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October 12, 2020

SY201496-SL02-B

Gareth Bird
Ethos Urban
173 Sussex St
Sydney NSW 2000

Dear Gareth,

RE: Rail Signage Site 02 (Pyrmont)

Mono-pole - Structural Feasibility Statement

Northrop Consulting Engineers have been engaged to carry out a structural feasibility assessment for the proposed sign at the Western Distributor North in Pyrmont.

The investigation was based primarily aerial and ground photographs of the site, as well as a site survey. The available documentation is listed below. For detailed design, architectural drawings, survey plans and geotechnical investigation will be required.

- Site survey by C.M.S. Surveyors, dated 18/06/2020
- Preliminary Assessment provided by Ethos Urban dated 22/06/2020

Based on correspondence from Ethos Urban, the type of signage proposed at this site is an LED electronic display with associated electrical services and a structural steel walkway for maintenance. The screen dead loads have not yet been provided by Ethos Urban, however based on our prior experience with signage these are typically in the order of 55 kg/m^2.

In accordance with the Advertising Asset Development document provided by Sydney Trains, the minimum dimensions for the proposed signage are given as 13.0m wide x 3.5m high. For the purposes of the desktop review of the above site we have assumed that the monopole will support dual signages of these minimum dimensions. The following discussion relates to these initial design assumptions.

Based on the above, the overall weight of a LED signage is approximately 5.0 tonnes. This weight excludes additional fixings / supporting steelwork, access walkways etc.

Site Description

The proposed site is bounded between the Western Distributor North, Pyrmont Bridge Road and the light rail corridor. The site is heavily overgrown and features a steep embankment to the light-rail track. From ground photography it appears that the light rail at the base of a rock cutting, indicating that the proposed monopole location may be over shallow bedrock. The foundations from the overhead Western Distributor do not appear to clash with the proposed signage site. We believe that construction works for the signage foundations will not undermine any existing foundations.

Structural Requirements

For a monopole with the foundation installed into the top of the rock cutting, the total height of the pole (from the foundation to the top of the signage) will be approximately 19.2m. A clearance of 5.5m above the Western Distributor roadway to the underside of the signage has been assumed.

This height of monopole will require a supporting steel circular hollow section in the order of 1400mm diameter, which will most likely be a custom product. Alternatively, a welded fabricated frame (similar to a crane support) may be appropriate.

Given the above signage tonnage, the self-weight of the required steelwork will be in the order of 7.5 tonnes. The total weight of the entire signage element, including structure will be in the order of 12.5 tonnes.

The wind loads for the site are as follows:

- Importance Level = 2
- Design Life = 25 years
- Region = A2
- Regional Wind Speed V = 43 m/s
- Terrain Category = TC3
- Terrain Multiplier $M_{z,cat}$ = 0.915
- Site Wind Speed = 39.7 m/s

The overturning moment due to wind actions will be in the order of 2,000kNm, resulting in an approximate tension force of 500kN (for a four-pile system with pile centers at 2m and a pile cap) which is to be resolved via the foundations:

- Bored piers would need to be approximately 900mm diameter socketed 3m into rock
- Screw piles are most likely not an option due to the magnitude of the loads and construction difficulties

A minimum of 4 piles will be required to account for the unbalanced loads. As such, a pile cap at minimum 1m deep will be required to transfer the loads from the mono-pole to the piles.

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Recommendations

Based on our understanding of the proposed signage and site, we see no reason why a cantilevered signage on a supporting mono-pole structure could not be used subject to further engineering design and the following recommendations.

A geotechnical engineer will need to be engaged to investigate the ground conditions at the site including the soil and rock profiles, allowable bearing pressures (including shaft cohesions), stability of the rock face for the proposed loads, site reactivity and groundwater level. This investigation can typically be undertaken during the detailed design phase.

Architectural drawings are required to understand the signage location within the site and primarily, the required height of the structure.

This letter in intended to provide structural feasibility advice only and does not constitute a structural engineering approval. Signage details / loads etc are yet to be determined, and further work is required to provide structural detailing for construction.

Yours faithfully,

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BE Civil with Architecture Hons. MIEAust CPEng NER

ON BEHALF OF NORTHROP CONSULTING ENGINEERS