MALAYSIAN STANDARD

MS EN 1990:2010
(NATIONAL ANNEX)

MALAYSIA NATIONAL ANNEX TO EUROCODE - BASIS OF STRUCTURAL DESIGN

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Construction Industry Development Board Malaysia
Department of Irrigation and Drainage
Department of Standards Malaysia
Federation of Malaysian Manufacturers
Jabatan Bomba dan Penyelamat Malaysia
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The Institution of Engineers, Malaysia
Universiti Sains Malaysia
Universiti Teknologi Malaysia

The Technical Committee on Code of Practice for Design of Concrete Structures which developed this Malaysia National Annex was managed by The Institution of Engineers, Malaysia (IEM) in its capacity as an authorised Standards-Writing Organisation and consists of representatives from the following organisations:

Arup Jururunding Sdn Bhd

Association of Consulting Engineers Malaysia

Construction Industry Development Board Malaysia

Jabatan Kerja Raya Malaysia

Masters Builders Association Malaysia

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FOREWORD

The Malaysia National Annex was developed by the Technical Committee on Code of Practice for Design of Concrete Structures under the authority of the Industry Standards Committee on Building, Construction and Civil Engineering. Development of this national annex was carried out by The Institution of Engineers, Malaysia which is the Standards-Writing Organisation (SWO) appointed by SIRIM Berhad to develop standards for concrete structure.

This Malaysia National Annex shall be used together with MS EN 1990:2010, *Eurocode - Basis of structural design*.

Acknowledgement is given to BSI for the use of information from *UK National Annex to Eurocode 0 - Basis of structural design.*

Compliance with a Malaysian Standard does not of itself confer immunity from legal obligations.

MALAYSIA NATIONAL ANNEX TO MS EN 1990:2010, EUROCODE - BASIS OF STRUCTURAL DESIGN

NA0 Introduction

This national annex has been prepared by the Technical Committee on Code of Practice for Design of Concrete Structures. In Malaysia, it shall be used in conjunction with MS EN 1990:2010, *Eurocode - Basis of structural design*.

NA1 Scope

This national annex gives:

a) Nationally Determined Parameters for the A2.1.1 (1) of MS EN 1990:2010 where national choice is allowed. The nationally determined parameters for the A2.1.1 (1) of MS EN 1990:2010 applies to buildings and civil engineering works (see NA2.1):

- A2.1.1 (1)

b) Nationally Determined Parameters, applicable to buildings only for the following clauses of MS EN 1990:2010 where national choice is allowed (see NA2.2).

- A1.1 (1);
- A1.2.1 (1);
- A1.2.2 (Table A.1.1);
- A1.3.1 (1) Tables A1.2 (A) to (C);
- A1.3.1 (5);
- A1.3.2 (Table A.1.3); and
- A1.4.2 (2).

NOTE. Clauses applicable for bridges, cranes and machinery, silos and tanks, etc., will be added by amending the national annex at appropriate future dates.

c) Guidance on use of the MS EN 1990:2010 Informative Annexes B, C and D for buildings and civil engineering works (see NA3).

d) References to non-contradictory complementary information applicable to buildings and civil engineering works (see NA4).

NA2 Nationally Determined Parameters

NA2.1 Nationally Determined Parameters for buildings and civil engineering works

NA2.1.1 MS EN 1990:2010 Clause A1.1, Field of application

Table NA1 provides modified values for the design working life given in Table 2.1 of MS EN 1990:2010.

Table NA1. Indicative design working life

Design working life category	Indicative design working life (years)	Examples
1	10	Temporary structures[a]
2	10 to 30	Replaceable structural parts, e.g. gantry girders, bearings
3	15 to 25	Agricultural and similar structures
4	50	Building structures and other common structures, not listed elsewhere in this table
5	120	Monumental building structures, highway and railway bridges, and other civil engineering structures

[a] Structures or parts of structures that can be dismantled with a view of being re-used should not be considered as temporary.

NA2.2 Nationally Determined Parameters for buildings

NA2.2.1 Clause A1.2.1 (1)

a) All effects of action that can exist simultaneously should be considered together in combination of actions.

b) With regards to Note 2 of Clause A1.2.1(1) of MS EN 1990:2010 no modifications are allowed through the National Annex for A1.2.1(2) and (3).

NA2.2.2 Clause A1.2.2

Table NA2 provides values for the symbols of Table A1.1 of MS EN 1990:2010.

Table NA2. Values of ψ factors for buildings

Action	ψ_0	ψ_1	ψ_2
Imposed loads in buildings, category (see MS EN 1991-1-1)			
Category A: domestic, residential areas	0.7	0.5	0.3
Category B: office areas	0.7	0.5	0.3
Category C: congregation areas	0.7	0.7	0.6
Category D: shopping areas	0.7	0.7	0.6
Category E: storage areas	1.0	0.9	0.8
Category F: traffic areas, vehicle weight ≤ 30 kN	0.7	0.7	0.6
Category G: traffic area, 30 kN < vehicle weight ≤ 200 kN	0.7	0.5	0.3
Category H: roofs[a]	0.7	0	0
Wind loads on buildings (see MS 1553:2002)	0.5	0.2	0
Temperature (non-fire) in buildings (see EN 1991-1-5)	0.6	0.5	0

[a] See also MS EN 1991-1-1: Clause 3.3.2(1).

NA2.2.3 Clause A1.3

NA2.2.3.1 Values for the symbols of γ of Table A1.2(A)

Table NA3a provides the values for the symbol γ of Table A1.2(A). The values chosen are:

$\gamma_{Gj,sup}$ = 1.10

$\gamma_{Gj,inf}$ = 0.90

$\gamma_{Q,1}$ = 1.50 where unfavourable (0 where favourable)

$\gamma_{Q,i}$ = 1.50 where unfavourable (0 where favourable)

NOTE. For ψ values see Table A1.1 (MS EN 1990:2010).

Table NA3a. Design values of actions (EQU)(Set A)

Persistent and transient design situations	Permanent actions		Loading variable action[a]	Accompanying variable actions	
	Unfavourable	Favourable		Main (if any)	Others
(Expression 6.10)	1.10 $G_{kj,sup}$	0.90 $G_{kj,inf}$	1.5 $Q_{k,1}$ (0 when favourable)		1.5 $\psi_{0,i}$ $Q_{k,i}$ (0 when favourable)

[a] Variable actions are those considered in Table NA2.

In cases where the verification of static equilibrium also involves the resistance of structural members, as an alternative to two separate verifications based on Tables NA3a and NA3b, a combined verification, based on Table NA3a, should be adopted, with the following set of values:

$\gamma_{Gj,sup}$ = 1.35

$\gamma_{Gj,inf}$ = 1.15

$\gamma_{Q,1}$ = 1.50 where unfavourable (0 where favourable)

$\gamma_{Q,i}$ = 1.50 where unfavourable (0 where favourable)

provided that applying $\gamma_{Gj,inf}$ = 1.00 both to the favourable part and to the unfavourable part of permanent action does not give a more unfavourable effect.

NA2.2.3.2 Values for the symbols of γ and ξ of Table A1.2(B)

Table NA3b provides the values for the symbol γ and ξ of Table A1.2(B). The values chosen are:

$\gamma_{Gj,sup}$ = 1.35

$\gamma_{Gj,inf}$ = 1.00

$\gamma_{Q,1}$ = 1.50 where unfavourable (0 where favourable)

$\gamma_{Q,i}$ = 1.50 where unfavourable (0 where favourable)

ξ = 0.925

NOTE. For ψ values see Table NA2.

Table NA3b. Design values of actions (STR/GEO)(Set B)

Persistent and transient design situations	Permanent actions		Leading variable action	Accompanying variable actions[a]		Persistent and transient design situations	Permanent actions		Leading variable action[a]	Accompanying variable actions[a]	
	Unfavourable	Favourable		Main (if any)	Others		Unfavourable	Favourable		Main (if any)	Others
Expression 6.10	$1.35G_{kj,sup}$	$1.00G_{kj,inf}$	$1.5Q_{k,1}$		$1.5\psi_{0,1}Q_{k,i}$	Expression 6.10a	$1.35G_{kj,sup}$	$1.00G_{kj,inf}$		$1.5\psi_{0,1}Q_{k,1}$	$1.5\psi_{0,1}Q_{k,i}$
						Expression 6.10b	$0.925*1.35G_{kj,sup}$	$1.00G_{kj,inf}$	$1.5Q_{k,1}$		$1.5\psi_{0,1}Q_{k,i}$

NOTES:

1. Either expression 6.10 or expression 6.10a together with and 6.10b may be made, as desired.

2. The characteristic values of all permanent actions from one source are multiplied by $\gamma_{G,sup}$ if the total resulting action effect is unfavorable and $\gamma_{G,inf}$ if the total resulting action effect is favourable. For example, all actions originating from the self weight of the structure may be considered as coming from one source; this also applies if different materials are involved.

3. For particular verifications, the values for γ_G and γ_Q may be subdivided into γ_g and γ_q and the model uncertainty factor γ_{sd}. A value of γ_{sd} in the range 1.05 to 1.15 can be used in most common cases and can be modified in the national annex.

4. When variable actions are favourable Q_k should be taken as 0.

[a] Variable actions are those considered in Table NA2.

NA2.2.3.3 Values for the symbols γ of Table A1.2(C)

Table NA3c provides the values for the symbols γ of Table A1.2(C). The values chosen are:

$\gamma_{Gj,sup}$ = 1.00

$\gamma_{Gj,inf}$ = 1.00

$\gamma_{Q,l}$ = 1.30 where unfavourable (0 where favourable)

$\gamma_{Q,i}$ = 1.30 where unfavourable (0 where favourable)

NOTE. For ψ values see Table NA2.

Table NA3c. Design values of actions (STR/GEO)(Set C)

Persistent and transient design situations	Permanent actions		Loading variable action[a]	Accompanying variable actions[a]	
	Unfavourable	Favourable		Main (if any)	Others
Expression 6.10	1.0 $G_{kj,sup}$	1.0 $G_{kj,inf}$	1.3 $Q_{k,l}$ (0 when favourable)		1.3 $\psi_{0,i}$ $Q_{k,i}$ (0 when favourable)

[a] Variable actions are those considered in Table NA2.

NA2.2.4 Clause A1.3.1(5)

Approach 1 should be used for the design of buildings in Malaysia.

NA2.2.5 Clause A1.3.2

Table NA4 provides the values for the symbol of Table A1.3 of MS EN 1990:2010. All γ factors are equal to 1.00. Coefficient $\psi_{1,l}$ is selected for the main accompanying variable action for the accidental design situation.

NOTE. For ψ values see Table NA2.

Table NA4. Design values of actions for use in accidental and seismic combinations of actions

Design situations	Permanent actions		Loading accidental or seismic action	Accompanying variable actions[b]	
	Unfavourable	Favourable		Main (if any)	Others
Accidental (Expression 6.11a/b)	$G_{kj,sup}$	$G_{kj,inf}$	A_d	$\psi_{1,l}$ $Q_{k,l}$	$\psi_{2,i}$ $Q_{k,i}$
Seismic[a] (Expression 6.12a/b)	$G_{kj,sup}$	$G_{kj,inf}$	$\gamma_I A_{Ek}$ or A_{Ed}		$\psi_{2,i}$ $Q_{k,i}$

[a] The seismic design situation should be used only when specified by the client. See also Eurocode 8.

[b] Variable actions are those considered in Table NA2.

NA2.2.6 Clause A1.4.2

Clause A1.4.2 of MS EN 1990:2010 states that the serviceability criteria should be specified for each project and agreed with the client. In the absence of specific requirements in MS EN documents to date or their national annexes, it is recommended that the following combination of action expressions are used with particular serviceability requirements:

a) for function and damage to structural and non-structural elements (e.g. partition walls, etc.) the characteristic combination (i.e. Expression 6.14b of MS EN 1990:2010);

b) for comfort to user, use of machinery, avoiding ponding of water, etc. the frequent combination (i.e. Expression 6.15b of MS EN 1990:2010); and

c) for appearance of the structure the quasi-permanent combination (i.e. Expression 6.16a of MS EN 1990:2010).

Separate consideration should be given to serviceability related to appearance and that related to user comfort which may be affected by structural deformation or vibration.

NOTE. Nationally Determined Parameters for Annex A2 of MS EN 1990:2010 and other annexes (e.g. cranes and machinery, silos and tanks, towers and masts) will be added when available.

NA3 Guidance on using the MS EN 1990:2010 Informative Annexes B, C and D

NA3.1 For buildings

NA3.1.1 Annex B

Annex B may be used. If used it should be in accordance with the full reliability based approach described in Annex C of MS EN 1990:2010.

Annex B provides informative guidance relating to a number of the assumptions (see Clause 1.3 of MS EN 1990:2010), and in particular on quality management and control measures in design, detailing and execution which aim to eliminate failures due to gross errors, and to achieve the resistance assumed in the design.

For this purpose the use of Clauses B4 and B5 of this annex are recommended.

NA3.1.2 Annex C

Annex C may be used for calibration purposes, and for cases of actions not covered by MS EN 1991.

NA3.1.3 Annex D

Annex D may be used for design assisted by testing.

NOTE. Guidance on using MS EN 1990:2010 Annexes B, C and D for bridges, crane and machinery, silos and tanks, towers and masts, etc. will be given when available.

NA4 Reference to non-contradictory complementary information (NCCI)

NA4.1 For buildings

Guidance will be given when available.

NOTE. References to any non-contradictory complementary information for bridges, crane and machinery, silos and tanks, towers and masts, etc. will be given when available.

Acknowledgements

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