

**DRAFT AMENDMENT
FOR PUBLIC COMMENT**

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Draft Amendment No.1 to the Singapore National Annex to Eurocode 1 : Actions on structures
– Part 1-5 : General actions – Thermal actions (SS EN 1991-1-5:2009(2015))

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AMENDMENT NO. 1

Month / Year

1. Page 6, National Foreword

Replace paragraph 2 with the following text:

This National Annex (NA to SS EN 1991-1-5:2009(2022)+A1:2022) is a modified adoption of the UK National Annex (NA to BS EN 1991-1-5:2003) to Eurocode 1 : Actions on structures – Part 1-5 : General actions – Thermal actions and is implemented with the permission of BSI Standards Limited.

2. Page 7, NA.2.1 Determination of temperature profiles

Replace entire clause with the following text:

The values recommended in SS EN 1991-1-5:2009(2022), Table 5.1, should be used.

SS EN 1991-1-5:2009(2022), Table 5.2 should be used, except that the following values should apply to Singapore:

| Return period (years) | Maximum shade air temperature T_{max} | Minimum shade air temperature T_{min} |
|-----------------------|--|--|
| 50 | 40.0 °C | 19.5 °C |
| 100 | 41.0 °C | 19.0 °C |

$T_3 = 18$ °C

$T_4 = 26$ °C

$T_5 = 34$ °C

SS EN 1991-1-5:2009(2022), Table 5.3 should be used, except that the following values should apply to Singapore:

$T_6 = 24$ °C

$T_7 = 21$ °C

T_8 and T_9 are not applicable.

3. Page 8, NA.2.2.3 Temperature difference component

Replace Table NA.1 with the following:

Table NA.1 – Recommended values of ΔT for deck type 3

| Type of surfacing | Temperature difference °C | | | | | | |
|--|---------------------------|--------------|--------------|--------------|--------------|--------------|--------------|
| | Heating | | | Cooling | | | |
| | ΔT_1 | ΔT_2 | ΔT_3 | ΔT_1 | ΔT_2 | ΔT_3 | ΔT_4 |
| Surfaced (Surfacing of not less than 50 mm) | 11.0 | 3.0 | 2.5 | -8.4 | -0.5 | -1.0 | -6.5 |
| Unsurfaced | 15.4 | 4.5 | 2.0 | -8.4 | -1.0 | -0.6 | -6.5 |

4. Page 9, NA.2.4 Uniform temperature components – General

a) Replace 1st paragraph with the following text:

The values of $T_{e,min}$ and $T_{e,max}$ recommended in SS EN 1991-1-5 : 2009, Figure 6.1, should be used, except for bridge deck Type 3 which shall be replaced by Table NA.3, subject to the adjustments for deck surfacing given in Table NA.2.

b) Replace Table NA.2 with the following:

Table NA.2 – Adjustment to uniform bridge temperature for deck surfacing

| Deck surface | Addition to minimum uniform bridge temperature component, °C | | | Addition to maximum uniform bridge temperature component, °C | | |
|--------------------------------|--|--------|--------|--|--------|--------|
| | Type 1 | Type 2 | Type 3 | Type 1 | Type 2 | Type 3 |
| Unsurfaced | 0 | -3 | 0 | +4 ^{c)} | 0 | 0 |
| Water-proofed ^{a)} | 0 | -3 | 0 | +4 ^{c)} | +4 | +2 |
| 40 mm surfacing ^{b)} | 0 | -2 | 0 | 0 | +2 | +1 |
| 100 mm surfacing ^{b)} | N/A | 0 | 0 | N/A | 0 | 0 |
| 200 mm surfacing ^{b)} | N/A | +3 | +1 | N/A | -4 | -2 |

a) Waterproofed deck values are conservative, assuming dark material; there may be some alleviation when light coloured waterproofing is used; specialist advice should be sought if required.

b) Surfacing depths include waterproofing.

c) For steel truss and plate girders the values for unsurfaced and waterproofed deck surfaces may be reduced to +2 °C.

5. Page 10, NA.2.6 Range of uniform bridge temperature component

Replace entire clause with following text:

In general, the values of the minimum ($T_{e,min}$) and maximum ($T_{e,max}$) uniform bridge temperature components for determination of movements and restraining forces shall be derived from the minimum (T_{min}) and maximum (T_{max}) shade air temperatures. The proposed correlation rules between minimum/maximum shade air temperature (T_{min} and T_{max}) and minimum/maximum uniform bridge temperature component ($T_{e,min}$ and $T_{e,max}$) for different types of bridge decks in

Singapore are summarised in Table NA.3. The correlation rules shown in Table NA.3 are based on daily temperature ranges of 10°C.

Table NA.3 – Recommended minimum and maximum uniform bridge temperature component $T_{e,max}$ and $T_{e,min}$

| Bridge deck type | $T_{e,min}$ (°C) | $T_{e,max}$ (°C) |
|------------------|------------------|------------------|
| 3 | $T_{min} + 2$ | $T_{max} + 2$ |

Where:

| | | |
|--------|----------------|---|
| Type 3 | Concrete deck: | – Concrete slab – Concrete beam – Concrete box girder |
|--------|----------------|---|

For bearings and expansion joints, the maximum expansion and contraction ranges of the uniform bridge temperature component should be as given by other relevant standards (for example, SS EN 1993-2). Where no information is given the requirements should be as follows:

$$(\Delta T_{N,exp} + 6) \text{ °C}$$

and

$$(\Delta T_{N,con} + 6) \text{ °C, respectively.}$$

6. Page 12, NA.2.21 Isotherms of national minimum and maximum shade air temperatures – General

Replace the last sentence with the following text:

T_0 may be taken as 30 °C.

7. Page 12, NA.2.23 Temperature differences for various surfacing depths

Replace entire paragraph with the following text:

Temperature difference profiles for surfacing depths, other than 40 mm for Type 1 and 100 mm for deck Types 2 and 3, should be as given in SS EN 1991-1-5:2009(2022), Table B.1 and Table B.2. The temperature difference profile for deck Type 3 should be as given in Table NA.1.