STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

BEVERLY EAVES PERDUE
GOVERNOR

EUGENE A. CONTI, JR.
SECRETARY

MEMORANDUM TO: Project Engineers
Project Design Engineers

FROM: G. R. Perfetti, P. E.
State Bridge Management Engineer

DATE: September 28, 2012

SUBJECT: FOAM JOINT SEALS

The design temperature ranges used to determine formed joint openings, sawed joint openings, and uncompressed seal widths for foam joint seals have been revised. The temperature ranges were adjusted to represent temperatures typically found in North Carolina. The joint size tables located in Design Manual Figures 6-43 and 6-44 have been combined to incorporate both concrete and steel superstructures. The new Design Manual Figure 6-43 is attached and Figure 6-44 has been deleted.

This policy is effective for all new projects, as well as for existing projects that are in early stages of design. The Design Manual has been updated and is available online.

GRP/BCH/GM

Attachments

Fig 6-43 (English)
Fig 6-43 M (Metric)

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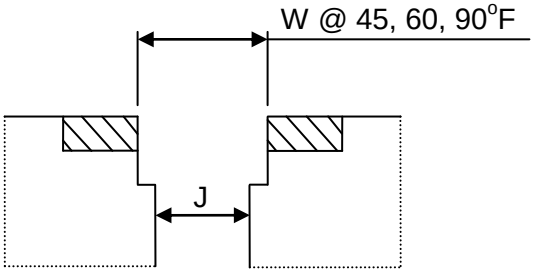

Figure 1

To select the appropriate uncompressed seal width, compute M_{tot} and use the chart below. The chart is based on a maximum compression of 50% at T_{max}, a maximum tension of 10% at T_{min}, and a maximum sawed joint opening of 3½" at T_{min}.

M_{tot} = Total Movement Normal to Joint = α x L x 12 x Δ_T x sin θ

Where:

α = Coefficient of Thermal Expansion (per °F) = { **6.0×10^{-6}** for concrete superstructures; **6.5×10^{-6}** for steel superstructures }

L = Length of Superstructure Expanding (feet)

$\Delta_T = T_{max} - T_{min}$ = { $105^o - 20^o$ = **85^o** for concrete superstructures; $110^o - 10^o$ = **100^o** for steel superstructures }

θ = Skew Angle of Joint (degrees)

M_{tot} = { **0.00612 x L x sin θ for concrete superstructures**; **0.00780 x L x sin θ for steel superstructures** }

M_{tot}	E_W	W @ 90°F	W @ 60°F	W @ 45°F	J
$M_{tot} \leq 1.000$"	2"	1 9/16" - C_{90}	1 9/16"	1 9/16" + C_{45}	1"
1.000" < $M_{tot} \leq 1.250$"	2 1/2"	1 15/16" - C_{90}	1 15/16"	1 15/16" + C_{45}	1 1/4"
1.250" < $M_{tot} \leq 1.500$"	3"	2 5/16" - C_{90}	2 5/16"	2 5/16" + C_{45}	1 1/2"
1.500" < $M_{tot} \leq 1.750$"	3 1/2"	2 11/16" - C_{90}	2 11/16"	2 11/16" + C_{45}	1 3/4"

E_W = Width of uncompressed seal

W @ 45°, 60°, 90°F = Sawed joint opening, to be shown on plans; see Figure 1

J = Formed joint opening; see Figure 1

$C_{90} = (30 / \Delta_T) \times M_{tot}$
$C_{45} = (15 / \Delta_T) \times M_{tot}$

Foam Joint Seals for Concrete and Steel Superstructures

FIGURE 6 - 43

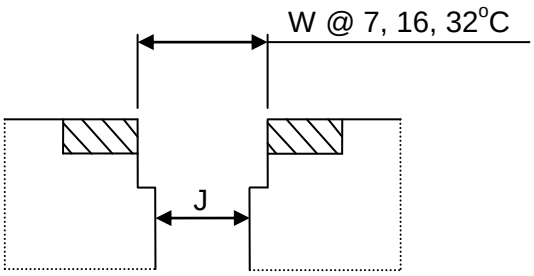

Figure 1

To select the appropriate uncompressed seal width, compute M_{tot} and use the chart below. The chart is based on a maximum compression of 50% at T_{max}, a maximum tension of 10% at T_{min}, and a maximum sawed joint opening of 89mm at T_{min}.

M_{tot} = Total Movement Normal to Joint = α x L x Δ_T x sin θ

Where:

α = Coefficient of Thermal Expansion (per ^oC) = { **10.8×10^{-6}** for concrete superstructures; **11.7×10^{-6}** for steel superstructures }

L = Length of Superstructure Expanding (mm)

$\Delta_T = T_{max} - T_{min}$ = { $41^o - (-7^o) =$ **48^o** for concrete superstructures; $43^o - (-12^o) =$ **55^o** for steel superstructures }

θ = Skew Angle of Joint (degrees)

M_{tot} = { 0.00052 x L x sin θ for concrete superstructures; 0.00064 x L x sin θ for steel superstructures }

M_{tot}	E_W	W @ 32°C	W @ 16°C	W @ 7°C	J
$M_{tot} \leq$ 25mm	50mm	40mm – C_{32}	40mm	40mm + C_7	25mm
25mm < $M_{tot} \leq$ 32mm	65mm	50mm – C_{32}	50mm	50mm + C_7	32mm
32mm < $M_{tot} \leq$ 38mm	75mm	60mm – C_{32}	60mm	60mm + C_7	38mm
38mm < $M_{tot} \leq$ 45mm	90mm	70mm – C_{32}	70mm	70mm + C_7	45mm

E_W = Width of uncompressed seal

W @ 7^o, 16^o, 32^oC = Sawed joint opening, to be shown on plans; see Figure 1

J = Formed joint opening; see Figure 1

$C_{32} = (16 / \Delta_T) \times M_{tot}$
$C_7 = (9 / \Delta_T) \times M_{tot}$

Foam Joint Seals for Concrete and Steel Superstructures

FIGURE 6 – 43 M