ACOR CONSULTANTS

Our Reference: SY190717
Your Reference:

[redacted]

ENGINEERS
MANAGERS
INFRASTRUCTURE PLANNERS
DEVELOPMENT CONSULTANTS

28 May 2020

Hardi Aged Care Nursing Home
C/- John W Flower Architect
14B, 1110 Middle Head Road
MOSMAN NSW 2088

Attention: Mr John Flower

Dear John

**Re: Mountainview Nursing Home, Penrith
Structural Feasibility Assessment**

We refer to your instructions in relation to the proposed alterations and first-floor additions in this aged care facility, and your request for a feasibility assessment on the existing building under the proposed works.

We acknowledge receipt of the following documents, relevant to this assessment:

- DA set of Architectural Drawings prepared by John W Flower Architect (Rev A)
- Survey Drawings prepared by Project Surveyors dated June 2019
- Tender Issue of original structural drawings prepared by Low & Hooke (Aust) Consulting Engineers dated May 1993 (Rev A)
- Two geotechnical reports for nearby sites (as a guide for this site in absence of a site-specific foundation assessment)

We also confirm having attended the site on 11 September 2019 in order to visually examine the condition of the existing building. A number of photos were taken during our site visit, some of which have been included under Annexure A.

Based on the information provided to us and our site observations, we have carried out a series of feasibility assessments, including a number of structural capacity checks and concept designs, in order to explore the structural options viable for this proposal, and whether the existing building has the capacity to accept the proposed alterations and additions. The following comments represent a highlight of our findings:

- We understand that the initial concept was to remove the existing roof and construct the proposed first floor on the existing ground floor walls, using lightweight material to minimise the impact on the footing systems. Our load analysis of this concept determined that the addition of the first floor and associated live load appropriate for a nursing home would in fact significantly increase the loads applied on the footing system (despite the light weight concrete), which necessitated further structural assessment of the existing footing system under the new loading regime.

- We then carried out a high-level capacity assessment of the existing foundation system including the base suspended slab, stiffening beams and the supporting piles. For this purpose, a number of models were generated to examine and understand the behaviour of the footing system under the current condition and also the additional loading regime. The diagrams under Annexure B show some of the critical results from our computer analysis and our preliminary mark-ups. We subsequently concluded that:
  - Assuming that the tender drawings are accurate (unknown at this stage as the "as-constructed" drawings are not available), the existing piles appear to have been designed accurately with effectively no / minimal reserve capacity left to withstand any additional loads;
  - The base slab appears to be generally adequate only for the current loading condition with some localised areas exhibiting minor overstressing. Assuming that the tender drawings are accurate (unknown at this stage) the slab seems to have no extra capacity to tolerate the additional loads of the first floor addition through the Ground Floor (GF) walls;
  - The proposed alterations for the GF layout, particularly around the services, necessitate extensive amount of destructive and remedial works on the base slab (to enable installation of the new services); which appears to be a major issue, given the suspended nature of the slab, close proximity of the piles and all the existing stiffening beams under the slab; and
  - The footing system may be considered as "already heavily utilised" and therefore incapable of withstanding our additional loads i.e. the proposed first floor addition. Accordingly, the concept of using the existing internal and external walls as the supporting elements for the proposed first floor was, inevitably, discarded.
- Given the outcomes of the footing assessment (as elaborated above), an independent structural system for the new first floor was then suggested and later investigated. ACOR developed two conceptual models for independent structural systems, entirely isolated from the existing building, to support the upper floor without affecting the existing GF walls and footings:
  - Gantry truss system as the roof framing with the first floor deck supported from the roof via internal posts, bracing, etc.
  - Large span trusses within the first floor deck (spanning over the existing GF walls wall) supporting the roof framing via internal columns, bracing, etc.

  Both systems relied on external steel columns, positioned offset from the existing façade (approx. within 500mm-1000mm), and a series of independent footing systems (possibly deep piles to minimise the footprint of the footing) also outside the footprint of the existing building. These concepts were to minimise the disruption to the internal space of the ground floor, while minimising the adverse effects on the existing footing systems.

  The diagrams under Annexure C conceptually illustrate the proposed framing for the two proposed concepts.
- We understand that the trussed floor system has been approved for this project and adopted in the DA set of architectural drawings. We, nevertheless, emphasise that, whilst the proposed independent structure eliminates the majority of the complexities in dealing with the existing building and its tightly-designed footing, it requires a carefully engineered steel framing, given its unconventional approach. We highlight the following critical matters that the future design should take into consideration:

- The floor steel framing shall be designed for both fully and patterned loading, making provisions for staged construction and operation;
- The design of floor framing will require special attention to deflection and vibration analysis under various loading scenarios, given the large spans of the trusses (bridging over the exiting building) and the sensitive nature of the facility to serviceability and comfort level.
- The interface of the existing building and the proposed independent steel framing over is of importance (to negate any interaction between the structures) and shall therefore be further investigated in detail.
- The design shall provide adequate lateral support e.g. bracing, portal frames, etc. for the upper floor and the roof, entirely independent from the existing ground floor building.
- Given the extensive and complex structural steel framing anticipated for this proposal (both internally and externally), methods of fire protection and overall durability of all the steel elements shall be thoroughly explored and detailed, to ensure compliance with the BCA and relevant Australian Standards.
- In design of independent footing systems for the external steel columns, attention shall be paid to long term settlement of the new footings, its implication on the interaction between the new and existing building.

- Despite the upper floor structure being independent from the existing building and its footing, the ground floor slab will still require extensive retrofitting works (cutting, stitching and reinstating of the slabs and beams), due to the new layout of the lower floor and the necessary alterations proposed to upgrade the existing services currently under the slab. It should be noted that the existing slab is a suspended system which will have to be reinstated to its current shape (same reinforcement, concrete thickness, etc.) if altered / cut for any reasons. This may require special temporary works and work sequencing to avoid distressing the slab.

We trust that the above meets your requirement at this stage. Should you require further clarification on the matters outlined above, please do not hesitate to contact the undersigned. We will be pleased to further assist the project during the Construction Certificate stage.

Yours faithfully,
ACOR Consultants Pty Ltd

[redacted]

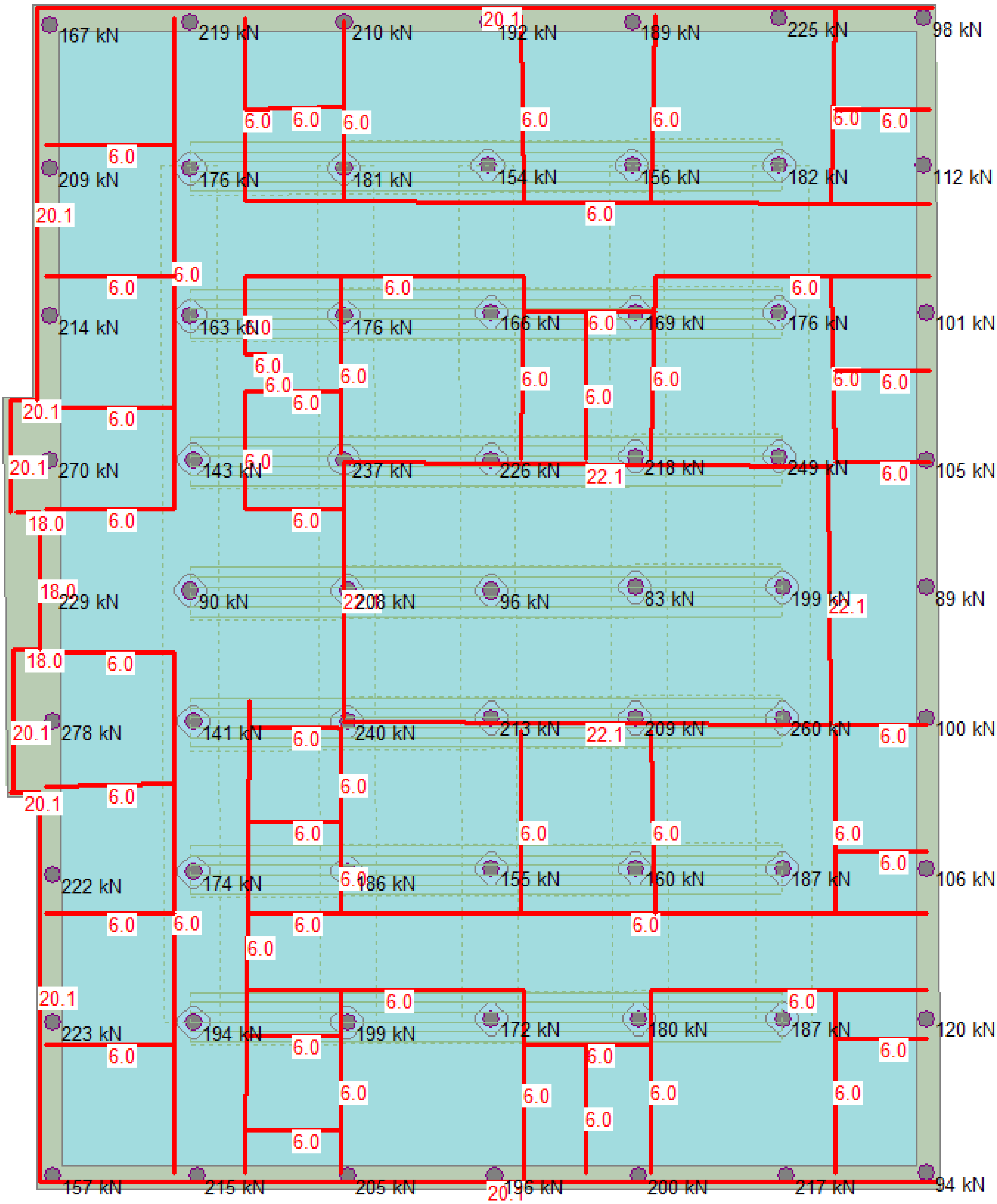
Afshin Kazemi
Associate Principal / Senior Structural Engineer

Annexure A – Photos


Panasonic

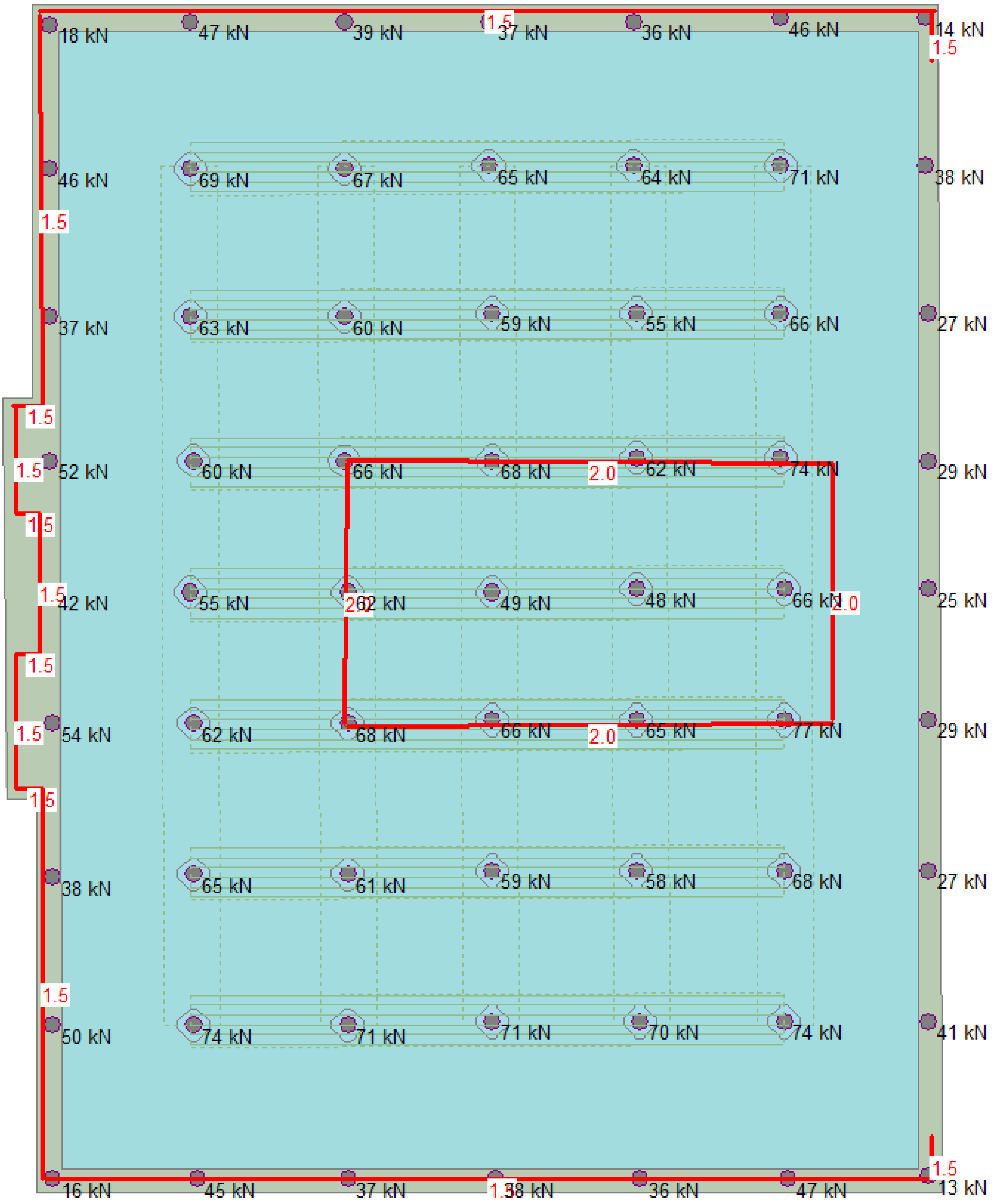
Document Set ID: 9374514
Version: 1, Version Date: 12/11/2020

Annexure B – Footing Analysis Diagrams

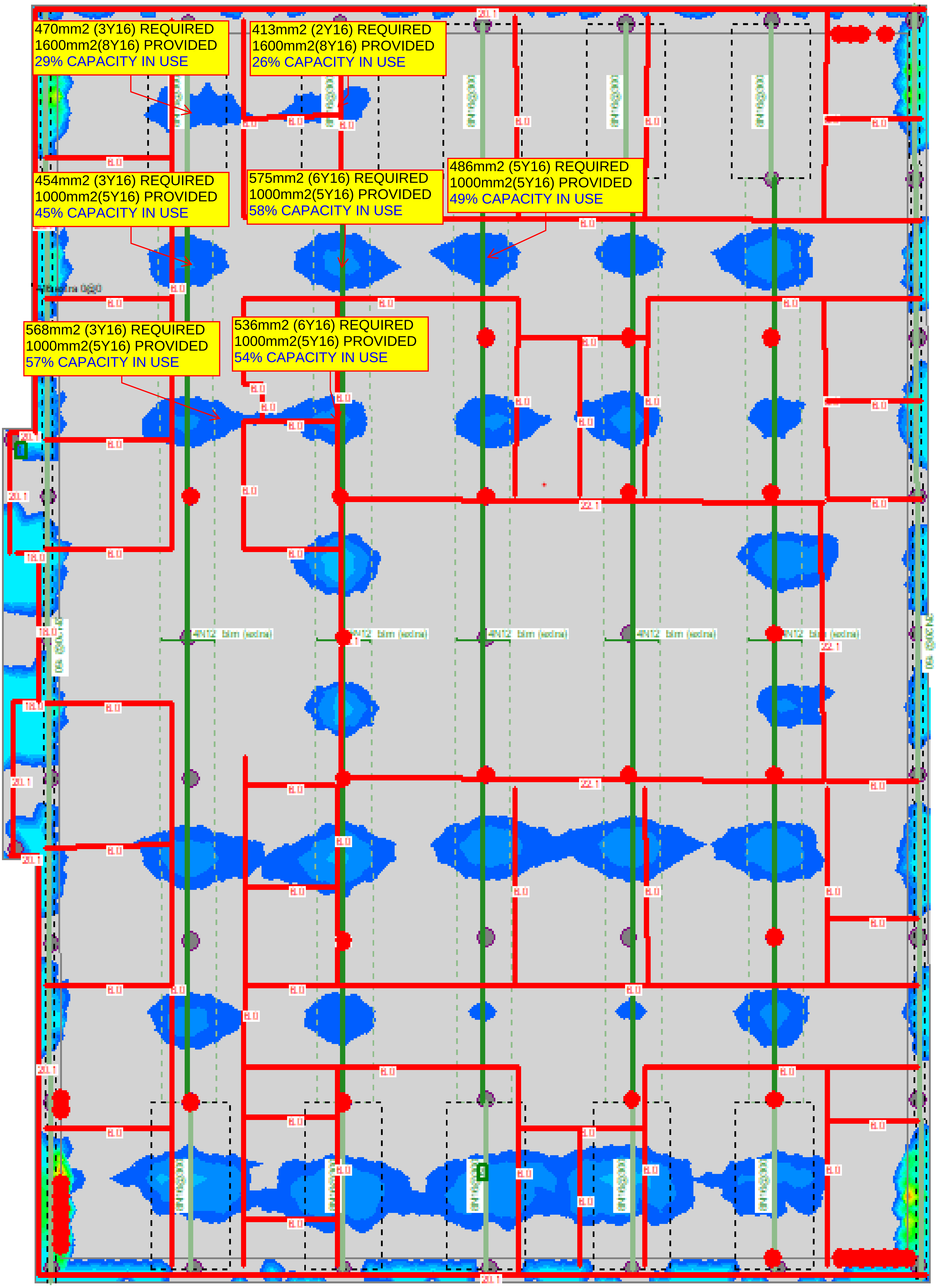


Pile Reactions under Dead Load ONLY

Document Set ID: 9374514
Version: 1, Version Date: 12/11/2020

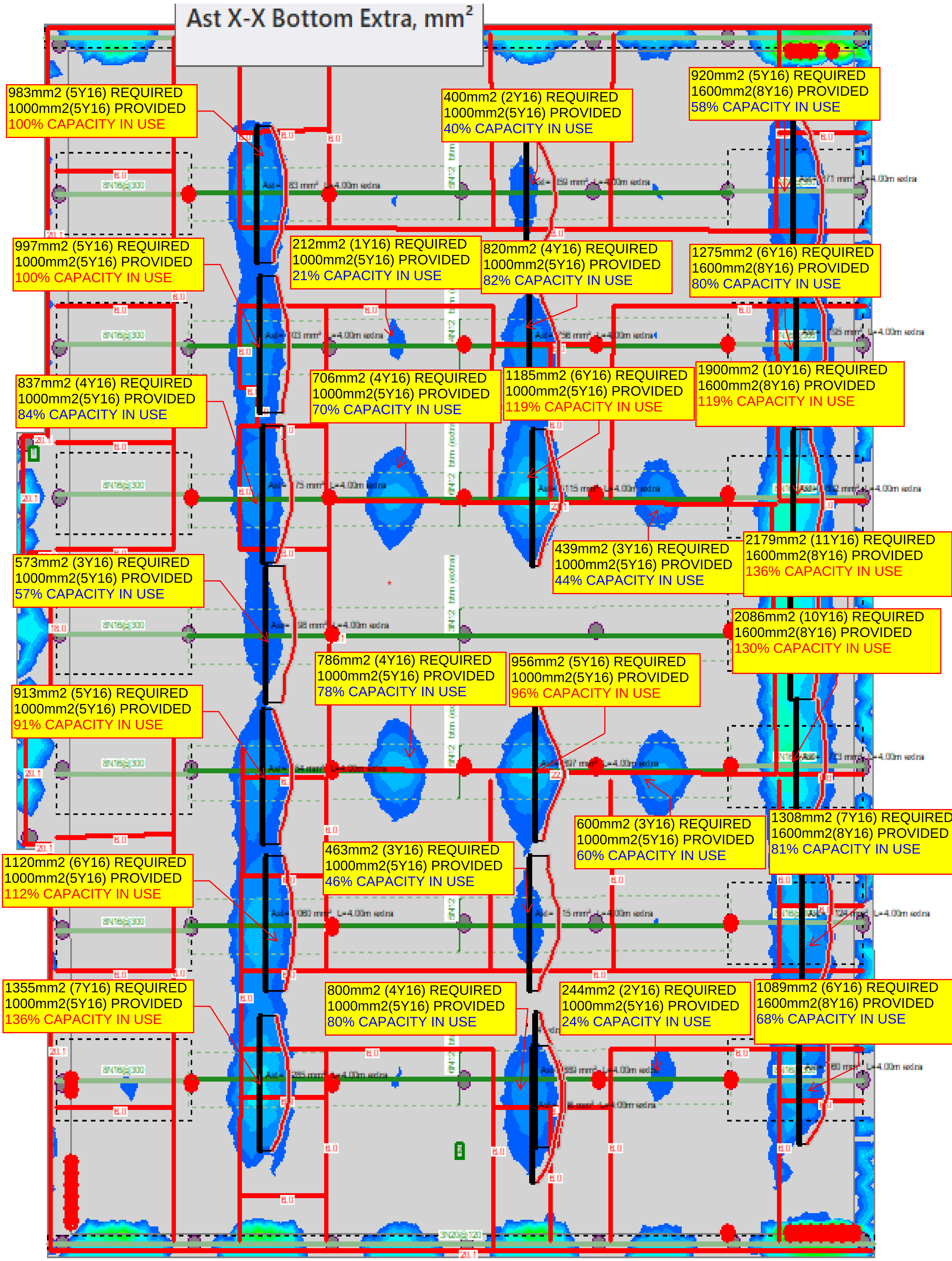


Pile Reactions under Dead Load ONLY

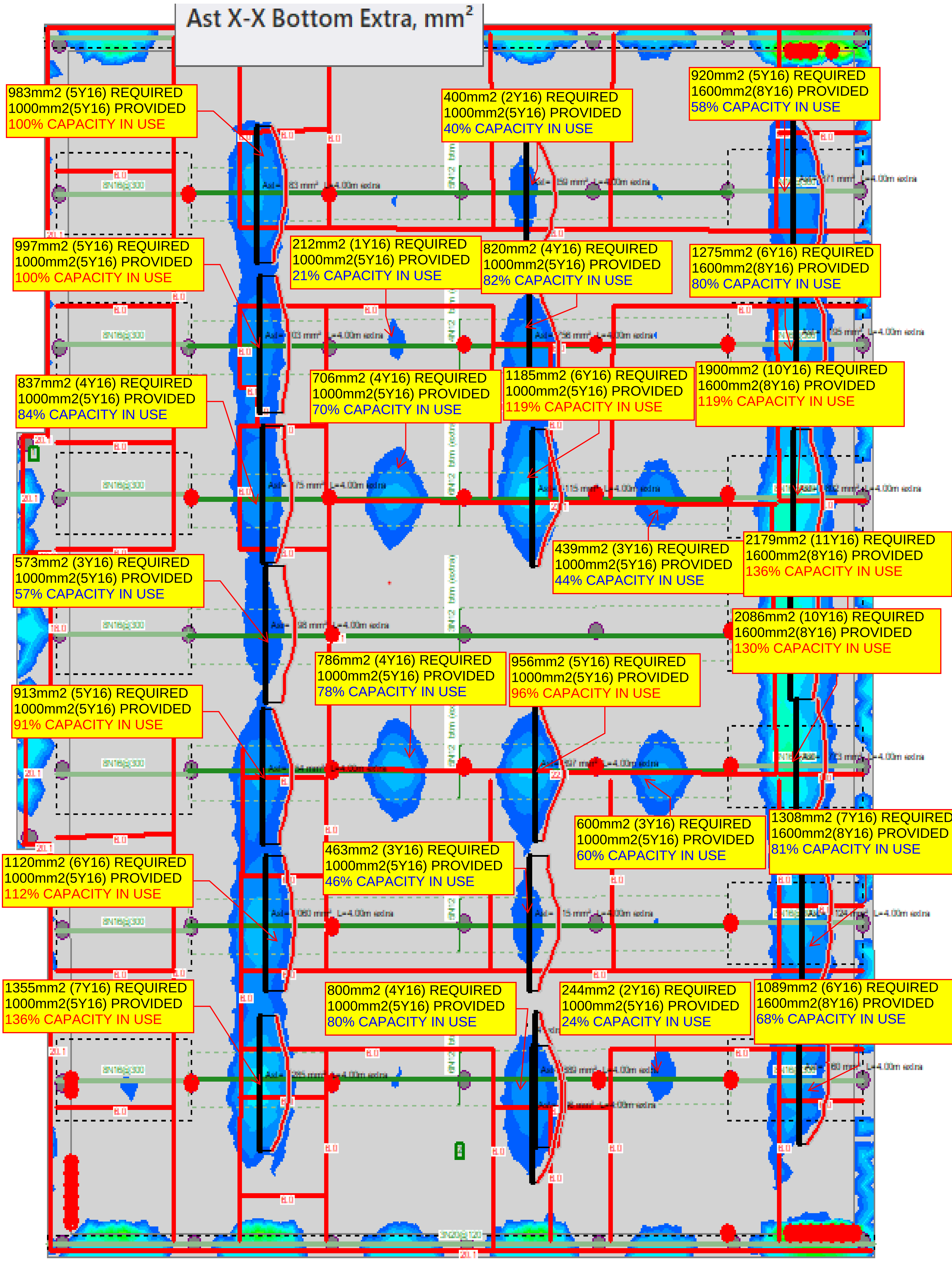


Reinforcing Bars in Y-Y Bottom

Document Set ID: 9374514
Version: 1, Version Date: 12/11/2020



Reinforcing Bars in X-X Bottom



Reinforcing Bars in X-X Bottom

Existing

Level 1	Beds
	99
	99

Existing

Level 1 Room	No
1 Bed	7
2 Bed	11
3 Bed	2
4 Bed	16
Bth WC	18
Corridor	12
Dining	1
E/S	1
Entry	1
GBA	1
GFA	1
Hair	1
Kitchen	2
Laundry	1
Lounge	1
Nurse	2
Quiet	1
Reception	1
Sitting	2
Staff	7
Store	7
Stores	6
Tea	1

north

2 4 6 8 10 metres 20

JOHN W FLOWER ARCHITECT

HARDI AGEDCARE

Mountainview 57 Mulgoa Road Penrith
Nursing Home Renewal Studies

Project No 1903192

01

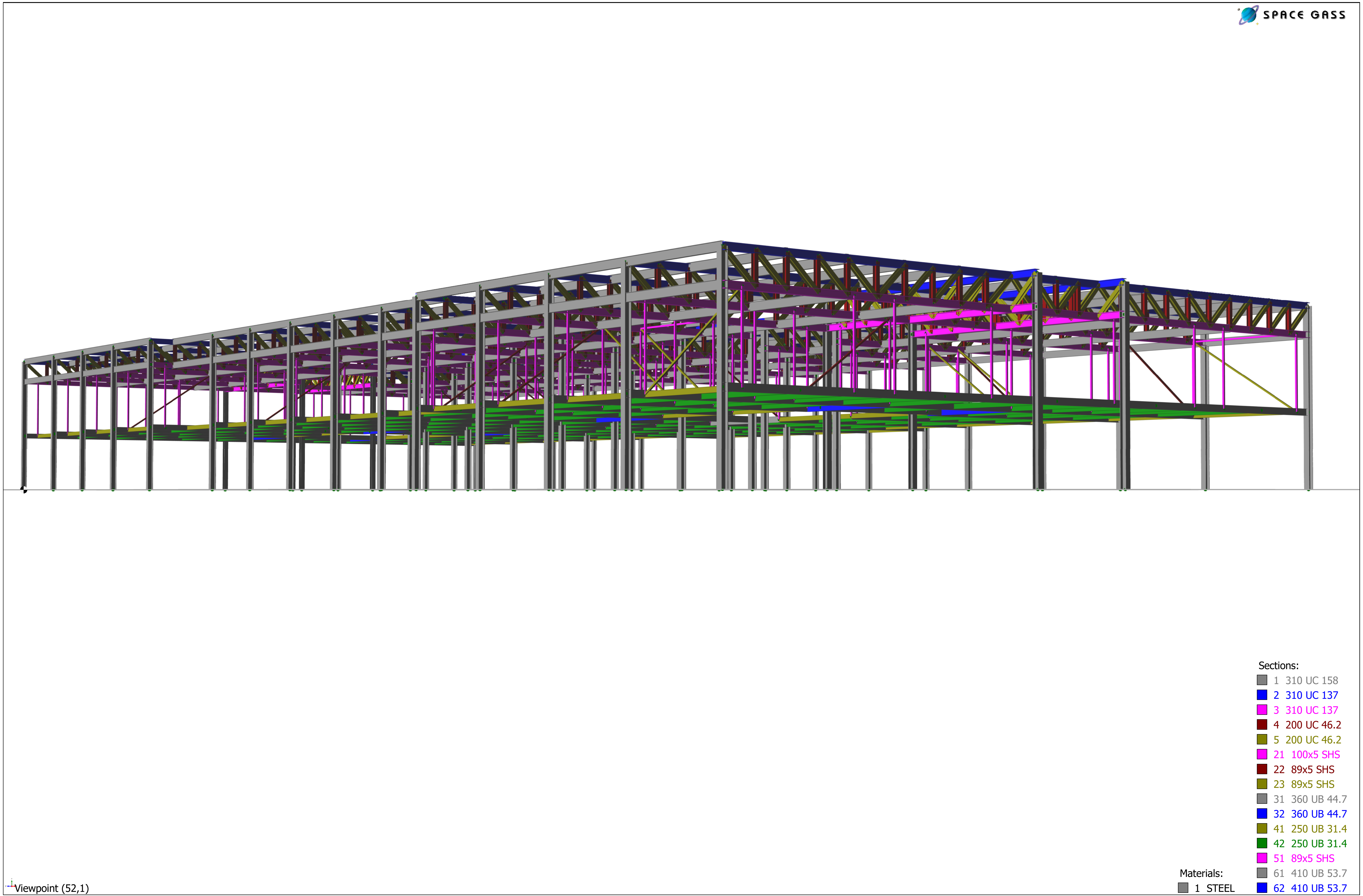
Issue E

Drawing Title
Existing Plan

Date Revision Rev Issue

[redacted]

Annexure C – Proposed Independent Steel Framing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21 100x5 SHS
22 89x5 SHS
23 89x5 SHS
31 360 UB 44.7
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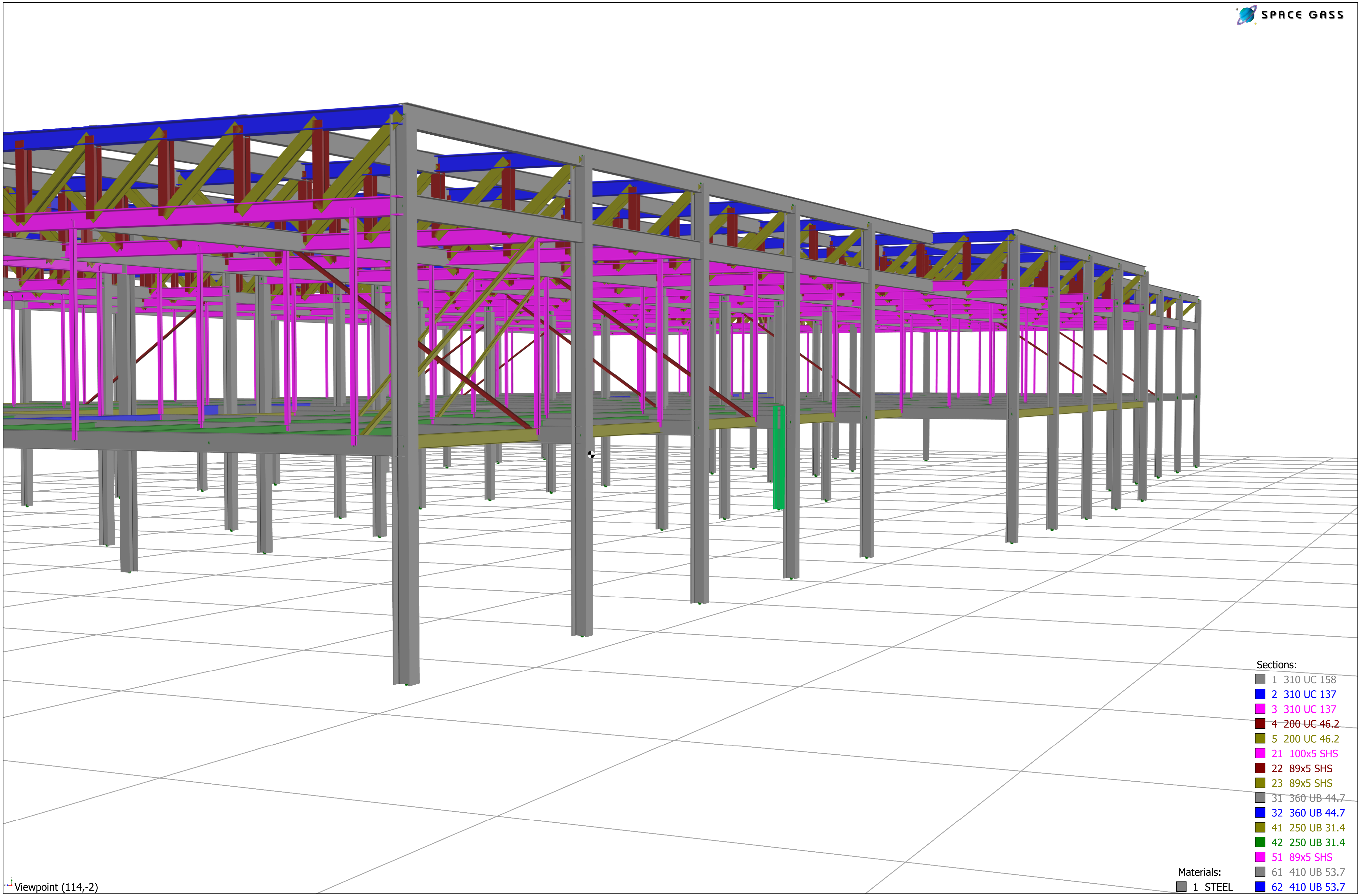
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32 360 UB 44.7
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Viewpoint (114,-2)

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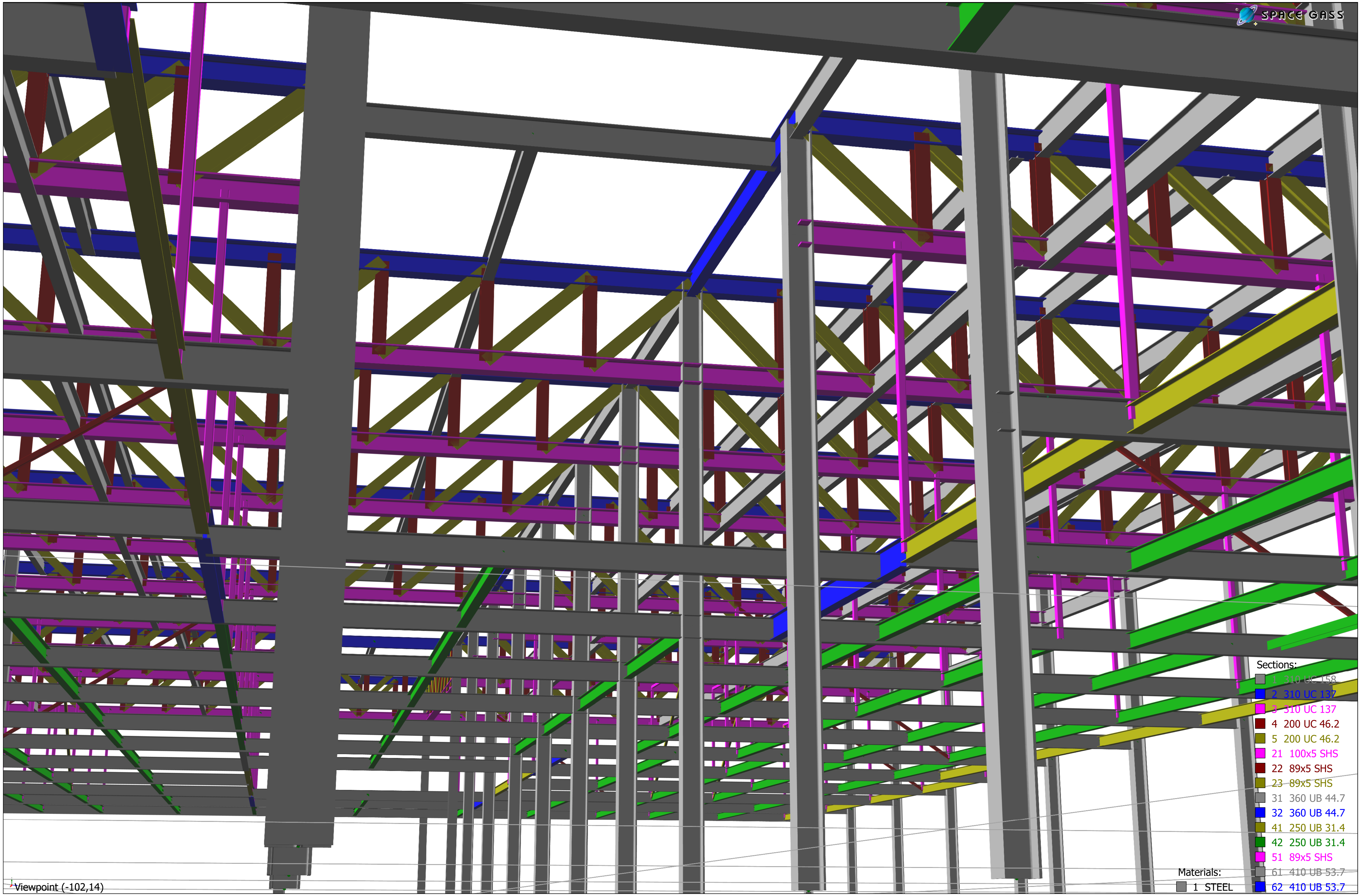

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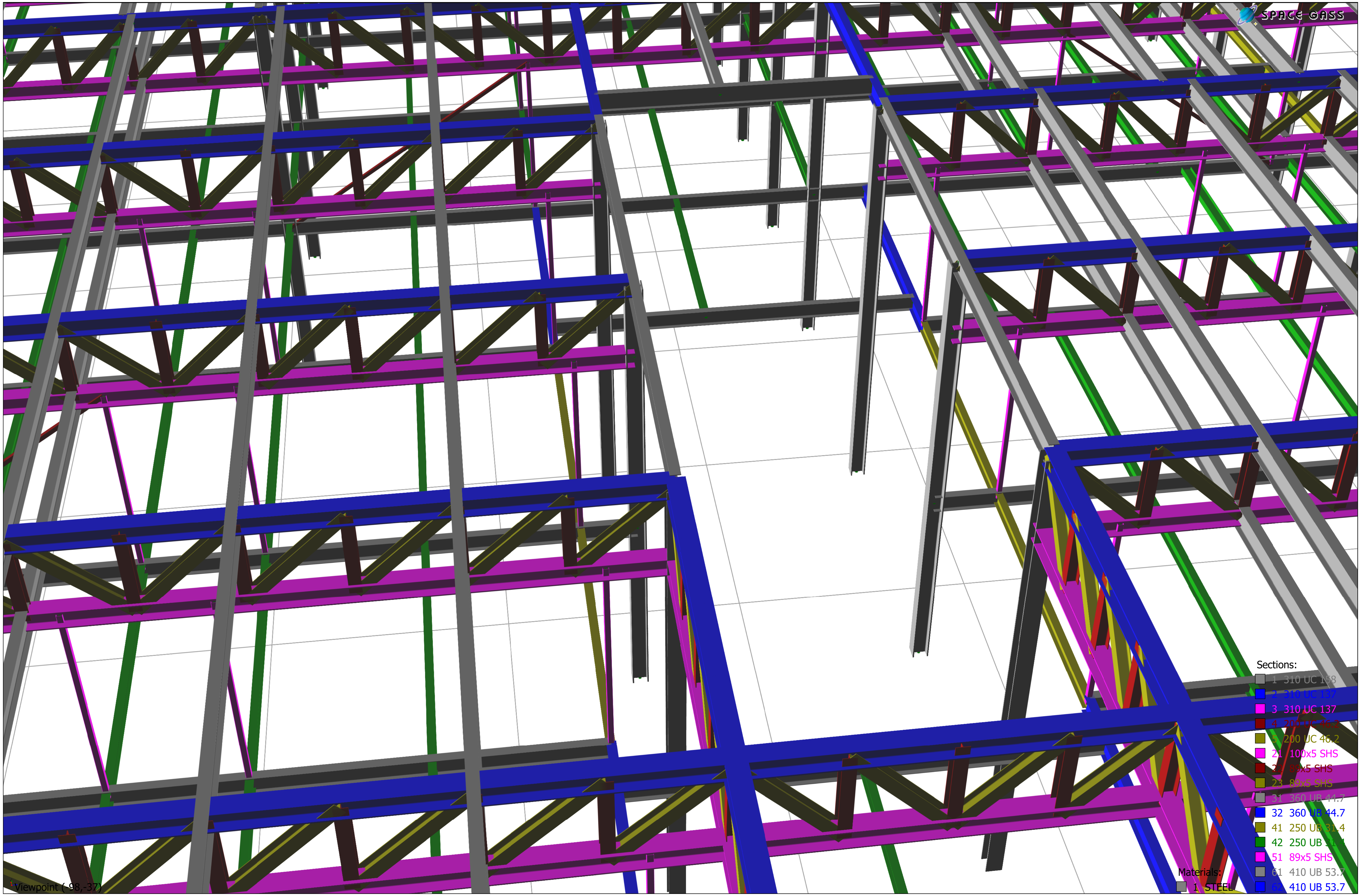

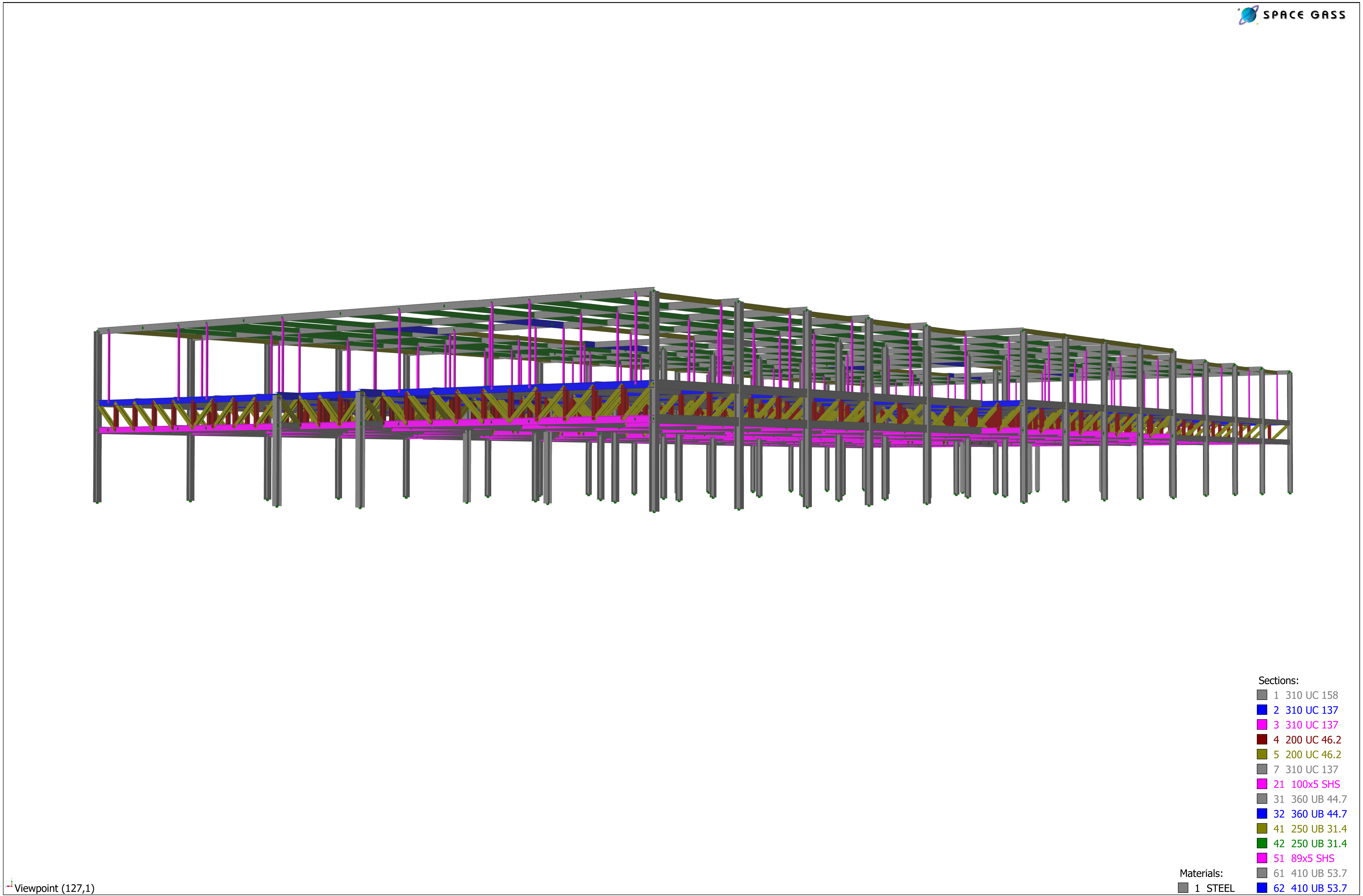
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32 360 UB 44.7
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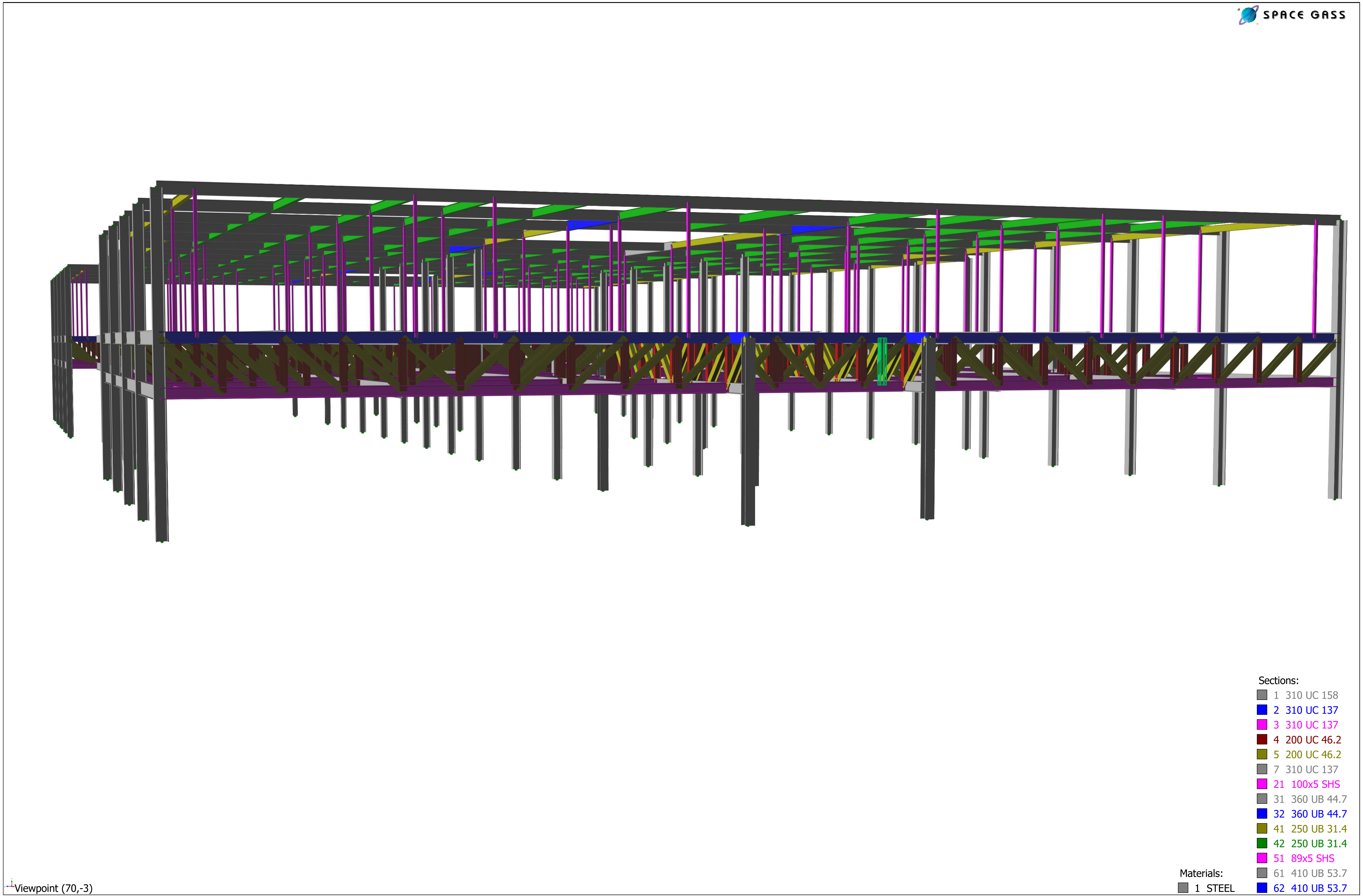
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32 360 UB 44.7
41 250 UB 31.4
42 250 UB 31.4
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