DESIGN ASSUMPTIONS FOR TRANSVERSELY STRESSED STANDARD DECK UNITS
EXPOSURE CLASSIFICATION B2, REGULAR PERFORMANCE BARRIER

1. Bridge Geometry
(a) These design assumptions are for bridge spans from 10m to 20m.
(b) Road cross-sections consist of a central carriageway plus 2.0m shoulder on each side.
(c) The deck units have been designed as single spans for each end.
(d) If the gradient of the deck along the bridge centreline is greater than 1%, the designers will assess the effects on the supports.
(e) The key diagram for bridge deck cross sections is shown below.

2. Show Traction
Show traction is the angle between transverse stresses and the line perpendicular to the bridge centreline. Bridges with a show traction ranging from 0° to 30° may utilise standard deck units with transverse stressing; bridges with a show traction ranging from 30° to 45° may utilise transverse stressing with show spans in a reinforced concrete cast-in-situ deck shell.

3. General Arrangement of Deck Units
Standard deck units are cast-in-situ.

4. Design Parameters
(a) General Parameters
Design for superimposed dead load+deck wearing surface (DWS) thickness;
for two-way cross-bridges, 70mm minimum DWS thickness at both ends, and 65mm minimum at mid spans, plus 2.5% cross fall.
for one-way cross-bridges, the minimum DWS thickness shall be 65mm.

(b) Sectional Properties
Class II concrete of minimum 30N/mm² strength.
Transverse stressing bars are located at 200mm centres, minimizing transverse forces.

5. Prestressing Losses
Losses shall be calculated in accordance with AS 5105.3.2005.

6. Bridge Calculation
To determine the ultimate limit of the hog of deck units or transfers the following parameters have been estimated.
(a) Loss due to relaxation = 3%
(b) The modulus of elasticity of the concrete = 25000MPa

7. Structural Analysis
The following section properties shall be used in the calculation:

(a) Cross-sectional Properties

8. Design of Deck Units
(a) Dowel Connections
(b) Beam Fixtures
(c) Anchorage Systems

9. Design and Details of Internal Frame
(b) Bolted Connections
(c) Welded Connections
(d) Cast-in-situ Connections

10. Transport and Storage of Units

NOTES:

REFERENCE DOCUMENTS:
Departmental Specifications:
WP2022: Reinforcement Steel
WP105: Manufacturing of Prestressed Concrete Members and Spacing Units
WP104: Supply and Erection of Prestressed Concrete Deck and Deck Units
Departmental Manuals:
Design Criteria for Bridges and Other Structures

PREFECTION UNITS

Design Assumptions for Transversely Stressed Standard Deck Units
Drawing 1 of 2

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8. Structural Design

After the active effects have been determined in Section 7 above, the deck units shall be designed in accordance with AS 3600.5.

The units shall be designed for strength and serviceability. The design shall satisfy the following requirements.

(a) Strand System

- Edge distance and strand spacing shall conform to standard strand patterns shown in TNF standard deck unit drawings and be in accordance with the following requirements:

<table>
<thead>
<tr>
<th>Strand Type</th>
<th>Minimum Distance from Unit to Strand</th>
<th>Minimum Strand to Unit</th>
<th>Minimum Strand Center to Center</th>
<th>Minimum Distance from Unit to Strand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>60</td>
<td>60</td>
<td>5000</td>
<td>60</td>
</tr>
<tr>
<td>Standard</td>
<td>70</td>
<td>70</td>
<td>6000</td>
<td>70</td>
</tr>
</tbody>
</table>

Dimensions are in millimetres.

All internal and external units shall have the same strand pattern and number and have some voids along each to limit the visibility of the hooks.

There shall be a minimum of 8 strands per lady providing provision for holding down ball joints at the centre of the units.

The distance for the void shall be 75mm x 75mm.

(b) Lifting System

- Minimum lifting force of 500 kN for each strand shall be specified in the drawings.

(c) Stressing of Tendons

- Minimum allowable stress shall be 0.75 fyk or 0.75 fyk if reinforcement or bonded strands are provided in the tendon face.

- Maximum allowable stress shall be 0.8 fyk.

(d) Intersection of Strands

The allowable maximum stress in concrete shall be 0.75 fyk or 0.75 fyk if reinforcement or bonded strands are provided in the tendon face.

(e) Distribution of Tendons

For prestressed tendons, the tendon stress shall be calculated in accordance with Clause 8.2.3 of AS 5005.

(f) Anchorage

- Minimum capacity shall be determined in accordance with AS 5005.

- Wrench ultimate capacity shall be satisfied at location of debonded cross sections.

- Ultimate Capacity

The ultimate capacity of the deck unit shall be determined in accordance with AS 5005.

9. Design and Detailing of Lifting Anchors

Lifting anchors shall be designed for the following criteria.

- Maximum load factor for lifting anchors and concrete balance capacity shall be 4.0.

- Minimum bending moment (MUM) of anchor shall be calculated as M/MG, where M is the critical bending moment on the anchor.

- All units shall have 4 lifting anchors per unit (one on each side). A load equalization device is required to share load between the lifting anchors in each unit of the unit.

Refer to relevant TNF standard deck unit drawings for details of lifting anchors and lifting diagram for each particular deck and height.

TNF approved proprietary lifting anchors shall be used.

10. Detailing of Reinforcement and Strands

- Particular attention is drawn to Clause 8.2.1.3 and 8.2.1.4 for the detailing of reinforcement and strands, as appropriate.

11. Transport and Storage of Units

- Designers shall ensure that allowable concrete stress is not exceeded during transportation and storage, and units are subjected to a loading of 1.5 times self-weight of the units and supported as shown in the table below.

- Provide additional reinforcing steel as required.

<table>
<thead>
<tr>
<th>Unit Type</th>
<th>Minimum Length L (m)</th>
<th>Minimum Overhang (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steels</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Steel-deck units</td>
<td>1.5</td>
<td>1.5</td>
</tr>
</tbody>
</table>

*Calculated using formula of deck units.

Refer to Drawing 1 for Design Assumptions in respect of:

1. Bridge Security
2. Slew Angle
3. General Arrangement of Deck Units
4. Design Parameters
5. Piers/Supports
6. Hanger Calculation
7. Structural Analysis

[Diagram and details of deck units]

[Table of dimensions and specifications]

[Notes and calculations related to structural design]