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STARNIGHT IMPORT & EXPORT HQ

STRUCTURAL DESIGN BRIEF

(Issued for Schematic Design)

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AMR Project No.: 24-2280

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1.0 GENERAL DESCRIPTION OF STRUCTURAL SYSTEM

1.1 General Description

One storey steel framed warehouse structure with slab on grade construction and partial second floor area to serve as office space in Ajax, Ontario. Exterior walls consist of non-load bearing insulated precast panels. The front elevation consists of a combination of precast, ACM panels and continuous glazing panels. The building has one elevator which serves the second floor office area and has a full depth pit (1525mm deep). There are two staircases located in the north and south of the building.

1.2 Roof Framing

Roof framing consists of 38mm deep steel deck, minimum 22 gauge & minimum 3 span continuous, supported on open web steel joists and steel beams at about 1800 mm on centres max. Steel deck with continuous angle around perimeter of building is designed as horizontal diaphragm to resist lateral loads due to wind and earthquake. Steel deck shall be profile P-3615 as manufactured by Canam or approved equal.

Live load deflection of joists shall not exceed $\text{Span}/360$. Joist bridging shall be top and bottom horizontal bridging at about 3000 mm c/c with additional x-bridging at end panels in accordance with CSA S16-19.

Refer to S103 for preliminary roof framing.

1.3 Second Floor Framing

Second floor framing consists of 62mm concrete with 152 x 152 x MW13.3 x MW13.3 welded wire mesh on 38mm deep composite steel deck minimum 22 gauge with 3 span continuous supported on open web steel joists and steel beams at about 1200 mm on centres max. Steel deck with continuous angle around perimeter of building is designed as horizontal diaphragm to resist lateral loads due to wind and earthquake. Composite steel deck shall be profile P-2436 as manufactured by Canam or approved equal having a weight of approximately 1.86 KN/m^2 .

Live load deflection of joists shall not exceed $L/480$. Joist bridging shall be top and bottom horizontal bridging at about 3000 mm c/c with additional x-bridging at end panels and at every third joist space in accordance with CSA S16-19.

Refer to S102 for preliminary second floor framing.

1.4 Ground Floor Slab-on-grade

Slab-on-grade shall be 150mm thick concrete reinforced with 10M@400 c/c each way (placed at center). Slab will be designed to support storage racking system. Slab shall be placed on compacted granular backfill as recommended by soil consultant. Refer to geotechnical report dated June 17, 2022, prepared by Pinchin Ltd. Slab shall be placed over compact subgrade soil on a minimum 200 mm thick layer of 19 mm clear stone Type I or Type II (OPSS 1004) or Granular

“A” (OPSS 1010). Any required up-fill should consist of a Granular “B” Type I or Type II (OPSS 1010).

Provide saw cuts joints (5mm x 38mm deep) in two perpendicular directions at about 4500 mm on centres. Saw cuts shall be filled with Loadflex wherever slab is to be left exposed.

1.5 Exterior Walls

Exterior above grade walls are assumed to be 230 thick insulated precast panels.

The precast panel supplier shall be responsible for design for exterior wind and openings in precast wall. The contractor shall provide engineered shop drawings and shall provide a letter of certification for installation of precast panels by professional engineer responsible for design of precast panels.

1.6 Elevator Pit

Elevator pit walls shall be 250 mm thick poured in place concrete walls reinforced with 10M@400 c/c verticals and horizontals, each way, each face. The elevator pit slab shall be 300 mm thick reinforced with 15M@300 T&B each way. Refer to architectural design brief for any waterproofing requirements.

1.7 Foundations

Preliminary foundation design is based on recommendations provided in geotechnical report dated June 17, 2022, prepared by Pinchin Ltd. Interior column footings are supported on piers and spread footings. Exterior walls are supported on continuous strip footing. All footings to bear on soil capable of safely supporting a bearing pressure of 200 kPa (SLS) and 300 kPa (ULS).

Refer to S101 for preliminary foundations sizes.

1.8 Lateral Force Resisting System

Seismic and wind forces are calculated based on seismic and wind parameters shown on section 2.4 and 2.5 of the design brief. Seismic and wind forces are resisted by steel bracing in both directions.

Refer to S102 & S103 for preliminary bracing locations.

2.0 DESIGN ASSUMPTIONS

The following is a list of items in the design process or inherent in this particular project which may create risk to the Owner and should be reviewed in more detail to mitigate this risk. This list will be refined as the design progresses.

The following is a list of items in the design process or inherent in this project which may create risk to the Owner and should be reviewed in more detail to mitigate this risk. This list will be refined as the design progresses.

- 1) The project design is not yet complete. Structural design continues to evolve in parallel with the design by other consultants and through an evolution of the program requirements. The project may go through various iterations which will affect the structural quantities before the final tender solution is arrived at. We recommend that a Construction Contingency be carried to reflect the preliminary nature of the available information.
- 2) No information on mechanical unit weights and locations is currently available so allowance shall be made for structural support for roof top units.
- 3) No information is yet available on the storage racking system to finalize the slab on grade design.
- 4) The cost estimate shall also include allowances for secondary structure, special structures and atypical elements consistent with this building type. Some such elements are as follows:
 - a) Secondary framing for the support of cladding, louvers, screens and glazing.
 - b) Secondary framing for mechanical equipment and at electrical rooms.
 - c) Secondary framing for floor and roof openings as well as sleeves for floor penetrations. Refer also to architectural, mechanical and electrical design briefs.
 - d) Parapets and roof projections.
 - e) Steel stairs.
 - f) Window washing and fall arrest requirements – davit bases and roof anchors.
 - g) Housekeeping pads below major mechanical and electrical equipment.
 - h) Elevators – hoist beams, divider beams etc.

APPENDIX A – SUMMARY OF DESIGN CRITERIA

Unless otherwise noted, the design criteria for this project are summarized as follows:

1.0 Design Codes and Standards:

1. Amended Ontario Building Code (OBC) 2012 which is based on the National Building Code of Canada (NBCC) 2015.
2. CSA/CAN-S16.1-19 – “Limit States Design of Steel Structures”
3. CSA A23.3-14 – “Design of Concrete Structures”
4. CSA A23.1/A23.2-14 – “Concrete Materials and Methods of Concrete Construction/Methods of Testing for Concrete”

2.0 Design Loads – General

Design loads adhere to code requirements and are based on the intended building uses, building finishes and proposed building equipment. The importance factor for load types is based on the importance category. The building is designated at a **Normal** building based on its use. The resulting Importance Factors are as follows:

Load Type	Importance Factor	
	Ultimate Limit States (ULS)	Serviceability Limit States (SLS)
Snow & Rain	1.0	0.9
Wind	1.0	0.75
Earthquake	1.0	N/A

2.1 Design Dead Loads:

Design dead loads are based on the roof assemblies and floor finishes noted on the architectural drawings at the time of design. Refer to enclosed drawings for design dead loads for different areas.

2.2 Design Live Loads:

Refer to enclosed drawings for design live loads for different areas.

2.3 Control Flow Drains

Structural roof framing will be designed for control flow roof drains over the roof area. The Plumbing code has the following requirements when incorporating flow control roof drains:

- the maximum drain down time does not exceed 24 h,
- one or more scuppers are installed, so that the maximum depth of water on the roof cannot exceed 150 mm,
- drains are located not more than 15 m from the edge of the roof and not more than 30 m from adjacent drains, and
- there is at least one drain for each 900 sq m.

2.4 Design Wind Loads

Design wind loads are calculated based on the code using a 1 in 50 year return wind reference velocity pressure using the climatic data for the city in which the building will be located. For this project in the City of Ajax, $q(1/50) = 0.48$ kPa.

Wind uplift loads on all roofs shall be 0.50 kPa (net factored load) unless otherwise noted.

2.5 Design Seismic Loads

Seismic design loads are calculated based on the code which is based on a 2% probability of exceedance in 50 years using design data for the city in which the building is located. For this project in the City of Ajax:

$S_a(0.2) = 0.21$, $S_a(0.5) = 0.114$, $S_a(1.0) = 0.06$,
 $S_a(2.0) = 0.029$, $S_a(5.0) = 0.0071$, $S_a(10.0) = 0.0028$,
PGA = 0.134, PGV = 0.091

Foundation factors are in accordance with the code based on assuming the Seismic Site Class C as per soil report. Importance factor $I_e = 1.0$ for normal category.

$I_e \times F_a \times S_a(0.2) = 0.21$ which is less than 0.35. Therefore, additional seismic restraint of mechanical equipment in Part 4 of the code is not required for this project.

3.0 Serviceability Limits:

Building drifts, displacements, deflections and other serviceability criteria is in accordance with the code and as noted below:

3.1 Deflection Criteria

The structure shall be designed to minimize the effects of deflections including the effects of long-term creep in concrete. The limitations are as per CSA S16.1-19, Limit State Design of Steel Structure, for steel structures and CSA A23.3, Design of Concrete Structures, Concrete Structures.

Deflection Criteria Summary

- Concrete Structures - Incremental Deflection - Span/360
- Concrete Structures - Long-Term Deflection - Span/240
- Steel Structures Floor - Live Load Deflection- Span/360
- Steel Structures Roof - Live Load Deflection - Span/300
- Wind Storey Drift - Height/500
- Seismic Storey Drift - Height/40

3.2 Levelness of Floors

Floors shall be designed and finished to acceptable tolerances for levelness to minimize installation problems with finishes and equipment. Floor flatness tolerances shall be in accordance with CSA A23.1 Table 22. Class A institutional + commercial floors (hand

screeded and steel trowel finish) based on using the straight edge method +/- 8 mm over 3 m is recommended. This recommendation shall be confirmed with the tenant requirements.

3.3 Construction tolerances

Except where specifically noted otherwise, construction tolerances are as described in CSA A23.1/A23.2 for concrete construction, per CSA S16.1-19 for steel construction.

APPENDIX B – STRUCTURAL MATERIALS

Unless otherwise noted, structural materials shall meet the following specifications and requirements:

1. Structural Steel

W Sections: Grade 350W CAN/CSA-G40.20/G40.21 or Grade 50 (345MPa) ASTM A992/A992M

WWF Sections: Grade 350W CAN/CSA-G40.20/G40.21

Channels, Angles & Plates: Grade 300W CAN/CSA-G40.20/G40.21

HSS Sections: ASTM A500 Class C
 Square/rectangular (Fy=345MPa)
 Circular (Fy=317MPa)

2. Steel Reinforcement for Concrete: CSA G30 Series (Fy=400MPa)

3. Reinforced Concrete

Reinforced concrete shall meet the requirements of CSA A23.1/A23.2-19 “Concrete Materials and Methods of Concrete Construction/Methods of Testing for Concrete” and shall generally adhere to the following requirements:

Element or Location	Concrete Strength (f'c at 28 days)	Notes
Footings	25 MPa	N exposure
Slab on grade (interior)	25 MPa	N exposure
Slab on grade (exterior)	32 MPa	C2 exposure
Foundation Walls	25 MPa	F-2 exposure
Concrete Walls	25 MPa	N exposure (interior) F-2 exposure (exterior)
Concrete topping	25MPa	N

FOUNDATION PLAN S101

NOTE:

1. TOP OF GROUND FLOOR SLAB ON GRADE IS AT ELEVATION 0.0 (DATUM) UNLESS CROSSED AND NOTES OTHERWISE ON PLAN.
2. BOTTOM OF FOOTINGS ASSUMED MIN. 1500 BELOW FIN. GRADE TO GOOD SOIL LEVEL FOR PRICING. FOOTINGS IN SOME AREAS WILL NEED TO BE LOCALLY STEPPED DOWN TO GOOD SOIL ELEVATIONS AND TO SUIT EXTERIOR GRADING SLOPING.

CONCRETE PIER SCHEDULE

- CP1: 700Ø CONC. PIER +8-20M VERTICALS +10M@300 TIES +2 TIES AT TOP
- CP2: 600X600 R/W 8-20M VERT.+10M@300 BEW+ 2 SET OF TIES AT TOP

Design Soil Bearing Capacity:

- 200 kPa at SLS
- 300 kPa at ULS

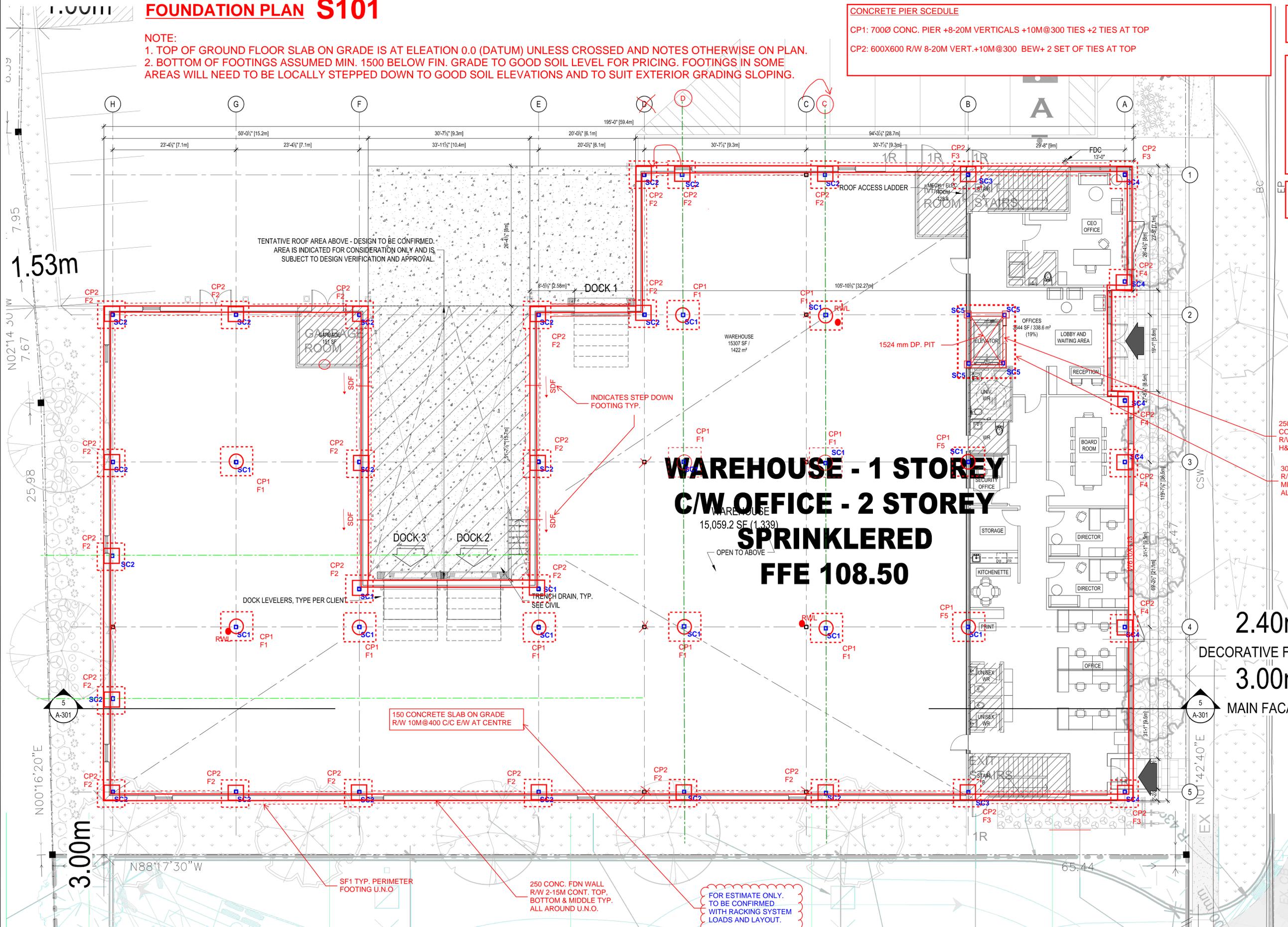
SPREAD FOOTING SCHEDULE

- F1: 1200X1200X300 THK R/W 5-15M BEW
- F2: 1000X1000X300 THK R/W 4-15M BEW
- F3: 1500X1500X300 THK R/W 6-15M BEW
- F4: 1750X1750X350 THK R/W 7-15M BEW
- F5: 2000X2000X400 THK R/W 8-15M BEW

STRIP FOOTING SCHEDULE

- SF1: 600X250 DP. R/W 2-15M CONT.

STOREY	AREA	DEDUCTED AREA
Ground Floor	1,764.10	62.9
2nd Floor	353.2	44.3



WAREHOUSE - 1 STOREY
C/W OFFICE - 2 STOREY
SPRINKLERED
FFE 108.50

2.40n
 DECORATIVE FF
 3.00n
 MAIN FACA

150 CONCRETE SLAB ON GRADE
 R/W 10M@400 C/C E/W AT CENTRE

250 CONC. FDN WALL
 R/W 2-15M CONT. TOP,
 BOTTOM & MIDDLE TYP.
 ALL AROUND U.N.O.

FOR ESTIMATE ONLY.
 TO BE CONFIRMED
 WITH RACKING SYSTEM
 LOADS AND LAYOUT.

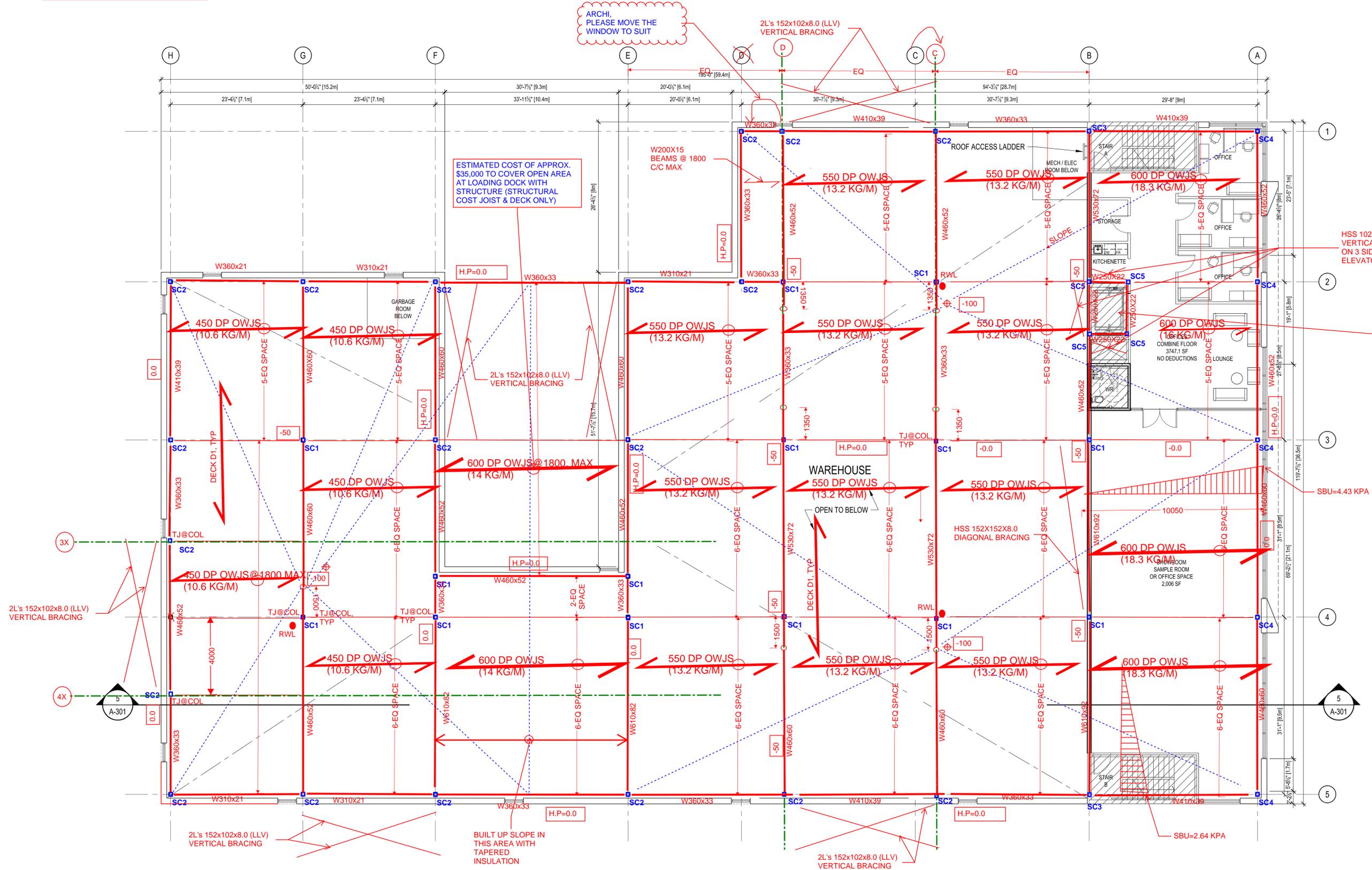
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ISSUE	BY	DESCRIPTION	DATE (YYYYMMDD)
GENERAL NOTES			
DO NOT SCALE DRAWINGS. USE ONLY DRAWINGS MARKED "ISSUED FOR CONSTRUCTION". VERIFY CONFIGURATIONS & DIMENSIONS ON SITE BEFORE BEGINNING WORK. NOTIFY ARCHITECT IMMEDIATELY OF ANY ERRORS, OMISSIONS OR DISCREPANCIES.			
CLIENT			
STARNIGHT IMPORT & EXPORT 358 IRONSIDE CRESCENT SCARBOROUGH, ON M1X 1G5			
ARCHITECT			
SAPLYS ARCHITECTS INC. 60 ST. CLAIR AVE E, SUITE 806 TORONTO, ON M4T 1N5			
DEVELOPMENT CONSULTANT			
API DEVELOPMENT CONSULTANTS INC. 1464 UNIT #7 CORNWALL ROAD OAKVILLE, ON L6J 7W5			
NORTH			
PROFESSIONAL CERTIFICATION			
PROJECT NAME			
WAREHOUSE AND OFFICE HEADQUARTERS			
PROJECT ADDRESS			
45 BLOWERS CRES AJAX, ON L1Z 0N4			
DRAWING TITLE			
GROUND FLOOR PLAN			
BY	CHECKED	ISSUED FOR	SEE TABLE ABOVE
NZ	SB		
PROJECT No.	SHEET No.		
A22-018	A-201		
SCALE			
1/8"=1'-0"			
A-201			1

ROOF FRAMING PLAN S103

ROOF DESIGN LOADS
 DEAD LOAD = 1.20 KPA + MECH'L
 LIVE LOAD = 1.20 KPA + SBU
 TOTAL LOAD = 2.40 KPA + MECH'L+SBU

STEEL DECK SCHEDULE		
MARK	SIZE	NOTES
D1	38MM STEEL DECK - MIN 22 GA. (0.76mm)	- MIN. 3 SPAN CONTINUOUS WHEREVER POSSIBLE - DESIGN DECK FOR A FACTORED FORCE DIAPHRAGM SHEAR FORCES SHOWN ON ROOF FRAMING PLAN
D2	62MM CONC. RW 152X152 MW (8.7 X MW) 8.7 WWF + 38MM STEEL DECK - MIN 22 GA. (0.76MM COMPOSITE DECK)	- MIN. 3 SPAN CONTINUOUS

STEEL COLUMN SCHEDULE	
SC1:	HSS 203X203X8.0
SC2:	HSS 203X203X6.4
SC3:	HSS 203X203X6.4
SC4:	HSS 203X203X6.4
SC5:	HSS 152X152X6.4



AREA DEDUCTIONS		
STOREY	AREA	DEDUCTED AREA
Ground Floor	1,764.10	62.9
2nd Floor	353.2	44.3

AREA DEDUCTED FROM THE PLAN FOR PARKING

HSS 102X102X6.4 VERTICAL BRACING ON 3 SIDES OF ELEVATOR SHAFT

NOTE: SCHINDLER ELEVATOR O/H CLEARANCE IS 3835. BASED ON CURRENT ELEVATIONS AND 600 DP JOISTS THERE IS ENOUGH HEADROOM AT SECOND FLOOR FOR ELEVATOR THEREFORE NO NEED TO EXTEND ROOF AT ELEVATOR AREA

RTU LOCATIONS TO BE CONFIRMED BY MECH'L

ARCH/MECH'L TO CONFIRM LOCATION OF ROOF DRAINS AND LOCATIONS FOR ROOF AREA

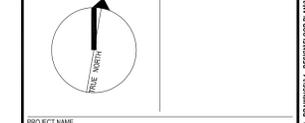
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ISSUE	BY	DESCRIPTION	DATE

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CLIENT
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DEVELOPMENT CONSULTANT
 API DEVELOPMENT CONSULTANTS INC.
 164 UNIT #7 CORNWALL ROAD
 OAKVILLE, ON L6J 7W5



PROJECT NAME		WAREHOUSE AND OFFICE HEADQUARTERS	
PROJECT ADDRESS		45 BLOWERS CRES AJAX, ON L1Z 0N4	
DRAWING TITLE		2ND FLOOR PLAN	
BY	CHECKED	ISSUED FOR	SEE TABLE ABOVE
NZ	SB		
PROJECT NO.	SHEET NO.	SHEET REVISION	
A22-018	A-202		
SCALE	1/8"=1'-0"		