

Dear Mitch,

Phelan Shilo ('PS') have been engaged by Diverge Entertainment ('the Client', 'DE') to provide structural feedback and advice regarding allowable rigging loading to an existing portal frame at the DET Performing Arts Unit, 102 Rupert St, Collingwood VIC 3066. The portal frame under review is to be subject to aerial acrobatics style loading. The overall scope of works comprises of two parts, namely:

- 1 Design of aerial support rigging, transfer and pinrail brackets to be installed on the portal frame rafters and central column members.
- 2 Structural capacity review of the existing portal frame to support the proposed rigging loads.

For reference and completeness, details of the rigging bracket design under part 1 have been outlined in the drawings prepared by PS as listed below, enclosed with this project memorandum (PM). Supporting calculations relating to this design item have also been included.

- 24-S-133-DWG-001 (Rev 0), dated 2024-11-08
- 24-S-133-DWG-002 (Rev 0), dated 2024-11-08
- 24-S-133-DWG-003 (Rev 0), dated 2024-11-08
- 24-S-133-DWG-004 (Rev 0), dated 2024-11-08

This PM is intended to provide feedback on part 2 of the scope as outlined above. A total of five (5) rigging points are proposed, each subject to a load of 500kg. The nature of this loading is further explained in the 'Loading Assumptions' section of this PM. A site visit was conducted by PS on 14th November 2024 to examine the existing conditions and surrounding elements that are understood to load the portal frame. The following documents provided by the Client have also been relied upon in formulating this advice:

- Acoustic Drawings prepared by Peter Brown Architects Pty Ltd:
 - Job No. 2002, Drawing No. SA101 (Rev 8), dated 2023-09-01
 - Job No. 2002, Drawing No. SA103 (Rev 5), dated 2023-02-03
 - Job No. 2002, Drawing No. SA104 (Rev 4), dated 2022-07-15
- Structural CAD Files, received 2024-10-31 from the Client
- Structural Drawing: Job No. S49952_271057, Drawing No. S10 (Rev C3), prepared by FMG Engineering, dated 2024-01-18
- Engineer's Advice 'CM22' document, Project No. S49952-271057, prepared by FMG Engineering, dated 2024-03-01
- Engineer's Advice 'CM37' document, Project No. S49952-271057, prepared by FMG Engineering, dated 2024-06-20

PS have based the advice contained herein on the above listed documentation and other relevant information provided by the Client. This does not constitute a full design review or certification of existing structures or substructures including but not limited to existing steelwork, walls, footings and slabs. The structural review also did not include a review of the lateral stability of the structure for wind pressures and seismic loading.

Relevant loads, loading combinations and review of the portal frame has carried out in accordance with the following current Australian standards:

- AS 1170.0:2002 Structural Design Actions, Part 0, General Principles
- AS 1170.1:2002 Structural Design Actions, Part 1, Permanent, Imposed and Other Actions
- AS 1170.2:2012 Structural Design Actions, Part 2, Wind Actions
- AS 4100:2020 Steel Structures

PORTAL FRAME OVERVIEW

The location of the portal frame under review is highlighted in Figure 1 below. Figure 2 is an excerpt from structural drawing 24-S-133-DWG-001 (Rev 0), indicating a sectional view of the frame with the proposed new rigging load locations.

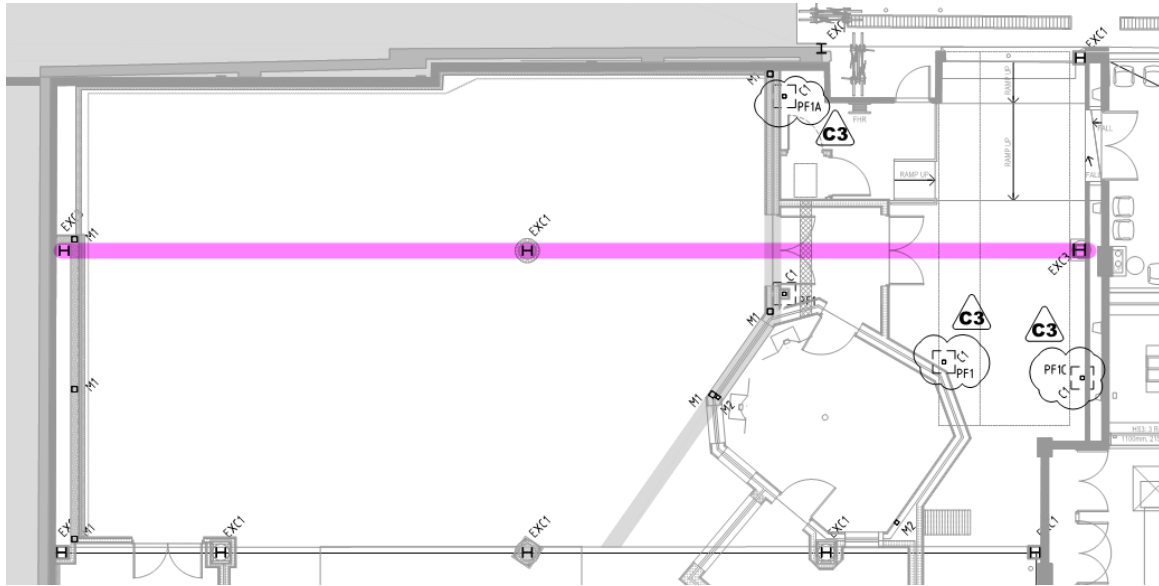


Figure 1 – Alignment of existing portal frame under review highlighted in pink, excerpt from structural drawing, Job No. S49952_271057, Drawing No. S10 (Rev C3), prepared by FMG Engineering, dated 2024-01-18

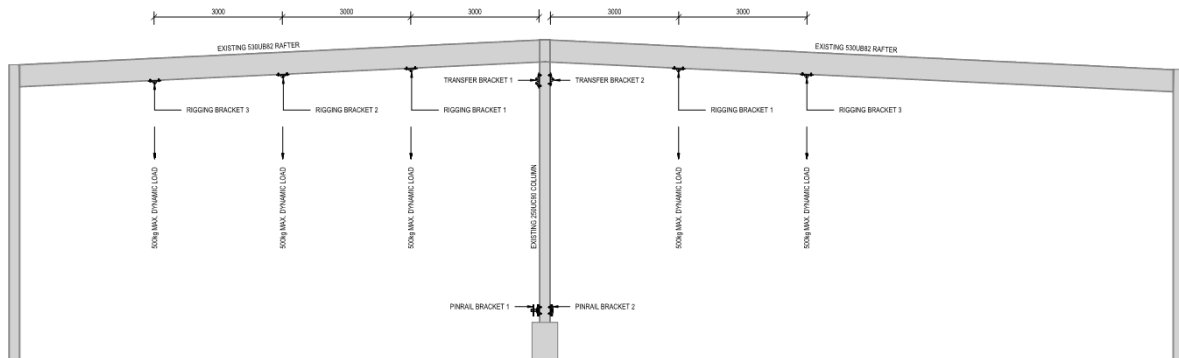


Figure 2 – Sectional view of existing portal frame with proposed rigging loads indicated, excerpt from structural drawing 24-S-133-DWG-001 (Rev 0), prepared by Phelan Shilo, dated 2024-11-08

Based on Client provided documents and site observations, it is understood that the frame is made up of the following members:

- 530UB82 rafters
- 310UC158 end columns
- 250UC90 central column

LOADING & DESIGN ASSUMPTIONS

Loading assumptions have been made based on the available information and existing conditions as at the time of inspection and writing of this PM (2024-11-14). A summary is provided below, with a more detailed breakdown of loads in the enclosed calculations package.

Superimposed dead loading (G)

- G, roof = 40kg/m² maximum allowance; roof sheet, purlins, insulation, ceiling and services
- G, new rooftop plant platform = 100kg/m² maximum allowance; partially loading portal frame rafter towards south end
- G, new internal plant platform = 100kg/m² maximum allowance; partially loading portal frame column to south end
- G, existing rooftop plant platform = allowance for 460UB roof beams, partially loading portal frame rafter to north side of ridge

Live loading (Q)

- Q, roof = 25kg/m² maximum, as per normative loading code requirements
- Q, new rooftop plant platform = 980kg⁽¹⁾ total equipment weight, partially loading portal frame rafter towards south end
- Q, new internal plant platform = 520kg⁽¹⁾ total equipment weight, partially loading portal frame column towards south end
- Q, existing rooftop plant platform = 250kg/m² maximum allowance as per normative loading code requirements for access platforms, partially loading portal frame rafter to north side of ridge
- Q, rigging = 500kg maximum dynamic load per point⁽²⁾, total five (5) points loading portal frame rafters

⁽¹⁾ The new rooftop plant platform equipment loads have been based on values as indicated in Client provide structural CAD documentation.

⁽²⁾ **The 500kg rigging load is a maximum load inclusive of dynamic components. A factor of safety of 1.5 has been applied to this value in design combination cases to yield a maximum ultimate limit state load of 750kg per rigging point. It is understood that the Client will monitor the rigging points with load cells to ensure that the 500kg dynamic load per point is not exceeded at any time.**

Wind Loading (Wu)

A lateral wind load and net downward wind pressure were conservatively applied to the portal frame to determine envelope design actions. Further details are included in the calculations package.

FINDINGS & RECOMMENDATIONS

The portal frame structure was analysed using the RFEM software package for the requisite loads and load combinations. An 'envelope' modelling approach was taken to determine critical design actions the portal frame can be subject to. This involved considering the portal frame connections to have full rigidity or alternatively, be 'pinned' at column locations. PS believe this is a conservative approach given structural details and specifications of the existing connections are limited in the available documentation and had to be largely based on site observations. The central moment splice connection and central column cap plate connections were modelled in the IDEA Statica Software to determine design resistances.

Based on its analysis, PS can confirm the following:

- 1 The existing portal frame performs adequately for strength under the proposed maximum rigging loads and relevant design load combinations.
- 2 Rigging loads can be applied in any combinations, to the left and right of the central column, or all acting concurrently.
- 3 No reduction in roof live load or similar management of currently applied loads is necessary when the portal frame is subject to the additional rigging loads. This will enable the DE to operate its aerial loadings without any other loading restrictions on the existing portal frame.

CONCLUSION

In summary, PS can conclude that the existing portal frame performs satisfactorily under the proposed rigging loads and relevant design combinations as outlined in this PM. Should any loading conditions be changed or increased from those outlined in this PM, the Client is to advise this office for further review and advice.

This review does not constitute certification of the existing structures or supporting structures. All care has been taken in conducting this review. We trust that this feedback satisfies DE's requirements as it pertains to structural review of the existing portal frame at DET Performing Arts Unit. Should you have any questions regarding this advice, please do not hesitate to contact the undersigned.

Kind regards,

Anton Shilo

Co-Founder | Principal Structural Engineer

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Enc: Structural Drawings - '24-S-133-DWG-000 (Rev 0)' to '24-S-133-DWG-004 (Rev 0)', prepared by Phelan Shilo, dated 2024-11-08
Supporting Calculations Package – 24-S-133-CAL-001 (Rev 0)