

3.4. Soil Site Class

After the section properties were calculated, the next step was to determine the site class of the soil underneath the bridge, which would be used subsequently to determine the appropriate type of support at the bottom of the column. The classification of the soil under the bridge had to be determined using the site class definitions in the new LRFD Specifications, which depend on the shear wave velocity (\bar{v}_s), blow count (\bar{N}), or undrained shear strength (\bar{s}_u) in the upper 30 m (100 ft) of site profile. The site class definitions in the new LRFD Specifications are as follows:

- A Hard Rock with measured shear wave velocity, $\bar{v}_s > 1500$ m/s (5000 ft/sec)
- B Rock with 760 m/s $< \bar{v}_s \leq 1500$ m/s (2500 ft/sec $< \bar{v}_s \leq 5000$ ft/sec)
- C Very dense soil and soft rock with 360 m/s $< \bar{v}_s \leq 760$ m/s
(1200 ft/sec $< \bar{v}_s \leq 2500$ ft/sec) or with either $\bar{N} > 50$ blows/0.30 m (blows/ft) or $\bar{s}_u > 100$ kPa (2000 psf)
- D Stiff soil with 180 m/s $\leq \bar{v}_s \leq 360$ m/s (600 ft/sec $\leq \bar{v}_s \leq 1200$ ft/sec) or with either $15 \leq \bar{N} \leq 50$ blows/0.30 m (blows/ft) or 50 kPa $\leq \bar{s}_u \leq 100$ kPa
(1000 psf $\leq \bar{s}_u \leq 2000$ psf)
- E A soil profile with $\bar{v}_s < 180$ m/s (600 ft/sec) or with either $\bar{N} < 15$ blows/0.30 m (blows/ft) or $\bar{s}_u < 50$ kPa (1000 psf), or any profile with more than 3 m (10 ft) of soft clay defined as soil with $PI > 20$, $w \geq 40\%$, and $\bar{s}_u < 25$ kPa (500 psf)
- F Soils requiring site-specific evaluations:
 - 1. Peats and/or highly organic clays ($H > 3$ m [10 ft] of peat and/or highly organic

clay where H = thickness of soil)

2. Very high plasticity clays ($H > 8$ m [25 ft] with $PI > 75$)
3. Very thick soft/medium stiff clays ($H > 36$ m [120 ft])

[MCEER/ATC, 2002].

After analyzing the boring results, the soil underneath this bridge was classified as class B [Dove, 2002].

3.5. RISA 3D Model of the Bridge

Once the soil site class underneath the bridge is classified, the bridge RISA 3D model could be drawn. The bridge has two spans, 37.9 m. each. The pier consists of a pier cap beam and five columns. The pier cap beam is 24.6 m. long, and the columns are 5.432 m. high [Maday, 2002]. The RISA 3D model of the bridge is shown in Figure 3.6.

As mentioned in section 3.2, a rigid link was used to connect the superstructure and the pier cap beam. The end supports of the superstructure were modeled as pins, because the embedment of the beams into the backwall was relatively short, as shown in Figure 3.7. The bridge was modeled continuously at the midpoint of the superstructure, where the two spans met, because the construction drawings showed that a continuity diaphragm was used to connect the girders from both sides of it. This is illustrated in Figures 3.8 and 3.9.

The site class of the soil underneath the bridge was determined earlier to be class B, and spread footings were used for the foundation of this bridge. Therefore according to Table 3.1 of this report, which was taken from Table 5.3.4-1 of the new LRFD Guidelines, the support at the bottom of the columns had to be rigid (fixed).

The joint coordinates of the bridge model were calculated according to the locations of the column center lines, pier cap beam centroidal axis and superstructure centroidal axis. The joint coordinates of the bridge are provided in Appendix III.

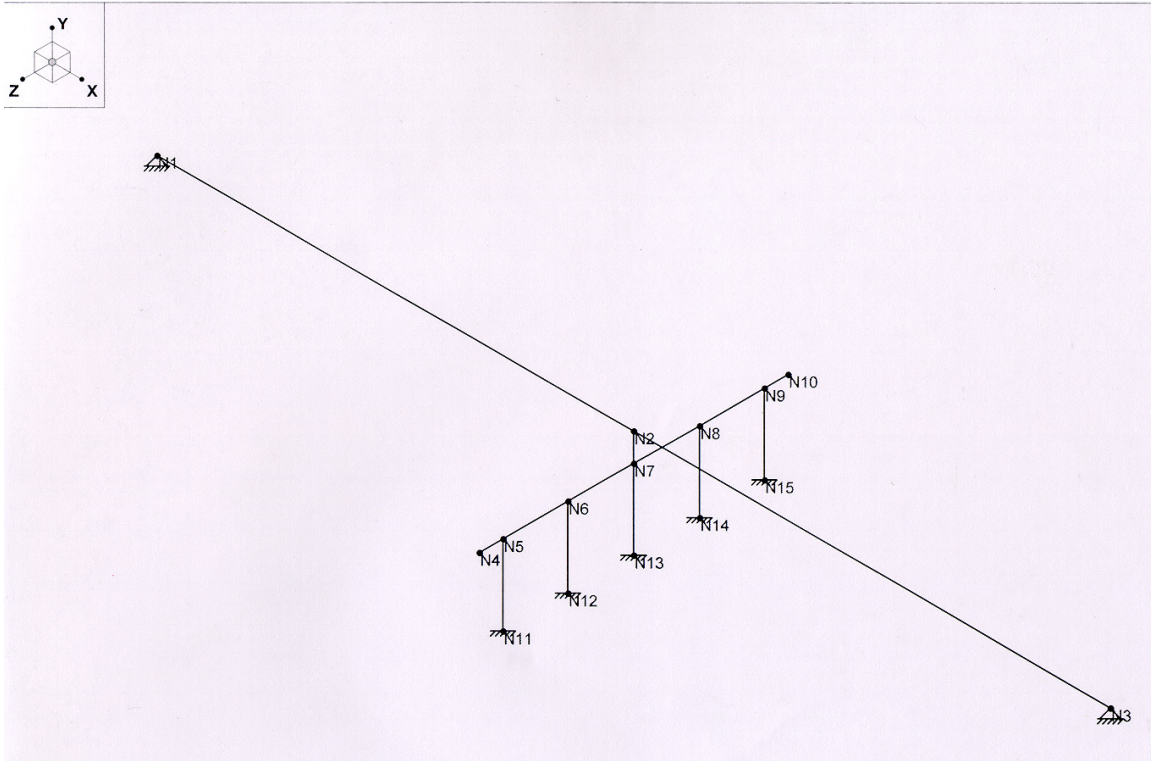


Figure 3.6. The RISA 3D model of the bridge.

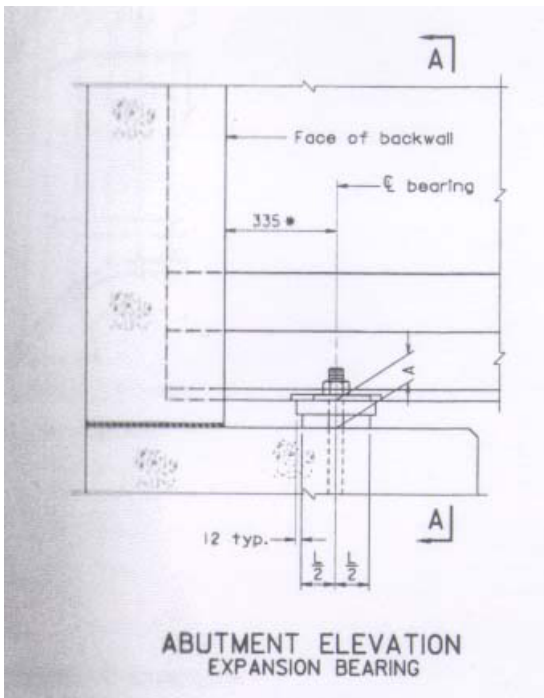


Figure 3.7. The embedment of the girder on the backwall, which is not deep enough to be considered a fixed support [Maday, 2002].

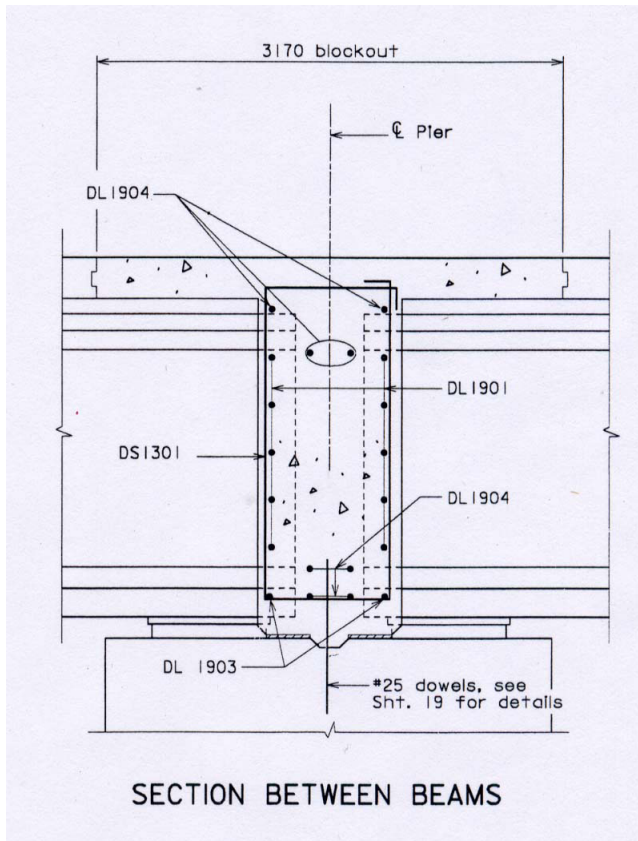


Figure 3.8. A section of the continuity diaphragm used between the prestressed concrete girders [Maday, 2002].

Table 3.1. Definition of Foundation Modeling Method [MCEER/ATC, 2002].

Foundation Type	FMM I	FMM II
Spread Footing	Rigid	Rigid for Soil Types A and B. For other soil types, foundation springs required if footing flexibility contributes more than 20% to pier displacement
Pile Footing with Pile Cap	Rigid	Foundation springs required if footing flexibility contributes more than 20% to pier displacement
Pile Bent/Drilled Shaft	Estimated depth to fixity	Estimated depth to fixity or soil-springs based on P-y curves.

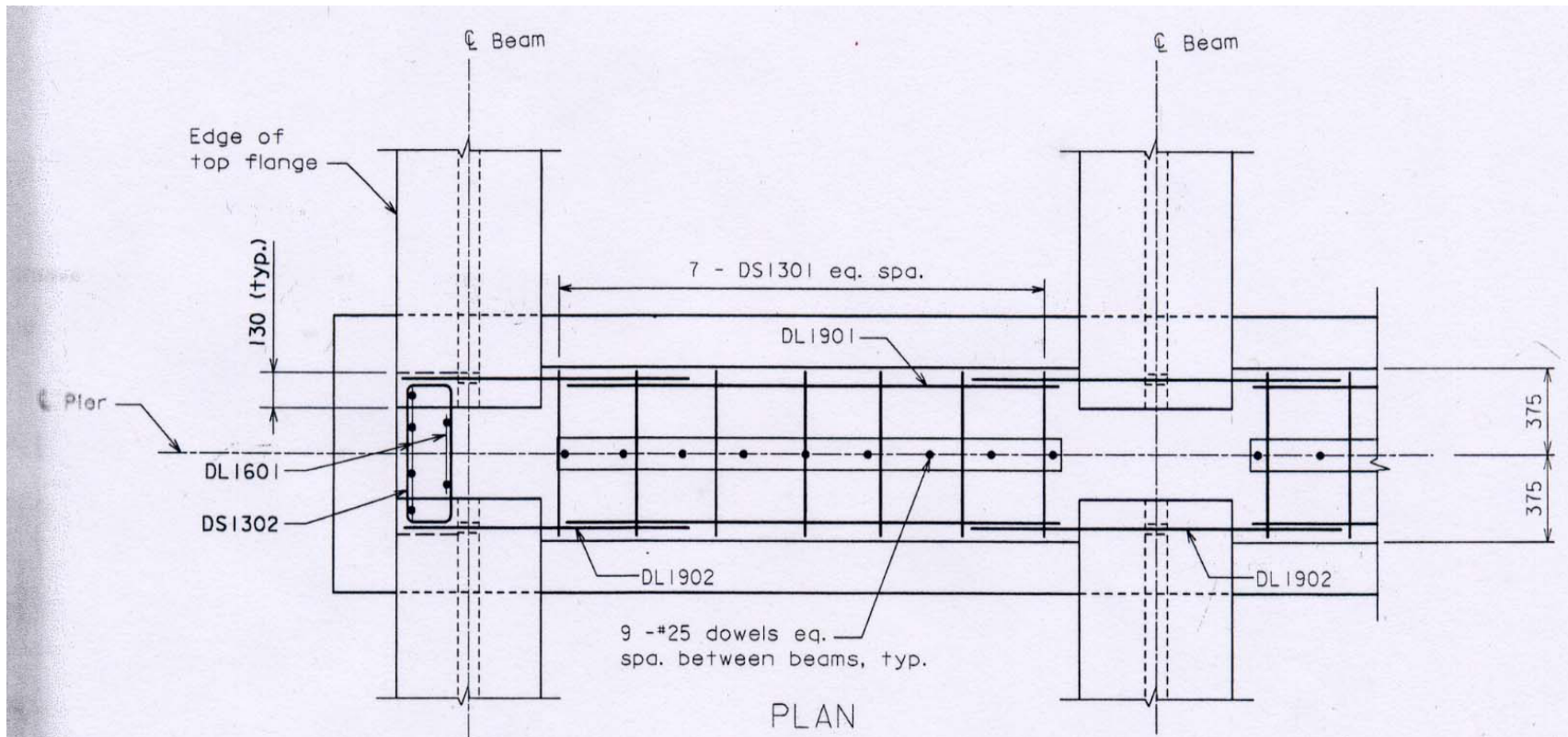


Figure 3.9. The plan of the continuity diaphragm used to connect the prestressed concrete girders [Maday, 2002]. All dimensions are in mm.