HERITAGE RETENTION STUDY FOR 505 UNIVERSITY AVENUE, REDEVELOPMENT CONFIDENTIAL & WITHOUT PREJUDICE

PREPARED FOR

CARTAREAL CORPORATION N.V.

PREPARED BY

JABLONSKY, AST, AND PARTNERS

CONSULTING ENGINEERS

400-3 CONCORDE GATE

TORONTO, ON M3C 3N7

PROJECT NO. 23287

November 25, 2024

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INTRODUCTION:

The existing building located at 505 University Avenue consists of a 20-storey commercial building that was constructed in two phases. The original building was completed in approximately 1958 at 13 stories in height and a vertical addition was added in the 1960s to bring the building to 20 stories. The building has a single below-grade level that covers much of the site as well as a one-story commercial extension beyond the footprint of the tower at grade. We were able to obtain the original drawings for the 13-storey building but do not have the drawings for the vertical addition.

The building was constructed with structural steel columns and beams with precast floor panels and solid masonry and stone cladding. The steel framing consists of a fairly regular grid in the East-West and North-South directions with three primary column lines on the North exterior wall, the South exterior wall, and near the mid-point of the floor plate. The lateral force resisting system for the building is moment frames in the steel structure. We understand that the building was originally designed to support the vertical addition, and the original drawings would lead us to believe this was the case. The building is founded on caissons that extend to shale with grade beams and caps at the interface of the structure and caissons.

The façade consists of a monolithic construction of masonry and limestone facing. The brick and limestone are interlocked and built monolithically around the perimeter beams and columns. There does not appear to be any intermediate vertical support for the façade, and we believe that it is load bearing while engaging the beams at each floor level.

The building appears to generally be in good condition with some signs of age-related deterioration and wear. We did not observe any significant deflections or signs of distress. We were not able to observe the foundations but did not see any signs or evidence of differential settlement.

SITE DEVELOPMENT:

We understand that the site has been proposed as a possible candidate for redevelopment and intensification and formal Applications have been submitted to the City of Toronto. As part of this application, we were asked to help develop a strategy to retain all or part of the existing building in place for the duration of construction of the proposed new building and comment on how the structures could be integrated. As part of this exercise, we performed a structural review of the existing building, and the proposed plans as well as developing numerous retention and construction strategies.

New construction in the GTA, particularly for residential applications, is primarily built with cast-in-place concrete. Given that the existing building was constructed with structural steel, the interaction of the two materials was a leading consideration for design. Also, the existing building employed steel moment frames (Image 1), with lower strength steel than what is in common use today. The steel moment frames are flexible in nature, whereas cast-in-place concrete is much more rigid, which also poses a consideration. The rigidity of the exterior wall assembly and cladding was also found to be in direct contrast to the flexibility of the existing steel framing.

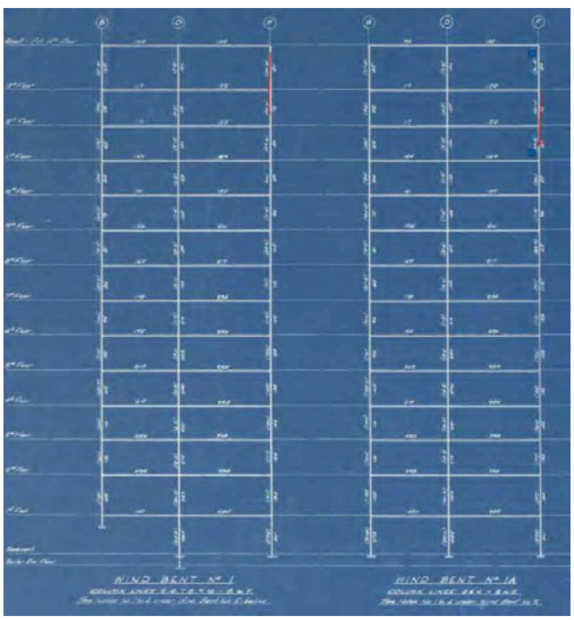

Image 1: Steel Moment Frames

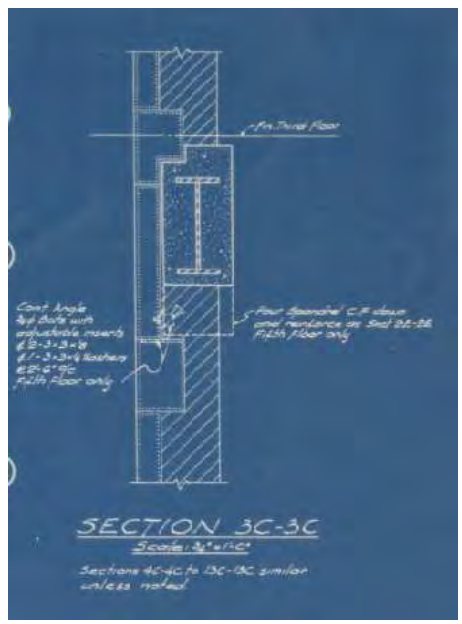

Image 2: Exterior Wall Assembly

At the time the original building was designed, the construction industry was beginning a transitionary period that would see the onset of new design codes and philosophies as well as the development of building science and improved construction techniques. The original structure was designed using Working Stress which was changed in 1960 to Ultimate Strength Design and then in 1970 to the current Limit States Design. The building had some steel angles installed above the windows, but shelf angles were not yet in common use and there were no soft joints in the exterior façade.

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Based on our review, we concluded that the original building was designed for the additional stories but not for loading beyond that with the foundations at 95% utilization (Image 3). We also found that the lateral load resisting system, the steel moment frames, were not effective in resisting loads in accordance with current codes. Based on these findings we concluded that the existing building, as it stands, could not support additional vertical loads or additional lateral loads.

Image 3: Foundation Utilization

If a vertical addition were to be added with the introduction of a new vertical structure within the existing floor plate, the practical installation of columns would not increase the lateral load resistance of the existing building. Also, given the soil condition at the site, and in the nearby vicinity, the foundations would need to extend to shale similar to the existing caissons. It was also readily apparent that the equipment required to install the caissons could not be mobilized due to the presence of the existing structure (Image 4). Appendix A contains the options that were explored with respect to a vertical addition to the existing building with additional structure.

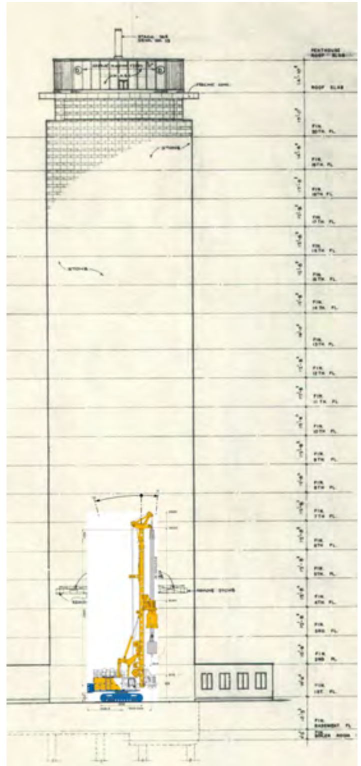


Image 4: Scaled Overlay of Drill Rig on Existing Building

A condition assessment of the existing façade elements was performed by Clifford Restoration Limited and identified vertical cracks in the North-East and South-West corners of the façade. The façade, while robust, is also stiff and inflexible and inadvertently contributes to the lateral stiffness of the existing building. Based on our review, we believe the cracks observed were caused by the torsion of the building under wind and seismic loads. Without lateral stiffening, we believe that these cracks will continue to develop and deteriorate over time. As previously referenced, the steel frame is flexible and does not get fully mobilized before the façade provides resistance to the lateral loads. It would be challenging to increase the stiffness of the existing steel framing to match the stiffness of the façade.

This led us to review a strategy of partial retention of the existing building. The major limitation of this would be the height of the building. We reviewed local retention precedents for both projects we were involved in as well as others, including façade only retention as well as partial building retention. A list of comparable examples is contained in Appendix B. For façade only the tallest retention to date has been 19 Duncan which was preceded by the King Blue development both at 6 stories in height. The tallest current historical retention is located at 481 University Avenue and includes an interior bay of structure as well as the façade. Beyond this, there have been no taller in-situ façade retention projects to our knowledge. The facades at the National Bank Building (1 Adelaide Street East.) and the Ernst and Yonge Building (100 Adelaide Street West) are 11 and 14 stories in height, respectively, and both were removed and rebuilt to match the original buildings. At 12 stories, the original height of the building would be in keeping with these precedents however, this would require a total removal and re-instatement of the façade elements. At 20 stories, there are no precedents for retention or reconstruction.

Our analysis for retention strategy started with maintaining the façade on the East, South, and West elevations with returns on the North elevation (Image 5). We determined that the existing steel frame did not have sufficient strength to resist the applied loads and that the deflections were excessive (Image 6). Combined with strengthening of the existing framing and adding stiffness to reduce movement, the deflections were still excessive. Appendix C contains a report on the Analysis of retention of the 20-storey Building.

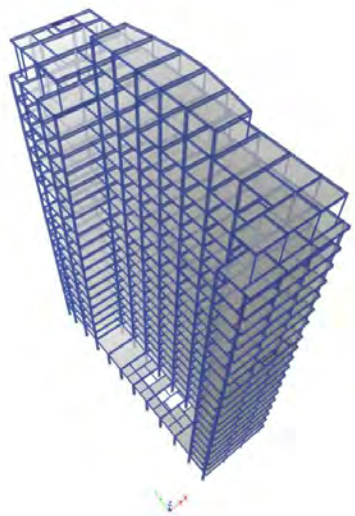


Image 5: Model of Full Building Retention

Story	Interstory Drift Ratio											
	WXDR	WX1DR	WX2DR	WYDR	WY1DR	WY2DR	WCDR1	WCDR2	WCDR3	WCDR4	WCDR5	WCDR6
PH	90%	37%	74%	46%	24%	22%	80%	72%	46%	64%	44%	73%
ROOF	[illegible]	57%	[illegible]	68%	46%	46%	[illegible]	[illegible]	78%	[illegible]	79%	[illegible]
F20	[illegible]	50%	[illegible]	74%	36%	40%	100%	[illegible]	56%	[illegible]	85%	93%
F19	[illegible]	67%	[illegible]	81%	39%	45%	[illegible]	[illegible]	61%	[illegible]	72%	[illegible]
F18	[illegible]	66%	[illegible]	82%	44%	51%	[illegible]	[illegible]	70%	[illegible]	82%	[illegible]
F17	[illegible]	75%	[illegible]	[illegible]	49%	57%	[illegible]	[illegible]	80%	[illegible]	82%	[illegible]
F16	[illegible]	86%	[illegible]	[illegible]	54%	64%	[illegible]	[illegible]	90%	[illegible]	[illegible]	[illegible]
F15	[illegible]	[illegible]	[illegible]	[illegible]	58%	70%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
F14-OLDROOF	[illegible]	[illegible]	[illegible]	[illegible]	66%	70%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
F13	[illegible]	[illegible]	[illegible]	[illegible]	62%	74%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
F12	[illegible]	[illegible]	[illegible]	[illegible]	72%	85%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
F11	[illegible]	[illegible]	[illegible]	[illegible]	74%	86%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
F10	[illegible]	[illegible]	[illegible]	[illegible]	78%	91%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
F9	[illegible]	[illegible]	[illegible]	[illegible]	79%	93%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
F8	[illegible]	[illegible]	[illegible]	[illegible]	81%	90%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
F7	[illegible]	[illegible]	[illegible]	[illegible]	81%	96%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
F6	[illegible]	[illegible]	[illegible]	[illegible]	82%	90%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
F5	[illegible]	[illegible]	[illegible]	[illegible]	81%	97%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
F4	[illegible]	[illegible]	[illegible]	[illegible]	83%	99%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
F3	[illegible]	[illegible]	[illegible]	[illegible]	91%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
F2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 4 : Storey Drift Summary

Image 6: Summary of Deflection Exceedances For Full Height Retention

This led us to review the entire building and its original framing. Based on our analysis, the existing steel framing does not have sufficient stiffness to adequately support the building or resist deflections given the stiffness of the exterior cladding. It has become readily apparent that the stiffness and robustness of the exterior wall assembly has contributed to the performance of the building to date. The cracks in the corners of the building are indicative of the overstress in the wall assembly during wind and seismic events. Appendix D contains the analysis of the existing structure and clearly demonstrates that the exterior wall assembly is supporting the existing building from a lateral perspective. We would not criticize the original designers of the building as they were working with the knowledge and technology that was available to them at the time, however, the building in its current form and design would not meet modern-day Building Code Requirements for strength and serviceability. The building has performed to date in a satisfactory manner, however, over time the exterior wall assembly will continue to provide resistance for lateral loading and continue to show evidence of this via cracking.

We then reviewed the partial retention of the original 12-storey building (Image 7). The results of the analysis were similar in that even with the strengthening of the existing structure and added stiffness, the deflections were excessive to the extent that the façade would incur significant damage resulting from movement (Image 8). This added to the conclusion we had initially, that the existing façade was carrying much of the lateral capacity of the buildings. Appendix E contains a Report on the results of the Retention of the 12-story building.

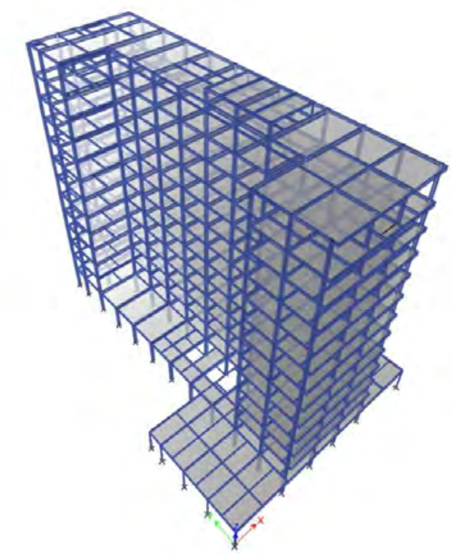
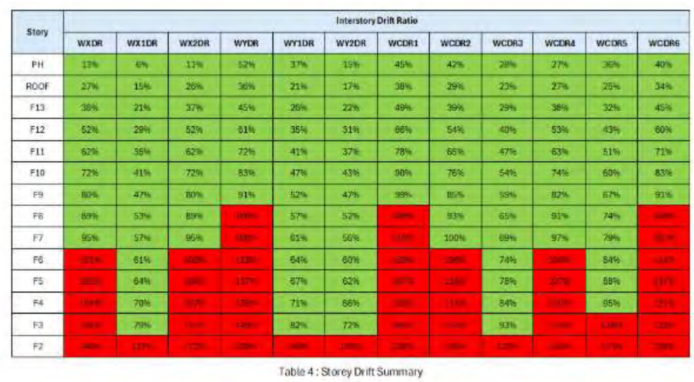


Image 7: Retention of 12 Storey Building

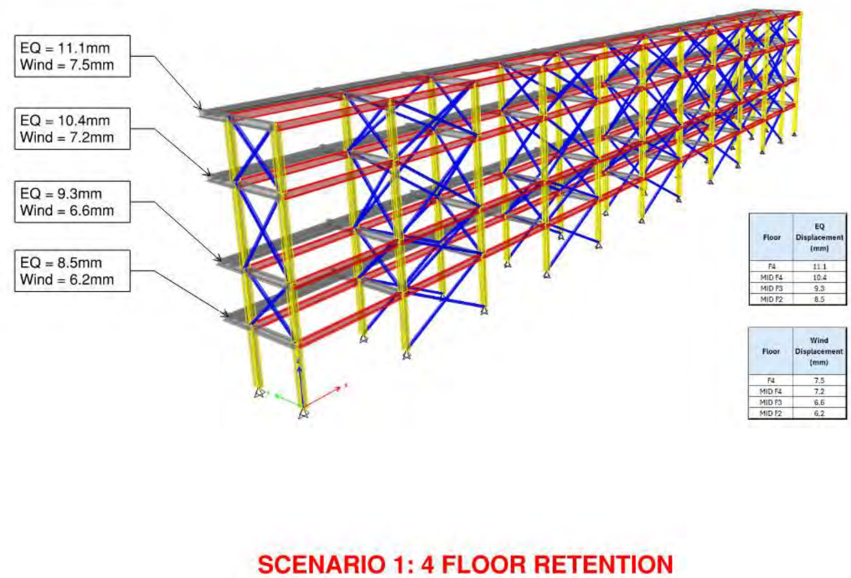


Story	Interstory Drift Ratio											
	WXDR	WX1DR	WX2DR	WYDR	WY1DR	WY2DR	WCDR1	WCDR2	WCDR3	WCDR4	WCDR5	WCDR6
PH	13%	6%	11%	52%	37%	19%	45%	42%	28%	27%	36%	40%
ROOF	27%	15%	26%	36%	21%	17%	38%	29%	23%	27%	25%	34%
F13	38%	21%	37%	45%	26%	22%	49%	39%	29%	38%	32%	45%
F12	52%	29%	52%	61%	35%	31%	66%	54%	40%	53%	43%	60%
F11	62%	35%	62%	72%	41%	37%	78%	65%	47%	63%	51%	71%
F10	72%	41%	72%	83%	47%	43%	90%	76%	54%	74%	60%	83%
F9	80%	47%	80%	91%	52%	47%	99%	85%	59%	82%	67%	91%
F8	89%	53%	89%	[illegible]	57%	52%	[illegible]	93%	65%	91%	74%	[illegible]
F7	95%	57%	95%	[illegible]	61%	56%	[illegible]	100%	69%	97%	79%	[illegible]
F6	[illegible]	61%	[illegible]	[illegible]	64%	60%	[illegible]	[illegible]	74%	[illegible]	84%	[illegible]
F5	[illegible]	64%	[illegible]	117%	67%	62%	[illegible]	[illegible]	78%	[illegible]	88%	[illegible]
F4	[illegible]	70%	[illegible]	[illegible]	71%	66%	[illegible]	[illegible]	84%	[illegible]	95%	[illegible]
F3	[illegible]	79%	[illegible]	[illegible]	82%	72%	[illegible]	[illegible]	93%	[illegible]	[illegible]	[illegible]
F2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 4 : Storey Drift Summary

Image 8: Summary of Deflection Exceedneces of 12-Storey Retention

The retention strategy then turned to façade only with supplemental framing on the exterior of the building. We reviewed several options for the height of the façade to be retained and the associated deflection for each option. The review settled on 6-storey and 4-storey façade retention schemes, and we determined that the deflection at the top of the wall would be twice as large for 6-stories as for 4-stories (Image 9). Given the stiffness of the exterior façade, the deflection sensitivity is crucial as is evidenced in the existing cracks in the corners of the building. Appendix F contains the analysis of the façade retention for 4 and 6-storey.



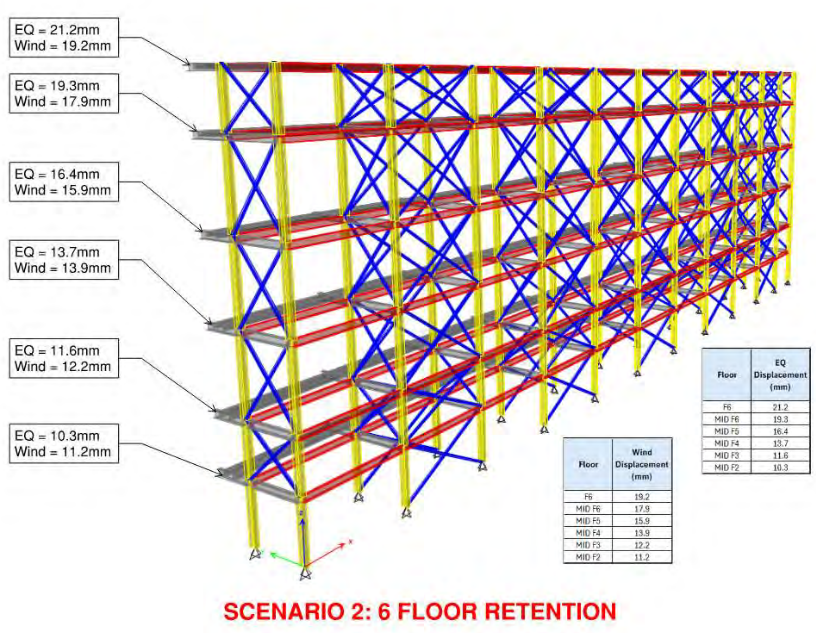


Image 9: Comparison of 4 and 6 Storey Facade Retention Deflections

DISCUSSION:

Based on the foregoing, there are several limitations to the existing site, building, and the proposed development. The location of the existing building on the site presents a significant challenge in that there is insufficient space to place a new building adjacent to the existing building. The existing building cannot support additional load in terms of a vertical addition, nor can it resist additional lateral load. If a new independent structure were to be installed to support a new vertical addition, the existing framing, on a regular grid, does not allow equipment required to access the site to install new foundations for additional structure. Also, the existing building could not resist the lateral load associated with an independently supported vertical addition.

The height of the existing building puts in well beyond what has been feasibly done and the experiences we have had on shorter retentions are cause for concern. Structural modeling has confirmed the concerns with respect to the movement of the building during the retention process. The original height of 12 stories and the current height of 20 stories preclude the ability to retain the building successfully with both vertical and lateral reinforcing of the existing structure.

With façade only retention, a 6-storey façade will sustain twice the amount of deflection as a 4-storey façade. Given the robust exterior wall construction, the façade is highly susceptible to deflection and will crack if the retention system is not sufficiently robust. Based on past experience, we have observed that the façade retention systems expand and contract with temperature fluctuations which cause the heritage wall to move with the retention frame. This induces cracking in a typical brick façade which will be more pronounced in the large stone, interlocked façade. The temperature fluctuations are not controllable and must be considered in any retention system design.

The rigidity and construction of the exterior walls make this building a strong candidate for panelization. The façade could be removed in sizeable panels, maintaining the current bonding and composition, and be re-installed on a new structural frame. A concrete structural back-up would compliment the stiffness of the exterior wall much more than the current steel structure.

CONCLUSION:

Based on our analysis of the existing building, façade retention options, and the sensitivity of the existing façade to movement, we believe that a 4-storey façade retention will preserve the heritage façade in keeping with the heritage retention goals. The remaining portion of the façade to be retained can be panelized and re-instated on the building incorporating current building science principles and carbon-conscious design. The retention of the façade at greater heights, with or without interior bays, will experience excessive deflections.

The building in its current state will continue to see cracks in the corners due to the stiffness differential between the exterior wall and the structural steel framing, whereas, a new concrete structure would be more compatible with the stone exterior and would serve to extend the useful lifespan and long term performance of the stone façade.

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DISCLAIMER:

This report was prepared for the account of Cartareal Corporation N.V., by Jablonsky, Ast and Partners Consulting Engineers. The material presented in it reflects Jablonsky, Ast and Partners Consulting Engineers' best judgement in light of the information available to it at the time of preparation, based on the information provided by Cartareal Corporation N.V., Any use that a third party makes of this report, or any reliance on or decisions made based on it, are the responsibility of such third parties. Jablonsky, Ast and Partners Consulting Engineers accept no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions taken based on this report.

Cartareal Corporation N.V., expressly agrees that it has engaged Jablonsky, Ast and Partners Consulting Engineers both on its own behalf and as an agent on behalf of its principals and employees. Cartareal Corporation N.V., expressly agrees that Jablonsky, Ast and Partners Consulting Engineers' principals and employees shall have no personal liability to Cartareal Corporation N.V., with respect to a claim whether in contract and/or any other cause of legal action. Cartareal Corporation N.V., accordingly, expressly agrees that it will bring no legal proceedings and take no legal action against any of the principals or employees, of Jablonsky, Ast and Partners Consulting Engineers, in their personal capacity.

Should you have any questions, please do not hesitate to contact this office.

Respectfully submitted,

JABLONSKY, AST AND PARTNERS
CONSULTING ENGINEERS

Jeff Watson, P. Eng.

cc: Farhang Haghighat, JAP
Gordon Tattle, JAP

APPENDIX A

Vertical Addition Commentary

Room Finish Schedule -

ROOM		FLOORS								BASE								WALLS										CEILINGS							REMARKS
		COLOURED CONC.	CERAMIC TILE	TERRAZZO	RESILIENT FLOOR	MARBLE	GRANITE	CARPET	FINISH	COVED METAL	CERAMIC TILE	TERRAZZO	VINYL	MARBLE	CARPET	GRANITE	FINISH	PLASTER	GLAZED TILE	DRYWALL	BRICK	MARBLE	GRANITE	MOVABLE	SPECIAL	SMOOTH FACED TILE	FINISH	METAL PAN	PLASTER	PLASTER BORDER	SUSPEND A/C TILE	DRYWALL	FINISH	CEILING HEIGHT	FINISH LEGEND ● EXISTING FINISH O NEW FINISH P PAINT
ELEVATOR LOBBY	901				●					●								●											●					9'-0"	
POWDER ROOM	902				●					●								●											●					8'-5"	
JANITOR CLOSET	903			●								●						●											●					8'-5"	
WOMENS WASHROOM	904			●								●						●											●					8'-5"	
MENS WASHROOM	905			●								●						●											●					8'-5"	
VESTIBULE	906				●					●								●											●					8'-5"	
TELEPHONE	907				●																					●									
STORAGE(H.C. W.R.)	908				O								O							O									●					8'-5"	Remove existing floor & wall tiles
ELEVATOR LOBBY	909				●					●								●											●					9'-0"	
OFFICE SPACE	910				●					●								●												●	O			9'-0"	
STAIR NO. 1		●																															P		Painted Plaster Soffit
STAIR NO. 2		●																															P		"

General Notes:

1. General Contractor to patch all resilient VAT floors with similar colour and thickness tiles to all floor area and to clean existing VAT of glue or other materials to new conditions. Replace as required.
2. General Contractor to remove all wall fabrics wood veneers, etc., from all walls, column surfaces rad covers, etc. & patch for paint surfaces. (Paint to specifications)
3. General Contractor to patch and sand all existing plaster/drywall walls and rad covers for paint finish. (Paint to specifications)
4. General Contractor to patch and sand all existing doors and frames for paint finish (Paint to specifications)
5. Cross over floors

   Floors 5,10,15 & 19 are proposed cross over floors as required by the building code sections 3.4.8.13 (14) & 3.4.8.13 (15) as follows:

Emergency access to floor areas

(14) In *buildings* that are regulated by the provisions of Subsection 3.2.6.

(a) each door opening into an *exit* stairway shall be identified on the stairway side with the number assigned to that floor,

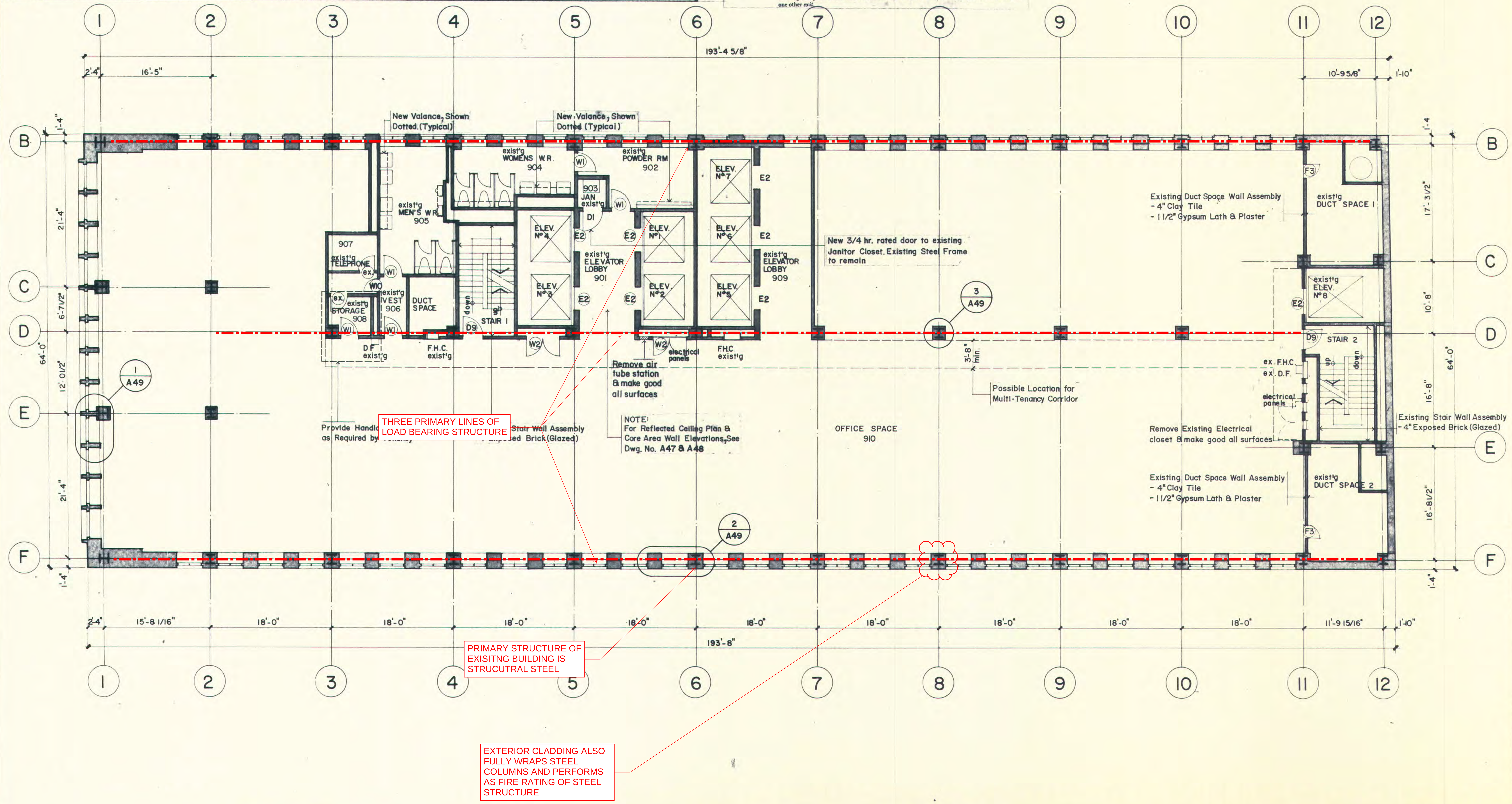
(b) doors providing access to *floor areas* into which occupants have to enter in an emergency shall not have locking devices to prevent such entry, and

(c) it shall be possible at all times at intervals of 5 *storeys* or less in an *exit* stair to pass through an unlocked door from the *exit* stairway into the *floor area*, and each such door shall be suitably identified by a sign on the stairway side.

(15) Where access to *floor areas* is required in Clause (14)(c), it shall be possible for a person entering such *floor area* to have access through unlocked doors within the *floor area* to at least one other *exit*.

NOTE:

All dimensions shown thus 18'-0" and existing building conditions are taken from architects drawing prepared by Marani and Morris Architects dated November 26, 1956 and Marani, Morris, and Allan Architects dated December 1966. These dimensions are to be verified on site where required.



Revision | Date | Initial

This drawing is to be used for the following purpose: TENDER

Not to be used for construction unless signed by the architect.

Young+Wright Architects

15 Delisle Avenue
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M4V 1S8
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ONTARIO ASSOCIATION OF ARCHITECTS
DAVID W. HASTINGS
LICENCE 3061

Client: CARTAREAL CORPORATION N.V.

Project: PROPOSED RENOVATION TO 505 UNIVERSITY AVENUE Toronto, Ontario

Date: APRIL 8 / 85 | Drawn: | Checked:

Drawing Title: Ninth Floor Plan

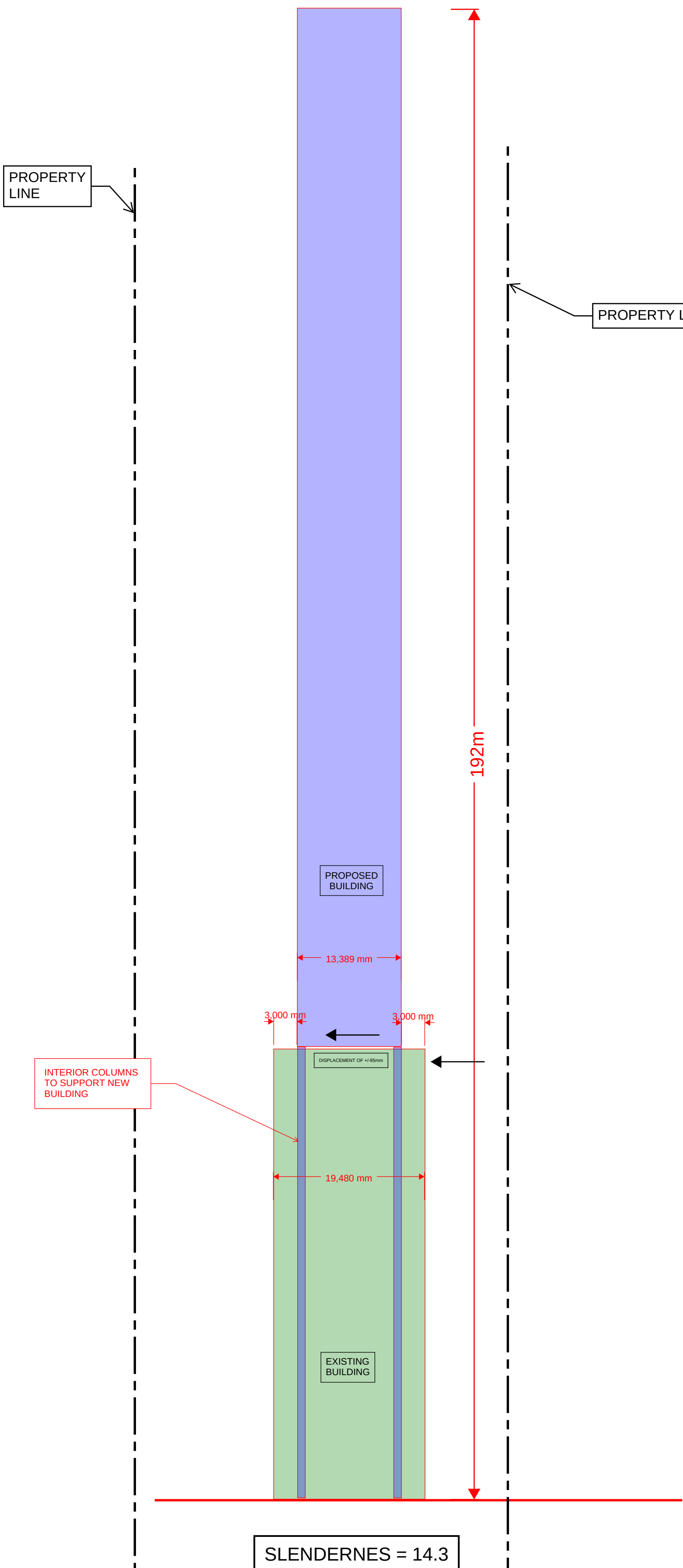
Scale: 1/8"=1'-0"

Project No.: 84145

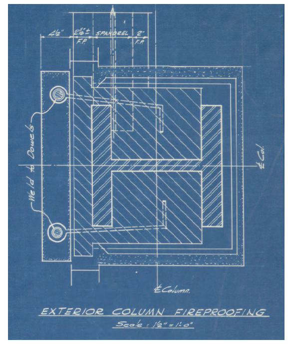
Drawing No.: A11

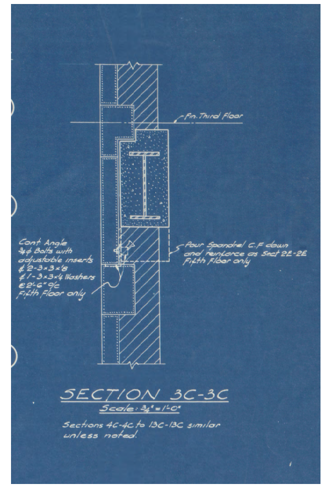
Revision:

VERTICAL ADDITION WITH SETBACKS

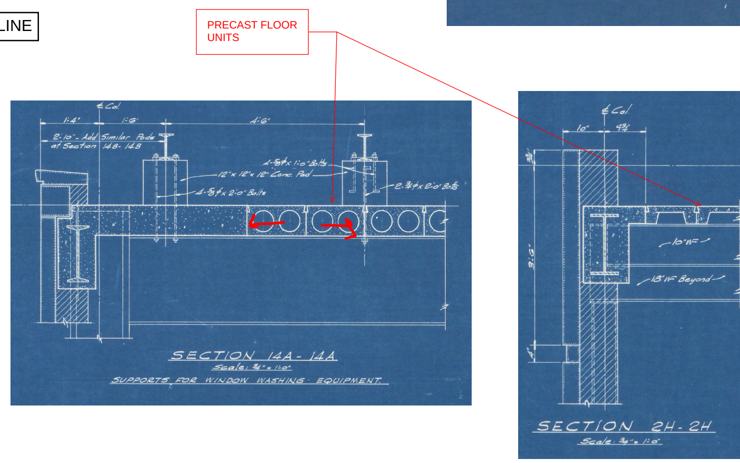


NORTH-SOUTH SECTION

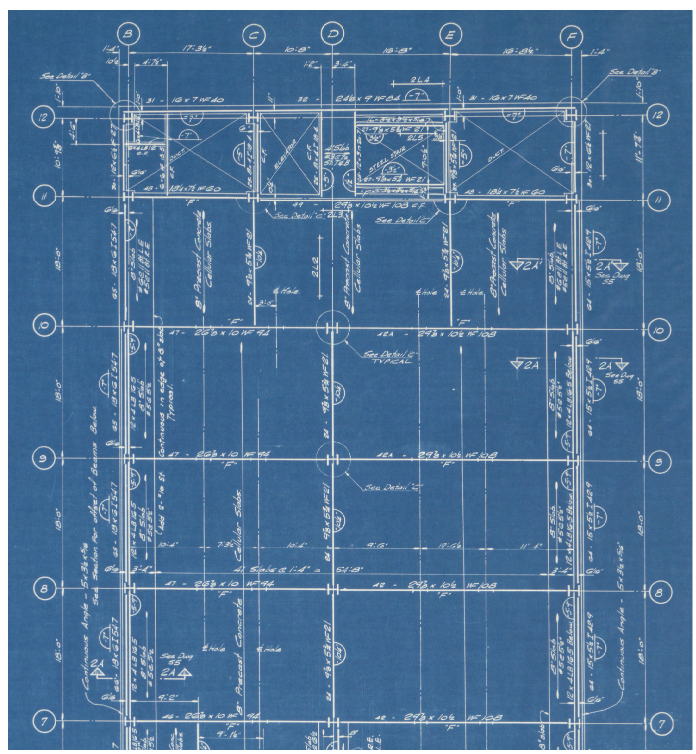




EXISITNG EXTERIOR STRUCTURE DETAILS

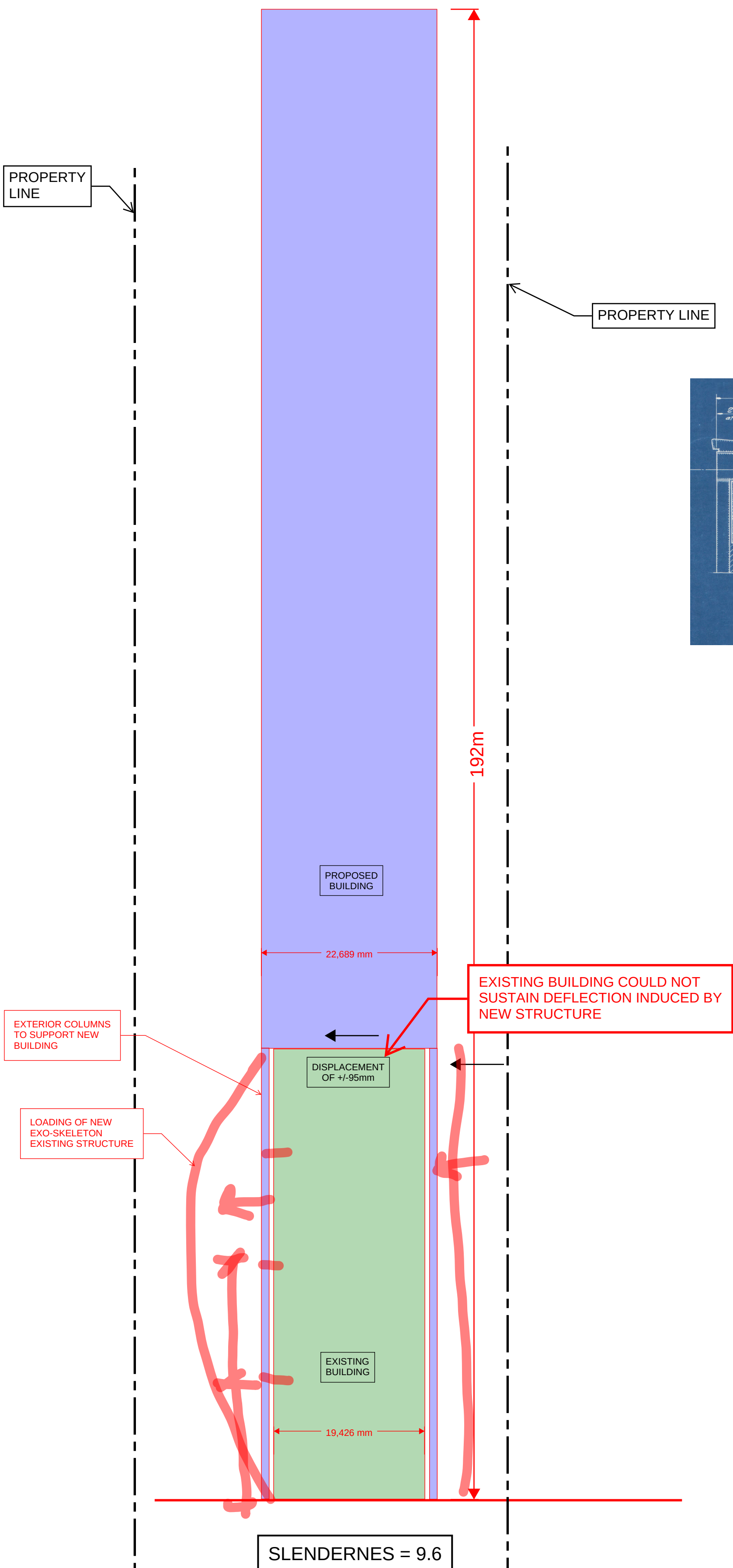


EXISITNG FLOOR STRUCTURE SECTIONS

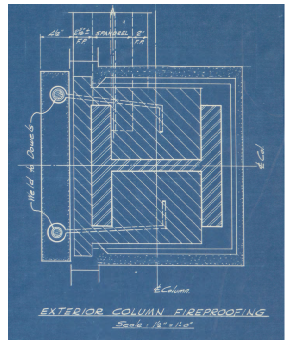


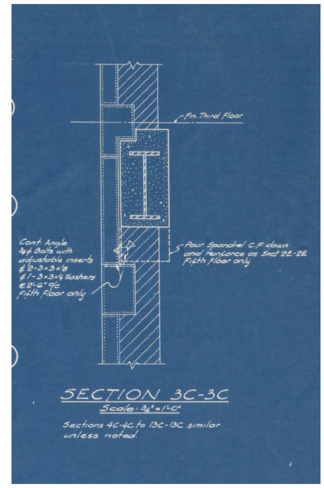
PART PLAN EXISITNG STRUCTURE

VERTICAL ADDITION WITH EXTERIOR STRUCTURE



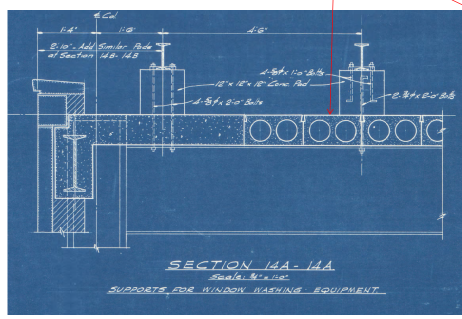
NORTH-SOUTH SECTION

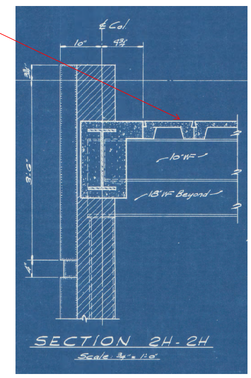




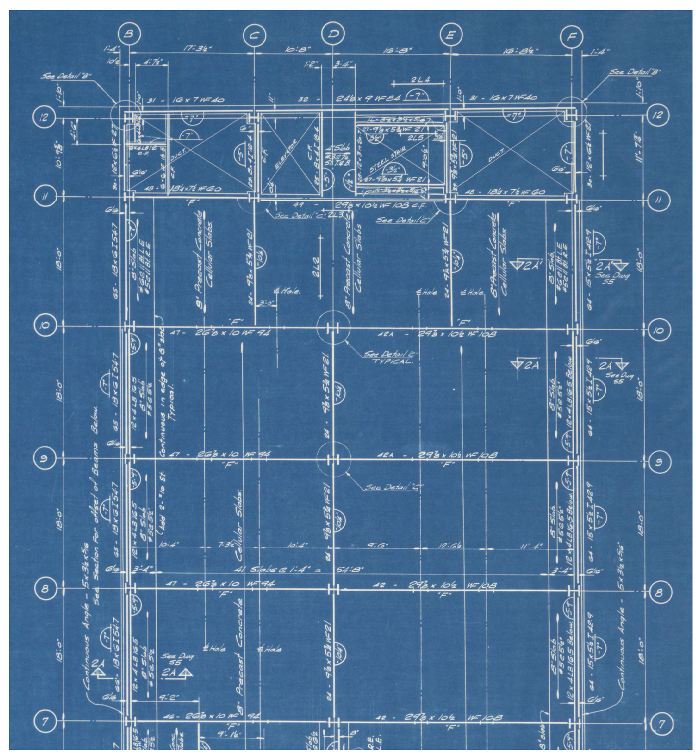
EXISITNG EXTERIOR STRUCTURE DETAILS

PRECAST FLOOR UNITS



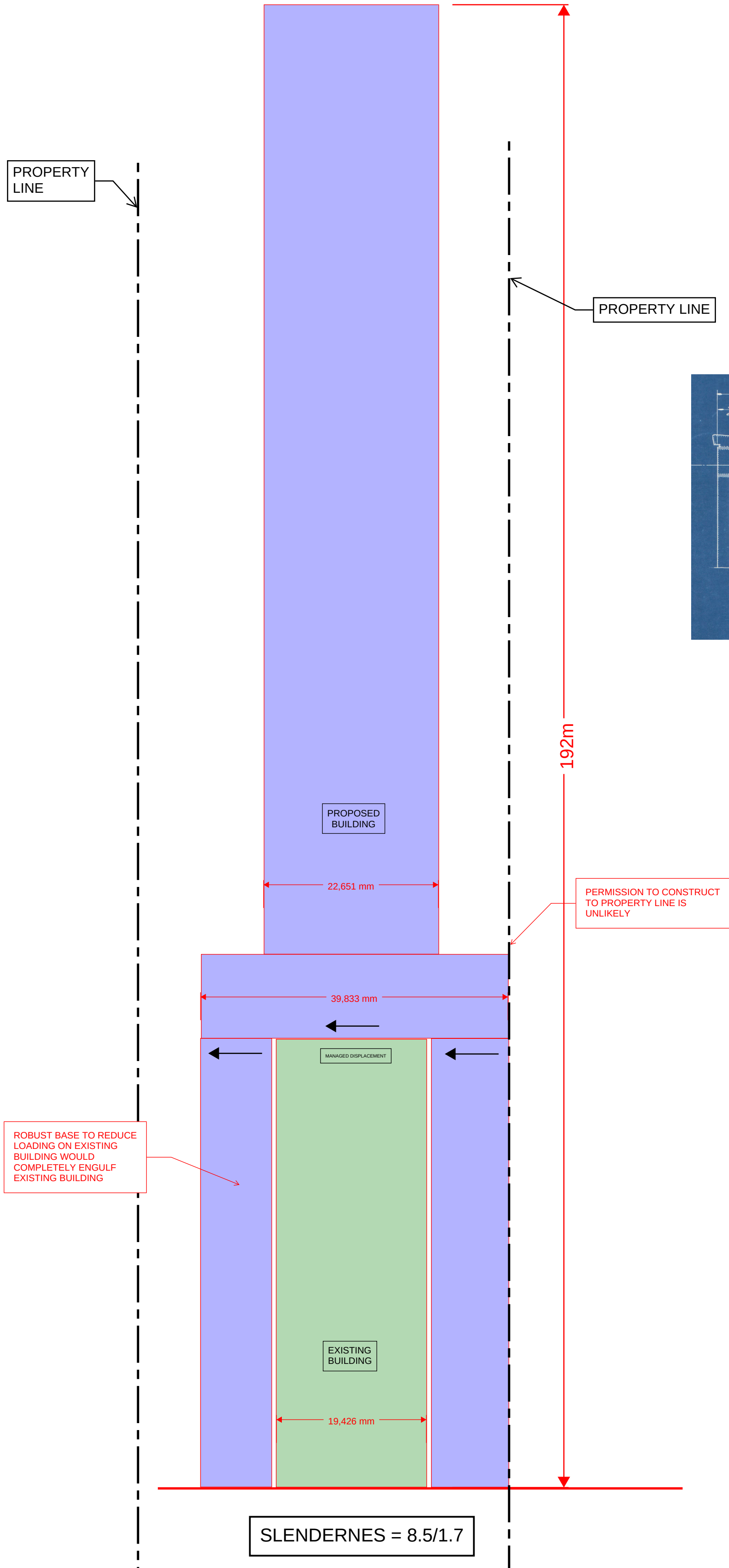


EXISITNG FLOOR STRUCTURE SECTIONS

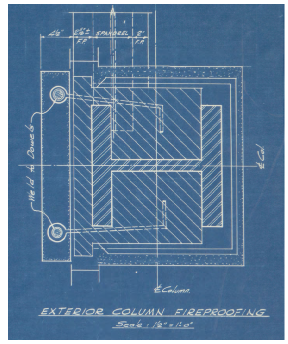


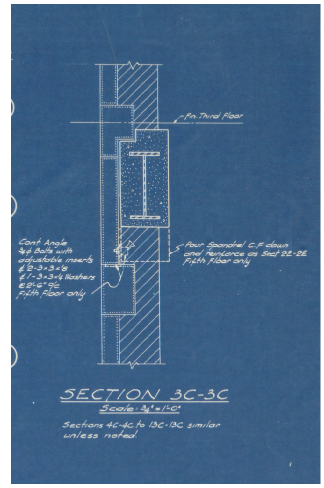
PART PLAN EXISITNG STRUCTURE

VERTICAL ADDITION WITH ADDITIONAL PODIUM

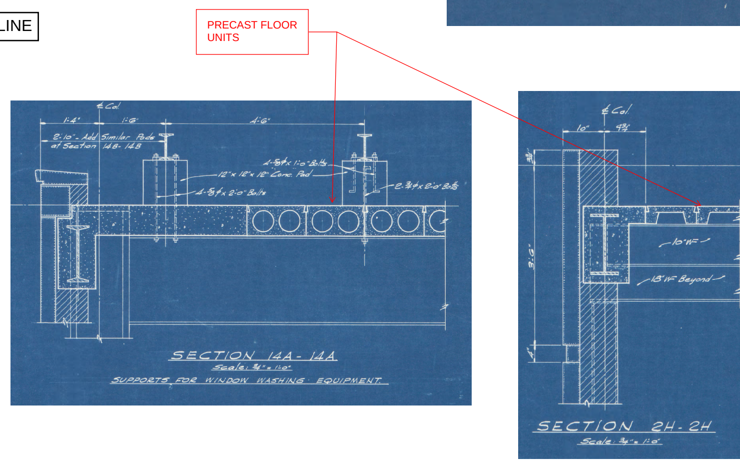


NORTH-SOUTH SECTION

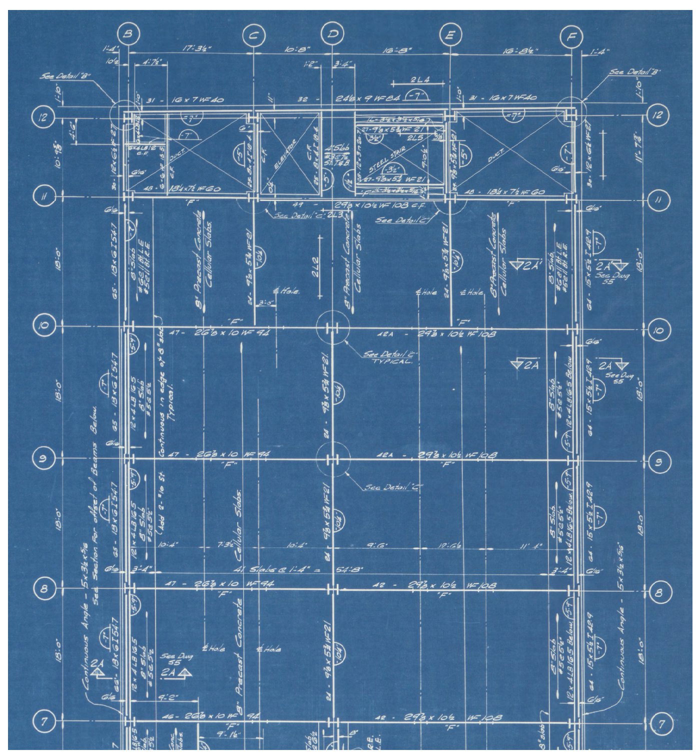




EXISITNG EXTERIOR STRUCTURE DETAILS

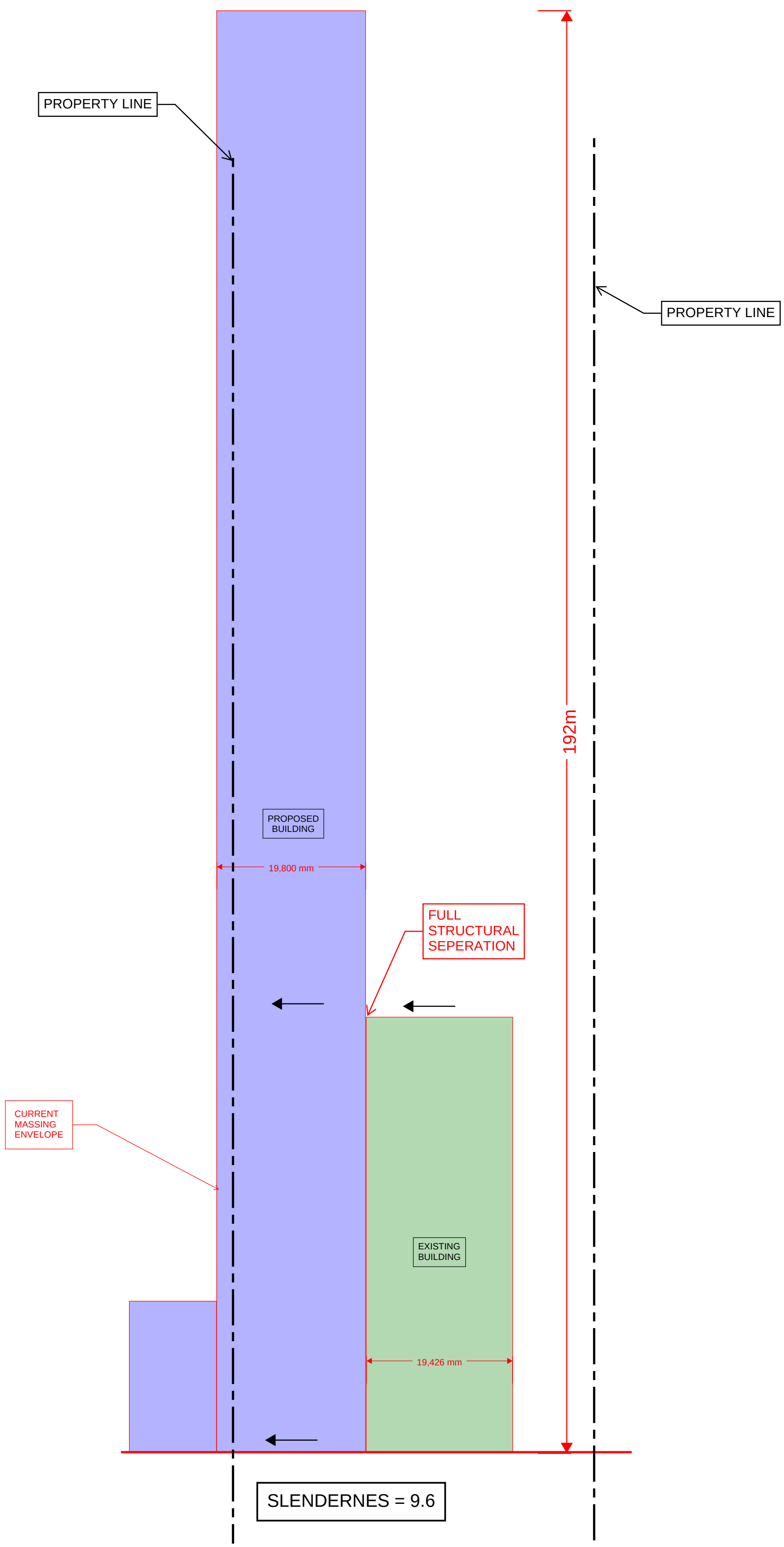


EXISITNG FLOOR STRUCTURE SECTIONS



PART PLAN EXISITNG STRUCTURE

HORIZONTAL ADDITION



NORTH-SOUTH SECTION

Room Finish Schedule -

FINISH LEGEND: ● EXISTING FINISH; O NEW FINISH; P PAINT

ROOM		FLOORS: COLOURED CONC.	CERAMIC TILE	TERRAZZO	RESILIENT FLOOR	MARBLE	GRANITE	CARPET	FINISH	BASE: COVED METAL	CERAMIC TILE	TERRAZZO	VINYL	MARBLE	CARPET	GRANITE	FINISH
ELEVATOR LOBBY	901				●					●							
POWDER ROOM	902				●					●							
JANITOR CLOSET	903			●								●					
WOMENS WASHROOM	904			●								●					
MENS WASHROOM	905			●								●					
VESTIBULE	906				●					●							
TELEPHONE	907				●												
STORAGE(H.C. W.R.)	908				O								O				
ELEVATOR LOBBY	909				●					●							
OFFICE SPACE	910				●					●							
STAIR NO. 1		●															
STAIR NO. 2		●															

ROOM		WALLS: PLASTER	GLAZED TILE	DRYWALL	BRICK	MARBLE	GRANITE	MOVABLE	SPECIAL	SMOOTH FACED TILE	FINISH	CEILINGS: METAL PAN	PLASTER	PLASTER BORDER	SUSPEND A/C TILE	DRYWALL	FINISH	CEILING HEIGHT	REMARKS
ELEVATOR LOBBY	901	●											●					9'-0"	
POWDER ROOM	902	●											●					8'-5"	
JANITOR CLOSET	903	●											●					8'-5"	
WOMENS WASHROOM	904	●											●					8'-5"	
MENS WASHROOM	905	●											●					8'-5"	
VESTIBULE	906	●											●					8'-5"	
TELEPHONE	907									●									
STORAGE(H.C. W.R.)	908			O									●					8'-5"	Remove existing floor & wall tiles
ELEVATOR LOBBY	909	●											●					9'-0"	
OFFICE SPACE	910	●												●	O			9'-0"	
STAIR NO. 1																	P		Painted Plaster Soffit
STAIR NO. 2																	P		"

General Notes:

1. General Contractor to patch all resilient VAT floors with similar colour and thickness tiles to all floor area and to clean existing VAT of glue or other materials to new conditions. Replace as required.

2. General Contractor to remove all wall fabrics wood veneers, etc., from all walls, column surfaces rad covers, etc. & patch for paint surfaces. (Paint to specifications)

3. General Contractor to patch and sand all existing plaster/drywall walls and rad covers for paint finish. (Paint to specifications)

4. General Contractor to patch and sand all existing doors and frames for paint finish (Paint to specifications)

5. Cross over floors

   Floors 5,10,15 & 19 are proposed cross over floors as required by the building code sections 3.4.8.13 (14) & 3.4.8.13 (15) as follows:

   Emergency access to floor areas

   (14) In *buildings* that are regulated by the provisions of Subsection 3.2.6.

   (a) each door opening into an *exit* stairway shall be identified on the stairway side with the number assigned to that floor,

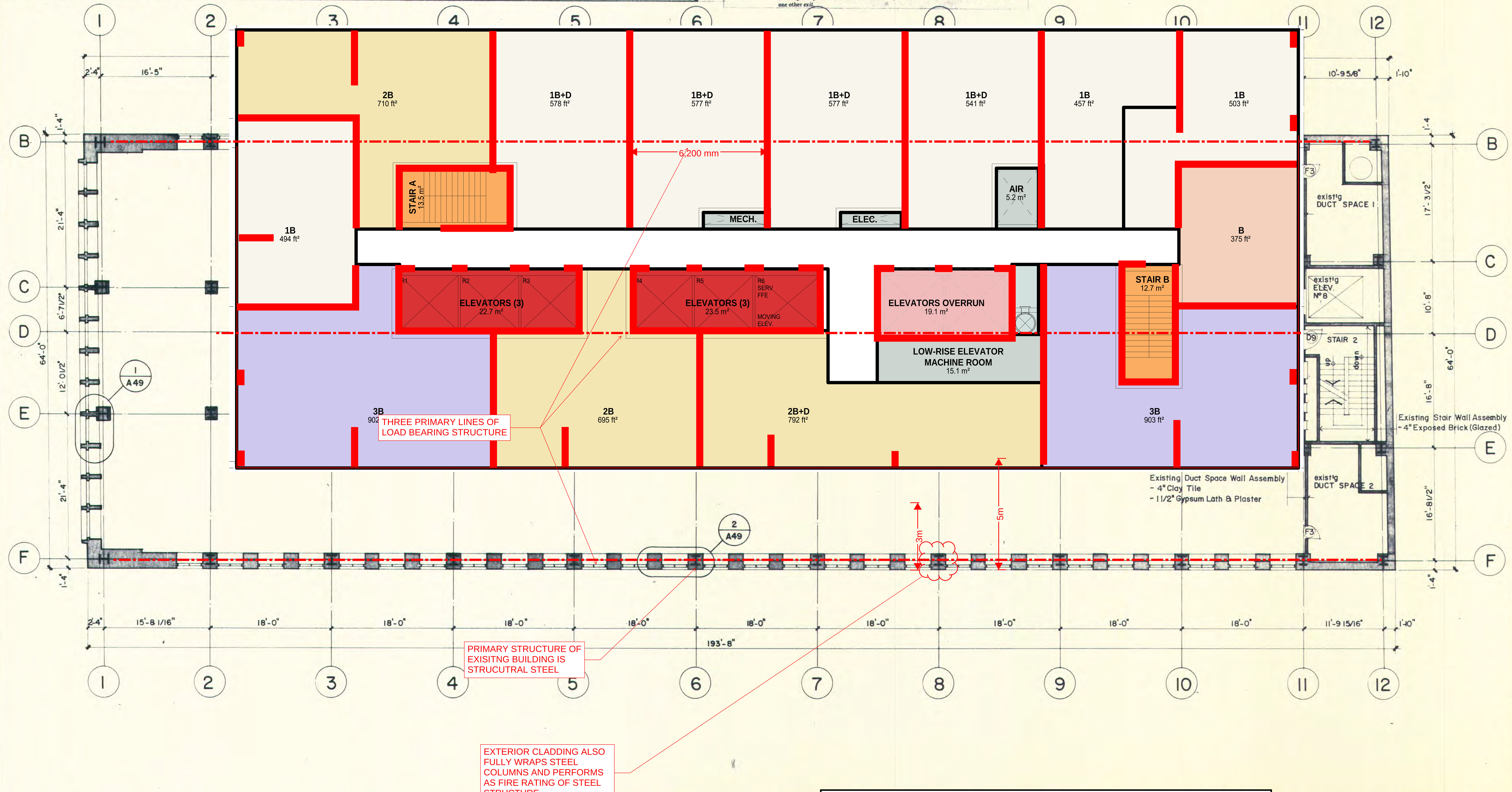
   (b) doors providing access to *floor areas* into which occupants have to enter in an emergency shall not have locking devices to prevent such entry, and

   (c) it shall be possible at all times at intervals of 5 *storeys* or less in an *exit* stair to pass through an unlocked door from the *exit* stairway into the *floor area*, and each such door shall be suitably identified by a sign on the stairway side.

   (15) Where access to *floor areas* is required in Clause (14)(c), it shall be possible for a person entering such *floor area* to have access through unlocked doors within the *floor area* to at least one other *exit*.

NOTE:

All dimensions shown thus 18'-0" and existing building conditions are taken from architects drawing prepared by Marani and Morris Architects dated November 26, 1956 and Marani, Morris, and Allan Architects dated December 1966. These dimensions are to be verified on site where required.



OVERLAY OF TYPICAL FLOOR AND EXISTING FLOOR PLATE

Revision	Date	Initial

This drawing is to be used for the following purpose: TENDER

Not to be used for construction unless signed by the architect.

Young+Wright Architects

15 Delisle Avenue
Toronto, Ontario
M4V 1S8
416/968-3522

ONTARIO ASSOCIATION OF ARCHITECTS

Client: CARTAREAL CORPORATION N.V.

Project: PROPOSED RENOVATION TO 505 UNIVERSITY AVENUE Toronto, Ontario

Date: APRIL 8 / 85 | Drawn: | Checked:

Drawing Title: Ninth Floor Plan

Scale: 1/8"=1'-0" | Drawing No.: A11 | Revision:

Project No.: 84145

Room Finish Schedule -

ROOM	No.	FLOORS: Coloured Conc.	Ceramic Tile	Terrazzo	Resilient Floor	Marble	Granite	Carpet	Finish	BASE: Coved Metal	Ceramic Tile	Terrazzo	Vinyl	Marble	Carpet	Granite	Finish	WALLS: Plaster	Glazed Tile	Drywall	Brick	Marble	Granite	Movable	Special	Smooth Faced Tile	Finish	CEILINGS: Metal Pan	Plaster	Plaster Border	Suspend A/C Tile	Drywall	Finish	Ceiling Height	REMARKS
ELEVATOR LOBBY	901				●					●								●											●					9'-0"	
POWDER ROOM	902				●					●								●											●					8'-5"	
JANITOR CLOSET	903			●								●						●											●					8'-5"	
WOMENS WASHROOM	904			●								●						●											●					8'-5"	
MENS WASHROOM	905			●								●						●											●					8'-5"	
VESTIBULE	906				●					●								●											●					8'-5"	
TELEPHONE	907				●																					●									
STORAGE (H.C. W.R.)	908				O								O							O									●					8'-5"	Remove existing floor & wall tiles
ELEVATOR LOBBY	909				●					●								●											●					9'-0"	
OFFICE SPACE	910				●					●								●												●	O			9'-0"	
STAIR NO. 1		●																															P		Painted Plaster Soffit
STAIR NO. 2		●																															P		"

FINISH LEGEND
● EXISTING FINISH
O NEW FINISH
P PAINT

General Notes:

1. General Contractor to patch all resilient VAT floors with similar colour and thickness tiles to all floor area and to clean existing VAT of glue or other materials to new conditions. Replace as required.

2. General Contractor to remove all wall fabrics wood veneers, etc., from all walls, column surfaces rad covers, etc. & patch for paint surfaces. (Paint to specifications)

3. General Contractor to patch and sand all existing plaster/drywall walls and rad covers for paint finish. (Paint to specifications)

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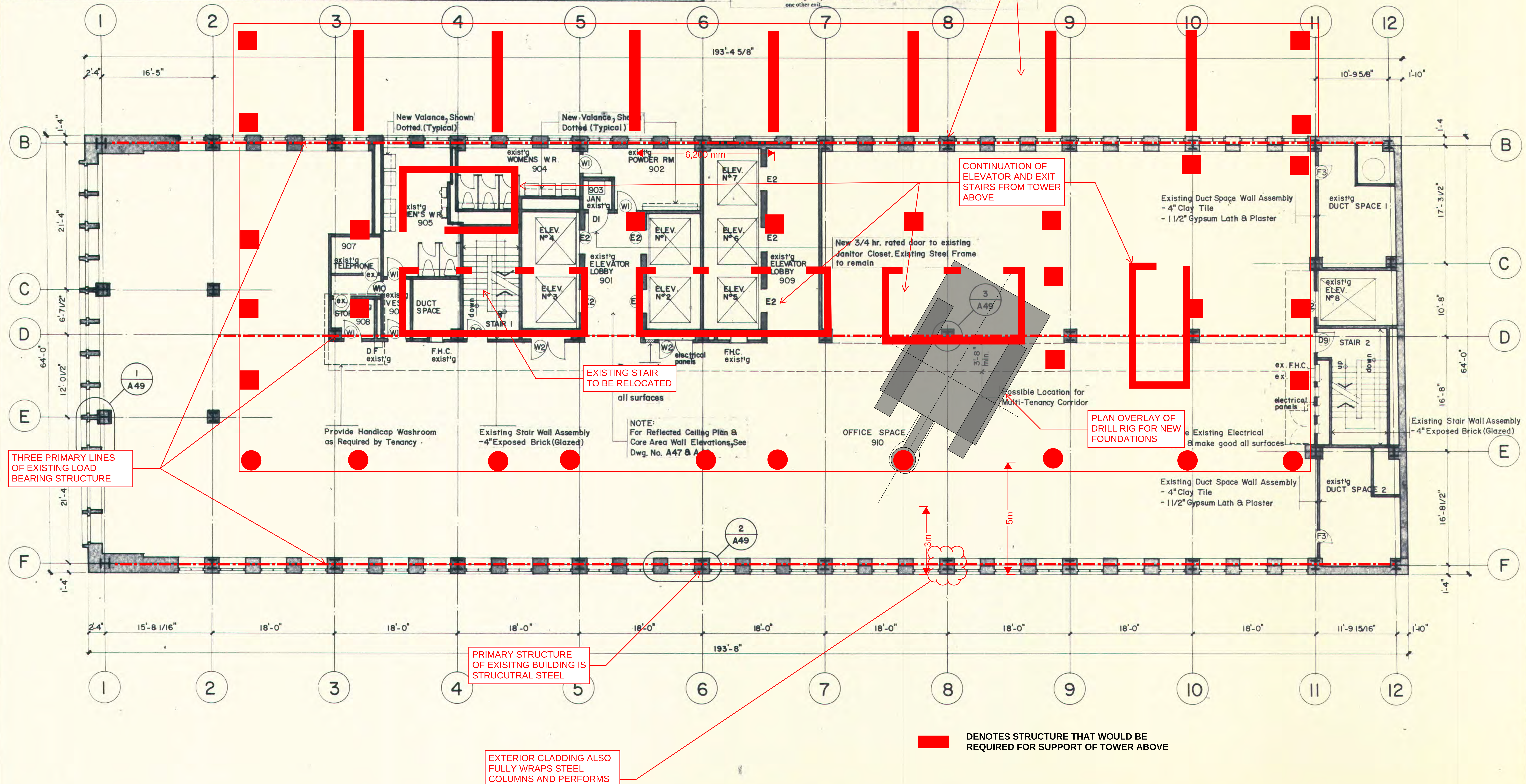


OVERLAY OF ADDITIONAL STRUCURE TO SUPPORT NEW TOWER AND AND EXISTING FLOOR PLATE

Revision	Date		Initial

This drawing is to be used for the following purpose: TENDER

Not to be used for construction unless signed by the architect.

Young+Wright Architects
15 Delisle Avenue
Toronto, Ontario
M4V 1S8
416/968-3522

ONTARIO ASSOCIATION OF ARCHITECTS
DAVID W. HASTINGS
LICENCE 3061

Client: CARTAREAL CORPORATION N.V.

Project: PROPOSED RENOVATION TO 505 UNIVERSITY AVENUE Toronto, Ontario

Date: APRIL 8 / 85 | Drawn: | Checked:

Drawing Title: Ninth Floor Plan

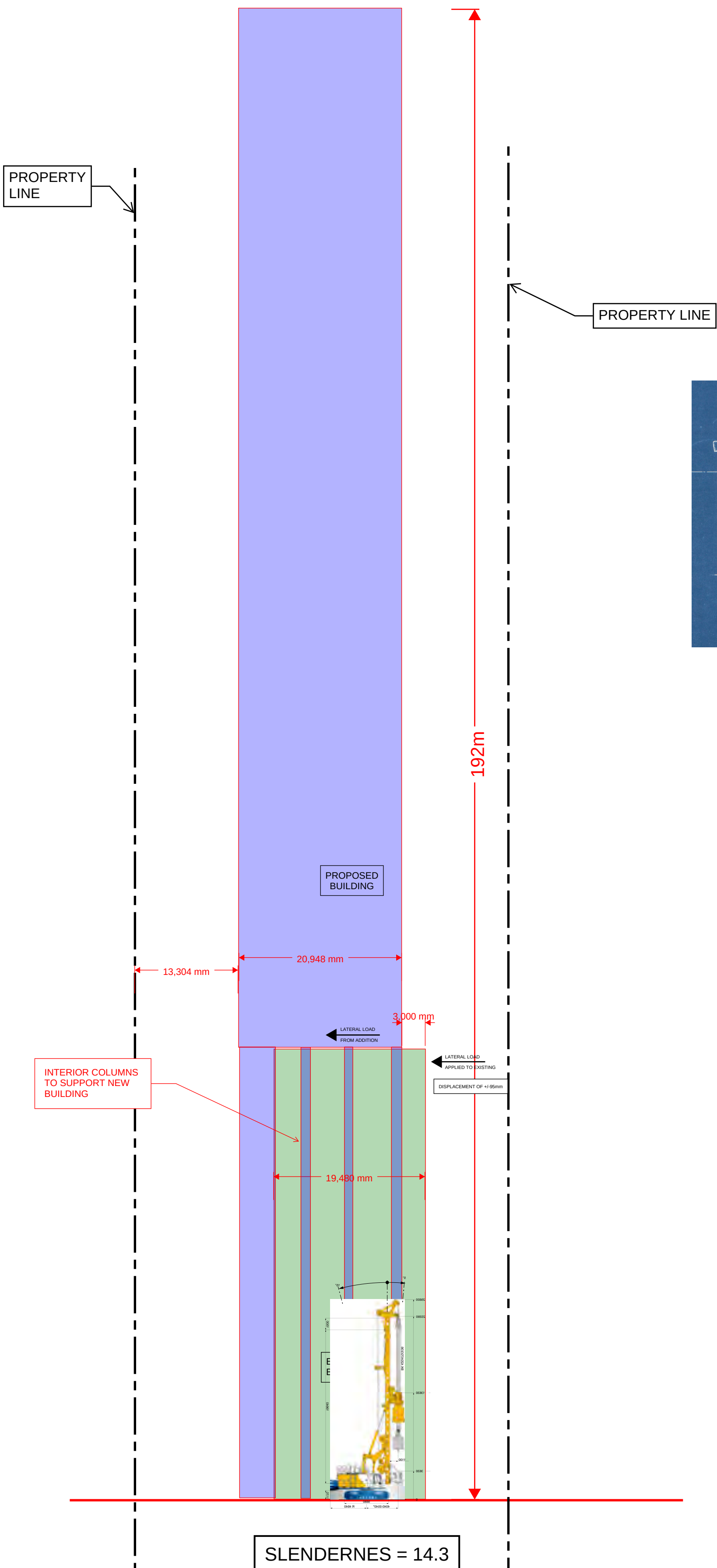
Scale: 1/8"=1'-0"

Project No.: 84145

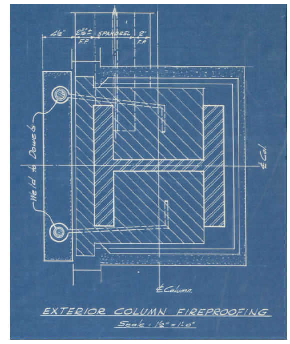
Drawing No.: A11

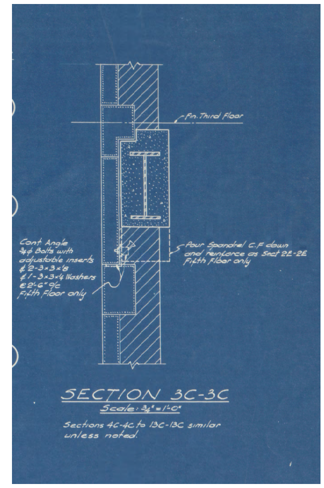
Revision:

VERTICAL ADDITION WITH SETBACKS



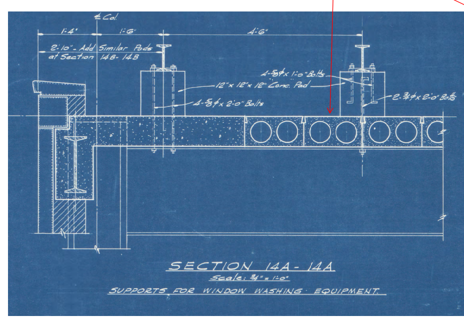
NORTH-SOUTH SECTION

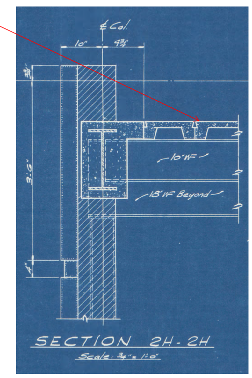




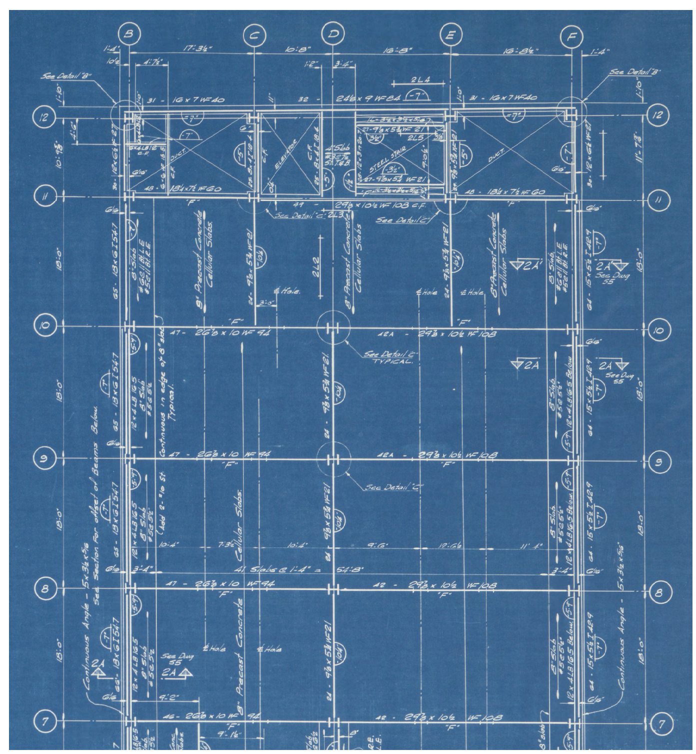
EXISITNG EXTERIOR STRUCTURE DETAILS

PRECAST FLOOR UNITS





EXISITNG FLOOR STRUCTURE SECTIONS



PART PLAN EXISITNG STRUCTURE

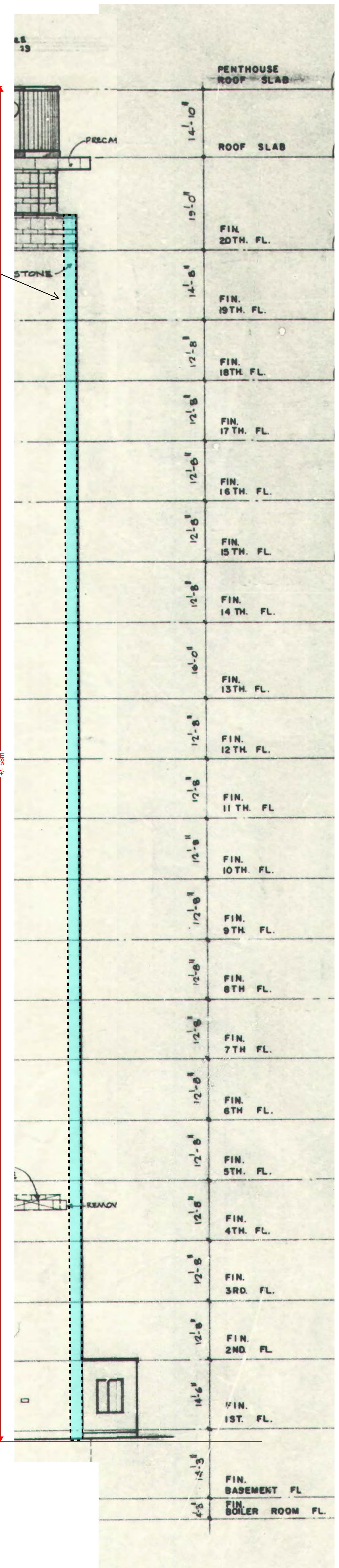
APPENDIX B

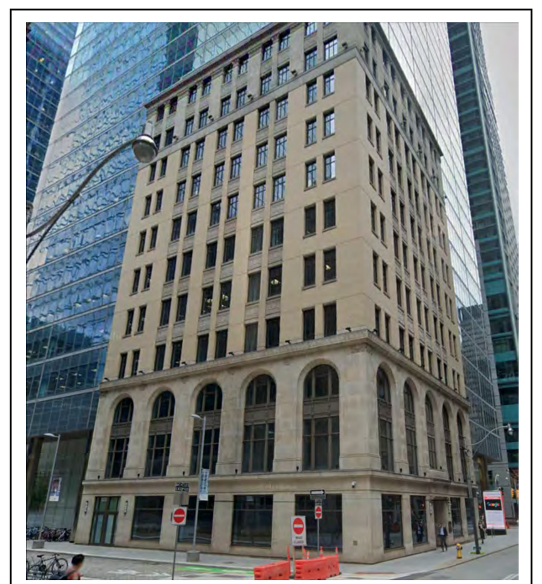
Comparables

COMPARABLES

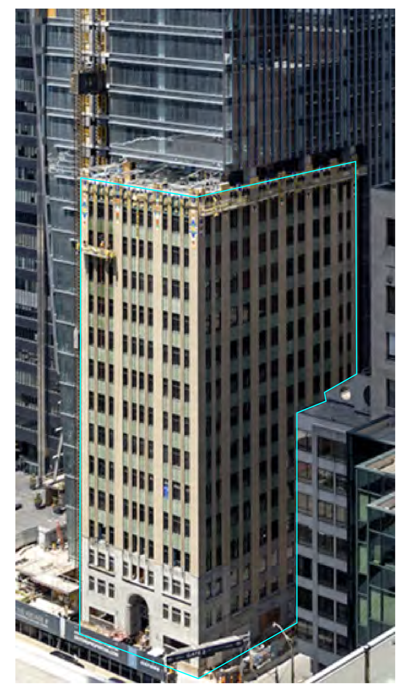
505 UNIVERSITY (20 STORIES)

505 UNIVERSITY MODIFIED HEIGHT



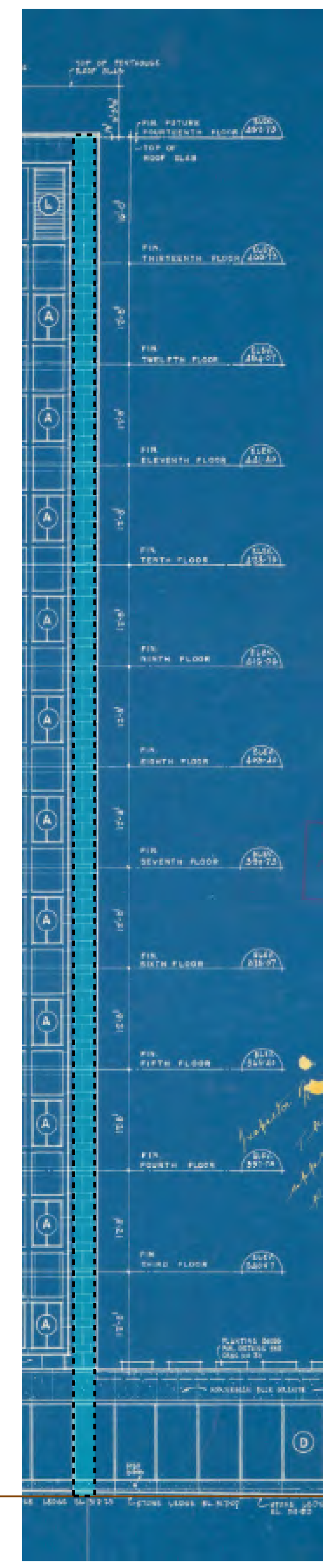


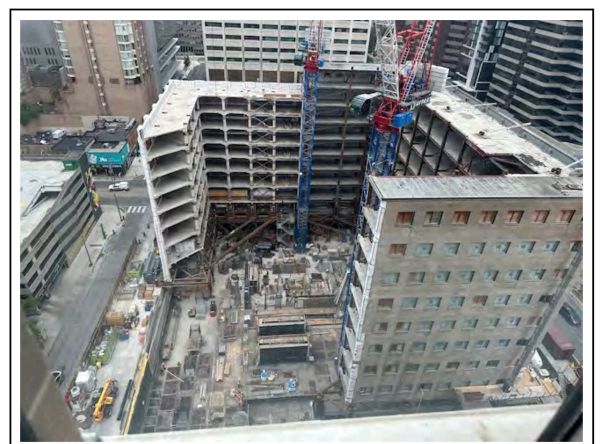
NATIONAL BANK RE-BUILT FACADE (11 STORIES)



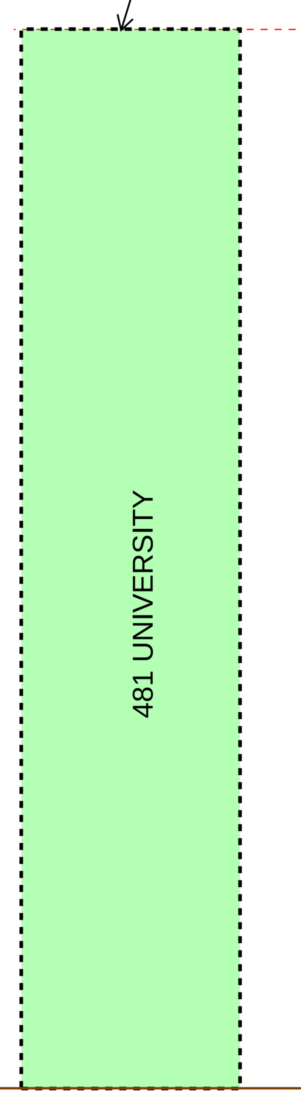
ERNST AND YOUNG RE-BUILT FACADE (14 STORIES)

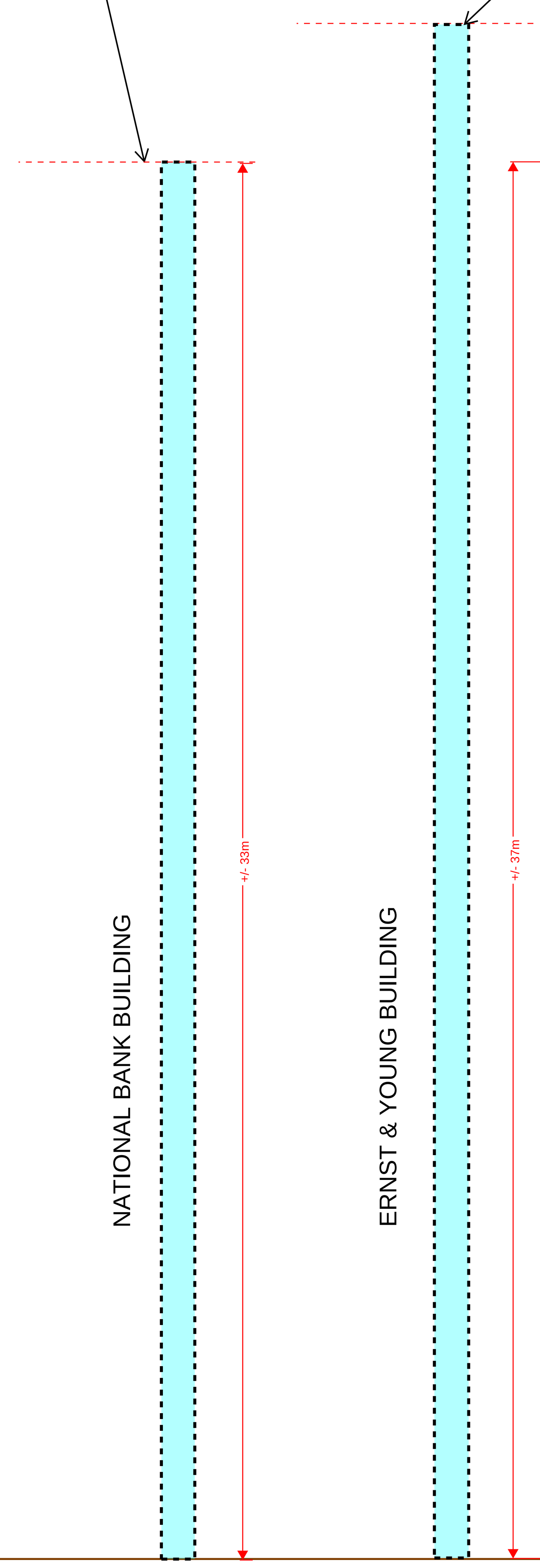
505 UNIVERSITY ORIGINAL HEIGHT





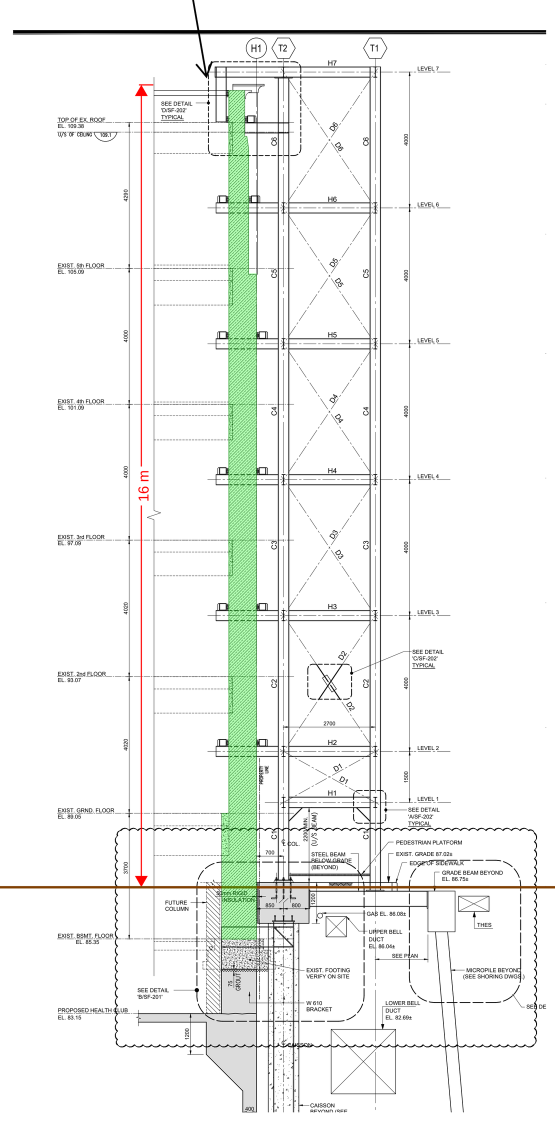
EXISTING RETENTION OF 481 UNIVERSITY (8 STORIES)

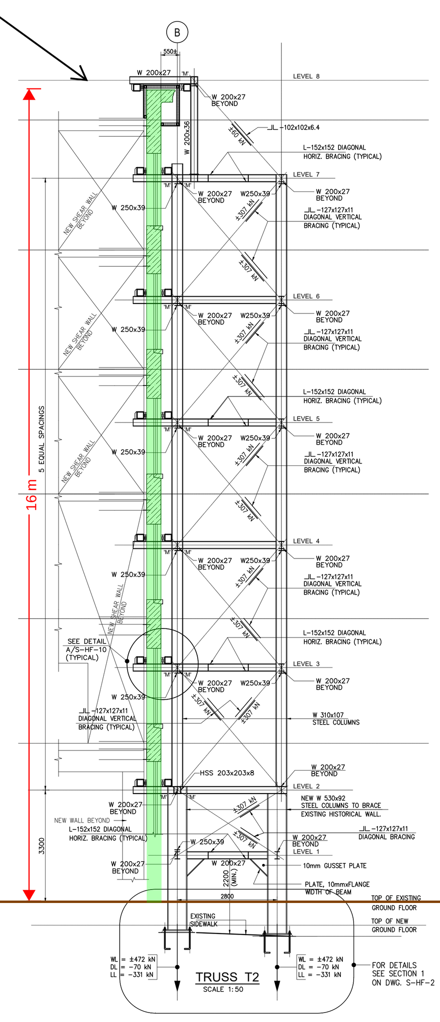




EXISTING RETENTION OF KING BLUE (6 STORIES)

EXISTING RETENTION OF 19 DUNCAN (6 STORIES)





APPENDIX C

Report on the Retention of 20-storey Building

JABLONSKY, AST
AND PARTNERS
CONSULTING ENGINEERS
SINCE 1955

Building Structural Framing Study for Existing Structure

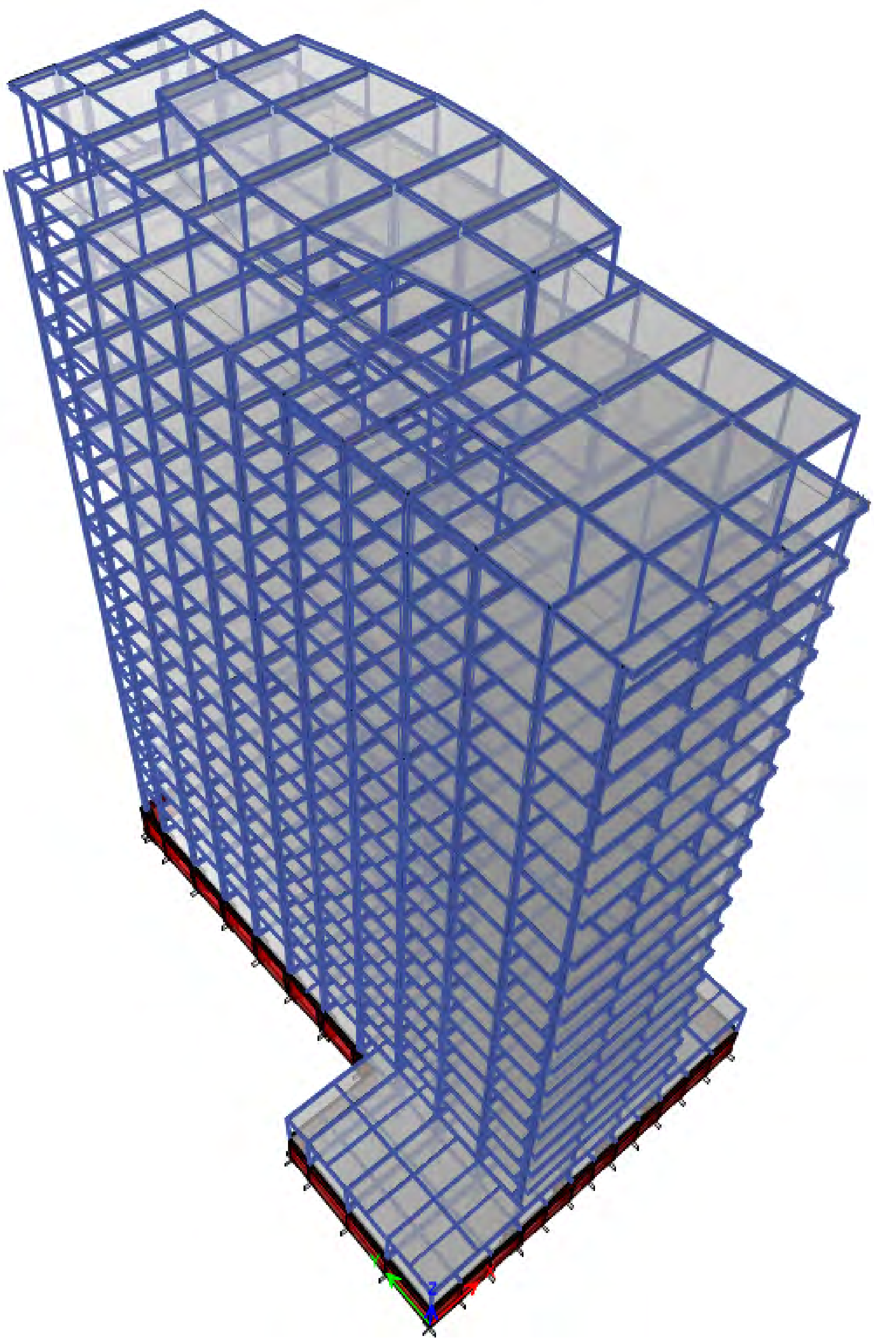
505 UNIVERSITY AVE. REDEVELOPMENT

PREPARED FOR:
Cartareal Corporation N.V.
NOV 2024

Introduction (Building with 21 Floors + PH):

This report is to study the behavior of buildings under wind and seismic loads in ETABS models.

The ETABS model has elements such as columns, beams, braces and slabs. The building is having 20 floors + Roof + Pent House levels and the structural drawings are there up to 14th floors. For the 15th and above floors, the beams / slabs sections and framing arrangements are considered as same as the 12th floor and columns section properties are considered as same as the 14th Floor. Penthouse and roof level floating columns section properties are assumed in this ETABS model. Below is a 3D view of the model. Basement floor is considered as base level in ETABS model.



Section Property:

95% of sections in this model are as per real geometric sections/properties (from base to 14th Floor).

Time Period:

ETABS model is analyzed for own weight, SDL, EQSDL, Facade, Live loads. Wind loads are calculated and applied to the diaphragms (rigid diaphragm assigned to the slabs) for the respective time periods from the model. Seismic loads are calculated and applied as auto seismic loads in ETABS. Both are calculated based on NBCC2020 The time period is shown in the table below:

Model / Parameter	ETABS Model
	20 Floors + Roof + PH
Time Period Tx (s)	3.459
Time Period Ty (s)	5.289
Time Period Tz (s)	4.156

Table 1 : Time Period (s)

Base Shear:

The wind and seismic loads base shear from the ETABS model is shown below:

Model / Parameter	ETABS Model
	20 Floors + Roof + PH
Shear Vx (kN)	6015
Moment Mx (kNm)	312007
Shear Vy (kN)	2987
Moment My (kNm)	149967

Table 2 : Wind Load Base Shear

Model / Parameter	ETABS Model
	20 Floors + Roof + PH
Shear Vx (kN)	3574
Moment Mx (kNm)	232128
Shear Vy (kN)	3574
Moment My (kNm)	232128

Table 3 : Seismic Load Base Shear

Inter-Storey Drift and Displacement:

The inter-storey drift in ETABS model is calculated and the summarized tables are shown below: (note: the limit is 500 for inter-storey drift)

Model / Parameter	ETABS Model	Allowable Limits	Exceed By:
	20 Floors + Roof + PH		
10-year max observed inter-storey drift (Storey height / Inter storey Displacement)	220	Greater Than 500	227%
10-yea r max observed horizontal displacement (mm)	282	Greater Than 500	177%

Table 4 : Storey Drift

Inter-storey Drift ratio from ETABS model is shown below:

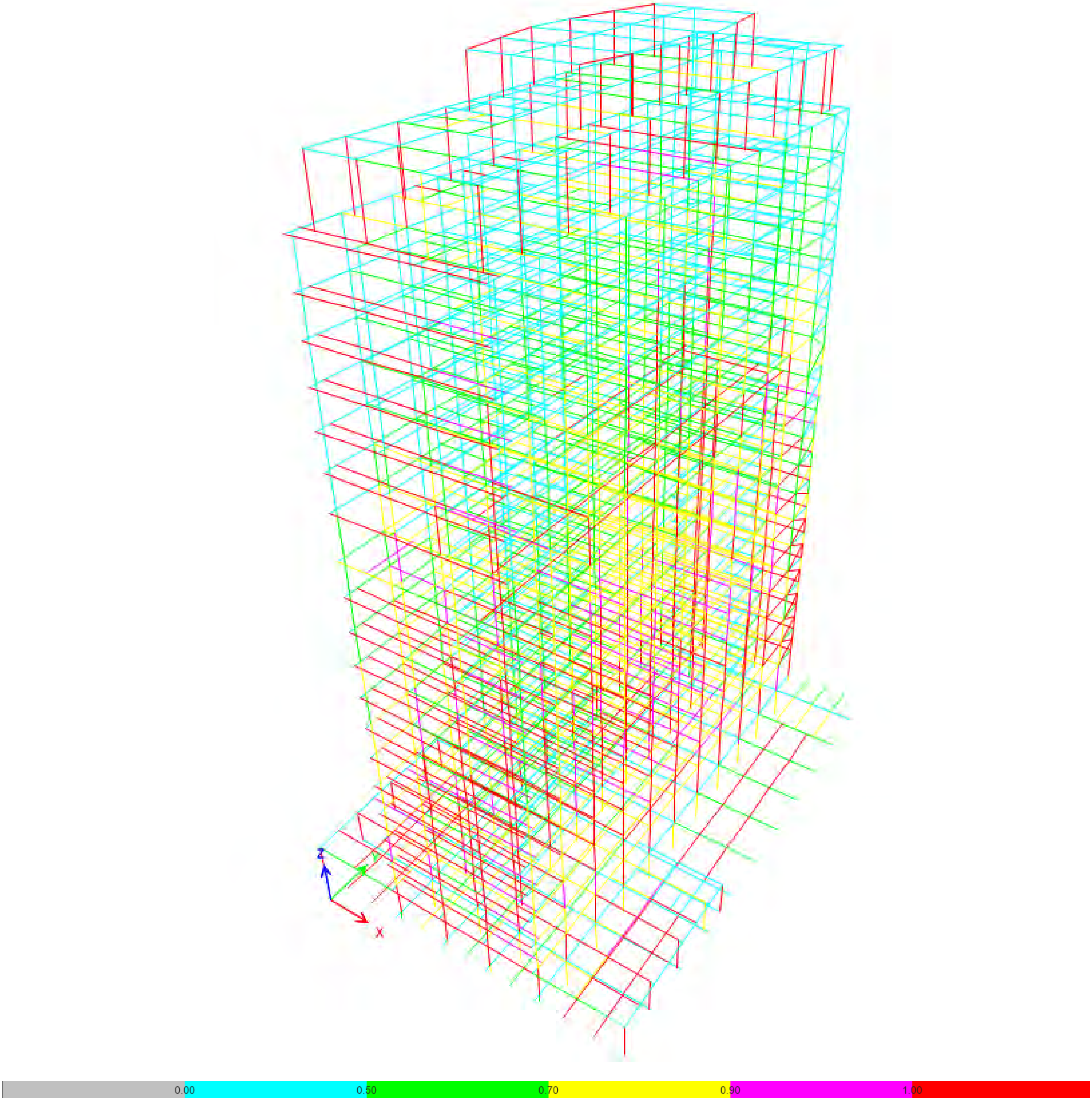
Story	Interstory Drift Ratio											
	WXDR	WX1DR	WX2DR	WYDR	WY1DR	WY2DR	WCDR1	WCDR2	WCDR3	WCDR4	WCDR5	WCDR6
PH	47%	39%	52%	64%	50%	48%	62%	59%	50%	58%	53%	61%
ROOF	104%	67%	125%	104%	80%	78%	117%	111%	85%	114%	82%	120%
F20	70%	56%	89%	57%	45%	40%	74%	63%	50%	69%	57%	80%
F19	82%	64%	103%	61%	49%	44%	84%	72%	56%	80%	63%	91%
F18	95%	74%	120%	69%	55%	50%	96%	85%	64%	93%	71%	104%
F17	109%	85%	138%	78%	62%	57%	108%	98%	73%	108%	80%	118%
F16	123%	96%	155%	87%	69%	64%	120%	110%	82%	122%	90%	132%
F15	134%	114%	172%	95%	76%	71%	131%	121%	96%	135%	103%	144%
F14-OLD ROOF	153%	137%	198%	109%	86%	83%	147%	140%	116%	157%	121%	164%
F13	145%	118%	186%	104%	82%	79%	140%	135%	103%	149%	108%	155%
F12	159%	125%	203%	117%	93%	89%	156%	149%	111%	164%	117%	171%
F11	168%	127%	212%	123%	97%	94%	164%	158%	114%	172%	120%	179%
F10	174%	133%	219%	129%	102%	99%	170%	165%	121%	180%	126%	185%
F9	176%	135%	221%	132%	104%	102%	172%	168%	124%	183%	128%	187%
F8	178%	140%	225%	136%	107%	105%	174%	172%	129%	187%	133%	190%
F7	177%	141%	224%	138%	108%	107%	174%	174%	132%	189%	134%	189%
F6	179%	145%	227%	140%	110%	110%	175%	177%	135%	192%	136%	191%
F5	174%	142%	221%	140%	109%	110%	171%	175%	135%	189%	135%	186%
F4	166%	143%	211%	139%	107%	109%	164%	169%	136%	183%	135%	178%
F3	144%	133%	186%	130%	101%	102%	147%	151%	128%	163%	127%	159%
F2	99%	99%	134%	97%	79%	78%	108%	107%	95%	121%	96%	122%

Table 5 : Lateral Drifts on existing structure and 2020 NBCC Wind Loads

General Stress Evaluation for Wind load design combinations:

Columns, beams and braces are designed in ETABS for the design load combinations by setting the design code as **CSA S16-14** and framing type as **Conventional Moment Frame**

3D view of the overall building is shown below and some the braces, beams and columns which are not satisfying for wind load design combinations are red in color.

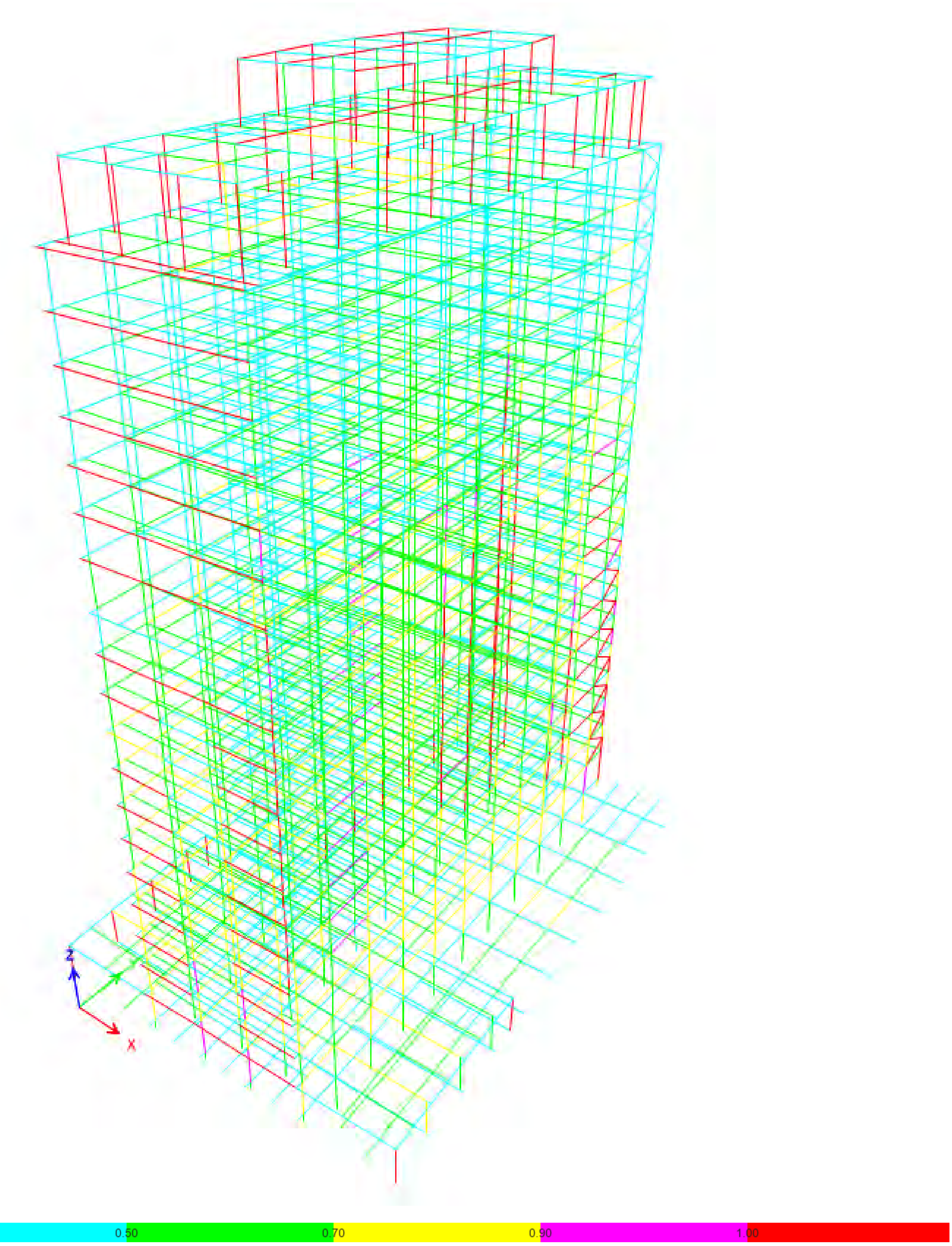


Stress Contour Diagram for Wind Load Combination

General Stress Evaluation for Seismic load design combinations:

Columns, beams and braces are designed in ETABS for the design load combinations by setting the design code as **CSA S16-14** and framing type as **Conventional Moment Frame**

3D view of the overall building is shown below and some the braces, beams and columns which are not satisfying for seismic load design combinations are red in color.

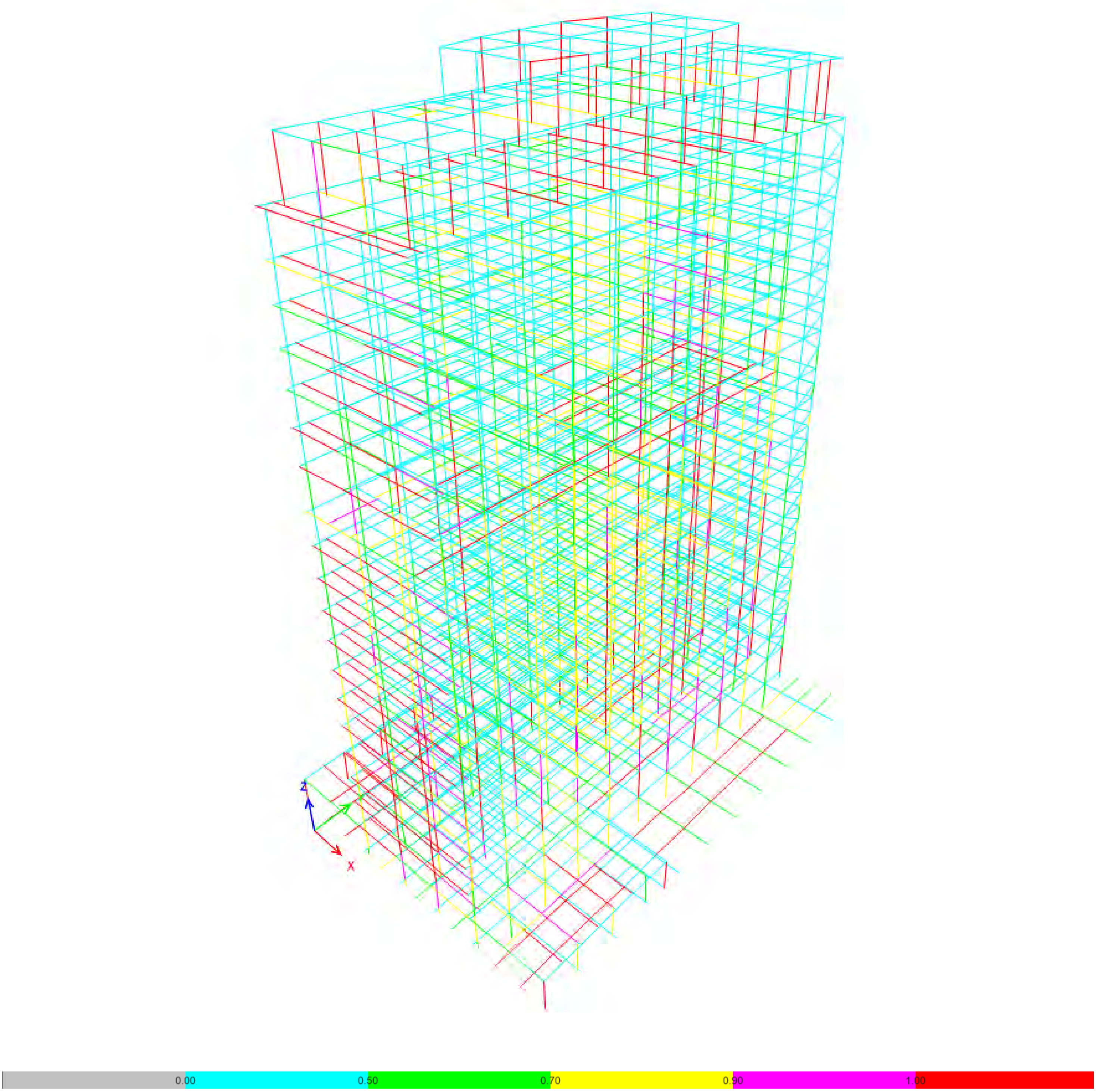


Stress Contour Diagram for Seismic Load Combination

General Stress Evaluation for Gravity load design combinations:

Columns, beams and braces are designed in ETABS for the design load combinations by setting the design code as **CSA S16-14** and framing type as **Conventional Moment Frame**

3D view of the overall building is shown below and some the braces, beams and columns which are not satisfying for gravity load design combinations are red in color.



Stress Contour Diagram for Gravity Load Combination

APPENDIX D

Lateral Analysis of Existing Building

JABLONSKY, AST
AND PARTNERS
CONSULTING ENGINEERS
SINCE 1955

Building Structural Framing Study for Existing Structure

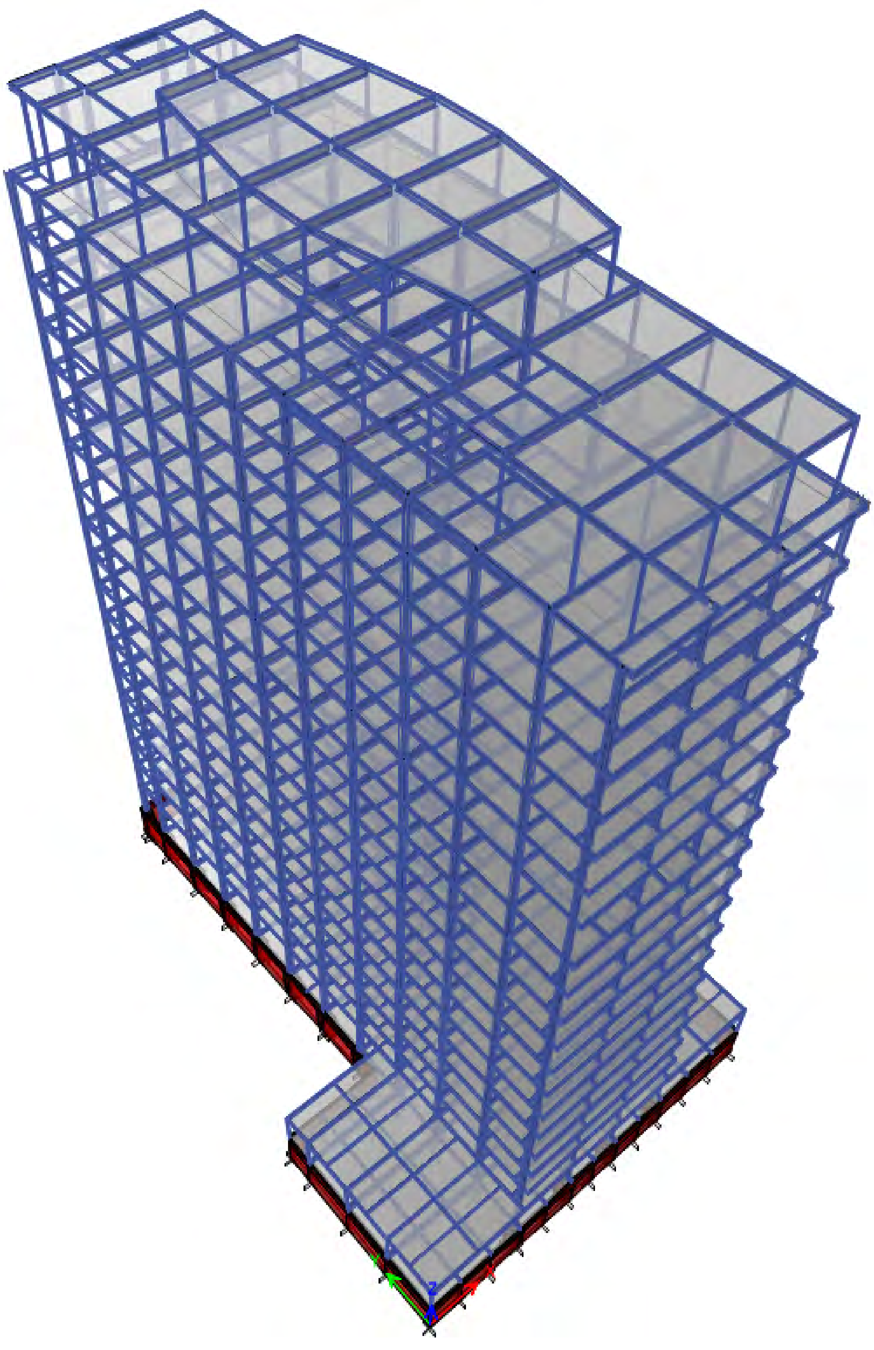
505 UNIVERSITY AVE. REDEVELOPMENT

PREPARED FOR:
Cartareal Corporation N.V.
NOV 2024

Introduction (Building with 21 Floors + PH):

This report is to study the behavior of buildings under wind and seismic loads in ETABS models.

The ETABS model has elements such as columns, beams, braces and slabs. The building is having 20 floors + Roof + Pent House levels and the structural drawings are there up to 14th floors. For the 15th and above floors, the beams / slabs sections and framing arrangements are considered as same as the 12th floor and columns section properties are considered as same as the 14th Floor. Penthouse and roof level floating columns section properties are assumed in this ETABS model. Below is a 3D view of the model. Basement floor is considered as base level in ETABS model.



Section Property:

95% of sections in this model are as per real geometric sections/properties (from base to 14th Floor).

Time Period:

ETABS model is analyzed for own weight, SDL, EQSDL, Facade, Live loads. Wind loads are calculated and applied to the diaphragms (rigid diaphragm assigned to the slabs) for the respective time periods from the model. Seismic loads are calculated and applied as auto seismic loads in ETABS. Both are calculated based on NBCC2020 The time period is shown in the table below:

Model / Parameter	ETABS Model
	20 Floors + Roof + PH
Time Period Tx (s)	3.459
Time Period Ty (s)	5.289
Time Period Tz (s)	4.156

Table 1 : Time Period (s)

Base Shear:

The wind and seismic loads base shear from the ETABS model is shown below:

Model / Parameter	ETABS Model
	20 Floors + Roof + PH
Shear Vx (kN)	6015
Moment Mx (kNm)	312007
Shear Vy (kN)	2987
Moment My (kNm)	149967

Table 2 : Wind Load Base Shear

Model / Parameter	ETABS Model
	20 Floors + Roof + PH
Shear Vx (kN)	3574
Moment Mx (kNm)	232128
Shear Vy (kN)	3574
Moment My (kNm)	232128

Table 3 : Seismic Load Base Shear

Inter-Storey Drift and Displacement:

The inter-storey drift in ETABS model is calculated and the summarized tables are shown below: (note: the limit is 500 for inter-storey drift)

Model / Parameter	ETABS Model	Allowable Limits	Exceed By:
	20 Floors + Roof + PH		
10-year max observed inter-storey drift (Storey height / Inter storey Displacement)	220	Greater Than 500	227%
10-yea r max observed horizontal displacement (mm)	282	Greater Than 500	177%

Table 4 : Storey Drift

Inter-storey Drift ratio from ETABS model is shown below:

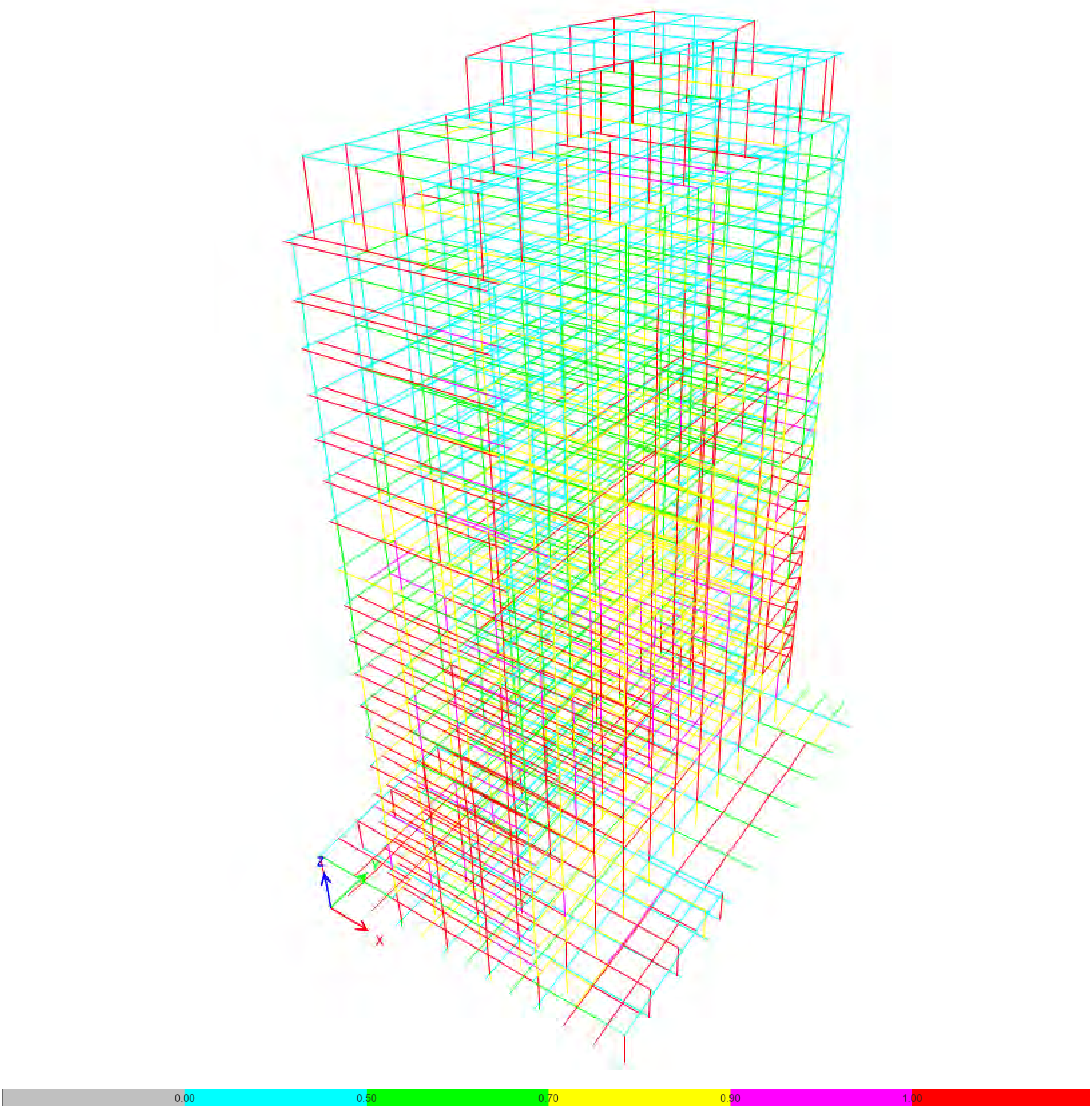
Story	Interstory Drift Ratio											
	WXDR	WX1DR	WX2DR	WYDR	WY1DR	WY2DR	WCDR1	WCDR2	WCDR3	WCDR4	WCDR5	WCDR6
PH	47%	39%	52%	64%	50%	48%	62%	59%	50%	58%	53%	61%
ROOF	104%	67%	125%	104%	80%	78%	117%	111%	85%	114%	82%	120%
F20	70%	56%	89%	57%	45%	40%	74%	63%	50%	69%	57%	80%
F19	82%	64%	103%	61%	49%	44%	84%	72%	56%	80%	63%	91%
F18	95%	74%	120%	69%	55%	50%	96%	85%	64%	93%	71%	104%
F17	109%	85%	138%	78%	62%	57%	108%	98%	73%	108%	80%	118%
F16	123%	96%	155%	87%	69%	64%	120%	110%	82%	122%	90%	132%
F15	134%	114%	172%	95%	76%	71%	131%	121%	96%	135%	103%	144%
F14-OLD ROOF	153%	137%	198%	109%	86%	83%	147%	140%	116%	157%	121%	164%
F13	145%	118%	186%	104%	82%	79%	140%	135%	103%	149%	108%	155%
F12	159%	125%	203%	117%	93%	89%	156%	149%	111%	164%	117%	171%
F11	168%	127%	212%	123%	97%	94%	164%	158%	114%	172%	120%	179%
F10	174%	133%	219%	129%	102%	99%	170%	165%	121%	180%	126%	185%
F9	176%	135%	221%	132%	104%	102%	172%	168%	124%	183%	128%	187%
F8	178%	140%	225%	136%	107%	105%	174%	172%	129%	187%	133%	190%
F7	177%	141%	224%	138%	108%	107%	174%	174%	132%	189%	134%	189%
F6	179%	145%	227%	140%	110%	110%	175%	177%	135%	192%	136%	191%
F5	174%	142%	221%	140%	109%	110%	171%	175%	135%	189%	135%	186%
F4	166%	143%	211%	139%	107%	109%	164%	169%	136%	183%	135%	178%
F3	144%	133%	186%	130%	101%	102%	147%	151%	128%	163%	127%	159%
F2	99%	99%	134%	97%	79%	78%	108%	107%	95%	121%	96%	122%

Table 5 : Lateral Drifts on existing structure and 2020 NBCC Wind Loads

General Stress Evaluation for Wind load design combinations:

Columns, beams and braces are designed in ETABS for the design load combinations by setting the design code as **CSA S16-14** and framing type as **Conventional Moment Frame**

3D view of the overall building is shown below and some the braces, beams and columns which are not satisfying for wind load design combinations are red in color.

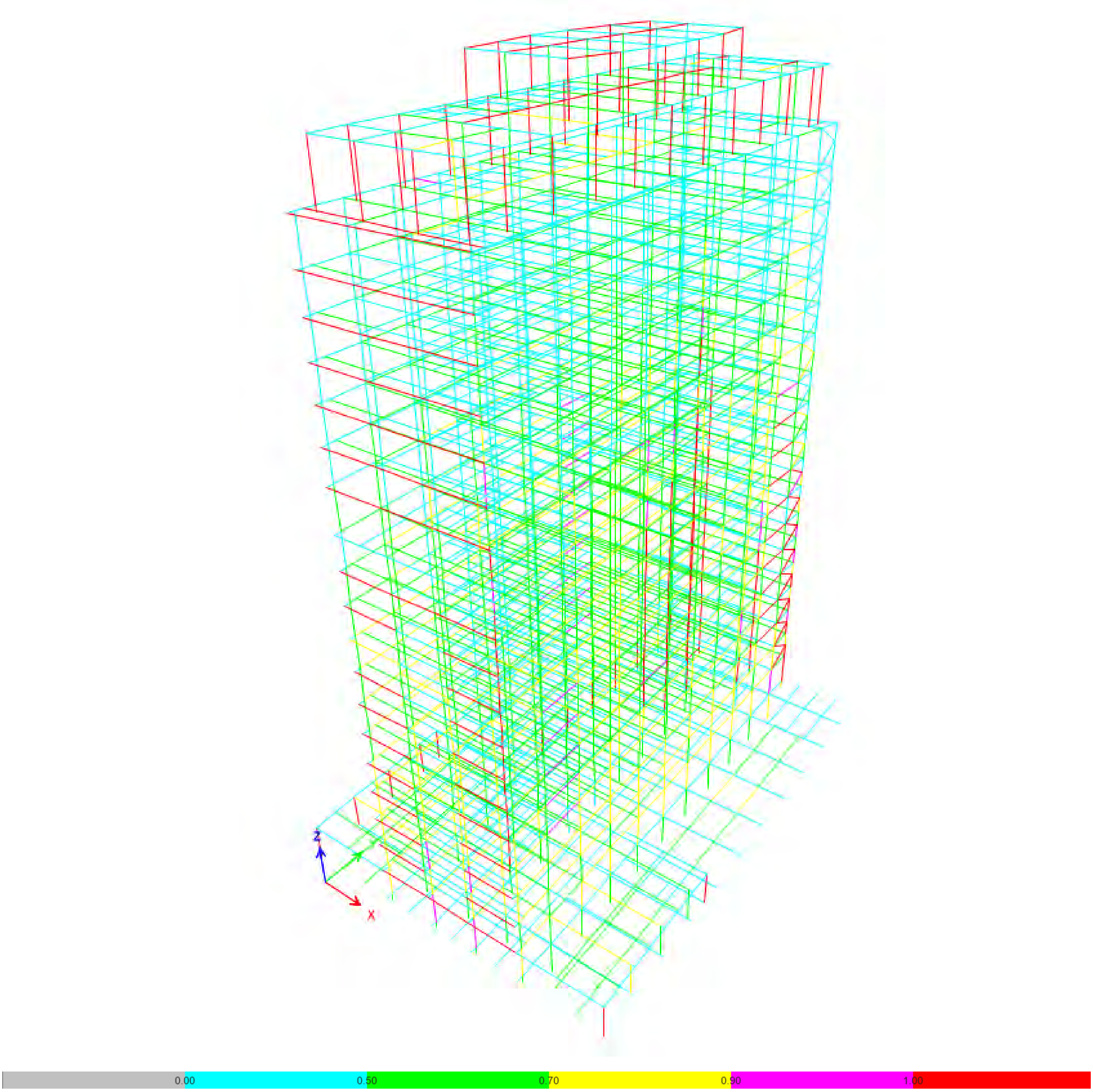


Stress Contour Diagram for Wind Load Combination

General Stress Evaluation for Seismic load design combinations:

Columns, beams and braces are designed in ETABS for the design load combinations by setting the design code as **CSA S16-14** and framing type as **Conventional Moment Frame**

3D view of the overall building is shown below and some the braces, beams and columns which are not satisfying for seismic load design combinations are red in color.

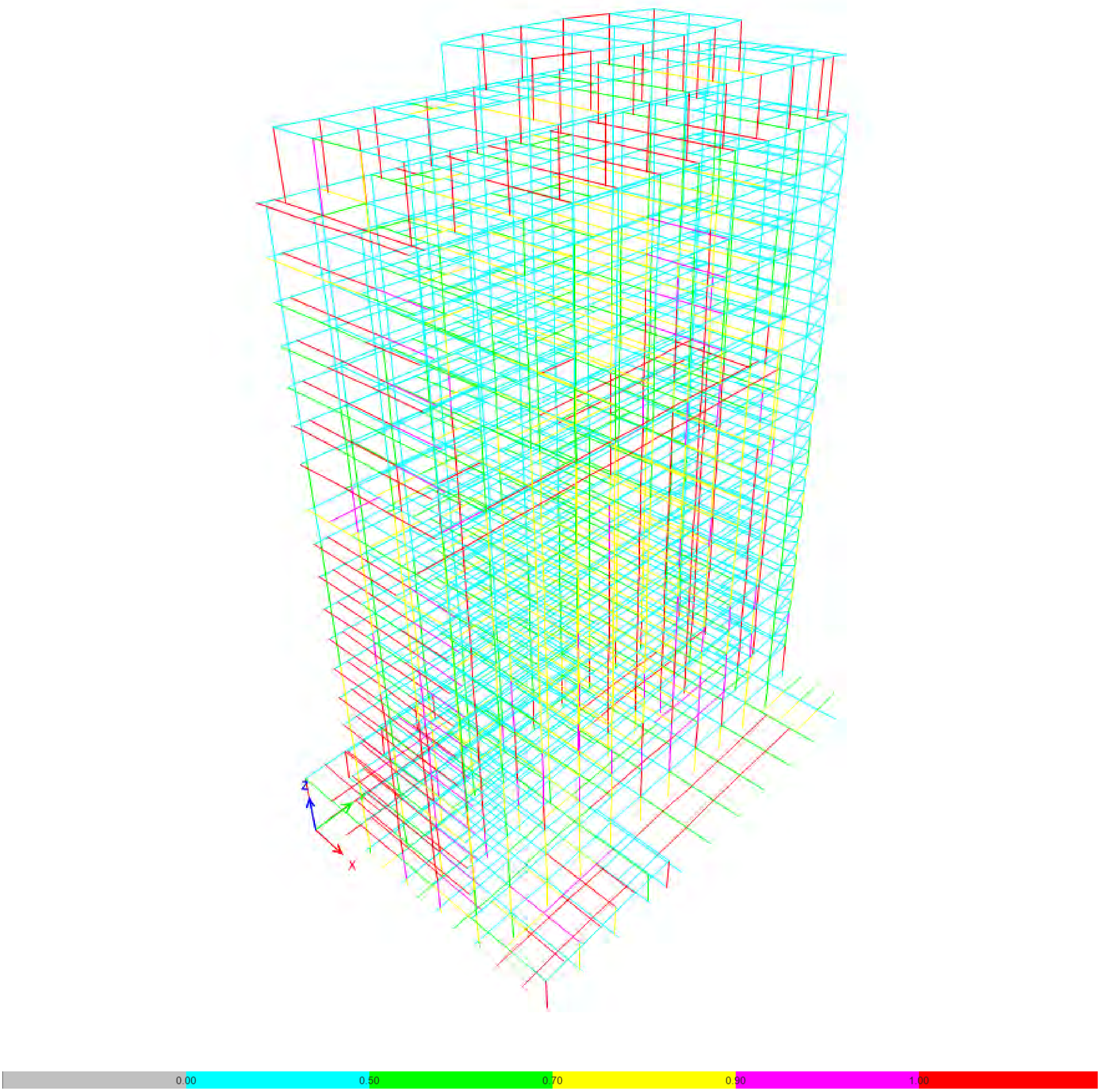


Stress Contour Diagram for Seismic Load Combination

General Stress Evaluation for Gravity load design combinations:

Columns, beams and braces are designed in ETABS for the design load combinations by setting the design code as **CSA S16-14** and framing type as **Conventional Moment Frame**

3D view of the overall building is shown below and some the braces, beams and columns which are not satisfying for gravity load design combinations are red in color.



Stress Contour Diagram for Gravity Load Combination

APPENDIX E

Review on the Retention of 12-storey Building

JABLONSKY, AST
AND PARTNERS
CONSULTING ENGINEERS
SINCE 1955

Building Structural Framing Study and Rehabilitation

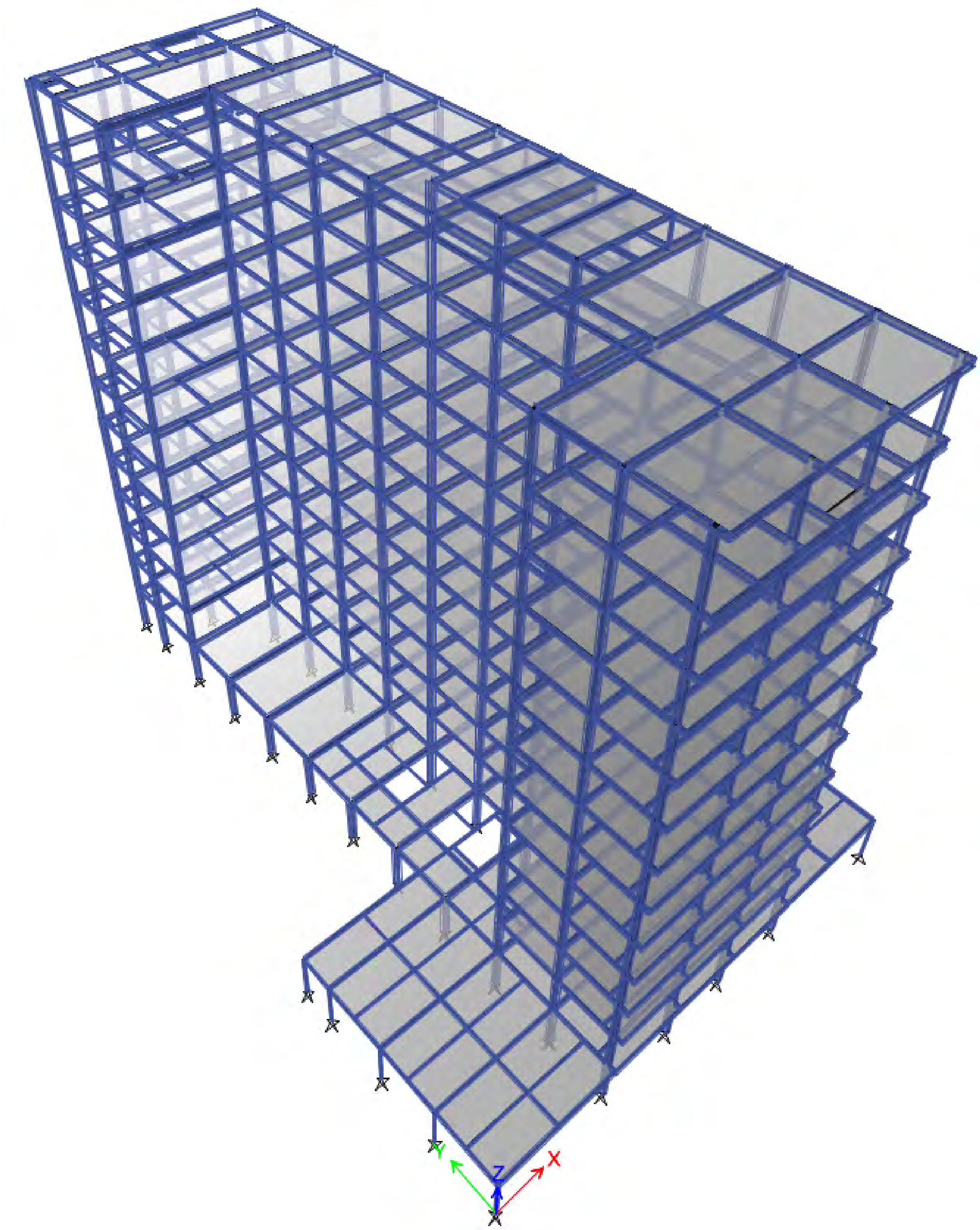
505 UNIVERSITY AVE. REDEVELOPMENT

PREPARED FOR:
Cartareal Corporation N.V.
MAY 2024

Introduction (Building with 14 Floors + PH):

This report is to study the behavior of buildings under wind loads in ETABS models.

The ETABS model includes all elements such as columns, beams, braces and slabs (including the slabs' own weight). Below is a 3D view of the model. 1st floor in reality is considered as base level in ETABS model as the foundation walls are up-to 1st floor on all sides in reality



Material Property:

Material property for steel sections are taken from Iron and Steel Beams (1873 to 1952) published by American Institute of Steel Construction Inc.

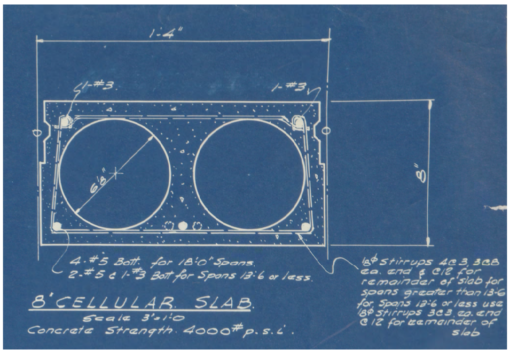
1949	ASTM, A6-49T issued as a tentative revision to ASTM, A7-49T covering requirements for delivery			
	ASTM, A7-49T	Structural Steel	60,000 to 72,000	1/2 T.S. or not less than 33,000
	ASTM, A141-49T	Rivet Steel	52,000 to 62,000	min. 28,000
	AISC	Allowable basic working stress 20,000 psi		

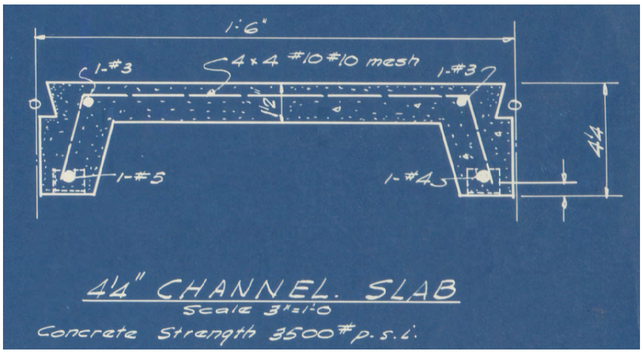
Based on the above limits, the Fy is considered as 260 MPa (37709 psi) and Fu is considered as 413 MPa (60000 psi) in ETABS for steel material property (refer below image)

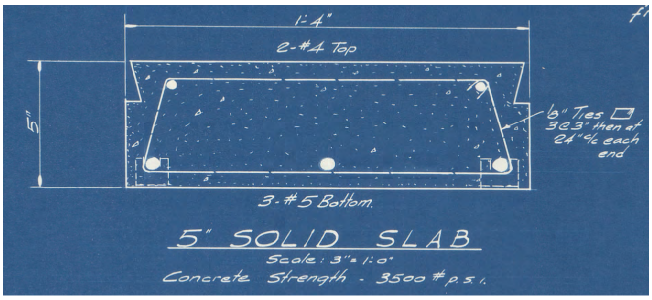
Design Properties for Steel Materials

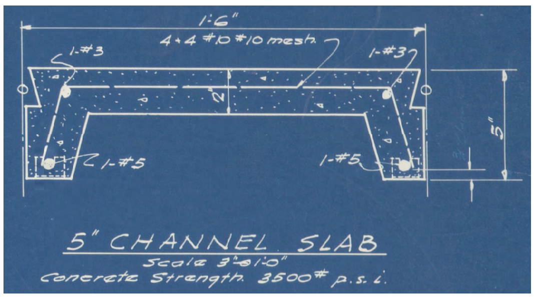
Minimum Yield Stress, Fy	260	MPa
Minimum Tensile Strength, Fu	413	MPa
Expected Yield Stress, Fye	260	MPa
Effective Tensile Strength, Fue	413	MPa

Concrete strength of the slabs are considered from the below images which are part of the structural drawings



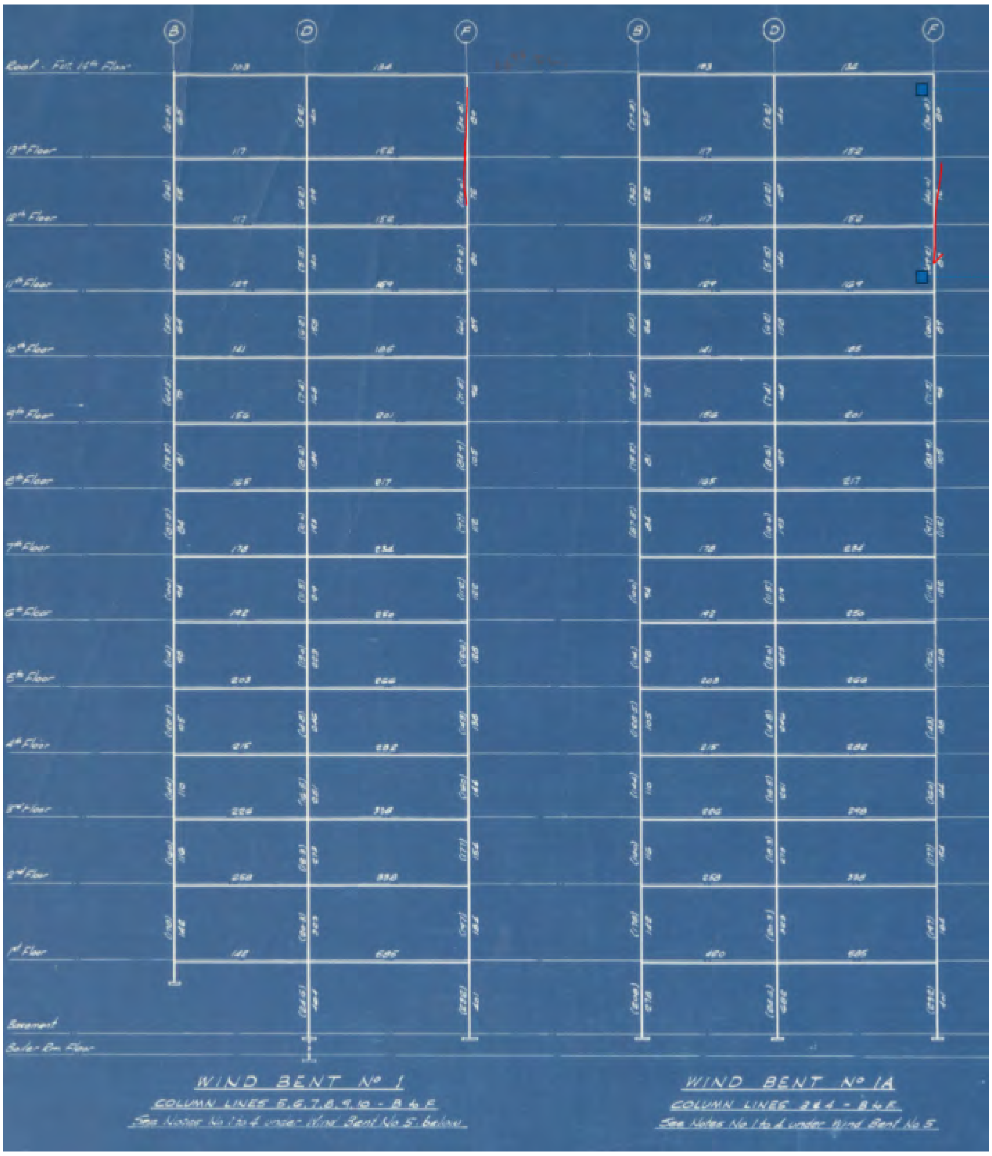






Boundary Conditions:

The supports at base level are considered as pin supports. Secondary beams are moment released in the model. Element properties and geometry are followed as per the drawings (sample drawing is shown below)



Section Property:

Section property of columns, beams and braces are assigned as shown in the drawing. ETABS has a feature to use imperial, metric and user defined steel sections. User defined steel sections are used when the preferred sections are not available inside ETABS section database. For slabs, the equivalent thickness of cellular and channel slabs are calculated and those equivalent thickness are considered for membrane slabs in ETABS. 95% of the sections in the models are as per real geometric sections/properties.

Time Period:

ETABS model is analyzed for their own weight. Wind loads are calculated and applied to the diaphragms (rigid diaphragm assigned to the slabs) for the respective time period from the model. The time period is shown in the table below

Parameter \ Model	Model 14th Floor + PH
Time Period Tx (s)	1.996
Time Period Ty (s)	2.643
Time Period Tz (s)	1.527

Table 1 : Time Period (s)

Base Shear:

The wind loads base shear from ETABS model is shown below:

Parameter \ Model	Model 14th Floor + PH
Shear Vx (kN)	2774
Moment Mx (kNm)	82552
Shear Vy (kN)	1885
Moment My (kNm)	56018

Table 2 : Wind Load Base Shear

The seismic loads are calculated and they are compared with the wind load base shear. It is concluded to proceed only with wind load since the seismic base shear is less than the wind load base shear. The seismic load base shear along the X-axis is 525 kN and along the Y-axis, it is 523 kN

Inter-Storey Drift and Displacement:

The inter-storey drift in ETABS model is calculated and the summarized tables are shown below: (note: the limit is 500 for inter-storey drift)

Parameter \ Model	Model 14th Floor + PH
10-year max observed interstorey drift (Storey height / Displacement)	210
10-year max observed horizontal displacement (mm)	103

Table 3 : Storey Drift

Inter-storey Drift ratio in ETABS model is calculated and summarized in below table

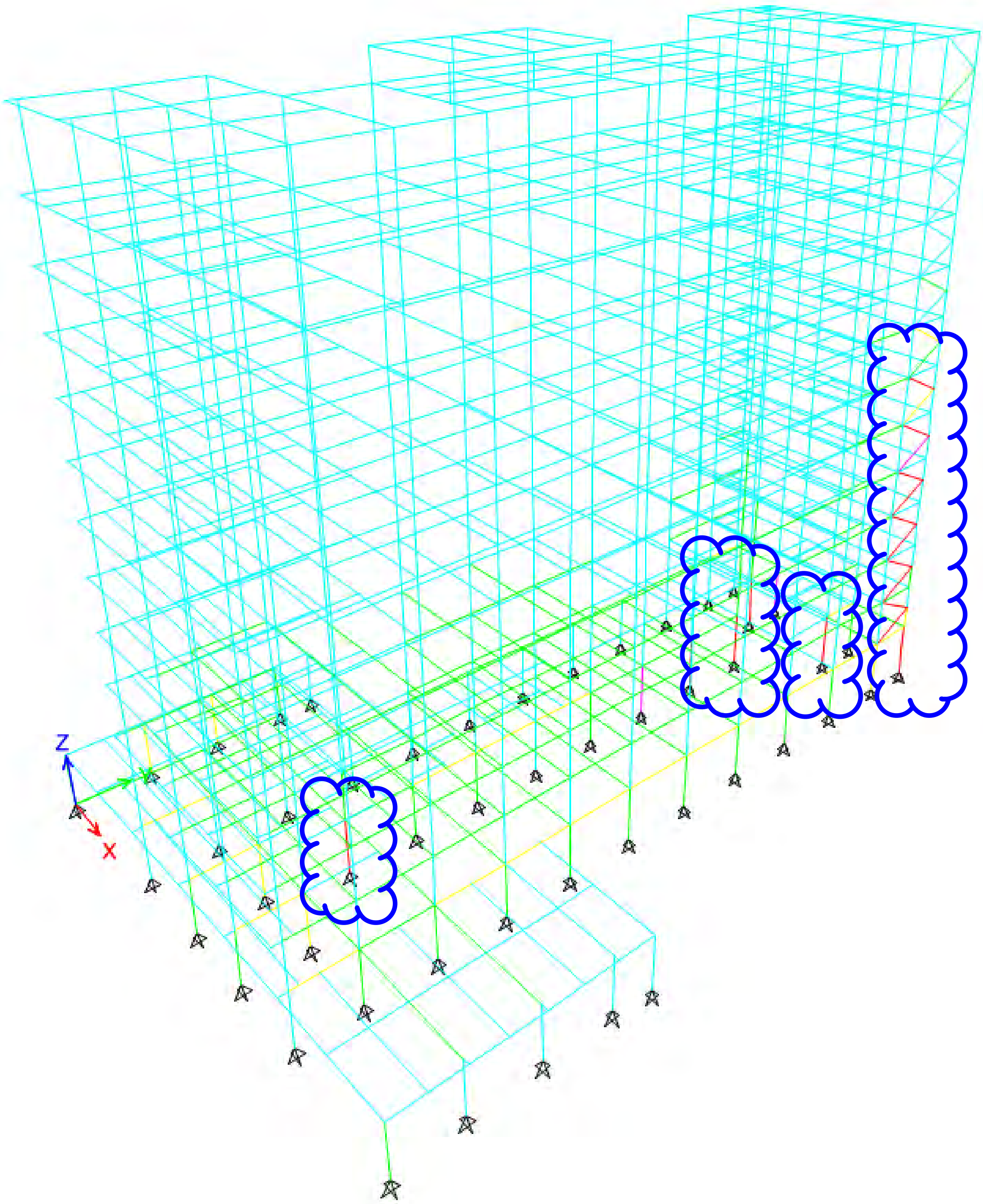
Story	Interstory Drift Ratio											
	WXDR	WX1DR	WX2DR	WYDR	WY1DR	WY2DR	WCDR1	WCDR2	WCDR3	WCDR4	WCDR5	WCDR6
PH	13%	6%	11%	52%	37%	15%	45%	42%	28%	27%	36%	40%
ROOF	27%	15%	26%	36%	21%	17%	38%	29%	23%	27%	25%	34%
F13	38%	21%	37%	45%	26%	22%	49%	39%	29%	38%	32%	45%
F12	52%	29%	52%	61%	35%	31%	66%	54%	40%	53%	43%	60%
F11	62%	35%	62%	72%	41%	37%	78%	65%	47%	63%	51%	71%
F10	72%	41%	72%	83%	47%	43%	90%	76%	54%	74%	60%	83%
F9	80%	47%	80%	91%	52%	47%	99%	85%	59%	82%	67%	91%
F8	89%	53%	89%	100%	57%	52%	109%	93%	65%	91%	74%	100%
F7	95%	57%	95%	106%	61%	56%	116%	100%	69%	97%	79%	107%
F6	101%	61%	102%	113%	64%	60%	123%	106%	74%	104%	84%	114%
F5	103%	64%	104%	117%	67%	62%	127%	110%	78%	107%	88%	117%
F4	104%	70%	107%	125%	71%	66%	132%	113%	84%	110%	95%	121%
F3	104%	79%	111%	143%	82%	72%	145%	123%	93%	114%	110%	133%
F2	148%	117%	172%	238%	148%	105%	238%	188%	132%	165%	171%	228%

Table 4 : Storey Drift Summary

General Stress Evaluation:

Columns, beams and braces are designed in ETABS for the wind load design combinations by setting the design code as **CSA S16-14** and framing type as **Conventional Moment Frame** and ignored the consideration for seismic code.

3D view of the overall building is shown below and some the braces and columns which are not satisfying the design are red in color and clouded.



APPENDIX F

Report of the 4 and 6-storey Façade Retention

JABLONSKY, AST AND PARTNERS
CONSULTING ENGINEERS
SINCE 1955

4 AND 6 Floor Facade Retention

505 UNIVERSITY AVE. REDEVELOPMENT

PREPARED FOR:
Cartareal Corporation N.V.
NOV 2024