/h)$ $\mu_{sl}=-0.6$ where $h_1=h$
11	Closed double-slope roof with skylight and slope		—
12	Closed double-slope roof with skylight and double-slope		—
13	Closed three-span double-slope roof with unequal height and unequal span and with skylight at midspan		1 μ_s of windward slope shall be adopted according to Item 2; 2 μ_{sl} of windward wall at midspan upside shall be adopted according to the following formula: $\mu_{sl}=0.6\ (1-2h_1/h)$ $\mu_{sl}=-0.6$ where $h_1=h$

Table 8.3.1 (continued)

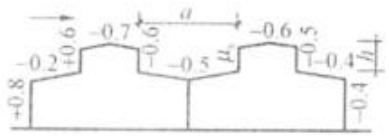
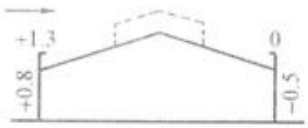
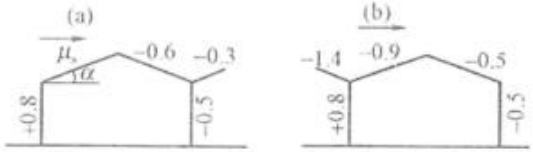
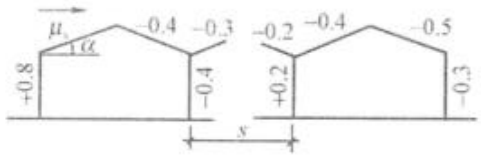
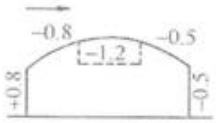
Item	Category	Shape and shape factor μ_s	Remarks
14	Closed double-span double-slope roof with skylight		μ_s of skylight surface at the second span of windward side shall be adopted according to the following requirements: 1 μ_s=0.2 where $a \leq 4h$; 2 μ_s=0.6 where $a>4h$
15	Closed double-slope roof with parapet		Where the roof slope is not greater than 15°, the shape factor on the roof may be adopted according to the roof without parapet
16	Closed double-slope roof with awning		μ_s of windward slope shall be adopted according to Item 2
17	Closed double-slope roof with two opposite awnings		1 This diagram is applicable to the range where s is 8m~20m; 2 μ_s of windward slope shall be adopted according to Item 2
18	Closed double-slope roof or arched roof with sunk skylight		—

Table 8.3.1 (continued)

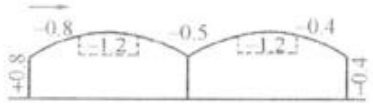
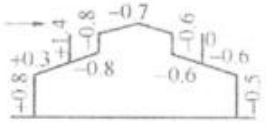
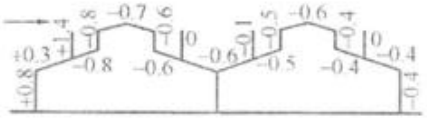
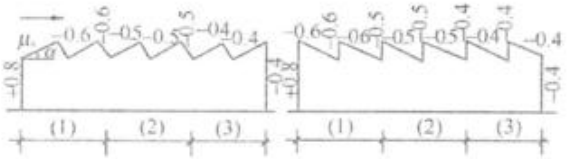
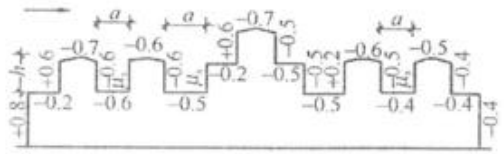
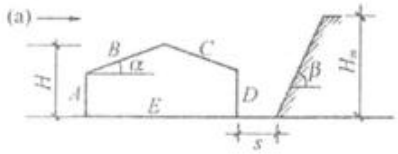
Item	Category	Shape and shape factor μ_s	Remarks
19	Closed double-span double-slope or arched roof with sunk skylight		—
20	Closed sloping roof with skylight and wind screen		—
21	Closed double-span sloping roof with skylight and wind screen		—
22	Closed serrated roof		1 μ_s of windward slope shall be adopted according to Item 2; 2 Where the tooth surface increases or decreases, adjustment may be carried out uniformly within (1), (2) and (3) sections
23	Closed complex multi-span roof		μ_s of skylight surface shall be adopted according to the following requirements: 1 μ_s=0.2 where $a \leq 4h$; 2 μ_s=0.6 where $a > 4h$

Table 8.3.1 (continued)

<table>
<tr><th>Item</th><th>Category</th><th>Shape and shape factor μ_s</th><th>Remarks</th></tr>
<tr><td>24</td><td>Backing closed double-slope roof</td><td>

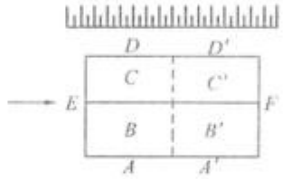
(a)



This diagram is applicable to $H_m/H \geq 2$ and $s/H=0.2\sim0.4$

<table>
<tr><th>β</th><th>α</th><th>A</th><th>B</th><th>C</th><th>D</th><th>E</th></tr>
<tr><td rowspan="3">30°</td><td>15°</td><td>+0.9</td><td>−0.4</td><td>0.0</td><td>+0.2</td><td>−0.2</td></tr>
<tr><td>30°</td><td>+0.9</td><td>+0.2</td><td>−0.2</td><td>−0.2</td><td>−0.3</td></tr>
<tr><td>60°</td><td>+1.0</td><td>+0.7</td><td>−0.4</td><td>−0.2</td><td>−0.5</td></tr>
<tr><td rowspan="3">60°</td><td>15°</td><td>+1.0</td><td>+0.3</td><td>+0.4</td><td>+0.5</td><td>+0.4</td></tr>
<tr><td>30°</td><td>+1.0</td><td>+0.4</td><td>+0.3</td><td>+0.4</td><td>+0.2</td></tr>
<tr><td>60°</td><td>+1.0</td><td>+0.8</td><td>−0.3</td><td>0.0</td><td>−0.5</td></tr>
<tr><td rowspan="3">90°</td><td>15°</td><td>+1.0</td><td>+0.5</td><td>+0.7</td><td>+0.8</td><td>+0.6</td></tr>
<tr><td>30°</td><td>+1.0</td><td>+0.6</td><td>+0.8</td><td>+0.9</td><td>+0.7</td></tr>
<tr><td>60°</td><td>+1.0</td><td>+0.9</td><td>−0.1</td><td>+0.2</td><td>−0.4</td></tr>
</table>

(b)

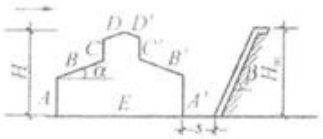


Shape factor μ_s shall be adopted according to the following table:

<table>
<tr><th>β</th><th>ABCD</th><th>E</th><th>A'B'C'D'</th><th>F</th></tr>
<tr><td>15°</td><td>−0.8</td><td>+0.9</td><td>−0.2</td><td>−0.2</td></tr>
<tr><td>30°</td><td>−0.9</td><td>+0.9</td><td>−0.2</td><td>−0.2</td></tr>
<tr><td>60°</td><td>−0.9</td><td>+0.9</td><td>−0.2</td><td>−0.2</td></tr>
</table>

</td><td>—</td></tr>
</table>

Table 8.3.1 (continued)

<table>
<tr><th>Item</th><th>Category</th><th>Shape and shape factor μ_s</th><th>Remarks</th></tr>
<tr><td>25</td><td>Backing closed double-slope roof with skylight</td><td>


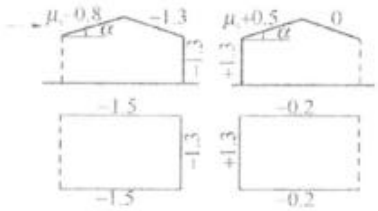
This diagram is applicable to $H_m/H \geq 2$ and s/H=0.2~0.4
Shape factor μ_s shall be adopted according to the following table:
<table>
<tr><th>β</th><th>A</th><th>B</th><th>C</th><th>D</th><th>D'</th><th>C'</th><th>B'</th><th>A'</th><th>E</th></tr>
<tr><td>30°</td><td>+0.9</td><td>+0.2</td><td>−0.6</td><td>−0.4</td><td>−0.3</td><td>−0.3</td><td>−0.3</td><td>−0.2</td><td>−0.5</td></tr>
<tr><td>60°</td><td>+0.9</td><td>+0.6</td><td>+0.1</td><td>+0.1</td><td>+0.2</td><td>+0.2</td><td>+0.2</td><td>+0.4</td><td>+0.1</td></tr>
<tr><td>90°</td><td>+1.0</td><td>+0.8</td><td>+0.6</td><td>+0.2</td><td>+0.6</td><td>+0.6</td><td>+0.6</td><td>+0.8</td><td>+0.6</td></tr>
</table>
</td><td>—</td></tr>
<tr><td>26</td><td>Single-side open double-slope roof</td><td>(a) Opening windward (b) Opening leeward

</td><td>μ_s of windward slope shall be adopted according to Item 2</td></tr>
</table>

Table 8.3.1 (continued)

<table>
<tr><th>Item</th><th>Category</th><th>Shape and shape factor μ_s</th><th>Remarks</th></tr>
<tr><td>27</td><td>Double-side open and four-side open double-slope roof</td><td>(a) Gable on both ends(b) Open on four sides

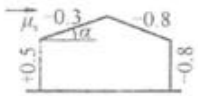
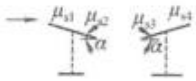
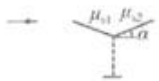
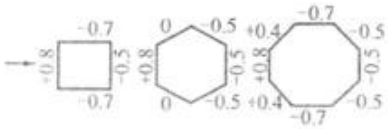
Shape factor μ_s
<table><tr><th>α</th><th>μ_{s1}</th><th>μ_{s2}</th></tr><tr><td>≤10°</td><td>−1.3</td><td>−0.7</td></tr><tr><td>30°</td><td>+1.6</td><td>+0.4</td></tr></table></td><td>1 Median shall be calculated through linear interpolation;
2 The roof in this diagram is sensitive to wind action and the wind pressure is positive and negative, so the design shall consider the reversal of μ_s value;
3 The total horizontal force caused by longitudinal wind load to roof is $0.05A\omega h$ where $\alpha \geq 30°$ and $0.10A\omega h$ where $\alpha < 30°$; where, A is the horizontal projected area of roof and ωh is the wind pressure at roof height h;
4 Where some goods are stacked indoors or the house is at hillside, the roof suction shall be increased and may be adopted according to Item 26 (a)</td></tr>
<tr><td>28</td><td>Double-slope roof with semi-open front and back longitudinal walls</td><td>  </td><td>1 μ_s of windward slope shall be adopted according to Item 2;
2 This diagram is applicable to the building with wall's upper concentrated open area ≥10% and <50%;
3 Where the open area reaches 50%, the factor of leeward wall shall be changed to −1.1</td></tr>
<tr><td>29</td><td>Single-slop and double-slope top cover</td><td>(a)
 
<table><tr><th>α</th><th>μ_{s1}</th><th>μ_{s2}</th><th>μ_{s3}</th><th>μ_{s4}</th></tr><tr><td>≤10°</td><td>−1.3</td><td>−0.5</td><td>+1.3</td><td>+0.5</td></tr><tr><td>30°</td><td>−1.4</td><td>−0.6</td><td>+1.4</td><td>+0.6</td></tr></table></td><td>1 Median shall be calculated through linear interpolation;
2 Shape factor of Item (b) shall be adopted according to Item 27;
3 (b) and (c) shall consider Note 2 and Note 3 in Item 27</td></tr>
</table>

Table 8.3.1 (continued)

<table>
<tr><th>Item</th><th>Category</th><th>Shape and shape factor μ_s</th><th>Remarks</th></tr>
<tr><td>29</td><td>Single-slop and double-slope top cover</td><td>(b)

(c)
 
<table>
<tr><th>α</th><th>μ_{s1}</th><th>μ_{s2}</th></tr>
<tr><td>≤10°
30°</td><td>+1.0
−1.6</td><td>+0.7
−0.4</td></tr>
</table></td><td>1 Median shall be calculated through linear interpolation;
2 Shape factor of Item (b) shall be adopted according to Item 27;
3 (b) and (c) shall consider Note 2 and Note 3 in Item 27</td></tr>
<tr><td>30</td><td>Closed buildings and structures</td><td>(a) Regular polygon (including rectangle) plane
 

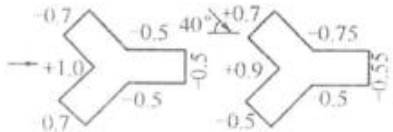
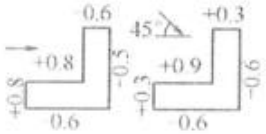
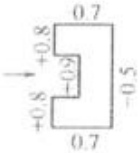
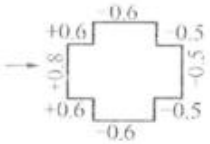
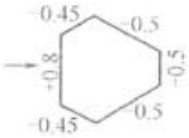
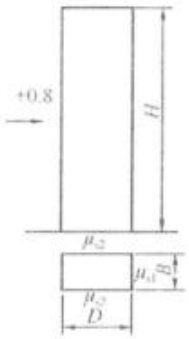
(b) Y-shaped plan
 
</td><td>—</td></tr>
</table>

Table 8.3.1 (continued)

<table>
<tr><th>Item</th><th>Category</th><th>Shape and shape factor μ_s</th><th>Remarks</th></tr>
<tr><td>30</td><td>Closed buildings and structures</td><td>(c) L-shaped plane
 

(d) II-shaped plane
 

(e) Cruciform plane
 

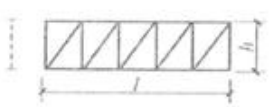
(f) Chamfered trilateral plane
 
</td><td>—</td></tr>
<tr><td>31</td><td>Tall buildings of rectangular section exceeding 45m</td><td> 

<table>
<tr><td>D/B</td><td>≤1</td><td>1.2</td><td>2</td><td>≥4</td></tr>
<tr><td>μ_{s1}</td><td>−0.6</td><td>−0.5</td><td>−0.4</td><td>−0.3</td></tr>
<tr><td>μ_{s2}</td><td colspan="4">−0.7</td></tr>
</table></td><td>—</td></tr>
<tr><td>32</td><td>Members of various sections</td><td>
</td><td>—</td></tr>
</table>

Table 8.3.1 (continued)

<table>
<tr><th>Item</th><th>Category</th><th>Shape and shape factor μ_s</th><th>Remarks</th></tr>
<tr><td>33</td><td>Truss</td><td>

(a)



Shape factor of single truss

$$\mu_{st}=\sigma\mu_s$$

Where, μ_s is the shape factor of truss member, which shall be adopted according to Item 32 for section steel members and according to Item 37 (b) for circular pipe members;

$\sigma=A_n/A$ is the windshield factor of truss;

A_n is the net projected area of truss member and joint windshield;

$A=hl$ is the bounded area of truss.

(b)

Whole shape factor of n parallel trusses

$$\mu_{stw}=\mu_{st}\frac{1-\eta^n}{1-\eta}$$

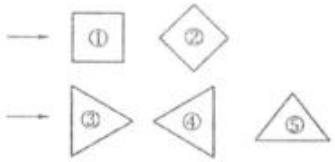
Where, μ_{st} is the shape factor of single truss;

η factor shall be adopted according to the following table.

<table>
<tr><th>ϕ \ b/h</th><th>≤1</th><th>2</th><th>4</th><th>6</th></tr>
<tr><td>≤0.1</td><td>1.00</td><td>1.00</td><td>1.00</td><td>1.00</td></tr>
<tr><td>0.2</td><td>0.85</td><td>0.90</td><td>0.93</td><td>0.97</td></tr>
<tr><td>0.3</td><td>0.66</td><td>0.75</td><td>0.80</td><td>0.85</td></tr>
<tr><td>0.4</td><td>0.50</td><td>0.60</td><td>0.67</td><td>0.73</td></tr>
<tr><td>0.5</td><td>0.33</td><td>0.45</td><td>0.53</td><td>0.62</td></tr>
<tr><td>0.6</td><td>0.15</td><td>0.30</td><td>0.40</td><td>0.50</td></tr>
</table>

</td><td>—</td></tr>
</table>

Table 8.3.1 (continued)

<table>
<tr><th>Item</th><th>Category</th><th>Shape and shape factor μ_s</th><th>Remarks</th></tr>
<tr><td>34</td><td>Independent wall and fence</td><td> </td><td>—</td></tr>
<tr><td>35</td><td>Tower frame</td><td> 

(a) The shape factor μs of angle steel tower frame in monolithic calculation shall be adopted according to the following table.
<table>
<tr><th rowspan="3">ø</th><th colspan="3">Square</th><th rowspan="3">Triangle
Wind direction
③ ④ ⑤</th></tr>
<tr><th rowspan="2">Wind direction ①</th><th colspan="2">Wind direction ②</th></tr>
<tr><th>Single angle steel</th><th>Combined angle steel</th></tr>
<tr><td>≤0.1</td><td>2.6</td><td>2.9</td><td>3.1</td><td>2.4</td></tr>
<tr><td>0.2</td><td>2.4</td><td>2.7</td><td>2.9</td><td>2.2</td></tr>
<tr><td>0.3</td><td>2.2</td><td>2.4</td><td>2.7</td><td>2.0</td></tr>
<tr><td>0.4</td><td>2.0</td><td>2.2</td><td>2.4</td><td>1.8</td></tr>
<tr><td>0.5</td><td>1.9</td><td>1 9</td><td>2 0</td><td>1.6</td></tr>
</table>
(b) Shape factor μ_s of pipe and round steel tower frame in monolithic calculation:
Where $\mu_z\omega_0 d^2$ is not greater than 0.002, μ_s shall be adopted by μ_s value of angle steel tower frame multiplied by 0.8;
Where $\mu_z\omega_0 d^2$ is not less than 0.015, μ_s shall be adopted by μ_s value of angle steel tower frame multiplied by 0.6.</td><td>Median shall be calculated through linear interpolation</td></tr>
</table>

Table 8.3.1 (continued)

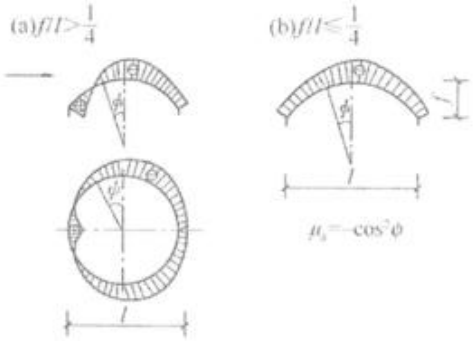
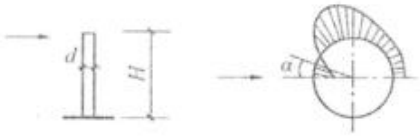
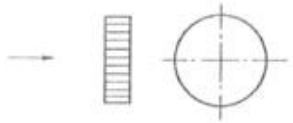
Item	Category	Shape and shape factor μ_s	Remarks
36	Rotary top shell	 $\mu_s=0.5\sin^2\phi\sin\psi-\cos^2\phi$ Where, ψ is a plane angle and ø is an elevation angle.	—
37	Structures of circular section (including chimney, tower, etc.)	(a) Shape factor of surface distribution in local calculation 	1 The value in this table for local calculation in Item (a) is applicable to smooth surface with $\mu_s\omega_0 d^2$ greater than 0.015, where, ω_0 is calculated by kN/m^2 and d is by m. 2 The median in this table for monolithic calculation in Item (b) shall be calculated through linear interpolation; Δ is the surface bulge height

Table 8.3.1 (continued)

<table>
<tr><th>Item</th><th>Category</th><th>Shape and shape factor μ_s</th><th>Remarks</th></tr>
<tr><td>37</td><td>Structures of circular section (including chimney, tower, etc.)</td><td>

A	$H/d \geq 25$	$H/d=7$	$H/d=1$
0°	+1.0	+1.0	+1.0
15°	+0.8	+0.8	+0.8
30°	+0.1	+0.1	+0.1
45°	−0.9	−0.8	−0.7
60°	−1.9	−1.7	−1.2
75°	−2.5	−2.2	−1.5
90°	−2.6	−2.2	−1.7
105°	−1.9	−1.7	−1.2
120°	−0.9	−0.8	−0.7
135°	−0.7	−0.6	−0.5
150°	−0.6	−0.5	−0.4
165°	−0.6	−0.5	−0.4
180°	−0.6	−0.5	−0.4

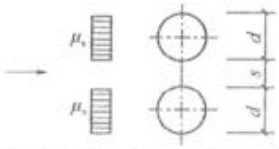
(b) Shape factor in monolithic calculation

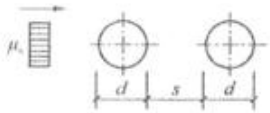


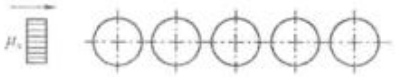
$\mu_s\omega_0 d^2$	Surface condition	$H/d \geq 25$	$H/d=7$	$H/d=1$
≥0.015	$\Delta \approx 0$	0.6	0.5	0.5
	$\Delta=0.02d$	0.9	0.8	0.7
	$\Delta=0.08d$	1.2	1.0	0.8
≤0.002		1.2	0.8	0.7

</td><td>1 The value in this table for local calculation in Item (a) is applicable to smooth surface with $\mu_s\omega_0 d^2$ greater than 0.015, where, ω_0 is calculated by kN/m^2 and d is by m.
2 The median in this table for monolithic calculation in Item (b) shall be calculated through linear interpolation; Δ is the surface bulge height</td></tr>
</table>

Table 8.3.1 (continued)

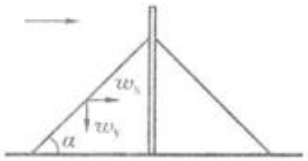
<table>
<tr><th>Item</th><th>Category</th><th>Shape and shape factor μ_s</th><th>Remarks</th></tr>
<tr><td rowspan="3">38</td><td rowspan="3">Overhead pipeline</td><td>(a) Up-down double pipes
 

<table>
<tr><td>s/d</td><td>≤0.25</td><td>0.5</td><td>0.75</td><td>1.0</td><td>1.5</td><td>2.0</td><td>≥3.0</td></tr>
<tr><td>μ_s</td><td>+1.20</td><td>+0.90</td><td>+0.75</td><td>+0.70</td><td>+0.65</td><td>+0.63</td><td>+0.60</td></tr>
</table>
(b) Front-back double pipes
 

<table>
<tr><td>s/d</td><td>≤0.25</td><td>0.5</td><td>1.5</td><td>3.0</td><td>4.0</td><td>6.0</td><td>8.0</td><td>≥10.0</td></tr>
<tr><td>μ_s</td><td>+0.68</td><td>+0.86</td><td>+0.94</td><td>+0.99</td><td>+1.08</td><td>+1.11</td><td>+1.14</td><td>+1.20</td></tr>
</table>
(c) Densely-arrayed pipes
 

μ_s=+1.4</td><td>1 This diagram is applicable to $\mu_s \omega_0 d^2 \geq 0.015$;
2 μ_s value of front-back double pipes in Item (b) is the sum of front-back double pipes, therein, μ_s value of the front pipe is 0.6;
3 μ_s value of densely-arrayed pipes in Item (c) is the sum of all the pipes</td></tr>
</table>

Table 8.3.1 (continued)

<table>
<tr><th>Item</th><th>Category</th><th>Shape and shape factor μ_s</th><th>Remarks</th></tr>
<tr><td>39</td><td>Cable</td><td>


The shape factor μ_{sx} of horizontal component ω_x of wind load and the shape factor μ_{sy} of vertical component ω_y shall be adopted according to the following table:
<table>
<tr><th>α</th><th>μ_{sx}</th><th>μ_{sy}</th><th>α</th><th>μ_{sx}</th><th>μ_{sy}</th></tr>
<tr><td>0°</td><td>0.00</td><td>0.00</td><td>50°</td><td>0.60</td><td>0.40</td></tr>
<tr><td>10°</td><td>0.05</td><td>0.05</td><td>60°</td><td>0.85</td><td>0.40</td></tr>
<tr><td>20°</td><td>0.10</td><td>0.10</td><td>70°</td><td>1.10</td><td>0.30</td></tr>
<tr><td>30°</td><td>0.20</td><td>0.25</td><td>80°</td><td>1.20</td><td>0.20</td></tr>
<tr><td>40°</td><td>0.35</td><td>0.40</td><td>90°</td><td>1.25</td><td>0.00</td></tr>
</table>
</td><td>—</td></tr>
</table>

8.3.2 Where the mutual spacing of multiple buildings, in particular clustered tall buildings are closer, the population effect of mutual interference of wind force should be considered; in general, the shape factor μ_s of the independent building may be multiplied by the mutual interference factor. The mutual interference factor may be determined according to the following requirements:

1 For the tall buildings of rectangular plane, where the single interfering building is close to the interfered building in height, the along-wind load may be selected within 1.00~1.10 and the across-wind load may be selected within 1.00~1.20 according to the position of the interfering building;

2 Other conditions may be determined according to the wind tunnel test data under similar conditions; if necessary, they should be determined through a wind tunnel test.

8.3.3 In the calculation of wind load of enclosure member and its connection, the local shape factor μ_{sl} may be adopted according to the following requirements:

1 The walls and roofs of the buildings of closed rectangular plane may be adopted in accordance with those specified in Table 8.3.3;

2 −2.0 shall be taken for the protruding members such as cornice, awning, sunshading board and decoration strip at arris;

3 Other buildings and structures may be valued according to 1.25 times the shape factor specified in Article 8.3.1 of this code.

Table 8.3.3 Local Shape Factor of Buildings of Closed Rectangular Plane

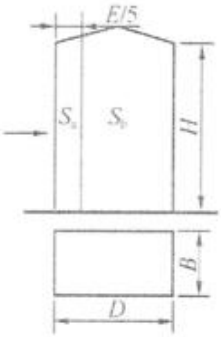
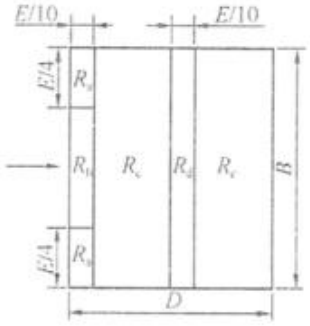
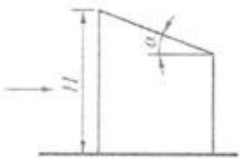
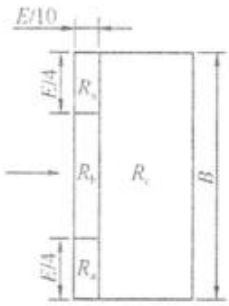
Item	Category	Shape and local shape factor	Remarks
1	Wall of buildings of closed rectangular plane	 Windward side: 1.0 Side: S_a: −1.4; S_b: −1.0 Leeward side: −0.6	E shall take the smaller one between $2H$ and windward width B

Table 8.3.3 (continued)

<table>
<tr><th>Item</th><th>Category</th><th>Shape and local shape factor</th><th>Remarks</th></tr>
<tr><td>2</td><td>Double-slope roof of buildings of closed rectangular plane</td><td>



<table>
<tr><th colspan="2">α</th><th>≤5</th><th>15</th><th>30</th><th>≥45</th></tr>
<tr><td rowspan="2">R_a</td><td>$H/D \le 0.5$</td><td>−1.8
0.0</td><td>−1.5
+0.2</td><td rowspan="2">−1.5
+0.7</td><td rowspan="2">0.0
+0.7</td></tr>
<tr><td>$H/D \ge 1.0$</td><td>−2.0
0.0</td><td>−2.0
+0.2</td></tr>
<tr><td colspan="2">R_b</td><td>−1.8
0.0</td><td>−1.5
+0.2</td><td>−1.5
+0.7</td><td>0.0
+0.7</td></tr>
<tr><td colspan="2">R_c</td><td>−1.2
0.0</td><td>−0.6
+0.2</td><td>−0.3
+0.4</td><td>0.0
+0.6</td></tr>
<tr><td colspan="2">R_d</td><td>−0.6
+0.2</td><td>−1.5
0.</td><td>−0.5
0.0</td><td>−0.3
0.0</td></tr>
<tr><td colspan="2">R_e</td><td>−0.6
0.0</td><td>−0.4
0.0</td><td>−0.4
0.0</td><td>−0.2
0.0</td></tr>
</table>
</td><td>1 E shall take the smaller one between $2H$ and windward width B;
2 Median may be calculated through linear interpolation (interpolation for the item with the same sign);
3 The area with two given values simultaneously shall respectively consider the action of positive and negative wind pressures;
4 Where the wind blows along a longitudinal axis, the roof close to the gable may be valued by reference to R_a and R_b at $\alpha \le 5$ in this table</td></tr>
<tr><td>3</td><td>Single-slope roof of buildings of closed rectangular plane</td><td>




<table>
<tr><th>α</th><th>≤5</th><th>15</th><th>30</th><th>≥45</th></tr>
<tr><td>R_a</td><td>−2.0</td><td>−2.5</td><td>−2.3</td><td>−1.2</td></tr>
<tr><td>R_b</td><td>−2.0</td><td>−2.0</td><td>−1.5</td><td>−0.5</td></tr>
<tr><td>R_c</td><td>−1.2</td><td>−1.2</td><td>−0.8</td><td>−0.5</td></tr>
</table>
</td><td>1 E shall take the smaller one between $2H$ and windward width B;
2 Median may be calculated through linear interpolation;
3 Windward slope may be valued by reference to Item 2</td></tr>
</table>

8.3.4 In the calculation of wind load of enclosure member not directly bearing wind load, the local shape factor μ_{sl} may be reduced according to the tributary area of the member, and the reduction factor shall be adopted according to the following requirements:

1 Where the tributary area is not greater than $1m^2$, the reduction factor shall take 1.0;

2 Where the tributary area is greater than or equal to $25m^2$, the reduction factor of wall shall take 0.8; for the roof area with absolute value of local shape factor greater than 1.0, the reduction factor shall take 0.6; and the reduction factor of other roof areas shall take 1.0;

3 Where the tributary area is greater than $1m^2$ but less than $25m^2$, the local shape factor of wall and of roof with absolute value greater than 1.0 may adopt the logarithm interpolation, i.e. calculated according to the following formula:

$$\mu_{sl}(A)=\mu_{sl}(1)+[\mu_{sl}(25)-\mu_{sl}(1)]\log A/1.4 \tag{8.3.4}$$

8.3.5 In the calculation of wind load of enclosure member, the local shape factor of internal pressure of the buildings may be adopted according to the following requirements:

1 For closed buildings, −0.2 or 0.2 may be taken according to the positive or negative wind pressure of the outside surface;

2 The buildings of which only one wall has dominant opening shall be adopted according to the following requirements:

1) Where the opening ratio is greater than 0.02 and less than or equal to 0.10, $0.4\mu_{sl}$ shall be taken;

2) Where the opening ratio is greater than 0.12 and less than or equal to 0.30, $0.6\mu_{sl}$ shall be taken;

3) Where the opening ratio is greater than 0.30, $0.8\mu_{sl}$ shall be taken.

3 Other conditions shall be valued according to μ_{sl} of open buildings.

Note: 1 The opening ratio of dominant opening refers to the ratio of the area of single dominant opening to the whole area of this wall;

2 μ_{sl} shall take the value of corresponding dominant opening position.

8.3.6 For the wind tunnel test of building structures, the test equipment, test methods and data processing shall meet the requirements of the relevant codes.

8.4 Along-wind Vibration and Dynamic Response Factor

8.4.1 For the buildings with height greater than 30m and height-width ratio greater than 1.5 and various high-rise structures with fundamental natural period T_1 greater than 0.25s, the along-wind vibration influence of wind pressure fluctuation on structures shall be considered. The response calculation of along-wind vibration shall be carried out according to the theory of random vibration of structures. For the structures meeting the requirements of Article 8.4.3 of this code, the along-wind load may be calculated through dynamic response factor method.

Note: 1 The natural vibration period of structures shall be calculated according to the structural dynamics; the approximate fundamental natural period T_1 may be calculated according to Appendix F;

2 The acceleration of along-wind vibration of tall buildings may be calculated according to Appendix J of this code.

8.4.2 For the flexible roof structures sensitive to wind or with span greater than 36m, the wind vibration influence of wind pressure fluctuation on structures shall be considered. The wind vibration response of roof structures should be determined through calculation according to the random vibration theory based on the wind tunnel test results.

8.4.3 For general vertical cantilever structures, e.g. Tall buildings and high-rise structures such as framework, tower frame and chimney, only the influence of the first vibration mode of the structures may be considered; the along-wind load of the structures may be calculated according to Formula (8.1.1-1). The dynamic response factor β_z at z height may be calculated according to the following formula:

$$\beta_z = 1 + 2gI_{10}B_Z\sqrt{1+R^2} \tag{8.4.3}$$

Where g——The peak factor, taking 2.5;

I_{10}——The nominal turbulence intensity of height, taking 0.12, 0.14, 0.23 and 0.39 corresponding to Category A, B, C and D terrain roughness respectively;

R——The resonant component factor of fluctuating wind load;

B_z——The background component factor of fluctuating wind load.

8.4.4 The resonant component factor of fluctuating wind load may be calculated according to the following formula:

$$R = \sqrt{\frac{\pi}{6\xi_1}\frac{x_1^2}{(1+x_1^2)^{4/3}}} \tag{8.4.4-1}$$

$$x_1 = \frac{30f_1}{\sqrt{k_w\omega_0}}, x_1 > 5 \tag{8.4.4-2}$$

Where f_1——The natural vibration frequency of the first order of structure (Hz);

k_w——The correction coefficient of terrain roughness, taking 1.28, 1.0, 0.54 and 0.26 corresponding to Category A, B, C and D terrain roughness respectively;

ζ_1——The damping ratio of structure, may take 0.01 for steel structure, 0.02 for steel structure building with infilled wall, 0.05 for reinforced concrete and masonry structures, and may be determined according to engineering experience for other structures.

8.4.5 The background component factor of fluctuating wind load may be determined according to the following requirements:

1 For the tall buildings and high-rise structures with shape and mass being uniformly distributed along the height, it may be calculated according to the following formula:

$$B_z = kH^{a_1}\rho_x\rho_z\frac{\phi_1(z)}{\mu_z} \tag{8.4.5}$$

Where $\phi_1(z)$——The coefficient of the first order vibration mode of structure;

H——The total height of structure (m), shall not be greater than 300m, 350m, 450m and 550m corresponding to Category A, B, C and D terrain roughness respectively;

ρ_x——The correlation coefficient of fluctuating wind load in horizontal direction;

ρ_z——The correlation coefficient of fluctuating wind load in vertical direction;

k, a_1——The coefficient, valued in accordance with those specified in Table 8.4.5-1.

Table 8.4.5-1 Coefficients k and a_1

Roughness category		A	B	C	D
Tall buildings	k	0.944	0.670	0.295	0.112
	a_1	0.155	0.187	0.261	0.346
High-rise structures	k	1.276	0.910	0.404	0.155
	a_1	0.186	0.218	0.292	0.376

2 For the high-rise structures that the width on windward side and crosswind side varies straight or nearly along the height, but the mass varies continuously and regularly along the height, the background component factor B_z calculated according to Formula (8.4.5) shall be multiplied by the correction coefficient θ_B and θ_v. θ_B is the ratio of the windward side width $B(z)$ to the bottom width $B(0)$ of the structures at z height; θ_v may be determined in accordance with those specified in Table 8.4.5-2.

Table 8.4.5-2 Correction Coefficient θ_v

$B(H)/B(0)$	1	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	≤0.1
θ_V	1.00	1.10	1.20	1.32	1.50	1.75	2.08	2.53	3.30	5.60

8.4.6 The space correlation coefficient of fluctuating wind load may be determined according to the following requirements:

1 The correlation coefficient in vertical direction may be calculated according to the following formula:

$$\rho_z = \frac{10\sqrt{H + 60e^{-H/60} - 60}}{H} \tag{8.4.6-1}$$

Where H——The total height of structure (m), shall not be greater than 300m, 350m, 450m and 550m corresponding to Category A, B, C and D terrain roughness respectively.

2 The correlation coefficient in horizontal direction may be calculated according to the following formula:

$$\rho_z = \frac{10\sqrt{B + 50e^{-B/50} - 50}}{B} \tag{8.4.6-2}$$

Where B——The windward side width of structure (m), $B \leq 2H$.

3 For high-rise structures with smaller windward side width, the correlation coefficient in horizontal direction may take $\rho_x=1$.

8.4.7 The coefficient of vibration mode shall be determined according to structure dynamic calculation. For the high-rise structures of vertical cantilever type, whose shape, mass and rigidity vary continuously and regularly along the height, and the relatively uniform tall buildings along the height, the coefficient of vibration mode $\varphi_1(z)$ may also be determined according to Appendix G of this code in accordance with the relative height z/H.

8.5 Across-wind and Wind-induced Torsional Vibration

8.5.1 For the tall buildings with obvious across-wind vibration action effect and the structures of slender circular section, the influence of across-wind vibration should be considered.

8.5.2 The equivalent wind load of across-wind vibration may be adopted according to the following requirements:

1 For the tall buildings and high-rise structures with complex plane or elevation shape, the equivalent wind load ω_{Lk} of across-wind vibration should be determined through a wind tunnel test, or determined according to the relevant data;

2 For the tall buildings and structures of circular section, the equivalent wind load ω_{Lk} of across-wind vibration caused by trans-critical strong wind resonance (vortex shedding) may be determined according to Appendix H.1 of this code;

3 For the tall buildings of rectangular section and of concave or chamfered rectangular section, the equivalent wind load ω_{Lk} of across-wind vibration may be determined according to Appendix H.2 of this code.

Note: The acceleration of across-wind vibration of tall buildings may be calculated according to Appendix J of this code.

8.5.3 For the structures of circular section, the across-wind vibration (vortex shedding) shall be checked for different Reynolds numbers Re according to the following requirements:

1 Where $Re<3\times10^5$ and the wind speed v_H at the top of the structures is greater than v_{cr}, the subcritical breeze resonance may occur. In this case, antivibration measures may be taken structurally or the critical wind speed v_{cr} of the structures may be controlled as no less than 15m/s.

2 Where $Re\geq3.5\times10^6$ and 1.2 times the wind speed v_H at the top of the structures is greater than v_{cr}, the crossing critical strong wind resonance may occur; in this case, the equivalent wind load of across-wind vibration shall be considered.

3 Where $3\times10^5\leq Re<3.5\times10^6$, the wind vibration beyond critical range may not be handled.

4 The Reynolds number Re may be determined according to the following formula:

$$Re=69000vD \tag{8.5.3-1}$$

Where v——The wind speed for calculation, taking the critical wind speed value v_{cr};

D——The diameter of structure section (m), where the structure section reduces along the height (inclination not greater than 0.02), the diameter at 2/3 structure height may be approximately taken.

5 The critical wind speed v_{cr} and the wind speed v_H at the top of the structures may be determined according to the following formulae:

$$\upsilon_{cr} = \frac{D}{T_i St} \tag{8.5.3-2}$$

$$\upsilon_H = \sqrt{\frac{2000\mu_H\omega_0}{\rho}} \tag{8.5.3-3}$$

Where T_i——The natural vibration period of the ith vibration mode of structure, taking the fundamental natural period T_i in the checking of subcritical breeze resonance;

St——The strouhal number, taking 0.2 for the structures of circular section;

μ_H——The exposure factor for wind pressure at the top of structure;

ω_0——The reference wind pressure (kN/m^2);

ρ——The air density (kg/m^3).

8.5.4 For the tall buildings and high-rise structures with obvious wind-induced torsional vibration action effect, the influence of wind-induced torsional vibration should be considered.

8.5.5 The equivalent wind load of wind-induced torsional vibration may be adopted according to the following requirements:

1 For the tall buildings with complex shape and obviously eccentric mass or rigidity, the equivalent wind load ω_{Tk} of wind-induced torsional vibration should be determined through a wind tunnel test, or determined according to the relevant data;

2 For the tall buildings of rectangular section with relatively symmetrical mass and rigidity, the equivalent wind load ω_{Tk} of wind-induced torsional vibration may be determined according to Appendix H.3 of this code.

8.5.6 The along-wind load and the equivalent wind load of across-wind vibration and wind-induced torsional vibration should consider the wind load combination conditions in accordance with those specified in Table 8.5.6. The characteristic values of unit height wind force F_{Dk}, F_{Lk} and torque T_{Tk} in Table 8.5.6 shall be calculated according to the following formulae:

$$F_{Dk}=(\omega_{k1}-\omega_{k2})B \tag{8.5.6-1}$$

$$F_{Lk}=\omega_{Lk}B \tag{8.5.6-2}$$

$$T_{Tk}=\omega_{Tk}B^2 \tag{8.5.6-3}$$

Where F_{Dk}——The characteristic value of along-wind force in unit height (kN/m);

F_{Lk}——The characteristic value of across-wind force in unit height (kN/m);

T_{Tk}——The characteristic value of wind-reduced torque in unit height (kN · m/m);

ω_{k1}, ω_{k2}——The characteristic value of wind load on windward side and leeward side (kN/m^2);

ω_{Lk}, ω_{Tk}——The characteristic value of equivalent wind load of across-wind vibration and wind-induced torsional vibration (kN/m^2);

B——The windward side width (m).

Table 8.5.6 Wind Load Combination Conditions

Condition	Along-wind load	Equivalent wind load of across-wind vibration	Equivalent wind load of wind-induced torsional vibration
1	F_{Dk}	—	—
2	$0.6F_{Dk}$	F_{Lk}	—
3	—	—	T_{Tk}

8.6 Gust Factor

8.6.1 The gust factor in the calculation of wind load of enclosure structures (including doors and windows) shall be determined in accordance with those specified in Table 8.6.1.

Table 8.6.1 Gust Factor β_{gz}

Height from the ground surface (m)	Terrain roughness category			
	A	B	C	D
5	1.65	1.70	2.05	2.40
10	1.60	1.70	2.05	2.40
15	1.57	1.66	2.05	2.40
20	1.55	1.63	1.99	2.40
30	1.53	1.59	1.90	2.40
40	1.51	1.57	1.85	2.29
50	1.49	1.55	1.81	2.20
60	1.48	1.54	1.78	2.14
70	1.48	1.52	1.75	2.09
80	1.47	1.51	1.73	2.04
90	1.46	1.50	1.71	2.01
100	1.46	1.50	1.69	1.98
150	1.43	1.47	1.63	1.87
200	1.42	1.45	1.59	1.79
250	1.41	1.43	1.57	1.74
300	1.40	1.42	1.54	1.70
350	1.40	1.41	1.53	1.67
400	1.40	1.41	1.51	1.64
450	1.40	1.41	1.50	1.62
500	1.40	1.41	1.50	1.60
550	1.40	1.41	1.50	1.59

9 Thermal Action

9.1 General Requirements

9.1.1 The thermal action shall consider the factors such as air temperature variation, solar radiation and heat source use; the thermal action acting on structures or members shall be expressed with temperature variation.

9.1.2 In the calculation of thermal action effect of structures or members, the coefficient α_T of linear expansion of materials shall be adopted. The coefficient of linear expansion of commonly used materials may be adopted in accordance with those specified in Table 9.1.2.

Table 9.1.2 Coefficient of Linear Expansion of Commonly Used Materials α_T

Material	Coefficient of linear expansion α_T ($\times 10^{-6}$/℃)
Lightweight aggregate concrete	7
Ordinary concrete	10
Masonry	6~10
Steel, wrought iron and cast iron	12
Stainless steel	16
Aluminium and aluminum alloy	24

9.1.3 The combination value coefficient, frequent value coefficient and quasi-permanent value coefficient of thermal action may take 0.6, 0.5 and 0.4 respectively.

9.2 Reference Air Temperature

9.2.1 The reference air temperature may adopt the monthly average maximum air temperature T_{max} and monthly average minimum air temperature T_{min} with 50-year recurrence interval, which are determined according to the method specified in Appendix E of this code; the reference air temperature values of the cities throughout the country may be adopted according to Table E.5 in Appendix E of this code. Where the reference air temperature value of a city or construction site is not given in Appendix E of this code, the reference air temperature value may be determined through statistical analysis according to the method specified in Appendix E based on the air temperature data recorded by local meteorological station. In the absence of local air temperature data, the reference air temperature may be determined through comparative analysis on meteorological and topographic conditions according to the reference air temperature specified for nearby areas, or determined approximately according to Figure E.6.4 and Figure E.6.5 in Appendix E of this code.

9.2.2 For the structures such as metal structures which are sensitive to air temperature variation, the influence of extreme air temperature should be considered; the reference air temperature T_{max} and T_{min} may be properly increased or decreased according to the local climate conditions.

9.3 Uniform Temperature Action

9.3.1 The characteristic value of uniform temperature action shall be determined according to the following requirements:

1 For the operating condition of structures at maximum temperature rise, the characteristic value of uniform temperature action shall be calculated according to the following formula:

$$\Delta T_k = T_{s,max} - T_{0,min} \tag{9.3.1-1}$$

Where ΔT_k——The characteristic value of uniform temperature action (℃);

$T_{s,max}$——The maximum average temperature of structure (℃);

$T_{0,min}$——The minimum initial average temperature of structure (℃).

2 For the operating condition of structures at maximum temperature drop, the characteristic value of uniform temperature action shall be calculated according to the following formula:

$$\Delta T_k = T_{s,min} - T_{0,max} \tag{9.3.1-2}$$

Where $T_{s,min}$——The minimum average temperature of structure (℃);

$T_{0,max}$——The maximum initial average temperature of structure (℃).

9.3.2 The maximum average temperature $T_{s,max}$ and the minimum average temperature $T_{s,min}$ of the structures should be determined according to the heat engineering principle in accordance with reference air temperature T_{max} and T_{min} respectively. For the indoor structures with enclosure, their average temperature shall consider the influence of indoor and outdoor temperature difference; for the structures exposed outdoors or structures during construction period, the influence of solar radiation should be considered according to the structure orientation and surface heat absorptivity.

9.3.3 The maximum initial average temperature $T_{0,max}$ and the minimum initial average temperature $T_{0,max}$ of the structures shall be determined according to the structure healing or restraint forming time, or determined according to the unfavorable condition based on the possible structure temperature during construction.

10 Accidental Load

10.1 General Requirements

10.1.1 The accidental load shall cover the loads caused by explosion, impact, fire and other accidental disasters. This chapter is only applicable to explosion and impact load.

10.1.2 Where the accidental load is used as the dominant load in structural design, the structure shall be ensured without progressive collapse caused by accidental load under the condition that local member damage is allowed for the structure.

10.1.3 The design value of accidental load may directly take the characteristic value of accidental load determined according to the method specified in this chapter.

10.2 Explosion

10.2.1 The explosion load caused by explosive, gas and dust, etc. should be adopted according to the equivalent static load.

10.2.2 Under the action of dynamic explosion load of routine explosive, the characteristic value of equivalent uniformly distributed static load of structural members may be calculated according to the following formula:

$$q_{ce}=K_{dc}p_c \tag{10.2.2}$$

Where q_{ce}——The characteristic value of equivalent uniformly distributed static load acting on structural members;

p_c——The maximum pressure of uniformly distributed dynamic load acting on structural members, may be adopted according to the relevant requirements of Article 4.3.2 and Article 4.3.3 of the national standard "Code for Design of Civil Air Defence Basement" GB 50038−2005;

K_{dc}——The dynamic coefficient, determined according to the principle of equivalent maximum internal force based on the dynamic analysis result under the action of uniformly distributed dynamic load for the members.

Note: For the explosion caused by other reasons, the equivalent uniformly distributed static load may be determined according to the equivalent TNT charging quantity by reference to the method of this article.

10.2.3 For the building structures with access plate, where the ratio of the access plate area A_v to the explosion space volume V is 0.05~0.15, and the volume V is less than 1000m^3, the equivalent uniformly distributed static load p_k of gas explosion may be calculated according to the following formula and shall take the larger value:

$$p_k=3+p_V \tag{10.2.3-1}$$

$$p_k=3+0.5p_V+0.04\left(\frac{A_V}{V}\right)^2 \tag{10.2.3-2}$$

Where p_V——The rated breakdown pressure of access plate (generally meaning plate glass of window opening) (kN/m^2);

A_V——The area of access plate (m^2);

V——The volume of explosion space (m^3).

10.3 Impact

10.3.1 The characteristic value of vertical impact load of elevators may be selected within the range (4~6) times the gross gravity load of the elevators.

10.3.2 The impact load of automobile may be adopted according to the following requirements:

1 The characteristic value P_k (kN) of impact force of automobile in direct motion may be calculated according to the following formula:

$$P_k = \frac{mv}{t} \tag{10.3.2}$$

Where m——The automobile mass (t), including self-weight and carrying capacity;

v——The speed (m/s);

t——The impact time (s).

2 The impact force calculation parameters m, v and t as well as the load action point positions should be adopted according to the actual conditions; in the absence of data, the automobile mass may take 15t; the speed may take 22.2m/s; the impact time may take 1.0s; and the impact force load action point positions of small and large vehicles may take 0.5m and 1.5m above the pavement respectively.

3 The characteristic value of impact force in vertical traveling direction may take 0.5 times the characteristic value of impact force in direct motion, and both may not consider the simultaneous action.

10.3.3 The impact load of helicopter at abnormal landing may be adopted according to the following requirements:

1 The characteristic value P_k (kN) of vertical equivalent static impact force may be calculated according to the following formula:

$$P_k = C\sqrt{m} \tag{10.3.3}$$

Where C——The coefficient, taking 3kN · kg$^{-0.5}$;

m——The helicopter mass (kg).

2 The action range of the vertical impact force should cover the roof structures in any areas of parking apron and within 7m from the boundary line of the parking apron.

3 The action areas of the vertical impact force should take 2m×2m.

Appendix A Self-weight of Commonly Used Materials and Members

Table A Self-weight of Commonly Used Materials and Members

Item	Name		Self-weight	Remarks
1	Timber (kN/m^3)	China fir	4.0	Vary with moisture content
		Fir, spruce, Korean pine, pinus armandii, pinus sylvestris, hemlock, alniphyllum fortunei, toon, poplar, Chinese ash	4.0~5.0	Vary with moisture content
		Masson pine, pinus yunnanensis, Chinese pine, pinus densiflora, pinus kwangtungensis, alder, sweetgum, willow, common sassafras, Qinling larch, Xinjiang larch	5.0~6.0	Vary with moisture content
		Larch in northeast China, dacrydium pierrei, elm, birch, northeast China ash, melia azedarach, schima superba, ailanthus	6.0~7.0	Vary with moisture content
		Castanopsis fagaceae, lithocarpus glaber, locust, caryophyllifolium	7.0~8.0	Vary with moisture content
		Cyclobalanopsis glauca (broussonetia papyrifera), oak (Chinese oak), eucalyptus, horsetail beefwood	8.0~9.0	Vary with moisture content
		Ordinary lath, rafter purlin timber	5.0	Vary with moisture content
		Sawdust	2.0~2.5	$3kN/m^3$ when anticorrosive agent is added
		Wood wool slab	4.0~5.0	—
		Cork board	2.5	—
		Shaving board	6.0	—
2	Plywood (kN/m^2)	Three plywood (poplar)	0.019	—
		Three plywood (basswood)	0.022	—
		Three plywood (northeast China ash)	0.028	—
		Five plywood (poplar)	0.030	—
		Five plywood (basswood)	0.034	—
		Five plywood (northeast China ash)	0.040	—
		Cane fibre board (by 10mm thickness)	0.030	Commonly used thicknesses are 13mm, 15mm, 19mm and 25mm
		Sound boarding (by 10mm thickness)	0.030	Commonly used thicknesses are 13mm and 20mm
		Particle board (by 10mm thickness)	0.120	Commonly used thicknesses are 6mm and 10mm
3	Metal mineral (kN/m^3)	Wrought iron	77.5	—
		Iron slag	27.6	—
		Hematite	25.0~30.0	—
		Steel	78.5	—
		Red copper and copper	89.0	—
		Brass and bronze	85.0	—
		Sulphide copper ore	42.0	—
		Aluminium	27.0	—

Table A (continued)

Item	Name		Self-weight	Remarks
3	Metal mineral (kN/m^3)	Aluminum alloy	28.0	—
		Zinc	70.5	—
		Sub-zinc ore	40.5	—
		Lead	114.0	—
		Galena	74.5	—
		Gold	193.0	—
		Platinum	213.0	—
		Silver	105.0	—
		Stannum	73.5	—
		Nickel	89.0	—
		Mercury	136.0	—
		Tungsten	189.0	—
		Magnesium	18.5	—
		Stibium	66.6	—
		Crystal	29.5	—
		Borax	17.5	—
		Sulphur ore	20.5	—
		Asbestos ore	24.6	—
		Asbestos	10.0	Compact
		Asbestos	4.0	Loose, with water content not greater than 15%
		Lime-stone (kaolin)	22.0	—
		Gypsum ore	25.5	—
		Gypsum	13.0~14.5	Coarse stacking φ=30°
				Fine stacking φ=40°
		Gypsum powder	9.0	—
4	Soil, sand, gravel and rock (kN/m^3)	Humus	15.0~16.0	Dry, φ=40°; wet, φ=35°; very wet, φ=25°
		Clay	13.5	Dry and loose, with a void ratio of 1.0
		Clay	16.0	Dry, φ=40°, compact
		Clay	18.0	Wet, φ=35°, compact
		Clay	20.0	Very wet, φ=25°, compact
		Sandy soil	12.2	Dry and loose
		Sandy soil	16.0	Dry, φ=35°, compact
		Sandy soil	18.0	Wet, φ=35°, compact
		Sandy soil	20.0	Very wet, φ=25°, compact
		Sandy soil	14.0	Dry, fine sand
		Sandy soil	17.0	Dry, coarse sand
		Pebble	16.0~18.0	Dry
		Clay mixed with pebble	17.0~18.0	Dry and loose
		Sand mixed with pebble	15.0~17.0	Dry and loose

Table A (continued)

Item	Name		Self-weight	Remarks
4	Soil, sand, gravel and rock (kN/m^3)	Sand mixed with pebble	16.0~19.2	Dry and compact
		Sand mixed with pebble	18.9~19.2	Wet
		Pumice	6.0~8.0	Dry
		Pumice filler	4.0~6.0	—
		Sandrock	23.6	—
		Shale	28.0	—
		Shale	14.8	Rubble stacking
		Marlstone	14.0	φ=40°
		Granite and marble	28.0	—
		Granite	15.4	Rubble stacking
		Limestone	26.4	—
		Limestone	15.2	Rubble stacking
		Shell limestone	14.0	—
		Dolomite	16.0	Rubble stacking φ=48°
		Talc	27.1	—
		Firestone (flint)	35.2	—
		Porphyry	27.6	—
		Basalt	29.5	—
		Feldspar	25.5	—
		Amphibole and greenstone	30.0	—
		Amphibole and greenstone	17.1	Rubble stacking
		Blinding	14.0~15.0	Stacking
		Rock powder	16.0	Clayey or calcareous
		Porous clay	5.0~8.0	Used as filler, φ=35°
		Kieselguhr filler	4.0~6.0	—
		Diabase slab	29.5	—
5	Brick and masonry block (kN/m^3)	Common brick	18.0	240mm×115mm×53mm (684 blocks/m^3)
		Common brick	19.0	Machined
		Clinker brick	21.0~21.5	230mm×110mm×65mm (609 blocks/m^3)
		Red clinker brick	20.4	—
		Fire brick	19.0~22.0	230mm×110mm×65mm (609 blocks/m^3)
		Acidproof ceramic tile	23.0~25.0	230mm×113mm×65mm (590 blocks/m^3)
		Malm brick	18.0	Sand:lime=92:8
		Cinder brick	17.0~18.5	—
		Slag brick	18.5	Hard slag:soot:lime=75:15:10
		Breeze brick	12.0~14.0	—
		Soot brick	14.0~15.0	Slag:carbide slag:soot=30:40:30
		Clay adobe	12.0~15.0	—
		Sawdust brick	9.0	—

Table A (continued)

Item	Name		Self-weight	Remarks
5	Brick and masonry block (kN/m^3)	Cinder hollow block	10.0	290mm×290mm×140mm (85 blocks/m^3)
		Cement hollow brick	9.8	290mm×290mm×140mm (85 blocks/m^3)
		Cement hollow brick	10.3	300mm×250mm×110mm (121 blocks/m^3)
		Cement hollow brick	9.6	300mm×250mm×160mm (83 blocks/m^3)
		Autoclaved fly ash brick	14.0~16.0	Dry unit weight
		Haydite hollow block	5.0	600mm and 400mm long, 150mm and 250mm wide, 250mm and 200mm height
			6.0	390mm×290mm×190mm
		Fly ash hollow block with light slag	7.0~8.0	390mm×190mm×190mm, 390mm×240mm×190mm
		Autoclaved fly ash aerated concrete block	5.5	—
		Small concrete hollow block	11.8	390mm×190mm×190mm
		Broken brick	12.0	Stacking
		Cement tile	19.8	200mm×200mm×24mm (1042 blocks/m^3)
		Porcelain facing brick	17.8	150mm×150mm×8mm (5556 blocks/m^3)
		Ceramic mosaic	0.12kN/m^2	Thickness 5mm
6	Lime, cement, mortar and concrete (kN/m^3)	Quick lime block	11.0	Stacking, φ=30°
		Quick lime powder	12.0	Stacking, φ=35°
		Lime putty	13.5	—
		Lime mortar and composite mortar	17.0	—
		Cement lime cinder mortar	14.0	—
		Lime slag	10.0~12.0	—
		Cement slag	12.0~14.0	—
		Lime cinder mortar	13.0	—
		Lime soil	17.5	Lime:soil=3:7, compact
		Straw lime slurry	16.0	—
		Straw pulp lime slurry	16.0	—
		Lime sawdust	3.4	Lime:sawdust=1:3
		Lime cement	17.5	Lime, sand and pebble
		Cement	12.5	Lightweight and loose, φ=20°
		Cement	14.5	Bulk, φ=30°
		Cement	16.0	Bagged compact, φ=40°
		Slag cement	14.5	—
		Cement mortar	20.0	—
		Cement vermiculite mortar	5.0~8.0	—
		Asbestos cement slurry	19.0	—
		Expanded pearlite mortar	7.0~15.0	—
		Plaster mortar	12.0	—
		Broken brick concrete	18.5	—

Table A (continued)

Item	Name		Self-weight	Remarks
6	Lime, cement, mortar and concrete (kN/m^3)	Plain concrete	22.0~24.0	Vibrate or not vibrate
		Slag concrete	20.0.	—
		Cinder concrete	16.0~17.0	For load bearing
		Cinder concrete	10.0~14.0	For filling
		Scrap iron concrete	28.0~60.0	—
		Pumice concrete	9.0~14.0	—
		Bituminous concrete	20.0	—
		Non-sand macroporous concrete	16.0~19.0	—
		Foam concrete	4.0~6.0	—
		Aerated concrete	5.5~7.5	Single block
		Lime fly ash aerated concrete	6.0~6.5	—
		Reinforced concrete	24.0~25.0	—
		Broken brick reinforced concrete	20.0	—
		Wire mesh cement	25.0	For bearing structures
		Water glass acid proof concrete	20.0~23.5	—
		Fly ash ceramsite concrete	19.5	—
7	Bitumen, coal ash and oil materials (kN/m^3)	Petroleum bitumen	10.0~11.0	According to relative density
		Tar	12.0	—
		Coal tar pitch	13.4	—
		Coal tar	10.0	—
		Anthracite	15.5	Whole
		Anthracite	9.5	Blocky stacking, φ=30°
		Anthracite	8.0	Broken stacking, φ=35°
		Conny	7.0	Stacking, φ=15°
		Coalball	10.0	Stacking
		Lignite	12.5	—
		Lignite	7.0~8.0	Stacking
		Peat	7.5	—
		Peat	3.2~3.4	Stacking
		Charcoal	3.0~5.0	—
		Coke	12.0	—
		Coke	7.0	Stacking, φ=45°
		Cinder	10.0	—
		Coal ash	6.5	—
		Coal ash	8.0	Compact
		Graphite	20.8	—
		Coal wax	9.0	—
		Oil wax	9.6	—
		Crude oil	8.8	—

Table A (continued)

Item	Name		Self-weight	Remarks
7	Bitumen, coal ash and oil materials (kN/m^3)	Crude oil	8.8	—
		Kerosene	8.0	—
		Kerosene	7.2	Barrelled, with a relative density of 0.82~0.89
		Lubricating oil	7.4	—
		Gasoline	6.7	—
		Gasoline	6.4	Barrelled, with a relative density of 0.72~0.76
		Animal oil and vegetable oil	9.3	—
		Soybean oil	8.0	In large iron barrel, 360kg per barrel
8	Miscellan-eous (kN/m^3)	Simple glass	25.6	—
		Ferroglass	26.0	—
		Foam glass	3.0~5.0	—
		Glass wool	0.5~1.0	For insulating layer filler
		Rock wool	0.5~2.5	—
		Bitumen glass wool	0.8~1.0	Heat conductivity coefficient 0.035~0.047[W/(m · K)]
		Glass wool board (sleeve)	1.0~1.5	
		Glass fiber reinforced plastics	14.0~22.0	—
		Slag wool	1.2~1.5	Loose, with a heat conductivity coefficient of 0.031~0.044 [W/(m · K)]
		Slag wool products (board, brick and pipe)	3.5~4.0	Heat conductivity coefficient 0.047~0.07 [W/(m · K)]
		Bitumen slag wool	1.2~1.6	Heat conductivity coefficient 0.041~0.052 [W/(m · K)]
		Expanded perlite powder	0.8~2.5	Dry and loose, with a heat conductivity coefficient of 0.052~0.076 [W/(m · K)]
		Cement perlite products and hydrophobic perlite products	3.5~4.0	With a strength of $1N/m^2$ and a heat conductivity coefficient of 0.058~0.081[W/(m·K)]
		Expanded vermiculite	0.8~2.0	Heat conductivity coefficient 0.052~0.07 [W/(m · K)]
		Bitumen vermiculite products	3.5~4.5	Heat conductivity coefficient 0.81~0.105 [W/(m · K)]
		Cement vermiculite products	4.0~6.0	Heat conductivity coefficient 0.093~0.14 [W/(m · K)]
		Polyvinyl chloride plate (pipe)	13.6~16.0	—
		Polystyrene foam	0.5	Heat conductivity coefficient not greater than 0.035 [W/(m · K)]
		Asbestos plate	13.0	Moisture content not greater than 3%
		Emulsified bitumen	9.8~10.5	—
		Soft rubber	9.30	—
		White phosphorus	18.30	—
		Rosin	10.70	—
		Magnetism	24.00	—

Table A (continued)

Item	Name		Self-weight	Remarks
8	Miscellan-eous (kN/m^3)	Alcohol	7.85	100% purity
		Alcohol	6.60	Barrelled, with a relative density of 0.79~0.82
		Hydrochloric acid	12.00	Concentration 40%
		Nitric acid	15.10	Concentration 91%
		Sulfuric acid	17.90	Concentration 87%
		Caustic soda	17.00	Concentration 60%
		Ammonium chloride	7.50	Bagged stacking
		Urea	7.50	Bagged stacking
		Ammonium bicarbonate	8.00	Bagged stacking
		Water	10.00	At maximum density under a temperature of 4℃
		Ice	8.96	—
		Book	5.00	Hidden on bookshelf
		Wood-free paper	10.00	—
		Newspaper	7.00	—
		Rice paper	4.00	—
		Cotton and cotton yarn	4.00	Compact average weight
		Straw	1.20	—
		Construction debris (construction waste)	15.00	—
9	Food (kN/m^3)	Rough rice	6.00	φ=35°
		Rice	8.50	Bulk stacking,
		Bean	7.50~8.00	φ=20°
		Bean	6.80	Bagged
		Wheat	8.00	φ=25°
		Flour	7.00	—
		Corn	7.80	φ=28°
		Millet and sorghum	7.00	Bulk
		Millet and sorghum	6.00	Bagged
		Sesame	4.50	Bagged
		Fresh fruit	3.50	Bulk
		Fresh fruit	3.00	Cased
		Peanut	2.00	Bagged with enclosure
		Can	4.50	Cased
		Alcohol, sauce, oil and vinegar	4.00	Cased in bottles
		Bean cake	9.00	Placed in round cake, 28kg per block
		Rock salt	10.0	Blocked
		Salt	8.60	Fine-particle bulk stacking
		Salt	8.10	Bagged
		Granulated sugar	7.50	Bulk
		Granulated sugar	7.00	Bagged

Table A (continued)

Item	Name		Self-weight	Remarks
10	Masonry (kN/m^3)	Grouting fine ashlar	26.4	Granite, square stone (monoblock)
		Grouting fine ashlar	25.6	Limestone
		Grouting fine ashlar	22.4	Sandrock
		Grouting rubble ashlar	24.8	Granite, with roughly smooth upper and lower surface
		Grouting rubble ashlar	24.0	Limestone
		Grouting rubble ashlar	20.8	Sandrock
		Dry rubble	20.8	Granite, with roughly smooth upper and lower surface
		Dry rubble	20.0	Limestone
		Dry rubble	17.6	Sandrock
		Grouting common brick	18.0	—
		Grouting brick	19.0	—
		Grouting clinker brick	21.0	—
		Grouting fire brick	22.0	—
		Grouting slag brick	21.0	—
		Grouting breeze brick	12.5~14.0	—
		Adobe block masonry	16.0	—
		Clay brick hollow masonry	17.0	Broken debris is filled in the middle, one sleep and one working
		Clay brick hollow masonry	13.0	Full
		Clay brick hollow masonry	12.5	Cannot bear load
		Clay brick hollow masonry	15.0	Can bear load
		Fly ash foam block masonry	8.0~8.5	Fly ash:carbide slag:waste gypsum=74:22:4
		Cement	17.0	Ash:sand:soil=1:1:9~1:1:4
11	Partition and wall surface (kN/m^2)	Double-side rendering lath partition	0.9	Rendering thickness of 16~24mm on each side and joist inside
		Single-side rendering lath partition	0.5	Rendering thickness of 16~24mm on each side and joist inside
		C-shaped lightgage steel joist partition	0.27	Two-layer 12mm gypsum plasterboard, without thermal insulation layer
			0.32	Two-layer 12mm gypsum plasterboard, filled 50mm rock wool insulation board in the middle
			0.38	Three-layer 12mm gypsum plasterboard, without thermal insulation layer
			0.43	Three-layer 12mm gypsum plasterboard, filled 50mm rock wool insulation board in the middle
			0.49	Four-layer 12mm gypsum plasterboard, without thermal insulation layer
			0.54	Four-layer 12mm gypsum plasterboard, filled 50mm rock wool insulation board in the middle

Table A (continued)

Item	Name		Self-weight	Remarks
11	Partition and wall surface (kN/m^2)	Tiling wall surface	0.50	With a total thickness of 25mm, including cement mortar rendering
		Cement rendered wall surface	0.36	20mm thick, cement coarse sand
		Waterstone wall surface	0.55	25mm thick, including rendering
		Granitic plaster wall surface	0.50	25mm thick, including rendering
		Lime coarse sand plastering	0.34	20mm thick
		Imitation stone wall surface	0.50	25mm thick, including rendering
		Exterior stucco wall surface	0.70	Including 25mm cement mortar rendering
12	Roof truss, door and window (kN/m^2)	Wood roof truss	0.07+0.007*l*	Calculated according to horizontal projected area of roof; span *l* calculated by m
		Steel roof truss	0.12+0.011*l*	Without skylight, including support, calculated according to horizontal projected area of roof; span *l* calculated by m
		Wooden-frame glass window	0.20~0.30	—
		Steel-frame glass window	0.40~0.45	—
		Wood door	0.10~0.20	—
		Steel door	0.40~0.45	—
13	Roof (kN/m^2)	Clay plain tile roof	0.55	Calculated according to the actual area, the same below
		Cement plain tile roof	0.50~0.55	—
		Small grey tile roof	0.90~1.10	—
		Cold booth tile roof	0.50	—
		Slating roof	0.46	6.3mm thick
		Slating roof	0.71	9.5mm thick
		Slating roof	0.96	12.1mm thick
		Wheat straw marl roof	0.16	By 10mm thick
		Asbestos plate tile	0.18	Only tile self-weight
		Corrugated asbestos tile	0.20	1820mm×725mm×8mm
		Galvanized sheet steel	0.05	No. 24
		Corrugated iron	0.05	No. 26
		Colour steel sheet pantile	0.12~0.13	0.6mm-thick colour steel sheet
		Arched colour steel sheet roof	0.30	Including thermal insulation and lamp weight $0.15kN/m^2$
		Organic glass roof	0.06	1.0mm thick
		Glass roof	0.30	9.5mm wired glass, frame self-weight inside
		Glass brick roof	0.65	Frame self-weight inside
		Asphalt felt waterproof layer (including modified bituminous waterproof sheet)	0.05	Brush two passes of asphalt for one-layer asphalt felt
			0.25~0.30	Four-layer practice, one-layer felt, two-layer asphalt, and one-layer scree thereon

Table A (continued)

Item	Name		Self-weight	Remarks
13	Roof (kN/m^2)	Asphalt felt waterproof layer (including modified bituminous waterproof sheet)	0.30~0.35	Six-layer practice, two-layer felt, three-layer asphalt, and one-layer scree thereon
			0.35~0.40	Eight-layer practice, three-layer felt, four-layer asphalt, and one-layer scree thereon
		Jieluoke waterproof layer	0.10	8mm thick
		Roof window	0.35~0.40	9.5mm wired glass, frame self-weight inside
14	Ceiling (kN/m^2)	Metal lath and plaster suspended ceiling	0.45	—
		Hemp cut lime mortar lathed ceiling	0.45	Dead wood inside, with an average ash thickness of 20mm
		Sand lath ceiling	0.55	Dead wood inside, with an average ash thickness of 25mm
		Reed matting plastered ceiling	0.48	Dead wood joist inside
		Deal board ceiling	0.25	Dead wood inside
		Three plywood ceiling	0.18	Dead wood inside
		Strawboard ceiling	0.15	Dead wood and cover strip inside
		Fiber board suspended ceiling	0.26	25mm thick, dead wood and cover strip inside
		Fiber board suspended ceiling	0.29	30mm thick, dead wood and cover strip inside
		Sound insulation paperboard ceiling	0.17	10mm thick, dead wood and cover strip inside
		Sound insulation paperboard ceiling	0.18	13mm thick, dead wood and cover strip inside
		Sound insulation paperboard ceiling	0.20	20mm thick, dead wood and cover strip inside
		V-shaped lightgage steel joist suspended ceiling	0.12	One-layer 9mm gypsum plasterboard, without thermal insulation layer
			0.17	Two-layer 9mm gypsum plasterboard, with 50mm-thick rock wool board thermal insulation layer
			0.20	Two-layer 9mm gypsum plasterboard, without thermal insulation layer
			0.25	Two-layer 9mm gypsum plasterboard, with 50mm-thick rock wool board thermal insulation layer
		V-shaped lightgage steel joist and aluminium alloy joist suspended ceiling	0.10~0.12	One-layer 15mm-thick mineral wool acoustic board, without thermal insulation layer
		Cinder sawdust insulating layer on ceiling	0.20	50mm-thick cinder and sawdust are mixed by 1:5
15	Floor (kN/m^2)	Floor grating	0.20	Only grating self-weight
		Hardwood floor	0.20	25mm thick, diagonal bracing, nail, etc. self-weight inside, excluding grating self-weight
		Pinewood floor	0.18	—
		Small tile floor	0.55	Including cement coarse sand rendering
		Cement tile floor	0.60	Tile thickness of 25mm, including cement coarse sand rendering
		Terrazzo floor	0.65	10mm surface course, 20mm cement mortar rendering

Table A (continued)

Item	Name		Self-weight	Remarks
15	Floor (kN/m^2)	Linoleum	0.02~0.03	Linoleum, for floor surface
		Wood block floor	0.70	Pave 76mm thickness by adding anticorrosive factice
		Magnesite floor	0.28	20mm thick
		Cast iron floor	4.00~5.00	60mm broken stone cushion, 60mm surface course
		Clinker floor	1.70~2.10	60mm sand cushion, 53mm wool layer, laid horizontally
		Clinker floor	3.30	60mm sand cushion, 115mm wool layer, laid laterally
		Black tile floor	1.50	Sand cushion, laid horizontally
16	Profiled steel sheet for building (kN/m^2)	Single-wave V-300 (S-30)	0.120	Wave height 173mm and sheet thickness 0.8mm
		Double-wave W-500	0.110	Wave height 130mm and sheet thickness 0.8mm
		Three-wave V-200	0.135	Wave height 70mm and sheet thickness 1mm
		Multi-wave V-125	0.065	Wave height 35mm and sheet thickness 0.6mm
		Multi-wave V-115	0.079	Wave height 35mm and sheet thickness 0.6mm
17	Building wallboard (kN/m^2)	Colour steel sheet metal curtain wallboard	0.11	Two-layer, colour steel sheet thickness of 0.6mm, polystyrene core material thickness of 25mm
		Metallic heat insulating material (polyurethane) composite board	0.14	Board thickness of 40mm and steel sheet thickness of 0.6mm
			0.15	Board thickness of 60mm and steel sheet thickness of 0.6mm
			0.16	Board thickness of 80mm and steel sheet thickness of 0.6mm
		Colour steel sheet mixed with polystyrene insulation board	0.12~0.15	Two-layer, colour steel sheet thickness of 0.6mm, polystyrene core material sheet thickness of (50~250)mm
		Colour steel sheet rock wool coreboard	0.24	Board thickness of 100mm, two-layer colour steel sheet, Z-shaped joist rock wool core material
			0.25	Board thickness of 120mm, two-layer colour steel sheet, Z-shaped joist rock wool core material
		GRC reinforced cement polyphenyl composite insulation board	1.13	—
		GRC hollow partition board	0.30	(2400~2800)mm long, 600mm wide and 60mm thick
		GRC internal partition board	0.35	(2400~2800)mm long, 600mm wide and 60mm thick
		Lightweight GRC insulation board	0.14	3000mm×600mm×60mm
		Lightweight GRC hollow partition board	0.17	3000mm×600mm×60mm
		Lightweight large wallboard (skate board series)	0.70~0.90	6000mm×1500mm×120mm, high strength cement foamed core

Table A (continued)

Item	Name			Self-weight	Remarks
17	Building wallboard (kN/m^2)	Lightweight strip wallboard (skate board series)	80mm thick	0.40	Foamed by standard specification 3000mm×1000 (1200, 1500)mm high strength cement
			100mm thick	0.45	Core material, equipped with different steel skeletons and cold-drawn steel wire meshes according to different purlin spacings and loads
			120mm thick	0.50	
		GRC wallboard		0.11	10mm thick
		Steel wire mesh rock wool core composite board (GY board)		1.10	Rock wool core material thickness of 50mm, double-side wire mesh cement mortar thickness of 25mm each
		Calcium silicate board		0.08	Board thickness of 6mm
				0.10	Board thickness of 8mm
				0.12	Board thickness of 10mm
		Taibo board		0.95	Board thickness of 10mm, steel wire mesh mixed polystyrene thermal insulation layer, plastering 20mm cement mortar layer per surface
		Honeycomb composite board		0.14	75mm thick
		Gypsum perlite hollow ribbon board		0.45	(2500~3000)mm long, 600mm wide, 60mm thick
		Reinforced cement gypsum polyphenyl insulation board		0.17	3000mm×600mm×60mm
		Glass curtain wall		1.00~1.50	Generally adopted by increasing 20%~30% according to the glass self-weight in unit area

Appendix B Reduction Factor of Fire Engine Load Accounting for the Influence of Covered Soil

B.0.1 Where the influence of covered soil on fire engine load on floor is considered, the characteristic value of fire engine load on floor may be reduced, and the reduction factor may be adopted in accordance with those specified in Table B.0.1 and Table B .0.2.

Table B.0.1 Reduction Factor of Fire Engine Load on One-way Slab Floor

Converted covered soil thickness $\bar{s}$ (m)	Floor slab span (m)		
	2	3	4
0	1.00	1.00	1.00
0.5	0.94	0.94	0.94
1.0	0.88	0.88	0.88
1.5	0.82	0.80	0.81
2.0	0.70	0.70	0.71
2.5	0.56	0.60	0.62
3.0	0.46	0.51	0.54

Table B.0.2 Reduction Factor of Fire Engine Load on Two-way Slab Floor

Converted covered soil thickness $\bar{s}$ (m)	Floor slab span (m)			
	3×3	4×4	5×5	6×6
0	1.00	1.00	1.00	1.00
0.5	0.95	0.96	0.99	1.0
1.0	0.88	0.93	0.98	1.00
1.5	0.79	0.83	0.93	1.00
2.0	0.67	0.72	0.81	0.92
2.5	0.57	0.62	0.70	0.81
3.0	0.48	0.54	0.61	0.71

B.0.2 The converted covered soil thickness $\bar{s}$ on the slab top shall be calculated according to the following formula:

$$\bar{s} = 1.43 s \tan\theta \tag{B.0.2}$$

Where s——The covered soil thickness (m);

θ——The stress diffusion angle of covered soil, not greater than 45°.

Appendix C Determination Method of Equivalent Uniformly Distributed Live Loads on Floors

C.0.1 The equivalent uniformly distributed live loads on floors (slab, secondary beam and main beam) shall be determined as required according to the equivalence requirements of internal force, deformation and crack at the design control position. Under normal circumstances, they may only be determined according to the equivalence of internal force.

C.0.2 The equivalent uniformly distributed live loads of continuous beam and slab may be calculated according to single-span simple support. But they shall still be considered according to continuation in the calculation of internal force.

C.0.3 Where the live loads on floors have large difference due to the difference of production, overhaul, installation process and structural layout, the equivalent uniformly distributed live loads shall be determined respectively by zoning.

C.0.4 The equivalent uniformly distributed live loads of local loads (including concentrated load) on one-way slabs may be calculated according to the following requirements:

1 The equivalent uniformly distributed live load q_e may be calculated according to the following formula:

$$q_e = \frac{8M_{max}}{bl^2} \tag{C.0.4-1}$$

Where l——The slab span;

b——The effective distribution width of load on slab, determined according to C.0.5 of this Appendix;

M_{max}——The absolute maximum bending moment of simply-supported one-way slab, determined according to the most unfavorable layout of equipment.

2 In the calculation of M_{max}, the equipment load shall be multiplied by a dynamic coefficient and deducted the bending moment caused by operation load on the equipment area within this slab span.

C.0.5 The effective distribution width b of local load on one-way slab may be calculated according to the following requirements:

1 Where the longer side of the local load acting surface is parallel to the slab span, the effective distribution width b of load on simply-supported slab is (Figure C.0.5-1):

Where $b_{cx} \geq b_{cy}$, $b_{cy} \leq 0.6l$ and $b_{cx} \leq l$:

$$b = b_{cy} + 0.7l \tag{C.0.5-1}$$

Where $b_{cx} \geq b_{cy}$, $0.6l < b_{cy} \leq l$ and $b_{cx} \leq l$:

$$b = 0.6b_{cy} + 0.94l \tag{C.0.5-2}$$

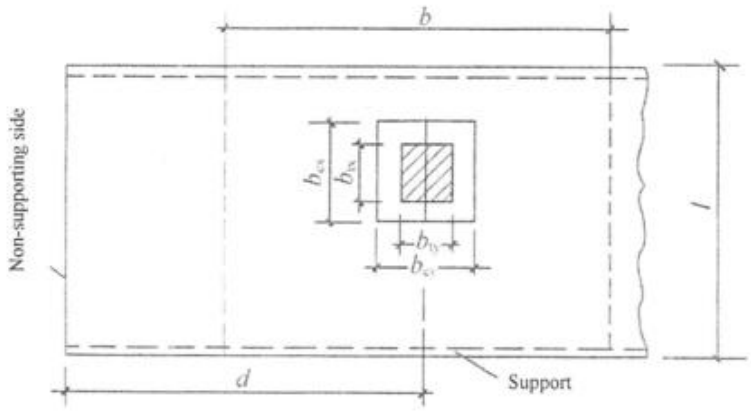


Figure C.0.5-1 Effective Distribution Width of Local Load on Simply-supported Slab (Longer Side of Load Acting Surface Parallel to Slab Span)

2 Where the longer side of the load acting surface is vertical to the slab span, the effective distribution width b of load on simply-supported slab shall be determined according to the following requirements (Figure C.0.5-2):

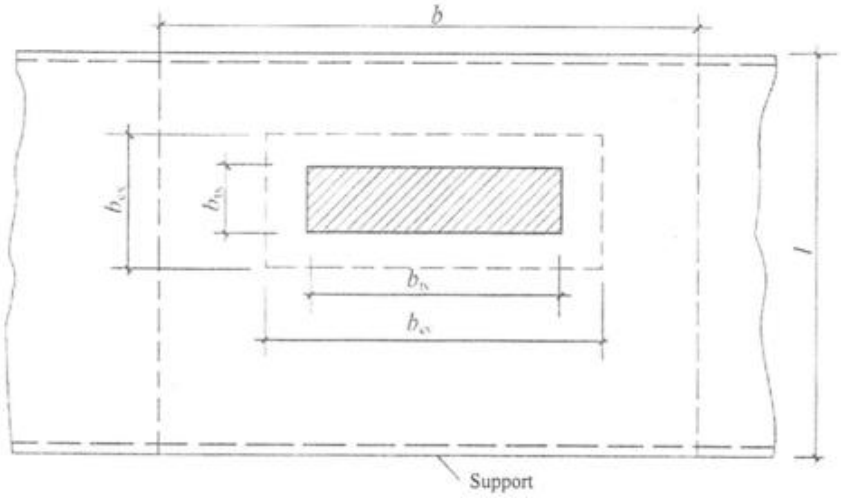


Figure C.0.5-2 Effective Distribution Width of Local Load on Simply-supported Slab (Longer Side of Load Acting Surface Vertical to Slab Span)

1) Where $b_{cx}<b_{cy}$, $b_{cy}\leq 2.2l$ and $b_{cx}\leq l$:

$$b=\frac{2}{3}b_{cy}+0.73l \tag{C.0.5-3}$$

2) Where $b_{cx}<b_{cy}$, $b_{cy}>2.2l$ and $b_{cx}\leq l$:

$$b=b_{cy} \tag{C.0.5-4}$$

Where l——The slab span;

b_{cx}, b_{cy}——The calculation widths when load acting surface parallel and vertical to slab span, respectively taking $b_{cx}=b_{tx}+2s+h$ and $b_{cy}=b_{ty}+2s+h$. Where, b_{tx} is the width when the load acting surface is parallel to the slab span, b_{ty} is the width when the load acting surface is vertical to the slab span, s is the cushion thickness, and h is the slab thickness.

3 Where the local load acts near the non-supporting side of the slab, i.e. $d < \frac{b}{2}$ (Figure C.0.5-1), the effective distribution width of load shall be reduced, and may be calculated according to the following formula:

$$b' = \frac{b}{2} + d \tag{C.0.5-5}$$

Where b'——The reduced effective distribution width;

d——The distance from the load acting surface center to the non-supporting side.

4 Where two local loads are adjacent and $e<b$ (Figure C.0.5-3), the effective distribution width of load shall be reduced, and may be calculated according to the following formula:

$$b' = \frac{b}{2} + \frac{e}{2} \tag{C.0.5-6}$$

Where e——The center distance of two adjacent local loads.

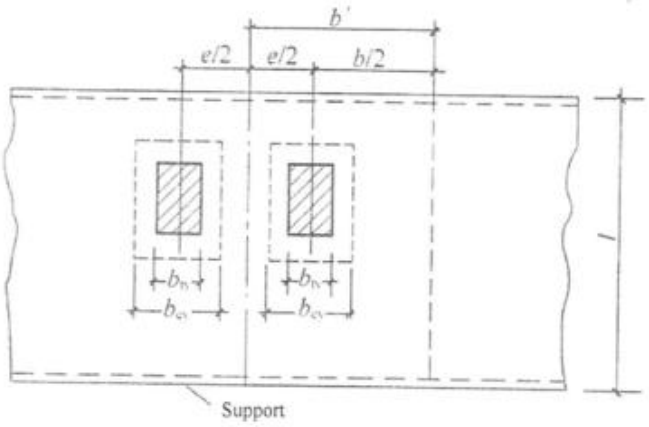


Figure C.0.5-3 Effective Distribution Width of Two Adjacent Local Loads

5 The effective distribution width of local load on cantilever slab (Figure C.0.5-4) shall be calculated according to the following formula:

$$b=b_{cy}+2x \tag{C.0.5-7}$$

Where x——The distance from the local load acting surface center to the support.

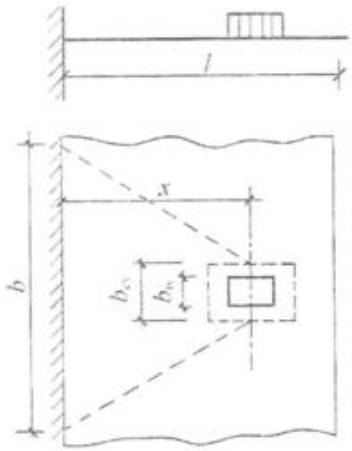


Figure C.0.5-4 Effective Distribution Width of Local Load on Cantilever Slab

C.0.6 The equivalent uniform live load of two-way slab may be determined according to the equivalence of absolute maximum bending moment of slab simply supported along four sides based on the principle same as one-way slab.

C.0.7 For the local load on secondary beam (including longitudinal rib of trough slab), the equivalent uniformly distributed live load shall be determined according to the following requirements:

1 The equivalent uniformly distributed live load shall be calculated according to the following formula in accordance with the uniformly distributed live loads at equivalent bending moment and shear force respectively by taking the larger one between the uniformly distributed live loads at equivalent bending moment and shear force:

$$q_{eM} = \frac{8M_{max}}{sl^2} \tag{C.0.7-1}$$

$$q_{eV} = \frac{2V_{max}}{sl} \tag{C.0.7-2}$$

Where s——The spacing of secondary beams;

l——The span of secondary beam;

M_{max}, V_{max}——The absolute maximum bending moment and maximum shear force of simply-supported secondary beam, determined according to the most unfavorable layout of equipment.

2 In the calculation of M_{max} and V_{max} according to simply-supported beam, in addition to the local load directly transferred to secondary beam, the live load transferred from the adjacent slab surface (therein, equipment load shall consider dynamic influence and deduct operation load on equipment area) and the unloading action of the adjacent secondary beams on both sides shall be considered.

C.0.8 Where the load distribution is relatively uniform, the equivalent uniformly distributed live load on main beam may be obtained by the sum of all the loads divided by all the load bearing areas.

C.0.9 The equivalent uniformly distributed live loads on column and foundation may be the same as main beam under normal circumstances.

Appendix D Live Loads on Floors of Industrial Buildings

D.0.1 The equivalent uniformly distributed live loads on floors of general metalworking workshop, instrument and meter production workshop, semiconductor device workshop, cotton textile workshop, tyre plant preparing workshop and grain processing workshop may be adopted in accordance with those specified in Table D.0.1-1~Table D.0.1-6.

Table D.0.1-1 Uniformly Distributed Live Loads on Floors of Metalworking Workshop

No.	Item	Characteristic value (kN/m²)					Combination value coefficient ψ_c	Frequent value coefficient ψ_f	Quasi-permanent value coefficient ψ_q	Model of representative machine tool
		Slab		Secondary beam (rib)		Main beam				
		Slab span ≥1.2m	Slab span ≥2.0m	Beam spacing ≥1.2m	Beam spacing ≥2.0m					
1	Category I metalworking	22.0	14.0	14.0	10.0	9.0	1.00	0.95	0.85	CW6180, X53K, X63W, B690, M1080, Z35A
2	Category II metalworking	18.0	12.0	12.0	9.0	8.0	1.00	0.95	0.85	C6163, X52K, X62W, B6090, M1050A, Z3040
3	Category III metalworking	16.0	10.0	10.0	8.0	7.0	1.00	0.95	0.85	C6140, X51K, X61W, B6050, M1040, Z3025
4	Category IV metalworking	12.0	8.0	8.0	6.0	5.0	1.00	0.95	0.85	C6132, X50A, X60W, B635-1, M1010, Z32K

Note: 1 The listed loads are applicable to the floor structures such as one-way supported cast-in-situ beam slab and precast trough slab; for trough slab, the listed slab span refers to the spacing of longitudinal ribs of trough slab.

2 The listed loads exclude partition and suspended ceiling self-weight.

3 The listed loads considered the equipment load (including dynamic influence) and operation load under installation, overhaul and normal use.

4 In the design of wall, column and foundation, the listed live loads on floors may adopt the load same as the designed main beam.

Table D.0.1-2 Uniformly Distributed Live Loads on Floors of Instrument and Meter Production Workshop

No.	Workshop name		Characteristic value (kN/m²)				Combination value coefficient ψ_c	Frequent value coefficient ψ_f	Quasi-permanent value coefficient ψ_q	Remarks
			Slab		Secondary beam (rib)	Main beam				
			Slab span ≥1.2m	Slab span ≥2.0m						
1	Optical workshop	Optical processing	7.0	5.0	5.0	4.0	0.80	0.80	0.70	Representative equipment: H015 grinder, ZD-450 and GZD300 coating machine, Q8312 lens polisher
2		Larger optical instrument assembly	7.0	5.0	5.0	4.0	0.80	0.80	0.70	Representative equipment: C0502A finishing lathe, universal tool-measuring microscope
3		General optical instrument assembly	4.0	4.0	4.0	3.0	0.70	0.70	0.60	Assembly on the table
4	Larger optical instrument assembly		7.0	5.0	5.0	4.0	0.80	0.80	0.70	Assembly on the floor
5	General optical instrument assembly		4.0	4.0	4.0	3.0	0.70	0.70	0.60	Assembly on the table
6	Small module gear processing, crystal element (gem) processing		7.0	5.0	5.0	4.0	0.80	0.80	0.70	Representative equipment: YM3680 gear hobbing machine, gem surface grinding machine
7	Workshop warehouse	General instrument warehouse	4.0	4.0	4.0	3.0	1.0	0.95	0.85	—
		Larger instrument warehouse	7.0	7.0	7.0	6.0	1.0	0.95	0.85	—

Note: See Note of Table D.0.1-1.

Table D.0.1-3 Uniformly Distributed Live Loads on Floors of Semiconductor Device Workshop

No.	Workshop name	Characteristic value (kN/m²)					Combination value coefficient ψ_c	Frequent value coefficient ψ_f	Quasi-permanent value coefficient ψ_q	Self-weight of single representative equipment (kN)
		Slab		Secondary beam (rib)		Main beam				
		Slab span ≥1.2m	Slab span ≥2.0m	Beam spacing ≥1.2m	Beam spacing ≥2.0m					
1	Semiconductor device workshop	10.0	8.0	8.0	6.0	5.0	1.0	0.95	0.85	14.0~18.0
2		8.0	6.0	6.0	5.0	4.0	1.0	0.95	0.85	9.0~12.0
3		6.0	5.0	5.0	4.0	3.0	1.0	0.95	0.85	4.0~8.0
4		4.0	4.0	3.0	3.0	3.0	1.0	0.95	0.85	≤3.0

Note: See Note of Table D.0.1-1.

Table D.0.1-4 Uniformly Distributed Live Loads on Floors of Cotton Textile Workshop

No.	Workshop name		Characteristic value (kN/m²)					Combination value coefficient ψ_c	Frequent value coefficient ψ_f	Quasi-permanent value coefficient ψ_q	Representative equipment
			Slab		Secondary beam (rib)		Main beam				
			Slab span ≥1.2m	Slab span ≥2.0m	Beam spacing ≥1.2m	Beam spacing ≥2.0m					
1	Card room		12.0	8.0	10.0	7.0	5.0	0.8	0.8	0.7	FA201, 203
			15.0	10.0	12.0	8.0					FA221A
2	Rough yarn room		8.0 (15.0)	6.0 (10.0)	6.0 (8.0)	5.0	4.0				FA401, 415°, 421TJEA458A
3	Spun yarn room Winding room		6.0 (10.0)	5.0	5.0	5.0	4.0				FA705,506,507A GA013, 015ESPERO
4	Twisting room Warping room		8.0	6.0	6.0	5.0	4.0				FAT05, 721, 762 AC-L-180, D3-1000-180
5	Weaving room	Shuttle loom	12.5	6.5	6.5	5.5	4.4				GA615-150, GA615-180
		Rapier loom	18.0	9.0	10.0	6	4.5				GA731-190, 733-190 TP600-200, SOMET-190

Note: The values in parentheses are not only applicable to local floor of bobbiner head.

Table D.0.1-5 Uniformly Distributed Live Loads on Floors of Tyre Plant Preparing Workshop

No.	Workshop name	Characteristic value (kN/m²)				Combination value coefficient ψ_c	Frequent value coefficient ψ_f	Quasi-permanent value coefficient ψ_q	Representative equipment
		Slab		Secondary beam (rib)	Main beam				
		Slab span ≥1.2m	Slab span ≥2.0m						
1	Preparing workshop	14.0	14.0	12.0	10.0	1.0	0.95	0.85	Carbon black processing feed intake
2		10.0	8.0	8.0	6.0	1.0	0.95	0.85	Chemical raw material processing coordination, milling glue with internal mixer

Note: 1 The load of electric hoist used for internal mixer overhaul is counted in and shall be considered separately in design.

2 The live load of carbon black processing feed intake means considering the condition being doubles as carbon black warehouse use, if not, the above load shall be reduced.

3 See Note of Table D.0.1-1.

Table D.0.1-6 Uniformly Distributed Live Loads on Floors of Grain Processing Workshop

No.	Workshop name		Characteristic value (kN/m²)							Combination value coefficient ψ_c	Frequent value coefficient ψ_f	Quasi-permanent value coefficient ψ_q	Representative equipment
			Slab			Secondary beam			Main beam				
			Slab span ≥2.0m	Slab span ≥2.5m	Slab span ≥3.0m	Beam spacing ≥2.0m	Beam spacing ≥2.5m	Beam spacing ≥3.0m					
1	Flour mill	Drawing workshop	14.0	12.0	12.0	12.0	12.0	12.0	12.0	1.0	0.95	0.85	JMNI0 drawing machine
2		Mill room	12.0	10.0	9.0	10.0	9.0	8.0	9.0				MF011 flour mill
3		Wheat room and flour milling workshop	5.0	5.0	4.0	5.0	4.0	4.0	4.0				SX011 vibrating screen GF031 roller brush machine GF011 scourer
4		Top hanging flat screen	2.0	2.0	2.0	6.0	6.0	6.0	6.0				SL011 flat screen

Table D.0.1-6 (continued)

No.	Workshop name		Characteristic value (kN/m²)							Combination value coefficient ψ_c	Frequent value coefficient ψ_f	Quasi-permanent value coefficient ψ_q	Representative equipment
			Slab			Secondary beam			Main beam				
			Slab span ≥2.0m	Slab span ≥2.5m	Slab span ≥3.0m	Beam spacing ≥2.0m	Beam spacing ≥2.5m	Beam spacing ≥3.0m					
5	Flour mill	Wheat washing workshop	14.0	12.0	10.0	10.0	9.0	9.0	9.0	1.0	0.95	0.85	Wheat washer
6	Rice mill	Rice huller and rice milling workshop	7.0	6.0	5.0	5.0	4.0	4.0	4.0				LG309 rubber roller rice huller
7		Cleaning workshop	4.0	3.0	3.0	4.0	3.0	3.0	3.0				Combined cleaning screen

Note: 1 Where the drawing workshop fails to fully spread grinder roll, the live load of main beam may be adopted according to 10kN/m².

2 The load of top hanging flat screen is considered by equipment being hung below the beam.

3 Where the cleaning workshop of the rice mill adopts SX 011 vibrating screen, the equivalent uniformly distributed live load may be adopted according to the wheat room of the flour mill.

4 See Note of D.0.1-1.

Appendix E Determination Method of Reference Snow Pressure, Wind Pressure and Temperature

E.1 Reference Snow Pressure

E.1.1 In the determination of snow pressure, the observing site shall meet the following requirements:

1 The topography around the observing site shall be open and flat;

2 The snow distribution shall be uniform;

3 The design project location shall be within the topography of the observing site or they have the same topography;

4 For the areas with particularly large local snow variation and the mountain areas with plateaus topography, special investigation and special handling shall be carried out.

E.1.2 The snow pressure sample data shall meet the following requirements:

1 The snow pressure sample data shall adopt the snow weight in unit horizontal area (kN/m^2);

2 Where there is snow pressure record in meteorological station, the snow pressure data shall be adopted directly for calculating the reference snow pressure; In the absence of snow pressure record, the snow pressure s may be calculated according to the snow depth and density;

$$s=h\rho g \tag{E.1.2}$$

Where h——The snow depth, the vertical depth from snow surface to ground surface (m);

ρ——The snow density (t/m^3);

g——The gravity acceleration, $9.8m/s^2$.

3 The snow density may vary greatly with the factors such as snow depth, snow time and local geographical and climatic conditions, so the snow pressure may be calculated according to the local average snow density for the station without direct snow pressure record.

E.1.3 The maximum snow pressure data over the years shall be adopted according to the maximum snow pressure from July to June next.

E.1.4 The reference snow pressure shall be subjected to statistical calculation according to the method specified in E.3, and the recurrence interval shall take 50 years.

E.2 Reference Wind Pressure

E.2.1 In the determination of wind pressure, the observing site shall meet the following requirements:

1 The topography of the observing site and its surrounding shall be open and flat;

2 It shall be capable of reflecting the meteorological characteristics of a larger range of local area, and avoid the influence of local topography and environment.

E.2.2 The wind speed observed data shall meet the following requirements:

1 10min average wind speed data recorded by self-recording anemometer shall be adopted; the non-self-recorded regular observation data before shall be properly corrected and then adopted.

2 The standard height of the anemometer shall be 10m; where the observed anemometer height has a large difference from the standard height, the wind speed v of standard height may be converted according to the following formula:

$$v = vz\left(\frac{10}{z}\right)^{a} \tag{E.2.2}$$

Where z——The actual height of anemometer (m);

v_z——The wind speed observed by anemometer (m/s);

α——The index of terrain roughness in open and flat area, taking 0.15.

3 Where the wind cup anemoscope is used, the correction of air density subject to temperature and atmospheric pressure influence must be considered.

E.2.3 In the selection of annual maximum wind speed data, the over 25-year wind speed data shall be available in general; if not, the wind speed data should not be less than 10 years. The observed data shall consider its uniformity, and the nonuniform data shall be corrected reasonably in combination with the surrounding meteorological station conditions.

E.2.4 The reference wind pressure shall be determined according to the following requirements:

1 The reference wind pressure ω_o shall be calculated according to the following formula based on the reference wind speed:

$$\omega_0 = \frac{1}{2}\rho v_0^2 \tag{E.2.4-1}$$

Where v_0——The reference wind speed;

ρ——The air density (t/m^3).

2 The reference wind speed v_0 shall be subjected to statistical calculation according to the method specified in Appendix E.3 of this code, and the recurrence interval shall take 50 years.

3 The air density ρ may be adopted according to the following requirements:

1) The air density ρ may be calculated according to the following formula:

$$\rho = \frac{0.001276}{1+0.00366t}\left(\frac{P-0.378P_{vap}}{100000}\right) \tag{E.2.4-2}$$

Where t——The air temperature (℃);

P——The atmospheric pressure (Pa);

P_{vap}——The vapor pressure (Pa).

2) The air density ρ may also be approximately estimated according to the following formula based on the located absolute altitude:

$$\rho=0.00125e^{-0.0001z} \quad \text{(E.2.4-3)}$$

Where z——The absolute altitude (m).

E.3 Statistical Calculation of Snow Pressure and Wind Speed

E.3.1 The statistical samples of snow pressure and wind speed shall adopt the annual maximum value, and adopt the extreme value I-shaped probability distribution, and its distribution function shall be:

$$F(x)=\exp\{-\exp[-\alpha(x-u)]\} \quad \text{(E.3.1-1)}$$

$$\alpha=\frac{1.28255}{\sigma} \quad \text{(E.3.1-2)}$$

$$u=\mu-\frac{0.57722}{\alpha} \quad \text{(E.3.1-3)}$$

Where x——The annual maximum snow pressure or annual maximum wind speed sample;

u——The distribution location parameter, i.e. its distribution mode;

α——The distribution scale parameter;

σ——The standard deviation of sample;

μ——The average value of sample.

E.3.2 Where the mean $\bar{x}$ of finite sample n and the standard deviation σ_1 are used as approximate estimations of μ and σ, the distribution parameters μ and σ shall be calculated according to the following formulae:

$$\alpha=\frac{C_1}{\sigma_1} \quad \text{(E.3.2-1)}$$

$$u=\bar{x}-\frac{C_2}{\alpha} \quad \text{(E.3.2-2)}$$

Where C_1, C_2——The coefficient, adopted in accordance with those specified in Table E.3.2.

Table E.3.2 Coefficients C_1 and C_2

n	C_1	C_2	n	C_1	C_2
10	0.9497	0.4952	60	1.17465	0.55208
15	1.02057	0.5182	70	1.18536	0.55477
20	1.06283	0.52355	80	1.19385	0.55688
25	1.09145	0.53086	90	1.20649	0.5586
30	1.11238	0.53622	100	1.20649	0.56002
35	1.12847	0.54034	250	1.24292	0.56878
40	1.14132	0.54362	500	1.2588	0.57240
45	1.15185	0.54630	1000	1.26851	0.57450
50	1.16066	0.54853	∞	1.28255	0.57722

E.3.3 The maximum snow pressure and maximum wind speed x_R with a recurrence interval of R may be determined according to the following formula:

$$x_R = u - \frac{1}{\alpha}\ln\left[\ln\left(\frac{R}{R-1}\right)\right] \tag{E.3.3}$$

E.3.4 The snow pressure and wind pressure values with a recurrence interval of 10, 50 and 100 years of each city throughout the country may be adopted in accordance with those specified in Table E.5; the corresponding value with other recurrence interval R may be determined according to the following formula based on 10-year and 100-year snow pressure and wind pressure values:

$$x_R = x_{10} + (x_{100} - x_{10})(\ln R/\ln 10 - 1) \tag{E.3.4}$$

E.4 Reference Air Temperature

E.4.1 The air temperature refers to the temperature measured in a standard thermometer screen of meteorological station and recorded at regular time by the hour.

E.4.2 The reference air temperature shall be determined through statistical analysis according to the monthly average maximum air temperature value in the months with maximum temperature and the monthly average minimum air temperature value in the months with minimum temperature recorded by the local meteorological station over the years. The monthly average maximum air temperature and the monthly average minimum air temperature may assume that they comply with the extreme value I-shaped distribution, and the reference air temperature may take the value in extreme value distribution, with an average recurrence interval of 50 years.

E.4.3 In the statistical analysis of reference air temperature, the selected monthly average maximum air temperature and monthly average minimum air temperature data shall take the data of recent 30 years in general; if not, the data should not be less than 10 years.

E.5 Snow Pressure, Wind Pressure and Reference Air Temperature of Each City throughout the Country

Table E.5 Snow Pressure, Wind Pressure and Reference Air Temperature of Each City throughout the Country

Province name	City name	Absolute altitude (m)	Wind pressure (kN/m²)			Snow pressure (kN/m²)			Reference air temperature (℃)		Zone of quasi-permanent value coefficient of snow load
			R=10	R=50	R=100	R=10	R=50	R=100	Minimum	Maximum	
Beijing	Beijing	54.0	0.30	0.30	0.50	0.25	0.40	0.45	−13	36	II
Tianjin	Tianjin	3.3	0.30	0.30	0.60	0.25	0.40	0.45	−12	35	II
	Tanggu	3.2	0.40	0.40	0.65	0.20	0.35	0.40	−12	35	II
Shanghai	Shanghai	2.8	0.40	0.40	0.60	0.10	0.20	0.25	−4	36	III
Chongqing	Chongqing	259.1	0.25	0.25	0.45	—	—	—	1	37	—
	Fengjie	607.3	0.25	0.25	0.45	0.20	0.35	0.40	−1	35	III
	Liangping	454.6	0.20	0.20	0.35	—	—	—	−1	36	—
	Wanzhou	186.7	0.20	0.20	0.45	—	—	—	0	38	—

Table E.5 (continued)

Province name	City name	Absolute altitude (m)	Wind pressure (kN/m²)			Snow pressure (kN/m²)			Reference air temperature (℃)		Zone of quasi-permanent value coefficient of snow load
			R=10	R=50	R=100	R=10	R=50	R=100	Minimum	Maximum	
Chongqing	Fuling	273.5	0.20	0.20	0.35	—	—	—	1	37	—
	Jinfoshan	1905.9	—	—	—	0.35	0.50	0.60	−10	25	II
Hebei	Shijiazhuang	80.5	0.25	0.35	0.40	0.20	0.30	0.35	−11	36	II
	Yuxian	909.5	0.20	0.30	0.35	0.20	0.30	0.35	−24	33	II
	Xingtai	76.8	0.20	0.30	0.35	0.25	0.35	0.40	−10	36	II
	Fengning	659.7	0.30	0.40	0.45	0.15	0.25	0.30	−22	33	II
	Weichang	842.8	0.35	0.45	0.50	0.20	0.30	0.35	−23	32	II
	Zhangjiakou	724.2	0.35	0.55	0.60	0.15	0.25	0.30	−18	34	II
	Huailai	536.8	0.25	0.35	0.40	0.15	0.20	0.25	−17	35	II
	Chengde	377.2	0.30	0.40	0.45	0.20	0.30	0.35	−19	35	II
	Zunhua	54.9	0.30	0.40	0.45	0.25	0.40	0.50	−18	35	II
	Qinglong	227.2	0.25	0.30	0.35	0.25	0.40	0.45	−19	34	II
	Qinhuangdao	2.1	0.35	0.45	0.50	0.15	0.25	0.30	−15	33	II
	Baxian	9.0	0.25	0.40	0.45	0.20	0.30	0.35	−14	36	II
	Tangshan	27.8	0.30	0.40	0.45	0.20	0.35	0.40	−15	35	II
	Leting	10.5	0.30	0.40	0.45	0.25	0.40	0.45	−16	34	II
Hebei	Baoding	17.2	0.30	0.40	0.45	0.20	0.35	0.40	−12	36	II
	Raoyang	18.9	0.30	0.35	0.40	0.20	0.30	0.35	−14	36	II
	Cangzhou	9.6	0.30	0.40	0.45	0.20	0.30	0.35	—	—	II
	Huanghua	6.6	0.30	0.40	0.45	0.20	0.30	0.35	−13	36	II
	Nangong	27.4	0.25	0.35	0.40	0.15	0.25	0.30	−13	37	II
Shanxi	Taiyuan	778.3	0.30	0.40	0.45	0.25	0.35	0.40	−16	34	II
	Youyu	1345.8	—	—	—	0.20	0.30	0.35	−29	31	II
	Datong	1067.2	0.35	0.55	0.65	0.15	0.25	0.30	−22	32	II
	Hequ	861.5	0.30	0.50	0.60	0.20	0.30	0.35	−24	35	II
	Wuzhai	1401.0	0.30	0.40	0.45	0.20	0.25	0.30	−25	31	II
	Xingxian	1012.6	0.25	0.45	0.55	0.20	0.25	0.30	−19	34	II
	Yuanping	828.2	0.30	0.50	0.60	0.20	0.30	0.35	−19	34	II
	Lishi	950.8	0.30	0.45	0.50	0.20	0.30	0.35	−19	34	II
	Yangquan	741.9	0.30	0.40	0.45	0.20	0.35	0.40	−13	34	II
Shanxi	Yushe	1041.4	0.20	0.30	0.35	0.20	0.30	0.35	−17	33	II
	Xixian	1052.7	0.25	0.35	0.40	0.20	0.30	0.35	−16	34	II
	Jiexiu	743.9	0.25	0.40	0.45	0.20	0.30	0.35	−15	35	II
	Linfen	449.5	0.25	0.40	0.45	0.15	0.25	0.30	−14	37	II
	Changzhi	991.8	0.30	0.50	0.60	—	—	—	−15	32	—
	Yuncheng	376.0	0.30	0.45	0.50	0.15	0.25	0.30	−11	38	II

Table E.5 (continued)

Province name	City name	Absolute altitude (m)	Wind pressure (kN/m²)			Snow pressure (kN/m²)			Reference air temperature (℃)		Zone of quasi-permanent value coefficient of snow load
			R=10	R=50	R=100	R=10	R=50	R=100	Minimum	Maximum	
Shanxi	Yangcheng	659.5	0.30	0.45	0.50	0.20	0.30	0.35	−12	34	II
Inner Mongolia	Hohhot	1063.0	0.35	0.55	0.60	0.25	0.40	0.45	−23	33	II
	Labudalin of Argun Right Banner	581.4	0.35	0.50	0.60	0.35	0.45	0.50	−41	30	I
	Tulihe of Yakeshi	732.6	0.30	0.40	0.45	0.40	0.60	0.70	−42	28	I
	Manzhouli	661.7	0.50	0.65	0.70	0.20	0.30	0.35	−35	30	I
	Hailaer	610.2	0.45	0.65	0.75	0.35	0.45	0.50	−38	30	I
	Xiaoergou of Oroqen	286.1	0.30	0.40	0.45	0.35	0.50	0.55	−40	31	I
	New Barag Right Banner	554.2	0.45	0.60	0.65	0.25	0.40	0.45	−32	32	I
	Amugulang of New Barag Left Banner	642.0	0.40	0.55	0.60	0.25	0.35	0.40	−34	31	I
	Boketu of Yakeshi	739.7	0.40	0.55	0.60	0.35	0.55	0.65	−31	28	I
	Zhalantun	306.5	0.30	0.40	0.45	0.35	0.55	0.65	−28	32	I
	Arxan Mountain of Horqin Right Front Banner	1027.4	0.35	0.50	0.55	0.45	0.60	0.70	−37	27	I
	Suolun of Horqin Right Front Banner	501.8	0.45	0.55	0.60	0.25	0.35	0.40	−30	31	I
	Ulanhot	274.7	0.40	0.55	0.60	0.20	0.30	0.35	−27	32	I
	East Ujimqin Banner	838.7	0.35	0.55	0.65	0.20	0.30	0.35	−33	32	I
	Ejin Banner	940.5	0.40	0.60	0.70	0.05	0.10	0.15	−23	39	II
	Guaizihu of Ejin Banner	960.0	0.45	0.55	0.60	0.05	0.10	0.10	−23	39	II
	Bayanmaodao of Alxa Left Banner	1328.1	0.40	0.55	0.60	0.10	0.15	0.20	−23	35	II
	Alxa Right Banner	1510.1	0.45	0.55	0.60	0.05	0.10	0.10	−20	35	II
	Erenhot	964.7	0.55	0.65	0.70	0.15	0.25	0.30	−30	34	II
	Naran Bulag	1181.6	0.40	0.55	0.60	0.20	0.30	0.35	−33	31	I
	Mandala of Damao Banner	1225.2	0.50	0.75	0.85	0.15	0.20	0.25	−25	34	II
	Abaga Banner	1126.1	0.35	0.50	0.55	0.30	0.45	0.50	−33	31	I
	Sonid Left Banner	1111.4	0.40	0.50	0.55	0.25	0.35	0.40	−32	33	I
	Hailisu of Urat Rear Banner	1509.6	0.45	0.50	0.55	0.10	0.15	0.20	−25	33	II
	Zhurihe of Sonid Right Banner	1150.8	0.50	0.65	0.75	0.15	0.20	0.25	−26	33	II
	Hailiutu of Urat Middle Banner	1288.0	0.45	0.60	0.65	0.20	0.30	0.35	−26	33	II
	Bailingmiao	1376.0	0.50	0.75	0.85	0.25	0.35	0.40	−27	32	II
	Siziwang Banner	1490.1	0.40	0.60	0.70	0.30	0.45	0.55	−26	30	II

Table E.5 (continued)

Province name	City name	Absolute altitude (m)	Wind pressure (kN/m²)			Snow pressure (kN/m²)			Reference air temperature (℃)		Zone of quasi-permanent value coefficient of snow load
			R=10	R=50	R=100	R=10	R=50	R=100	Minimum	Maximum	
Inner Mongolia	Huade	1482.7	0.45	0.75	0.85	0.15	0.25	0.30	−26	29	II
	Shanba of Hanggin Rear Banner	1056.7	0.30	0.45	0.50	0.15	0.20	0.25	—	—	II
	Baotou	1067.2	0.35	0.55	0.60	0.15	0.25	0.30	−23	34	II
	Jining	1419.3	0.40	0.60	0.70	0.25	0.35	0.40	−25	30	II
	Jilantai of Alxa Left Banner	1031.8	0.35	0.50	0.55	0.05	0.10	0.15	−23	37	II
	Linhe	1039.3	0.30	0.50	0.60	0.15	0.25	0.30	−21	35	II
	Etuoke Banner	1380.3	0.35	0.55	0.65	0.15	0.20	0.20	−23	33	II
	Dongsheng	1460.4	0.30	0.50	0.60	0.25	0.35	0.40	−21	31	II
	Altan Xiret	1329.3	0.40	0.50	0.55	0.20	0.30	0.35	—	—	II
	Bayanhot	1561.4	0.40	0.60	0.70	0.15	0.20	0.25	−19	33	II
	West Ujimqin Banner	995.9	0.45	0.55	0.60	0.30	0.40	0.45	−30	30	I
	Lubei of Jarud	265.0	0.40	0.55	0.60	0.20	0.30	0.35	−23	34	II
	Lindong of Baarin Left Banner	484.4	0.40	0.55	0.60	0.20	0.30	0.35	−26	32	II
	Xilinhot	989.5	0.40	0.55	0.60	0.20	0.40	0.45	−30	31	I
	Linxi	799.0	0.45	0.60	0.70	0.25	0.40	0.45	−25	32	I
	Kailu	241.0	0.40	0.55	0.60	0.20	0.30	0.35	−25	34	II
	Tongliao	178.5	0.40	0.55	0.60	0.20	0.30	0.35	−25	33	II
	Duolun	1245.5	0.40	0.55	0.60	0.20	0.30	0.35	−28	30	I
	Wudan of Ongniud Banner	631.8	—	—	—	0.20	0.30	0.35	−23	32	II
	Chifeng	571.1	0.30	0.55	0.65	0.20	0.30	0.35	−23	33	II
	Baotutu of Aohan Banner	400.5	0.40	0.50	0.55	0.25	0.40	0.45	−23	33	II
Liaoning	Shenyang	42.8	0.40	0.55	0.60	0.30	0.50	0.55	−24	33	I
	Zhangwu	79.4	0.35	0.45	0.50	0.20	0.30	0.35	−22	33	II
	Fuxin	144.0	0.40	0.60	0.70	0.25	0.40	0.45	−23	33	II
	Kaiyuan	98.2	0.30	0.45	0.50	0.35	0.45	0.55	−27	33	I
	Qingyuan	234.1	0.25	0.40	0.45	0.45	0.70	0.80	−27	33	I
	Chaoyang	169.2	0.40	0.55	0.60	0.30	0.45	0.55	−23	35	II
	Yebaishou of Jianping County	421.7	0.30	0.35	0.40	0.25	0.35	0.40	−22	35	II
	Heishan	37.5	0.45	0.65	0.75	0.30	0.45	0.50	−21	33	II
	Jinzhou	65.9	0.40	0.60	0.70	0.30	0.40	0.45	−18	33	II
	Anshan	77.3	0.30	0.50	0.60	0.30	0.45	0.55	−18	34	II

Table E.5 (continued)

Province name	City name	Absolute altitude (m)	Wind pressure (kN/m²)			Snow pressure (kN/m²)			Reference air temperature (℃)		Zone of quasi-permanent value coefficient of snow load
			R=10	R=50	R=100	R=10	R=50	R=100	Minimum	Maximum	
Liaoning	Benxi	185.2	0.35	0.45	0.50	0.40	0.55	0.60	−24	33	I
	Zhangdang of Fushun	118.5	0.30	0.45	0.50	0.35	0.45	0.50	−28	33	I
	Huanren	240.3	0.25	0.30	0.35	0.35	0.50	0.55	−25	32	I
	Suizhong	15.3	0.25	0.40	0.45	0.25	0.35	0.40	−19	33	II
	Xingcheng	8.8	0.35	0.45	0.50	0.20	0.30	0.35	−19	32	II
	Yingkou	3.3	0.40	0.65	0.75	0.30	0.40	0.45	−20	33	II
	Xiongyue of Gai County	20.4	0.30	0.40	0.45	0.25	0.40	0.45	−22	33	II
	Caohekou of Benxi County	233.4	0.25	0.45	0.55	0.35	0.55	0.60	—	—	I
	Xiuyan	79.3	0.30	0.45	0.50	0.35	0.50	0.55	−22	33	II
	Kuandian	260.1	0.30	0.50	0.60	0.40	0.60	0.70	−26	32	II
	Dandong	15.1	0.35	0.55	0.65	0.30	0.40	0.45	−18	32	II
	Wafangdian	29.3	0.35	0.50	0.55	0.20	0.30	0.35	−17	32	II
	Pikou of Xinjin County	43.2	0.35	0.50	0.55	0.20	0.30	0.35	—	—	II
	Zhuanghe	34.8	0.35	0.50	0.55	0.25	0.35	0.40	−19	32	II
	Dalian	91.5	0.40	0.65	0.75	0.25	0.40	0.45	−13	32	II
Jilin	Changchun	236.8	0.45	0.65	0.75	0.30	0.45	0.50	−26	32	I
	Baicheng	155.4	0.45	0.65	0.75	0.15	0.20	0.25	−29	33	II
	Qianan	146.3	0.35	0.45	0.55	0.15	0.20	0.23	−28	33	II
	Qian Gorlos	134.7	0.30	0.45	0.50	0.15	0.25	0.30	−28	33	II
	Tongyu	149.5	0.35	0.50	0.55	0.15	0.25	0.30	−28	33	II
	Changling	189.3	0.30	0.45	0.50	0.15	0.20	0.25	−27	32	II
	Sanchahe of Fuyu	196.6	0.40	0.60	0.70	0.25	0.35	0.40	−29	32	II
	Shuangliao	114.9	0.35	0.50	0.55	0.20	0.30	0.35	−27	33	I
	Siping	164.2	0.40	0.55	0.60	0.20	0.35	0.40	−24	33	II
	Yantongshan of Panshi County	271.6	0.30	0.40	0.45	0.25	0.40	0.45	−31	31	I
	Jilin	183.4	0.40	0.50	0.55	0.30	0.45	0.50	−31	32	I
	Jiaohe	295.0	0.30	0.45	0.50	0.50	0.75	0.85	−31	32	I
	Dunhua	523.7	0.30	0.45	0.50	0.30	0.50	0.60	−29	30	I
	Meihekou	339.9	0.30	0.40	0.45	0.30	0.45	0.50	−27	32	I
	Huadian	263.8	0.30	0.40	0.45	0.40	0.65	0.75	−33	32	I
	Jingyu	549.2	0.25	0.35	0.40	0.40	0.60	0.70	−32	31	I
	Donggang of Fusong County	774.2	0.30	0.45	0.55	0.80	1.15	1.30	−27	30	I
	Yanji	176.8	0.35	0.50	0.55	0.35	0.55	0.65	−26	32	I

Table E.5 (continued)

Province name	City name	Absolute altitude (m)	Wind pressure (kN/m²)			Snow pressure (kN/m²)			Reference air temperature (℃)		Zone of quasi-permanent value coefficient of snow load
			R=10	R=50	R=100	R=10	R=50	R=100	Minimum	Maximum	
Jilin	Tonghua	402.9	0.30	0.50	0.60	0.50	0.80	0.90	−27	32	I
	Linjiang of Hunjiang	332.7	0.20	0.30	0.30	0.45	0.70	0.80	−27	33	I
	Ji'an	177.7	0.20	0.30	0.35	0.45	0.70	0.80	−26	33	I
	Changbai	1016.7	0.35	0.45	0.50	0.40	0.60	0.70	−28	29	I
Heilongjiang	Harbin	142.3	0.35	0.55	0.70	0.30	0.45	0.50	−31	32	I
	Mohe	296.0	0.25	0.35	0.40	0.60	0.75	0.85	−42	30	I
	Tahe	357.4	0.25	0.30	0.35	0.50	0.65	0.75	−38	30	I
	Xinlin	494.6	0.25	0.35	0.40	0.50	0.65	0.75	−40	29	I
	Huma	177.4	0.30	0.50	0.60	0.45	0.60	0.70	−40	31	I
	Jiagedaqi	371.7	0.25	0.35	0.40	0.45	0.65	0.70	−38	30	I
	Heihe	166.4	0.35	0.50	0.55	0.60	0.75	0.85	−35	31	I
	Nenjiang	242.2	0.40	0.55	0.60	0.40	0.55	0.60	−39	31	I
	Sunwu	234.5	0.40	0.60	0.70	0.45	0.60	0.70	−40	31	I
	Beian	269.7	0.30	0.50	0.60	0.40	0.55	0.60	−36	31	I
	Keshan	234.6	0.30	0.45	0.50	0.30	0.50	0.55	−34	31	I
	Fuyu	162.4	0.30	0.40	0.45	0.25	0.35	0.40	−34	32	I
	Tsitsihar	145.9	0.35	0.45	0.50	0.25	0.40	0.45	−30	32	I
	Hailun	239.2	0.35	0.55	0.65	0.30	0.40	0.45	−32	31	I
	Mingshui	249.2	0.35	0.45	0.50	0.25	0.40	0.45	−30	31	I
	Yinchun	240.9	0.25	0.35	0.40	0.50	0.65	0.75	−36	31	I
	Hegang	227.9	0.30	0.40	0.45	0.45	0.65	0.70	−27	31	I
	Fujin	64.2	0.30	0.45	0.50	0.40	0.55	0.60	−30	31	I
	Tailai	149.5	0.30	0.45	0.50	0.20	0.30	0.35	−28	33	I
	Suihua	179.6	0.35	0.55	0.65	0.35	0.50	0.60	−32	31	I
	Anda	149.3	0.35	0.55	0.65	0.20	0.30	0.35	−31	32	I
	Tieli	210.5	0.25	0.35	0.40	0.50	0.75	0.85	−34	31	I
	Kiamusze	81.2	0.40	0.65	0.75	0.60	0.85	0.95	−30	32	I
	Yilan	100.1	0.45	0.65	0.75	0.30	0.45	0.50	−29	32	I
	Baoqing	83.0	0.30	0.40	0.45	0.55	0.85	1.00	−30	31	I
	Tonghe	108.6	0.35	0.50	0.55	0.50	0.75	0.85	−33	32	I
	Shangzhi	189.7	0.35	0.55	0.60	0.40	0.55	0.60	−32	32	I
	Jixi	233.6	0.40	0.55	0.65	0.45	0.65	0.75	−27	32	I
	Hulin	100.2	0.35	0.45	0.50	0.95	1.40	1.60	−29	31	I
	Mudanjiang	241.4	0.35	0.50	0.55	0.50	0.75	0.85	−28	32	I
	Suifenhe	496.7	0.40	0.60	0.70	0.60	0.75	0.85	−30	29	I

Table E.5 (continued)

Province name	City name	Absolute altitude (m)	Wind pressure (kN/m²)			Snow pressure (kN/m²)			Reference air temperature (℃)		Zone of quasi-permanent value coefficient of snow load
			R=10	R=50	R=100	R=10	R=50	R=100	Minimum	Maximum	
Shandong	Jinan	51.6	0.30	0.45	0.50	0.20	0.30	0.35	−9	36	II
	Dezhou	21.2	0.30	0.45	0.50	0.20	0.35	0.40	−11	36	II
	Huimin	11.3	0.40	0.50	0.55	0.25	0.35	0.40	−13	36	II
	Yangjiaogou of Shouguang County	4.4	0.30	0.45	0.50	0.15	0.25	0.30	−11	36	II
	Longkou	4.8	0.45	0.60	0.65	0.25	0.35	0.40	−11	35	II
	Yantai	46.7	0.40	0.55	0.60	0.30	0.40	0.45	−8	32	II
	Weihai	46.6	0.45	0.65	0.75	0.30	0.50	0.60	−8	32	II
	Chengshantou of Rongcheng	47.7	0.60	0.70	0.75	0.25	0.40	0.45	−7	30	II
	Chaocheng of Shen County	42.7	0.35	0.45	0.50	0.25	0.35	0.40	−12	36	II
	Taishan of Taian	1533.7	0.65	0.85	0.95	0.40	0.55	0.60	−16	25	II
	Taian	128.8	0.30	0.40	0.45	0.20	0.35	0.40	−12	33	II
	Zhangdian of Zibo	34.0	0.30	0.40	0.45	0.30	0.45	0.50	−12	36	II
	Yiyuan	304.5	0.30	0.35	0.40	0.20	0.30	0.35	−13	35	II
	Weifang	44.1	0.30	0.40	0.45	0.25	0.35	0.40	−12	36	II
	Laiyang	30.5	0.30	0.40	0.45	0.15	0.25	0.30	−13	35	II
	Qingdao	76.0	0.45	0.60	0.70	0.15	0.20	0.25	−9	33	II
	Haiyang	65.2	0.40	0.55	0.60	0.10	0.15	0.15	−10	33	II
	Shidao of Rongcheng	33.7	0.40	0.55	0.65	0.10	0.15	0.15	−8	31	II
	Heze	49.7	0.25	0.40	0.45	0.20	0.30	0.35	−10	36	II
	Yanzhou	51.7	0.25	0.40	0.45	0.25	0.35	0.45	−11	36	II
	Ying County	107.4	0.25	0.35	0.40	0.20	0.35	0.40	−11	35	II
	Linyi	87.9	0.30	0.40	0.45	0.25	0.40	0.45	−10	35	II
	Rizhao	16.1	0.30	0.40	0.45	—	—	—	−8	33	—
Jiangsu	Nanjing	8.9	0.25	0.40	0.45	0.40	0.65	0.75	−6	37	II
	Xuzhou	41.0	0.25	0.35	0.40	0.25	0.35	0.40	−8	35	II
	Ganyu	2.1	0.30	0.45	0.50	0.25	0.35	0.40	−8	35	II
	Xuyu	34.5	0.25	0.35	0.40	0.20	0.30	0.35	−7	36	II
	Huaiyin	17.5	0.25	0.40	0.45	0.25	0.40	0.45	−7	35	II
	Sheyang	2.0	0.30	0.40	0.45	0.15	0.20	0.25	−7	35	III
	Zhenjiang	26.5	0.30	0.40	0.45	0.25	0.35	0.40	—	—	III
	Wuxi	6.7	0.30	0.45	0.50	0.30	0.40	0.45	—	—	III
	Taizhou	6.6	0.25	0.40	0.45	0.25	0.35	0.40	—	—	III
	Lianyungang	3.7	0.35	0.55	0.65	0.25	0.40	0.45	—	—	II

Table E.5 (continued)

Province name	City name	Absolute altitude (m)	Wind pressure (kN/m²)			Snow pressure (kN/m²)			Reference air temperature (℃)		Zone of quasi-permanent value coefficient of snow load
			R=10	R=50	R=100	R=10	R=50	R=100	Minimum	Maximum	
Jiangsu	Lianyungang	3.7	0.35	0.55	0.65	0.25	0.40	0.45	—	—	II
	Yancheng	3.6	0.25	0.45	0.55	0.20	0.35	0.40	—	—	III
	Gaoyou	5.4	0.25	0.40	0.45	0.20	0.35	0.40	−6	36	III
	Dongtai	4.3	0.30	0.40	0.45	0.20	0.30	0.35	−6	36	III
	Nantong	5.3	0.30	0.45	0.50	0.15	0.25	0.30	−4	36	III
	Lvsi of Qidong County	5.5	0.35	0.50	0.55	0.10	0.20	0.25	−4	35	III
	Changzhou	4.9	0.25	0.40	0.45	0.20	0.35	0.40	−4	37	III
	Liyang	7.2	0.25	0.40	0.45	0.30	0.50	0.55	−5	37	III
	Dongshan of Wu County	17.5	0.30	0.45	0.50	0.25	0.40	0.45	−5	36	III
Zhejiang	Hangzhou	41.7	0.30	0.45	0.50	0.30	0.45	0.50	−4	38	III
	Tianmu Mountain of Lin'an	1505.9	0.55	0.75	0.85	1.00	1.60	1.85	−11	28	II
	Zhapu of Pinghu County	5.4	0.35	0.45	0.50	0.25	0.35	0.40	−5	36	III
	Cixi	7.1	0.30	0.45	0.50	0.25	0.35	0.40	−4	37	III
	Shengsi	79.6	0.85	1.30	1.55	—	—	—	−2	34	—
	Shengshan of Shengsi County	124.6	1.00	1.65	1.95	—	—	—	0	30	—
	Zhoushan	35.7	0.50	0.85	1.00	0.30	0.50	0.60	−2	35	III
	Jinhua	62.6	0.25	0.35	0.40	0.35	0.55	0.65	−3	39	III
	Sheng County	104.3	0.25	0.40	0.50	0.35	0.55	0.65	−3	39	III
	Ningbo	4.2	0.30	0.50	0.60	0.20	0.30	0.35	−2	37	III
	Shipu of Xiangshan County	128.4	0.75	1.20	1.45	0.20	0.30	0.35	−2	35	III
	Quzhou	66.9	0.25	0.35	0.40	0.30	0.50	0.60	−3	38	III
	Lishui	60.8	0.20	0.30	0.35	0.30	0.45	0.50	−3	39	III
	Longquan	198.4	0.20	0.30	0.35	0.35	0.55	0.65	−2	38	III
	Kuocangshan of Linhai	1383.1	0.60	0.90	1.05	0.45	0.65	0.75	−8	29	III
	Wenzhou	6.0	0.35	0.60	0.70	0.25	0.35	0.40	0	36	III
	Hongjia of Jiaojiang	1.3	0.35	0.55	0.65	0.20	0.30	0.35	−2	36	III
	Xiadachen of Jiaojiang	86.2	0.95	1.45	1.75	0.25	0.35	0.40	−1	33	III
	Kanmen of Yuhuan	95.9	0.70	1.20	1.45	0.20	0.35	0.40	0	34	III
	Beiji of Ruian	42.3	1.00	1.80	2.20	—	—	—	2	33	—
Anhui	Hefei	27.9	0.25	0.35	0.40	0.40	0.60	0.70	−6	37	II
	Dangshan	43.2	0.25	0.35	0.40	0.25	0.40	0.45	−9	36	II
	Bozhou	37.7	0.25	0.45	0.55	0.25	0.40	0.45	−8	37	II

Table E.5 (continued)

Province name	City name	Absolute altitude (m)	Wind pressure (kN/m²)			Snow pressure (kN/m²)			Reference air temperature (℃)		Zone of quasi-permanent value coefficient of snow load
			R=10	R=50	R=100	R=10	R=50	R=100	Minimum	Maximum	
Anhui	Suxiu	25.9	0.25	0.40	0.50	0.25	0.40	0.45	−8	36	II
	Shouxian	22.7	0.25	0.35	0.40	0.30	0.50	0.55	−7	35	II
	Bengbu	18.7	0.25	0.35	0.40	0.30	0.45	0.55	−6	36	II
	Chu County	25.3	0.25	0.35	0.40	0.30	0.50	0.60	−6	36	II
	Lu'an	60.5	0.20	0.35	0.40	0.35	0.55	0.60	−5	37	II
	Huoshan	68.1	0.20	0.35	0.40	0.45	0.65	0.75	−6	37	II
	Chaohu	22.4	0.25	0.35	0.40	0.30	0.45	0.50	−5	37	II
	Anqing	19.8	0.25	0.40	0.45	0.20	0.35	0.40	−3	36	III
	Ningguo	89.4	0.25	0.35	0.40	0.30	0.50	0.55	−6	38	III
	Mount Huang	1840.4	0.50	0.70	0.80	0.35	0.45	0.50	−11	24	III
	Huangshan	142.7	0.25	0.35	0.40	O.30	0.45	0.50	−3	38	III
	Fuyang	30.6	—	—	—	0.35	0.55	0.60	−7	36	II
Jiangxi	Nanchang	46.7	0.30	0.45	0.55	0.30	0.45	0.50	−3	38	III
	Xiushui	146.8	0.20	0.30	0.35	0.25	0.40	0.50	−4	37	III
	Yichun	131.3	0.20	0.30	0.35	0.25	0.40	0.45	−3	38	III
	Ji'an	76.4	0.25	0.30	0.35	0.25	0.35	0.45	−2	38	III
	Ninggang	263.1	0.20	0.30	0.35	0.30	0.45	0.50	−3	38	III
	Suichuan	126.1	0.20	0.30	0.35	0.30	0.45	0.55	−1	38	III
	Ganzhou	123.8	0.20	0.30	0.35	0.20	0.35	0.40	0	38	III
	Jiujiang	36.1	0.25	0.35	0.40	0.30	0.40	0.45	−2	38	III
	Lushan	1164.5	0.40	O.55	0.60	0.60	0.95	1.05	−9	29	III
	Boyang	40.1	0.25	0.40	0.45	0.35	0.60	0.70	−3	38	III
	Jingdezhen	61.5	0.25	0.25	0.40	0.25	0.35	0.40	−3	38	III
	Zhangshu	30.4	0.20	0.30	0.35	0.25	0.40	0.45	−3	38	III
	Guixi	51.2	0.20	0.30	0.25	0.35	0.50	0.60	−2	38	III
	Yushan	116.3	0.20	0.30	0.35	0.35	0.55	0.65	−3	38	III
	Nancheng	80.8	0.25	0.30	0.35	0.20	0.35	0.40	−3	37	III
	Guangchang	143.8	0.20	0.30	0.35	0.30	0.45	0.50	−2	38	III
	Xunwu	303.9	0.25	0.30	0.35	—	—	—	−0.3	37	—
Fujian	Fuzhou	83.8	0.40	0.70	0.85	—	—	—	3	37	—
	Shaowu	191.5	0.20	0.30	0.35	0.25	0.35	0.40	−1	37	III
	Qixianshan of Chong'an County	1401.9	0.55	0.70	0.80	0.40	0.60	0.70	−5	28	III
	Pucheng	276.9	0.20	0.30	0.35	0.35	0.55	0.65	−2	37	III
	Jianyang	196.9	0.25	0.35	0.40	0.35	0.50	0.55	−2	38	III
	Jianou	154.9	0.25	0.35	0.40	0.25	0.35	0.40	0	38	III

Table E.5 (continued)

Province name	City name	Absolute altitude (m)	Wind pressure (kN/m²)			Snow pressure (kN/m²)			Reference air temperature (℃)		Zone of quasi-permanent value coefficient of snow load
			R=10	R=50	R=100	R=10	R=50	R=100	Minimum	Maximum	
Fujian	Fuding	36.2	0.35	0.70	0.90	—	—	—	1	37	—
	Taining	342.9	0.20	0.30	0.35	0.30	0.50	0.60	−2	37	III
	Nanping	125.6	0.20	0.35	0.45	—	—	—	2	38	—
	Taishan of Fuding County	106.6	0.75	1.00	1.10	—	—	—	4	30	—
	Changting	310.0	0.20	0.35	0.40	0.15	0.25	0.30	0	36	III
	Shanghang	197.9	0.25	0.30	0.35	—	—	—	2	36	—
	Yong'an	206.0	0.25	0.40	0.45	—	—	—	2	38	—
	Longyan	342.3	0.20	0.35	0.45	—	—	—	3	36	—
	Jiuxianshan of Dehua County	1653.5	0.60	0.80	0.90	0.25	0.40	0.50	−3	25	III
	Pingnan	896.5	0.20	0.30	0.35	0.25	0.45	0.50	−2	32	III
	Pingtan	32.4	0.75	1.30	1.60	—	—	—	4	34	—
	Chongwu	21.8	0.55	0.85	1.05	—	—	—	5	33	—
	Xiamen	139.4	0.50	0.80	0.95	—	—	—	5	35	—
	Dongshan	53.3	0.80	1.25	1.45	—	—	—	7	34	—
Shaanxi	Xi'an	397.5	0.25	0.35	0.40	0.20	0.25	0.30	−9	37	III
	Yulin	1057.5	0.25	0.40	0.45	0.20	0.25	0.30	−22	35	II
	Wuqi	1272.6	0.25	0.40	0.50	0.15	0.20	0.20	−20	33	II
	Hengshan	1111.0	0.30	0.40	0.45	0.15	0.25	0.30	−21	35	II
	Suide	929.7	0.30	0.40	0.45	0.20	0.35	0.40	−19	35	II
	Yan'an	957.8	0.25	0.35	0.40	0.15	0.25	0.30	−17	34	II
	Changwu	1206.5	0.20	0.30	0.35	0.20	0.30	0.35	−15	32	II
	Luochuan	1158.3	0.25	0.35	0.40	0.25	0.35	0.40	−15	32	II
	Tongchuan	978.9	0.20	0.35	0.40	0.15	0.20	0.25	−12	33	II
	Baoji	612.4	0.20	0.35	0.40	0.15	0.20	0.25	−8	37	II
	Wugong	447.8	0.20	0.35	0.40	0.20	0.25	0.30	−9	37	II
	Huashan Mountain of Huayin County	2064.9	0.40	0.50	0.55	0.50	0.70	0.75	−15	25	II
	Lvyang	794.2	0.25	0.35	0.40	0.10	0.15	0.15	−6	34	III
	Hanzhong	508.4	0.20	0.30	0.35	0.15	0.20	0.25	−5	34	III
	Foping	1087.7	0.25	0.35	0.45	0.15	0.25	0.30	−8	33	III
	Shangzhou	742.2	0.25	0.30	0.35	0.20	0.30	0.35	−8	35	II
	Zhen'an	693.7	0.20	0.35	0.40	0.20	0.30	0.35	−7	36	III
	Shiquan	484.9	0.20	0.30	0.35	0.20	O.30	0.35	−5	35	III
	Ankang	290.8	0.30	0.45	0.50	0.10	0.15	0.20	−4	37	III
Gansu	Lanzhou	1517.2	0.20	0.30	0.35	0.10	0.15	0.20	−15	34	II

Table E.5 (continued)

Province name	City name	Absolute altitude (m)	Wind pressure (kN/m²)			Snow pressure (kN/m²)			Reference air temperature (℃)		Zone of quasi-permanent value coefficient of snow load
			R=10	R=50	R=100	R=10	R=50	R=100	Minimum	Maximum	
Gansu	Jihede	966.5	0.45	0.55	0.60	—	—	—	—	—	—
	Anxi	1170.8	0.40	0.55	0.60	0.10	0.20	0.25	−22	37	II
	Jiuquan	1477.2	0.40	0.55	0.60	0.20	0.30	0.35	−21	33	II
	Zhangye	1482.7	0.30	0.50	0.60	0.05	0.10	0.15	−22	34	II
	Wuwei	1530.9	0.35	0.55	0.65	0.15	0.20	0.25	−20	33	II
	Minqin	1367.0	0.40	0.50	0.55	0.05	0.10	0.10	−21	35	II
	Wushaoling	3045.1	0.35	0.40	0.45	0.35	0.55	0.60	−22	21	II
	Jingtai	1630.5	0.25	0.40	0.45	0.10	0.15	0.20	−18	33	II
	Jingyuan	1398.2	0.20	0.30	0.35	0.15	0.20	0.25	−18	33	II
	Linxia	1917.0	0.20	0.30	0.35	0.15	0.25	0.30	−18	30	II
	Lintao	1886.6	0.20	0.30	0.35	0.30	0.50	0.55	−19	30	II
	Huajialing	2450.6	0.30	0.40	0.45	0.25	0.40	0.45	−17	24	II
	Huan County	1255.6	0.20	0.30	0.35	0.15	0.25	0.30	−18	33	II
	Pingliang	1346.6	0.25	0.30	0.35	0.15	0.25	0.30	−14	32	II
	Xifeng Town	1421.0	0.20	0.30	0.35	0.25	0.40	0.45	−14	31	II
	Maqu	3471.4	0.25	0.30	0.35	0.15	0.20	0.25	−23	21	II
	Hezuo of Xiahe County	2910.0	0.25	0.30	0.35	0.25	0.40	0.45	−23	24	II
	Wudu	1079.1	0.25	0.35	0.40	0.05	0.10	0.15	−5	35	III
	Tianshui	1141.7	0.20	0.35	0.40	0.15	0.20	0.25	−11	34	II
	Mazongshan	1962.7	—	—	—	0.10	0.15	0.20	−25	32	II
	Dunhuang	1139.0	—	—	—	0.10	0.15	0.20	−20	37	II
	Yumen	1526.0	—	—	—	0.15	0.20	0.25	−21	33	II
	Dingxin of Jinta County	1177.4	—	—	—	0.05	0.10	0.15	−21	36	II
	Gaotai	1332.2	—	—	—	0.10	0.15	0.20	−21	34	II
	Shandan	1764.6	—	—	—	0.15	0.20	0.25	−21	32	II
	Yongchang	1976.1	—	—	—	0.10	0.15	0.20	−22	29	II
	Yuzhong	1874.1	—	—	—	0.15	0.20	0.25	−19	30	II
	Huining	2012.2	—	—	—	0.20	0.30	0.35	—	—	II
	Min County	2315.0	—	—	—	0.10	0.15	0.20	−19	27	II
Ningxia	Yinchuan	1111.4	0.40	0.65	0.75	0.15	0.20	0.25	−19	34	II
	Huinong	1091.0	0.45	0.65	0.70	0.05	0.10	0.10	−20	35	II
	Taole	1101.6	—	—	—	0.05	0.10	0.10	−20	35	II
	Zhongwei	1225.7	0.30	0.45	0.50	0.05	0.10	0.15	−18	33	II
	Zhongning	1183.3	0.30	0.35	0.40	0.10	0.15	0.20	−18	34	II
	Yanchi	1347.8	0.30	0.40	0.45	0.20	0.30	0.35	−20	34	II
	Haiyuan	1854.2	0.25	0.35	0.40	0.25	0.40	0.45	−17	30	II

Table E.5 (continued)

Province name	City name	Absolute altitude (m)	Wind pressure (kN/m²)			Snow pressure (kN/m²)			Reference air temperature (℃)		Zone of quasi-permanent value coefficient of snow load
			R=10	R=50	R=100	R=10	R=50	R=100	Minimum	Maximum	
Ningxia	Tongxin	1343.9	0.20	0.30	0.35	0.10	0.10	0.15	−18	34	II
	Guyuan	1753.0	0.25	0.35	0.40	0.30	0.40	0.45	−20	29	II
	Xiji	1916.5	0.20	0.30	0.35	0.15	0.20	0.20	−20	29	II
Qinghai	Xining	2261.2	0.25	0.35	0.40	0.15	0.20	0.25	−19	29	II
	Mangya	3138.5	0.30	0.40	0.45	0.05	0.10	0.10	—	—	II
	Lenghu	2733.0	0.40	0.55	0.60	0.05	0.10	0.10	−26	29	II
	Tuole of QilianCounty	3367.0	0.30	0.40	0.45	0.20	0.25	0.30	−32	22	II
	Yeniugou of Qilian County	3180.0	0.30	0.40	0.45	0.15	0.20	0.20	−31	21	II
	Qilian County	2787.4	0.30	0.35	0.40	0.10	0.15	0.15	−25	25	II
	Xiaozaohuoof Golmud	2767.0	0.30	0.40	0.45	0.05	0.10	0.10	−25	30	II
	Dachaidan	3173.2	0.30	0.40	0.45	0.10	0.15	0.15	−27	26	II
	Delingha	2981.5	0.25	0.35	0.40	0.10	0.15	0.20	−22	28	II
	Gangcha	3301.5	0.25	0.35	0.40	0.20	0.25	0.30	−26	21	II
	Menyuan	2850.0	0.25	0.35	0.40	0.20	0.30	0.30	−27	24	II
	Golmud	2807.6	0.30	0.40	0.45	0.10	0.20	0.25	−21	29	II
	Nuomuhongof Dulan County	2790.4	0.35	0.50	0.60	0.05	0.10	0.10	−22	30	II
	Dulan	3191.1	0.30	0.45	0.55	0.20	0.25	0.30	−21	26	II
	Chaka of Wulan County	3087.6	0.25	0.35	0.40	0.15	0.20	0.25	−25	25	II
	Qiabuqia of Gonghe County	2835.0	0.25	0.35	0.40	0.10	0.15	0.20	−22	26	II
	Guide	2237.1	0.25	0.30	0.35	0.05	0.10	0.10	−18	30	II
	Minhe	1813.9	0.20	0.30	0.35	0.10	0.10	0.15	−17	31	II
	Wudaoliangof Tanggulashan	4612.2	0.35	0.45	0.50	0.20	0.25	0.30	−29	17	I
	Xinghai	3323.2	0.25	0.35	0.40	0.15	0.20	0.20	−25	23	II
	Tongde	3289.4	0.25	0.35	0.40	0.20	0.30	0.35	−28	23	II
	Zeku	3662.8	0.25	0.30	0.35	0.20	0.40	0.45	—	—	II
	Tuotuohe of Golmud	4533.1	0.40	0.50	0.55	0.25	0.35	0.40	−33	19	I
	Zhiduo	4179.0	0.25	0.30	0.35	0.15	0.20	0.25	—	—	I
	Zaduo	4066.4	0.25	0.35	0.40	0.20	0.25	0.30	−25	22	II
	Qumacai	4231.2	0.25	0.35	0.40	0.15	0.25	0.30	−28	20	I
	Yushu	3681.2	0.20	0.30	0.35	0.15	0.20	0.25	−20	24.4	II
	Maduo	4272.3	0.30	0.40	0.45	0.25	0.35	0.40	−33	18	I
	Qingshuihe of Chengduo County	4415.4	0.25	0.30	0.35	0.25	0.30	0.35	−33	17	I

Table E.5 (continued)

Province name	City name	Absolute altitude (m)	Wind pressure (kN/m²)			Snow pressure (kN/m²)			Reference air temperature (℃)		Zone of quasi-permanent value coefficient of snow load
			R=10	R=50	R=100	R=10	R=50	R=100	Minimum	Maximum	
Qinghai	Renxiamu of Maqen County	4211.1	0.30	0.35	0.40	0.20	0.30	0.35	−33	18	I
	Jimai of Dari County	3967.5	0.25	0.35	0.40	0.20	0.25	0.30	−27	20	I
	Henan	3500.0	0.25	0.40	0.45	0.20	0.25	0.30	−29	21	II
	Jiuzhi	3628.5	0.20	0.30	0.35	0.20	0.25	0.30	−24	21	II
	Angqian	3643.7	0.25	0.30	0.35	0.10	0.20	0.25	−18	25	II
	Banma	3750.0	0.20	0.30	0.35	0.15	0.20	0.25	−20	22	II
Xinjiang	Urumqi	917.9	0.40	0.60	0.70	0.65	0.90	1.00	−23	34	I
	Altay	735.3	0.40	0.70	0.85	1.20	1.65	1.85	28	32	I
	Alashankou	284.8	0.95	1.35	1.55	0.20	0.25	0.25	−25	39	I
	Karamay	427.3	0.65	0.90	1.00	0.20	O.30	0.35	−27	38	I
	Yining	662.5	0.40	0.60	0.70	1.00	1.40	1.55	−23	35	I
	Zhaosu	1851.0	0.25	0.40	0.45	0.65	0.85	0.95	−23	26	I
	Dabancheng	1103.5	0.55	0.80	0.90	0.15	0.20	0.20	−21	32	I
	Bayanbulak	2458.0	0.25	0.35	0.40	0.55	0.75	0.85	−40	22	I
	Turpan	34.5	0.50	0.85	1.00	0.15	0.20	0.25	−20	44	II
	Aksu	1103.8	0.30	0.45	0.50	0.15	0.25	0.30	−20	36	II
	Kuqa	1099.0	0.35	0.50	0.60	0.15	0.20	0.30	−19	36	II
	Korla	931.5	0.30	0.45	0.50	0.15	0.20	0.30	−18	37	II
	Ulugqat	2175.7	0.25	0.35	0.40	0.35	0.50	0.60	−20	31	II
	Kashgar	1288.7	0.35	0.55	0.65	0.30	0.45	0.50	−17	36	II
	Akqi	1984.9	0.25	0.25	0.40	0.25	0.35	0.40	−21	31	II
	Pishan	1375.4	0.20	0.30	0.35	0.15	0.20	0.25	−18	37	II
	Hetian	1374.6	0.25	0.40	0.45	0.10	0.20	0.25	−15	37	II
	Minfeng	1409.3	0.20	0.30	0.35	0.10	0.15	0.15	−19	37	II
	Andehe	1262.8	0.20	0.30	0.35	0.05	0.05	0.05	−23	39	II
	Yutian	1422.0	0.20	0.30	0.35	0.10	0.15	0.15	−17	36	II
	Kumul	737.2	0.40	0.60	0.70	0.15	0.25	0.30	−23	38	II
	Habahe	532.6	—	—	—	0.70	1.00	1.15	−26	33.6	I
	Jeminay	984.1	—	—	—	0.85	1.15	1.35	−24	31	I
	Fuhai	500.9	—	—	—	0.30	0.45	0.50	−31	34	I
	Fuyun	807.5	—	—	—	0.95	1.35	1.50	−33	34	I
	Tacheng	534.9	—	—	—	1.10	1.55	1.75	−23	35	I
	Hoboksar	1291.6	—	—	—	0.25	0.40	0.45	−23	30	I
	Qinghe	1218.2	—	—	—	0.90	1.30	1.45	−35	31	I
	Tuoli	1077.8	—	—	—	0.55	0.75	0.85	−24	32	I

Table E.5 (continued)

Province name	City name	Absolute altitude (m)	Wind pressure (kN/m²)			Snow pressure (kN/m²)			Reference air temperature (℃)		Zone of quasi-permanent value coefficient of snow load
			R=10	R=50	R=100	R=10	R=50	R=100	Minimum	Maximum	
Xinjiang	Beitashan	1653.7	—	—	—	0.55	0.65	0.70	−25	28	I
	Wenquan	1354.6	—	—	—	0.35	0.45	0.50	−25	30	I
	Jinghe	320.1	—	—	—	0.20	0.30	0.35	−27	38	I
	Wusu	478.7	—	—	—	0.40	0.55	0.60	−26	37	I
	Shihezi	442.9	—	—	—	0.50	0.70	0.80	−28	37	I
	Caijiahu	440.5	—	—	—	0.40	0.50	0.55	−32	38	I
	Qitai	793.5	—	—	—	0.55	0.75	0.85	−31	34	I
	Baluntai	1752.5	—	—	—	0.20	0.30	0.35	−20	30	II
	Qijiaojin	873.2	—	—	—	0.05	0.10	0.15	−23	38	II
	Kumishi	922.4	—	—	—	0.10	0.15	0.15	−25	38	II
	Yanqi	1055.8	—	—	—	0.15	0.20	0.25	−24	35	II
	Baicheng	1229.2	—	—	—	0.20	0.30	0.35	−26	34	II
	Luntai	976.1	—	—	—	0.15	0.20	0.30	−19	38	II
	Tuergete	3504.4	—	—	—	0.40	0.55	0.65	−27	18	II
	Bachu	1116.5	—	—	—	0.10	0.15	0.20	−19	38	II
	Keping	1161.8	—	—	—	0.05	0.10	0.15	−20	37	II
	Alaer	1012.2	—	—	—	0.05	0.10	0.10	−20	36	II
	Tikanlik	846.0	—	—	—	0.10	0.15	0.15	−20	39	II
	Ruoqiang	888.3	—	—	—	0.10	0.15	0.20	−18	40	II
	Tajik	3090.9	—	—	—	0.15	0.25	0.30	−28	28	II
	Shache	1231.2	—	—	—	0.15	0.20	0.25	−17	37	II
	Qiemo	1247.5	—	—	—	0.10	0.15	0.20	−20	37	II
	Hongliuhe	1700.0	—	—	—	0.10	0.15	0.15	−25	35	II
Henan	Zhengzhou	110.4	0.30	0.45	0.50	0.25	0.40	0.45	−8	36	II
	Anyang	75.5	0.25	0.45	0.55	0.25	0.40	0.45	−8	36	II
	Xinxiang	72.7	0.30	0.40	0.45	0.20	0.30	0.35	−8	36	II
	Sanmenxia	410.1	0.25	0.40	0.45	0.15	0.20	0.25	−8	36	II
	Lushi	568.8	0.20	0.30	0.35	0.20	0.30	0.35	−10	35	II
	Mengjin	323.3	0.30	0.45	0.50	0.30	0.40	0.50	−8	35	II
	Luoyang	137.1	0.25	0.40	0.45	0.25	0.35	0.40	−6	36	II
	Luanchuan	750.1	0.20	0.30	0.35	0.25	0.40	0.45	−9	34	II
	Xuchang	66.8	0.30	0.40	0.45	0.25	0.40	0.45	−8	36	II
	Kaifeng	72.5	0.30	0.45	0.50	0.20	0.30	0.35	−8	36	II
	Xixia	250.3	0.25	0.35	0.40	0.20	0.30	0.35	−6	36	II
	Nanyang	129.2	0.25	0.35	0.40	0.30	0.45	0.50	−7	36	II
	Baofeng	136.4	0.25	0.35	0.40	0.20	0.30	0.35	−8	36	II

Table E.5 (continued)

Province name	City name	Absolute altitude (m)	Wind pressure (kN/m²)			Snow pressure (kN/m²)			Reference air temperature (℃)		Zone of quasi-permanent value coefficient of snow load
			R=10	R=50	R=100	R=10	R=50	R=100	Minimum	Maximum	
Henan	Xihua	52.6	0.25	0.45	0.55	0.30	0.45	0.50	−8	37	II
	Zhumadian	82.7	0.25	0.40	0.45	0.30	0.45	0.50	−8	36	II
	Xinyang	114.5	0.25	0.35	0.40	0.35	0.55	0.65	−6	36	II
	Shangqiu	50.1	0.20	0.35	0.45	0.30	0.45	0.50	−8	36	II
	Gushi	57.1	0.20	0.35	0.40	0.35	0.55	0.65	−6	36	II
Hubei	Wuhan	23.3	0.25	0.35	0.40	0.30	0.50	0.60	−5	37	II
	Yun County	201.9	0.20	0.30	0.35	0.25	0.40	0.45	−3	37	II
	Fang County	434.4	0.20	0.30	0.35	0.20	0.30	0.35	−7	35	III
	Laohekou	90.0	0.20	0.30	0.35	0.25	0.35	0.40	−6	36	II
	Zaoyang	125.5	0.25	0.40	0.45	0.25	0.40	0.45	−6	36	II
	Badong	294.5	0.15	0.30	0.35	0.15	0.20	0.25	−2	38	III
	Zhongxiang	65.8	0.20	0.30	0.35	0.25	0.35	0.40	−4	36	II
	Macheng	59.3	0.20	0.35	0.45	0.35	0.55	0.65	−4	37	II
	Enshi	457.1	0.20	0.30	0.35	0.15	0.20	0.25	−2	36	III
	Lvcongpo of Badong County	1819.3	0.30	0.35	0.40	0.65	0.95	1.10	−10	26	III
	Wufeng	908.4	0.20	0.30	0.35	0.25	0.35	0.40	−5	34	III
	Yichang	133.1	0.20	0.30	0.35	0.20	0.30	0.35	−3	37	III
	Jinzhou	32.6	0.20	0.30	0.35	0.25	0.40	0.45	−4	36	II
	Tianmen	34.1	0.20	0.30	0.35	0.25	0.35	0.45	−5	36	II
	Laifeng	459.5	0.20	0.30	0.35	0.15	0.20	0.25	−3	35	III
	Jiayu	36.0	0.20	0.35	0.45	0.25	0.35	0.40	−3	37	III
	Yingshan	123.8	0.20	0.30	0.35	0.25	0.40	0.45	−5	37	III
	Huangshi	19.6	0.25	0.35	0.40	0.25	0.35	0.40	−3	38	III
Hunan	Changsha	44.9	0.25	0.35	0.40	0.30	0.45	0.50	−3	38	III
	Sangzhi	322.2	0.20	0.30	0.35	0.25	0.35	0.40	−3	36	III
	Shimen	116.9	0.25	0.30	0.35	0.25	0.35	0.40	−3	36	III
	Nan County	36.0	0.25	0.40	0.50	0.30	0.45	0.50	−3	36	III
	Yueyang	53.0	0.25	O.40	0.45	O.35	O.55	0.65	−2	36	III
	Jishou	206.6	0.20	0.30	0.35	0.20	0.30	0.35	−2	36	III
	Yuanling	151.6	0.20	0.30	0.35	0.20	0.35	0.40	−3	37	III
	Changde	35.0	0.25	0.40	0.50	0.30	0.50	0.60	−3	36	II
	Anhua	128.3	0.20	0.30	0.35	0.30	0.45	0.50	−3	38	II
	Ruanjiang	36.0	0.25	0.40	0.45	0.35	0.55	0.65	−3	37	III
	Pingjiang	106.3	0.20	0.30	0.35	0.25	0.40	0.45	−4	37	III
	Zhijiang	272.2	0.20	0.30	0.35	0.25	0.35	0.45	−3	36	III

Table E.5 (continued)

Province name	City name	Absolute altitude (m)	Wind pressure (kN/m²)			Snow pressure (kN/m²)			Reference air temperature (℃)		Zone of quasi-permanent value coefficient of snow load
			R=10	R=50	R=100	R=10	R=50	R=100	Minimum	Maximum	
Hunan	Xuefeng Mountain	1404.9	—	—	—	0.50	0.75	0.85	−8	27	II
	Shaoyang	248.6	0.20	0.30	0.35	0.20	0.30	0.35	−3	37	III
	Shuangfeng	100.0	0.20	0.30	0.35	0.25	0.40	0.45	−4	38	III
	Nanyue	1265.9	0.60	0.75	0.85	0.50	0.75	0.85	−8	28	III
	Tongdao	397.5	0.25	0.30	0.35	0.15	0.25	0.30	−3	35	III
	Wugang	341.0	0.20	0.30	0.35	0.20	0.30	0.35	−3	36	III
	Lingling	172.6	0.25	0.40	0.45	0.15	0.25	0.30	−2	37	III
	Hengyang	103.2	0.25	0.40	0.45	0.20	0.35	0.40	−2	38	III
	Dao County	192.2	0.25	0.35	0.40	0.15	0.20	0.25	−1	37	III
	Chenzhou	184.9	0.20	0.30	0.35	0.20	0.30	0.35	−2	38	III
Guangdong	Guangzhou	6.6	0.30	0.50	0.60	—	—	—	6	36	—
	Nanxiong	133.8	0.20	0.30	0.35	—	—	—	1	37	—
	Lian County	97.6	0.20	0.30	0.35	—	—	—	2	37	—
	Shaoguan	69.3	0.20	0.35	0.45	—	—	—	2	37	—
	Fogang	67.8	0.20	0.30	0.35	—	—	—	4	36	—
	Lianping	214.5	0.20	0.30	0.35	—	—	—	2	36	—
	Mei County	87.8	0.20	0.30	0.35	—	—	—	4	37	—
	Guangning	56.8	0.20	0.30	0.35	—	—	—	4	36	—
	Gaoyao	7.1	0.30	0.50	0.60	—	—	—	6	36	—
	Heyuan	40.6	0.20	0.30	0.35	—	—	—	5	36	—
	Huiyang	22.4	0.35	0.55	0.60	—	—	—	6	36	—
	Wuhua	120.9	0.20	0.30	0.35	—	—	—	4	36	—
	Shantou	1.1	0.50	0.80	0.95	—	—	—	6	35	—
	Huilai	12.9	0.45	0.75	0.90	—	—	—	7	35	—
	Nan'ao	7.2	0.50	0.80	0.95	—	—	—	9	32	—
	Xinyi	84.6	0.35	0.60	0.70	—	—	—	7	36	—
	Luoding	53.3	0.20	0.30	0.35	—	—	—	6	37	—
	Taishan	32.7	0.35	0.55	0.65	—	—	—	6	35	—
	Shenzhen	18.2	0.45	0.75	0.90	—	—	—	8	35	—
	Shanwei	4.6	0.50	0.85	1.00	—	—	—	7	34	—
	Zhanjiang	25.3	0.50	0.80	0.95	—	—	—	9	36	—
	Yangjiang	23.3	0.45	0.75	0.90	—	—	—	7	35	—
	Dianbai	11.8	0.45	0.70	0.80	—	—	—	8	35	—
	Shangchuandao of Taishan County	21.5	0.75	1.05	1.20	—	—	—	8	35	—
	Xuwen	67.9	0.45	0.75	0.90	—	—	—	10	36	—

Table E.5 (continued)

Province name	City name	Absolute altitude (m)	Wind pressure (kN/m²)			Snow pressure (kN/m²)			Reference air temperature (℃)		Zone of quasi-permanent value coefficient of snow load
			R=10	R=50	R=100	R=10	R=50	R=100	Minimum	Maximum	
Guangxi	Nanning	73.1	0.25	0.35	0.40	—	—	—	6	36	—
	Guilin	164.4	0.20	0.30	0.35	—	—	—	1	36	—
	Liuzhou	96.8	0.20	0.30	0.35	—	—	—	3	36	—
	Mengshan	145.7	0.20	0.30	0.35	—	—	—	2	36	—
	Heshan	108.8	0.20	0.30	0.35	—	—	—	2	36	—
	Baise	173.5	0.25	0.45	0.55	—	—	—	5	37	—
	Jingxi	739.4	0.20	0.30	0.35	—	—	—	4	32	—
	Guiping	42.5	0.20	0.30	0.35	—	—	—	5	36	—
	Wuzhou	114.8	0.20	0.30	0.35	—	—	—	4	36	—
	Longzhou	128.8	0.20	0.30	0.35	—	—	—	7	36	—
	Lingshan	66.0	0.20	0.30	0.35	—	—	—	5	35	—
	Yulin	81.9	0.20	0.30	0.35	—	—	—	5	36	—
	Dongxing	18.2	0.45	0.75	0.90	—	—	—	8	34	—
	Beihai	15.3	0.45	0.75	0.90	—	—	—	7	35	—
	Weizhou Island	55.2	0.70	1.10	1.30	—	—	—	9	34	—
Hainan	Haikou	14.1	0.45	0.75	0.90	—	—	—	10	37	—
	Dongfang	8.4	0.55	0.85	1.00	—	—	—	10	37	—
	Dan County	168.7	0.40	0.70	0.85	—	—	—	9	37	—
	Qiongzhong	250.9	0.30	0.45	0.55	—	—	—	8	36	—
	Qionghai	24.0	0.50	0.85	1.05	—	—	—	10	37	—
	Sanya	5.5	0.50	0.85	1.05	—	—	—	14	36	—
	Lingshui	13.9	0.50	0.85	1.05	—	—	—	12	36	—
	Xishan Island	4.7	1.05	1.80	2.20	—	—	—	18	35	—
	Shanhu Island	4.0	0.70	1.10	1.30	—	—	—	16	36	—
Sichuan	Chengdu	506.1	0.20	0.30	0.35	0.10	0.10	0.15	−1	34	III
	Shiqu	4200.0	0.25	0.30	0.35	0.35	0.50	0.60	−28	19	II
	Ruoergai	3439.6	0.25	0.30	0.35	0.30	0.40	0.45	−24	21	II
	Ganzi	3393.5	0.35	0.45	0.50	0.30	0.50	0.55	−17	25	II
	Dujiangyan	706.7	0.20	0.30	0.35	0.15	0.25	0.30	—	—	III
	Mianyang	470.8	0.20	0.30	0.35	—	—	—	−3	35	—
	Ya'an	627.6	0.20	0.30	0.35	0.10	0.20	0.20	0	34	III
	Ziyang	357.0	0.20	0.30	0.35	—	—	—	1	33	—
	Kangding	2615.7	0.30	0.35	0.40	0.30	0.50	0.55	−10	23	II
	Hanyuan	795.9	0.20	0.30	0.35	—	—	—	2	34	—
	Jiulong	2987.3	0.20	0.30	0.35	0.15	0.20	0.20	−10	25	III
	Yuexi	1659.0	0.25	0.30	0.35	0.15	0.25	0.30	−4	31	III

Table E.5 (continued)

Province name	City name	Absolute altitude (m)	Wind pressure (kN/m²)			Snow pressure (kN/m²)			Reference air temperature (℃)		Zone of quasi-permanent value coefficient of snow load
			R=10	R=50	R=100	R=10	R=50	R=100	Minimum	Maximum	
Sichuan	Zhaojue	2132.4	0.25	0.30	0.35	0.25	0.35	0.40	−6	28	III
	Leibo	1474.9	0.20	0.30	0.40	0.20	0.30	0.35	−4	29	III
	Yibin	340.8	0.20	0.30	0.35	—	—	—	2	35	—
	Yanyuan	2545.0	0.20	0.30	0.35	0.20	0.30	0.35	−6	27	III
	Xichang	1590.9	0.20	0.30	0.35	0.20	0.30	0.35	−1	32	III
	Huili	1787.1	0.20	0.30	0.35	—	—	—	−4	30	—
	Wanyuan	674.0	0.20	0.30	0.35	0.05	0.10	0.15	−3	35	III
	Langzhong	382.6	0.20	0.30	0.35	—	—	—	−1	36	—
	Bazhong	358.9	0.20	0.30	0.35	—	—	—	−1	36	—
	Daxian	310.4	0.20	0.35	0.45	—	—	—	0	37	—
	Suining	278.2	0.20	0.30	0.35	—	—	—	0	36	—
	Nanchong	309.3	0.20	0.30	0.35	—	—	—	0	36	—
	Neijiang	347.1	0.25	0.40	0.50	—	—	—	0	36	—
	Luzhou	334.8	0.20	0.30	0.35	—	—	—	1	36	—
	Xuyong	377.5	0.20	0.30	0.35	—	—	—	1	36	—
	Dege	3201.2	—	—	—	0.15	0.20	0.25	−15	26	III
	Seda	3893.9	—	—	—	0.30	0.40	0.45	−24	21	III
	Daofu	2957.2	—	—	—	0.15	0.20	0.25	−16	28	III
	Aba	3275.1	—	—	—	0.25	0.40	0.45	−19	22	III
	Barkam	2664.4	—	—	—	0.15	0.25	0.30	−12	29	III
	Hongyuan	3491.6	—	—	—	0.25	0.40	0.45	−26	22	II
	Xiaojin	2369.2	—	—	—	0.10	0.15	0.15	−8	31	II
	Songpan	2850.7	—	—	—	0.20	0.30	0.35	−16	26	II
	Xinlong	3000.0	—	—	—	0.10	0.15	0.15	−16	27	II
	Litang	3948.9	—	—	—	0.35	0.50	0.60	−19	21	II
	Daocheng	3727.7	—	—	—	0.20	0.30	0.30	−19	23	III
	Emei Mountain	3047.4	—	—	—	0.40	0.55	0.60	−15	19	II
Guizhou	Guiyang	1074.3	0.20	0.30	0.35	0.10	0.20	0.25	−3	32	III
	Weining	2237.5	0.25	0.35	0.40	0.25	0.35	0.40	−6	26	III
	Pan County	1515.2	0.25	0.35	0.40	0.25	0.35	0.45	−3	30	III
	Tongzi	972.0	0.20	0.30	0.35	0.10	0.15	0.20	−4	33	III
	Xishui	1180.2	0.20	0.30	0.35	0.15	0.20	0.25	−5	31	III
	Bijie	1510.6	0.20	0.30	0.35	0.15	0.25	0.30	−4	30	III
	Zunyi	843.9	0.20	0.30	0.35	0.10	0.15	0.20	−2	34	III
	Meitan	791.8	—	—	—	0.15	0.20	0.25	−3	34	III
	Sinan	416.3	0.20	0.30	0.35	0.10	0.20	0.25	−1	36	III

Table E.5 (continued)

Province name	City name	Absolute altitude (m)	Wind pressure (kN/m²)			Snow pressure (kN/m²)			Reference air temperature (℃)		Zone of quasi-permanent value coefficient of snow load
			R=10	R=50	R=100	R=10	R=50	R=100	Minimum	Maximum	
Guizhou	Tongren	279.7	0.20	0.30	0.35	0.20	0.30	0.35	−2	37	III
	Qianxi	1251.8	—	—	—	0.15	0.20	0.25	−4	32	III
	Anshun	1392.9	0.20	0.30	0.35	0.20	0.30	0.35	−3	30	III
	Kaili	720.3	0.20	0.30	0.35	0.15	0.20	0.25	−3	34	III
	Sansui	610.5	—	—	—	0.20	0.30	0.35	−4	34	III
	Xingren	1378.5	0.20	0.30	0.35	0.20	0.35	0.40	−2	30	III
	Luodian	440.3	0.20	0.30	0.35	—	—	—	1	37	—
	Dushan	1013.3	—	—	—	0.20	0.30	0.35	−3	32	III
	Rongjiang	285.7	—	—	—	0.10	0.15	0.20	−1	37	III
Yunnan	Kunming	1891.4	0.20	0.30	0.35	0.20	0.30	0.35	−1	28	III
	Deqin	3485.0	0.25	0.35	0.40	0.60	0.90	1.05	−12	22	II
	Gongshan	1591.3	0.20	0.30	0.35	0.45	0.75	0.90	−3	30	II
	Zhongdian	3276.1	0.20	0.30	0.35	0.50	0.80	0.90	−15	22	II
	Weixi	2325.6	0.20	0.30	0.35	0.45	0.65	0.75	−6	28	III
	Zhaotong	1949.5	0.25	0.35	0.40	0.15	0.25	0.30	−6	28	III
	Lijiang	2393.2	0.25	0.30	0.35	0.20	0.30	0.35	−5	27	III
	Huaping	1244.8	0.30	0.45	0.55	—	—	—	−1	35	—
	Huize	2109.5	0.25	0.35	0.40	0.25	0.35	0.40	−4	26	III
	Tengchong	1654.6	0.20	0.30	0.35	—	—	—	−3	27	—
	Lushui	1804.9	0.20	0.30	0.35	—	—	—	1	26	—
	Baoshan	1653.5	0.20	0.30	0.35	—	—	—	−2	29	—
	Dali	1990.5	0.45	0.65	0.75	—	—	—	−2	28	—
	Yuanmou	1120.2	0.25	0.35	0.40	—	—	—	2	35	—
	Chuxiong	1772.0	0.20	0.35	0.40	—	—	—	−2	29	—
	Zhanyi of Qujing	1898.7	O.25	0.30	0.35	0.25	0.40	0.45	−1	28	III
	Ruili	776.6	0.20	0.30	0.35	—	—	—	3	32	—
	Jingdong	1162.3	0.20	0.30	0.35	—	—	—	1	32	—
	Yuxi	1636.7	0.20	0.3()	0.35	—	—	—	−1	30	—
	Yiliang	1532.1	0.25	0.45	0.55	—	—	—	1	28	—
	Luxi	1704.3	0.25	0.30	0.35	—	—	—	−2	29	—
	Mengding	511.4	0.25	0.40	0.45	—	—	—	−5	32	—
	Lincang	1502.4	0.20	0.30	0.35	—	—	—	0	29	—
	Lancang	1054.8	0.20	0.30	0.35	—	—	—	1	32	—
	Jinghong	552.7	0.20	0.40	0.50	—	—	—	7	35	—
	Simao	1302.1	0.25	0.45	0.50	—	—	—	3	30	—
	Yuanjiang	400.9	0.25	0.30	0.35	—	—	—	7	37	—

Table E.5 (continued)

Province name	City name	Absolute altitude (m)	Wind pressure (kN/m²)			Snow pressure (kN/m²)			Reference air temperature (℃)		Zone of quasi-permanent value coefficient of snow load
			R=10	R=50	R=100	R=10	R=50	R=100	Minimum	Maximum	
Yunnan	Mengla	631.9	0.20	0.30	0.35	—	—	—	7	34	—
	Jiangcheng	1119.5	0.20	0.40	0.50	—	—	—	4	30	—
	Mengzi	1300.7	0.25	0.35	0.45	—	—	—	3	31	—
	Pingbian	1414.1	0.20	0.40	0.35	—	—	—	2	28	—
	Wenshan	1271.6	0.20	0.30	0.35	—	—	—	3	31	—
	Guangnan	1249.6	0.25	0.35	0.40	—	—	—	0	31	—
Xizang	Lhasa	3658.0	0.20	0.30	0.35	0.10	0.15	0.20	−13	27	III
	Bange	4700.0	0.35	0.55	0.65	0.20	0.25	0.30	−22	18	I
	Anduo	4800.0	0.45	0.75	0.90	0.25	0.40	0.45	−28	17	I
	Naqu	4507.0	0.30	0.45	0.50	0.30	0.40	0.45	−25	19	I
	Shigatse	3836.0	0.20	0.30	0.35	0.10	0.15	0.15	−17	25	III
	Zedang of Naidong County	3551.7	0.20	0.30	0.35	0.10	0.15	0.15	−12	26	III
	Longzi	3860.0	0.30	0.45	0.50	0.10	0.15	0.20	−18	24	III
	Suo County	4022.8	0.30	0.40	0.50	0.20	0.25	0.30	−23	22	I
	Changdu	3306.0	0.20	0.30	0.35	0.15	0.20	0.20	−15	27	II
	Linzhi	3000.0	0.25	0.35	0.45	0.10	0.15	0.15	−9	25	III
	Ge'er	4278.0	—	—	—	0.10	0.15	0.15	−27	25	I
	Gaize	4414.9	—	—	—	0.20	O.30	0.35	−29	23	I
	Pulan	3900.0	—	—	—	0.50	0.70	0.80	−21	25	I
	Shenzha	4672.0	—	—	—	0.15	0.20	0.20	−22	19	I
	Dangxiong	4200.0	—	—	—	0.30	0.45	0.50	−23	21	II
	Nimu	3809.4	—	—	—	0.15	0.20	0.25	−17	26	III
	Nielamu	3810.0	—	—	—	2.00	3.30	3.75	−13	18	I
	Dingri	4300.0	—	—	—	0.15	0.25	0.30	−22	23	II
	Gyangze	4040.0	—	—	—	0.10	0.10	0.15	−19	24	III
	Cuona	4280.0	—	—	—	0.60	0.90	1.00	−24	16	III
	Pali	4300.0	—	—	—	0.95	1.50	1.75	−23	16	II
	Dingqing	3873.1	—	—	—	0.25	0.35	0.40	−17	22	II
	Bomi	2736.0	—	—	—	0.25	0.35	0.40	−9	27	III
	Chayu	2327.6	—	—	—	0.35	0.55	0.65	−4	29	III
Taiwan	Taipei	8.0	0.40	0.70	0.85	—	—	—	—	—	—
	Hsinchu	8.0	0.50	0.80	0.95	—	—	—	—	—	—
	Yilian	9.0	1.10	1.85	2.30	—	—	—	—	—	—
	Taichung	78.0	0.50	0.80	0.90	—	—	—	—	—	—
	Hualien	14.0	0.40	0.70	0.85	—	—	—	—	—	—

Table E.5 (continued)

Province name	City name	Absolute altitude (m)	Wind pressure (kN/m²)			Snow pressure (kN/m²)			Reference air temperature (℃)		Zone of quasi-permanent value coefficient of snow load
			R=10	R=50	R=100	R=10	R=50	R=100	Minimum	Maximum	
Taiwan	Chiayi	20.0	0.50	0.80	0.95	—	—	—	—	—	—
	Makung	22.0	0.85	1.30	1.55	—	—	—	—	—	—
	Taitung	10.0	0.65	0.90	1.05	—	—	—	—	—	—
	Gangshan	10.0	0.55	0.80	0.95	—	—	—	—	—	—
	Hengchun	24.0	0.70	1.05	1.20	—	—	—	—	—	—
	Ali Mountain	2406.0	0.25	0.35	0.40	—	—	—	—	—	—
	Tainan	14.0	0.60	0.85	1.00	—	—	—	—	—	—
Hong Kong	Hong Kong	50.0	0.80	0.90	0.95	—	—	—	—	—	—
	Waglan Island	55.0	0.95	1.25	1.40	—	—	—	—	—	—
Macao	Macao	57.0	0.75	0.85	0.90	—	—	—	—	—	—

E.6 Distribution Maps of Reference Snow Pressure, Wind Pressure and Reference Air Temperature Throughout the Country

E.6.1 The distribution map of reference snow pressure throughout the country is detailed in Figure E.6.1.

E.6.2 The zoning map of quasi-permanent value coefficient of snow load is detailed in Figure E.6.2.

E.6.3 The distribution map of reference wind pressure throughout the country is detailed in Figure E.6.3.

E.6.4 The distribution map of reference air temperature (maximum air temperature) throughout the country is detailed in Figure E.6.4.

E.6.5 The distribution map of reference air temperature (minimum air temperature) throughout the country is detailed in Figure E.6.5.

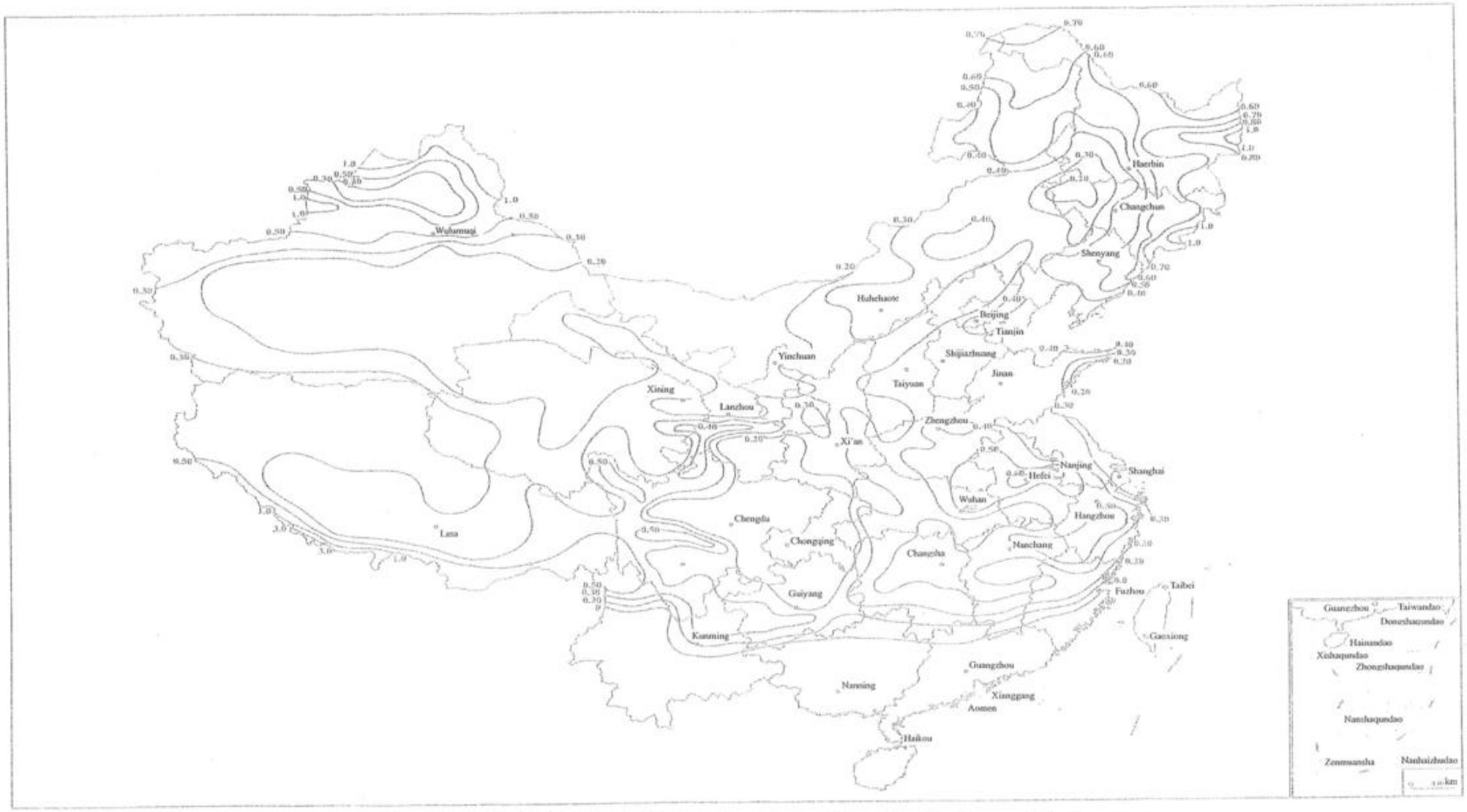


Figure E.6.1 Distribution Map of Reference Snow Pressure Throughout the Country (kN/m^2)

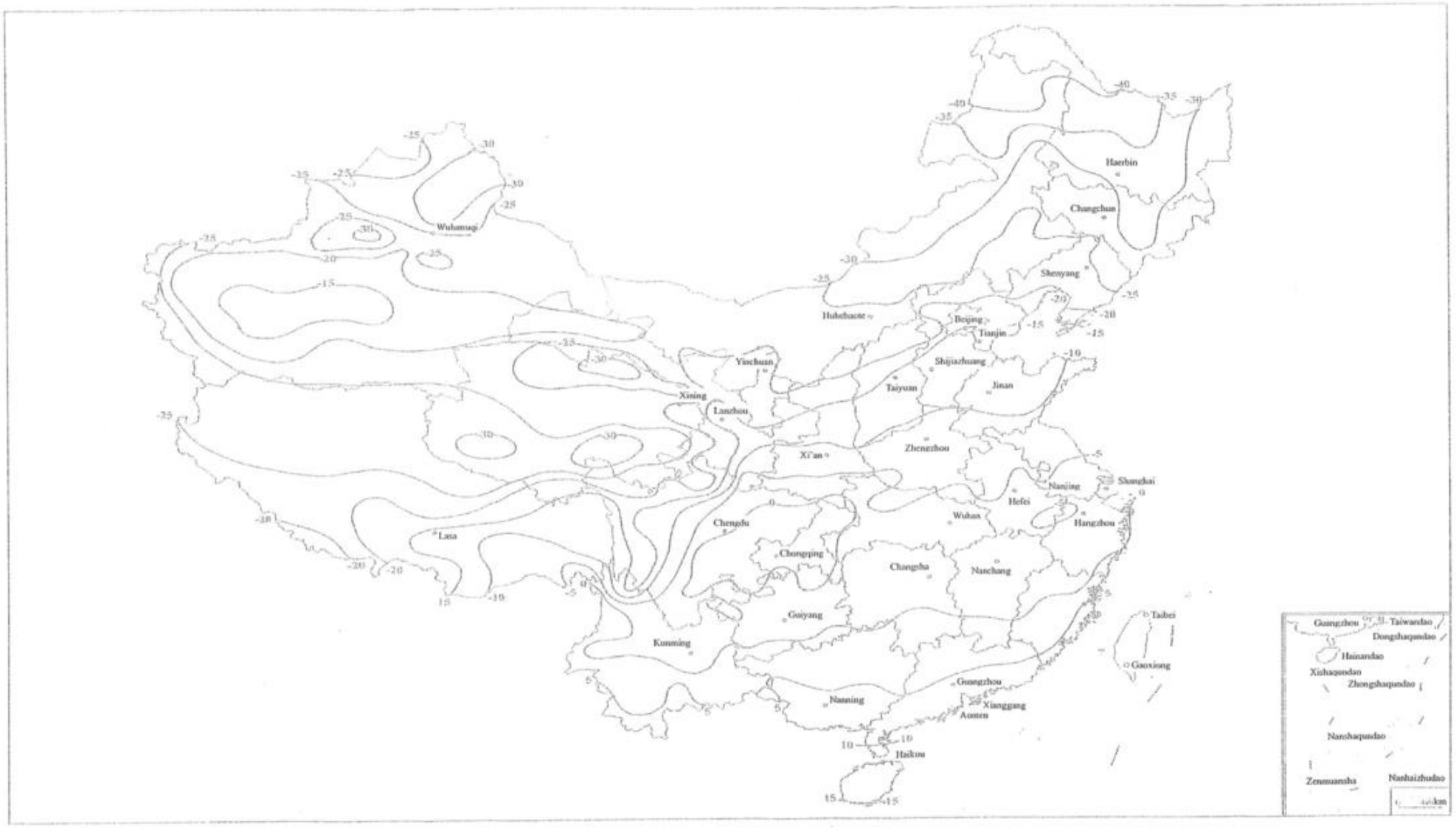


Figure E.6.5 Distribution Map of Reference Air Temperature (Minimum Air Temperature) Throughout the Country

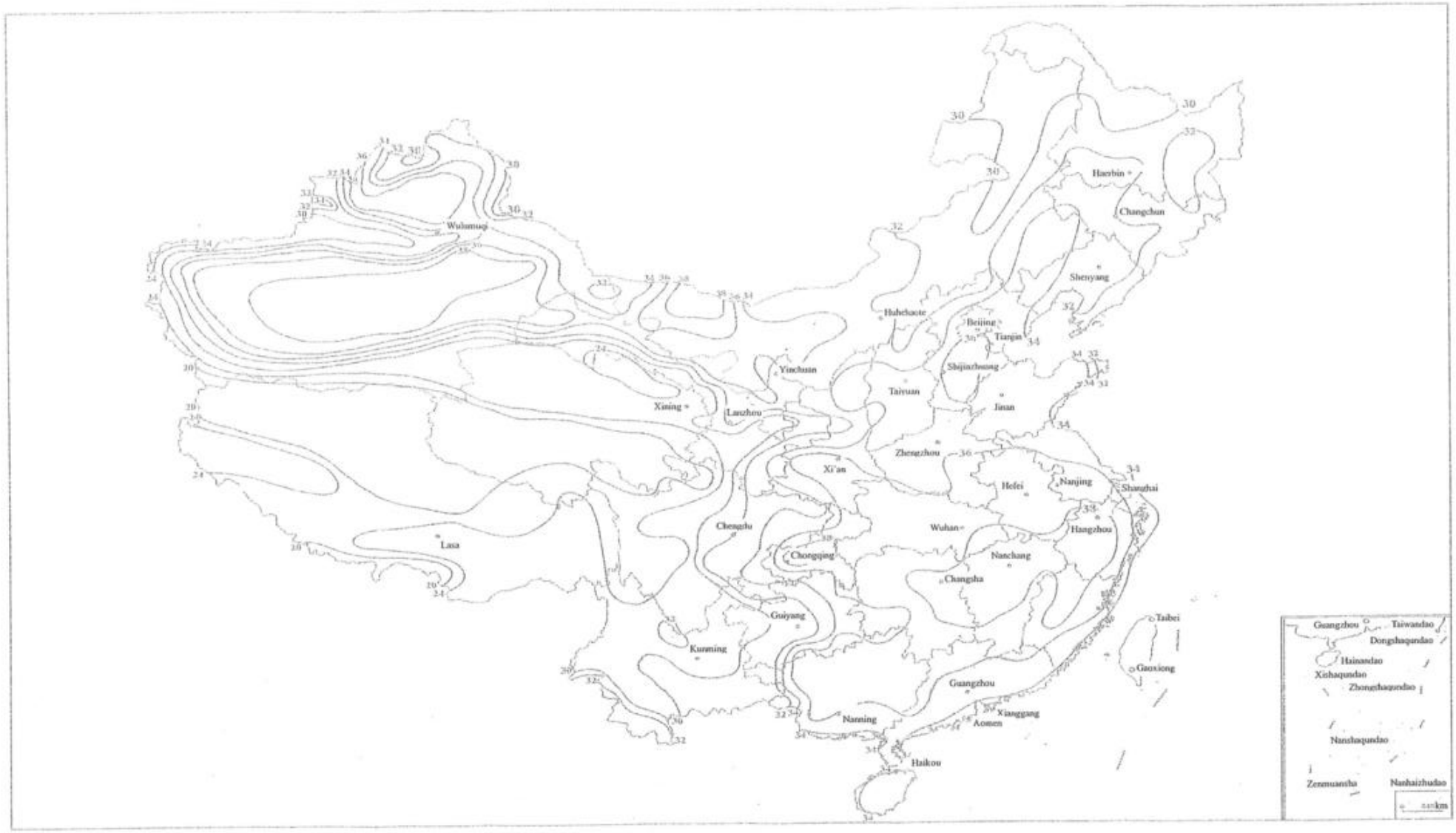


Figure E.6.4 Distribution Map of Reference Air Temperature (Maximum Air Temperature) Throughout the Country

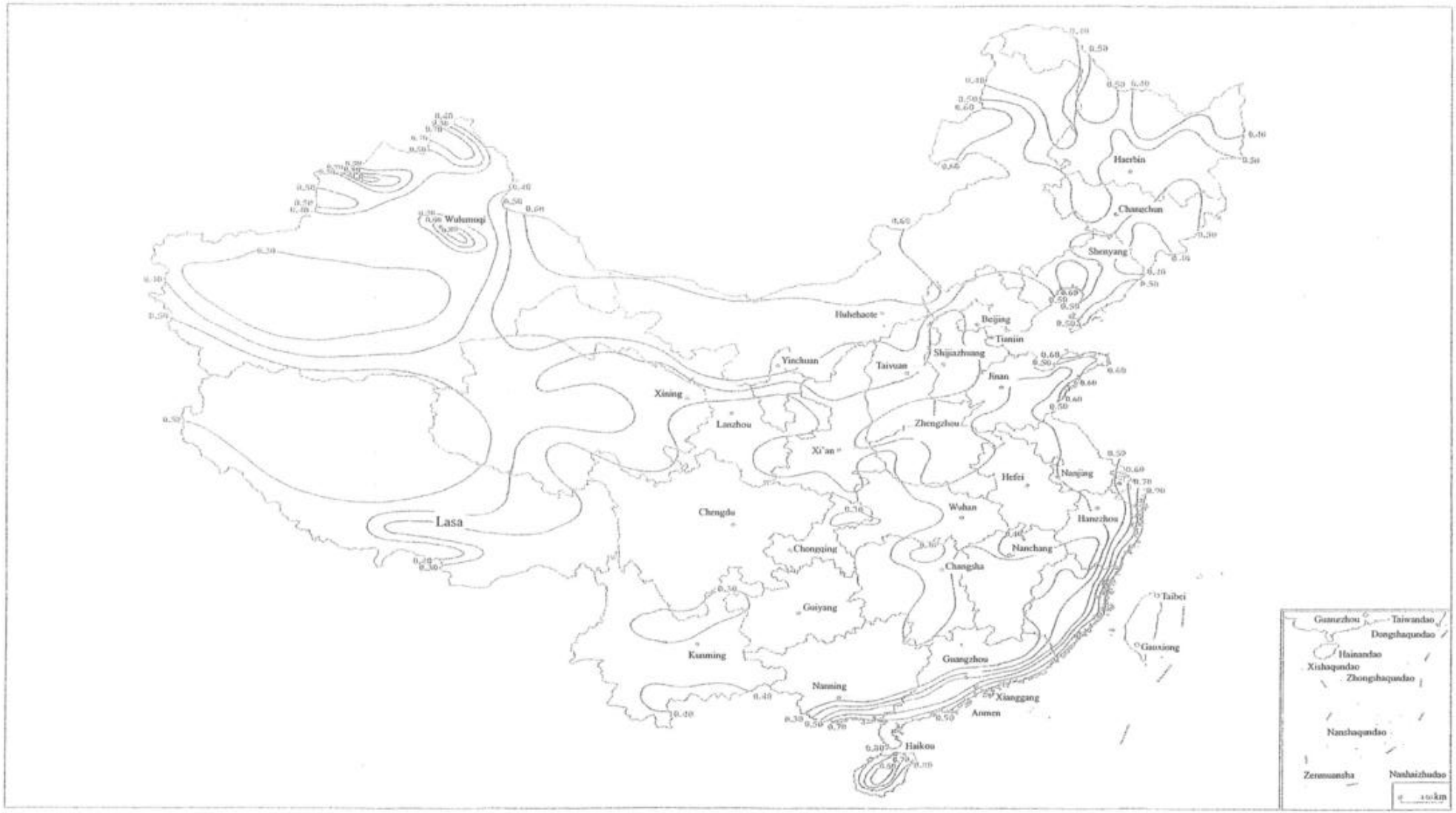
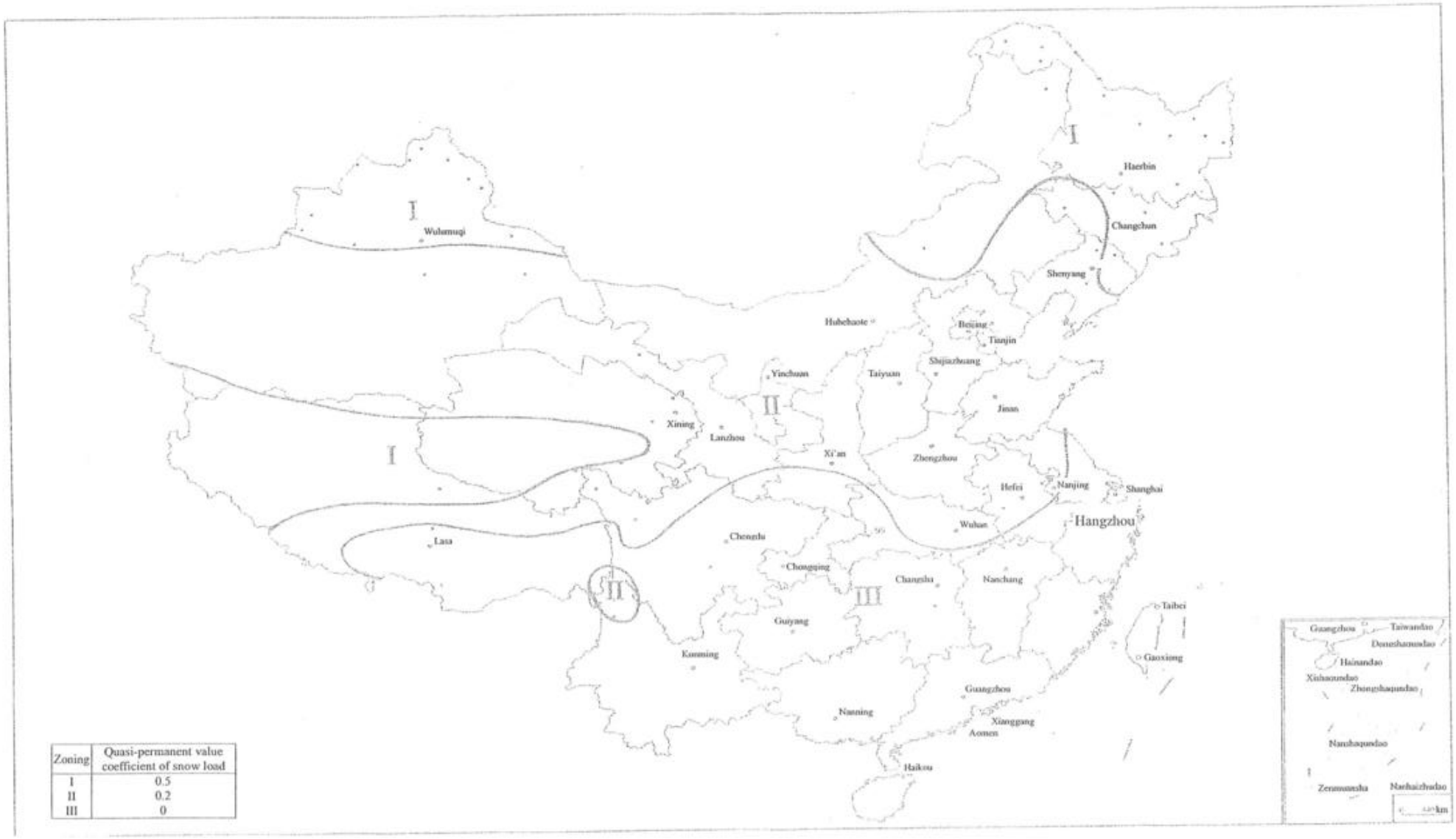


Figure E.6.3 Distribution Map of Reference wind Pressure Throughout the Country



Zoning	Quasi-permanent value coefficient of snow load
I	0.5
II	0.2
III	0

Figure E.6.2 Zoning Map of Quasi-permanent Value Coefficient of Snow Load

Appendix F Empirical Formula for Fundamental Natural Period of Structures

F.1 High-rise Structures

F.1.1 The fundamental natural period of general high-rise structures may take the larger value calculated according to the following formula for steel structures and the smaller value for reinforced concrete structures:

$$T_1=(0.007\sim0.013)H \tag{F.1.1}$$

Where H——The structure height (m).

F.1.2 The fundamental natural period of specific structures such as chimney and tower frame may be adopted according to the following requirements:

1 The fundamental natural period of chimney may be calculated according to the following requirements:

1) The fundamental natural period of brick chimney not exceeding 60m shall be calculated according to the following formula:

$$T_1 = 0.23 + 0.22\times10^{-2}\frac{H^2}{d} \tag{F.1.2-1}$$

2) The fundamental natural period of reinforced concrete chimney not exceeding 150m shall be calculated according to the following formula:

$$T_1 = 0.41 + 0.10\times10^{-2}\frac{H^2}{d} \tag{F.1.2-2}$$

3) The fundamental natural period of reinforced concrete chimney exceeding 150m but below 210m shall be calculated according to the following formula:

$$T_1 = 0.53 + 0.08\times10^{-2}\frac{H^2}{d} \tag{F.1.2-3}$$

Where H——The chimney height (m);

d——The outside diameter at 1/2 chimney height (m).

2 The fundamental natural period of petrochemical engineering tower frame (Figure F.1.2) may be calculated according to the following requirements:

1) The fundamental natural period of cylindrical (drum) foundation tower (with column wall thickness not greater than 30mm) shall be calculated according to the following formula:

When $H^2/D_0<700$

$$T_1 = 0.35 + 0.85\times10^{-3}\frac{H^2}{D_0} \tag{F.1.2-4}$$

When $H^2/D_0 \geq 700$

$$T_1 = 0.25 + 0.99 \times 10^{-3} \frac{H^2}{D_0} \qquad \text{(F.1.2-5)}$$

Where H——The total height from the foundation slab or column foundation top surface to the equipment tower top surface (m);

D_0——The outside diameter of equipment tower (m), taking the weighted average of outside diameters by taking the section height as a weight for the tower with variable diameter.

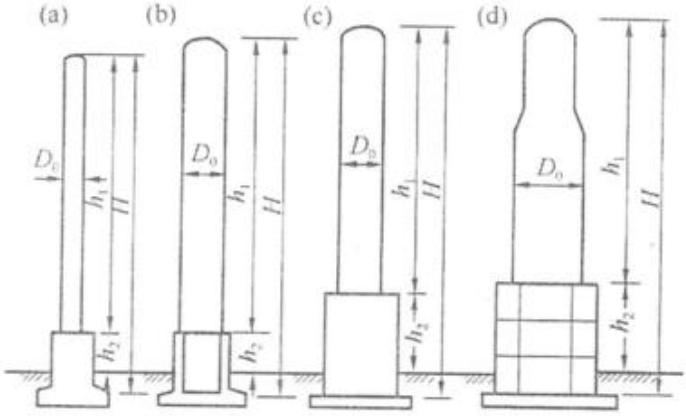


Figure F.1.2 Foundation Type of Equipment Tower Frame

(a) Cylindrical foundation tower; (b) Drum foundation tower; (c) Square (slab) frame foundation tower; (d) Ring frame foundation tower

2) The fundamental natural period of frame foundation tower (with column wall thickness not greater than 30mm) shall be calculated according to the following formula:

$$T_1 = 0.56 + 0.40 \times 10^{-3} \frac{H^2}{D_0} \qquad \text{(F.1.2-6)}$$

3) The fundamental natural period of various equipment tower frame with column wall thickness greater than 30mm shall be calculated according to the relevant theoretical formula.

4) Where several towers are lined in a row on the platform, the fundamental natural period T_1 of the towers vertical to the lining direction may adopt that of the main tower (i.e. The tower with the longest period); the fundamental natural period T_1 of the towers parallel to the lining direction may adopt that of the main tower multiplied by a reduction factor of 0.9.

F.2 Tall Buildings

F.2.1 Generally, the fundamental natural period of tall buildings may be adopted approximately according to the following requirements based on the total storey number of the buildings:

1 The fundamental natural period of steel structures shall be calculated according to the following formula:

$$T_1=(0.10\sim0.15)n \tag{F.2.1-1}$$

Where n——The total storey number of the buildings.

2 The fundamental natural period of reinforced concrete structures shall be calculated according to the following formula:

$$T_1=(0.05\sim0.10)n \tag{F.2.1-2}$$

F.2.2 The fundamental natural period of reinforced concrete frame, frame-shear and shear wall structures may be adopted according to the following requirements:

1 The fundamental natural period of reinforced concrete frame and frame-shear structures shall be calculated according to the following formula:

$$T_1 = 0.25 + 0.53\times10^{-3}\frac{H^2}{\sqrt[3]{B}} \tag{F.2.2-1}$$

2 The fundamental natural period of reinforced concrete shear wall structures shall be calculated according to the following formula:

$$T_1 = 0.03 + 0.03\frac{H}{\sqrt[3]{B}} \tag{F.2.2-2}$$

Where H——The total height of the buildings (m);

B——The width of the buildings (m).

Appendix G Approximate Vibration Mode Shape of Structures

G.0.1 The coefficient of vibration mode of structures shall be obtained through structural dynamics calculation according to the actual engineering. Generally, the influence of the first vibration mode may only be considered for along-wind response; for across-wind resonance response of tall buildings and structures of circular section, the response of the first to the fourth vibration mode shall be checked. This appendix lists the coefficient of the corresponding first four vibration modes.

G.0.2 For the high-rise structures whose windward side width is greatly less than its height, the coefficient of vibration mode may be adopted in accordance with those specified in Table G.0.2.

Table G.0.2 Coefficient of Vibration Mode of High-rise Structures

Relative height	Vibration mode number			
z/H	1	2	3	4
0.1	0.02	−0.09	0.23	−0.39
0.2	0.06	−0.30	0.61	−0.75
0.3	0.14	−0.53	0.76	−0.43
0.4	0.23	−0.68	0.53	0.32
0.5	0.34	−0.71	0.02	0.71
0.6	0.46	−0.59	−0.48	0.33
0.7	0.59	−0.32	−0.66	−0.40
0.8	0.79	0.07	−0.40	−0.64
0.9	0.86	0.52	0.23	−0.05
1.0	1.00	1.00	1.00	1.00

G.0.3 For the tall buildings with greater windward side width, where both the shear wall and the frame play a leading role, their coefficient of vibration mode may be adopted in accordance with those specified in Table G.0.3.

Table G.0.3 Coefficient of Vibration Mode of Tall Buildings

Relative height	Vibration mode number			
z/H	1	2	3	4
0.1	0.02	−0.09	0.22	−0.38
0.2	0.08	−0.30	0.58	−0.73
0.3	0.17	−0.50	0.70	−0.40
0.4	0.27	−0.68	0.46	0.33
0.5	0.38	−0.63	−0.03	0.68
0.6	0.45	−0.48	−0.49	0.29
0.7	0.67	−0.18	−0.63	−0.47
0.8	0.74	0.17	−0.34	−0.62
0.9	0.86	0.58	0.27	−0.02
1.0	1.00	1.00	1.00	1.00

G.0.4 For the high-rise structures whose section has a regular variation along the height, the coefficient of the first vibration mode may be adopted in accordance with those specified in Table G.0.4.

Table G.0.4 Coefficient of the First Vibration Mode of High-rise Structures

Relative height	High-rise structures				
z/H	B_H/B_0=1.0	0.8	0.6	0.4	0.2
0.1	0.02	0.02	0.01	0.01	0.01
0.2	0.06	0.06	0.05	0.04	0.03
0.3	0.14	0.12	0.11	0.09	0.07
0.4	0.23	0.21	0.19	0.16	0.13
0.5	0.34	0.32	0.29	0.26	0.21
0.6	0.46	0.44	0.41	0.37	0.31
0.7	0.59	0.57	0.55	0.51	0.45
0.8	0.79	0.71	0.69	0.66	0.61
0.9	0.86	0.86	0.85	0.83	0.80
1.0	1.00	1.00	1.00	1.00	1.00

Note: B_H and B_0 in this table are the top and bottom widths of the structures.

Appendix H Equivalent Wind Load for Across-wind and Torsional Vibration

H.1 Equivalent Wind Load for Across-wind Vibration of Structures of Circular Section

H.1.1 The characteristic value of equivalent wind load of vibration mode j caused by trans-critical strong wind resonance at z height may be determined according to the following requirements:

1 The characteristic value $\omega_{\mathrm{Lk},j}$ (kN/m^2) of equivalent wind load may be calculated according to the following formula:

$$\omega_{\mathrm{Lk},j} = |\lambda_j| v_{\mathrm{cr}}^2 \varnothing_j(z)/12800\xi_j \qquad \text{(H.1.1-1)}$$

Where λ_j——The calculation coefficient;

v_{cr}——The critical wind speed, calculated according to Formula (8.5.3-2) of this code;

$\varnothing_j(z)$——The coefficient of the jth vibration mode of structure, determined through calculation or according to Appendix G of this code;

ξ_j——The damping ratio of the jth vibration mode of structure, taking 0.01 for steel structures for the first vibration mode, 0.02 for steel structures of buildings, and 0.05 for concrete structures; the damping ratio of high order vibration mode may be approximately taken according to the first vibration mode in the absence of relevant data.

2 The starting point height H_1 of critical wind speed may be calculated according to the following formula:

$$H_1 = H \times \left(\frac{v_{\mathrm{cr}}}{1.2v_{\mathrm{H}}}\right)^{1/\alpha} \qquad \text{(H.1.1-2)}$$

Where α——The index of terrain roughness, taking 0.12, 0.15, 0.22 and 0.30 corresponding to Category A, B, C and D terrain roughness respectively;

v_{H}——The wind speed at the top of structure (m/s), calculated according to Formula (8.5.3-3) of this code.

Note: The high order vibration mode number considered for equivalent wind load of across-wind vibration shall not be greater than 4; for general cantilever structures, the first or the second order vibration mode may be taken only.

3 The calculation coefficient λ_j may be adopted in accordance with those specified in Table H.1.1.

H.2 Equivalent Wind Load for Across-wind Vibration of Structures of Rectangular Section

H.2.1 For the tall buildings of rectangular section, their equivalent wind load for across-wind vibration may be determined according to those specified in this section where the following conditions are

met:

Table H.1.1 λ_j Calculation

Structure type	Vibration mode number	H_i/H										
		0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
High-rise structures	1	1.56	1.55	1.54	1.49	1.42	1.31	1.15	0.94	0.68	0.37	0
	2	0.83	0.82	0.76	0.60	0.37	0.09	−0.16	−0.33	−0.38	−0.27	0
	3	0.52	0.48	0.32	0.06	−0.19	-0.30	−0.21	0.00	0.20	0.23	0
	4	0.30	0.33	0.02	−0.20	−0.23	0.03	0.16	0.15	−0.05	−0.18	0
Tall buildings	1	1.56	1.56	1.54	1.49	1.41	1.28	1.12	0.91	0.65	0.35	0
	2	0.73	0.72	0.63	0.45	0.19	−0.11	−0.36	−0.52	-0.53	−0.36	0

1 The flat shape and mass of the buildings are almost the same within the whole height range;

2 The height-width ratio $H/\sqrt{BD}$ is 4~8; the depth-width ratio D/B is 0.5~2; where, B is the windward side width of structure and D is the structural plane depth (along-wind dimension);

3 $v_H T_{L1}/\sqrt{BD} \leq 10$, T_{L1} is the natural vibration period of the across-wind first order of structure and v_H is the wind speed at the top of structure.

H.2.2 The characteristic value of equivalent wind load for across-wind vibration of tall buildings of rectangular section may be calculated according to the following formula:

$$\omega_{LK} = g\omega_0 \mu_z C'_L \sqrt{1 + R_L^2} \tag{H.2.2}$$

Where ω_{LK}——The characteristic value of equivalent wind load for across-wind vibration (kN/m^2), shall be multiplied by the area of windward side in the calculation of across-wind force;

g——The peak factor, taking 2.5;

C'_L——The across-wind coefficient;

R_L——The across-wind resonance factor.

H.2.3 The across-wind wind coefficient may be calculated according to the following formula:

$$C'_L = (2+2\alpha) C_m \gamma_{CM} \tag{H.2.3-1}$$

$$\gamma_{CM} = C_R - 0.019\left(\frac{D}{B}\right)^{-2.54} \tag{H.2.3-2}$$

Where C_m——The angle edge correction coefficient of across-wind force, may be adopted in accordance with those specified in Article H.2.5 of this appendix;

α——The wind speed profile index, taking 0.12, 0.15, 0.22 and 0.30 corresponding to Category A, B, C and D roughness respectively;

C_R——The coefficient of terrain roughness, taking 0.236, 0.211, 0.202 and 0.197 corresponding to Category A, B, C and D roughness respectively.

H.2.4 The across-wind resonance factor may be determined according to the following requirements:

1 The across-wind resonance factor R_L may be calculated according to the following formula:

$$R_L = K_L \sqrt{\frac{\pi S_{FL} C_{sm} / \gamma_{CM}^2}{4(\zeta_1 + \zeta_{al})}} \tag{H.2.4-1}$$

$$K_L = \frac{1.4}{(\alpha + 0.95) C_m} \cdot \left(\frac{z}{H}\right)^{-2\alpha + 0.9} \tag{H.2.4-2}$$

$$\zeta_{al} = \frac{0.0025(1 - T_{L1}^{*2}) T_{L1}^{*} + 0.000125 T_{L1}^{*2}}{(1 - T_{L1}^{*2})^2 + 0.0291 T_{L1}^{*2}} \tag{H.2.4-3}$$

$$T_{L1}^{*} = \frac{v_H T_{L1}}{9.8B} \tag{H.2.4-4}$$

Where S_{FL}——The power spectrum of non-dimensional across-wind generalized force;

C_{sm}——The angle edge correction coefficient of power spectrum of across-wind force, may be adopted in accordance with those specified in Article H.2.5 of this appendix;

ζ_1——The damping ratio of the first order vibration mode of structure;

K_L——The correction coefficient of vibration mode;

ζ_{al}——The aerodynamic damping ratio of the across-wind first order vibration mode of structure;

T_{L1}^{*}——The reduced period.

2 The power spectrum S_{FL} of non-dimensional across-wind generalized force may be determined according to Figure H.2.4 based on the depth-width ratio D/B and reduced frequency f_{L1}^{*}. The reduced frequency f_{L1}^{*} shall be calculated according to the following formula:

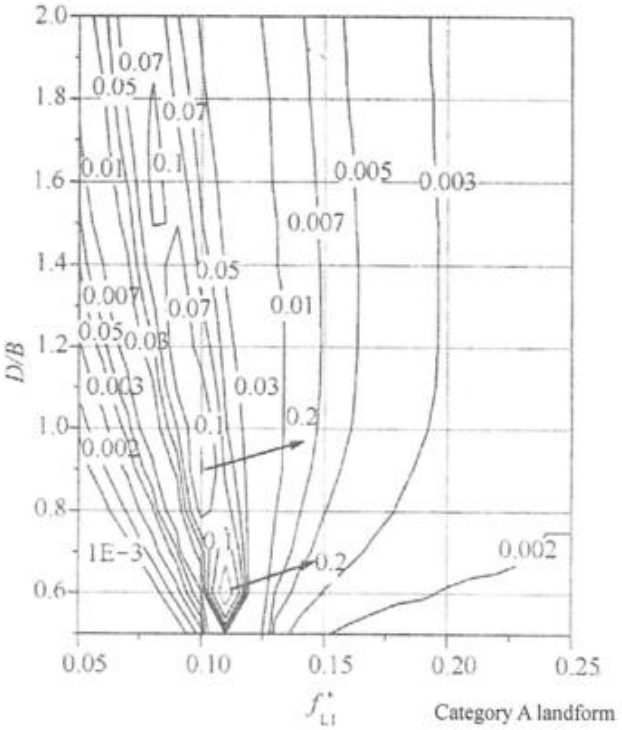
$$f_{L1}^{*} = f_{L1} B / v_H \tag{H.2.4-5}$$

Where f_{L1}——The frequency of the across-wind first order vibration mode of structure (Hz).

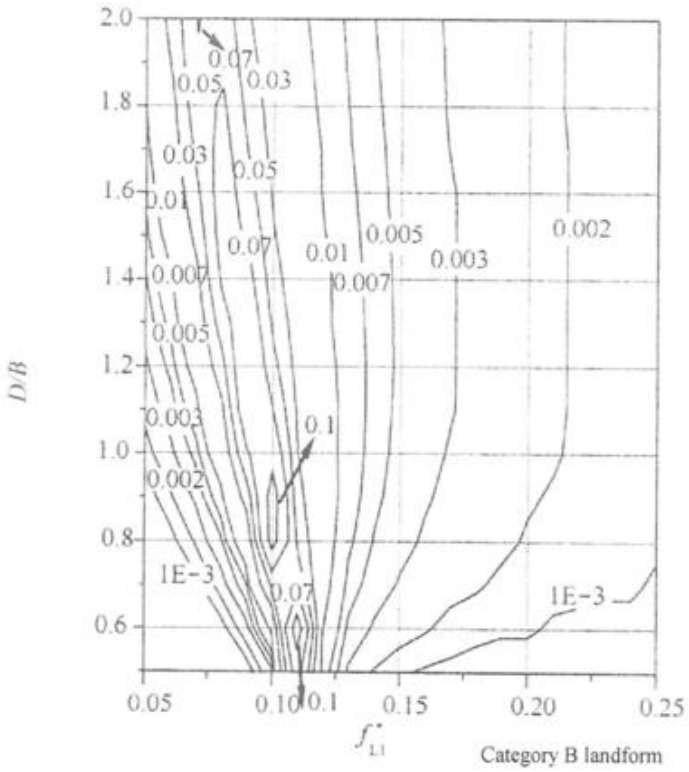
H.2.5 The angle edge correction coefficients C_m and C_{sm} may be determined according to the following requirements:

1 For the tall buildings whose cross section is standard square or rectangular, C_m and C_{sm} may take 1.0;

2 For chamfered or concave rectangular section as shown in Figure H.2.5, the angle edge correction coefficient C_m of across-wind force coefficient may be calculated according to the following formula:

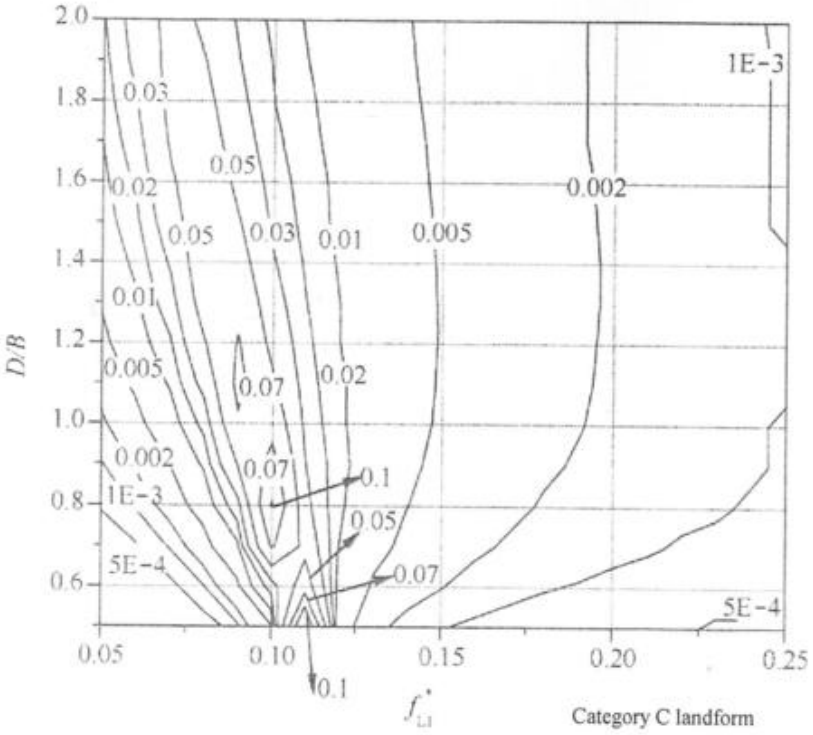


(a)

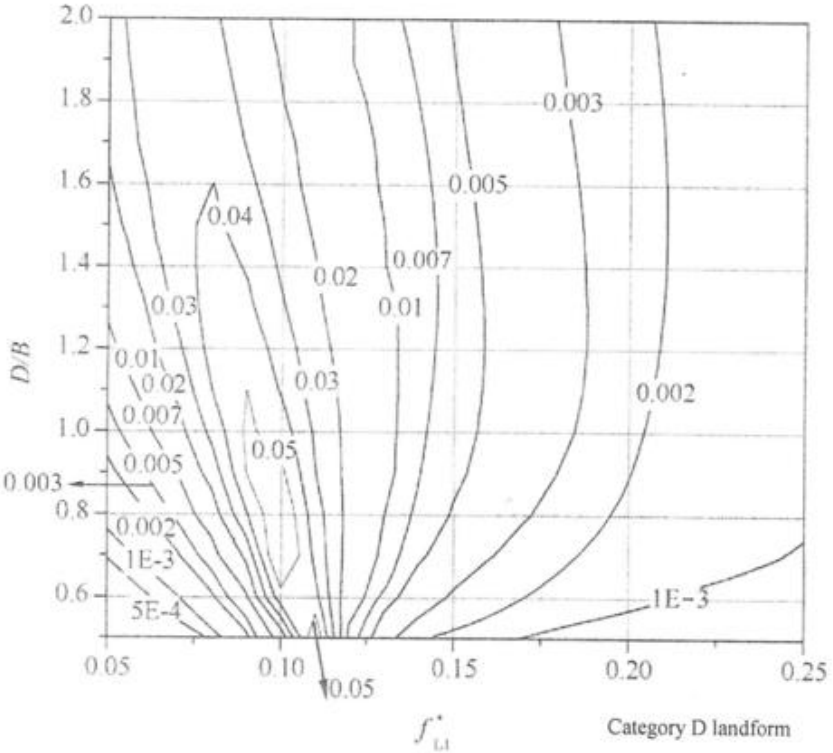


(b)

Figure H.2.4 Power Spectrum of Non-dimensional Across-wind Generalized Force (I)



(c)



(d)

Figure H.2.4 Power Spectrum of Non-dimensional Across-wind Generalized Force (II)

$$C_m = \begin{cases} 1.00 - 81.6\left(\dfrac{b}{B}\right)^{1.5} + 301\left(\dfrac{b}{B}\right)^{2} - 290\left(\dfrac{b}{B}\right)^{2.5} \\ \qquad 0.05 \le b/B \le 0.2 \quad \text{concave} \\ 1.00 - 2.05\left(\dfrac{b}{B}\right)^{0.5} + 24\left(\dfrac{b}{B}\right)^{1.5} - 36.8\left(\dfrac{b}{B}\right)^{2} \\ \qquad 0.05 \le b/B \le 0.2 \quad \text{chamfered} \end{cases} \tag{H.2.5}$$

Where b——The correction dimension of chamfer or concave angle (Figure H.2.5).

(a) Chamfered (b) Concave

Figure H.2.5 Diagram of Chamfered and Concave Section

3 For chamfered or concave rectangular section as shown in Figure H.2.5, the angle edge correction coefficient C_{ms} of power spectrum of across-wind generalized force may be adopted in accordance with those specified in Table H.2.5.

Table H.2.5 Angle Edge Correction Coefficient of Power Spectrum of Across-wind Generalized Force C_{sm}

Angle edge condition	Terrain roughness category	b/B	Reduced frequency (f_{L1}^{*})						
			0.100	0.125	0.150	0.175	0.200	0.225	0.250
Chamfered	Category B	5%	0.183	0.905	1.2	1.2	1.2	1.2	1.1
		10%	0.070	0.349	0.568	0.653	0.684	0.670	0.653
		20%	0.106	0.902	0.953	0.819	0.743	0.667	0.626
Chamfered	Category D	5%	0.368	0.749	0.922	0.955	0.943	0.917	0.897
		10%	0.256	0.504	0.659	0.706	0.713	0.697	0.686
		20%	0.339	0.974	0.977	0.894	0.841	0.805	0.790
Concave	Category B	5%	0.106	0.595	0.980	1.0	1.0	1.0	1.0
		10%	0.033	0.228	0.450	0.565	0.610	0.604	0.594
		20%	0.042	0.842	0.563	0.451	0.421	0.400	0.400
	Category D	5%	0.267	0.586	0.839	0.955	0.987	0.991	0.984
		10%	0.091	0.261	0.452	0.567	0.613	0.633	0.628
		20%	0.169	0.954	0.659	0.527	0.475	0.447	0.453

Note: 1 C_{sm} of Category A terrain roughness may be valued according to Category B;

2 C_{sm} of Category C terrain roughness may be valued according to Category B and Category D through interpolation.

H.3 Equivalent Wind Load for Torsional Vibration of Structures of Rectangular Section

H.3.1 For the tall buildings of rectangular section, their equivalent wind load for torsional vibration may be determined according to those specified in this section where the following conditions are met:

1 The flat shape of the buildings is almost the same within the whole height range;

2 The eccentricity (eccentricity/gyration radius) of rigidity and mass is less than 0.2;

3 $\frac{H}{\sqrt{BD}} \leq 6$, D/B is within 1.5~5, $\frac{T_{T1} v_H}{\sqrt{BD}} \leq 10$; where, T_{T1} is the period of the first order torsional vibration mode of structure (s), shall be determined according to the structure dynamic calculation.

H.3.2 The characteristic value of equivalent wind load for torsional vibration of tall buildings of rectangular section may be calculated according to the following formula:

$$\omega_{Tk} = 1.8 g \omega_0 \mu_H C'_T \left(\frac{z}{H}\right)^{0.9} \sqrt{1 + R_T^2} \tag{H.3.2}$$

Where ω_{Tk}——The characteristic value of equivalent wind load for torsional vibration (kN/m^2), shall be multiplied by the windward side area and width in torque calculation;

μ_H——The exposure factor for wind pressure at the top of structure;

g——The peak factor, taking 2.5;

C'_T——The wind-induced torque coefficient;

R_T——The torsional resonance factor.

H.3.3 The wind-induced torque coefficient may be calculated according to the following formula:

$$C'_T = \left\{0.0066 + 0.015(D/B)^2\right\}^{0.78} \tag{H.3.3}$$

H.3.4 The torsional resonance factor may be determined according to the following requirements:

$$R_T = K_T \sqrt{\frac{\pi F_T}{4\zeta_1}} \tag{H.3.4-1}$$

$$K_T = \frac{(B^2 + D2)}{20r^2} \left(\frac{z}{H}\right)^{-0.1} \tag{H.3.4-2}$$

1 The torsional resonance factor may be calculated according to the following formula:

Where F_T——The energy factor of torque spectrum;

K_T——The correction coefficient of torsional vibration mode;

r——The gyration radius of structure (m).

2 The energy factor of torque spectrum F_T may be determined according to Figure H.3.4 based on the depth-width ratio *D/B* and the torsion reduced frequency f_{T1}^{*}. The torsion reduced frequency f_{T1}^{*} shall be calculated according to the following formula:

$$f_{T1}^{*} = \frac{f_{T1}\sqrt{BD}}{v_H} \tag{H.3.4-3}$$

Where f_{T1}——The natural vibration frequency of the first order torsion of structure (Hz).

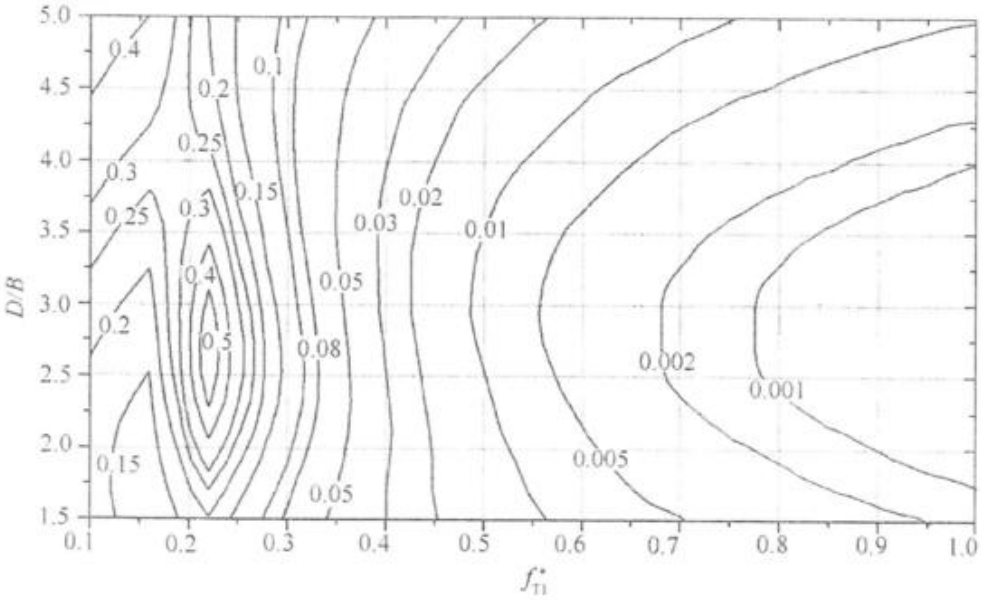


Figure H.3.4 Energy Factor of Torque Spectrum

Appendix J Acceleration of Wind Induced Along-wind and Across-wind Vibration for Tall Buildings

J.1 Calculation of Acceleration of Along-wind Vibration

J.1.1 For the tall buildings with shape and mass being uniformly distributed along the height, the acceleration of along-wind vibration may be calculated according to the following formula:

$$a_{D,z} = \frac{2gI10\omega_R\mu_s\mu_z B_z\eta_a B}{m} \tag{J.1.1}$$

Where $a_{D,z}$——The acceleration of along-wind vibration at z height of tall buildings (m/s^2);

g——The peak factor, taking 2.5;

I_{10}——The nominal turbulivity of 10m height, taking 0.12, 0.14, 0.23 and 0.39 corresponding to Category A, B, C and D terrain roughness respectively;

ω_R——The wind pressure with a recurrence interval of R (kN/m^2), may be calculated according to Formula (E.3.3) in Appendix E of this code;

B——The windward side width (m);

m——The mass in unit height of structure (t/m);

μ_z——The exposure factor for wind pressure;

μ_s——The shape factor of wind load;

B_z——The background component factor of fluctuating wind load, calculated according to Formula (8.4.5) of this code;

η_a——The fluctuation coefficient of acceleration of along-wind vibration.

J.1.2 The fluctuation coefficient η_a of acceleration of along-wind vibration may be determined in accordance with those specified in Table J.1.2 based on the structure's damping ratio ζ_1 and coefficient x_1. The coefficient x_1 shall be calculated according to Formula (8.4.4-2) of this code.

Table J.1.2 Fluctuation Coefficient η_a of Acceleration of Along-wind Vibration

x_1	ζ_1=0.01	ζ_1=0.02	ζ_1=0.03	ζ_1=0.04	ζ_1=0.05
5	4.14	2.94	2.41	2.10	1.88
6	3.93	2.79	2.28	1.99	1.78
7	3.75	2.66	2.18	1.90	1.70
8	3.59	2.55	2.09	1.82	1.63
9	3.46	2.46	2.02	1.75	1.57
10	3.35	2.38	1.95	1.69	1.52
20	2.67	1.90	1.55	1.35	1.21
30	2.34	1.66	1.36	1.18	1.06

Table J.1.2 (continued)

x_1	ζ_1=0.01	ζ_1=0.02	ζ_1=0.03	ζ_1=0.04	ζ_1=0.05
40	2.12	1.51	1.23	1.07	0.96
50	1.97	1.40	1.15	1.00	0.89
60	1.86	1.32	1.08	0.94	0.84
70	1.76	1.25	1.03	0.89	0.80
80	1.69	1.20	0.98	0.85	0.76
90	1.62	1.15	0.94	0.82	0.74
100	1.56	1.11	0.91	0.79	0.71
120	1.47	1.05	0.86	0.74	0.67
140	1.40	0.99	0.81	0.71	0.63
160	1.34	0.95	0.78	0.68	0.61
180	1.29	0.91	0.75	0.65	0.58
200	1.24	0.88	0.72	0.63	0.56
220	1.20	0.85	0.70	0.61	0.55
240	1.17	0.83	0.68	0.59	0.53
260	1.14	0.81	0.66	0.58	0.52
280	1.11	0.79	0.65	0.56	0.50
300	1.09	0.77	0.63	0.55	0.49

J.2 Calculation of Acceleration of Across-wind Vibration

J.2.1 For the tall buildings with rectangular section with shape and mass being uniformly distributed along the height, the acceleration of along-wind vibration may be calculated according to the following formula:

$$a_{L,z} = \frac{2.8 g \omega_R \mu_H B}{m} \varphi_{L1}(z) \sqrt{\frac{\pi S_{FL} C_{sm}}{4(\xi_1 + \xi_{a1})}} \tag{J.2.1}$$

Where $a_{L,z}$——The acceleration of across-wind vibration at z height of tall buildings (m/s^2);

g——The peak factor, taking 2.5;

ω_R——The wind pressure with a recurrence interval of R (kN/m^2), may be calculated according to Article E.3.3 in Appendix E of this code;

B——The windward side width (m);

m——The mass in unit height of structure (t/m);

μ_H——The exposure factor for wind pressure at the top of structure;

S_{FL}——The power spectrum of non-dimensional across-wind generalized force, may be determined according to Article H.2.4 in Appendix H of this code;

C_{sm}——The angle edge correction coefficient of across-wind force spectrum, may be adopted according to Article H.2.5 in Appendix H of this code;

$\varphi_{L1}(z)$——The coefficient of the across-wind first order vibration mode of structure;

ζ_1——The damping ratio of the across-wind first order vibration mode of structure;

ζ_{a1}——The aerodynamic damping ratio of the across-wind first order vibration mode of structure, may be calculated according to Formula (H.2.4-3) in Appendix H of this code.

Explanation of Wording in this Code

1 Words used for different degrees of strictness are explained as follows in order to mark the difference in executing the requirements in this code:

1) Words denoting a very strict or mandatory requirement:

"Must" is used for affirmation; "must not" for negation.

2) Words denoting a strict requirement under normal conditions:

"Shall" is used for affirmation; "shall not" for negation.

3) Words denoting a permission of a slight choice or an indication of the most suitable choice when conditions permit:

"Should" is used for affirmation; "should not" for negation.

4) "May" is used to express the option available, sometimes with the conditional permission.

2 "Shall be in accordance with……" or "shall execute based upon……" is used in this code to indicate that it is necessary to comply with the requirements stipulated in other relative standards and codes.

List of Quoted Standards

"Code for Design of Civil Air Defence Basement" GB 50038

"Unified Standard for Reliability Design of Engineering Structures" GB 50153