FIBRE REINFORCED POLYMER (FRP) COMPOSITE GIRDERS FOR TIMBER BRIDGE REHABILITATION

GENERAL NOTES:
01. The details shown on this standard are for individual girder replacement only using FRP girders designed and manufactured by Wagner (Aegisthenes girdlers) for the "Bridge the Gap" project. This standard design is not applicable for any other use.
02. Refer Standard drawing 2299 for fabrication procedure.
03. This Standard Drawing is applicable for the following cases:
   - Single girder requiring replacement in one span
   - Bridges with a timber sub-structure and the following class:
     - Class A and B: Class bridges up to 30m long - edge girder replacement
     - B and C class bridges up to 30m long - edge or interior girder replacement
   - Bridges with an existing timber truss system and edge girder replacement
04. Refer to FRP girders' replacement per span using Wagner Girders referenced to NCTT-S1, S2 or S3 in this drawing.
05. The scope of the FRP girders replacement for timber bridges standard drawings is to define situations where approved FRP girders may be used as timber girder replacements in the rehabilitation of existing timber bridges.
06. Coordination needs to be given to load and longitudinal movement and some samples of typical connection systems are detailed on these drawings. When timber girders are replaced, props may be required to provide stability in the span area. In each case, calculations need to be performed to assess the design for each project.
07. All dimensions listed in these drawings are to be confirmed on site prior to construction.

STEELWORK NOTES:
01. STEELWORK to be fabricated to the requirements of AS1061 to be Grade C500 (D) to AS/NZS 1163.
02. Steel plates to be Grade 350 to AS/NZS 3878.
03. Pint bar to be Grade 300 to AS/NZS 3679.
04. Bolts Class 4.6 to AS 1111.1 weights to AS/NZS 3878.
05. Bolts Class 6.8 to AS 1111.1 weights to AS/NZS 3878.
06. All bolts and nuts to be hot dip galvanized to AS 1214. All other shot peened to be hot dip galvanised to AS/NZS 8160 unless otherwise specified. Prior to galvanizing all welds should be removed and welds should be re-done.

WELDING symbols conform to AS 1100.3.

All welding to be AS/NZS 1554.1.

All welds, except location welds, to be 2F category.

Welding consumables to be controlled as per IS (ISO 14341-1) or ISO 14341-2, unless otherwise specified.

TYPICAL ARRANGEMENT "A" CLASS TIMBER BRIDGE (1939)

INDIVIDUAL GIRDER REPLACEMENT CENTRAL ORDER

INDIVIDUAL GIRDER REPLACEMENT INTERMEDIATE ORDER

INDIVIDUAL GIRDER REPLACEMENT EXTERNAL ORDER

TYPICAL ARRANGEMENT "A" CLASS TIMBER BRIDGE (1939)

DRAWING INDEX

<table>
<thead>
<tr>
<th>DRAWING INDEX</th>
<th>DESCRIPTION</th>
<th>DRAWING REFERENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheet 1</td>
<td>General notes and General notes</td>
<td>1 of 17</td>
</tr>
<tr>
<td>Sheet 2</td>
<td>General arrangement Girder Bridge</td>
<td>2 of 17</td>
</tr>
<tr>
<td>Sheet 3</td>
<td>Girder Bridge</td>
<td>3 of 17</td>
</tr>
<tr>
<td>Sheet 4</td>
<td>MCF-T5 detail</td>
<td>4 of 17</td>
</tr>
<tr>
<td>Sheet 5</td>
<td>MCF-T2 detail</td>
<td>5 of 17</td>
</tr>
<tr>
<td>Sheet 6</td>
<td>MCF-T2 detail</td>
<td>6 of 17</td>
</tr>
<tr>
<td>Sheet 7</td>
<td>External Girder Replacement - 6A</td>
<td>7 of 17</td>
</tr>
<tr>
<td>Sheet 8</td>
<td>External Girder Replacement - Section</td>
<td>8 of 17</td>
</tr>
<tr>
<td>Sheet 9</td>
<td>External Girder Replacement - 6A</td>
<td>9 of 17</td>
</tr>
<tr>
<td>Sheet 10</td>
<td>Permanent Bridge Replacement</td>
<td>10 of 17</td>
</tr>
<tr>
<td>Sheet 11</td>
<td>Permanent Bridge Replacement</td>
<td>11 of 17</td>
</tr>
<tr>
<td>Sheet 12</td>
<td>Permanent Bridge Replacement</td>
<td>12 of 17</td>
</tr>
<tr>
<td>Sheet 13</td>
<td>Central Girder Replacement - 6A</td>
<td>13 of 17</td>
</tr>
<tr>
<td>Sheet 14</td>
<td>Central Girder Replacement</td>
<td>14 of 17</td>
</tr>
<tr>
<td>Sheet 15</td>
<td>Central Girder Replacement</td>
<td>15 of 17</td>
</tr>
<tr>
<td>Sheet 16</td>
<td>Steel Fabrication Details - 1 of 2</td>
<td>16 of 17</td>
</tr>
<tr>
<td>Sheet 17</td>
<td>Steel Fabrication Details - 2 of 2</td>
<td>17 of 17</td>
</tr>
</tbody>
</table>

ACRONYMS

A: Australian Standards
AS: 1103.3: Graphical symbols for general engineering - Welding and non-destructive examination
AS: 1111.1: Epoxy resin hexagon nuts and acorns - Product grade 6C, 6B
AS: 1111.2: Epoxy resin hexagon nuts - Style 1 - Product grade 6A, 6B
AS: 1111.4: Epoxy resin hexagon nuts - Charred threaded nuts - Product grade 6B
AS: 1163: Cold-formed structural steel profiles
AS: 1214: Hot dip galvanized coatings or threaded fastenings (ISO metric imperial thread series)
AS: 1237: Slip on wooden blocks, screws and nuts for general purposes
AS: 1250: Wood screws, dowels, etc., in stainless steel
AS: 1250: Wood screws, dowels, etc., in stainless steel
AS: 1250: Wood screws, dowels, etc., in stainless steel
AS: 1434: Glued connection for timber and steel structures
AS: 267B: Structural steel - Structural steel - Structural steel - Structural steel - Structural steel
AS: 316B: Structural steel - Structural steel - Structural steel - Structural steel - Structural steel
AS: 367B: Structural steel - Structural steel - Structural steel - Structural steel - Structural steel
AS: 585B: Structural steel - Structural steel - Structural steel - Structural steel - Structural steel
AS: 586B: Structural steel - Structural steel - Structural steel - Structural steel - Structural steel
TYPICAL DETAILS – EXISTING 30'x18' WIDE TIMBER SUBSTRUCTURE & SUPERSTRUCTURE

*Dimensions to be confirmed on site

PART ELEVATION
1. General Arrangement for a five girder timber bridge.
Top Plate Assembly (TPA) not shown refer sheet 16

PLAN - GENERAL ARRANGEMENT OF WCFT-S2

ELEVATION - GENERAL ARRANGEMENT OF WCFT-S2

LEGENDS:
- - Cut length (maximum 300 at each end)

NOTES FOR GIRDER TYPE WCFT-S2

MATERIAL:
1. 25x525 Pultruded solid angle A7
2. 300x545 Pultrusion including 600x600 double box layer on one face only
3. 300x600 Pultrusion
4. Resin - General 4084
5. Catalyst - GMA-80

GENERAL:
Refer sheet 6 for the following:
1. Gilder Performance Criteria
2. Gilder Properties
3. Individually Pultrusion Mechanical Properties

Department of Transportation and Main Roads

PRP COMPOSITE GIRDERs FOR TIMBER BRIDGE REHABILITATION

WCFT-S1, S2 & S3 INSTALLATION DETAILS
SHEET 5 of 17

2285

Date: 12/05/2011
**PLN - GENERAL ARRANGEMENT OF WCFT-S3**

**ELEVATION - GENERAL ARRANGEMENT OF WCFT-S3**

**SECTION**

- Hardened Web Stiffener (HWS) not shown - refer sheet 16
- 62.5x62.5 Fibre composite angle each side

**LEGENDS:**
- - Cut length (minimum 300 at each end)
- 1/4" ruled sheet 16

**SECTION**

- Hardened Web Stiffener (HWS) not shown - refer sheet 16
- 62.5x62.5 Fibre composite angle each side

**NOTES FOR GIRDERS TYPE WCFT-S3**

1. 125x125 Parallel chord angle 45°
2. 500x62.5 Fibre composite including 7x7x6.5 mm double beam layer on one face only.
3. 62.5x62.5 Fibre composite angle cut from 125x125 Pullulan
4. House - Shearwall 0924
5. Catalogue - SWHS-50

**GENERAL**

- Notes Table 34:
- 1. Girders Performance Criteria
- 2. Girders Properties
- 3. Individual Pullulan Mechanical Properties

**GIRDERS PERFORMANCE CRITERIA**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Value</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Width</td>
<td>500</td>
<td>mm</td>
</tr>
<tr>
<td>Maximum Depth</td>
<td>400</td>
<td>mm</td>
</tr>
<tr>
<td>Wp at failure (in direction of loads)</td>
<td>660</td>
<td>kN</td>
</tr>
<tr>
<td>Wp at composite beam</td>
<td>300</td>
<td>kN</td>
</tr>
<tr>
<td>Wp at failure (in direction of loads)</td>
<td>350</td>
<td>kN</td>
</tr>
<tr>
<td>Axial deflection at failure</td>
<td>170</td>
<td>mm</td>
</tr>
<tr>
<td>E (GPa)</td>
<td>29,900</td>
<td>kN/mm²</td>
</tr>
</tbody>
</table>

**WCFT 62.5x62.5x125BF GIRDERS PROPERTIES**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>23.00x10⁶ kN/mm²</td>
</tr>
<tr>
<td>k</td>
<td>83.00x10⁶ kN/mm⁴</td>
</tr>
<tr>
<td>b</td>
<td>128.00x10⁶ kN/mm⁶</td>
</tr>
<tr>
<td>I</td>
<td>30.00x10⁶ kN/mm⁸</td>
</tr>
<tr>
<td>E</td>
<td>0.0045x10⁻⁶ mm²/kN</td>
</tr>
<tr>
<td>d</td>
<td>31.80x10⁻⁶ kN/mm²</td>
</tr>
<tr>
<td>D</td>
<td>30.59x10⁻⁸ kN/mm⁴</td>
</tr>
<tr>
<td>Dd</td>
<td>27.39x10⁻⁸ kN/mm⁶</td>
</tr>
<tr>
<td>Ed</td>
<td>64.00x10⁻⁶ kN/mm⁸</td>
</tr>
<tr>
<td>Ex</td>
<td>35.94x10⁻⁶ kN/mm²</td>
</tr>
<tr>
<td>C</td>
<td>5.57x10⁻⁶ kN/mm⁵</td>
</tr>
<tr>
<td>G</td>
<td>44.42x10⁻⁶ kN/mm⁶</td>
</tr>
</tbody>
</table>