STEPS

REHABILITATION FACILITY

GROUP 17 JULY 2026

THE FIRM

Sunshine Consulting is an interdisciplinary design firm, dedicated to the pursuit of sustainable building solutions that prioritize occupant comfort and accessibility. Grounded in industry best practices, Sunshine Consulting believes in the profound impact each building has in shaping a brighter, more beautiful built environment.

ALEXANDRIA RICHARDS

PROJECT MANAGER

CO - STRUCTURAL LEAD

RODAINA ABOELELA

BIM LEAD

CO - STRUCTURAL LEAD

ANABELLA KURNIAWAN

MECHANICAL LEAD

CO - ARCHITECTURAL LEAD

YOLANDA LI

BUILDING ENCLOSURE LEAD

CO - ARCHITECTURAL LEAD

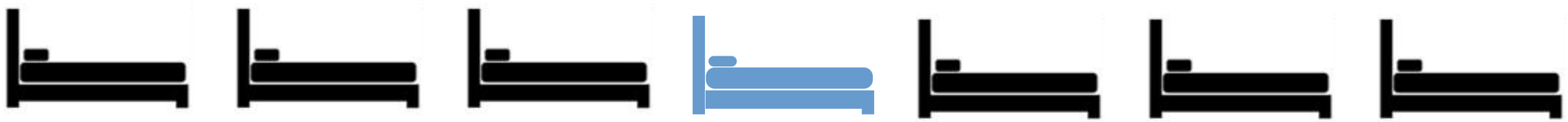
THE PROBLEM

WATERLOO is Ontario's third fastest growing community.

To accomodate this ...

WRHN is planning to invest $10 million into the expansion of St Mary's and Grand River Hospital through the construction of a new **ACUTE** care hospital; thus, leading the region to an 854 designated quantity of acute care beds.

THE PROBLEM

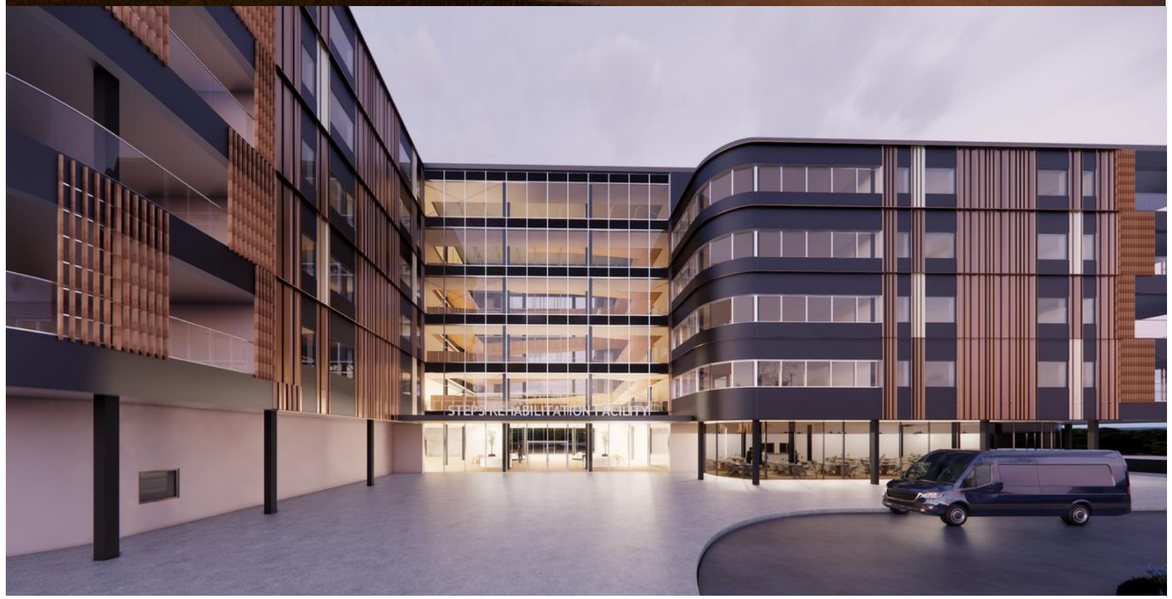


In Ontario **1 in 7 Beds** are occupied by those who no longer require urgent care.

The closest dedicated rehabilitation facility is **75 km** away from Waterloo, with a maximum capacity of **91 patients**

Within the current Waterloo Regional Health Network Hospital, there are **777** acute care beds meaning **111 beds** are occupied by patients no longer requiring urgent care.*

*Grand River Hospital houses 580 acute care beds. St. Mary's General Hospital while St. Mary's General Hospital houses 197.



DESIGN OVERVIEW

117
SINGLE PATIENT ROOMS

Gross Floor Area (GFA)
21, 750 m^2

Typical Footprint
3310 m^2

Key Design Elements

- INPATIENT ROOMS WITH WINDOWS
- TERRACES FOR EACH WARD
- OUTPATIENT CLINIC
- HYDROTHERAPY
- FITNESS CENTRE
- EAT IN DINING AREA
- PHARMACY WITH SMALL CONVENIENCE STORE
- INPATIENT PROCEDURE AREAS
- STAFF AREAS & LOUNGES

DESIGN OBJECTIVES

01 DAYLIGHTING

1. Spatial daylight autonomy (sDA300,50%) is achieved for at least 55% of regularly occupied space. Aim for 75% of regularly occupied space.

2. Annual sunlight exposure (ASE1000,250) is achieved for no more than 10% of regularly occupied space

02 ACCESSIBILITY

1. Integrate accessible features into the architectural design of the building.

2. Accessible public spaces, furniture, walkways, in accordance with the 7 Principles of Universal Design.

3. Barrier - Free Access to all spaces in the building.

03 SUSTAINABILITY & LCA

1. Optimize bay and span configurations for carbon reduction within applicable code limitations.

2. Spec 80%+ of steel to be produced by manufacturers that use Electric Arc Furnaces (EAFs) (as opposed to Basic Oxygen Furnaces (BOFs)) and manufacturers that are Canadian-based.

3. Conduct an assessment of steel-based EPDs to specify maximum GWP limits for structural set in relation to:
   - Rolled Steel Shapes
   - Steel Plates
   - Open Web Steel Joists

4. Conduct an A1 to A4 (raw material to transport) full life cycle assessment of the structural system.

5. Achieve a lean superstructure embodied carbon of less than 150 kgCO2e/m2.

6. Assemble a material passport for structural steel elements to allow disassembly and future re-use.

ARCHITECTURE

SITE CONTEXT

PROPERTY OWNERS

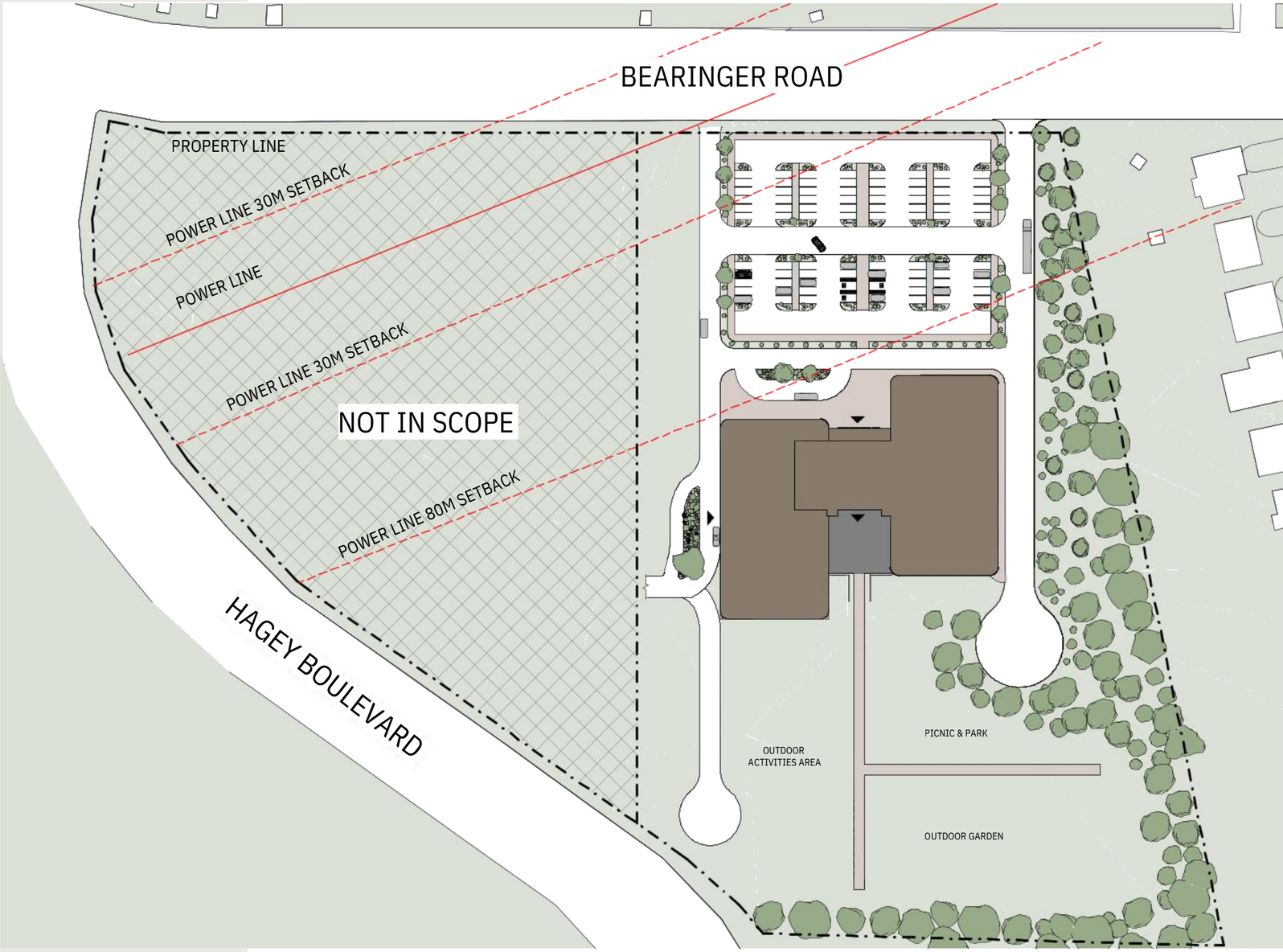
Waterloo Regional Health Network

University of Waterloo

INFRASTRUCTURE

New WRHN hospital

Integration of light rail train and bus routes to new site



ARCHITECTURE

GROUND FLOOR

ATRIUM

KEY FEATURES

GENERAL

- KITCHEN & DINING
- PHARMACY
- ATRIUM LOUNGE

INPATIENT

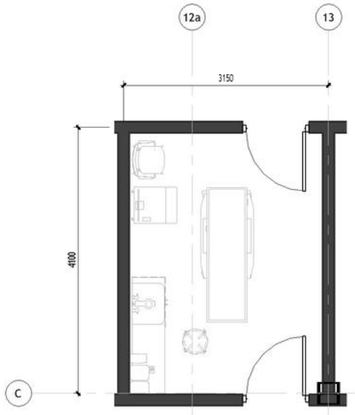
- RECEPTION
- CONSULT ROOMS
- PROCEDURE ROOMS
- STAFF AREA

OUTPATIENT

- RECEPTION
- CONSULT ROOMS
- PROCEDURE ROOMS & TREATMENT ROOMS
- STAFF AREA

RAMP

- STAFF CIRCULATION
- GENERAL CIRCULATION
- SHARED AMENITIES
- TREATMENT
- STAFF
- OUTPATIENTS
- INPATIENTS
- BACK OF HOUSE



TYPICAL CONSULT ROOM

ARCHITECTURE

GROUND FLOOR

PHARMACY

KEY FEATURES

GENERAL

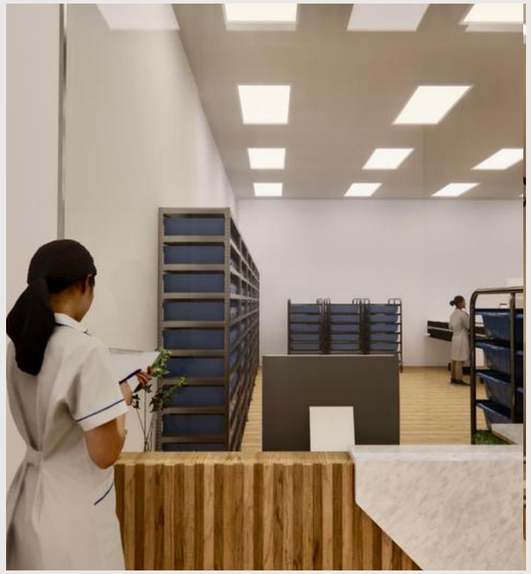
- KITCHEN & DINING
- PHARMACY
- ATRIUM LOUNGE

INPATIENT

- RECEPTION
- CONSULT ROOMS
- PROCEDURE ROOMS
- STAFF AREA

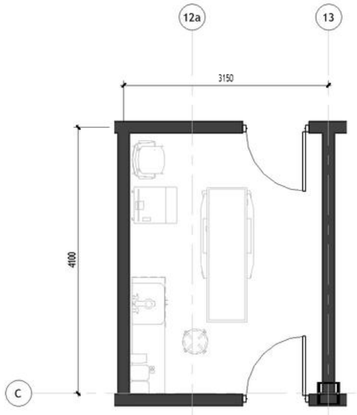
OUTPATIENT

- RECEPTION
- CONSULT ROOMS
- PROCEDURE ROOMS & TREATMENT ROOMS
- STAFF AREA



STAFF PHARMACY PICKUP

- STAFF CIRCULATION
- GENERAL CIRCULATION
- SHARED AMENITIES
- TREATMENT
- STAFF
- OUTPATIENTS
- INPATIENTS
- BACK OF HOUSE



TYPICAL CONSULT ROOM

ARCHITECTURE

GROUND FLOOR

TYPICAL CONSULT

KEY FEATURES

GENERAL

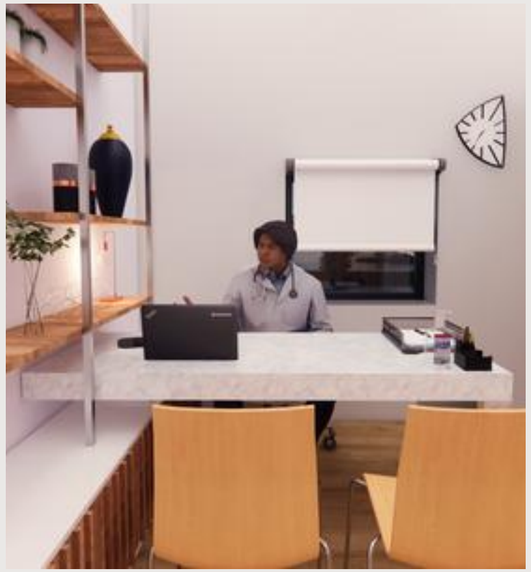
- KITCHEN & DINING
- PHARMACY
- ATRIUM LOUNGE

INPATIENT

- RECEPTION
- CONSULT ROOMS
- PROCEDURE ROOMS
- STAFF AREA

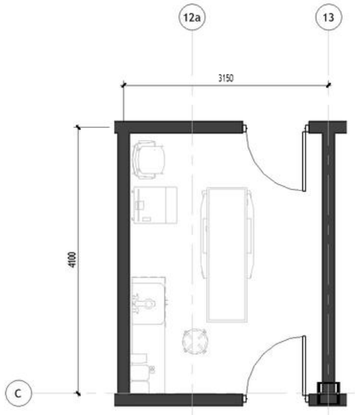
OUTPATIENT

- RECEPTION
- CONSULT ROOMS
- PROCEDURE ROOMS & TREATMENT ROOMS
- STAFF AREA



TYPICAL OFFICE

STAFF CIRCULATION
GENERAL CIRCULATION
SHARED AMENITIES
TREATMENT
STAFF
OUTPATIENTS
INPATIENTS
BACK OF HOUSE



TYPICAL CONSULT ROOM

ARCHITECTURE

BASEMENT

FITNESS CENTRE

KEY FEATURES

INPATIENT

- 26 SINGLE PATIENT ROOMS/FLOOR
- INDOOR LOUNGE AREAS
- TERRACES
- WALKING TRACK
- RAMP TO UPPER FLOORS

STAFF

- STAFF LOUNGES
- CHANGEROOMS
- MEDICAL UTILITY/STORAGE SPACES

BACK OF HOUSE

- DEDICATED MECHANICAL SPACE/WARD

SAUNA

CHANGE ROOM

STAFF CIRCULATION
GENERAL CIRCULATION
SHARED AMENITIES
TREATMENT
STAFF
OUTPATIENTS
INPATIENTS
BACK OF HOUSE

ARCHITECTURE

LEVEL 2 - LEVEL 6

PATIENT ROOMS

KEY FEATURES

INPATIENT

- 26 SINGLE PATIENT ROOMS/FLOOR
- INDOOR LOUNGE AREAS
- TERRACES
- WALKING TRACK
- RAMP TO UPPER FLOORS

STAFF

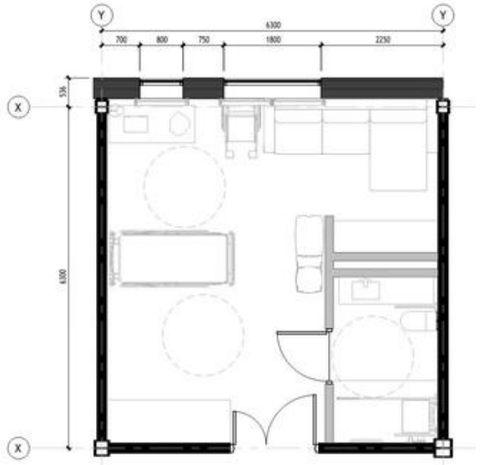
- STAFF LOUNGES
- CHANGEROOMS
- MEDICAL UTILITY/STORAGE SPACES

BACK OF HOUSE

- DEDICATED MECHANICAL SPACE/WARD

PATIENT WASHROOMS

STAFF CIRCULATION	STAFF
GENERAL CIRCULATION	OUTPATIENTS
SHARED AMENITIES	INPATIENTS
TREATMENT	BACK OF HOUSE



TYPICAL PATIENT ROOM

ARCHITECTURE

LEVEL 2 - LEVEL 6

NURSES STATION

KEY FEATURES

INPATIENT

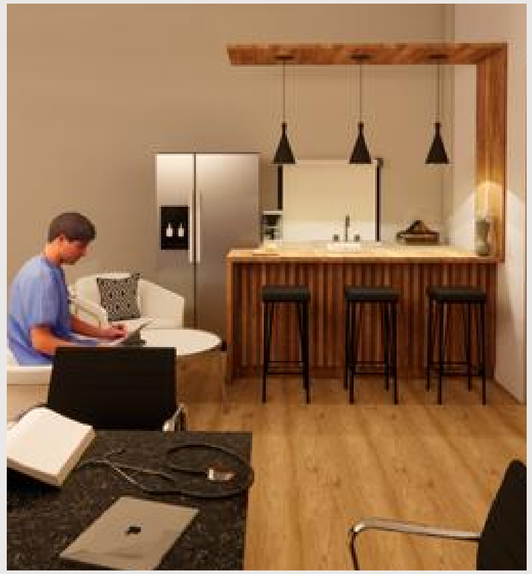
- 26 SINGLE PATIENT ROOMS/FLOOR
- INDOOR LOUNGE AREAS
- TERRACES
- WALKING TRACK
- RAMP TO UPPER FLOORS

STAFF

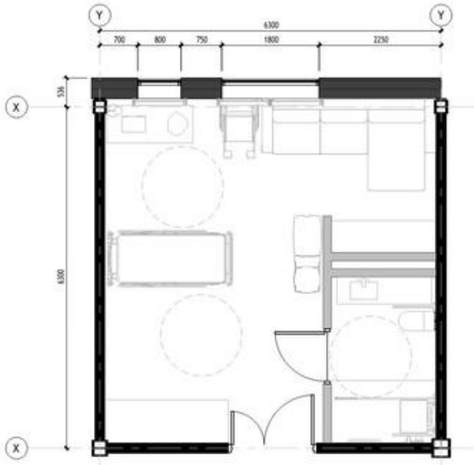
- STAFF LOUNGES
- CHANGEROOMS
- MEDICAL UTILITY/STORAGE SPACES

BACK OF HOUSE

- DEDICATED MECHANICAL SPACE/WARD



STAFF ROOM



TYPICAL PATIENT ROOM

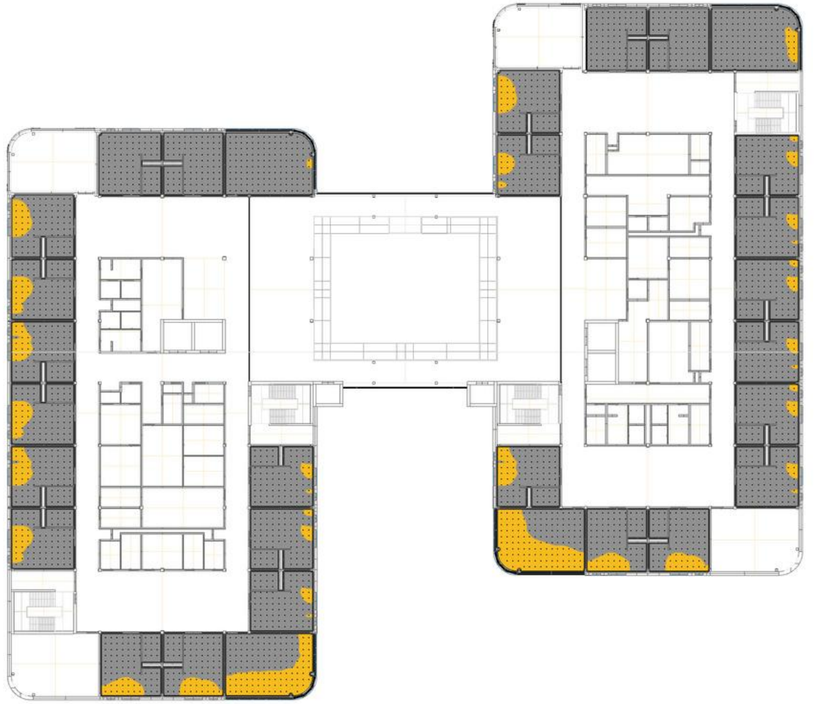
STAFF CIRCULATION	STAFF
GENERAL CIRCULATION	OUTPATIENTS
SHARED AMENITIES	INPATIENTS
TREATMENT	BACK OF HOUSE

DAYLIGHTING ANALYSIS

OVERVIEW

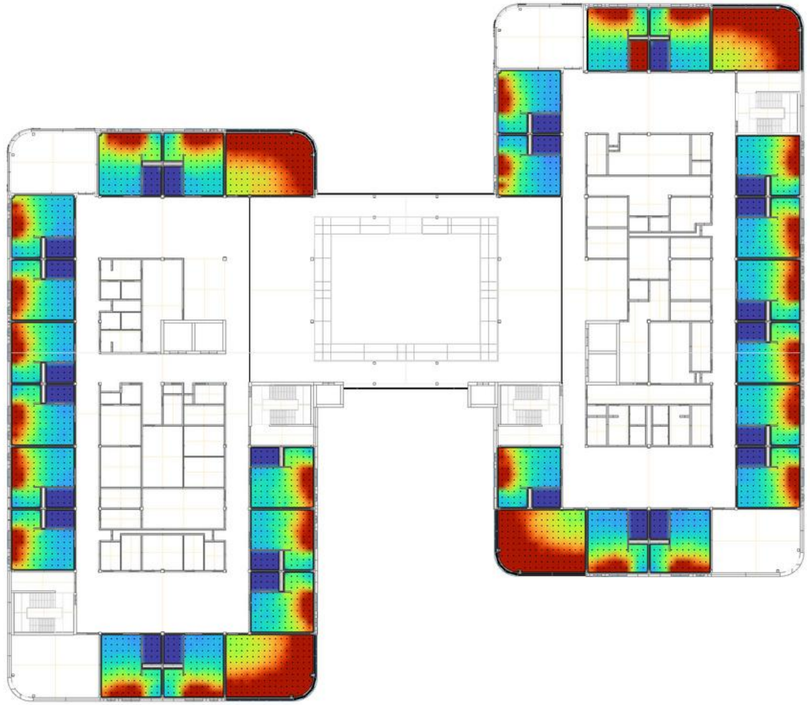
0 credits	44.8%** $sDA_{300/50\%}$	13.5% $ASE_{1000,250}$	567 avg lux	80.5% blinds open

** Spaces with ASE >= 20% not counted.



0 credits	44.8%** $sDA_{300/50\%}$	13.5% $ASE_{1000,250}$	567 avg lux	80.5% blinds open

** Spaces with ASE >= 20% not counted.



0 credits	44.8%** $sDA_{300/50\%}$	13.5% $ASE_{1000,250}$	567 avg lux	80.5% blinds open

** Spaces with ASE >= 20% not counted.

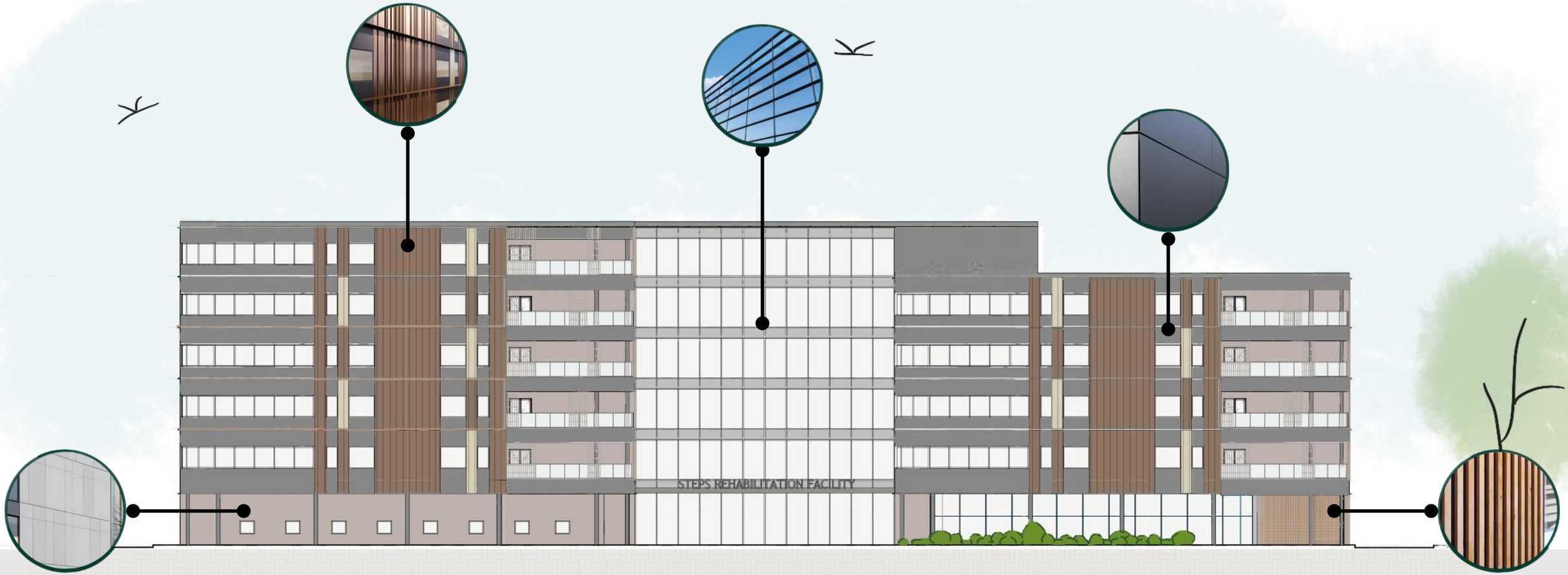
LEED v4 Daylight

Spatial daylight autonomy (sDA300,50%) is achieved for at least 55% of regularly occupied space. I
Annual sunlight exposure (ASE1000,250) is achieved for no more than 10% of regularly occupied space.

PRIMARY DC

ENCLOSURE

OVERVIEW



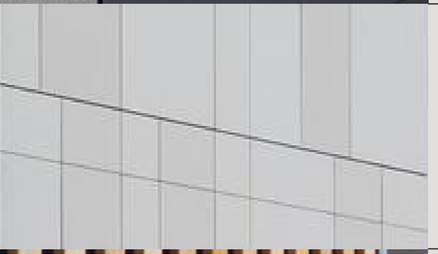
PRIMARY DC

ENCLOSURE

WALLS

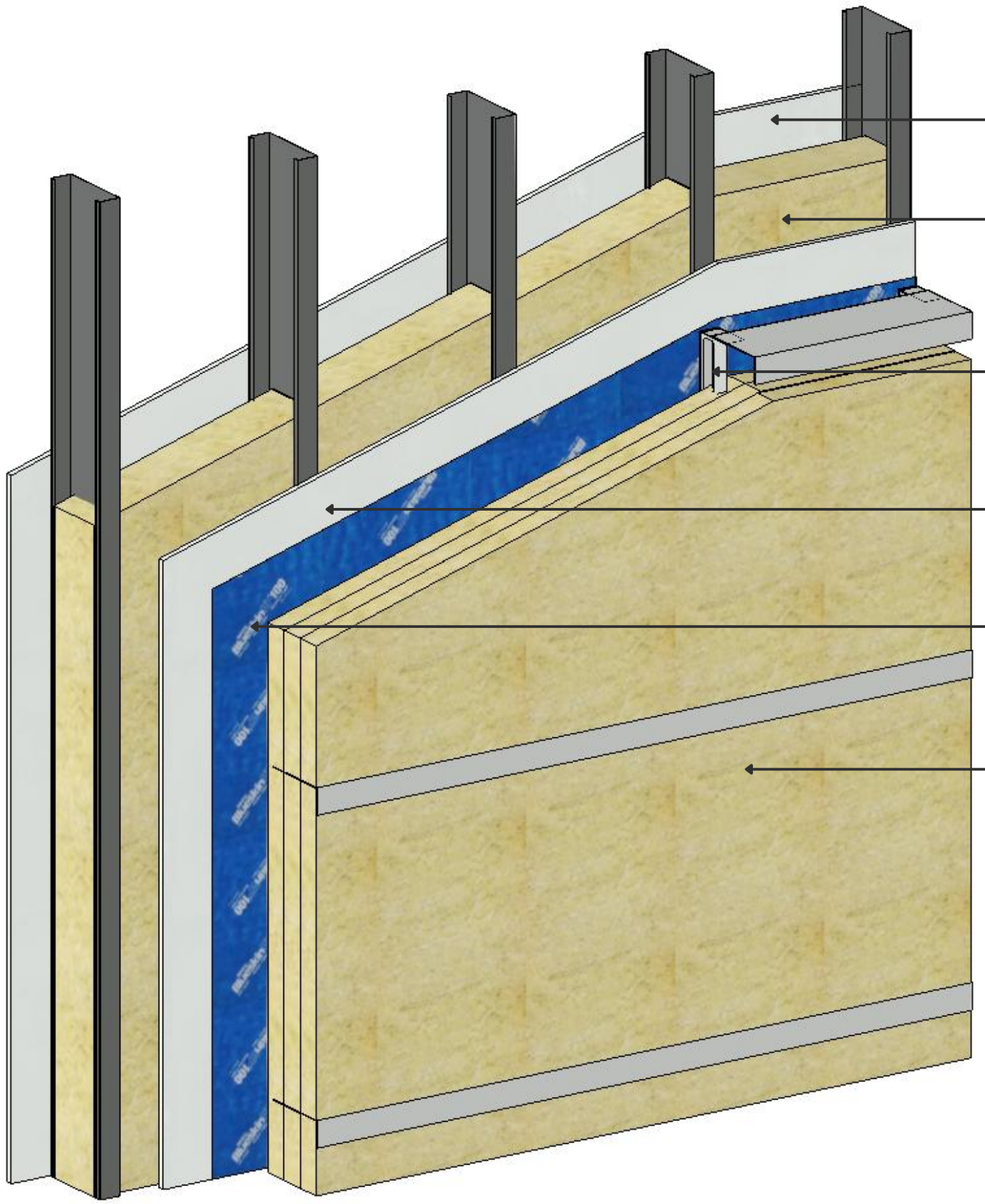
VICWEST FLUTED METAL PANELS

ALUCOBOND PLUS ALUMINUM COMPOSITE PANEL



EQUITONE FIBRE CEMENT SIDING

NORTWOOD WPC FLUTED PANELS



CLEAR WALL R - VALUE
RSI - 5.89 R - 33

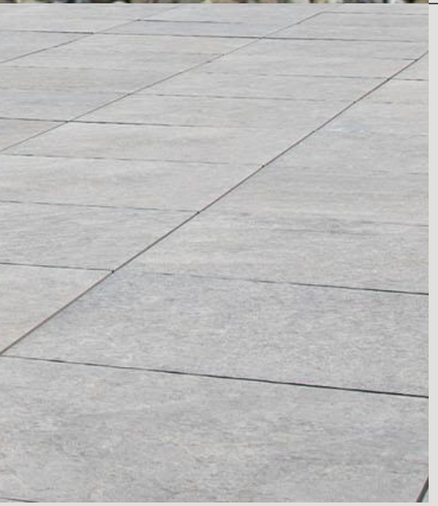
WITH ISO CLIPS AND GIRTS
RSI - 5.22 R-30

PRIMARY DC

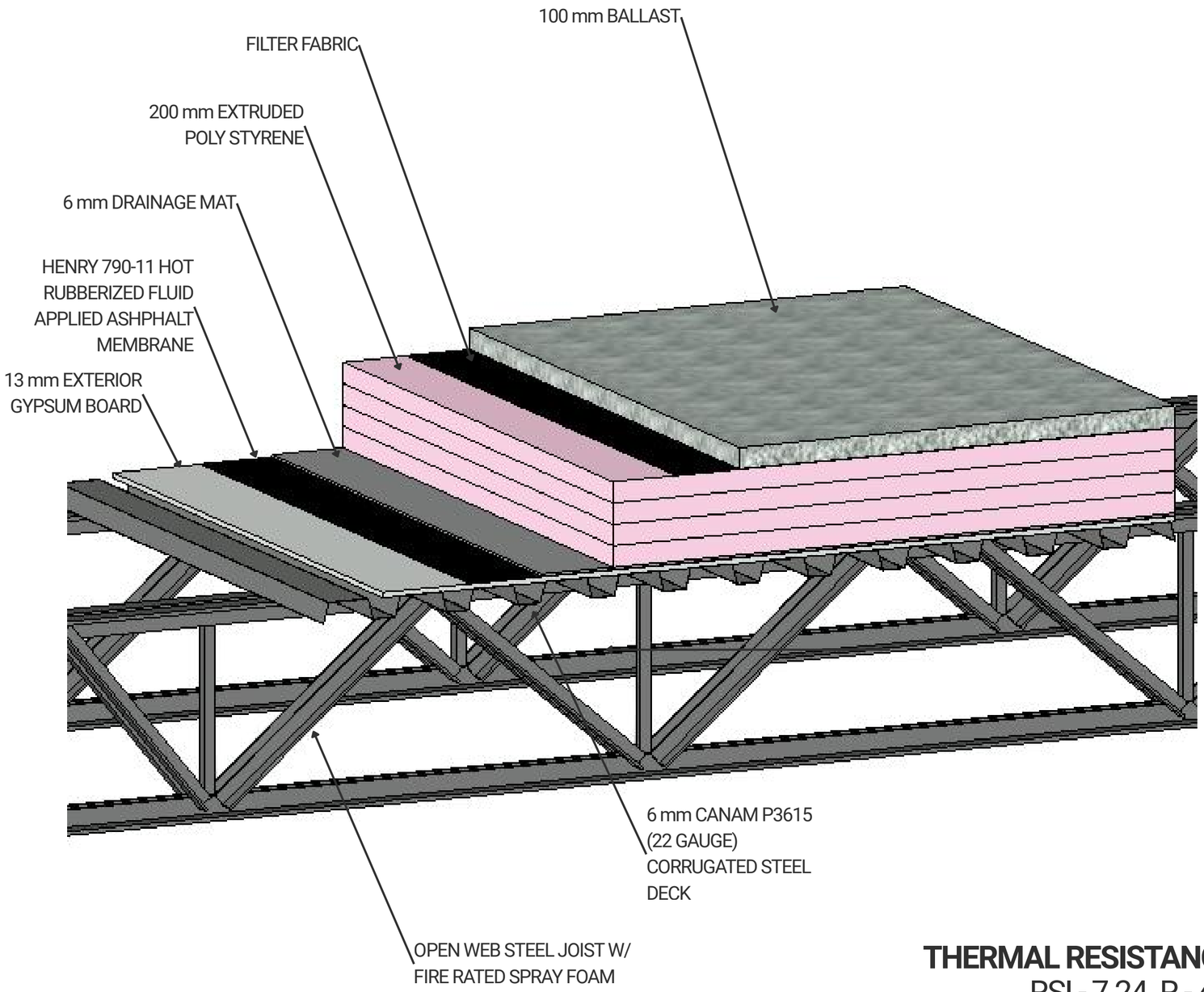
ENCLOSURE

ROOFS

BALLAST



PAVERS



THERMAL RESISTANCE

RSI - 7.24 R - 40

PRIMARY DC

ENCLOSURE

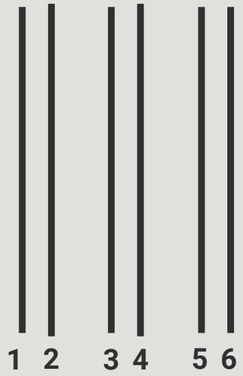
CURTAIN WALL

TRIPLE GLAZE, THERMALLY BROKEN,
STICK BUILT CURTAIN WALL WITH AIR

EFFECTIVE THERMAL CONDUCTANCE

U - 1.16 W/m²K

SHGC = 0.253



SURFACE	EMISSIVITY
1	0.840
2	0.050
3	0.840
4	0.840
5	0.050
6	0.840

ALUMICOR THERMAWALL TW2200

STRUCTURE

ROOF

38 mm CANAM METAL DECK
w/ OWSJ on JOIST GIRDERS (TYP)

PRIMARY
LATERAL

300 mm CONCRETE SHEAR WALL

SECONDARY
LATERAL

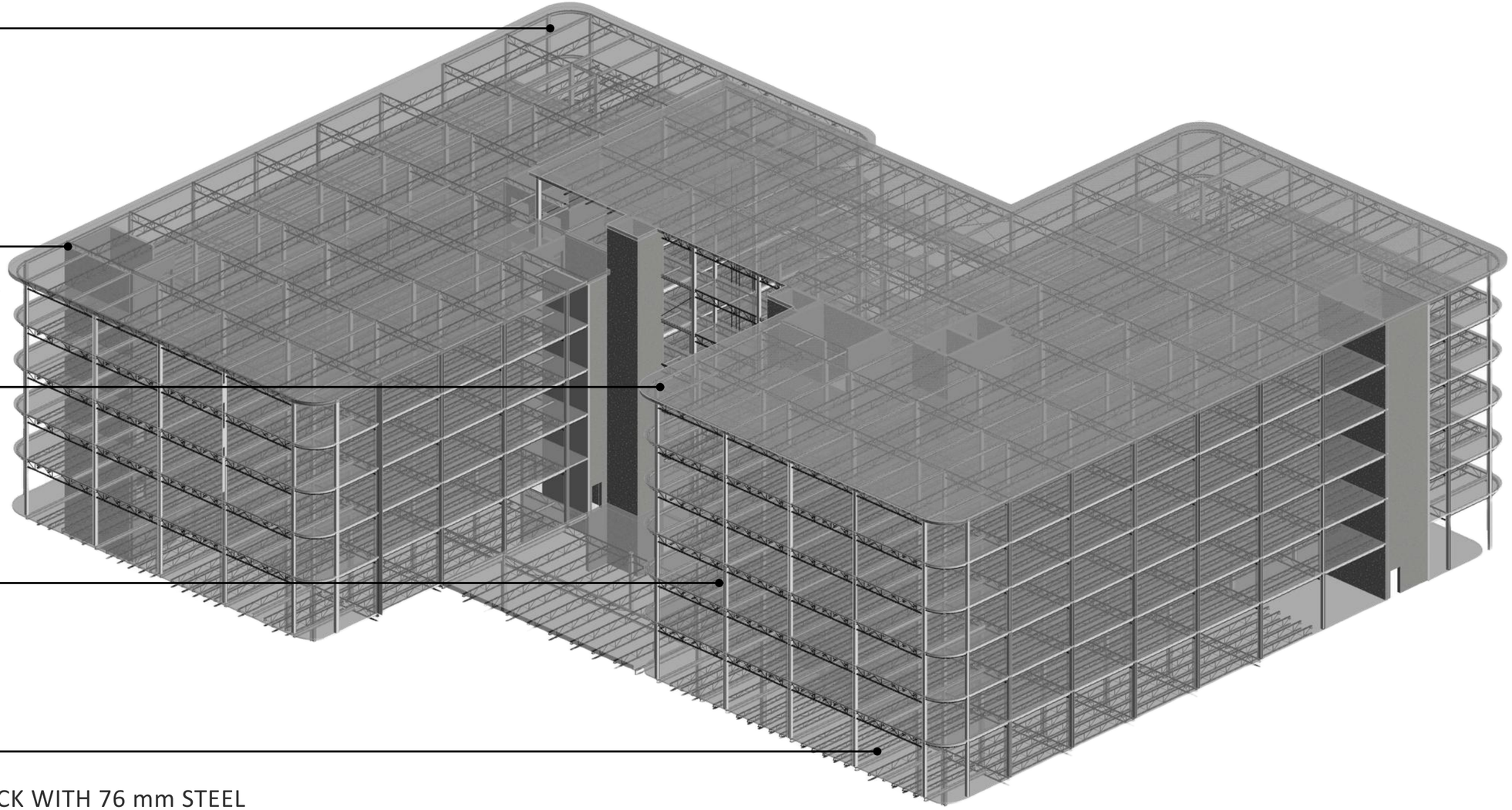
TENSION RODS FOR RAMP

COLUMN

W-Shape COLUMNS (*TYP)*

FLOOR

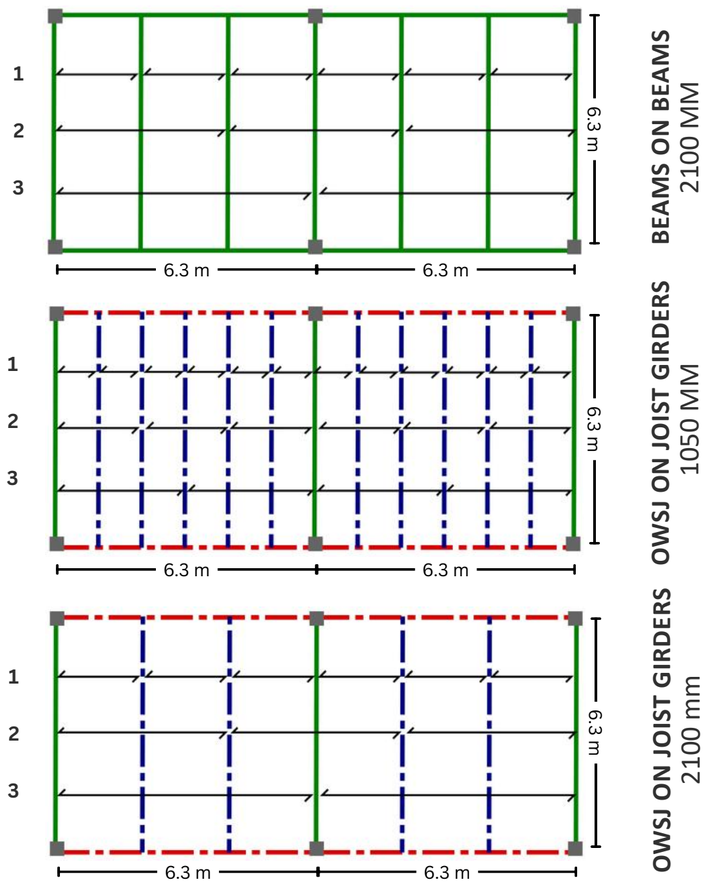
125 mm CANAM COMPOSITE DECK WITH 76 mm STEEL
w/ OWSJ on JOIST GIRDERS (TYP)

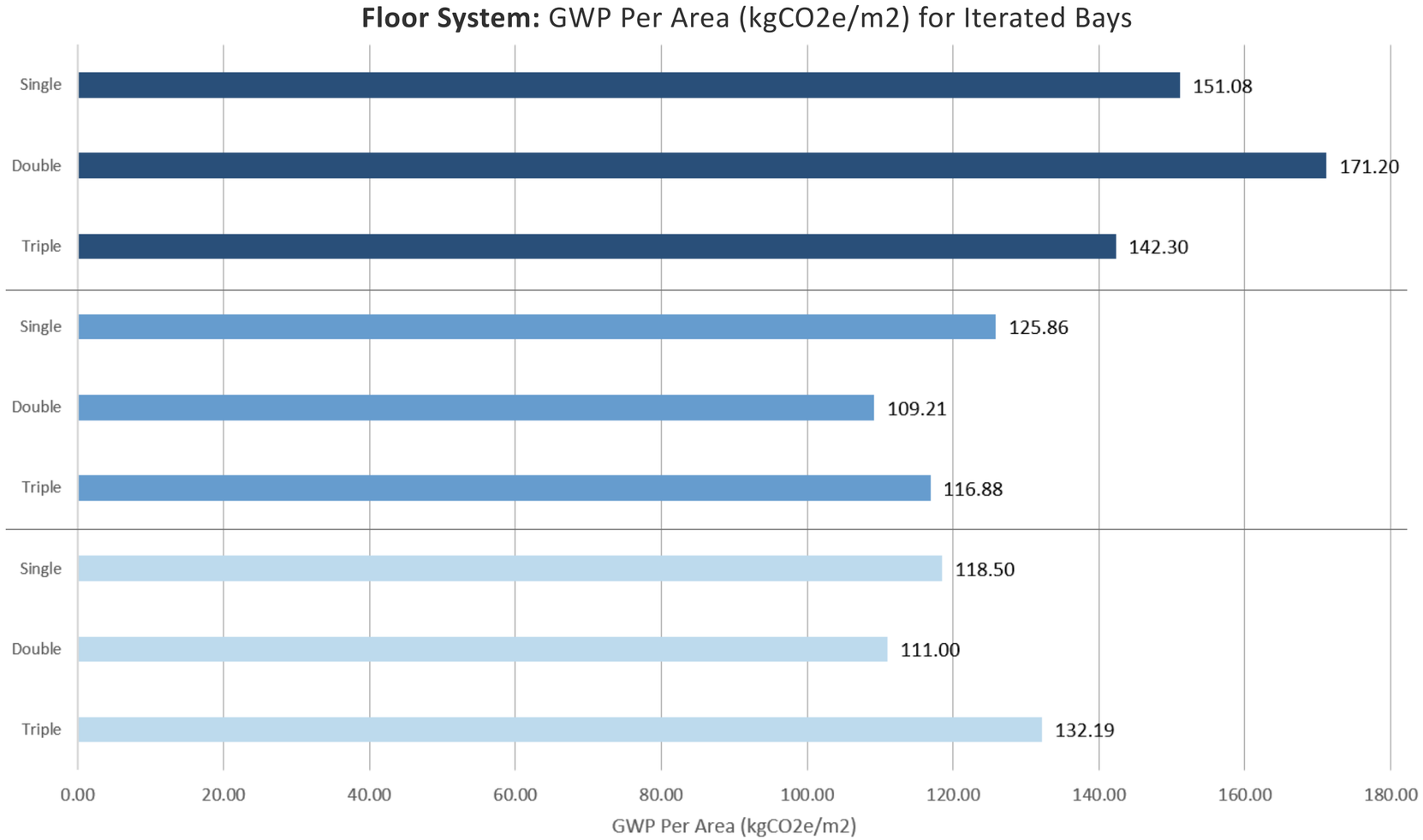


SECONDARY DC

STRUCTURE CARBON ACCOUNTING

TYPICAL FLOOR



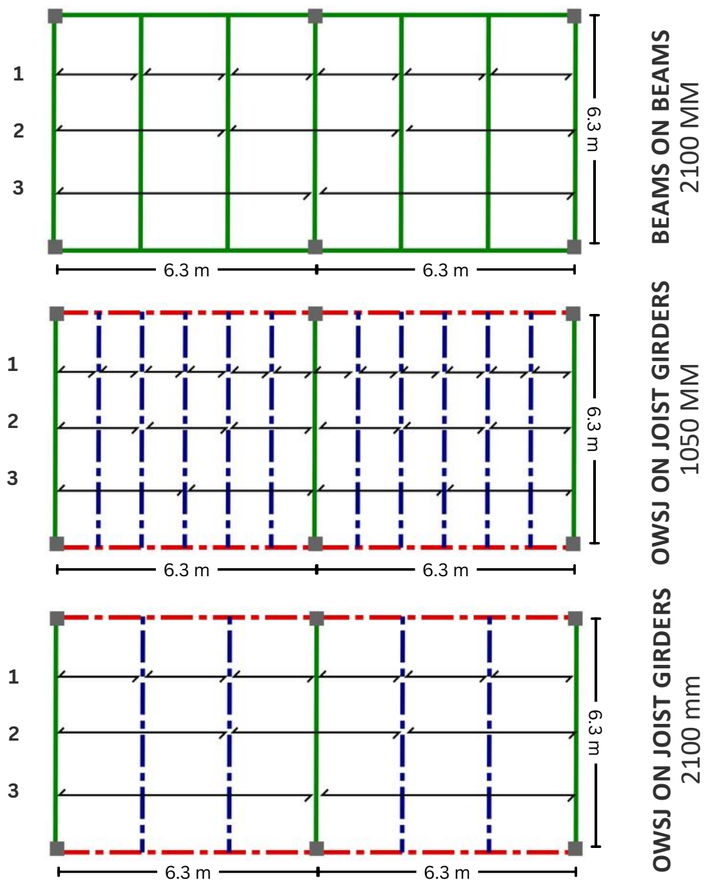


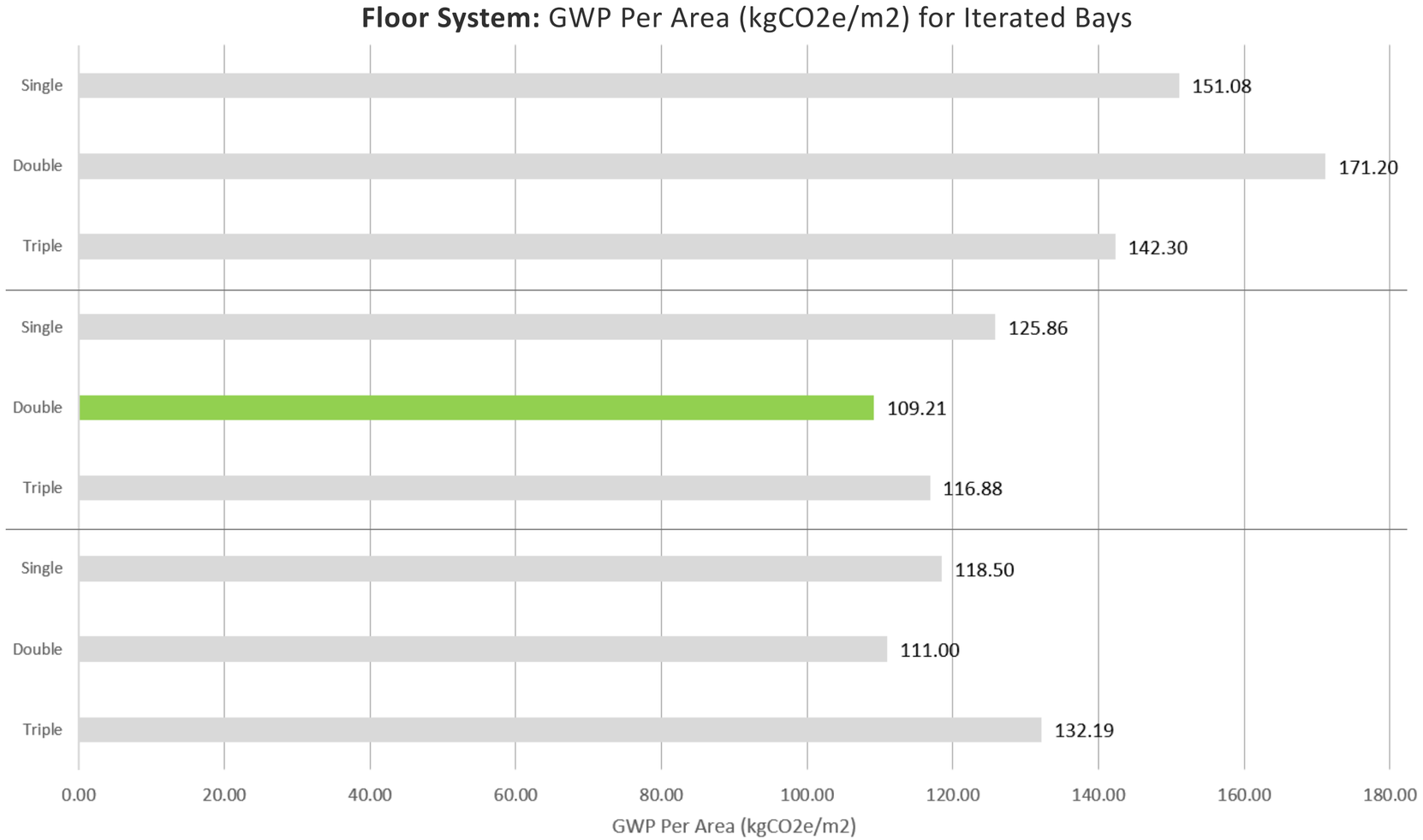
OPEN WEB STEEL JOIST (OWSJ)
BEAM
JOIST GIRDER
OUTSIDE OF SCOPE

SECONDARY DC

STRUCTURE CARBON ACCOUNTING

TYPICAL FLOOR



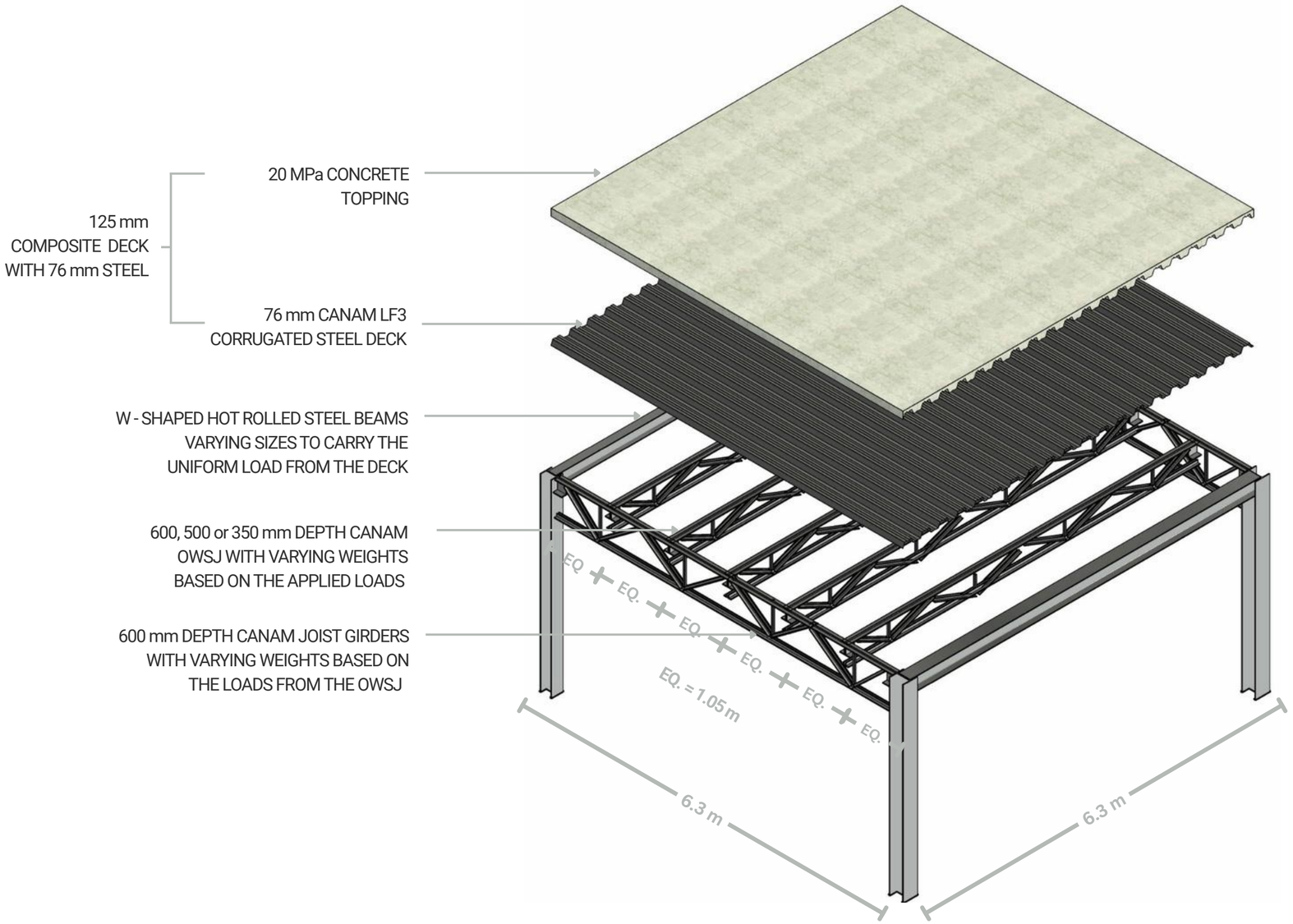


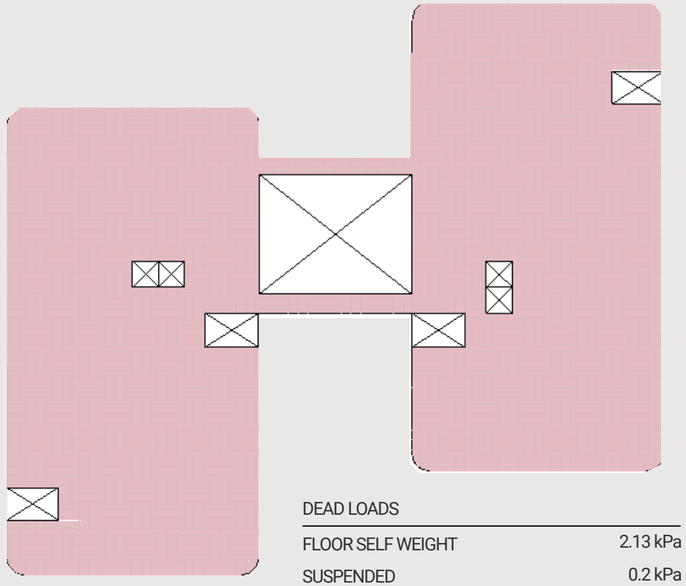
OPEN WEB STEEL JOIST (OWSJ)
BEAM
JOIST GIRDER
OUTSIDE OF SCOPE

PRIMARY DC

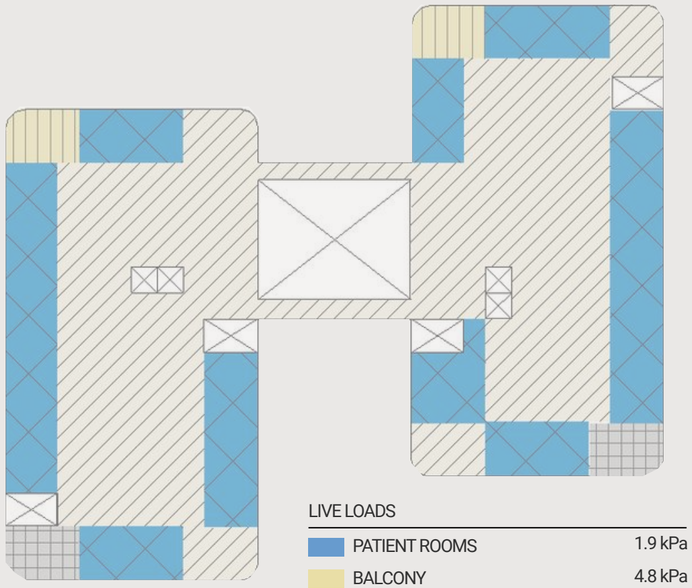
STRUCTURE DESIGN

TYPICAL FLOOR





DEAD LOADS	
FLOOR SELF WEIGHT	2.13 kPa
SUSPENDED	0.2 kPa
FRAMING	0.25 kPa
	2.6 kPa



LIVE LOADS	
PATIENT ROOMS	1.9 kPa
BALCONY	4.8 kPa
CORRIDOR/COMMON AREA	4.8 kPa
MECH/ELEC ROOMS	3.6 kPa

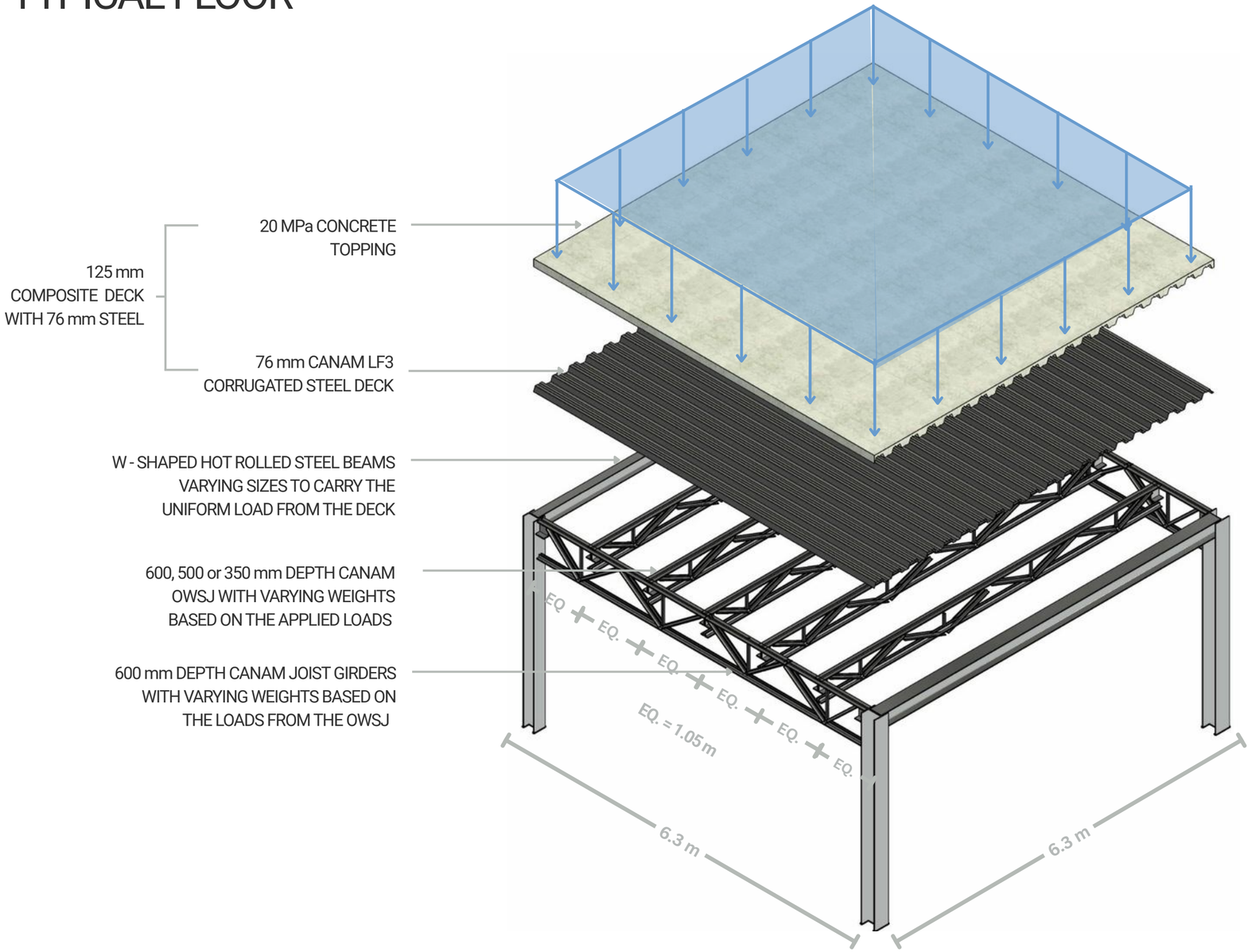
PRIMARY DC

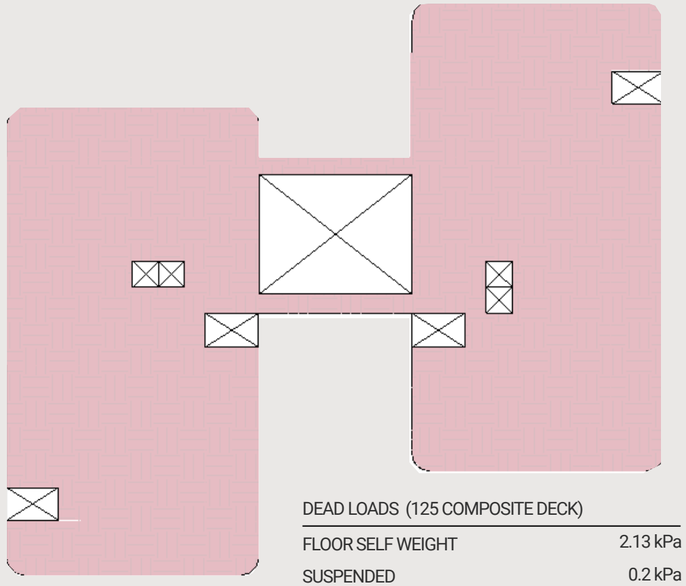
STRUCTURE DESIGN

TYPICAL FLOOR

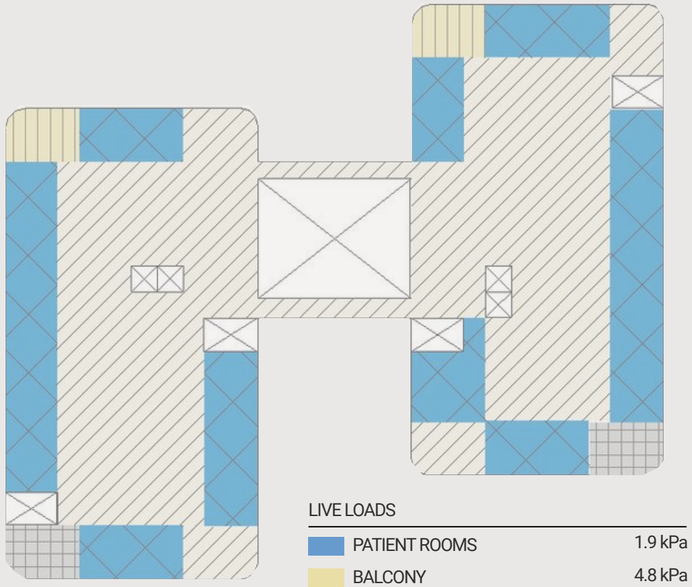
UDL → DECK → OWSJ → JOIST GIRDERS → COLUMNS
DECK → BEAMS → COLUMNS

UNIFORMLY DISTRIBUTED LOAD
POINT LOAD





DEAD LOADS (125 COMPOSITE DECK)	
FLOOR SELF WEIGHT	2.13 kPa
SUSPENDED	0.2 kPa
FRAMING	0.25 kPa
	2.6 kPa

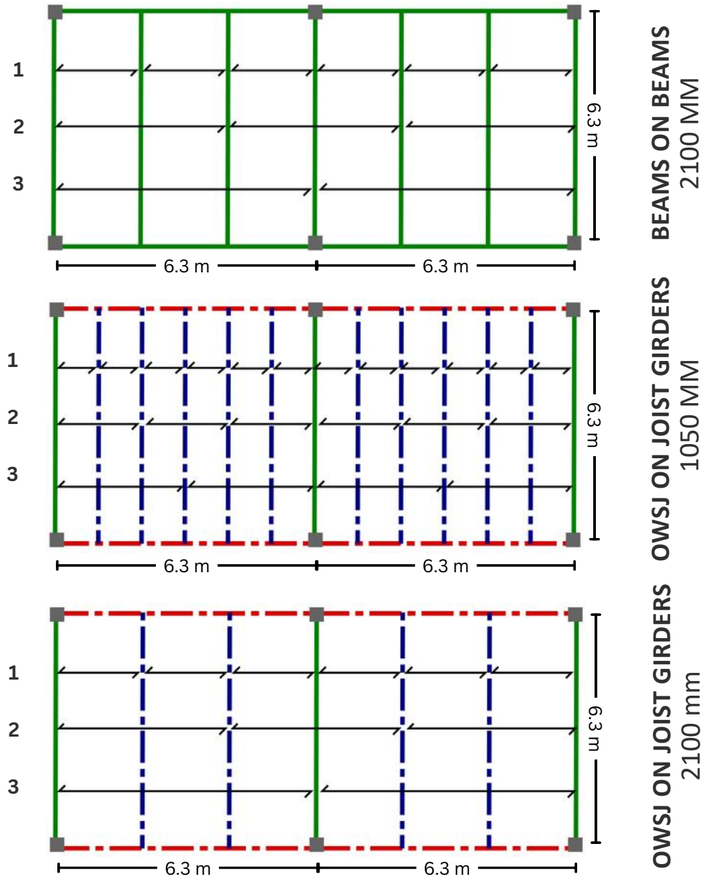


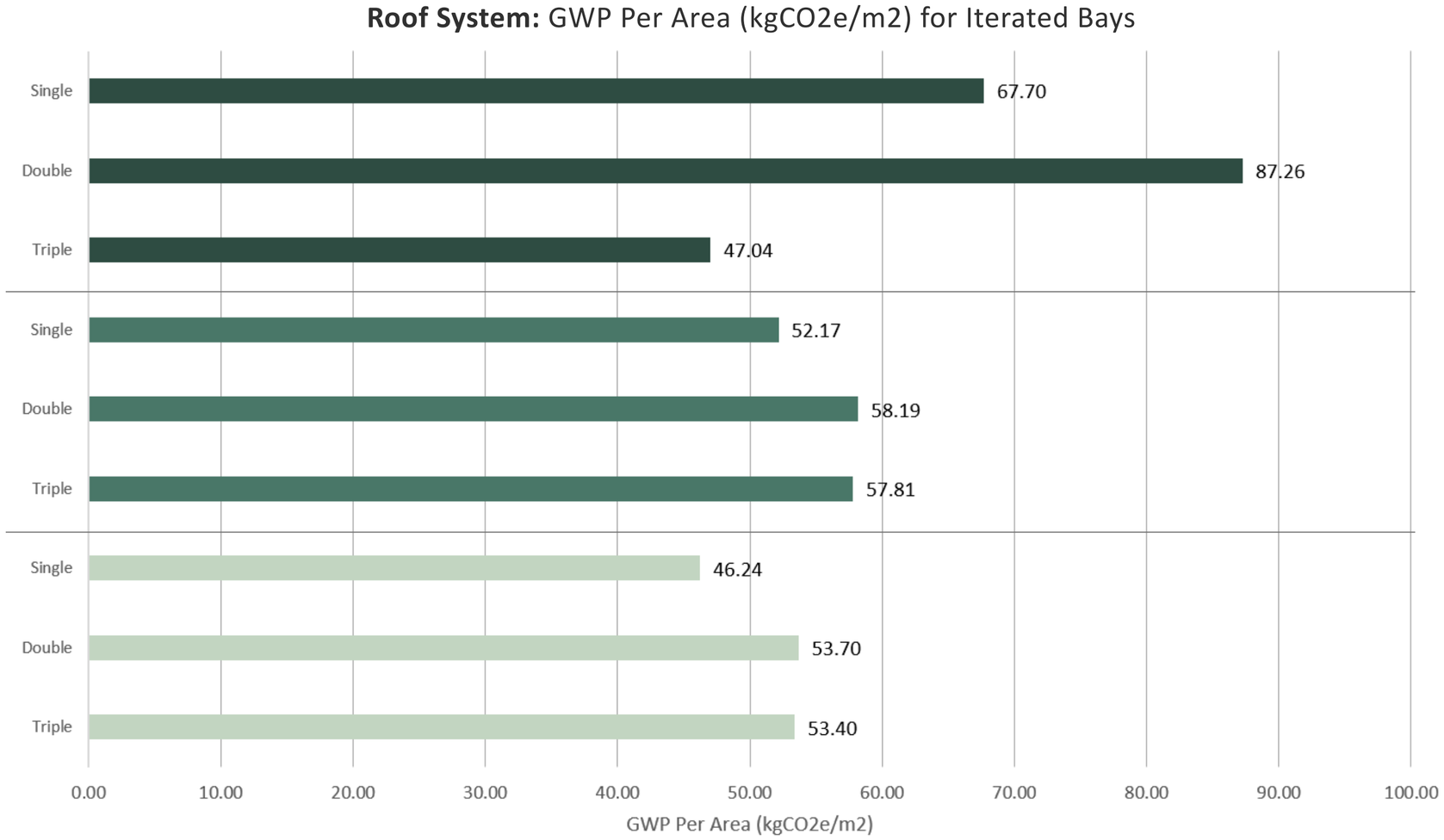
LIVE LOADS	
PATIENT ROOMS	1.9 kPa
BALCONY	4.8 kPa
CORRIDOR/COMMON AREA	4.8 kPa
MECH/ELEC ROOMS	3.6 kPa

SECONDARY DC

STRUCTURE CARBON ACCOUNTING

TYPICAL ROOF



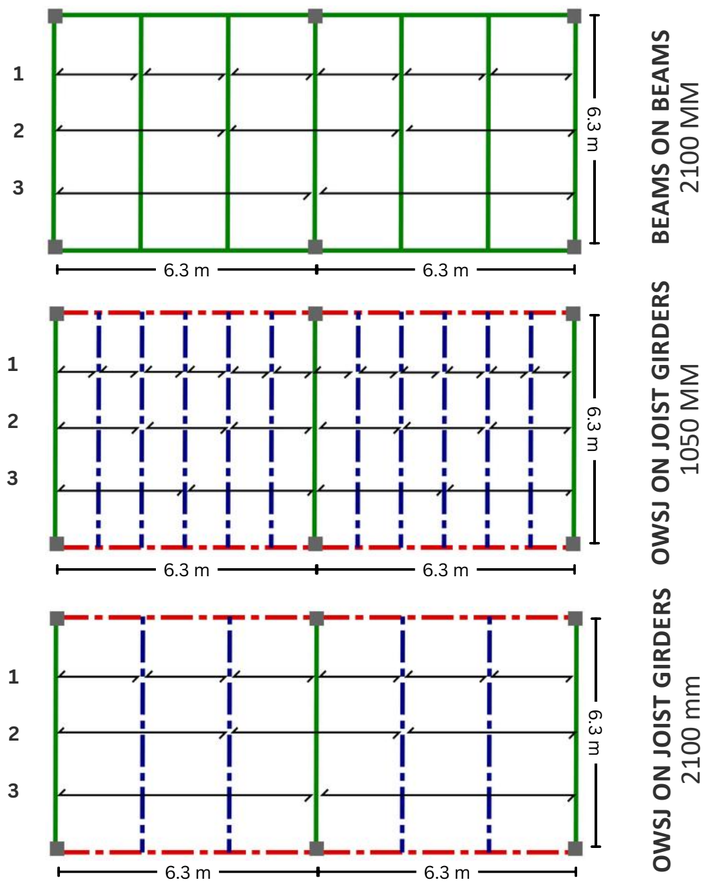


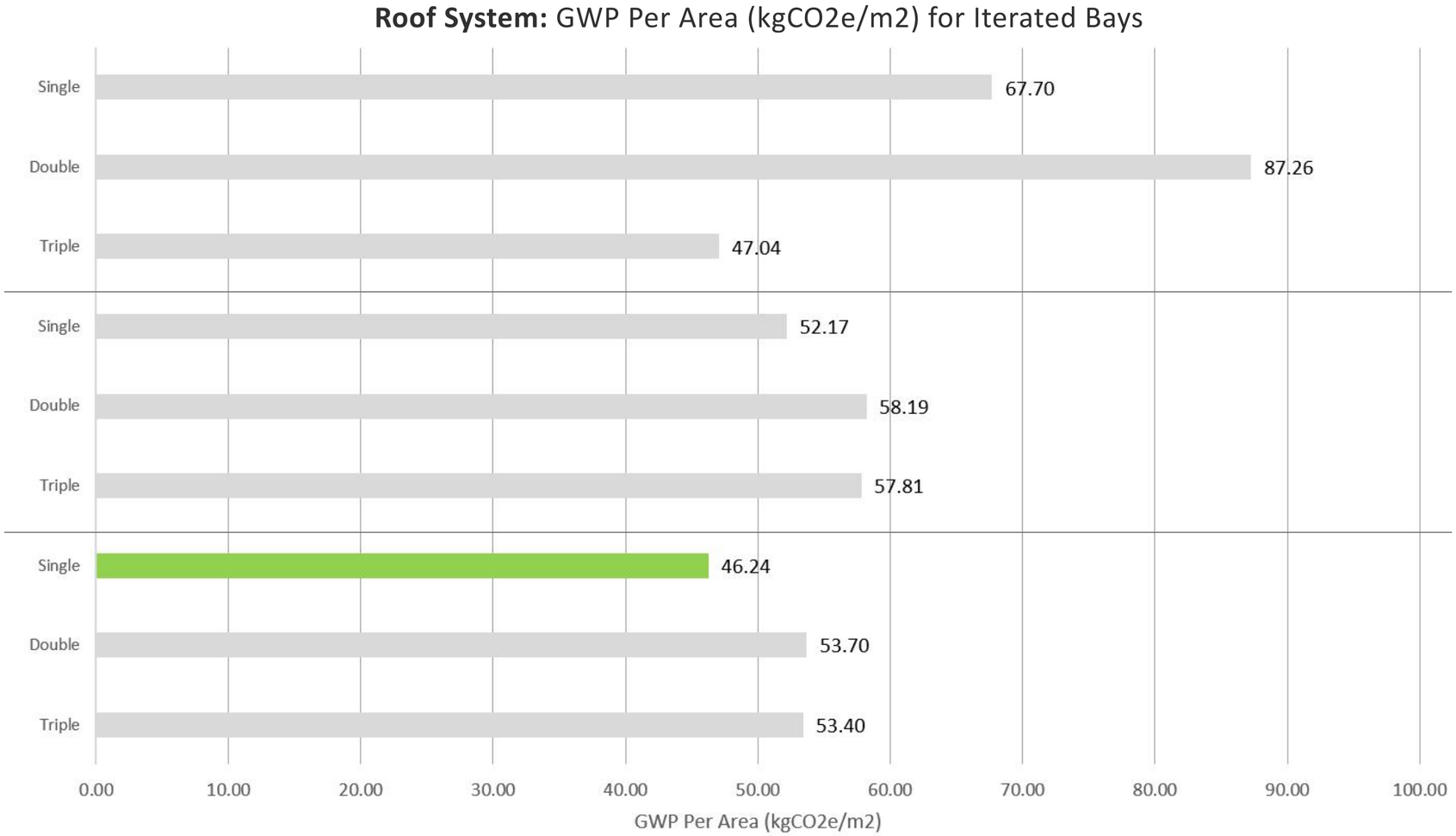
OPEN WEB STEEL JOIST (OWSJ)
JOIST GIRDER
BEAM
OUTSIDE OF SCOPE

SECONDARY DC

STRUCTURE CARBON ACCOUNTING

TYPICAL ROOF





OPEN WEB STEEL JOIST (OWSJ)
JOIST GIRDER
BEAM
OUTSIDE OF SCOPE

PRIMARY DC

STRUCTURE DESIGN

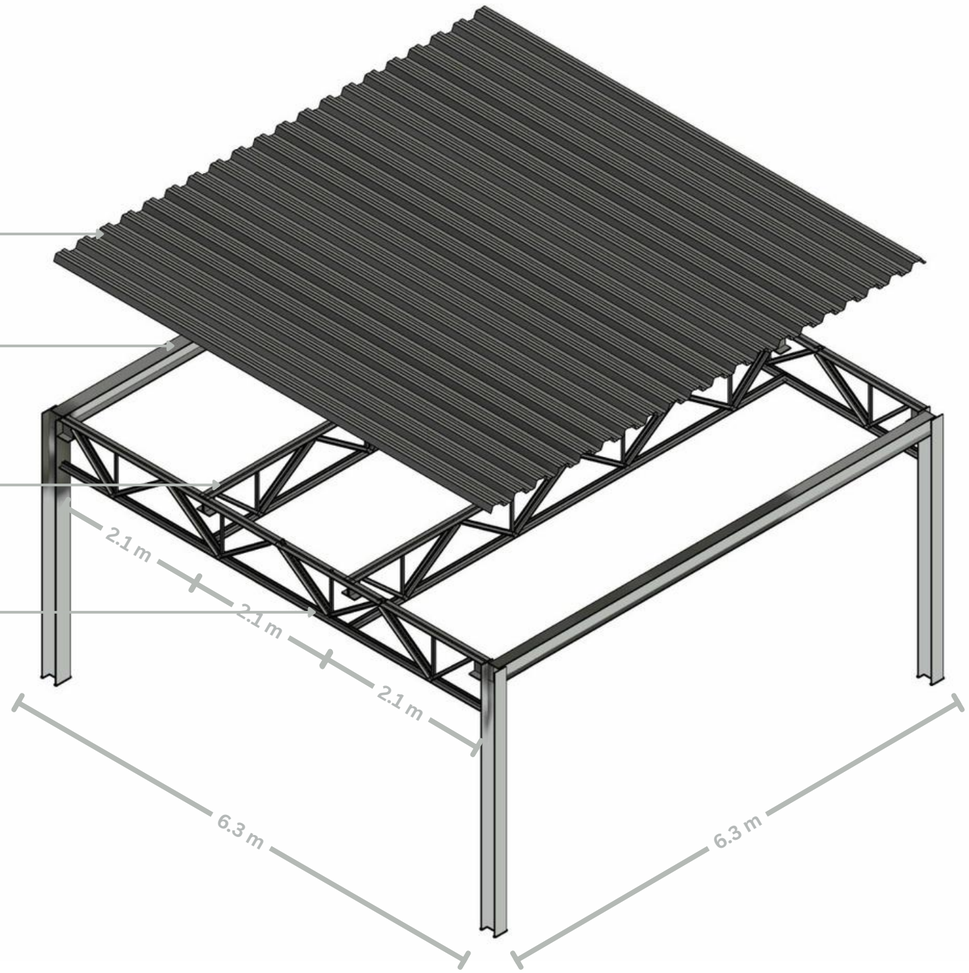
TYPICAL ROOF

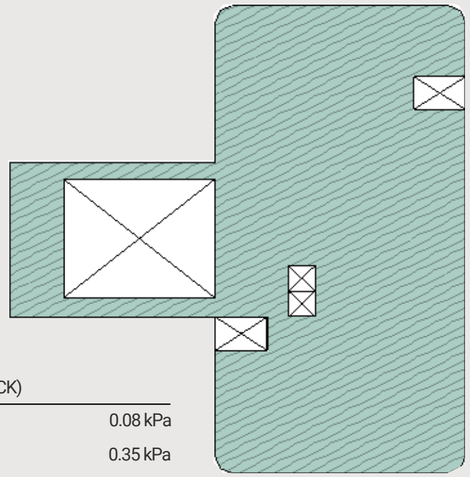
38 mm CANAM P3615
CORRUGATED STEEL DECK

W - SHAPED HOT ROLLED STEEL BEAMS
VARYING SIZES TO CARRY THE
UNIFORM LOAD FROM THE DECK

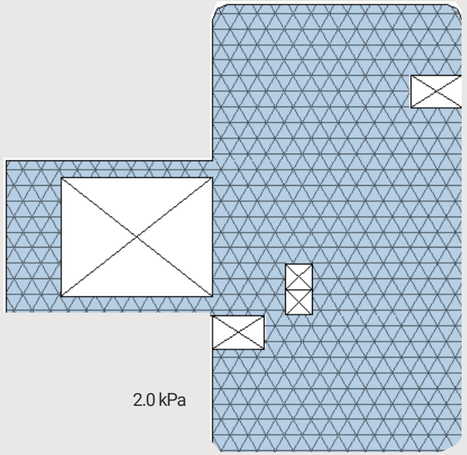
600 mm DEPTH CANAM OWSJ WITH
VARYING WEIGHTS BASED ON THE
APPLIED LOADS

600 mm DEPTH CANAM JOIST GIRDERS
WITH VARYING WEIGHTS BASED ON
THE LOADS FROM THE OWSJ





DEAD LOADS (38 METAL DECK)	
ROOF SELF WEIGHT	0.08 kPa
PV PANELS	0.35 kPa
GYPSUM BOARD	0.12 kPa
BALLAST	0.54 kPa
FRAMING ALLOWANCE	0.20 kPa
SUSPENDED	0.20 kPa
RTU ALLOWANCE	0.25 kPa
	1.6 kPa



SNOW LOAD 2.0 kPa

PRIMARY DC

STRUCTURE DESIGN

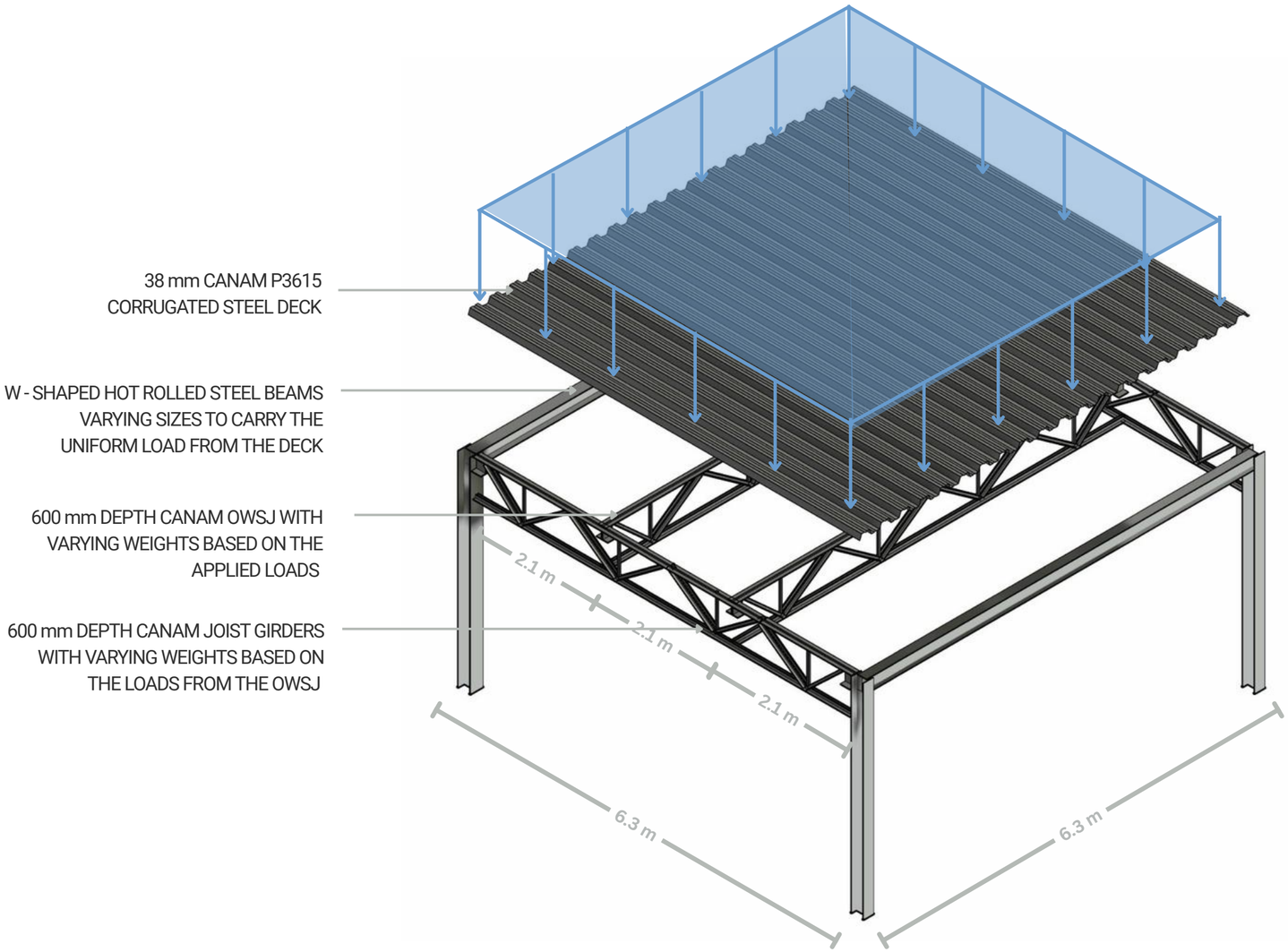
TYPICAL ROOF

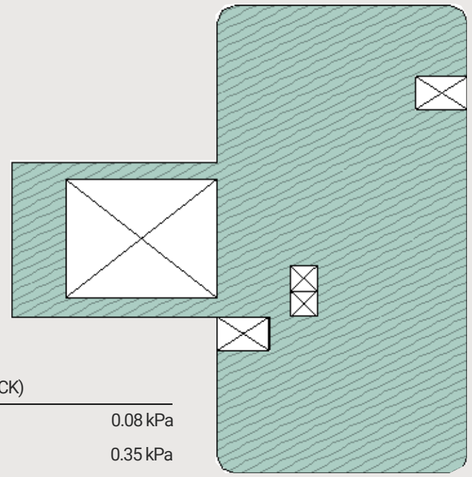
UDL → DECK → OWSJ → JOIST GIRDERS → COLUMNS

DECK → BEAMS → COLUMNS

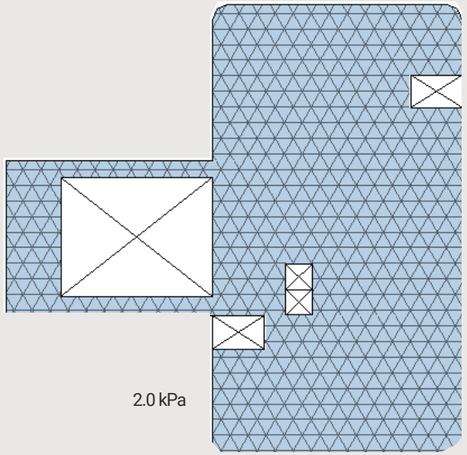
UNIFORMLY DISTRIBUTED LOAD

POINT LOAD





DEAD LOADS (38 METAL DECK)	
ROOF SELF WEIGHT	0.08 kPa
PV PANELS	0.35 kPa
GYPSUM BOARD	0.12 kPa
BALLAST	0.54 kPa
FRAMING ALLOWANCE	0.20 kPa
SUSPENDED	0.20 kPa
RTU ALLOWANCE	0.25 kPa
	1.6 kPa

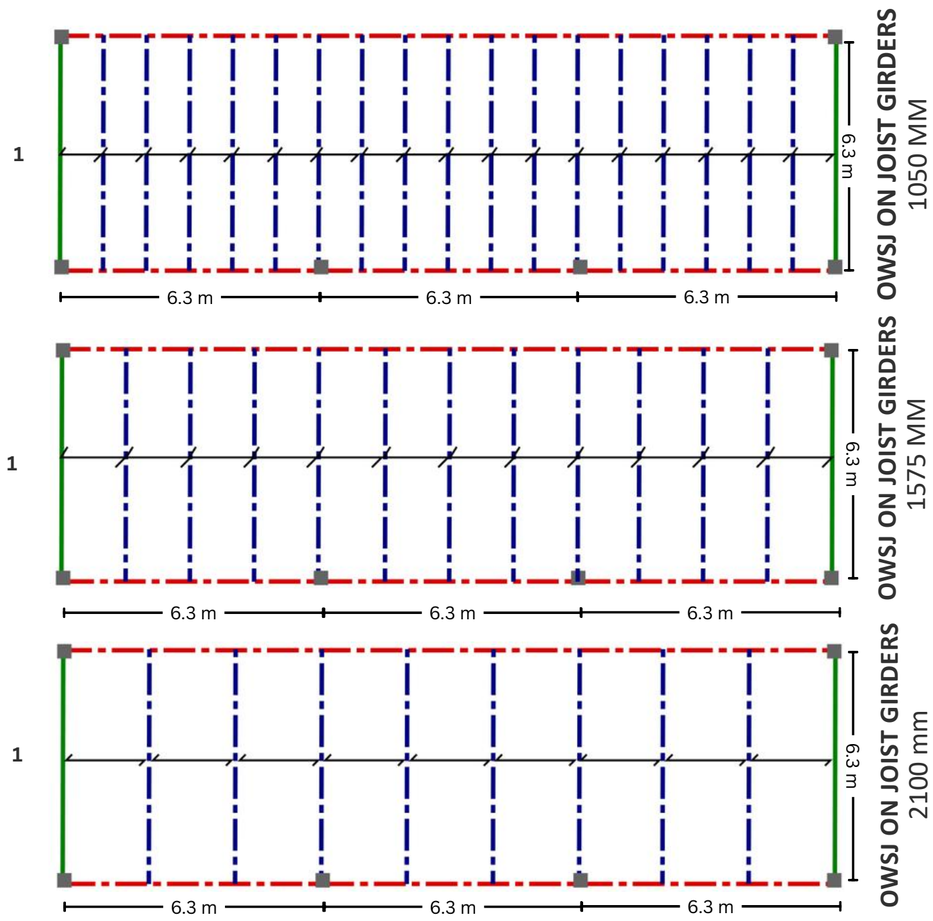


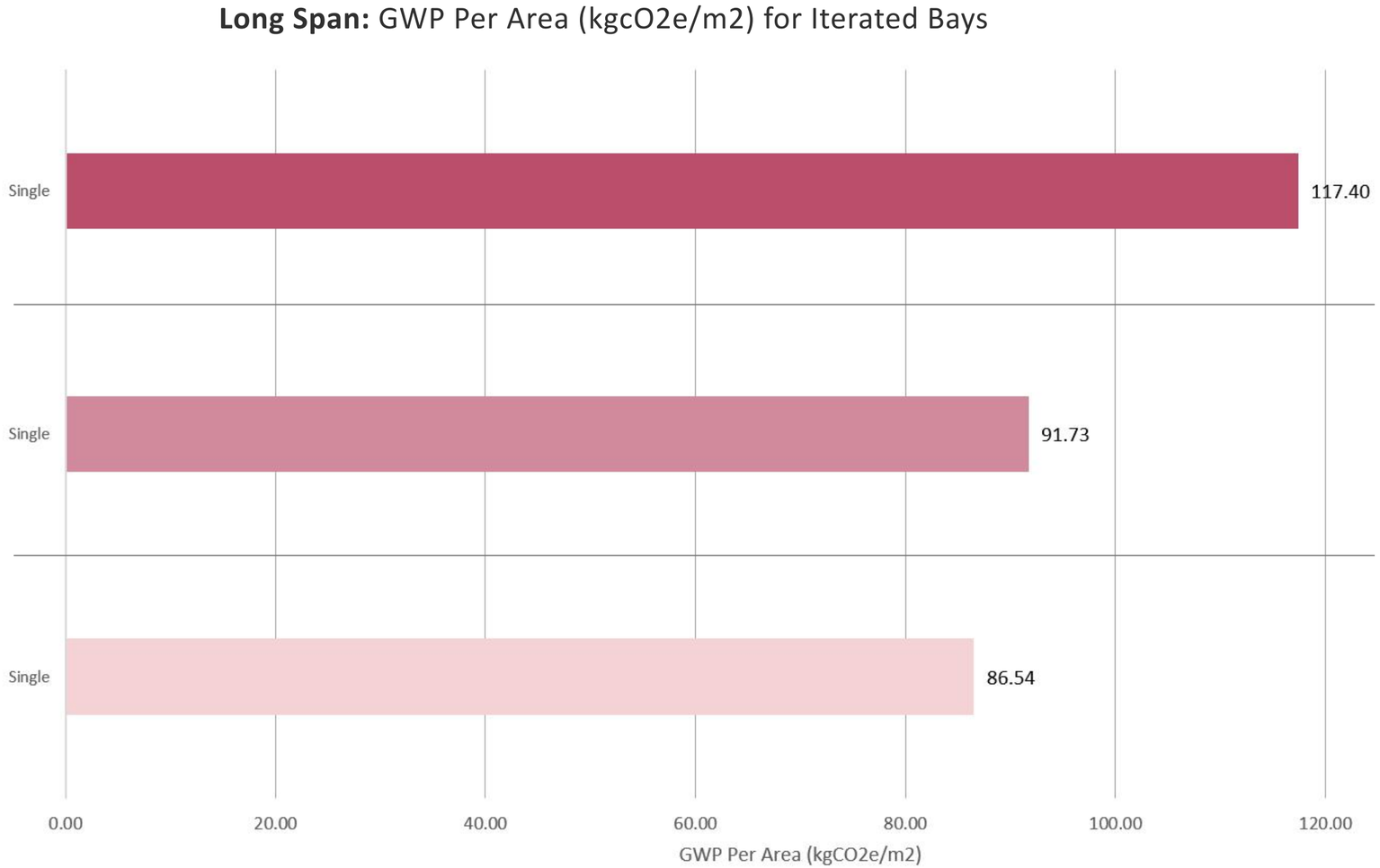
SNOW LOAD 2.0 kPa

SECONDARY DC

STRUCTURE CARBON ACCOUNTING

LONG-SPAN



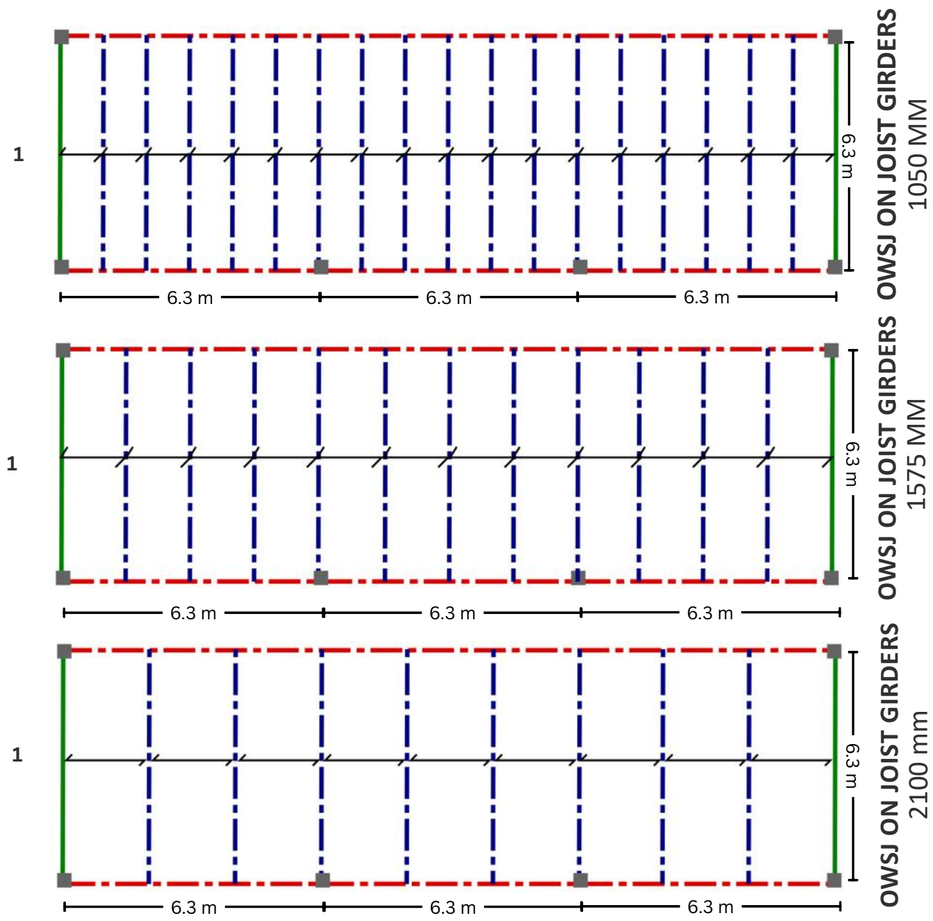


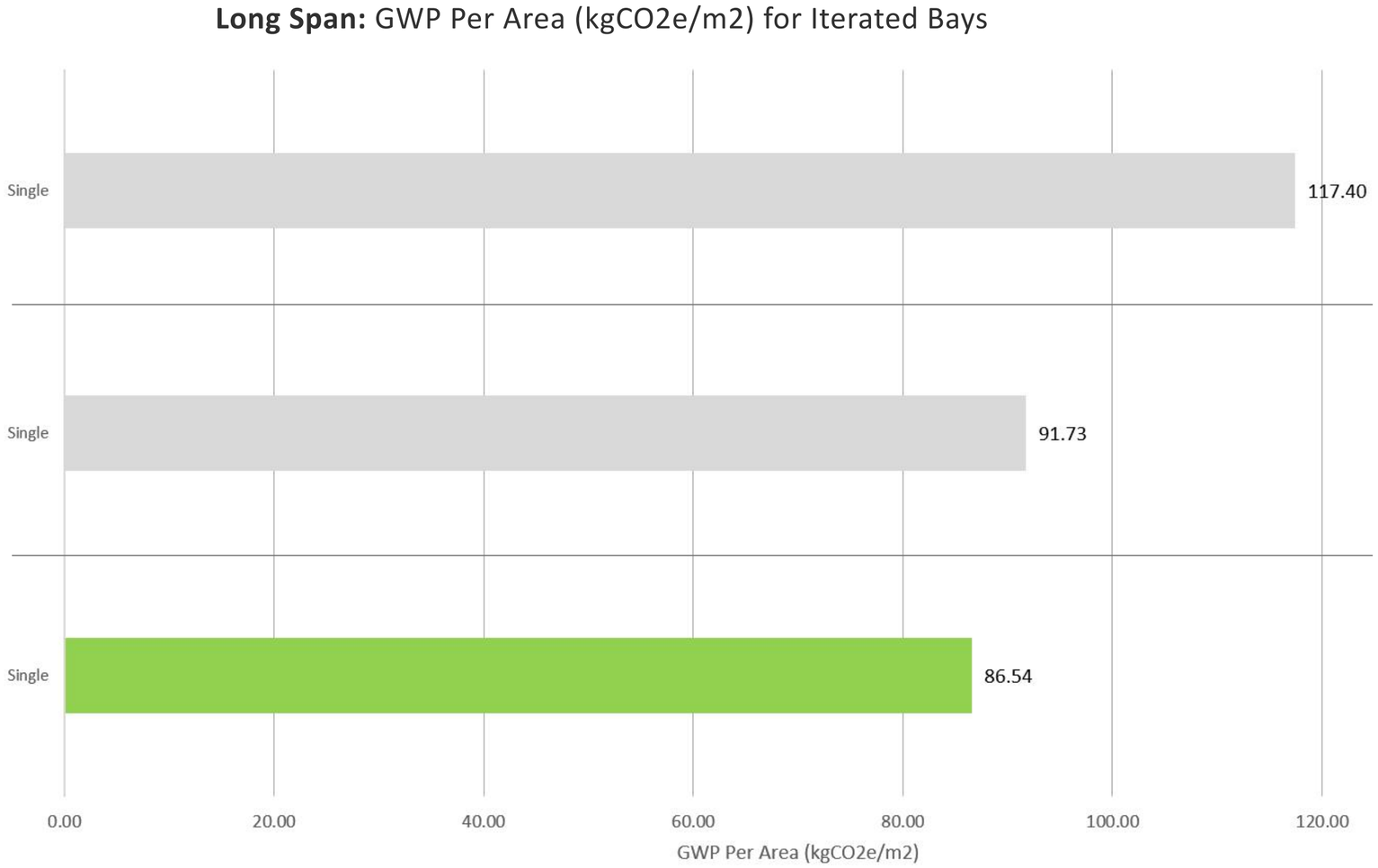
OPEN WEB STEEL JOIST (OWSJ)
JOIST GIRDER
BEAM
OUTSIDE OF SCOPE

SECONDARY DC

STRUCTURE CARBON ACCOUNTING

LONG-SPAN



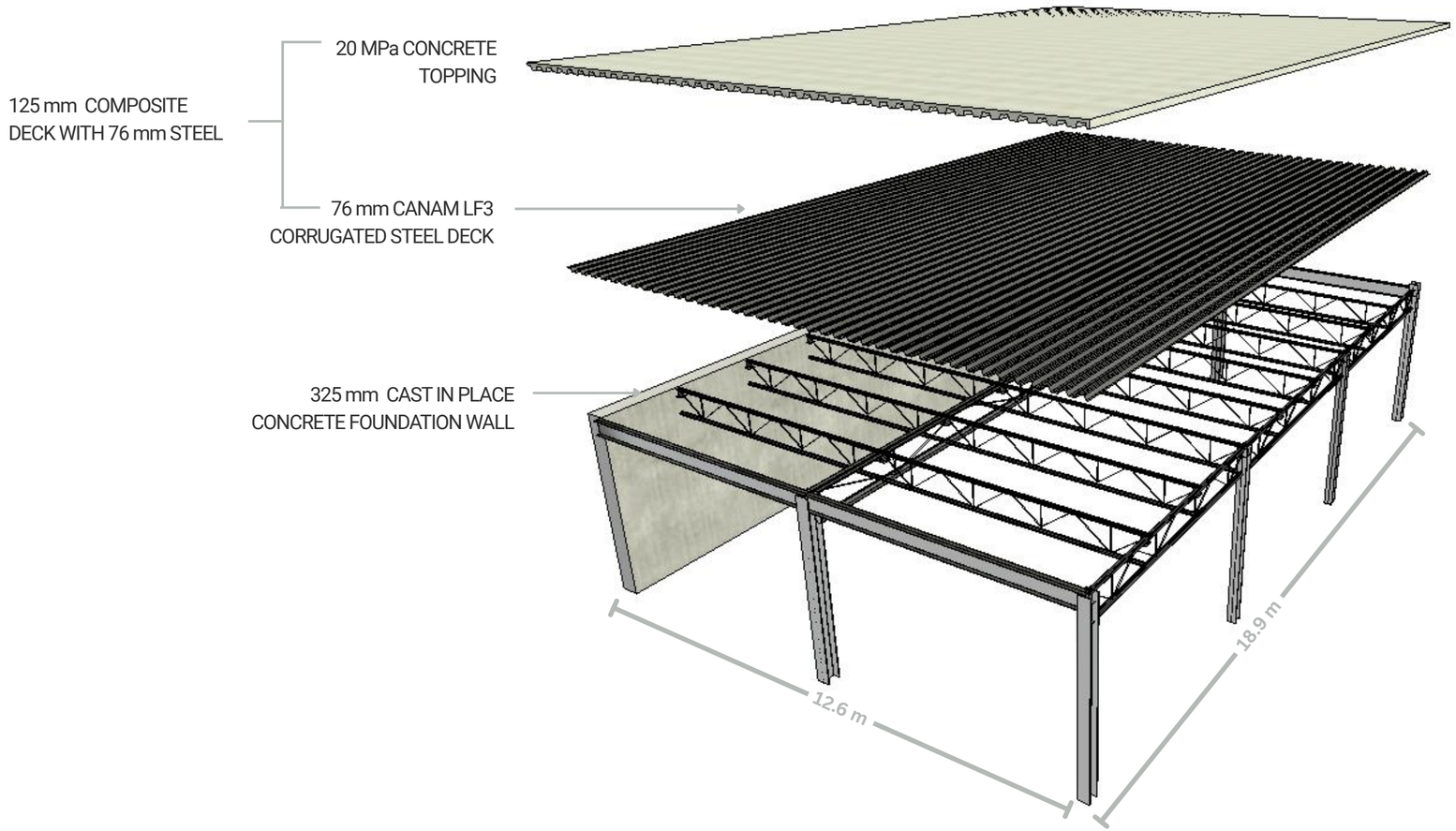


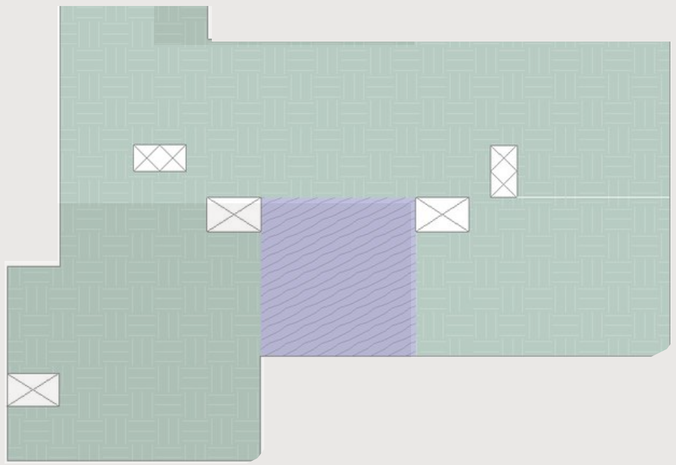
OPEN WEB STEEL JOIST (OWSJ)
JOIST GIRDER
BEAM
OUTSIDE OF SCOPE

PRIMARY DC

STRUCTURE

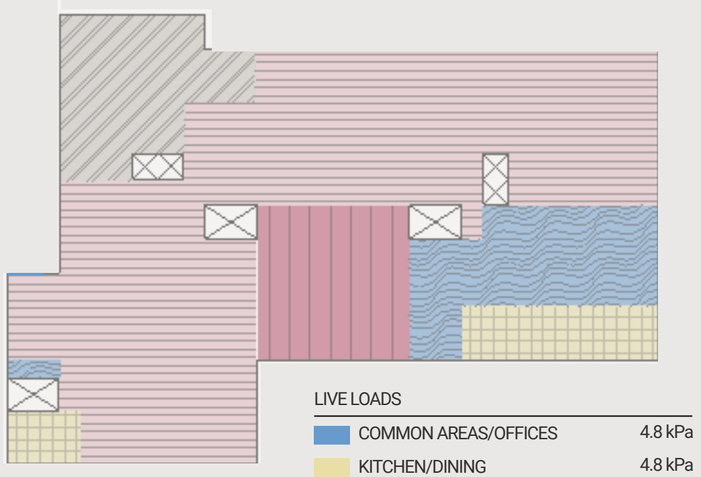
LONG-SPAN





DEAD LOAD (PAVERS)	
ROOF SELF WEIGHT	0.13 kPa
PV PANELS	0.35 kPa
GYPSUM BOARD	0.12 kPa
CONCRETE PAVERS	1.6 kPa
	2.2 kPa

DEAD LOAD (BALLAST)	
FLOOR SELF WEIGHT	2.13 kPa
CEILING	0.2 kPa
SUSPENDED	0.25 kPa
	2.6 kPa



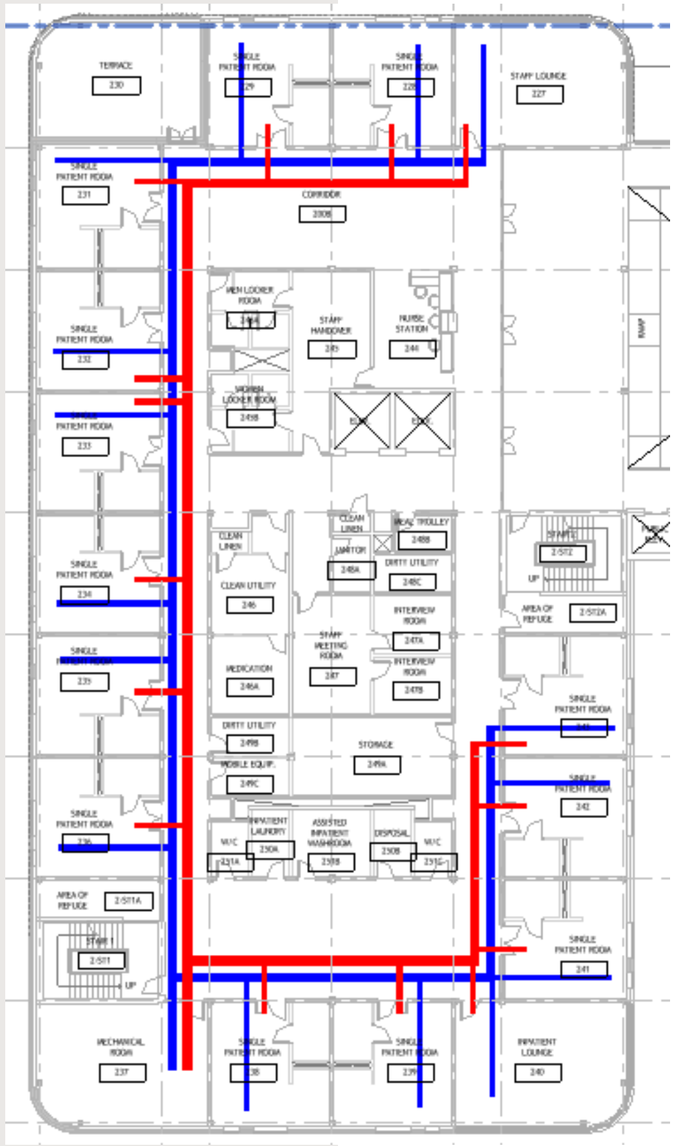
LIVE LOADS	
COMMON AREAS/OFFICES	4.8 kPa
KITCHEN/DINING	4.8 kPa
LANDSCAPING	4.8 kPa
MECH/ELEC ROOM	3.6 kPa

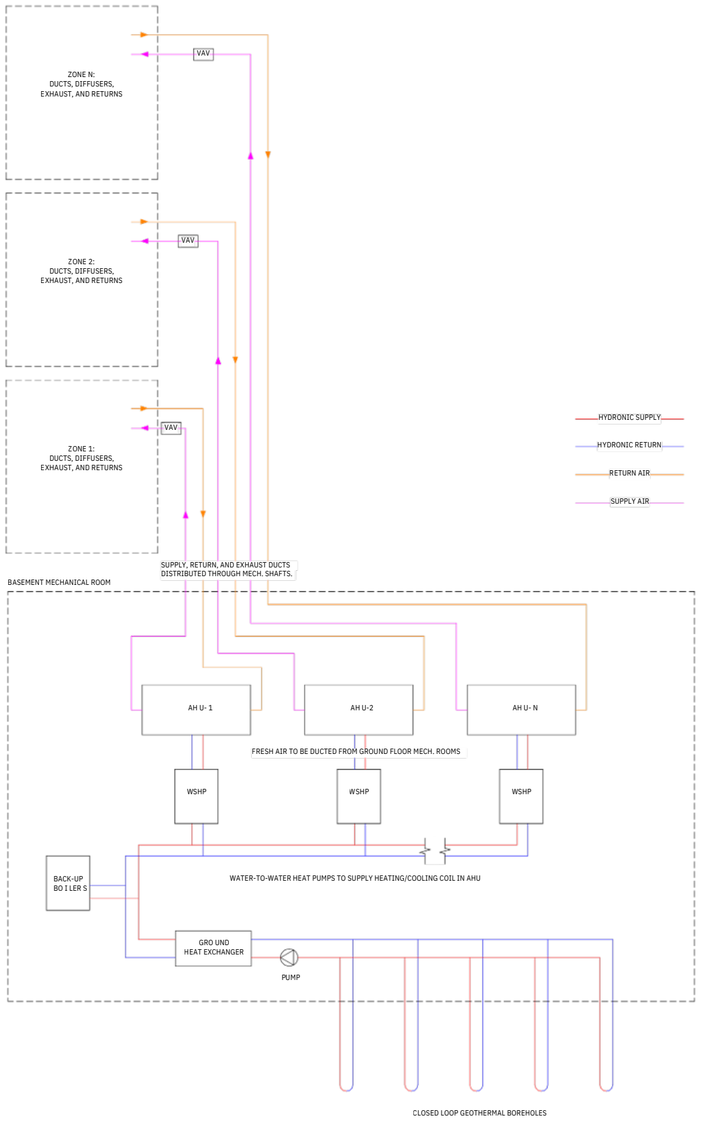
MECHANICAL

LEVEL 2 - LEVEL 6

- GEOTHERMAL BOREHOLES
- BACK-UP BOILER
- ZONE-SPECIFIC ACH

- DUCTS RUN THROUGH OWSJ
- DISTRIBUTED FROM HALLWAYS





PHASE 2 CONSIDERATIONS

STRUCTURAL PRIMARY DC

LATERAL SYSTEM

Shear walls assumed to support loads. Detailed calculations to be completed in Phase 2.

RAMP DESIGN

Tension rods assumed to support loads. Detailed calculations to be completed in Phase 2.

FOUNDATION DESIGN

Foundations assumed to support loads based on preliminary calculation: T(in) = Height(ft) - 2
Detailed calculations to be completed in Phase 2.

CONNECTIONS

Detailed connection drawings to be completed in Phase 2 with refinement of framing elements.

MECHANICAL SECONDARY DC

EQUIPMENT SELECTION

Mechanical equipment selection to be completed in Phase 2.

PLAN DRAWINGS

Plan drawings depicting ducting system location, diffuser/grille placement, and location of risers to be completed in Phase 2.

ISOMETRICS

Mechanical & plumbing isometric for typical inpatient room to be completed in Phase 2.

ENCLOSURE PRIMARY DC

CONNECTIONS

Detailed connection drawings to be completed in Phase 2.

HYGROTHERMAL ANALYSIS

Detailed analysis to be completed in Phase 2 with refinement of assemblies

PERFORMANCE ANALYSIS

Representative performance analyses to be completed in Phase 2

ACKNOWLEDGEMENTS

CAMERON SETH

Professional Squash Player
PhD Student

DR. FRANCE NOEL DE TILLY

Sports Medicine Practitioner (MD)
Chief Medical Officer at Skate Canada

DAVID MATHER

Associate Professor
Mechanical Engineering

ANDREA ATKINS

Associate Professor
Structural Engineering & Accessibility

CORY ZURELL

Associate Professor
Structural Engineering

COSTA KAPSIS

Assistant Professor
Building Engineering

SHIYU WEI

Assistant Professor
Architecture & Code

ASHLEY JURASCHKA

Teaching Assistant

MAPENDO NGILINGA DE CARVALHO

Teaching Assistant

GUEST CRITIQUERS

THANK YOU! we hope you have a sunny day ☀️

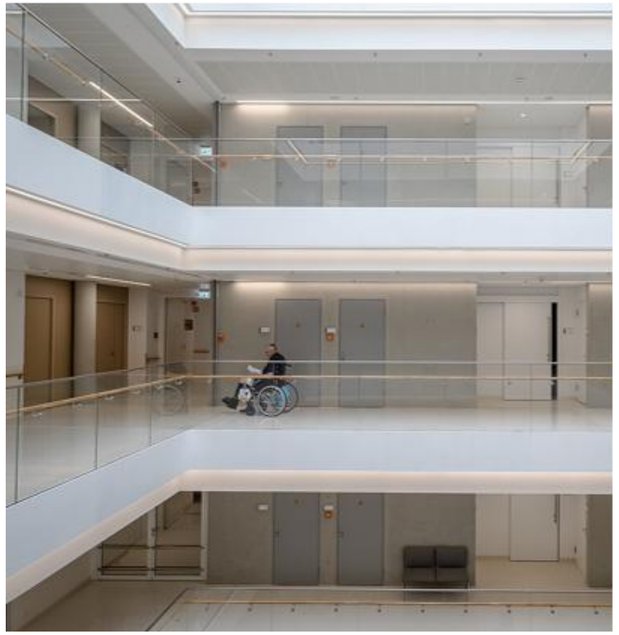
REFERENCES

https://climatestudiodocs.com/docs/daylightLEEDOpt1.html
https://www.arup.com/globalassets/downloads/insights/net-zero-carbon-healthcare.pdf
https://www.canam.com/en/engineering-tools/
https://www.ctvnews.ca/kitchener/article/only-one-bed-available-at-grand-river-hospital-amid-unprecedented-level-of-pressure/ https://www.waterlooedc.ca/blog/waterloo-fastest-growing-community-canada-2024 https://news.ontario.ca/en/release/1002079/ontario-building-a-stronger-more-resilient-health-care-system-in-waterloo-region https://www.cbc.ca/news/canada/canada-hospitals-wait-times-9.7123684
https://pmc.ncbi.nlm.nih.gov/articles/PMC3999549/ https://frameweb.com/article/biophilic-design-paves-way-for-human-centric-care-at-this-dutch-hospitalhttps://www.archdaily.com/783542/the-christ-hospital-joint-and-spine-center-som https://www.archdaily.com/994120/main-building-radboudumc-egm-architects https://www.lamilux.com/hub/health-and-daylight/healing-healthcare-architecture-in-hospitals.html
https://www.swecogroup.com/portfolio/architecture/university-hospital-bonn/ https://www.bg-kliniken.de/unfallkrankenhaus-berlin/besucher/
https://www.archdaily.com/1025439/tampere-psychiatric-clinic-cf-moller https://www.archdaily.com/933182/the-financial-park-helen-and-hard-architects-plus-saaha https://www.archdaily.com/971040/architecture-project-for-the-34th-bienal-de-arte-de-sao-paulo-andrade-morettin-arquitetos-associados
https://www.archdaily.com/170369/garden-5-tool-destefano-partners https://letsmakecozy.com/35-modern-house-exterior-ideas/?utm_source=Pinterest&utm_medium=organic https://cadmapper.com/
https://www.healthfacilityguidelines.com/ViewPDF/ViewIndexPDF/iHFG_part_b_pharmacy_unit
https://www.healthfacilityguidelines.com/ViewPDF/ViewIndexPDF/iHFG_part_b_outpatients_unit
https://www.healthfacilityguidelines.com/ViewPDF/ViewIndexPDF/iHFG_part_b_main_entrance_unit
https://www.healthfacilityguidelines.com/ViewPDF/ViewIndexPDF/iHFG_part_b_rehabilitation_allied_health
https://www.healthfacilityguidelines.com/ViewPDF/ViewIndexPDF/iHFG_part_b_admissions_unit-discharge
https://www.healthfacilityguidelines.com/ViewPDF/ViewIndexPDF/iHFG_part_b_administration
https://www.healthfacilityguidelines.com/ViewPDF/ViewIndexPDF/iHFG_part_b_engineering-maintenance_unit
https://www.healthfacilityguidelines.com/ViewPDF/ViewIndexPDF/iHFG_part_b_catering_unit
https://www.healthfacilityguidelines.com/ViewPDF/ViewIndexPDF/iHFG_part_b_ipu_rehabilitation_unit
https://alumicor.com/products/curtainwall/thermawall-tw2200/

APPENDIX A1

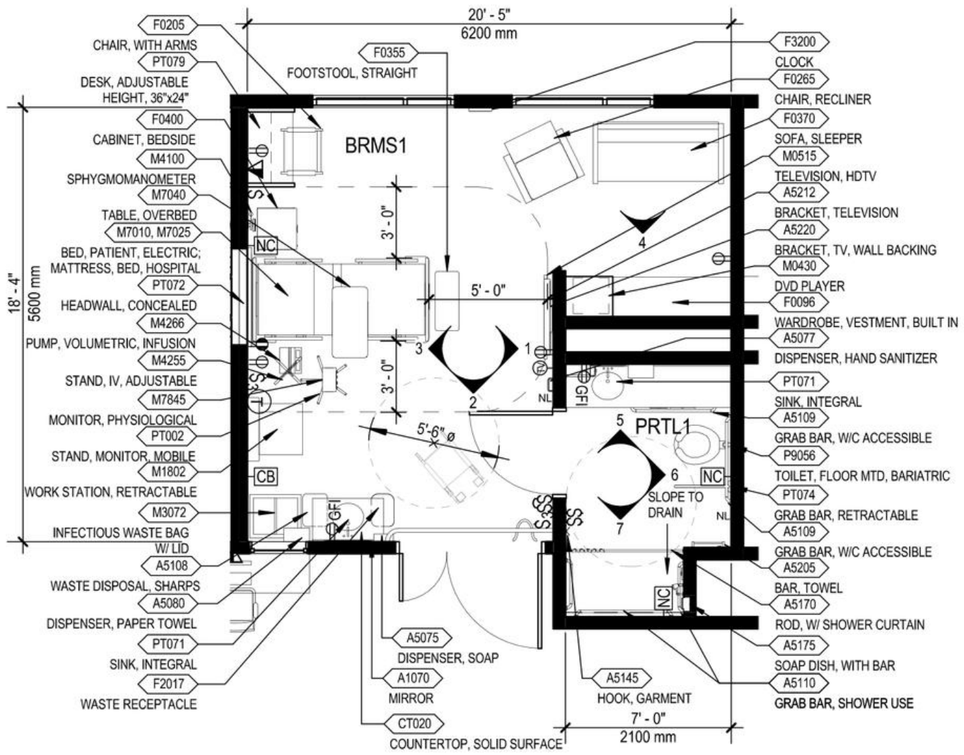
ARCHITECTURE
PRECENDENTS

EXTERIOR/INTERIOR



TYP INPATIENT ROOM

Bedroom, Patient (BRMS1); Toilet/Shower, Patient (PRTL1) – Option 2



SCALE: 3/16" = 1'-0"

0' 6' 12'

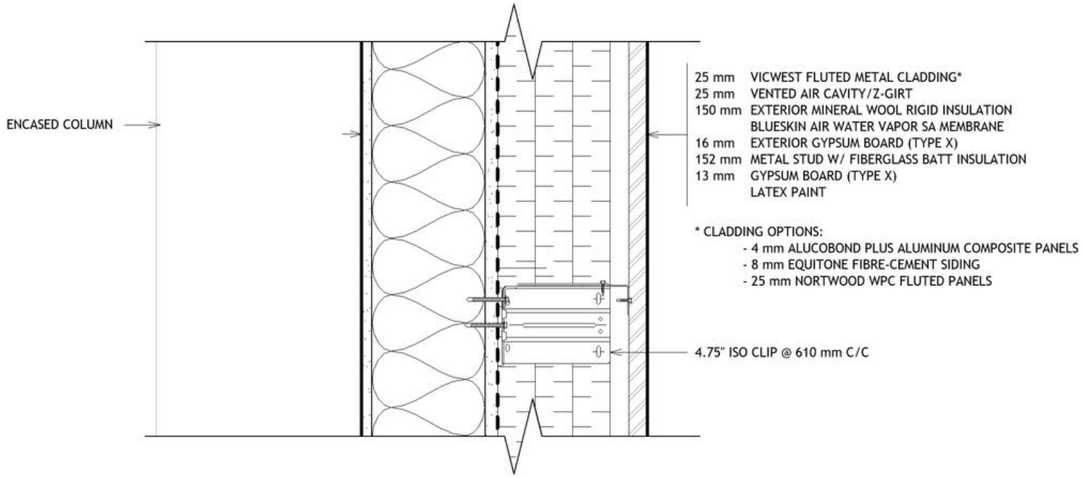
Polytrauma Rehabilitation Center • Inpatient Unit
Floor/Equipment Plan (300 NSF/27.9 NSM; 75 NSF/7.0 NSM)

NOTE: Guide plates are graphical representations of selected room types, illustrating the integration of space, components, systems, and equipment. They provide typical configurations and general technical guidance, and are not intended to be project specific. Specific infrastructure design requirements are contained in VA Design Manuals and Space Planning Criteria located in the VA Technical Information Library.

APPENDIX B1

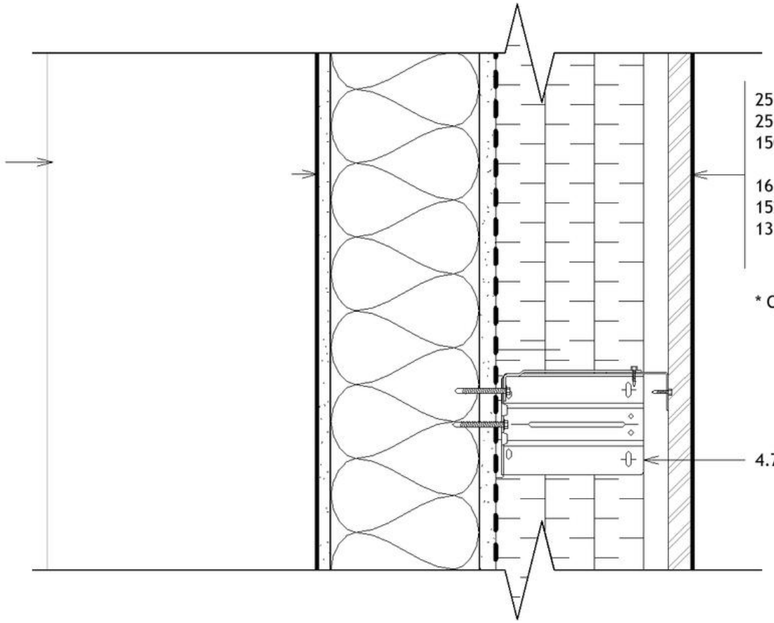
ENCLOSURE
DRAWINGS

WALL SANDWICH



Layer	Interface	Description	k (W/mK)	L (mm)	RSI (m^2K/W)	R-Value (°F ft^2 h/BTU)	Notes and Assumptions
		Indoors					
1		Interior Film	-	-	0.12	0.68	T.5.4 - Vertical, Normal Emissivity
	1						
2		Latex Paint	-	-	-		
	2						
3		Gypsum Board	0.16	13	0.08	0.46	T.5.1 - Average k for the range from 0.15-0.21 W/mK
	3						
4		Metal Studs & Mineral Wool Batt		152	1.34	7.61	Mineral Wool insulatation added between the studs to provide sound proofing, R-Value Obtained using Table 5.8 Straube
	4						
5		Exterior Gypsum Board	0.2	16	0.08	0.454	T.5.1 - Average k for the range from 0.19-0.21 W/mK
	5						
6		Blueskin Air Water Vapor Barrier	-	-	-	-	Blueskin VP100 Self Adhered Membrane
	6						
7		Exterior Mineral Wool Insulation	0.037	150	4.05	23.019	T.5.1 - Stonewool Roof Insulation (water-resistant material)
	7						
8		Vented Air Cavity		25	0.18	1.02	Using Straube 5.1.8 and NBCC - thermal resistance for air space between 20 and 90mm
	8						
9		Various Cladding	-	-	-	-	
	9						
10		Exterior Film			0.030	0.17	T.5.4 - Winter Conditions, Normal Emissivity
		Outdoors					
					5.89	**33.42**	

WALL SANDWICH



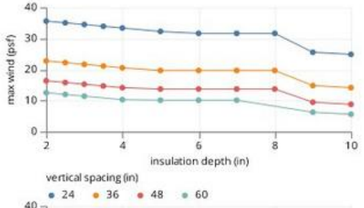
isoclip
THERMAL ISOLATION CLIP

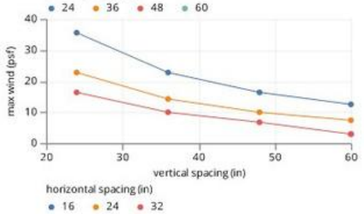
Wall description

AE400 - STEPS REHABILITATION TYPICAL WALL

Structural capacity

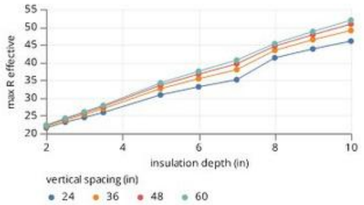
The charts below show the maximum wind load plotted against insulation depth and against vertical spacing. These are the maximum confirmed scenarios out of the entire set of configurations that satisfy the clip parameters you have specified. Changes in any line's trend usually indicate that some part of the configuration has changed, eg. from a 2" to a 3.25" ISO Clip depth.

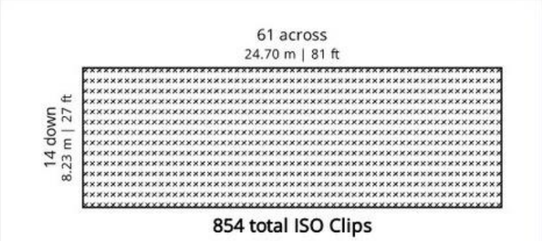




Thermal performance

The charts below show the maximum effective thermal performance plotted against insulation depth. These are the maximum confirmed scenarios out of the entire set of configurations that satisfy the clip parameters you have specified. Changes in any line's trend usually indicate that some part of the configuration has changed, eg. from a 2" to a 3.25" ISO Clip depth.





Clip parameters

Structural design method	Limit States Design (Canada)
Insulation depth	150mm | 6in
ISO Clip bracket size	120mm | 4.75in
Exterior insulation effectiveness	0.70 RSI per 25.4mm | 4 R per in
Back-up wall	20 ga metal framing
Include cavity insulation?	Yes
Add thermal insulation tape?	—
Girt orientation	Horizontal
Horizontal spacing	405mm | 16in
Cladding dead load	0.19kPa | 4psf
Vertical spacing	610mm | 24in
Consider girts?	Yes
Girt gauge	18 ga
Available girt depth(s)	2.50in
Fastener arrangement	3 screw arrangement (corner)

Your results

Your chosen horizontal spacing	405mm | 16in
Your chosen vertical spacing	610mm | 24in
Maximum possible vertical spacing	610mm | 24in
Maximum specified wind load	1.51kPa | 31.62psf
Governing component	bracket-to-substrate connection
Maximum possible effective R-value	RSI 5.22 | R-29.63
ISO Clip count (per unit area)	4.03 per m² | 0.38 per ft²

Remarks

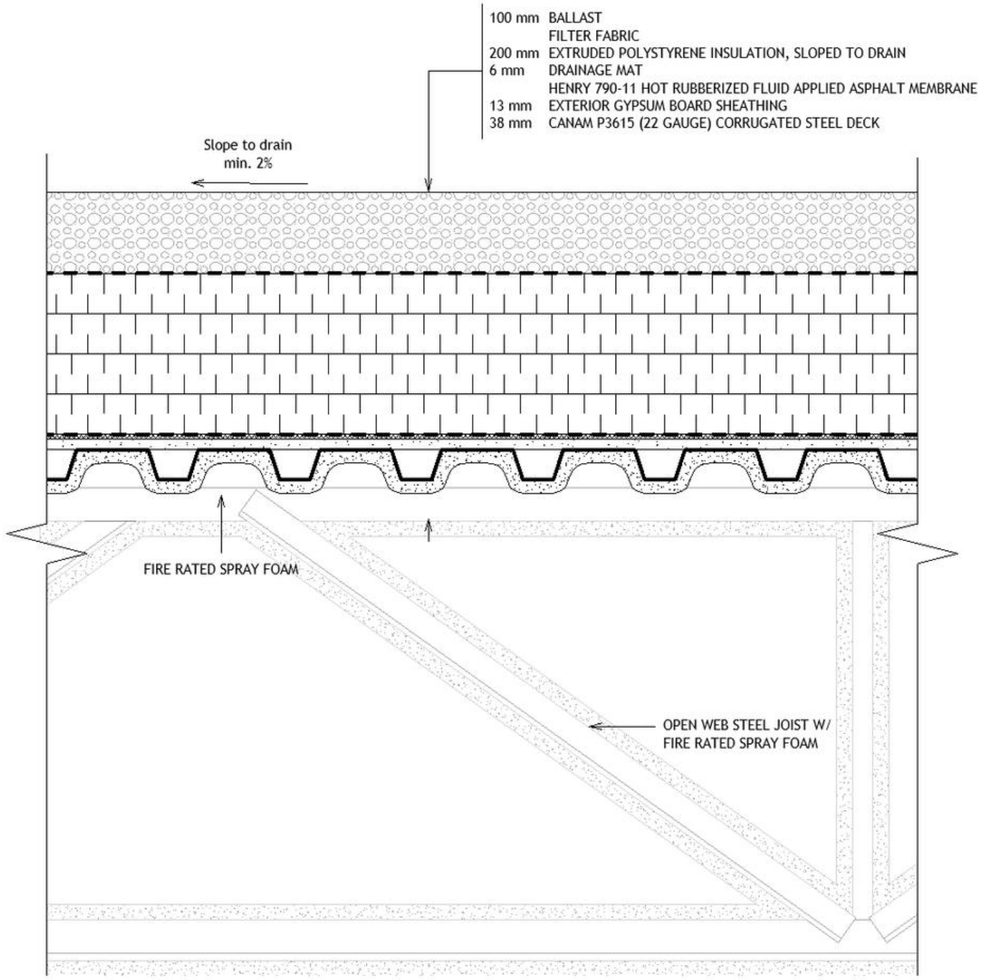
ROOF SANDWICH

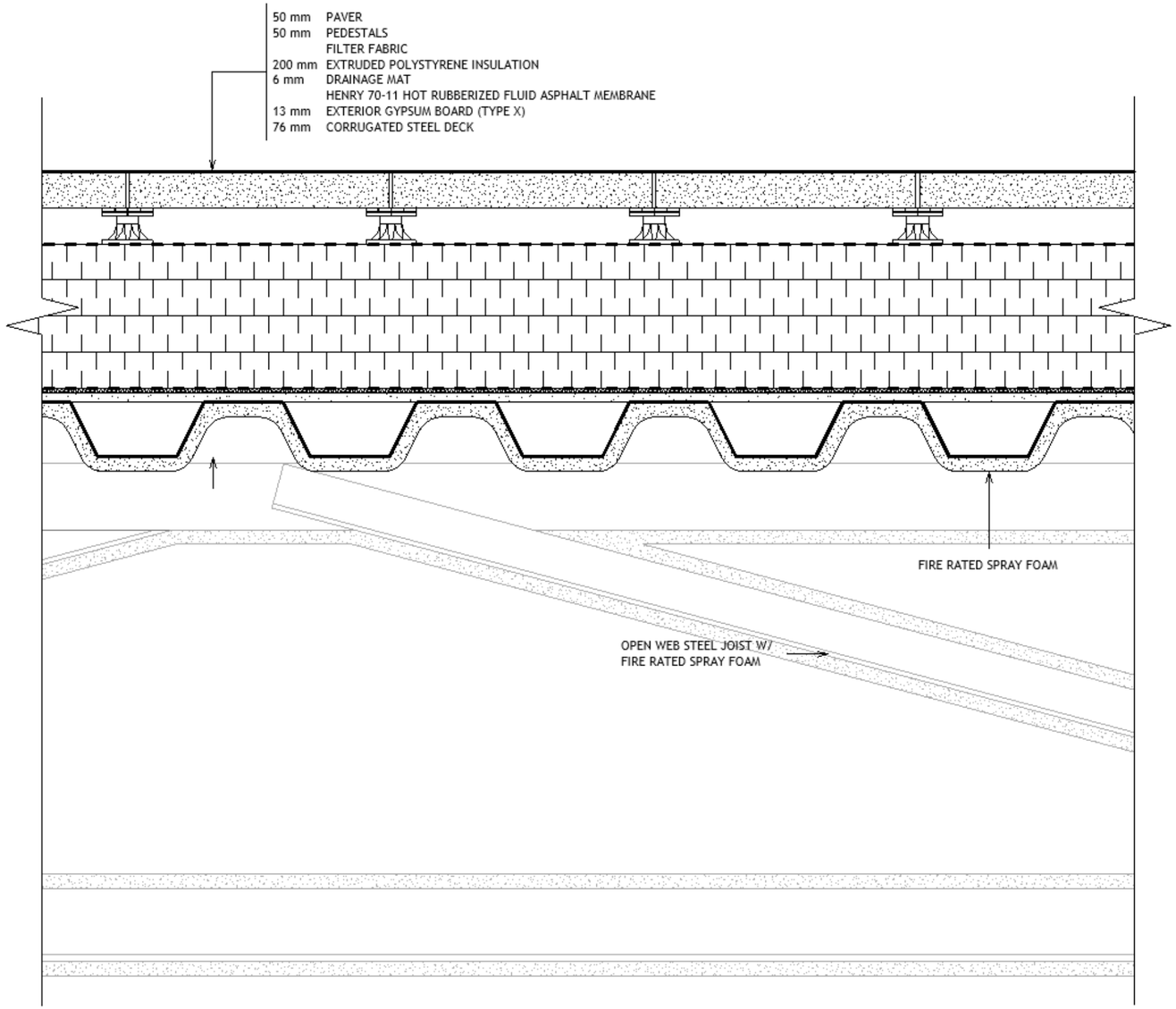
Layer	Interface	Description	k (W/mK)	L (mm)	RSI (m^2K/W)	R-Value (°F ft^2 h/BTU)	Notes and Assumptions
		Indoors					
1		Interior Film	-	-	0.11	0.61	T.5.4 - Interior Film, Horizontal Surface, Upwards
	1						
2		Corrugated Steel Deck	2	90	-	-	T.5.1 - Negligeable
	2						
3		Exterior Gypsum Board Sheathing	0.2	13	0.07	0.369	T.5.1 - Average k for the range from 0.19-0.21 W/mK
	3						
4		Henry 790-11 Hot Ruberized Fluid Applied Roof Membrane	-	-	-	-	https://www.henry.com/en-CA/commercial/products/waterproofing/hot-rubberized-asphalt/790-11-hot-rubberized-asphalt-membrane/#technical-installation-section
	4						
5		Drainage Mat	-	6	-	-	
	5						
6		Extruded Polystyrene Insulation	0.029	200	6.90	39.16	T.5.1
	6						
7		Filter Fabric	-	-	-	-	
	7						
8		Ballast	-	-	-	-	
	8						
9		Exterior Film		0.030	0.17	0.21	T.5.4 - Winter Conditions, Normal Emissivity
		Outdoors					
					7.239	**40.35**	

POOL ROOF SANDWICH

Layer	Interface	Description	k (W/mK)	L (mm)	RSI (m^2K/W)	R-Value (°F ft^2 h/BTU)	Notes and Assumptions
		Indoors					
1		Interior Film	-	-	0.11	0.61	T.5.4 - Interior Film, Horizontal Surface, Upwards
	1						
2		Corrugated Steel Deck with Concrete Topping	0.16	49	0.31	1.74	T.5.1 - Average k for the range from 1.4-2.5 W/mK, Concrete thickness on top of corrugated steel decking (125mm - 76mm), concrete between flutes and steel neck are negligeable
	2						
4		Henry 790-11 Hot Ruberized Fluid Applied Roof Membrane	-	-	-	-	https://www.henry.com/en-CA/commercial/products/waterproofing/hot-rubberized-asphalt/790-11-hot-rubberized-asphalt-membrane/#technical-installation-section
	4						
5		Drainage Mat	-	6	-	-	
	5						
6		Extruded Polystyrene Insulation	0.029	200	6.90	39.16	T.5.1
	6						
7		Filter Fabric	-	-	-	-	
	7						
8		Pedastals with Concrete Pavers	-	-	-	-	
	8						
9		Exterior Film		0.030	0.17	0.21	T.5.4 - Winter Conditions, Normal Emissivity
		Outdoors					
					7.480	**41.72**	

ROOF & POOL ROOF SANDWICH





FOUNDATION WALL & SLAB

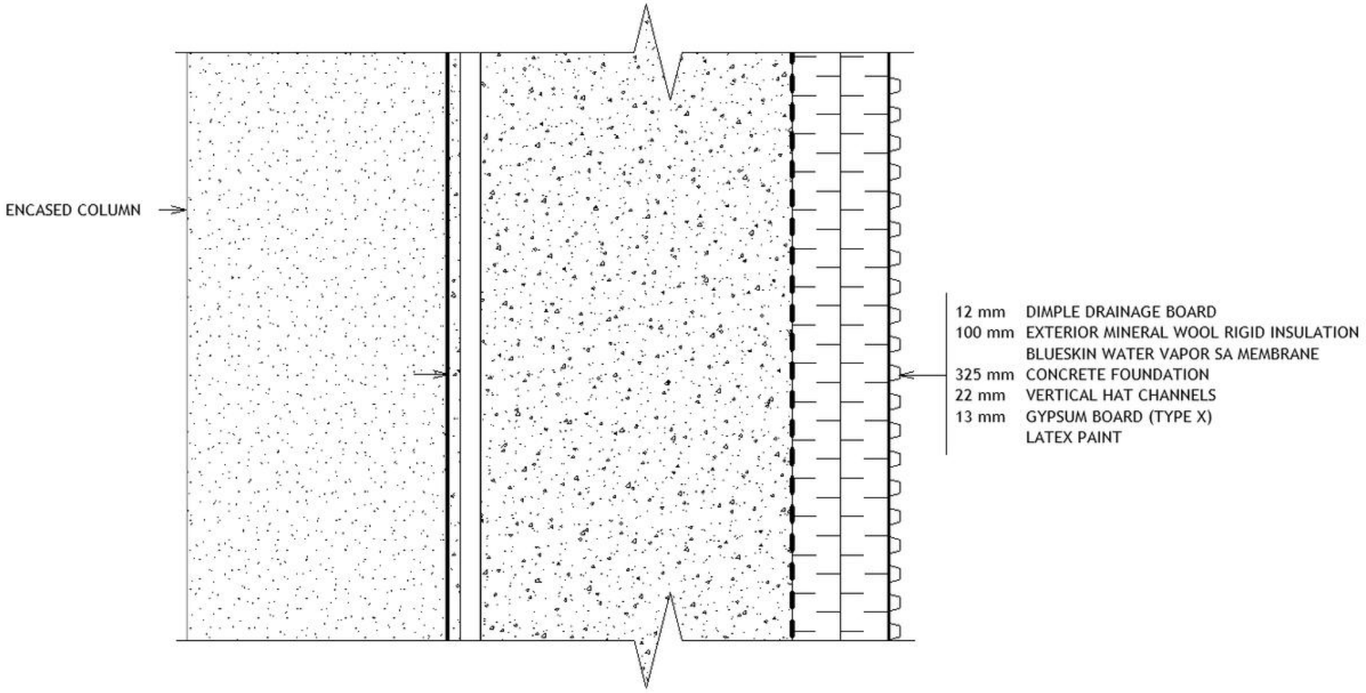
FOUNDATION WALL

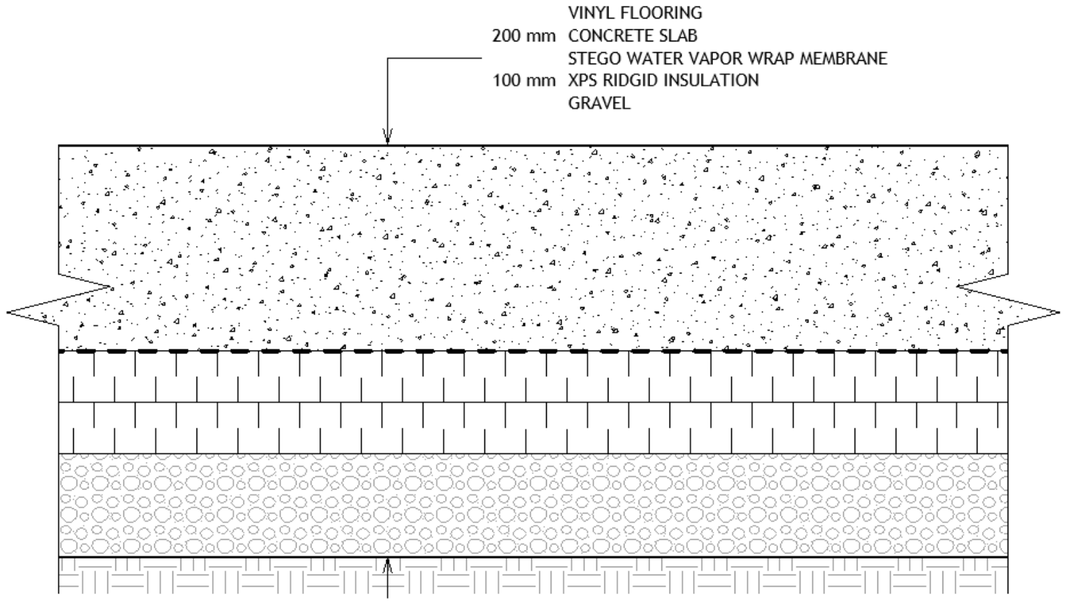
Layer	Interface	Description	k (W/mK)	L (mm)	RSI (m^2K/W)	R-Value (°F ft^2 h/BTU)	Notes and Assumptions
		Indoors					
1		Interior Film	-	-	0.12	0.68	T.5.4 - Vertical, Normal Emissivity
	1						
2		Gypsum Board	0.16	13	0.08	0.46	T.5.1 - Average k for the range from 0.15-0.21 W/mK
	2						
3		Hat Channels	-	22	-	-	
	3						
4		Concrete Foundation Wall	1.95	325	0.17	0.95	T.5.1 - Average k for the range from 1.4-2.5 W/mK
	4						
5		Blueskin Air Water Vapor Barrier	-	-	-	-	Blueskin VP100 Self Adhered Membrane
	5						
6		Extruded Polystyrene Insulation	0.029	100	3.45	19.58	T.5.1
	6						
7		Exterior Film		0.030	0.17	0.21	T.5.4 - Winter Conditions, Normal Emissivity
		Outdoors					
					3.986	**21.88**	

BASEMENT SLAB

Layer	Interface	Description	k (W/mK)	L (mm)	RSI (m^2K/W)	R-Value (°F ft^2 h/BTU)	Notes and Assumptions
		Indoors					
1		Interior Film	-	-	0.164	0.93	T.5.4 - Horizontal, Normal Emissivity, Downwards
	1						
2		Concrete Slab	1.95	200	0.10	0.58	T.5.1 - Average k for the range from 1.4-2.5 W/mK
	2						
3		Stego Vapor & Air Wrap Membrane	-	-	-	-	https://www.stegoindustries.com/products/vapor-barrier-15-mil
	3						
4		Extruded Polystyrene Insulation	0.029	100	3.45	19.58	T.5.1
	4						
5		Exterior Film		0.030	0.17	0.21	T.5.4 - Winter Conditions, Normal Emissivity
		Outdoors					
					3.885	**21.31**	

FOUNDATION WALL & SLAB

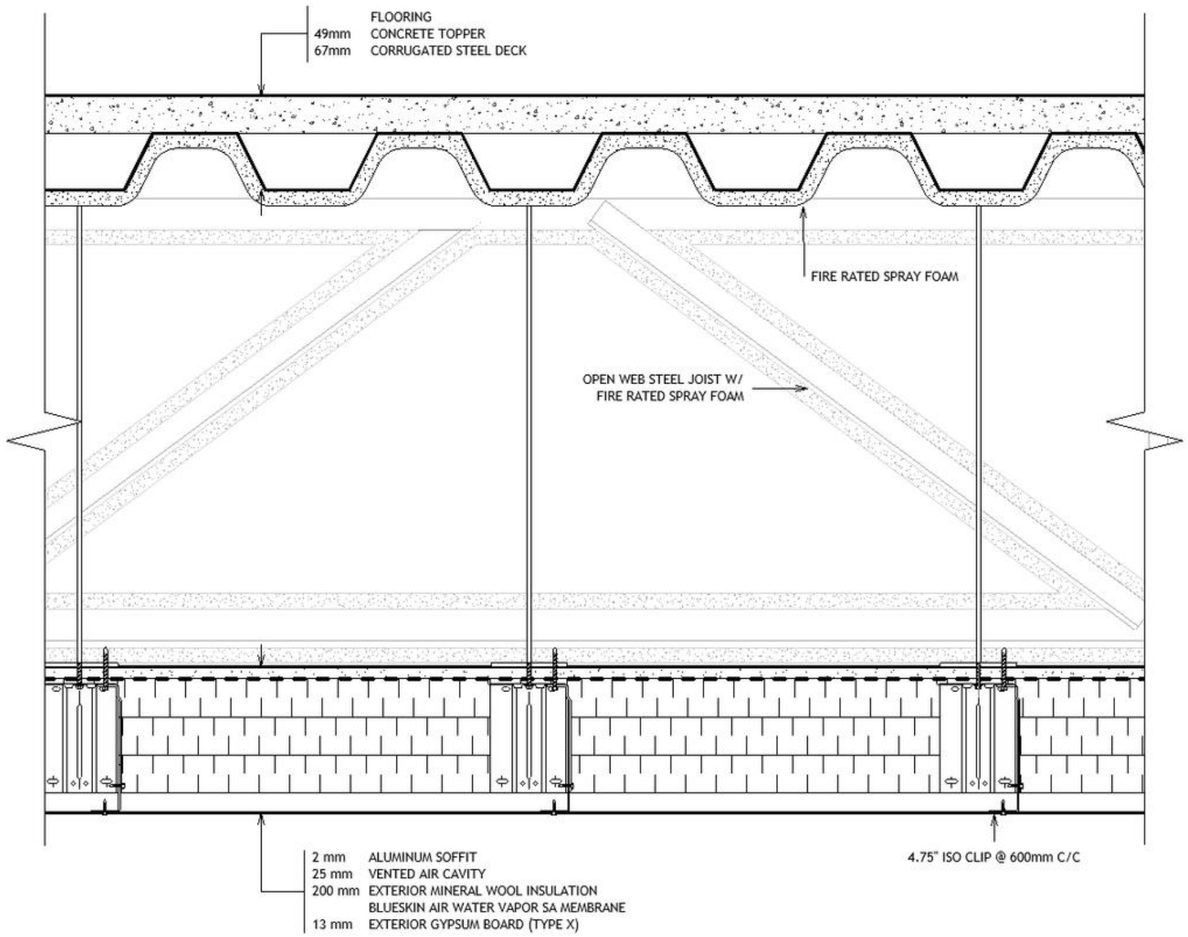




SOFFIT SANDWICH

Layer	Interface	Description	k (W/mK)	L (mm)	RSI (m^2K/W)	R-Value ($°F\ ft^2\ h/BTU$)	Notes and Assumptions
		Indoors					
1		Interior Film	-	-	0.164	0.93	T.5.4 - Horizontal, Normal Emissivity, Downwards
	1						
2		OWSJ	-	-	-	-	Negligeable Air Cavity
	2						
3		Exterior Gypsum Board	0.2	16	0.08	0.454	T.5.1 - Average k for the range from 0.19-0.21 W/mK
	3						
4		Blueskin Air Water Vapor Barrier	-	-	-	-	Blueskin VP100 Self Adhered Membrane
	4						
5		Exterior Mineral Wool Insulation	0.037	150	4.05	23.019	T.5.1 - Stonewool Roof Insulation (water-resistant material)
	5						
6		Vented Air Cavity		25	0.18	1.02	Using Straube 5.1.8 and NBCC - thermal resistance for air space between 20 and 90mm
	6						
7		Aluminum Vented Soffit	-	-	-	-	
	7						
8		Exterior Film			0.030	0.17	T.5.4 - Winter Conditions, Normal Emissivity
		Outdoors					
					4.51	**25.60**	

SOFFIT SANDWICH



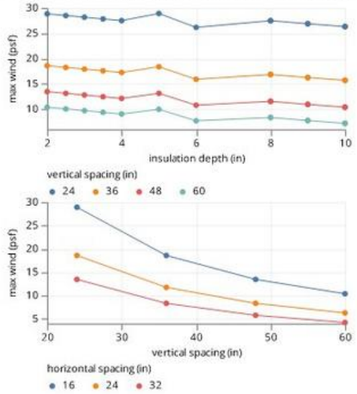
isoclip
THERMAL ISOLATION CLIP

Soffit

AE400 - STEPS REHABILITATION

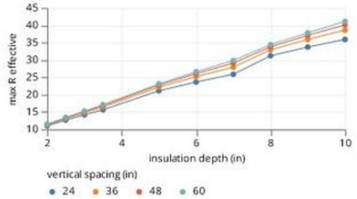
Structural capacity

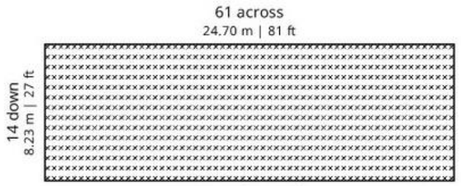
The charts below show the maximum wind load plotted against insulation depth and against vertical spacing. These are the maximum confirmed scenarios out of the entire set of configurations that satisfy the clip parameters you have specified. Changes in any line's trend usually indicate that some part of the configuration has changed, eg. from a 2" to a 3.25" ISO Clip depth.



Thermal performance

The charts below show the maximum effective thermal performance plotted against insulation depth. These are the maximum confirmed scenarios out of the entire set of configurations that satisfy the clip parameters you have specified. Changes in any line's trend usually indicate that some part of the configuration has changed, eg. from a 2" to a 3.25" ISO Clip depth.





854 total ISO Clips

Clip parameters

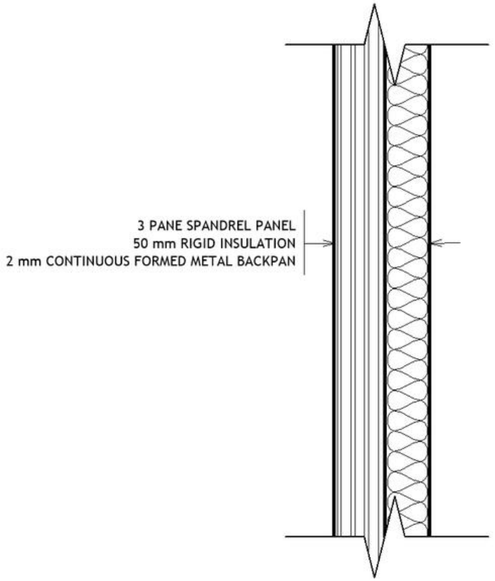
Structural design method	Limit States Design (Canada)
Insulation depth	150mm | 6in
ISO Clip bracket size	85mm | 3.25in
Exterior insulation effectiveness	0.70 RSI per 25.4mm | 4 R per in
Back-up wall	20 ga metal framing
Include cavity insulation?	No
Add thermal insulation tape?	—
Girt orientation	Horizontal
Horizontal spacing	405mm | 16in
Cladding dead load	0.14kPa | 3psf
Vertical spacing	610mm | 24in
Consider girts?	No
Girt gauge	—
Available girt depth(s)	4.50in
Fastener arrangement	2 screw arrangement

Your results

Your chosen horizontal spacing	405mm | 16in
Your chosen vertical spacing	610mm | 24in
Maximum possible vertical spacing	610mm | 24in
Maximum specified wind load	1.25kPa | 26.16psf
Governing component	bracket-to-substrate connection
Maximum possible effective R-value	RSI 3.20 | R-18.19
ISO Clip count (per unit area)	4.03 per m² | 0.38 per ft²

Remarks

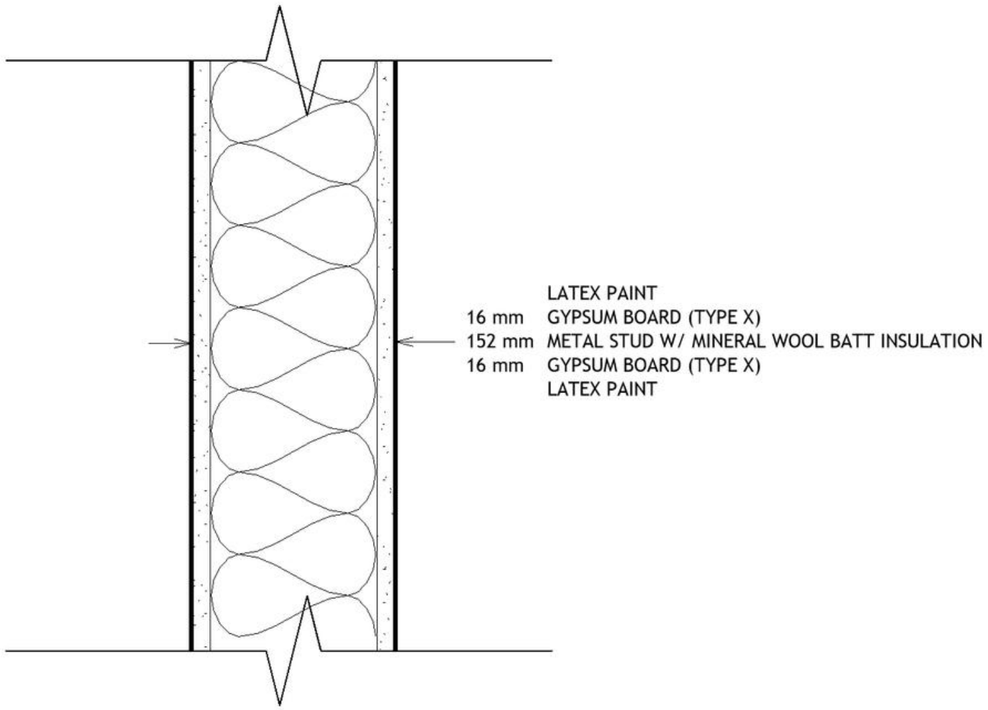
SPANDREL SANDWICH

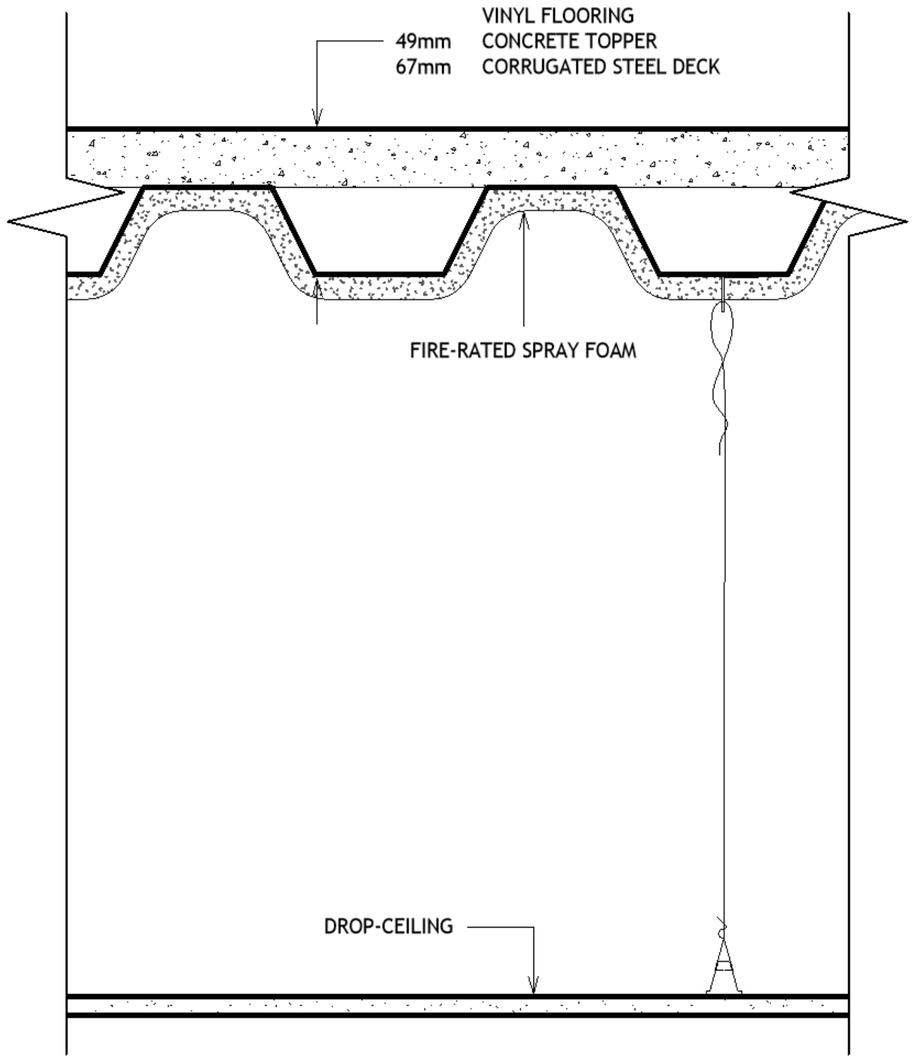


Ucw (W/m2K)	0.26
Acw (m2)	1.125
Ψ (W/mK)	0.2
L(m)	4.5
ΔT	42
q'' (W)	49.92
Utotal	1.06
RSItotal	0.95
R-Total	5.37

Layer	Interface	Description	k (W/mK)	L (mm)	RSI (m^2K/W)	R-Value ($°F\ ft^2\ h/BTU$)	Notes and Assumptions
		Indoors					
1		Interior Film	-	-	0.12	0.68	T.5.4 - Vertical, Normal Emissivity
	1						
2		Metal Backpan	-	-	-	-	
	2						
5		Exterior Mineral Wool Insulation	0.037	100	2.70	15.346	T.5.1 - Stonewool Roof Insulation (water-resistant material)
	5						
6		Metal Sheet	-	-	-	-	
	6						
7		Vented Air Cavity		25	0.18	1.02	Using Straube 5.1.8 and NBCC - thermal resistance for air space between 20 and 90mm
	7						
8		Spandrel Panel	0.9	6	0.01	0.0379	T.5.1 - Average k for the range from 0.8-1 W/mK
	8						
9		Air Space	0.03	12.7	0.42	2.4037	T.5.1 - Still Air
	9						
10		Spandrel Panel	0.9	6	0.01	0.0379	T.5.1 - Average k for the range from 0.8-1 W/mK
	10						
11		Air Space	0.03	12.7	0.42	2.4037	T.5.1 - Still Air
	11						
12		Spandrel Panel	0.9	6	0.01	0.0379	T.5.1 - Average k for the range from 0.8-1 W/mK
	12						
13		Exterior Film			0.030	0.17	T.5.4 - Winter Conditions, Normal Emissivity
		Outdoors					
					3.90	**22.14**	

INTERIOR WALL & SLAB SANDWICH





APPENDIX C2

WINDOW
CALCULATIONS

WINDOW 1 - PATIENT ROOM

List
Calc (F9)
New
Copy
Delete
Save
Report
Dividers
Dividers
Awnings
Generic 1 >>
Display mode:
Normal

SHGC/VT Detail

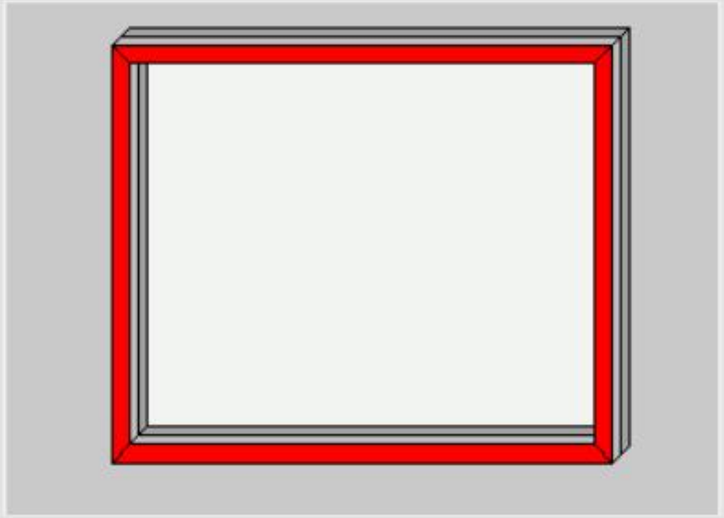
CR Detail

ID #	1	
Name	AE400 Window 1	
Mode	NFRC	
Type	Custom Single Vision	>>
Width	1800	mm
Height	1500	mm
Area	2.700	m2
Tilt	90	

Environmental Conditions
NFRC 100-2010

Total Window Results - Normal Incidence

U-factor	1.847	W/m2-K
SHGC	0.264	
VT	0.473	
CR	N/A	



Click on a component to display characteristics below

Glazing System

Name	AE400 - Double Glaze	>>			
ID	2		Ucenter	1.712	W/m2-K
Nlayers	2		SC	0.346	
Area	1.891	m2	SHGC	0.301	
Edge area	0.367	m2	Vtc	0.565	

Frame

Name	Vinyl	>>			
ID	4		Uedge	2.717	W/m2-K
Source	1		Edge area	0.101	m2
Ufactor	1.700	W/m2-K	PFD	69.850	
Area	0.121	m2	Abs	0.900	

WINDOW 2 - PATIENT ROOM

List
Calc (F9)
New
Copy
Delete
Save
Report
Dividers
Dividers
Awnings
Generic 1 >>
Display mode:
Normal

SHGC/VT Detail

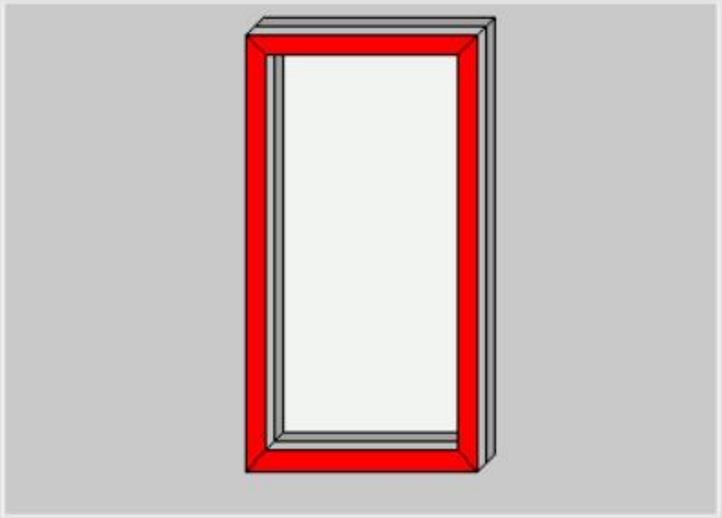
CR Detail

ID #	1	
Name	AE400 Window 2	
Mode	NFRC	
Type	Custom Single Vision	>>
Width	800	mm
Height	1500	mm
Area	1.200	m2
Tilt	90	

Environmental Conditions
NFRC 100-2010

Total Window Results - Normal Incidence

U-factor	1.911	W/m2-K
SHGC	0.244	
VT	0.423	
CR	N/A	



Click on a component to display characteristics below

Glazing System

Name	Double Low-e Air	>>			
ID	3		Ucenter	1.845	W/m2-K
Nlayers	2		SC	0.724	
Area	0.658	m2	SHGC	0.630	
Edge area	0.240	m2	Vtc	0.735	

Frame

Name	Vinyl	>>			
ID	4		Uedge	2.717	W/m2-K
Source	1		Edge area	0.082	m2
Ufactor	1.700	W/m2-K	PFD	69.850	
Area	0.100	m2	Abs	0.900	

WINDOW 3 - OFFICES

List
Calc (F9)
New
Copy
Delete
Save
Report
Dividers
Dividers
Awnings
Generic 1 >>
Display mode:
Normal

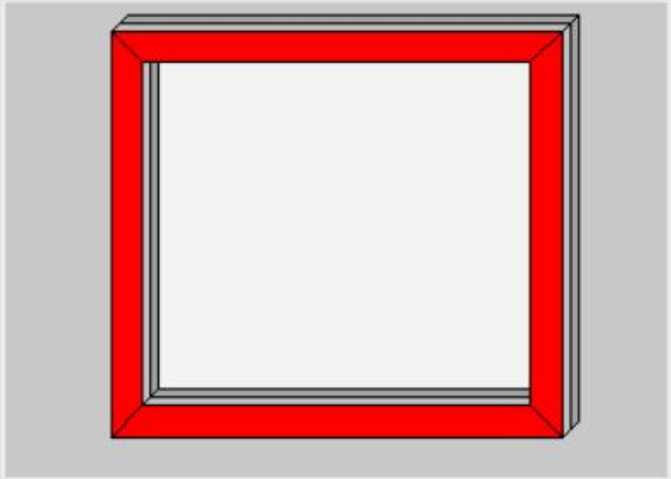
SHGC/VT Detail

CR Detail

ID # 1
Name AE400 Window 3
Mode NFRC
Type Custom Single Vision >>
Width 1000 mm
Height 900 mm
Area 0.900 m2
Tilt 90
Environmental Conditions
NFRC 100-2010

Total Window Results - Normal Incidence

U-factor	1.934	W/m2-K
SHGC	0.239	
VT	0.411	
CR	N/A	



Click on a component to display characteristics below

Glazing System

Name AE400 - Double Glaze >>

ID	2		Ucenter	1.734	W/m2-K
Nlayers	2		SC	0.347	
Area	0.464	m2	SHGC	0.302	
Edge area	0.190	m2	Vtc	0.565	

Frame

Name Vinyl >>

ID	4		Uedge	2.727	W/m2-K
Source	1		Edge area	0.044	m2
Ufactor	1.700	W/m2-K	PFD	69.850	
Area	0.058	m2	Abs	0.900	

WINDOW 4 - BASEMENT

List
Calc (F9)
New
Copy
Delete
Save
Report
Dividers
Dividers
Awnings
Generic 1 >>
Display mode:
Normal

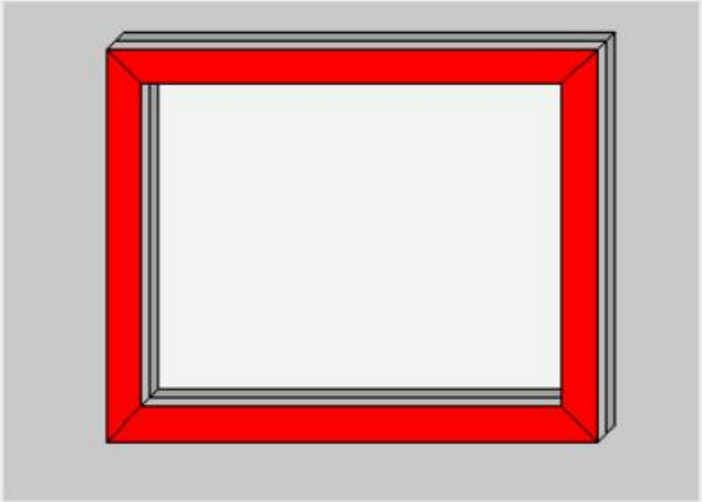
SHGC/VT Detail

CR Detail

ID # 1
Name AE400 Window 4
Mode NFRC
Type Custom Single Vision >>
Width 1000 mm
Height 800 mm
Area 0.800 m2
Tilt 90
Environmental Conditions
NFRC 100-2010

Total Window Results - Normal Incidence

U-factor	1.947	W/m2-K
SHGC	0.236	
VT	0.401	
CR	N/A	



Click on a component to display characteristics below

Click on a component to display characteristics below

Glazing System

Name AE400 - Double Glaze >>

ID	2		Ucenter	1.739	W/m2-K
Nlayers	2		SC	0.347	
Area	0.391	m2	SHGC	0.302	
Edge area	0.177	m2	Vtc	0.565	

Frame

Name Vinyl >>

ID	4		Uedge	2.730	W/m2-K
Source	1		Edge area	0.038	m2
Ufactor	1.700	W/m2-K	PFD	69.850	
Area	0.051	m2	Abs	0.900	

WINDOW 5 - BASEMENT

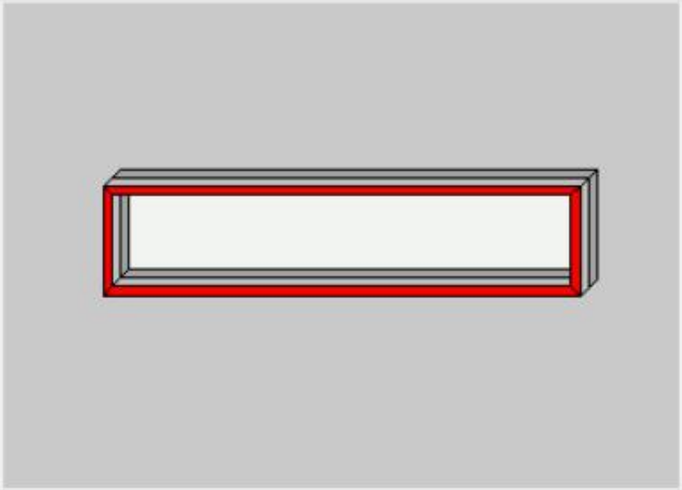
List
Calc (F9)
New
Copy
Delete
Save
Report
Dividers
Dividers
Awnings
Generic 1 >>
Display mode:
Normal

SHGC/VT Detail

CR Detail

ID #	1	
Name	AE400 Window 5	
Mode	NFRC	
Type	Custom Single Vision	>>
Width	3450	mm
Height	800	mm
Area	2.760	m2
Tilt	90	

Environmental Conditions
NFRC 100-2010



Total Window Results - Normal Incidence

U-factor	1.906	W/m2-K
SHGC	0.254	
VT	0.447	
CR	N/A	

Click on a component to display characteristics below

Glazing System

Name	AE400 - Double Glaze	>>			
ID	2		Ucenter	1.739	W/m2-K
Nlayers	2		SC	0.347	
Area	1.698	m2	SHGC	0.302	
Edge area	0.488	m2	Vtc	0.565	

Frame

Name	Vinyl	>>			
ID	4		Uedge	2.730	W/m2-K
Source	1		Edge area	0.038	m2
Ufactor	1.700	W/m2-K	PFD	69.850	
Area	0.051	m2	Abs	0.900	

CURTAIN WALLS

List
Calc (F9)
New
Copy
Delete
Save
Report
Radiance

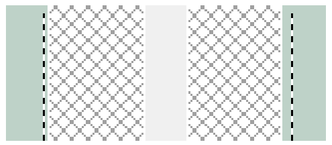
ID #: 1 Name: AE400 - Curtain Wall

3 Tilt: 90 ° IG Height: 1000.00 mm

Environmental Conditions: NFRC 100-2010 IG Width: 1000.00 mm

Comment:

Overall thickness: 43.300 mm Mode: #



	ID	Name	Mode	Thick	Flip	Tsol	Rsol1	Rsol2	Tvis	Rvis1	Rvis2	Tir	E1	E2	Cond	Comment
Glass 1	8343	YNE2275_6.syp	#	6.0	☐	0.271	0.081	0.399	0.628	0.056	0.040	0.000	0.840	0.050	1.000	
Gap 1	1	Air		12.7												
Glass 2	16834	Clear Glass_6.KBG	#	5.9	☐	0.821	0.081	0.081	0.896	0.088	0.088	0.000	0.840	0.840	1.000	
Gap 2	1	Air		12.7												
Glass 3	8343	YNE2275_6.syp	#	6.0	☒	0.271	0.399	0.081	0.628	0.040	0.056	0.000	0.050	0.840	1.000	

Center of Glass Results | Temperature Data | Optical Data | Angular Data | Color Properties | Radiance Results

Ufactor	SC	SHGC	Rel. Ht. Gain	Tvis	Keff	Layer 1 Keff	Gap 1 Keff	Layer 2 Keff	Gap 2 Keff	Layer 3 Keff
W/m2-K			W/m2		W/m-K	W/m-K	W/m-K	W/m-K	W/m-K	W/m-K
0.912	0.291	0.253	191	0.359	0.0472	1.0000	0.0278	1.0000	0.0287	1.0000

CURTAIN WALLS

Index

ThermaWall TW2200

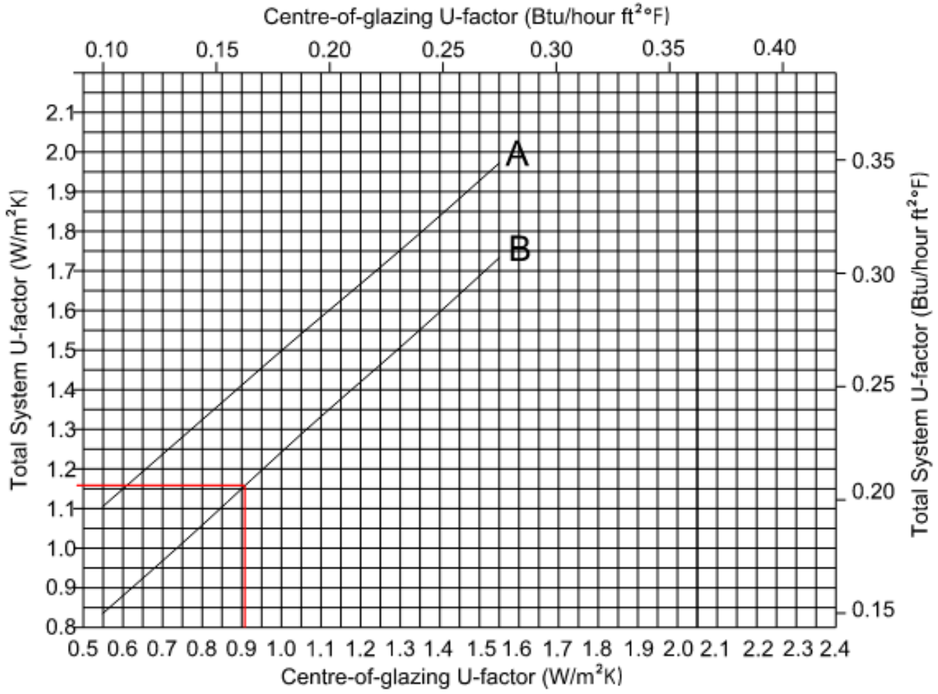
Thermal simulation chart - Triple glazed

THE FOLLOWING THERMAL CHARTS ARE TO BE USED TO DETERMINE OVERALL U VALUE OF THE PRODUCT BY KNOWING U VALUE CENTRE OF GLASS AND SELECTED SPACER OR DETERMINE CENTRE OF GLASS U VALUE AND SPACER BY KNOWING THE PRODUCT REQUIREMENTS FOR U VALUE.

- Curves represent tested simulation results based on triple glazing options using the lowest (curve a) and highest (curve b) performing spacers. Spacer conductance values are based on NFRC 100-2010 section 5.9.5.1.
- Simulation methodology followed NFRC 100-2010
- Simulated curtain wall is 78 3/4" (2000mm) x 78 3/4" (2000mm) between mullion centres with one vertical central mullion as per NFRC100-2010 table 4.3.
- The charts should be used as a budget or design guide for fenestration product u-factor and rating purposes.

A = Triple glazed with Generic Group1
-Spacer containing aluminum
B = Triple glazed with Generic Group4
-Spacer containing all non metallic materials

CHART BASED ON 1 3/4" (44.5 mm)
TRIPLE GLAZED SEALED UNIT



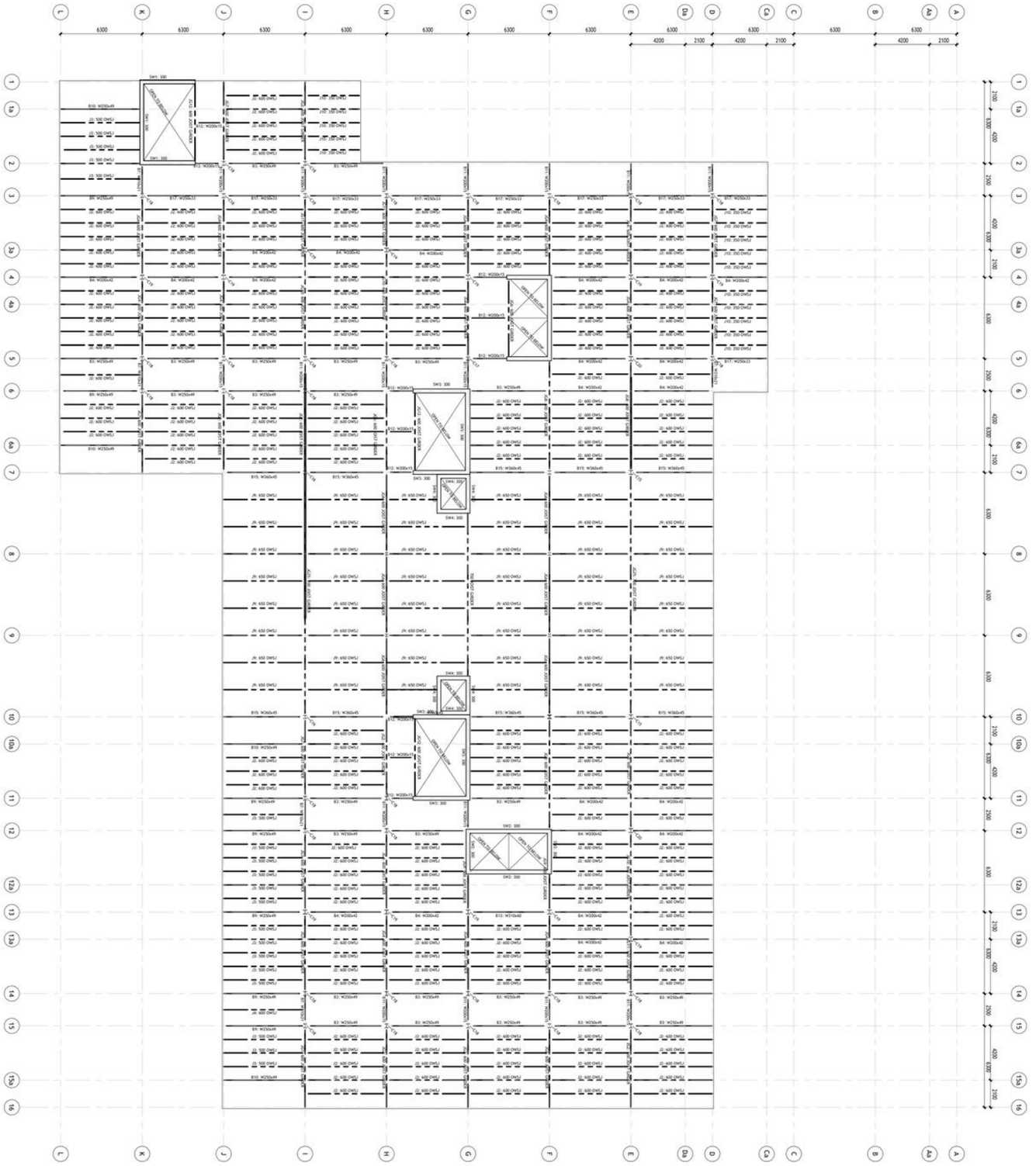
ENVIRONMENTAL CONDITIONS: NFRC 100-2001		
Inside Air Temperature	Outside Air Temperature	Outside Wind Speed
21° C	-18° C	5.5 m/s

Pour la version en français, veuillez voir la page : 1.7.2.6

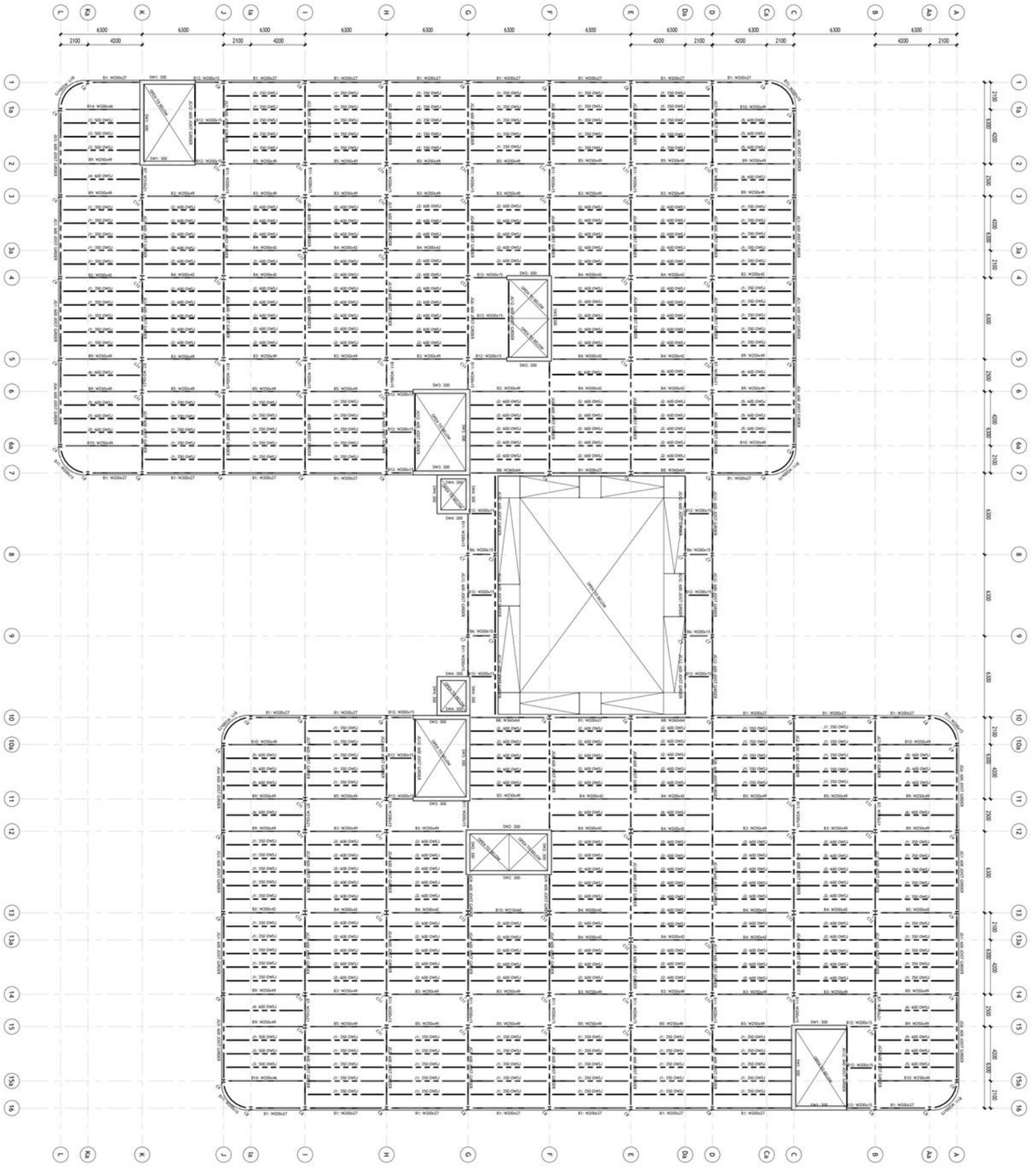
APPENDIX C1

STRUCTURAL
FRAMING PLANS

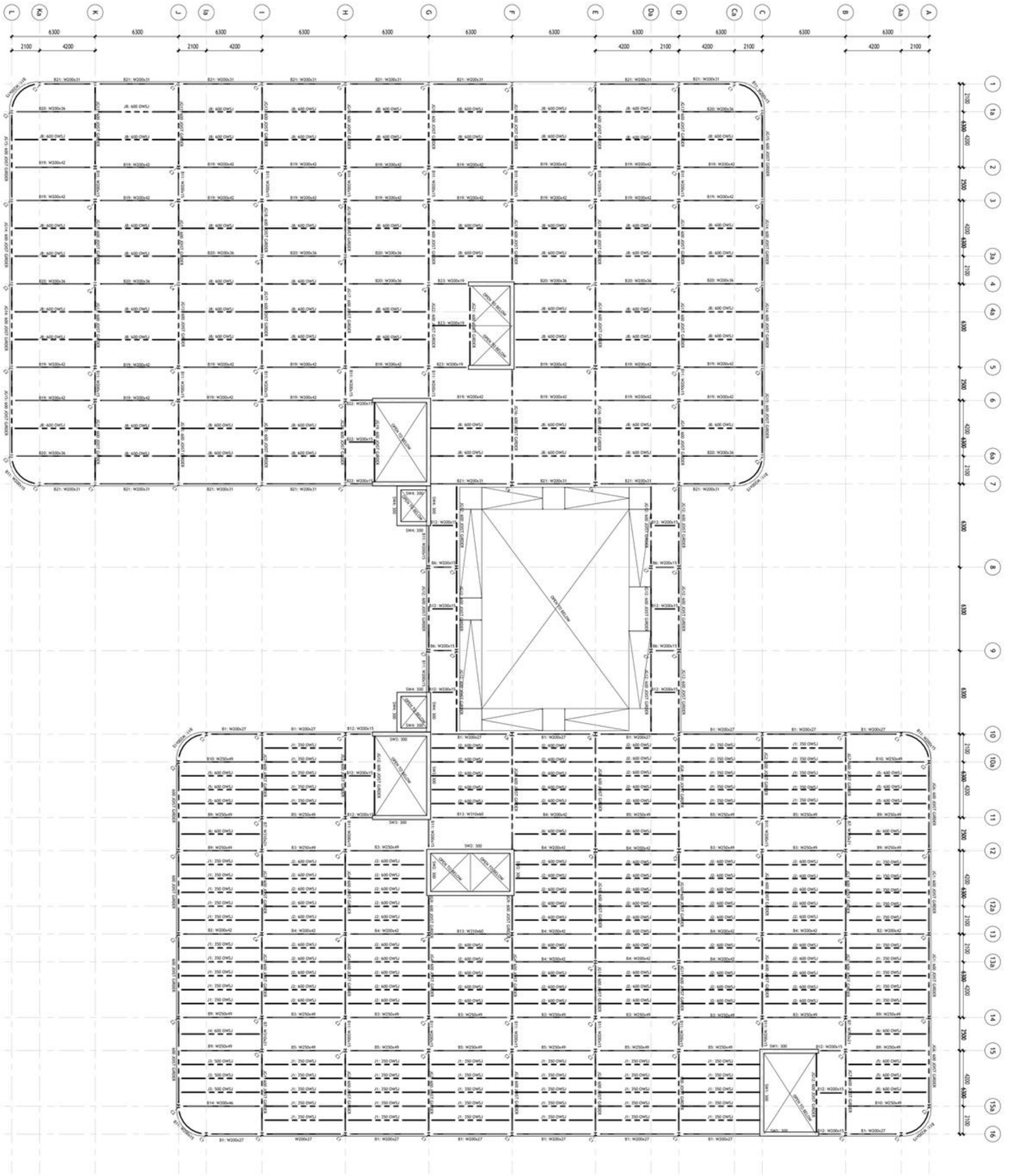
BASEMENT STRUCTURAL FRAMING PLAN



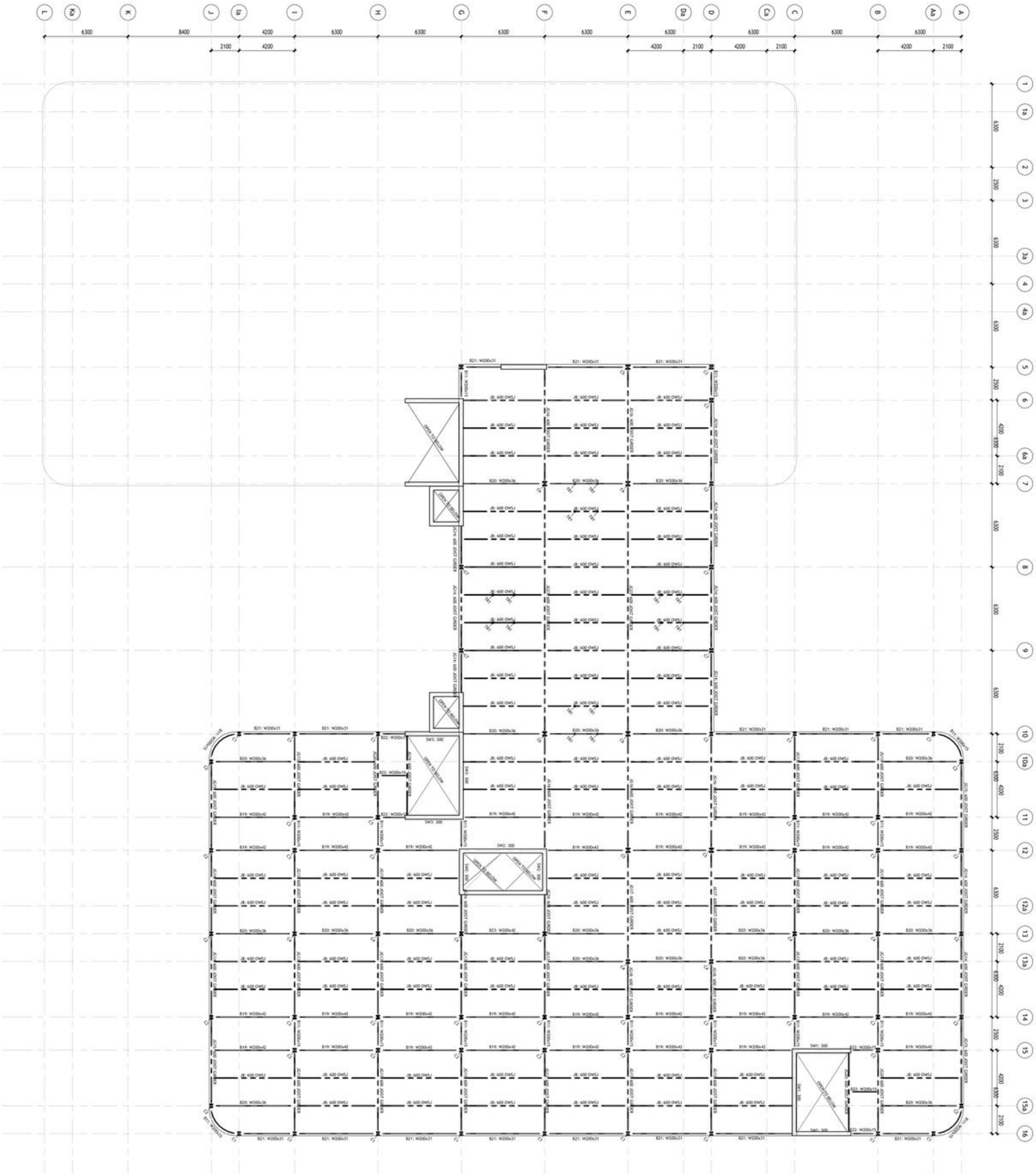
LEVEL 1 TO LEVEL 3 STRUCTURAL FRAMING PLAN



LOW ROOF STRUCUTRAL FRAMING PLAN



HIGH ROOF STUCTURAL FRAMING PLAN



APPENDIX C2
STRUCTURAL LOADS

(FOR CARBON PURPOSES)

INITIAL ASSEMBLY CALCS

ROOF

Material	Thickness (m)	Weight (kg/m2)	Density (kg/m3)	Weight (kN/m3)	Weight (kN/m2)
Roof Assembly					
Interior Film					0.00
Latex Paint					0.00
Gypsum Board	0.013	12.2		0.11964113	0.12
Furring Strips					0.00
P-3615 Non-Composite Metal Deck (no concrete)		8.5		0.083356525	0.08
Water Membrane					0.00
Drainage Mat					0.00
XPS Insulation					0.00
Filter Fabric					0.00
Ballast		50		0.4903325	0.49
Exterior Film					0.00
Additional					
PV Panels					0.35
Framing Allowance					0.05
Suspended					0.20
RTU Allowance					0.25
				TOTAL:	1.500

FLOOR

Material	Thickness (m)	Weight (kg/m2)	Density (kg/m3)	Weight (kN/m3)	Weight (kN/m2)
Floor Assembly					
P-3615 Compoiste Metal Deck (includes concrete)					1.62
Slab Thickness					
Additional					
Framing Allowance					0.05
Suspended					0.20
Partition					0.25
				TOTAL:	2.100

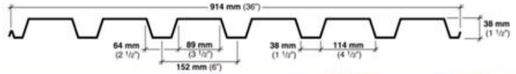
CANAM

STEEL DECK
Roof Deck - Maximum Loads

INPUT DATA

Profile:	P-3615	Calculation Method:	Limit States Design (LSD)
Thickness:	0.76 mm	Organism:	CSSBI
Orientation:	Normal	Country:	Canada
Span:	2 100 mm		
Deflection:	L/240		
Bearing Lengths			
▪ Exterior:	50 mm		
▪ Interior:	100 mm		

DECK PROFILE



Type	Thickness	Overall Depth	Weight	Section Modulus S+	Section Modulus S-	Inertia for Deflection I+	Inertia for Deflection I-
	mm (in.)	mm (in.)	kg/m² (lb/ft.²)	mm³ (in.³)	mm³ (in.³)	mm⁴ (in.⁴)	mm⁴ (in.⁴)
22	0.76 (0.030)	37.4 (1.47)	8.50 (1.74)	9 244 (0.1719)	9 410 (0.1750)	188 189 (0.1378)	226 252 (0.1657)

- Properties are based on a unit width of 1000 mm (metric) or 12 in (imperial).
- Reference: Standard CAN/CSA-S136-16.
- Section modulus are based on flexural stress limit equal to Fy. Moment of inertia is based on flexural stress limit equal to 0.6Fy.

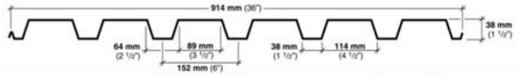
RESULTS

Span = 2 100 mm	Uniform Loads (kPa) Maximum Factored Load (F)	Uniform Loads (kPa) Service load L/240 (D)
Single	5.13	1.32
Double	5.14	3.18
Triple	6.37	2.49

INPUT DATA

Profile:	P-3615	Calculation Method:	Limit States Design (LSD)
Thickness:	0.76 mm	Organism:	CSSBI
Orientation:	Normal	Country:	Canada
Span:	2 100 mm		
Slab Thickness:	90 mm		
Concrete			
▪ Density:	Normal Density (2400 kg/m³)		
▪ Compression Limit:	20 MPa		

DECK PROFILE



Type	Thickness	Overall Depth	Weight	Section Modulus S+	Section Modulus S-	Moment of Inertia I+	Steel Area	Center of Gravity
	mm (in.)	mm (in.)	kg/m² (lb/ft.²)	mm³ (in.³)	mm³ (in.³)	mm⁴ (in.⁴)	mm² (in.²)	mm (in.)
22	0.76 (0.030)	37.4 (1.47)	8.50 (1.74)	9 244 (0.1719)	9 410 (0.1750)	188 189 (0.1378)	1 016 (0.480)	22.46 (0.88)

- Properties are based on a unit width of 1000 mm (metric) or 12 in (imperial).
- Section modulus are based on flexural stress limit equal to Fy. Moment of inertia is based on flexural stress limit equal to 0.6Fy. Steel area and center of gravity are from gross section.
- Reference: Standard CAN/CSA-S136-16.

RESULTS

Span c/c of supports = 2 100 mm Slab Thickness = 90 mm	Maximum factored load (kPa)
	11.96

- ASTM A 653M SS Grade 340, yield strength of 340 MPa
- Self Weight (Deck + Concrete) = 1.62 kPa
- Concrete Volume = 0.06510 m³/m²
- Comp. Mom. of Inertia = 3 920 494 mm⁴/ m. Slab deflections also need to be verified.
- Maximum factored load shown must be compared to factored loads (including slab weight) obtained from load combinations according to NBC.

DEAD LOADS

ACTUAL ASSEMBLY CALCS

ROOF

Material	Thickness (m)	Weight (kg/m2)	Density (kg/m3)	Weight (kN/m3)	Weight (kN/m2)
Roof Assembly					
Interior Film					0.00
Latex Paint					0.00
Gypsum Board	0.013	12.2		0.11964113	0.12
Furring Strips					0.00
38 Metal Deck (Canam P-3615 22 gauge)		8.5		0.083356525	0.08
Water Membrane					0.00
Drainage Mat					0.00
XPS Insulation					0.00
Filter Fabric					0.00
Ballast		55		0.53936575	0.54
Exterior Film					0.00
Additional					
PV Panels					0.35
Framing Allowance					0.05
Suspended					0.20
RTU Allowance					0.25
				TOTAL:	1.600

FLOOR

Material	Thickness (m)	Weight (kg/m2)	Density (kg/m3)	Weight (kN/m3)	Weight (kN/m2)
Floor Assembly					
125 Concrete on 76 Composite Metal Deck (Canam LF3 20 gauge)					2.13
Slab Thickness					
Additional					
Framing Allowance					0.02
Suspended					0.20
Partition					0.25
				TOTAL:	2.600

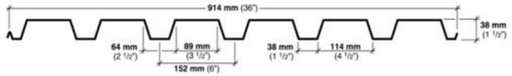
CANAM

STEEL DECK
Roof Deck - Maximum Loads

INPUT DATA

Profile:	P-3615	**Calculation Method:**	Limit States Design (LSD)
Thickness:	0.76 mm	**Organism:**	CSSBI
Orientation:	Normal	**Country:**	Canada
Span:	1 200 mm		
Deflection:	L/240		
Bearing Lengths			
▪ **Exterior:**	50 mm		
▪ **Interior:**	100 mm		

DECK PROFILE



Type	Thickness	Overall Depth	Weight	Section Modulus S+	Section Modulus S-	Inertia for Deflection I+	Inertia for Deflection I-
	mm (in.)	mm (in.)	kg/m² (lb/ft.²)	mm³ (in.³)	mm³ (in.³)	mm⁴ (in.⁴)	mm⁴ (in.⁴)
22	0.76 (0.030)	37.4 (1.47)	8.50 (1.74)	9 244 (0.1719)	9 410 (0.1750)	188 189 (0.1378)	226 252 (0.1657)

- Properties are based on a unit width of 1000 mm (metric) or 12 in (imperial).
- Reference: Standard CAN/CSA-S136-16.
- Section modulus are based on flexural stress limit equal to Fy. Moment of inertia is based on flexural stress limit equal to 0.6Fy.

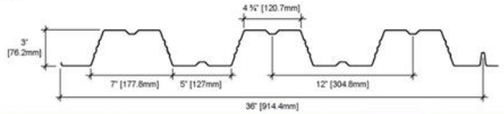
RESULTS

Span = 1 200 mm	Uniform Loads (kPa) Maximum Factored Load (F)	Uniform Loads (kPa) Service load L/240 (D)
Single	15.71	7.07
Double	15.26	17.04
Triple	18.64	13.36

INPUT DATA

Profile:	LF3	**Calculation Method:**	Limit States Design (LSD)
Thickness:	0.91 mm	**Organism:**	CSSBI
Orientation:	Normal	**Country:**	Canada
Span:	2 100 mm		
Slab Thickness:	125 mm		
Concrete			
▪ **Density:**	Normal Density (2400 kg/m³)		
▪ **Compression Limit:**	20 MPa		

DECK PROFILE



Type	Thickness	Overall Depth	Weight	Section Modulus S+	Section Modulus S-	Moment of Inertia I+	Steel Area	Center of Gravity
	mm (in.)	mm (in.)	kg/m² (lb/ft.²)	mm³ (in.³)	mm³ (in.³)	mm⁴ (in.⁴)	mm² (in.²)	mm (in.)
20	0.91 (0.036)	77.4 (3.05)	10.16 (2.08)	28 130 (0.5232)	29 661 (0.5517)	1 276 579 (0.9348)	1 291 (0.610)	36.98 (1.46)

- Properties are based on a unit width of 1000 mm (metric) or 12 in (imperial).
- Section modulus are based on flexural stress limit equal to Fy. Moment of inertia is based on flexural stress limit equal to 0.6Fy. Steel area and center of gravity are from gross section.
- Reference: Standard CAN/CSA-S136-16.

RESULTS

Span c/c of supports = 2 100 mm Slab Thickness = 125 mm	Maximum factored load (kPa)
	24.05

- ASTM A 653M SS Grade 340, yield strength of 340 MPa
- Self Weight (Deck + Concrete) = 2.13 kPa
- Concrete Volume = 0.08632 m³/m²
- Comp. Mom. of Inertia = 11 078 798 mm⁴/ m. Slab deflections also need to be verified.
- Maximum factored load shown must be compared to factored loads (including slab weight) obtained from load combinations according to NBC.

DEAD LOADS

ACTUAL ASSEMBLY CALCS

Roof Dimensions			
l	69300	mm	
w	32300	mm	
Snow Load (NBCC 2020, Cl.4.1.6.2)			
Is	1.0		Normal Importance
Ss	2.0	kPa	1 in 50 year Snow Load for Waterloo, ON
Cw	1.0		Cl.4.1.6.2 3)
lc	49.55	m	2*w-w^2/l
Cb	0.8		lc<70/cw^2
Cs	1.0		No roof slope
Ca	1.0		No Accumulation
Sr	0.4	kPa	1 in 50 year Rain Load for Waterloo, ON
S	2	kPa	Ground Snow Load
S_SLS	1.8	kPa	SLS Ground Snow Load (used for deflections)

SNOW LOADS

APPENDIX C3

STRUCTURAL
CARBON STUDY

OPTION 1: OWSJS ON JOIST GIRDERS (2100 MM SPACING)

INITIAL FLOOR CARBON CALCS

Single Span OWSJ

Carbon Floors

Type	Amount	Area (m2)	Material Type	Area Density (kg material/m2)	kgCO2/kg material	GWP (kgCO2)
90 Concrete on 38 Composite Metal Deck	1	39.69	Deck Floor 38	166.21	0.29	1913.14

Not Applicable → deck too light for loads. On a 76 mm deck, carbon is bumped up to 118.5 kgCO2e/m2.

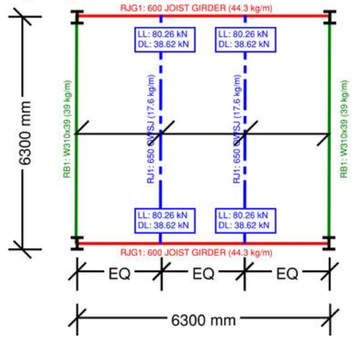
Carbon Framing

Type	Amount	Distance (m)	Material Type	Linear Density (kg material/m)	kgCO2/kg material	GWP (kgCO2)
RB1: W310x39	2	6.30	Rolled	39.00	1.19	584.80
RJ1: 650 OWSJ	2	6.30	Rolled	17.60	1.19	263.91
RJ2: 600 Joist Girder	2	6.30	Rolled	44.30	1.19	664.27

TOTAL: 3426.11 kgCO2

TOTAL PER SQM: ~~86.32 kgCO2/m2~~ → 118.5 kgCO2e/m2

Single Span OWSJ



Double Span OWSJ

Carbon Floors

Type	Amount	Area (m2)	Material Type	Area Density (kg material/m2)	kgCO2/kg material	GWP (kgCO2)
90 Concrete on 76 Composite Metal Deck	1	79.38	Deck Floor 76	277.36	0.29	6384.95

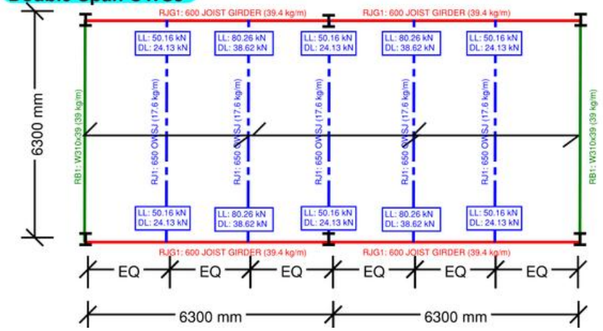
Carbon Framing

Type	Amount	Distance (m)	Material Type	Linear Density (kg material/m)	kgCO2/kg material	GWP (kgCO2)
RB1: W310x39	2	6.30	Rolled	39.00	1.19	584.80
RJ1: 650 OWSJ	5	6.30	Rolled	17.60	1.19	659.77
RJG1: 600 Joist Girder	4	6.30	Rolled	39.40	1.19	1181.59

TOTAL: 8811.11 kgCO2

TOTAL PER SQM: 111.00 kgCO2/m2

Double Span OWSJ



Triple Span OWSJ

Carbon Floors

Type	Amount	Area (m2)	Material Type	Area Density (kg material/m2)	kgCO2/kg material	GWP (kgCO2)
90 Concrete on 76 Composite Metal Deck	1	79.38	Deck Floor 76	277.36	0.29	6384.95

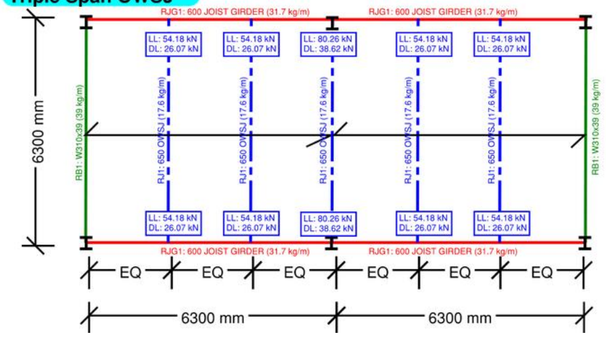
Carbon Framing

Type	Amount	Distance (m)	Material Type	Linear Density (kg material/m)	kgCO2/kg material	GWP (kgCO2)
RB1: W310x39	2	6.30	Rolled	39.00	1.19	584.80
RJ1: 650 OWSJ	5	6.30	Rolled	17.60	1.19	659.77
RJG1: 600 Joist Girder	4	6.30	Rolled	31.70	1.19	950.67

TOTAL: 10493.32 kgCO2

TOTAL PER SQM: 132.19 kgCO2/m2

Triple Span OWSJ



OPTION 2: OWSJS ON JOIST GIRDERS (1050 MM SPACING)

INITIAL FLOOR CARBON CALCS

Single Span OWSJ

Carbon Floors

Type	Amount	Area (m2)	Material Type	Area Density (kg material/m2)	kgCO2/kg material	GWP (kgCO2)
90 Concrete on 38 Composite Metal Deck	1	39.69	Deck Floor 38	166.21	0.29	1913.14

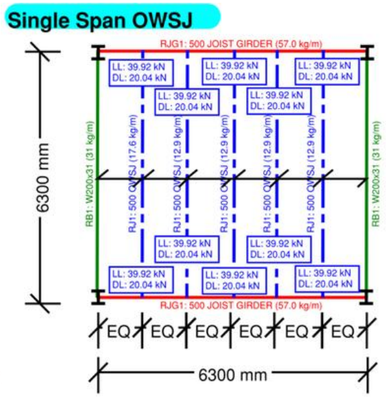
Not Applicable → deck too light for loads. On a 76 mm deck, carbon is bumped up to 125.86 kgCO2e/m2.

Carbon Framing

Type	Amount	Distance (m)	Material Type	Linear Density (kg material/m)	kgCO2/kg material	GWP (kgCO2)
RB1: W200x31	2	6.30	Rolled	31.00	1.19	464.81
RJ1: 500 OWSJ	5	6.30	Rolled	12.90	1.19	483.58
RJ2: 500 Joist Girder	2	6.30	Rolled	57.00	1.19	854.70

TOTAL: 3716.24 kgCO2

TOTAL PER SQM: ~~93.63 kgCO2/m2~~ → 125.86 kgCO2e/m2



MOST EFFECTIVE

Double Span OWSJ

Carbon Floors

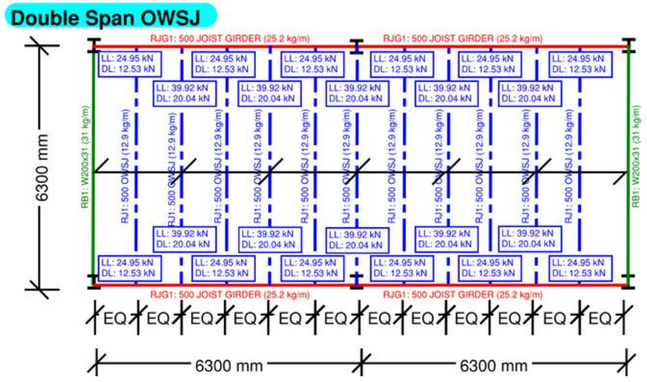
Type	Amount	Area (m2)	Material Type	Area Density (kg material/m2)	kgCO2/kg material	GWP (kgCO2)
90 Concrete on 76 Composite Metal Deck	1	79.38	Deck Floor 38	277.36	0.29	6384.95

Carbon Framing

Type	Amount	Distance (m)	Material Type	Linear Density (kg material/m)	kgCO2/kg material	GWP (kgCO2)
RB1: W200x31	2	6.30	Rolled	31.00	1.19	464.84
RJ1: 500 OWSJ	11	6.30	Rolled	12.90	1.19	1063.88
RJG1: 500 Joist Girder	4	6.30	Rolled	25.20	1.19	755.74

TOTAL: 8669.41 kgCO2

TOTAL PER SQM: 109.21 kgCO2/m2



Triple Span OWSJ

Carbon Floors

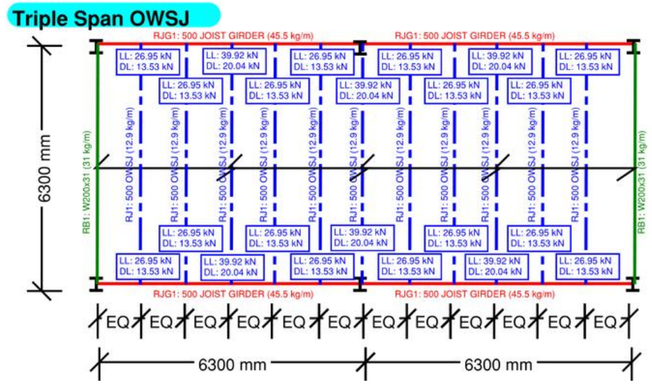
Type	Amount	Area (m2)	Material Type	Area Density (kg material/m2)	kgCO2/kg material	GWP (kgCO2)
90 Concrete on 76 Composite Metal Deck	1	79.38	Deck Floor 38	277.36	0.29	6384.95

Carbon Framing

Type	Amount	Distance (m)	Material Type	Linear Density (kg material/m)	kgCO2/kg material	GWP (kgCO2)
RB1: W200x31	2	6.30	Rolled	31.00	1.19	464.84
RJ1: 500 OWSJ	11	6.30	Rolled	12.90	1.19	1063.88
RJG1: 500 Joist Girder	4	6.30	Rolled	45.50	1.19	1364.53

TOTAL: 9278.19 kgCO2

TOTAL PER SQM: 116.88 kgCO2/m2



OPTION 3: BEAMS ON BEAMS (2100 MM SPACING)

INITIAL FLOOR CARBON CALCS

Single Span Beam

Carbon Floors

Type	Amount	Area (m2)	Material Type	Area Density (kg material/m2)	kgCO2/kg material	GWP (kgCO2)
90 Concrete on 38 Composite Metal Deck	1	39.69	Deck Floor 38	166.21	0.29	1913.14

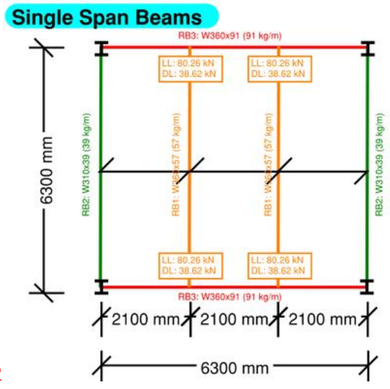
Not Applicable → deck too light for loads. On a 76 mm deck, carbon is bumped up to 151.08 kgCO2e/m2.

Carbon Framing

Type	Amount	Distance (m)	Material Type	Linear Density (kg material/m)	kgCO2/kg material	GWP (kgCO2)
RB1: W360x57	2	6.30	Rolled	57.00	1.19	854.70
RB2: W310x39	2	6.30	Rolled	39.00	1.19	584.80
RB3: W360x91	2	6.30	Rolled	91.00	1.19	1364.53

TOTAL: 4717.16 kgCO2

TOTAL PER SQM: ~~118.85 kgCO2/m2~~ → 151.08 kgCO2e/m2



Double Span Beam

Carbon Floors

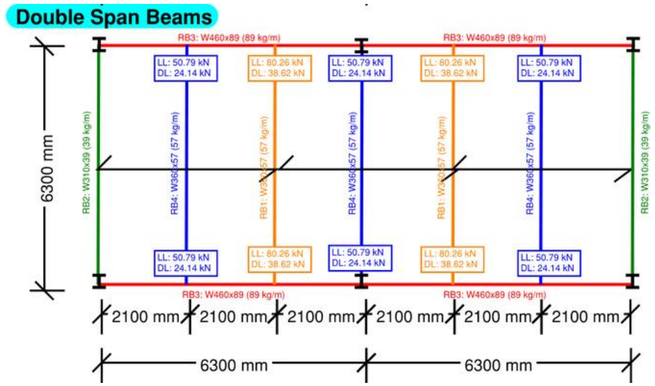
Type	Amount	Area (m2)	Material Type	Area Density (kg material/m2)	kgCO2/kg material	GWP (kgCO2)
90 Concrete on 76 Composite Metal Deck	1	79.38	Deck Floor 38	277.36	0.29	6384.95

Carbon Framing

Type	Amount	Distance (m)	Material Type	Linear Density (kg material/m)	kgCO2/kg material	GWP (kgCO2)
RB1: W460x89	4	6.30	Rolled	89.00	1.19	2669.07
RB2: W310x39	2	6.30	Rolled	39.00	1.19	584.80
RB3: W460x89	4	6.30	Rolled	89.00	1.19	2669.07
RB4: W360x57	3	6.30	Rolled	57.00	1.19	1282.06

TOTAL: 13589.95 kgCO2

TOTAL PER SQM: 171.20 kgCO2/m2



Triple Span Beam

Carbon Floors

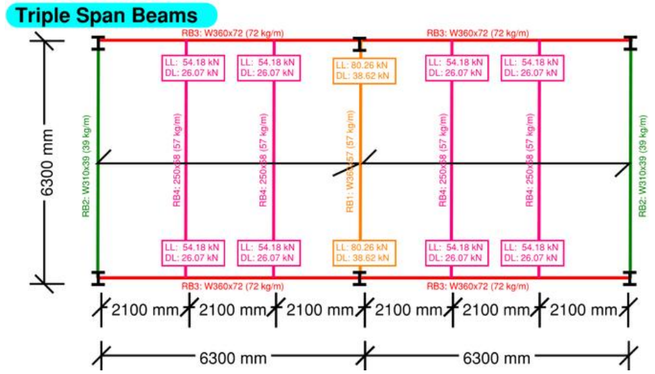
Type	Amount	Area (m2)	Material Type	Area Density (kg material/m2)	kgCO2/kg material	GWP (kgCO2)
90 Concrete on 76 Composite Metal Deck	1	79.38	Deck Floor 38	277.36	0.29	6384.95

Carbon Framing

Type	Amount	Distance (m)	Material Type	Linear Density (kg material/m)	kgCO2/kg material	GWP (kgCO2)
RB1: W360x57	1	6.30	Rolled	57.00	1.19	427.35
RB2: W310x39	2	6.30	Rolled	39.00	1.19	584.80
RB3: W360x72	4	6.30	Rolled	72.00	1.19	2159.25
RB4: W250x58	4	6.30	Rolled	58.00	1.19	1739.40

TOTAL: 11295.75 kgCO2

TOTAL PER SQM: 142.30 kgCO2/m2



OPTION 1: OWSJS ON JOIST GIRDERS (2100 MM SPACING)

INITIAL ROOF CARBON CALCS

MOST EFFECTIVE

Single Span OWSJ

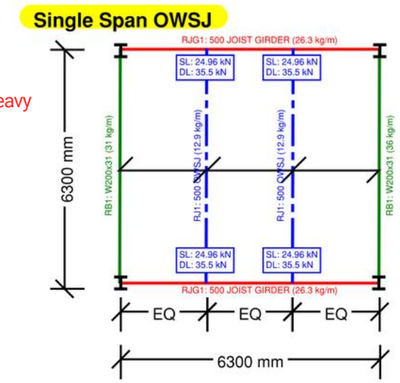
Carbon Floors

Type	Amount	Area (m2)	Material Type	Area Density (kg material/m2)	kgCO2/kg material	GWP (kgCO2)
38 Metal Deck	1	39.69	Deck Roof	8.50	2.32	782.69

Applicable. Roof loads are NOT heavy enough to require a 76 mm deck.

Carbon Framing

Type	Amount	Distance (m)	Material Type	Linear Density (kg material/m)	kgCO2/kg material	GWP (kgCO2)
RB1: W200x31	2	6.30	Rolled	31.00	1.19	464.84
RJ1: 500 OWSJ	2	6.30	Rolled	12.90	1.19	193.43
RJ2: 500 Joist Girder	2	6.30	Rolled	26.30	1.19	394.36
					TOTAL:	1835.32 kgCO2
					TOTAL PER SQM:	**46.24 kgCO2/m2**



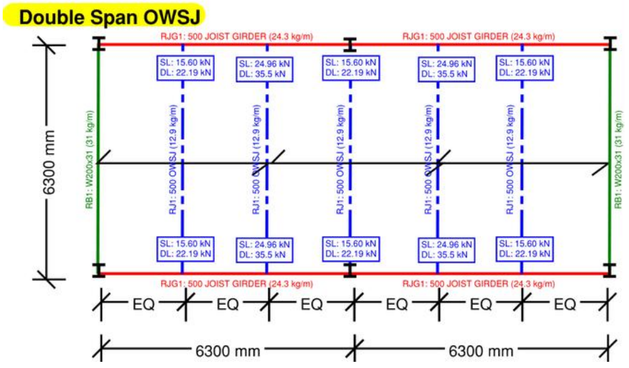
Double Span OWSJ

Carbon Floors

Type	Amount	Area (m2)	Material Type	Area Density (kg material/m2)	kgCO2/kg material	GWP (kgCO2)
76 Metal Deck	1	79.38	Deck Roof	14.04	2.32	2585.63

Carbon Framing

Type	Amount	Distance (m)	Material Type	Linear Density (kg material/m)	kgCO2/kg material	GWP (kgCO2)
RB1: W200x31	2	6.30	Rolled	31.00	1.19	464.84
RJ1: 500 OWSJ	5	6.30	Rolled	12.90	1.19	483.58
RJG1: 500 Joist Girder	4	6.30	Rolled	24.30	1.19	728.75
					TOTAL:	4262.80 kgCO2
					TOTAL PER SQM:	**53.70 kgCO2/m2**



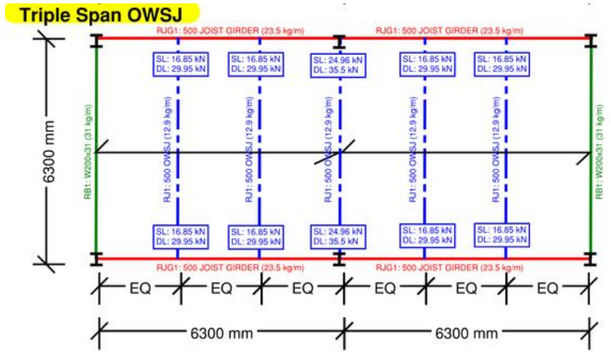
Triple Span OWSJ

Carbon Floors

Type	Amount	Area (m2)	Material Type	Area Density (kg material/m2)	kgCO2/kg material	GWP (kgCO2)
76 Metal Deck	1	79.38	Deck Roof	14.04	2.32	2585.63

Carbon Framing

Type	Amount	Distance (m)	Material Type	Linear Density (kg material/m)	kgCO2/kg material	GWP (kgCO2)
RB1: W200x31	2	6.30	Rolled	31.00	1.19	464.84
RJ1: 500 OWSJ	5	6.30	Rolled	12.90	1.19	483.58
RJG1: 500 Joist Girder	4	6.30	Rolled	23.50	1.19	704.76
					TOTAL:	4238.81 kgCO2
					TOTAL PER SQM:	**53.40 kgCO2/m2**



OPTION 2: OWSJS ON JOIST GIRDERS (1050 MM SPACING)

INITIAL ROOF CARBON CALCS

Single Span OWSJ

Carbon Floors

Type	Amount	Area (m2)	Material Type	Area Density (kg material/m2)	kgCO2/kg material	GWP (kgCO2)
38 Metal Deck	1	39.69	Deck Roof	8.50	2.32	782.69

Carbon Framing

Type	Amount	Distance (m)	Material Type	Linear Density (kg material/m)	kgCO2/kg material	GWP (kgCO2)
RB1: W200x31	2	6.30	Rolled	31.00	1.19	464.84
RJ1: 500 OWSJ	5	6.30	Rolled	9.60	1.19	359.88
RJ2: 500 Joist Girder	2	6.30	Rolled	30.90	1.19	463.34
					TOTAL:	2070.74 kgCO2
					TOTAL PER SQM:	**52.17 kgCO2/m2**

Double Span OWSJ

Carbon Floors

Type	Amount	Area (m2)	Material Type	Area Density (kg material/m2)	kgCO2/kg material	GWP (kgCO2)
76 Metal Deck	1	79.38	Deck Roof	14.04	2.32	2585.63

Carbon Framing

Type	Amount	Distance (m)	Material Type	Linear Density (kg material/m)	kgCO2/kg material	GWP (kgCO2)
RB1: W200x31	2	6.30	Rolled	31.00	1.19	464.84
RJ1: 500 OWSJ	11	6.30	Rolled	9.60	1.19	791.73
RJG1: 500 Joist Girder	4	6.30	Rolled	25.90	1.19	776.73
					TOTAL:	4618.92
					TOTAL PER SQM:	**58.19 kgCO2/m2**

Triple Span OWSJ

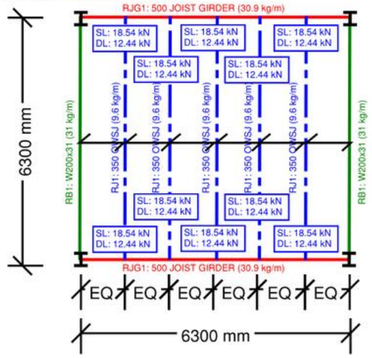
Carbon Floors

Type	Amount	Area (m2)	Material Type	Area Density (kg material/m2)	kgCO2/kg material	GWP (kgCO2)
76 Metal Deck	1	79.38	Deck Roof	14.04	2.32	2585.63

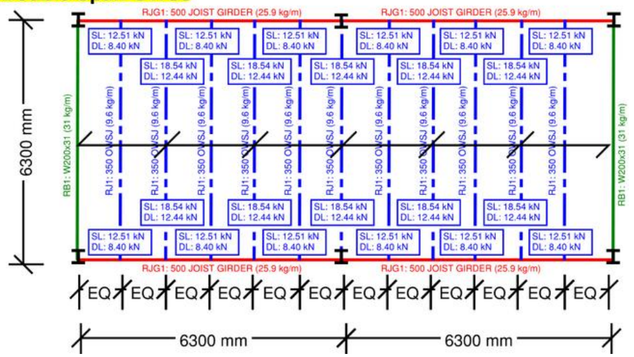
Carbon Framing

Type	Amount	Distance (m)	Material Type	Linear Density (kg material/m)	kgCO2/kg material	GWP (kgCO2)
RB1: W200x31	2	6.30	Rolled	31.00	1.19	464.84
RJ1: 500 OWSJ	11	6.30	Rolled	9.60	1.19	791.73
RJG1: 500 Joist Girder	4	6.30	Rolled	24.90	1.19	746.74
					TOTAL:	4588.93 kgCO2
					TOTAL PER SQM:	**57.81 kgCO2/m2**

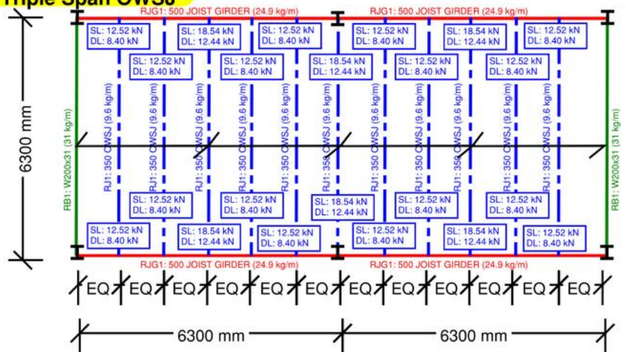
Single Span OWSJ



Double Span OWSJ



Triple Span OWSJ



OPTION 3: BEAMS ON BEAMS (2100 MM SPACING)

INITIAL ROOF CARBON CALCS

Single Span Beam

Carbon Floors

Type	Amount	Area (m2)	Material Type	Area Density (kg material/m2)	kgCO2/kg material	GWP (kgCO2)
38 Metal Deck	1	39.69	Deck Roof	8.50	2.32	782.69

Carbon Framing

Type	Amount	Distance (m)	Material Type	Linear Density (kg material/m)	kgCO2/kg material	GWP (kgCO2)
RB1: W200x36	2	6.30	Rolled	36.00	1.19	539.81
RB2: W310x39	2	6.30	Rolled	31.00	1.19	464.84
RB3: W310x60	2	6.30	Rolled	60.00	1.19	899.69
					TOTAL:	2687.03 kgCO2
					TOTAL PER SQM:	**67.70 kgCO2/m2**

Double Span Beam

Carbon Floors

Type	Amount	Area (m2)	Material Type	Area Density (kg material/m2)	kgCO2/kg material	GWP (kgCO2)
76 Metal Deck	1	79.38	Deck Roof	14.04	2.32	2585.63

Carbon Framing

Type	Amount	Distance (m)	Material Type	Linear Density (kg material/m)	kgCO2/kg material	GWP (kgCO2)
RB1: W200x36	4	6.30	Rolled	36.00	1.19	1079.63
RB2: W310x39	2	6.30	Rolled	39.00	1.19	584.80
RB3: W310x60	4	6.30	Rolled	60.00	1.19	1799.38
RB4: W310x39	3	6.30	Rolled	39.00	1.19	877.20
					TOTAL:	6926.62 kgCO2
					TOTAL PER SQM:	**87.26 kgCO2/m2**

Triple Span Beam

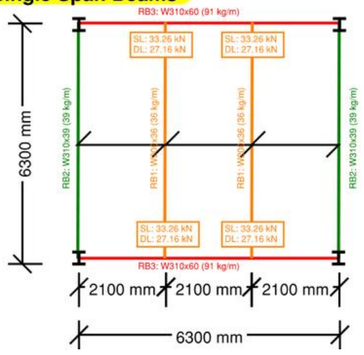
Carbon Floors

Type	Amount	Area (m2)	Material Type	Area Density (kg material/m2)	kgCO2/kg material	GWP (kgCO2)
76 Metal Deck	1	79.38	Deck Roof	14.04	2.32	2585.63

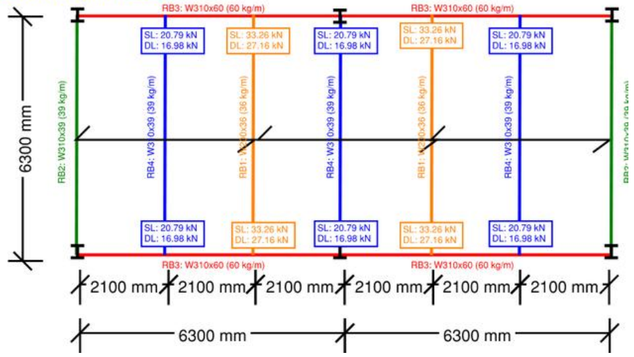
Carbon Framing

Type	Amount	Distance (m)	Material Type	Linear Density (kg material/m)	kgCO2/kg material	GWP (kgCO2)
RB1: W200x36	1	6.30	Rolled	36.00	1.19	269.91
RB2: W310x39	2	6.30	Rolled	39.00	1.19	584.80
RB3: W360x57	4	6.30	Rolled	57.00	1.19	1709.41
RB4: W310x39	4	6.30	Rolled	39.00	1.19	1169.59
					TOTAL:	3733.71 kgCO2
					TOTAL PER SQM:	**47.04 kgCO2/m2**

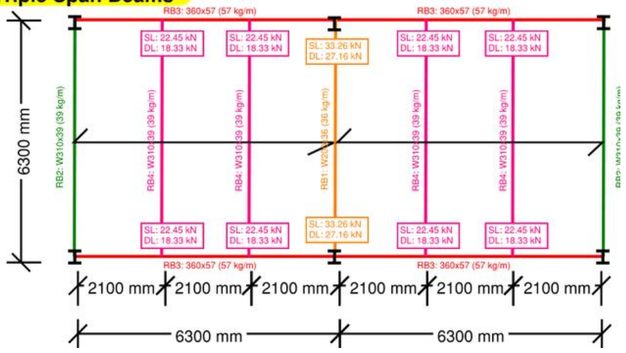
Single Span Beams



Double Span Beams



Triple Span Beams



OWSJS AT VARIED SPACING (APPLICABLE TO POOL AND GYM)

INITIAL LONG SPAN CARBON CALCS

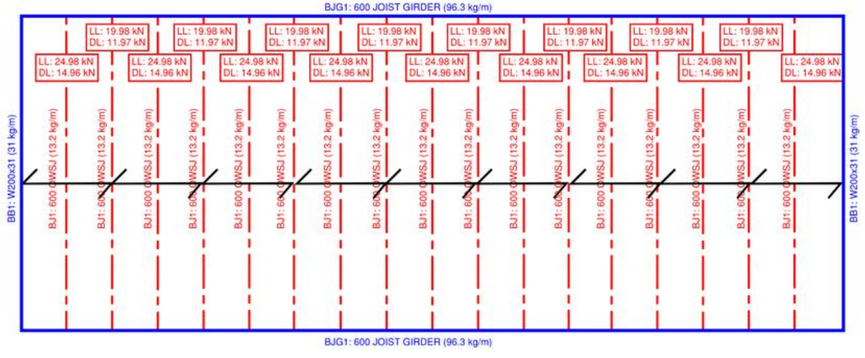
Single Span OWSJ Spaced 1050mm

Carbon Floors

Type	Amount	Area (m2)	Material Type	Area Density (kg material/m2)	kgCO2/kg material	GWP (kgCO2)
125 Concrete on 76 Composite Metal Deck	1	119.07	Deck Floor 76	217.20	0.29	7499.97

Carbon Framing

Type	Amount	Distance (m)	Material Type	Linear Density (kg material/m)	kgCO2/kg material	GWP (kgCO2)
BB1: W200x31	2	6.30	Rolled	31.00	1.19	464.84
BJ1: 600 OWSJ	17	6.30	Rolled	13.20	1.19	1682.42
BRJ1: 600 Joist Girder	2	18.90	Rolled	96.30	1.19	4332.00
					TOTAL:	13979.22 kgCO2
					TOTAL PER SQM:	**117.40 kgCO2/m2**



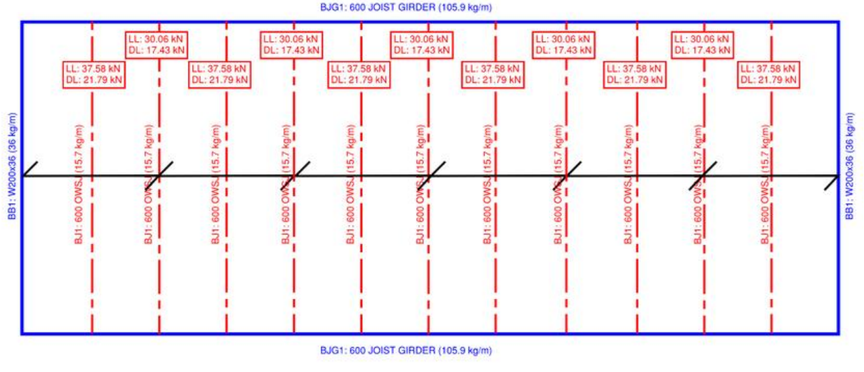
Single Span OWSJ Spaced 1575mm

Carbon Floors

Type	Amount	Area (m2)	Material Type	Area Density (kg material/m2)	kgCO2/kg material	GWP (kgCO2)
125 Concrete on 76 Composite Metal Deck	1	119.07	Deck Floor 76	217.20	0.29	7499.97

Carbon Framing

Type	Amount	Distance (m)	Material Type	Linear Density (kg material/m)	kgCO2/kg material	GWP (kgCO2)
BB1: W200x36	2	6.30	Rolled	36.00	1.19	539.81
BJ1: 600 OWSJ	11	6.30	Rolled	15.70	1.19	1294.80
BRJ1: 600 Joist Girder	2	6.30	Rolled	105.90	1.19	1587.95
					TOTAL:	10922.53 kgCO2
					TOTAL PER SQM:	**91.73 kgCO2/m2**



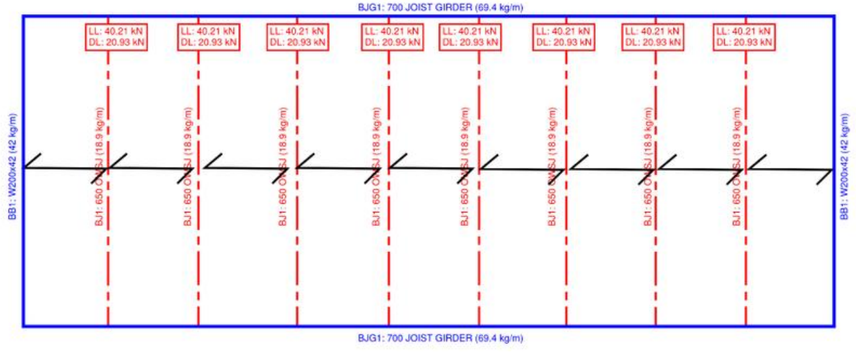
Single Span OWSJ Spaced 2100mm

Carbon Floors

Type	Amount	Area (m2)	Material Type	Area Density (kg material/m2)	kgCO2/kg material	GWP (kgCO2)
125 Concrete on 76 Composite Metal Deck	1	119.07	Deck Floor 76	217.20	0.29	7499.97

Carbon Framing

Type	Amount	Distance (m)	Material Type	Linear Density (kg material/m)	kgCO2/kg material	GWP (kgCO2)
BB1: W200x42	2	6.30	Rolled	42.00	1.19	629.78
BJ1: 650 OWSJ	8	6.30	Rolled	18.90	1.19	1133.61
BRJ1: 700 Joist Girder	2	6.30	Rolled	69.40	1.19	1040.64
					TOTAL:	10303.99 kgCO2
					TOTAL PER SQM:	**86.54 kgCO2/m2**



APPENDIX C4

STRUCTURAL SIZING

SAMPLE JOIST GIRDER FILE

WoodWorks® SOFTWARE FOR WOOD DESIGN

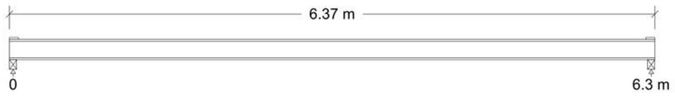
COMPANY	PROJECT
July 12, 2026 13:39	JG1 Moment

Design Check Calculation Sheet
WoodWorks Sizer 11.5

Loads:

Load	Type	Distribution	Pat-tern	Location [m] Start	Location [m] End	Magnitude Start	Magnitude End	Unit
DL1	Dead	Point		1.09		14.53		kN
LL1	Live	Point		1.09		9.86		kN
DL2	Dead	Point		2.10		11.62		kN
LL2	Live	Point		2.10		7.89		kN
DL3	Dead	Point		3.19		14.53		kN
LL3	Live	Point		3.19		9.86		kN
DL4	Dead	Point		4.20		11.62		kN
LL4	Live	Point		4.20		7.89		kN
DL5	Dead	Point		5.29		14.53		kN
LL5	Live	Point		5.29		9.86		kN

Maximum Reactions (kN):



Unfactored:			
Dead	33.54		33.28
Live	22.77		22.59
Factored:			
Total	76.09		75.49
Bearing:			
Capacity			
Support	76.09		75.49
Des ratio			
Support	1.00		1.00
Load comb	#2		#2
Length	72		71
Min req'd	72**		71**
KD	0.92		0.92
KB support	1.00		1.00
fcp sup	7.00		7.00
Kzcp sup	1.00		1.00

**Minimum bearing length governed by the required width of the supporting member.

Steel, 345 MPa, W200x71
Supports: All - Timber Beam, D.Fir-L No.2
Total length: 6.372 m; Clear span: 6.2 m
Lateral support: top = at supports, bottom = at supports;
This section PASSES the design code check.

Canadian Wood Council | Conseil canadien du bois

JG1 Moment | **WoodWorks® Sizer 11.5** | **Page 2**

Force vs. Resistance and Deflection using CSA S16-14:

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	Vf = 76.09	Vr = 452.00	kN	Vf/Vr = 0.17
Moment(+)	Mf = 141.86	Mr = 214.80	kN-m	Mf/Mr = 0.66
Perm. Defl'n	16.4 = L/383	17.5 = L/360	mm	0.94
Live Defl'n	11.2 = L/564	17.5 = L/360	mm	0.64
Total Defl'n	27.6 = L/228	35.0 = L/180	mm	0.79

Additional Data:

CRITICAL LOAD COMBINATIONS:

```
Shear     : LC #2  = 1.25D + 1.5L
Moment(+) : LC #2  = 1.25D + 1.5L
Deflection: LC #1  = 1.0D  (permanent)
            LC #2  = 1.0D + 1.0L  (live)
            LC #2  = 1.0D + 1.0L  (total)
Bearing   : Support 1 - LC #2 = 1.25D + 1.5L
            Support 2 - LC #2 = 1.25D + 1.5L
Load Types:  D=dead  L=live(use,occupancy)
Load combinations from NBC 2015; code references and LC's listed in the Analysis report
```

CALCULATIONS:

```
I =  76.60e06 mm^4
"Live" deflection is due to all non-dead loads (live, wind, snow…)
```

Design Notes:

1. WoodWorks analysis and design are in accordance with the CSA S16-14 design standard.
2. Please verify that the default deflection limits are appropriate for your application.
3. BEAMS require restraint against lateral displacement and rotation at points of bearing.

CANAM

JOIST GIRDERS
Economical Depth Selection

INPUT DATA

Factored Moment: 142 kN•m
Span: 6 300 mm
Calculation Method: Limit States Design (LSD)
Country: Canada

RESULTS

Depth	Weight Linear	Weight Total	Inertia	Deflection Calculated	Deflection Ratio
(mm)	(kg/m)	(kg)	($x10^6 mm^4$)	(mm)	
500	23.8	149.8	113.1	N/A	N/A
600	23.2	146.0	135.8	N/A	N/A
700	22.7	142.9	158.4	N/A	N/A

NOTES

For more information regarding Canam joist girders, please refer to the Joist Catalog or contact our experts by phone at 1-866-466-8769 or online.

WARNING

Canam Group Inc. does not warrant the accuracy of the information and graphs resulting from these calculations. All information and graphs are provided "AS IS" without warranty of any kind. Under no circumstances will Canam Group Inc. be held liable for any direct or indirect damage arising from or in connection with the use of the information or graphs resulting from these calculations. The use of these calculations confirms acceptance of these terms by their user.

Version 5.0.1 Copyright © Canam Group Inc., 2006-2026, All Rights Reserved Printed: 7/12/2026

SAMPLE OWSJ FILE

CANAM

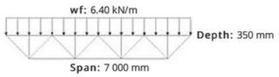
JOISTS
Economical Depth Selection

INPUT DATA

Dead Load: 2.60 kPa
Live Load: 1.90 kPa
Spacing: 1 050 mm
Span: 7 000 mm

Calculation Method: Limit States Design (LSD)
Country: Canada

PROPERTIES



RESULTS

Uniform Factored Load (wf)	Uniform Service Live Load	Depth	Estimated Linear Weight	Service Load to Produce a Deflection of L/360
kN/m	kN/m	mm	kg/m	kN/m
6.40	2.00	350	12.4	3

NOTES

For more information regarding Canam joists, please refer to the Joist Catalog or contact our experts by phone at 1-866-466-8769 or online.

WARNING

Canam Group Inc. does not warrant the accuracy of the information and graphs resulting from these calculations. All information and graphs are provided "AS IS" without warranty of any kind. Under no circumstances will Canam Group Inc. be held liable for any direct or indirect damage arising from or in connection with the use of the information or graphs resulting from these calculations. The use of these calculations confirms acceptance of these terms by their user.

Copyright © Canam Group Inc., 2006-2026, All Rights Reserved

SAMPLE BEAM FILE

WoodWorks® SOFTWARE FOR WOOD DESIGN	COMPANY	PROJECT
	July 10, 2026 14:27	B1

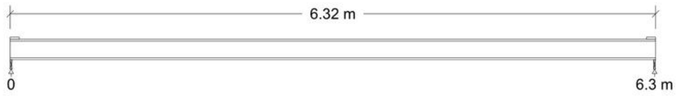
Design Check Calculation Sheet
WoodWorks Sizer 11.5

Loads:

Load	Type	Distribution	Pat-tern	Location [m] Start	End	Magnitude Start	End	Unit
DL	Dead	Full Area				2.60(0.53m)		kN/m2
LL	Live	Full Area				1.90(0.53m)		kN/m2
Self-weight	Dead	Full UDL				0.26		kN/m

Beam is a continuous support for all area loads, such that 125% of load on tributary width is applied to beam.

Maximum Reactions (kN):



Unfactored:			
Dead	6.21		6.21
Live	3.94		3.94
Factored:			
Total	13.67		13.67
Bearing:			
Capacity			
Support	13.67		13.67
Des ratio			
Support	1.00		1.00
Load comb	#2		#2
Length	19		19
Min req'd	19**		19**
KD	0.90		0.90
KB support	1.07		1.07
fcp sup	7.00		7.00
Kzcp sup	1.00		1.00

**Minimum bearing length governed by the required width of the supporting member.

Steel, 345 MPa, W200x27
Supports: All - Timber Beam, D.Fir-L No.2
Total length: 6.319 m; Clear span: 6.3 m
Lateral support: top = at supports, bottom = at supports;
This section PASSES the design code check.

Force vs. Resistance and Deflection using CSA S16-14:

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	Vf = 13.64	Vr = 246.00	kN	Vf/Vr = 0.06
Moment(+)	Mf = 21.48	Mr = 30.95	kN-m	Mf/Mr = 0.69
Perm. Defl'n	7.8 = L/805	17.5 = L/360	mm	0.45
Live Defl'n	5.0 = < L/999	17.5 = L/360	mm	0.28
Total Defl'n	12.8 = L/493	35.0 = L/180	mm	0.37

	Canadian Wood Council	Conseil canadien du bois

Additional Data:

CRITICAL LOAD COMBINATIONS:

```
 Shear     : LC #2  = 1.25D + 1.5L
 Moment(+) : LC #2  = 1.25D + 1.5L
 Deflection: LC #1  = 1.0D  (permanent)
             LC #2  = 1.0D + 1.0L  (live)
             LC #2  = 1.0D + 1.0L  (total)
 Bearing   : Support 1 - LC #2 = 1.25D + 1.5L
             Support 2 - LC #2 = 1.25D + 1.5L
 Load Types:  D=dead  L=live(use,occupancy)
 Load combinations from NBC 2015; code references and LC's listed in the Analysis report
```

CALCULATIONS:

```
 I =  25.80e06 mm^4
 "Live" deflection is due to all non-dead loads (live, wind, snow…)
```

Design Notes:

1. WoodWorks analysis and design are in accordance with the CSA S16-14 design standard.
2. Please verify that the default deflection limits are appropriate for your application.
3. BEAMS require restraint against lateral displacement and rotation at points of bearing.