PAVEMENT STANDARD DRAWINGS

RIGID PAVEMENT

STEEL FIBRE REINFORCED CONCRETE PAVEMENT (SFCP)

FOR ROUNDBOUTS
**ANCHORS**

1. Anchor types are:
   - Type 6: 0.6 m deep
   - Type 12: 1.2 m deep
   (a) Anchors must be provided as follows:
      - At flexible pavement interfaces according to the length of restrained concrete pavement L, at
        - L < 25 m: Type 6
        - L ≥ 25 m: Type 12
    At structures (bridges) and on grades > 4%, refer to Drawings MD.R83.P F 12
   (b) Anchors must be identified by a surface stamp placed above the anchor centreline and:
      - (i) within 0.5 m of each extremity
      - (ii) at each deflection alignment.

**TIEBARS**

4. Steel reinforcement size must be in accordance with AS 6651, Bar laps must be as follows:
   - (a) N12: 360 mm min.
   - (b) N16: 525 mm min.

**SLAB DIMENSIONAL LIMITS**

6. The total bed width of pavement between relief edges must not exceed 2.2 m.

**SLAB DIMENSIONS**

7. Slab dimension limits are listed in Table 4. These are critical criteria for the layout and design of slabs and must be complied with.

**GENERAL**

1. Steel reinforcement must be in accordance with AS 4671, Steel Fibre Reinforced Concrete Pavement (SFCP)
2. Steel stirrups must be lapped to the pavement mesh.
3. Steel reinforcement must be in accordance with the specification.

**REFERENCES**

RO 27/10/2014
For Consultants on location of construction joints in LCS.

R82 Steel Reinforcing Materials

Refer to R82 for constraints on location of construction joints in LCS.

R83 Sealants and fillers must comply with R83.

R84 Where joints daylight at formed joints or edges, the sealant (both temporary and permanent) must extend down to the base of the joint (in accordance with the specification) to prevent the ingress of incompatible material during subsequent paving.

Sealants and fillers must comply with R83.

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R84 Where joints daylight at formed joints or edges, the sealant (both temporary and permanent) must extend down to the base of the joint (in accordance with the specification) to prevent the ingress of incompatible material during subsequent paving.

Sealants and fillers must comply with R83.
### JOINT TYPE F1
LONGITUDINAL: TIED AND SAWN

- **Depth of Base**: 500 ± 75
- **SFCP**
- **LCS**
- **SFCP**
- **J**

### JOINT TYPE F2
LONGITUDINAL: TIED AND FORMED

- **Depth of Base**: 500 ± 75
- **SFCP**
- **LCS**
- **SFCP**
- **J**

### JOINT TYPE F3
LONGITUDINAL: BUTT EDGE

- **Depth of Base**: 80 ± 20
- **SFCP**
- **LCS**
- **SFCP**
- **F**

### JOINT TYPE F4
LONGITUDINAL: UNTIED AND FORMED

- **Depth of Base**: 80 ± 20
- **SFCP**
- **LCS**
- **SFCP**
- **J**

### JOINT TYPE F5
LONGITUDINAL: EDGE

- **Depth of Base**: 200 ± 20
- **SFCP**
- **LCS**
- **SFCP**
- **J**

### JOINT TYPE F6
LONGITUDINAL: CORRUGATED EDGE

- **Depth of Base**: 200 ± 20
- **SFCP**
- **LCS**
- **SFCP**
- **J**

### JOINT TYPE F7
TRANSVERSE: TIED AND FORMED

- **Depth of Base**: 500 ± 75
- **SFCP**
- **LCS**
- **SFCP**
- **J**

### JOINT TYPE F8
TRANSVERSE: CONTRACTION, SAWN

- **Depth of Base**: 500 ± 75
- **SFCP**
- **LCS**
- **SFCP**
- **J**

### JOINT TYPE F9
ISOLATION, WITHOUT BEAM

- **Depth of Base**: 500 ± 75
- **SFCP**
- **LCS**
- **SFCP**
- **J**

### JOINT TYPE F10
ISOLATION, WITH BEAM

- **Depth of Base**: 500 ± 75
- **SFCP**
- **LCS**
- **SFCP**
- **J**

### JOINT TYPE F11
CORRUGATIONS, IN ACCORDANCE WITH TABLE 3

- **Depth of Base**: 500 ± 75
- **SFCP**
- **LCS**
- **SFCP**
- **J**

### JOINT TYPE F12
CORRUGATIONS, IN ACCORDANCE WITH TABLE 3

- **Depth of Base**: 500 ± 75
- **SFCP**
- **LCS**
- **SFCP**
- **J**

### JOINT TYPE F13
CORRUGATIONS, IN ACCORDANCE WITH TABLE 3

- **Depth of Base**: 500 ± 75
- **SFCP**
- **LCS**
- **SFCP**
- **J**
# Table 3: Joint Corrugation Details

<table>
<thead>
<tr>
<th>Base Thickness (mm)</th>
<th>Number of Corrugations</th>
<th>Corrugation Depth (mm)</th>
<th>Minimum Flat (mm)</th>
<th>Minimum Vertical (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 200</td>
<td>3</td>
<td>9 ± 3</td>
<td>20</td>
<td>10 ± 5</td>
</tr>
<tr>
<td>200 - 240</td>
<td>3 or 4</td>
<td>10 ± 3</td>
<td>25</td>
<td>12 ± 5</td>
</tr>
<tr>
<td>&gt; 240</td>
<td>3 or 4</td>
<td>12 ± 3</td>
<td>30</td>
<td>15 ± 5</td>
</tr>
</tbody>
</table>

Note: (a) The top and bottom corrugations must be concave in the first placed face (that is, convex on the form). (b) See Figure 7.1 Criteria for spacing of tiebars.

# Table 4: Slab Dimensional Limits for Steel Fibre Reinforced Concrete Pavement (SFPC)

<table>
<thead>
<tr>
<th>Trafficked slabs (mm)</th>
<th>Untrafficked slabs (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum corner angles (°)</td>
<td>76° (70°)</td>
</tr>
<tr>
<td>Slab length, L (m)</td>
<td>6.0</td>
</tr>
<tr>
<td>Slab width, W (m)</td>
<td>2.5 (1.5)</td>
</tr>
<tr>
<td>Shape factor, R_0/</td>
<td>4.0 (4.5)</td>
</tr>
<tr>
<td>Shape factor, R_max</td>
<td>0.0</td>
</tr>
<tr>
<td>Shape factor, R_min</td>
<td>6.0</td>
</tr>
<tr>
<td>Shape factor, R_sat</td>
<td>0.6</td>
</tr>
</tbody>
</table>

Notes: (a) A slab is deemed to be trafficked if any part of that slab lies within the trafficked canyons as defined by face lines. (b) Corner angles must be maximised wherever possible. (c) Length is measured perpendicularly between transverse contraction joints. (d) Width is measured between longitudinal joints. (e) Slab lengths of 4-6 m are preferred and the use of lower values should be limited to the inside of curves. (f) Bracketed values should only be used where unavoidable.

# Table 5: Reinforcement Schedule

<table>
<thead>
<tr>
<th>Mark</th>
<th>Designation</th>
<th>Shape</th>
<th>Location</th>
<th>Length (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1</td>
<td>N12</td>
<td>1</td>
<td>Base, longitudinal joints</td>
<td>1.0</td>
</tr>
<tr>
<td>E4</td>
<td>N12</td>
<td>1 OR 2</td>
<td>Drilled holes (drill bars)</td>
<td>0.75</td>
</tr>
<tr>
<td>E7</td>
<td>N12</td>
<td>1</td>
<td>Base, transverse construction</td>
<td>1.0</td>
</tr>
<tr>
<td>J1</td>
<td>N12</td>
<td>21</td>
<td>Kerb Types SA, SB and SC</td>
<td>1.0</td>
</tr>
<tr>
<td>J2</td>
<td>N12</td>
<td>1</td>
<td>Kerb Types SE and SL</td>
<td>1.0</td>
</tr>
<tr>
<td>J3</td>
<td>N12</td>
<td>5</td>
<td>Kerb Type SF and SM</td>
<td>-</td>
</tr>
<tr>
<td>F</td>
<td>N16</td>
<td>4</td>
<td>Terminal anchor</td>
<td>-</td>
</tr>
<tr>
<td>G</td>
<td>N16</td>
<td>3</td>
<td>Terminal anchor</td>
<td>-</td>
</tr>
<tr>
<td>H</td>
<td>N16</td>
<td>1</td>
<td>Terminal anchor</td>
<td>-</td>
</tr>
<tr>
<td>M1</td>
<td>SL92</td>
<td>-</td>
<td>SFPC-P general</td>
<td>-</td>
</tr>
<tr>
<td>M2</td>
<td>SL92</td>
<td>-</td>
<td>Terminal anchor slab</td>
<td>-</td>
</tr>
<tr>
<td>M3</td>
<td>SL92 or LMT</td>
<td>-</td>
<td>Subgrade beams</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: (a) Bending pin diameter to be 5 times the bar diameter. (b) Where "JP" is used instead of a dimension, take the average of the two slabs abutting the joint under design. Tied joints (such as F7) are ignored in the calculation of length or width. (c) Design Joint opening L = length of longitudinal joint between contraction joints (m) A = 110 mm for 12 mm diameter deformed 500N steel reinforcement. Use 0.6f' = 0.6 x 500 = 300 MPa. Where f' is the allowable tensile stress of the reinforcing steel (MPa). Use 0.9f' = 0.9 x 500 = 450 MPa. Slovakia acceleration due to gravity (ms²). Use 9.81 m/s². (d) L = thickness of the base (mm), including any asphalt surface. (e) M = mass per unit volume of the concrete base (kg/m³). Use 2.400 kg/m³. (f) P = coefficient of friction between the concrete base and the lean-mix concrete subbase. Use 1.5 for Roads and Maritimes Services projects.

# Table 6: Jointed Units - Silicone Sealant Dimensions

<table>
<thead>
<tr>
<th>Joint Seinent label</th>
<th>Slab Length L or Width W (mm)</th>
<th>Design Joint opening (mm)</th>
<th>Sealant Width (mm)</th>
<th>Sealant Depth (mm)</th>
<th>Residue Width (mm)</th>
<th>Residue Depth (mm)</th>
<th>Joint Depth (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>JS1</td>
<td>M241</td>
<td>M21</td>
<td>M9</td>
<td>M6</td>
<td>M3</td>
<td>M1</td>
<td>M0</td>
</tr>
<tr>
<td>JS2</td>
<td>4.8 &lt; L ≤ 6.0</td>
<td>2.9</td>
<td>9 (3-0)</td>
<td>8 (3-0)</td>
<td>5 ± 3</td>
<td>6 ± 2</td>
<td>35 ± 5</td>
</tr>
<tr>
<td>JS3</td>
<td>6.5 &lt; L ≤ 8.0</td>
<td>3.5</td>
<td>10 (3-0)</td>
<td>8 (3-0)</td>
<td>6 ± 3</td>
<td>8 ± 2</td>
<td>45 ± 5</td>
</tr>
<tr>
<td>JS4</td>
<td>8.0 &lt; L ≤ 9.5</td>
<td>4.0</td>
<td>11 (2-0)</td>
<td>9 (3-0)</td>
<td>6 ± 3</td>
<td>8 ± 2</td>
<td>45 ± 5</td>
</tr>
<tr>
<td>JS5</td>
<td>9.5 &lt; L ≤ 11.5</td>
<td>4.4</td>
<td>12 (4-0)</td>
<td>10 (4-0)</td>
<td>7 ± 3</td>
<td>10 ± 4</td>
<td>45 ± 5</td>
</tr>
<tr>
<td>JS6</td>
<td>11.5 &lt; L ≤ 13.0</td>
<td>4.8</td>
<td>14 (4-0)</td>
<td>11 (4-0)</td>
<td>8 ± 3</td>
<td>10 ± 4</td>
<td>45 ± 5</td>
</tr>
<tr>
<td>JS7</td>
<td>13.0 &lt; L ≤ 15.0</td>
<td>6.0</td>
<td>17 (5-0)</td>
<td>14 (4-0)</td>
<td>10 ± 3</td>
<td>12 ± 4</td>
<td>50 ± 5</td>
</tr>
<tr>
<td>JS9</td>
<td>Bridge approach slabs</td>
<td>25 ± 4</td>
<td>14 (4-0)</td>
<td>10 ± 4</td>
<td>12 ± 4</td>
<td>50 ± 5</td>
<td></td>
</tr>
</tbody>
</table>

Note: (a) Slab length (in the case of transverse joints) or width (in the case of longitudinal joints) are calculated as the average of the two slabs abutting the joint under design. Tied joints (such as F7) are ignored in the measurement of length or width.

# Table 7: Provision of Tiebars

Calculation Procedure:
1. Calculate the required area of tiebar reinforcing steel using Austroads Guide to Pavement Technology Part 2, Clause 9.5.3 Equation 30.

A_b = A_br * L_g

where:
- A_br = required area of steel (mm²/m of length of slab). Use 0.9f' = 0.9 x 500 = 450 MPa.
- L_g = allowable tensile stress of the reinforcing steel (MPa). Use 0.9f' = 0.9 x 500 = 450 MPa.
- g = acceleration due to gravity (ms²). Use 9.81 m/s².
- D = thickness of the base (mm), including any asphalt surface. (m).
- M = slenderness ratio (m). Slenderness ratio (M) is measured from the joint (or section) under design to the nearest untied joint or edge of the base. The value for RED must include stress contributors such as tied kerbs, kerbs, barriers, and concrete infill placed on the base. The total tied width is limited to 22 m, hence the maximum RED is 11 m. (m).
- p = mass per unit volume of the concrete base (kg/m³). Use 2.400 kg/m³.

For roundabouts, tiebars are spaced at 1.5 times the slab thickness in order to reduce the risk of fatigue cracking.

2. Calculate A_br, the total area of reinforcing steel required for the length of longitudinal joint between contraction joints:

A_br = A_br * L_g

3. Calculate the number of tiebars required to be installed in each slab between contraction joints:

N = A_br / A_br * L

rounded up to the nearest whole number where:
- A_br = 110 mm² for 12 mm diameter deformed 500N steel reinforcement.

4. Specify the number of tiebars to be used in each slab. To simplify construction, specify one constant number of tiebars throughout each transition zone, and another constant number between the transitions. Specify each number on the basis of the higher relief-edge distance.

5. Space the tiebars evenly along the length of the longitudinal joint according to the criteria shown in Figure 7.1. Maximum tiebar spacing is 1.40 m.