Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

Noise and Vibration Studies

patersongroup

Confederation Line Level 2 Proximity Study

Proposed Health Science Building
University of Ottawa
200 Lees Avenue
Ottawa, Ontario

Prepared For

PCL Constructors Canada Inc.

Paterson Group Inc.
Consulting Engineers
154 Colonnade Road South
Ottawa (Nepean), Ontario
Canada K2E 7J5

Tel: (613) 226-7381
Fax: (613) 226-6344
www.patersongroup.ca

June 25, 2021

Report: PG5656-1

1.0 Introduction

Paterson Group (Paterson) was commissioned by PCL Constructors Canada Ltd. (PCL) to conduct a Confederation Line Level 2 Proximity Study for the proposed multi-storey University of Ottawa Health Science Building to be located at 200 Lees Avenue, in the City of Ottawa.

The objectives of the current study were to:

- ❑ Review all current information provided by the City of Ottawa with regards to the Confederation Line infrastructure.

- ❑ Liason between the City of Ottawa and the PCL consultant team involved with the aforementioned project.

The following report has been prepared specifically and solely for the aforementioned project which is described herein. It contains a collaboration of civil, structural and geotechnical design information as they pertain to the aforementioned project.

2.0 Development Details

It is understood that the proposed development at 200 Lees Avenue will consist of a multi-storey institutional building. The development will also include associated access lanes, walkways, parking areas and landscaped areas. The proposed building is setback approximately 16 m from the property boundary with the Confederation Line LRT rail line to the west. The building will consist of a slab-on-grade structure supported on deep foundations which extend to the bedrock surface, which is located at approximate geodetic elevation 48 m.

It is understood that the Confederation Line is located in close proximity to the proposed development. Rail elevation details for the Confederation Line in proximity to the subject site were provided in City of Ottawa drawings Confederation Line Guideway Design - Segment 3 Grading and Drainage - STA. 104+400 to 105+000 Drawings REM-30-3-000-DRD-2015 and REM-30-3-0000-DRD-2016 prepared by MMM Group dated April 12, 2016, presented in Appendix A. For purposes of distances between the Confederation Line and the proposed building and property line, a survey sketch prepared by Fairhall, Moffatt & Woodland Limited dated June 18, 2021, presented in Appendix A, was referenced.

Therefore, the following will be considered to account for a 'worst case' scenario regarding the Confederation Line with respect to the proposed development. The following was known about the Confederation Line:

- ❑ The Confederation Line alignment is running in an approximate north-south direction adjacent to the existing parking lot at the west portion of the subject site. The rail is located at an approximate distance of 10 m west of the property boundary of the subject site.

- ❑ The Confederation Line is located above ground within the vicinity of the subject site. The top of rail elevation adjacent to the north-west portion of the subject site is approximately 57.3 m and the top of rail elevation adjacent to the south-west portion of the subject site is approximately 60.4 m, as noted on the above mentioned LRT drawings. The average elevation of the top of rail within the vicinity of the site is 58.8 m. There is a concrete retaining wall associated with the LRT located on the east side of the rail, and adjacent to the western boundary of the subject site.

- ❑ Based on the subsurface profile at 200 Lees Avenue, bedrock is located at approximate geodetic elevation 48 m at the location of the rail.

3.0 Construction Methodology and Impact Review

Paterson has prepared a construction methodology summary along with possible impacts on the adjacent segment of the Confederation Line based on the current building design details. The Construction Methodology and Impact Review is provided in Appendix A and presents the anticipated construction items, impact review and a mitigation program recommended for the Confederation Line.

One of the primary considerations will 'be vibrations associated with the installation of the deep foundations. Accordingly, it is recommended that a vibration monitoring program be implemented to ensure vibration levels remain below recommended tolerances. Details of a recommended vibration monitoring program are presentedin the following pages.

3.1 Vibration Monitoring and Control Program

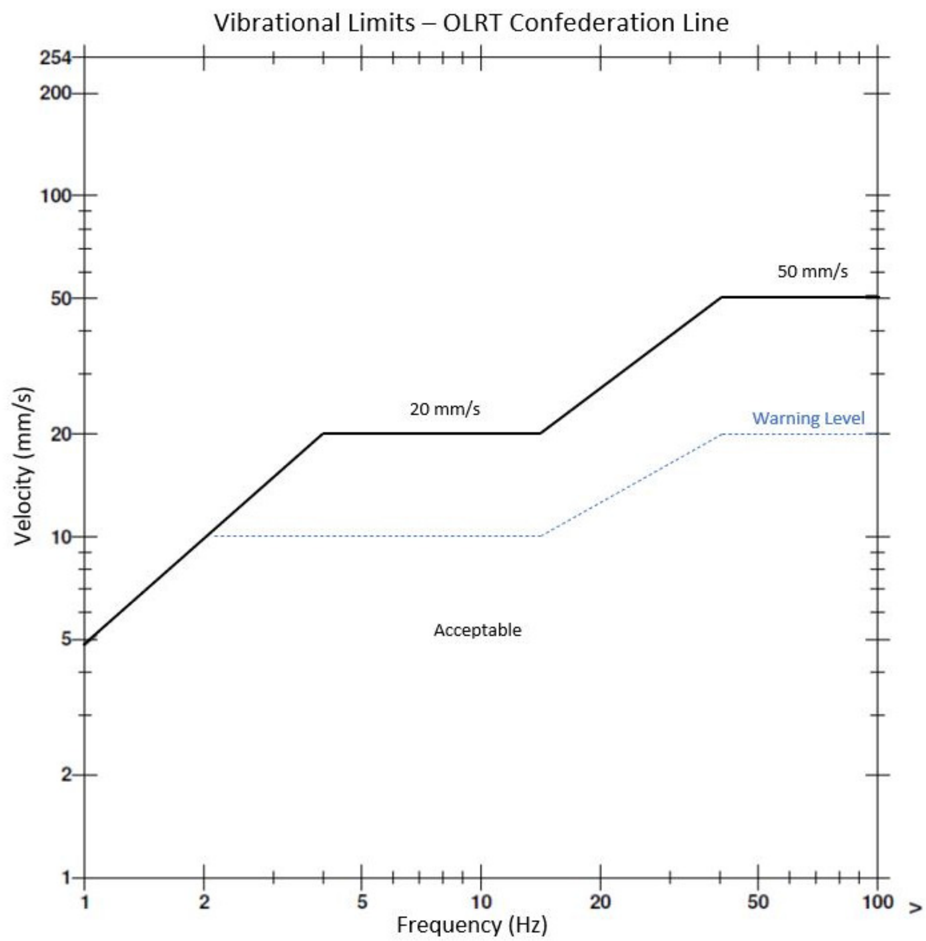
Due to the presence of the Confederation Line and the associated concrete retaining wall, the contractor should take extra precaution to minimize vibrations. The vibration monitoring program will be required for the full construction duration of the deep foundation installation operations, dewatering, backfilling and compaction, construction traffic, and other construction activities. The purpose of the Vibration Monitoring and Control Program (VMCP) is to provide a description of the measures to be implemented by the contractor to manage deep foundation installation operations and any other vibration sources during the construction for the proposed development. The VMCP will also provide a guideline for assessing results against the relevant vibration impact assessment criteria and recommendations to meet the required limits.

The monitoring program will incorporate real time results at the Confederation Line infrastructure, which is located in the general vicinity of the subject site. The monitoring equipment should consist of a tri-axial seismograph, capable of measuring vibration intensities up to 254 mm/s at a frequency response of 2 to 250 Hz. The monitoring equipment should be placed at the rail and the adjacent retaining wall.

The location of the monitoring equipment should be reviewed periodically throughout construction to ensure that the monitoring equipment remains at the closest radius to the construction activities. The vibration monitor locations should be approved by the project manager prior to installation. During construction, the vibration monitor will be relocated for the ‘worst case’ location for each construction activity. When an event is triggered, Paterson will review the results and provide any necessary feedback. Otherwise, the vibration results will be summarized in the weekly report.

Proposed Vibration Limits

The following figure outlines the recommended vibration limits for the Confederation Line railway and associated retaining wall:



Monitoring Data

The monitoring protocol should include the following information:

Warning Level Event

- ❑ Paterson will review all vibrations over the established warning level, illustrated by the blue line in the above figure, and;
- ❑ Paterson will notify the contractor if any vibrations occur due to construction activities which are close to the exceedance level.

Exceedance Level Event

- ❑ Paterson will notify all the relevant stakeholders via email if any vibrations surpass the exceedance level, illustrated by the black line in the above figure.
- ❑ Ensure monitors are functioning
- ❑ Issue the vibration exceedance result

The data collected should include the following:

- ❑ Measured vibration levels
- ❑ Distance from the construction activity to monitoring location
- ❑ Vibration type

Monitoring should be compliant with all related regulations.

3.2 Incident/Exceedance Reporting

In case an incident/exceedance occurs from construction activities, the Senior Project Management and any relevant personnel should be notified immediately. A report should be completed which contains the following:

- ❑ Identify the location of vibration exceedance
- ❑ The date, time and nature of the exceedance/incident
- ❑ Purpose of the exceeded monitor and current vibration criteria
- ❑ Identify the likely cause of the exceedance/incident
- ❑ Describe the response action that has been completed to date
- ❑ Describe the proposed measures to address the exceedance/incident.

The contractor should implement mitigation measures for future piling or any construction activities as necessary and provide updates on the effectiveness of the improvement. Response actions should be pre-determined prior to construction, depending on the approach provided to protect elements. Processes and procedures should be in-place prior to completing any vibrations to identify issues and react in a quick manner in the event of an exceedance.

4.0 Proximity Study Requirement Responses

Paterson was informed by the City of Ottawa that a Level 2 Confederation Line Proximity Study should be completed for the proposed development. A Level 2 Confederation Line Proximity Study is required where the proposed development is located within the City of Ottawa's Development Zone of Influence.

The following table lists the applicable requirements for Level 1 and Level 2 study and the response location for each item:

Table 1 - List of Confederation Line Proximity Study Requirements

Level 1 Projects	Response
A site plan of the development with the centreline or reference line of the Confederation Line structure and/or right-of-way located and the relevant distances between the Confederation Line and developer's structure shown clearly;	See Confederation Line Proximity Plan presented in Appendix A.
Plan and cross-sections of the development locating the Confederation Line structure/right-of-way and founding elevations relative to the development, including any underground storage tanks and associated piping;	Refer to the Confederation Line Proximity Plan and Cross-Section A-A' presented in Appendix A.
A geotechnical investigation report showing up-to-date geotechnical conditions at the site of the development. The geotechnical investigation shall be prepared in accordance with the Geotechnical Investigation and Reporting Guidelines for Development Applications in the City;	Refer to the Paterson Group Supplemental Geotechnical Investigation letter report PG5656-LET.01 dated June 24, 2021 and the geotechnical report prepared by Golder Associates Ltd.: Report Number 20144766 dated September 8, 2020 presented in Appendix B.
Structural, foundation, excavation and shoring drawings;	Structural and foundation drawings are presented in Appendix C. Excavation and shoring drawings are not required for the proposed development, as this will be a slab-on-grade building and will only require shallow, sloped excavations. Based on available design details, the foundation support for the proposed building will consist of deep foundations extending to the bedrock surface. Therefore there will be no building footprint deep excavations necessary. Local excavations will be sloped. No negative impacts are anticipated for the Confederation Line or associated concrete retaining wall due to the proposed building location.
Acknowledgment that the potential for noise, vibration, electro-magnetic interference and stray current from Confederation Line operations have been considered in the design of the project, and appropriate mitigation measures applied.	Refer to the draft Noise and Vibration Impact Assessment - Lees Campus - Faculty of Health Sciences Building prepared by WSP Global Inc. dated June 22, 2021 which is presented in Appendix C. It should be noted that the study available at the time of preparation of this report is a draft, the final version of the study will be provided once available.

Level 2 Projects	Response
A structural analysis or calculations of the effects of loadings, including construction loading, on the Confederation Line structure, and demonstrating that the Confederation Line will not be adversely affected by the development, including solutions to mitigate any impact on the Confederation Line structure.	No building loads will be imposed on the subject alignment of the Confederation Line or associated concrete retaining wall due to the presence of the proposed building, as the building will be slab-on-grade and the building loads will be transferred directly to the bedrock by deep foundations. Local, shallow excavations for the proposed development will be sloped. Further, due to the approximate proposed distance of 26 m between the building and the LRT, as well as the rail elevation, it can be determined that the rail is located outside of the zone of influence of the building's foundations. Refer to Cross-Section A-A' and the Proximity Assessment Report PG5656-LET.01 dated June 25, 2021 presented in Appendix D. Structural drawings are presented in Appendix C.
Documentation showing that the excavation support system and permanent structure adjacent to the Confederation Line property are designated for at-rest earth pressures.	A temporary shoring support system is not required for the proposed building construction, as it is a slab-on-grade structure. Local excavations for the proposed development will be sloped. Therefore, this comment is not applicable to this development. Refer to Cross-Section A-A' and the Proximity Assessment Report PG5719-LET.01 dated June 25, 2021 presented in Appendix D.
Structural drawings, including foundation plans, sections and details, floor plans, column and wall schedules and loads on foundation for the development. The relationship of the development to the Confederation Line structure should be depicted in both plan and section;	No building loads will be imposed on the subject alignment of the Confederation Line due to the buildings loads being extended to the bedrock surface using deep foundations. Further, the Confederation Line is located approximately 26 m away from the building foundation. Refer to the Confederation Line Proximity Plan and Cross-Section A-A' presented in Appendix A, as well as the Proximity Assessment Report PG5656-LET.01 dated June 25, 2021 presented in Appendix D. Structural drawings can be found in Appendix C.
Shoring design criteria and description of excavation and shoring method;	As described above, temporary shoring will not be required for the construction of the proposed building, therefore shoring design criteria are not applicable to this project.

Groundwater control plan, including the determination of the short-term (during construction) and long-term effects of dewatering on the Confederation Line structure, and provision of assurances that the influences of dewatering will have no impact on the Confederation Line structure;	The building will consist of slab-on-grade construction supported on deep foundations. No deep building footprint excavations will occur, excavations for pile cap and grade beam construction will be sloped and shallow and will not extend below the groundwater level. Therefore, no groundwater lowering effects on the Confederation Line due to the proposed development are anticipated. Refer to Proximity Assessment Report PG5656-LET.01 dated June 25, 2021 presented in Appendix D.
Proposal to replace/repair waterproofing system of the affected Confederation Line structure, including the Confederation Line expansion joint;	The LRT is located above grade within the vicinity of the subject site, therefore there will be no waterproofing system installed at the rail. Further, there will be at least a 26 m buffer between the Confederation Line and the proposed building at 200 Lees Avenue. Therefore, any waterproofing system if present would not be damaged by the construction of the proposed building.
Identification of utility installations proposed through or adjacent to Confederation Line property.	Draft site servicing layout plans are presented in Appendix C. Due to the proposed distance of 26 m between the LRT and the proposed development, no negative impacts to the LRT will occur as a result of the proposed site servicing systems at the subject site. It should be noted that a draft of the plan was available at the time of preparation of this report. The final plan will be provided once available.
Identification of the exhaust air quality and relationship of air in-take/discharge to the Confederation Line at-grade vent shaft openings and station entrance openings.	The mechanical plans are presented in Appendix C. Due to the proposed distance of 26 m between the LRT and the proposed development, no negative impacts to the LRT will occur as a result of the proposed mechanical systems.
Proposal for a pre-construction condition survey of the Confederation Line structure, including a survey to confirm locations of existing walls and foundations;	A thorough pre-construction condition survey of the Confederation Line will be completed prior to the start of construction at 200 Lees Avenue.
Monitoring plan for movement of the shoring and Confederation Line structure prior to and during construction of the development, including an Action Protocol.	As noted above, temporary shoring is not required for the proposed building construction as it is a slab-on-grade structure, therefore a monitoring plan is not applicable for this project.

We trust that this information satisfies your immediate request.

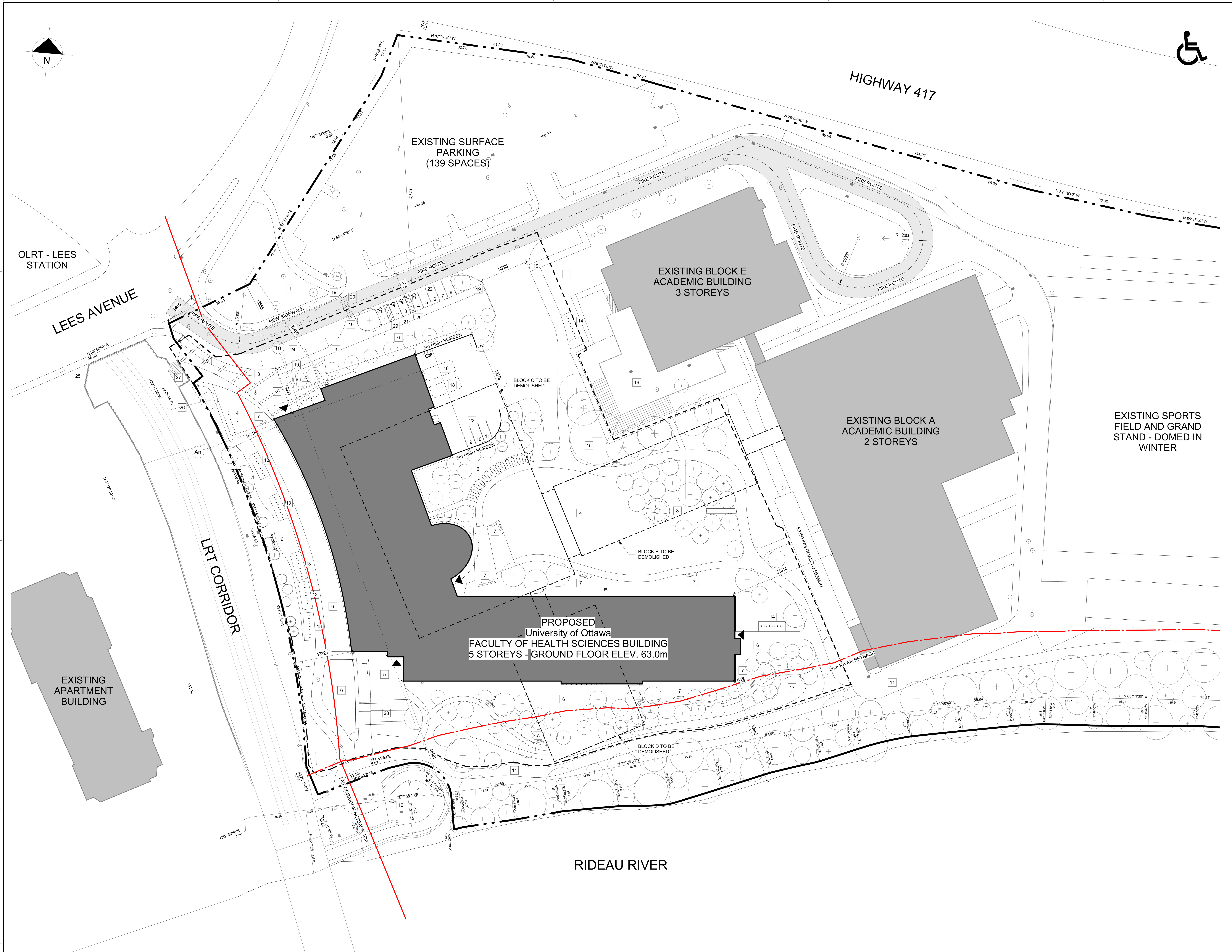
Paterson Group Inc.

Nicole R.L. Patey, B.Eng.

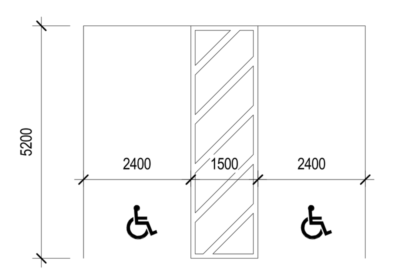
Scott S. Dennis, P.Eng.

APPENDIX A

Confederation Line Proximity Plan
Cross Section A-A’
Topographic Survey Plan
LRT Survey Sketch
LRT Grading Drawings
Construction Methodology and Impact Review



1 SITE PLAN
A0001 1 : 400



2 TYP. BARRIER FREE PARKING SPACE
A0001 1 : 100

LEGEND

TRANSFORMER
GARBAGE DISPOSAL
EXISTING CATCH BASIN
EXISTING FIRE HYDRANT
FH NEW FIRE HYDRANT
EXISTING MAN HOLE
BARRIER FREE PARKING
BUILDING ENTRY/EXIT
EXISTING LIGHT STANDARD
PROPOSED LIGHT STANDARD
EXISTING TREE
PROPOSED TREE
CODE BLUE STATION
GM GAS METER
LIMIT OF WORK
CONCRETE PAVING
ASPHALT PAVING
NOTE: HEAVY DUTY IN SERVICE COURTYARD

SITE LEGEND

1	SNOW STORAGE AREA
2	ARRIVAL PLAZA
3	FIRE ROUTE SIGN - NO PARKING
4	ACADEMIC QUAD
5	RIVER TERRACE - MULTI-FUNCTIONAL PLAZA
6	SOFT LANDSCAPE
7	NEW BENCH
8	INDIGENOUS PAVILION & FIREPIT GATHERING CIRCLE
9	NEW CONCRETE CURB AND CONCRETE SIDEWALK
11	EXISTING MULTI-USE PATHWAY
12	EXISTING SWITCHBACK MULTI-USE PATHWAY
13	SHELTERED BICYCLE RACKS
14	BICYCLE RACKS
15	EXISTING TREE GROVE TO BE PRESERVED
16	EXISTING SUNKEN COURTYARD
17	BIO-SWALE
18	LOADING BAY
19	DEPRESSED CURB WITH TACTILE WALKING SURFACE INDICATORS
20	PAINTED SURFACE MARKING
21	ELECTRICAL VEHICLE CHARGING
22	NEW SURFACE PARKING
23	RAISED PLANTER WITH SEATING AND GROUND SIGN
24	LAY-BY
25	EXISTING BUS STOP
26	EXISTING NORTH BOUND LRT PLATFORM
27	EXISTING STAIR TO LRT PLATFORM
28	TERRACED SEATING
29	RAMP WITH TACTILE WALKING SURFACE INDICATORS

REGULAR PARKING

MAXIMUM PARKING	250 SPACES
EXISTING PARKING	137 SPACES
EXISTING BARRIER FREE SPACES	2 SPACES
PARKING PROVIDED	7 SPACES
BARRIER FREE SPACES	4 SPACES
PARKING REMOVED	X SPACES

BICYCLE PARKING

GROSS FLOOR AREA	5,218m²
SPACES PER 250m²	94 SPACES
TOTAL PROVIDED	x SPACES

SITE AND BUILDING -m²

BUILDING AREA (FOOTPRINT)	5,218
AREA OF LOT	69,319
LOT COVERAGE	

BUILDING AREA BY USE -m²

CLASSROOMS
LABS
ADMIN/STAFF
LIBRARY
SERVICES (WR/MECH/ELEC/JAN)
CIRCULATION
STORAGE
TOTAL PROVIDED

GROSS FLOOR AREA -m²

GROUND LEVEL	5,218
SECOND LEVEL	
THIRD LEVEL	
FOURTH LEVEL	
FIFTH LEVEL	
TOTAL	23,147

ZONING INFORMATION

	REQUIRED	PROPOSED
LOT AREA		
LOT WIDTH		
LOT COVERAGE		
MAX. BUILDING HEIGHT		23m
LANDSCAPE AREA		
ASPHALT AREA		
SETBACKS		
FRONT YARD		
INTERIOR SIDE YARD		
REAR YARD		
CORNER SIDE YARD		
PARKING	MAX 250	11
PARKING SPACE SIZE	NONE	2.6x5.2m
BARRIER FREE SPACES		4
AISLE WIDTH	6m	7.4m
LOADING SPACE	2	2
LOADING SPACE SIZE	9.0x3.5m	9.0x3.5m
BICYCLE PARKING	1/250m²	79 (need94)

ARCHITECTURE 49
1000-150 ISABELLA STREET
OTTAWA (ONTARIO) CANADA K1S 1V7
Phone: 613-238-0440 | Fax: 613-238-6597 | WWW.ARCHITECTURE49.COM

wsp
2611 Queensview Dr, Suite 300
Ottawa, Ontario, K2B 8K2 Canada
T 613-829-2800 | F 613-829-8299 | www.wsp.com

PCL CONSTRUCTION
49 Auriga Drive
Ottawa, Ontario, K2E 8A1 Canada
T 613-978-5398 | www.pcl.com

SITE PLAN INFORMATION TAKEN FROM

TOPOGRAPHY PLAN OF
PART OF LOT G
CONCESSION D (RIDEAU FRONT)
GEOGRAPHIC TOWNSHIP OF NEPEAN
CITY OF OTTAWA

PREPARED BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD.

DATE: JULY 14th, 2020

SEAL:

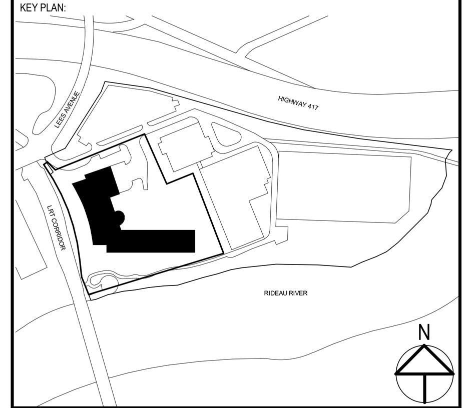
CLIENT: uOttawa

RFP #: 2020-40369 CLIENT REF. #: BT20-18477

PROJECT:
University of Ottawa - Faculty of Health Sciences Building

200 LEES AVENUE
OTTAWA, ON

KEY PLAN:



ISSUED FOR - REVISION:

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ORIGINAL SCALE: As indicated	IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
DESIGNED BY: WP	
DRAWN BY: VW	
CHECKED BY: WP	25mm

DISCIPLINE: ARCHITECTURE

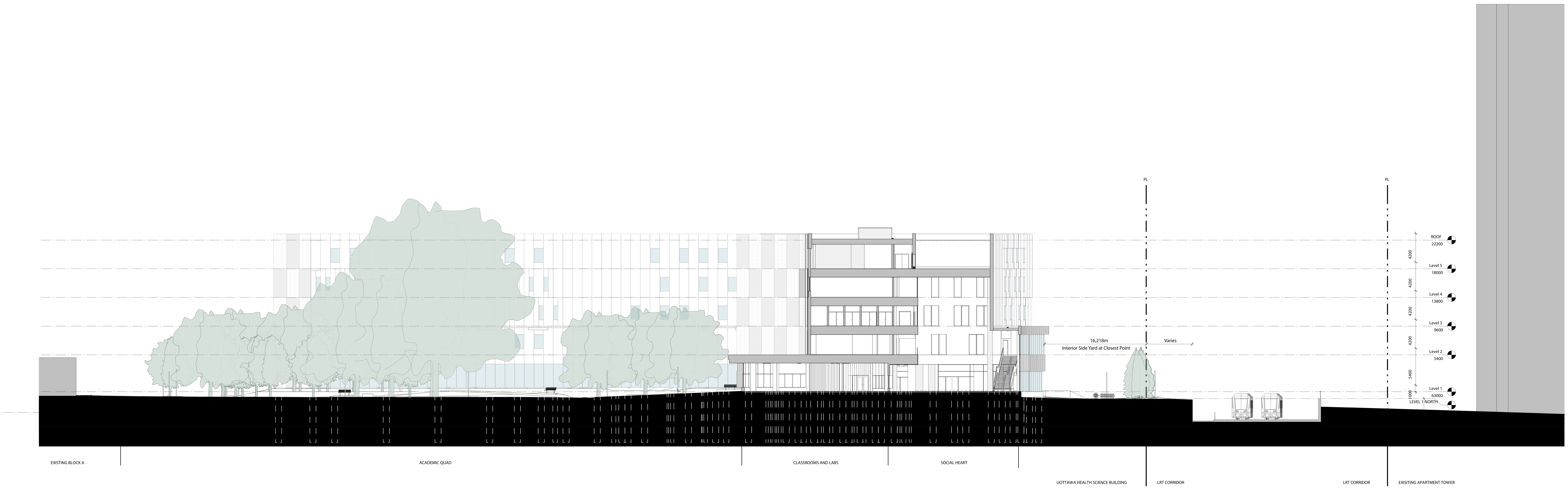
TITLE: SITE PLAN

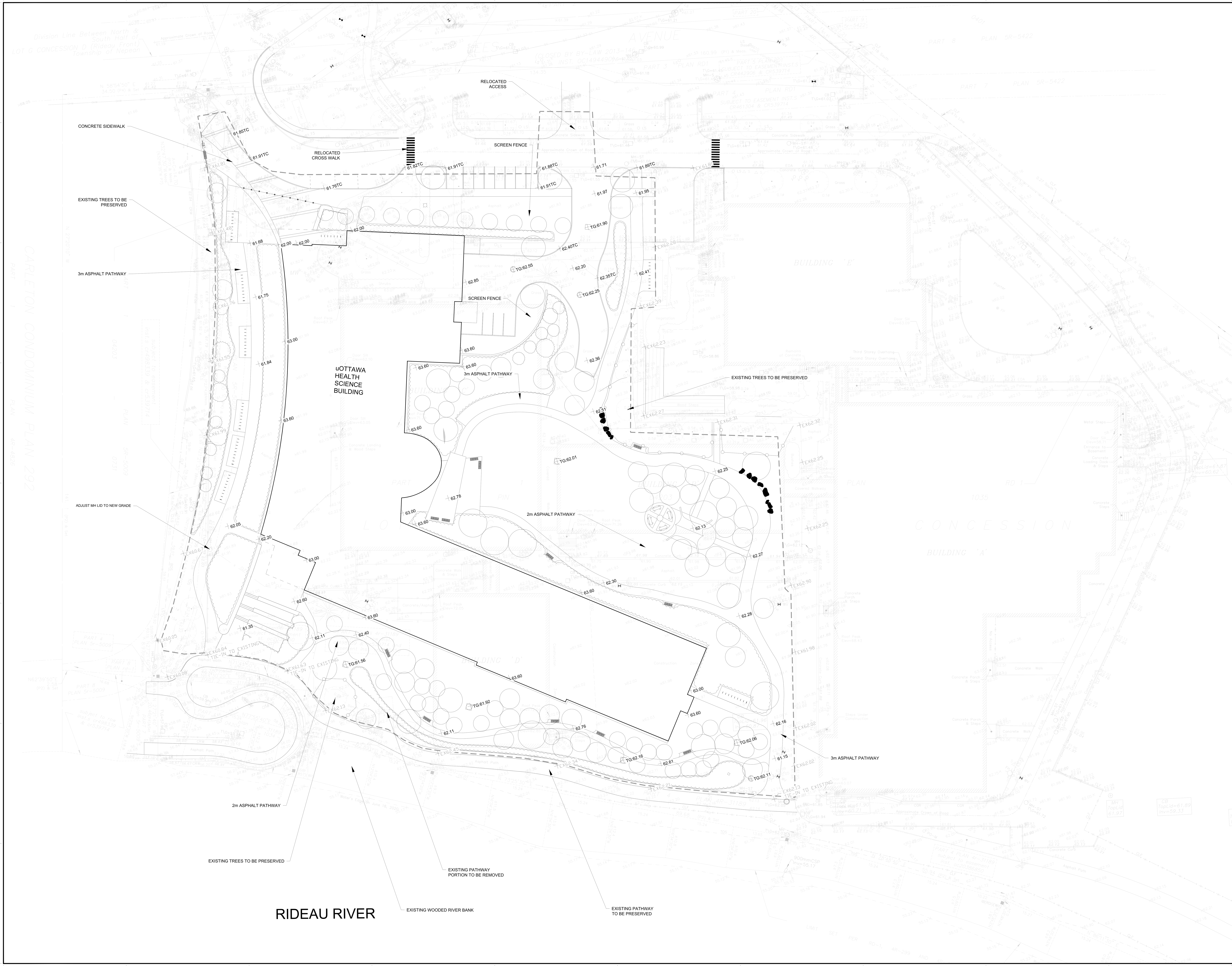
SHEET NUMBER: A0001

SHEET #: OF

ISSUE: REV # 1

DATE OF:


PL
PL
ROOF
22200
Level 5
18000
Level 4
13800
Level 3
9600
Level 2
5400
Level 1
63000
LEVEL 1 NORTH
4200
4200
4200
4200
5400
1000
16,218m
Interior Side Yard at Closest Point
Varies
EXISTING BLOCK A
ACADEMIC QUAD
CLASSROOMS AND LABS
SOCIAL HEART
UOTTAWA HEALTH SCIENCE BUILDING
LRT CORRIDOR
LRT CORRIDOR
EXISITING APARTMENT TOWER



ARCHITECTURE | 49

1000-150 ISABELLA STREET
OTTAWA (ONTARIO) CANADA K1S 1V7
Phone: 613-238-0440 | Fax: 613-238-6597 | WWW.ARCHITECTURE49.COM

wsp

2611 Queensview Dr, Suite 300
Ottawa, Ontario, K2B 8K2 Canada
T 613-829-2800 | F 613-829-8299 | www.wsp.com

49 Auriga Drive
Ottawa, Ontario, K2E 8A1 Canada
T 613-978-5398 | www.pcl.com

SEAL:

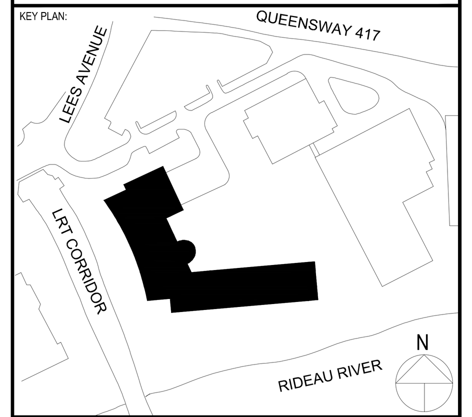
uOttawa

RFP #: 2020-40369 CLIENT REF. #: BT20-18477

PROJECT:

University of Ottawa - Faculty of Health Sciences Building

KEY PLAN:



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THIS DRAWING AND DESIGN IS COPYRIGHT PROTECTED WHICH SHALL NOT BE USED, REPRODUCED OR REVISED WITHOUT WRITTEN PERMISSION BY WSP. THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS AND UTILITY LOCATIONS AND REPORT ALL ERRORS AND OMISSIONS PRIOR TO COMMENCING WORK.
THIS DRAWING IS NOT TO BE SCALED.

ISSUED FOR - REVISION:

IS	RE	DATE	DESCRIPTION

PROJECT NO: 211-01094-00
DATE: 2021-01-04
ORIGINAL SCALE: A49_ORI_SCA
IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
25mm
DESIGNED BY: STEPHEN McCAUGHY
DRAWN BY: ADIL MEDDAOUI
CHECKED BY: A49_CHK_NAM

DISCIPLINE: CIVIL

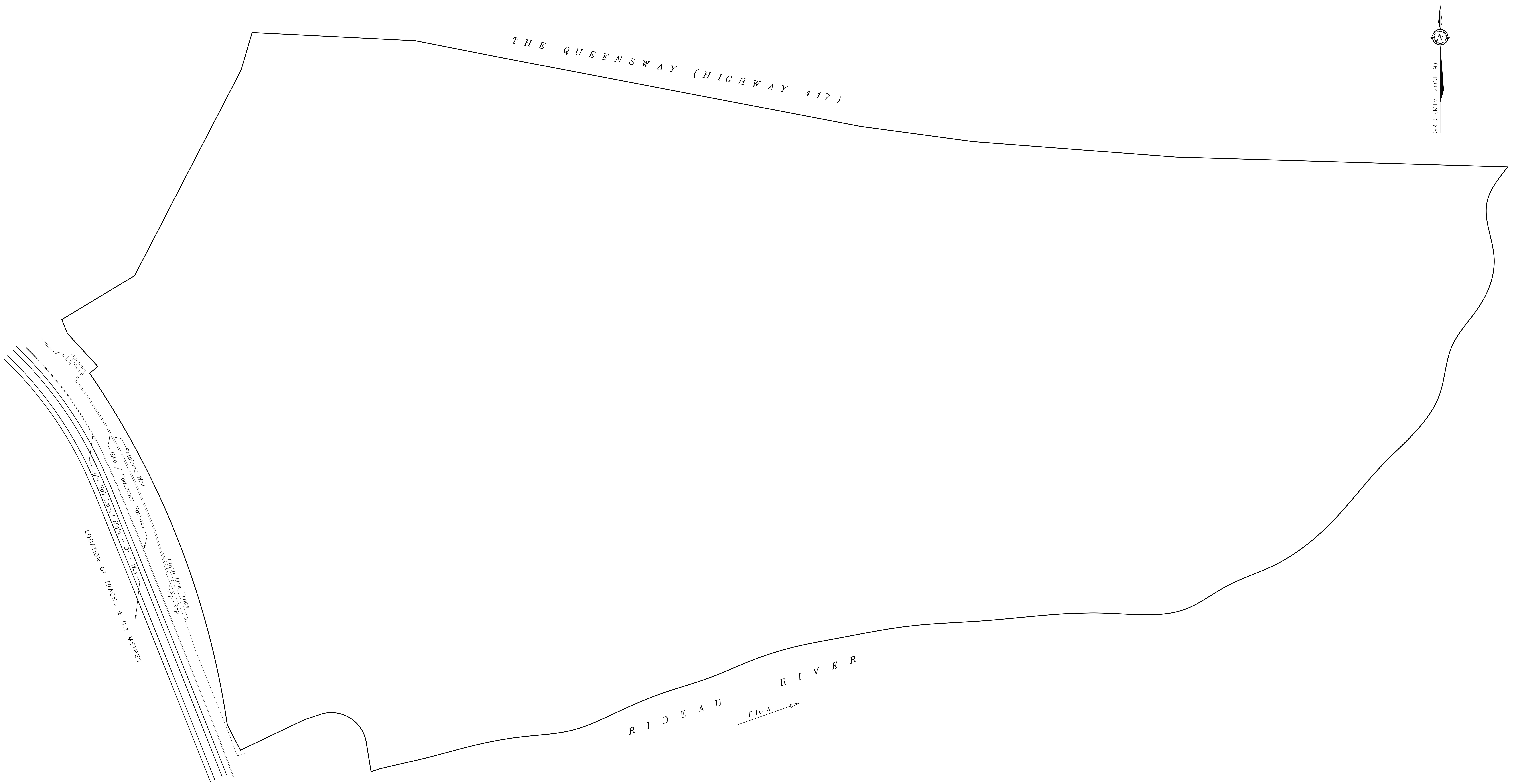
TITLE: GRADING PLAN

SHEET NUMBER: A49_SHT_NUM

SHEET #: A49_SHT_CUR OF A49_SHT_TOT

ISSUE: A49_ISS_FOR
DATE OF: A49_ISS_DAT

REV #: A49_REV_NUM



SKETCH SHOWING

COMPILED BOUNDARY
LANDS OWNED BY UNIVERSITY OF OTTAWA
BEING
PART OF LOT G
CONCESSION D (RIDEAU FRONT)
GEOGRAPHIC TOWNSHIP OF NEPEAN
CITY OF OTTAWA

SCALE 1 : 500

0 10 20 50 metres

FAIRHALL, MOFFATT & WOODLAND LIMITED

ONTARIO LAND SURVEYORS

NOTE

CAD FILE REFERENCED TO THE MTM COORDINATE SYSTEM, ZONE 9, (NAD83 ORIGINAL).

ADDITIONS: LRT R–O–W JUNE 18,2021

Fairhall Moffatt & Woodland LIMITED ONTARIO LAND SURVEYORS OTTAWA *Surveying and Land Information Services* 100–600 TERRY FOX DRIVE, KANATA, ONTARIO K2L 4B6 TEL: (613) 591–2580 FAX: (613) 591–1495 www.fmw.on.ca	JOB No. A B 2 2 6 0 0
	E 369972, N 5030917
	REFERENCE No. 36 – D (RF) NP
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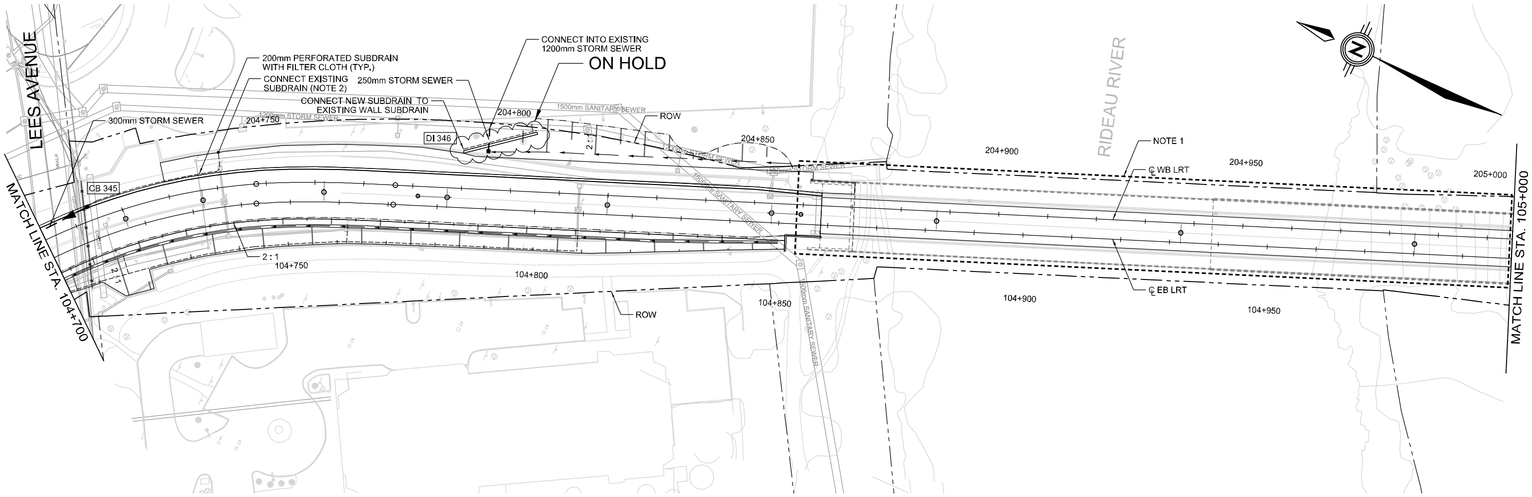

CATCH BASIN DATA

NO.	STATION	OFFSET	COVER	STRUCTURE	ELEVATION	
					T/GRATE	LOW/INV.
CB 345	104+710.0	6.9 LT	400.030	705.010	55.394	52.977

Confederation Line
Ligne de la Confédération

Ottawa

GUIDEWAY DESIGN - SEGMENT 3
GRADING AND DRAINAGE
STA. 104+700 TO 105+000

CONTRACT No.	OILC-11-00-P006
DESIGNED	M. BARTLETT
CHECKED	P. HILL
DRAWN	N. LAMBERT
SEALED	M. BARTLETT

DRAWING NUMBER
REM-30-3-0000-DRD-2015

PRIMARY SEAL
LICENSED PROFESSIONAL ENGINEER
M. S. BARTLETT
100084687
PROVINCE OF ONTARIO

DESIGN/BUILDER
OLRT CONSTRUCTORS CONSTRUCTEURS

ENGINEERING JV
RTGE Joint Venture

SECONDARY SEAL (IF REQUIRED)

DESIGN FIRM
MMM GROUP

SCALE
HORIZONTAL 1:500 FULL SIZE
1:1000 HALF SIZE
0m 5 10 20 40

ASSET No.

ASSET GROUP

REV	DESCRIPTION	BY	DATE
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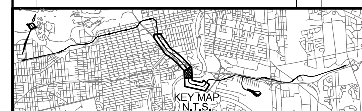


LAYOUT INFORMATION BASED ON 3 DEGREE MTM ZONE 9 NAD 83 (OLRT) COORDINATE SYSTEM. COMBINED SCALE FACTOR 0.999946

GENERAL NOTES:

A. THE LOCATION OF EXISTING UTILITIES ARE APPROXIMATE AND SHOULD BE VERIFIED BY THE CONTRACTOR IN THE FIELD. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ADEQUATE PROTECTION FROM DAMAGE.

B. REFER TO 'STRAY CURRENT REPORT' FOR ADDITIONAL CORROSION CONTROL SYSTEMS, INCLUDING THE LOCATION AND TYPICAL ARRANGEMENT, MEASURING POINTS, AND STRAY CURRENT MONITORING SYSTEMS. CORROSION CONTROL MEASURES SHALL BE PROVIDED FOR BURIED PIPES AND PIPES SUBJECT TO DIRECT CURRENT (DC) STRAY CURRENTS.

C. MATERIAL SUBSTITUTIONS MAY BE CONSIDERED AT THE DISCRETION OF THE OLRTC REPRESENTATIVE. SUBSTITUTIONS SHALL NOT BE MADE WITHOUT THE PRIOR APPROVAL OF THE OLRTC REPRESENTATIVE. THE APPROVAL OR REJECTION OF A PROPOSED SUBSTITUTION WILL BE MADE AT THE DISCRETION OF THE OLRTC REPRESENTATIVE.

D. CONNECTION POINTS TO EXISTING UTILITIES TO BE VERIFIED BY VISUAL EXPOSURE AND SURVEY AS REQUIRED.

E. CONTRACTOR TO LOCATE AND RECONNECT EXISTING STRUCTURE SUBDRAINS TO PROPOSED SEWER SYSTEM.

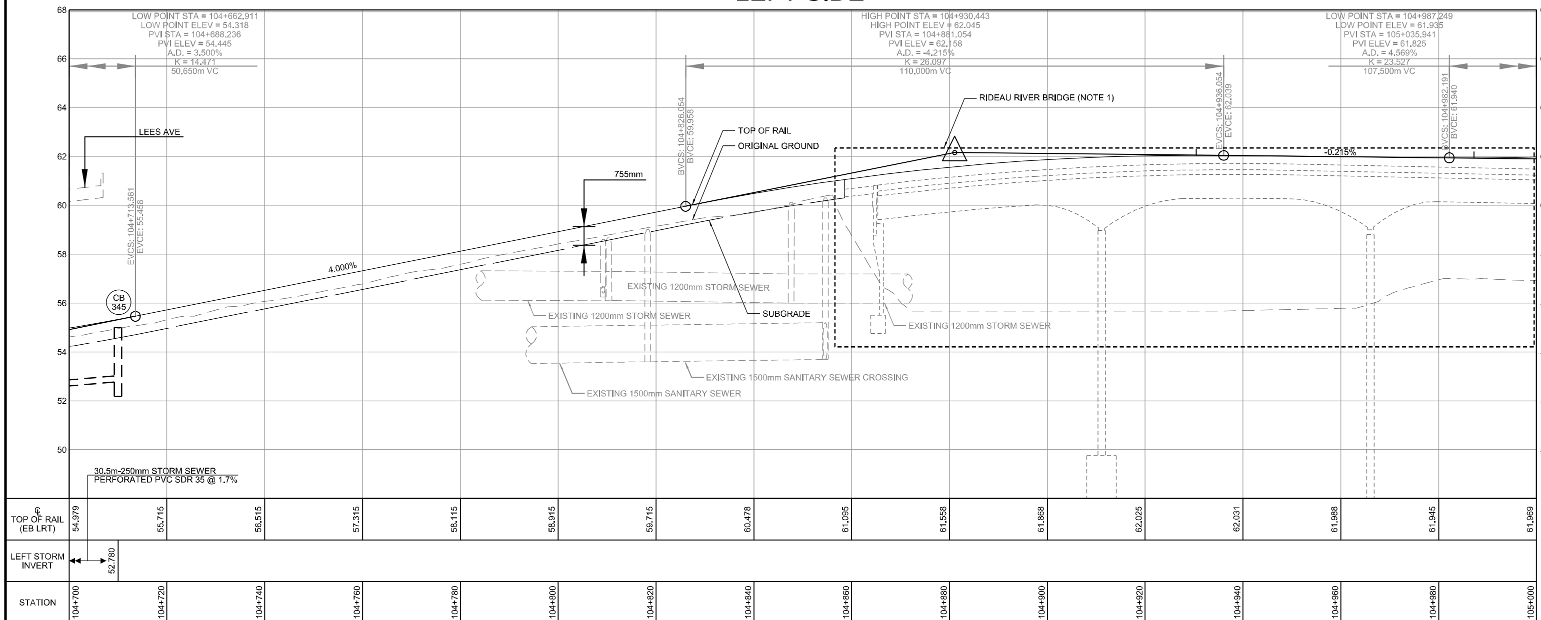
F. ROW BASED ON PROPERTY REQUEST PLANS (PRP) PROVIDED BY THE CITY.

NOTES:

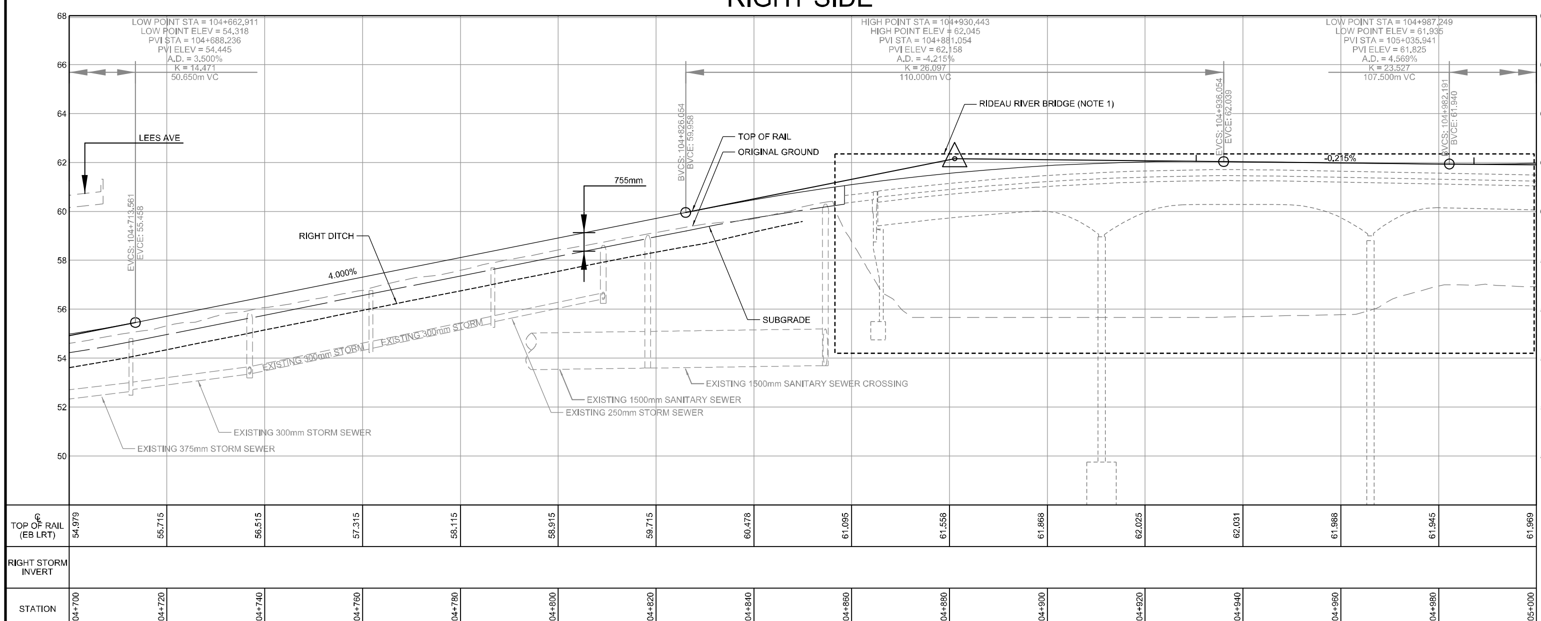
1. REFER TO THE 'STRUCTURES - RIDEAU RIVER BRIDGE' PACKAGE FOR DETAILS.

2. CONTRACTOR TO LOCATE AND RECONNECT EXISTING STRUCTURE SUBDRAINS TO PROPOSED STRUCTURE. CONTRACTOR TO ENSURE POSITIVE DRAINAGE.

LEFT SIDE



RIGHT SIDE



Confederation Line
Ligne de la Confédération

Ottawa

CONTRACT No. OILC-11-00-P006

GUIDEWAY DESIGN - SEGMENT 3
GRADING AND DRAINAGE
STA. 104+700 TO 105+000

DESIGNED	CHECKED
M. BARTLETT	P. HILL
DRAWN	**SEALED**
N. LAMBERT	M. BARTLETT

DRAWING NUMBER: REM-30-3-0000-DRD-2016

DESIGN/BUILDER: OLRT CONSTRUCTORS CONSTRUCTEURS

ENGINEERING JV: RTGE Joint Venture

DESIGN FIRM: MMM GROUP

PRIMARY SEAL: LICENSED PROFESSIONAL ENGINEER, M. S. BARTLETT, 100084687, PROVINCE OF ONTARIO, APR 12/16

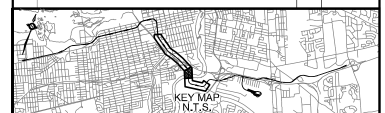
SECONDARY SEAL (IF REQUIRED)

SCALE: HORIZONTAL 1:500 FULL SIZE, 1:1000 HALF SIZE; VERTICAL 1:100 FULL SIZE, 1:200 HALF SIZE

ASSET No.

ASSET GROUP

REV	DESCRIPTION	BY	DATE
0	SIN-0638: ISSUED FOR CONSTRUCTION	MSB	2016-04-12



LAYOUT INFORMATION BASED ON 3 DEGREE MTM ZONE 9 NAD 83 (OLRT) COORDINATE SYSTEM. COMBINED SCALE FACTOR 0.999946

GENERAL NOTES:

A. THE LOCATION OF EXISTING UTILITIES ARE APPROXIMATE AND SHOULD BE VERIFIED BY THE CONTRACTOR IN THE FIELD. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ADEQUATE PROTECTION FROM DAMAGE.

B. REFER TO 'STRAY CURRENT REPORT' FOR ADDITIONAL CORROSION CONTROL SYSTEMS, INCLUDING THE LOCATION AND TYPICAL ARRANGEMENT, MEASURING POINTS, AND STRAY CURRENT MONITORING SYSTEMS. CORROSION CONTROL MEASURES SHALL BE PROVIDED FOR BURIED PIPES AND PIPES SUBJECT TO DIRECT CURRENT (DC) STRAY CURRENTS.

C. MATERIAL SUBSTITUTIONS MAY BE CONSIDERED AT THE DISCRETION OF THE OLRTC REPRESENTATIVE. SUBSTITUTIONS SHALL NOT BE MADE WITHOUT THE PRIOR APPROVAL OF THE OLRTC REPRESENTATIVE. THE APPROVAL OR REJECTION OF A PROPOSED SUBSTITUTION WILL BE MADE AT THE DISCRETION OF THE OLRTC REPRESENTATIVE.

D. CONNECTION POINTS TO EXISTING UTILITIES TO BE VERIFIED BY VISUAL EXPOSURE AND SURVEY AS REQUIRED.

E. CONTRACTOR TO LOCATE AND RECONNECT EXISTING STRUCTURE SUBDRAINS TO PROPOSED SEWER SYSTEM.

NOTES:

1. REFER TO THE 'STRUCTURES - RIDEAU RIVER BRIDGE' PACKAGE FOR DETAILS.

Construction Methodology and Impact Review		
Construction Item	**Potential Impact**	**Mitigation Program**
Item A - Deep Foundation Installation - The building construction will consist of a slab-on-grade with building loads being extended to the bedrock surface by deep foundations. The installation of deep foundation could be a source of vibrations at the LRT structure.	Vibration issues during deep foundation installation.	A vibration monitoring control program will be implemented to monitor deep foundation installation activities to ensure the recommended vibration limits are not exceeded at the Confederation Line.
Item B - Excavation within Lateral Support Zone of Rail Line - A certain amount of excavation will be required for construction of pile caps and grade beams.	Damage of Confederation Line due to localized excavation within the lateral support zone of the rail line.	Only shallow excavation will be occuring for the proposed building foundations. Due to the setback of the proposed building from the Confederaiton Line, which is located at finished grade, no negative impacts to the Confederation Line will occur due to localized excavations for the proposed development.
Item C - Construction of Footings and Foundation Walls - The proposed building will consist of slab-on-grade construction with building loads extended to the bedrock surface by deep foundations.	Building footing loading on adjacent Confederation Line, and excavation within the lateral support zone of the Confederation Line.	Due to the approximate 26 m distance between the proposed building and rail line structure and the building consisting of slab-on-grade construction with building loads being extended to bedrock by deep foundations, the building loading will not impact the lateral support zone of the Confederation Line. Further, local excavations for the development will be shallow and sloped.

APPENDIX B

Paterson Supplemental Geotechnical Investigation Report: PG5656-LET.01 dated June 24, 2021

Geotechnical Investigation Prepared by Golder Associates Ltd.: Report Number 20144766 dated September 8, 2020

patersongroup

Consulting Engineers

154 Colonnade Road South
Ottawa, Ontario
Canada, K2E 7J5
Tel: (613) 226-7381
Fax: (613) 226-6344

Geotechnical Engineering
Environmental Engineering
Hydrogeology
Geological Engineering
Materials Testing
Building Science
Noise and Vibration Studies

www.patersongroup.ca

June 24, 2021
File: PG5656-LET.01

PCL Constructors Canada Inc.
49 Auriga Drive
Ottawa, On
K2E 8A1

Attention: **Mr. David Wroblewski**

Subject: **Preliminary Geotechnical Investigation**
Proposed Institutional Building
200 Lees Avenue - Ottawa, Ontario

Sir,

Paterson Group (Paterson) was commissioned by PCL Constructor Canada Inc (PCL) to conduct a supplementary geotechnical investigation to review and supplement the information provided in “Geotechnical Report, Proposed New Building, Lees Campus”, report number 20144766 dated September 8, 2020 by Golder for the aforementioned site.

1.0 Proposed Project

It is of our understanding that the University of Ottawa is proposing to build a new campus building at the aforementioned site. The building is to consist of a 5 storey slab on grade structure constructed on a series of deep foundation elements (caisson and driven piles). Paterson reviewed the information provided by Golder in the above noted report and completed a supplemental field investigation to provide further geotechnical recommendations for the construction of the proposed building.

2.0 Field Program and Observations

Field Program

The field program for the current investigation was carried out on between June 11 and 14, 2021 and consisted of a total of 7 boreholes sampled to a maximum depth of 17.3 m below the existing grade.

The borehole locations for the current investigations were determined in the field by Paterson personnel taking into consideration existing borehole coverage and existing site features. The locations of the boreholes are illustrated on the Test Hole Location Plans attached.

The boreholes were put down using a track-mounted auger drill. The rigs were operated by a two person crew. All fieldwork was conducted under the full-time supervision of personnel from Paterson's geotechnical division under the direction of a senior engineer. The testing procedure for boreholes consisted of augering to the required depths at the selected locations and sampling the overburden.

Surface Conditions

The subject site is currently occupied by the existing campus owned by the University of Ottawa. The site is fairly flat and at grade with the neighbouring road way. The LRT tracks and Lees Station are located directly west of the site and lowered within the independent corridor. The Rideau River circles the site along the south and east side of the site and Highway 417 and Lees Avenue are located along the north portion of the property.

The existing campus consist of 5 buildings linked by covered and structural walkways. A sports field is location in the eastern portion of the site. It is understood that building B, C and D will be demolished as part of this project. The remainder of the site consist of parking area with access lanes with a green space between building D and A.

The banks of the Rideau river are sloped down approximately 10 to 12 m down. A slope stability analysis was completed by Golder to review the proposed development setbacks.

Subsurface Conditions

Based on available information and the completed field investigation the subsurface conditions at the available borehole locations consists of a fill layer, consisting mainly of silt/silty sand with cinder and ash. The fill layer was noted to be in a loose to dense state of compaction. A glacial till consisting of sand, cobbles and boulders within a clayey silt soil matrix was encountered underlying the fill layer. A shale bedrock was encountered underlying the glacial till layer.

Groundwater

Historical groundwater level readings were recorded at the borehole locations. The groundwater level readings indicate that the longterm groundwater table is located approximately 7 to 8 m below existing grade.

It should be noted that surface water can become trapped within a backfilled borehole that can lead to higher than typical groundwater level observations. It should be noted that groundwater levels are subject to seasonal fluctuations, therefore the groundwater levels could vary at the time of construction.

Laboratory Testing

he soil samples recovered from our field investigation were examined in our laboratory to collaborate the field findings. Three representative bedrock sample were tested under unconfined compression strength.One soil sample was submitted for analytical testing to assess the corrosion potential for exposed ferrous metals and the potential of sulphate attacks against subsurface concrete structures. The sample was submitted to determine the concentration of sulphate and chloride, the resistivity and the pH of the sample. The testing results are attached for reference.

3.0 Geotechnical Assessment

3.1 Site Grading and Preparation

Stripping Depth

All topsoil and deleterious fill, such as those containing organic materials and marl, should be stripped from under any buildings, paved areas, pipe bedding and other settlement sensitive structures.

Fill Placement

Fill used for grading beneath the building footprint, unless otherwise specified, should consist of clean imported granular fill, such as Ontario Provincial Standard Specifications (OPSS) Granular A or Granular B Type II. The fill should be tested and approved prior to delivery to the site. It should be placed in lifts no greater than 300 mm thick and compacted using suitable compaction equipment for the lift thickness. Fill placed beneath the building area should be compacted to at least 98% of its standard Proctor maximum dry density (SPMDD).

Site-excavated soil can be used as general landscaping fill where settlement of the ground surface is of minor concern. These materials should be spread in thin lifts and at least compacted by the tracks of the spreading equipment to minimize voids. If these materials are to be used to build up the subgrade level for areas to be paved, they should be compacted in thin lifts to a minimum density of 95% of their respective SPMDD. Site-excavated soils are not suitable for use as backfill against foundation walls unless a composite drainage blanket connected to a perimeter drainage system is provided.

3.2 Foundation Design

Conventional Shallow Foundation

It is expected that auxiliary structures can be founded on conventional shallow footings. For areas where a fill layer is encountered at the underside of footing, it is recommended to sub-excavate 600 mm below the underside of footing and reinstate with a select subgrade material, such as OPSS Granular B Type II, in maximum 300 mm loose lifts and compacted to a minimum 98% of its SPMDD.

It is recommended that a proof-rolling program be completed by a vibratory roller making several passes and approved by Paterson personnel prior to placement of the select subgrade material. Any poor performing areas noted during the proof-rolling program should be removed and reinstated with a select subgrade fill compacted to 98% of its SPMDD under dry and above freezing temperatures.

Footings on a compacted engineered fill placed over the approved fill layer can be designed using a bearing resistance value at serviceability limit states (SLS) of **100 kPa** and a factored bearing resistance value at ultimate limit states (ULS) of **200 kPa**. A geotechnical resistance factor of 0.5 was applied to the above noted bearing resistance value at ULS.

Lateral Support

The bearing medium under footing-supported structures is required to be provided with adequate lateral support with respect to excavations and different foundation levels. Adequate lateral support is provided to silt/silty sand above the groundwater table when a plane extending down and out from the bottom edge of the footing at a minimum of 1.5H:1V passes only through in situ soil of the same or higher capacity as the bearing medium soil.

Foundation Option - End Bearing Piled Foundation

A deep foundation system driven to refusal in the bedrock is recommended for foundation support of the proposed building. For deep foundations, concrete-filled steel pipe piles are generally utilized in the Ottawa area. Applicable pile resistance values at ultimate limit states (ULS) are given in Table 1. A resistance factor of 0.4 has been incorporated into the factored at ULS values. Note that these are all geotechnical axial resistance values.

The geotechnical pile resistance values were estimated using the Hiley dynamic formula, to be confirmed during pile installation with a program of dynamic monitoring. Re-striking of all piles at least once will also be required after at least 48 hours have elapsed since initial driving.

Table 1 - Pile Foundation Design Data

Pile Outside Diameter (mm)	Pile Wall Thickness (mm)	Geotechnical Axial Resistance	Geotechnical Uplift Resistance
		Factored at ULS (kN)	Factored at ULS (kN) (assumed 12 m pile)
245	9	1350	200
245	11	1425	200
245	13	1500	200

The minimum centre-to-centre pile spacing is 2.5 times the pile diameter. The closer the piles are spaced, however, the more potential that the driving of subsequent piles in a group could have influence on piles in the group that have already been driven. These effects, primarily consisting of uplift of previously driven piles, are checked as part of the field review of the pile driving operations.

It is expected that the existing piles will be subexcavated and will not carry any loads from the new proposed building. The new pile foundations should be installed leaving a minimum spacing of 300 mm between the edge of the existing pile and new pile.

Prior to the commencement of production pile driving, a limited number of indicator piles should be installed across the site. It is recommended that each indicator pile be dynamically load tested to evaluate pile stresses, hammer efficiency, pile load transfer, and end-of-driving criteria for end-bearing in the bedrock.

The structural axial capacity of the pile is governed by its structural strength at the neutral plane when subjected to the permanent load plus the downdrag load. Transient live load is not to be included. At or below the pile cap, the structural strength of the embedded pile is determined as a short column subjected to the permanent load plus the transient live load, but downdrag load is to be excluded.

At the depth of the neutral plane where the downdrag load is applied, the pile structure is well confined. The 4th edition of the Canadian Foundation Engineering Manual recommends that the allowable structural axial capacity of piles at the neutral plane, for resisting permanent load plus the downdrag load, can be determined by applying a factor of safety of 1.5 to the pile material strength (steel yield and concrete 28 day compressive strength).

Foundation Option - Drilled Shafts and Caissons

End bearing cast-in-place caissons can be used where supplemental axial resistance is required for structural design for the proposed building. The caisson should be installed by driving a temporary steel casing and excavating the soil through the casing. A minimum of 35 MPa concrete should be used to in fill the caissons. The caissons are to be structurally reinforced over their entire length.

Two conditions for drilled shafts are applicable for this site. The first alternative is a caisson installed on the sound bedrock augering through the weathered bedrock (end bearing). The compressive resistance for such piles is directly related to the compressive strength of the bedrock. It is recommended that the entire capacity be derived from the end bearing capacity.

The second alternative is a concrete caisson socketed into bedrock. The axial capacity is increased by the shear capacity of the concrete/rock interface. Furthermore, the tensile resistance of the caisson is increased by the rock capacity. It should be noted that the rock socket should be reinforced.

Table 2 below presents the estimated capacity for different typical caisson sizes for a rock bearing caisson and rock socketed caisson extending 3 m into sound bedrock.

Table 2 - Caisson Pile Capacities

Caisson Diameter		Axial Capacity (kN)		Factored Capacity Tension at ULS (kN)	
inch	mm	End Bearing	Rock Socket	End Bearing	Rock Socket
36	900	10000	14500	920	2700
42	1000	15000	19000	1050	3450
48	1200	19000	24500	1200	4500
54	1375	24000	31000	1350	5300
60	1500	30000	38000	1500	6000

notes:
- 3 m rock socket in sound bedrock
- Reinforced caisson and rock socket when applicable
- 0.4 geotechnical factor applied to the shaft capacity

Based on the recent field investigation and bedrock coring it is expected that a weathered layer of bedrock will need to be removed to reach a sound surface. The thickness of the weathered layer was evaluated to vary from1.5 to 1.8 m across the site. It is expected that the deep foundation rig will be able to auger through the weathered bedrock layer.

3.3 Lateral Load Resistance

Lateral loads on the foundations can be resisted using passive resistance on the sides of the foundations. For Limit States Design, the resistance factor to be applied to the ultimate lateral resistance, including passive pressure, is 0.50. The total lateral resistance will be comprised of the individual contributions from up to several material layers, as follows.

Geotechnical parameters for the silty sand fill, glaical till and for typical backfill materials compacted to 98% of SPMDD in 300 mm lift thicknesses are provided in Table 3, below, along with the associated earth pressure coefficients for horizontal resistance calculations. Friction factors between concrete and the various subgrade materials are also provided in Table 3, where normal loads allow them to be used.

Where granular soils and/or granular backfill materials are present, the passive pressure can be calculated using a triangular distribution equal to $K_P \cdot \gamma \cdot H$ where:

K_P = passive earth pressure coefficient of the applicable retained soil
γ = unit weight of the fill of the applicable retained soil (kN/m^3)
H = height of the equivalent wall or footing side (m)

Note that for cases where the depth to the top of the structure (i.e. footing) pushing against the soil does not exceed 50% of the depth to the base of the structure, the effective value of H in the above noted relationship will be the overall depth to the base of the structure. There will also be "edge effects" where the effective width of soil providing the resistance can be increased by 50% of the effective depth on each side of the pushing structural component.

Note that where the foundation extends below the groundwater level, the effective unit weight should be utilized for the saturated portion of the soil or fill.

Should additional passive resistance be require, the horizontal component of the axial resistance of battered piles (up to 1H:3V inclination), or anchors can be used in the building foundation design.

Table 3 - Geotechnical Parameters for Uplift and Lateral Resistance Design							
Material Description	Unit Weight (kN/m^3)		Internal Friction Angle (°) φ'	Friction Factor, tan δ	Earth Pressure Coefficients		
	Drained γ_{dr}	Effective γ'			Active K_A	At-Rest K_O	Passive K_P
OPSS Granular A Fill (Crushed Stone)	22.0	13.7	38	0.55	0.22	0.36	4.2
OPSS Granular B Type I Fill (Well-Graded Sand-Gravel)	21.5	13.4	36	0.45	0.26	0.41	3.9
OPSS Granular B Type II Fill (Crushed Stone)	22.5	14.0	40	0.55	0.20	0.33	4.6
Glacial Till	22.0	13.5	35	0.40	0.27	0.42	3.7
In Situ Silty Sand or Site Excavated Silty Sand Fill	18.0	11.2	32	0.40	0.30	0.46	3.3

Notes:
1. Properties for backfill materials are for condition of 98% of standard Proctor maximum dry density.
2. The earth pressure coefficients provided are for horizontal profile.

3.4 Design for Earthquakes

The results of seismic shear wave velocity testing performed by others indicated an average shear wave velocity, Vs_{30}, at this site of 467 m/s. A **Site Class C** is therefore applicable for design across the site. The soils underlying the subject site are not susceptible to liquefaction.

Reference should be made to the latest revision of the Ontario Building Code (OBC) 2012 for a full discussion of the earthquake design requirements.

4.0 Design and Construction Precautions

4.1 Protection of Footings Against Frost Action

Perimeter footings of heated structures are required to be insulated against the deleterious effect of frost action. A minimum of 1.5 m thick soil cover (or equivalent) should be provided for footings supported on an undisturbed, compact silty sand to sand bearing surface. However, perimeter footings supported directly on clean, surface-sounded bedrock will only require 0.6 m of soil cover for frost protection.

Exterior unheated footings, such as isolated exterior piers, are more prone to deleterious movement associated with frost action than the exterior walls of the structure proper and require additional protection, such as soil cover of 2.1 m or a combination of soil cover and foundation insulation.

4.2 Excavation Side Slopes

The side slopes of excavations in the overburden soils should be sloped back at acceptable slopes from the start of the excavation until the structure is backfilled. The excavation side slopes above the groundwater level extending to a maximum depth of 3 m should be cut back at 1H:1V or flatter. The flatter slope is required for excavation below groundwater level. The subsoil at this site is considered to be mainly Type 2 and 3 soil according to the Occupational Health and Safety Act and Regulations for Construction Projects.

Excavated soil should not be stockpiled directly at the top of excavations and heavy equipment should be kept away from the excavation sides. Slopes in excess of 3 m in height should be periodically inspected by Paterson in order to detect if the slopes are exhibiting signs of distress.

It is recommended that a trench box be used at all times to protect personnel working in trenches with steep or vertical sides. It is expected that services will be installed by “cut and cover” methods and excavations will not be left open for extended periods of time.

4.3 Rock Anchor Design

The geotechnical design of grouted rock anchors in sedimentary bedrock is based upon two possible failure modes. The anchor can fail either by shear failure along the grout/rock interface or by pullout of a 60 to 90 degree cone of rock with the apex of the cone near the middle of the bonded length of the anchor. It should be noted that interaction may develop between the failure cones of anchors that are relatively close to one another resulting in a total group capacity smaller than the sum of the load capacity of each anchor taken individually.

A third failure mode of shear failure along the grout/steel interface should also bereviewed by a qualified structural engineer to ensure all typical failure modes have been reviewed. Typical rock anchor suppliers, such as Dywidag Systems International (DSI Canada), have qualified personnel on staff to recommend appropriate rock anchor size and materials.

It should be further noted that center to center spacing between bond lengths be at least four times the anchor hole diameter and greater than 1.2 m to lower the group influence effects. It is also recommended that anchors in close proximity to each other be grouted at the same time to ensure any fractures or voids are completely in-filled and that fluid grout does not flow from one hole to an adjacent empty one.

Anchors can be of the “passive” or the “post-tensioned” type, depending on whether the anchor tendon is provided with post-tensioned load or not prior to being put into service. To resist seismic uplift pressures, a passive rock anchor system can be used. It should be noted that a post-tensioned anchor will take the uplift load with much less deflection than a passive anchor.

Regardless of whether an anchor is of the passive or the post tensioned type, it is recommended that the anchor be provided with a bonded length, or fixed anchor length, at the base of the anchor, which will provide the anchor capacity, as well an unbonded length, or free anchor length, between the rock surface and the start of the bonded length. As the depth at which the apex of the shear failure cone develops is midway along the bonded length, a fully bonded anchor would tend to have a much shallower cone, and therefore less geotechnical resistance, than one where the bonded length is limited to the bottom part of the overall anchor.

Permanent anchors should be provided with corrosion protection. As a minimum, this requires that the entire drill hole be filled with cementitious grout. The free anchor length is provided by installing a plastic sleeve to act as a bond break.

Grout to Rock Bond

Based on the type of rock encountered on site, a factored tensile grout to rock bond resistance value at ULS of **1 MPa**, incorporating a resistance factor of 0.3, can be used. A minimum grout strength of 30 MPa is recommended.

Rock Cone Uplift

As discussed previously, the geotechnical capacity of the rock anchors depends on the dimensions of the rock anchors and the configuration of the anchorage system. Based on existing bedrock information, a **Rock Mass Rating (RMR) of 58** was assigned to the bedrock, and Hoek and Brown parameters (**m and s**) were taken as **0.608 and 0.00198**, respectively.

Recommended Rock Anchor Lengths

Parameters used to calculate rock anchor lengths are provided in Table 4.

Table 4 - Parameters used in Rock Anchor Review	
Grout to Rock Bond Strength - Factored at ULS	1.0 MPa
Compressive Strength - Grout	30 MPa
Rock Mass Rating (RMR) - Fair Good quality shale Hoek and Brown parameters	58 m=0.608 and s=0.00198
Unconfined compressive strength - Shale bedrock	50 MPa
Unit weight - Submerged Bedrock	15.2 kN/m^3
Apex angle of failure cone	60^o
Apex of failure cone	mid-point of fixed anchor length

From a geotechnical perspective, the fixed anchor length will depend on the diameter of the drill holes. Recommended anchor lengths for a 75 and 125 mm diameter hole are provided in Table 5 below.

The factored tensile resistance value have been calculated using the Hoek and Brown design parameters and the design method presented by Serrano and Olalla (1999).

It is recommended that the anchor drill hole diameter be within 1.5 to 2 times the rock anchor tendon diameter and the anchor drill holes be inspected by geotechnical personnel and should be flushed clean prior to grouting. The use of a tremie tube to place grout from the bottom up in the anchor holes is further recommended.

Table 5 - Recommended Rock Anchor Lengths - Grouted Rock Anchor

Diameter of Corehole (mm)	Anchor Lengths (m)			Factored Tensile Resistance (kN)
	Bonded Length	Unbonded Length	Total Length	
75	1.6	1.0	2.6	350
	2.4	1.0	3.4	550
	4.3	0.6	4.8	1000
125	1.4	1.0	2.4	350
	1.6	1.2	2.8	550
	2.8	1.4	4.2	1000

The geotechnical capacity of each rock anchor should be proof tested at the time of construction. More information on testing can be provided upon request. Compressive strength testing is recommended to be completed for the rock anchor grout. A set of grout cubes should be tested for each day grout is prepared.

The provided rock anchor parameters can be used in conjunction with the preliminary pile foundation design parameters for the design of micropile if supplemental tensile resistance is required.

Installation Procedures

Rock anchor should be installed using a down the hole rotary air hammer. The operator should keep a log of all drill holes. A casing should be used the advanced the drilling tool through the existing fill material and glacial till layer.

Once completed the hole should be flushed through the casing until the water returns clear. It will be important to remove rock dust and particles prior to the placement of the central reenforcement rod and grouting.

The anchor should be grouted by gravity using a tremie tube extending all the way to the bottom of the hole. Pressure grouting can be used if supplemental capacity is required.

4.4 Slab on Grade Construction

With the removal of all topsoil and fill, containing significant amounts of deleterious or organic materials, the fill layer will required to be proofed rolled using an oversized compactor making several passes.

It is also expected that a crane/foundation rig working platform will be put in place. The working platform will provide a suitable surface to begin backfill below the slab on grade. The platform should be stripped of deleterious material and proof rolled prior to backfilling for the slab on grade.

The slab on grade can be backfilled using approved site excavated material free of deleterious material and place in under dry conditions and above freezing temperatures. All backfill material required to raise the grade within the footprint of the proposed building should be placed in maximum 300 mm thick loose layers and compacted to at least 98% of its SPMDD.

For mechanical and electrical conduit, it is recommended that the upper 450 mm of sub-floor fill consist of OPSS Granular A crushed stone. If site excavated material is used to backfill below the slab on grade, the upper granular layer and fill layer should be separated with a non woven geotextile such as Terrafix 420R or equivalent.

Paterson should review the proof rolling activities as well as all backfilling activities. Paterson will conduct regular inspection to test density, compaction and review bearing surface conditions.

4.5 Pipe Bedding and Backfill

Bedding and backfill materials should be in accordance with the most recent Material Specifications & Standard Detail Drawings from the Department of Public Works and Services, Infrastructure Services Branch of the City of Ottawa.

At least 150 mm of OPSS Granular A should be used for bedding for sewer and water pipes when placed on soil subgrade. The bedding should extend to the spring line of the pipe. Cover material, from the spring line to at least 300 mm above the obvert of the pipe should consist of OPSS Granular A (concrete or PSM PVC pipes) or sand (concrete pipe). The bedding and cover materials should be placed in maximum 225 mm thick lifts compacted to a minimum of 95% of the material’s SPMDD.

Where hard surface areas are considered above the trench backfill, the trench backfill material within the frost zone (about 1.8 m below finished grade) should match the soils exposed at the trench walls to minimize differential frost heaving. The trench backfill should be placed in maximum 300 mm thick loose lifts and compacted to a minimum of 95% of the material’s SPMDD.

4.6 Pavement Structure

For design purposes, the pavement structure presented in the following tables could be used for the design of car only parking areas, local streets and roadways with bus traffic. It should be noted that for car only parking areas, an Ontario Traffic Category A is applicable. For local roadways and roadways with bus traffic, an Ontario Traffic Category B and Category D should be used for design purposes, respectively.

If soft spots develop in the subgrade during compaction or due to construction traffic, the affected areas should be excavated and replaced with OPSS Granular B Type II material. Weak subgrade conditions may be experienced over service trench fill materials. This may require the use of a geotextile, thicker subbase or other measures that can be recommended at the time of construction as part of the field observation program.

Table 6 - Recommended Pavement Structure - Parking Areas

Thickness (mm)	Material Description
50	**Wear Course** - HL 3 or Superpave 12.5 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
300	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - Either fill, in situ silty clay or sand or crushed stone material placed over in situ soil.	

Table 7 - Recommended Pavement Structure - Local Roadways, Access Lanes and Heavy Vehicle Parking

Thickness (mm)	Material Description
40	**Wear Course** - Superpave 12.5 Asphaltic Concrete
50	**Binder Course** - Superpave 19.0 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
450	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - Either fill, in situ silty clay or sand or crushed stone material placed over in situ soil.	

Minimum Performance Graded (PG) 58-34 asphalt cement should be used for parking areas and local roadways and access lanes. The pavement granular base and subbase should be placed in maximum 300 mm thick lifts and compacted to a minimum of 100% of the material's SPMDD using suitable vibratory equipment.

The proposed pavement structure, where it abuts the existing pavement, should match the existing pavement layers. It is recommended that a 300 mm wide and 50 mm deep stepped joint be provided where the new asphalt layer joins with the existing asphalt layer to provide more resistance to cracking at the joint.

4.7 Corrosion Protection

The results of previous and current corrosion testing are indicative of a moderate to aggressive environment to corrosion and exposed ferrous. The result also indicate that the sulphate content is below or marginally above 0.1% within the lower layer of fill. The exceedance is not significant from a geotechnical perspective and has been found to be localized to some pockets around the site. It is recommended that a Type GU or GUL Portland cement (normal cement) be considered for this site.

The proposed steel pipe piles should be designed with a minimum sacrificial steel layer of 2 mm. The above noted capacities take into consideration the effect of long term corrosion. No further steel corrosion protection will be required for the proposed steel piles.

If the option to reused site excavated fill to backfill below the slab on grade is considered, it is further recommended that separation layer be placed between the fill, pile caps and grade beams. The protective layer should be composed of clean important OPSS Granular A or Granular B Type I or Type II. A minimum width of 300 mm is recommended to separate the structural element and site excavated fill material.

4.8 Slope Stability Review

Paterson completed a review of the slope stability analysis and recommended limit of hazard land recommended by Golder. Two slope sections closest to the proposed redevelopment have been analysed. Section A is located in the south west corner of the site and section B is located south of the existing Building D. Reference should be made to the report noted above for further information.

Based on the finding of the analysis a limit of hazard lands setback of 13 m for section A and 10 m for Section B is recommended from the top of the existing slope.

Paterson completed a field review of the slope in the area during the current field program. The slope was noted to be heavily vegetation and no erosion was observed along the site. Erosion protection was also noted in some area. The erosion control measure was noted to consist of rip rap stone placed along the bottom of the slope.

Based on our field review and current geotechnical information acquired from site, the proposed setback are acceptable for the proposed project. It is expected that the building will be constructed on a deep foundation system and will not impact the stability of the existing slopes.

5.0 Recommendations

It is recommended that the following be completed once the master plan and site development are determined:

- ❑ Observation of all bearing surfaces prior to the placement of concrete.
- ❑ Conduct a full time geotechnical inspection program during the piling activities.
- ❑ Complete a full material and testing inspection program during the construction of the project.
- ❑ Periodic observation of the condition of unsupported excavation side slopes in excess of 3 m in height, if applicable.
- ❑ Observation of all subgrades prior to placing backfilling materials.
- ❑ Field density tests to ensure that the specified level of compaction has been achieved.
- ❑ Sampling and testing of the bituminous concrete including mix design reviews.

A report confirming that these works have been conducted in general accordance with Paterson's recommendations could be issued upon request, following the completion of a satisfactory material testing and observation program by the geotechnical consultant.

6.0 Statement of Limitations

The recommendations provided in the report are in accordance with Paterson's present understanding of the project. Paterson requests permission to review the recommendations when the drawings and specifications are completed.

The client should be aware that any information pertaining to soils and all test hole logs are furnished as a matter of general information only and test hole descriptions or logs are not to be interpreted as descriptive of conditions at locations other than those of the test holes.

A soils investigation is a limited sampling of a site. Should any conditions at the site be encountered which differ from the test locations, Paterson requests immediate notification to permit reassessment of the recommendations.

The present report applies only to the project described in this document. Use of this report for purposes other than those described herein or by person(s) other than PCL Constructors Canada Inc., or their agents, is not authorized without review by Paterson Group for the applicability of our recommendations to the altered use of the report.

We trust this report meets your present requirements.

Best Regards,

Paterson Group Inc.

LICENSED PROFESSIONAL ENGINEER
June 24, 2021
J. R. VILLENEUVE
100504344
PROVINCE OF ONTARIO

Joey R. Villeneuve, M.A.Sc, P.Eng.

David J. Gilbert, P.Eng

Attachments

- ❏ Soil Profile and Test Data Sheets
- ❏ Symbols and Terms
- ❏ Laboratory Testing Results
- ❏ Analytical Testing Results
- ❏ Figure 1 - Key Plan
- ❏ Drawing PG5656-01 - Test Hole Location Plan

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
uOttawa Faculty of Health Sciences Building
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5656

REMARKS

HOLE NO. BH 1-21

BORINGS BY CME-55 Low Clearance Drill **DATE** June 14, 2021

SOIL DESCRIPTION	Depth to base (m)
GROUND SURFACE	
Asphaltic concrete	0.10
FILL: Brown silty sand with crushed stone and gravel - trace asphalt by 0.6m depth	1.45
FILL: Dark brown silty sand with ash and coal	2.21
FILL: Brown to grey silty clay with topsoil, some ash and coal	2.97
GLACIAL TILL: Very stiff, brown silty clay with sand, gravel, cobbles and boulders - grey by 4.3m depth	5.18
End of Borehole (GWL @ 3.0m depth based on field observations)	

SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD
AU	1		
SS	2	40	27
SS	3	75	19
SS	4	50	5
SS	5	75	5
SS	6	42	8
SS	7	0	11

DEPTH (m)	ELEV. (m)
0	61.95
1	60.95
2	59.95
3	58.95
4	57.95
5	56.95

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Water Content %

20 40 60 80

Piezometer Construction

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
uOttawa Faculty of Health Sciences Building
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY CME-55 Low Clearance Drill

DATE June 14, 2021

FILE NO. PG5656

HOLE NO. BH 2-21

SOIL DESCRIPTION	Depth to base (m)	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	61.94
Asphaltic concrete	0.08	AU	1				
FILL: Brown silty sand with crushed stone and gravel	0.60	SS	2	62	9	1	60.94
FILL: Ash and coal with brown silty sand, some gravel	3.96	SS	3	50	6	2	59.94
		SS	4	42	4	3	58.94
		SS	5	62	1		
TOPSOIL	4.42	SS	6	42	5	4	57.94
Stiff, brown **CLAYEY SILT**	5.18	SS	7	62	5	5	56.94
End of Borehole							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Water Content %

20 40 60 80

Piezometer Construction

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
uOttawa Faculty of Health Sciences Building
Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY CME-55 Low Clearance Drill **DATE** June 14, 2021

FILE NO. PG5656

HOLE NO. BH 3-21

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content % (20 40 60 80)	Piezometer Construction
GROUND SURFACE						0	61.70		
Asphaltic concrete 0.08		AU	1						
FILL: Brown silty sand with crushed stone and gravel 0.60		SS	2	67	28	1	60.70		
FILL: Brown silty sand, some ash and coal, trace clay and gravel		SS	3	21	11	2	59.70		
		SS	4	75	12				
3.17		SS	5	0	50+	3	58.70		
End of Borehole Practical refusal to augering at 3.17m depth. (BH dry upon completion)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
uOttawa Faculty of Health Sciences Building
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5656

REMARKS

HOLE NO. BH 4-21

BORINGS BY CME-55 Low Clearance Drill **DATE** June 14, 2021

SOIL DESCRIPTION	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE					0	61.84
Asphaltic concrete 0.08	AU	1				
FILL: Brown silty sand with crushed stone and gravel, trace clay 0.60	SS	2	50	15	1	60.84
FILL: Dark brown to black silty sand with ash and coal, some gravel	SS	3	75	14	2	59.84
	SS	4	17	5	3	58.84
	SS	5	25	4		
4.42	SS	6	58	3	4	57.84
Very stiff, grey **CLAYEY SILT,** tarce topsoil 5.18	SS	7	75	11	5	56.84
Compact, brown **CLAYEY SILT to SANDY SILT**					6	55.84
	SS	8	67	21	7	54.84
7.77						
Compact to very dense, grey **SILTY SAND**	SS	9	0	16	8	53.84
- trace to some gravel by 10.8m depth	SS	10	83	43	9	52.84
					10	51.84
	SS	11	67	94	11	50.84
	SS	12	75	78	12	49.84
					13	48.84
14.10	SS	13	100	50+	14	47.84
BEDROCK: Fair to excellent quality, black shale	RC	1	100	50	15	46.84
	RC	2	100	73	16	45.84
17.20	RC	3	100	100	17	44.84
End of Borehole						
(GWL @ 5.5m depth based on field observations)						

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Water Content %

20 40 60 80

Piezometer Construction

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

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Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY CME-55 Low Clearance Drill

DATE June 11, 2021

FILE NO. PG5656

HOLE NO. BH 5-21

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	61.95		
Asphaltic concrete 0.08		AU	1						
FILL: Brown silty sand with crushed stone, gravel, trace wood 0.60		SS	2	42	45	1	60.95		
FILL: Dark brown to black silty sand, some ash, coal, wood and brick, trace gravel		SS	3	0		2	59.95		
		SS	4	33	2	3	58.95		
		SS	5	25	10	4	57.95		
		SS	6	42	2				
- some clay by 4.7m depth 5.18		SS	7	42	3	5	56.95		
End of Borehole									
(BH dry upon completion)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

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Ottawa, Ontario

DATUM Geodetic

REMARKS

BORINGS BY CME-55 Low Clearance Drill

DATE June 11, 2021

FILE NO. PG5656

HOLE NO. BH 6-21

SOIL DESCRIPTION	Depth to base (m)	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	62.05
FILL: Organics with silty sand	0.08	AU	1				
FILL: Brown silty sand, trace gravel, cobbles, organics	0.43	SS	2	12	2	1	61.05
FILL: Brown to black silty sand with ash, coal, slag, trace wood, brick and gravel	5.79	SS	3	0	3	2	60.05
		SS	4	58	3	3	59.05
		SS	5	33	5	4	58.05
		SS	6	42	4	5	57.05
		SS	7	33	4		
Compact, brownt o grey **CLAYEY SILT to SANDY SILT,** trace organics	7.16	SS	8	58	11	6	56.05
GLACIAL TILL: Dense to very dense, dark grey silty sand with gravel, cobbles and boulders, trace clay	12.27	SS	9	54	47	7	55.05
		SS	10	58	26	8	54.05
		SS	11	52	106	9	53.05
		SS	12	100	50+	10	52.05
BEDROCK: Poor to excellent quality, black shale - vertical seams from 12.4 to 13.5m, 13.9 to 14.2m and from 14.4 to 15.1m depths	15.06	RC	1	100	36	11	51.05
		RC	2	100	92	12	50.05
End of Borehole (GWL @ 6.10m depth based on field observations)						13	49.05
						14	48.05
						15	47.05

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Water Content %

20 40 60 80

Piezometer Construction

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
uOttawa Faculty of Health Sciences Building
Ottawa, Ontario

DATUM Geodetic

FILE NO. PG5656

REMARKS

HOLE NO. BH 7-21

BORINGS BY CME-55 Low Clearance Drill **DATE** June 11, 2021

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE								20 40 60 80	
FILL: Brown silty sand with gravel, trace cobbles and organics 0.76		AU	1			0	61.95		
FILL: Brown silty sand with ash, coal and brick, trace wood - black by 3.0m depth - reddish brown by 3.7m depth 4.88		SS	2	33	2	1	60.95		
		SS	3	21	1	2	59.95		
		SS	4	50	5	3	58.95		
		SS	5	50	3	4	57.95		
		SS	6	33	3				
		SS	7	0	17	5	56.95		
Very stiff, brown to grey **SILTY CLAY,** trace organics 7.16		SS	8	58	14	6	55.95		
						7	54.95		
GLACIAL TILL: Dense, dark grey silty sand with gravel, cobbles and boulders, trace clay 8.70		SS	9	50	47	8	53.95		
GLACIAL TILL: Dense, dark grey silty clay with sand, gravel, cobbles, boulders and shale fragments - shale fragments increasing with depth 14.45		SS	10	50	44	9	52.95		
						10	51.95		
		SS	11	62	24	11	50.95		
		SS	12	100	50+	12	49.95		
						13	48.95		
						14	47.95		
BEDROCK: Excellent to good quality, black shale 17.25		RC	1	100	98	15	46.95		
		RC	2	100	78	16	45.95		
						17	44.95		
End of Borehole (BH dry upon completion)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

SYMBOLS AND TERMS

SOIL DESCRIPTION

Behavioural properties, such as structure and strength, take precedence over particle gradation in describing soils. Terminology describing soil structure are as follows:

Desiccated	-	having visible signs of weathering by oxidation of clay minerals, shrinkage cracks, etc.
Fissured	-	having cracks, and hence a blocky structure.
Varved	-	composed of regular alternating layers of silt and clay.
Stratified	-	composed of alternating layers of different soil types, e.g. silt and sand or silt and clay.
Well-Graded	-	Having wide range in grain sizes and substantial amounts of all intermediate particle sizes (see Grain Size Distribution).
Uniformly-Graded	-	Predominantly of one grain size (see Grain Size Distribution).

The standard terminology to describe the relative strength of cohesionless soils is the compactness condition, usually inferred from the results of the Standard Penetration Test (SPT) 'N' value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm. An SPT N value of "P" denotes that the split-spoon sampler was pushed 300 mm into the soil without the use of a falling hammer.

Compactness Condition	'N' Value	Relative Density %
Very Loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by the in situ or laboratory shear vane tests, unconfined compression tests, or occasionally by the Standard Penetration Test (SPT). Note that the typical correlations of undrained shear strength to SPT N value (tabulated below) tend to underestimate the consistency for sensitive silty clays, so Paterson reviews the applicable split spoon samples in the laboratory to provide a more representative consistency value based on tactile examination.

Consistency	Undrained Shear Strength (kPa)	'N' Value
Very Soft	<12	<2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very Stiff	100-200	15-30
Hard	>200	>30

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

Cohesive soils can also be classified according to their “sensitivity”. The sensitivity, S_t, is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil. The classes of sensitivity may be defined as follows:

Low Sensitivity:	$S_t < 2$
Medium Sensitivity:	$2 < S_t < 4$
Sensitive:	$4 < S_t < 8$
Extra Sensitive:	$8 < S_t < 16$
Quick Clay:	$S_t > 16$

ROCK DESCRIPTION

The structural description of the bedrock mass is based on the Rock Quality Designation (RQD).

The RQD classification is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be a result of closely-spaced discontinuities (resulting from shearing, jointing, faulting, or weathering) in the rock mass and are not counted. RQD is ideally determined from NQ or larger size core. However, it can be used on smaller core sizes, such as BQ, if the bulk of the fractures caused by drilling stresses (called “mechanical breaks”) are easily distinguishable from the normal in situ fractures.

RQD %	**ROCK QUALITY**
90-100	Excellent, intact, very sound
75-90	Good, massive, moderately jointed or sound
50-75	Fair, blocky and seamy, fractured
25-50	Poor, shattered and very seamy or blocky, severely fractured
0-25	Very poor, crushed, very severely fractured

SAMPLE TYPES

SS	-	Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT))
TW	-	Thin wall tube or Shelby tube, generally recovered using a piston sampler
G	-	"Grab" sample from test pit or surface materials
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size BQ, NQ, HQ, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

PLASTICITY LIMITS AND GRAIN SIZE DISTRIBUTION

WC%	-	Natural water content or water content of sample, %
LL	-	Liquid Limit, % (water content above which soil behaves as a liquid)
PL	-	Plastic Limit, % (water content above which soil behaves plastically)
PI	-	Plasticity Index, % (difference between LL and PL)
Dxx	-	Grain size at which xx% of the soil, by weight, is of finer grain sizes These grain size descriptions are not used below 0.075 mm grain size
D10	-	Grain size at which 10% of the soil is finer (effective grain size)
D60	-	Grain size at which 60% of the soil is finer
Cc	-	Concavity coefficient = $(D30)^2 / (D10 \times D60)$
Cu	-	Uniformity coefficient = $D60 / D10$

Cc and Cu are used to assess the grading of sands and gravels:
Well-graded gravels have: $1 < Cc < 3$ and $Cu > 4$
Well-graded sands have: $1 < Cc < 3$ and $Cu > 6$
Sands and gravels not meeting the above requirements are poorly-graded or uniformly-graded.
Cc and Cu are not applicable for the description of soils with more than 10% silt and clay (more than 10% finer than 0.075 mm or the #200 sieve)

CONSOLIDATION TEST

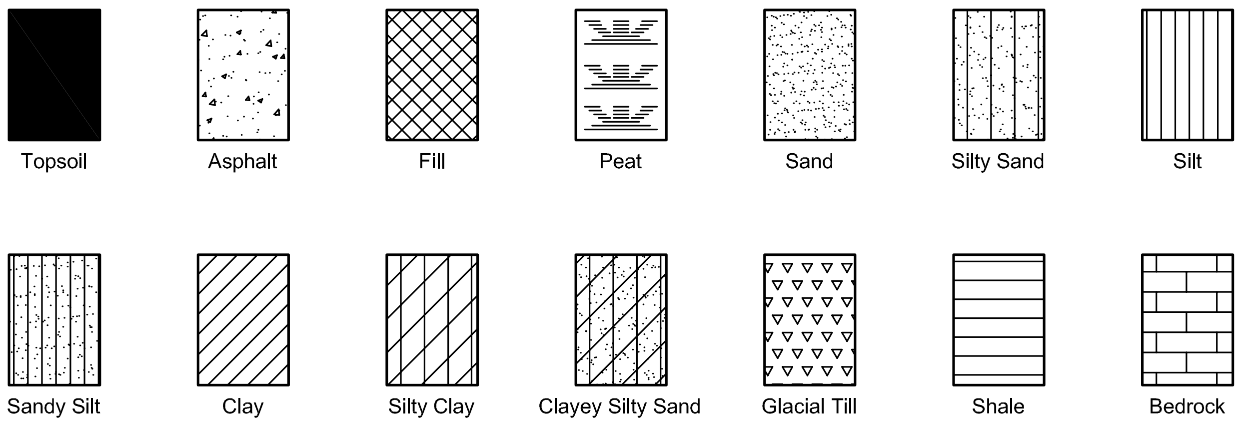
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void Ratio		Initial sample void ratio = volume of voids / volume of solids
Wo	-	Initial water content (at start of consolidation test)

PERMEABILITY TEST

k	-	Coefficient of permeability or hydraulic conductivity is a measure of the ability of water to flow through the sample. The value of k is measured at a specified unit weight for (remoulded) cohesionless soil samples, because its value will vary with the unit weight or density of the sample during the test.

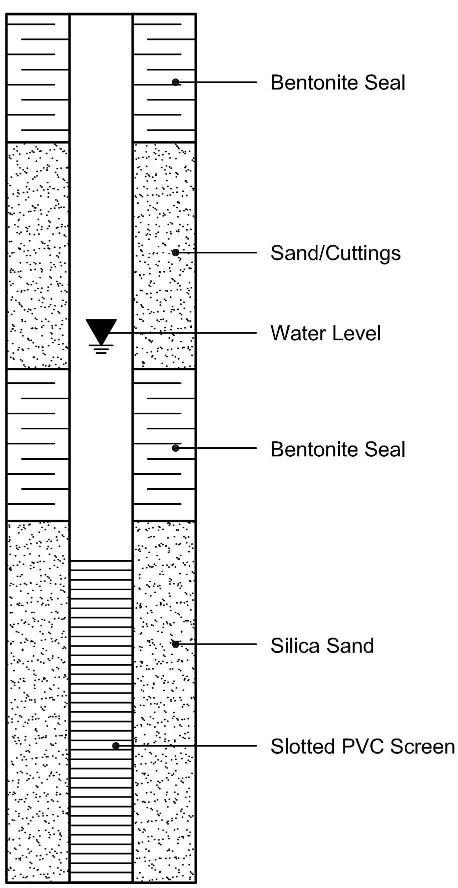
SYMBOLS AND TERMS (continued)

STRATA PLOT

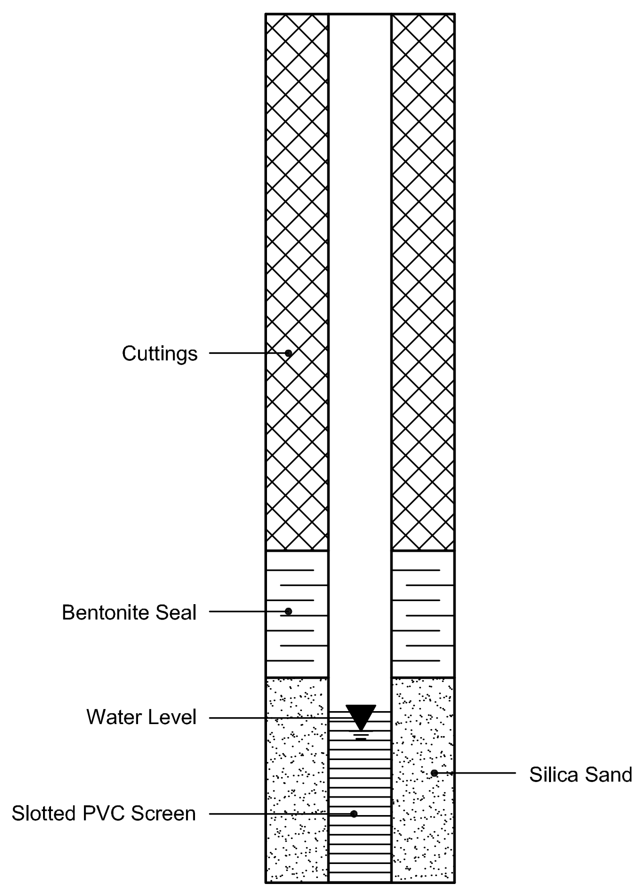


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION



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ROCK CORE COMPRESSIVE STRENGTH ASTM D7012

CLIENT:	**PCL c/o University of Ottawa**		FILE No.: **PG5656**
PROJECT:	200 Lees Avenue		REPORT No.: 3
SITE ADDRESS	**200 Lees Avenue**		DATE REPT'D: 17-Jun-21
STRUCTURE TYPE & LOCATION:		Bedrock	
SAMPLE INFORAMTION			
LAB NO.:	-	-	-
SAMPLE NO.:	BH4 - RC2	BH7 - RC2	BH7 RC2
LOCATION:	-	-	-
SAMPLE DATES			
DATE CAST	-	-	-
DATE CORED	June 11-14, 2021	June 11-14, 2021	June 11-14, 2021
DATE RECEIVED	17-Jun-21	17-Jun-21	17-Jun-21
DATE TESTED	17-Jun-21	17-Jun-21	17-Jun-21
SAMPLE DIMENSIONS			
AVERAGE DIAMETER (mm)	47.00	47.00	47.00
HEIGHT (mm)	85.00	72.40	88.20
WEIGHT (g)	420	400	400
AREA (mm^2)	1735	1735	1735
VOLUME (cm^3)	147	126	153
UNIT WEIGHT (kg/m^3)	**2848**	**3184**	**2614**
TEST RESULTS			
H / D RATIO	1.81	1.54	1.88
CORRECTION FACTOR	0.984	0.964	0.989
LOAD (lbs)	13549	12350	11797
GROSS Mpa	34.7	31.7	30.2
MPa CORRECTED	**34.2**	**30.5**	**29.9**
FORM OF BREAK	I	I	I
DIRECTION OF LOADING	Parallel	Parallel	Parallel
CURING CONDITIONS	SITE→→→→→→→→→→→→→→→→→→→→→→→→→→→→→→→→→		
REMARKS			

TECHNICAL PERSONNEL				
TECHNICIAN: C.M.	**VERIFIED BY:**	**C. Beadow**	**APPROVED BY:**	**Joe Forsyth, P. Eng.**

CERTIFIED LAB

John D. Paterson & Associates Ltd., 28 Concourse Gate, Nepean, ON

Certificate of Analysis

Client: Paterson Group Consulting Engineers

Client PO: 32181

Report Date: 21-Jun-2021

Order Date: 15-Jun-2021

Project Description: PG5656

	Client ID:	BH4-21-SS3	-	-	-
	Sample Date:	14-Jun-21 09:00	-	-	-
	Sample ID:	2125227-01	-	-	-
	MDL/Units	Soil	-	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	82.4	-	-	-
General Inorganics					
pH	0.05 pH Units	7.23	-	-	-
Resistivity	0.10 Ohm.m	2.73	-	-	-
Anions					
Chloride	5 ug/g dry	1980	-	-	-
Sulphate	5 ug/g dry	129	-	-	-

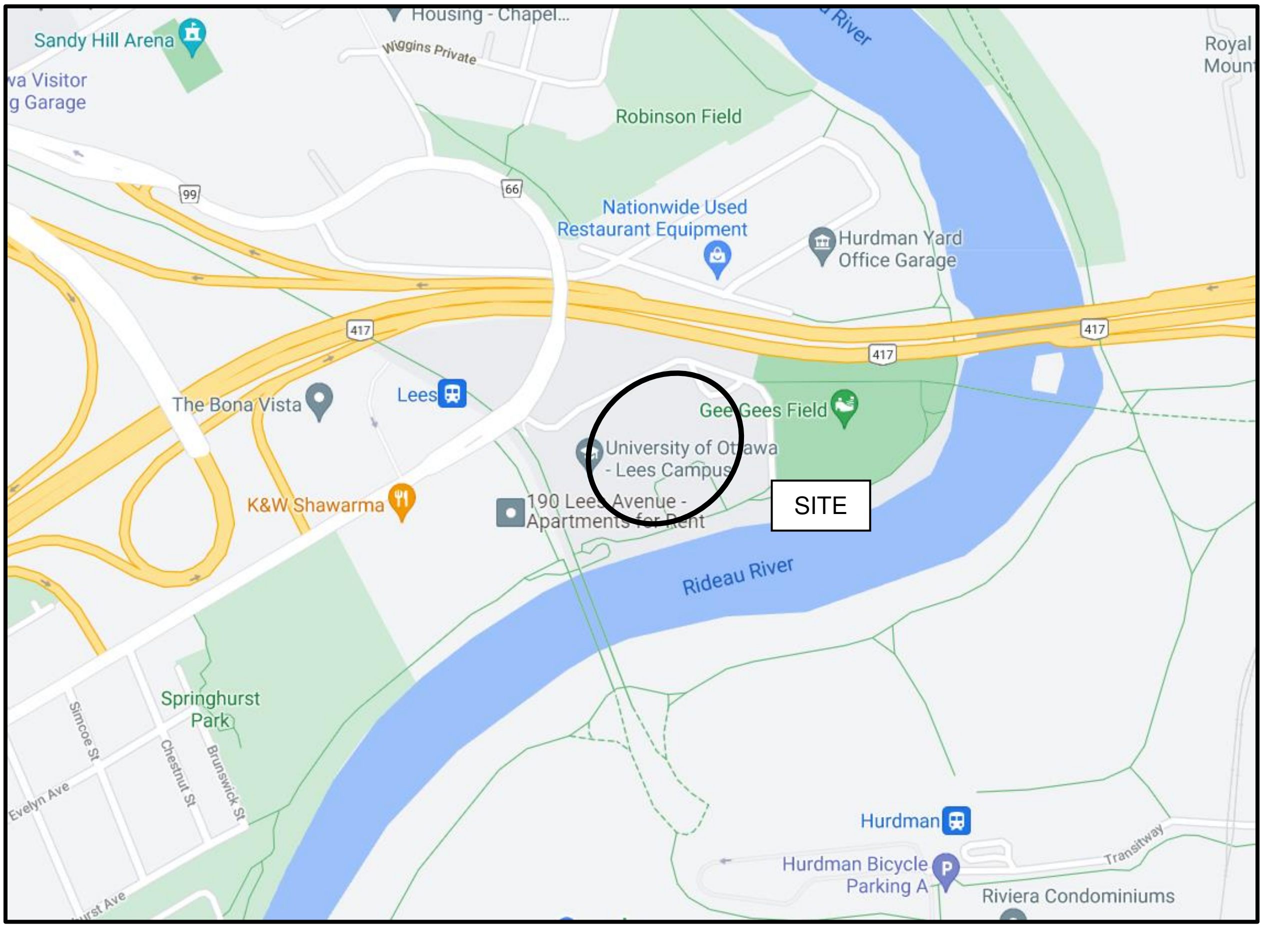
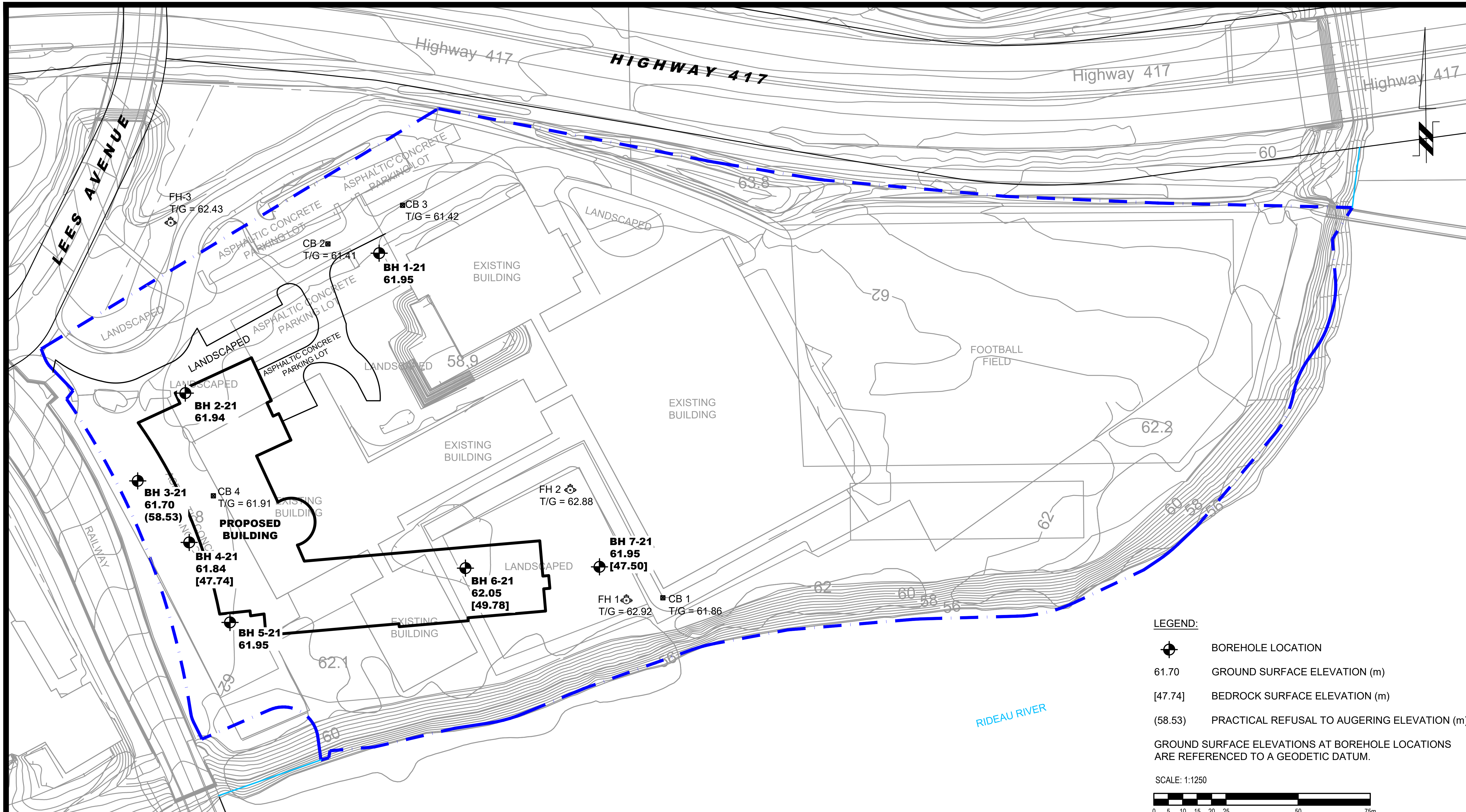


FIGURE 1

KEY PLAN



patersongroup
consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

NO.	REVISIONS	DATE	INITIAL

PCL c/o U OF OTTAWA HEALTH SCIENCES
GEOTECHNICAL INVESTIGATION
PROPOSED BUILDING
200 LEES AVENUE

OTTAWA, ONTARIO

Title:
TEST HOLE LOCATION PLAN

Scale: 1:1250	Date: 06/2021
Drawn by: JM	Report No.: PG5656-1
Checked by: JV	Dwg. No.: PG5656-1
Approved by: DJG	Revision No.:

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REPORT

Geotechnical Report

Proposed New Building, Lees Campus

200 Lees Avenue, Ottawa, Ontario

Submitted to:

The University of Ottawa
10 privé Marie-Curie
Ottawa, ON K1N 9A4

Submitted by:

Golder Associates Ltd.
1931 Robertson Road,
Ottawa, Ontario, K2H 5B7

+1 613 592 9600

20144766

September 8, 2020

Distribution List

1 Copy - University of Ottawa

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1.0 INTRODUCTION

Golder Associates Ltd. (Golder) was retained by the University of Ottawa to conduct a geotechnical investigation in order to provide geotechnical input to the detailed design of the proposed new building at the 200 Lees Ave Campus in Ottawa, Ontario. A Site Location Plan showing the proposed building footprint is attached as Figure 1.

Golder completed two previous desktop studies; the first desktop study was to provide recommendations in support of the seismic retrofit of four buildings (Buildings A through D) at the site. Subsequent to that study the project plans changed to include the potential demolition of three of the buildings (Buildings B through D) and replacement with a new building up to six storeys in height (which will not have a basement level). A second desktop study was completed in June 2020 to provide preliminary engineering guidelines on the geotechnical design and foundation aspects of the project, including construction and environmental considerations which could influence design decisions. Additional fieldwork was proposed and carried out in general accordance with the scope of work provided in our proposal no. P20144766 dated April 2020.

The purpose of this current investigation was to assess the general subsurface conditions within the study area by means of a limited number of boreholes and associated laboratory testing. Based on an interpretation of the factual information obtained during the current investigation, along with the existing subsurface information available for the site from previous investigations, a general description of the soil and groundwater conditions is presented. These interpreted subsurface conditions and available project details were used to prepare engineering guidelines on the geotechnical design aspects of the project, including construction considerations which could influence design decisions.

The reader is referred to the ‘Important Information and Limitations of This Report’ which follows the text but forms an integral part of this document.

2.0 DESCRIPTION OF THE PROJECT AND SITE

The 200 Lees Avenue Campus was originally developed in the early 1960’s for Algonquin College, and was subsequently transferred to the University of Ottawa. Most of the main campus construction was completed in 1964, and included Buildings A to D. The construction of the Building E was started and completed in 1979.

The campus is bounded by the Rideau River to the south and east, Highway 417 to the north and the Transitway to the west.

The area was used by the City of Ottawa as a landfill between 1906 and 1947. Previous geotechnical and environmental investigations at this site indicate that up to approximately 8 metres of cinder and ash fill overlies the site. This fill was received from the former municipal waste incinerator on Lees Avenue. Below the fill, native soil consisting of mostly glacial till overlies shale bedrock.

From previous McRostie, Genest, St-Louis and Associates (MGS) records, the foundation elements for Buildings A, B, C and D, consist of uncased, cast-in-place, expanded base caissons (Franki piles).

The proposed new building is understood to be up to 6 storeys high with no basement. The proposed building footprint is shown on Figure 1.

Existing boreholes from previous investigations completed at this site by Golder Associates and McRostie & Associates have been used to supplement the current investigation. The locations of these previous boreholes are shown on the attached Site Plan (Figure 1). The results of the previous investigations are contained in the following reports:

1) Golder Associates, June 2020, Report 20144766 to the University of Ottawa titled: *"Preliminary Geotechnical Study, Proposed New Building, Lees Campus, 200 Lees Avenue, Ottawa, Ontario."*

2) Golder Associates, April 2020, Report 20140660 to the University of Ottawa titled: "*Geotechnical Study, Proposed Seismic Retrofits, 200 Lees Avenue, Ottawa, Ontario.*"

3) Golder Associates, 2012, Report 11-1121-0057 to the University of Ottawa titled: "*Geotechnical Investigation, Proposed Block A Redevelopment, 200 Lees Avenue, University of Ottawa, Ottawa, Ontario*"

4) Golder Associates, 2011, Report 11-1121-0057 to the University of Ottawa titled: "*Preliminary Geotechnical Investigation, Proposed Block A Redevelopment, 200 Lees Avenue, University of Ottawa, Ottawa, Ontario*"

5) Golder Associates, 2000. Report 001-2721 to the University of Ottawa titled: "*Final Report on Characterization of Subsurface/Material Condition, Geotechnical and Environmental Considerations, Algonquin College, Rideau Campus, Ottawa, Ontario*"

6) McRostie & Associates, 1962. Report SF-624 to Department of Public Works and Burgess, McLean & Mac Phadyen, Architects titled: "*Report on Foundation Investigation at Lees Avenue, Ottawa Site for Eastern Ontario Institute of Technology Buildings*"

Based on the results of previous investigations and the published geology maps available from the Geologic Survey of Canada (GSC) for this area, the subsurface conditions at the site are expected to consist of fill comprised of cinders and ashes in a matrix of sand to silty clay overlying silty clay to clayey silt and/or alluvium, over glacial till, over bedrock. The bedrock in the vicinity of the site is indicated to consist of shale of the Carlsbad formation.

3.0 PROCEDURE

The fieldwork for this investigation was carried out between July 6 and 13, 2020. During that time, a total of 3 boreholes (numbered 20-01 to 20-03) were advanced at the approximate locations shown on the attached Site Plan (Figure 1). The boreholes were advanced using a truck-mounted hollow-stem auger drill rig supplied and operated by Grenville Drilling from Grenville, Quebec. The boreholes were advanced to depths ranging between 14.8 and 17.1 m below the existing ground surface. Practical refusal to auger advancement was encountered in all of the boreholes which were then extended into the bedrock at two of the three locations using rotary diamond drilling techniques while retrieving HQ-sized core. Within these boreholes, the drilled lengths in the bedrock were about 3.2 metres.

Standard Penetration Tests (SPTs) were carried out within the overburden at regular intervals of depth. Samples of the soils encountered were recovered using 35 mm diameter split-spoon sampling equipment.

The fieldwork was supervised by technicians from our staff who located the boreholes, directed the drilling and in-situ testing operations, logged the boreholes and samples, and took custody of the soil and bedrock samples retrieved. On completion of the drilling operations, the soil and bedrock samples were transported to our laboratory for further examination by the project engineer and for laboratory testing, which included natural water content, grain size distribution, and Atterberg limit tests on selected soil samples.

One sample of soil from borehole 20-03 was submitted to Eurofins Environment Testing for basic chemical analyses related to potential sulphate attack on buried concrete elements and potential corrosion of buried ferrous elements. The results of the chemical analyses are still pending and will be included in the final version of the report.

Monitoring wells were installed in all boreholes. The wells were installed in bedrock in boreholes 20-01 and 20-02. Due to cave-in, the well was installed in the overburden about 1.4 m above the bedrock surface in borehole 20-03.

The borehole locations were selected in consultation with the University of Ottawa, marked in the field, and subsequently surveyed by Golder Associates personnel. The borehole coordinates and ground surface elevations were measured using a Trimble R8 GPS survey unit. The geodetic reference system used for the survey is the North American datum of 1983 (NAD83). The borehole coordinates are based on the Modified Transverse Mercator (MTM Zone 9) coordinate system. The elevations are referenced to Geodetic datum (CGVD28).

4.0 SUBSURFACE CONDITIONS

4.1 General

Information on the subsurface conditions is presented as follows:

- Borehole records from the current investigation are provided in Appendix A.
- Borehole records from previous investigations are provided in Appendix B.
- Photographs of the bedrock core are provided in Appendix C.
- Results of the basic chemical analyses will be provided in Appendix D in the final version of the report.
- Results of geophysical testing carried out in 2011 are provided in Appendix E.
- Results of the water content and Atterberg limit testing will be provided on the Record of Borehole Sheets in the final version of the report.
- Results of the grain size distribution testing will be provided in the final version of the report.

The Record of Borehole sheets describe the subsurface conditions at the borehole locations only.
The stratigraphic boundaries shown on the borehole records are inferred from non-continuous sampling, observations of drilling progress and results of Standard Penetration Tests and, therefore, represent transitions between soil types rather than exact planes of geological change. Furthermore, subsurface soil, bedrock and groundwater conditions will vary between and beyond the borehole locations.

The following sections present a more detailed overview of the subsurface conditions encountered in the boreholes advanced during the current 2020 investigation within the proposed new building footprint.

4.2 Overview of Subsurface Conditions

In general, the subsurface conditions at this site consists of surficial topsoil or pavement, over an extensive layer of cinders and ash in a matrix of sandy fill, underlain by glacial till comprising of clayey silt and sandy silt underlain by shale bedrock. A layer of silty clay was encountered beneath the fill in Borehole 20-03.

The following sections provide a more detailed description of the subsurface conditions encountered in the current borehole investigation that were advanced within the proposed building footprint.

4.3 Topsoil , Asphaltic Concrete/Concrete

An 80 mm thick layer of topsoil was encountered in Borehole 20-01 while a 40 mm thick layer of asphaltic concrete and a 130 mm concrete layer were encountered in Boreholes 20-02 and 20-03, respectively.

4.4 Fill

Fill was encountered in boreholes from previous investigations and in all boreholes in the current investigation. Where asphaltic concrete and concrete was encountered, the upper portion of the fill generally consists of brown, granular pavement structure comprised predominantly of varying amounts of sand and gravel. The pavement structure and/or granular fill extends to depths ranging from between about 0.4 to 2.4 m below the ground surface.

Beneath the topsoil in borehole 20-01 and beneath the pavement structure in boreholes 20-02 and 20-03, the fill consists of cinders and ashes within a matrix of predominantly sandy silt and silty sand. This fill extends to depths ranging from 5.2 m to 5.3 m below existing grade. In previous investigations this fill extended to depths ranging from 6.1 to 6.3 m below ground surface at the time of those investigations (the historical boreholes are not in exactly the same location, and the previous investigations were prior to the current site development).

The presence of organic matter and brick pieces was observed in some fill samples. Pieces of glass, wire and other materials were observed in the boreholes and test pits from previous investigations advanced within the vicinity of the proposed new building. Coal pieces were also observed in borehole 20-01 between about 3 and 5.2 m below grade and in borehole 20-03 between about 1.5 and 5.3 m below grade.

SPT “N” values measured within the pavement fill ranged from 11 to 36 blows per 0.3 m of penetration indicating a compact to dense state. The SPT “N” values for the sandy silt and silty sand fill ranged from 2 to 14 blows per 0.3 m of penetration indicating a compact to dense state. The measured moisture content of a sample of the pavement structure base/subbase measured about 6% while the moisture content of samples of the fill ranged from about 7 to 51 percent.

The results of a grain size distribution test carried out on a sample of the granular fill material is provided on Figures B1 in Appendix B.

4.5 Silty Clay

The cinder and ash fill is underlain by a silty clay layer that was encountered in borehole 20-03 and was also observed in previously drilled boreholes within the proposed building footprint. In this current investigation the clay extended from about 5.3 to 6.9 metres below existing grade. SPT ‘N’ values ranging from 7 to 12 blows per 0.3 metres of penetration were obtained, indicating a stiff consistency.

The moisture content of one sample of the clay deposit measured about 32%.

The results of Atterberg limit testing carried out on one select sample of the clay is shown on Figure B4 in Appendix B, which measured a plasticity index value of 9% and liquid limit value of 32% indicating the soil is of intermediate plasticity.

4.6 Glacial Till

A deposit of glacial till was encountered beneath the fill in boreholes 20-01 and 20-02 and beneath the silty clay in borehole 20-03. The glacial till typically consists of a heterogeneous mixture of gravel, cobbles, and boulders in a matrix of clayey (cohesive) silt, sandy silt and silty sand. The till layer was fully penetrated in all boreholes and extends to depths ranging between about 12.9 and 14.1 metres below existing ground surface. In previous investigations the till extended to depths ranging from about 10.7 to 13.3 metres within the vicinity of the proposed new building.

SPT “N” values within the cohesive glacial till layer gave ‘N’ values ranging from about 5 to 11 blows per 0.3 metres of penetration. SPT “N” values within the cohesionless glacial till (sandy silt and silty sand) layer gave ‘N’ values ranging from about “Weight of Hammer” to greater than 50 blows per 0.3 metres of penetration, indicating a very loose to very dense state of packing. Very high blow counts may also be indicative of the presence of cobbles and boulders in the till rather than the state of packing.

The moisture content of selected samples of the cohesive till measured between 26 and 30% and between 8 to 19% for the cohesionless till.

The results of grain size distribution testing carried out on one sample of the cohesive till and one sample of the cohesionless till deposit are provided on Figures B2 and B3, respectively, in Appendix B.

4.7 Bedrock

Bedrock was encountered in all boreholes below the glacial till. Boreholes 20-01 and 20-02 were extended about 3.2 metres into the bedrock and borehole 20-03 about 0.7 metres. The recovered bedrock cores from these locations consist of fresh, thinly to medium bedded, dark grey to black, fine grained shale bedrock.

The Total Core Recovery (TCR) of the cored bedrock was 100 percent and the Rock Quality Designation (RQD) ranged from about 10 to 90 percent, indicating a variable very poor to excellent quality rock.

Photographs of the bedrock core are presented in Appendix A.

Table 1 below summarizes the depths and elevations of the bedrock surface from the current and previous investigations. Based on this, the bedrock surface is anticipated to be between elevation 48.1 and 52.1 m.

Table 1: Summary of Bedrock Surface Depths and Elevations Near the Proposed New Building

Borehole No.	Report No.	Ground Surface Elevation$^{(1)}$ in Borehole (m)	Bedrock Depth $^{(2)}$ (m)	Bedrock Surface Elevation (m)
BH20-01	Current Report	62.3	12.9	49.4
BH20-02	Current Report	62.1	13.9	48.2
BH20-03	Current Report	62.5	14.1	48.4
BH-1	SF-624	61.7	13.6	48.1
BH-2	SF-624	62.1	13.1	49.0

Borehole No.	Report No.	Ground Surface Elevation$^{(1)}$ in Borehole (m)	Bedrock Depth $^{(2)}$ (m)	Bedrock Surface Elevation (m)
BH-3	SF-624	62.8	10.7	52.1
BH-6	SF-624	62.5	13.6	48.9
BH-8	SF-624	62.1	13.0	49.1
BH-10	SF-624	62.2	12.8	49.4
BH-11	SF-624	62.7	13.2	49.5
BH-101	SF-624	62.4	13.4	49.0
BH00-2	001-2721	62.1	11.9^{R}	50.2^{R}

Note: (1) Elevation – Geodetic.
(2) Depth below ground surface at borehole location.
^{R} – Auger refusal.

4.8 Groundwater Conditions

Monitoring wells were installed in boreholes 20-01 to 20-03. The groundwater levels observed in the monitoring wells on July 21, 2020 have been summarized in the following table:

Borehole	Geological Material Well Installed In	Ground Surface Elevation (m)	Groundwater Depth (m)	Groundwater Elevation (m)	Date of Measurement
20-01	Bedrock	62.3	7.4	54.9	July 21, 2020
20-02	Bedrock	62.1	7.3	54.8	July 21, 2020
20-03	Glacial Till	62.5	7.3	55.2	July 21, 2020

Monitoring wells installed as part of the Golder 2000 subsurface investigation in the vicinity of the proposed new building indicated that the groundwater was at about elevation 56.5 m east of the proposed building. Overnight water levels were measured in the 1962 McRostie & Associates Ltd. boreholes and ranged from elevation 54.6 m to 60.7 m. This groundwater level appears to be within the fill in most boreholes with the exception of BH00-3 and BH-2 in which the groundwater was encountered within the alluvium deposit and within the silt layer, respectively.

Groundwater levels are expected to fluctuate seasonally. Higher groundwater levels are expected during wet periods of the year, such as spring.

4.9 Corrosion Testing

One sample of soil from borehole 20-03 was submitted to Eurofins Environment Testing for basic chemical analysis related to potential sulphate attack on buried concrete elements and corrosion of buried ferrous elements. This results are shown in the table below.

Borehole / Sample Number	Sample Depth (m)	Chloride (%)	Sulphate (%)	pH	Conductivity (mS/cm)	Resistivity (Ohm-cm)
20-03 SA6	3.1 – 3.7	0.093	1.04	6.15	2.30	435

4.10 Environmental Concerns

The site is known to have previous environmental impacts. The environmental condition of the site was investigated separately (by others) and does not form part of the scope of the geotechnical investigation.

5.0 DISCUSSION

5.1 General

This section of the report provides preliminary engineering guidelines on the geotechnical design aspects of the project based on our interpretation of the available subsurface information described herein and our understanding of the project requirements. Reference should be made to the "*Important Information and Limitations of This Report*", which follows the text but forms part of this document.

The foundation engineering guidelines presented in this section have been developed in a manner consistent with the procedures outlined in Part 4 of the 2012 Ontario Building Code (OBC) for Limit States Design.

5.2 Foundation Options

It is understood that the existing buildings B, C and D will be demolished to facilitate the construction of the new multi-storey building which will be located approximately within the footprints of existing Buildings C and D based on preliminary drawings provided by the University of Ottawa. The building is not expected to have a basement level.

As part of this preliminary study, a number of different foundation options have been considered (from a geotechnical perspective). These include:

<u>Shallow Foundations</u>

Shallow foundations, such as a raft or mat foundation would be technically feasible but would require excavation and removal, disposal, and replacement (if there is not basement) of a significant amount of the existing fill material in order to avoid founding the building on the loose, uncontrolled, historical fill. These excavations would be below the water table in the sandy fill material and would require an active dewatering system as well as, potentially, shoring. In addition, the excavation would require removal of all of the existing pile foundations.

Overall, it is considered that there is no strong reason (from a geotechnical perspective) why a shallow foundation system would be beneficial to the currently proposed project unless there are basement levels. There are a number of reasons why shallow foundations are less desirable and it is likely that a deep foundation system is more appropriate.

<u>Driven Steel Piles</u>

Driven steel piles (H-piles or pipe piles) are a common foundation system in the area and are feasible for this project. Driven steel piles do not require extensive excavation or management of cuttings/spoil and are relatively fast and easy to install.

<u>Drilled Caissons</u>

Drilled Caissons are also feasible at the site. Caissons would typically be drilled through the fill and glacial till and socketed into rock. They would can typically generate very high capacities, but are typically more expensive than driven piles, due to the method of installation and the need to manage spoils and groundwater during construction.

Based on the fact that a basement level is not be required, the use of a deep foundation system (HP piles, steel pipe piles or caissons) is likely to be the most viable option from a geotechnical perspective. It is understood an assessment of the project from an environmental perspective is being completed by others concurrent with the geotechnical investigation.

5.3 Summary of Subsurface Conditions

The table bellow summarises the typical subsurface conditions in the north, south and central portions of the proposed new building footprint:

Table 2: Simplified Soil Stratigraphy for Proposed New Building[1]

Soil Stratigraphy	Proposed New Building		
Relevant Boreholes	North (BH20-01, BH-1, BH-8, BH00-2 and TP00-3)	Central (BH20-02, BH-6 and BH-101)	South (BH20-03, BH-2, BH-10, BH-11 and BH00-3)
Range of Ground Surface Elevation	62.1 to 62.3 m	62.1 to 62.5 m	62.2 to 62.5 m
Fill (cinder, ash and sand)	0 – 5.2 m	0 - 5.5 m	0 – 6.2 m
Native Soils - Silty Clay or Alluvium / Glacial Till (Clayey Silt and Sandy Silt)	5.2 – 13.0	5.5 – 13.9	6.2 – 14.1 m
Bedrock	> 13.0 m	>13.9 m	>14.1 m

Table Notes:
[1] The values provided above provide a typical or average stratigraphy for each building. Some variability of the strata depths within the building footprint should be expected. See individual borehole records for detailed information at the various borehole locations.

For preliminary design purposes, the groundwater level is assumed to be at elevation 55 m as measured in the monitoring wells installed in boreholes 20-01 to 20-03.

5.4 Frost Protection

All perimeter and exterior foundation elements (footings, etc.) or interior foundation elements in unheated areas should be provided with a minimum of 1.5 m of earth cover for frost protection purposes. Isolated, unheated exterior footings adjacent to surfaces which are cleared of snow cover during winter months should be provided with a minimum of 1.8 m of earth cover.

5.5 Seismic Design Considerations

The site falls within the Western Québec Seismic Zone (WQSZ) according to the Geological Survey of Canada. The WQSZ constitutes a large area that extends from Montréal to Témiscaming, and which encompasses the Ottawa area. Within the WQSZ recent seismic activity has been concentrated in two subzones; one along the Ottawa River and another more active subzone along the Montréal-Maniwaki axis. Historical seismicity within the

WQSZ from 1900 to 2000 includes the 1935 Témiscaming event which had a magnitude of 6.2, the 1944 Cornwall Massena event which had a magnitude 5.6, and the more recent 2010 Val-des-Bois (Québec) event which had a magnitude of 5.0 at about 55 kilometres north of Ottawa. In comparison to other seismically active areas in the world (e.g., California, Japan, New Zealand), the frequency of earthquake activity within the WQSZ is significantly lower but there still exists the potential for significant earthquake events to be generated.

The seismic design provisions of the 2012 OBC depend, in part, on the shear wave velocity of the upper 30 m of soil and/or bedrock below founding level.

Shear wave velocities were measured in borehole 11-1 during the Golder 2011 investigation. The seismic technical memorandum is provided in Appendix B of this report. The harmonic mean shear wave velocity of the subsurface soil and bedrock in the upper 30 metres depth was calculated by the following equation:

V_s = total thickness of all layers/ ∑ (each layer thickness/each layer shear wave velocity)

Based on the results of the vertical seismic profile (VSP) testing as well as a review of the subsurface conditions at the proposed building location, it is considered that a Site Class of C would be applicable to the design of the new building.

The soils present at the site are not considered to be liquefiable under the design earthquake.

5.6 Existing Foundations

The location of the new building falls within the footprints of Buildings C and D as shown on Figure 1. It is understood that Buildings A through D have a crawlspace in order to gain access to the building utilities. The height of the crawlspace is slightly more than one metre on average and there is evidence of the on-site fill having been left in place due to the visible presence of glass, cinder, etc.

The foundation elements for Buildings A, B, C and D, consist of uncased cast-in-place expanded base caisson piles of the Franki type. The 1962 piling specifications showed a 406-millimetre diameter shaft with Type 20 cement used in the concrete as a means of resisting the site-specific corrosive properties of existing fills. The piling records from Franki of Canada Limited indicate that a 5,500 pound hammer with a 20 foot drop was used to provide the energy (medium) to produce the base of the caisson piles. The specifications for the Franki piles were included in Appendix D of Golders April 2020 desktop report. All expanded base piles were made with a base having a volume of about 0.3 cubic metres (2 buckets).

The original piling records for Building A are included in Appendix D of Golders April 2020 report, however piling records for the remaining buildings (Buildings B, C and D) were not available.

The proposed building column/grid layout should be overlaid to the existing building grids/pile locations to identify which gridlines will be impacted by the existing foundations. The locations of the existing piles within the new building footprint should be located and surveyed during demolition. It has been assumed that it is unlikely that the proposed building can be matched to the existing building grids, such that consideration could be given to re-using the existing piles. As a result, it will be important that the proposed building foundations are designed such that the new piles should be located as far as possible away from the existing piles to avoid the new piles being obstructed by the old piles.

An estimate of the minimum distance can be calculated by determining the approximate size of the Franki pile base using pile records for Building A (it should be noted that none were available for the other buildings). This calculation would be a very rough estimate which will assume that the base is spherical and then applying a suitable factor of safety to account for the fact that the base is likely not perfectly spherical.

For instance, assuming that 2 buckets (equivalent to 0.3 cubic metres) of concrete was used for the base of the pile (as indicated in the Franki pile records), the diameter of the pile base would be about 0.85 m. Applying a FOS of 3, the minimum distance measured from the centre of an existing pile would be approximately 1.275 m. This minimum distance should be maintained for all existing piles.

5.7 New Foundations

New piles will be required for the proposed building. As previously noted, the use of driven or cast-in-place piles should be considered. The following sections discuss the geotechnical resistances for steel H-piles or steel pipe piles driven to refusal on dense till or on bedrock and caissons socketed in the shale bedrock.

5.7.1 Steel H-Pile or Steel Pipe Pile Foundations

5.7.1.1 Founding Elevations

The proposed structure may be supported on close-ended steel pipe (tube) piles or steel H-piles driven to refusal either within the lower, very dense portion of the till deposits or on the underlying bedrock.

Based on boreholes from previous studies, the following table provides an overview of the expected elevations of the very dense glacial till, as well as the bedrock surface elevations within the vicinity of the new building.

Table 3: Dense Glacial Till and Bedrock Surface Approximate Elevations

Approximate Location	Borehole Number (Report Number)	Approximate Elevation (m) of Surface of Dense Glacial Till	Approximate Bedrock Surface Elevation (m)
Northern Section of New Building	BH-8 (SF-624)	51.4	49.1
Central Section of Building	BH20-02	52.9	48.3
Southern Section of Building	BH20-03	51.9	48.4

H-piles should be reinforced at the tip with rock point driving shoes to improve seating of the piles on the bedrock and to reduce the potential for damage to the piles during driving through the overlying cobbles and boulders, in accordance with Ontario Provincial Standard Specification (OPSS) 903 *(Deep Foundations)*. To ensure adequate penetration into the hard and locally steeply sloping bedrock to provide fixity, a Titus HD Rock Injector rock point (or equivalent) driving shoe should be used.

As an alternative to driven piles (i.e. H-piles and/or closed-ended pipe piles), the use of an open-ended drilled pile advanced into the bedrock could also be considered. This pile type requires a specialized contractor and is generally more expensive than driven piles, but the use of drilled piles greatly reduces the risk of pile deflections, pile damage and piles ‘hanging up’ in the glacial till. For preliminary design purposes, the drilled pipe piles should be advanced to a minimum embedment depth of 1.5 metres into the bedrock.

5.7.1.2 Axial Geotechnical Resistance

For preliminary design purposes, HP 310x110 piles or 324 mm diameter closed-ended steel pipe piles driven to practical refusal within the very dense portions of the glacial till may be designed using factored axial geotechnical resistances at Ultimate Limit States (ULS) of 1,100 kN. The geotechnical reaction for an individual pile at SLS will not govern and may be higher than the factored geotechnical resistance at ULS; however, settlements of pile groups should be reviewed during the detailed design stage. Higher capacities would be achievable if larger pile sizes are used.

From past experience in this area, it is unlikely that the full factored structural capacity of 2,000 kN for an HP 310x110 or 1,500 kN for a 245 mm diameter closed-ended steel pipe pile with a 9 mm wall thickness driven to refusal on the shale bedrock can be achieved due to relaxation in the shale bedrock. Relaxation of the piles following the initial set could result from several processes, including:

- Softening of the shale bedrock into which the piles are driven;
- The dissipation of negative excess pore water pressures in the dense silty soil above the bedrock surface; and,
- The driving of adjacent piles.

Therefore, a reduced geotechnical capacity is recommended for piles installed in shale bedrock to account for the relaxation. For preliminary design of HP 310x110 piles driven to found on the shale bedrock, the factored axial geotechnical resistance at ULS may be taken as 1,500 kN. For design of 245 mm diameter pipe piles driven to bedrock, a factored geotechnical resistance at ULS may be taken as 1,050 kN. Serviceability Limit States (SLS) resistances do not apply to piles founded on the shale bedrock, since the SLS resistance for 25 mm of settlement is greater than the factored axial geotechnical resistance at ULS. As noted above, pre-drilling could be required to advance the piles through the lower, dense portions of the till if piles driven to bedrock are considered.

As an alternative to pre-drilling, the use of drilled pipe piles socketed into the bedrock may be considered. For a concrete-filled, 245 mm diameter steel pipe pile having a minimum wall thickness of 9 mm and at least 1.5 metre penetration into the bedrock, an axial geotechnical resistance at ULS of 1,050 kN may be used for assessment purposes. Serviceability Limit States (SLS) resistances would not govern for piles founded on the shale bedrock.

Provision should be made for restriking all of the piles several times to confirm the design set and/or the permanence of the set and to check for upward displacement due to driving adjacent piles. For the subsurface conditions at this site, it is expected that several rounds of restriking will be required on some or most of the piles. Our experience has shown that on similar sites five restrikes were required to obtain set.

The ULS pile capacities discussed herein have been based on static analyses and incorporate a geotechnical resistance factor of 0.4. Higher resistance values (0.5 for Pile Driver Analyzer or 0.6 for static pile load test methods) can be used where field testing is completed which would allow the use of higher design pile capacities. Given the large number of piles that will likely be required for the proposed building, consideration should be given to incorporating a pile testing program (at a minimum PDA testing which would justify increasing the resistance factor to 0.5; if a very large number of piles are required then a static load test could also be considered) into the contract requirements.

Pile installation should be in accordance with OPSS 903 *(Construction Specification for Deep Foundations).*
For driven piles, the drawings should incorporate the appropriate note stating that the piles (both H-piles and pipe piles) should be equipped with a protective plate for the pipe piles or pile points/shoe for the H-piles

(e.g. Titus Standard H Point, or similar) and should be driven to bedrock. The pile points / protective plates will provide additional protection to the pile tips against damage from boulders during driving. For piles driven to refusal on bedrock, and as described in OPSS 903, it is a generally accepted practice to reduce the hammer energy after abrupt peaking is met on the bedrock surface, and to then gradually increase the energy over a series of blows to seat the pile.

5.7.2 Caisson Foundations

As an alternative to driven pile foundations, the proposed building can be supported on caisson foundations socketed into the shale bedrock. The use of liners or casings will be required in order to advance the caissons through the overburden with minimal loss of ground. The casings should be extended so that they are “seated” a minimum of 500 mm into the bedrock.

Casing installation through the glacial till containing cobbles and boulders will be difficult and contractors should be prepared to deal with boulders and similar obstructions during drilling. Churn drilling and possibly rock coring techniques may be required to advance the caissons through the glacial till.

5.7.2.1 Axial Geotechnical Resistance

Due to the relatively high water table and the difficulty in socketing liners into shale bedrock to completely cut off the water infiltrations, it may not be feasible to dewater and clean the base of the caisson and, as such, end-bearing support may not be developed. The axial geotechnical resistance for rock socketed caissons is therefore recommended to be based primarily on the side-wall (shaft) resistance of the rock socket rather than end-bearing.

Rock-socketed caissons should be designed based on the side-wall (shaft) resistance of the rock socket and a factored geotechnical resistance at ULS of 900 kPa (i.e. a resistance factor of 0.4 has been applied), provided that the caisson socket is within competent bedrock (i.e., RQD greater than 75 percent) which was encountered from about elevation 49.5 m in borehole 20-01 and from about elevation 47.2 m in borehole 20-02. This value assumes that the side wall of the socket will be cleaned of any cuttings or smeared material.

To provide full fixity, the caissons should be provided with a minimum socket length equal to 2 times the caisson diameter. The structural engineer should check that the shear strength of the concrete is adequate to support these loads.

For a 0.9 metre diameter caisson socketed 4 m into the competent bedrock, a factored axial geotechnical resistance at ULS of about 10,200 kN is achievable. SLS resistances do not apply to caissons founded within the shale bedrock, because the SLS resistance for 25 mm of settlement is greater than the factored axial geotechnical resistance at ULS.

5.7.3 Uplift Resistance

It is understood that the piles could also be required to resist uplift forces. The uplift resistance of a pile is derived from friction along the shaft of the pile, and therefore depends on the length of the pile. It has been assumed that the pile will be installed to bedrock.

Driven Piles

For preliminary design, the ULS geotechnical resistance to uplift (factored) may be taken as 200 kilonewtons for an HP310X110 pile driven to a depth of about 12 m below the pile cap level.

<u>Rock-Socketed Caissons</u>

For preliminary design, the ULS geotechnical resistance to uplift (factored) may be calculated similarly to the axial geotechnical resistance discussed in Section 5.7.2.1, however a factor of 0.3 should be applied instead.

5.7.4 Lateral Resistance

The coefficient of horizontal subgrade reaction when applied over a specific area provides a spring constant that is commonly used to model load-deformation response of a pile subjected to lateral loading. The spring constant represents the stiffness of the ground and is controlled by the lateral resistance of the ground. The ultimate value of the lateral resistance developed by the ground in which the pile is embedded is controlled by the net passive pressure mobilized in the ground. Once the passive pressure resistance is fully mobilized, no further increase in lateral resistance is developed with additional lateral displacement of the pile. In most cases, the allowable or tolerable lateral displacement of the pile (i.e., Serviceability Limit States, SLS) is substantially lower than the movement required to fully mobilize the passive pressure (i.e., Ultimate Limit States, ULS).

5.7.4.1 Serviceability Limit States (SLS)

The soil parameter most used to determine the lateral resistance of piles at SLS is the coefficient of horizontal subgrade reaction. The coefficient of horizontal subgrade reaction is not a fundamental soil property and varies with geometry of the foundation. The suggested values for coefficient of horizontal subgrade reaction are summarized in Table 4 bellow:
For cohesionless soils:

$$k_h = \frac{n_h z}{B}$$

Where: n_h is the constant of horizontal subgrade reaction, as given below;

z is the depth (m); and,

B is the pile diameter/width (m).

The following ranges for the values of n_h may be used in the preliminary structural analysis. The ranges in values reflect the variability in the subsurface conditions, the soil properties and the approximate nature of the analysis and the non-linear nature of the soil behaviour (such that k_h is a function of deflection).

Table 4: Coefficients of Horizontal Subgrade Reaction

Depth (metres)	Soil Type	n_h (MN/m^3)
0 – 7.5	Fill and Native Soil (Above Water Table)	2.2
> 7.5	Glacial Till (Below Water Table)	4.4

Group action for lateral loading should be considered when the pile spacing in the direction of loading is less than eight pile diameters. Group action can be evaluated by reducing the coefficient of horizontal subgrade reaction in the direction of loading using a reduction factor, R, as follows:

Table 5: Pile Group Action Reduction Factors

Pile Spacing in Direction of Loading d = Pile Diameter or Width	Subgrade Reaction Reduction Factor, R
8d	1.00
6d	0.70
4d	0.40
3d	0.25

The coefficient of horizontal subgrade reaction values calculated as described above may then be used to calculate the lateral deflection of the pile (i.e., the SLS response of the pile), taking into the account the soil-structure interaction.

For establishing the ULS factored *structural* resistance, the shear force and bending moment distribution in the piles under factored loading can be established using these same procedures and parameters for evaluating the SLS response of the pile.

5.7.4.2 Ultimate Limit States (ULS)

The ULS *geotechnical* resistance to lateral loading may be calculated using passive earth pressure.

The ULS lateral passive resistance may be assumed to act over the pile shaft to a depth equal to six pile diameters below the underside of the pile cap (except where the silty clay thickness exceeds that depth) and the resistance per unit length of pile may be calculated as:

$$P_p(z) = 3dK_p\gamma D_w + 3dK_p (z - D_w)(\gamma - \gamma_w)$$

Where:

$P_p(z)$	=	is the ULS lateral resistance at depth 'z' below the ground surface, i.e., underside of pile cap (kN/m)
γ	=	is average unit weight of overlying soil; use parameters provided in Lateral Earth Pressure Section
K_p	=	is the coefficient of passive earth pressure, use parameters provided in Lateral Earth Pressure Section
D_w	=	is the depth to groundwater table below the ground surface(m), assume at underside of pile cap level; use 2.4 m below the ground surface
γ_w	=	is the unit weight of water, use 9.81 kN/m^3
D	=	is the pile diameter or width (m)

The ULS lateral resistance of a pile group may be estimated as the sum of the individual resistances across the face of the group, perpendicular to the direction of the applied lateral force.

The ULS resistances obtained using the above parameters represent unfactored values; a resistance factor of 0.5 should be applied in calculating the horizontal resistance.

The lateral resistance of piles is a complex non-linear problem which involves not only soil mechanics, but soil-structure interaction. Furthermore, the modulus of subgrade reaction is not a material property but is a simplification to allow the soil resistance to be modelled as a linear elastic "spring". For more complex or critical projects there are more sophisticated methods to analyze lateral pile capacity such as the method of p-y curves or finite element and finite difference modelling. Golder can provide additional guidance related to these methods if required.

5.7.5 Rock Anchors

Given the depth to the bedrock surface on this site, additional resistance to the uplift could be provided by the use of grouted rock anchors.

In designing grouted rock anchors, consideration should be given to four possible anchor failure modes.

i) failure of the steel tendon or top anchorage

ii) failure of the grout/tendon bond

iii) failure of the rock/grout bond

iv) failure within the rock mass, or rock cone pull-out

Potential failure modes i) and ii) are structural and are best addressed by the structural engineer. Adequate corrosion protection of the steel components should be provided to prevent potential premature failure due to steel corrosion.

For potential failure mode iii), the factored bond stress at the concrete/rock interface may be taken as 1,000 kilopascals for ULS design purposes. This value should be used in calculating the resistance under ULS conditions. If the response of the anchor under SLS conditions needs to be evaluated, for a preliminary assessment it may conservatively be taken as the elastic elongation of the unbonded portion of the anchor under the design loading.

For potential failure mode iv), the resistance should be calculated based on the buoyant weight of the potential mass of rock which could be mobilized by the anchor. This is typically considered as the mass of rock included within a cone (or wedge for a line of closely spaced anchors) having an apex at the tip of the anchor and having an apex angle of 60 degrees. For each individual anchor, the ULS factored geotechnical resistance can be calculated based on the following equation:

$$Q_r = \phi \frac{\pi}{3} \gamma' D^3 \tan^2(\theta)$$

where:

Q_r	=	factored uplift resistance of the anchor, kilonewtons
ϕ	=	resistance factor, 0.4
γ'	=	effective unit weight of rock, use 27 kilonewtons per cubic metre above groundwater level, 17 kilonewtons per cubic metre below the groundwater level
D	=	anchor length in metres
θ	=	½ of the apex angle of the rock failure cone, use 30 degrees

Where the anchor load is applied at an angle to the vertical, the anchor and anchor group capacity should be reduced as follows:

$$q_{a'llow} = q_{allow} \cos(\alpha)$$

where:

$q_{a'llow}$ = allowable uplift capacity of anchor subject to inclined load in kilonewtons

q_{allow} = allowable uplift capacity of anchor subject to vertical load in kilonewtons

α = angle between the load direction and the vertical

For a group of anchors or for a line of closely spaced anchors the resistance must consider the potential overlap between the rock masses mobilized by individual anchors.

In the case of group effects for a series of rock anchors in a rectangle with width “a” and length “b” installed to a depth “D”, the equation for the volume of the truncated trapezoid failure zone would be as follows:

$$V = \frac{4}{3} D^3 sin^2\varphi + aD^2 \sin\varphi + bDH^2 \sin\varphi + abD$$

Where:

V = Volume of the truncated trapezoid failure zone

D = Depth of anchor group in metres

a = width of anchor group in metres

b = length of the anchor group in metres

φ = ½ of the apex angle of the rock failure cone, use 30 degrees

The ULS factored geotechnical resistance for the truncated trapezoid failure formed by the group of anchors can then be calculated based on the following equation:

$$Q_r = \phi \ \gamma' V$$

Where:

Q_r = Factored uplift resistance of the anchor, kN

f = Resistance factor, use 0.4

γ' = Effective unit weight of rock, use 17 kN per cubic metre below groundwater level

V = Volume of truncated trapezoid

It is suggested that pull-out tests be carried out on anchors to confirm their pull-out capacity. The pull-out tests should be carried out to 1.3 times the anchor service loads, and at least 10 percent of the anchors should be tested in this manner.

It is suggested that the installation and testing of the anchors be supervised by the geotechnical engineer. Care must be taken during grouting to ensure that the grouting pressure is sufficient to bond the entire length of the grout area with a minimum of voids. Probing of the holes should be carried out by the geotechnical engineer to ensure that the anchors are being installed in rock of adequate quality. It is also suggested that the anchor holes be thoroughly flushed with water to remove all debris and rock flour. It is essential that rock flour be completely removed from the holes to be grouted to ensure an adequate bond between the grout and the rock.

5.8 Site Servicing

At least 150 millimetres of OPSS Granular A should be used as pipe bedding for sewer and water pipes. Where unavoidable disturbance to the subgrade surface occurs during construction, it may be necessary to place a sub-bedding layer consisting of 300 millimetres of compacted OPSS Granular B Type II beneath the Granular A. The bedding material should, in all cases, extend to the spring line of the pipe and should be compacted to at least 95 percent of the material's standard Proctor maximum dry density. The use of clear crushed stone as a bedding layer should not be permitted anywhere on this project since fine particles from the sandy backfill materials and native soils could potentially migrate into the voids in the clear crushed stone and cause loss of lateral pipe support.

Cover material, from the spring line of the pipe to at least 300 millimetres above the top of pipe, should consist of OPSS Granular A or Granular B Type I with a maximum particle size of 25 millimetres. The cover material should be compacted to at least 95 percent of the material's standard Proctor maximum dry density.

It should generally be possible to re-use the existing fill, silty clay, and glacial till as trench backfill. Where the trench will be covered with hard surfaced areas, the type of material placed in the frost zone (between subgrade level and 1.8 metres depth) should match the soil exposed on the trench walls for frost heave compatibility. Trench backfill should be placed in maximum 300 millimetre thick lifts and should be compacted to at least 95 percent of the material's standard Proctor maximum dry density using suitable vibratory compaction equipment.

5.9 Pavement Design

In preparation for pavement construction, all topsoil, unsuitable fill, disturbed, or otherwise deleterious materials (i.e., those materials containing organic material) should be removed from the pavement areas. Some of the existing fill could remain provided that it is free of organic matter, and that the subgrade be subjected to a proof roll with a loaded tandem truck to reveal weak or soft areas prior to the construction of the new pavement structure. Soft or weak areas should be removed and repaired with acceptable earth borrow or OPSS Select Subgrade Material (SSM).

Pavement areas requiring grade raising to proposed subgrade level should be brought to grade using acceptable (compactable and inorganic) earth borrow or OPSS SSM. These materials should be placed in maximum 300 mm thick lifts and should be compacted to at least 95% of the materials standard Proctor maximum dry density using suitable compaction equipment.

The surface of the pavement subgrade should be crowned or sloped to promote drainage of the pavement granular structure towards perimeter swales or subdrains placed at the subgrade level

The following light-duty pavement design is recommended for the parking lot for this project and the following heavy-duty pavement design is recommended for any loading docks (if required):

Material		Light Duty Pavement Thickness of Pavement Elements (mm)	Heavy Duty Pavement Thickness of Pavement Elements (mm)
	Superpave 12.5 mm	60	40

Material		Light Duty Pavement Thickness of Pavement Elements (mm)	Heavy Duty Pavement Thickness of Pavement Elements (mm)
Bituminous Concrete OPSS 1150	Superpave 19.0 mm	-	50
Granular Material OPSS 1010	Granular A Base	150	150
	Granular B, Type II Subbase	300	450
	Prepared and Approved Subgrade		

The granular base and subbase materials should be uniformly compacted as per OPSS 310, Method A. The asphaltic concrete should be compacted in accordance with the procedures outlined in OPSS 310.

The asphaltic cement should consist of PG 58-34 and the design of the mixes should be based on a Traffic Category B.

The above pavement designs are based on the assumption that the pavement subgrade has been acceptably prepared (i.e., grade raise fill has been adequately compacted to the required density and the subgrade surface not disturbed by construction operations or precipitation). Depending on the actual conditions of the pavement subgrade at the time of construction, it could be necessary to increase the thickness of the subbase and/or to place a woven geotextile beneath the granular materials.

Where the new pavements will connect to existing pavements, the new pavement structures should be continued at least to the limits of construction, with any longitudinal transitions and/or tapers occurring thereafter. At these locations, the longitudinal transitions should be constructed by cutting the existing pavement structure vertically to the bottom of the existing subbase. The new granular layers should then be tapered up or down, as required, at a slope of 5 horizontal to 1 vertical to match the existing pavement structure. The asphaltic concrete does not need to be tapered between the new construction and the existing pavement. However, the asphaltic concrete of the existing pavement should be milled back an additional 300 mm to a depth of about 60 mm in areas where its thickness is greater than 100 mm, or matching the proposed surface course of the new asphaltic concrete. A tack coat should be provided, and the new surface course asphaltic concrete placed over the milled surface to form the new pavement joint. Where the existing pavement is less than 100 mm, then a butt joint on a vertical saw cut surface is acceptable. A tack coat should be placed on the vertical saw cut surface. The tack coat should be in accordance with the City SP F-3107.

5.10 Corrosion and Cement Type

One sample of soil from Borehole 20-03 was submitted to Eurofins Scientific for chemical analysis related to potential corrosion of exposed buried steel and concrete elements (corrosion and sulphate attack). The results of this testing are provided in Appendix C. The results indicate that there is a very high potential for sulphate attack. Concrete made with Type HS or HSb Portland cement should be used for concrete substructures.

The results also indicate a very high potential for corrosion of buried ferrous elements, which should be considered in the design of substructures and pile foundations.

6.0 SLOPE STABILITY ASSESSMENT

In general, six main components are typically involved in assessing the stability of a slope:

7) The geometry of the slope;
8) The geology of the slope (i.e., the composition of the various soil layers within the slope and their depth, thickness, and orientation);
9) The groundwater conditions (the groundwater levels and the hydraulic gradient/flow conditions);
10) The strength parameters for the soils;
11) The unit weights (i.e., densities) of the soils and waste within the slope; and,
12) External loading (i.e., surcharge, seismic forces).

For this assessment, the slope geometries used in the analyses were based on a topographic survey provided by the University of Ottawa. The two overall cross-sections selected for analysis are shown on Figure 1 (denoted as A-A’, B-B’).

The stability of the slope was evaluated using the SLOPE/W computer program. The Morgernstern-Price method, which satisfies both moment and force equilibrium, was used to compute a factor of safety. The factor of safety is defined as the ratio of the magnitude of the forces tending to resist failure to the magnitude of the forces tending to cause failure.

Theoretically, a slope with a factor of safety of less than 1.0 will undergo movement and one with a factor of safety of 1.0 or greater will not undergo movement. For analyses of the stability of slopes under static loading conditions, a factor of safety of greater than about 1.3 can be considered acceptable for this project and reflects inherent uncertainties related to the potential variability of the existing fill material and other subsurface variabilities, geometric imprecision, strain incompatibilities, and other risk factors.

The seismic loads imposed on a slope are modelled in a simplified manner by applying a horizontal “pseudo static” force to the soil mass. The “pseudo-static” force, F_s, is calculated as:

$$F_s = k_s \times M$$

Where: k_s = horizontal seismic coefficient; and,

M = mass of soil contained within the failure surface.

Since the site is used for recreational purposes, a minimum factor of safety of 1.1 is recommended under seismic loading conditions.

The seismic slope stability evaluations were carried out assuming that the design earthquake would correspond to an event with a 10% probability of occurrence in 50 years (i.e. the 475-year design earthquake). Based on the methodology outlined in 2012 OBC and VSP testing carried out in 2011, the Site Class was determined to be a Site Class C. Considering a site coefficient, F(PGA) = 1.0 and the firm ground PGA of 0.102 g, the ground surface PGA was calculated to be about 0.102 g. Therefore, a k_h value of 0.05 g, equal to one-half the ground surface PGA, was used in the slope stability analyses.

6.1 Material Properties

In general, the slopes range from approximately 5 to 6 metres in height, and the overall slope angle ranges from approximately 26 to 32 degrees from the horizontal 2H:1V and 1.6H:1V respectively.

The key material properties required to complete a stability analysis are the unit weight and shear strength of the materials. The shear strength of soil or waste is conventionally described using a Mohr-Coulomb criterion. This criterion describes the shear strength of a soil in terms of cohesive and frictional components. The magnitude of the frictional component depends on the stress acting perpendicular to the potential failure plane. From this criterion, the strength of a soil to resist shear stress (i.e., to resist sliding) is described by:

$$\tau = c' + \sigma' \tan \phi'$$

τ =Strength of the soil;

c' =Effective cohesion of the soil;

σ' =Effective normal stress (i.e., stress acting perpendicular to the shear plane); and,

ϕ' =Effective internal friction angle.

The characteristics of the soil stratigraphy within the slope was inferred from the results of the boreholes put down at the Site as part of the current and past investigations by Golder Associates Ltd. The borehole data indicates that the subsurface conditions on this site consist of surficial topsoil over a layer of cinders and ash in a matrix of sandy and silty fill, underlain by silty clay or alluvium over clayey silt and sandy silt glacial till.

The soil parameters used for the cinder and ash fill layer were based on results from previous investigations, and a visual examination of the samples from this fill layer. Upon a detailed visual inspection of all cinder and ash fill samples, it was observed that the fill consisted predominantly of silty sand and sandy silt with trace to some gravel and gravel sized pieces of brick and other miscellaneous gravel sized debris. On this basis, the fill layer is modelled as a silty sand with trace to some gravel.

The soil parameters used for the silty clay in the analyses were based on experience with similar soil in eastern Ontario.

A water level reading taken on July 21, 2020 in the wells installed in boreholes 20-01 to 20-03 provided a ground water elevation of about 55.0 m, indicating that the ground water level was within the glacial till deposit.

The material parameters adopted for the analysis are summarized in the table below.

Material	Bulk Unit Weight (kN/m^3)	Drained Parameters		Undrained Parameters
		Effective Cohesion (kPa)	Effective Internal Friction Angle (°)	Cohesion (kPa)
Existing Fill	19	0	33	-

Material	Bulk Unit Weight (kN/m^3)	Drained Parameters		Undrained Parameters
		Effective Cohesion (kPa)	Effective Internal Friction Angle (°)	Cohesion (kPa)
Silty Clay (Very Stiff to Stiff)	16	7.4	28.7	75
Glacial Till (Clayey Silt)	19	3	32	50
Glacial Till (Silty Sand or Sandy Silt)	19	0	33	-

6.2 Slope Stability Analysis Results

Two overall cross sections (identified as A-A' and B-B') were analyzed. The locations of the cross-sections are shown on Figure 1. The SLOPE/W outputs are shown in Appendix E.

The following table indicates the global factors of safety obtained for both static and dynamic analyses for the existing slopes.

Section	Global Factor of Safety		
	Static Drained	Static Undrained	Seismic
A-A'	1.4	1.4	1.3
B-B'	1.8	1.8	1.7

'Hazard Lands' associated with unstable slopes are defined as the table land adjacent to the slope for which there would be an inadequate 'factor of safety' against the land being affected by a slope failure. The Hazard Lands, as defined by Ministry of Natural Resources (MNR) guidelines and provincial planning policies, are unsuitable for development with buildings, roadways, parking areas or other infrastructure. In accordance with the MNR guidelines, the setback distance from the crest of an unstable slope to the Limit of Hazard Lands includes three components, as appropriate, namely:

1) A "Stable Slope Allowance", which is determined as the limit beyond which there is an acceptable factor of safety (i.e., greater than about 1.5 static or 1.1 seismic) against slope instability.
2) An "Erosion Allowance", to account for future movement of the slope toe, in the table land direction, as a result of erosion along the slope toe/creek bank.
3) An "Erosion Access Allowance" of 6 metres, to allow a corridor by which equipment could travel to access and repair a future slope failure. This Access Allowance is included in the determination of the Limit of Hazard Lands wherever the development could restrict future slope access.

Stable Slope Allowance must be applied to slopes that do not have an acceptable factor of safety (i.e., greater than about 1.5 static or 1.1 seismic). The static slope stability analysis for the slopes of the Rideau River indicates a factor of safety lower than 1.5 at section A-A' and higher than 1.5 at section B-B'. The "pseudo-static" (or seismic) factors of safety at sections A-A’ and B-B are greater than 1.1.

Based on these analyses, the slopes in the area of section A-A’ will require a *Stable Slope Allowance* of 4 m as determined by the global slope stability analysis and the slopes in the area of section B-B are considered stable, and no *Stable Slope Allowance* is required.

An *Erosion Allowance* needs to be applied wherever there is active erosion, or the potential for active erosion based on the flow velocities. The width of the *Erosion Allowance* is described in the MNR guidelines and is a function of the soil type, state of erosion, and water course characteristics. Using Table 3 of the MNR Technical Guide, it was determined that an *Erosion Allowance* setback of 4 m is required. The following assumptions were made:

- The native soil type is assumed to be stiff/hard cohesive soil (clays, silt), coarse granular (gravels) tills,
- Based on an examination of the slope toe it was observed that the toe of the slope is adequately protected from erosion by previously placed open rip rap consisting of boulders, cobbles and broken pieces of concrete as shown on the photographs of the shoreline in Appendix E.
- The bankfull width was assumed to be greater than 30 m.

An *Erosion Access Allowance* needs to be applied when access to the slopes in the event of a slope failure is difficult. One example of a difficult slope access would be a row of semi-detached residential structures which back onto a slope. In the event of a failure, access would be provided by this 6 m access route behind the structures. At this site, there is a thick line of trees that could make access to the slope difficult, therefore a 6 m *Erosion Access Allowance* is required to the total setback distance from the top of the slope.

Based on the above, the setbacks shown in the following table should be applied to the top of the slopes:

Section	Stable Slope Allowance (m)	Erosion Allowance (m)	Erosion Access Allowance (m)	Setback Distance from Top of Slope (m)
A-A’	3	4	6	13
B-B’	0	4	6	10

7.0 ADDITIONAL CONSIDERATIONS

At the time of writing this report, only conceptual details related to the building were available. This information suggests this building will consist of up to 6 storeys with no basement levels. Golder Associates should review the final drawings and specifications for this project prior to tendering to confirm that the guidelines in this report have been adequately interpreted.

The construction activities could impact the existing adjacent structures and buildings. Appropriate damage assessments (pre and post condition surveys for example) should be carried out as necessary.

During construction, sufficient foundation inspections, subgrade inspections, in-situ density tests, materials testing, pile and rock anchor installation monitoring should be carried out to confirm that the conditions exposed are consistent with those encountered in the boreholes, and to monitor conformance to the pertinent project specifications. Concrete testing should be carried out in a CCIL certified laboratory.

The soils at this site are sensitive to disturbance from ponded water, construction traffic and frost. All bearing surfaces must be inspected by Golder prior to filling or concreting to ensure that strata having adequate bearing capacity have been reached and that the bearing surfaces have been properly prepared.

8.0 CLOSURE

We trust that this report provides sufficient geotechnical engineering information to facilitate the design of this project. If you have any questions regarding the contents of this report or require additional information, please do not hesitate to contact this office.

Signature Page

Golder Associates Ltd.

Bridgit Bocage, M.Eng., P.Eng.
Geotechnical Engineer

Chris Hendry, M.Eng., P.Eng.
Technical Lead, Eastern Canada Geotechnical

BB/CH/hdw

https://golderassociates.sharepoint.com/sites/127981/project files/6 deliverables/final geotechnical report/20144766-uofo-200 lees ave_geotech rpt_final_20200903.docx

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Unless otherwise stated, the suggestions, recommendations and opinions given in this report are intended only for the guidance of the Client in the design of the specific project. The extent and detail of investigations, including the number of test holes, necessary to determine all of the relevant conditions which may affect construction costs would normally be greater than has been carried out for design purposes. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.

Soil, Rock and Groundwater Conditions: Classification and identification of soils, rocks, and geologic units have been based on commonly accepted methods employed in the practice of geotechnical engineering and related disciplines. Classification and identification of the type and condition of these materials or units involves judgment, and boundaries between different soil, rock or geologic types or units may be transitional rather than abrupt. Accordingly, Golder does not warrant or guarantee the exactness of the descriptions.

IMPORTANT INFORMATION AND LIMITATIONS OF THIS REPORT (cont'd)

Special risks occur whenever engineering or related disciplines are applied to identify subsurface conditions and even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions. The environmental, geologic, geotechnical, geochemical and hydrogeologic conditions that Golder interprets to exist between and beyond sampling points may differ from those that actually exist. In addition to soil variability, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. **The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report.** The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.

Soil and groundwater conditions shown in the factual data and described in the report are the observed conditions at the time of their determination or measurement. Unless otherwise noted, those conditions form the basis of the recommendations in the report. Groundwater conditions may vary between and beyond reported locations and can be affected by annual, seasonal and meteorological conditions. The condition of the soil, rock and groundwater may be significantly altered by construction activities (traffic, excavation, groundwater level lowering, pile driving, blasting, etc.) on the site or on adjacent sites. Excavation may expose the soils to changes due to wetting, drying or frost. Unless otherwise indicated the soil must be protected from these changes during construction.

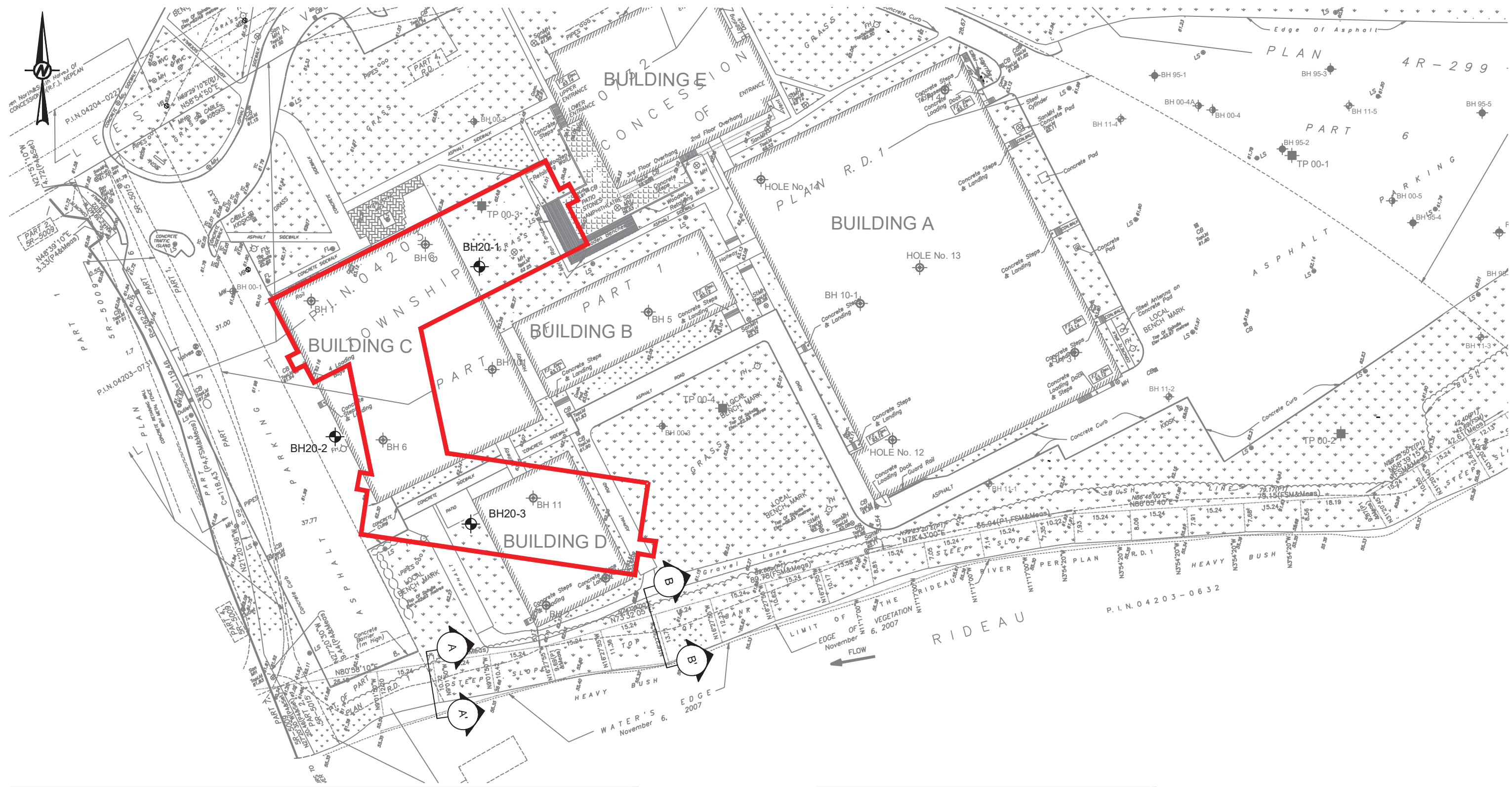
Sample Disposal: Golder will dispose of all uncontaminated soil and/or rock samples 90 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fills or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.

Follow-Up and Construction Services: All details of the design were not known at the time of submission of Golder's report. Golder should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of Golder's report.

During construction, Golder should be retained to perform sufficient and timely observations of encountered conditions to confirm and document that the subsurface conditions do not materially differ from those interpreted conditions considered in the preparation of Golder's report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in Golder's report. Adequate field review, observation and testing during construction are necessary for Golder to be able to provide letters of assurance, in accordance with the requirements of many regulatory authorities. In cases where this recommendation is not followed, Golder's responsibility is limited to interpreting accurately the information encountered at the borehole locations, at the time of their initial determination or measurement during the preparation of the Report.

Changed Conditions and Drainage: Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that Golder be notified of any changes and be provided with an opportunity to review or revise the recommendations within this report. Recognition of changed soil and rock conditions requires experience and it is recommended that Golder be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.

Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage or dewatering can have serious consequences. Golder takes no responsibility for the effects of drainage unless specifically involved in the detailed design and construction monitoring of the system.



LEGEND

GOLDER 2020 PROPOSED BOREHOLE LOCATIONS	APPROXIMATE BOREHOLE LOCATION IN PLAN, PREVIOUS INVESTIGATION BY GOLDER ASSOCIATES LTD., REPORT No. 001-2721
APPROXIMATE BOREHOLE LOCATION IN PLAN, PREVIOUS INVESTIGATION BY BY GOLDER ASSOCIATES LTD. ' REPORT No. 11-1121-0057	APPROXIMATE TEST PIT LOCATION IN PLAN, PREVIOUS INVESTIGATION BY GOLDER ASSOCIATES LTD., REPORT No. 001-2721
APPROXIMATE TEST PIT LOCATION IN PLAN, PREVIOUS INVESTIGATION BY BY GOLDER ASSOCIATES LTD. ' REPORT No. 11-1121-0057	APPROXIMATE MONITORING WELL LOCATION IN PLAN, PREVIOUS INVESTIGATION BY CH2M HILL, REPORT No. 120209
APPROXIMATE BOREHOLE LOCATION IN PLAN, PREVIOUS INVESTIGATION BY GOLDER ASSOCIATES LTD., REPORT No. 10-1121-0117	APPROXIMATE BOREHOLE LOCATION IN PLAN, PREVIOUS INVESTIGATION BY CANVIRO CONSULTANTS, 1988
APPROXIMATE BOREHOLE LOCATION IN PLAN, PREVIOUS INVESTIGATION BY McROSTIE GENEST ST-LOUIS, REPORT No. SF-4306	APPROXIMATE PROPOSED NEW BUILDING FOOTPRINT
APPROXIMATE BOREHOLE LOCATION IN PLAN, PREVIOUS INVESTIGATION BY McROSTIE GENEST ST-LOUIS, REPORT No. SF-624	

REFERENCE(S)

1. BASE PLAN SUPPLIED IN ELECTRONIC FORMAT BY BARRY J. HOBIN AND ASSOCIATES ARCHITECHTS INC. DATED JULY 19, 2011.

0 25 50
1:1,000 METRES

CLIENT
UNIVERSITY OF OTTAWA

PROJECT
GEOTECHNICAL INVESTIGATION

CONSULTANT
GOLDER

YYYY-MM-DD	2020-09-04
DESIGNED	----
PREPARED	ABD/JM
REVIEWED	BB
APPROVED	CH

TITLE
200 LEES AVENUE,
OTTAWA, ONTARIO

PROJECT NO.	CONTROL	REV.	FIGURE
20144766	0001	0	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
25 mm

APPENDIX A

- Current Investigation Borehole Records

- Bedrock Core Photographs (Boreholes 20-01 to 20-03)

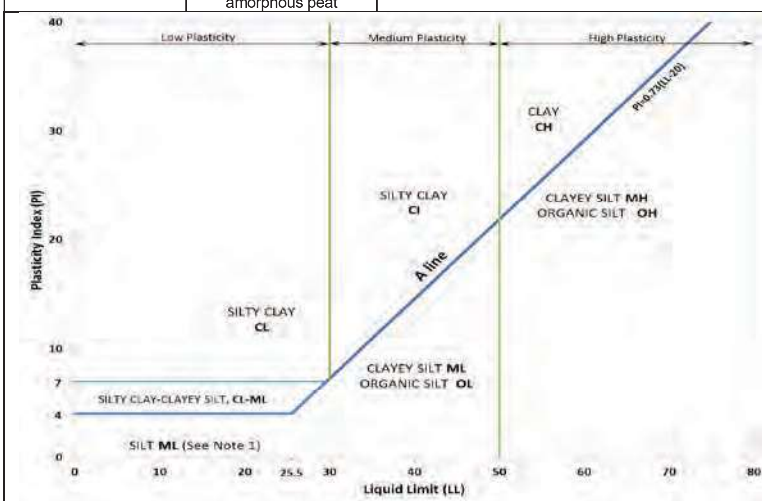
- Previous Borehole Records

METHOD OF SOIL CLASSIFICATION

The Golder Associates Ltd. Soil Classification System is based on the Unified Soil Classification System (USCS)

Organic or Inorganic	Soil Group	Type of Soil		Gradation or Plasticity	$Cu = \frac{D_{60}}{D_{10}}$	$Cc = \frac{(D_{30})^2}{D_{10} x D_{60}}$	Organic Content	USCS Group Symbol	Group Name
INORGANIC (Organic Content ≤30% by mass)	COARSE-GRAINED SOILS (>50% by mass is larger than 0.075 mm)	GRAVELS (>50% by mass of coarse fraction is larger than 4.75 mm)	Gravels with ≤12% fines (by mass)	Poorly Graded	<4	≤1 or ≥3	≤30%	GP	GRAVEL
				Well Graded	≥4	1 to 3		GW	GRAVEL
			Gravels with >12% fines (by mass)	Below A Line	n/a			GM	SILTY GRAVEL
				Above A Line	n/a			GC	CLAYEY GRAVEL
		SANDS (≥50% by mass of coarse fraction is smaller than 4.75 mm)	Sands with ≤12% fines (by mass)	Poorly Graded	<6	≤1 or ≥3		SP	SAND
				Well Graded	≥6	1 to 3		SW	SAND
			Sands with >12% fines (by mass)	Below A Line	n/a			SM	SILTY SAND
				Above A Line	n/a			SC	CLAYEY SAND

Organic or Inorganic	Soil Group	Type of Soil	Laboratory Tests	Field Indicators: Dilatancy	Dry Strength	Shine Test	Thread Diameter	Toughness (of 3 mm thread)	Organic Content	USCS Group Symbol	Primary Name
INORGANIC (Organic Content ≤30% by mass)	FINE-GRAINED SOILS (≥50% by mass is smaller than 0.075 mm)	SILTS (Non-Plastic or PI and LL plot below A-Line on Plasticity Chart below)	Liquid Limit <50	Rapid	None	None	>6 mm	N/A (can't roll 3 mm thread)	<5%	ML	SILT
				Slow	None to Low	Dull	3mm to 6 mm	None to low	<5%	ML	CLAYEY SILT
				Slow to very slow	Low to medium	Dull to slight	3mm to 6 mm	Low	5% to 30%	OL	ORGANIC SILT
			Liquid Limit ≥50	Slow to very slow	Low to medium	Slight	3mm to 6 mm	Low to medium	<5%	MH	CLAYEY SILT
				None	Medium to high	Dull to slight	1 mm to 3 mm	Medium to high	5% to 30%	OH	ORGANIC SILT
		CLAYS (PI and LL plot above A-Line on Plasticity Chart below)	Liquid Limit <30	None	Low to medium	Slight to shiny	~ 3 mm	Low to medium	0% to 30% **(see Note 2)**	CL	SILTY CLAY
			Liquid Limit 30 to 50	None	Medium to high	Slight to shiny	1 mm to 3 mm	Medium		CI	SILTY CLAY
			Liquid Limit ≥50	None	High	Shiny	<1 mm	High		CH	CLAY
HIGHLY ORGANIC SOILS (Organic Content >30% by mass)		Peat and mineral soil mixtures							30% to 75%	PT	SILTY PEAT, SANDY PEAT
		Predominantly peat, may contain some mineral soil, fibrous or amorphous peat							75% to 100%		PEAT



Note 1 – Fine grained materials with PI and LL that plot in this area are named (ML) SILT with slight plasticity. Fine-grained materials which are non-plastic (i.e. a PL cannot be measured) are named SILT.

Note 2 – For soils with <5% organic content, include the descriptor "trace organics" for soils with between 5% and 30% organic content include the prefix "organic" before the Primary name.

Dual Symbol — A dual symbol is two symbols separated by a hyphen, for example, GP-GM, SW-SC and CL-ML.

For non-cohesive soils, the dual symbols must be used when the soil has between 5% and 12% fines (i.e. to identify transitional material between "clean" and "dirty" sand or gravel.

For cohesive soils, the dual symbol must be used when the liquid limit and plasticity index values plot in the CL-ML area of the plasticity chart (see Plasticity Chart at left).

Borderline Symbol — A borderline symbol is two symbols separated by a slash, for example, CL/CI, GM/SM, CL/ML.

A borderline symbol should be used to indicate that the soil has been identified as having properties that are on the transition between similar materials. In addition, a borderline symbol may be used to indicate a range of similar soil types within a stratum.

ABBREVIATIONS AND TERMS USED ON RECORDS OF BOREHOLES AND TEST PITS

PARTICLE SIZES OF CONSTITUENTS

Soil Constituent	Particle Size Description	Millimetres	Inches (US Std. Sieve Size)
BOULDERS	Not Applicable	>300	>12
COBBLES	Not Applicable	75 to 300	3 to 12
GRAVEL	Coarse Fine	19 to 75 4.75 to 19	0.75 to 3 (4) to 0.75
SAND	Coarse Medium Fine	2.00 to 4.75 0.425 to 2.00 0.075 to 0.425	(10) to (4) (40) to (10) (200) to (40)
SILT/CLAY	Classified by plasticity	<0.075	< (200)

MODIFIERS FOR SECONDARY AND MINOR CONSTITUENTS

Percentage by Mass	Modifier
>35	Use 'and' to combine major constituents (*i.e.,* SAND and GRAVEL)
> 12 to 35	Primary soil name prefixed with "gravelly, sandy, SILTY, CLAYEY" as applicable
> 5 to 12	some
≤ 5	trace

PENETRATION RESISTANCE

Standard Penetration Resistance (SPT), N:
The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) required to drive a 50 mm (2 in.) split-spoon sampler for a distance of 300 mm (12 in.). Values reported are as recorded in the field and are uncorrected.

Cone Penetration Test (CPT)
An electronic cone penetrometer with a 60° conical tip and a project end area of 10 cm^2 pushed through ground at a penetration rate of 2 cm/s. Measurements of tip resistance (q_t), porewater pressure (u) and sleeve frictions are recorded electronically at 25 mm penetration intervals.

Dynamic Cone Penetration Resistance (DCPT); N_d:
The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) to drive uncased a 50 mm (2 in.) diameter, 60° cone attached to "A" size drill rods for a distance of 300 mm (12 in.).

PH: Sampler advanced by hydraulic pressure
PM: Sampler advanced by manual pressure
WH: Sampler advanced by static weight of hammer
WR: Sampler advanced by weight of sampler and rod

SAMPLES

AS	Auger sample
BS	Block sample
CS	Chunk sample
DD	Diamond Drilling
DO or DP	Seamless open ended, driven or pushed tube sampler – note size
DS	Denison type sample
GS	Grab Sample
MC	Modified California Samples
MS	Modified Shelby (for frozen soil)
RC	Rock core
SC	Soil core
SS	Split spoon sampler – note size
ST	Slotted tube
TO	Thin-walled, open – note size (Shelby tube)
TP	Thin-walled, piston – note size (Shelby tube)
WS	Wash sample

SOIL TESTS

w	water content
PL , w_p	plastic limit
LL , w_L	liquid limit
C	consolidation (oedometer) test
CHEM	chemical analysis (refer to text)
CID	consolidated isotropically drained triaxial test[1]
CIU	consolidated isotropically undrained triaxial test with porewater pressure measurement[1]
D_R	relative density (specific gravity, Gs)
DS	direct shear test
GS	specific gravity
M	sieve analysis for particle size
MH	combined sieve and hydrometer (H) analysis
MPC	Modified Proctor compaction test
SPC	Standard Proctor compaction test
OC	organic content test
SO_4	concentration of water-soluble sulphates
UC	unconfined compression test
UU	unconsolidated undrained triaxial test
V (FV)	field vane (LV-laboratory vane test)
γ	unit weight

1. Tests anisotropically consolidated prior to shear are shown as CAD, CAU.

NON-COHESIVE (COHESIONLESS) SOILS

Compactness[2]

Term	SPT 'N' (blows/0.3m)[1]
Very Loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	>50

1. SPT 'N' in accordance with ASTM D1586, uncorrected for the effects of overburden pressure.
2. Definition of compactness terms are based on SPT 'N' ranges as provided in Terzaghi, Peck and Mesri (1996). Many factors affect the recorded SPT 'N' value, including hammer efficiency (which may be greater than 60% in automatic trip hammers), overburden pressure, groundwater conditions, and grainsize. As such, the recorded SPT 'N' value(s) should be considered only an approximate guide to the soil compactness. These factors need to be considered when evaluating the results, and the stated compactness terms should not be relied upon for design or construction.

Field Moisture Condition

Term	Description
Dry	Soil flows freely through fingers.
Moist	Soils are darker than in the dry condition and may feel cool.
Wet	As moist, but with free water forming on hands when handled.

COHESIVE SOILS

Consistency

Term	Undrained Shear Strength (kPa)	SPT 'N'[1,2] (blows/0.3m)
Very Soft	<12	0 to 2
Soft	12 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 200	15 to 30
Hard	>200	>30

1. SPT 'N' in accordance with ASTM D1586, uncorrected for overburden pressure effects; approximate only.
2. SPT 'N' values should be considered ONLY an approximate guide to consistency; for sensitive clays (e.g., Champlain Sea clays), the N-value approximation for consistency terms does NOT apply. Rely on direct measurement of undrained shear strength or other manual observations.

Water Content

Term	Description
w < PL	Material is estimated to be drier than the Plastic Limit.
w ~ PL	Material is estimated to be close to the Plastic Limit.
w > PL	Material is estimated to be wetter than the Plastic Limit.

LIST OF SYMBOLS

Unless otherwise stated, the symbols employed in the report are as follows:

I. GENERAL

π	3.1416
ln x	natural logarithm of x
$\log_{10}$	x or log x, logarithm of x to base 10
g	acceleration due to gravity
t	time

II. STRESS AND STRAIN

γ	shear strain
Δ	change in, e.g. in stress: $\Delta\,\sigma$
ε	linear strain
ε_v	volumetric strain
η	coefficient of viscosity
υ	Poisson's ratio
σ	total stress
σ'	effective stress ($\sigma' = \sigma - u$)
σ'_{vo}	initial effective overburden stress
$\sigma_1, \sigma_2, \sigma_3$	principal stress (major, intermediate, minor)
σ_{oct}	mean stress or octahedral stress $= (\sigma_1 + \sigma_2 + \sigma_3)/3$
τ	shear stress
u	porewater pressure
E	modulus of deformation
G	shear modulus of deformation
K	bulk modulus of compressibility

III. SOIL PROPERTIES

(a) Index Properties

$\rho(\gamma)$	bulk density (bulk unit weight)*
$\rho_d(\gamma_d)$	dry density (dry unit weight)
$\rho_w(\gamma_w)$	density (unit weight) of water
$\rho_s(\gamma_s)$	density (unit weight) of solid particles
γ'	unit weight of submerged soil ($\gamma' = \gamma - \gamma_w$)
D_R	relative density (specific gravity) of solid particles ($D_R = \rho_s / \rho_w$) (formerly G_s)
e	void ratio
n	porosity
S	degree of saturation

* Density symbol is ρ. Unit weight symbol is γ where $\gamma = \rho g$ (i.e. mass density multiplied by acceleration due to gravity)

(a) Index Properties (continued)

w	water content
w_l or LL	liquid limit
w_p or PL	plastic limit
I_p or PI	plasticity index = $(w_l - w_p)$
NP	non-plastic
w_s	shrinkage limit
I_L	liquidity index = $(w - w_p) / I_p$
I_C	consistency index = $(w_l - w) / I_p$
e_{max}	void ratio in loosest state
e_{min}	void ratio in densest state
I_D	density index = $(e_{max} - e) / (e_{max} - e_{min})$ (formerly relative density)

(b) Hydraulic Properties

h	hydraulic head or potential
q	rate of flow
v	velocity of flow
i	hydraulic gradient
k	hydraulic conductivity (coefficient of permeability)
j	seepage force per unit volume

(c) Consolidation (one-dimensional)

C_c	compression index (normally consolidated range)
C_r	recompression index (over-consolidated range)
C_s	swelling index
C_α	secondary compression index
m_v	coefficient of volume change
c_v	coefficient of consolidation (vertical direction)
c_h	coefficient of consolidation (horizontal direction)
T_v	time factor (vertical direction)
U	degree of consolidation
σ'_p	pre-consolidation stress
OCR	over-consolidation ratio = σ'_p / σ'_{vo}

(d) Shear Strength

τ_p, τ_r	peak and residual shear strength
ϕ'	effective angle of internal friction
δ	angle of interface friction
μ	coefficient of friction = $\tan\delta$
c'	effective cohesion
c_u, s_u	undrained shear strength ($\phi = 0$ analysis)
p	mean total stress $(\sigma_1 + \sigma_3)/2$
p′	mean effective stress $(\sigma'_1 + \sigma'_3)/2$
q	$(\sigma_1 - \sigma_3)/2$ or $(\sigma'_1 - \sigma'_3)/2$
q_u	compressive strength $(\sigma_1 - \sigma_3)$
S_t	sensitivity

Notes: 1 $\tau = c' + \sigma' \tan\phi'$
2 shear strength = (compressive strength)/2

LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY

WEATHERINGS STATE

Fresh: no visible sign of rock material weathering.

Faintly weathered: weathering limited to the surface of major discontinuities.

Slightly weathered: penetrative weathering developed on open discontinuity surfaces but only slight weathering of rock material.

Moderately weathered: weathering extends throughout the rock mass but the rock material is not friable.

Highly weathered: weathering extends throughout rock mass and the rock material is partly friable.

Completely weathered: rock is wholly decomposed and in a friable condition but the rock and structure are preserved.

BEDDING THICKNESS

Description	Bedding Plane Spacing
Very thickly bedded	Greater than 2 m
Thickly bedded	0.6 m to 2 m
Medium bedded	0.2 m to 0.6 m
Thinly bedded	60 mm to 0.2 m
Very thinly bedded	20 mm to 60 mm
Laminated	6 mm to 20 mm
Thinly laminated	Less than 6 mm

JOINT OR FOLIATION SPACING

Description	Spacing
Very wide	Greater than 3 m
Wide	1 m to 3 m
Moderately close	0.3 m to 1 m
Close	50 mm to 300 mm
Very close	Less than 50 mm

GRAIN SIZE

Term	Size*
Very Coarse Grained	Greater than 60 mm
Coarse Grained	2 mm to 60 mm
Medium Grained	60 microns to 2 mm
Fine Grained	2 microns to 60 microns
Very Fine Grained	Less than 2 microns

Note: * Grains greater than 60 microns diameter are visible to the naked eye.

CORE CONDITION

Total Core Recovery (TCR)
The percentage of solid drill core recovered regardless of quality or length, measured relative to the length of the total core run.

Solid Core Recovery (SCR)
The percentage of solid drill core, regardless of length, recovered at full diameter, measured relative to the length of the total core run.

Rock Quality Designation (RQD)
The percentage of solid drill core, greater than 100 mm length, as measured along the centerline axis of the core, relative to the length of the total core run. RQD varies from 0% for completely broken core to 100% for core in solid segments.

DISCONTINUITY DATA

Fracture Index
A count of the number of naturally occuring discontinuities (physical separations) in the rock core. Mechanically induced breaks caused by drilling are not included.

Dip with Respect to Core Axis
The angle of the discontinuity relative to the axis (length) of the core. In a vertical borehole a discontinuity with a 90^{o} angle is horizontal.

Description and Notes
An abbreviation description of the discontinuities, whether naturally occurring separations such as fractures, bedding planes and foliation planes and mechanically separated bedding or foliation surfaces. Additional information concerning the nature of fracture surfaces and infillings are also noted.

Abbreviations

JN	Joint	PL	Planar
FLT	Fault	CU	Curved
SH	Shear	UN	Undulating
VN	Vein	IR	Irregular
FR	Fracture	K	Slickensided
SY	Stylolite	PO	Polished
BD	Bedding	SM	Smooth
FO	Foliation	SR	Slightly Rough
CO	Contact	RO	Rough
AXJ	Axial Joint	VR	Very Rough
KV	Karstic Void		
MB	Mechanical Break		

PROJECT: 20144766

RECORD OF BOREHOLE: 20-01

LOCATION: N 5031000.8 ;E 369909.0

BORING DATE: July 6, 2020

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

BORING METHOD: Power Auger, 200 mm Diam. (Hollow Stem)

SOIL PROFILE

ELEV. / DEPTH (m)	DESCRIPTION
62.34	GROUND SURFACE
0.00	FILL/TOPSOIL - (ML) sandy SILT; brown, contains wood; non-cohesive
0.08	FILL - (ML) sandy SILT, trace gravel; brown to dark brown, contains rootlets, ash and cinders; non-cohesive, moist, compact to very loose
59.29 / 3.05	FILL - (ML) gravelly sandy SILT, some plastic fines; dark grey, contains cinders and ash; non-cohesive, moist, loose to very loose
57.77 / 4.57	FILL - (SM) gravelly SILTY SAND, some plastic fines; grey, contains cinders and ash; non-cohesive, moist, very, loose
57.15 / 5.19	(SM) gravelly SILTY SAND, some clay (GLACIAL TILL); wet, very loose to compact

SAMPLES

NUMBER	TYPE	BLOWS/0.30m	ADDITIONAL LAB. TESTING
1	SS	14	
2	SS	3	
3	SS	2	
4	SS	4	
5	SS	4	
6	SS	2	
7	SS	2	
8	SS	6	
9	SS	15	
10	SS	9	
11	SS	10	MH
12	SS	2	
13	SS	12	
14	SS	WH	

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80

SHEAR STRENGTH Cu, kPa: nat V. + Q - ● ; rem V. ⊕ U - ○ : 20 40 60 80

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp —○W— Wl : 20 40 60 80

PIEZOMETER OR STANDPIPE INSTALLATION: Flush Mount Casing; Bentonite Seal

DEPTH SCALE METRES: 0 1 2 3 4 5 6 7 8 9 10

CONTINUED NEXT PAGE

DEPTH SCALE 1 : 50

GOLDER

LOGGED: RA

CHECKED: BB

MIS-BHS 001 20144766.GPJ GAL-MIS.GDT 9/4/20 JEM

PROJECT: 20144766

RECORD OF BOREHOLE: 20-01

LOCATION: N 5031000.8 ;E 369909.0

BORING DATE: July 6, 2020

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - O (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT Wp —O W— Wl (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	Power Auger 200 mm Diam. (Hollow Stem)	(SM) gravelly SILTY SAND, some clay (GLACIAL TILL); wet, very loose to compact			14	SS	WH				
11					15	SS	2		O		
					16	SS	3				Bentonite Seal
12					17	SS	>50		O		
				49.48 12.86							
13		Borehole continued on RECORD OF DRILLHOLE 20-01									
14											
15											
16											
17											
18											
19											
20											

MIS-BHS 001 20144766.GPJ GAL-MIS.GDT 9/4/20 JEM

DEPTH SCALE
1 : 50

GOLDER

LOGGED: RA
CHECKED: BB

PROJECT: 20144766

RECORD OF DRILLHOLE: 20-01

SHEET 3 OF 3

LOCATION: N 5031000.8 ;E 369909.0

DRILLING DATE: July 6, 2020

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME-75

DRILLING CONTRACTOR: Grenville Drilling

JN - Joint, FLT - Fault, SHR - Shear, VN - Vein, CJ - Conjugate
BD - Bedding, FO - Foliation, CO - Contact, OR - Orthogonal, CL - Cleavage
PL - Planar, CU - Curved, UN - Undulating, ST - Stepped, IR - Irregular
PO - Polished, K - Slickensided, SM - Smooth, Ro - Rough, MB - Mechanical Break
BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	FLUSH / COLOUR % RETURN	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	R.Q.D. %	FRACT. INDEX PER 0.25 m	DIP w.r.t. CORE AXIS	DISCONTINUITY DATA TYPE AND SURFACE DESCRIPTION	Jcon	Jr	Ja	HYDRAULIC CONDUCTIVITY K, cm/sec	Diametral Point Load Index (MPa)	RMC -Q' AVG.	
		GROUND SURFACE		49.48															
13–16	Rotary Drill HQ Core	Slightly weathered to fresh, black, fine grained SHALE		12.86	1														Bentonite Seal
					2														Silica Sand
					3														51 mm Diam. PVC #10 Slot Screen
				46.24															
		End of Drillhole		16.10															WL in Screen at Elev. 54.94 m on July 21, 2020

Depth scale marks: 13, 14, 15, 16, 17, 18, 19, 20, 21, 22

MIS-RCK 004 20144766.GPJ GAL-MISS.GDT 9/4/20 JEM

DEPTH SCALE

1 : 50

GOLDER

LOGGED: RA

CHECKED: BB

PROJECT: 20144766

RECORD OF BOREHOLE: 20-02

SHEET 1 OF 3

LOCATION: N 5030948.6 ;E 369860.9

BORING DATE: July 9, 2020

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE DESCRIPTION	ELEV. DEPTH (m)	SAMPLE NUMBER	TYPE	BLOWS/0.30m	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200 mm Diam. (Hollow Stem)	GROUND SURFACE	62.14					
		ASPHALTIC CONCRETE	0.04					Flush Mount Casing
		FILL - (SM) gravelly SILTY SAND; brown, contains organics; non-cohesive, moist		1	SS	36		
		FILL - (SM) gravelly SILTY SAND; grey black, contains cinders, ash, and red brick pieces; non-cohesive, moist, very loose to compact	61.38 0.76	2	SS	14		
1–2				3	SS	4		
2–3				4	SS	7		
3				5	SS	3	M	
4				6	SS	3		
5				7	SS	4		Bentonite Seal
		(ML) CLAYEY SILT to SILT; grey brown (GLACIAL TILL); cohesive, w~PL, firm to stiff	56.80 5.34	8	SS	5		
6				9	SS	11	MH	
7								▽
		(SM) gravelly SILTY SAND, some clay; grey (GLACIAL TILL); non-cohesive, moist, compact to dense	54.51 7.63	10	SS	26		
8–9				11	SS	12	MH	
9				12	SS	35		
10			52.23 9.91	13	SS	35		

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80

SHEAR STRENGTH Cu, kPa: nat V. + Q - ● ; rem V. ⊕ U - ○ ; 20 40 60 80

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp —○W— Wl ; 20 40 60 80

CONTINUED NEXT PAGE

DEPTH SCALE 1 : 50

GOLDER

LOGGED: RA

CHECKED: BB

PROJECT: 20144766

RECORD OF BOREHOLE: 20-02

LOCATION: N 5030948.6 ;E 369860.9

BORING DATE: July 9, 2020

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT Wp —○W— Wl (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	Power Auger; 200 mm Diam. (Hollow Stem)	(ML) sandy SILT to SILT, some gravel; grey, contains shale fragments (GLACIAL TILL); non-cohesive, wet, dense to very dense			13	SS	35		○		
11					14	SS	39		○		
12					15	SS	78		○		
					16	SS	>50				Bentonite Seal
13					17	SS	>50		○		
				48.28	18	SS	>50				
14		Borehole continued on RECORD OF DRILLHOLE 20-02		13.86							
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

GOLDER

LOGGED: RA

CHECKED: BB

RECORD OF DRILLHOLE: 20-02

PROJECT: 20144766

SHEET 3 OF 3

LOCATION: N 5030948.6 ;E 369860.9

DRILLING DATE: July 9, 2020

DATUM: Geodetic

DRILL RIG: CME-75

INCLINATION: -90° AZIMUTH: ---

DRILLING CONTRACTOR: Grenville Drilling

JN - Joint, FLT - Fault, SHR - Shear, VN - Vein, CJ - Conjugate, BD - Bedding, FO - Foliation, CO - Contact, OR - Orthogonal, CL - Cleavage, PL - Planar, CU - Curved, UN - Undulating, ST - Stepped, IR - Irregular, PO - Polished, K - Slickensided, SM - Smooth, Ro - Rough, MB - Mechanical Break, BR - Broken Rock

NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	Installation
		GROUND SURFACE		48.28		
14	Rotary Drill, HQ Core	Highly weathered to fresh, black, fine grained SHALE		13.86	1	Bentonite Seal
15					2	Silica Sand
16						51 mm Diam. PVC #10 Slot Screen
17				45.02 17.12	3	
		End of Drillhole				WL in Screen at Elev. 54.84 m on July 21, 2020
18						
19						
20						
21						
22						
23						

Column headings: COLOUR % RETURN; FLUSH; RECOVERY (TOTAL CORE %, SOLID CORE %; 80 60 40 20); R.Q.D. % (80 60 40 20); FRACT. INDEX PER 0.25 m (5 10 15 20); DISCONTINUITY DATA (DIP w.r.t. CORE AXIS 0 30 60 90; TYPE AND SURFACE DESCRIPTION; Jcon; Jr; Ja); HYDRAULIC CONDUCTIVITY K, cm/sec (10^{-6} 10^{-5} 10^{-4} 10^{-3}); Diametral Point Load Index (MPa) (2 4 6); RMC -Q' AVG.

MIS-RCK 004 20144766.GPJ GAL-MISS.GDT 9/4/20 JEM

DEPTH SCALE

1 : 50

GOLDER

LOGGED: RA

CHECKED: BB

PROJECT: 20144766

RECORD OF BOREHOLE: 20-03

LOCATION: N 5030932.9 ;E 369899.2

BORING DATE: July 13, 2020

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

Column headings: DEPTH SCALE METRES | BORING METHOD | SOIL PROFILE (DESCRIPTION, STRATA PLOT, ELEV. DEPTH (m)) | SAMPLES (NUMBER, TYPE, BLOWS/0.30m) | DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20, 40, 60, 80) | SHEAR STRENGTH Cu, kPa (nat V. + Q - ●; rem V. ⊕ U - ○) (20, 40, 60, 80) | HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}) | WATER CONTENT PERCENT (Wp ⊢—○W—⊣ Wl) (20, 40, 60, 80) | ADDITIONAL LAB. TESTING | PIEZOMETER OR STANDPIPE INSTALLATION

BORING METHOD: Power Auger, 200 mm Diam. (Hollow Stem)

DESCRIPTION	ELEV. / DEPTH (m)
GROUND SURFACE	62.47
CONCRETE	0.00
FILL - (SM) gravelly SILTY SAND; brown; non-cohesive, moist, compact to dense	0.13
FILL - (SM) gravelly SILTY SAND; brown black, contains cinders, ash, and red brick pieces; non-cohesive, wet, loose	60.94 / 1.53
(CI) SILTY CLAY; grey brown; cohesive, w>PL, moist, firm to stiff	57.13 / 5.34
(ML) CLAYEY SILT to SILT; grey (GLACIAL TILL); cohesive, w~PL, wet, firm	55.61 / 6.86
(SM) gravelly SILTY SAND, some clay; dark grey (GLACIAL TILL); cohesive, wet, loose to compact	54.85 / 7.62
	52.56 / 9.91

NUMBER	TYPE	BLOWS/0.30m	ADDITIONAL LAB. TESTING
1	SS	11	
2	SS	36	
3	SS	5	
4	SS	4	
5	SS	6	CHEM
6	SS	4	
7	SS	4	
8	SS	12	
9	SS	7	
10	SS	5	
11	SS	17	
12	SS	24	
13	SS	9	
14	SS	15	

PIEZOMETER OR STANDPIPE INSTALLATION: Flush Mount Casing; Bentonite Seal; Silica Sand

CONTINUED NEXT PAGE

DEPTH SCALE 1 : 50

GOLDER

LOGGED: RA

CHECKED: BB

PROJECT: 20144766

RECORD OF BOREHOLE: 20-03

LOCATION: N 5030932.9 ;E 369899.2

BORING DATE: July 13, 2020

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	TYPE	BLOWS/0.30m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT Wp ⊢—○W—⊣ Wl (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	Power Auger, 200 mm Diam. (Hollow Stem)	(ML) sandy SILT to SILT; grey (GLACIAL TILL); non-cohesive, compact to very dense			14	SS	15				Silica Sand
11				51.03 / 11.44	15	SS	64				
12		(SM) gravelly SILTY SAND, some clay; grey (GLACIAL TILL); non-cohesive, wet, very dense			16	SS	55				51 mm Diam. PVC #10 Slot Screen
					17	SS	>50				
13					18	SS	>50				WL in Screen at Elev. 55.19 m on July 21, 2020
14				48.35 / 14.12	19	SS	>50				
	Rotary Drill, HW Casing	Mechanically broken SHALE		47.67 / 14.80							
15		End of Borehole									
16											
17											
18											
19											
20											

MIS-BHS 001 20144766.GPJ GAL-MIS.GDT 9/4/20 JEM

DEPTH SCALE

1 : 50

GOLDER

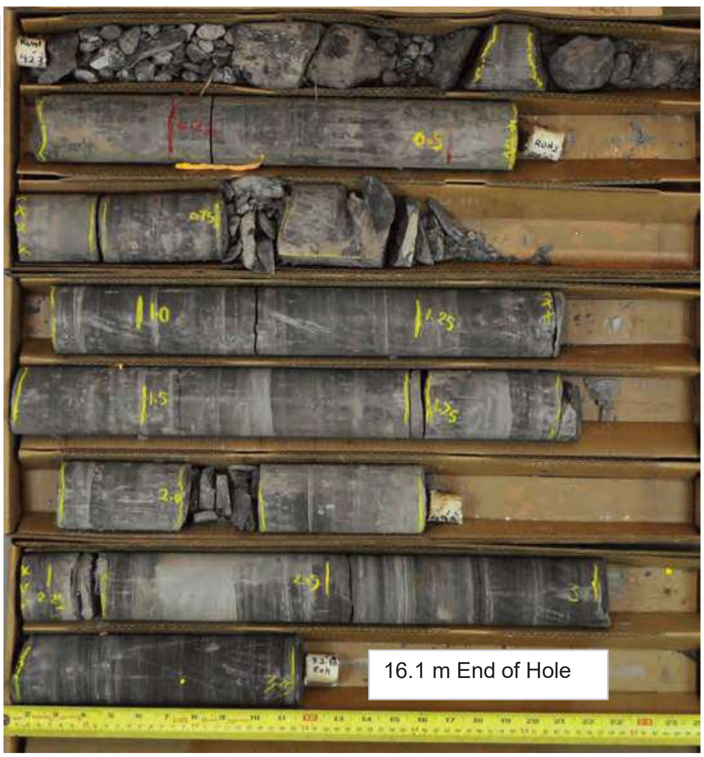
LOGGED: RA

CHECKED: BB

Path: https://golderassociates.sharepoint.com/sites/127981/Project Files/5 Technical Work/Bedrock Core Photos/20144766 Core Photos/Core Plates | File: Core Plates

BH 20-01 (Dry)
Cored Length of 12.90 to 16.10 metres
Core Box 1 to 3 of 3

12.9 m Top of Bedrock



CLIENT The Univeristy of Ottawa	PROJECT 200 Lees Ave Redevelopment

CONSULTANT			TITLE			
GOLDER	DD/MM/YYYY	2020-08-07	**BOREHOLE 20-01 (DRY)**			
	PREPARED	BB	**CORE PHOTOGRAPHS**			
	DESIGN					
	REVIEW	CH	PROJECT No.	PHASE	Rev.	FIGURE
	APPROVED	CH	20144766	2000	A	A1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

BH 20-01 (Wet)
Cored Length of 12.90 to 16.10 metres
Core Box 1 to 3 of 3

12.9 m Top of Bedrock

CLIENT The University of Ottawa	PROJECT 200 Lees Ave Redevelopment

CONSULTANT			TITLE			
GOLDER	DD/MM/YYYY	2020-08-07	**BOREHOLE 20-01 (WET)**			
	PREPARED	BB	**CORE PHOTOGRAPHS**			
	DESIGN					
	REVIEW	CH	PROJECT No.	PHASE	Rev.	FIGURE
	APPROVED	CH	20144766	2000	A	A2

BH 20-02 (Dry)
Cored Length of 13.90 to 17.10 metres
Core Box 1 to 3 of 3

13.9 m Top of Bedrock

17.1 m - End of Hole

CLIENT The University of Ottawa	PROJECT 200 Lees Ave Redevelopment

CONSULTANT
GOLDER

DD/MM/YYYY	2020-08-07
PREPARED	BB
DESIGN	
REVIEW	CH
APPROVED	CH

TITLE
BOREHOLE 20-02 (DRY)
CORE PHOTOGRAPHS

PROJECT No.	PHASE	Rev.	FIGURE
20144766	2000	A	A3

Path: https://golderassociates.sharepoint.com/sites/127981/Project Files/5 Technical Work/Bedrock Core Photos/20144766 Core Photos/Core Plates | File: Core Plates

BH 20-02 (Wet)
Cored Length of 13.90 to 17.10 metres
Core Box 1 to 3 of 3

13.9 m Top of Bedrock

17.1 m - End of Hole

CLIENT The Univeristy of Ottawa	PROJECT 200 Lees Ave Redevelopment

CONSULTANT		
GOLDER	DD/MM/YYYY	2020-08-07
	PREPARED	BB
	DESIGN	
	REVIEW	CH
	APPROVED	CH

TITLE
BOREHOLE 20-02 (WET)
CORE PHOTOGRAPHS

PROJECT No.	PHASE	Rev.	FIGURE
20144766	2000	A	A4

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A

BH 20-03 (Dry)
Cored Length of 14.10 to 14.80 metres
Core Box 1 to 1 of 1

14.1 m Top of Bedrock

14.8 m - End of Hole

CLIENT The Univeristy of Ottawa	PROJECT 200 Lees Ave Redevelopment

CONSULTANT: GOLDER

DD/MM/YYYY	2020-08-07
PREPARED	BB
DESIGN	
REVIEW	CH
APPROVED	CH

TITLE
BOREHOLE 20-03 (DRY)
CORE PHOTOGRAPHS

PROJECT No.	PHASE	Rev.	FIGURE
20144766	2000	A	A5

BH 20-03 (Wet)
Cored Length of 14.10 to 14.80 metres
Core Box 1 to 1 of 1

14.1 m Top of Bedrock

14.8 m - End of Hole

CLIENT The Univeristy of Ottawa	PROJECT 200 Lees Ave Redevelopment

CONSULTANT			TITLE			
GOLDER	DD/MM/YYYY	2020-08-07	**BOREHOLE 20-03 (WET)** **CORE PHOTOGRAPHS**			
	PREPARED	BB				
	DESIGN					
	REVIEW	CH	PROJECT No.	PHASE	Rev.	FIGURE
	APPROVED	CH	20144766	2000	A	A6

PROJECT: 11-1121-0057

RECORD OF BOREHOLE: 11-1

SHEET 1 OF 3

LOCATION: See Site Plan

BORING DATE: May 12, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger, 200mm Diam. (Hollow Stem)	GROUND SURFACE	62.23				
		ASPHALTIC CONCRETE	0.09				
		Grey crushed stone (FILL)	0.26				
		Brown sand, some gravel, trace silt (FILL)	61.41 / 0.82				
1		Very loose brown and black cinders and ash in sand and sandy silt matrix, trace to some glass, brick and mortar (FILL)		1	50 DO	5	
2				2	50 DO	2	
				3	50 DO	2	
3				4	50 DO	1	
4				5	50 DO	1	
5				6	50 DO	2	
		Dark grey organic clayey silt (ALLUVIUM)	57.05 / 5.18				
		Very stiff grey brown SILTY CLAY	56.59 / 5.64	7	50 DO	1	
6				8	50 DO	4	
7		Very loose to compact grey SANDY SILT, with some gravel (GLACIAL TILL)	55.37 / 6.86	9	50 DO	1	63.5mm Diam. VSP Pipe
8				10	50 DO	>100	
9				11	50 DO	25	
				12	50 DO	19	
10				13	50 DO	30	
11	Rotary Drill, HQ Core	Fresh black SHALE BEDROCK (Carlsbad Formation)	51.29 / 10.94	C1	HQ RC	DD	
12				C2	HQ RC	DD	
13							
14				C3	HQ RC	DD	
15			47.29				

Chart columns (no data plotted): DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20, 40, 60, 80); SHEAR STRENGTH Cu, kPa — nat V + Q - ●, rem V ⊕ U - ○ (20, 40, 60, 80); HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}); WATER CONTENT PERCENT — Wp, W, Wl (20, 40, 60, 80); ADDITIONAL LAB TESTING; STRATA PLOT.

CONTINUED NEXT PAGE

DEPTH SCALE 1 : 75

Golder Associates

LOGGED: P.A.H.

CHECKED: N.R.L.

PROJECT: 11-1121-0057

RECORD OF BOREHOLE: 11-1

SHEET 2 OF 3

LOCATION: See Site Plan

BORING DATE: May 12, 2011

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - O (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT Wp —O W— Wl (20 40 60 80)	ADDITIONAL LAB TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		— CONTINUED FROM PREVIOUS PAGE —									
15	Rotary Drill, HQ Core	Fresh black SHALE BEDROCK some grey limestone interbedding (Carlsbad Formation)									
16					C4	HQ RC	DD				
17					C5	HQ RC	DD				63.5mm Diam VSP Pipe
18					C6	HQ RC	DD				
19		End of Borehole		42.56 / 19.67							
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											

DEPTH SCALE

1 : 75

Golder Associates

LOGGED: P.A.H.

CHECKED: N.R.L.

PROJECT: 11-1121-0057

RECORD OF DRILLHOLE: 11-1

LOCATION: See Site Plan

DRILLING DATE: May 12, 2011

DATUM: Geodetic

DRILL RIG: CME 75

INCLINATION: -90° AZIMUTH: ---

DRILLING CONTRACTOR: Marathon Drilling

FR/FX-FRACTURE, F-FAULT, SM-SMOOTH, FL-FLEXURED, BC-BROKEN CORE, CL-CLEAVAGE, J-JOINT, R-ROUGH, UE-UNEVEN, MB-MECH BREAK, SH-SHEAR, P-POLISHED, ST-STEPPED, W-WAVY, B-BEDDING, VN-VEIN, S-SLICKENSIDED, PL-PLANAR, C-CURVED

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	ELEV. DEPTH (m)	RUN No	FLUSH % RETURN	NOTES WATER LEVELS INSTRUMENTATION
		BEDROCK SURFACE	51.29 10.94			
11	Rotary Drill HQ Core	Fresh black SHALE BEDROCK, some grey limestone interbedding (Carlsbad Formation)		1	100	
12–13				2	100	
14				3	100	63.5mm Diam VSP Pipe
15–16				4	100	
17				5	100	
18			43.56 18.67	6	100	
		End of Borehole				

Other column headers: SYMBOLIC LOG; PENETRATION RATE (m/min); COLOUR; RECOVERY (TOTAL CORE %, SOLID CORE %); R.Q.D. %; FRACT INDEX PER 0.3; DISCONTINUITY DATA (DIP w.r.t. CORE AXIS; TYPE AND SURFACE DESCRIPTION); HYDRAULIC CONDUCTIVITY K, cm/sec (10^{-6} 10^{-5} 10^{-4} 10^{-3}); DIAMETRAL POINT LOAD INDEX (MPa).

Depth scale: 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25

DEPTH SCALE
1 : 75

Golder Associates

LOGGED: P.A.H.
CHECKED: J.M.R.

Golder Associates Ltd

32 Steacie Drive
Kanata, Ontario K2K 2A9
Tel: (613) 592-9600
Fax: (613) 592-9601

TEST PIT RECORD

TEST PIT # 11-7

DATE: May 13, 2011

PROJECT: U of O - 200 Lees Avenue Block A Redevelopment
PROJECT No.: 11-1121-0057

EQUIPMENT: Test pits excavated with rubber-tired backhoe.

Depth (m)	Elevation (m)		Description	Remarks
0.00	62.20	Grade Beam Foundation	TOPSOIL	
0.55	61.65		Brown cinders and ashes in a matrix of silty sand, some gravel and cobbles, with pieces of glass, steel, wire and other miscellaneous debris (FILL)	
2.00	60.20	Franki Pile		Franki Pile width about 300 to 400 mm
2.55	59.65		Bottom of test pit -- No groundwater infiltration.	

Logged by : NRL
Compiled by : NRL
Checked by : TJN

RECORD OF BOREHOLE: 00-2

PROJECT: 001-2721

SHEET 1 OF 1

LOCATION: See Site Plan

BORING DATE: March 23, 2000

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

BORING METHOD: Power Auger, 200mm Diam (Hollow Stem)

SOIL PROFILE – DESCRIPTION	ELEV. / DEPTH (m)	SAMPLE NUMBER	TYPE	BLOWS/0.3m
Ground Surface	62.08			
TOPSOIL	0.15			
Very loose grey brown and red brown to black cinders and ash, sand, trace brick, glass, ceramics, organics and coal fragments (Cinder & Ash FILL)		1	50 DO	3
		2	76 DO	3
		3	76 DO	2
		4	76 DO	2
Compact to loose grey brown to dark grey sandy silt with gravel (GLACIAL TILL)	58.27 / 3.81	5	76 DO	17
		6	50 DO	16
		7	50 DO	10
		8	50 DO	7
Dense dark grey sandy silt with gravel, occasional medium to coarse sand seam/layer (GLACIAL TILL)	55.37 / 6.71	9	50 DO	36
		10	50 DO	41
		11	50 DO	37
Very dense dark grey SILTY SAND and GRAVEL	51.72 / 10.36	12	50 DO	111
END OF BOREHOLE REFUSAL TO AUGER	50.19 / 11.89			

Gastechtor ppm ⊕ (100, 200, 300, 400)

PID ppm □ (20, 40, 60, 80)

HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6}, 10^{-5}, 10^{-4}, 10^{-3})

WATER CONTENT PERCENT: Wp ⊢—○W—⊣ Wl (20, 40, 60, 80)

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION:

- Cement Seal
- Pea Stone Backfill
- Native Backfill
- Bentonite Seal
- Granular Filler
- 50mm PVC #10 Slot Screen
- Bentonite Seal
- Sand Backfill
- Native and Caved Material

Screen Dry Mar. 31, 2000

DEPTH SCALE (METRES): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15

DEPTH SCALE

1 : 75

Golder Associates

LOGGED: P.A.H.

CHECKED: PLE

RECORD OF BOREHOLE: 00-3

PROJECT: 001-2721
LOCATION: See Site Plan
SAMPLER HAMMER, 64kg; DROP, 760mm

BORING DATE: March 21, 2000

SHEET 1 OF 1
DATUM: Geodetic
PENETRATION TEST HAMMER, 64kg; DROP, 760mm

BORING METHOD: Power Auger, 200mm Diam (Hollow Stem)

DESCRIPTION (SOIL PROFILE)	ELEV. / DEPTH (m)
Ground Surface	62.10
SAND, some organics	0.15
Very loose to loose grey brown, grey, red-brown to black cinders and ash, some sand, trace glass, organics, coal fragments (Cinder & Ash FILL)	56.92 / 5.18
Loose to compact, layered, grey fine sand and silts, trace organics (ALLUVIUM)	55.55 / 6.55
Compact grey brown sandy silt, some gravel (GLACIAL TILL)	54.78 / 7.32
END OF BOREHOLE	

SAMPLES NUMBER	TYPE	BLOWS/0.3m
1	50 DO	3
2	50 DO	2
3	76 DO	5
4	50 DO	7
5	76 DO	5
6	76 DO	3
7	50 DO	6
8	50 DO	11
9	50 DO	12

Gastechtor ppm ⊕ 100 200 300 400
PID ppm □ 20 40 60 80

HYDRAULIC CONDUCTIVITY, k, cm/s 10^{-6} 10^{-5} 10^{-4} 10^{-3}
WATER CONTENT PERCENT Wp W Wl 20 40 60 80

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION:
Cement Seal
Pea Stone Backfill
Bentonite Seal
Granular Filter
50mm PVC #10 Slot Screen

W.L in Screen at Elev.56.52m Mar. 31, 2000

DEPTH SCALE METRES: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

DEPTH SCALE
1 : 75

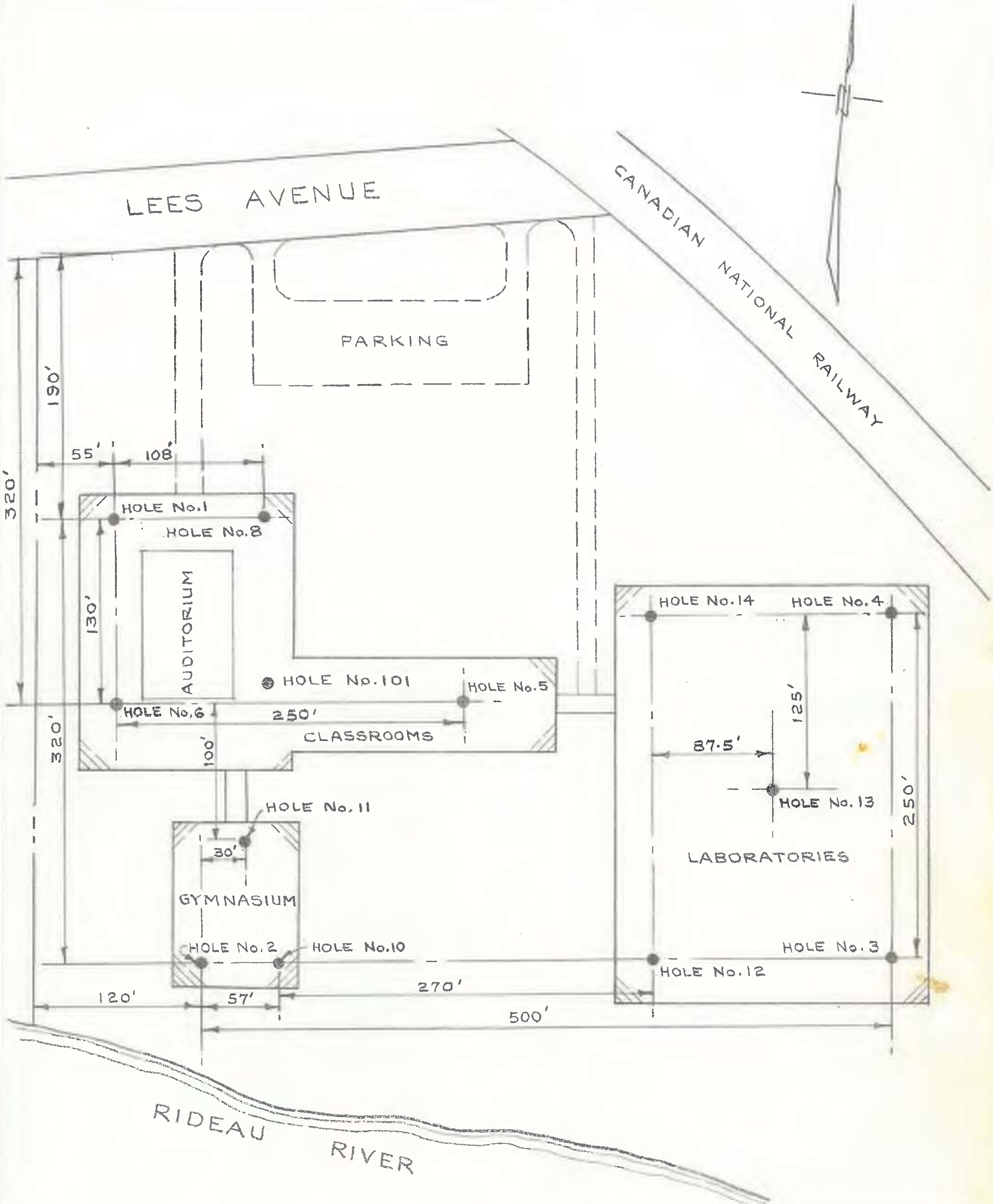
Golder Associates

LOGGED: P.A.H.
CHECKED: PE

RECORD OF TEST PITS

Test Pit *Number*	**Depth** **(metres)**	*Description*
TP00-1 Ground Surface Elev. 61.68 m	0.00 – 0.09	Asphalt
	0.09 – 0.90	Grey stone, sand and gravel (FILL)
	0.90 – 1.50	Red brown and grey brown cinders and ash, some sand, trace boulders, glass and wood (CINDER AND ASH FILL)
	1.50 – 1.80	Grey silty clay (FILL)
	1.70 – 1.80	North side of test pit only – Light brown medium sand (FILL)
	1.80 – 2.10	Dark brown to black fine to medium sand, some gravel (FILL)
	2.10 – 2.40	Dark brown fine to medium sand, some gravel, trace ash (FILL)
	2.40 – 4.00	Brown fine to medium sand, some gravel, trace boulders (GLACIAL TILL)
	4.00	End of Test Pit
		Note: Test pit dry upon completion
TP00-2 Ground Surface Elev. 62.16 m	0.00 – 0.13	Organic TOPSOIL
	0.13 – 4.00	Red brown and grey brown cinders and ash, some sand, glass and metal, trace coal, wood, gravel, brick and concrete (metal content increases with depth) (CINDER AND ASH FILL)
	4.00	End of Test Pit
		Note: Test pit dry upon completion
TP00-3 Ground Surface Elev. 62.21 m	0.00– 0.10	Organic TOPSOIL
	0.10 – 0.50	Dark brown to black fine sand (FILL)
	0.50 – 2.10	Brown sand, some cinders and ash, glass, traces of coal, metal and organics (CINDER AND ASH FILL)
	2.10 – 2.50	Black sand, trace coal fragments and gravel, strong odour (FILL)
	2.50	End of Test Pit
		Note: Test pit dry upon completion
TP00-4 Ground Surface Elev. 62.05 m	0.00 – 0.13	Organic TOPSOIL
	0.13 – 2.50	Red brown and grey brown cinders and ash, some sand, glass, trace coal, wood, gravel and brick (CINDER AND ASH FILL)
	2.50 – 3.00	Black sand, trace coal fragments and gravel (FILL)
	3.00 – 4.00	Grey brown cinders and ash, some sand, trace coal (CINDER AND ASH FILL)
	4.00	End of Test Pit
		Note: Test pit dry upon completion

FORM 5-11-3



McROSTIE & ASSOCIATES LTD.
CONSULTING ENGINEERS

BOREHOLE LOCATIONS
LEES AVENUE

SCALE 1" = 100'	**PLATE** 1

FORM S-10-4

McROSTIE & ASSOCIATES LTD.
CONSULTING ENGINEERS
OTTAWA CANADA

SOIL PROFILE AND SUMMARY OF FIELD AND LABORATORY TESTS

LEES AVENUE

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 202.5' DATE MARCH 22 1962

HOLE No. 1

REMARKS B.M. (EL. 195.47') GEODETIC CITY B.M. NORTH SIDE OF LEES AVENUE ON OTTAWA GAS OFFICE.

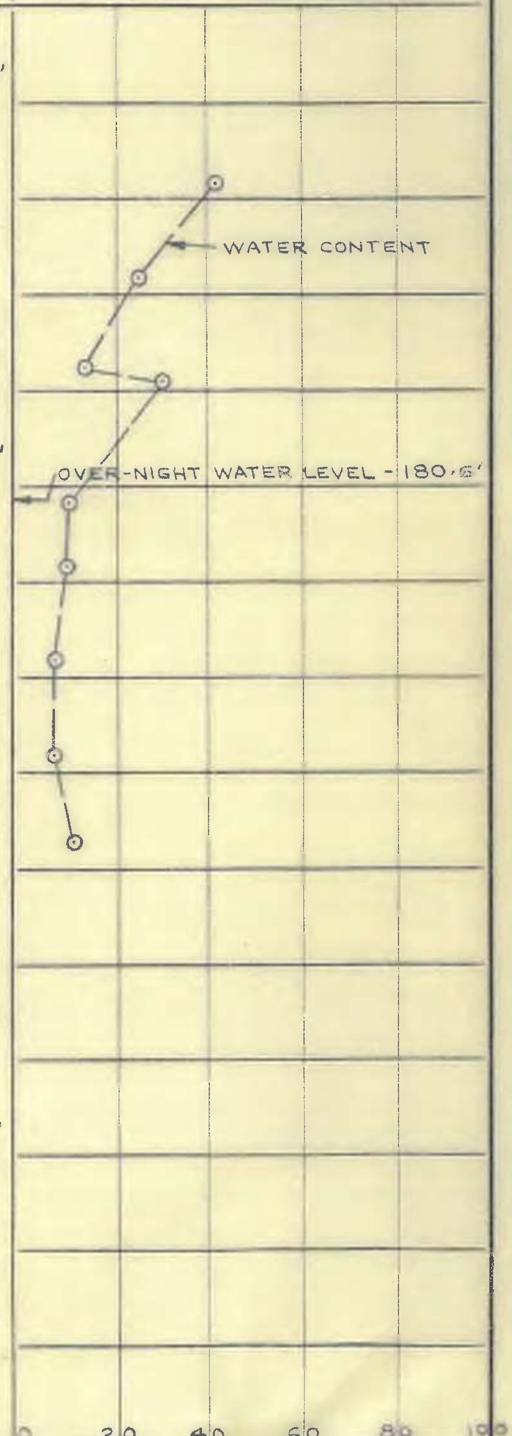
Unconfined Compressive Strength Kips/Ft.²	Small Scale Penetrometer Kips/Ft.²	Standard Penetration Blows/Ft.	Sample Number	Description of Soil	Depth in Feet	Elevation
				GROUND SURFACE	0'	202.5'
		7	1-1	FILL (SAND, ASHES, CINDERS, GLASS, WOOD & A NAIL)		
		12	1-2			
LOOSE SILTY FINE SAND WITH A LITTLE CLAY & A FEW PEBBLES					15'	187.5'
		3 for 6"	1-3A		15.5'	
		8	1-3B	LOOSE SILT WITH A FEW 1/8" CLAY LAYERS	20'	182.5'
		26	1-4	MEDIUM DENSE SANDY TILL		
		20	1-5			
		28	1-6		35'	167.5'
		123	1-7	DENSE TILL	38'	
		23 for 6"	1-8	DENSE SILT WITH A FEW PEBBLES & SHALE PARTICLES	43'	
				SHALEY TILL	44.6'	157.9'
				WEATHERED OR FRACTURED ROCK CORE RECOVERY 46%	49.6'	152.9
				ROCK CORE RECOVERY 98%	55'	147.5'
				BOTTOM OF HOLE		

~~PROBING OR VANE TEST~~

............LB. HAMMER ....INCH DROP

NO CASING ....INCH DIA. ROD

~~BLOWS PER FOOT OR~~ ~~SHEAR STRENGTH IN KIPS PER FT.²~~



% WATER CONTENT

NATURAL ⊙

LIQUID LIMIT □

PLASTIC LIMIT △

PLATE 2

R - REMOULDED

LOWE-MARTIN CO.—A55512

FORM S-10-4

McROSTIE & ASSOCIATES LTD.
CONSULTING ENGINEERS
OTTAWA CANADA

SOIL PROFILE AND SUMMARY OF FIELD AND LABORATORY TESTS

LEES AVENUE

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 203.7' DATE MARCH 26, 1962

REMARKS SEE PLATE No. 2

HOLE No. 2

UNCONFINED COMPRESSIVE STRENGTH Kips/FT.^{2}	SMALL SCALE PENETROMETER KIPS/FT.^{2}	STANDARD PENETRATION BLOWS/FT.	SAMPLE NUMBER	DESCRIPTION OF SOIL	DEPTH IN FEET	ELEVATION
				GROUND SURFACE	0'	203.7'
		3	2-1	FILL (ASHES WITH SILT WOOD, CINDERS & TILE)		
		5	2-2			
		5	2-3			
		6 6 for 6"	2-4		20'	183.7'
		15 2 for 6"	2-5	LOOSE TO MEDIUM DENSE SILT WITH A FEW 1/8" CLAY LAYERS		
					28'	175.7'
		58	2-6	BOULDERS IN DENSE SANDY TILL		
		138	2-7			
					40'	
		48	2-8	DENSE SILTY FINE SAND WITH SOME PEBBLES & SHALE PARTICLES		
					43.1'	160.6'
				ROCK CORE RECOVERY 94%		
					49'	
				ROCK CORE RECOVERY 97%		
				BOTTOM OF HOLE	54.5	149.2'

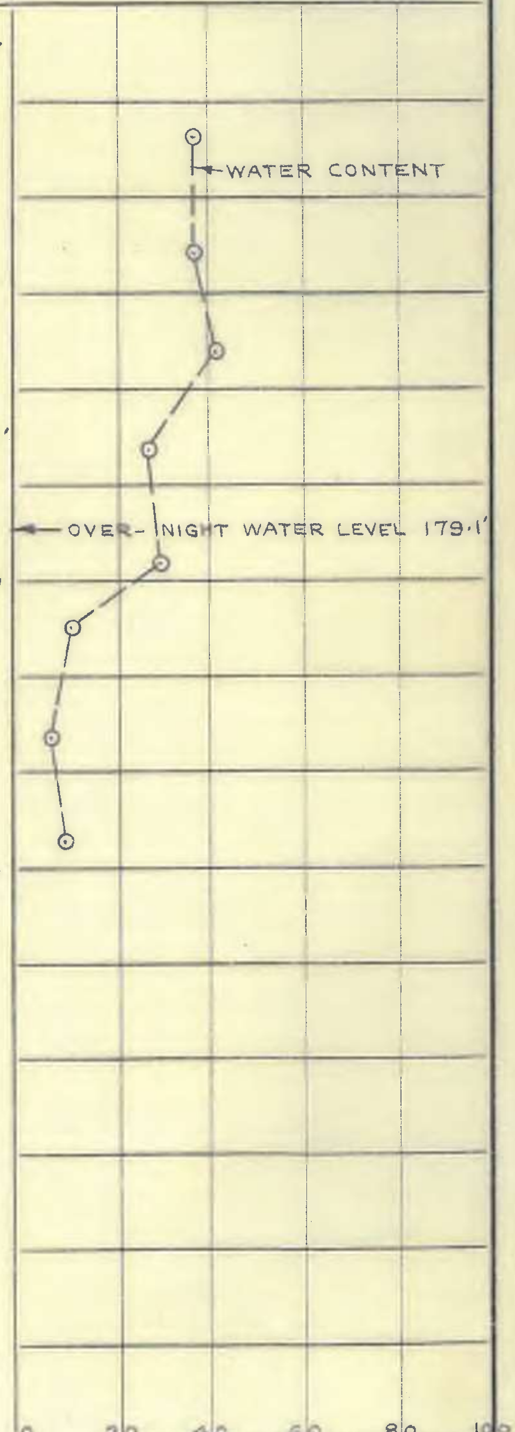
R - REMOULDED

PROBING OR VANE TEST

......LB. HAMMER ......INCH DROP

NO CASING ......INCH DIA. ROD

~~BLOWS PER FOOT OR~~ ~~SHEAR STRENGTH IN KIPS PER FT.^{2}~~



% WATER CONTENT
NATURAL ⊙
LIQUID LIMIT □
PLASTIC LIMIT △

PLATE 3

LOWE-MARTIN CO.—A55512

McROSTIE & ASSOCIATES LTD.
CONSULTING ENGINEERS
OTTAWA CANADA

SOIL PROFILE AND SUMMARY OF FIELD AND LABORATORY TESTS

LEES AVENUE

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 205·9' DATE MARCH 28, 1962

REMARKS SEE PLATE No. 2

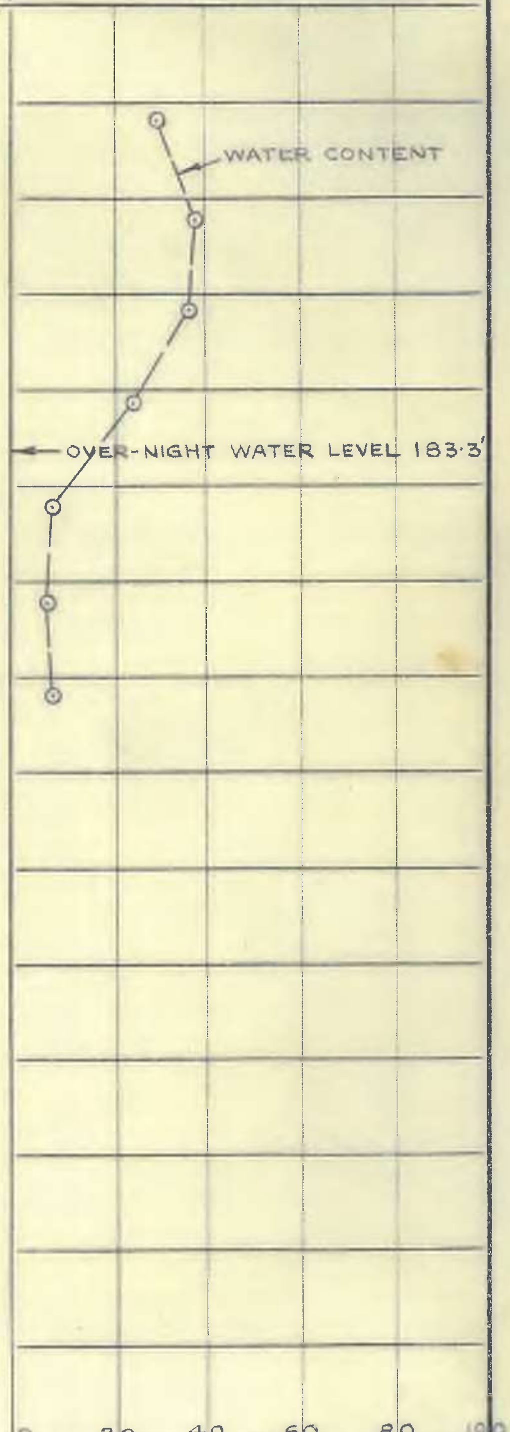
HOLE No. 3

UNCONFINED COMPRESSIVE STRENGTH Kips/FT.²	SMALL SCALE PENETROMETER KIPS/FT.²	STANDARD PENETRATION BLOWS/FT.	SAMPLE NUMBER	DESCRIPTION OF SOIL	DEPTH IN FEET	ELEVATION
				GROUND SURFACE	0'	205·9'
		13	3-1	FILL (SAND, ASHES, CONCRETE GLASS, TIN, WOOD & BRICK)		
		19	3-2			
		46	3-3			
		39	3-4			
		58	3-5		25·5'	180·4'
		77	3-6	DENSE TILL		
		90 for 6"	3-7		35'	170·9'
				WEATHERED SHALE	38·3'	167·6'
				ROCK CORE RECOVERY 87%	42·9'	
				ROCK CORE RECOVERY 82%	48·3'	157·6'
				BOTTOM OF HOLE		

~~PROBING OR VANE TEST~~

.....LB. HAMMER .....INCH DROP | NO CASING .....INCH DIA. ROD

~~BLOWS PER FOOT OR SHEAR STRENGTH IN KIPS PER FT.²~~



% WATER CONTENT
NATURAL ⊙
LIQUID LIMIT □
PLASTIC LIMIT △

PLATE 4

R - REMOULDED

McROSTIE & ASSOCIATES LTD.
CONSULTING ENGINEERS
OTTAWA CANADA

SOIL PROFILE AND SUMMARY OF FIELD AND LABORATORY TESTS

LEES AVENUE

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 204.0′ DATE MAR. 30, 1962

REMARKS SEE PLATE No. 2

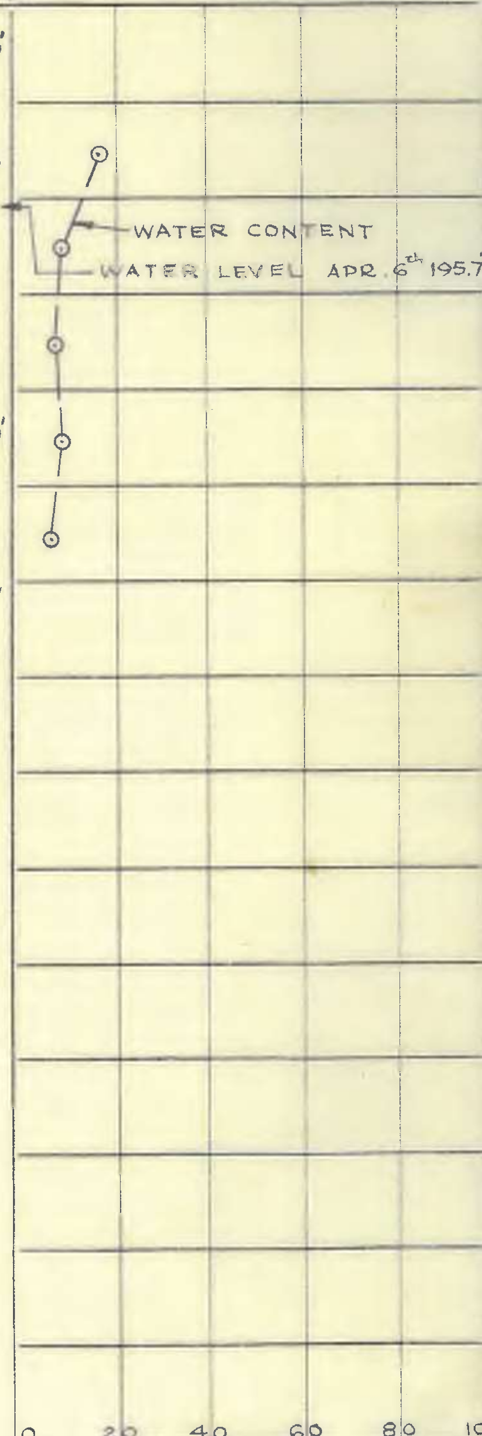
HOLE No. 4

Unconfined Compressive Strength Kips/Ft.^{2}	Small Scale Penetrometer Kips/Ft.^{2}	Standard Penetration Blows/Ft.	Sample Number	Description of Soil	Depth in Feet	Elevation
				GROUND SURFACE	0′	204.0′
		4	4-1	FILL (ASHES WITH SOME TILL)	6.5′	197.5′
		52	4-2	DENSE TILL		
		22	4-3	MEDIUM DENSE TILL	15′	
		34	4-4	DENSE TILL	20′	184.0′
		105	4-5	DENSE TILL		
		58 for 4″	4-6	BOULDERS IN TILL	28.4′	175.6′
				BOTTOM OF HOLE	32.5′	171.5′

~~PROBING OR VANE TEST~~

......LB. HAMMER ......INCH DROP | NO CASING ......INCH DIA. ROD

~~BLOWS PER FOOT OR SHEAR STRENGTH IN KIPS PER FT.^{2}~~



% WATER CONTENT
NATURAL ⊙
LIQUID LIMIT □
PLASTIC LIMIT △

R - REMOULDED

PLATE 5

McROSTIE & ASSOCIATES LTD.
CONSULTING ENGINEERS
OTTAWA CANADA

SOIL PROFILE AND SUMMARY OF FIELD AND LABORATORY TESTS

LEES AVENUE

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 205.2' DATE APRIL 27, 1962

HOLE No. 5

REMARKS SEE PLATE No. 2

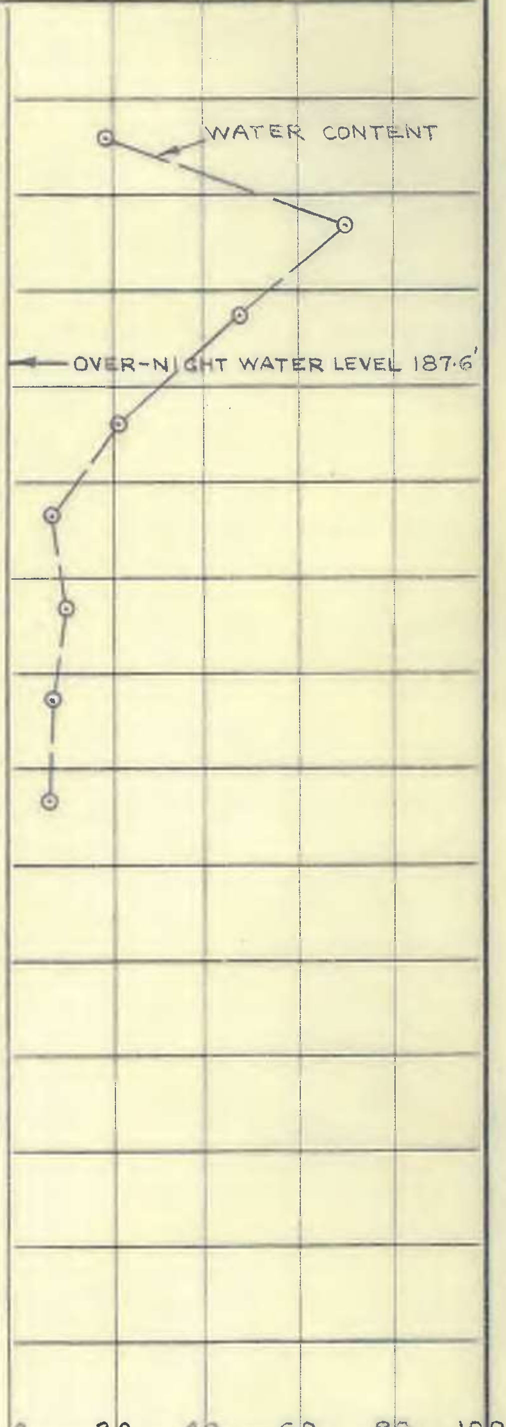
UNCONFINED COMPRESSIVE STRENGTH KIPS/FT.²	SMALL SCALE PENETROMETER KIPS/FT.²	STANDARD PENETRATION BLOWS/FT.	SAMPLE NUMBER	DESCRIPTION OF SOIL	DEPTH IN FEET	ELEVATION
				GROUND SURFACE	0'	205.2'
		2	5-1	FILL SAND, CINDERS GLASS, SILT & ASHES		
		6	5-2			
		8	5-3			
		34	5-4			
		21	5-5		25'	180.2'
				MEDIUM DENSE TILL WITH A 1' DENSE LAYER		
		37 "10 for 6"	5-6			
		70	5-7		35'	
				DENSE SANDY TILL		
		22	5-8	MEDIM DENSE SANDY TILL	40' / 41.2'	164.0'
				ROCK CORE RECOVERY 93%		
				BOTTOM OF HOLE	47.2'	158.0'

PROBING ~~OR VANE TEST~~

....LB. HAMMER ....INCH DROP

NO CASING ....INCH DIA. ROD

~~BLOWS PER FOOT OR~~ ~~SHEAR STRENGTH IN KIPS PER FT.²~~



% WATER CONTENT
NATURAL ⊙
LIQUID LIMIT □
PLASTIC LIMIT △

R - REMOULDED

PLATE 6

FORM S-10-4

McROSTIE & ASSOCIATES LTD.
CONSULTING ENGINEERS
OTTAWA CANADA

SOIL PROFILE AND SUMMARY OF FIELD AND LABORATORY TESTS

LEES AVENUE

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 204.9' DATE MAY 3, 1962

REMARKS SEE PLATE No. 2

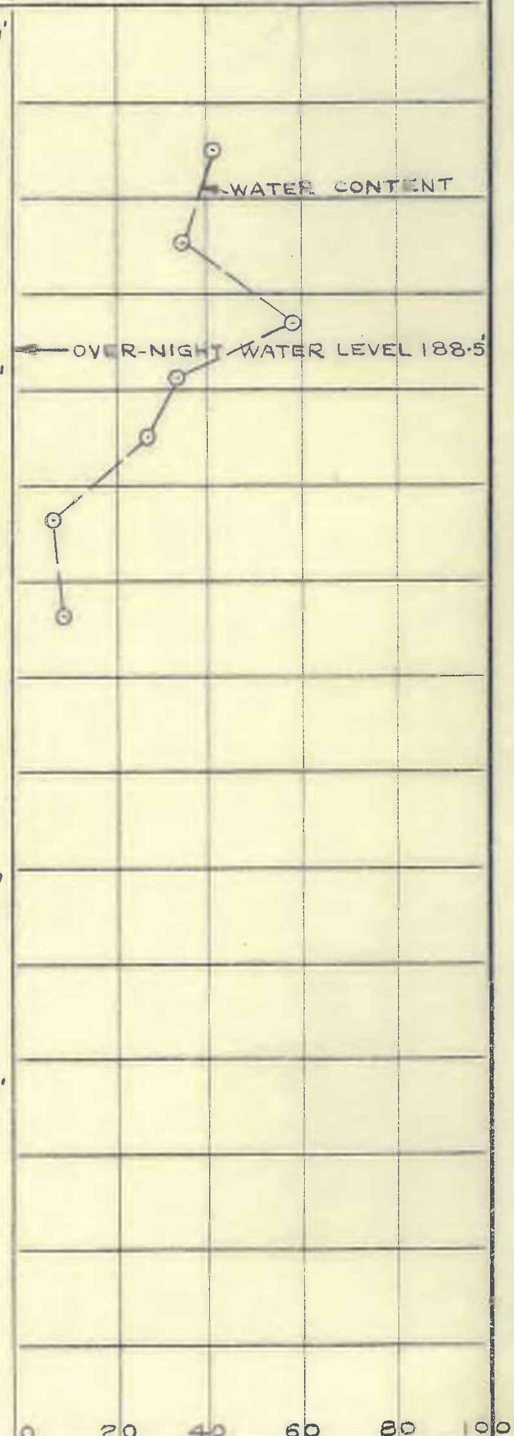
HOLE No. 6

UNCONFINED COMPRESSIVE STRENGTH KIPS/FT.²	SMALL SCALE PENETROMETER KIPS/FT.²	STANDARD PENETRATION BLOWS/FT.	SAMPLE NUMBER	DESCRIPTION OF SOIL	DEPTH IN FEET	ELEVATION
				GROUND SURFACE	0'	204.9'
		5	6-1	FILL ASHES, SILT, CINDERS SAND, TOPSOIL CLAY, WOOD & ORGANIC MATERIAL		
		4	6-2			
		8	6-3			
		4	6-4		18'	186.9'
		6 6 for 6"	6-5	LOOSE SILT	21.5'	183.4
				DENSE SANDY TILL	26'	
		45 14 for 6"	6-6	MEDIUM DENSE SANDY TILL	30.5'	
		13 8	6-7	BOULDERS IN SANDY TILL	44.6	160.3'
				ROCK CORE RECOVERY 83%	50.6	
				ROCK CORE RECOVERY 80%	55.3'	149.6'
				BOTTOM OF HOLE		

PROBING OR VANE TEST

..........LB. HAMMER ....INCH DROP | NO CASING ....INCH DIA. ROD

BLOWS PER FOOT OR SHEAR STRENGTH IN KIPS PER FT.²



% WATER CONTENT
NATURAL ⊙
LIQUID LIMIT □
PLASTIC LIMIT △

PLATE 7

R - REMOULDED

LOWE-MARTIN CO.—A55512

FORM S-10-4

McROSTIE & ASSOCIATES LTD.
CONSULTING ENGINEERS
OTTAWA CANADA

SOIL PROFILE AND SUMMARY OF FIELD AND LABORATORY TESTS

LEES AVENUE

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 204.6' DATE APRIL 18, 1960

HOLE No. 101

REMARKS THIS BOREHOLE WAS MADE IN 1960 AS PART OF QUEENSWAY ROUTE STUDY - UNIFIED CLASSIFICATION SYSTEM USED.

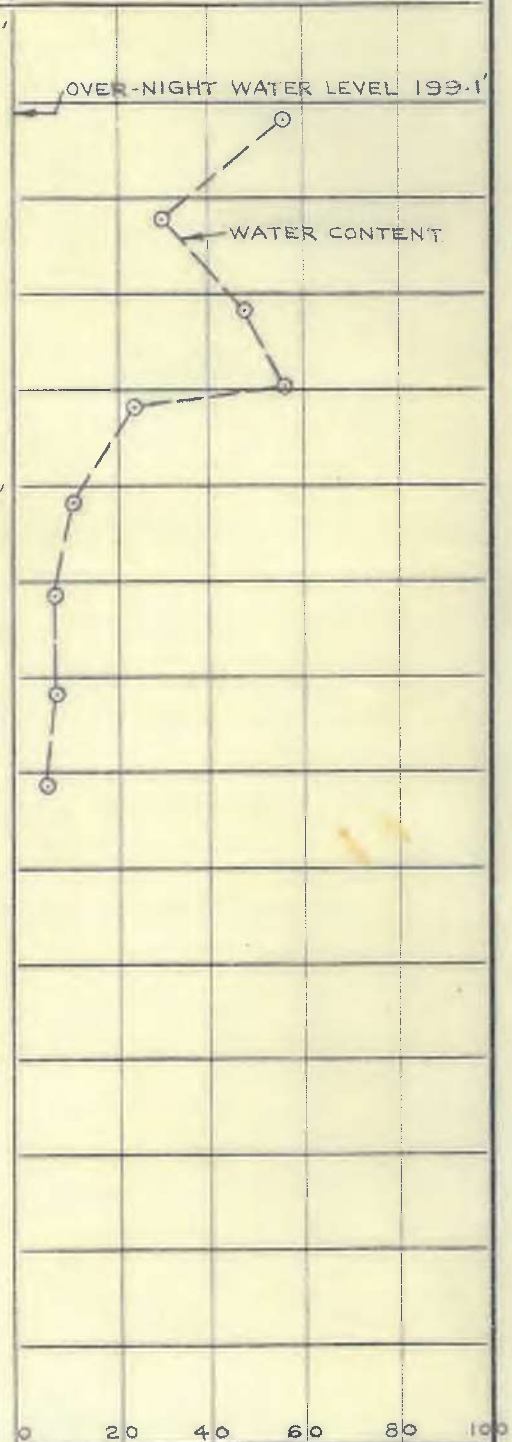
~~PROBING OR VANE TEST~~

....................LB. HAMMER ....INCH DROP

NO CASING ....INCH DIA. ROD

~~BLOWS PER FOOT OR~~ ~~SHEAR STRENGTH IN KIPS PER FT.^{2}~~

Unconfined Compressive Strength Kips/Ft.^{2}	Small Scale Penetrometer Kips/Ft.^{2}	Standard Penetration Blows/Ft.	Sample Number	Description of Soil	Depth in Feet	Elevation
				GROUND SURFACE	0'	204.6'
		5	1-1	FILL MOSTLY SAND & CINDERS		
		7	1-2			
		8	1-3			
		6 for 6"	1-4A		20.5'	184.1'
		24	1-4B	SANDY SILT WITH A TRACE OF CLAY NON-PLASTIC, MEDIUM DENSE (ML)	24'	180.6'
		15	1-5	GRAVELLY SAND WITH SOME SILT & A TRACE OF CLAY (TILL) MEDIUM DENSE (SM)	26.5'	
		56	1-6	GRAVELLY SAND WITH SOME SILT & A TRACE OF CLAY (TILL) DENSE (SM)	31.5'	173.1'
		14	1-7	SAND & GRAVEL MIXTURE WITH SOME SILT & A TRACE OF CLAY (TILL) MEDIUM DENSE (SM)		
		15	1-8		43.7'	160.9'
				SHALE CORE RECOVERY - 86%	48.6'	
				SHALE CORE RECOVERY - 97%	53.7'	150.9'
				BOTTOM OF HOLE		



% WATER CONTENT
NATURAL ⊙
LIQUID LIMIT □
PLASTIC LIMIT △

PLATE 8

R - REMOULDED

LOWE-MARTIN CO.—A55512

FORM S-10-4

McROSTIE & ASSOCIATES LTD.
CONSULTING ENGINEERS
OTTAWA CANADA

SOIL PROFILE AND SUMMARY OF FIELD AND LABORATORY TESTS

LEES AVENUE

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 203·6' DATE MAY 4, 1962

REMARKS SEE PLATE No. 2

HOLE No. 8

Unconfined Compressive Strength Kips/Ft.²	Small Scale Penetrometer Kips/Ft.²	Standard Penetration Blows/Ft.	Sample Number	Description of Soil	Depth in Feet	Elevation
				GROUND SURFACE	0'	203·6'
		4	8-1	FILL CINDERS, ASHES, CLAY, SAND, GRAVEL, COAL & ORGANIC MATERIAL		
		6	8-2			
		8	8-3		17'	186·6'
		87	8-4	BOULDERS IN DENSE SILTY TILL	25'	
		16	8-5	MEDIUM DENSE SILTY TILL	30'	
		12	8-6	MEDIUM DENSE SHALEY TILL	35'	
		52	8-7	BOULDERS IN DENSE SHALEY TILL		
		129	8-8		42·5'	161·1'
				WEATHERED OR FRACTURED ROCK CORE RECOVERY 62%	48·2'	155·4
				ROCK CORE RECOVERY 100%	53·3'	150·3'
				BOTTOM OF HOLE		

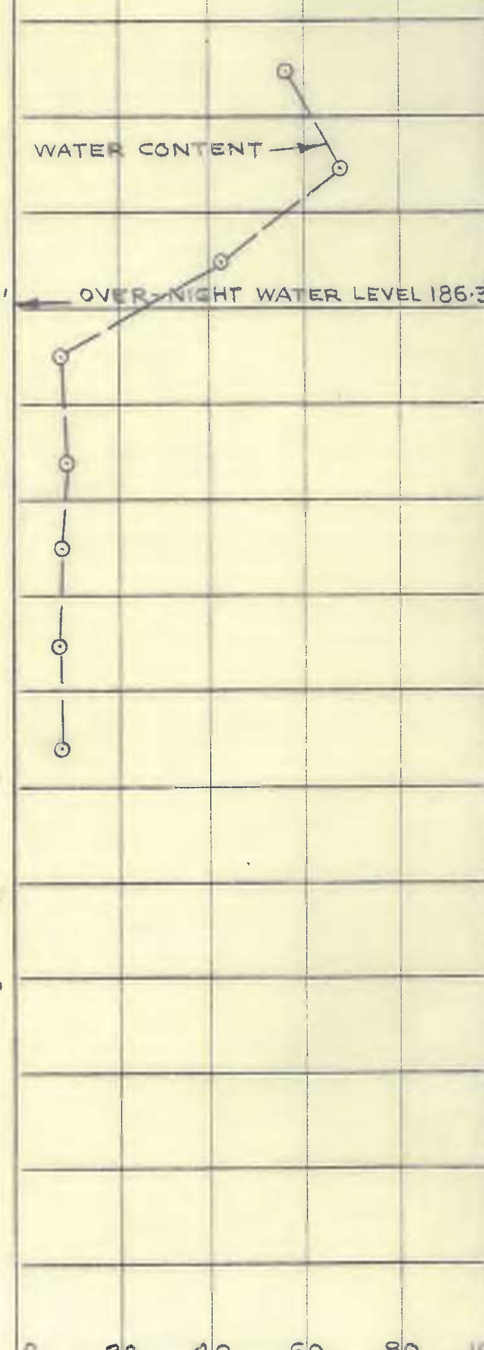
R - REMOULDED

~~PROBING OR VANE TEST~~

........LB. HAMMER ....INCH DROP

NO CASING ....INCH DIA. ROD

~~BLOWS PER FOOT OR SHEAR STRENGTH IN KIPS PER FT.²~~



% WATER CONTENT
NATURAL ⊙
LIQUID LIMIT □
PLASTIC LIMIT △

PLATE 9

LOWE-MARTIN CO.—A55512

FORM S-10-4

McROSTIE & ASSOCIATES LTD.
CONSULTING ENGINEERS
OTTAWA CANADA

SOIL PROFILE AND SUMMARY OF FIELD AND LABORATORY TESTS

LEES AVENUE

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 204.2' DATE MAY 8, 1962

REMARKS SEE PLATE No. 2

HOLE No. 10

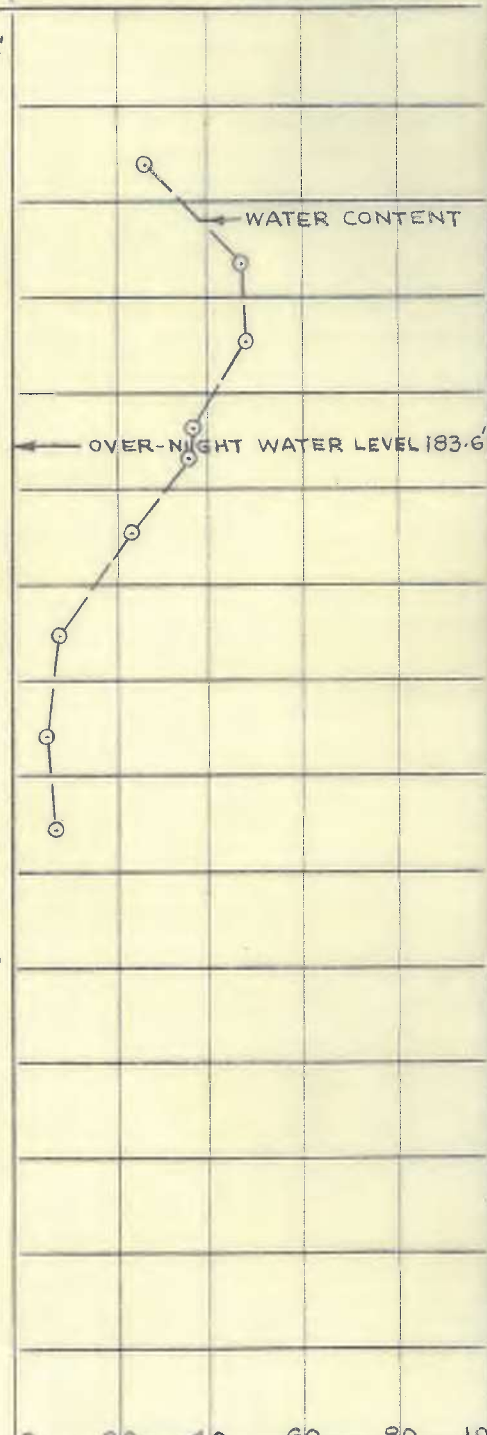
UNCONFINED COMPRESSIVE STRENGTH Kips/FT.²	SMALL SCALE PENETROMETER KIPS/FT.²	STANDARD PENETRATION BLOWS/FT.	SAMPLE NUMBER	DESCRIPTION OF SOIL	DEPTH IN FEET	ELEVATION
				GROUND SURFACE	0'	204.2'
		4	10-1	FILL CINDERS, SAND, BRICK TOPSOIL, COAL, ASHES & GLASS		
		4	10-2			
		4	10-3			
		12	10-4A		20.8'	183.4'
		5 for 6"	10-4B	STIFF GRAY CLAY WITH SOME SAND	21.5'	
		12	10-5	MEDIUM DENSE SILT	28.5'	175.7'
		25	10-6	MEDIUM DENSE SILTY VERY FINE SAND WITH A TRACE OF GRAVEL & A FEW SHALE PARTICLES	35'	169.2'
		65	10-7	DENSE SHALEY TILL	40'	
		33 for 6"	10-8	DENSE SILT & VERY FINE SAND WITH SOME SHALE PARTICLES	42.2'	162.0'
				ROCK CORE RECOVERY - 96%	48'	156.2'
				BOTTOM OF HOLE		

R - REMOULDED

~~PROBING OR VANE TEST~~

.........LB. HAMMER ....INCH DROP | NO CASING ....INCH DIA. ROD

~~BLOWS PER FOOT OR~~ ~~SHEAR STRENGTH IN KIPS PER FT.²~~



% WATER CONTENT
NATURAL ⊙
LIQUID LIMIT □
PLASTIC LIMIT △

PLATE 10

LOWE-MARTIN CO.—A55512

FORM S-10-4

McROSTIE & ASSOCIATES LTD.
CONSULTING ENGINEERS
OTTAWA CANADA

SOIL PROFILE AND SUMMARY OF FIELD AND LABORATORY TESTS

LEES AVENUE

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 205·2' DATE MAY 10, 1962

REMARKS SEE PLATE No. 2

HOLE No. 11

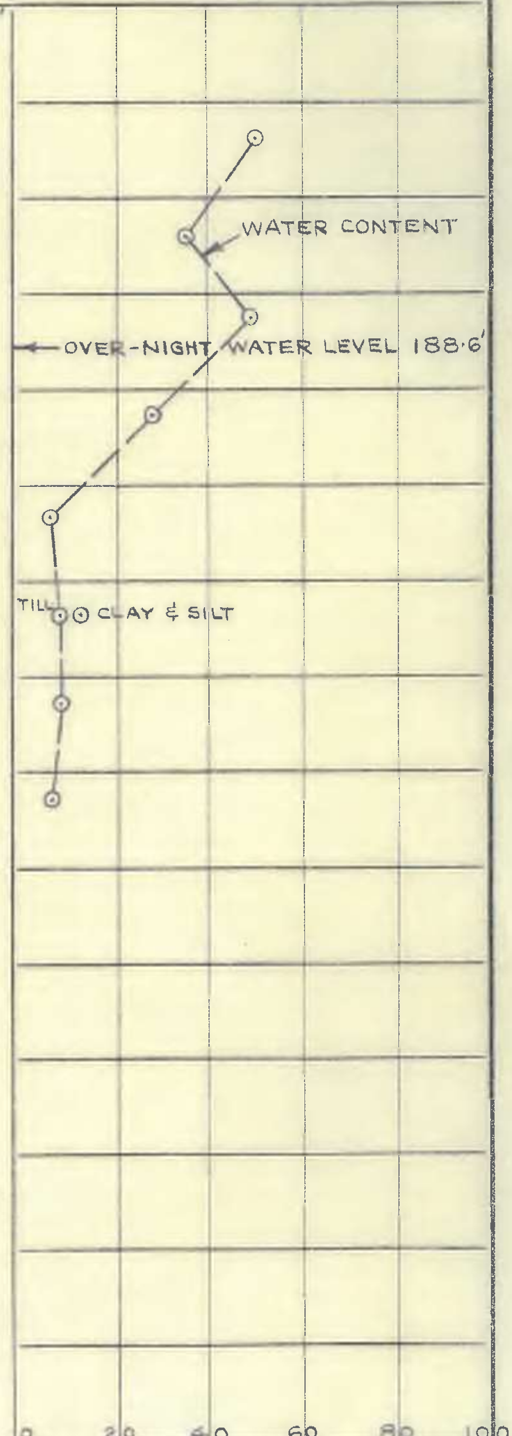
UNCONFINED COMPRESSIVE STRENGTH Kips/FT.^{2}	SMALL SCALE PENETROMETER KIPS/FT.^{2}	STANDARD PENETRATION BLOWS/FT.	SAMPLE NUMBER	DESCRIPTION OF SOIL	DEPTH IN FEET	ELEVATION
				GROUND SURFACE	0'	205·7'
		4	11-1	FILL SAND, ASHES, WOOD, TOPSOIL, GLASS & GRAVEL		
		4	11-2			
		5	11-3			
					20'	185·7'
		8	11-4	LOOSE CLAYEY SILT		
					24'	181·7'
		59	11-5	BOULDERS IN DENSE TILL WITH A 2" CLAY & SILT LAYER & A FEW MEDIUM DENSE LAYERS		
		26 24 for 6"	11-6			
					35'	170·7'
		13 for 6" 35	11-7	DENSE SILTY VERY FINE SAND WITH A LITTLE GRAVEL & A FEW SHALE PARTICLES & A MEDIUM DENSE LAYER		
					40'	
		67	11-8	DENSE SANDY TILL		
					43·3	162·4'
				ROCK CORE RECOVERY 83%		
					49·1'	
				ROCK CORE RECOVERY 95%		
				BOTTOM OF HOLE	54·6'	151·1'

~~PROBING OR VANE TEST~~

..........LB. HAMMER ....INCH DROP

NO CASING ....INCH DIA. ROD

~~BLOWS PER FOOT OR SHEAR STRENGTH IN KIPS PER FT.^{2}~~



% WATER CONTENT
NATURAL ⊙
LIQUID LIMIT □
PLASTIC LIMIT △

PLATE 11

R - REMOULDED

LOWE-MARTIN CO.—A55512

McROSTIE & ASSOCIATES LTD.
CONSULTING ENGINEERS
OTTAWA CANADA

SOIL PROFILE AND SUMMARY OF FIELD AND LABORATORY TESTS

LEES AVENUE

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 206.2' DATE APRIL 12, 1962

REMARKS SEE PLATE No. 2

HOLE No. 12

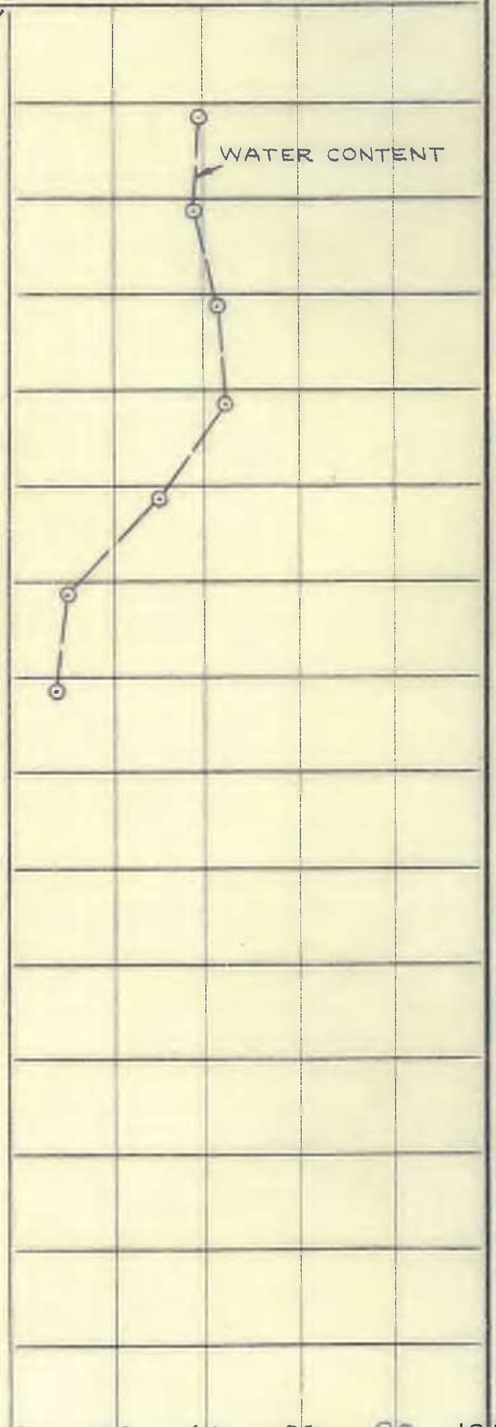
UNCONFINED COMPRESSIVE STRENGTH Kips/FT.^{2}	SMALL SCALE PENETROMETER KIPS/FT.^{2}	STANDARD PENETRATION BLOWS/FT.	SAMPLE NUMBER	DESCRIPTION OF SOIL	DEPTH IN FEET	ELEVATION
				GROUND SURFACE	0'	206.2'
		4	12-1	FILL (ASHES, CINDERS, SAND, SILT, WOOD & GLASS)		
		8	12-2			
		9	12-3			
		4	12-4			
					25'	
		74	12-5	FILL GRAY CLAY WITH SOME SAND & A FEW PEBBLES		
					28.5'	177.7'
		50	12-6	DENSE TILL		
		94	12-7			
					39'	167.2'
				WEATHERED OR FRACTURED ROCK CORE RECOVERY 59%		
					44.7'	161.5
				ROCK CORE RECOVERY 89%		
					47'	
				WEATHERED OR FRACTURED ROCK CORE RECOVERY 56%		
					49.3'	156.9'
				BOTTOM OF HOLE		

~~PROBING OR VANE TEST~~

.......LB. HAMMER ....INCH DROP

NO CASING ....INCH DIA. ROD

~~BLOWS PER FOOT OR~~ ~~SHEAR STRENGTH IN KIPS PER FT.^{2}~~



% WATER CONTENT
NATURAL ⊙
LIQUID LIMIT □
PLASTIC LIMIT △

R - REMOULDED

PLATE 12

FORM S-10-4

McROSTIE & ASSOCIATES LTD.
CONSULTING ENGINEERS
OTTAWA CANADA

SOIL PROFILE AND SUMMARY OF FIELD AND LABORATORY TESTS

LEES AVENUE

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 204.4' DATE APRIL 25, 1962

REMARKS SEE PLATE No. 2

HOLE No. 13

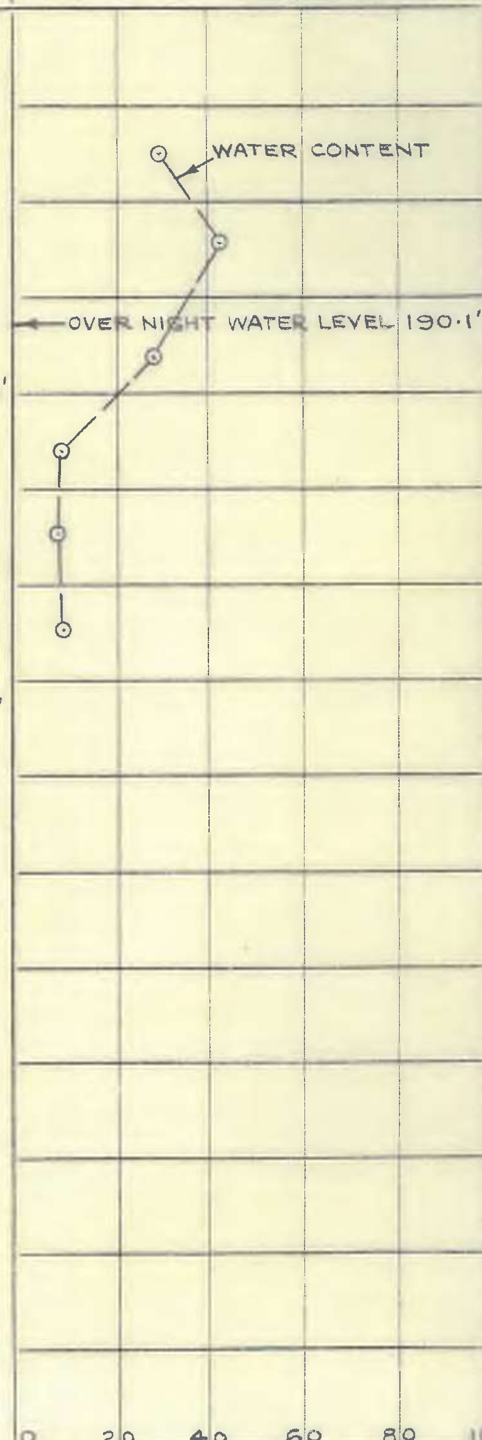
Unconfined Compressive Strength Kips/FT.²	Small Scale Penetrometer Kips/FT.²	Standard Penetration Blows/FT.	Sample Number	Description of Soil	Depth in Feet	Elevation
				GROUND SURFACE	0'	204.4'
		7	13-1	FILL WOOD, ASHES, CLAY, GLASS, TOPSOIL, CINDERS & BRICK		
		7	13-2			
		11	13-3			
					18'	186.4'
		37	13-4	DENSE TILL		
					25'	
		25	13-5	MEDIUM DENSE TILL		
		25 5 for 6"	13-6		31'	173.4'
					34.7'	169.7'
				WEATHERED OR FRACTURED ROCK CORE RECOVERY 60%		
					40.8'	163.6
				WEATHERED OR FRACTURED ROCK CORE RECOVERY INDEFINITE		
				BOTTOM OF HOLE	46.6'	157.8'

~~PROBING OR VANE TEST~~

.................LB. HAMMER NO CASING

.................INCH DROP ....INCH DIA. ROD

~~BLOWS PER FOOT OR~~ ~~SHEAR STRENGTH IN KIPS PER FT.²~~



% WATER CONTENT
NATURAL ⊙
LIQUID LIMIT □
PLASTIC LIMIT △

PLATE 13

R - REMOULDED

LOWE-MARTIN CO.—A55512

FORM S-10-4

McROSTIE & ASSOCIATES LTD.
CONSULTING ENGINEERS
OTTAWA CANADA

SOIL PROFILE AND SUMMARY OF FIELD AND LABORATORY TESTS

LEES AVENUE

ELEVATION OF GROUND SURFACE (ZERO DEPTH) 204.5' DATE APRIL 11, 1962

REMARKS SEE PLATE No. 2

HOLE No. 14

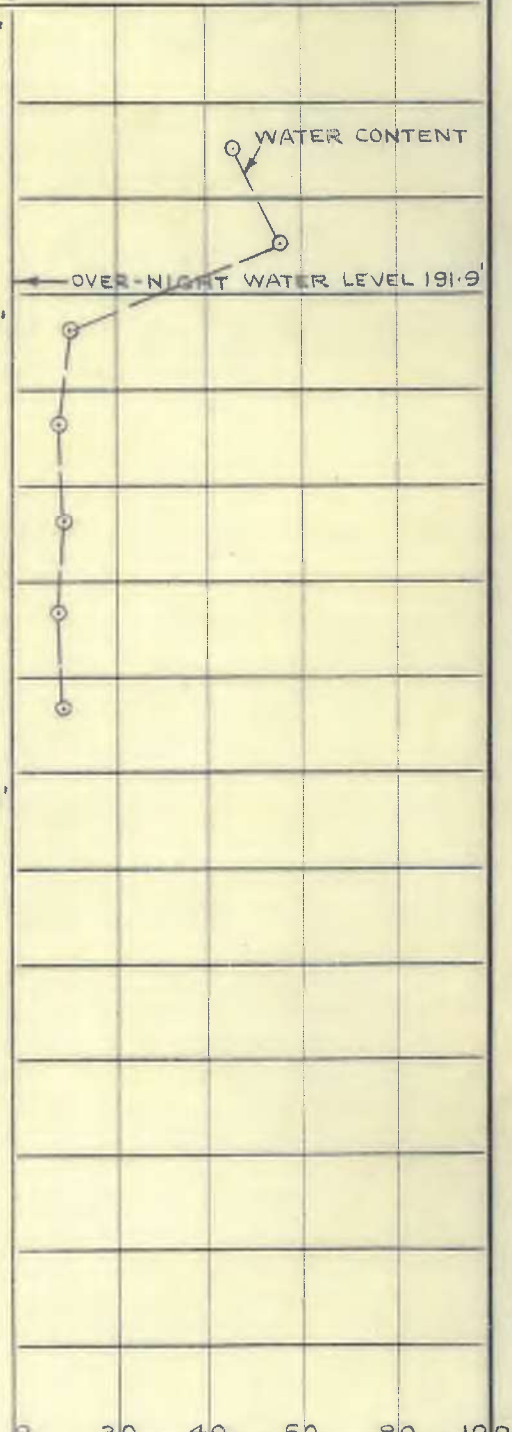
UNCONFINED COMPRESSIVE STRENGTH Kips/FT.^{2}	SMALL SCALE PENETROMETER KIPS/FT.^{2}	STANDARD PENETRATION BLOWS/FT.	SAMPLE NUMBER	DESCRIPTION OF SOIL	DEPTH IN FEET	ELEVATION
				GROUND SURFACE	0'	204.5'
		5	14-1	FILL (ASHES, CINDERS & SAND)		
		4	14-2			
					15'	189.5'
		24 18 for 6"	14-3	MEDIUM DENSE TILL WITH SOME DENSE LAYERS		
		22 19 for 6"	14-4			
		21	14-5			
		20	14-6			
		24 25 for 6"	14-7			
					39.6'	164.9'
				ROCK CORE RECOVERY 100%	41.5'	
				WEATHERED OR FRACTURED ROCK C.R. 36%	42.6'	
				WEATHERED OR FRACTURED ROCK C.R. 38%	43.7'	
				WEATHERED OR FRACTURED ROCK CORE RECOVERY 74%	46.6'	
				ROCK CORE RECOVERY 100%	51.5'	153.0'
				ROCK CORE RECOVERY INDEFINITE	55'	149.5'
				BOTTOM OF HOLE		

~~PROBING OR VANE TEST~~

......LB. HAMMER ......INCH DROP

NO CASING ......INCH DIA. ROD

~~BLOWS PER FOOT OR SHEAR STRENGTH IN KIPS PER FT.^{2}~~



% WATER CONTENT
NATURAL ⊙
LIQUID LIMIT □
PLASTIC LIMIT △

PLATE 14

R - REMOULDED

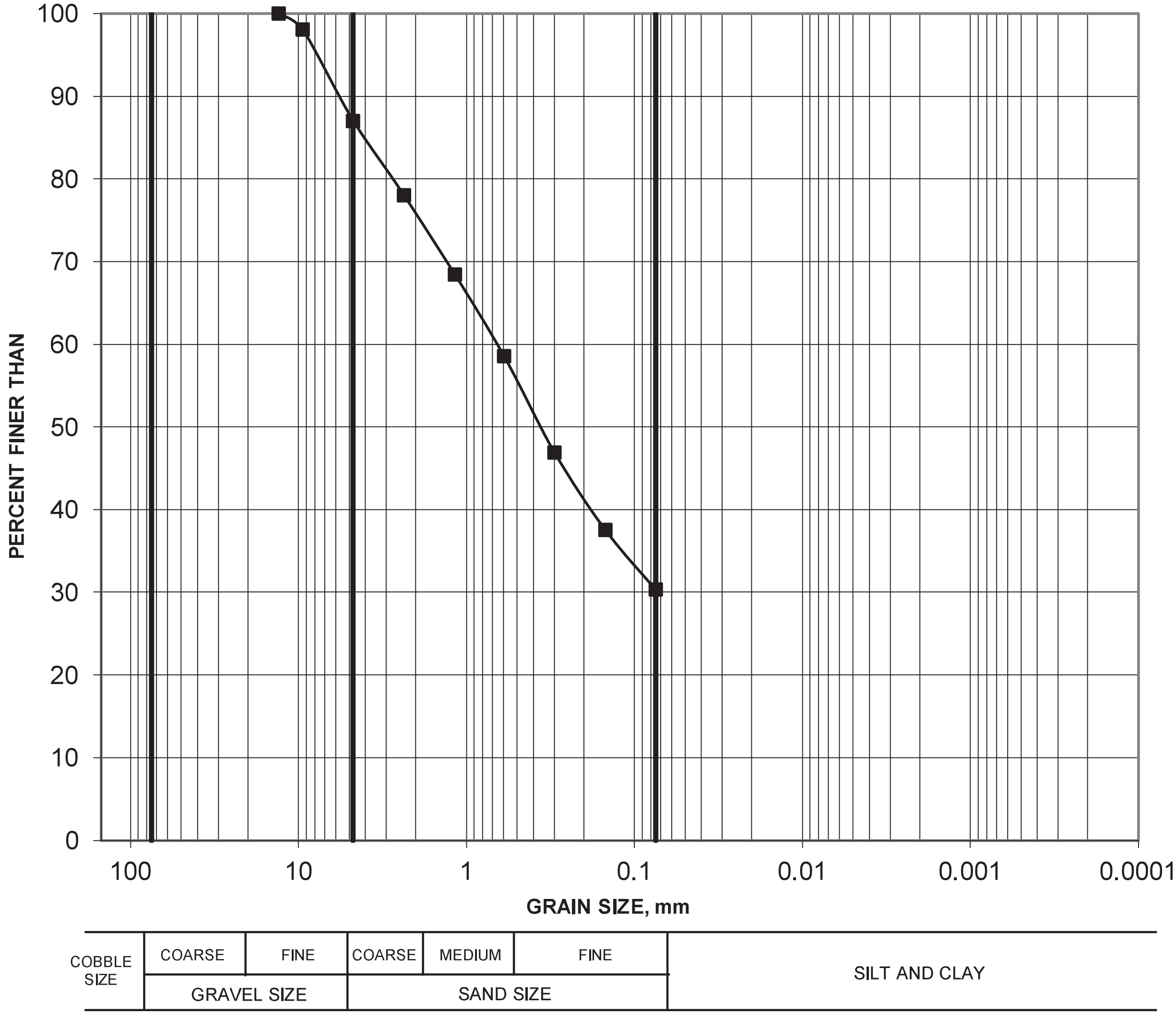
LOWE-MARTIN CO.—A55512

APPENDIX B

- Laboratory Test Results

GRAIN SIZE DISTRIBUTION	FIGURE B1

FILL - (SM) GRAVELLY SILTY SAND



			Constituents (%)			
Borehole	Sample	Depth (m)	Gravel	Sand	Silt	Clay
20-02	5	3.10-3.70	13	57	30	

Project: 20144766

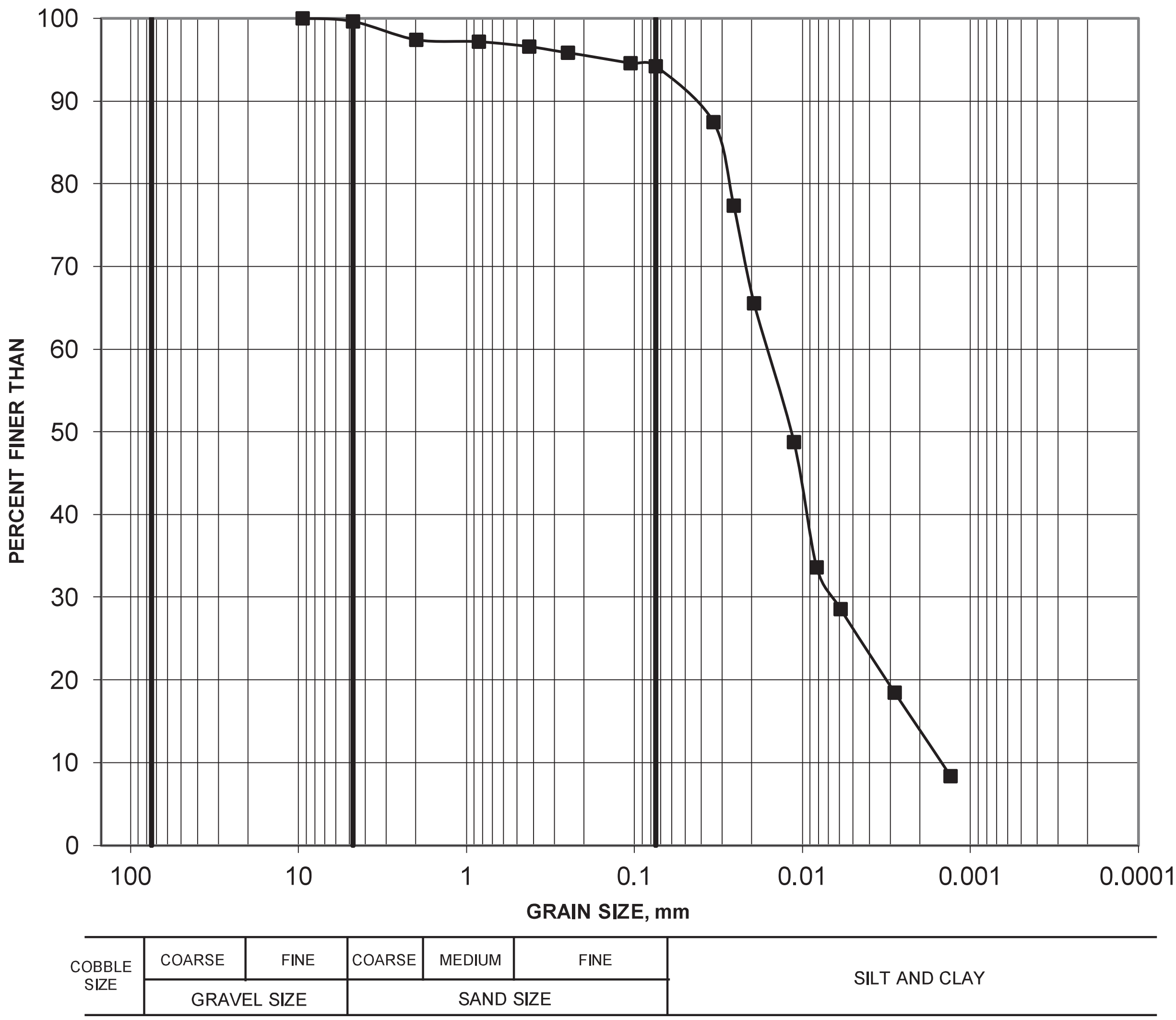
GOLDER

Created by: CW
Checked by: MI

https://golderassociates.sharepoint.com/sites/35409g/Shared Documents/Active/2020/20144766/Figures/

GRAIN SIZE DISTRIBUTION	FIGURE B2

(ML) CLAYEY SILT TO SILT (GLACIAL TILL)



			Constituents (%)			
Borehole	Sample	Depth (m)	Gravel	Sand	Silt	Clay
20-02	9	6.10-6.70	0	6	80	14

Project: 20144766

GOLDER

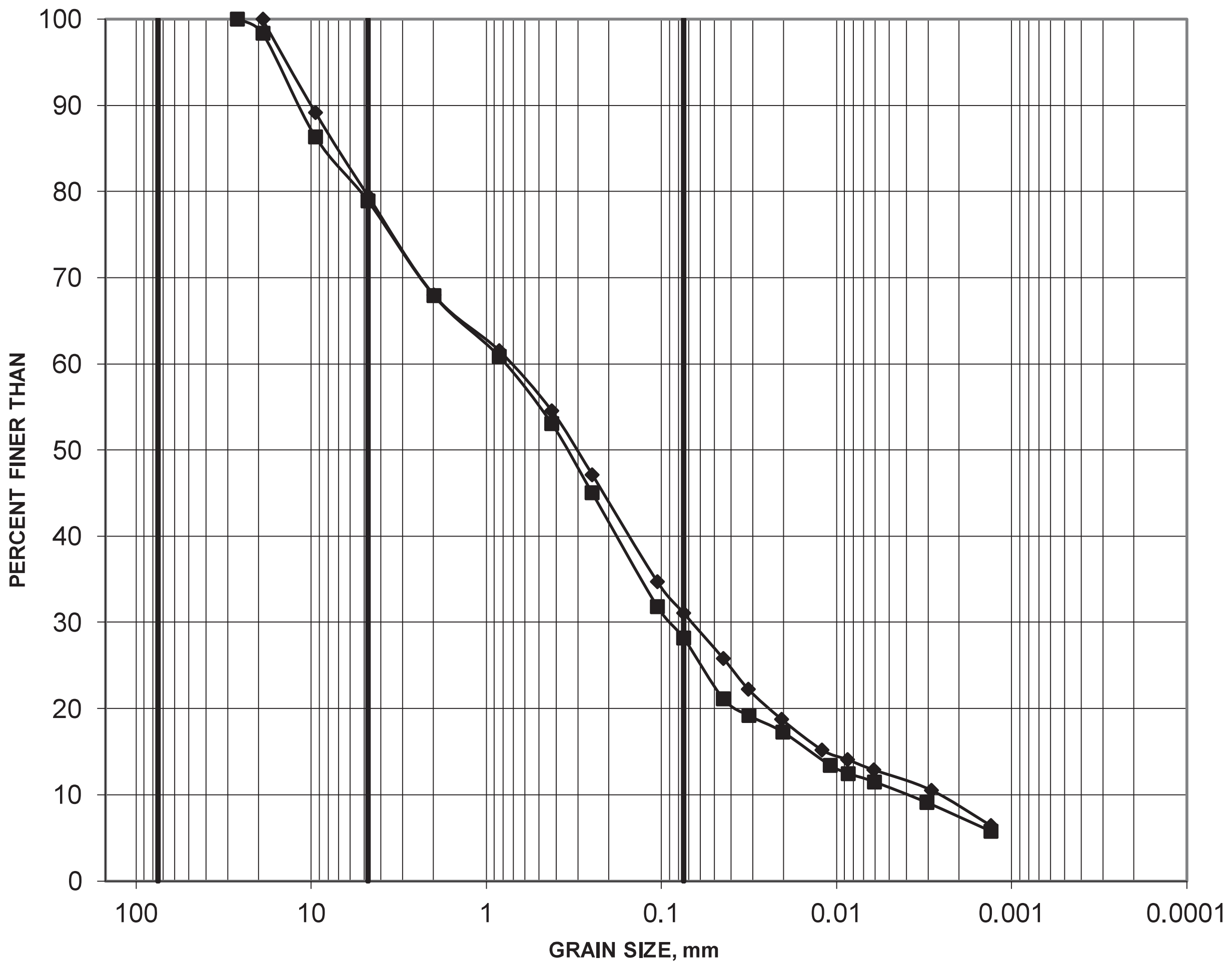
Created by: CW

Checked by: MI

https://golderassociates.sharepoint.com/sites/35409g/Shared Documents/Active/2020/20144766/Figures/

GRAIN SIZE DISTRIBUTION	FIGURE B3

(SM) GRAVELLY SILTY SAND (GLACIAL TILL)



COBBLE SIZE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
	GRAVEL SIZE		SAND SIZE			

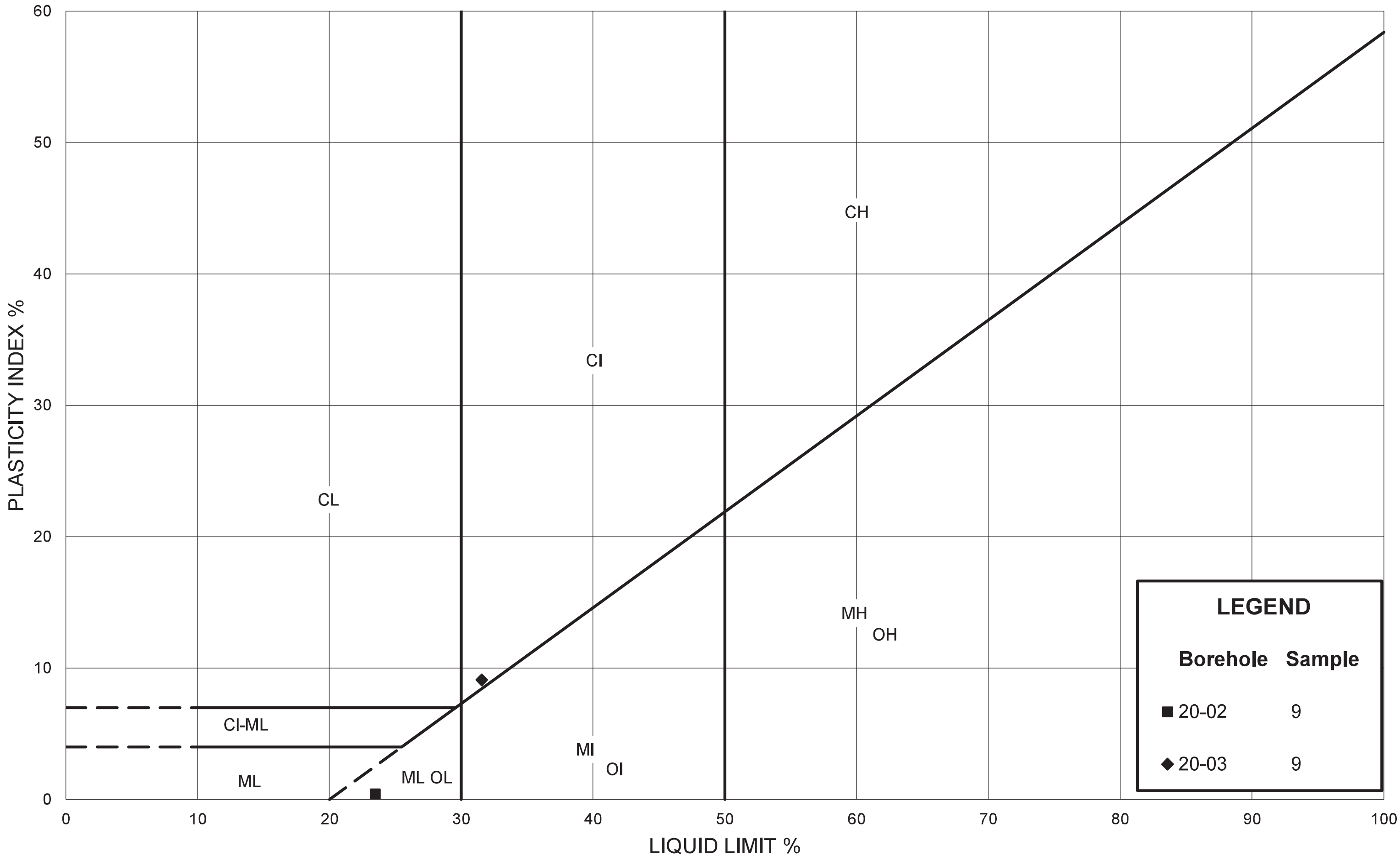
Borehole	Sample	Depth (m)	Constituents (%) Gravel	Sand	Silt	Clay
■ 20-01	11	7.60-8.20	21	51	21	7
◆ 20-02	11	8.40-9.00	20	49	22	9

Project: 20144766

GOLDER

Created by: CW
Checked by: MI

https://golderassociates.sharepoint.com/sites/35409g/Shared Documents/Active/2020/20144766/Figures/



PLASTICITY CHART

Figure:	B4
Project:	20144766
Created By: CW	Checked By: MI

APPENDIX C

- Chemical Testing Results

Certificate of Analysis

eurofins | Environment Testing

Client: Golder Associates Ltd. (Ottawa)
1931 Robertson Road
Ottawa, ON
K2H 5B7
Attention: Ms Bridgit Bocage
PO#:
Invoice to: Golder Associates Ltd. (Ottawa)

Report Number: 1935625
Date Submitted: 2020-07-30
Date Reported: 2020-08-07
Project: 20144766
COC #: 860833

Group	Analyte	MRL	Units	Guideline	Lab I.D. 1507482 / Sample Matrix Soil / Sample Type / Sampling Date 2020-07-10 / Sample I.D. 20-03 sa5 / 10-12'
Anions	SO4	0.01	%		1.04
Cl in Concrete	Cl	0.002	%		0.093
General Chemistry	Electrical Conductivity	0.05	mS/cm		2.30
	pH	2.00			6.15
	Resistivity	1	ohm-cm		435

Guideline = *** = Guideline Exceedence**

Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

APPENDIX D

- 2011 Vertical Seismic Profiling Memo

TECHNICAL MEMORANDUM

DATE June 7, 2011 **PROJECT No.** 11-1121-0057

TO Nicolas LeBlanc
Golder Associates Ltd.

CC Michel St-Louis Golder Associates Ltd.

FROM Stephane Sol, Christopher Phillips **EMAIL** ssol@golder.com; cphillips@golder.com

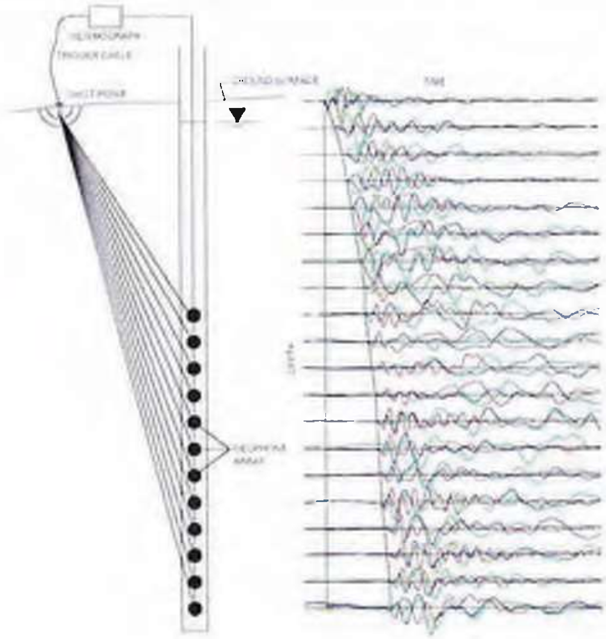
VSP TEST RESULTS – 200 LEES AVENUE, UNIVERSITY OF OTTAWA, OTTAWA, ONTARIO

This memorandum presents the results of the vertical seismic profile (VSP) testing performed at 200 Lees Avenue in Ottawa, Ontario. VSP testing was completed in Borehole BH11-1 on May18, 2011. Borehole BH11-1 is flush mounted and cased with a PVC pipe grouted in place. Borehole logs for BH11-1 indicate approximately 5 metres of fill overlying approximately 6 metres of clayey silt and sandy silt. The clayey silt layer is underlaid by shale bedrock to the bottom of the borehole (approximately 18 metres).

Methodology

For the VSP (Vertical Seismic Profiling) method, seismic energy is generated at the ground surface by an active seismic source and recorded by a geophone located in a nearby borehole at a known depth. The active seismic source can be either compression or shear wave. The time required for the energy to travel from the source to the receiver (geophone) provides a measurement of the average compression or shear-wave seismic velocity of the medium between the source and the receiver. Data obtained from different geophone depths are used to calculate a detailed vertical seismic velocity profile of the subsurface in the immediate vicinity of the test borehole.

The high resolution results of a VSP survey are often used for earthquake engineering site classification, as per the National Building Code of Canada, 2005.



Example 1: Layout and resulting time traces from a VSP survey

Field Work

The field work was completed on May 18, 2011, by personnel from the Golder Mississauga and Ottawa offices.

Both compression and shear-wave seismic sources were used and both were located in close vicinity to the borehole. The seismic source for the compression wave test consisted of a 5.5 kilogram sledge hammer vertically impacted on a metal plate. The plate was located 2 metres from the borehole on asphalt. The seismic source for the shear-wave test consisted of a 2.4 metres long, 150 millimetres by 150 millimetres wooden beam, weighted by a vehicle and horizontally struck with a 5.5 kilogram sledge hammer on alternate ends of the beam to induce polarized shear waves. The shear source was also located 2 metres from the borehole BH11-1, and coupled to the ground surface by parking a vehicle on top of it. Test measurements started at 1-metre below the surface. Data were recorded in the borehole with a 3-component receiver spaced sequentially at 1-metre intervals below the ground surface, to a maximum depth of the borehole (18 metres).

The seismic records collected for each source location were stacked a minimum of ten times to minimize the effects of ambient background seismic noise on the collected data. The data was sampled at 0.020833 millisecond intervals and a total time window of 0.341 seconds was collected for each seismic shot.

Data Processing

Processing of the VSP test results consisted of the following main steps:

1) Combination of seismic records to present seismic traces for all depth intervals on a single plot for each seismic source and for each component;

2) Low Pass Filtering of data to remove spurious high frequency noise;

3) First break picking of the compression and shear-wave arrivals; and

4) Calculation of the average compression and shear-wave velocity to each tested depth interval.

Processing of the VSP data was completed using the SeisImager/SW software package (Geometrics Inc.). The seismic records are presented on the following two plots and show the first break picks of the compression-wave and shear wave arrivals overlaid on the seismic waveform traces recorded at the different geophone depths (Figures 1 and 2). The arrivals were picked on the vertical component for the compression source and on the two horizontal components for the shear source.

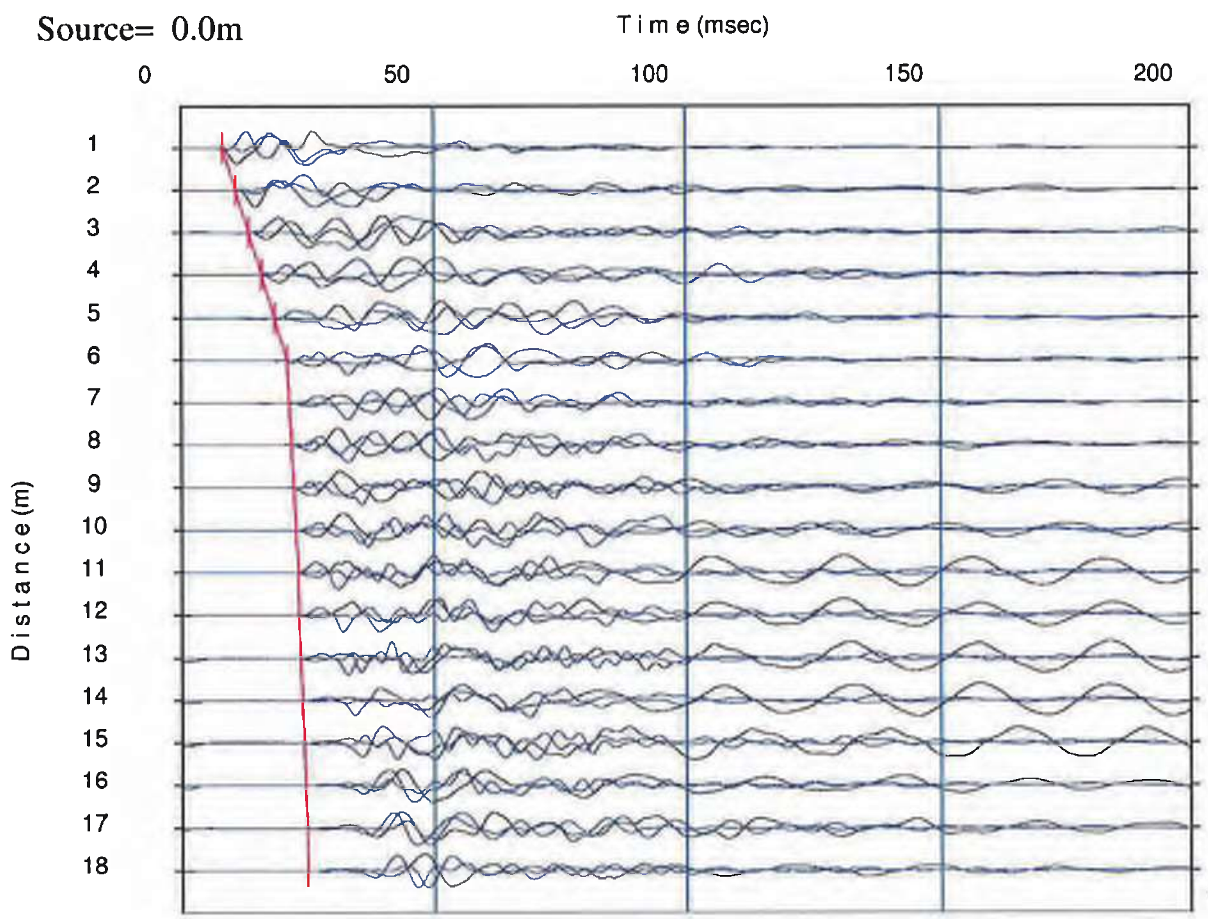


Figure 1: First break picking of compression wave arrivals (red) along the seismic traces recorded at each receiver depth

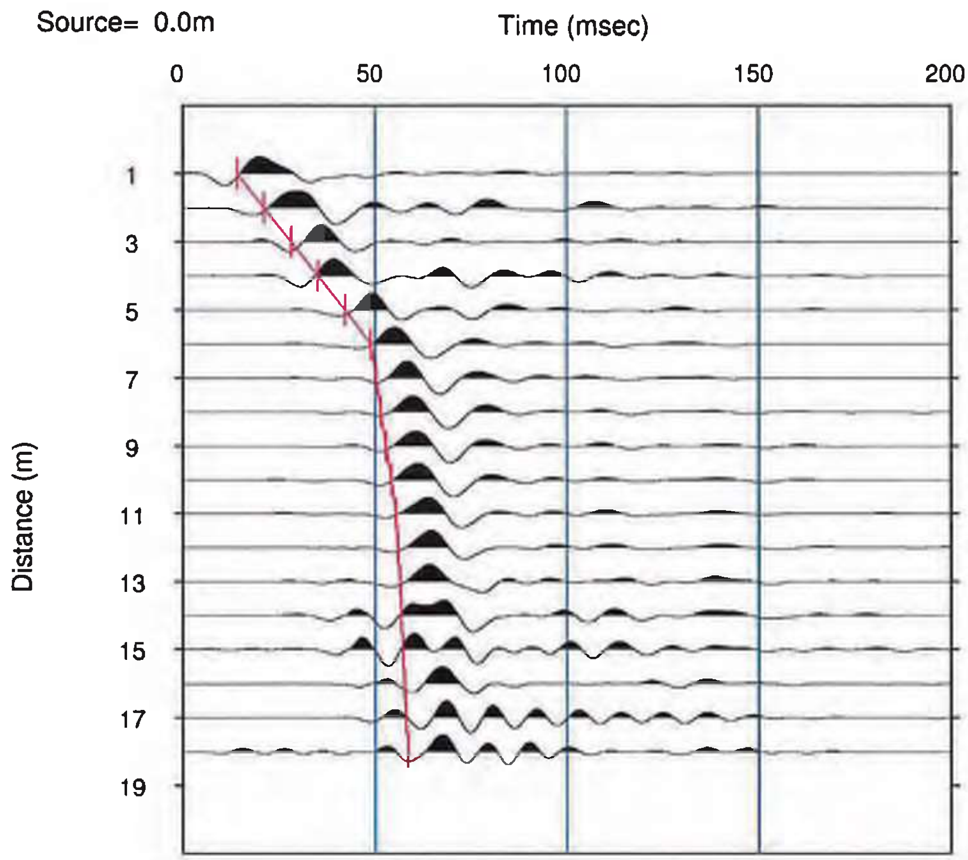


Figure 2: First break picking of shear wave arrivals (red) along the seismic traces recorded at each receiver depth

Results

The VSP results are summarized in Table 1. The shear-wave and compression-wave layer velocities, at one metre intervals, were calculated by best fitting a theoretical travel time model to the field data collected at one metre intervals. The depths presented on the tables are relative to ground surface.

The estimated dynamic engineering moduli, based on the calculated wave velocities, are also presented on Table 1. The engineering moduli were calculated using an estimated bulk density, based on the borehole log, but a more detailed geotechnical investigation would be necessary to determine a more exact density for each layer. For the top soil down to a depth of approximately 11 metres, a bulk density of 1,750 kg/m^3 was estimated. Further down to a depth of 30 metres, the bulk density for the shale bedrock clay was estimated at 2,500 kg/m^3.

The average velocity was calculated assuming that the velocity from 18 metres to a depth of 30 metres was constant with an average shear-wave velocity value of 2,000 m/s which is equal to the velocity of the bedrock at the bottom of the borehole.

The average shear-wave velocity from ground surface to a depth of 30 metres was measured to be 467 m/s.

Closure

We trust that these results meet your current needs. If you have any questions or require clarification, please contact the undersigned at your convenience.

GOLDER ASSOCIATES LTD.

Stephane Sol, Ph.D.
Geophysics Group

Christopher Phillips, M.Sc., P.Geo.
Senior Geophysicist, Associate

SS/CRP/wlm

Attachments: Table 1

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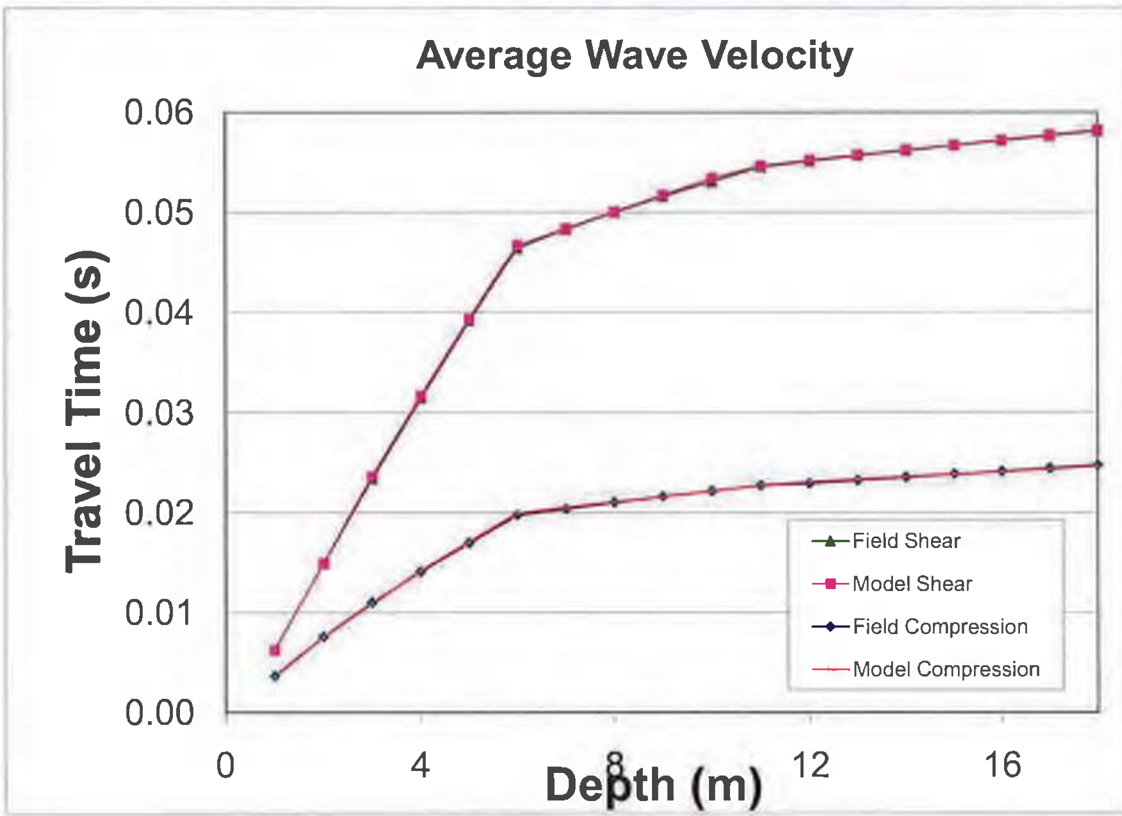
TABLE 1
VSP SURVEY RESULTS - BOREHOLE BH11-1
LEES AVENUE
OTTAWA, ONTARIO

Layer Depth (m)				Estimated Bulk Density (kg/m^3)	Dynamic Engineering Properties			
Top	Bottom	Compression Wave	Shear Wave		Poissons Ratio	Shear Modulus (MPa)	Deformation Modulus (MPa)	Bulk Modulus (MPa)
0	1	280	160	1750	0.26	45	113	77
1	2	250	115	1750	0.37	23	63	79
2	3	300	115	1750	0.41	23	65	127
3	4	300	125	1750	0.39	27	76	121
4	5	350	130	1750	0.42	30	84	175
5	6	350	135	1750	0.41	32	90	172
6	7	1800	600	1750	0.44	630	1811	4830
7	8	1800	600	1750	0.44	630	1811	4830
8	9	1800	600	1750	0.44	630	1811	4830
9	10	1800	600	1750	0.44	630	1811	4830
10	11	1800	800	1750	0.38	1120	3084	4177
11	12	3000	1700	2500	0.26	7225	18258	12867
12	13	3800	2000	2500	0.31	10000	26169	22767
13	14	3800	2000	2500	0.31	10000	26169	22767
14	15	3800	2000	2500	0.31	10000	26169	22767
15	16	3800	2000	2500	0.31	10000	26169	22767
16	17	3800	2000	2500	0.31	10000	26169	22767
17	18	3800	2000	2500	0.31	10000	26169	22767



Notes
1. Depth presented relative to ground surface.
2. This Table to be analyzed in conjunction with the accompanying report.

APPENDIX E

- Slope Stability Analysis Output

- Shoreline Photographs

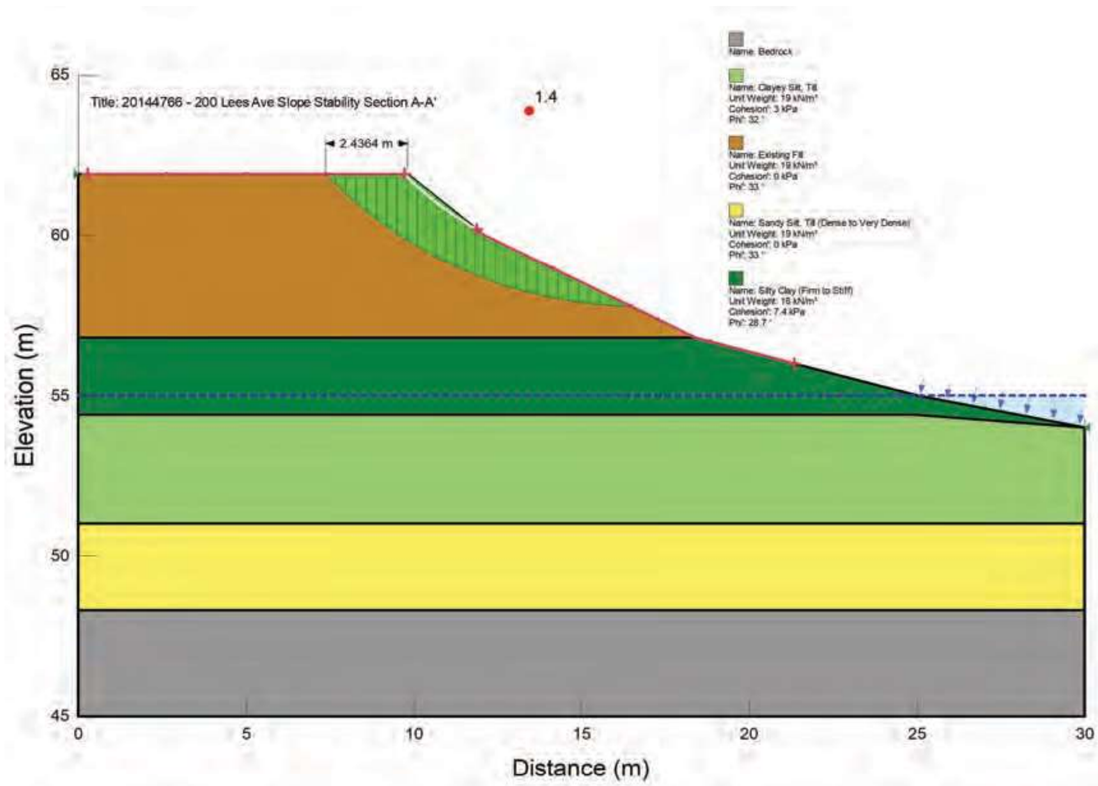


FIGURE E1	
REVIEW	
CHECK	CH 2020-08-07
CADD	
DESIGN	BB 2020-08-07
REV. 0	SCALE AS SHOWN
FILE No.	20144766
PROJECT No.	20144766

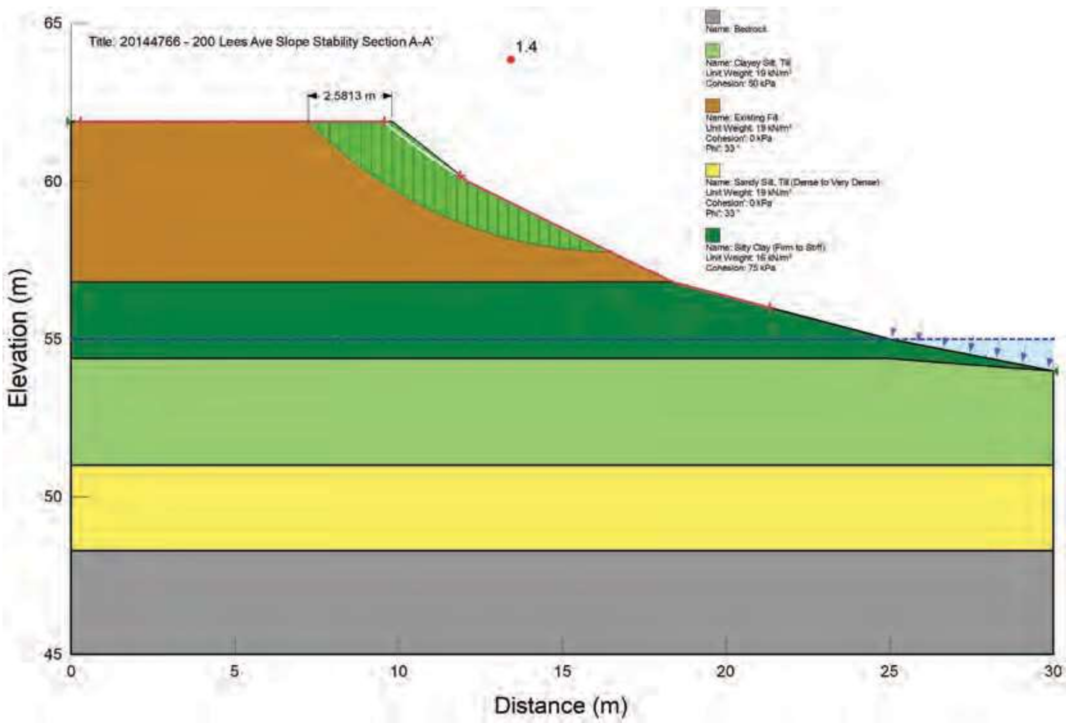
TITLE

SECTION A-A'
STABILITY ANALYSES
STATIC DRAINED CONDITION

PROJECT

**GEOTECHNICAL INVESTIGATION
AND SLOPE STABILITY ASSESSMENT
200 LEES REDEVELOPMENT
OTTAWA, ONTARIO**

GOLDER



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FILE No.	20144766
REV. 0	SCALE AS SHOWN
DESIGN	BB 2020-08-07
CADD	
CHECK	CH 2020-08-07
REVIEW	

TITLE

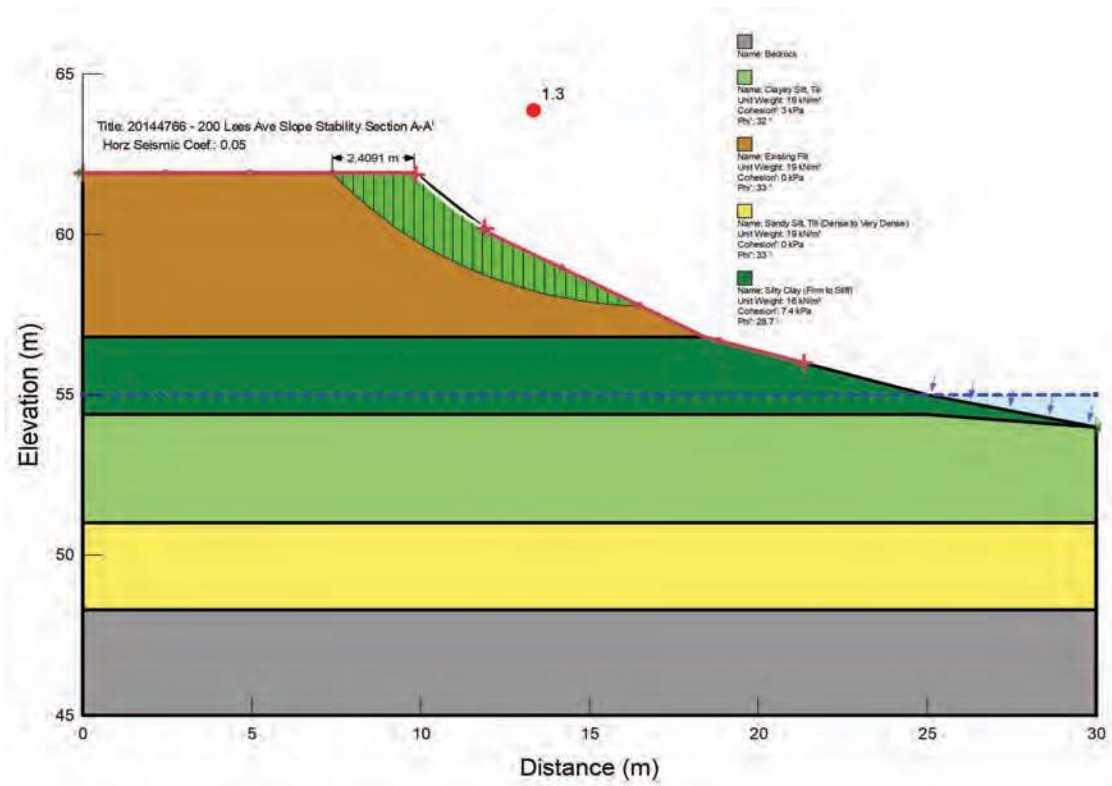
SECTION A-A'
STABILITY ANALYSES
STATIC UNDRAINED CONDITION

PROJECT

GEOTECHNICAL INVESTIGATION
AND SLOPE STABILITY ASSESSMENT
200 LEES REDEVELOPMENT
OTTAWA, ONTARIO

GOLDER

FIGURE E2



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FILE No.	20144766	
REV. 0	SCALE AS SHOWN	
DESIGN	BB	2020-08-07
CADD		
CHECK	CH	2020-08-07
REVIEW		

FIGURE E3

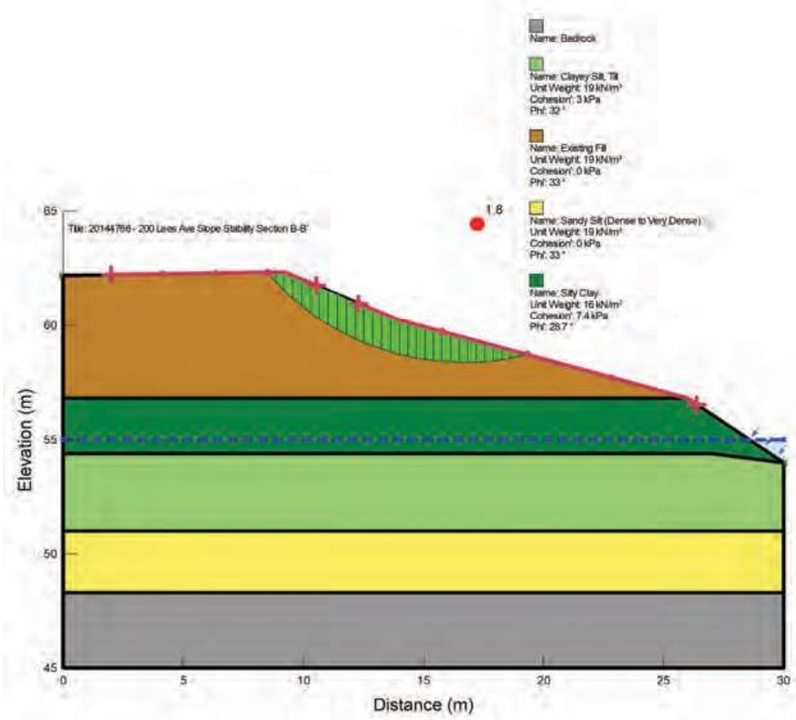
TITLE

SECTION A-A'
STABILITY ANALYSES
SEISMIC CONDITION

PROJECT

GEOTECHNICAL INVESTIGATION
AND SLOPE STABILITY ASSESSMENT
200 LEES REDEVELOPMENT
OTTAWA, ONTARIO

GOLDER



PROJECT No.	20144766
FILE No.	20144766
REV. 0	SCALE AS SHOWN
DESIGN	BB 2020-08-07
CADD	
CHECK	CH 2020-08-07
REVIEW	

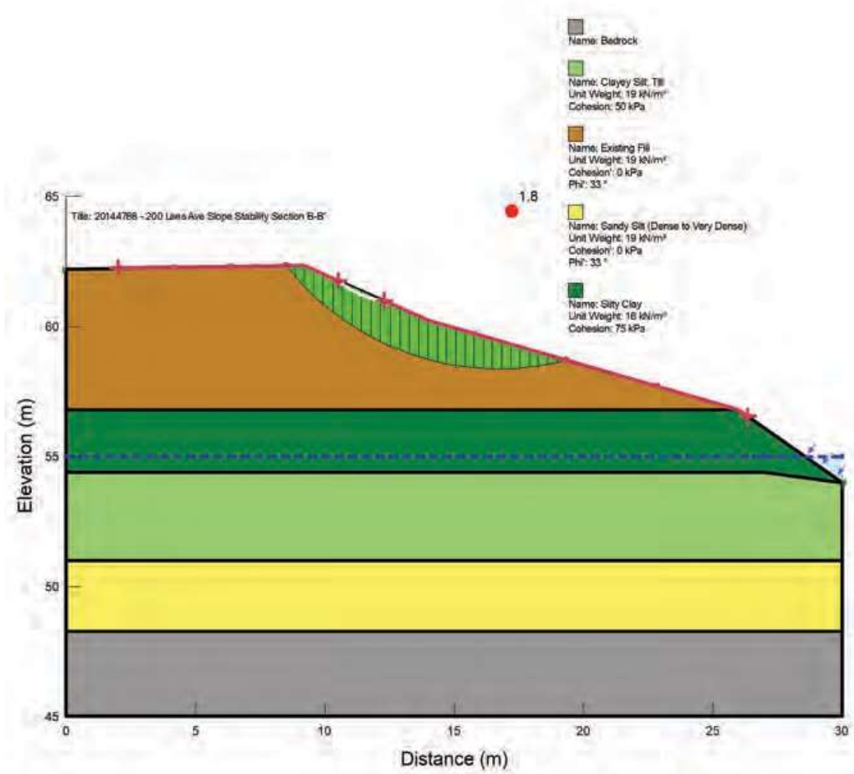
FIGURE E4

TITLE

SECTION B-B'
STABILITY ANALYSES
STATIC DRAINED CONDITION

PROJECT

**GEOTECHNICAL INVESTIGATION
AND SLOPE STABILITY ASSESSMENT
200 LEES REDEVELOPMENT
OTTAWA, ONTARIO**



PROJECT No. 20144766	TITLE		PROJECT	
FILE No. 20144766	**SECTION B-B'**		**GEOTECHNICAL INVESTIGATION**	GOLDER
REV. 0	SCALE AS SHOWN	**STABILITY ANALYSES**	**AND SLOPE STABILITY ASSESSMENT**	
DESIGN	BB 2020-08-07	**STATIC UNDRAINED CONDITION**	**200 LEES REDEVELOPMENT**	
CADD			**OTTAWA, ONTARIO**	
CHECK	CH 2020-08-07			
REVIEW				

FIGURE E5

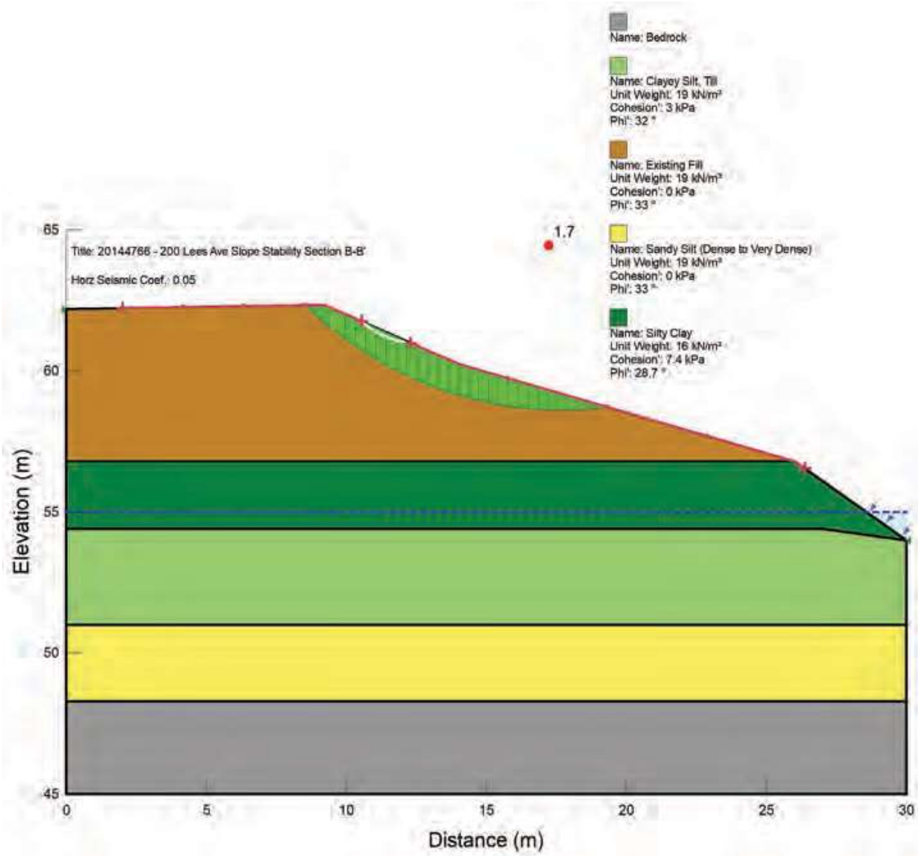


FIGURE E6

REVIEW	CHECK	CADD	DESIGN	REV. 0	FILE No.	PROJECT No.
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	2020-08-07		2020-08-07			

TITLE

SECTION B-B'
STABILITY ANALYSES
SEISMIC CONDITION

PROJECT

GEOTECHNICAL INVESTIGATION
AND SLOPE STABILITY ASSESSMENT
200 LEES REDEVELOPMENT
OTTAWA, ONTARIO

GOLDER

PHOTO 1

REVIEW	
CHECK	CH 2020-08-07
CADD	
DESIGN	BB 2020-08-07
REV. 0	SCALE AS SHOWN
FILE No.	20144766
PROJECT No.	20144766

TITLE

SHORELINE PHOTO
FACING EAST

PROJECT

GEOTECHNICAL INVESTIGATION
AND SLOPE STABILITY ASSESSMENT
200 LEES REDEVELOPMENT
OTTAWA, ONTARIO

GOLDER

PROJECT No.		20144766
FILE No.		20144766
REV. 0	SCALE AS SHOWN	
DESIGN	BB	2020-08-07
CADD		
CHECK	CH	2020-08-07
REVIEW		

PHOTO 2

TITLE

SHORELINE PHOTO
FACING EAST

PROJECT

GEOTECHNICAL INVESTIGATION
AND SLOPE STABILITY ASSESSMENT
200 LEES REDEVELOPMENT
OTTAWA, ONTARIO

GOLDER

PHOTO 3

PROJECT No.		20144766	
FILE No.		20144766	
REV. 0	SCALE AS SHOWN		
DESIGN	BB	2020-08-07	
CADD			
CHECK	CH	2020-08-07	
REVIEW			

TITLE

SHORELINE PHOTO
FACING EAST

PROJECT

GEOTECHNICAL INVESTIGATION
AND SLOPE STABILITY ASSESSMENT
200 LEES REDEVELOPMENT
OTTAWA, ONTARIO

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APPENDIX C

Structural Drawings

Draft Noise and Vibration Study

Draft Site Servicing Layout

Mechanical Drawings

Crane Layout Plan

Concept Drawings for Construction Site Layout

University of Ottawa - Faculty of Health Sciences Building

RFP #: 2020-40369

CLIENT REF. #: BT20-18477

ADDRESS: 200 Lees Avenue
Ottawa, ON
K1N 6N5

Civil Drawing List	
C-001	SERVICING PLAN
C-002	GRADING PLAN

Landscape Drawing List	
L100	LANDSCAPE PLAN
L200	LANDSCAPE MATERIALS
L300	PLANTING ZONES

Architectural Drawing List	
A011	GROUND FLOOR LIFE SAFETY PLAN
A012	SECOND FLOOR LIFE SAFETY PLAN
A013	THIRD FLOOR LIFE SAFETY PLAN
A014	FOURTH FLOOR LIFE SAFETY PLAN
A015	FIFTH FLOOR LIFE SAFETY PLAN
A100	SITE PLAN
A101	GROUND FLOOR PLAN
A102	SECOND FLOOR PLAN
A103	THIRD FLOOR PLAN
A104	FOURTH FLOOR PLAN
A105	FIFTH FLOOR PLAN
A110	ROOF PLAN
A121	GROUND FLOOR RCP
A122	SECOND FLOOR RCP
A123	THIRD FLOOR RCP
A124	FOURTH FLOOR RCP
A125	FIFTH FLOOR RCP
A200	ELEVATIONS
A201	ELEVATIONS
A300	SECTIONS
A301	SECTIONS
A310	WALL SECTIONS
A400	VERTICAL ELEMENTS
A401	VERTICAL ELEMENTS
A801	GROUND FLOOR MILLWORK PLAN
A802	SECOND FLOOR MILLWORK PLAN
A803	THIRD FLOOR MILLWORK PLAN
A804	FOURTH FLOOR MILLWORK PLAN
A805	FIFTH FLOOR MILLWORK PLAN
A810	DOOR & FRAME SCHEDULE
A811	DOOR & FRAME SCHEDULE
A812	DOOR & FRAME SCHEDULE
A820	ROOM FINISH SCHEDULE
A821	ROOM FINISH SCHEDULE
A822	ROOM FINISH SCHEDULE
A901	GROUND FLOOR FURNITURE PLAN
A902	SECOND FLOOR FURNITURE PLAN
A903	THIRD FLOOR FURNITURE PLAN
A904	FOURTH FLOOR FURNITURE PLAN
A905	FIFTH FLOOR FURNITURE PLAN

Architectural Functional Programing Drawing List	
P001	GROUND FLOOR
P002	SECOND FLOOR
P003	THIRD FLOOR
P004	FOURTH FLOOR
P005	FIFTH FLOOR

- Structural Drawing List -	
S000	BUILDING RENDERINGS
S100	GENERAL REQUIREMENTS
S101	GENERAL REQUIREMENTS
S110	CONCRETE FOUNDATION AND SLAB-ON-GRADE TYPICAL DETAILS
S111	CONCRETE COLUMN AND WALL TYPICAL DETAILS
S112	CONCRETE SLAB AND BEAM TYPICAL DETAILS
S113	CONCRETE REINFORCING AND MISCELLANEOUS TYPICAL DETAILS
S114	MASONRY WALL TYPICAL DETAILS
S115	STEEL TYPICAL DETAILS
S200	FOUNDATION PLAN
S201	LEVEL 1 FRAMING PLAN
S202	LEVEL 2 FRAMING PLAN
S203	LEVEL 3 FRAMING PLAN
S204	LEVEL 4 FRAMING PLAN
S205	LEVEL 5 FRAMING PLAN
S206	ROOF FRAMING PLAN
S400	SECTIONS

Electrical Drawing List	
E001	ELECTRICAL DRAWING LIST AND LEGEND
E002	ELECTRICAL DEMOLITION & NEW WORK - SITE PLAN
E003	LIGHTING - SITE PLAN
E004	EXTERIOR LIGHTING SITE PLAN PHOTOMETRICS
E101	GROUND FLOOR LIGHTING PLAN AND PHOTOMETRICS
E102	SECOND FLOOR LIGHTING PLAN AND PHOTOMETRICS
E103	THIRD FLOOR LIGHTING PLAN AND PHOTOMETRICS
E104	FOURTH FLOOR LIGHTING PLAN AND PHOTOMETRICS
E105	FIFTH FLOOR LIGHTING PLAN AND PHOTOMETRICS
E200	TYPICAL ROOM LIGHTING CONTROLS LAYOUTS
E201	LEVEL 1 LIGHTING PLAN
E202	LEVEL 2 LIGHTING PLAN
E203	LEVEL 3 LIGHTING PLAN
E204	LEVEL 4 LIGHTING PLAN
E205	LEVEL 5 LIGHTING PLAN
E210	LIGHTING FIXTURE SCHEDULE
E301	LEVEL 1 POWER PLAN
E302	LEVEL 2 POWER PLAN
E303	LEVEL 3 POWER PLAN
E304	LEVEL 4 POWER PLAN
E305	LEVEL 5 POWER PLAN
E306	ROOF POWER PLAN
E310	TYPICAL ROOM POWER AND SYSTEMS LAYOUTS
E311	TYPICAL ROOM POWER AND SYSTEMS LAYOUTS - LEVEL 1
E312	TYPICAL ROOM POWER AND SYSTEMS LAYOUTS - LEVEL 2
E313	TYPICAL ROOM POWER AND SYSTEMS LAYOUTS - LEVEL 3
E314	TYPICAL ROOM POWER AND SYSTEMS LAYOUTS - LEVEL 4
E401	GROUND FLOOR PROPOSED ROUTING PATHWAY
E402	SECOND FLOOR PROPOSED ROUTING PATHWAY
E403	THIRD FLOOR PROPOSED ROUTING PATHWAY
E404	FOURTH FLOOR PROPOSED ROUTING PATHWAY
E405	FIFTH FLOOR PROPOSED ROUTING PATHWAY
E500	ROOFTOP PHOTOVOLTAIC LAYOUT
E601	LEVEL 1 ENLARGED ROOM LAYOUTS
E602	LEVEL 2 ENLARGED ROOM LAYOUTS
E603	LEVEL 3 ENLARGED ROOM LAYOUTS
E604	LEVEL 4 ENLARGED ROOM LAYOUTS
E605	LEVEL 5 ENLARGED ROOM LAYOUTS
E606	ENLARGED 3D LAYOUTS OF MAJOR ROOMS
E700	ELECTRICAL SINGLE LINE RISER DIAGRAM
E701	FIRE ALARM RISER DIAGRAM

Mechanical Drawing List	
M000	LEGEND AND DRAWING LIST
M001	SITE PLAN
M100	FIRE FIGHTING SCHEMATIC
M101	FIRE PROTECTION FIRST FLOOR PLAN
M102	FIRE PROTECTION SECOND FLOOR PLAN
M103	FIRE PROTECTION THIRD FLOOR PLAN
M104	FIRE PROTECTION FOURTH FLOOR PLAN
M105	FIRE PROTECTION FIFTH FLOOR PLAN
M200	PLUMBING SCHEMATIC
M300	HVAC SCHEMATIC
M301	HVAC FIRST FLOOR PLAN
M302	HVAC SECOND FLOOR PLAN
M303	HVAC THIRD FLOOR PLAN
M304	HVAC FOURTH FLOOR PLAN
M305	HVAC FIFTH FLOOR PLAN
M400	UTILITIES SCHEMATIC
M501	CONTROLS SCHEMATICS
M502	CONTROLS SCHEMATICS
M503	CONTROLS SCHEMATICS
M504	CONTROLS SCHEMATICS
M505	CONTROLS ARCHITECTURE

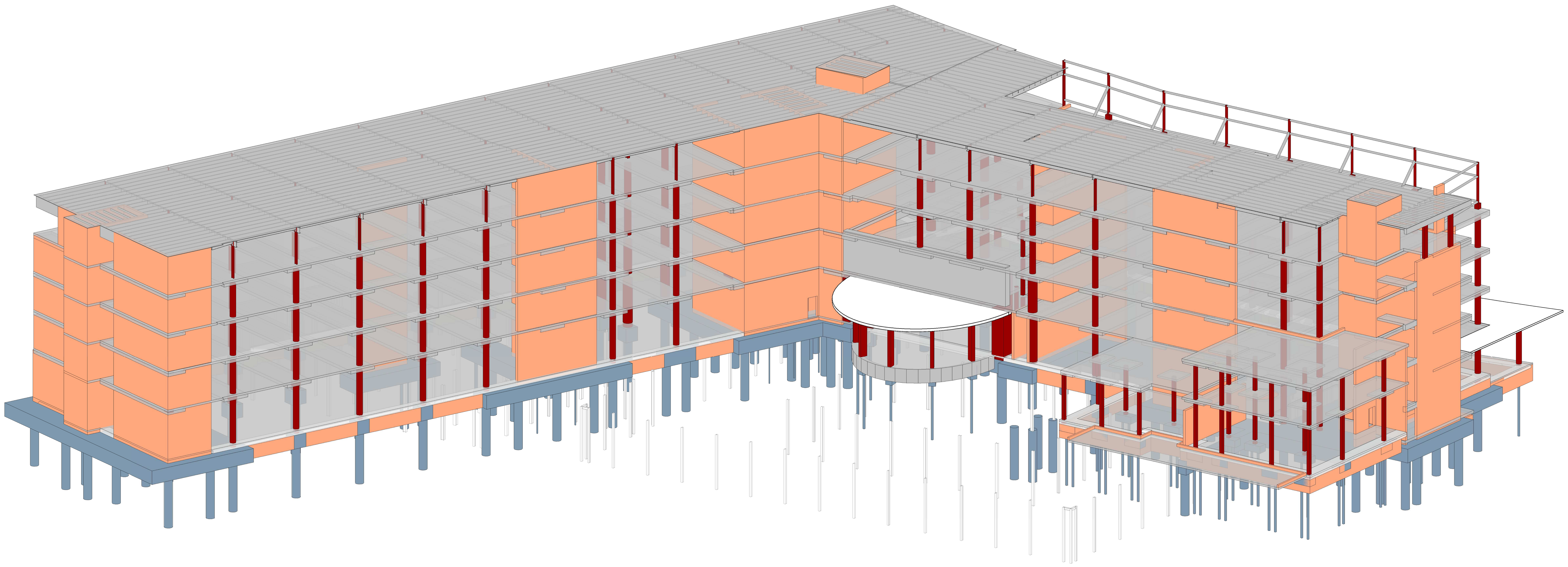
Technology Drawing List	
T001	TECHNOLOGY DRAWING LIST AND LEGEND
T002	SITE PLAN
T101	LEVEL 01 COMMUNICATION PLAN
T102	LEVEL 02 COMMUNICATION PLAN
T103	LEVEL 03 COMMUNICATION PLAN
T104	LEVEL 04 COMMUNICATION PLAN
T105	LEVEL 05 COMMUNICATION PLAN
T201	LEVEL 01 SECURITY PLAN
T202	LEVEL 02 SECURITY PLAN
T203	LEVEL 03 SECURITY PLAN
T204	LEVEL 04 SECURITY PLAN
T205	LEVEL 05 SECURITY PLAN
T401	COMMUNICATION PATHWAY RISER DIAGRAM
T402	COPPER RISER DIAGRAM
T403	FIBRE RISER DIAGRAM
T404	AV RISER DIAGRAM
T405	FMO NETWORK RISER DIAGRAM
T406	SECURITY RISER DIAGRAM
T407	DISTRIBUTED ANTENNA SYSTEM RISER DIAGRAM
T408	BONDING AND GROUNDING SYSTEM RISER DIAGRAM
T501	ENLARGED AV ROOM DETAILS 1
T502	ENLARGED AV ROOM DETAILS 2
T503	ENLARGED AV ROOM DETAILS 3
T504	ENLARGED AV ROOM DETAILS 4
T505	ENLARGED COMMUNICATION ROOM DETAILS
T506	ENLARGED COMMUNICATION ROOM DETAILS
T601	ACCESS CONTROL DOOR DETAILS
T602	COMMUNICATION DETAILS
T603	SECURITY CAMERA DETAILS
T604	AV EQUIPMENT CONNECTION DETAILS 1
T605	AV EQUIPMENT CONNECTION DETAILS 2
T606	AV EQUIPMENT CONNECTION DETAILS 3
T607	AV EQUIPMENT RACK DETAIL
T701	LEVEL 01 CAMERA COVERAGE
T702	LEVEL 02 CAMERA COVERAGE
T703	LEVEL 03 CAMERA COVERAGE
T704	LEVEL 04 CAMERA COVERAGE
T705	LEVEL 05 CAMERA COVERAGE

uOttawa

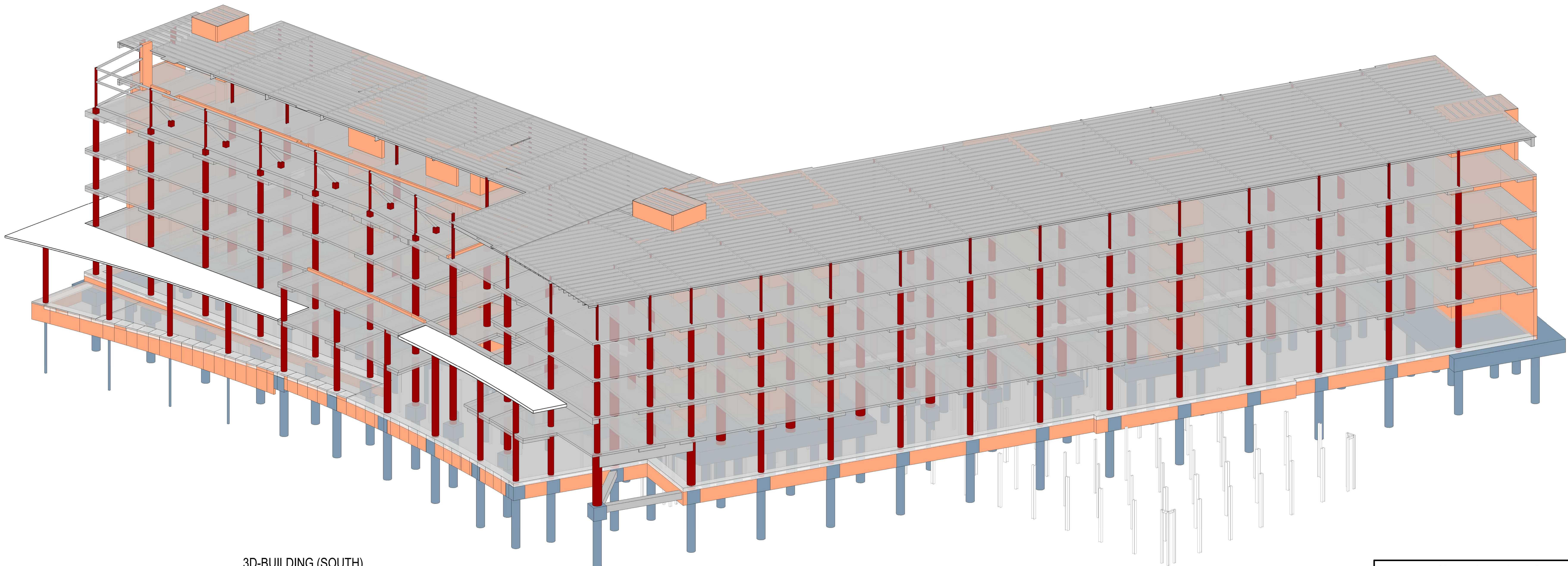
ARCHITECTURE 49   wsp   PCL CONSTRUCTION

Issued for Technical Submission

2021-04-15



3D-BUILDING (NORTH)



3D-BUILDING (SOUTH)

ALL RENDERINGS ARE FOR ILLUSTRATION PURPOSES ONLY. THEY DO NOT INCLUDE ALL STRUCTURAL ELEMENTS AND DETAILS, AND SHOULD NOT BE USED FOR CONSTRUCTION

DRAWING LIST

DRAWING No	DRAWING NAME
S000	BUILDING RENDERINGS
S100	GENERAL REQUIREMENTS
S101	GENERAL REQUIREMENTS
S110	CONCRETE FOUNDATION AND SLAB-ON-GRADE TYPICAL DETAILS
S111	CONCRETE COLUMN AND WALL TYPICAL DETAILS
S112	CONCRETE SLAB AND BEAM TYPICAL DETAILS
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S114	MASONRY WALL TYPICAL DETAILS
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S202	LEVEL 2 FRAMING PLAN
S203	LEVEL 3 FRAMING PLAN
S204	LEVEL 4 FRAMING PLAN
S205	LEVEL 5 FRAMING PLAN
S206	ROOF FRAMING PLAN
S400	SECTIONS

ARCHITECTURE 49

1000-150 ISABELLA STREET
OTTAWA (ONTARIO) CANADA K1S 1V7
Phone: 613-238-0440 | Fax: 613-238-6597 | WWW.ARCHITECTURE49.COM

wsp

2611 Queensview Dr, Suite 300
Ottawa, Ontario, K2B 8K2 Canada
T 613-829-2800 | F 613-829-8299 | www.wsp.com

PCL CONSTRUCTION

49 Auriga Drive
Ottawa, Ontario, K2E 8A1 Canada
T 613-978-5398 | www.pcl.com

SEAL:

CLIENT:

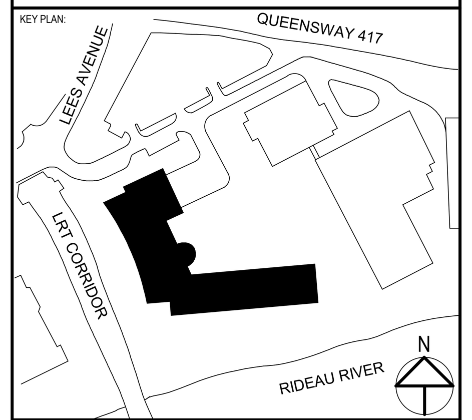
uOttawa

RFP #: 2020-40639 CLIENT REF. #: BT20-18477

PROJECT:

University of Ottawa - Faculty of Health Sciences Building

KEY PLAN:



ISSUED FOR - REVISION:

IS	RE	DATE	DESCRIPTION
1		2021-04-15	ISSUED FOR TECHNICAL SUBMISSION

PROJECT NO: 211-01094-00
DATE: 2021-04-15
ORIGINAL SCALE:
IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
25mm
DESIGNED BY: L.HAJSAID
DRAWN BY: P.MCKEE
CHECKED BY: S.HOWARD
DISCIPLINE: STRUCTURAL

TITLE:

BUILDING RENDERINGS

SHEET NUMBER: S000
SHEET #: OF
ISSUE: REV #
DATE OF:

GENERAL

1. THIS IS A METRIC PROJECT. UNLESS OTHERWISE NOTED, ALL DIMENSIONS ARE IN MILLIMETERS AND ALL FORCES ARE IN METRIC UNITS (PER TG-ABBR-02).
2. "WSP-S" REFERS TO WSP CANADA STRUCTURAL CONSULTANT.
3. PRIOR TO CONSTRUCTION, REVIEW STRUCTURAL DRAWINGS IN CONJUNCTION WITH DRAWINGS PROVIDED BY ALL OTHER CONSULTANTS. CONFIRM ALL DIMENSIONS, ELEVATIONS AND HEADROOM CLEARANCES, AND COORDINATE ALL OPENINGS, SLEEVES AND EMBEDDED ITEMS.
4. REPORT ANY DISCREPANCIES OR CONFLICTS BEFORE PROCEEDING WITH THE WORK.
5. DO NOT CUT OR DRILL ANY OPENINGS IN STRUCTURAL MEMBERS WITHOUT WRITTEN PERMISSION FROM WSP-S.
6. EXISTING STRUCTURAL INFORMATION IS BASED UPON DRAWINGS PREPARED BY BURGESS, McLEAN AND MacPHAYDEN, EASTERN ONTARIO INSTITUTE OF TECHNOLOGY DATED AUGUST 1962.
7. VERIFY EXISTING DIMENSIONS AND CONDITIONS ON SITE PRIOR TO CONSTRUCTION.
8. USE THESE DRAWINGS ONLY FOR THE PURPOSE IDENTIFIED IN THE REVISIONS COLUMN. DO NOT CONSTRUCT FROM THESE DRAWINGS UNLESS MARKED "ISSUED FOR CONSTRUCTION".
9. DO NOT USE INFORMATION ON THESE DRAWINGS FOR ANY OTHER PROJECT OR WORKS.
10. DO NOT SCALE THESE DRAWINGS.
11. UNLESS OTHERWISE NOTED ON DRAWINGS, FOLLOW TYPICAL DETAILS SHOWN ON S100 DRAWING SERIES. TYPICAL DETAILS SHOW STRUCTURAL INTENT RATHER THAN ACTUAL CONDITIONS FOR THIS PROJECT. IF A TYPICAL DETAIL INCLUDES A CROSS REFERENCE TO ANOTHER TYPICAL DETAIL WHICH IS NOT INCLUDED IN THE DRAWING SET, THE CROSS REFERENCED DETAIL IS NOT APPLICABLE ON THIS PROJECT.
12. ALL SECTIONS, DETAILS AND STATEMENTS NOTED AS "TYPICAL" APPLY TO LIKE / SIMILAR CONDITIONS IN THE STRUCTURE.
13. ASSUMED CLADDING SUPPORT CONDITIONS ARE IDENTIFIED ON DRAWINGS AS FOLLOWS:

    CWS - CLADDING SELF-WEIGHT SUPPORTED AT THIS LEVEL

    CLS - CLADDING ONLY LATERALLY SUPPORTED AT THIS LEVEL (SELF WEIGHT SUPPORTED AT LEVEL ABOVE/BELOW)
14. REFER TO ARCHITECTURAL DRAWINGS AND SPECIFICATIONS FOR REQUIRED FIRE RATING, SPRAYED FIREPROOFING, INTUMESCENT PAINTING AND ALL OTHER MEASURES REQUIRED TO ACHIEVE IT.
15. REFER TO ARCHITECTURAL DRAWINGS AND SPECIFICATIONS FOR WATERPROOFING, SEALERS, ETC.
16. REFER TO GEOTECHNICAL REPORT AND ARCHITECTURAL / CIVIL DRAWINGS AND SPECIFICATIONS FOR ALL SOIL WORKS.
17. DRAWINGS SHOW COMPLETED STRUCTURE ONLY. THEY DO NOT SHOW TEMPORARY WORKS FOR WHICH THE CONTRACTOR IS RESPONSIBLE AND WHICH MAY BE REQUIRED FOR EXECUTION OF THE PROJECT, INCLUDING TEMPORARY SHORING, BRACING, GUYS AND TIE DOWNS. CONTRACTOR TO ESTABLISH CONSTRUCTION PROCEDURE AND SEQUENCE TO ENSURE SAFETY OF THE WHOLE STRUCTURE AND ALL ITS COMPONENTS DURING ERECTION.
18. EXTENT OF ALL TEMPORARY SHORING FOR EXCAVATION WHICH MAY BE REQUIRED IS NOT NECESSARILY SHOWN ON STRUCTURAL DRAWINGS, CONTRACTOR TO DETERMINE. REFER TO SPECIFICATIONS FOR TEMPORARY SHORING REQUIREMENTS.
19. DESIGN AND CONSTRUCTION REVIEW OF ALL TEMPORARY WORKS TO BE CARRIED OUT BY A PROFESSIONAL ENGINEER RETAINED BY THE CONTRACTOR, LICENSED IN THE PLACE WHERE THE PROJECT IS LOCATED.
20. ANCHOR RODS AND OTHER EMBEDDED ITEMS ARE DESIGNED FOR LOADS ACTING ON THE COMPLETED STRUCTURE ONLY AND ARE NOT TO BE USED OR RELIED UPON FOR TEMPORARY SUPPORT OR BRACING DURING ERECTION UNLESS REVIEWED AND APPROVED BY THE CONTRACTOR'S ENGINEER RESPONSIBLE FOR THE ERECTION PROCEDURES.
21. CONSTRUCTION LOADS ON COMPLETED STRUCTURE NOT TO EXCEED DESIGN LOADS INDICATED ON DRAWINGS. FULL DESIGN LOADS MAY ONLY BE APPLIED TO CONCRETE ELEMENTS AFTER THE CONCRETE HAS REACHED ITS DESIGN STRENGTH.
22. UNLESS SHOWN ON STRUCTURAL DRAWINGS, DESIGN OF NON-STRUCTURAL AND SECONDARY STRUCTURAL ELEMENTS AND THEIR CONNECTIONS TO THE PRIMARY BUILDING STRUCTURE ARE NOT WITHIN THE SCOPE OF SERVICES PROVIDED BY WSP-S. SUCH ELEMENTS INCLUDE (BUT ARE NOT LIMITED TO) THE FOLLOWING:
    1. MISCELLANEOUS STEEL ELEMENTS: STAIRS, RAILINGS, GUARDRAILS.
    2. PARTITIONS: MASONRY, GLASS, WOOD AND STEEL STUDS, PREFABRICATED PANELS
    3. BULKHEADS, SUSPENDED CEILINGS, INTERIOR AND EXTERIOR SIGNAGE.
    4. ARCHITECTURAL PRECAST, PRECAST STAIRS.
    5. EXTERIOR CLADDING: PRECAST PANELS, METAL WALL SYSTEMS, CURTAIN WALLS AND WINDOWS.
    6. MASONRY, STONE OR PRECAST VENEER CONNECTIONS TO BACKUP STRUCTURE.
    7. MODULAR ASSEMBLIES FOR THERMALLY BROKEN BALCONIES.
    8. SKYLIGHTS, SNOW FENCES, GUTTERS, ROOF ANCHORS, WINDOW WASHING SYSTEMS, CHIMNEYS AND STACKS.
    9. SUPPORTS FOR MECHANICAL AND ELECTRICAL EQUIPMENT: HANGERS, BRACES, POSTS, RACKS, SLEEPERS, SEISMIC RESTRAINTS, SUPPORT PLATFORMS AND PADS, SERVICE PLATFORMS.
    10. SUPPORTS AND SEISMIC RESTRAINTS FOR OTHER EQUIPMENT, SUCH AS MEDICAL AND SPORTS EQUIPMENT.
    11. STORAGE RACKS.
    12. LANDSCAPING ELEMENTS: WALLS, CURBS, BENCHES, PLANTERS, WATER FEATURES.
    13. LIGHT POLES, FLAG POLES, SIGNS AND THEIR FOUNDATIONS.

    WSP-S WILL NOT REVIEW DESIGN, DETAILING AND INSTALLATION OF THESE ELEMENTS, FOR WHICH SUPPLIERS AND / OR SPECIALTY PROFESSIONAL ENGINEERS ARE RESPONSIBLE; THE ONLY REVIEW PROVIDED (WHERE APPLICABLE) WILL BE FOR IMPACT ON THE BASE BUILDING STRUCTURE.
23. NON-STRUCTURAL ELEMENTS
    1. UNLESS NOTED OTHERWISE, DESIGN AND DETAIL NON-STRUCTURAL ELEMENTS AND THEIR CONNECTIONS TO BE ABLE TO ACCOMMODATE THE MAXIMUM MOVEMENTS OF THE SUPPORTING STRUCTURE INDICATED UNDER "STRUCTURAL MOVEMENTS" IN THE DESIGN DATA NOTES. CLADDING SUPPLIER TO DESIGN AND PROVIDE NON-STANDARD ELEMENTS AND CONNECTIONS IF REQUIRED TO ACCOMMODATE THESE MOVEMENTS.
24. MAINTAIN A QUALITY CONTROL PLAN FOR STRUCTURAL WORK, AND MAKE IT AVAILABLE TO THE CONSULTANT UPON REQUEST. AT A MINIMUM, THE PLAN TO INCLUDE:
    1. NAMES OF PERSONNEL RESPONSIBLE FOR EXECUTION OF THE PLAN.
    2. MEANS AND METHODS FOR CONFIRMING MATERIAL COMPLIANCE WITH SPECIFICATIONS AND ASSOCIATED DOCUMENTATION PROCEDURES.
    3. PROGRAM FOR CONFIRMING AND DOCUMENTING COMPLIANCE WITH REQUIRED SUB-TRADE QUALIFICATIONS AND QUALIFICATIONS OF THEIR INDIVIDUAL EMPLOYEES AND SUB-CONTRACTORS.
    4. PROCEDURES FOR REVIEWING FIELD COMPLIANCE WITH CONSTRUCTION DOCUMENTS, INCLUDING DOCUMENTATION OF LOCATIONS REVIEWED, PHOTOGRAPHS TAKEN AND TIMING OF REVIEW. THE CONTRACTOR'S REVIEW TO BE COMPLETED PRIOR TO REVIEW BY THE CONSULTANT.
    5. PROCEDURES FOR RECTIFYING DEFICIENCIES NOTED BY THE CONTRACTOR, SUB-CONTRACTORS, CONSULTANTS AND INDEPENDENT INSPECTION AGENCIES.
25. FOR INSPECTION AND TESTING REQUIREMENTS, REFER TO SPECIFICATIONS.
26. IN CASE OF DISCREPANCY BETWEEN GENERAL NOTES, DRAWINGS AND SPECIFICATIONS, COMPLY WITH THE MOST STRINGENT REQUIREMENTS.

DESIGN DATA

1. STRUCTURAL DESIGN IS IN ACCORDANCE WITH THE 2012 ONTARIO BUILDING CODE AND ASSOCIATED AMENDMENTS (OBC), SUPPLEMENTED BY THE USER'S GUIDE - NBC 2015 STRUCTURAL COMMENTARIES.
2. CONCRETE ELEMENTS ARE DESIGNED PER CSA A23.3-14 - DESIGN OF CONCRETE STRUCTURES.
3. STEEL ELEMENTS ARE DESIGNED PER CSA S16-14 - DESIGN OF STEEL STRUCTURES.
4. COLD FORMED STEEL STRUCTURAL ELEMENTS ARE DESIGNED PER CSA S136-16 - NORTH AMERICAN SPECIFICATION FOR THE DESIGN OF COLD FORMED STEEL STRUCTURAL MEMBERS.
5. MASONRY STRUCTURAL ELEMENTS ARE DESIGNED PER CSA S304-14 - DESIGN OF MASONRY STRUCTURES.
6. SAWN LUMBER AND GLUE LAMINATED LUMBER STRUCTURAL ELEMENTS ARE DESIGNED PER CSA O86-14 - ENGINEERING DESIGN IN WOOD.
7. THE VALUES FOR CLIMATIC DATA USED IN THE DETERMINATION OF DESIGN LOADS HAVE BEEN OBTAINED FROM THE 2012 OBC AND ASSOCIATED AMENDMENTS FOR THE SPECIFIC LOCATION OF OTTAWA (CITY HALL).
8. BASED ON THE USE AND OCCUPANCY, THE BUILDING IS DESIGNED TO THE REQUIREMENTS OF A NORMAL IMPORTANCE CATEGORY.
9. SELF WEIGHT (SWT) IS DUE TO THE WEIGHT OF THE STRUCTURE ITSELF. IT VARIES WITH THE STRUCTURAL SYSTEM AND INCLUDES CONCRETE TOPPINGS WHERE APPLICABLE.
10. SUPERIMPOSED DEAD LOADS (SDL) ARE NON-STRUCTURAL DEAD LOADS DUE TO NON-STRUCTURAL TOPPINGS, FINISHES, PARTITIONS, ROOFING MATERIALS, SUSPENDED EQUIPMENT, PAVERS, SOIL, ETC.
11. DEAD LOAD (DL) IS THE SELF WEIGHT OF THE STRUCTURE PLUS THE SUPERIMPOSED DEAD LOAD.
12. LIVE LOAD (LL) REDUCTION HAS NOT BEEN USED.
13. UNLESS OTHERWISE NOTED, DESIGN LOADS SHOWN ON DRAWINGS ARE SPECIFIED (UNFACTORED) LOADS, TO BE USED FOR ULS DESIGN. FOR SLS DESIGN, THESE LOADS CAN BE REDUCED BY MULTIPLYING WITH THE RATIO OF APPROPRIATE IMPORTANCE FACTORS Ix(SLS) / Ix(ULS) GIVEN BELOW.
14. IF ONLY ONE VALUE IS GIVEN FOR A LOAD, CONSIDER IT LIVE LOAD.
15. FOR CONNECTION LOADS, "+" SIGN INDICATES TENSION AND "-" SIGN INDICATES COMPRESSION, EXCEPT FOR COLUMN LOADS WHERE "+" SIGN INDICATES COMPRESSION AND "-" SIGN INDICATES TENSION.
16. SNOW:

    S_s =2.4 kPa S_r = 0.4 kPa I_s(ULS) = 1.0 I_s(SLS) = 0.9

    MINIMUM UNFACTORED SNOW LOAD = 2.32 kPa x Is
17. RAIN:

    24 HOUR RAINFALL = 86mm
18. LATERAL LOADS IN THIS STRUCTURE ARE RESISTED BY SHEAR WALLS AND ARE DETERMINED BASED ON THE WIND AND SEISMIC DATA BELOW.
19. WIND:

    q_{50} =0.41 kPa I_w (ULS) = 1.0 I_w (SLS) = 0.75

    BUILDING IS: LOW RISE
    TERRAIN TYPE: OPEN
    INTERNAL PRESSURE CATEGORY: 2

    C_e = 0.9

    WIND LOAD AT GRADE LEVEL FOR DESIGN OF OVERALL BUILDING LATERAL LOAD RESISTING SYSTEM:
    0.5kPa.

    WIND LOAD AT GRADE LEVEL OUTSIDE THE END ZONES FOR DESIGN OF SECONDARY STRUCTURAL ELEMENTS (GIRTS, WIND COLUMNS, ETC. BUT NOT INCLUDING CLADDING): 0.7 kPa.

    FACTORED BASE SHEARS & OVERTURNING MOMENTS:

    V(NS) = 2,610 kN
    M(NS) = 33,544kNm

    V(EW) = 1,960 kN
    M(EW) = 25,340 kNm
20. SEISMIC FORCE RESISTING SYSTEM (SFRS)

    SYSTEM & CONNECTIONS : (OBC CLAUSE 4.1.8.9 / 4.1.8.10)
    LATERAL LOAD RESISTING SYSTEM: CONVENTIONAL CONSTRUCTION SHEAR WALLS
    R_d = 1.5
    R_o = 1.3
    CSA STANDARD: A23.3-14
    APPLICABLE CLAUSE(S): 21

    DIAPHRAGMS & CONNECTIONS : (OBC CLAUSE 4.1.8.15)
    CSA STANDARD: A23.3-14
    APPLICABLE CLAUSE(S): 21

    FOUNDATIONS : (OBC CLAUSE 4.1.8.16)
    CSA STANDARD: A23.3-14
    APPLICABLE CLAUSE(S): 21 (FOR ANCHORED FOOTINGS)

    IMPORTANCE FACTOR : (OBC CLAUSE 4.1.8.5)
    Ie = 1.0

    5% DAMPED SPECTRAL RESPONSE ACCELERATION VALUES:
    PGA = 0.281
    S_a(0.2) = 0.439
    S_a(0.5) = 0.237
    S_a(1.0) = 0.118
    S_a(2.0) = 0.056
    S_a(5.0) = 0.015
    S_a(10.0) = 0.0055
21. SITE CLASS:

    THE NOTED SITE CLASSIFICATION FOR SEISMIC SITE RESPONSE INDICATED ARE AS REPORTED IN THE GEOTECHNICAL REPORT.
    SEISMIC SITE CLASSIFICATION = C.

    F_a = 1
    F_v = 1
22. DESIGN SPECTRAL RESPONSE ACCELERATION VALUES

    S(0.2) = 0.439
    S(0.5) = 0.237
    S(1.0) = 0.118
    S(2.0) = 0.056
    S(5.0) = 0.015
    $I_eF_aS_a$ (0.2) = 0.439
23. STRUCTURAL MOVEMENTS

    UNLESS NOTED OTHERWISE, MAXIMUM EXPECTED MOVEMENT OF THE BUILDING STRUCTURE (AFTER INSTALLATION OF FINISHES) WILL BE AS FOLLOWS ("L" IS THE CLEAR SPAN OF THE SUPPORTING STRUCTURAL ELEMENT, "H" IS THE STOREY HEIGHT):
    - VERTICAL DEFLECTION OF CONCRETE FRAMED FLOORS AND ROOFS: L/480 u/n
    - INTERSTOREY WIND DRIFT: H/500
    - INTERSTOREY SEISMIC DRIFT H/40

    DESIGN AND DETAIL NON STRUCTURAL ELEMENTS AND THEIR CONNECTIONS TO BE ABLE TO ACCOMMODATE THE ABOVE MOVEMENTS.

SHOP DRAWINGS

1. REFER TO SPECIFICATIONS FOR SHOP DRAWINGS WHICH NEED TO BE SUBMITTED FOR REVIEW.
2. SUBMIT SIGNED AND SEALED TOWER CRANE SHOP DRAWINGS TO BE REVIEWED FOR IMPACT ON THE BASE BUILDING STRUCTURE.
3. REVIEW OF SHOP DRAWINGS BY WSP-S IS ON A SAMPLING BASIS, FOR GENERAL CONFORMITY WITH STRUCTURAL CONTRACT DOCUMENTS. IT IS NOT A DETAILED CHECK AND MUST NOT BE CONSTRUED AS RELIEVING THE CONTRACTOR OF THE CONTRACTOR'S RESPONSIBILITY TO MAKE THE WORK ACCURATE AND IN CONFORMITY WITH ALL CONTRACT DOCUMENTS, TO REVIEW SHOP DRAWINGS AND TO COORDINATE WORK OF INTERFACING TRADES AND MANUFACTURE OF INTERFACING PRODUCTS.
4. REVIEW OF SHOP DRAWINGS DOES NOT IMPLY ANY CHANGE IN ANY OTHER CONSULTANTS' OR PROFESSIONALS' RESPONSIBILITIES RELATED TO DESIGN OF SPECIFIC ITEMS AS OUTLINED BY THE SPECIFICATIONS.
5. ALLOW A MINIMUM OF 10 WORKING DAYS FOR REVIEW OF EACH SUBMISSION OF SHOP DRAWINGS IN WSP-S OFFICE. ALLOW MORE TIME WHEN LARGE QUANTITIES OF SHOP DRAWINGS ARE SUBMITTED. SUBMIT IN GENERAL CONFORMITY WITH THE SEQUENCE OF CONSTRUCTION INTENDED.
6. AFTER REVIEW, THE DRAWINGS WILL BE STAMPED AND RETURNED. DO NOT COMMENCE FABRICATION UNTIL RETURNED SHOP DRAWINGS HAVE BEEN EXAMINED. IF FABRICATION BEGINS PRIOR TO EXAMINATION OF RETURNED SHOP DRAWINGS, THE COST ASSOCIATED WITH ANY REQUIRED REPLACEMENT OR REWORK OF FABRICATED ELEMENTS IS THE RESPONSIBILITY OF THE CONTRACTOR.
7. SHOP DRAWINGS MARKED " **REVIEWED** " CAN BE USED FOR FABRICATION. DO NOT MAKE ANY CHANGES OR ADDITIONS TO THESE DRAWINGS WITHOUT NOTIFYING THE CONSULTANT.
8. SHOP DRAWINGS MARKED " **REVIEWED AS NOTED** " CAN BE USED FOR FABRICATION AFTER THE REVISIONS NOTED ARE IMPLEMENTED. DO NOT MAKE ANY FURTHER CHANGES OR ADDITIONS TO THESE DRAWINGS WITHOUT NOTIFYING THE CONSULTANT.
9. SHOP DRAWINGS MARKED " **REVISE AND RESUBMIT** " REQUIRE SUBSTANTIAL REVISIONS AND MUST BE RESUBMITTED FOR ADDITIONAL REVIEW PRIOR TO FABRICATION. ALL CHANGES AND ADDITIONS TO THE PREVIOUS SUBMISSION TO BE CLEARLY IDENTIFIED ON THE RESUBMITTED DRAWINGS. ONLY THE IDENTIFIED CHANGES WILL BE REVIEWED ON RE-SUBMISSION.
10. SHOP DRAWINGS MARKED " **REVIEWED FOR IMPACT ON BASE STRUCTURE ONLY** " SHOW WORKS WHICH ARE NOT WITHIN THE SCOPE OF STRUCTURAL CONSULTING SERVICES BUT AFFECT BEHAVIOUR OF THE BASE STRUCTURE. WSP-S WILL NOT REVIEW DESIGN OF THESE WORKS AND ASSUMES THAT THE INDICATED WEIGHTS AND ALL OTHER LOADS IMPOSED ON THE BASE STRUCTURE ARE CORRECTLY IDENTIFIED BY THE DESIGNER / SUPPLIER OF THESE ELEMENTS.
11. DRAWINGS MARKED " **NOT REVIEWED** " SHOW WORKS WHICH ARE NOT WITHIN THE SCOPE OF STRUCTURAL CONSULTING SERVICES AND DO NOT IMPACT THE BASE BUILDING STRUCTURE.
12. EXCEPT FOR TOWER CRANE AND EXCAVATION SHORING (WHICH WILL BE REVIEWED FOR IMPACT ON THE BASE STRUCTURE ONLY), WSP-S WILL NOT REVIEW DESIGN AND IMPLEMENTATION OF ANY TEMPORARY WORKS, NOR ASSESS IMPACT OF THESE WORKS ON THE BASE STRUCTURE. THE CONTRACTOR AND / OR THE PROFESSIONAL ENGINEER ENGAGED BY THE CONTRACTOR MUST ENSURE THAT THE BASE STRUCTURE IS NOT ADVERSELY AFFECTED BY THE TEMPORARY WORKS AND CONSTRUCTION PROCESS AND THAT TEMPORARY LOADS DO NOT EXCEED THE DESIGN LOADS INDICATED ON STRUCTURAL DRAWINGS.
13. DO NOT USE SHOP DRAWINGS AS A MEANS TO PROPOSE SUBSTITUTIONS OR ALTERNATIVES TO THE MATERIALS, PRODUCTS OR DETAILS INDICATED IN CONTRACT DOCUMENTS. SUCH SHOP DRAWINGS WILL BE MARKED "REVISE AND RESUBMIT".
14. PROVIDE FINAL RECORD DRAWINGS AFTER ALL CORRECTIONS ARE MADE.

FIELD REVIEW

1. WSP-S WILL PROVIDE PERIODIC FIELD REVIEW OF A REPRESENTATIVE SAMPLE OF THE STRUCTURAL WORKS DETAILED ON THESE DRAWINGS FOR GENERAL CONFORMANCE WITH CONTRACT DOCUMENTS. THESE REVIEWS DO NOT REPLACE THE CONTRACTOR'S RESPONSIBILITY TO IMPLEMENT AND MAINTAIN A QUALITY CONTROL PROGRAM, AND DO NOT MAKE WSP-S A GUARANTOR OF THE CONTRACTOR'S WORK.
2. CONSTRUCTION REVIEW REPORTS WILL OUTLINE ANY DEFICIENCIES FOUND.
3. ASSIST WSP-S DURING FIELD REVIEW, AND PROVIDE SAFE ACCESS TO WORK AREAS AS REQUIRED.
4. CHECK THE WORK PRIOR TO FIELD REVIEW TO CONFIRM IT IS COMPLETED AND IN ACCORDANCE WITH CONTRACT DOCUMENTS.
5. BRING TO THE ATTENTION OF WSP-S ANY DEFICIENCIES FOUND IN THE WORK TOGETHER WITH A PROPOSAL FOR REMEDY. WSP-S WILL DECIDE WHAT CORRECTIVE ACTION MAY BE TAKEN AND ISSUE THE NECESSARY INSTRUCTIONS.
6. PROVIDE REASONABLE NOTICE (NOT LESS THAN 24 HOURS) TO ALLOW FOR THE FIELD REVIEW OF THE FOLLOWING:

a.	CONCRETE WALLS, BEAMS AND COLUMNS	BEFORE CLOSING FORMS
b.	ALL OTHER CONCRETE	BEFORE EACH CONCRETE POUR
c.	POST TENSIONING	BEFORE STRESSING
d.	MASONRY	BEFORE EACH GROUT POUR
e.	STRUCTURAL STEEL DECK	BEFORE COVERING UP OR PLACING STEEL
f.	METAL FLOOR DECK	BEFORE PLACING REINFORCING
g.	METAL ROOF DECK	BEFORE ROOFING
h.	WOOD FRAMING	BEFORE COVERING UP

7. SCHEDULE REVIEW WORK TO OCCUR DURING NORMAL BUSINESS HOURS.
8. ORGANIZE FOR FIELD REVIEW OF ALL PROPRIETARY PRODUCTS AND OTHER STRUCTURAL WORKS DESIGNED BY SPECIALTY ENGINEERS. THE REVIEW TO BE BY THE ENGINEERS RESPONSIBLE FOR THE DESIGN OR BY OTHER ENGINEERS DESIGNATED BY THE ENGINEERS RESPONSIBLE FOR THE DESIGN AND LICENSED IN THE PLACE WHERE THE PROJECT IS LOCATED. SUBMIT CONSTRUCTION REVIEW REPORTS FOR CONSULTANT'S RECORD.

EXISTING STRUCTURES

1. EXISTING CONDITIONS ARE ASSUMED. SURVEY THE EXISTING PILE LOCATIONS ONCE DECONSTRUCTION OF THE BUILDINGS ARE COMPLETE. PROVIDE SURVEY WITH DETAILED DIMENSIONS TO WSP-S FOR REVIEW.
2. DESIGN OF STRUCTURAL COORDINATION RELATED TO THE EXISTING BUILDING FOUNDATIONS HAS BEEN CARRIED OUT AS FAR AS PRACTICAL, GIVEN LIMITED AVAILABILITY OF THE EXISTING DRAWINGS AND LIMITED RECORDS. MODIFICATIONS TO THE PROPOSED STRUCTURAL FRAMING AND / OR DETAILS MAY BE REQUIRED IF EXISTING CONDITIONS ARE FOUND TO BE DIFFERENT FROM THOSE ASSUMED AND SHOWN ON DRAWINGS.
3. REMOVE FROM SITE ALL OTHER STRUCTURAL ELEMENTS AND PRODUCTS WHICH ARE NOT INDICATED TO BE HANDED OVER TO THE OWNER.
4. ALL DEMOLITION, SHORING AND OTHER TEMPORARY WORKS TO BE DESIGNED BY A PROFESSIONAL ENGINEER RETAINED BY THE CONTRACTOR, LICENSED IN THE PLACE WHERE THE PROJECT IS LOCATED. PREPARE DRAWINGS SIGNED AND SEALED BY THAT ENGINEER SHOWING DEMOLITION PROCEDURE AND SEQUENCE AND ALL THE NECESSARY SHORING.
5. INSTALL AND AFTERWARDS REMOVE ALL TEMPORARY SHORING AND BRACING REQUIRED TO ENSURE THE INTEGRITY OF THE EXISTING STRUCTURE DURING CONSTRUCTION.
6. MAKE GOOD ALL EXISTING WORK DISTURBED BY THE SHORING OPERATIONS, DEMOLITION, EXCAVATION AND OTHER CONSTRUCTION PROCEDURES.

EXCAVATION, BACKFILL AND COMPACTION

1. REFER TO GEOTECHNICAL REPORT FOR ALL EXCAVATION, BACKFILL AND COMPACTION REQUIREMENTS.
2. VERIFY GEOTECHNICAL INFORMATION ON SITE AND OBTAIN ADDITIONAL DATA IF REQUIRED.
3. PRIOR TO COMMENCING EXCAVATION, LOCATE AND IDENTIFY ALL EXISTING UNDERGROUND STRUCTURES AND SERVICES.
4. MAINTAIN STRUCTURES AND SERVICES WHICH ARE TO REMAIN OPERATIONAL OR WHICH WILL BE RE-USED. DESIGN AND PROVIDE PROTECTION AND SUPPORT. WHERE REQUIRED, OBTAIN APPROVAL FROM THE AUTHORITIES HAVING JURISDICTION AND DIVERT OR RELOCATE EXISTING SERVICES. REMOVE ALL OTHER STRUCTURES AND SERVICES.
5. ESTABLISH LINES OF EXCAVATION AS REQUIRED NOT TO EXCEED MAXIMUM SLOPE OF EXCAVATION GIVEN IN THE GEOTECHNICAL REPORT. ANY DEVIATIONS FROM THIS DETAIL TO BE APPROVED BY THE GEOTECHNICAL CONSULTANT AND WSP-S.
6. DESIGN AND PROVIDE SHORING AND BRACING FOR EXCAVATION WHERE NECESSARY.
7. EXCAVATE TO EXPOSE NATIVE UNDISTURBED SOIL, AND TO ALLOW FOR MINIMUM COMPACTED BACKFILL AND CONSTRUCTION CLEARANCES AS REQUIRED. REMOVE ALL TOPSOIL, LOOSE FILL, DEBRIS, SOFT SPOTS AND ORGANIC MATERIALS.
8. DIG TRENCHES FOR MECHANICAL AND ELECTRICAL SERVICES TO PROVIDE UNIFORM CONTINUOUS BEARING AND SUPPORT BEDDING MATERIAL ON UNDISTURBED SOIL. REFER TO MECHANICAL, ELECTRICAL AND CIVIL DRAWINGS FOR TRENCH CONSTRUCTION DETAILS. AT A MINIMUM, FILL TRENCHES WITH SAND TO 300 (12") ABOVE PIPES OR CONDUITS.
9. LEGALLY DISPOSE OF ALL EXCAVATED MATERIALS, OR STORE ON SITE FOR BACKFILLING OPERATIONS IN ACCORDANCE WITH GEOTECHNICAL RECOMMENDATIONS AND PROJECT SPECIFICATIONS.
10. PROTECT BOTTOM OF EXCAVATION FROM EXCESSIVE MOISTURE. USE GRANULAR FILL OR LEAN CONCRETE (MUD SLAB) AS RECOMMENDED IN THE GEOTECHNICAL REPORT. SLOPE FOR DRAINAGE. PROVIDE DRAINAGE TRENCHES AND PITS AND PUMP OUT WATER AS REQUIRED.
11. GEOTECHNICAL ENGINEER TO REVIEW AND APPROVE ALL EXCAVATIONS BEFORE BACKFILLING OR PLACING CONCRETE.
12. BACKFILLING MATERIALS TO BE AS PER GEOTECHNICAL RECOMMENDATIONS. GEOTECHNICAL ENGINEER TO REVIEW AND APPROVE ALL BACKFILLING MATERIALS.
13. ALL BACKFILLING MATERIALS TO BE SOUND AND CLEAN, FREE FROM DEBRIS, ORGANIC AND FROZEN MATTER, WITH NO REACTIVE MINERALS NOR FRIABLE MATERIALS WITH SWELLING POTENTIAL.
14. UNLESS NOTED OTHERWISE IN THE GEOTECHNICAL REPORT, BACKFILL TO GRADES INDICATED IN LIFTS NOT EXCEEDING 300(12"), EXCEPT THAT LIFTS FOR INFRASTRUCTURE (GRANULAR BASE) SHOULD NOT EXCEED 150(6"), USE MECHANICAL COMPACTION EQUIPMENT. DO NOT PLACE BACKFILL OVER FROZEN SOIL.
15. USE ONLY LIGHT, HAND-OPERATED EQUIPMENT FOR COMPACTION ADJACENT TO BASEMENT WALLS AND RETAINING WALLS. DO NOT BACKFILL UNTIL ELEMENTS PROVIDING LATERAL SUPPORT, INCLUDING SLABS ON GRADE AND ALL SUSPENDED LEVELS, ARE COMPLETED AND CONCRETE HAS REACHED 75% OF ITS DESIGN STRENGTH. FOR ELEMENTS THAT ARE TO BE BACKFILLED ON BOTH SIDES, PLACE BACKFILL SIMULTANEOUSLY ON BOTH SIDES SUCH THAT HEIGHTS DO NOT VARY BY MORE THAN 500 (1'-8") FROM ONE SIDE TO THE OTHER.
16. MAINTAIN MOISTURE CONTENT IN BACKFILLING MATERIAL AS REQUIRED TO ACHIEVE THE SPECIFIED COMPACTION. PROTECT FROM EXCESSIVE MOISTURE DURING AND AFTER THE BACKFILLING OPERATION.
17. INDEPENDENT INSPECTION AND TESTING AGENCY TO MONITOR COMPACTION AND CONDUCT DENSITY TESTING DURING INSTALLATION OF ALL GRANULAR MATERIALS. IF NO TESTING AGENCY IS ENGAGED BY THE OWNER, THE CONTRACTOR TO RETAIN.

FOUNDATIONS

1. STRUCTURAL DESIGN IS BASED ON THE GEOTECHNICAL MEMORANDA PREPARED BY PATERSON GROUP,
    a. FOUNDATION RECOMMENDATIONS NUMBER PG5656-MEMO.01, Rev.02, DATED MARCH 17, 2021
    b. EXCAVATION AND EARTHWORKS RECOMMENDATIONS NUMBER PG5656-MEMO.02, Rev.01, DATED MARCH 2, 2021
2. BUILDING FOUNDATIONS WILL BE SUPPORTED BY A COMBINATION OF END BEARING DRIVEN PIPE PILES AND BORED CONCRETE PILES. AUXILIARY EXTERIOR STRUCTURES WILL BE FOUNDED CONVENTIONAL SHALLOW FOOTINGS BEARING ON PRESCRIBED PRE-ENGINEERED FILL. REFER TO THE GEOTECHNICAL REPORT FOR DETAILED INFORMATION ON GEOTECHNICAL CONDITIONS, FOUNDATION RECOMMENDATIONS, AND FOR ALL EARTHWORK INCLUDING EXCAVATION, BACKFILL AND SUBGRADE PREPARATION.
3. CONVENTIONAL SHALLOW FOOTINGS - ASSUMED FOOTING BEARING RESISTANCE:
    150 kPa AT ULS (ULTIMATE LIMIT STATES DESIGN)
    100 kPa AT SLS (SERVICEABILITY LIMIT STATES DESIGN)

    CONSTRUCTION SHALLOW FOOTINGS ON ENGINEERED FILL OVER APPROVED FILL LAYER.
    a. CONSTRUCT ALL FOOTINGS ON STRATA CAPABLE TO PROVIDE THE BEARING RESISTANCE NOTED, BUT NOT ABOVE THE ELEVATIONS INDICATED ON DRAWINGS.
    b. STRUCTURAL DRAWINGS SHOW FOOTINGS AT ELEVATIONS WHERE THE REQUIRED BEARING RESISTANCE IS ANTICIPATED. GEOTECHNICAL CONSULTANT TO REVIEW AND APPROVE IN WRITING ALL BEARING SURFACES PRIOR TO CONSTRUCTING FOOTINGS.
    c. IF THE ASSUMED BEARING RESISTANCE IS NOT OBTAINED AT THE UNDERSIDE OF FOOTING ELEVATION INDICATED ON DRAWINGS, EXTEND EXCAVATION UNTIL COMPETENT SOIL IS REACHED, AND PROVIDE LEAN CONCRETE FILL (OR CONCRETE SAME AS SPECIFIED FOR THE FOOTING) TO UNDERSIDE OF FOOTING. DO NOT DROP DOWELS; MAINTAIN THE SPECIFIED PROJECTION REQUIRED FOR LAPS.
    d. PROVIDE MIN. 50 (2") DEEP MUD SLAB AS REQUIRED TO PROTECT BOTTOM OF EXCAVATION AND PLACE REBAR, AND IN ALL CASES WHERE RECOMMENDED IN GEOTECHNICAL REPORT OR SHOWN ON DRAWINGS.
    e. REFER TO TYPICAL DETAIL TC-FDN-33 FOR STEPS IN FOOTINGS.
4. END BEARING DRIVEN PIPE PILES TO BE CONCRETE FILLED 245 DIA x 13 PIPES

    ASSUMED ULS PILE CAPACITY IN COMPRESSION IS 1500 kN.

    ASSUMED ULS PILE CAPACITY IN TENSION IS 200 kN.
    a. IF REQUIRED, SPLICE PILES BY FULL PENETRATION BUTT WELDS IN PLANES PERPENDICULAR TO CENTERLINE OF PILES.
    b. PILE TOLERANCES:
       MAXIMUM DEVIATION AT CUT OFF ELEVATION FROM POSITION ON PLAN: 75 (3")
       CENTER TO CENTER DISTANCE OF PILES IN GROUP: 75 (3")
       MAXIMUM DEVIATION FROM CUT OFF ELEVATION: +12 (+1/2"), -50 (-2")
       MAXIMUM DEVIATION FROM PLUMB: 2%
       CURVATURE: MIN. 100m; REFER TO SPECIFICATIONS IF CURVATURE IS BETWEEN 100m TO 200m.
       PROJECTION OVER LEGAL BOUNDARY: ZERO
    c. GEOTECHNICAL CONSULTANT TO REVIEW PILE LENGTH AND REFUSAL CRITERIA REQUIRED TO ACHIEVE THE SPECIFIED CAPACITY, TO OBSERVE PILE TESTING, AND TO MONITOR PILE DRIVING ON A FULL TIME BASIS.
5. END BEARING BORED CONCRETE PILES:.

    900mm DIA. BORED CONCRETE PILE
    ASSUMED ULS CAISSON CAPACITY IN COMPRESSION IS 10,000 kN
    ASSUMED ULS CAISSON CAPACITY IN TENSION IS 920 kN

    1000mm DIA. BORED CONCRETE PILE
    ASSUMED ULS CAISSON CAPACITY IN COMPRESSION IS 15,000 kN
    ASSUMED ULS CAISSON CAPACITY IN TENSION IS 1050 kN
    a. REFER TO SOILS REPORT FOR SPECIFIC BEARING SURFACE PREPARATION PROCEDURES.
    b. PILE TOLERANCES:
       MAX. DIAMETER VARIATION: 25 (1")
       MAXIMUM DEVIATION AT CUT OFF ELEVATION FROM POSITION ON PLAN: 75 (3")
       MAXIMUM DEVIATION FROM CUT OFF ELEVATION: +50 (+2"), -100 (-4")
       MAXIMUM DEVIATION FROM PLUMB: 2%
       MAXIMUM SLOPE OF EXCAVATION AT BOTTOM OF PILE: 1:25
       PROJECTION OVER LEGAL BOUNDARY: ZERO
    c. GEOTECHNICAL CONSULTANT TO REVIEW ALL BEARING SURFACES AND PILE LENGTHS PRIOR TO PLACING CONCRETE IN PILES AND TO MONITOR PILE INSTALLATION.
6. FOR FROST PROTECTION, MINIMUM DISTANCE FROM FINISHED GRADE TO UNDERSIDE OF FOOTINGS, GRADE BEAMS AND PILE CAPS TO BE NOT LESS THAN:
    - AT BUILDING PERIMETER ADJACENT TO HEATED AREAS: 1500
    - IN UNHEATED AREAS: 1800
7. WHERE UNDERSIDES OF PERIMETER WALLS, GRADE BEAMS OR PILE CAPS ARE SHOWN SUCH THAT THE REQUIRED FROST PROTECTION INDICATED ABOVE IS NOT PROVIDED, PROVIDE FROST CUSHION BELOW THE FULL LENGTH OF WALLS AND GRADE BEAMS AND BELOW OVERHANGING PORTION OF PILE CAPS. REFER TO GEOTECHNICAL REPORT FOR MINIMUM THICKNESS OF THE FROST CUSHION.
8. UNLESS OTHERWISE NOTED, CENTRE FOOTINGS, PIERS, PILES AND PILE CAPS UNDER CENTROID OF COLUMNS. WHERE THERE ARE NO COLUMNS ABOVE, CENTER UNDER WALLS OR GRADE BEAMS.
9. LOCATE ALL EXISTING UNDERGROUND SERVICES PRIOR TO EXCAVATION.
10. THE LINE OF SLOPE BETWEEN ADJACENT EXCAVATIONS FOR FOOTINGS OR TRENCHES NOT TO EXCEED A RISE OF1 IN A RUN OF 1.5. DO NOT EXPOSE PILE OR UNDERMINE PILE CAP WHEN EXCAVATING FOR TRENCHES UNLESS APPROVED IN WRITING BY WSP-S.
11. KEEP EXCAVATION DRAINED AND FREE OF WATER AT ALL TIMES.
12. PROTECT FOOTINGS, PIERS, TOPS OF PILES, PILE CAPS, GRADE BEAMS, FOUNDATION WALLS, SLABS-ON-GRADE AND ADJACENT SOIL AGAINST FREEZING AND FROST ACTION AT ALL TIMES DURING CONSTRUCTION. DO NOT POUR CONCRETE AGAINST FROZEN EARTH.
13. DO NOT USE EARTH FORMS UNLESS APPROVED IN WRITING BY WSP-S AND GEOTECHNICAL CONSULTANT. FOR ELEMENTS APPROVED TO BE CAST AGAINST SOIL, INCREASE FOOTING SIZE SHOWN ON DRAWINGS AS REQUIRED TO OBTAIN 75 (3") CONCRETE COVER AGAINST SOIL.
14. UNLESS OTHERWISE NOTED, LAP ALL HORIZONTAL GRADE BEAM REINFORCEMENT WITH CLASS B LAPS. CARRY CONTINUOUSLY THROUGH PIERS AND PILE CAPS WHERE APPLICABLE.
15. PLACE ANCHOR RODS AND DOWELS BEFORE CONCRETE IS CAST. USE TEMPLATES TO KEEP IN POSITION.
16. UNLESS NOTED OTHERWISE, PROVIDE DRAINAGE WITH WEEPING TILE TIED INTO MECHANICAL DRAINAGE SYSTEM AT ALL CONCRETE ELEMENTS BELOW GRADE. REFER TO GEOTECHNICAL REPORT FOR FREE DRAINING BACKFILL REQUIREMENTS AND GROUND WATER FLOW.
17. IF WEEPING TILE IS LOCATED AT THE INSIDE FACE OF THE STRUCTURE (NOT AT THE FACE SUPPORTING EARTH), PROVIDE MIN. 50 (2") DIA. WEEPERS AT MAX 2000 (6'-8") O/C THROUGH THE WALL. LOCATE JUST ABOVE TOP OF FOOTING.
18. IF A RETAINING WALL DOES NOT HAVE A WEEPING TILE, PROVIDE MIN. 50 (2") DIA. WEEPERS AT MAX 2000 (6'-8") O/C THROUGH THE WALL. LOCATE 200 (8") ABOVE THE LOWER GRADE LEVEL.
19. DO NOT BACKFILL AGAINST WALLS RETAINING EARTH UNTIL ELEMENTS PROVIDING LATERAL SUPPORT, INCLUDING SLAB ON GRADE AND ALL SUSPENDED LEVELS, ARE COMPLETED AND CONCRETE HAS REACHED 75% OF ITS DESIGN STRENGTH.
20. WHERE SLAB ON GRADE IS USED TO TIE THE TOP OF A WALL RETAINING EARTH, PROVIDE TEMPORARY SHORING OF THE WALL FROM START OF BACKFILLING UNTIL THE ENTIRE SLAB ON GRADE REACHES 75% OF ITS DESIGN STRENGTH.
21. FOR ELEMENTS THAT ARE TO BE BACKFILLED ON BOTH SIDES, PLACE BACKFILL SIMULTANEOUSLY ON BOTH SIDES SUCH THAT HEIGHTS DO NOT VARY BY MORE THAN 600 (2'-0") FROM ONE SIDE TO THE OTHER.

UNDERPINNING

1. UNDERPINNING DETAILS AND PROCEDURE TO BE DESIGNED BY A PROFESSIONAL ENGINEER REGISTERED IN THE PLACE WHERE THE PROJECT IS LOCATED.
2. SUBMIT STAMPED DESIGN AND CONSTRUCTION DOCUMENTS FOR REVIEW BY WSP-S.
3. UNDERPINNING ENGINEER TO PROVIDE SITE REVIEW AND SUBMIT REPORTS FOR RECORD.
4. PREVENT LOSS OF MATERIAL FROM UNDERNEATH THE EXISTING STRUCTURE.
5. MAKE GOOD ALL EXISTING WORK DISTURBED BY THE UNDERPINNING OPERATIONS.
6. AN INDEPENDENT INSPECTION AND TESTING AGENCY WILL BE APPOINTED TO CARRY OUT PRE-CONSTRUCTION CONDITION SURVEY OF THE EXISTING STRUCTURE BEING UNDERPINNED AND TO PROVIDE CONTINUOUS MONITORING FOR THE DURATION OF THE WORK.

CAST-IN-PLACE CONCRETE

1. CONCRETE IS SPECIFIED PER ALTERNATIVE 1 - PERFORMANCE SPECIFICATION, AS OUTLINED IN CSA A23.1. THE CONTRACTOR AND THE CONCRETE SUPPLIER TO MEET ALL CERTIFICATION, DOCUMENTATION, AND QUALITY CONTROL REQUIREMENTS.
2. CONTRACTOR AND CONCRETE SUPPLIER TO ENSURE THAT PLASTIC AND HARDENED MIX PROPERTIES MEET SITE REQUIREMENTS FOR PLACING, FINISHING AND THE SPECIFIED PERFORMANCE REQUIREMENTS.
3. CONCRETE SUPPLIER TO BE CERTIFIED BY THE READY MIXED CONCRETE ASSOCIATION OF ONTARIO.
4. CEMENT TO BE PORTLAND CEMENT TYPE GU or GUL UNLESS NOTED OTHERWISE APPROVED OR REQUIRED BY EXPOSURE CLASS.
5. CONCRETE TO BE NORMAL DENSITY (MIN. 2300 kg/m^3) UNLESS NOTED OTHERWISE.
6. NOMINAL MAXIMUM SIZE OF COARSE AGGREGATE TO BE 20 (3/4") UNLESS NOTED OTHERWISE.
7. UNLESS NOTED OTHERWISE, CONCRETE TO BE IN ACCORDANCE WITH THE FOLLOWING SCHEDULE:

ELEMENT	COMPRESSIVE STRENGTH (MPa) AT 28 DAYS (SEE NOTE #3 BELOW)	EXPOSURE CLASS	SPECIAL REQUIREMENTS & REMARKS
PIPE PILES / CONCRETE CAISSONS	35 MPa		
PILE CAPS / CAISSON CAPS	35 MPa	N	
PILE CAPS / CONCRETE CAISSON CAPS IN VEHICLE ACCESSIBLE AREAS	35 MPa	C1	
FOOTINGS	35 MPa	N	
FOOTINGS IN VEHICLE ACCESSIBLE AREAS	35 MPa	C1	
RAFT FOUNDATIONS	35 MPa	N	NOMINAL MAXIMUM SIZE OF COARSE AGGREGATE 40 (1-1/2"). CONCRETE COVER NOT TO BE LESS THAN 40 (1-1/2") FOR CLASS N, 60 (2-3/8") FOR OTHER CLASSES
PIERS	35 MPa	N	
PIERS IN VEHICLE ACCESSIBLE AREAS	35 MPa	C1	
GRADE BEAMS	30 MPa	N	
GRADE BEAMS IN VEHICLE ACCESSIBLE AREAS	35 MPa	C1	
FOUNDATION WALLS, PITS (NOT SHEAR WALLS)	30 MPa	F2	
PITS AND OTHER MISCELLANEOUS REINFORCED CONCRETE ELEMENTS IN VEHICLE ACCESSIBLE AREAS (BALUSTRADES, CURBS, ETC)	35 MPa	C1	
RETAINING WALLS	35 MPa	C1	
SHEAR WALLS	35 MPa	N	
OTHER INTERIOR WALLS	30 MPa	N	
COLUMNS	35 MPa	N / F2	
COLUMNS IN VEHICLE ACCESSIBLE AREAS	35 MPa	C1	
SLAB-ON-GRADE (HEATED, INTERIOR AREAS)	30 MPa	N-CF	FOR SLABS 125 (5") AND THICKER, NOMINAL MAXIMUM SIZE OF COARSE AGGREGATE 40 (1-1/2"). CONCRETE COVER NOT TO BE LESS THAN 40 (1-1/2") AT RESILIENT FINISHES, USE W/CM <0.45.
SLAB-ON-GRADE (UNHEATED VEHICLE ACCESSIBLE AREAS), SIDEWALKS, FROST SLABS	32 MPa	C-2	FOR SLABS 125 (5") AND THICKER, NOMINAL MAXIMUM SIZE OF COARSE AGGREGATE 40 (1-1/2") CONCRETE COVER NOT TO BE LESS THAN 60 (2-3/8")
INTERIOR FORMED SLABS & BEAMS	35 MPa	N-CF	
SLABS ON STEEL DECK	30 MPa	N-CF	
NON-STRUCTURAL TOPPINGS, HOUSEKEEPING PADS, FLOATING SLABS	30 MPa	N	NOMINAL MAXIMUM SIZE OF COARSE AGGREGATE: 10 (3/8") FOR TOPPINGS BETWEEN 25 (1") AND 35 (1-3/8") THICK, 14 (9/16") FOR TOPPINGS BETWEEN 35 (1-3/8") AND 60 (2-3/8") THICK
LEAN CONCRETE, MUDSLABS	10 MPa	N	
UNSHRINKABLE FILL	0.4 MAX.		

NOTES:

1. WHERE EXPOSURE CLASS IS NOTED "N / F2", USE "F-2" EXPOSURE CLASS FOR PERIMETER AND EXTERIOR NON-INSULATED ELEMENTS ABOVE THE FROST LINE, AND FOR ELEMENTS IN INTERIOR UNHEATED SPACES, WHICH ARE SUSCEPTIBLE TO FREEZING. USE "N" EXPOSURE CLASS FOR ELEMENTS PROTECTED FROM FREEZING.
2. LIMIT NOMINAL MAXIMUM AGGREGATE SIZE TO 10 (3/8") FOR COLUMNS WITH SMALLEST DIMENSION LESS THAN 300 (12") AND FOR WALLS LESS THAN 200 (8") THICK.
3. WHERE HVSCM (AS DEFINED IN CSA A23.1), CX, C1 OR ANY CLASS "S" EXPOSURE CONCRETE IS USED, SPECIFIED CONCRETE STRENGTH TO BE ATTAINED AT 56, RATHER THAN AT 28 DAY.
4. MINIMUM DOSAGE OF CORROSION INHIBITOR IS 10L/m^3 OF 30% SOLUTION OF CALCIUM NITRITE, AS PER CSA-S413.
5. FOR EXPOSURE CLASSES "C-XL", "C-1" AND, "C-2", PROVIDE ENTRAINED AIR UNLESS NOTED OTHERWISE IN THE "SPECIAL REQUIREMENTS AND REMARKS" COLUMN.

8. REFER TO CSA A23.1 FOR THE MAXIMUM WATER/CEMENT RATIO, MINIMUM COMPRESSIVE STRENGTH, AIR CONTENT, CURING REQUIREMENTS, CHLORIDE ION PENETRABILITY AND ALTERNATE CEMENT TYPES TO MEET THE REQUIREMENTS FOR THE NOTED EXPOSURE CLASS.
9. WHERE REQUIRED BY SPECIFICATIONS, PROVIDE MINIMUM AMOUNT OF SUPPLEMENTAL CEMENTING MATERIALS SPECIFIED FOR THE OVERALL PROJECT.
10. DO NOT ADD WATER TO CONCRETE ON SITE.
11. CONVEY CONCRETE FROM TRUCK TO FINAL LOCATION BY METHODS WHICH WILL PREVENT SEPARATION OR LOSS OF MATERIAL. MAXIMUM FREE FALL NOT TO EXCEED 1.5m (5'-0"). CONSOLIDATE CONCRETE USING MECHANICAL VIBRATORS.
12. PLACE CONCRETE AS CLOSE AS POSSIBLE TO FINAL LOCATION TO AVOID SEGREGATION. VIBRATE ALL CONCRETE.
13. PROTECT CONCRETE FROM FREEZING. DO NOT PLACE CONCRETE AGAINST FROZEN GROUND. USE COLD WEATHER CONCRETING METHODS IN ACCORDANCE WITH CSA-A23.1.
14. PROTECT CONCRETE FROM EXCESSIVE HEAT AND DRYING. USE HOT WEATHER CONCRETING METHODS IN ACCORDANCE WITH CSA-A23.1.
15. PROVIDE PENETRATING SEALER AT COLUMNS AND WALLS IN VEHICLE ACCESSIBLE AREAS IN ACCORDANCE WITH TYPICAL DETAILS TC-COL-41.
16. COLUMNS
    1. DO NOT PLACE RECESSED BOXES IN CONCRETE COLUMNS WITHOUT PRIOR APPROVAL FROM STRUCTURAL CONSULTANT.
    2. MAXIMUM AREA OF CONCRETE DISPLACED BY CONDUITS EMBEDDED IN COLUMNS (INCLUDING THE CONDUIT AND THE PROJECTED AREA OF THE CONDUIT EXIT PATH) NOT TO EXCEED 4% OF THE COLUMN CROSS SECTIONAL AREA, REFER TO TYPICAL DETAIL TC-MISC-22 FOR FURTHER EXPLANATION AND GUIDELINES.
    3. WHERE APPLICABLE, COLUMN OFFSETS FROM GRIDLINES ARE NOTED ON DRAWINGS. UPPER COLUMNS ARE CENTRED ON COLUMNS BELOW UNLESS NOTED OTHERWISE.
17. SLABS AND BEAMS
    1. SURVEY TOP OF FORMWORK / SLAB ELEVATIONS AT SUPPORTS, AT MIDSPAN BETWEEN SUPPORTS, AT CENTERS OF BAYS, AND AT CANTILEVERED ENDS AT THE FOLLOWING TIMES:
       - BEFORE CONCRETE PLACEMENT
       - AFTER CONCRETE PLACEMENT BUT PRIOR TO REMOVAL OF SUPPORTING FALSEWORK
       - AFTER REMOVAL OF SUPPORTING FALSEWORK.

       SUBMIT SURVEY DATA FOR ENGINEER'S RECORD.
    2. DO NOT USE LASER LEVEL WHEN POURING CAMBERED SLABS AND SLABS SUPPORTED BY STEEL BEAMS. USE SCREED PINS TO MAINTAIN THE SPECIFIED SLAB THICKNESS.
    3. DO NOT USE STEEL TROWEL TO FINISH AIR-ENTRAINED CONCRETE.
    4. PROVIDE MINIMUM 150 (6") BEARING ON MASONRY WALLS.
    5. SUBMIT COMPOSITE LAYOUT DRAWINGS SHOWING SLEEVES AND OPENINGS REQUIRED BY ALL TRADES FOR WSP-S REVIEW. REFER TO TYPICAL DETAILS TC-SL-63 AND TC-BM-31 FOR PLACEMENT GUIDELINES. DO NOT INSTALL ANY SLEEVES OR OPENINGS WHICH ARE NOT SHOWN ON STRUCTURAL DRAWINGS WITHOUT WSP-S REVIEW AND ACCEPTANCE.
    6. SUBMIT COMPOSITE LAYOUT DRAWINGS SHOWING ALL EMBEDDED PIPES AND CONDUITS. MAXIMUM OUTSIDE DIAMETER OF ANY CONDUIT OR PIPE EMBEDDED IN SLAB NOT TO EXCEED ONE THIRD OF THE SLAB THICKNESS. REFER TO TYPICAL DETAIL TC-MISC-21 AND TS-DECK-41 FOR PLACEMENT GUIDELINES.
    7. FOR SLABS-ON-GRADE OR UNBONDED CONCRETE TOPPINGS, LOCATE ALL CONDUITS, PIPES, OR HEATING CABLES EMBEDDED IN CONCRETE CLEAR OF THE TOP ONE THIRD OF THE SLAB THICKNESS TO AVOID DAMAGE DURING SAWCUTTING.
    8. FOR SLABS TO RECEIVE RESILIENT FLOORING AND OTHER SENSITIVE FLOOR FINISHES, REFER TO SPECIFICATIONS FOR SPECIAL CURING REQUIREMENTS. MONITOR SLAB MOISTURE CONTENT AND DO NOT APPLY FINISHES BEFORE THE MOISTURE CONTENT IS FOUND TO BE WITHIN THE ACCEPTABLE RANGE.
18. CONSTRUCTION & CONTROL JOINTS
    1. PROVIDE JOINTS WHERE SPECIFIED OR SHOWN ON DRAWINGS. LOCATE SO AS NOT TO IMPAIR THE REQUIRED STRENGTH OF THE STRUCTURE. SUBMIT JOINT LAYOUT FOR WSP-S REVIEW AND APPROVAL A MINIMUM OF 2 WEEKS PRIOR TO POURING CONCRETE. REFER TO TYPICAL DETAILS AND SPECIFICATIONS FOR ADDITIONAL INFORMATION.
    2. UNLESS OTHERWISE NOTED, PROVIDE STANDARD CONTINUOUS 38 x 89 (2x4) FORMED KEYS AT ALL CONSTRUCTION JOINTS. CENTER AT JOINTS AND CHAMFER SIDES.
    3. IF A SPECIFIC CONSTRUCTION JOINT DETAIL IS SHOWN ON DRAWINGS, IT CAN NOT BE SUBSTITUTED BY ANY ALTERNATIVE CONSTRUCTION JOINT DETAIL.
    4. HORIZONTAL CONSTRUCTION JOINTS IN CONCRETE WALLS (OTHER THAN AT UNDERSIDE OF SLABS) ARE NOT PERMITTED, EXCEPT WHERE SHOWN ON THESE DRAWINGS.
    5. CAST CONCRETE BEAMS INTEGRALLY WITH SLABS (WITH NO HORIZONTAL CONSTRUCTION JOINTS) UNLESS OTHERWISE SHOWN ON DRAWINGS.
    6. NON-STRUCTURAL SLABS ON GRADE AND UNBONDED TOPPINGS: UNLESS NOTED OTHERWISE, PROVIDE CONSTRUCTION JOINTS AT 30m (100ft) MAXIMUM IN BOTH DIRECTIONS, WITH CONTROL JOINTS IN BETWEEN AT 25 TIMES THE SLAB THICKNESS, BUT NOT MORE THAN 4.5 m (15ft). LONGER DIMENSION OF ANY SOG SEGMENT CREATED BY CONSTRUCTION AND CONTROL JOINTS NOT TO EXCEED 1.25 TIMES THE SHORTER DIMENSION OF THE SEGMENT. CONSIDER SLAB DEPRESSIONS AND PITS WHEN PROPOSING LAYOUT, AND SHOW ON LAYOUT DRAWINGS. COMPLETE SAWCUTTING WITHIN 6 TO 18 HOURS OF PLACING CONCRETE. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
    7. DO NOT PLACE CONTROL JOINTS IN STRUCTURAL SLAB ON GRADE; PROVIDE CONSTRUCTION JOINTS AS DESCRIBED FOR FORMED SLABS.
    8. FORMED SLABS AND SLABS ON NON-COMPOSITE STEEL DECK FORM: PROVIDE CONSTRUCTION JOINTS AT 30m (100ft) MAXIMUM IN BOTH DIRECTIONS. SEE TYPICAL DETAIL TC-SL-42 FOR ACCEPTABLE LOCATIONS OF CONSTRUCTION JOINTS IN FORMED SLABS.
    9. BONDED TOPPING: JOINTS TO MATCH LOCATIONS OF THOSE IN BASE SLAB.
    10. SLABS ON COMPOSITE DECK: PROVIDE CONSTRUCTION JOINTS TO SUIT CONSTRUCTION PROCEDURE. SEE TYPICAL DETAIL TS-DECK-02 FOR ACCEPTABLE LOCATIONS.
    11. FOUNDATION WALLS AND GRADE BEAMS: PROVIDE VERTICAL CONSTRUCTION JOINTS AT 30m (100ft) MAXIMUM. LOCATE JOINTS IN GRADE BEAMS AND FOUNDATION WALLS ACTING AS BEAMS (SPANNING BETWEEN FOOTINGS OR PILES) WITHIN THE MIDDLE THIRD OF THEIR SPAN.
    12. INTERIOR WALLS (EXCEPT SHEAR WALLS), AND BASEMENT WALLS IN HEATED AREAS: PROVIDE VERTICAL CONSTRUCTION JOINTS AT 30m (100ft) MAXIMUM, WITH CONTROL JOINTS IN BETWEEN AT 7.5m (25ft) MAXIMUM. LOCATE FIRST JOINT MAXIMUM 4.5m (15ft) FROM ANY CORNER. LOCATE CONSTRUCTION JOINTS WITH WATERSTOPS MIN. 300 (12") FROM ANY WALL CORNER OR INTERSECTION. SEE TYPICAL DETAIL TC-WALL-22 FOR ACCEPTABLE CONTROL JOINT LOCATIONS.
    13. SHEAR WALLS: NO CONSTRUCTION JOINTS (OTHER THAN AT UNDERSIDE OF SLABS) NOR CONTROL JOINTS UNLESS SHOWN ON DRAWINGS.
    14. EXTERIOR RETAINING WALLS: PROVIDE VERTICAL CONTROL JOINTS AT 5m (16ft) MAXIMUM, WITH KEYED EXPANSION JOINTS AT 15m (50ft) MAXIMUM.
    15. OTHER WALLS IN UNHEATED AREAS: PROVIDE VERTICAL CONSTRUCTION JOINTS AT 30m (100ft) MAXIMUM, AND CONTROL JOINTS AT 5m (16ft) MAXIMUM, LOCATE CONTROL JOINTS NOT MORE THAN 2.5m (8ft) FROM EACH SIDE OF CONSTRUCTION JOINTS AND ANY WALL CORNER.
19. CONSTRUCTION GAPS (CLOSURE STRIPS)
    1. SEE PLANS FOR SIZE AND LOCATION OF CONSTRUCTION GAPS.
    2. DO NOT FILL BEAM AND SLAB CONSTRUCTION GAPS UNTIL ALL CONCRETE AT THAT LEVEL IS AT LEAST 28 DAYS OLD. MAINTAIN SHORING AT EACH SIDE OF THE GAP UNTIL CONCRETE IN THE GAP REACHES MIN. 75% OF THE SPECIFIED 28 DAYS COMPRESSIVE STRENGTH.
    3. DO NOT FILL WALL CONSTRUCTION GAPS UNTIL ALL SLABS AT LEVELS ABOVE AND BELOW THE WALL ARE AT LEAST 28 DAYS OLD.

DRAWING LIST

DRAWING No	DRAWING NAME
S000	BUILDING RENDERINGS
S100	GENERAL REQUIREMENTS
S101	GENERAL REQUIREMENTS
S110	CONCRETE FOUNDATION AND SLAB-ON-GRADE TYPICAL DETAILS
S111	CONCRETE COLUMN AND WALL TYPICAL DETAILS
S112	CONCRETE SLAB AND BEAM TYPICAL DETAILS
S113	CONCRETE REINFORCING AND MISCELLANEOUS TYPICAL DETAILS
S114	MASONRY WALL TYPICAL DETAILS
S115	STEEL TYPICAL DETAILS
S200	FOUNDATION PLAN
S201	LEVEL 1 FRAMING PLAN
S202	LEVEL 2 FRAMING PLAN
S203	LEVEL 3 FRAMING PLAN
S204	LEVEL 4 FRAMING PLAN
S205	LEVEL 5 FRAMING PLAN
S206	ROOF FRAMING PLAN
S400	SECTIONS

ARCHITECTURE 49
1000-150 ISABELLA STREET
OTTAWA (ONTARIO) CANADA K1S 1V7
Phone: 613-238-0440 | Fax: 613-238-6597 | WWW.ARCHITECTURE49.COM

wsp
2611 Queensview Dr, Suite 300
Ottawa, Ontario, K2B 8K2 Canada
T 613-829-2800 | F 613-829-8299 | www.wsp.com

PCL CONSTRUCTION
49 Auriga Drive
Ottawa, Ontario, K2E 8A1 Canada
T 613-978-5398 | www.pcl.com

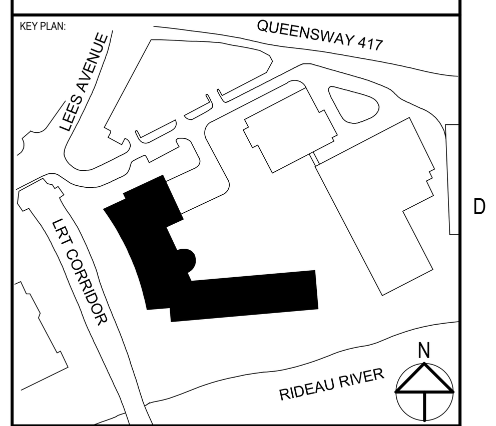
SEAL:

CLIENT: uOttawa

RFP # 2020-40639 CLIENT REF # BT20-18477

PROJECT: University of Ottawa - Faculty of Health Sciences Building

KEY PLAN



ISSUED FOR - REVISION

No	DATE	DESCRIPTION
1	2021-04-15	ISSUED FOR TECHNICAL SUBMISSION

PROJECT NO: 211-01094-00
DATE: 2021-04-15
ORIGINAL SCALE: 1 : 100
IF THIS BAR IS NOT 25mm LONG ADJUST YOUR PLOTTING SCALE.
DESIGNED BY: L.HAJSAID
DRAWN BY: P.MCKEE
CHECKED BY: S.HOWARD
DISCIPLINE: STRUCTURAL
TITLE: GENERAL REQUIREMENTS
SHEET NUMBER: S100

CONCRETE REINFORCEMENT

1. REINFORCEMENT TO CONFORM TO THE FOLLOWING STANDARDS:

   DEFORMED BARS - CSA G30.18, GRADE 400R OR 400W, UNLESS GRADE 500R / 500W IS INDICATED ON DRAWINGS. WHERE REBAR ARE SHOWN TO BE WELDED USE ONLY GRADE 400W/500W.

   WELDED WIRE FABRIC - ASTM A1064/A1064M, YIELD STRENGTH 450 MPA, SUPPLIED IN FLAT SHEETS ONLY.

2. ALL REINFORCING BAR SIZES ARE METRIC; "M" IS NOT NECESSARILY MARKED AFTER A BAR SIZE. FOR EXAMPLE, 10-15B NOTED ON PLAN INDICATES 10 BARS OF 15M DIAMETER, PLACED AT BOTTOM.
3. BARS MARKED CONTINUOUS TO BE TERMINATED IN STANDARD HOOKS AT ENDS AND SPLICED USING CLASS B LAPS. FOR LAP LENGTHS AND DEVELOPMENT LENGTHS, REFER TO TYPICAL .DETAILS
4. ALL REBAR HOOKS TO BE STANDARD LENGTH 90° OR 180° HOOKS. REBAR LENGTHS LISTED ON DRAWINGS DO NOT INCLUDE THE HOOK LENGTH.
5. UNLESS A SPECIFIC STIRRUP SHAPE IS INDICATED ON PLANS OR SCHEDULES, ALL STIRRUPS TO BE CLOSED HOOPS. NUMBER OF STIRRUPS DENOTES THE NUMBER OF FULL STIRRUPS, EACH HAVING TWO LEGS.
6. WHERE TWO BARS OF DIFFERENT SIZE ARE LAPPED IN TENSION, SPLICE LENGTH TO BE EQUAL TO THE SMALLER BAR'S TENSION LAP SPLICE, OR TO THE LARGER BAR'S TENSION DEVELOPMENT LENGTH, WHICHEVER IS LONGER.
7. WHERE TWO BARS OF DIFFERENT SIZE ARE LAPPED IN COMPRESSION, SPLICE LENGTH TO BE EQUAL TO THE SMALLER BAR'S COMPRESSION LAP SPLICE, OR TO THE LARGER BAR'S COMPRESSION DEVELOPMENT LENGTH, WHICHEVER IS LONGER.
8. FOR BUNDLED BARS, FULLY STAGGER SPLICES OF EACH INDIVIDUAL BAR IN THE BUNDLE.
9. LAP WELDED WIRE FABRIC SHEETS BY ONE SPACING OF CROSS WIRES + 50 (2"), MEASURED BETWEEN THE OUTERMOST CROSS WIRES IN EACH SHEET.
10. PROVIDE ADDITIONAL SUPPORT BARS AS REQUIRED TO ADEQUATELY SUPPORT AND SECURE ALL REINFORCEMENT AND PREVENT MOVEMENT WHEN PLACING CONCRETE.
11. PROVIDE SUFFICIENT CHAIRS TO REINFORCING TO MAINTAIN SPECIFIED CONCRETE COVER.
12. PLACE WELDED WIRE FABRIC IN SLABS ON GRADE AT 1/3 SLAB THICKNESS BELOW TOP OF SLAB. PROVIDE ADEQUATE CHAIRS TO KEEP IN SPECIFIED POSITION. LIFTING WWF AFTER CONCRETE IS POURED TO BRING IT IN POSITION IS NOT ACCEPTABLE.
13. ALL REINFORCING TO BE CLEAN, FREE OF LOOSE SCALE, OIL, DIRT, RUST, AND ANY OTHER FOREIGN COATING THAT AFFECT BONDING CAPACITY.
14. MINIMUM CLEAR SPACING BETWEEN ADJACENT BARS TO BE AT LEAST 1.4 TIMES THE BAR DIAMETER OR 1.4 TIMES THE NOMINAL MAXIMUM SIZE OF THE COARSE AGGREGATE, WHICHEVER IS MORE.
15. WHERE PARALLEL REINFORCEMENT IS PLACED IN TWO OR MORE LAYERS, POSITION BARS IN UPPER LAYER DIRECTLY ABOVE THE BARS IN LOWER LAYER, MAINTAINING THE MINIMUM CLEAR SPACING BETWEEN LAYERS AS SPECIFIED ABOVE.
16. EXCEPT FOR PARKING STRUCTURES WITH PROTECTION SYSTEM, UNLESS NOTED OTHERWISE ON DRAWINGS, MINIMUM CONCRETE COVER TO PRINCIPAL REINFORCEMENT TO BE AS FOLLOWS (ALSO REFER TO TYPICAL DETAIL TC-REINF-21):

EXPOSURE CLASS:	N, N-CF	F1, F2, S1, S2, S3	C-XL, C1, C2, C3
SURFACES CAST AGAINST GROUND	75 (3")		
FOOTINGS, RAFT FOUNDATIONS, PILE CAPS WITHOUT TIES	≤ 35M: 40 (1-5/8")	≤ 25M: 40 (1-5/8") 30M: 45 (1-3/4") 35M: 55 (2-1/8")	≤ 30M: 60 (2-3/8") 35M: 75 (3")
PILES, PILE CAPS WITH TIES, PIERS, GRADE BEAMS	≤ 35M: 55 (2-1/8")		≤ 35M: 75 (3")
SLAB ON GRADE - TOP COVER	≤ 25M: 25 (1")	≤ 25M: 40 (1-5/8")	≤ 30M: 60 (2-3/8")
SLAB ON GRADE NOT CAST AGAINST GROUND - BOTTOM COVER (CAST ON MUD SLAB, VAPOUR BARRIER, RIGID INSULATION)	≤ 25M: 40 (1-5/8")		≤ 30M: 60 (2-3/8")
BEAMS, GIRDERS, SLAB BANDS WITH STIRRUPS	≤ 35M: 45 (1-3/4")	≤ 35M: 55 (2-1/8")	≤ 35M: 75 (3")
STRUCTURAL SLABS, SLAB BANDS WITHOUT STIRRUPS, SLAB ON STEEL DECK	≤ 25M: 25 (1") 30M: 30 (1-1/4") 35M: 35 (1-3/8") PT REINF: 40 (1-5/8")	≤ 25M: 40 (1-5/8") 30M: 45 (1-3/4") 35M: 55 (2-1/8") PT REINF: 40 (1-5/8")	≤ 30M: 60 (2-3/8") 35M: 70 (2-3/4") PT REINF: 60 (2-3/8")
COLUMNS	≤ 45M: 50 (2") 55M: 55 (2-1/8")	≤ 35M: 55 (2-1/8") 45M: 70 (2-3/4") 55M: 85 (3-3/8")	≤ 35M: 75 (3") 45M: 90 (3-1/2") 55M: 110 (4-3/8")
BASEMENT WALLS, RETAINING WALLS	VISIBLE FACE: ≤ 25M: 25 (1") 30M: 30 (1-1/4") 35M: 35 (1-3/8") FACE AGAINST EARTH ≤ 25M: 40 (1-5/8") 30M: 45 (1-3/4") 35M: 55 (2-1/8")	≤ 25M: 40 (1-5/8") 30M: 45 (1-3/4") 35M: 55 (2-1/8")	≤30M: 60 (2-3/8") 35M: 70 (2-3/4")
OTHER INTERIOR WALLS	≤ 25M: 25 (1") 30M: 30 (1-1/4") 35M: 35 (1-3/8")	≤ 25M: 40 (1-5/8") 30M: 45 (1-3/4") 35M: 55 (2-1/8")	AREAS EXPOSED TO VEHICLE TRAFFIC: ≤ 35M: 40 (1-5/8") OTHERWISE: ≤ 30M: 60 (2-3/8") 35M: 70 (2-3/4")

NOTES:

1. COVERS SHOWN ABOVE MEET 2h FIRE RATING REQUIREMENTS; SEE DRAWINGS FOR AREAS WHICH REQUIRE 3 OR 4 HOUR FIRE RATING AND PROVIDE INCREASED COVER AS INDICATED.
2. COVERS SHOWN ABOVE ASSUME 20 (3/4") MAXIMUM NOMINAL SIZE OF CONCRETE AGGREGATE (Øa). REFER TO CONCRETE MIX DESIGN TABLE IN CAST-IN-PLACE CONCRETE NOTES FOR CONCRETE WITH LARGER AGGREGATE SIZE, AND INCREASE COVER TO REINFORCING CLOSEST TO THE SURFACE BY 1.0x Øa FOR "N_" CONCRETE, BY 1.5x Øa FOR "F_" AND "S_" CONCRETE, AND 2.0x Øa FOR "C_" CONCRETE.
3. "EXPOSED TO VEHICLE TRAFFIC" MEANS LOCATED WITHIN 1200 (4'-0") FROM VEHICLE ACCESSIBLE AREAS.
4. FOR BUNDLED BARS, PROVIDE COVER REQUIRED FOR A SINGLE BAR WITH EQUIVALENT CROSS-SECTIONAL AREA. FOR EXAMPLE, 2-25M BUNDLED BARS WITH TOTAL CROSS-SECTIONAL AREA = 1000mm² ARE EQUIVALENT TO 1-35M BAR, THEREFORE USE COVER TO BUNDLED BARS SAME AS COVER TO 1-35M BAR.
5. FOR BARS WITH 90° HOOKS, MINIMUM COVER NOT TO BE LESS THAN SHOWN ON TC-REINF-01/02.
6. INCREASE THE COVER SPECIFIED FOR PT REINFORCING TO ACCOMMODATE THE MINIMUM COVER TO THE MILD STEEL CROSSING OVER IT.

17. WALLS
    1. UNLESS OTHERWISE NOTED ON DRAWINGS, SCHEDULES OR NOTES, MINIMUM REINFORCEMENT FOR CONCRETE WALLS TO BE AS FOLLOWS:
       150 (6") MAXIMUM WALL: 10M @ 330 (13") H + 10M @ 450 (18") V IN CENTRE
       200 (8") MAXIMUM WALL: 10M @ 250 (10") H + 10M @ 330 (13") V IN CENTRE
       250 (10") MAXIMUM WALL: 10M @ 400 (16") HEF + 10M @ 500 (20") VEF
       300 (12") MAXIMUM WALL: 10M @ 330 (13") HEF + 10M @ 440 (17") VEF
       VERTICAL REINFORCING TO BE OUTSIDE LAYER. ALL SPLICES TO BE CLASS "B".
    2. REFER TO TYPICAL DETAIL TC-WALL-01 FOR REINFORCING REQUIRED AT WALL CORNERS AND INTERSECTIONS.
    3. REFER TO TYPICAL DETAIL TC-WALL-11 FOR MINIMUM DOWELING REQUIREMENTS BETWEEN WALLS AND SLABS.
    4. FOR OPENINGS LARGER THAN 400 x 400 (16"X16"), PROVIDE ADDITIONAL REINFORCING AS SHOWN ON TYPICAL DETAIL TC-WALL-32.
    5. FOR SHEAR WALL REQUIREMENTS, REFER TO SHEAR WALL NOTES ON DRAWINGS S____,
    6. FOR MASONRY WALL REINFORCEMENT REFER TO MASONRY NOTES.
18. SLABS
    1. UNLESS OTHERWISE SPECIFIED ON PLANS, PROVIDE BOTTOM TEMPERATURE REINFORCEMENT IN BOTH DIRECTIONS FOR FRAMED SLABS IN ACCORDANCE WITH TYPICAL DETAIL TC-SL-02.
    2. UNLESS NOTED OTHERWISE, DO NOT ELIMINATE OR CUT REINFORCEMENT TO ACCOMMODATE MECHANICAL AND ELECTRICAL SLEEVES, OPENINGS OR HARDWARE. SPREAD REINFORCING AROUND SLEEVES.
    3. FOR OPENINGS LARGER THAN 400 x 400 (16"x16"), PROVIDE ADDITIONAL REINFORCING AS SHOWN ON TYPICAL DETAIL TC-SL-62.
    4. WHERE IN FLOOR HEATING IS CAST INTO SLABS, PROVIDE ADDITIONAL LAYER OF WWF 102 X 102 MW18.7 X MW18.7 WHERE REQUIRED FOR IN FLOOR HEATING SECUREMENT.

POST-INSTALLED ANCHORS AND DOWELS

1. UNLESS OTHERWISE NOTED, ANCHORAGE TO CONCRETE TO BE:
   1. WHERE DRILLED CONCRETE ANCHORS (DCA) ARE NOTED ON DRAWINGS, PROVIDE HILTI KWIK BOLT - TZ EXPANSION ANCHORS OR APPROVED EQUIVALENT.
   2. WHERE ADHESIVE CONCRETE ANCHORS (ACA) ARE NOTED ON DRAWINGS, PROVIDE HILTI HIT-HY 200 ADHESIVE ANCHORING SYSTEM WITH HILTI HIT-Z ANCHOR RODS OR APPROVED EQUIVALENT.
   3. WHERE REBAR DOWEL ANCHORS (RDA) ARE NOTED ON DRAWINGS, PROVIDE HILTI HIT-RE 500 V3 ADHESIVE ANCHORING SYSTEM INSTALLED USING HILTI SAFESET HOLLOW DRILL BIT TECHNOLOGY OR APPROVED EQUIVALENT.
2. UNLESS OTHERWISE NOTED ON DRAWINGS, ANCHORAGE TO SOLID OR GROUTED MASONRY TO BE:
   1. WHERE DRILLED MASONRY ANCHORS (DMA) ARE NOTED ON DRAWINGS, PROVIDE HILTI KB-3 EXPANSION ANCHORS OR APPROVED EQUIVALENT. LOCATE MIN. 35 (1-3/8") FROM ANY VERTICAL MORTAR JOINT.
   2. WHERE ADHESIVE MASONRY (AMA) ANCHORS ARE NOTED ON DRAWINGS, PROVIDE HILTI HIT-HY 270 ADHESIVE ANCHORING SYSTEM WITH HAS-E THREADED RODS OR APPROVED EQUIVALENT.
3. UNLESS OTHERWISE NOTED ON DRAWINGS, ANCHORAGE TO HOLLOW MASONRY TO BE HILTI HIT-HY 270 ADHESIVE ANCHORING SYSTEM WITH HIT-SC MESH SLEEVE AND HAS-E THREADED RODS OR APPROVED EQUIVALENT.
4. IN ORDER TO BE ACCEPTED, ANY ALTERNATIVES TO THE HILTI PRODUCTS SPECIFIED IN NOTES 1, 2 AND 3 MUST BE ACCOMPANIED BY TESTING DATA AND ICC-ES REPORTS DEMONSTRATING THAT THEIR PERFORMANCE (INCLUDING CAPACITY IN CRACKED CONCRETE AND CAPACITY REDUCTIONS DUE TO SPACING AND EDGE DISTANCE) IS EQUIVALENT TO THE PERFORMANCE OF HILTI PRODUCTS. IN ADDITION, THAT PERFORMANCE MUST BE ACHIEVED USING INSTALLATION TOOLS AND PROCEDURES WHICH DO NOT REQUIRE DRILLED HOLES TO BE CLEANED PRIOR TO ANCHOR INSTALLATION.
5. ANCHORS LOCATED OUTSIDE THE BUILDING ENVELOPE'S VAPOUR BARRIER TO BE HOT DIP GALVANIZED.
6. CONCRETE TO BE MINIMUM 28 DAYS OLD AT THE TIME OF ANCHOR INSTALLATION.
7. USE DRILLING AND INSTALLATION TOOLS AND PROCEDURES PER MANUFACTURER'S RECOMMENDATIONS. DO NOT CORE DRILL UNLESS SPECIFICALLY NOTED ON DRAWINGS. HOLE DIAMETERS NOT TO EXCEED THOSE REQUIRED BY MANUFACTURER.
8. WHERE CORE DRILLING IS SPECIFIED, CLEAN AND ROUGHEN HOLES PER MANUFACTURER'S RECOMMENDATION.
9. ARRANGE FOR THE ANCHOR MANUFACTURER TO CONDUCT ON SITE TRAINING FOR INSTALLATION OF ALL THE PRODUCTS SPECIFIED, AND FOR ALL CONDITIONS ENCOUNTERED (E.G. HORIZONTAL, INCLINED, OVERHEAD). ALL INSTALLERS MUST COMPLETE THE SUPPLIER CERTIFIED INSTALLER TRAINING PROGRAM. SUBMIT COPIES OF COMPLETION CERTIFICATES FOR WSP-S RECORD.
10. ARRANGE FOR A MANUFACTURER'S TECHNICAL REPRESENTATIVE TO BE PRESENT DURING INSTALLATION OF FIRST FEW ANCHORS OF EACH SIZE AND TYPE. SUBMIT SITE REPORTS INDICATING ANCHOR TYPES AND SIZES INSTALLED, LOCATIONS AND INSTALLERS' NAMES.
11. ANCHOR AND DOWEL CAPACITY IS DEPENDENT UPON SPACING BETWEEN ADJACENT ANCHORS AND THEIR PROXIMITY TO CONCRETE AND MASONRY EDGES; THEREFORE, ALL ANCHORS MUST BE INSTALLED WITH CLEARANCES AND EDGE DISTANCES INDICATED ON DRAWINGS
12. UNLESS CORE DRILLING IS SPECIFIED ON DRAWINGS, DO NOT CUT REINFORCEMENT TO ACCOMMODATE DRILLED ANCHORS AND DOWELS. SCAN THE STRUCTURE TO LOCATE REINFORCEMENT PRIOR TO FABRICATING STRUCTURAL STEEL FASTENED BY DRILLED ANCHORS.
13. WHEN OBSTRUCTIONS PREVENT DRILLING HOLES IN SPECIFIED LOCATIONS TO THE REQUIRED DEPTH, RELOCATE AT NO EXTRA COST TO THE CONTRACT. OBTAIN WSP-S APPROVAL OF NEW LOCATIONS BEFORE DRILLING; MODIFICATIONS TO CONNECTED MEMBERS AND ADDITIONAL ANCHORS / DOWELS MAY BE REQUIRED. FILL ABANDONED HOLES WHICH ARE CLOSER THAN 3 TIMES THE HOLE DIAMETER FROM THE RELOCATED ANCHORS WITH HILTI HY-200 ADHESIVE. DO NOT TIGHTEN ANCHORS UNTIL THE ADHESIVE HAS FULLY CURED.
14. UNLESS OTHERWISE NOTED ON DRAWINGS, EMBEDMENT LENGTHS FOR POST-INSTALLED HILTI ANCHORS TO BE:

ANCHOR SIZE	EXPANSION ANCHORS (HILTI KB-TZ AND KB-3)	ADHESIVE ANCHORS INTO CONCRETE AND SOLID OR GROUTED CONCRETE MASONRY (HILTI HIT HY-200 AND HIT HY-270)	ADHESIVE ANCHORS INTO HOLLOW CONCRETE MASONRY (HILTI HIT HY-270)	ADHESIVE ANCHORS INTO HOLLOW BRICK MASONRY (HILTI HIT HY-270)
12 (1/2")	83 (3-1/4")	114 (4-1/2")	50 (2")	80 (3-1/8")
16 (5/8")	102 (4")	143 (5-5/8")	-	-
19 (3/4")	121 (4-3/4")	171 (6-3/4")	-	-

NOTES:

1. ALL EMBEDMENT LENGTHS SHOWN ARE EFFECTIVE EMBEDMENT LENGTHS; FOR REQUIRED HOLE DEPTHS FOLLOW HILTI RECOMMENDATIONS.
2. SEE DRAWINGS FOR EMBEDMENT LENGTHS OF REBAR DOWELS.

15. IF ANCHORS OTHER THAN THE HILTI PRODUCTS SPECIFIED IN NOTES 1, 2 AND 3 ARE APPROVED TO BE USED, ANCHOR SUPPLIER TO ESTABLISH THE EMBEDMENT LENGTHS REQUIRED TO ACHIEVE PERFORMANCE EQUIVALENT TO THE HILTI PRODUCTS EMBEDDED AS INDICATED IN THE TABLE ABOVE.
16. DO NOT BEND POST INSTALLED DOWELS AND RODS AFTER INSTALLATION.
17. DO NOT WELD TO PLATES FASTENED WITH ADHESIVE ANCHORS AFTER THE ADHESIVE IS PLACED.

STRUCTURAL STEEL

1. CONFORM TO CSA S16.
2. MATERIALS: TO CSA G40.21 UNLESS OTHERWISE NOTED, WITH THE FOLLOWING GRADES:

W, WWF AND S SECTIONS, CHANNELS AND ANGLES:	350W, OR ASTM A992, GRADE 50 (345MPa).
PLATES, BARS:	300W
HOLLOW STRUCTURAL SECTIONS:	350W (CLASS 'C" OR "H'), ASTM A1085 GRADE 50 (345 MPa) OR ASTM A500 (GRADE 'C'). USE ONLY ASTM A1085 WHERE SPECIFICALLY INDICATED ON DRAWINGS.
BOLTS:	ASTM F3125 GRADE A325, UNLESS NOTED
HEADED STUDS:	CSA W59, TYPE B, min. Fy= 350 MPa
ANCHOR RODS:	300W UNO

3. DETAILS ON STRUCTURAL DRAWINGS SHOW DESIGN INTENT. REFER TO SPECIFICATIONS FOR CONNECTION DESIGN, DETAILING, FABRICATION, AND ERECTION REQUIREMENTS.
4. CONNECT BEAMS FOR THE FORCES SHOWN; IF NO FORCE IS INDICATED, CONNECT NON COMPOSITE BEAMS FOR THE REACTION DUE TO MAXIMUM UNIFORMLY DISTRIBUTED LOAD CAPACITY OF THE BEAM IN BENDING, AND CONNECT COMPOSITE BEAMS FOR ONE AND A HALF TIMES THE REACTION DUE TO MAXIMUM UNIFORMLY DISTRIBUTED LOAD CAPACITY OF THE NON COMPOSITE SECTION IN BENDING.
5. DO NOT CUT HOLES OR OTHERWISE MODIFY STRUCTURAL MEMBERS ON SITE.
6. CLEAN SURFACES DOWN TO BARE METAL AND APPLY TWO COATS OF ZINC-RICH TOUCH-UP PAINT TO ANY GALVANIZED SURFACE THAT HAS BEEN DAMAGED OR FIELD WELDED.
7. IF STRUCTURAL STEEL IS IN DIRECT CONTACT WITH GROUND (E.I. COLUMN BASE IS NOT ENCASED IN CONCRETE), PROTECT WITH EPOXY PAINT.
8. PROVIDE ALL ERECTION BRACING REQUIRED TO KEEP THE STRUCTURE STABLE AND IN ALIGNMENT DURING CONSTRUCTION.
9. PROVIDE 40 MPa NON SHRINK GROUT UNDER BASE PLATES. DO NOT APPLY ANY LOADS TO THE STEELWORK BEFORE GROUT ACHIEVES SUFFICIENT STRENGTH.
10. DISTRIBUTE HANGER LOADS FROM MECHANICAL AND HEAVY ELECTRICAL SERVICES SUSPENDED FROM STEELWORK UNIFORMLY ALONG MEMBERS. ALTERNATE HANGER POSITION ON EITHER SIDE OF MEMBERS.
11. CONNECT HANGERS FOR MECHANICAL AND ELECTRICAL SERVICES AND OTHER NON STRUCTURAL ELEMENTS AS WELL AS ELEMENTS REQUIRED FOR THEIR SEISMIC RESTRAINT NOT TO CAUSE TWISTING OF STEEL MEMBERS OR EXCESSIVE BENDING OF MEMBER FLANGES.
12. DO NOT APPLY LATERAL LOADS TO MEMBERS UNLESS APPROVED BY THE CONSULTANT.
13. AESS MEMBERS: ERECT USING SOFTENED SLINGS OR OTHER METHODS SUCH THAT THEY ARE NOT DAMAGED. PROVIDE PADDING AS REQUIRED TO PROTECT WHILE RIGGING AND ALIGNING. WELD TABS FOR TEMPORARY BRACINGS AND SAFETY CABLING ONLY AT POINTS CONCEALED FROM VIEW IN THE COMPLETE STRUCTURE OR WHERE APPROVED BY WSP-S.

ROOF DECK ASSEMBLIES

1. CONFORM TO CSA S136 FOR STEEL DECKING, AND TO CAST IN PLACE CONCRETE AND CONCRETE REINFORCEMENT NOTES.
2. STEEL DECK MATERIAL: TO ASTM A653/653M OR ASTM A792/792M, GRADE 230.
3. REQUIRED DECK DEPTH AND CORE NOMINAL THICKNESS ARE SHOWN ON DRAWINGS; PROVIDE DECK PROFILE TO MEET THE LOADING AND PERFORMANCE REQUIREMENTS OUTLINED IN THE SPECIFICATIONS.
4. USE ONLY MECHANICAL ROOF DECK FASTENERS. DO NOT USE WELDING OR CLINCHING.
5. IF DIAPHRAGM SHEAR AND / OR DECK FASTENERS ARE NOT NOTED ON PLAN, MINIMUM DECK FASTENING REQUIREMENTS ARE AS FOLLOWS:

   TRANSVERSE (FRAME) FASTENERS

   HILTI DIRECT FASTENERS PLACED IN EVERY SECOND FLUTE (FOR DECKS WITH FLUTE SPACING OF 200 (8") OR LESS) OR IN EVERY FLUTE (FOR DECKS WITH FLUTE SPACING OF OVER 200 (8"). IN ADDITION, PLACE TWO FASTENERS IN FLUTES WHERE SIDE LAPS ARE MADE: AT INTERLOCKING JOINTS, LOCATE ONE FASTENER AT EACH SIDE OF LAP. FOR GALVANIZED AND PREFINISHED DECK, USE #10 STAINLESS STEEL SCREWS INSTEAD OF WELDING OR PAFs.

   LONGITUDINAL (PERIMETER) FASTENERS

   TYPE TO MATCH TRANSVERSE FASTENERS, SPACED AT 450 (18") ON CENTRE

   SIDELAPS

   MECHANICALLY FASTENED WITH #10 SCREWS, SPACED AT 600 (24") ON CENTRE. FOR GALVANIZED AND PREFINISHED DECK, USE ONLY #10 STAINLESS STEEL SCREWS.

   LONGITUDINAL (PERIMETER) FASTENERS

   TYPE TO MATCH TRANSVERSE FASTENERS, SPACED AT 450 (18") ON CENTRE
6. STEEL DECK IS DESIGNED TO SUPPORT UNIFORMLY DISTRIBUTED LOADS INDICATED ON DRAWINGS AND MAY NOT BE ABLE TO RESIST CONCENTRATED LOADS. IF CEILING IS PROPOSED TO BE HUNG DIRECTLY FROM STEEL ROOF DECK (OR FROM STEEL FLOOR DECK BEFORE CONCRETE IS POURED AND GAINED THE SPECIFIED STRENGTH), HANGER LOADS, LAYOUTS AND PROPOSED FASTENERS TO BE REVIEWED AND APPROVED BY A PROFESSIONAL ENGINEER RETAINED BY THE CONTRACTOR PRIOR TO INSTALLATION. DO NOT HANG ANY OTHER CONCENTRATED LOADS FROM STEEL ROOF DECK, ATTACH TO STRUCTURAL STEEL FRAMING INSTEAD.
7. DECK SUPPLIER TO DESIGN AND PROVIDE REINFORCING FOR ALL ROOF DECK OPENINGS BETWEEN 150 AND 450 WIDE, REFER TO ARCHITECTURAL AND MECHANICAL DRAWINGS FOR LOCATIONS. CLEAR SPACING BETWEEN ADJACENT OPENINGS TO BE MIN. 3 TIMES THE WIDTH OF THE LARGER OPENING.
8. PROVIDE ADDITIONAL REINFORCING STEEL AROUND FLOOR DECK OPENINGS BETWEEN 150 AND 300 WIDE, REFER TO TYPICAL DETAIL TS-DECK-03.

MASONRY

1. CONFORM TO CSA A370, CSA A371 AND CSA S304.1.
2. UNLESS OTHERWISE NOTED ON PLANS, MATERIALS TO BE:

HOLLOW BLOCK:	CSA A165.1 - H/15/A/M
SOLID BLOCK:	CSA A165.1 - SF/15/A/M
MORTAR:	CSA A179 - TYPE S, PROPORTIONED BY VOLUME.
MASONRY GROUT:	CSA A179M, PROPORTIONED BY VOLUME - COARSE GROUT, 1:3:2 - CEMENT: SAND: MAX 9.5 (3/8") AGGREGATE, OR FINE GROUT, 1:3 - CEMENT:SAND, OR APPROVED PRE-BAGGED MATERIAL
MASONRY TIES:	HOT DIP GALVANIZED

3. MASONRY CONTRACTOR TO BE A MEMBER OF THE CANADIAN MASONRY CONTRACTORS ASSOCIATION.
4. NON LOAD-BEARING MASONRY WALLS ARE NOT NECESSARILY SHOWN ON STRUCTURAL DRAWINGS, SEE ARCHITECTURAL DRAWINGS.
5. UNLESS NOTED OTHERWISE, LAY UNITS IN RUNNING BOND. ALL FACE SHELLS TO BE FULLY BEDDED.
6. DO NOT USE MORTAR WHERE GROUT IS SPECIFIED.
7. PROVIDE HOT, COLD AND WET WEATHER PROTECTION AS REQUIRED BY CSA A371.
8. UNLESS OTHERWISE NOTED, PROVIDE DEFORMED, LADDER TYPE HORIZONTAL JOINT REINFORCING (TO SUIT THE WALL THICKNESS) PER ARCHITECTURAL SPECIFICATIONS. STAGGER LAPS MIN. 750 (2'-6") FROM COURSE TO COURSE. CLIP OFF CROSS RODS AT LAPS TO KEEP WIRES IN ONE PLANE. FOR UNREINFORCED WALLS, IT IS ACCEPTABLE TO USE TRUSS TYPE INSTEAD OF LADDER TYPE JOINT REINFORCING.
9. FOR WALLS SHOWN TO BE LAID IN STACK BOND, PROVIDE HORIZONTAL JOINT REINFORCING IN EVERY BED JOINT.
10. PROVIDE HORIZONTAL JOINT REINFORCING IN THE FIRST TWO BED JOINTS ABOVE AND BELOW EACH WALL OPENING AND EXTEND 600 (2'-0") BEYOND EACH SIDE OF OPENING.
11. UNLESS OTHERWISE NOTED, USE CORNER TYPE LADDER REINFORCING AT MASONRY WALL CORNERS AND INTERSECTIONS.
12. UNLESS OTHERWISE NOTED, INTERLOCK MASONRY COURSES AT WALL CORNERS.
13. TOOL JOINTS IN ALL WALLS SHOWN ON STRUCTURAL DRAWINGS (WHETHER EXPOSED OR NOT IN THE FINISHED BUILDING) TO PROVIDE HARD, DENSE JOINTS.
14. PROVIDE LATERAL SUPPORT AT TOPS OF ALL WALLS, REFER TO TYPICAL DETAILS AND ARCHITECTURAL SPECIFICATIONS. LOCATE MAX 300 (12") FROM WALL ENDS AND MOVEMENT JOINTS.
15. UNLESS OTHERWISE NOTED, PROVIDE MINIMUM 25 (1") DEFLECTION GAP AT TOP OF ALL NON LOAD BEARING MASONRY WALLS.
16. PROVIDE TEMPORARY BRACING FOR LOAD BEARING MASONRY WALLS UNTIL THE SUPPORTED STRUCTURE, WHICH PROVIDES PERMANENT BRACING, IS COMPLETED.
17. MOVEMENT JOINTS
    1. PROVIDE VERTICAL MOVEMENT JOINTS (MJ) IN LOAD BEARING WALLS AT LOCATIONS INDICATED ON PLANS. CARRY HORIZONTAL REINFORCING IN BOND BEAMS LOCATED IMMEDIATELY BELOW FLOOR OR ROOF LEVELS CONTINUOUSLY THROUGH MOVEMENT JOINTS (WHERE APPLICABLE). DO NOT CARRY ANY OTHER WALL REINFORCING (INCLUDING HORIZONTAL JOINT REINFORCING) THROUGH MJ.
    2. PROVIDE VERTICAL MOVEMENT JOINTS (MJ) IN NON LOAD BEARING MASONRY WALLS AS FOLLOWS:
       - WHERE INDICATED ON ARCHITECTURAL DRAWINGS AND SPECIFICATIONS.
       - BETWEEN MASONRY WALLS AND ABUTTING COLUMNS OR CONCRETE WALLS.
       - AT MAX. 6000 (20') O/C
    3. PROVIDE VERTICAL MOVEMENT JOINTS BETWEEN ALL LOAD BEARING AND NON LOAD BEARING WALLS.
    4. UNLESS OTHERWISE NOTED ON PLANS, MOVEMENT JOINTS TO BE 12mm WIDE.
    5. FILL ALL MOVEMENT JOINTS WITH COMPRESSIBLE MATERIAL; SEE ARCHITECTURAL DRAWINGS AND SPECIFICATIONS FOR FIRE STOPPING REQUIREMENTS.
18. PROVIDE STANDARD LINTELS OVER ALL OPENINGS IN NON-LOAD BEARING MASONRY WALLS, REFER TO ARCHITECTURAL DRAWINGS AND TYPICAL DETAILS TM-WALL-11 TO TM-WALL- 14. THE OPENINGS ARE NOT NECESSARILY SHOWN ON STRUCTURAL DRAWINGS, REFER TO ARCHITECTURAL, MECHANICAL AND ELECTRICAL DRAWINGS

    USE ONLY FINE GROUT TO FILL MASONRY LINTELS.
19. REINFORCED MASONRY:
    1. SEE PLANS AND DETAILS FOR STRUCTURAL MASONRY REINFORCING.
    2. FOR NON-LOAD BEARING MASONRY, SEE TYPICAL DETAIL TM-WALL-01 FOR MINIMUM SEISMIC MASONRY REINFORCING.
       - WHERE 75% SOLID MASONRY WALLS ARE SHOWN ON ARCHITECTURAL DRAWINGS, USE FULLY GROUTED HOLLOW MASONRY AS REQUIRED TO ACCOMMODATE REBAR.
       - WHERE ACOUSTIC BLOCK WALLS ARE SHOWN ON ARCHITECTURAL DRAWINGS, USE SOUND BLOCKS WHICH CAN ACCOMMODATE REBAR; INCREASE THE SPECIFIED WALL THICKNESS IF REQUIRED.
    3. DO NOT PLACE CONDUITS IN, NOR ALLOW OVER-HANGING MORTAR OR DEBRIS INSIDE, MASONRY CELLS TO BE REINFORCED.
    4. SPLICES FOR MASONRY WALL REINFORCING TO BE:

WIRE REINFORCING	300 (12")
10M BARS	450 (18")
15M BARS	650 (26")
20M BARS	900 (36")
25M BARS	1300 (51")

    5. LOCATE VERTICAL BARS ACCURATELY WITHIN CELLS AS INDICATED ON DRAWINGS. HOLD IN POSITION TOP AND BOTTOM. USE REBAR POSITIONERS AS REQUIRED.
    6. LOCATE TOP HORIZONTAL BARS IN MASONRY BEAMS AND LINTELS 50 (2") CLEAR FROM TOP OF BEAM. LOCATE BOTTOM BARS TO PROVIDE MIN 6 (1/4") CLEARANCE BETWEEN BLOCK AND REINFORCING (INCLUDING STIRRUPS, IF APPLICABLE). IF BLOCKS WITH KNOCKOUT WEB ARE USED FOR BOND BEAMS, PLACE BOTTOM REINFORCING ON THE WEB.
    7. EXTEND ALL VERTICAL REINFORCING TO WITHIN 50 (2") FROM TOP OF WALL.
    8. CARRY ALL VERTICAL REINFORCING CONTINUOUSLY THROUGH BOND BEAMS AND MASONRY LINTELS.
    9. PROVIDE VERTICAL DOWELS AT BASE OF WALLS TO MATCH VERTICAL REINFORCING. UNLESS OTHERWISE NOTED ON DRAWINGS, EMBED INTO SLAB WITH STANDARD HOOKS OR PROVIDE CLASS B LAP INTO FOUNDATION WALLS BELOW (AS APPLICABLE).
    10. REINFORCE SIDES OF ALL WALL OPENINGS EXCEEDING 1000 (3'-6") IN WIDTH WITH ADDITIONAL 1-15 VERTICAL. CARRY FULL HEIGHT OF WALL. WHERE STEEL OR PRECAST CONCRETE LINTELS ARE USED, OFFSET VERTICALS TO CLEAR LINTEL BEARINGS.
    11. UNLESS OTHERWISE NOTED, ADD 1-15 VERTICAL AT WALL ENDS, AND AT EACH SIDE OF MOVEMENT JOINTS.
    12. THE ADDITIONAL REINFORCING SPECIFIED IN THE CLAUSES ABOVE IS NOT NOTED ON PLANS.
    13. SEE TYPICAL DETAILS FOR ADDITIONAL REINFORCING UNDER STEEL BEAM AND STEEL JOIST BEARINGS.
    14. UNLESS OTHERWISE NOTED, PROVIDE MIN. 190 (7-1/2") DEEP BOND BEAMS AT TOPS OF ALL WALLS AND WHERE INDICATED, AND AT MAX. VERTICAL SPACING OF 2400 (8"-0"). CONSTRUCT BOND BEAMS WITH LOW WEB MASONRY UNITS. REINFORCE WITH MIN. 1-15 TOP AND BOTTOM CONTINUOUS AND GROUT SOLID. BEND AND LAP REINFORCING AT MASONRY CORNERS AND INTERSECTIONS.
20. GROUTED MASONRY:
    1. UNLESS MASONRY WALLS ARE NOTED AS "FULLY GROUTED" OR "GROUTED SOLID", GROUT ONLY CELLS CONTAINING VERTICAL OR HORIZONTAL REINFORCEMENT AND ANCHOR RODS OR STRAPS, AND OTHER AREAS SPECIFICALLY INDICATED ON DRAWINGS.
    2. USE ONLY FINE GROUT TO FILL BOND BEAMS.
    3. USE LOW LIFT GROUTING PROCEDURE UNLESS OTHERWISE APPROVED IN WRITING BY WSP-S. PLACE GROUT IN LIFTS NOT EXCEEDING 1500 (5'-0") HEIGHT. TERMINATE EACH LIFT 40 (1 ½") BELOW TOP OF MASONRY UNIT.
    4. USE POLYPROPYLENE GROUT SCREENS BELOW BOND COURSES AND GROUTED BLOCKS TO ISOLATE GROUT FLOW IN DESIGNATED AREAS. DO NOT USE BUILDING PAPER.
    5. SEE TYPICAL DETAILS FOR GROUTING UNDER STEEL BEAM AND STEEL JOIST BEARINGS.
    6. PREFILL VOIDS IN MASONRY UNITS RECEIVING POST INSTALLED ANCHORS WITH GROUT EXTENDING MIN. 200 AROUND EACH ANCHOR.
    7. PREFILL VOIDS IN MASONRY UNITS WITH GROUT FOR A MINIMUM DEPTH OF 190 (8") BELOW STEEL DECK SUPPORTS, AND 390 (16") FORMED SLAB SUPPORTS.
    8. WHERE MASONRY WALL THICKNESS CHANGES, GROUT SOLID TOP COURSE OF THE THICKER WALL.
    9. GROUT SOLID ALL PARAPETS.
    10. FULLY GROUT ALL WALL POCKETS AFTER INSTALLATION OF STEEL BEAMS OR JOISTS.
21. INSPECTION AND TESTING:
    1. AN INDEPENDENT INSPECTION AND TESTING AGENCY WILL BE APPOINTED TO INSPECT MASONRY WORKS AND TO TEST MASONRY MATERIALS TO DETERMINE COMPRESSIVE STRENGTH OF GROUT AND MASONRY UNITS IN ACCORDANCE WITH CSA A179, REFER TO ARCHITECTURAL SPECIFICATIONS.
    2. THE AGENCY WILL REVIEW MORTAR BATCHING PROCEDURE TO VERIFY ACCURATE VOLUME PROPORTION.
    3. THE AGENCY WILL REVIEW REINFORCING AND GROUTING PROCEDURE, INCLUDING LIFT HEIGHTS, POSITIONING AND LAPPING OF REINFORCEMENT.
    4. AT LEAST THREE CYLINDERS WILL BE TESTED FOR EACH 20 CUBIC METERS OF PLACED MASONRY GROUT - ONE AT 7 DAYS AND TWO AT 28 DAYS. AT LEAST ONE SET OF CYLINDERS WILL BE MADE EACH DAY THE GROUT IS PLACED.
    5. FOR WALLS WITH SPECIFIED COMPRESSIVE STRENGTH OF MASONRY UNITS LARGER THAN 15 MPa, AT LEAST THREE MASONRY UNITS WILL BE TESTED FOR EACH 500 SQUARE METERS OF WALL.

GLUE LAMINATED TIMBER

1. CONFORM TO CSA O86.
2. MATERIALS: TO CSA O122.

   LAMINATING STOCK: SPRUCE PINE

   STRESS GRADE (MINIMUM): BEAMS, PURLINS, GIRTS: BENDING GRADE 20f-ex
   COLUMNS: COMPRESSION GRADE 12c-E
   TENSION MEMBERS: TENSION GRADE 14t-E
   SERVICE GRADE: INTERIOR
   APPEARANCE GRADE: QUALITY
3. REFER TO PLANS AND SPECIFICATIONS FOR LOADING AND PERFORMANCE REQUIREMENTS.
4. REFER TO ARCHITECTURAL DRAWINGS FOR FINISHING, STAINING AND SEALING REQUIREMENTS.
5. USE PROTECTIVE BLOCKING BETWEEN SLINGS AND WRAPPED GLUE LAMINATED MEMBERS WHEN UNLOADING AND ERECTING.
6. LEAVE PROTECTIVE WRAPPING IN PLACE UNTIL THE STRUCTURE IS ENCLOSED.
7. DO NOT FIELD CUT OR ALTER MEMBERS (NOTCH, CUT OR DRILL HOLES) WITHOUT WSP-S APPROVAL.

WOOD DECKING

1. CONFORM TO CSA O86.
2. MATERIALS: CLT PANELS

   SPECIES: SPRUCE PINE FIR.

   GRADE: NO. 1 / NO.2 MINIMUM
3. REFER TO ARCHITECTURAL DRAWINGS FOR FINISHING, STAINING AND SEALING REQUIREMENTS.

LOADING ABBREVIATIONS — TG-ABBR-02

Af	FACTORED AXIAL LOAD IN kN (+ INDICATES TENSION, - INDICATES COMPRESSION)
Cf	FACTORED COMPRESSION IN kN
f'c	COMPRESSIVE STRENGTH OF CONCRETE, IN MPa
fy	YIELD STRENGTH IN MPa
Mf	FACTORED MOMENT IN kN.m
Mfx	FACTORED MOMENT ABOUT X-X (STRONG) AXES IN kN.m
Mfy	FACTORED MOMENT ABOUT Y-Y (WEAK) AXES IN kN.m
MPL	MASONRY PARTITION LOAD IN kN/m
MTf	FACTORED TORSION IN KN.m
Rf	FACTORED VERTICAL REACTION IN kN
RHf	FACTORED HORIZONTAL REACTION IN kN
P	SPECIFIED (UNFACTORED) POINT LOAD IN kN
Pf	FACTORED POINT LOAD IN kN
Vf	FACTORED SHEAR IN kN
Tf	FACTORED TENSION IN kN

JUNE 2017

DRAWING ABBREVIATIONS — TG-ABBR-01

ABUT	ABUTMENT
ACA	ADHESIVE CONCRETE ANCHORS
ADD'L	ADDITIONAL
AEC	ARCHITECTURALLY EXPOSED CONCRETE
AESS	ARCHITECTURALLY EXPOSED STRUCTURAL STEEL
AIFB	ASPHALT IMPREGNATED FIBERBOARD
ALT	ALTERNATE
AMA	ADHESIVE MASONRY ANCHORS
ARCH	ARCHITECTURAL
A-ROD	ANCHOR ROD
ASPH	ASPHALT
AVG	AVERAGE
B, BOT	BOTTOM
BOF	BOTTOM OF FOOTING
BOP	BOTTOM OF PILE
BCE	BOTTOM CHORD EXTENSION
BCP	BORED CONCRETE PILE
BEW	BOTTOM EACH WAY
BLL	BOTTOM LOWER LAYER
BP	BASE PLATE
BRG	BEARING
BRP	BEARING PLATE
BSMT	BASEMENT
BUL	BOTTOM UPPER LAYER
BUP	BOTTOM OF UNDERPINNING
C	CAMBER
CA	COLUMN ABOVE ONLY (NO COLUMN BELOW)
CANT	CANTILEVER
CAT	CATEGORY (FOR AESS)
CB	COLUMN BELOW ONLY (NO COLUMN ABOVE)
CDL	COMPRESSION DEVELOPMENT LENGTH
CEL	CUT OFF ELEVATION FOR PILES
CIP	CAST-IN PLACE
CJ	CONTROL JOINT
CLR	CLEAR
CL	CENTRELINE
CMU	CONCRETE MASONRY UNITS
CNT	STEEL DECK CORE NOMINAL THICKNESS
COMP	COMPOSITE
COL	COLUMN
CONC	CONCRETE
CONT	CONTINUOUS
CONT'D	CONTINUED
CONST.J.	CONSTRUCTION JOINT
CP	CONNECTION PLATE
CPL	CAP PLATE
CS	COMPRESSION LAP SPLICE
COV	CLEAR COVER
C/W	COMPLETE WITH, CONNECT WITH
CWS	(SEE GENERAL NOTES)
CLS	(SEE GENERAL NOTES)
DCA	DRILLED CONCRETE ANCHOR, SEE GENERAL NOTES
DEMO	DEMOLITION
DET	DETAIL
D.FIR-L	DOUGLAS FIR-LARCH
DIA, Ø	DIAMETER
DIV	DIVIDER BEAM
DMA	DRILLED MASONRY ANCHOR, SEE GENERAL NOTES
DN	DOWN
DNW	DOUBLE NUT AND WASHER

DP	DEEP
DWG	DRAWING
DWL	DOWEL
EA	EACH
ECR	EPOXY COATED REINFORCEMENT
EBF	ECCENTRICALLY BRACED FRAME
EE	EACH END
EF	EACH FACE
EJ, EXP JT	EXPANSION JOINT
ELECT	ELECTRICAL
EL	ELEVATION
ELEV	ELEVATOR
EMBED	EMBEDMENT
ENG	ENGINEER
EOD	EDGE OF DECK
EOS	EDGE OF SLAB
ES	EACH SIDE
EQ	EQUAL
EW	EACH WAY
EX, EXIST	EXISTING
EXT	EXTERIOR
FC	FUTURE COLUMN
FD	FLOOR DRAIN
FF	FAR FACE
FIN	FINISHED
FL	FLOOR
FMC	FULL MOMENT CONNECTION (FOR FULL MOMENT CAPACITY)
FND	FOUNDATION
FTG	FOOTING
GA	GAUGE
GALV	GALVANIZED
GB	GRADE BEAM
GEN	GENERAL
GL	GRIDLINE
GRD	GROUND
h	TOTAL THICKNESS, SLAB THICKNESS AWAY FROM DROP PANEL
hd	SLAB OVERALL THICKNESS AT DROP PANEL
H, HORIZ	HORIZONTAL
(H)	HIGH BEAM
HC	HOLLOWCORE
HD	HOLD DOWN
HDG	HOT DIPPED GALVANIZED
HEF	HORIZONTAL EACH FACE
HIF	HORIZONTAL INSIDE FACE
HH	HOOK EACH END
HIC	HORIZONTAL IN CENTRE
HOF	HORIZONTAL OUTSIDE FACE
HP	HIGH POINT
HSC	HORIZONTAL SLOTTED CONNECTION
IBI	INTEGRITY BARS INTERIOR
IBE	INTEGRITY BARS EXTERIOR
IBA	INTEGRITY BARS ADDED
IBB	INTEGRITY BOTTOM BARS (THROUGHOUT)
ID	INSIDE DIAMETER
INT	INTERIOR
IF	INSIDE FACE
JG	JOIST GIRDER
KB	KNEE BRACING
(L)	LOW BEAM
2-L	BACK TO BACK ANGLES

ℓd	TENSION DEVELOPMENT LENGTH OF REBAR
ℓdc	COMPRESSION DEVELOPMENT LENGTH OF REBAR
ℓdh	TENSION EMBEDMENT LENGTH WITH STANDARD HOOK
LE	LEFT END
LG	LONG
LL	LOWER LEVEL
LLH	LONG LEG HORIZONTAL
LLV	LONG LEG VERTICAL
LONG	LONGITUDINAL
LSH	LONG SIDE HORIZONTAL
LP	LOW POINT
LWT	LIGHT WEIGHT
MAX	MAXIMUM
MC	MOMENT CONNECTION ( )
MECH	MECHANICAL
MEZZ	MEZZANINE
MF	MOMENT FRAME
MIN	MINIMUM
MISC	MISCELLANEOUS
MJ	MOVEMENT JOINT
ML	MIDDLE LAYER
NF	NEAR FACE
NIC	NOT IN CONTRACT
NOM	NOMINAL
NTS	NOT TO SCALE
O/C	ON CENTER
OD	OUTSIDE DIAMETER
OF	OUTSIDE FACE
OPP	OPPOSITE
OWSJ	OPEN WEB STEEL JOIST
PAF	POWDER ACTUATED FASTENERS
PC	PILE CAP
PL	PLATE
PROJ	PROJECT, PROJECTION
PS	PIPE SUPPORT
PT	POST TENSIONED
PTL	PRESSURE TREATED LUMBER
R	RADIUS
RA	ROOF ANCHOR
RD	ROOF DRAIN
RE	RIGHT END
REINF	REINFORCEMENT
REM	REMAINDER
REQ'D	REQUIRED
REV	REVISION
RF	RIGID FRAME
RL	REFERENCE LINE
RSS	RETAINED SOIL SYSTEM
RTU	ROOF TOP UNIT
RET. WALL	RETAINING WALL
R/W	REINFORCE WITH
r.w.	REQUIRED WITH
SDF	STEP DOWN FOOTING (IN DIRECTION OF ARROW)
SEC	SECTION
SIM	SIMILAR
SJ	STEEL JOIST
SL	SLAB, SHELF ANGLE
SLBB	SHORT LEG BACK TO BACK
SLS	SERVICEABILITY LIMIT STATE
SOG	SLAB-ON-GRADE

SPEC	SPECIFICATIONS
SPF	SPRUCE PINE FIR
SR	STUD RAIL
SS	STAINLESS STEEL
ST	STRAIGHT
STD	STANDARD
STE	SHEAR TRANSFER ELEMENTS
STG	STAGGERED
STIR	STIRRUP
STIFF	STIFFENER
STL	STEEL
STR	SEISMIC STRAP
STRUCT	STRUCTURAL
SWT	SELF WEIGHT
SYMM	SYMMETRICAL
t	THICKNESS
TB	TRANSFER BEAM
TBB	TOP BASIC BARS
T	TOP
TDL	TENSION DEVELOPMENT LENGTH
TEW	TOP EACH WAY
T&G	TONGUE AND GROOVE
TJ	TIE JOIST
TLL	TOP LOWER LAYER
T/O	TOP OF
TOB	TOP OF (GRADE) BEAM
TOC	TOP OF CONCRETE
TOF	TOP OF FOOTING
TOS	TOP OF STEEL
TOP	TOP OF PILE
TOW	TOP OF WALL
TPC	TOP OF PILE CAP
TRANS	TRANSVERSE
TSA	TENSION SPLICE "A"
TSB	TENSION SPLICE "B"
TUL	TOP UPPER LAYER
TYP	TYPICAL
U-BAR	"U" SHAPED BAR
UDB	UNIFORMLY DISTRIBUTED BARS
U/F	UNDERSIDE OF FOOTING
UL	UPPER LEVEL
ULS	ULTIMATE LIMIT STATE
U/S	UNDERSIDE
U/N, UNO	UNLESS NOTED OTHERWISE
UPT	UPTURNED
V, VERT	VERTICAL, VERTICALS
VB	VERTICAL BRACING
VEF	VERTICAL EACH FACE
VIF	VERTICAL INSIDE FACE
VIC	VERTICAL IN CENTRE
VOF	VERTICAL OUTSIDE FACE
VSC	VERTICALLY SLOTTED CONNECTION
WB	WALL BELOW
WC	WIND COLUMN
w/o	WITHOUT
WP	WORK POINT
WSP-S	WSP STRUCTURAL
WWF	WELDED WIRE FABRIC
ZRP	ZINC RICH PAINT
γ	CONCRETE DENSITY

DEC 2017

ARCHITECTURE 49

1000-150 ISABELLA STREET
OTTAWA (ONTARIO) CANADA K1S 1V7
Phone: 613-238-0440 | Fax: 613-238-6597 | WWW.ARCHITECTURE49.COM

wsp
2611 Queensview Dr, Suite 300
Ottawa, Ontario, K2B 8K2 Canada
T 613-829-2800 | F 613-829-8299 | www.wsp.com

PCL CONSTRUCTION
49 Auriga Drive
Ottawa, Ontario, K2E 8A1 Canada
T 613-976-5398 | www.pcl.com

SEAL:

CLIENT:

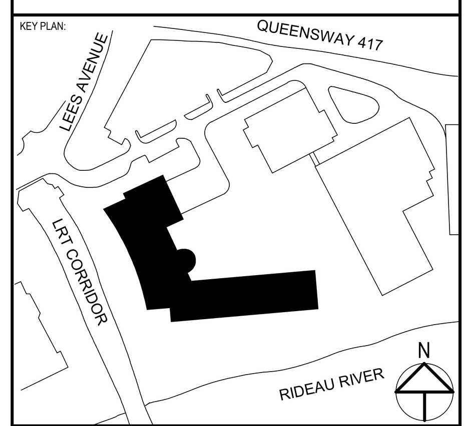
uOttawa

RFP #: 2020-40639 CLIENT REF #: BT20-18477

PROJECT:

University of Ottawa - Faculty of Health Sciences Building

KEY PLAN



ISSUED FOR / REVISION:

#	RE	DATE	DESCRIPTION
1		2021-04-15	ISSUED FOR TECHNICAL SUBMISSION

PROJECT NO: 211-01094-00 DATE: 2021-04-15

ORIGINAL SCALE: 1 : 100

IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE

25mm

DESIGNED BY: L.HAJSAID

DRAWN BY: P.MCKEE

CHECKED BY: S.HOWARD

DISCIPLINE: STRUCTURAL

TITLE: GENERAL REQUIREMENTS

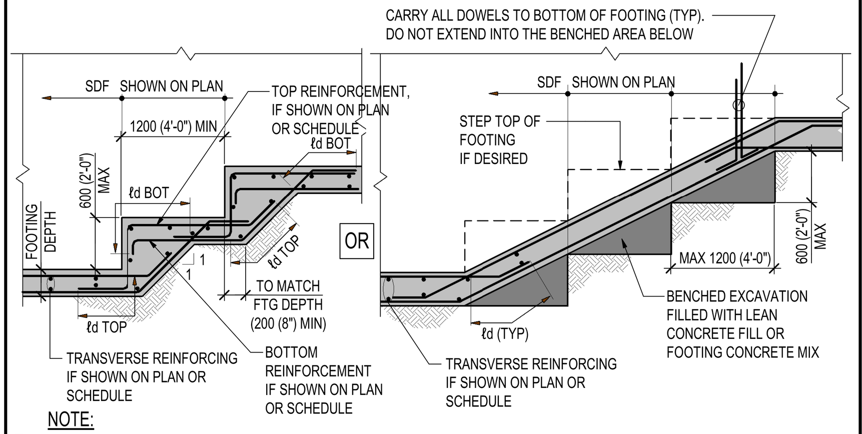
SHEET NUMBER: S101

SHEET # OF

ISSUE REV #

DATE OF

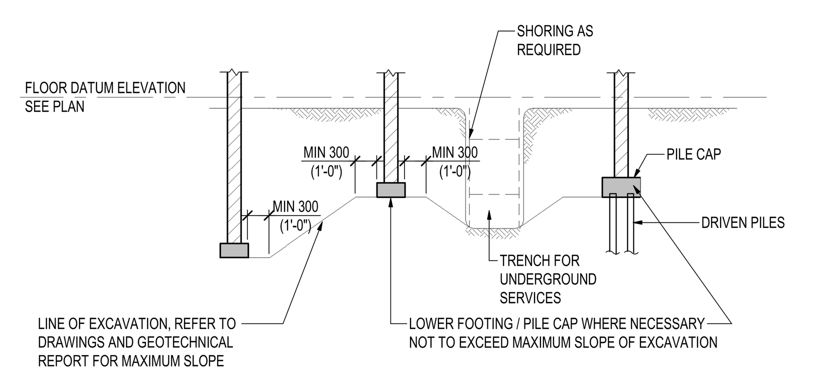
STEPS IN STRIP OR PAD FOOTING — TC-FDN-33



NOTE:
IF REINFORCING IS LOCATED AT FOOTING MIDHEIGHT, DETAIL REBAR SPLICE AS IF THEY WERE BOTTOM BARS

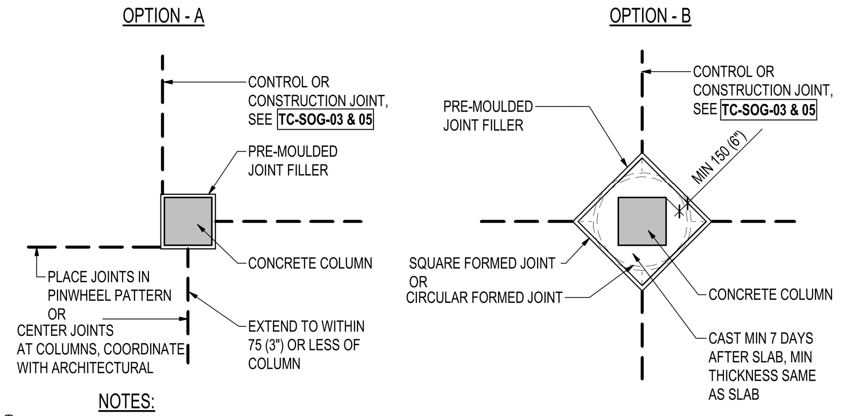
FEB 2020

SLOPE BETWEEN ADJACENT EXCAVATIONS — TC-FDN-41



MAY 2017

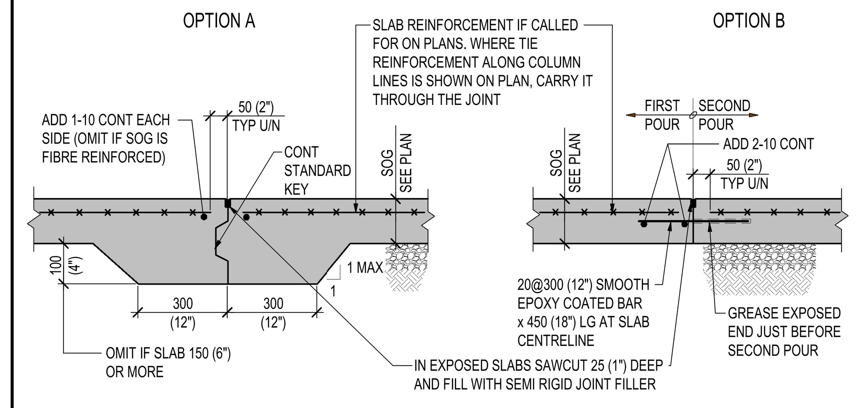
SLAB ON GRADE JOINTS AROUND CONCRETE COLUMN — TC-SOG-01



NOTES:
1. SUBMIT PROPOSED JOINT LAYOUT AND DETAILS FOR REVIEW BY ARCHITECT AND WSP-S.
2. DO NOT USE OPTION 'B' FOR SOG IN VEHICLE ACCESSIBLE AREAS.

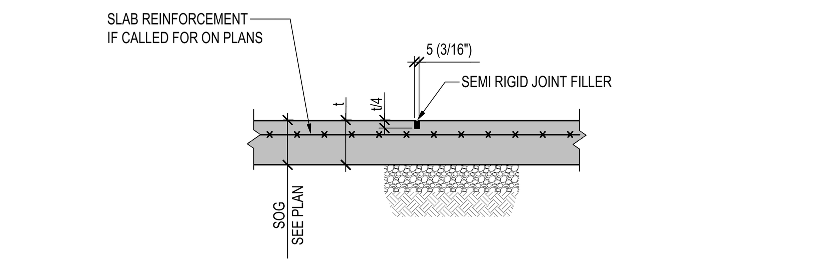
JUNE 2019

SLAB ON GRADE CONSTRUCTION JOINTS — TC-SOG-03



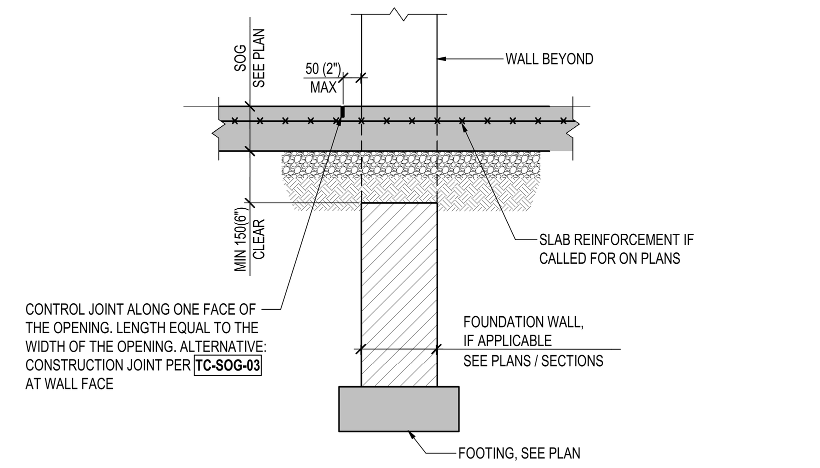
JUNE 2019

SLAB ON GRADE SAWCUT CONTROL JOINT — TC-SOG-05



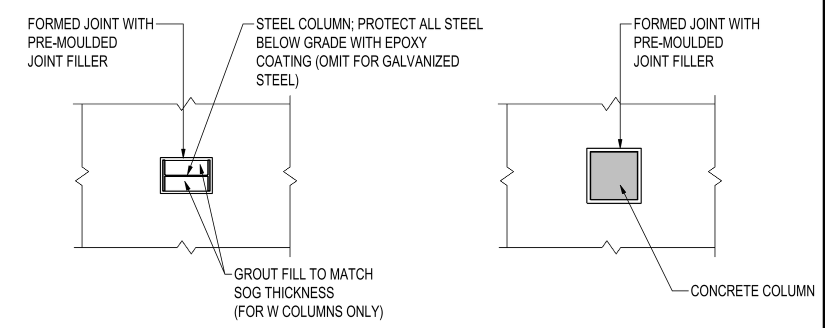
MAY 2017

SLAB ON GRADE CONTROL JOINT AT INTERIOR DOORWAY — TC-SOG-06



DEC 2017

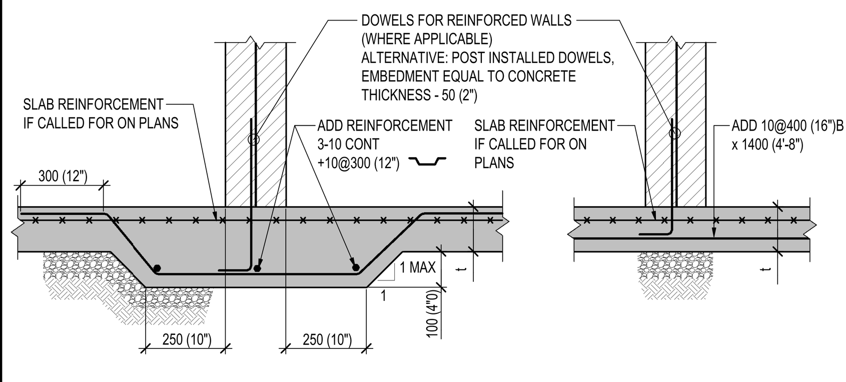
REBAR REINFORCED NON STRUCTURAL SLAB ON GRADE JOINTS AROUND COLUMNS — TC-SOG-08



NOTES:
1. THIS DETAIL APPLIES ONLY FOR SOG SPECIFICALLY IDENTIFIED ON PLAN NOT TO HAVE CONTROL JOINTS.
2. LOCATE CONSTRUCTION JOINTS HALFWAY BETWEEN COLUMNS.

OCT 2017

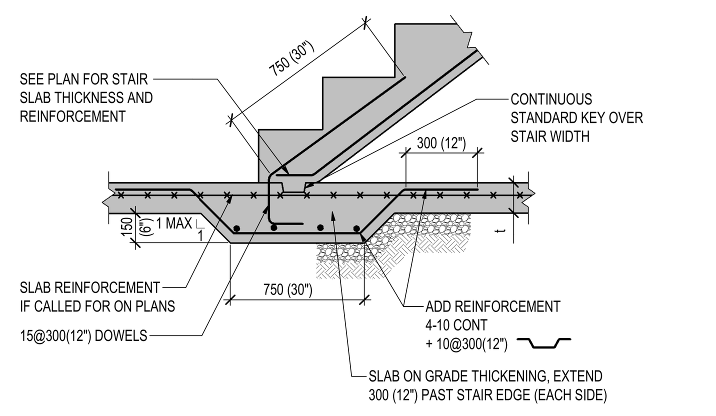
SLAB ON GRADE AT MASONRY PARTITIONS 190 (7 1/2") AND THICKER — TC-SOG-11



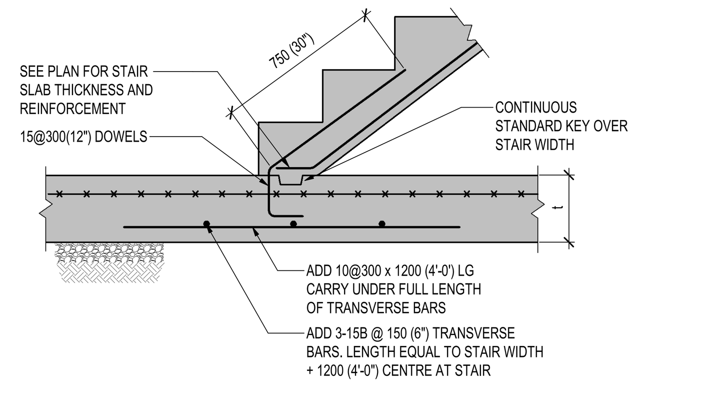
t < 150 (6") t ≥150 (6")

JUNE 2019

SLAB ON GRADE AT CONCRETE STAIR — TC-SOG-12



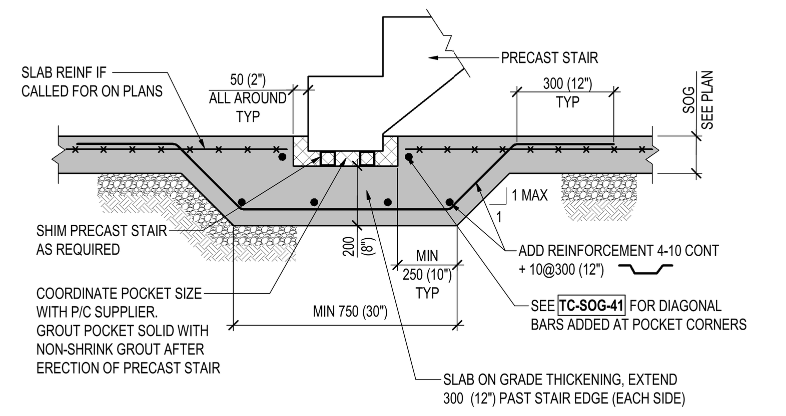
t < 150 (6")



t ≥150 (6")

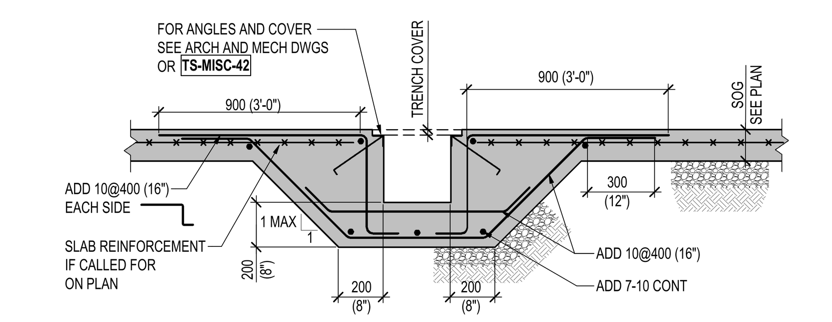
JUNE 2019

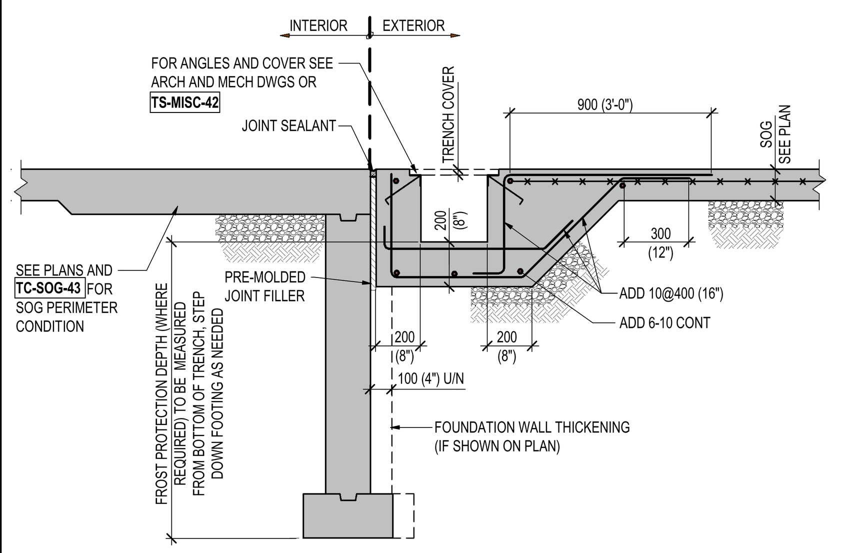
SLAB ON GRADE AT PRECAST STAIR — TC-SOG-13



MAY 2017

TRENCH DRAINS IN SLAB ON GRADE — TC-SOG-23

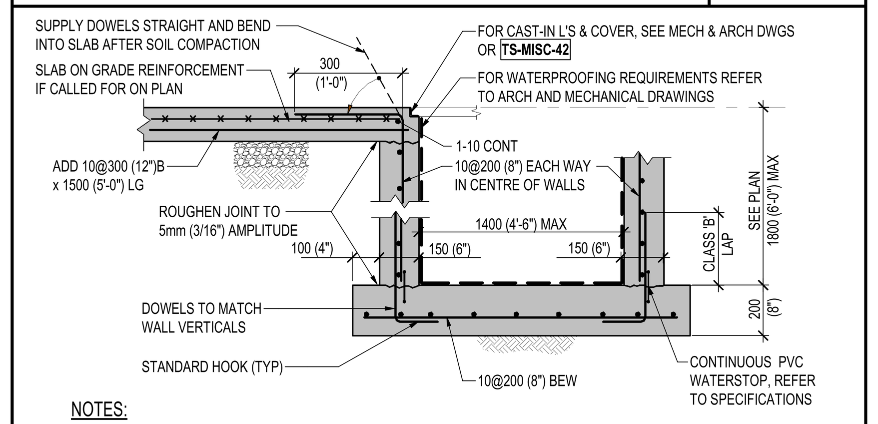




NOTES:
1. SEE TC-SOG-41 FOR SOG DIAGONAL BARS ADDED AT TRENCH ENDS.
2. SEE PLANS IF EPOXY COATED BARS ARE REQUIRED.

JUNE 2019

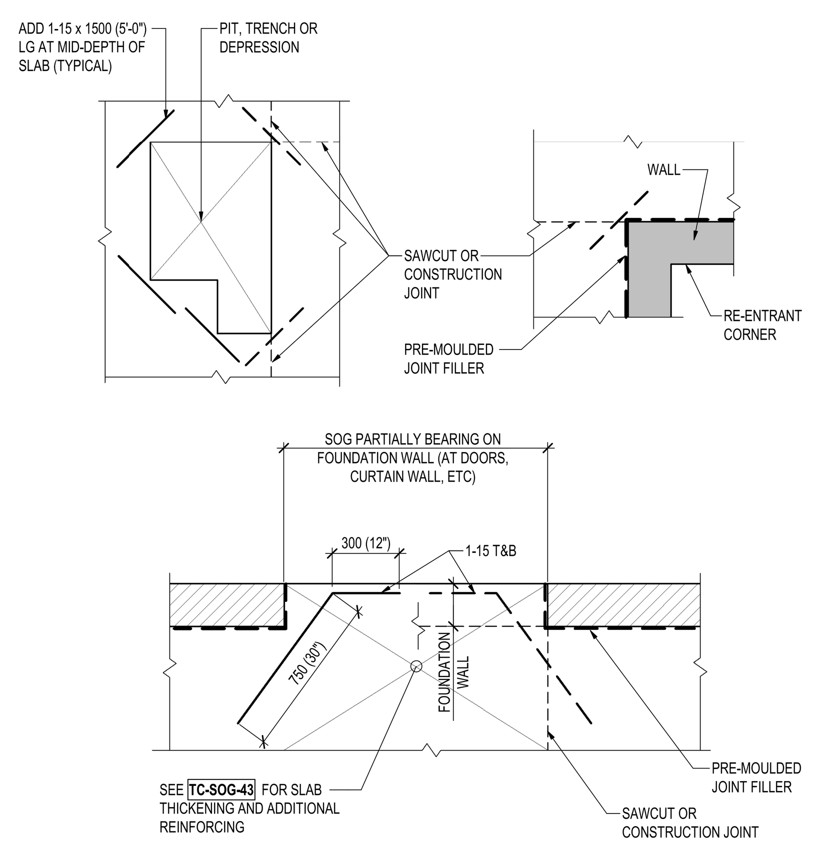
SUMP PIT MAX 1800 (6'-0") DEEP — TC-SOG-31



NOTES:
1. THIS DETAIL MAY BE USED FOR DEEPER PITS WHERE SPECIFICALLY NOTED ON PLANS.
2. SEE TC-SOG-41 FOR SOG DIAGONAL BARS ADDED AT PIT CORNERS.

FEB 2020

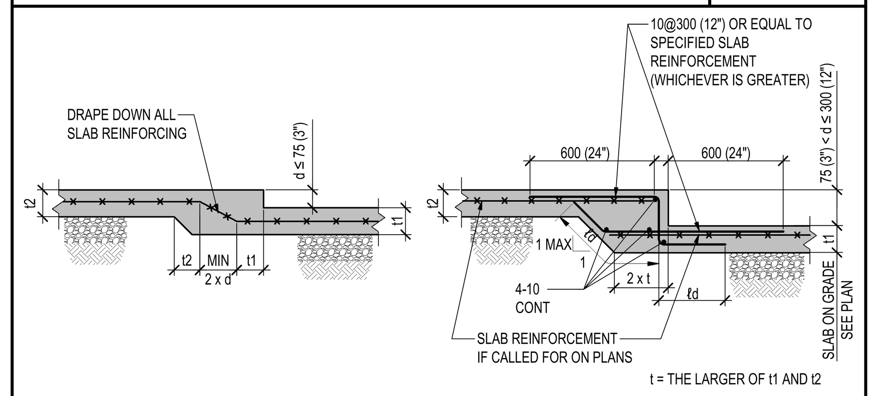
ADDED SLAB ON GRADE REINFORCEMENT AT RECESSES AND CORNERS — TC-SOG-41



NOTES:
1. ADDITIONAL REBARS SHOWN THUS — — — ARE NOT REQUIRED, IF SAWCUT OR CONSTRUCTION JOINTS ARE PROVIDED AS INDICATED.
2. ADDITIONAL REBARS ARE NOT REQUIRED FOR FIBRE REINFORCED SLABS.

AUG 2020

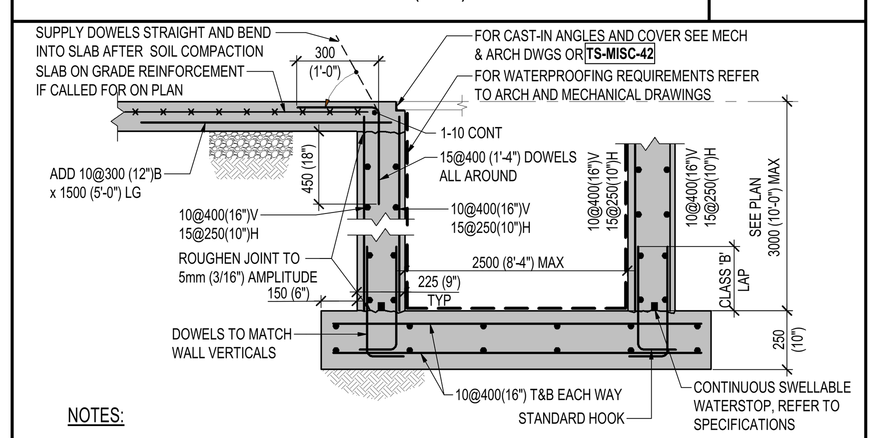
SLAB ON GRADE STEP UP TO 300 (12") — TC-SOG-21



NOTE:
SEE TC-SOG-41 FOR DIAGONAL BARS ADDED AT CORNERS

OCT 2017

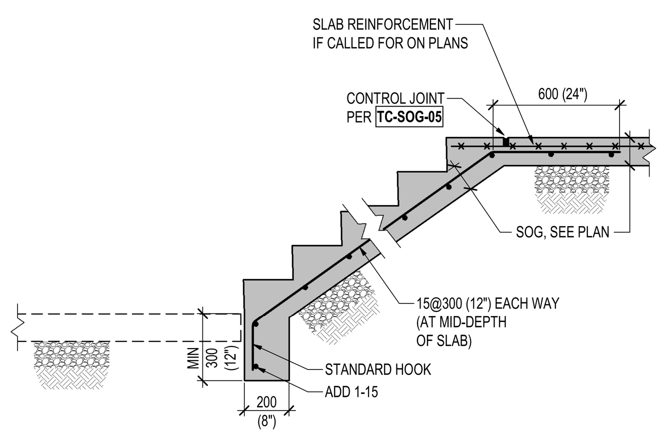
SUMP PIT OVER 1800 (6'-0") DEEP — TC-SOG-32



NOTES:
1. WHERE SPECIFICALLY INDICATED ON PLAN, DETAIL TC-SOG-31 FOR PITS MAXIMUM 1800 (6'-0") DEEP CAN BE USED FOR SOME PITS OVER 1800 (6'-0") DEEP.
2. SEE TC-SOG-41 FOR DIAGONAL SOG BARS ADDED AT PIT CORNERS.

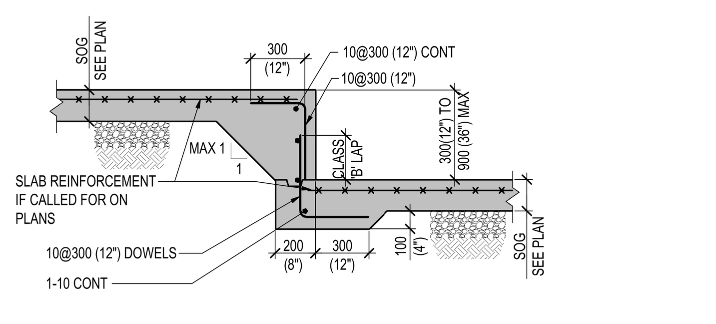
FEB 2020

STAIR IN SLAB ON GRADE — TC-SOG-42

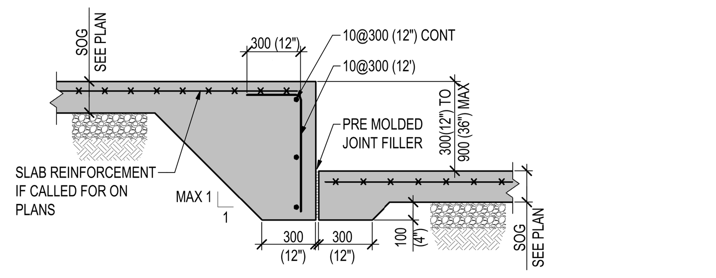


MAY 2017

SLAB ON GRADE STEPS 300(12") TO 900(36") — TC-SOG-22



OPTION A

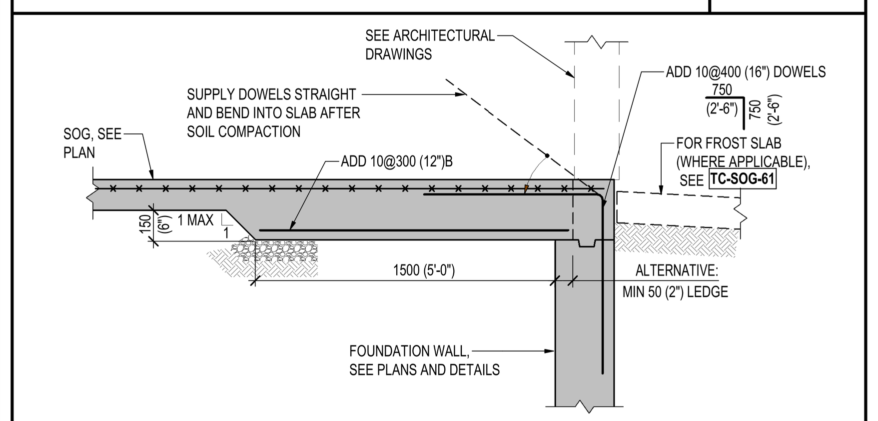


OPTION B

NOTE:
ADD TC-SOG-41 FOR DIAGONAL BARS ADDED AT CORNERS

OCT 2018

SLAB ON GRADE AT DOORS — TC-SOG-43



NOTE:
THIS DETAIL MAY APPLY AT OTHER LOCATIONS INDICATED ON PLANS

FEB 2020

ARCHITECTURE 49
1000-150 ISABELLA STREET
OTTAWA (ONTARIO) CANADA K1S 1V7
Phone: 613-238-0440 | Fax: 613-238-6597 | WWW.ARCHITECTURE49.COM

wsp
2611 Queensview Dr. Suite 300
Ottawa, Ontario, K2B 8K2 Canada
T 613-829-2800 | F 613-829-8299 | www.wsp.com

PCL CONSTRUCTION
49 Auriga Drive
Ottawa, Ontario, K2E 8A1 Canada
T 613-978-5398 | www.pcl.com

SEAL

CLIENT:

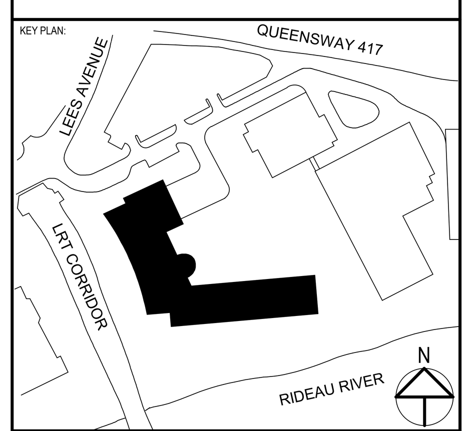
uOttawa

RFP #: 2020-40639 CLIENT REF. #: BT20-18477

PROJECT:

University of Ottawa - Faculty of Health Sciences Building

KEY PLAN



ISSUED FOR - REVISION

IS	RE	DATE	DESCRIPTION
1		2021-04-15	ISSUED FOR TECHNICAL SUBMISSION

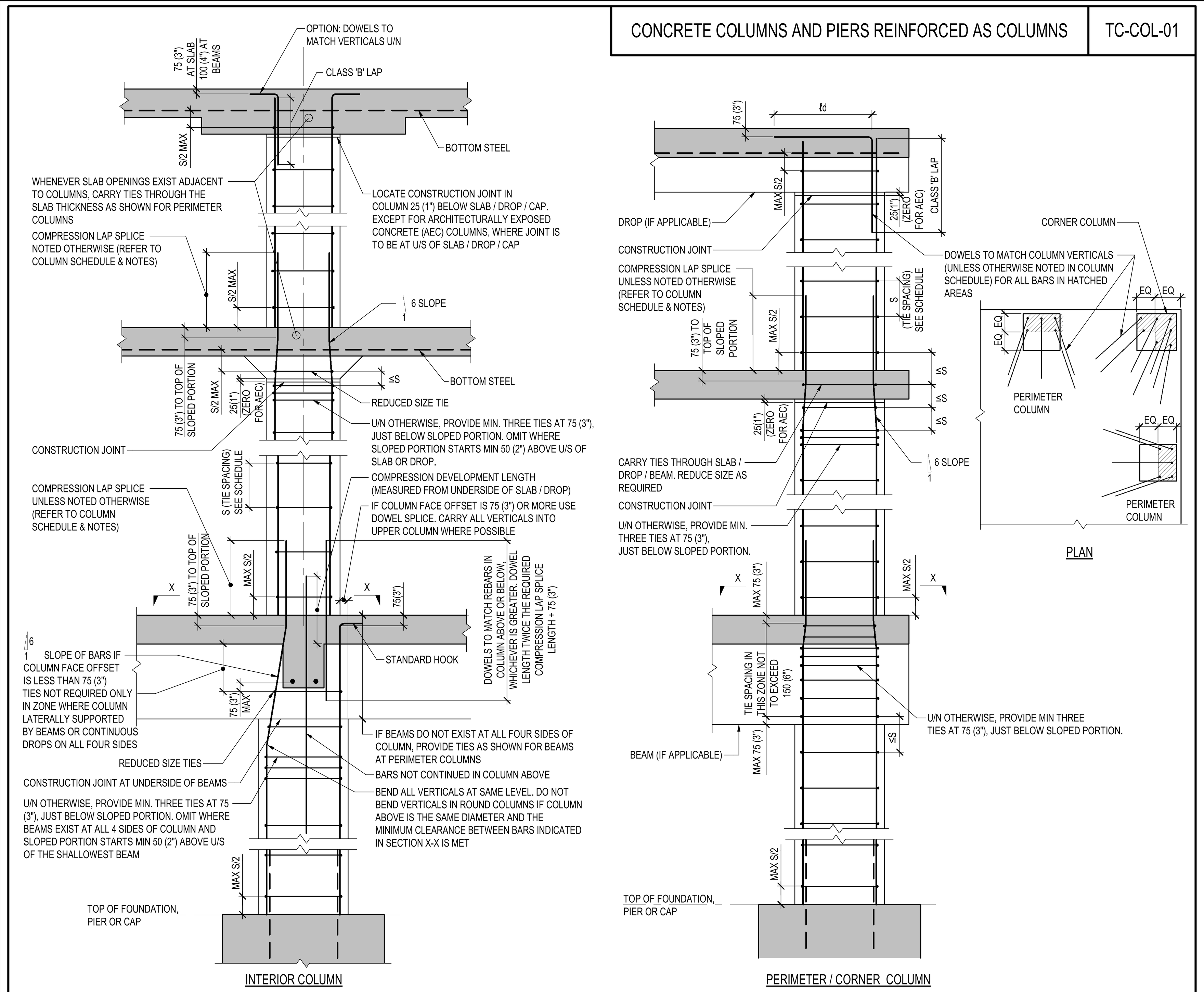
PROJECT NO: 211-01094-00
DATE: 2021-04-15
ORIGINAL SCALE: 1 : 100
IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
DESIGNED BY: L.HAJSAID
DRAWN BY: P.MCKEE
CHECKED BY: S.HOWARD
DISCIPLINE: STRUCTURAL
TITLE:

CONCRETE FOUNDATION AND SLAB-ON-GRADE TYPICAL DETAILS

SHEET NUMBER: S110

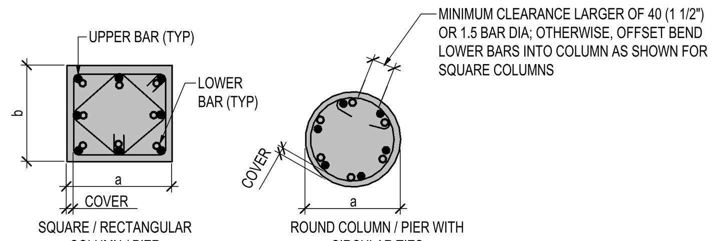
SHEET #: OF
ISSUE: REV #:
DATE OF:

CONCRETE COLUMNS AND PIERS REINFORCED AS COLUMNS — TC-COL-01



NOTES:

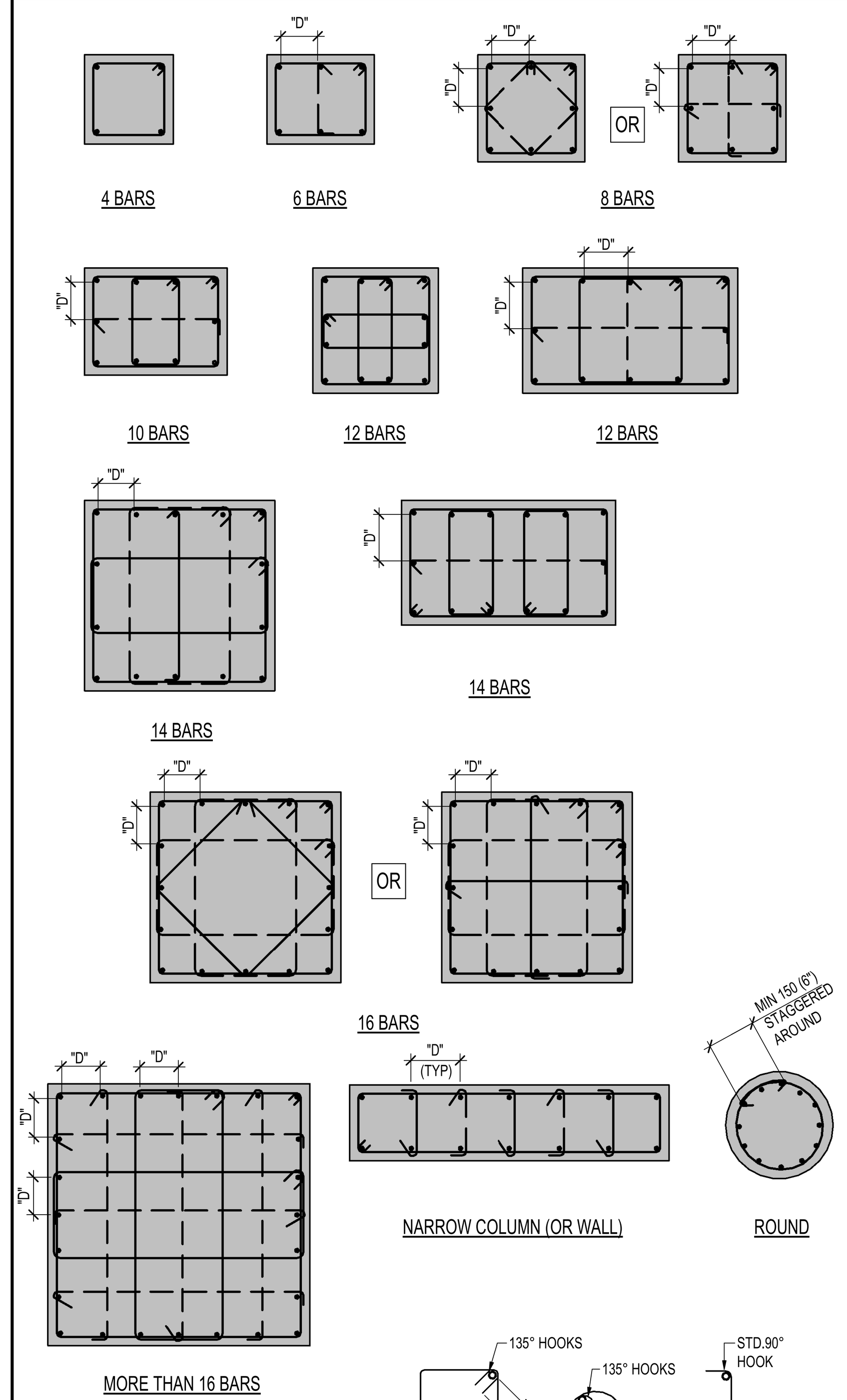
1. SEE TC-COL-02 FOR TYPICAL TIE ARRANGEMENT.
2. IF COLUMNS ARE CAST INTEGRALLY WITH SHEAR WALLS, ALL VERTICAL BARS TO HAVE LAPS AS SPECIFIED FOR SHEAR WALL CONCENTRATED REINFORCEMENT.
3. IF COLUMNS ARE CAST INTEGRALLY WITH SHEAR WALLS IN WHICH BENT CONCENTRATED REINFORCEMENT IS PROHIBITED, PROVIDE DOWELS BETWEEN COLUMN LIFTS INSTEAD OF USING OFFSET BENT VERTICALS.
4. INCREASE TIES ADDED BELOW SLOPED PORTION OF VERTICAL BARS TO 4-10 FOR 45 BARS, AND TO 4-15 FOR 55 BARS.
5. FOR COLUMNS IN MOMENT FRAMES, ALL VERTICAL BARS TO HAVE CLASS 'B' TENSION LAP SPLICES



SECTION X - X

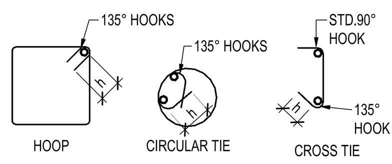
DEC 2017

TIES FOR CONCRETE COLUMNS, WALLS, BORED CONCRETE PILES, CAPS AND PIERS REINFORCED AS COLUMNS — TC-COL-02



NOTES:

1. DRAWINGS SHOW SIZE AND SPACING OF TIE SETS. "TIE" ON DRAWINGS MEANS TIE SET.
2. PROVIDE TIES FOR EVERY OTHER VERTICAL BAR.
3. IF CLEAR SPACING BETWEEN ADJACENT VERTICALS "D" IS MORE THAN 150 (6"), ADD TIES SHOWN DASHED.
4. PLACE ADJACENT CROSS TIES WITH 135 HOOKS ALTERNATING HORIZONTALLY AND VERTICALLY FROM SIDE TO SIDE OF COLUMN / WALL /PIER / CAP
5. ALTERNATE TIE ARRANGEMENTS MAY BE ACCEPTABLE SUBJECT TO THE CONSULTANT'S REVIEW.
6. SEE COLUMN SCHEDULE FOR SPECIAL TIE ARRANGEMENTS.

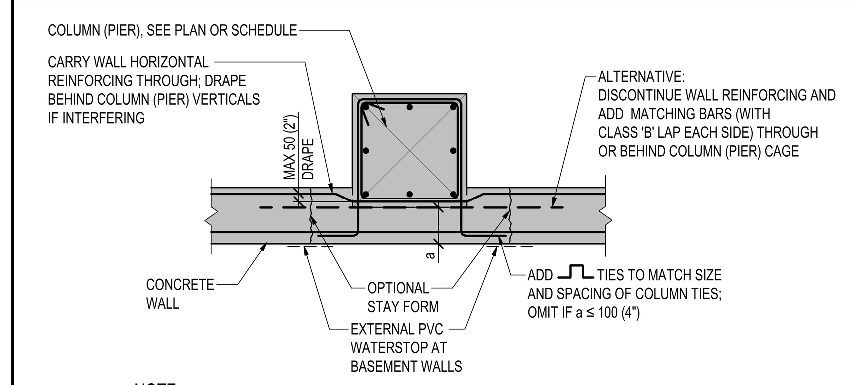


h=6 x TIE Ø, 60 (2 3/8") MIN U/N
IF Rd ≥ 2.0 (SEE DESIGN DATA NOTES), INCREASE 'h' TO 100 (4") MIN FOR COLUMNS CAST INTEGRALLY WITH SHEAR WALLS AND FOR SHEAR WALL ZONE REINFORCING.

TYPICAL TIE SHAPES

FEB 2020

COLUMN AND PIER CAST INTEGRALLY WITH WALL — TC-COL-21

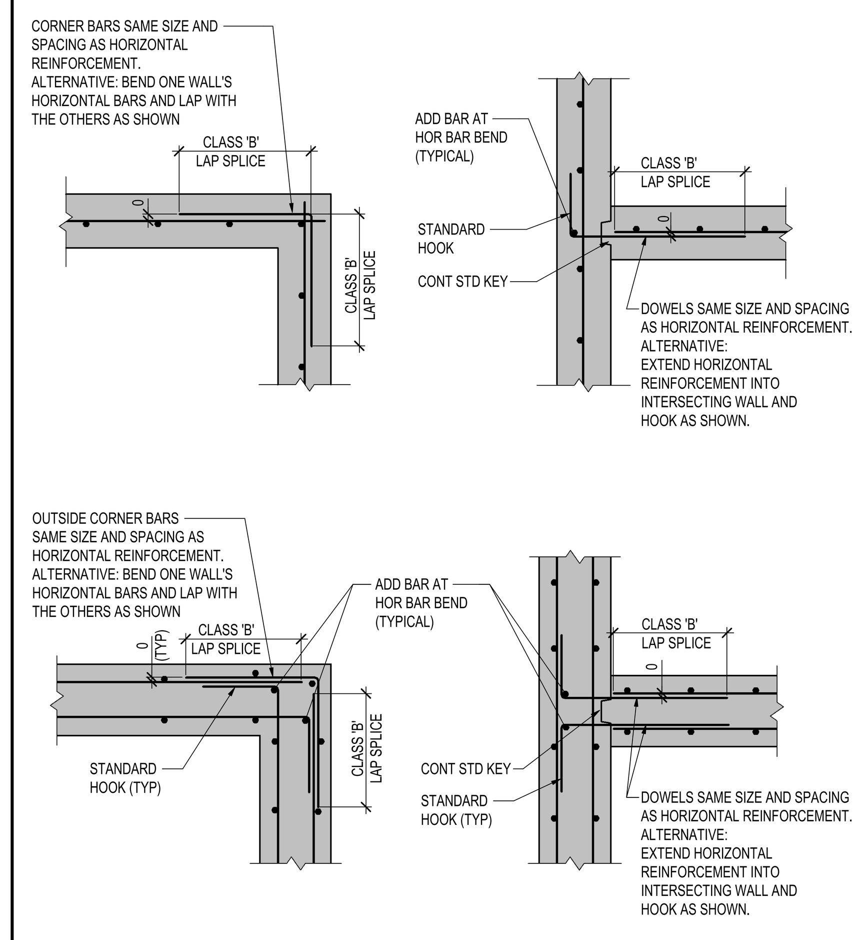


NOTE:

IF DIFFERENT CONCRETE MIXES ARE SPECIFIED FOR COLUMN (PIER) AND WALL, USE CONCRETE OF HIGHER STRENGTH AND MORE STRINGENT EXPOSURE CLASSIFICATION FOR BOTH. ALTERNATIVELY, PROVIDE STAY FORM AND POUR COLUMN AND WALL SEPARATELY.

JUNE 2017

CONCRETE WALL CORNERS AND INTERSECTIONS — TC-WALL-01

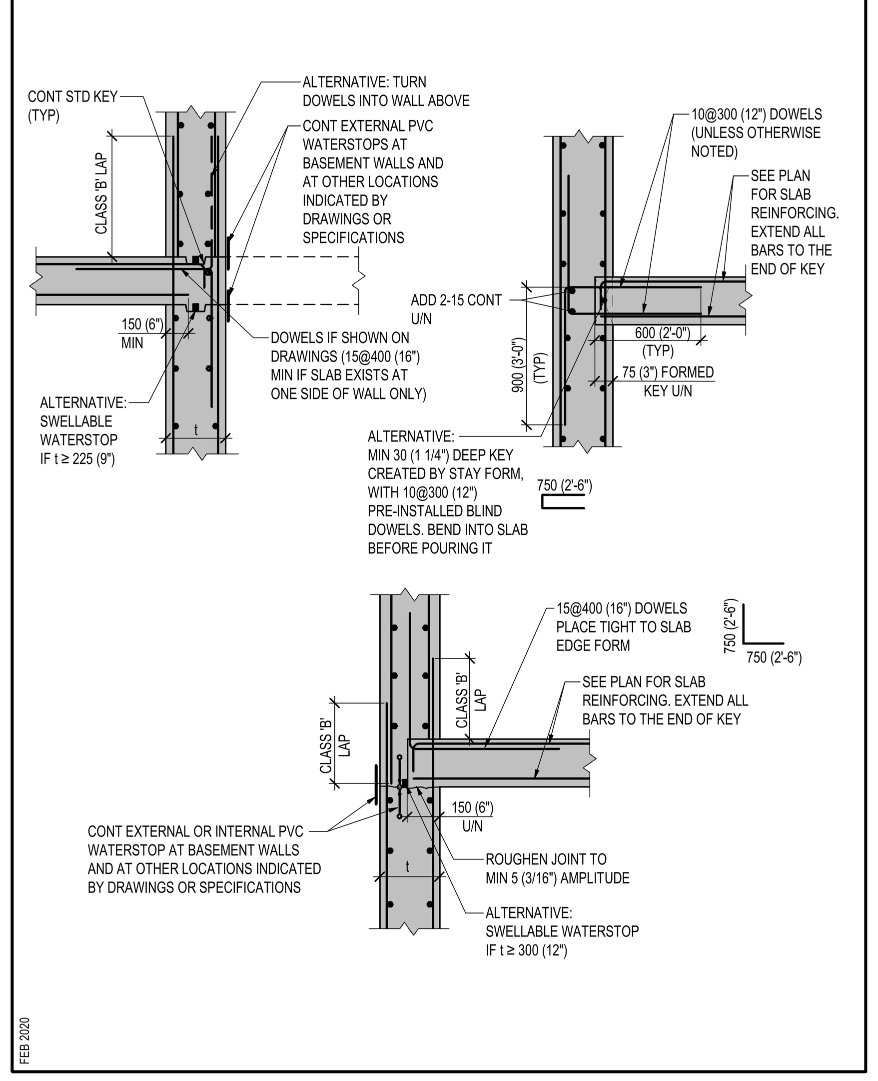


NOTES:

1. IF WALLS ARE NOT PERPENDICULAR TO EACH OTHER, ALL BAR BENDS TO MATCH THE WALL INTERSECTION ANGLE.
2. FOR SHEAR WALL CORNER AND INTERSECTION DETAILS, SEE TC-WALL-41 TO TC-WALL-43

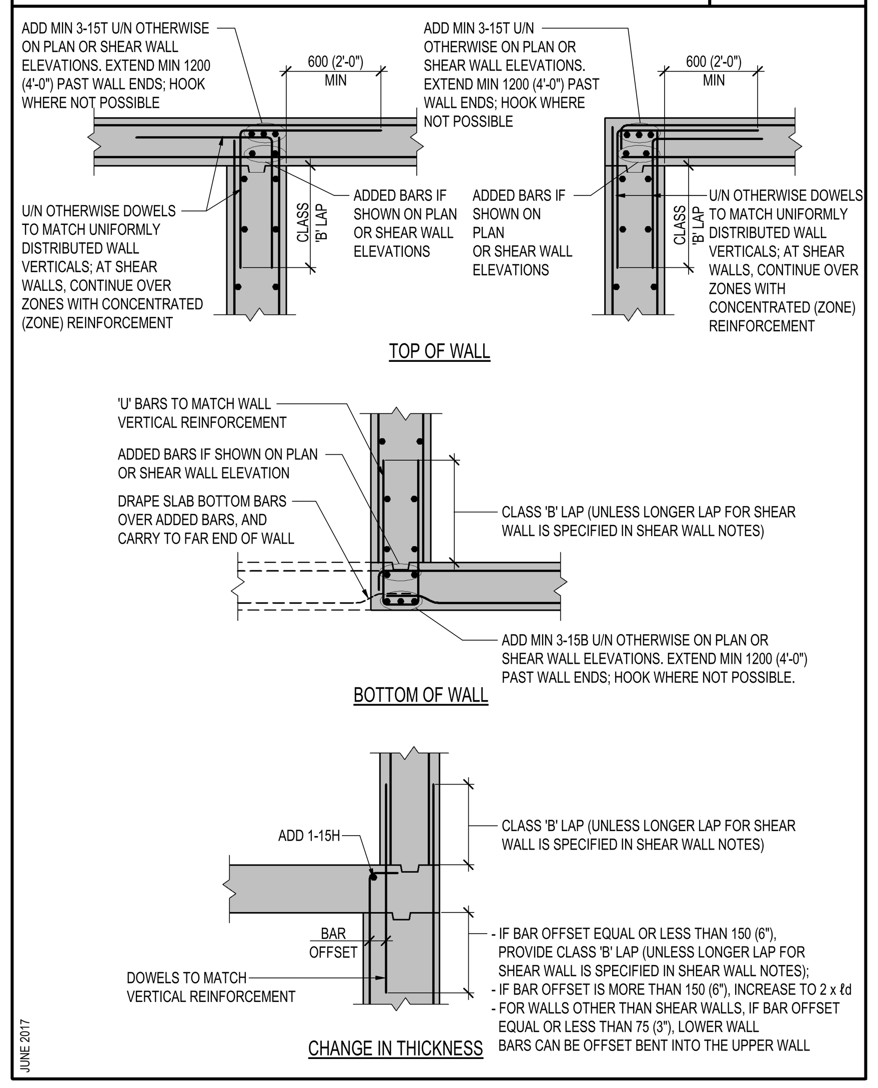
JUNE 2017

CONCRETE WALL AT SLAB SUPPORT — TC-WALL-11



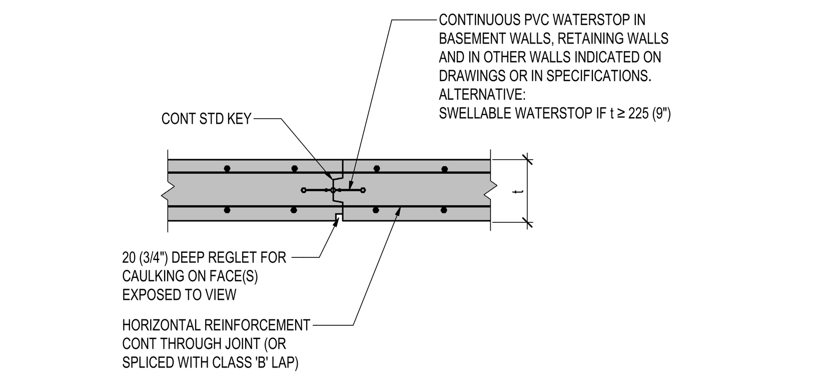
FEB 2020

DISCONTINUITIES IN CONCRETE WALL — TC-WALL-12



JUNE 2017

CONSTRUCTION JOINT IN WALL — TC-WALL-21

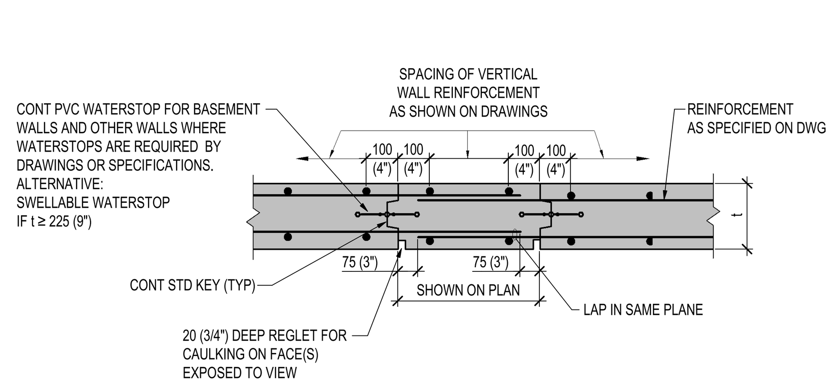


NOTE:

DO NOT PLACE CONSTRUCTION JOINTS IN ANY SHEAR WALLS.

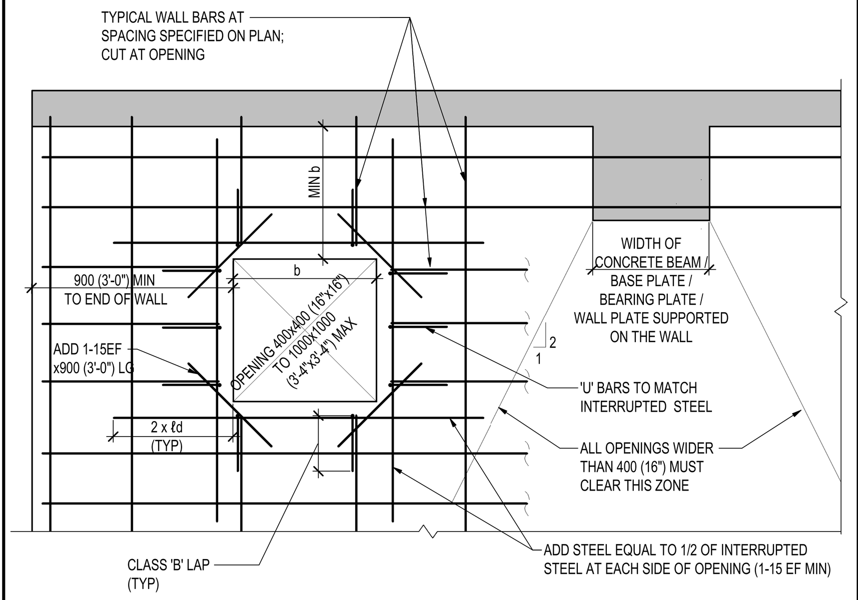
FEB 2020

CONSTRUCTION GAP (CLOSURE STRIP) IN WALL — TC-WALL-24



FEB 2020

GUIDELINES FOR WALL OPENINGS LARGER THAN 400 x 400 (16" x 16") / 400 (16")Ø — TC-WALL-32

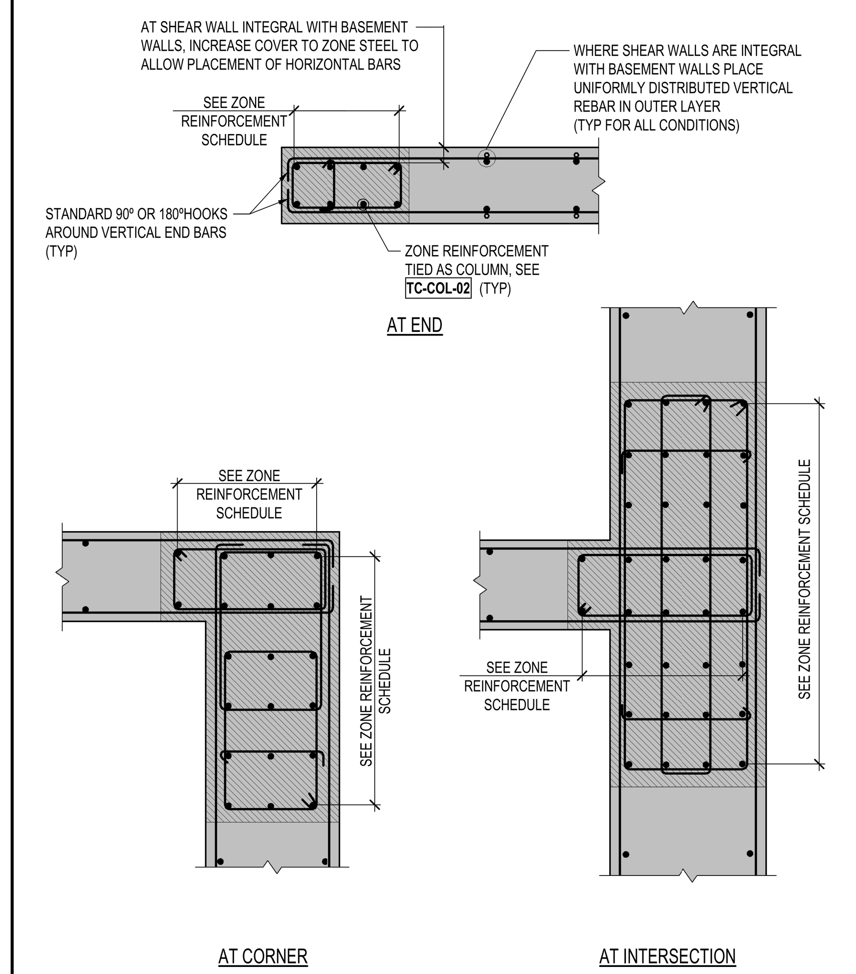


NOTES:

1. AT SHEAR WALL, ONLY THE OPENINGS INDICATED AT SHEAR WALL ELEVATIONS ARE ACCEPTABLE.
2. SUBMIT COMPOSITE SLEEVING DRAWINGS SHOWING SIZE AND LOCATION OF ALL WALL SLEEVES AND OPENINGS.
3. THIS DRAWING SHOWS ONLY GENERAL GUIDELINES FOR PLACING OPENINGS THROUGH WALLS. FOR ANY SPECIFIC JOB, OPENINGS AS SHOWN ON THIS DETAIL MAY NOT BE ACCEPTABLE OR MAY REQUIRE ADDITIONAL REINFORCING. DO NOT INSTALL ANY OPENINGS PRIOR TO REVIEWING RETURNED SLEEVING DRAWINGS.
4. MINIMUM SPACING BETWEEN ADJACENT OPENINGS NOT TO BE LESS THAN THE WIDTH OF THE LARGER OF THE OPENINGS.
5. NO OPENING CAN INTERFERE WITH ANY REINFORCEMENT SHOWN TO BE IN ADDITION TO UNIFORMLY DISTRIBUTED WALL REINFORCEMENT.

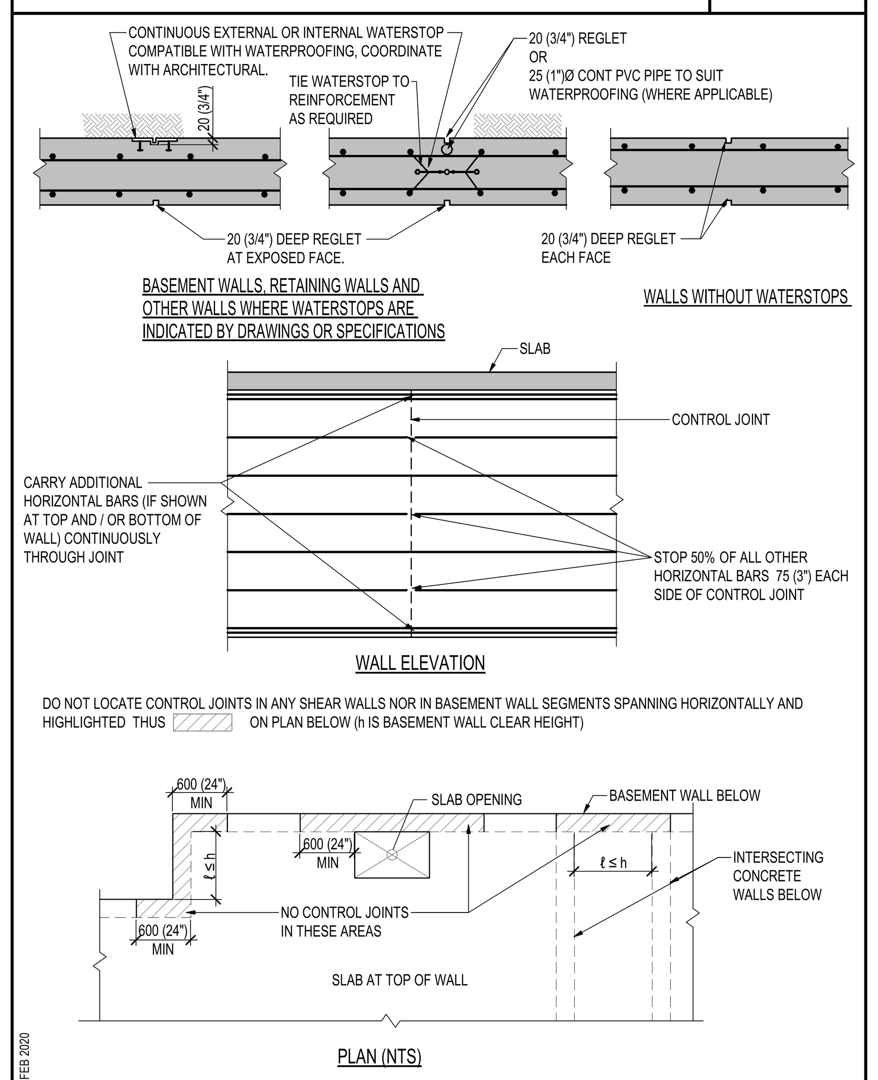
JUNE 2017

SHEAR WALL ZONE DETAILS WHEN Rd = 1.5 — TC-WALL-41



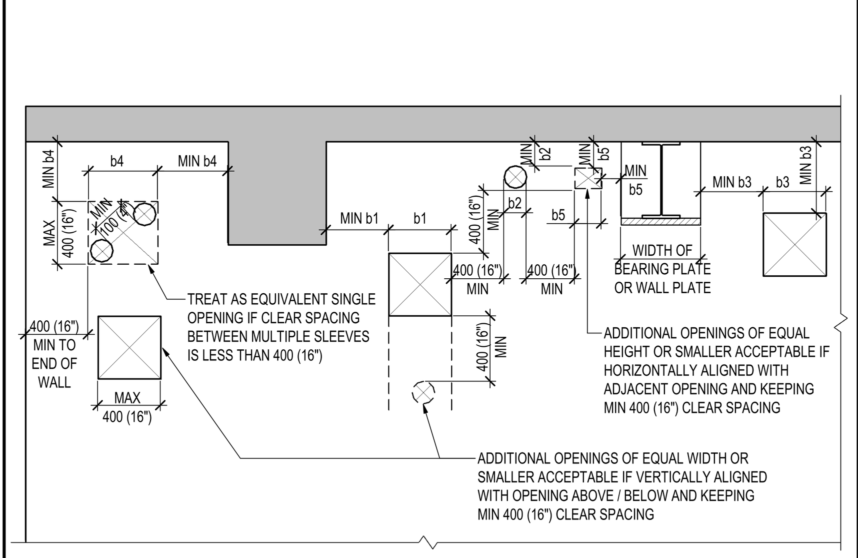
OCT 2018

CONTROL JOINT IN WALL — TC-WALL-22



FEB 2020

GUIDELINES FOR WALL SLEEVES AND OPENINGS LESS THAN 400 x 400 (16" x 16") / 400 (16")Ø — TC-WALL-31



NOTES:

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2. THIS DRAWING SHOWS ONLY GENERAL GUIDELINES FOR PLACING SLEEVES AND OPENINGS THROUGH WALLS. FOR ANY SPECIFIC JOB, OPENINGS AS SHOWN ON THIS DETAIL MAY NOT BE ACCEPTABLE OR MAY REQUIRE ADDITIONAL REINFORCING. DO NOT INSTALL ANY SLEEVES AND OPENINGS PRIOR TO REVIEWING RETURNED SLEEVING DRAWINGS.
3. RESPACE WALL REINFORCEMENT AS REQUIRED TO CLEAR OPENINGS.
4. NO OPENING CAN INTERFERE WITH ANY REINFORCEMENT SHOWN TO BE IN ADDITION TO UNIFORMLY DISTRIBUTED WALL REINFORCEMENT.
5. AT SHEAR WALLS, ALL OPENINGS TO STAY MIN 1000 (3'-4") CLEAR OF CONCENTRATED (ZONE) REINFORCEMENT.
6. SUM OF THE WIDTHS OF ALL SLEEVES AND OPENINGS IN ANY 3000 (10'-0") LONG WALL SEGMENT NOT TO EXCEED 750 (2'-6"), EXCEPT AT SHEAR WALLS WHERE THAT SUM SHOULD NOT EXCEED 400 (16").
7. FOR ADDITIONAL REINFORCEMENT AT DUCT BANK SLEEVES, SEE TC-SL-91

JUNE 2017

ARCHITECTURE 49
1000-150 ISABELLA STREET
OTTAWA (ONTARIO) CANADA K1S 1V7
Phone: 613-238-0440 | Fax: 613-238-6597 | WWW.ARCHITECTURE49.COM

WSP
2611 Queensview Dr, Suite 300
Ottawa, Ontario, K2B 8K2 Canada
T 613-829-2800 | F 613-829-8299 | www.wsp.com

PCL CONSTRUCTION
49 Auriga Drive
Ottawa, Ontario, K2E 8A1 Canada
T 613-978-5398 | www.pcl.com

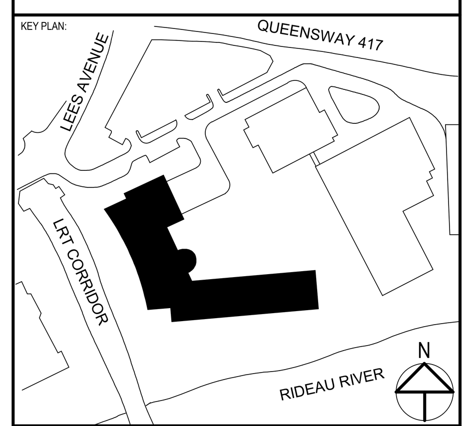
SEAL:

CLIENT: uOttawa

RFP #: 2020-40639 CLIENT REF. #: BT20-18477

PROJECT: University of Ottawa - Faculty of Health Sciences Building

KEY PLAN:



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PROJECT NO: 211-01094-00
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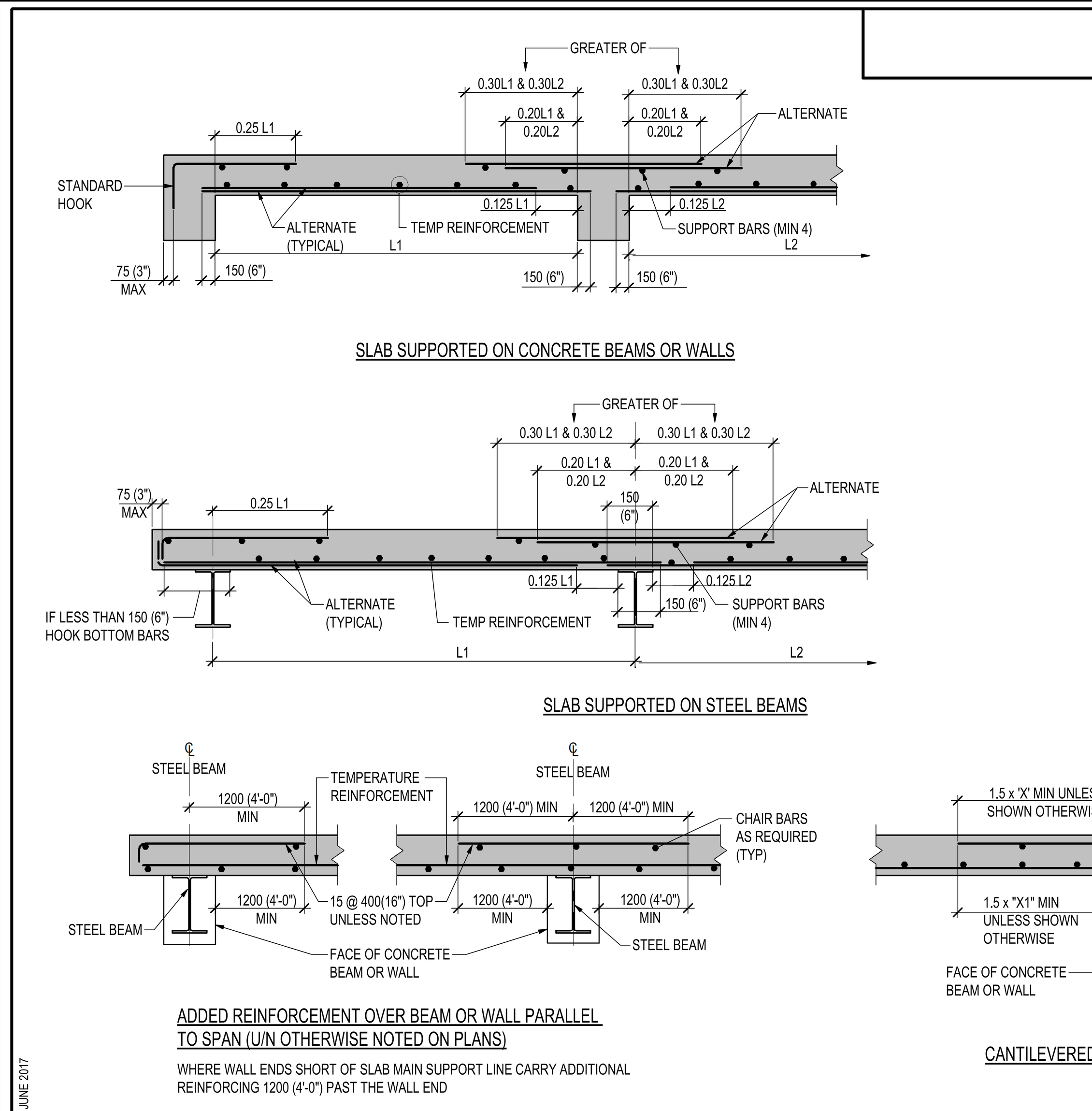
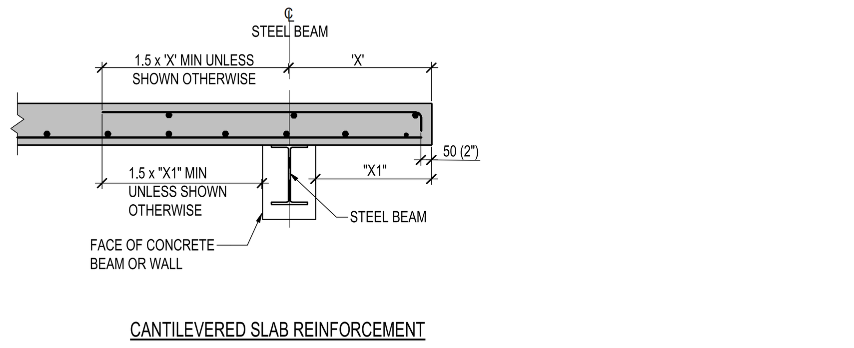
IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
25mm
DESIGNED BY: L.HAJSAID
DRAWN BY: P.MCKEE
CHECKED BY: S.HOWARD
DISCIPLINE: STRUCTURAL
TITLE: CONCRETE COLUMN AND WALL TYPICAL DETAILS
SHEET NUMBER: S111
SHEET #: OF
ISSUE: REV #
DATE OF:

ONE WAY SLAB — TC-SL-01



SLAB NOTES:

1. ONE WAY SLAB IS SHOWN THUS ⟵xx SLAB⟶ ON PLAN. xx INDICATES SLAB THICKNESS.
2. BAR LENGTHS ARE MINIMUM BAR LENGTHS UNLESS OTHERWISE SHOWN ON PLAN.
3. PROVIDE 1-15 x 1800 (6'-0") LONG TOP BARS ACROSS RE-ENTRANT CORNERS UNLESS OTHERWISE SHOWN.
4. PROVIDE BAR SUPPORTS AND ACCESSORIES TO THE REQUIREMENTS OF R.S.I.C. MANUAL.
5. SEE **TC-SL-02** FOR MINIMUM TEMPERATURE REINFORCEMENT.



MINIMUM TEMPERATURE REINFORCEMENT IN SLAB — TC-SL-02

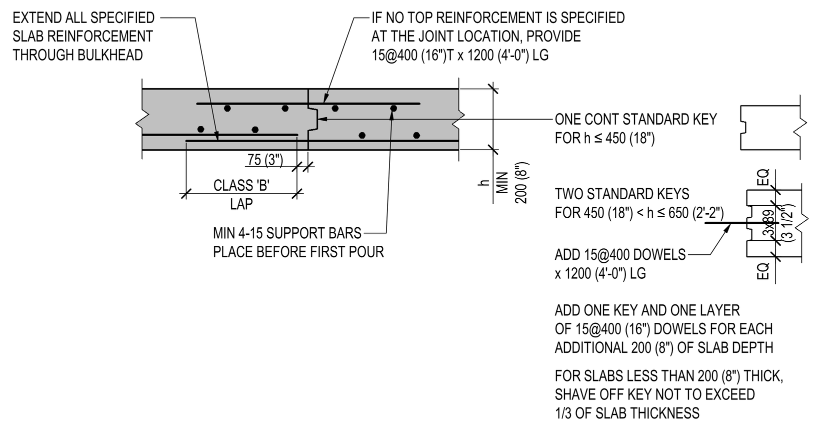
	SLAB THICKNESS														
	100 (4")	120 (5")	140 (5.5")	150 (6")	160 (6.5")	180 (7")	200 (8")	220 (9")	240 (9.5")	250 (10")	280 (11")	300 (12")	350 (14")	400 (16")	450 (18")
HEATED AREAS	10@500(20")	10@400(16")	10@350(14")	10@330(13")	10@300(12")	10@280(11")	15@500(20")	15@450(18")	15@400(16")	15@400(16")	15@350(14")	20@500(20")	20@420(16 1/2")	20@370(14 1/2")	20@330(13")
UNHEATED AREAS	10@400(16")	10@330(13")	10@280(11")	10@250(10")	15@500(20")	15@450(18")	15@400(16")	15@350(14")	20@500(20")	20@450(18")	20@430(17")	20@400(16")	20@330(13")	25@500(20")	25@440(17")

NOTES:

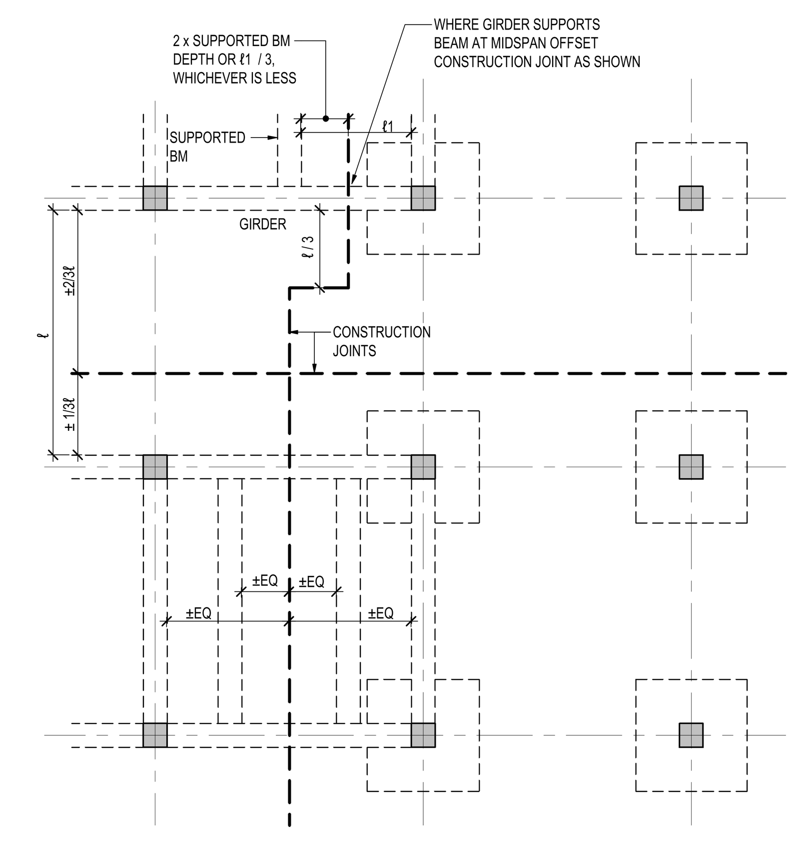
1. UNLESS OTHERWISE NOTED PLACE TEMPERATURE REINFORCEMENT IN BOTTOM UPPER LAYER
2. PROVIDE CLASS 'B' LAPS FOR ALL TEMPERATURE REINFORCEMENT.
3. FOR SLAB THICKNESSES NOT PROVIDED IN TABLE, INTERPOLATE BETWEEN THE NEAREST VALUES PROVIDED.

JUNE 2017

CONSTRUCTION JOINT IN FRAMED SLAB — TC-SL-41



CONSTRUCTION JOINT LOCATIONS IN FRAMED SLAB — TC-SL-42

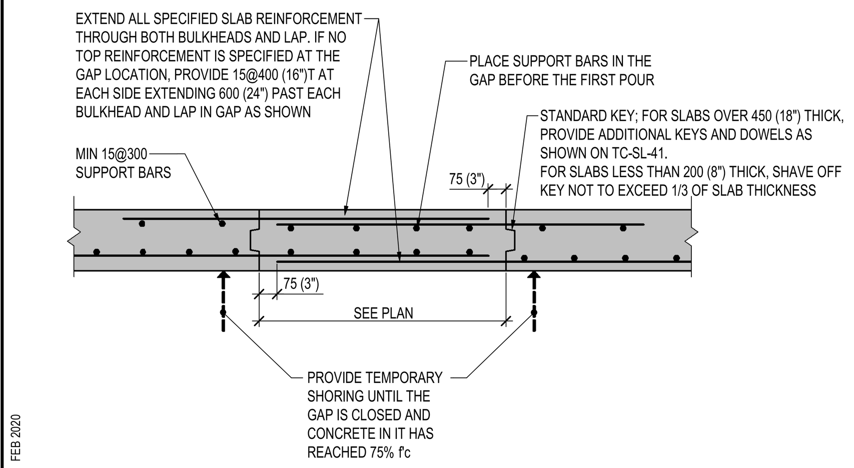


NOTES:

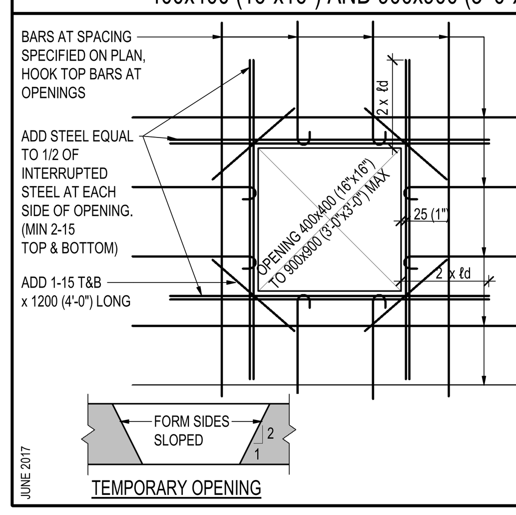
1. SUBMIT PROPOSED CONSTRUCTION JOINT LAYOUT FOR REVIEW
2. DEPENDING ON THE JOINT LOCATION, ADDITIONAL REINFORCING MAY BE REQUIRED.

JUNE 2017

CONSTRUCTION GAP (CLOSURE STRIP) IN FRAMED SLAB — TC-SL-43



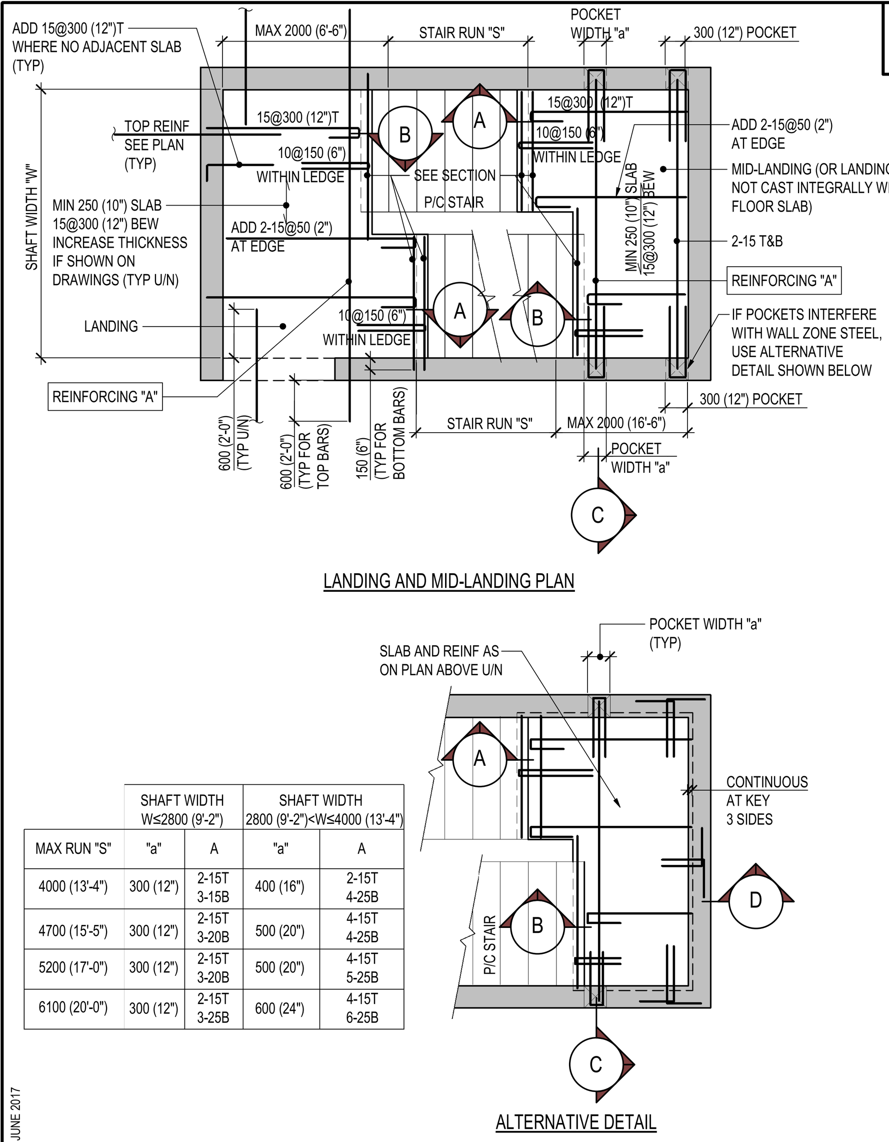
SLAB OPENINGS BETWEEN 400x400 (16"x16") AND 900x900 (3'-0"x3'-0") — TC-SL-62



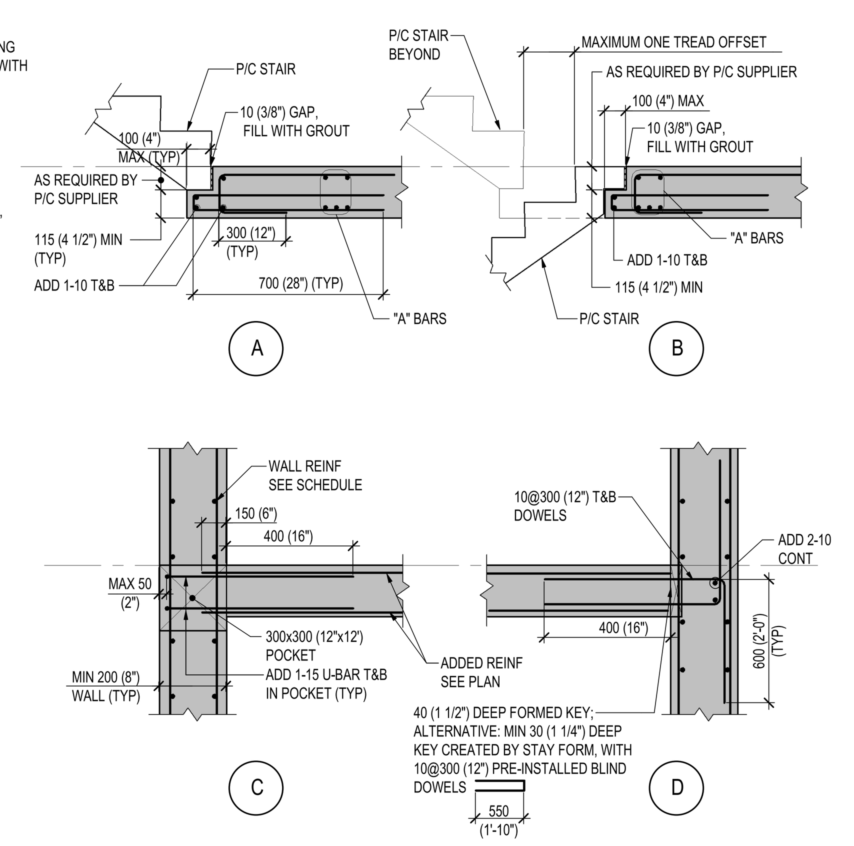
NOTES:

1. THIS DETAIL APPLIES FOR ANY LOCATION IN ONE WAY SLAB AND TWO WAY SLAB WITH BEAMS; FOR LARGER OPENINGS, SEE PLANS.
2. MINIMUM SPACING BETWEEN ADJACENT OPENINGS NOT TO BE LESS THAN THE SIZE OF THE LARGER OF THE OPENINGS.
3. FOR SIZE RESTRICTIONS AND ACCEPTABLE OPENING LOCATIONS IN FLAT SLAB OR FLAT PLATE, REFER TO **TC-SL-63**
4. IF THE OPENING IS LOCATED ENTIRELY WITHIN THE INTERSECTION OF FLAT SLAB OR FLAT PLATE MIDDLE STRIPS, MAXIMUM OPENING SIZE CAN BE INCREASED UP TO THE FULL SIZE OF THE INTERSECTING STRIPS.
5. FOR OPENING LESS THAN 400 x 400 (16"x16"), RESPACE SLAB REINFORCING TO SUIT. SEE **TC-SL-63** FOR PLACING RESTRICTIONS IN FLAT SLAB AND FLAT PLATE AND FOR ADDITIONAL REINFORCING BETWEEN MULTIPLE SLEEVES.
6. SEE **TC-SL-61** FOR CRANE OPENING DETAILS.

CAST-IN PLACE LANDING AND MID-LANDING FOR PRECAST STAIRS — TC-SL-81



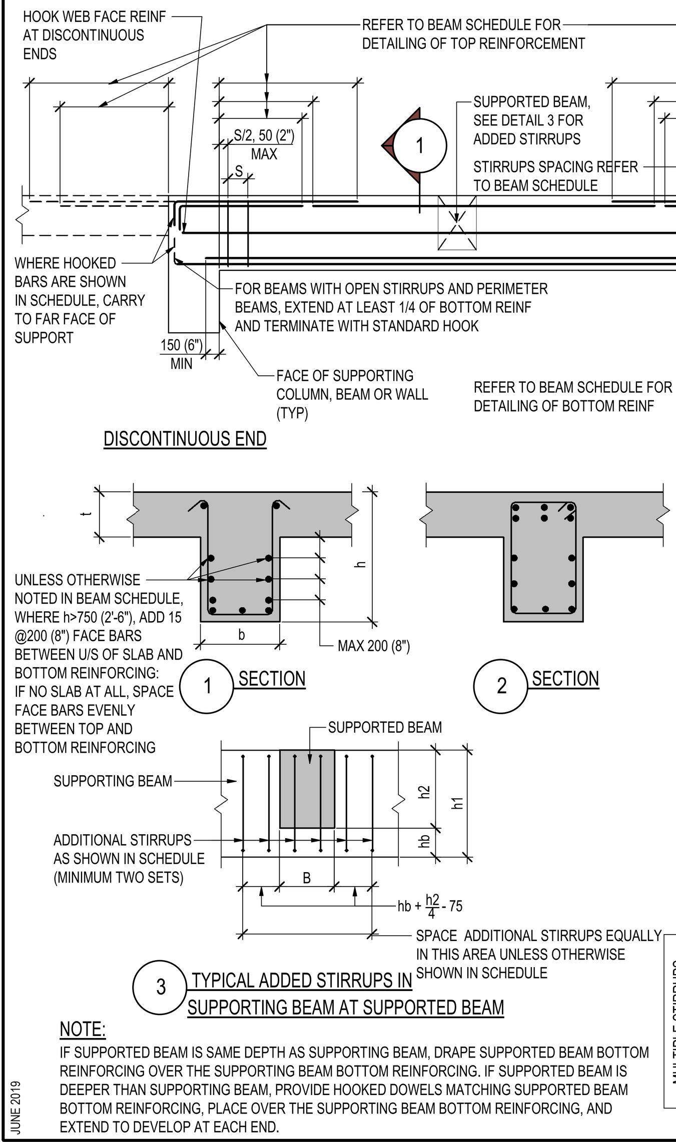
	SHAFT WIDTH W≤2800 (9'-2")		SHAFT WIDTH 2800 (9'-2")<W≤4000 (13'-4")	
MAX RUN "S"	"a"	A	"a"	A
4000 (13'-4")	300 (12")	2-15T 3-15B	400 (16")	2-15T 4-25B
4700 (15'-5")	300 (12")	2-15T 3-20B	500 (20")	4-15T 4-25B
5200 (17'-0")	300 (12")	2-15T 3-20B	500 (20")	4-15T 5-25B
6100 (20'-0")	300 (12")	2-15T 3-25B	600 (24")	4-15T 6-25B



NOTES:

1. SEE ARCHITECTURAL DRAWINGS FOR NUMBER AND ELEVATION OF MID-LANDINGS.
2. FOR STAIRS WITH FLIGHTS OFFSET BY MORE THAN ONE TREAD AND/OR FOR STAIRS LARGER THAN INDICATED, REFER TO PLANS.

CONCRETE BEAMS — TC-BM-01

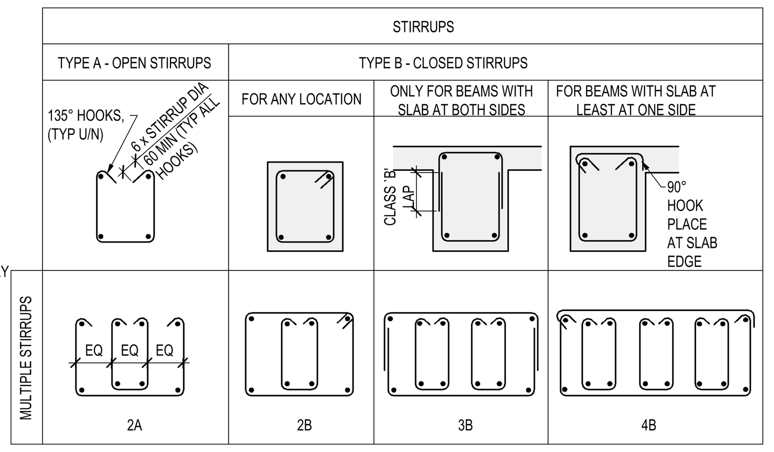


NOTE:
IF SUPPORTED BEAM IS SAME DEPTH AS SUPPORTING BEAM, DRAPE SUPPORTED BEAM BOTTOM REINFORCING OVER THE SUPPORTING BEAM BOTTOM REINFORCING. IF SUPPORTED BEAM IS DEEPER THAN SUPPORTING BEAM, PROVIDE HOOKED DOWELS MATCHING SUPPORTED BEAM BOTTOM REINFORCING, PLACE OVER THE SUPPORTING BEAM BOTTOM REINFORCING, AND EXTEND TO DEVELOP AT EACH END.

JUNE 2019

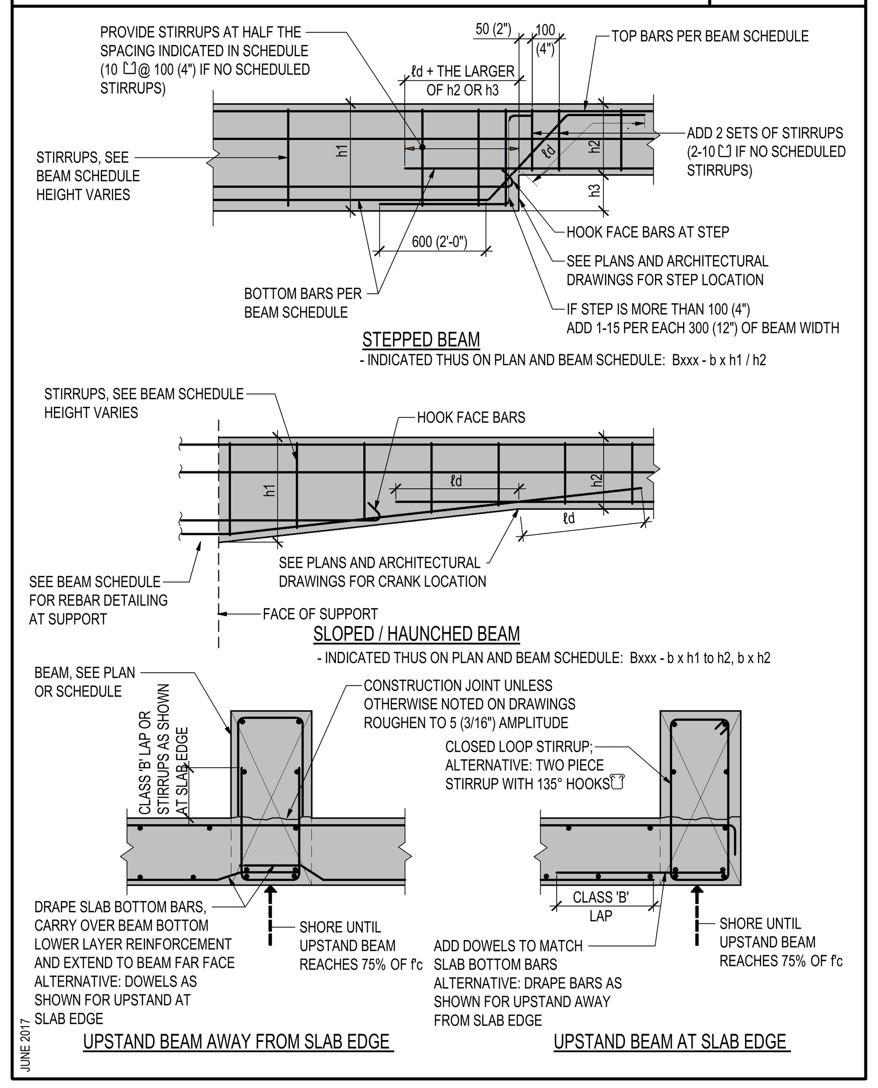
NOTES:

1. READ BEAM SCHEDULES IN THE SAME DIRECTION AS THE BEAM MARK AND SIZE SHOWN ON PLAN.
2. FOR STIRRUP TYPES, CONFIGURATION AND RANGE OF APPLICATION SEE TABLE BELOW.
3. WHEN MULTIPLE STIRRUPS ARE SHOWN (I.E. 2A, 3B, ETC.), PROVIDE ONE STIRRUP OF THE SPECIFIED TYPE EXTENDING FULL WIDTH OF THE BEAM, AND ADD OPEN STIRRUPS TO MAKE UP THE SPECIFIED NUMBER AS SHOWN BELOW.
4. SPECIAL STIRRUPS (MARKED X, Y, ETC.) ARE DETAILED ON DRAWINGS.
5. PROVIDE 10@600 (2'-0") STIRRUPS TO SUPPORT TOP BARS IF SUFFICIENT STIRRUPS ARE NOT CALLED FOR IN THE BEAM SCHEDULE.
6. IF THE NUMBER OF TOP AND BOTTOM BARS CALLED FOR IN THE BEAM SCHEDULE IS LESS THAN THE NUMBER OF STIRRUP LEGS IN ANY BEAM SECTION, PROVIDE ADDITIONAL 15 BARS AS REQUIRED TO HAVE EACH STIRRUP LEG BENT AROUND LONGITUDINAL BARS (T & B). EXTEND MINIMUM 300 (12') PAST THE LAST STIRRUP.
7. BARS IN SECOND AND THIRD LAYERS ARE SHOWN THUS: TOP2, BOT3. PLACE TO MAINTAIN THE MINIMUM CLEAR DISTANCE SHOWN.
8. IF STANDARD 90º HOOKS CAN NOT BE ACCOMMODATED BY THE BEAM SIZE, USE STANDARD 180º HOOKS.

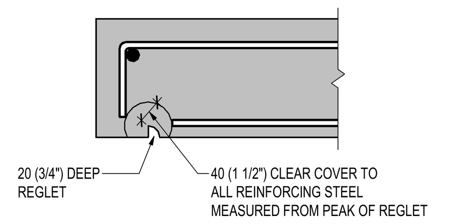


MIN CLEAR DISTANCE BETWEEN BARS/LAYERS	
BAR SIZE	CLEARANCE, mm
15 TO 20	30 (1 1/4")
25	35 (1 1/2")
30	45 (1 3/4")
35	50 (2")
45	65 (2 1/2")
55	85 (3 1/2")

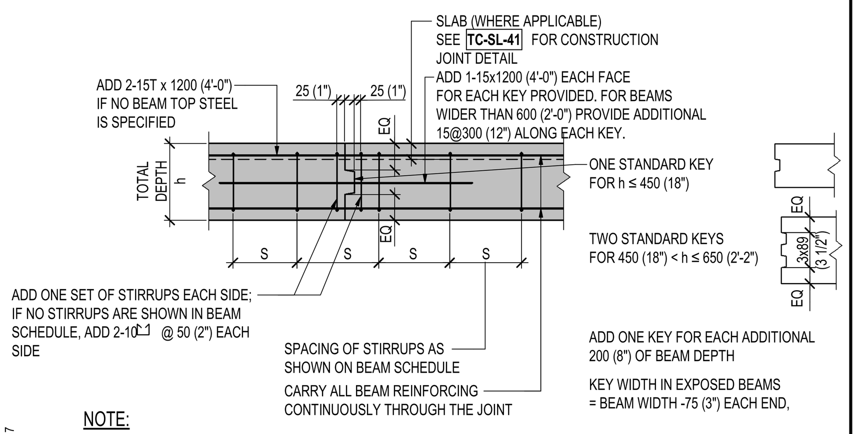
STEPPED, SLOPED / HAUNCHED AND UPSTAND BEAMS — TC-BM-21



EXPOSED CONCRETE OVERHANG — TC-SL-92



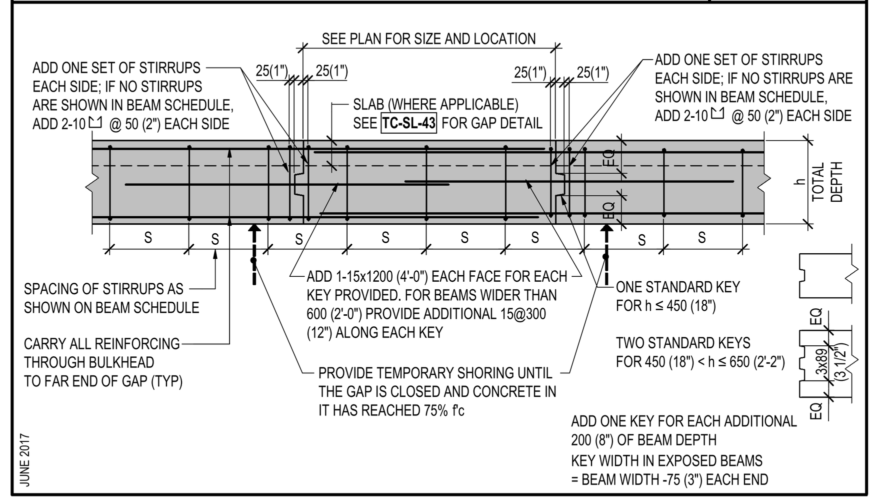
CONSTRUCTION JOINT IN BEAM / CONTINUOUS DROP (SLAB BAND) — TC-BM-11



NOTE:

SEE **TC-SL-42** FOR CONSTRUCTION JOINT LOCATIONS

CONSTRUCTION GAP (CLOSURE STRIP) IN BEAM / CONTINUOUS DROP (SLAB BAND) — TC-BM-12



ARCHITECTURE 49
1000-150 ISABELLA STREET OTTAWA (ONTARIO) CANADA K1S 1V7
Phone: 613-238-0440 | Fax: 613-238-6597 | WWW.ARCHITECTURE49.COM

WSP
2611 Queensview Dr, Suite 300 Ottawa, Ontario, K2B 8K2 Canada
T 613-829-2800 | F 613-829-8299 | www.wsp.com

PCL CONSTRUCTION
49 Auriga Drive Ottawa, Ontario, K2E 8A1 Canada
T 613-978-5398 | www.pcl.com

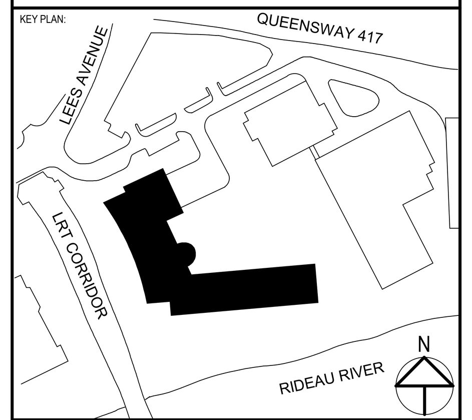
SEAL:

CLIENT: uOttawa

REF #: 2020-40639 CLIENT REF #: BT20-18477

PROJECT:
University of Ottawa - Faculty of Health Sciences Building

KEY PLAN:



ISSUED FOR - REVISION:

IS	RE	DATE	DESCRIPTION
1		2021-04-15	ISSUED FOR TECHNICAL SUBMISSION

PROJECT NO: 211-01094-00
DATE: 2021-04-15
ORIGINAL SCALE: 1 : 100
IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
25mm
DESIGNED BY: L.HAJSAID
DRAWN BY: P.MCKEE
CHECKED BY: S.HOWARD
DISCIPLINE: STRUCTURAL
TITLE: CONCRETE SLAB AND BEAM TYPICAL DETAILS
SHEET NUMBER: S112
SHEET #: OF
ISSUE: REV #
DATE OF:

TENSION DEVELOPMENT LENGTHS AND LAP SPLICES FOR BARS GRADE 400 MPa

TC-REINF-01

TENSION DEVELOPMENT LENGTHS ℓd FOR GRADE 400 INDIVIDUAL BLACK BAR IN NORMAL DENSITY CONCRETE

BAR SIZE	f'c = 25		f'c = 30		f'c = 35		f'c = 40		f'c = 50		f'c = 60	
	BOTTOM	TOP	BOTTOM	TOP	BOTTOM	TOP	BOTTOM	TOP	BOTTOM	TOP	BOTTOM	TOP
10	300 (12")	380 (15")	300 (12")	350 (14")	300 (12")	320 (13")	300 (12")	300 (12")	300 (12")	300 (12")	300 (12")	300 (12")
15	440 (17 ")	570 (23")	400 (16")	520 (21")	370 (14")	480 (19")	350 (14")	450 (18")	310 (12")	400 (16")	300 (12")	370 (14")
20	580 (23")	750 (30")	530 (21")	690 (27")	490 (19")	640 (25")	460 (18")	600 (24")	410 (16")	530 (21")	380 (15")	490 (19")
25	900 (36")	1170 (46")	830 (32")	1070 (42")	770 (30")	990 (39")	720 (28")	930 (37")	640 (25")	830 (33")	590 (23")	760 (30")
30	1080 (43")	1410 (55")	990 (39")	1290 (51")	920 (36")	1190 (47")	860 (34")	1110 (44")	770 (30")	1000 (39")	700 (28")	910 (36")
35	1260 (50")	1640 (65")	1160 (46")	1500 (60")	1070 (42")	1390 (55")	1000 (40")	1300 (52")	900 (35")	1160 (46")	820 (32")	1060 (42")
45	1620 (64")	2110 (83")	1480 (59")	1930 (76")	1370 (54")	1780 (71")	1290 (51")	1670 (66")	1150 (46")	1490 (59")	1050 (42")	1360 (54")
55	1980 (78")	2580 (102")	1810 (72")	2350 (93")	1680 (66")	2180 (86")	1570 (62")	2040 (81")	1410 (56")	1820 (72")	1280 (51")	1670 (66")

CLASS B TENSION LAP SPLICE LENGTHS FOR GRADE 400 INDIVIDUAL BLACK BAR IN NORMAL DENSITY CONCRETE

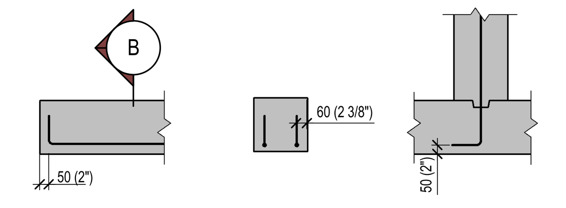
BAR SIZE	f'c = 25		f'c = 30		f'c = 35		f'c = 40		f'c = 50		f'c = 60	
	BOTTOM	TOP	BOTTOM	TOP	BOTTOM	TOP	BOTTOM	TOP	BOTTOM	TOP	BOTTOM	TOP
10	390 (16")	490 (19")	390 (16")	450 (18")	390 (16")	420 (17")	390 (16")	390 (16")	390 (16")	390 (16")	390 (16")	390 (16")
15	570 (23")	740 (29")	520 (21")	670 (27")	480 (19")	620 (25")	450 (18")	580 (23")	400 (16")	520 (20")	390 (16")	480 (19")
20	750 (29")	980 (39")	690 (27")	890 (35")	640 (25")	830 (33")	600 (24")	770 (30")	530 (21")	690 (27")	490 (19")	630 (25")
25	1170 (46")	1530 (61")	1070 (42")	1390 (55")	990 (39")	1290 (51")	930 (37")	1210 (48")	830 (33")	1080 (43")	760 (30")	990 (39")
30	1410 (56")	1830 (72")	1290 (51")	1670 (66")	1190 (47")	1550 (61")	1110 (44")	1450 (57")	1000 (39")	1300 (51")	910 (36")	1180 (46")
35	1640 (65")	2130 (84")	1500 (60")	1950 (77")	1390 (55")	1800 (72")	1300 (52")	1690 (67")	1160 (46")	1510 (59")	1060 (42")	1380 (54")

- FOR EPOXY BARS MULTIPLY VALUES IN TABLE BY 1.5 EXCEPT THAT A MULTIPLIER OF 1.2 CAN BE USED WHEN CLEAR COVER IS MORE THAN 3x BAR DIAMETER AND CLEAR SPACING BETWEEN BARS IS MORE THAN 6x BAR DIAMETER.
- FOR SEMI LOW DENSITY CONCRETE ($1850 < \gamma c \leq 2150$ kg/m³) MULTIPLY VALUES IN TABLE BY 1.2. FOR LOW DENSITY CONCRETE ($\gamma c \leq 1850$ kg/m³) MULTIPLY VALUES IN TABLE BY 1.3.
- FOR BUNDLED BARS, MULTIPLY VALUES IN TABLE BY 1.1 FOR A TWO BAR BUNDLE, 1.2 FOR A THREE BAR BUNDLE AND 1.33 FOR A FOUR BAR BUNDLE
- "TOP" MEANS THAT THERE IS MORE THAN 300 (12") OF CONCRETE BELOW, AND LESS THAN 300 (12") OF CONCRETE ABOVE THE HORIZONTAL BAR WITHIN THE INDIVIDUAL CONCRETE POUR. ALL HORIZONTAL BARS IN WALLS TO BE CONSIDERED "TOP".
- ALL VERTICAL BARS ARE CONSIDERED "BOTTOM"

MINIMUM TENSION EMBEDMENT LENGTHS WITH STANDARD END HOOKS ℓdh, FOR GRADE 400 BAR IN NORMAL WEIGHT CONCRETE

BAR SIZE	f'c = 25	f'c = 30	f'c = 35	f'c = 40	f'c = 50	f'c = 60
10	150 (6")	150 (6")	150 (6")	150 (6")	150 (6")	150 (6")
15	210 (8")	200 (8")	180 (7")	170 (7")	150 (6")	150 (6")
20	280 (11")	260 (10")	240 (10")	230 (9")	190 (8")	190 (8")
25	350 (14")	320 (13")	300 (12")	280 (11")	240 (9")	230 (9")
30	420 (17")	390 (16")	360 (14")	340 (14")	290 (11")	280 (11")
35	490 (20")	450 (18")	420 (17")	390 (16")	340 (13")	320 (13")

- FOR EPOXY BARS MULTIPLY VALUES IN TABLE BY 1.2
- FOR LOW DENSITY CONCRETE ($\gamma c \leq 1850$ kg/m³) MULTIPLY VALUES IN TABLE BY 1.3
- FOR HOOKS WITH COVER LESS THAN SHOWN IN DETAILS 'A', 'B' AND 'C' MULTIPLY VALUES IN TABLE BY 1.5



A FOR 90º HOOKS ONLY

B FOR 90º AND 180º HOOKS

C FOR 90º HOOKS ONLY

FOR VALUES NOT PROVIDED IN TABLES INTERPOLATE BETWEEN THE NEAREST VALUES PROVIDED.

JUNE 2017

COMPRESSION DEVELOPMENT LENGTHS AND LAP SPLICES FOR BARS GRADE 400 MPa

TC-REINF-02

COMPRESSION DEVELOPMENT LENGTH ℓdc FOR GRADE 400 INDIVIDUAL BARS

BAR SIZE	f'c = 25	f'c = 30 AND HIGHER
10	220 (9")	200 (8")
15	310 (12")	280 (11")
20	370 (15")	350 (14")
25	480 (19")	440 (17")
30	570 (23")	530 (21")
35	690 (27")	630 (25")
45	864 (34")	790 (31")
55	1070 (42")	970 (38")

COMPRESSION LAP SPLICE FOR BAR 400 INDIVIDUAL BARS

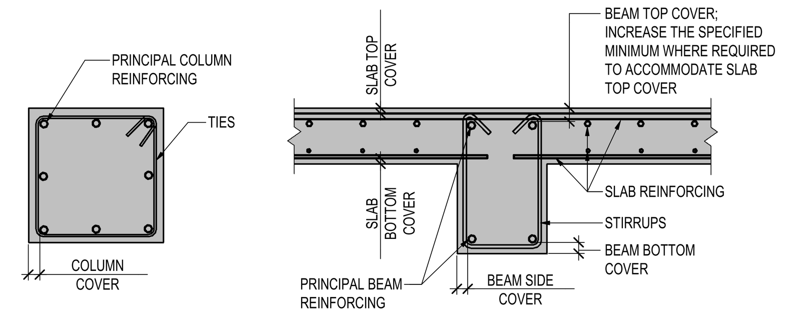
BAR SIZE	STANDARD LAP
10	300 (12")
15	440 (17")
20	590 (23")
25	730 (29")
30	880 (35")
35	1030 (41")

-FOR BUNDLED BARS, MULTIPLY VALUES IN TABLE BY 1.1 FOR A TWO BAR BUNDLE, 1.2 FOR A THREE BAR BUNDLE AND 1.33 FOR A FOUR BAR BUNDLE

FEB 2020

CONCRETE COVER

TC-REINF-21



CONCRETE COLUMN, PIER AND CAP REINFORCED AS COLUMN

CONCRETE SLAB AND BEAM (INCLUDING GRADE BEAM)

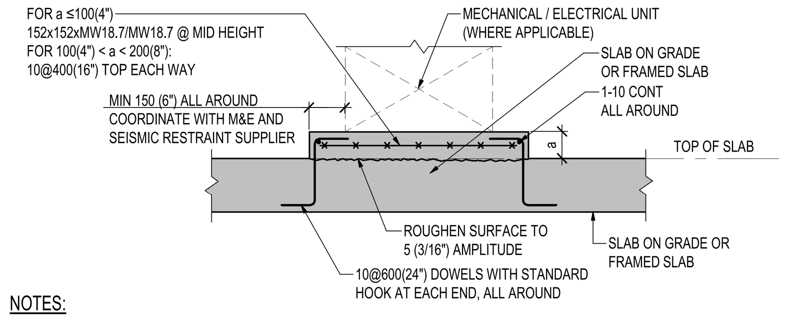
NOTES:

1. SEE CONCRETE REINFORCEMENT NOTES FOR MINIMUM COVER REQUIREMENTS.
2. FOR WALLS AND SLABS, "PRINCIPAL" REINFORCING IS THE ONE CLOSEST TO THE CONCRETE SURFACE (AT EACH SIDE OF WALL / SLAB)

JUNE 2019

HOUSEKEEPING PADS / BUILT UP SLABS

TC-MISC-01



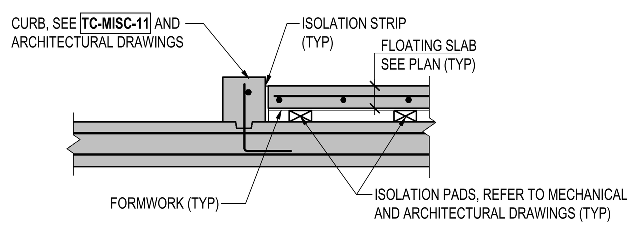
NOTES:

1. FOR PAD SIZES AND LOCATIONS, SEE MECHANICAL, ELECTRICAL AND ARCHITECTURAL DRAWINGS.
2. FOR PADS MORE THAN 200(8") THICK OBTAIN CONSULTANT'S APPROVAL PRIOR TO POURING.
3. FOR BUILT UP SLABS LESS THAN 25 (1") THICK, SEE TC-MISC-04
4. AT SLABS MINIMUM 125 (5") THICK DOWELS CAN BE POST INSTALLED AND EMBEDDED 100 (4") DEEP USING HILTI ADHESIVE SYSTEM.
5. REINFORCING SHOWN IS THE MINIMUM REQUIREMENT; COORDINATE WITH SEISMIC RESTRAINT DESIGN AND INCREASE IF REQUIRED.
6. UNLESS THE PAD ITSELF IS SUFFICIENT TO RESIST ALL THE LOAD IMPOSED TO IT BY SEISMIC RESTRAINT ELEMENTS WITHOUT RELYING ON BASE SLAB, EXTEND ALL THE ANCHORAGE INTO THE BASE SLAB AND NEGLECT THE PORTION OF THE ANCHORS WITHIN THE PAD.

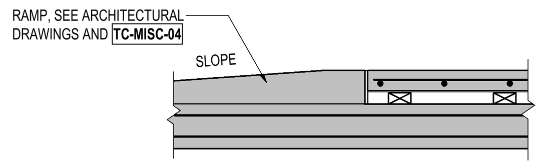
AUGUST 2017

FLOATING SLABS

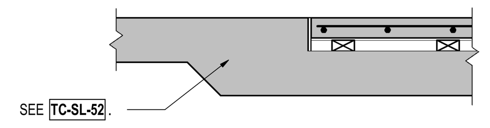
TC-MISC-02



A TYPICAL PERIMETER CONDITION



B TYPICAL ENTRANCE (WHERE APPLICABLE)



C TYPICAL RECESSED FLOATING SLAB

NOTES:

1. UNLESS OTHERWISE NOTED, MINIMUM FLOATING SLAB REINFORCEMENT IS15@250 (10") EACH WAY (AT MID HEIGHT).
2. PROVIDE ADDITIONAL FLOATING SLAB REINFORCEMENT IF REQUIRED BY ISOLATION PAD OR SEISMIC RESTRAINT DESIGN.

AUGUST 2017

ARCHITECTURE 49
1000-150 ISABELLA STREET
OTTAWA (ONTARIO) CANADA K1S 1V7
Phone: 613-238-0440 | Fax: 613-238-6597 | WWW.ARCHITECTURE49.COM

wsp
2611 Queensview Dr, Suite 300
Ottawa, Ontario, K2B 8K2 Canada
T 613-829-2800 | F 613-829-8299 | www.wsp.com

PCL CONSTRUCTION
49 Auriga Drive
Ottawa, Ontario, K2E 8A1 Canada
T 613-978-5398 | www.pcl.com

SEAL:

CLIENT:

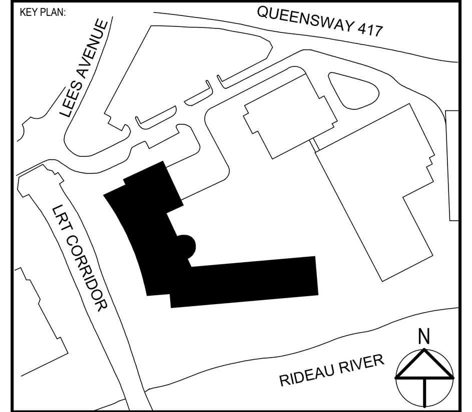
uOttawa

RFP #: 2020-40639 CLIENT REF. #: BT20-18477

PROJECT:

University of Ottawa - Faculty of Health Sciences Building

KEY PLAN:



ISSUED FOR - REVISION:

IS	RE	DATE	DESCRIPTION
1		2021-04-15	ISSUED FOR TECHNICAL SUBMISSION

PROJECT NO: 211-01094-00

DATE: 2021-04-15

ORIGINAL SCALE: 1 : 100

IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.

25mm

DESIGNED BY: L.HAJSAID

DRAWN BY: P.MCKEE

CHECKED BY: S.HOWARD

DISCIPLINE: STRUCTURAL

TITLE:

CONCRETE REINFORCING AND MISCELLANEOUS TYPICAL DETAILS

SHEET NUMBER: S113

SHEET #: OF

ISSUE: REV #

DATE OF:

SEISMIC REINFORCEMENT FOR NON-LOAD BEARING MASONRY WALLS WITH SEISMIC HAZARD INDEX $0.35 \le I_E$ Fa Sa(0.2)<0.75

TM-WALL-01

WALL THICKNESS	VERTICAL REINFORCEMENT	HORIZONTAL JOINT REINFORCEMENT
140 (6")	1-10@800 (2'-8")	2-3.66 @ 400 (16")
190 OR 240 (8" OR 10")	1-10@1200 (4'-0")	2-3.66 @ 400 (16")
290 (12")	1-10@1000 (3'-4")	2-3.66 @ 400 (16")

NOTES:

1. UNLESS NOTED OTHERWISE, PROVIDE THE ABOVE REINFORCEMENT FOR ALL MASONRY WALLS.
2. SEE MASONRY NOTES FOR DOWELLING, SPLICING AND OTHER REINFORCING AND GROUTING REQUIREMENTS.

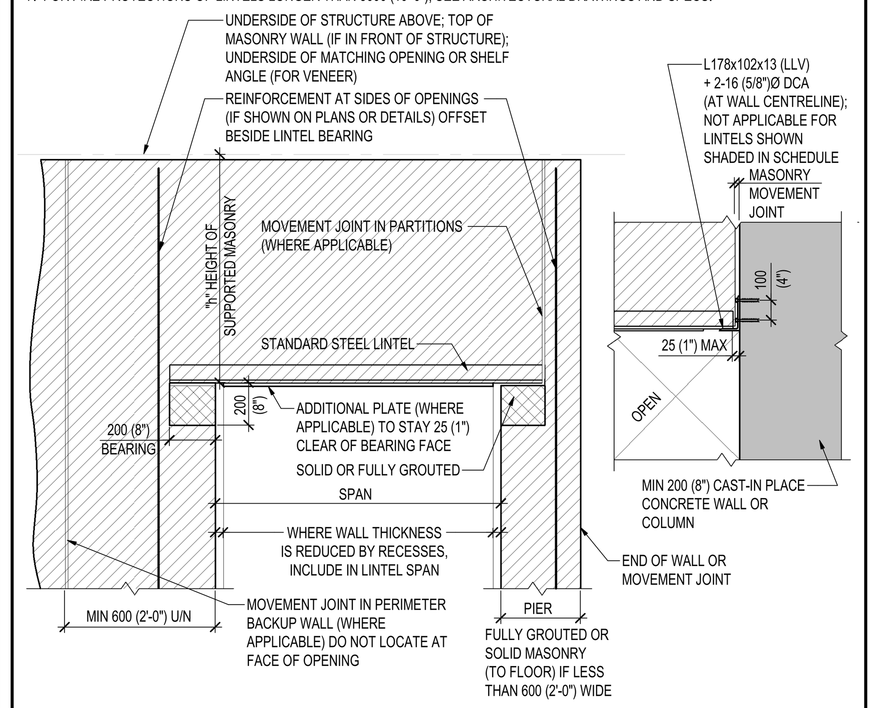
AUGUST 2017

STANDARD STEEL LINTELS IN NON LOAD BEARING MASONRY WALLS

TM-WALL-11

NOTES:

1. THIS DETAIL APPLIES FOR HOLLOW MASONRY WALLS AND FOR MASONRY WALLS WITH GROUTED CORES SPACED NOT CLOSER THAN 800 (2'-8").
2. STANDARD LINTELS ARE NOT NECESSARILY SHOWN ON STRUCTURAL DRAWINGS, REFER TO ARCHITECTURAL, MECHANICAL AND ELECTRICAL DRAWINGS FOR OPENING LOCATIONS.
3. SEE PLANS FOR SPECIAL LINTELS.
4. CONNECT BACK TO BACK DOUBLE ANGLES USING MIN 16 (5/8")Ø BOLTS @ 450 (1'-6") MAX , OR BY WELDING @ TOP & BOTTOM USING 6 (1/4") WELDS x 50 (2") LG @ 450 (1'-6") MAX LOCATE FIRST CONNECTION MAX 75 (3") FROM END OF LINTEL.
5. PROVIDE STEEL PACKING AS REQUIRED TO ENSURE EVEN BEARING OF STEEL LINTELS.
6. FOR LINTELS WHICH ARE SHADED IN SCHEDULE, SPECIAL DETAIL FOR CONNECTION TO CONCRETE WALL/COLUMN IS REQUIRED.
7. FOR FIRE PROTECTIONS OF LINTELS LONGER THAN 3000 (10'-0"), SEE ARCHITECTURAL DRAWINGS AND SPECS.

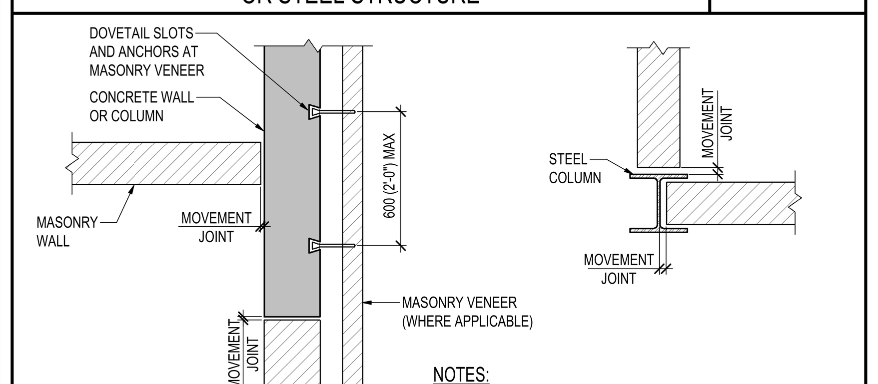


WALL THICKNESS	SPAN	HEIGHT OF SUPPORTED MASONRY "h"			DETAIL
		h≤1200 (4'-0")	1200 (4'-0")<h ≤ 2600 (8'-4")	2600 (8'-4")≤h ≤ 4800 (16'-0")	
90 (4") VENEER	UP TO 1200 (4'-0")	L89x89x6.4	L89x89x6.4	L89x89x7.9	70x13 (2 3/4"x1/2") STEEL PLATE, WHERE SHOWN IN SCHEDULE; 89
	1200 (4'-0") TO 1800 (6'-0")	L89x89x6.4	L89x89x6.4	L102x89x7.9	
	1800 (6'-0") TO 2400 (8'-0")	L89x89x6.4	L102x89x9.5	L152x89x7.9	
	2400 (8'-0") TO 3000 (10'-0")	L102x89x7.9	L152x89x7.9	L152x89x9.5 +PLATE	
	3000 (10'-0") TO 3600 (12'-0")	L127x89x7.9	L152x89x9.5 +PLATE	N/A	
140 (6")	UP TO 1200 (4'-0")	2-L64x64x6.4	2-L64x64x6.4	2-L64x64x6.4	120x13 (4 3/4"x1/2") STEEL PLATE, WHERE SHOWN IN SCHEDULE; 64, 64
	1200 (4'-0") TO 1800 (6'-0")	2-L64x64x6.4	2-L76x64x7.9	2-L89x64x7.9	
	1800 (6'-0") TO 2400 (8'-0")	2-L76x64x7.9	2-L89x64x9.5+PLATE	N/A	
	2400 (8'-0") TO 3000 (10'-0")	2-L89x64x9.5	N/A	N/A	
	3000 (10'-0") TO 3600 (12'-0")	2-L89x64x9.5+PLATE	N/A	N/A	
190 (8")	UP TO 1200 (4'-0")	2-L89x89x6.4	2-L89x89x6.4	2-L89x89x6.4	89, 89
	1200 (4'-0") TO 1800 (6'-0")	2-L89x89x6.4	2-L89x89x6.4	2-L102x89x6.4	
	1800 (6'-0") TO 2400 (8'-0")	2-L89x89x6.4	2-L102x89x7.9	2-L127x89x7.9	
	2400 (8'-0") TO 3000 (10'-0")	2-L102x89x7.9	2-L152x89x7.9	2-L152x89x9.5	
	3000 (10'-0") TO 3600 (12'-0")	2-L127x89x7.9	2-L152x89x9.5	N/A	
240 (10")	UP TO 1200 (4'-0")	2-L102x102x6.4	2-L102x102x6.4	2-L102x102x6.4	220x13(8x1/2") STEEL PLATE, WHERE SHOWN IN SCHEDULE; 102, 102
	1200 (4'-0") TO 1800 (6'-0")	2-L102x102x6.4	2-L102x102x6.4	2-L102x102x7.9	
	1800 (6'-0") TO 2400 (8'-0")	2-L102x102x6.4	2-L102x102x9.5	2-L152x102x7.9	
	2400 (8'-0") TO 3000 (10'-0")	2-L102x102x9.5	2-L152x102x7.9	2-L178x102x9.5	
	3000 (10'-0") TO 3600 (12'-0")	2-L152x102x7.9	2-L178x102x9.5	2-L178x102x9.5+PLATE	
290 (12")	UP TO 1200 (4'-0")	3-L89x89x6.4	3-L89x89x6.4	3-L89x89x6.4	89, 89, 89
	1200 (4'-0") TO 1800 (6'-0")	3-L89x89x6.4	3-L89x89x6.4	3-L102x89x6.4	
	1800 (6'-0") TO 2400 (8'-0")	3-L89x89x6.4	3-L127x89x6.4	3-L127x89x7.9	
	2400 (8'-0") TO 3000 (10'-0")	3-L127x89x6.4	3-L127x89x7.9	3-L152x89x9.5	
	3000 (10'-0") TO 3600 (12'-0")	3-L127x89x6.4	3-L152x89x9.5	N/A	

NOVEMBER 2020

MASONRY WALLS ABUTTING CONCRETE OR STEEL STRUCTURE

TM-WALL-21



NOTES:

1. SEE MASONRY GENERAL NOTES FOR MOVEMENT JOINT SIZE.
2. FILL MOVEMENT JOINT WITH COMPRESSIBLE MATERIAL; REFER TO ARCHITECTURAL SPECIFICATIONS FOR FIRE STOPPING REQUIREMENTS.

PLAN VIEW

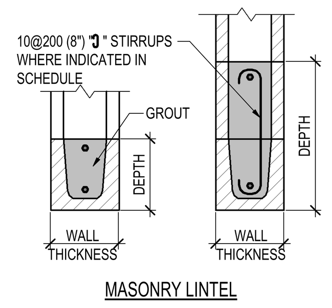
AUGUST 2017

STANDARD MASONRY LINTELS IN NON LOAD BEARING MASONRY WALLS

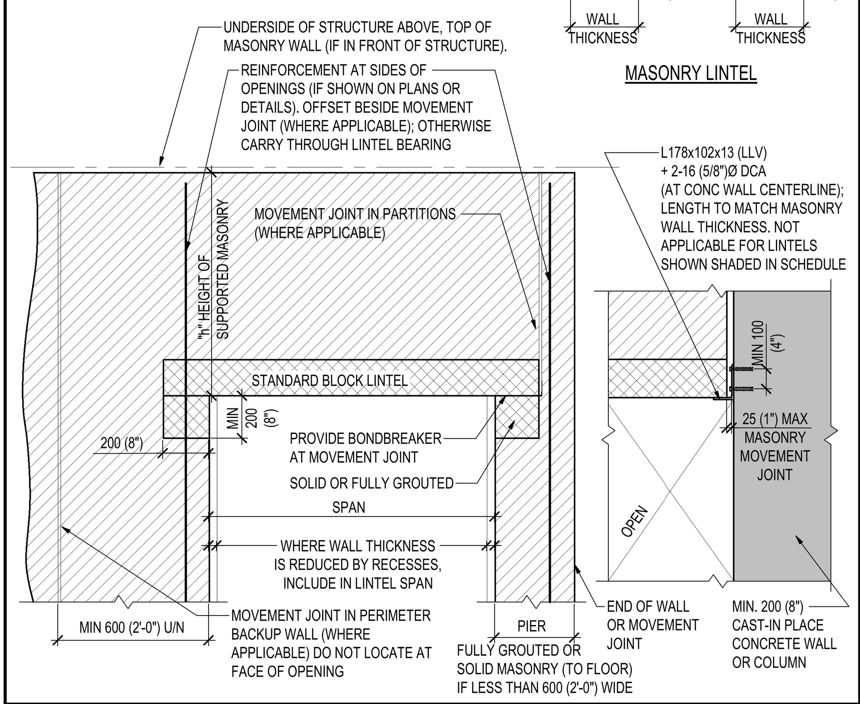
TM-WALL-12

NOTES:

1. THIS DETAIL APPLIES FOR HOLLOW MASONRY WALLS AND FOR MASONRY WALLS WITH GROUTED CORES SPACED NOT CLOSER THAN 800 (2'-8").
2. STANDARD LINTELS ARE NOT NECESSARILY SHOWN ON STRUCTURAL DRAWINGS, REFER TO ARCHITECTURAL, MECHANICAL AND ELECTRICAL DRAWINGS FOR OPENING LOCATIONS.
3. SEE PLANS FOR SPECIAL LINTELS.
4. LINTEL BLOCKS TO HAVE SOLID BOTTOM.
5. FILL LINTEL BLOCKS WITH FINE GROUT. IT IS NOT ACCEPTABLE TO FILL LINTELS WITH MORTAR OR COARSE GROUT.
6. SUPPORT LINTELS UNTIL GROUT REACHES SUFFICIENT STRENGTH, BUT NOT LESS THAN 7 DAYS.
7. FOR LINTELS WHICH ARE SHADED IN SCHEDULE, SPECIAL DETAIL FOR CONNECTION TO CONCRETE WALL IS REQUIRED.



MASONRY LINTEL



WALL THICKNESS	SPAN	HEIGHT OF SUPPORTED MASONRY "h"					
		h≤1200 (4'-0")		1200 (4'-0") < h ≤ 2600 (8'-4")		2600 (8'-4") ≤ h ≤ 4800 (16'-0")	
		BLOCK LINTEL DEPTH	REINF: T&B	BLOCK LINTEL DEPTH	REINF: T&B	BLOCK LINTEL DEPTH	REINF: T&B
140 (6")	UP TO 1200 (4'-0")	190 (7 1/2")	1-10	190 (7 1/2")	1-10	390 (15 1/2")	1-10
	1200(4'-0") TO 1800(6'-0")	190 (7 1/2")	1-10	390 (15 1/2")	1-10	390 (15 1/2")	1-10+STIRRUPS
	1800(6'-0") TO 2400(8'-0")	390 (15 1/2")	1-10	390 (15 1/2")	1-10+STIRRUPS	590 (23 1/2")	1-15+STIRRUPS
	2400(8'-0") TO 3000(10'-0")	390 (15 1/2")	1-10	390 (15 1/2")	1-10+STIRRUPS	590 (23 1/2")	1-15+STIRRUPS
	3000(10'-0") TO 3600(12'-0")	390 (15 1/2")	1-10	590 (23 1/2")	1-15+STIRRUPS	590 (23 1/2")	1-15+STIRRUPS
190 (8")	UP TO 1200 (4'-0")	190 (7 1/2")	1-10	190 (7 1/2")	1-10	390 (15 1/2")	1-15+STIRRUPS
	1200(4'-0") TO 1800(6'-0")	190 (7 1/2")	1-10	390 (15 1/2")	1-15+STIRRUPS	390 (15 1/2")	1-15+STIRRUPS
	1800(6'-0") TO 2400(8'-0")	390 (15 1/2")	1-15+STIRRUPS	390 (15 1/2")	1-15+STIRRUPS	590 (23 1/2")	1-15+STIRRUPS
	2400(8'-0") TO 3000(10'-0")	390 (15 1/2")	1-15+STIRRUPS	390 (15 1/2")	1-15+STIRRUPS	590 (23 1/2")	1-15+STIRRUPS
	3000(10'-0") TO 3600(12'-0")	390 (15 1/2")	1-15+STIRRUPS	590 (23 1/2")	1-15+STIRRUPS	590 (23 1/2")	1-20+STIRRUPS
240 (10")	UP TO 1200 (4'-0")	190 (7 1/2")	1-10	190 (7 1/2")	1-10	390 (15 1/2")	1-15+STIRRUPS
	1200(4'-0") TO 1800(6'-0")	190 (7 1/2")	1-10	390 (15 1/2")	1-15+STIRRUPS	390 (15 1/2")	1-15+STIRRUPS
	1800(6'-0") TO 2400(8'-0")	390 (15 1/2")	1-15+STIRRUPS	390 (15 1/2")	1-15+STIRRUPS	590 (23 1/2")	1-20+STIRRUPS
	2400(8'-0") TO 3000(10'-0")	390 (15 1/2")	1-15+STIRRUPS	390 (15 1/2")	1-15+STIRRUPS	590 (23 1/2")	1-20+STIRRUPS
	3000(10'-0") TO 3600(12'-0")	390 (15 1/2")	1-15+STIRRUPS	590 (23 1/2")	1-20+STIRRUPS	590 (23 1/2")	1-20+STIRRUPS
290 (12")	UP TO 1200 (4'-0")	190 (7 1/2")	1-15	190 (7 1/2")	1-15	390 (15 1/2")	1-15+STIRRUPS
	1200(4'-0") TO 1800(6'-0")	190 (7 1/2")	1-15	390 (15 1/2")	1-15+STIRRUPS	390 (15 1/2")	1-15+STIRRUPS
	1800(6'-0") TO 2400(8'-0")	390 (15 1/2")	1-15+STIRRUPS	390 (15 1/2")	1-15+STIRRUPS	590 (23 1/2")	1-20+STIRRUPS
	2400(8'-0") TO 3000(10'-0")	390 (15 1/2")	1-15+STIRRUPS	390 (15 1/2")	1-20+STIRRUPS	590 (23 1/2")	1-20+STIRRUPS
	3000(10'-0") TO 3600(12'-0")	390 (15 1/2")	1-15+STIRRUPS	590 (23 1/2")	1-20+STIRRUPS	590 (23 1/2")	1-25+STIRRUPS

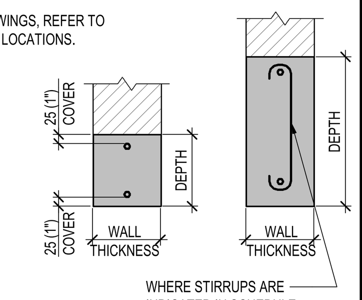
JUNE 2019

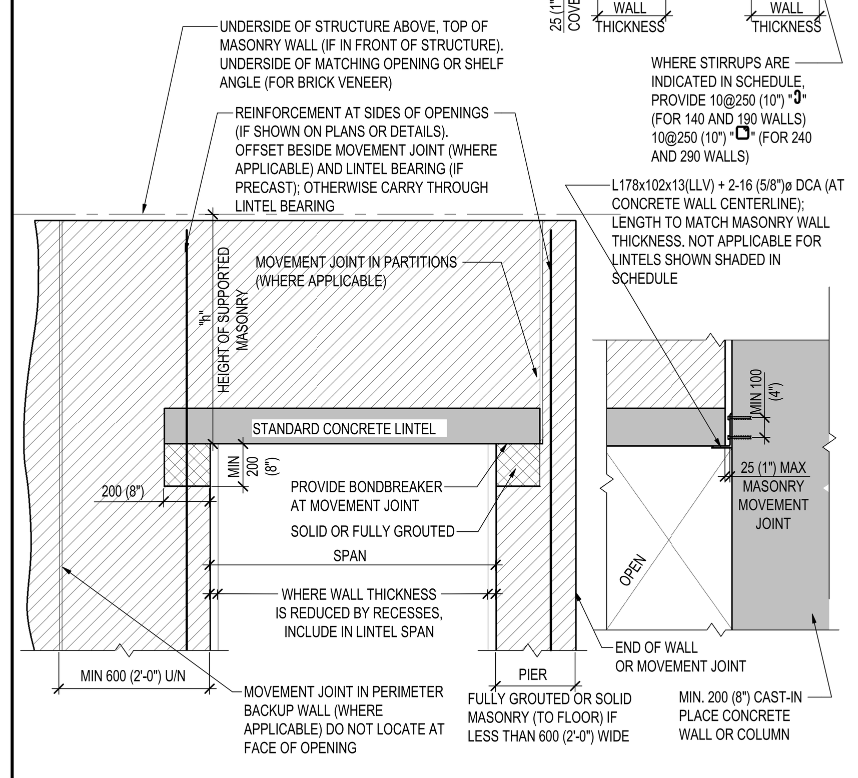
STANDARD CONCRETE LINTELS IN NON LOAD BEARING MASONRY WALLS

TM-WALL-13

NOTES:

1. THIS DETAIL APPLIES FOR HOLLOW MASONRY WALLS AND FOR MASONRY WALLS WITH GROUTED CORES SPACED NOT CLOSER THAN 800 (2'-8").
2. STANDARD LINTELS ARE NOT NECESSARILY SHOWN ON STRUCTURAL DRAWINGS, REFER TO ARCHITECTURAL, MECHANICAL AND ELECTRICAL DRAWINGS FOR OPENING LOCATIONS.
3. SEE PLANS FOR SPECIAL LINTELS.
4. SUPPORT CAST-IN PLACE LINTELS UNTIL CONCRETE REACHES SUFFICIENT STRENGTH, BUT NOT LESS THAN 7 DAYS.
5. FOR LINTELS WHICH ARE SHADED IN SCHEDULE, SPECIAL DETAIL FOR CONNECTION TO CONCRETE WALL IS REQUIRED.



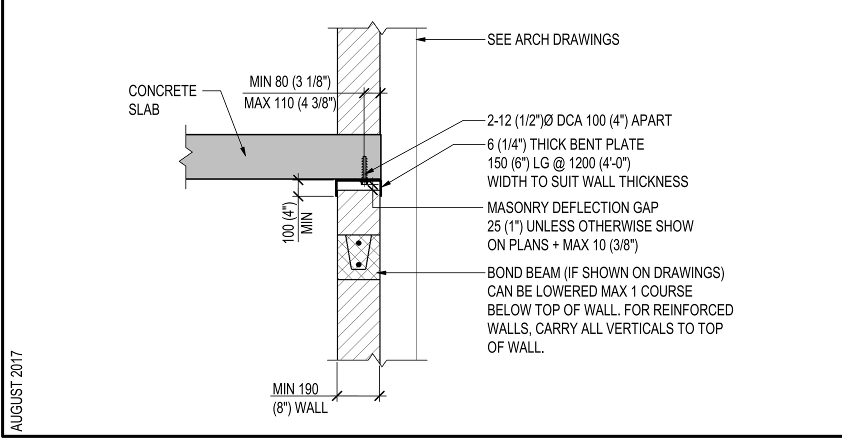


WALL THICKNESS	SPAN	HIGHT OF SUPPORTED MASONRY "h"					
		h≤1200 (4'-0")		1200 (4'-0") < h ≤ 2600 (8'-4")		2600 (8'-4" ≤ h ≤ 4800 (16'-0")	
		CONC LINTEL DEPTH	REINF: T&B	CONC LINTEL DEPTH	REINF: T&B	CONC LINTEL DEPTH	REINF: T&B
90 (4")	UP TO 1200 (4'-0")	190 (7 1/2")	1-10	190 (7 1/2")	1-10	190 (7 1/2")	1-10
	1200(4'-0") TO 1800(6'-0")	190 (7 1/2")	1-10	190 (7 1/2")	1-10	390 (15 1/2")	1-10
	1800(6'-0") TO 2400(8'-0")	190 (7 1/2")	1-10	390 (15 1/2")	1-10	390 (15 1/2")	1-10
	2400(8'-0") TO 3000(10'-0")	390 (15 1/2")	1-10	390 (15 1/2")	1-10	590 (23 1/2")	1-10
	3000(10'-0") TO 3600 (12'-0")	390 (15 1/2")	1-10	390 (15 1/2")	1-10	590 (23 1/2")	1-10
140 (6")	UP TO 1200 (4'-0)	190 (7 1/2")	1-10	190 (7 1/2")	1-10	190 (7 1/2")	1-10
	1200(4'-0) TO 1800(6'-0)	190 (7 1/2")	1-10	190 (7 1/2")	1-10	190 (7 1/2")	1-15
	1800(6'-0) TO 2400(8'-0)	190 (7 1/2")	1-10	390 (15 1/2")	1-15	390 (15 1/2")	1-15
	2400(8'-0) TO 3000(10'-0)	190 (7 1/2")	1-15	390 (15 1/2")	1-15	590 (23 1/2")	1-20+STIRRUPS
	3000(10'-0") TO 3600 (12'-0")	390 (15 1/2")	1-15	390 (15 1/2")	1-15	590 (23 1/2")	1-20+STIRRUPS
190 (8")	UP TO 1200 (4'-0")	190 (7 1/2")	2-10	190 (7 1/2")	2-10	190 (7 1/2")	2-10
	1200(4'-0") TO 1800(6'-0")	190 (7 1/2")	2-10	190 (7 1/2")	2-10	190 (7 1/2")	2-15
	1800(6'-0") TO 2400(8'-0")	190 (7 1/2")	2-10	190 (7 1/2")	2-15	390 (15 1/2")	2-15
	2400(8'-0") TO 3000(10'-0")	190 (7 1/2")	2-15	390 (15 1/2")	2-15	390 (15 1/2")	2-15
	3000(10'-0") TO 3600 (12'-0")	390 (15 1/2")	2-15	390 (15 1/2")	2-15	590 (23 1/2")	1-25+STIRRUPS
240 (10")	UP TO 1200 (4'-0)	190 (7 1/2")	2-10	190 (7 1/2")	2-10	190 (7 1/2")	2-10
	1200(4'-0) TO 1800(6'-0)	190 (7 1/2")	2-10	190 (7 1/2")	2-10	190 (7 1/2")	2-15
	1800(6'-0) TO 2400(8'-0)	190 (7 1/2")	2-10	190 (7 1/2")	2-15	390 (15 1/2")	2-15
	2400(8'-0) TO 3000(10'-0)	390 (15 1/2")	2-15	390 (15 1/2")	2-15	390 (15 1/2")	2-15
	3000(10'-0") TO 3600 (12'-0")	390 (15 1/2")	2-15	390 (15 1/2")	2-15	590 (23 1/2")	2-15+STIRRUPS
290 (12")	UP TO 1200 (4'-0)	190 (7 1/2")	2-10	190 (7 1/2")	2-10	190 (7 1/2")	2-10
	1200(4'-0) TO 1800(6'-0)	190 (7 1/2")	2-10	190 (7 1/2")	2-10	190 (7 1/2")	2-15
	1800(6'-0) TO 2400(8'-0)	190 (7 1/2")	2-10	390 (15 1/2")	2-15	390 (15 1/2")	2-15
	2400(8'-0) TO 3000(10'-0)	390 (15 1/2")	2-15	390 (15 1/2")	2-15	390 (15 1/2")	2-15
	3000(10'-0") TO 3600 (12'-0")	390 (15 1/2")	2-15	390 (15 1/2")	2-15	590 (23 1/2")	2-20+ STIRRUPS

AUGUST 2017

LATERAL SUPPORT OF PERIMETER NON-LOAD BEARING MASONRY WALLS AT FORMED CONCRETE

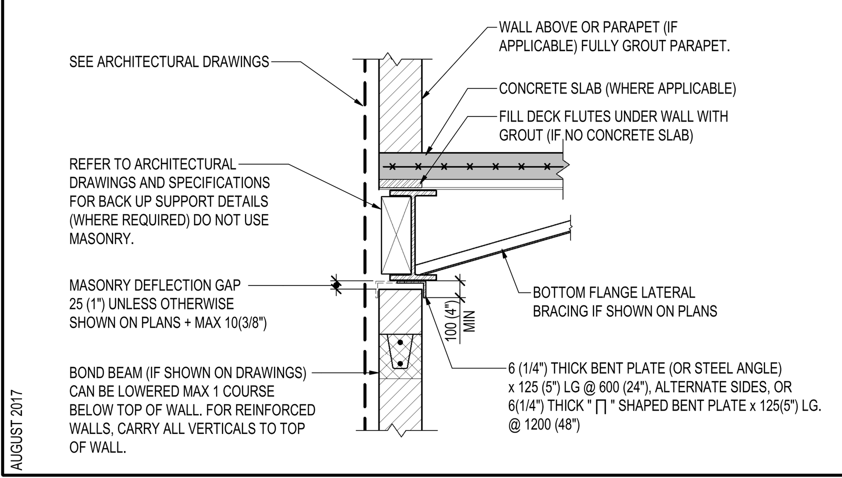
TM-LATS-01



AUGUST 2017

LATERAL SUPPORT OF PERIMETER NON-LOAD BEARING MASONRY WALL AT STEEL STRUCTURE

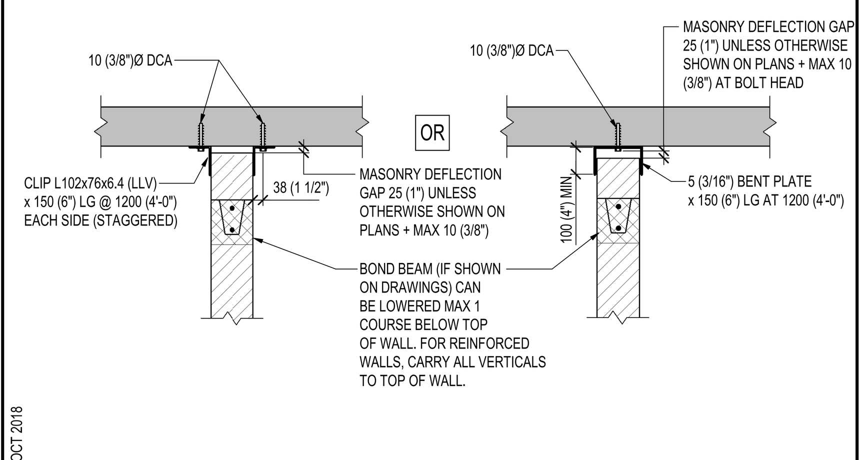
TM-LATS-02



AUGUST 2017

LATERAL SUPPORT OF MASONRY PARTITION AT FORMED CONCRETE STRUCTURE

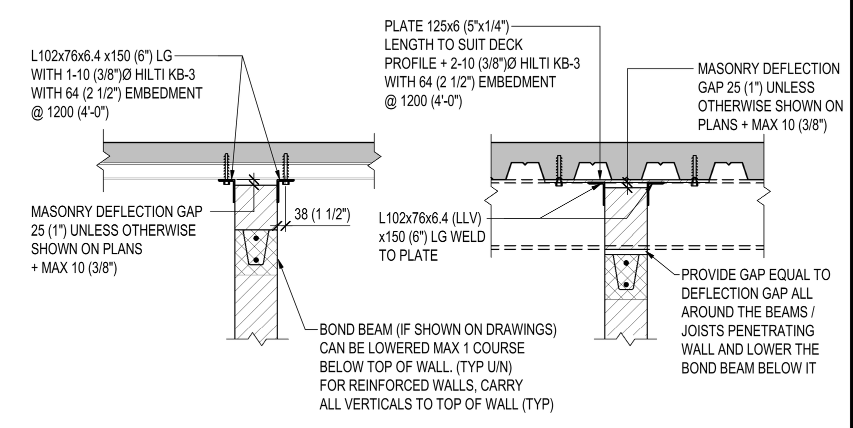
TM-LATS-11



OCT 2018

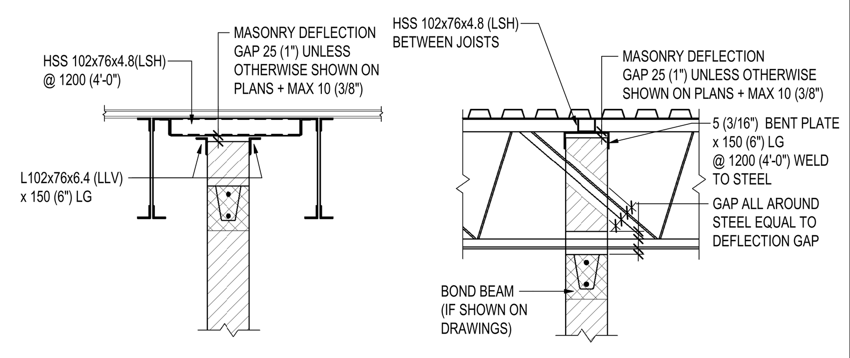
LATERAL SUPPORT OF MASONRY PARTITIONS AT STEEL STRUCTURE

TM-LATS-12



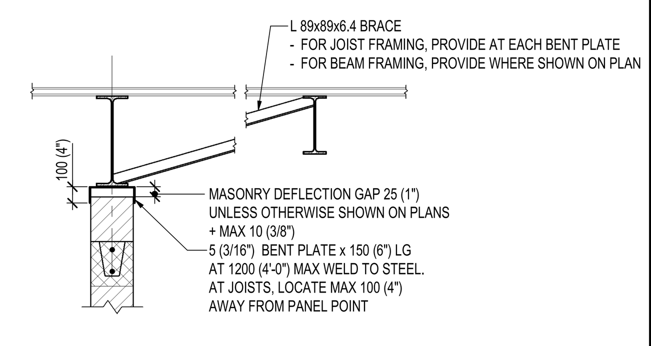
WALL PERPENDICULAR TO FLOOR DECK FLUTES

WALL PARALLEL TO FLOOR DECK FLUTES



WALL PERPENDICULAR TO ROOF DECK FLUTES

WALL PARALLEL TO ROOF DECK FLUTES



WALL IN LINE WITH FLOOR / ROOF JOISTS OR BEAMS

OCT 2017

ARCHITECTURE 49
1000-150 ISABELLA STREET
OTTAWA (ONTARIO) CANADA K1S 1V7
Phone: 613-238-0440 | Fax: 613-238-6597 | WWW.ARCHITECTURE49.COM

wsp
2611 Queensview Dr, Suite 300
Ottawa, Ontario, K2B 8K2 Canada
T 613-829-2800 | F 613-829-8299 | www.wsp.com

PCL CONSTRUCTION
49 Auriga Drive
Ottawa, Ontario, K2E 8A1 Canada
T 613-978-5398 | www.pcl.com

SEAL:

CLIENT:

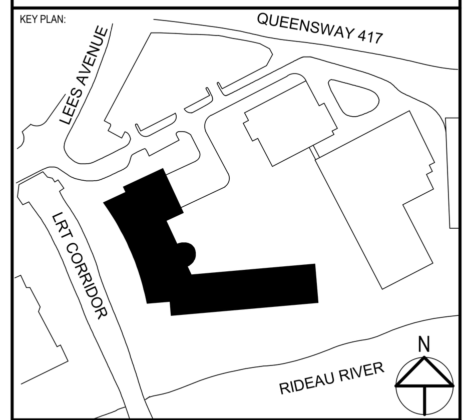
uOttawa

RFP #: 2020-40639 CLIENT REF. #: BT20-18477

PROJECT:

University of Ottawa - Faculty of Health Sciences Building

KEY PLAN:



DISCLAIMER: COPYRIGHT:

ISSUED FOR - REVISION:

IS	RE	DATE	DESCRIPTION
1		2021-04-15	ISSUED FOR TECHNICAL SUBMISSION

PROJECT NO: 211-01094-00

DATE: 2021-04-15

ORIGINAL SCALE: 1 : 100

IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.

25mm

DESIGNED BY: L.HAJSAID

DRAWN BY: P.MCKEE

CHECKED BY: S.HOWARD

DISCIPLINE: STRUCTURAL

TITLE:

MASONRY WALL TYPICAL DETAILS

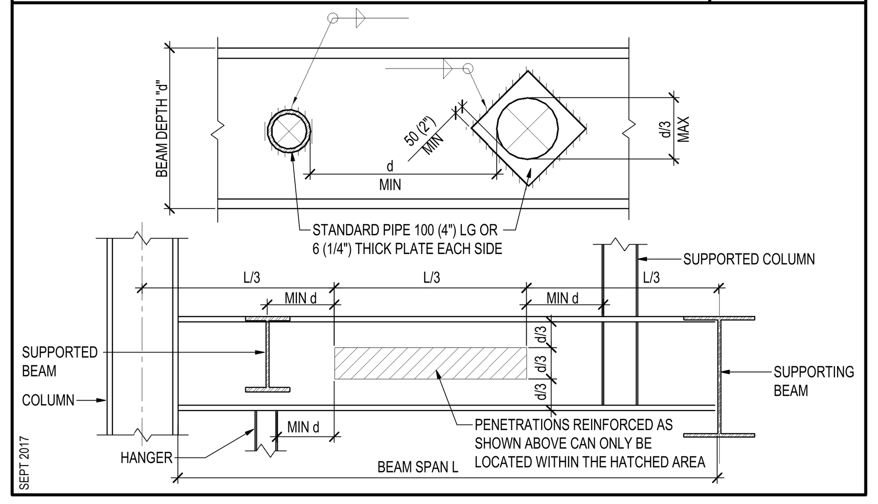
SHEET NUMBER: S114

SHEET #: OF

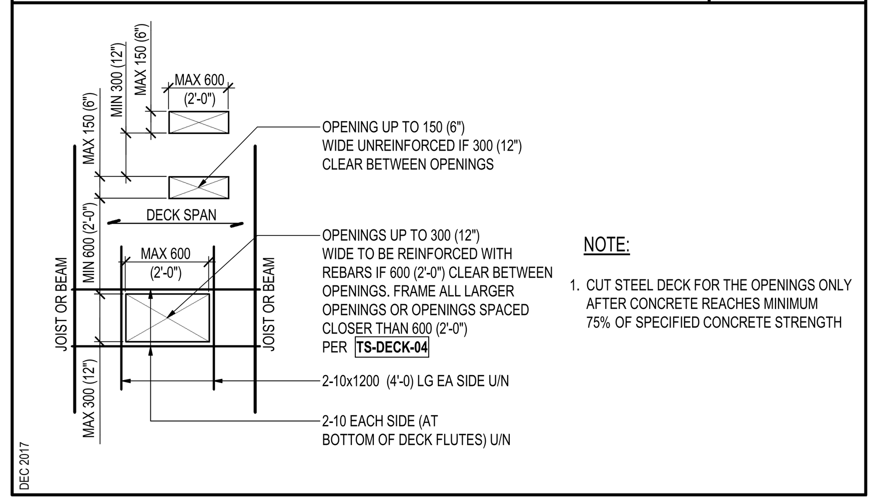
ISSUE: REV #

DATE OF:

REINFORCEMENT AT PIPE PENETRATIONS THROUGH STEEL BEAM — TS-BM-01



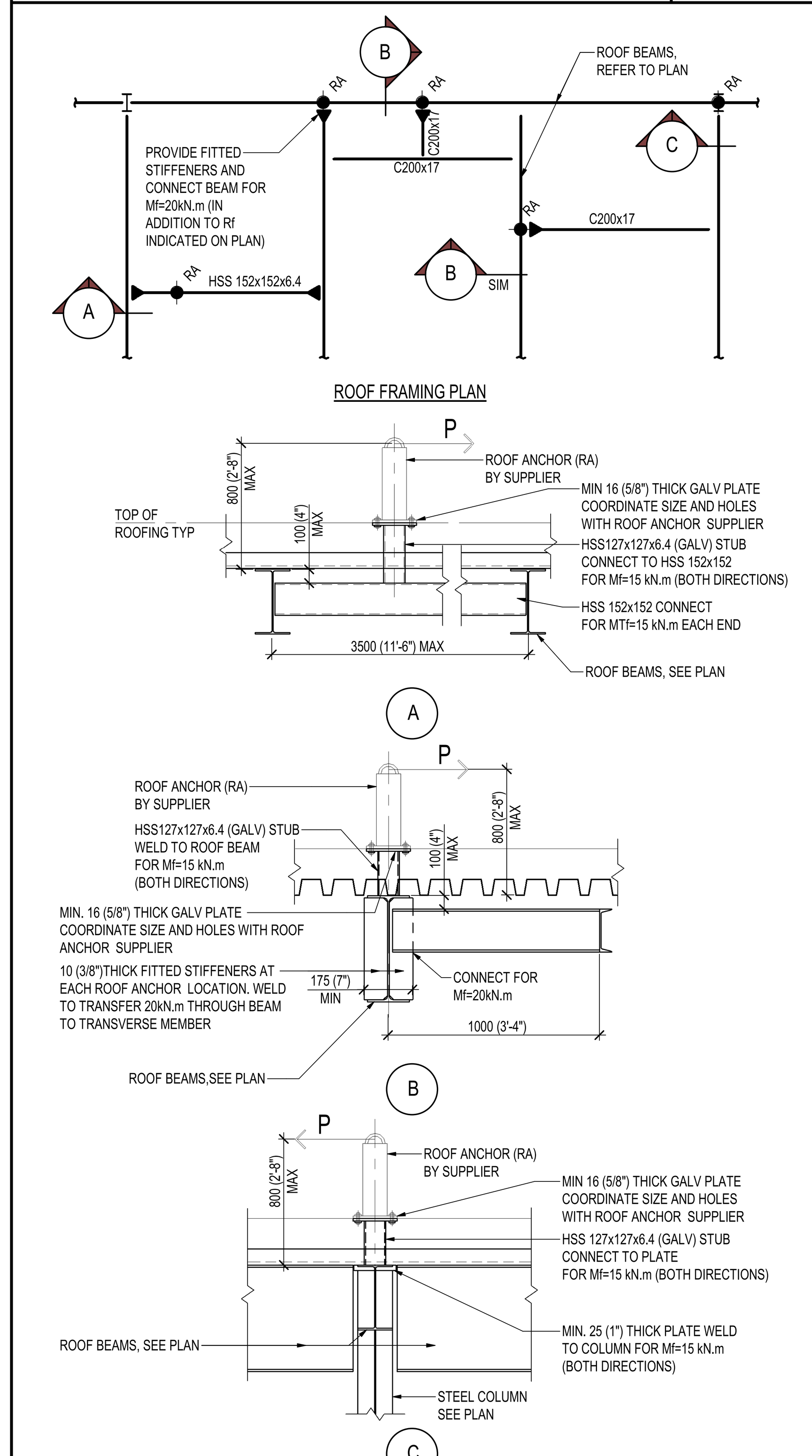
REINFORCEMENT AT OPENINGS IN SLAB ON DECK — TS-DECK-03



NOTE:

1. CUT STEEL DECK FOR THE OPENINGS ONLY AFTER CONCRETE REACHES MINIMUM 75% OF SPECIFIED CONCRETE STRENGTH

ROOF ANCHORS (RA) ON ROOFS FRAMED WITH STEEL BEAMS — TS-MISC-01

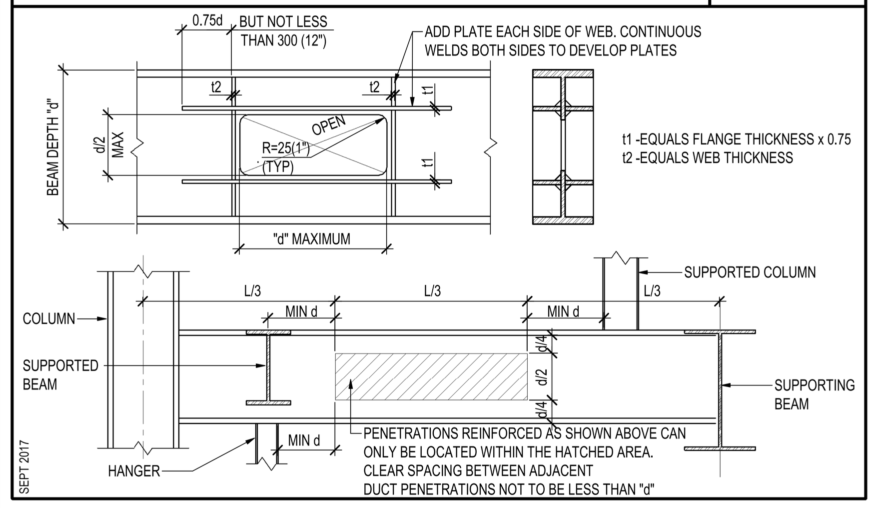


NOTES:

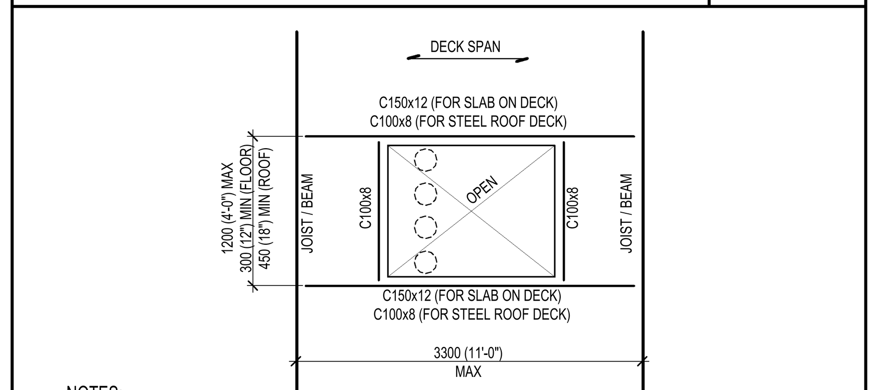
1. P = 23 kN ULTIMATE LOAD (15kN FACTORED LOAD) IN ANY DIRECTION.
2. COORDINATE ANCHOR LOCATIONS WITH ARCHITECTURAL DRAWINGS.
3. OMIT HSS 127x127 STUBS IF RA IS EXTENDED AND FASTENED DIRECTLY TO ROOF BEAMS (OR TOPS OF COLUMNS). COORDINATE WITH ARCHITECTURAL DRAWINGS AND RA SUPPLIER.

FEB 2020

REINFORCEMENT AT DUCT PENETRATIONS THROUGH STEEL BEAM — TS-BM-02



ADDITIONAL FRAMING AT DECK OPENINGS — TS-DECK-04

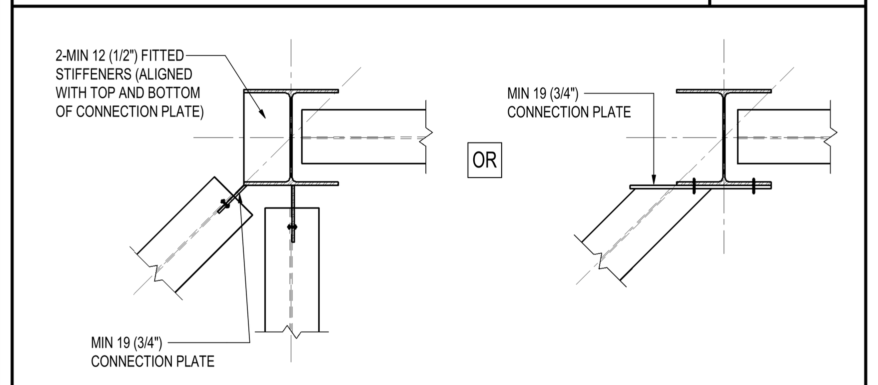


NOTES:

1. DECK SUPPLIER TO DESIGN AND PROVIDE REINFORCEMENT FOR STEEL ROOF DECK OPENINGS LESS THAN 450 (18")
2. SEE TS-DECK-03 FOR REINFORCING OF OPENINGS IN SLAB ON DECK LESS THAN 300 (12")
3. MULTIPLE SLEEVES PLACED IN LINE PERPENDICULAR TO DECK SPAN WITH LESS THAN ONE WHOLE DECK FLUTE (COMPLETE WITH TWO WEBS) REMAINING BETWEEN THEM SHOULD BE TREATED AS A SINGLE OPENING

JUNE 2019

SKEWED BEAM CONNECTION TO COLUMNS — TS-BM-11

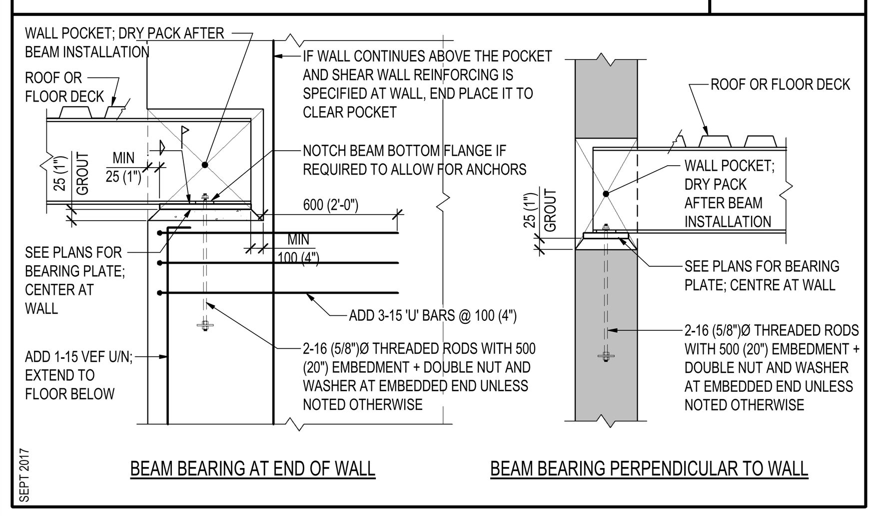


NOTES:

1. DESIGN CONNECTION PLATES AND STIFFENERS TO TRANSFER FORCES SHOWN ON DRAWINGS.
2. PROVIDE ADDITIONAL STIFFENERS AS REQUIRED BY CONNECTION DESIGN.

SEPT 2017

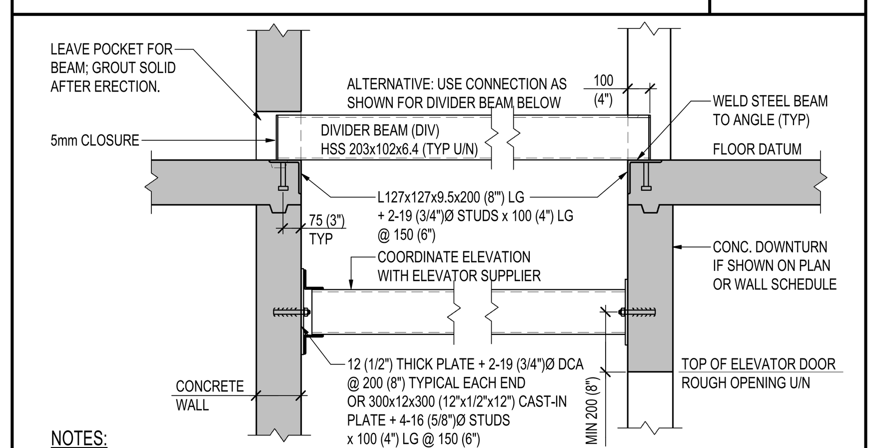
STEEL BEAMS BEARING ON CONCRETE WALLS — TS-BM-21



BEAM BEARING AT END OF WALL   BEAM BEARING PERPENDICULAR TO WALL

SEPT 2017

ELEVATOR DIVIDER BEAMS (DIV) — TS-MISC-03

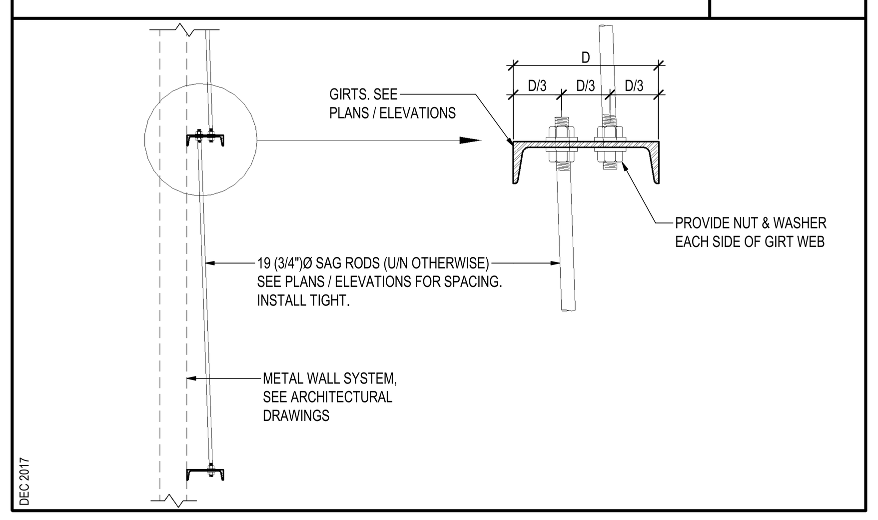


NOTES:

1. CONNECT DIVIDER BEAMS TO SUPPORTS FOR Rxf=20kN (PERPENDICULAR TO BEAM).
2. MORE THAN ONE DIVIDER BEAM PER LEVEL MAY BE REQUIRED, SEE PLANS AND COORDINATE WITH ELEVATOR SUPPLIER.

FEB 2020

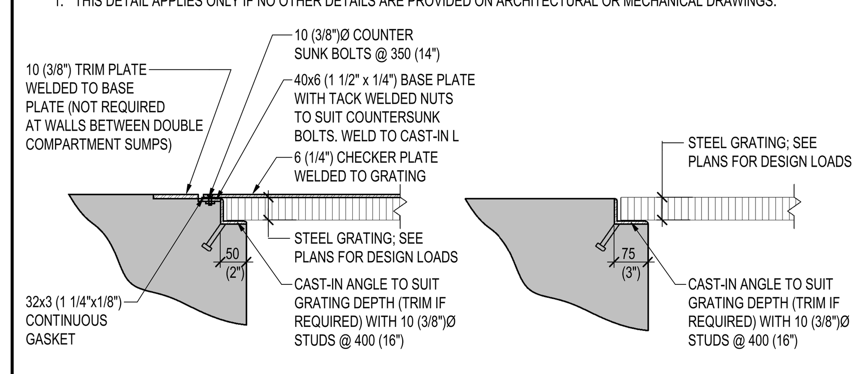
SAG RODS AT STEEL GIRTS — TS-MISC-11



SUMP AND TRENCH COVER SUPPORT DETAILS — TS-MISC-42

NOTE:

1. THIS DETAIL APPLIES ONLY IF NO OTHER DETAILS ARE PROVIDED ON ARCHITECTURAL OR MECHANICAL DRAWINGS.



SEALED SUMP COVER   STANDARD SUMP COVER

DEC 2017

ARCHITECTURE 49
1000-150 ISABELLA STREET
OTTAWA (ONTARIO) CANADA K1S 1V7
Phone: 613-238-0440 | Fax: 613-238-6597 | WWW.ARCHITECTURE49.COM

wsp
2611 Queensview Dr. Suite 300
Ottawa, Ontario, K2B 8K2 Canada
T 613-829-2800 | F 613-829-8299 | www.wsp.com

PCL CONSTRUCTION
49 Auriga Drive
Ottawa, Ontario, K2E 8A1 Canada
T 613-978-5398 | www.pcl.com

SEAL:

CLIENT:

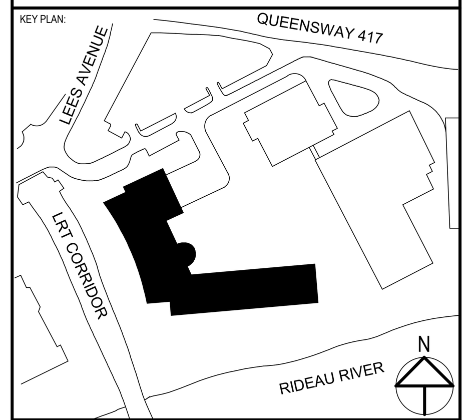
uOttawa

RFP #: 2020-40639   CLIENT REF #: BT20-18477

PROJECT:

University of Ottawa - Faculty of Health Sciences Building

KEY PLAN:



ISSUED FOR - REVISION:

IS	RE	DATE	DESCRIPTION
1		2021-04-15	ISSUED FOR TECHNICAL SUBMISSION

PROJECT NO: 211-01094-00   DATE: 2021-04-15

ORIGINAL SCALE: 1 : 100

IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.

25mm

DESIGNED BY: L.HAJSAID

DRAWN BY: P.MCKEE

CHECKED BY: S.HOWARD

DISCIPLINE: STRUCTURAL

TITLE: STEEL TYPICAL DETAILS

SHEET NUMBER: S115

SHEET #   OF

ISSUE: REV #

DATE OF:

FOUNDATION PLAN LEGEND

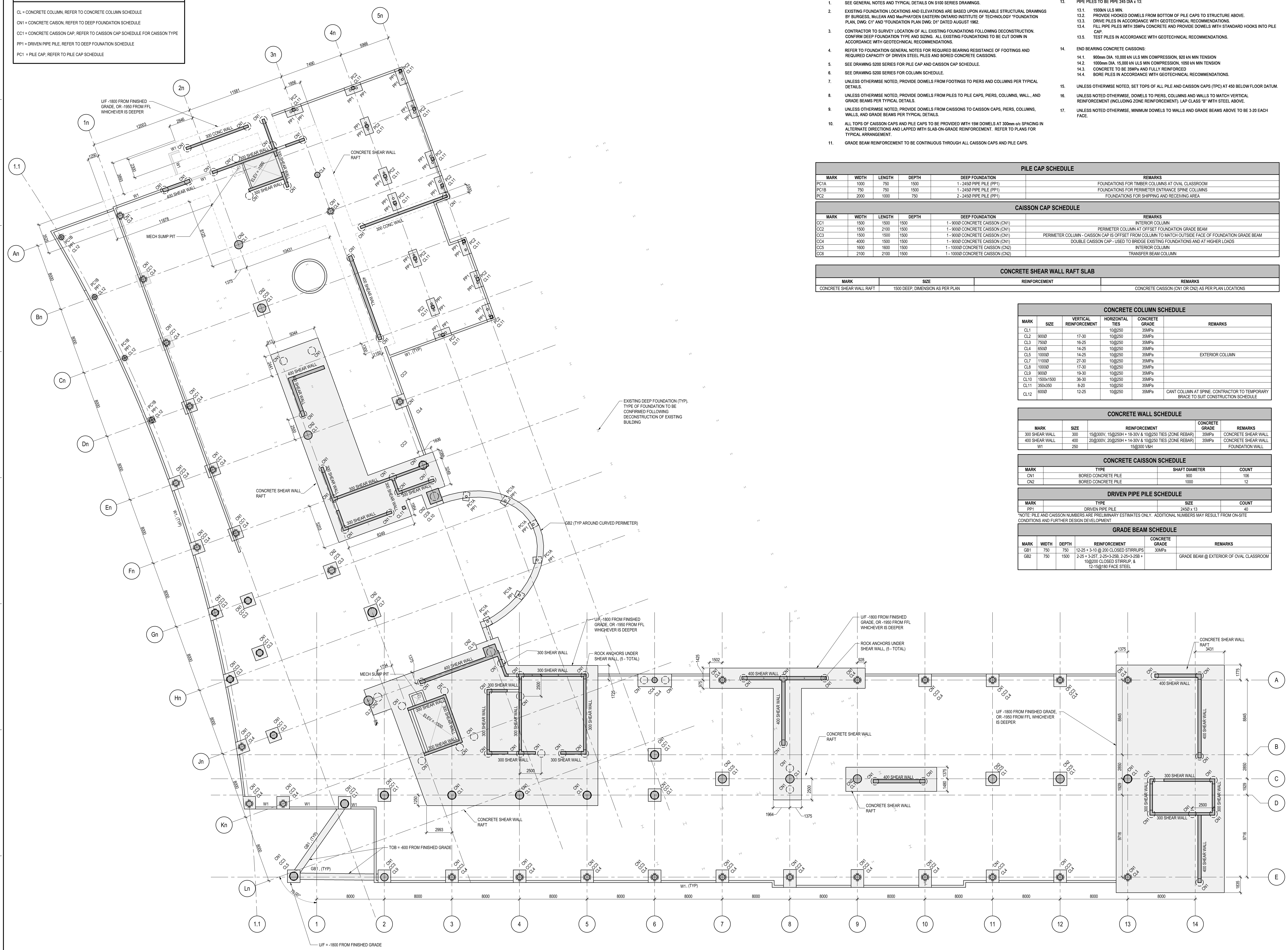
CL = CONCRETE COLUMN, REFER TO CONCRETE COLUMN SCHEDULE

CN1 = CONCRETE CAISON, REFER TO DEEP FOUNDATION SCHEDULE

CC1 = CONCRETE CAISSON CAP, REFER TO CAISSON CAP SCHEDULE FOR CAISSON TYPE

PP1 = DRIVEN PIPE PILE, REFER TO DEEP FOUNATION SCHEDULE

PC1 = PILE CAP, REFER TO PILE CAP SCHEDULE



1 FOUNDATION PLAN
S200 1 : 150

FOUNDATION PLAN NOTES

1. SEE GENERAL NOTES AND TYPICAL DETAILS ON S100 SERIES DRAWINGS.
2. EXISTING FOUNDATION LOCATIONS AND ELEVATIONS ARE BASED UPON AVAILABLE STRUCTURAL DRAWINGS BY BURGESS, McLEAN AND MacPHAYDEN EASTERN ONTARIO INSTITUTE OF TECHNOLOGY "FOUNDATION PLAN, DWG: C1" AND "FOUNDATION PLAN DWG: D1" DATED AUGUST 1962.
3. CONTRACTOR TO SURVEY LOCATION OF ALL EXISTING FOUNDATIONS FOLLOWING DECONSTRUCTION. CONFIRM DEEP FOUNDATION TYPE AND SIZING. ALL EXISTING FOUNDATIONS TO BE CUT DOWN IN ACCORDANCE WITH GEOTECHNICAL RECOMMENDATIONS.
4. REFER TO FOUNDATION GENERAL NOTES FOR REQUIRED BEARING RESISTANCE OF FOOTINGS AND REQUIRED CAPACITY OF DRIVEN STEEL PILES AND BORED CONCRETE CAISSONS.
5. SEE DRAWING S200 SERIES FOR PILE CAP AND CAISSON CAP SCHEDULE.
6. SEE DRAWING S200 SERIES FOR COLUMN SCHEDULE.
7. UNLESS OTHERWISE NOTED, PROVIDE DOWELS FROM FOOTINGS TO PIERS AND COLUMNS PER TYPICAL DETAILS.
8. UNLESS OTHERWISE NOTED, PROVIDE DOWELS FROM PILES TO PILE CAPS, PIERS, COLUMNS, WALL., AND GRADE BEAMS PER TYPICAL DETAILS.
9. UNLESS OTHERWISE NOTED, PROVIDE DOWELS FROM CAISSONS TO CAISSON CAPS, PIERS, COLUMNS, WALLS, AND GRADE BEAMS PER TYPICAL DETAILS.
10. ALL TOPS OF CAISSON CAPS AND PILE CAPS TO BE PROVIDED WITH 15M DOWELS AT 300mm o/c SPACING IN ALTERNATE DIRECTIONS AND LAPPED WITH SLAB-ON-GRADE REINFORCEMENT. REFER TO PLANS FOR TYPICAL ARRANGEMENT.
11. GRADE BEAM REINFORCEMENT TO BE CONTINUOUS THROUGH ALL CAISSON CAPS AND PILE CAPS.
12. REFER TO FOUNDATION GENERAL NOTES FOR ADDITIONAL REQUIREMENTS FOR PIPE PILES AND CONCRETE CAISSONS.
13. PIPE PILES TO BE PIPE 245 DIA x 13:
    - 13.1. 1500kN ULS MIN.
    - 13.2. PROVIDE HOOKED DOWELS FROM BOTTOM OF PILE CAPS TO STRUCTURE ABOVE.
    - 13.3. DRIVE PILES IN ACCORDANCE WITH GEOTECHNICAL RECOMMENDATIONS.
    - 13.4. FILL PIPE PILES WITH 35MPa CONCRETE AND PROVIDE DOWELS WITH STANDARD HOOKS INTO PILE CAP.
    - 13.5. TEST PILES IN ACCORDANCE WITH GEOTECHNICAL RECOMMENDATIONS.
14. END BEARING CONCRETE CAISSONS:
    - 14.1. 900mm DIA. 10,000 kN ULS MIN COMPRESSION, 920 kN MIN TENSION
    - 14.2. 1000mm DIA. 15,000 kN ULS MIN COMPRESSION, 1050 kN MIN TENSION
    - 14.3. CONCRETE TO BE 35MPa AND FULLY REINFORCED
    - 14.4. BORE PILES IN ACCORDANCE WITH GEOTECHNICAL RECOMMENDATIONS.
15. UNLESS OTHERWISE NOTED, SET TOPS OF ALL PILE AND CAISSON CAPS (TPC) AT 450 BELOW FLOOR DATUM.
16. UNLESS NOTED OTHERWISE, DOWELS TO PIERS, COLUMNS AND WALLS TO MATCH VERTICAL REINFORCEMENT (INCLUDING ZONE REINFORCEMENT). LAP CLASS "B" WITH STEEL ABOVE.
17. UNLESS NOTED OTHERWISE, MINIMUM DOWELS TO WALLS AND GRADE BEAMS ABOVE TO BE 3-20 EACH FACE.

PILE CAP SCHEDULE

MARK	WIDTH	LENGTH	DEPTH	DEEP FOUNDATION	REMARKS
PC1A	1000	750	1500	1 - 245Ø PIPE PILE (PP1)	FOUNDATIONS FOR TIMBER COLUMNS AT OVAL CLASSROOM
PC1B	750	750	1500	1 - 245Ø PIPE PILE (PP1)	FOUNDATIONS FOR PERIMETER ENTRANCE SPINE COLUMNS
PC2	2000	1000	750	2 - 245Ø PIPE PILE (PP1)	FOUNDATIONS FOR SHIPPING AND RECEIVING AREA

CAISSON CAP SCHEDULE

MARK	WIDTH	LENGTH	DEPTH	DEEP FOUNDATION	REMARKS
CC1	1500	1500	1500	1 - 900Ø CONCRETE CAISSON (CN1)	INTERIOR COLUMN
CC2	1500	2100	1500	1 - 900Ø CONCRETE CAISSON (CN1)	PERIMETER COLUMN AT OFFSET FOUNDATION GRADE BEAM
CC3	1500	1500	1500	1 - 900Ø CONCRETE CAISSON (CN1)	PERIMETER COLUMN - CAISSON CAP IS OFFSET FROM COLUMN TO MATCH OUTSIDE FACE OF FOUNDATION GRADE BEAM
CC4	4000	1500	1500	1 - 900Ø CONCRETE CAISSON (CN1)	DOUBLE CAISSON CAP - USED TO BRIDGE EXISTING FOUNDATIONS AND AT HIGHER LOADS
CC5	1600	1600	1500	1 - 1000Ø CONCRETE CAISSON (CN2)	INTERIOR COLUMN
CC6	2100	2100	1500	1 - 1000Ø CONCRETE CAISSON (CN2)	TRANSFER BEAM COLUMN

CONCRETE SHEAR WALL RAFT SLAB

MARK	SIZE	REINFORCEMENT	REMARKS
CONCRETE SHEAR WALL RAFT	1500 DEEP, DIMENSION AS PER PLAN		CONCRETE CAISSON (CN1 OR CN2) AS PER PLAN LOCATIONS

CONCRETE COLUMN SCHEDULE

MARK	SIZE	VERTICAL REINFORCEMENT	HORIZONTAL TIES	CONCRETE GRADE	REMARKS
CL1			10@250	35MPa	
CL2	900Ø	17-30	10@250	35MPa	
CL3	750Ø	16-25	10@250	35MPa	
CL4	650Ø	14-25	10@250	35MPa	
CL5	1000Ø	14-25	10@250	35MPa	EXTERIOR COLUMN
CL7	1100Ø	27-30	10@250	35MPa	
CL8	1000Ø	17-30	10@250	35MPa	
CL9	900Ø	19-30	10@250	35MPa	
CL10	1500x1500	36-30	10@250	35MPa	
CL11	350x350	8-20	10@250	35MPa	
CL12	600Ø	12-25	10@250	35MPa	CANT COLUMN AT SPINE. CONTRACTOR TO TEMPORARY BRACE TO SUIT CONSTRUCTION SCHEDULE

CONCRETE WALL SCHEDULE

MARK	SIZE	REINFORCEMENT	CONCRETE GRADE	REMARKS
300 SHEAR WALL	300	15@300V, 15@250H + 18-30V & 10@250 TIES (ZONE REBAR)	35MPa	CONCRETE SHEAR WALL
400 SHEAR WALL	400	20@300V, 20@250H + 14-30V & 10@250 TIES (ZONE REBAR)	35MPa	CONCRETE SHEAR WALL
W1	250	15@300 V&H		FOUNDATION WALL

CONCRETE CAISSON SCHEDULE

MARK	TYPE	SHAFT DIAMETER	COUNT
CN1	BORED CONCRETE PILE	900	106
CN2	BORED CONCRETE PILE	1000	12

DRIVEN PIPE PILE SCHEDULE

MARK	TYPE	SIZE	COUNT
PP1	DRIVEN PIPE PILE	245Ø x 13	40

*NOTE: PILE AND CAISSON NUMBERS ARE PRELIMINARY ESTIMATES ONLY. ADDITIONAL NUMBERS MAY RESULT FROM ON-SITE CONDITIONS AND FURTHER DESIGN DEVELOPMENT

GRADE BEAM SCHEDULE

MARK	WIDTH	DEPTH	REINFORCEMENT	CONCRETE GRADE	REMARKS
GB1	750	750	12-25 + 3-10 @ 200 CLOSED STIRRUPS	30MPa	
GB2	750	1500	2-25 + 3-25T, 2-25+3-25B, 2-25+3-25B + 10@200 CLOSED STIRRUP, & 12-15@180 FACE STEEL		GRADE BEAM @ EXTERIOR OF OVAL CLASSROOM

ARCHITECTURE 49
1000-150 ISABELLA STREET
OTTAWA (ONTARIO) CANADA K1S 1V7
Phone: 613-238-0440 | Fax: 613-238-6597 | WWW.ARCHITECTURE49.COM

wsp
2611 Queensview Dr, Suite 300
Ottawa, Ontario, K2B 8K2 Canada
T 613-829-2800 | F 613-829-8299 | www.wsp.com

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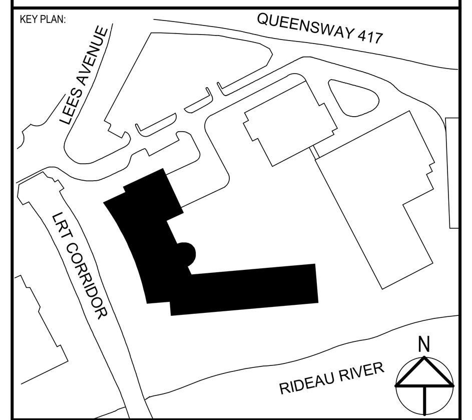
SEAL:

CLIENT: uOttawa

RFP #: 2020-40639 CLIENT REF. #: BT20-18477

PROJECT: University of Ottawa - Faculty of Health Sciences Building

KEY PLAN:



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PROJECT NO: 211-01094-00
DATE: 2021-04-15
ORIGINAL SCALE: As indicated
IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
25mm
DESIGNED BY: L.HAJSAID
DRAWN BY: P.MCKEE
CHECKED BY: S.HOWARD
DISCIPLINE: STRUCTURAL

TITLE: FOUNDATION PLAN

SHEET NUMBER: S200
SHEET #: OF
ISSUE: REV #
DATE OF:

LEVEL 1 FLOOR FRAMING PLAN NOTES

1. SEE GENERAL NOTES AND TYPICAL DETAILS ON S100 SERIES DRAWINGS.
2. LEVEL 1 FLOOR DATUM ELEVATION IS 63000 (GEODETIC).
3. UNLESS NOTED OTHERWISE ON PLAN, DESIGN LOADS ARE:

225/275 THICK CONC SLAB:	5.4/6.6 kN/m²
550/600 DEEP CONC BEAM:	13.2/14.4 kN/m²
PARTITIONS:	1.00 kN/m²
FLOORING:	0.10 kN/m²
MECH/ELEC	0.25 kN/m²
CEILING:	0.25 kN/m²
LIVE LOAD (LL) UNO:	4.8kN/m²
LIVE LOAD (LL) SHIPPING AND RECEIVING AREA:	9.6 kN/m²

4. SEE PLAN FOR SLAB ON GRADE THICKNESS AND REINFORCING.
5. TOP OF SOG IS ±0 FROM DATUM ELEVATION EXCEPT WHERE NOTED ±X ON PLAN. REFER TO ARCHITECTURAL DRAWINGS FOR SLOPES FOR DRAINAGE WHICH ARE NOT NECESSARILY INDICATED ON STRUCTURAL DRAWINGS. MAINTAIN THE SLAB THICKNESS SPECIFIED.
6. REFER TO ARCHITECTURAL DRAWINGS FOR LOCATIONS OF MASONRY PARTITIONS AND STAIRS SUPPORTED ON SOG AND PROVIDE SLAB THICKENING / ADDITIONAL REINFORCING PER TYPICAL DETAILS TC-SOG-11 TO 14.
7. REFER TO CONCRETE NOTES AND TYPICAL DETAILS FOR CONSTRUCTION JOINT AND CONTROL JOINT REQUIREMENTS. COORDINATE JOINT LOCATIONS WITH THE ARCHITECT.

SPECIFIC USER REQUIRED LOADING AND DESIGN REQUIREMENTS (BEYOND TYP. FLOOR LOADING)

ROOM NUMBER	LIVE LOAD	ADDITIONAL STRUCTURAL REQUIREMENTS	NOTES
B01 +	9.6 kPa		ALL ROOMS ASSOCIATED WITH SHIPPING AND RECEIVING AREA ON 200mm CONC. SLAB ON GRADE
B05	9.6 kPa		
BB8	7.2 kPa		
IT2B	9.6kPa		IT2B ROOM ON 200mm CONC. SLAB ON GRADE
IT2C	7.2 kPa		
IL20A		ANCHORING OF CEILING SUSPENDED EQUIPMENT - GAIT AND BALANCE SYSTEM	LOAD APPLIED TO LEVEL ABOVE
MR40		PROVIDE MECHANICAL AND VIBRATIONAL ISOLATION FOR SUSPENDED CAMERA RAIL SYSTEM TO AVOID VIBRATIONS; RELOCATE EXISTING. WWW.VICON.COM/HARDWARE/CAMERAS/VANTAGE. ANTIVIBRATION REQUIREMENTS: CANNOT VIBRATE AT ALL, CAMERA MEASURES WITH mm ACCURACY	LOAD APPLIED TO LEVEL ABOVE
MR7A		SUSPENSION OF HIGH VELOCITY IMPACTOR (PENDULUM EQUIPMENT) TO STRUCTURE AT CEILING, LATERAL REINFORCEMENT OF ENCLOSING PARTITIONS TO OTHER ANCHOR POINTS. CONCRETE SUPPORT REQUIRE - MAY REQUIRE EMBEDS INTO CONCRETE SLAB	LOAD APPLIED TO LEVEL ABOVE, PROVIDE LATERAL RESTRAINT AT TOP OF MASONRY PARTITION WALLS AS PER TYP. DETAILS AND ADDITIONAL LATERAL REINFORCEMENT AS REQUIRED.
MR7D		VALIDATE DEAD LOAD OF SPECIALTY EQUIPMENT AND PROVIDE STRUCTURAL REINFORCEMENT AS REQUIRED.	PROVIDE VIBRATION ISOLATION PAD FOR COMPRESSOR

CONCRETE COLUMN SCHEDULE

MARK	SIZE	VERTICAL REINFORCEMENT	HORIZONTAL TIES	CONCRETE GRADE	REMARKS
CL1			10@250	35MPa	
CL2	900Ø	17-30	10@250	35MPa	
CL3	750Ø	16-25	10@250	35MPa	
CL4	650Ø	14-25	10@250	35MPa	
CL5	1000Ø	14-25	10@250	35MPa	EXTERIOR COLUMN
CL7	1100Ø	27-30	10@250	35MPa	
CL8	1000Ø	17-30	10@250	35MPa	
CL9	900Ø	19-30	10@250	35MPa	
CL10	1500x1500	36-30	10@250	35MPa	
CL11	350x350	8-20	10@250	35MPa	
CL12	600Ø	12-25	10@250	35MPa	CANT COLUMN AT SPINE. CONTRACTOR TO TEMPORARY BRACE TO SUIT CONSTRUCTION SCHEDULE

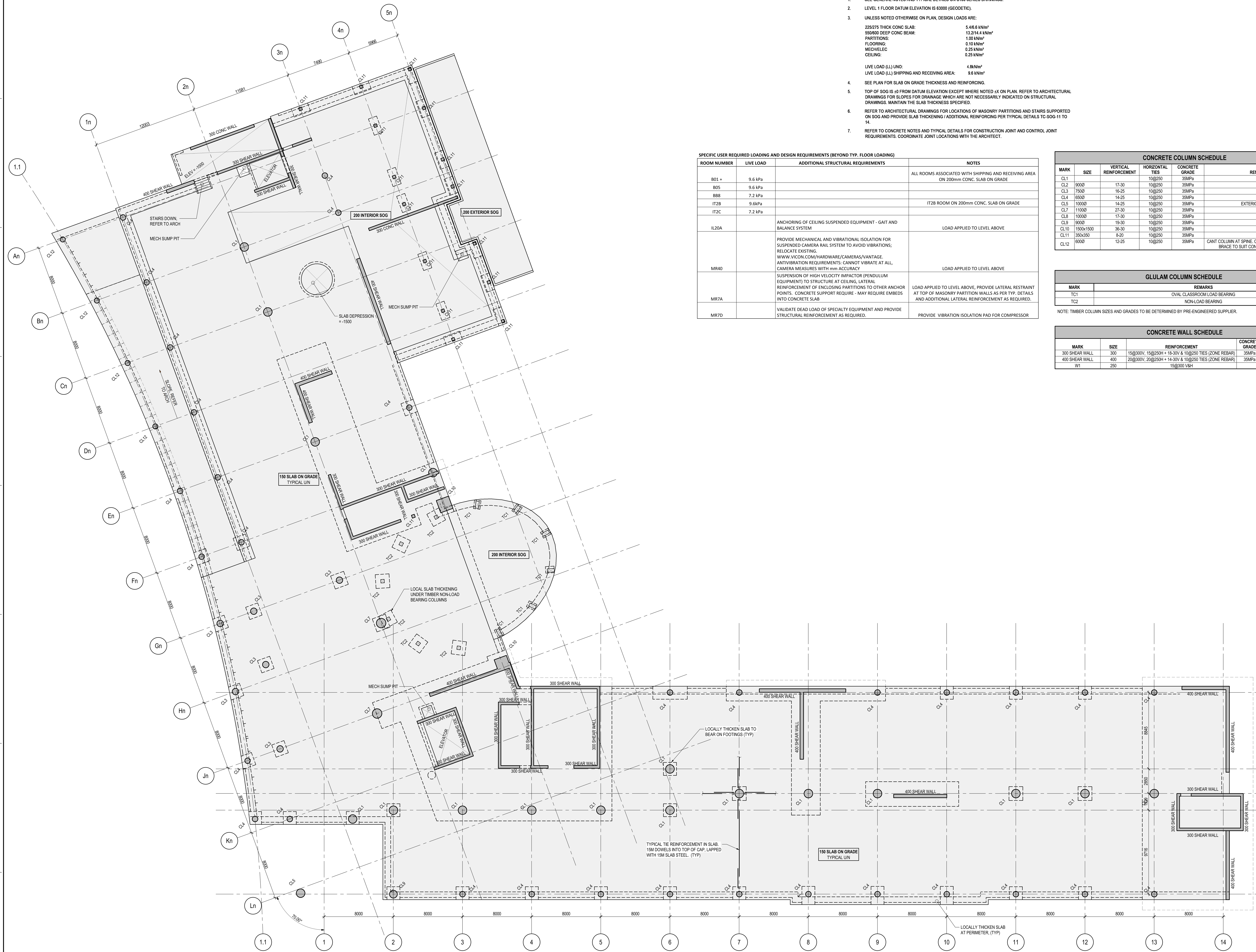
GLULAM COLUMN SCHEDULE

MARK	REMARKS
TC1	OVAL CLASSROOM LOAD BEARING
TC2	NON-LOAD BEARING

NOTE: TIMBER COLUMN SIZES AND GRADES TO BE DETERMINED BY PRE-ENGINEERED SUPPLIER.

CONCRETE WALL SCHEDULE

MARK	SIZE	REINFORCEMENT	CONCRETE GRADE	REMARKS
300 SHEAR WALL	300	15@300V, 15@250H + 18-30V & 10@250 TIES (ZONE REBAR)	35MPa	CONCRETE SHEAR WALL
400 SHEAR WALL	400	20@300V, 20@250H + 14-30V & 10@250 TIES (ZONE REBAR)	35MPa	CONCRETE SHEAR WALL
W1	250	15@300 V&H		FOUNDATION WALL



1 LEVEL 1 FRAMING PLAN
S201 1 : 150

ARCHITECTURE 49
1000-150 ISABELLA STREET
OTTAWA (ONTARIO) CANADA K1S 1V7
Phone: 613-238-0440 | Fax: 613-238-6597 | WWW.ARCHITECTURE49.COM

wsp
2611 Queensview Dr, Suite 300
Ottawa, Ontario, K2B 8K2 Canada
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SEAL:

CLIENT:
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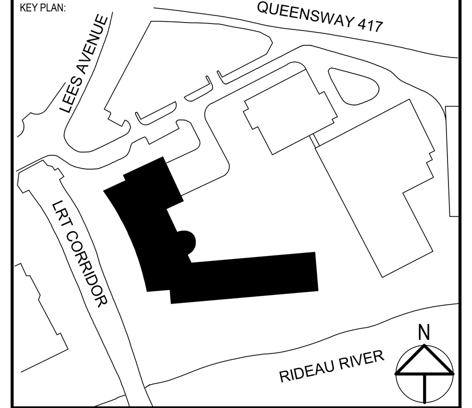
RFP #: 2020-40639 CLIENT REF. #: BT20-18477

PROJECT:
University of Ottawa - Faculty of Health Sciences Building

KEY PLAN:



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PROJECT NO: 211-01094-00	DATE: 2021-04-15
ORIGINAL SCALE: As indicated	IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
DESIGNED BY: L.HAJSAID	
DRAWN BY: P.MCKEE	
CHECKED BY: S.HOWARD	25mm

DISCIPLINE: STRUCTURAL

TITLE: LEVEL 1 FRAMING PLAN

SHEET NUMBER: S201

SHEET #: OF

ISSUE: REV #

DATE OF:

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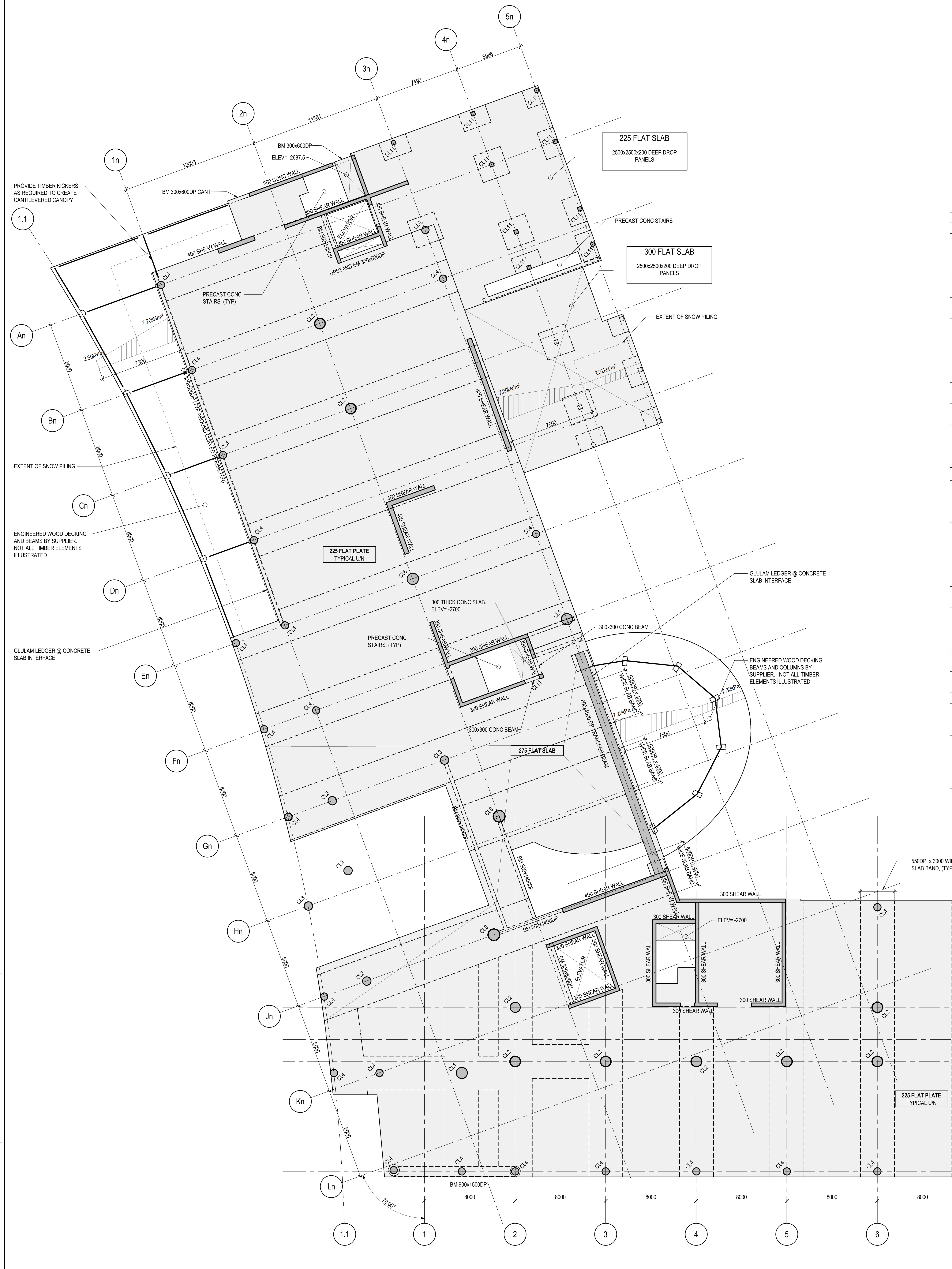


LEVEL 2 FRAMING PLAN
1 : 150

LEVEL 2 FLOOR FRAMING PLAN NOTES

1. SEE GENERAL NOTES AND TYPICAL DETAILS ON S100 SERIES DRAWINGS.
2. SEE DRAWING S300 FOR CONCRETE BEAM SCHEDULE.
3. LEVEL 2 FLOOR DATUM ELEVATION IS 68400 (GEODETIC EL).
4. DESIGN LOADS (IN kN/m²) ARE AS FOLLOWS:

225/275 THICK CONC SLAB:	5.4/6.6 kN/m²
550/600 DEEP CONC BEAM:	13.2/14.4 kN/m²
PARTITIONS:	1.00 kN/m²
FLOORING:	0.10 kN/m²
MECH/ELEC:	0.25 kN/m²
CEILING:	0.25 kN/m²

LIVE LOAD (LL) UNO*

OFFICES:	2.4 kN/m²
LAB/TREATMENT/SIMULATOR ROOMS:	3.6 kN/m²
WASHROOMS:	2.4 kN/m²
EXITS/HALLWAYS:	4.8 kN/m²
MEETING/BREAK-OUT/ACTIVITY ROOMS:	4.8 kN/m²
STORAGE ROOMS:	7.2 kN/m²
MECHANICAL/ELECTRICAL SPACES:	7.2 kN/m²

*SEE TABLE ON PLAN IDENTIFYING ROOMS WITH USER REQUIRED LIVE LOADS HIGHER THAN LISTED ABOVE AND/OR ADDITIONAL LOADING AND DESIGN REQUIREMENTS. REFER TO ARCH. PLANS FOR ROOM LOCATIONS. NOTE SOME STRUCTURAL REQUIREMENTS MAY AFFECT LEVEL OF STRUCTURE ABOVE.

5. EXTERIOR ROOF AREA LOADS (IN kN/m²) ARE AS FOLLOWS:

300 THICK CONC SLAB:	7.2 kN/m²
225/275 THICK CONC SLAB:	5.4/6.6 kN/m²
550/600 DEEP CONC BEAM:	13.2/14.4 kN/m²
ROOFING AND INSULATION:	0.60 kN/m²
MECH/ELEC:	0.25 kN/m²
CEILING:	0.25 kN/m²
TIMBER ASSEMBLY BY PROVIDER	

LIVE LOAD (LL) UNO*

LIVE LOAD:	1.0 kN/m²
SNOW:	2.32 kN/m² + DRIFTING AS SHOWN ON PLAN

6. UNLESS OTHERWISE NOTED ON PLANS OR DETAILS, THE FOLLOWING DATA APPLIES:
   - 6.1. TOP OF SLAB IS ±0 FROM FLOOR DATUM ELEVATION EXCEPT AS CROSSED AND NOTED ±X ON PLAN.
   - 6.2. WHERE BEAMS ARE NOTED THUS ±X , X IS THE DISTANCE TO TOP OF BEAM FROM FLOOR DATUM.
   - 6.3. REFER TO TYPICAL DETAILS TC-SL-62 AND TC-SL-63 FOR MAXIMUM SIZES AND PLACING RESTRICTIONS OF OPENINGS IN FORMED SLABS AND FOR ADDITIONAL REINFORCING AROUND THEM.
7. WHERE EQUIPMENT OR MECHANICAL LOADS ARE SHOWN ON PLAN, THE VALUES ARE ASSUMED. CONFIRM EXACT MAGNITUDE AND POSITION OF MECHANICAL LOADS WITH MECHANICAL SHOP DRAWINGS AND NOTIFY WSP-S IF ASSUMED VALUES ARE EXCEEDED.

SPECIFIC USER REQUIRED LOADING AND DESIGN REQUIREMENTS (BEYOND TYP. FLOOR LOADING)

ROOM NUMBER	LIVE LOAD	ADDITIONAL STRUCTURAL REQUIREMENTS	NOTES
BB25	7.2 kPa		
BB25/BB14	7.2 kPa		
BB8	7.2 kPa		
AD2		VALIDATE DEAD LOAD OF AUDIOMETRIC BOOTHS AND VIBRATION ISOLATION REQUIREMENTS	
AD3		VALIDATE DEAD LOAD OF AUDIOMETRIC BOOTHS AND VIBRATION ISOLATION REQUIREMENTS	
AD4C		VALIDATE DEAD LOAD OF AUDIOMETRIC BOOTHS AND VIBRATION ISOLATION REQUIREMENTS MODEL 120-ACT4	
AD4D		VALIDATE DEAD LOAD OF AUDIOMETRIC BOOTHS AND VIBRATION ISOLATION REQUIREMENTS MODEL 120-ACT4	
FS2		ANCHORAGE OF CEILING SUSPENDED ROLL-DOWN BARRIER/MOVEABLE PARTITIONS	LOAD APPLIED TO LEVEL ABOVE
IL10		VALIDATE DEAD LOAD OF AUDIOMETRIC SUITES AND VIBRATION ISOLATION REQUIREMENTS	
IL15B		SUPPORT FOR ANCHORAVE OF RELOCATED CEILING MOUNTED HOYER LIFT DEVICE (RADIUS APPROX. +/- 1630mm	LOAD APPLIED TO LEVEL ABOVE
IL15C		SUPPORT FOR ANCHORAGE OF CEILING MOUNTED PATIENT LIFT DEVICE AT HOSPITAL BED LOCATION	LOAD APPLIED TO LEVEL ABOVE
IL8A		VALIDATE DEAD LOAD OF AUDIOMETRIC SUITES AND VIBRATION ISOLATION REQUIREMENTS	
IL8B		VALIDATE DEAD LOAD OF AUDIOMETRIC SUITES AND VIBRATION ISOLATION REQUIREMENTS	

ROOM NUMBER	LIVE LOAD	ADDITIONAL STRUCTURAL REQUIREMENTS	NOTES
MR27A		VALIDATE DEAD LOAD OF SPECIALTY EQUIPMENT AND PROVIDE STRUCTURAL REINFORCEMENT AS REQUIRED, SLAB TREATMENT AT UNDERSIDE OF WALK-IN COLD ROOM	
MR27B		VALIDATE DEAD LOAD OF SPECIALTY EQUIPMENT AND PROVIDE STRUCTURAL REINFORCING AS REQUIRED	
MR27C		VALIDATE DEAD LOAD OF SPECIALTY EQUIPMENT AND PROVIDE STRUCTURAL REINFORCING AS REQUIRED	
MR27D		VALIDATE DEAD LOAD OF SPECIALTY EQUIPMENT AND PROVIDE STRUCTURAL REINFORCING AS REQUIRED	
MR31		DEXA MACHINE (INCLUDING MAX. PATIENT WEIGHT 450 LBS) = 1100 - 1200 LBS (5kN - 5.4 kN	
MR61		PROVIDE CEILING MOUNT FOR FOLDING WALL BETWEEN MR63 AND MR62	LOAD APPLIED TO LEVEL ABOVE
MR62		PROVIDE CEILING MOUNT FOR FOLDING WALL BETWEEN MR63 AND MR61	LOAD APPLIED TO LEVEL ABOVE
MR63		PROVIDE CEILING MOUNT FOR FOLDING WALL BETWEEN MR62 AND MR61	LOAD APPLIED TO LEVEL ABOVE
MR67		PROVIDE CEILING MOUNT FOR TOOL BALANCER	LOAD APPLIED TO LEVEL ABOVE
MR68		PROVIDE CEILING MOUNT FOR TOOL BALANCER	LOAD APPLIED TO LEVEL ABOVE
MR69		PROVIDE CEILING MOUNT FOR CABLE MANAGEMENT	LOAD APPLIED TO LEVEL ABOVE
MR70		RAIL IS CEILING MOUNTED AN DNEW. OVERHEAD RAIL FOR CEILING MOUNTED CAMERA. REQUIRE REINFORCING AND VIBRATION DAMPENING. WWW.VICON.COM/HARDWARE/CAMERAS/VANTAGE	LOAD APPLIED TO LEVEL ABOVE
MR8		CEILING RAIL TO BE STRUCTURALLY SUPPORTED AND TO PROVIDE VIBRATION CONTORL. ANTIVIBRATION REQUIREMENTS: CANNOT VIBRATE AT ALL, CAMERA MEASURES WITH mm ACCURACY	LOAD APPLIED TO LEVEL ABOVE
WR2B		SUPPORT FOR ANCHORAGE OF WALL MOUNTED GAS TANKS NEAR INCUBATOR	

CONCRETE COLUMN SCHEDULE

MARK	SIZE	VERTICAL REINFORCEMENT	HORIZONTAL TIES	CONCRETE GRADE	REMARKS
CL1			10@250	35MPa	
CL2	900Ø	17-30	10@250	35MPa	
CL3	750Ø	16-25	10@250	35MPa	
CL4	650Ø	14-25	10@250	35MPa	
CL5	1000Ø	14-25	10@250	35MPa	EXTERIOR COLUMN
CL7	1100Ø	27-30	10@250	35MPa	
CL8	1000Ø	17-30	10@250	35MPa	
CL9	900Ø	19-30	10@250	35MPa	
CL10	1500x1500	36-30	10@250	35MPa	
CL11	350x350	8-20	10@250	35MPa	
CL12	600Ø	12-25	10@250	35MPa	CANT COLUMN AT SPINE. CONTRACTOR TO TEMPORARY BRACE TO SUIT CONSTRUCTION SCHEDULE

CONCRETE WALL SCHEDULE

MARK	SIZE	REINFORCEMENT	CONCRETE GRADE	REMARKS
300 SHEAR WALL	300	15@300V, 15@250H + 18-30V & 10@250 TIES (ZONE REBAR)	35MPa	CONCRETE SHEAR WALL
400 SHEAR WALL	400	20@300V, 20@250H + 14-30V & 10@250 TIES (ZONE REBAR)	35MPa	CONCRETE SHEAR WALL
W1	250	15@300 V&H		FOUNDATION WALL

ROOM NUMBER	LIVE LOAD	ADDITIONAL STRUCTURAL REQUIREMENTS	NOTES
MR1		STRUCTURAL SUPPORT FOR SUSPENDED CABLE, HARNESS AND PARTICIPANT LOAD	STANDARDS TO BE FOLLOWED: CSA Z259
MR10		BIODEX DYNAMOMETER MASS (WITHOUT PATIENT): 1350LBS; VALIDATE DEAD LOAD OF SPECIALTY EQUIPMENT AND PROVIDE STRUCTURAL REINFORCEMENT AS REQUIRED	
MR13		CEILING RAIL TO BE STRUCTURALLY SUPPORTED AND TO PROVIDE VIBRATION CONTORL. ANTIVIBRATION REQUIREMENTS: CANNOT VIBRATE AT ALL, CAMERA MEASURES WITH mm ACCURACY	
MR16		CEILING RAIL TO BE STRUCTURALY SUPPORTED AND PROVIDE VIBRATION CONTROL. CEILING RAIL TO BE STRUCTURALLY SUPPORTED AND TO PROVIDE VIBRATION CONTORL. ANTIVIBRATION REQUIREMENTS: CANNOT VIBRATE AT ALL, CAMERA MEASURES WITH mm ACCURACY	LOAD APPLIED TO LEVEL ABOVE
MR22		CEILING RAIL TO BE STRUCTURALLY SUPPORTED AND TO PROVIDE VIBRATION CONTORL. ANTIVIBRATION REQUIREMENTS: CANNOT VIBRATE AT ALL, CAMERA MEASURES WITH mm ACCURACY	LOAD APPLIED TO LEVEL ABOVE

ARCHITECTURE 49
1000-150 ISABELLA STREET
OTTAWA (ONTARIO) CANADA K1S 1V7
Phone: 613-238-0440 | Fax: 613-238-6597 | WWW.ARCHITECTURE49.COM

wsp
2611 Queensview Dr, Suite 300
Ottawa, Ontario, K2B 8K2 Canada
T 613-829-2800 | F 613-829-8299 | www.wsp.com

PCL CONSTRUCTION
49 Auriga Drive
Ottawa, Ontario, K2E 8A1 Canada
T 613-978-5398 | www.pcl.com

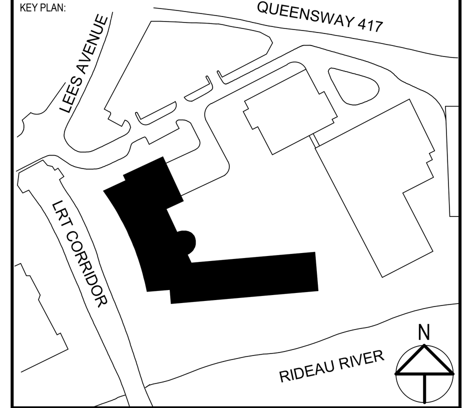
SEAL:

CLIENT: uOttawa

RFP #: 2020-40639 CLIENT REF. #: BT20-18477

PROJECT: University of Ottawa - Faculty of Health Sciences Building

KEY PLAN:



ISSUED FOR - REVISION:

IS	RE	DATE	DESCRIPTION
1		2021-04-15	ISSUED FOR TECHNICAL SUBMISSION

PROJECT NO: 211-01094-00	DATE: 2021-04-15
ORIGINAL SCALE: As indicated	IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
DESIGNED BY: L.HAJSAID	
DRAWN BY: P.MCKEE	
CHECKED BY: S.HOWARD	25mm

DISCIPLINE: STRUCTURAL

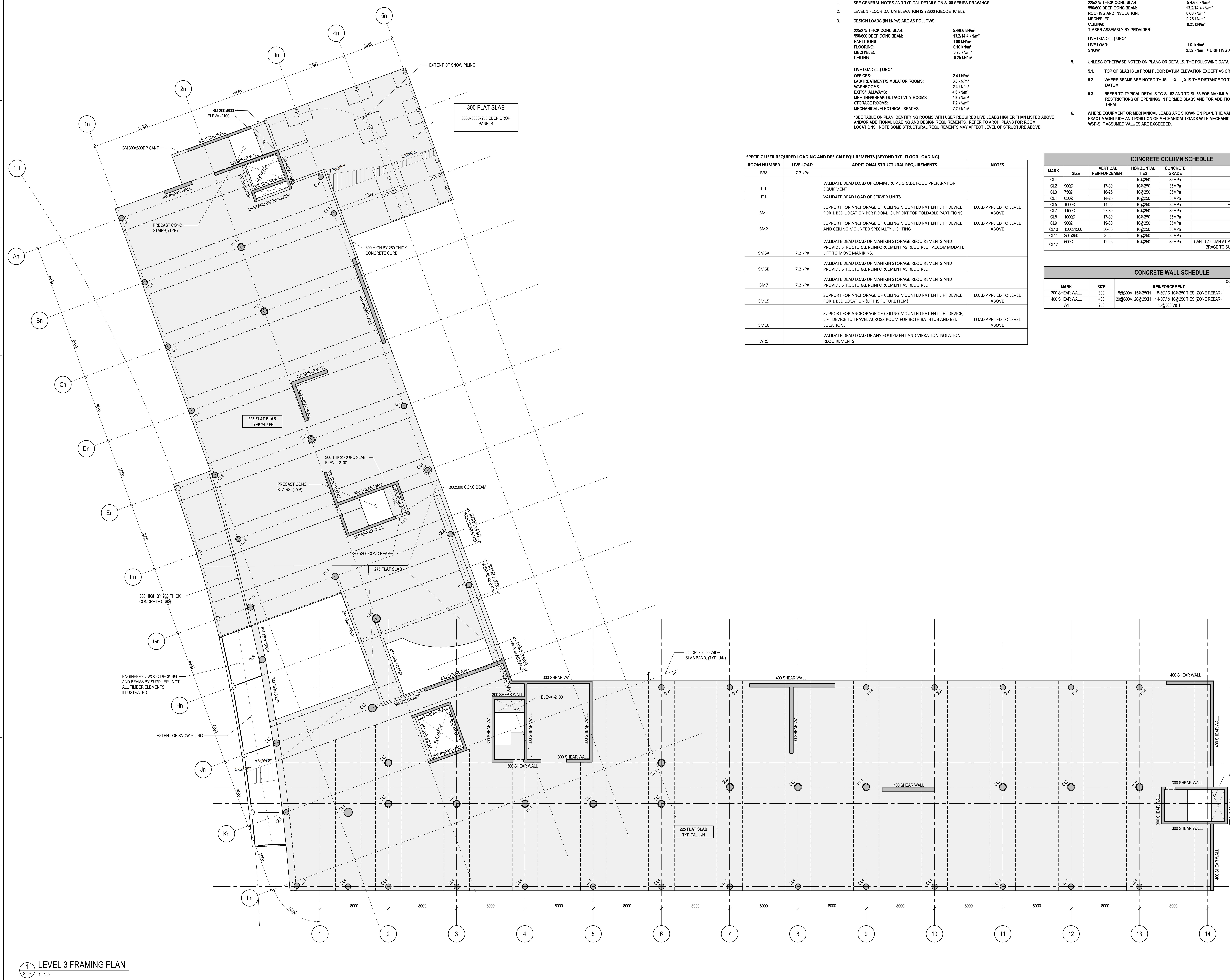
TITLE: LEVEL 2 FRAMING PLAN

SHEET NUMBER: S202

SHEET #: OF

ISSUE: REV #

DATE OF:



LEVEL 3 FLOOR FRAMING PLAN NOTES

1. SEE GENERAL NOTES AND TYPICAL DETAILS ON S100 SERIES DRAWINGS.
2. LEVEL 3 FLOOR DATUM ELEVATION IS 72600 (GEODETIC EL).
3. DESIGN LOADS (IN kN/m²) ARE AS FOLLOWS:

225/275 THICK CONC SLAB:	5.4/6.6 kN/m²
550/600 DEEP CONC BEAM:	13.2/14.4 kN/m²
PARTITIONS:	1.00 kN/m²
FLOORING:	0.10 kN/m²
MECH/ELEC:	0.25 kN/m²
CEILING:	0.25 kN/m²

LIVE LOAD (LL) UNO*

OFFICES:	2.4 kN/m²
LAB/TREATMENT/SIMULATOR ROOMS:	3.6 kN/m²
WASHROOMS:	2.4 kN/m²
EXITS/HALLWAYS:	4.8 kN/m²
MEETING/BREAK-OUT/ACTIVITY ROOMS:	4.8 kN/m²
STORAGE ROOMS:	7.2 kN/m²
MECHANICAL/ELECTRICAL SPACES:	7.2 kN/m²

*SEE TABLE ON PLAN IDENTIFYING ROOMS WITH USER REQUIRED LIVE LOADS HIGHER THAN LISTED ABOVE AND/OR ADDITIONAL LOADING AND DESIGN REQUIREMENTS. REFER TO ARCH. PLANS FOR ROOM LOCATIONS. NOTE SOME STRUCTURAL REQUIREMENTS MAY AFFECT LEVEL OF STRUCTURE ABOVE.

4. EXTERIOR ROOF AREA LOADS (IN kN/m²) ARE AS FOLLOWS:

300 THICK CONC SLAB:	7.2 kN/m²
225/275 THICK CONC SLAB:	5.4/6.6 kN/m²
550/600 DEEP CONC BEAM:	13.2/14.4 kN/m²
ROOFING AND INSULATION:	0.60 kN/m²
MECH/ELEC:	0.25 kN/m²
CEILING:	0.25 kN/m²
TIMBER ASSEMBLY BY PROVIDER	

LIVE LOAD (LL) UNO*

LIVE LOAD:	1.0 kN/m²
SNOW:	2.32 kN/m² + DRIFTING AS SHOWN ON PLAN

5. UNLESS OTHERWISE NOTED ON PLANS OR DETAILS, THE FOLLOWING DATA APPLIES:
   - 5.1. TOP OF SLAB IS ±0 FROM FLOOR DATUM ELEVATION EXCEPT AS CROSSED AND NOTED ±X ON PLAN.
   - 5.2. WHERE BEAMS ARE NOTED THUS ±X , X IS THE DISTANCE TO TOP OF BEAM FROM FLOOR DATUM.
   - 5.3. REFER TO TYPICAL DETAILS TC-SL-62 AND TC-SL-63 FOR MAXIMUM SIZES AND PLACING RESTRICTIONS OF OPENINGS IN FORMED SLABS AND FOR ADDITIONAL REINFORCING AROUND THEM.
6. WHERE EQUIPMENT OR MECHANICAL LOADS ARE SHOWN ON PLAN, THE VALUES ARE ASSUMED. CONFIRM EXACT MAGNITUDE AND POSITION OF MECHANICAL LOADS WITH MECHANICAL SHOP DRAWINGS AND NOTIFY WSP-S IF ASSUMED VALUES ARE EXCEEDED.

SPECIFIC USER REQUIRED LOADING AND DESIGN REQUIREMENTS (BEYOND TYP. FLOOR LOADING)

ROOM NUMBER	LIVE LOAD	ADDITIONAL STRUCTURAL REQUIREMENTS	NOTES
BB8	7.2 kPa		
IL1		VALIDATE DEAD LOAD OF COMMERCIAL GRADE FOOD PREPARATION EQUIPMENT	
IT1		VALIDATE DEAD LOAD OF SERVER UNITS	
SM1		SUPPORT FOR ANCHORAGE OF CEILING MOUNTED PATIENT LIFT DEVICE FOR 1 BED LOCATION PER ROOM. SUPPORT FOR FOLDABLE PARTITIONS.	LOAD APPLIED TO LEVEL ABOVE
SM2		SUPPORT FOR ANCHORAGE OF CEILING MOUNTED PATIENT LIFT DEVICE AND CEILING MOUNTED SPECIALTY LIGHTING	LOAD APPLIED TO LEVEL ABOVE
SM6A	7.2 kPa	VALIDATE DEAD LOAD OF MANIKIN STORAGE REQUIREMENTS AND PROVIDE STRUCTURAL REINFORCEMENT AS REQUIRED. ACCOMMODATE LIFT TO MOVE MANIKINS.	
SM6B	7.2 kPa	VALIDATE DEAD LOAD OF MANIKIN STORAGE REQUIREMENTS AND PROVIDE STRUCTURAL REINFORCEMENT AS REQUIRED.	
SM7	7.2 kPa	VALIDATE DEAD LOAD OF MANIKIN STORAGE REQUIREMENTS AND PROVIDE STRUCTURAL REINFORCEMENT AS REQUIRED.	
SM15		SUPPORT FOR ANCHORAGE OF CEILING MOUNTED PATIENT LIFT DEVICE FOR 1 BED LOCATION (LIFT IS FUTURE ITEM)	LOAD APPLIED TO LEVEL ABOVE
SM16		SUPPORT FOR ANCHORAGE OF CEILING MOUNTED PATIENT LIFT DEVICE; LIFT DEVICE TO TRAVEL ACROSS ROOM FOR BOTH BATHTUB AND BED LOCATIONS	LOAD APPLIED TO LEVEL ABOVE
WR5		VALIDATE DEAD LOAD OF ANY EQUIPMENT AND VIBRATION ISOLATION REQUIREMENTS	

CONCRETE COLUMN SCHEDULE

MARK	SIZE	VERTICAL REINFORCEMENT	HORIZONTAL TIES	CONCRETE GRADE	REMARKS
CL1			10@250	35MPa	
CL2	900Ø	17-30	10@250	35MPa	
CL3	750Ø	16-25	10@250	35MPa	
CL4	650Ø	14-25	10@250	35MPa	
CL5	1000Ø	14-25	10@250	35MPa	EXTERIOR COLUMN
CL7	1100Ø	27-30	10@250	35MPa	
CL8	1000Ø	17-30	10@250	35MPa	
CL9	900Ø	19-30	10@250	35MPa	
CL10	1500x1500	36-30	10@250	35MPa	
CL11	350x350	8-20	10@250	35MPa	
CL12	600Ø	12-25	10@250	35MPa	CANT COLUMN AT SPINE. CONTRACTOR TO TEMPORARY BRACE TO SUIT CONSTRUCTION SCHEDULE

CONCRETE WALL SCHEDULE

MARK	SIZE	REINFORCEMENT	CONCRETE GRADE	REMARKS
300 SHEAR WALL	300	15@300V, 15@250H + 18-30V & 10@250 TIES (ZONE REBAR)	35MPa	CONCRETE SHEAR WALL
400 SHEAR WALL	400	20@300V, 20@250H + 14-30V & 10@250 TIES (ZONE REBAR)	35MPa	CONCRETE SHEAR WALL
W1	250	15@300 V&H		FOUNDATION WALL

1 / S203 LEVEL 3 FRAMING PLAN
1 : 150

ARCHITECTURE 49
1000-150 ISABELLA STREET
OTTAWA (ONTARIO) CANADA K1S 1V7
Phone: 613-238-0440 | Fax: 613-238-6597 | WWW.ARCHITECTURE49.COM

WSP
2611 Queensview Dr, Suite 300
Ottawa, Ontario, K2B 8K2 Canada
T 613-829-2800 | F 613-829-8299 | www.wsp.com

PCL CONSTRUCTION
49 Auriga Drive
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T 613-978-5398 | www.pcl.com

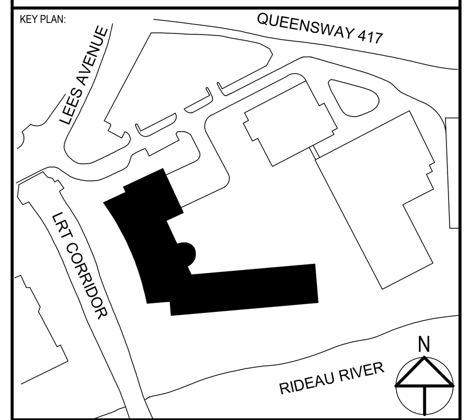
SEAL:

CLIENT: uOttawa

RFP #: 2020-40639 CLIENT REF. #: BT20-18477

PROJECT: University of Ottawa - Faculty of Health Sciences Building

KEY PLAN:



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PROJECT NO: 211-01094-00
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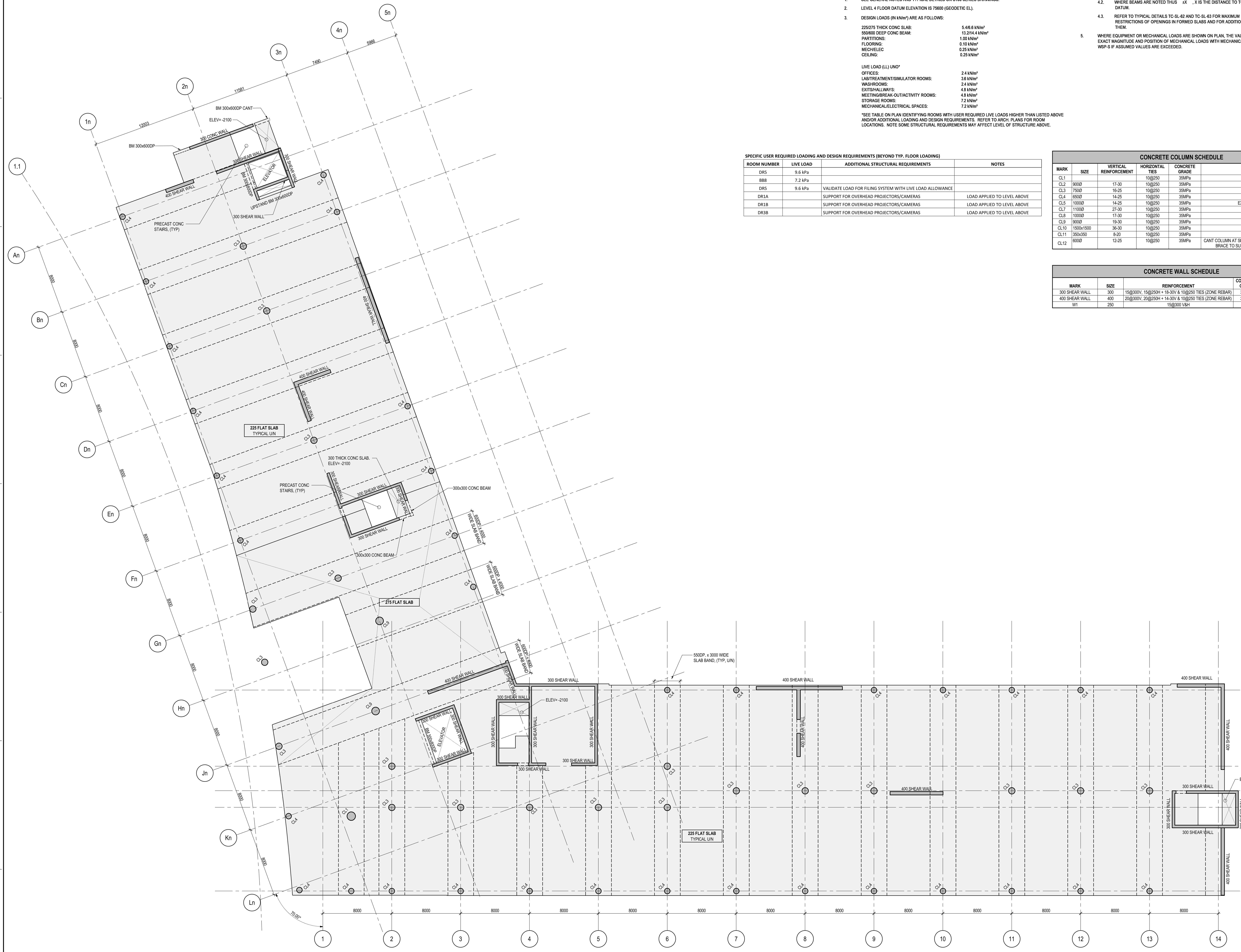
25mm
DESIGNED BY: L.HAJSAID
DRAWN BY: P.MCKEE
CHECKED BY: S.HOWARD
DISCIPLINE: STRUCTURAL
TITLE: LEVEL 3 FRAMING PLAN
SHEET NUMBER: S203
SHEET #: OF
ISSUE: REV #
DATE OF:



1 LEVEL 4 FRAMING PLAN

S204 1 : 150

LEVEL 4 FLOOR FRAMING PLAN NOTES

1. SEE GENERAL NOTES AND TYPICAL DETAILS ON S100 SERIES DRAWINGS.
2. LEVEL 4 FLOOR DATUM ELEVATION IS 75600 (GEODETIC EL).
3. DESIGN LOADS (IN kN/m²) ARE AS FOLLOWS:

225/275 THICK CONC SLAB:	5.4/6.6 kN/m²
550/600 DEEP CONC BEAM:	13.2/14.4 kN/m²
PARTITIONS:	1.00 kN/m²
FLOORING:	0.10 kN/m²
MECH/ELEC	0.25 kN/m²
CEILING:	0.25 kN/m²

LIVE LOAD (LL) UNO*

OFFICES:	2.4 kN/m²
LAB/TREATMENT/SIMULATOR ROOMS:	3.6 kN/m²
WASHROOMS:	2.4 kN/m²
EXITS/HALLWAYS:	4.8 kN/m²
MEETING/BREAK-OUT/ACTIVITY ROOMS:	4.8 kN/m²
STORAGE ROOMS:	7.2 kN/m²
MECHANICAL/ELECTRICAL SPACES:	7.2 kN/m²

*SEE TABLE ON PLAN IDENTIFYING ROOMS WITH USER REQUIRED LIVE LOADS HIGHER THAN LISTED ABOVE AND/OR ADDITIONAL LOADING AND DESIGN REQUIREMENTS. REFER TO ARCH. PLANS FOR ROOM LOCATIONS. NOTE SOME STRUCTURAL REQUIREMENTS MAY AFFECT LEVEL OF STRUCTURE ABOVE.

4. UNLESS OTHERWISE NOTED ON PLANS OR DETAILS, THE FOLLOWING DATA APPLIES:
   - 4.1. TOP OF SLAB IS ±0 FROM FLOOR DATUM ELEVATION EXCEPT AS CROSSED AND NOTED ±X ON PLAN.
   - 4.2. WHERE BEAMS ARE NOTED THUS ±X , X IS THE DISTANCE TO TOP OF BEAM FROM FLOOR DATUM.
   - 4.3. REFER TO TYPICAL DETAILS TC-SL-62 AND TC-SL-63 FOR MAXIMUM SIZES AND PLACING RESTRICTIONS OF OPENINGS IN FORMED SLABS AND FOR ADDITIONAL REINFORCING AROUND THEM.
5. WHERE EQUIPMENT OR MECHANICAL LOADS ARE SHOWN ON PLAN, THE VALUES ARE ASSUMED. CONFIRM EXACT MAGNITUDE AND POSITION OF MECHANICAL LOADS WITH MECHANICAL SHOP DRAWINGS AND NOTIFY WSP-S IF ASSUMED VALUES ARE EXCEEDED.

SPECIFIC USER REQUIRED LOADING AND DESIGN REQUIREMENTS (BEYOND TYP. FLOOR LOADING)

ROOM NUMBER	LIVE LOAD	ADDITIONAL STRUCTURAL REQUIREMENTS	NOTES
DR5	9.6 kPa		
BB8	7.2 kPa		
DR5	9.6 kPa	VALIDATE LOAD FOR FILING SYSTEM WITH LIVE LOAD ALLOWANCE	
DR1A		SUPPORT FOR OVERHEAD PROJECTORS/CAMERAS	LOAD APPLIED TO LEVEL ABOVE
DR1B		SUPPORT FOR OVERHEAD PROJECTORS/CAMERAS	LOAD APPLIED TO LEVEL ABOVE
DR3B		SUPPORT FOR OVERHEAD PROJECTORS/CAMERAS	LOAD APPLIED TO LEVEL ABOVE

CONCRETE COLUMN SCHEDULE

MARK	SIZE	VERTICAL REINFORCEMENT	HORIZONTAL TIES	CONCRETE GRADE	REMARKS
CL1			10@250	35MPa	
CL2	900Ø	17-30	10@250	35MPa	
CL3	750Ø	16-25	10@250	35MPa	
CL4	650Ø	14-25	10@250	35MPa	
CL5	1000Ø	14-25	10@250	35MPa	EXTERIOR COLUMN
CL7	1100Ø	27-30	10@250	35MPa	
CL8	1000Ø	17-30	10@250	35MPa	
CL9	900Ø	19-30	10@250	35MPa	
CL10	1500x1500	36-30	10@250	35MPa	
CL11	350x350	8-20	10@250	35MPa	
CL12	600Ø	12-25	10@250	35MPa	CANT COLUMN AT SPINE. CONTRACTOR TO TEMPORARY BRACE TO SUIT CONSTRUCTION SCHEDULE

CONCRETE WALL SCHEDULE

MARK	SIZE	REINFORCEMENT	CONCRETE GRADE	REMARKS
300 SHEAR WALL	300	15@300V, 15@250H + 18-30V & 10@250 TIES (ZONE REBAR)	35MPa	CONCRETE SHEAR WALL
400 SHEAR WALL	400	20@300V, 20@250H + 14-30V & 10@250 TIES (ZONE REBAR)	35MPa	CONCRETE SHEAR WALL
W1	250	15@300 V&H		FOUNDATION WALL

ARCHITECTURE 49
1000-150 ISABELLA STREET
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WSP
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SEAL:

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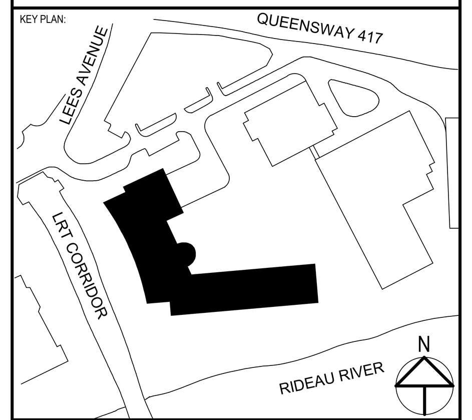
RFP #: 2020-40639 CLIENT REF. #: BT20-18477

PROJECT: University of Ottawa - Faculty of Health Sciences Building

KEY PLAN:



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IS	RE	DATE	DESCRIPTION
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PROJECT NO: 211-01094-00
DATE: 2021-04-15
ORIGINAL SCALE: As indicated
IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
25mm
DESIGNED BY: L.HAJSAID
DRAWN BY: P.MCKEE
CHECKED BY: S.HOWARD
DISCIPLINE: STRUCTURAL
TITLE: LEVEL 4 FRAMING PLAN
SHEET NUMBER: S204
SHEET #: OF
ISSUE:
REV #
DATE OF:

LEVEL 5 FLOOR FRAMING PLAN NOTES

1. SEE GENERAL NOTES AND TYPICAL DETAILS ON S100 SERIES DRAWINGS.
2. LEVEL 5 FLOOR DATUM ELEVATION IS 81000 (GEODETIC EL).
3. INTERIOR DESIGN LOADS (IN kN/m²) ARE AS FOLLOWS:

225/275 THICK CONC SLAB:	5.4/6.6 kN/m²
550/600 DEEP CONC BEAM:	13.2/14.4 kN/m²
PARTITIONS (OFFICE AND SHELL SPACE):	1.0 kN/m²
HOUSEKEEPING PADS WHERE REQUIRED (PENTHOUSE):	2.4 kN/m²
FLOORING:	0.10 kN/m²
MECH/ELEC:	0.25 kN/m²
CEILING:	0.25 kN/m²

LIVE LOAD (LL) UNO*

OFFICES AND SHELL SPACE:	2.4 kN/m²
WASHROOMS:	2.4 kN/m²
EXITS/HALLWAYS:	4.8 kN/m²
MEETING/BREAK-OUT/ACTIVITY ROOMS:	4.8 kN/m²
MECHANICAL PENTHOUSES: (OR EQUIPMENT LOADS WHERE HIGHER)	7.2 kN/m²

*SEE TABLE ON PLAN IDENTIFYING ROOMS WITH USER REQUIRED LIVE LOADS HIGHER THAN LISTED ABOVE AND/OR ADDITIONAL LOADING AND DESIGN REQUIREMENTS. REFER TO ARCH. PLANS FOR ROOM LOCATIONS. NOTE SOME STRUCTURAL REQUIREMENTS MAY AFFECT LEVEL OF STRUCTURE ABOVE.

4. EXTERIOR ROOF AREA LOADS (IN kN/m²) ARE AS FOLLOWS:

275 THICK CONC SLAB:	6.6 kN/m²
600 DEEP SLAB BAND:	14.4 kN/m²
ROOFING AND INSULATION:	0.60 kN/m²
MECH/ELEC:	0.25 kN/m²
CEILING:	0.25 kN/m²

LIVE LOAD (LL) UNO*

LIVE LOAD:	1.0 kN/m²
MECHANICAL PENTHOUSE: (OR EQUIPMENT LOADS WHERE HIGHER)	7.2 kN/m²
SNOW:	2.32 kN/m² + DRIFTING AS SHOWN ON PLAN

5. UNLESS OTHERWISE NOTED ON PLANS OR DETAILS, THE FOLLOWING DATA APPLIES:
   - 5.1. TOP OF SLAB IS ±0 FROM FLOOR DATUM ELEVATION EXCEPT AS CROSSED AND NOTED ±X ON PLAN.
   - 5.2. WHERE CONCRETE BEAMS ARE NOTED THUS ±X , X IS THE DISTANCE TO TOP OF BEAM FROM FLOOR DATUM.
   - 5.3. REFER TO TYPICAL DETAILS TC-SL-62 AND TC-SL-63 FOR MAXIMUM SIZES AND PLACING RESTRICTIONS OF OPENINGS IN FORMED SLABS AND FOR ADDITIONAL REINFORCING AROUND THEM.
6. WHERE EQUIPMENT OR MECHANICAL LOADS ARE SHOWN ON PLAN, THE VALUES ARE ASSUMED. CONFIRM EXACT MAGNITUDE AND POSITION OF MECHANICAL LOADS WITH MECHANICAL SHOP DRAWINGS AND NOTIFY WSP-S IF ASSUMED VALUES ARE EXCEEDED.

SPECIFIC USER REQUIRED LOADING AND DESIGN REQUIREMENTS (BEYOND TYP. FLOOR LOADING)

ROOM NUMBER	LIVE LOAD	ADDITIONAL STRUCTURAL REQUIREMENTS	NOTES
BB7	9.6 kPa		
BB8	7.2 kPa		
OF15	7.2 kPa		
IT2	7.2 kPa		

CONCRETE COLUMN SCHEDULE

MARK	SIZE	VERTICAL REINFORCEMENT	HORIZONTAL TIES	CONCRETE GRADE	REMARKS
CL1			10@250	35MPa	
CL2	900Ø	17-30	10@250	35MPa	
CL3	750Ø	16-25	10@250	35MPa	
CL4	650Ø	14-25	10@250	35MPa	
CL5	1000Ø	14-25	10@250	35MPa	EXTERIOR COLUMN
CL7	1100Ø	27-30	10@250	35MPa	
CL8	1000Ø	17-30	10@250	35MPa	
CL9	900Ø	19-30	10@250	35MPa	
CL10	1500x1500	36-30	10@250	35MPa	
CL11	350x350	8-20	10@250	35MPa	
CL12	600Ø	12-25	10@250	35MPa	CANT COLUMN AT SPINE. CONTRACTOR TO TEMPORARY BRACE TO SUIT CONSTRUCTION SCHEDULE

CONCRETE WALL SCHEDULE

MARK	SIZE	REINFORCEMENT	CONCRETE GRADE	REMARKS
300 SHEAR WALL	300	15@300V, 15@250H + 18-30V & 10@250 TIES (ZONE REBAR)	35MPa	CONCRETE SHEAR WALL
400 SHEAR WALL	400	20@300V, 20@250H + 14-30V & 10@250 TIES (ZONE REBAR)	35MPa	CONCRETE SHEAR WALL
W1	250	15@300 V&H		FOUNDATION WALL

STEEL COLUMN SCHEDULE

MARK	SIZE	BASE PLATE	ANCHORAGE	REMARKS
SC1	HSS 203x203			
SC2	W310			
SC3	W310			

1 S205 LEVEL 5 FRAMING PLAN
1 : 150

ARCHITECTURE 49
1000-150 ISABELLA STREET
OTTAWA (ONTARIO) CANADA K1S 1V7
Phone: 613-238-0440 | Fax: 613-238-6597 | WWW.ARCHITECTURE49.COM

wsp
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Ottawa, Ontario, K2B 8K2 Canada
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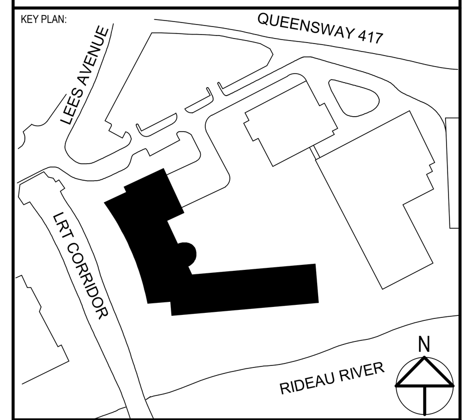
CLIENT:
uOttawa

RFP #: 2020-40639 CLIENT REF #: BT20-18477

PROJECT:
University of Ottawa - Faculty of Health Sciences Building

KEY PLAN:



ISSUED FOR - REVISION:

IS	RE	DATE	DESCRIPTION
1		2021-04-15	ISSUED FOR TECHNICAL SUBMISSION

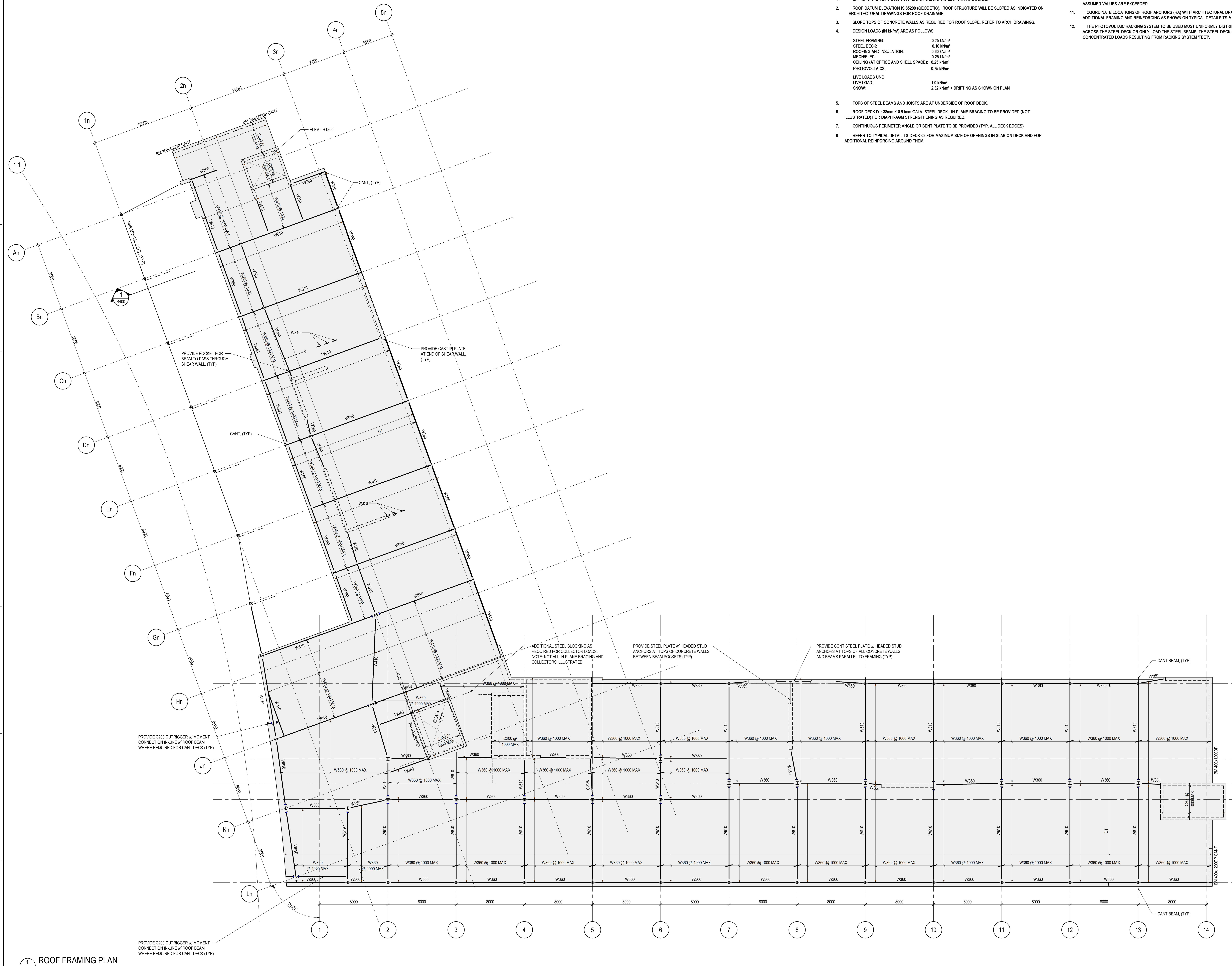
PROJECT NO: 211-01094-00
DATE: 2021-04-15
ORIGINAL SCALE: As indicated
DESIGNED BY: L.HAJSAID
DRAWN BY: P.MCKEE
CHECKED BY: S.HOWARD
IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
25mm
DISCIPLINE: STRUCTURAL
TITLE: LEVEL 5 FRAMING PLAN
SHEET NUMBER: S205
SHEET #: OF
ISSUE: REV #
DATE OF:

ROOF FRAMING PLAN NOTES

1. SEE GENERAL NOTES AND TYPICAL DETAILS ON S100 SERIES DRAWINGS.
2. ROOF DATUM ELEVATION IS 85200 (GEODETIC). ROOF STRUCTURE WILL BE SLOPED AS INDICATED ON ARCHITECTURAL DRAWINGS FOR ROOF DRAINAGE.
3. SLOPE TOPS OF CONCRETE WALLS AS REQUIRED FOR ROOF SLOPE. REFER TO ARCH DRAWINGS.
4. DESIGN LOADS (IN kN/m²) ARE AS FOLLOWS:

STEEL FRAMING:	0.25 kN/m²
STEEL DECK:	0.10 kN/m²
ROOFING AND INSULATION:	0.60 kN/m²
MECH/ELEC:	0.25 kN/m²
CEILING (AT OFFICE AND SHELL SPACE):	0.25 kN/m²
PHOTOVOLTAICS:	0.75 kN/m²
LIVE LOADS UNO:	
LIVE LOAD:	1.0 kN/m²
SNOW:	2.32 kN/m² + DRIFTING AS SHOWN ON PLAN

5. TOPS OF STEEL BEAMS AND JOISTS ARE AT UNDERSIDE OF ROOF DECK.
6. ROOF DECK D1: 38mm X 0.91mm GALV. STEEL DECK. IN-PLANE BRACING TO BE PROVIDED (NOT ILLUSTRATED) FOR DIAPHRAGM STRENGTHENING AS REQUIRED.
7. CONTINUOUS PERIMETER ANGLE OR BENT PLATE TO BE PROVIDED (TYP. ALL DECK EDGES).
8. REFER TO TYPICAL DETAIL TS-DECK-03 FOR MAXIMUM SIZE OF OPENINGS IN SLAB ON DECK AND FOR ADDITIONAL REINFORCING AROUND THEM.
9. TRIM SIDES OF DECK OPENINGS AS PER TYPICAL DETAIL TS-DECK-04.
10. WHERE MECHANICAL LOADS ARE SHOWN ON PLAN, THE VALUES ARE ASSUMED. CONFIRM EXACT MAGNITUDE AND POSITION OF MECHANICAL LOADS WITH MECHANICAL SHOP DRAWINGS AND NOTIFY WSP-S IF ASSUMED VALUES ARE EXCEEDED.
11. COORDINATE LOCATIONS OF ROOF ANCHORS (RA) WITH ARCHITECTURAL DRAWINGS AND PROVIDE ADDITIONAL FRAMING AND REINFORCING AS SHOWN ON TYPICAL DETAILS TS-MISC-01.
12. THE PHOTOVOLTAIC RACKING SYSTEM TO BE USED MUST UNIFORMLY DISTRIBUTE THE APPLIED LOADS ACROSS THE STEEL DECK OR ONLY LOAD THE STEEL BEAMS. THE STEEL DECK CANNOT SUPPORT CONCENTRATED LOADS RESULTING FROM RACKING SYSTEM 'FEET'.



1 S206 ROOF FRAMING PLAN
1 : 150

ARCHITECTURE 49
1000-150 ISABELLA STREET
OTTAWA (ONTARIO) CANADA K1S 1V7
Phone: 613-238-0440 | Fax: 613-238-6597 | WWW.ARCHITECTURE49.COM

wsp
2611 Queensview Dr, Suite 300
Ottawa, Ontario, K2B 8K2 Canada
T 613-829-2800 | F 613-829-8299 | www.wsp.com

PCL CONSTRUCTION
49 Auriga Drive
Ottawa, Ontario, K2E 8A1 Canada
T 613-978-5398 | www.pcl.com

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CLIENT:
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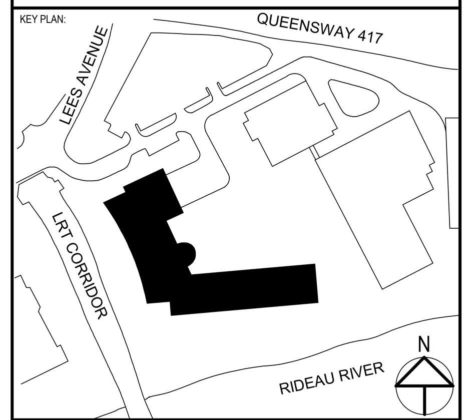

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DRAWN BY: P.MCKEE
CHECKED BY: S.HOWARD
DISCIPLINE: STRUCTURAL
TITLE: ROOF FRAMING PLAN
SHEET NUMBER: S206
SHEET #: OF
ISSUE: REV #
DATE OF:

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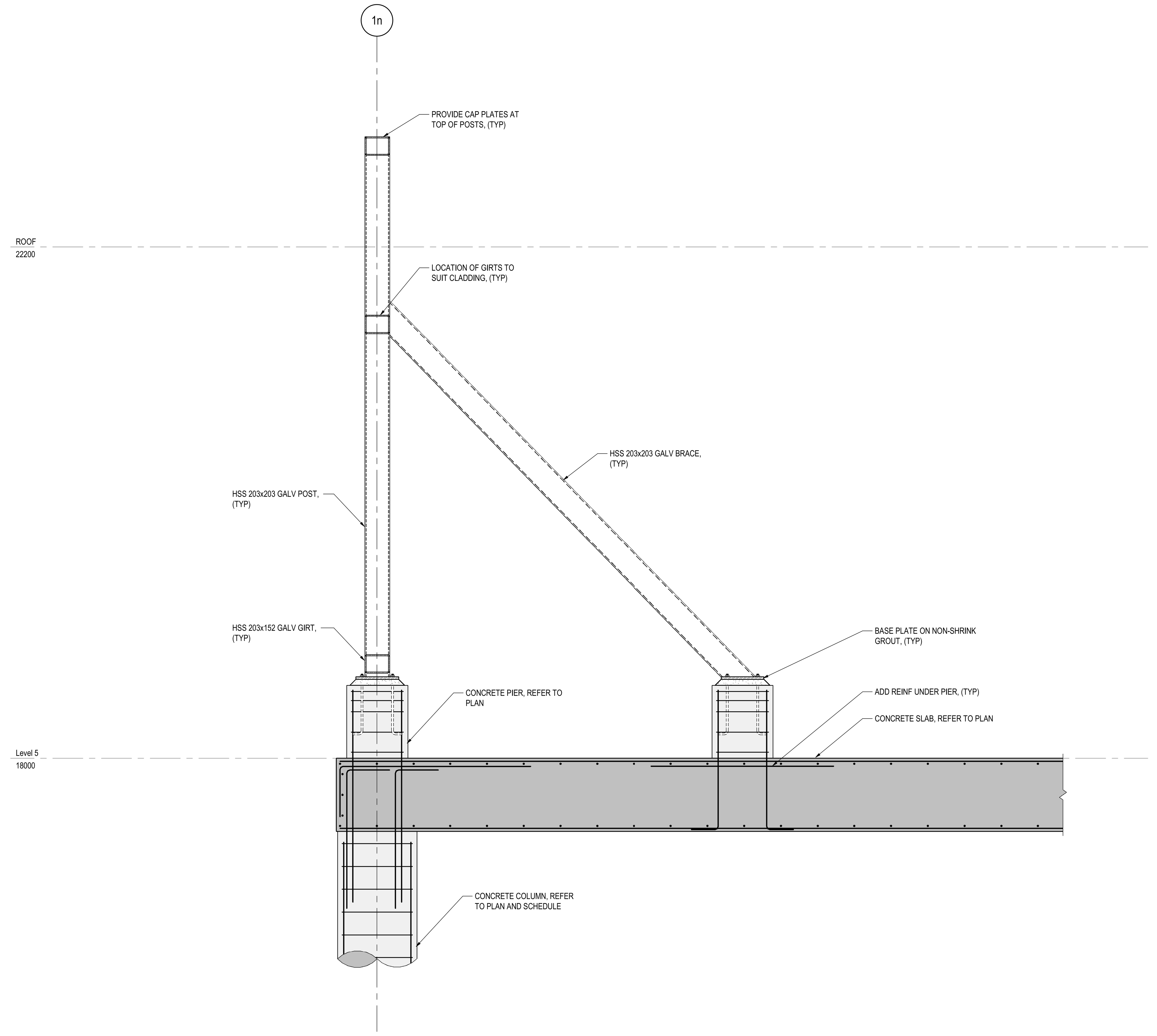

1 S400 SCREEN REINFORCING
1 : 20

0 0.5 1.0 1.5m
SCALE 1:20

ARCHITECTURE 49
1000-150 ISABELLA STREET
OTTAWA (ONTARIO) CANADA K1S 1V7
Phone: 613-238-0440 | Fax: 613-238-6597 | WWW.ARCHITECTURE49.COM

wsp
2611 Queensview Dr, Suite 300
Ottawa, Ontario, K2B 8K2 Canada
T 613-829-2800 | F 613-829-8299 | www.wsp.com

PCL CONSTRUCTION
49 Auriga Drive
Ottawa, Ontario, K2E 8A1 Canada
T 613-978-5398 | www.pcl.com

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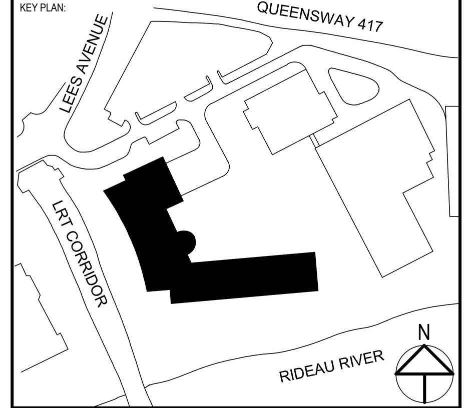

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DRAWN BY: P.MCKEE
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DISCIPLINE: STRUCTURAL
TITLE:
SECTIONS
SHEET NUMBER:
S400
SHEET #: OF
ISSUE: REV #
DATE OF:

UNIVERSITY OF OTTAWA

NOISE AND VIBRATION IMPACT ASSESSMENT

LEES CAMPUS - FACULTY OF HEALTH SCIENCES BUILDING

JUNE 22, 2021

NOISE AND VIBRATION IMPACT ASSESSMENT

LEES CAMPUS - FACULTY OF HEALTH SCIENCES BUILDING

UNIVERSITY OF OTTAWA

VERSION 1.0

PROJECT NO.: 211-01094-00
CLIENT REF:
DATE: JUNE 22, 2021

WSP
UNIT 2
126 DON HILLOCK DRIVE
AURORA, ON, CANADA L4G 0G9

T: +1 905 750-3080
F: +1 905 727-0463
WSP.COM

REVISION HISTORY

VERSION	DATE	TITLE	COMMENTS	PREPARED BY
1.0	June 22, 2021	Noise Impact Assessment	Prepared for SPA Application	WSP Canada Inc.

SIGNATURES

PREPARED BY

Carolyn Ropp, B.Sc.,
Acoustic Noise and Vibration Specialist

REVIEWED BY

Kana Ganesh, MSc., PhD., P.Eng.
Senior Technical Director, Acoustics and Vibration

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Abbreviations

dB	decibel
dBA	decibel, A-weighted
Hz	Hertz
ISO	International Organization for Standardization
KPH	Kilometers per hour
km	kilometre(s)
Leq(16)	Daytime 16-hour (0700-2300) Energy Equivalent Sound Level (Leq)
Leq(8)	Nighttime 8-hour (2300-0700) Energy Equivalent Sound Level (Leq)
Leq	Energy Equivalent Sound Level over a period of time
m	metre(s)
m^2	square metre(s)
MECP	Ontario Ministry of the Environment, Conservation and Parks
ORNAMENT	Ontario Road Noise Analysis Method for Environment and Transportation
POR	point of reception
RMS	root mean square
STEAM	Sound from Trains Environmental Analysis Method

Glossary

A-weighting	The weighting is applied to sound level data to account for changes in level sensitivity as a function of frequency. The A-weighting adjustment reflects average human ear.
decibel (dB)	A logarithmic quantity of generally used in the measurement of sound. The decibel (dB) provides the possibility of representing a large span of sound levels in a simplified manner. It is used for both sound pressure level as well as sound power level. When it is used to refer sound pressure level, a location or distance from a source is usually provided with the sound pressure level.
decibel, A-weighted (dBA)	A-weighted decibels (dBA). Most common units for expressing sound levels approximating the response of the human ear.
energy equivalent sound level	An energy-average sound level (Leq) over a specified period that would have the same sound energy as the actual (i.e., time varying) sound over the same period.
frequency	The number of times per second that the sine wave of sound repeats itself. It can be expressed in cycles per second, or Hertz (Hz).
frequency weighting (A, B, and C Weighting)	A method used to account for changes in sensitivity as a function of frequency. Three standard weighting networks, A, B, and C are used to account for different responses to sound pressure levels. Most commonly used weighting is A-weighting (see also A-weighting).
Hertz (Hz)	The unit of frequency also expressed as cycles per second.
noise	Unwanted sound.
octave band	The interval between two frequencies having a ratio of two to one. For acoustical measurements, the octaves start a 1,000 Hz centre frequency and go up or down from that point, at the 2:1 ratio. From 1,000 Hz, the next filter's centre frequency is 2,000 Hz, the next is 4,000 Hz, or 500 Hz, 250 Hz, etc.

point of reception (POR)	A noise-sensitive receptor such as a residence, campground, daycare, school, church, or hospital as defined in Ontario Ministry of the Environment and Climate Change Publication NPC-300.
root mean square (vibration)	The root mean square of a vibration velocity signal is the square root of the average of the squared velocity of the vibratory signal.
sound power level	The total sound energy radiated by a source per unit time. The unit of measurement is the Watt. The acoustical power radiated from a given sound source as related to a reference power level (i.e., typically 1E 12 watts, or 1 picowatt) and expressed as decibels. A sound power level of 1 watt = 120 decibels relative to a reference level of 1 picowatt.
sound pressure level	Logarithmic ratio of the root-mean-square sound pressure to the sound pressure at the threshold of human hearing (i.e., 20 micropascals).
vibration	Vibration is defined as an oscillatory motion of an element/particle. LRT related vibration is described in terms of the velocity. The velocity represents the instantaneous speed of the element/particle.

1 INTRODUCTION

WSP Canada Inc. (WSP) was retained by PCL Construction to prepare a Noise Impact Assessment for the proposed Faculty of Health Sciences Building at Lees Campus, University of Ottawa (Lees Campus or FHSB) to be located at 200 Lees Avenue, Ottawa, Ontario. This study addresses the noise impacts of stationary sources associated with the nearby buildings (Block A and Block B) as well as noise sources from development itself. In addition, it also considers the transportation sources associated with the nearby roads and LRT corridor on the proposed sensitive receptors. This report is prepared in support of a Site Plan Approval applications required at this stage of the development.

The noise impact assessment was conducted in accordance with the "Environmental Noise Control Guidelines", by City of Ottawa's, Planning and Growth Management department (Ottawa Guidelines) as well as Ontario Ministry of the Environment, Conservation and Parks (MECP's) Noise Pollution Control (NPC) publication NPC-300 "Environmental Noise Guideline, Stationery and Transportation Sources – Approval and Planning".

In accordance with the Ottawa Guidelines as well as NPC-300 requirements, this report discusses environmental noise from stationary sources and transportation sources as well as vibration from LRT corridor on the development. The results are presented in Section 3. Summary of recommendations are presented in Section 4.

Road traffic data was obtained from Ottawa Guidelines and Ottawa LRT was obtained from operation schedule of Ottawa. This data was used to estimate future sound levels (LEQ) at the façades of the proposed FHSB. Using the traffic data, proposed site plan and design drawings a predictive analysis was completed to estimate the future sound level at the proposed building façade. Similarly, using the information in the mechanical design drawings stationary sources of sound from were estimated. Both sound level from transportation sources (i.e. noise from road and LRT transportation corridor) and stationary sources (e.g. noise from roof top units) were compared to the guideline limits provided in the Ottawa Guidelines and MECP publication NPC-300. Similarly, vibration from LRT operations were estimated and assessed against the appropriate limits to establish compliance. The details are discussed within this report.

2 SITE DESCRIPTION

The proposed development is located east of Ottawa LRT and Lees Road (200 Lees Road), south of Highway 417 and north of Rideau River.

The location of the proposed development and surrounding land uses are presented in **Figure 1.**

The proposed development will include 5-storey building. A mechanical penthouse is proposed on the top floor. The site plan of the proposed development is included in **Appendix A**.

The acoustical environment surrounding the site is considered urban in nature, where anthropogenic noise dominates day and nighttime acoustic environment. The surrounding area is zoned for commercial purpose and a zoning map from the City of Ottawa is provided in **Figure 2**.

3 IMPACT OF THE SURROUNDING ENVIRONMENT ON THE DEVELOPMENT

The environmental noise and vibration sources with potential to have effect on the development are discussed and assessed in this section. The following sources are identified:

— Transportation noise impacts from roads and LRT;
— Vibration impacts from LRT; and
— Stationary noise from Block A, Block B and development (Ref: **Figure 3**).

The proposed development is not within the noise influence area (i.e. Noise Exposure Forecast/Noise Exposure Projection (NEF/NEP) contours) of Ottawa International Airport; therefore, assessment of aircraft noise is not considered in this report.

On the east of the development, two existing buildings identified as Block A and Block B are located; these buildings are closer to the proposed development than any other buildings in the area. These buildings have existing stationary noise sources associated with them (i.e. HVAC units and exhaust fans). There are some residential and utility land uses such as 190 Lees Road apartment buildings to the west and Lees LRT station to the northwest of the Site. There are potential stationary noise sources associated with these types of facilities, however they are further away from the development and are not considered a significant stationary noise source. The buildings in the surrounding area and associated activities within those buildings are not considered significant sources of noise or vibration.

This section discusses the transportation noise sources, stationary sources as well as vibration from LRT operation.

3.1 TRANSPORTATION NOISE IMPACTS

3.1.1 NOISE SOURCES

The following transportation sources have the potential to contribute to the sound levels at the proposed development:

— Highway 417;
— Lees Avenue; and
— Ottawa LRT

The proposed FHSB is within 100 meters of Lees Road and LRT and within 250 meters of Highway 417; as per Ottawa Guideline, a noise study will be required.

3.1.2 NOISE GUIDELINES AND ASSESSMENT CRITERIA

Noise is recognized as a pollutant in the Environmental Protection Act, as uncontrolled noise can affect human activities. Ontario provincial noise control guidelines require that noise concerns are addressed in the planning of any new development.

In land use planning, although elimination or control of the source of pollution is usually a primary objective, there are general limits as to what is practical and technically possible. Therefore, Ottawa Guidelines and MECP

Publication NPC-300, "Environmental Noise Guideline Stationery and Transportation Sources – Approval and Planning" provides sound level criteria for acceptable levels of transportation noise impacting on residential developments. These limits are discussed in **Table 3-1** below.

NPC-300 and Ottawa Guideline provides sound level limits in terms of energy equivalent (average) sound levels [L_{EQ}] in units of A-weighted decibels [dBA] at a specific noise-sensitive location.

Table 3-1 NPC-300 Sound Level Criteria for Road and LRT Noise

AREA	TIME PERIOD	L_{EQ} (dBA) -ROAD	L_{EQ} (dBA) -LRT
hospitals, nursing homes, schools	Daytime (0700 – 2300h)	45	40
	Nighttime (2300 – 0700h)	45	40

3.1.3 VENTILATION, BUILDING REQUIREMENTS

In order to decide appropriate control to achieve the above noted sound level limits, NPC-300 and Ottawa Guideline has provided further guidance.

To achieve indoor sound levels listed in **Table 3-1**, the MECP and Ottawa guideline provides guidelines based on predicted sound level at the façade/plane of window. If the predicted sound level at the plane of window exceeds, additional considerations such as the type of ventilation; type of windows, exterior walls, and doors that will be required must be selected.

Table 3-2 summarizes requirements for ventilation and the requirement for warning clauses to inform the future occupants of the exceedances.

Table 3-2 Ventilation Requirements

AREA	TIME PERIOD	SOUND LEVEL EXPOSURE LEQ (DBA) ROAD AND LRT[2]	VENTILATION REQUIREMENTS
Plane of Window [1]	Daytime (0700 – 2300h)	< 55	None
		>55 and <65	Forced Air Heating with provision for central air condition
		> 65	Central air conditioning is required
	Nighttime (2300 – 0700h)	< 50	None
		>51 and <60	Forced Air Heating with the provision to add central air conditioning
		> 60	Central air conditioning is required

Notes: [1] Plane of Window.
[2] Daytime: $L_{EQ\ 16HR}$; Nighttime: $L_{EQ\ 8\text{-}HR}$.

Table 3-3 provides sound level thresholds which if exceeded, will require building façade construction to be designed and selected accordingly to ensure that Table 2-3 indoor sound criteria is met. Building component requirements are assessed separately for road and railway noise. The resultant sound isolation parameter is required to be combined to determine the overall acoustic parameter.

Table 3-3 Building Requirements

AREA	TIME PERIOD	SOUND EXPOSURE LEVEL (dBA) ROAD[2]	SOUND EXPOSURE LEVEL (dBA) LRT[2]	BUILDING COMPONENT REQUIREMENTS
Plane of Window [1]	Daytime (0700 – 2300h)	< 65	< 60	Building components compliant with Ontario Building Code (OBC)
		> 65	> 60	Building components designed/selected to meet Indoor Requirements
	Nighttime (2300 – 0700h)	< 60	< 55	Building components compliant with Ontario Building Code (OBC)
		> 60	> 55	Building components designed/selected to meet Indoor Requirements

Notes: [1] Plane of Window.
[2] Daytime: $L_{EQ\ 16HR}$; Nighttime: $L_{EQ\ 8\text{-}HR}$.

3.1.4 TRAFFIC DATA

Road traffic volumes were obtained from the Ottawa Guideline (dated January 2016) Appendix B for Highway 417 and Lees Road and is summarized in **Table 3-4**. The data taken from the Ottawa Guideline provides ultimate future traffic volume data for various roadways based on roadway class and number of lanes. The traffic data used represents future traffic volumes and corresponding to a “mature state of development”, in the City’s Official Plan.

Table 3-4 Summary of Road Traffic Data Used in the Transportation Analysis

ROAD	TRAFFIC VOLUMES (AADT)	NO. OF LANES	DAY/NIGHT SPLIT (%)	MEDIUM TRUCKS (%)	HEAVY TRUCKS (%)	POSTED SPEED LIMIT (KPH)
Highway 417	183,33[1]	10	92/8	7%	5%	100
Lees Road	15,000	2	92/8	7%	5%	50

Notes: [1] AADT per lane.

Road traffic data and calculations used for the study are included in **Appendix B**.

The subway data was obtained from posted schedule. This information is provided in **Appendix B** and is summarized in **Table 3-5**.

Table 3-5 Summary of LRT Traffic Data Used in the Transportation Analysis

TYPE	DAYTIME	NIGHTTIME	LOCOMOTIVE	SPEED LIMIT (KPH)
LRT	234	44	LRT	50

3.1.5 NOISE IMPACT ASSESSMENT METHODS

Per MECP Guidelines, the impact at receptors was estimated for the road and LRT traffic. The sound level predictions were made using STAMSON version 5.04, a computer algorithm developed by the MECP. A copy of the sample STAMSON output file is included in **Appendix C**. Since there are no at-grade level crossings in the vicinity, whistle noise was not included in the calculations.

The following factors were taken into account in the analysis:

- Vehicle/Train speeds;
- Road and LRT traffic and volumes;
- Percentage of trucks;
- Horizontal and vertical road/LRT-receiver geometry;
- Ground absorption; and
- Screening provided by terrain, houses or existing barriers.

Most impacted receptor locations (in terms of façade and height) were chosen as representative receptor locations for each facade. The modelled receptor locations are shown in the site plan included in **Figure 3**.

3.1.6 RESULTS

Sound levels were predicted at the most impacted façades during the daytime and nighttime hours. The predicted sound levels were used to investigate ventilation and building construction requirements. The results of these predictions are summarized in **Table 3-6**.

Table 3-6 Summary of Predicted Facade Sound Levels – Transportation (Road & LRT)

LOC ID	DESCRIPTION	SPL – DAYTIME (DBA)	SPL – NIGHTTIME (DBA)
POR01	Southeast - South Façade (5th Level)	51	47

POR02	Southwest - South Façade (5th Level)	55	51
POR03	Southwest - West Façade (5th Level)	69	61
POR04	Southwest - West Façade (2nd Level)	70	63
POR05	Northwest- West Façade (5th Level)	71	64
POR06	Northwest- North Façade (5th Level)	74	66
POR07	Northeast - East Façade (5th Level)	75	67
POR08	East Façade (5th Level)	74	66
POR09	North Façade of east wing (5th Level)	73	65
POR10	Northeast - North Façade of east wing (5th Level)	74	67
POR11	East Façade on east wing (5th level)	72	65

The façade level indicates that due to the magnitude of exterior sound level, there is potential to exceed indoor sound level; therefore, as per NPC-300 noise control façade construction and ventilation requirements are required.

3.1.7 RECOMMENDATIONS

The following discussion outlines the preliminary recommendations for building facade constructions, and ventilation requirements to achieve the noise criteria stated in **Table 3-1**.

3.1.7.1 VENTILATION REQUIREMENTS

The predicted sound level at the plane of window is in the range of 51 – 75 dBA during the daytime and 47 to 67 dBA during the nighttime. Therefore, as per the MECP's requirements, alternative means of ventilation to open windows is required; A central air conditioning is provided to the building and mechanical design drawing is included in **Appendix D**. Therefore, central air conditioning system is recommended for this building.

3.1.7.2 BUILDING REQUIREMENTS

Based on the predicted sound level at the plane of window the sound exceeds 60 dBA during the daytime and 55 dBA during the nighttime. Therefore, the upgraded window glazing and façade constructions exceeding the minimum requirements of Ontario Building Code (OBC) are required to meet indoor sound level requirements as outlined in **Table 3-3**.

Exterior wall: Exterior wall can be constructed with a variety or material providing an STC-45 or more. The exterior façade can be brick veneer, masonry, spandrel glass or metal panels; the selected exterior façade for occupied spaces are provided below:

E01 - EXTERIOR STEEL STUD ALUMINIUM PARTITION

— Pre-Painted Alum. Panel On
— Thermally Broken Furring
— Min 25mm Air Space
— 100mm (Min) Mineral Wool Insulation
— Air Barrier
— 15mm Exterior Sheathing
— Steel Stud Wall W/
— 50mm Spray Foam Insulation (Vap. Bar.)
— 16mm Gyp. Bd.

- Paint Finish

E01a - EXTERIOR STEEL STUD ALUMINIUM PARTITION

- Pre-Painted Alum. Panel On
- Thermally Broken Furring
- Min 25mm Air Space
- 100mm (Min) Mineral Wool Insulation
- Air Barrier
- Concrete Shear Wall

E02 - EXTERIOR MASONRY PARTITION

- Masonry Veneer
- Min 25mm Air Space
- 100mm (Min) Mineral Wool Insulation
- Masonry Block Wall

E02a - EXTERIOR MASONRY PARTITION

- Masonry Veneer
- Min 25mm Air Space
- 100mm (Min) Mineral Wool Insulation
- Masonry Block Wall

E03 - EXTERIOR ALUMINIUM CURTAIN WALL

- Thermally Broken Aluminum Curtain Wall
- 25mm Igu – Tinted Glass, Solarban60, Argon Filled Thermally Broken Spacer
- Spandrel Glass W/100mm Mineral Wool Insulation W/ Stl. Stud & Gyp. Bd Back-Up Wall

Window assembly - It was confirmed that the building will include double glazed window assembly. The selected window includes 6mm Solarban 60 with 12,7mm air space and 6mm clear window glazing assembly providing a STC 38 or better. Typical window assemblies may include small operable portion within the window assembly. A good weather seal should be included for this operable portion to minimize the noise flanking.

With the wall assemblies providing STC-45 or better and window assemblies providing STC-38 (Sealed) or better, the indoor sound level of 40 dB or less is achieved.

3.2 VIBRATION IMPACTS

3.2.1 VIBRATION GUIDELINES

There are no guideline limits for vibration from the MECP for Railway vibration in land use planning. The Federation of Canadian Municipalities and The Railway Association of Canada (FCM/RAC) developed a document entitled “Guidelines for New Development in Proximity to Railway Operations” (“FCM/RAC Proximity Guidelines”), dated May 2013. This document provides guidance with respect to issues arising from Railway vibration for new sensitive developments near Rail corridors. This document also includes procedures for vibration measurements, such as selection of measurement locations, number of train pass-by events, equipment capabilities, and a general vibration zone of influence (ZOI) from Railway operations. The FCM/RAC Proximity Guidelines discuss a 75 m ZOI from the Rail right of way.

The FCM/RAC guideline require measurements of ground-borne vibration when residential developments or similar developments are to be located within 75 metres of a principal mainline such as the CN LRT line to the north of the site. There are no requirements noted for institutional buildings.

FCM/RAC guidelines requires that residential developments or similar developments to be assessed as follows:

- Ground-borne vibration transmission to be evaluated through site testing.
- Proposed developments within 75 metres of the rights-of-way shall be evaluated with a limit of 0.14 mm (vibration velocity in RMS) between 4 Hz and 200 Hz.
- If in excess of the limit were measured, isolation measures shall be investigated to ensure living areas do not exceed 0.14 mm/sec RMS.

The limits for commercial/institutional buildings are provided in International Organization for Standardization’s (ISO’s) publication ISO-2361-2 “Guideline for whole body vibration is buildings” is 0.4 mm/s (RMS). Since the University of Ottawa’s FHSB is considered a sensitive building and the building is less than 50 meters away from the nearest right of way the assessment considered the same criteria considered for residential development.

3.2.2 VIBRATION ASSESSMENT SUMMARY

Vibration measurements completed and reported by RWDI Inc., in the University of Ottawa, Volume 3, Guidelines, Lists, Reference, Reports document were reviewed. The vibration measurements were completed on June 4th, 2020 by RWDI. The measurements were taken along the foundation at the proposed development site, at a location closest to the LRT line. RWDI reported completing the ground-borne vibration measurements using a LMS SCADAS Data acquisition system equipped with triaxial sensors. The measured vibration levels are provided in **Table 3-7**.

Table 3-7 Measured Vibration Levels (RMS)

DESCRIPTION	RMS VIBRATION (OMM/S)
LRT - Northbound	0.076
LRT - Southbound	0.082

The measured vibration is less than the limit considered (i.e. 0.14 mm/s) and therefore vibration is not considered further. However, it should be noted that the proposed build is a concreate structure with spread concrete column footings. As noted in the Federal Transit Administration (FTA) guidelines, large masonry buildings with spread footings have a low response to ground vibration. Therefore, the concrete structure will minimize any residual vibration associated with the presence of the transit system.

3.3 STATIONARY NOISE IMPACTS

Stationary source is defined in MECP publication NPC-300 as source of sound or combination of sources of sound that are included and normally operated within the property lines of a facility. Accordingly, noise from the nearby Block A and B as well as noise from electro-mechanical unites within the proposed development are is considered as stationary sources and therefore MECP's guidelines (Section B of the NPC-300) applies to those noise sources

The roof top units on Block A and Block B is generally HVAC and exhaust fans. A site visit was not conducted but noise source data for Block A and B associated sources were taken from available information.

The noise sources associated with the proposed development are expected to be rooftop HVAC units and other similar mechanical units (refer **Appendix D**). These units have potential to cause noise impact, this section qualitatively assess noise impact from these units on:

1. the surrounding environment; and
2. itself

These aspects are discussed in this section.

The drawings indicate that there will be a mechanical penthouse provided to this development. The majority of other mechanical units such as the chiller, boiler, elevator machine, water softener and pumps are located inside mechanical rooms.

3.3.1 NOISE GUIDELINES AND ASSESSMENT CRITERIA

For stationary sources, the MECP Publication NPC-300 provides criteria based on one-hour equivalent sound level. In order to comply with the noise impact from stationary sources, the predicted sound level must comply with the noise guidelines stipulated in the MECP publication, NPC-300.

NPC-300 provides sound level limits for development (or receptors) based on the acoustical environment in which the development is located. NPC-300 categorizes the acoustical environment into four classes: Class 1 (urban), Class 2 (suburban), Class 3 (rural), or Class 4 (special cases). This classification depends on the local land use and the existing ambient sound environment. **Table 3-8** summarizes the MECP exclusionary limits for Class 1, 2, 3 and 4 areas.

Table 3-8 MECP's Exclusion Limits in dBA

	CLASS 1		CLASS 2		CLASS 3		CLASS 4	
PERIOD	PLANE OF WINDOW[2]	OUTDOOR POR[1]	PLANE OF WINDOW[2]	OUTDOOR POR[1]	PLANE OF WINDOW[2]	OUTDOOR POR[1]	PLANE OF WINDOW[2]	OUTDOOR POR[1]
Daytime (07:00 – 19:00)	50	50	50	50	45	45	60	55
Evening (19:00 – 23:00)	50	50	50	45	40	40	60	55
Night-time (23:00 – 07:00)	45	N/A[3]	45	N/A[3]	40	N/A[3]	55	N/A[3]

Notes:
1 PoR means point of reception; representing a point in a receptor location as defined by MECP.

2 Plane of window means a point in space corresponding with the location of the centre of a window of a noise sensitive space. The noise effects assessment excludes the effect of sound reflection from the plane of the window on which it is located. In general, the plane of a window is a point used for prediction (including extrapolation), rather than measurement, of sound levels (MOE 2013).

Since the area is considered a Class 1 acoustical environment, the sound level limit corresponding to Class 1 is considered in the assessment (i.e. 50 dBA during the daytime and 45 dBA during the nighttime).

3.3.2 SOURCE DATA

Based on the available information the following sources were identified in **Table 3-9** and the source locations are shown in **Figure 4**.

Table 3-9 Stationary Source Sound Data

SOURCE ID[1]	DESCRIPTION	OVERALL SOUND POWER LEVEL [DBA REF $^{10-12}$ W]	OPERATION		REMARKS
			DAY	NIGHT	
EF1 to EF 18	Exhaust Fans	80	Yes	Yes	
AHU01 to AHU 08	Air Handling Units	87	Yes	Yes	Inside mechanical rooms
GEN	New Generator	93	Yes	Yes	With silencer
LEF-1	LEF-1	76	Yes	Yes	
LEF-2	LEF-2	81	Yes	Yes	
KEF-1	KEF-1	81	Yes	Yes	
LEF-2	LEF-2	81	Yes	Yes	
FLF1	Food lab Fume Hood	81	Yes	Yes	
FLF2	Wet Lab Fume Hood	81	Yes	Yes	
GEN1	Existing Generator	105	Yes	Yes	With silencer
Vent	Vent	81	Yes	Yes	Vent mechanical room
Int	Intake	71	Yes	Yes	Air intake opening

3.3.3 RESULTS AND DISCUSSION

The following table compares the predicted sound level to the criteria.

Table 3-10 Predicted sound level

PREDICTIO N LOCATION[1]	DESCRIPTION	SOUND LEVEL DAY/NIGHT [dBA REF 10^{-6} PA]	LIMIT DAY/NIGHT [dBA REF 10^{-6} PA]	MEETING THE LIMIT?
POR01	South Façade	31 / 31	50 / 45	Yes

POR02	South Façade	28 / 28	50 / 45	Yes
POR03	West Façade	45 / 45	50 / 45	Yes
POR04	West Façade	49 / 49	50 / 45	Yes
POR05	West Façade	46 / 46	50 / 45	Yes
POR06	North Façade	37 / 37	50 / 45	Yes
POR07	East Facade	44 / 44	50 / 45	Yes
POR08	East Facade	44 / 44	50 / 45	Yes
POR09	East Facade	45 / 45	50 / 45	Yes
POR10	East Facade	49 / 49	50 / 45	Yes
POR11	East Facade	48 / 48	50 / 45	Yes

Notes:
1 Refer to **Figure 3** for receptor locations.

The receptor locations at the proposed development meets the required the limits with the estimated day and nighttime Leq (1 hour).

3.3.4 RECOMMENDATIONS

The sound levels associated with stationary noise sources from the nearby buildings as well as from the development itself meet the day and nighttime limits. The following are shown in the design drawings and considered part of the noise mitigations.

1. Generator will be inside the mechanical room and includes muffler for engine exhaust and intake and discharge silencers.
2. Air compressor, vacuum pump, Humidifiers 1 to 4 (DOAS-1, DOAS-2 etc.), Chillers 1 to 4, Chilled water pumps will be located indoors.

4 CONCLUSIONS AND CLOSURE

The predicted sound levels from surface transportation and stationary sources were assessed separately per MECP publication NPC-300 requirements. Each noise source type was assessed at the points of reception and their compliance with the NPC-300 requirements is evaluated. Noise from transportation sources are discussed in Section 3.1, vibration assessment is discussed in Section 3.2, and Stationary sources are discussed in Section 3.3. The development does not have dominant effect on its surrounding.

4.1 SUMMARY OF RECOMMENDATIONS

The following recommendations are offered:

1. The development will require central air conditioning as an alternate means of open window;
2. The preliminary acoustical performance requirements for exterior façade elements (i.e. exterior walls, and windows) for the development are discussed in Section 3.1
    a. Exterior wall: Exterior wall providing an STC-45 or more will be required;
    b. Exterior window: Exterior windows glazing into sensitives spaces providing a STC 38 or better
3. Noise control for stationary sources are discussed in Section 3.3
    a. Generator will be inside the mechanical room and includes muffler for engine exhaust and intake and discharge silencers.
    b. Air compressor, vacuum pump, Humidifiers 1 to 4 (DOAS-1, DOAS-2 etc.), Chillers 1 to 4, Chilled water pumps will be located indoors.
    c. All vents to mechanical rooms include louvers

4.2 CONCLUSIONS AND CLOSURE

Based on the content of this impact study it is concluded that developing the proposed development is in compliance with the City's and MECP's noise criteria.

This report has been prepared to support the site plan approval application being prepared. Once the design is finalized and details becomes available it will be reviewed further by the design team.

BIBLIOGRAPHY

- City of Ottawa (2016), Environmental Noise Control Guidelines", by City of Ottawa's, Planning and Growth Management department, Ontario, Canada.
- International Organization for Standardization (1996). ISO 9613-2: Acoustics – Attenuation of Sound During Propagation Outdoors Part 2: General Method of Calculation, Geneva, Switzerland
- National Research Council of Canada (1995, September). Building Practice Note No. 56: Controlling Sound Transmission into Buildings, Canada
- Ontario Ministry of the Environment and Climate Change (2013). Environmental Noise Guideline – Stationery and Transportation Sources – Approval and Planning – Publication NPC-300. Ontario, Canada
- Ontario Ministry of the Environment and Climate Change (1996), STAMSON v5.04: Road, LRT and Rapid Transit Noise Prediction Model, Ontario, Canada
- Ontario Ministry of the Environment (1989). Ontario Road Noise Analysis Method for Environment and Transportation (ORNAMENT), Ontario, Canada

FIGURES

wsp
126 DON HILLOCK DRIVE, UNIT 2
AURORA, ONTARIO CANADA L4G 0G9
TEL.: 905-750-3080 | FAX: 905-727-0463 | WWW.WSP.COM

LEGEND

APPROXIMATE STUDY AREA

CLIENT:
-

PROJECT:
ACOUSTIC ASSESSMENT REPORT
UNIVERSITY OF OTTAWA
OTTAWA, ONTARIO

PROJECT NO:	DATE:
211-01094-00	JUNE 2021

DESIGNED BY:
-

DRAWN BY:
TP

CHECKED BY:
-

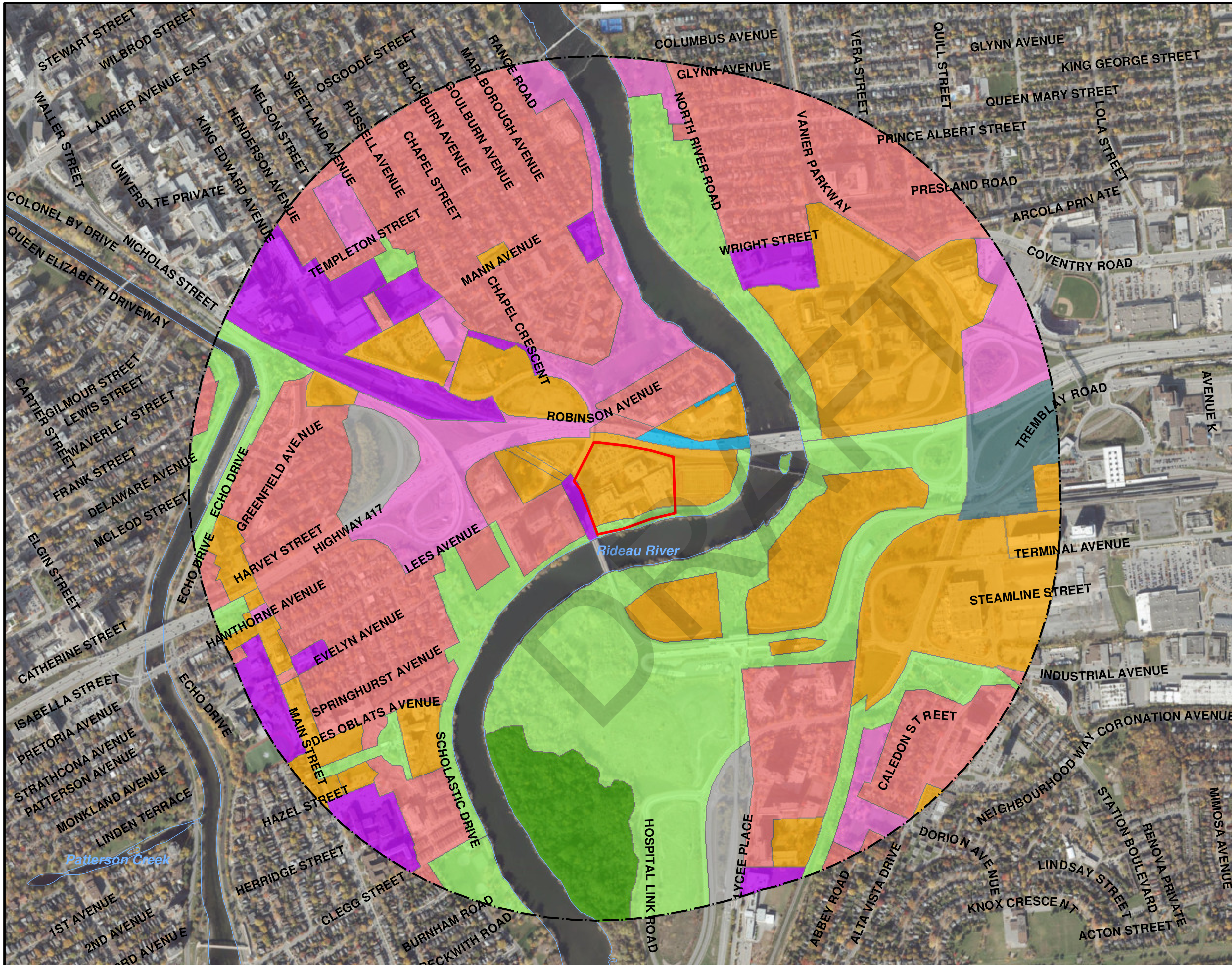
FIGURE NO:	SCALE:
1	1:3,000

TITLE:
AREA MAP SHOWING THE SITE

DISCIPLINE:
ENVIRONMENT

ISSUE:

REV.:
-



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126 DON HILLOCK DRIVE, UNIT 2
AURORA, ONTARIO CANADA L4G 0G9
TEL.: 905-750-3080 | FAX: 905-727-0463 | WWW.WSP.COM

LEGEND

- APPROXIMATE STUDY AREA
- 1 km STUDY AREA
- COMMERCIAL
- DEVELOPMENT RESERVE
- ENVIRONMENTAL PROTECTION
- GENERAL INDUSTRIAL
- INSTITUTIONAL
- LEISURE FACILITY
- OPEN SPACE
- RESIDENTIAL
- TRANSPORTATION

100 50 0 100 Metres

N W E S

CLIENT:
-

PROJECT:
ACOUSTIC ASSESSMENT REPORT
UNIVERSITY OF OTTAWA
OTTAWA, ONTARIO

PROJECT NO:	DATE:
211-01094-00	JUNE 2021
DESIGNED BY: -	
DRAWN BY: TP	
CHECKED BY: -	
FIGURE NO: 2	SCALE: 1:10,000

TITLE:
ZONING MAP

DISCIPLINE:
ENVIRONMENT

ISSUE: | REV.: -

Document Path: D:\aProjects\211-01094-00\MXD\211-01094-00 Figure 2 Zoning.mxd

wsp

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LEGEND

PROPOSED BUILDING

RECEPTOR LOCATION

CLIENT:
-

PROJECT:
ACOUSTIC ASSESSMENT REPORT
UNIVERSITY OF OTTAWA
OTTAWA, ONTARIO

PROJECT NO: 211-01094-00	DATE: JUNE 2021
DESIGNED BY: -	
DRAWN BY: TP	
CHECKED BY: -	
FIGURE NO: 3	SCALE: 1:1,250

TITLE:
SITE PLAN SHOWING PREDICTION (RECEPTOR) LOCATIONS

DISCIPLINE:
ENVIRONMENT

ISSUE: | REV.: -

Document Path: D:\aProjects\211-01094-00\MXD\211-01094-00 Figure 3 Receptors.mxd

126 DON HILLOCK DRIVE, UNIT 2
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TEL.: 905-750-3080 | FAX: 905-727-0463 | WWW.WSP.COM

LEGEND

- BUILDING
- POINT SOURCE
- VERTICAL SOURCE

30 15 0 30 Metres

N W E S

CLIENT:

-

PROJECT:

ACOUSTIC ASSESSMENT REPORT
UNIVERSITY OF OTTAWA
OTTAWA, ONTARIO

PROJECT NO:	DATE:
211-01094-00	JUNE 2021

DESIGNED BY:
-

DRAWN BY:
TP

CHECKED BY:
-

FIGURE NO:	SCALE:
4	1:1,250

TITLE:

SITE PLAN SHOWING STATIONARY SOURCES

DISCIPLINE:

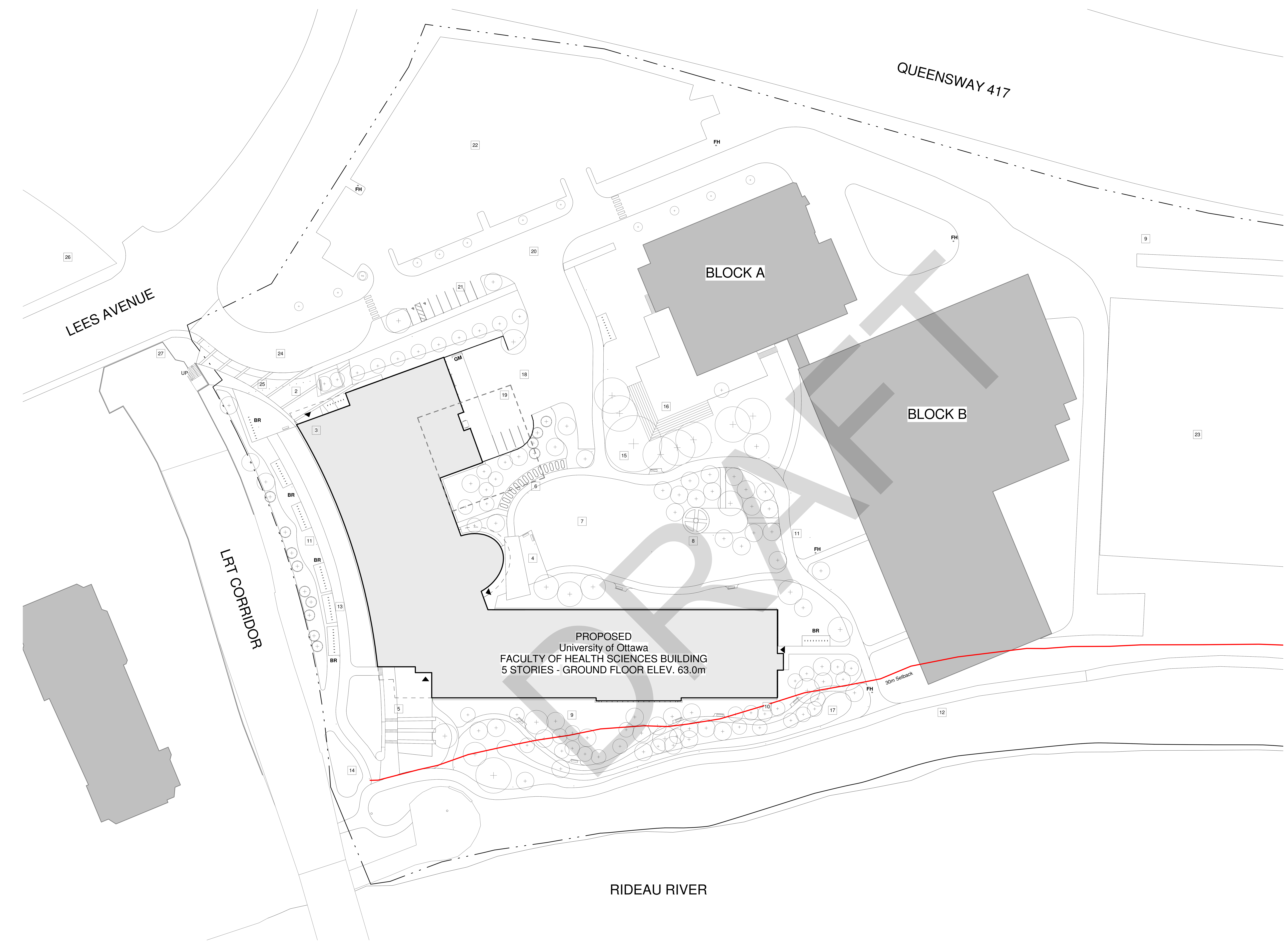
ENVIRONMENT

ISSUE:	REV.:
	-

APPENDIX

A

SITE PLAN



1 SITE PLAN
A100 1 : 400

LEGEND

- ▲ BUILDING ENTRANCE
- GM GAS METER
- FH FIRE HYDRANT
- BR BIKE RACKS
- RIVER SETBACK
- FHS ADDITION

SITE LEGEND	
2	ARRIVAL PLAZA
3	THE SPINE
4	ACADEMIC QUAD
5	RIVER TERRACE - MULTI-FUNCTIONAL PLAZA
6	NUTRITION GARDEN
7	LAWN COMMUNAL OPEN SPACE
8	INDIGENOUS PAVILION & FIREPIT GATHERING CIRCLE
9	HERITAGE WALK & INDIGENOUS GARDENS
10	HEALING GARDENS
11	MULTI-USE TRAIL
12	MULTI-USE PATHS (BIKE PATH)
13	SHELTERED BIKE RACKS
14	FUTURE ARTISTIC WELCOME SIGNAGE/SCULPTURE
15	PRESERVED MATURE MAPLE TREES
16	EXISTING TREE GROVE AND SUNKEN COURTYARD
17	BIO-SWALE
18	SERVICE COURTYARD
19	FHS ADDITION
20	FIRE ROUTE
21	BARRIER FREE & EV CHARGING PARKING
22	EXISTING SURFACE PARKING
23	EXISTING GEE GEES SPORTS FIELD
24	LAY-BY
25	ANTI-RAM BOLLARDS
26	LRT STATION
27	LRT STAIR

ARCHITECTURE 49
1000-150 ISABELLA STREET
OTTAWA (ONTARIO) CANADA K1S 1V7
Phone: 613-238-0440 | Fax: 613-238-6597 | WWW.ARCHITECTURE49.COM

wsp
2611 Queensview Dr, Suite 300
Ottawa, Ontario, K2B 8K2 Canada
T 613-829-2800 | F 613-829-8299 | www.wsp.com

PCL CONSTRUCTION
49 Auriga Drive
Ottawa, Ontario, K2E 8A1 Canada
T 613-978-5398 | www.pcl.com

SEAL:

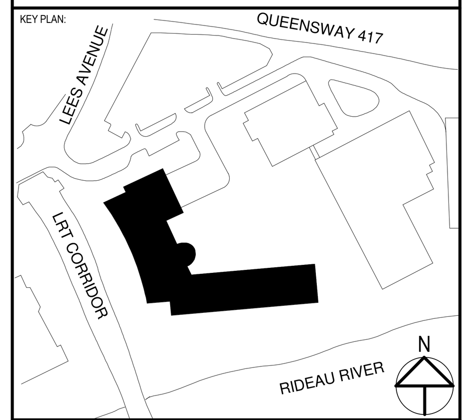
CLIENT:
uOttawa

RFP #: 2020-40369 CLIENT REF. #: BT20-18477

PROJECT:

University of Ottawa - Faculty of Health Sciences Building

KEY PLAN:



ISSUED FOR - REVISION:

IS	RE	DATE	DESCRIPTION
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PROJECT NO: 211-01094-00
DATE: 2021-04-15
ORIGINAL SCALE: 1 : 400
DESIGNED BY: WP
DRAWN BY: VW
CHECKED BY: WP / MK

IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
25mm

DISCIPLINE:

TITLE:

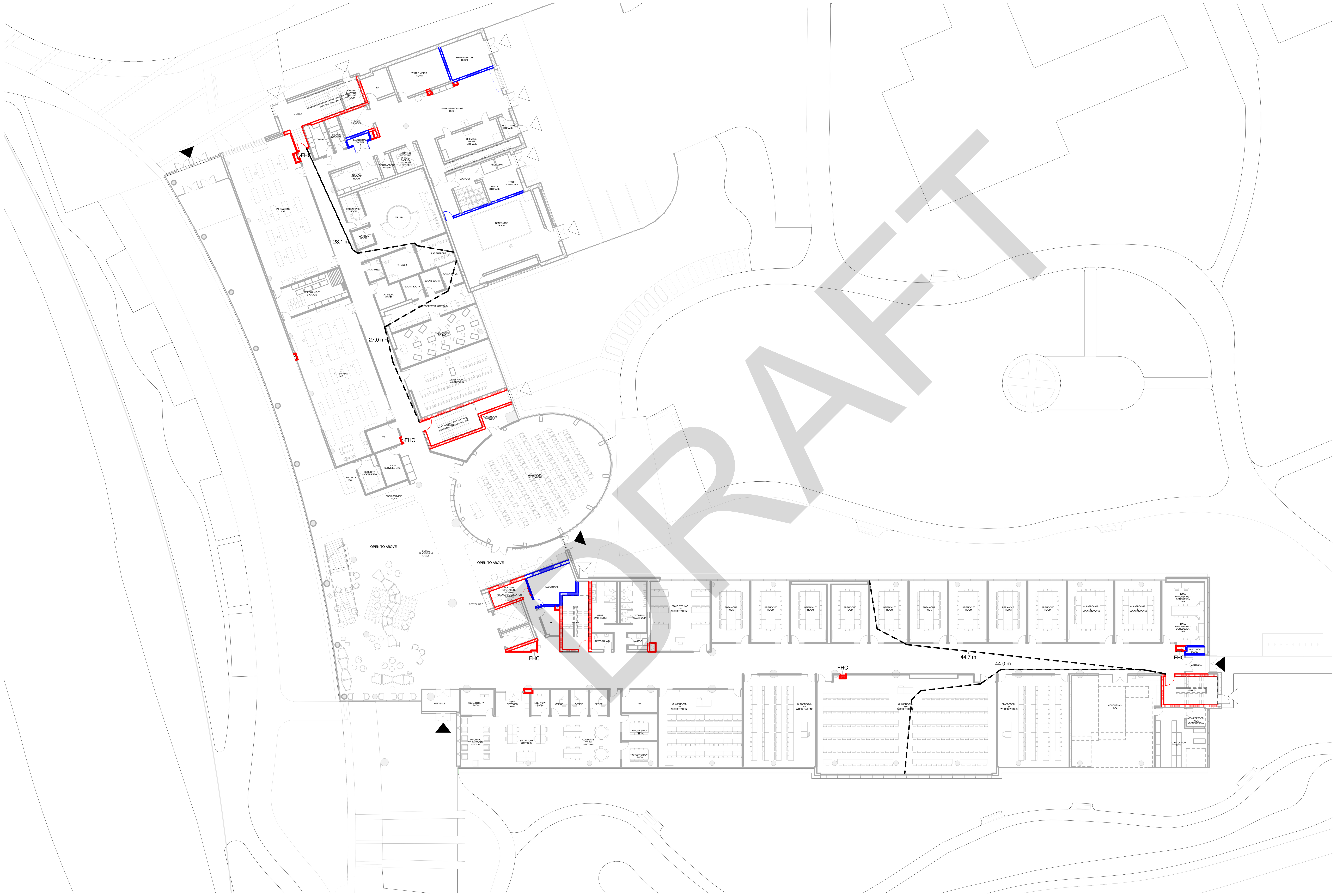
SITE PLAN

SHEET NUMBER:

A100

SHEET #: OF

ISSUE: REV #
DATE OF:



1 GROUND FLOOR LIFE SAFETY PLAN

A011 1 : 200

LEGEND

1 HOUR F.R.R. SEPARATIONS / 45min DOORS

2 HOUR F.R.R. SEPARATIONS / 90min DOORS

3 HOUR F.R.R. SEPARATIONS

PATH 1 45m — TOTAL EGRESS DISTANCE

TRAVEL DISTANCE

FHC — TOTAL EGRESS DISTANCE

PRIMARY EXITS

SECONDARY EXITS

Name Elevation — DATUM ELEVATION TAG

GRID BUBBLE

NORTH ARROW

RAMP DIRECTION

WALL TAG

Room name 101 Program Code 150 m2 — ROOM TAG

DXXXa — DOOR TAG

KEYNOTE

BUILDING SECTION

CALLOUT

WALL SECTION

INTERIOR ELEVATION TAG

EXTERIOR ELEVATION TAG

A1 View Name View Scale — SHEET TITLE

CEILING MATERIAL & HEIGHT TAG

CENTER LINE

ARCHITECTURE 49

1000-150 ISABELLA STREET
OTTAWA (ONTARIO) CANADA K1S 1V7
Phone: 613-238-0440 | Fax: 613-238-6597 | WWW.ARCHITECTURE49.COM

wsp

2611 Queensview Dr, Suite 300
Ottawa, Ontario, K2B 8K2 Canada
T 613-829-2800 | F 613-829-8299 | www.wsp.com

PCL CONSTRUCTION

49 Auriga Drive
Ottawa, Ontario, K2E 8A1 Canada
T 613-978-5398 | www.pcl.com

SEAL:

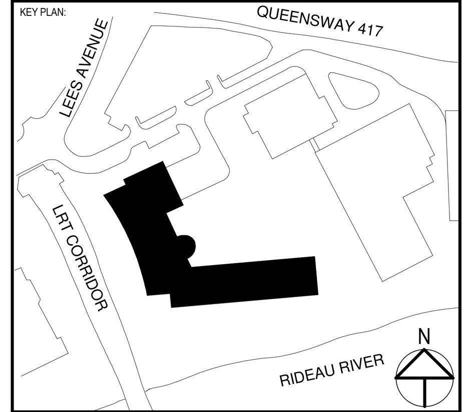
CLIENT: uOttawa

RFP #: 2020-40369 CLIENT REF. #: BT20-18477

PROJECT:

University of Ottawa - Faculty of Health Sciences Building

KEY PLAN:



ISSUED FOR - REVISION:

IS	RE	DATE	DESCRIPTION
1		2021-04-15	ISSUED FOR TECHNICAL SUBMISSION

PROJECT NO: 211-01094-00	DATE: 2021-04-15
ORIGINAL SCALE: As indicated	IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
DESIGNED BY: WP	
DRAWN BY: EV	
CHECKED BY: WP / MK	25mm

DISCIPLINE:

TITLE:

GROUND FLOOR LIFE SAFETY PLAN

SHEET NUMBER:

A011

SHEET #: OF

ISSUE: REV #

DATE OF:

APPENDIX

B TRAFFIC DATA

Appendix B: Table of Traffic and Road Parameters To Be Used For Sound Level Predictions

Table B1 Traffic And Road Parameters To Be Used For Sound Level Predictions

Row Width (m)	Implied Roadway Class	AADT Vehicles/Day	Posted Speed Km/Hr	Day/Night Split %	Medium Trucks %	Heavy Trucks % [1]
NA [2]	Freeway, Queensway, Highway	18,333 per lane	100	92/8	7	5
37.5-44.5	6-Lane Urban Arterial-Divided (6 UAD)	50,000	50-80	92/8	7	5
34-37.5	4-Lane Urban Arterial-Divided (4-UAD)	35,000	50-80	92/8	7	5
23-34	4-Lane Urban Arterial-Undivided (4-UAU)	30,000	50-80	92/8	7	5
23-34	4-Lane Major Collector (4-UMCU)	24,000	40-60	92/8	7	5
30-35.5	2-Lane Rural Arterial (2-RAU)	15,000	50-80	92/8	7	5
20-30	2-Lane Urban Arterial (2-UAU)	15,000	50-80	92/8	7	5
20-30	2-Lane Major Collector (2-UMCU)	12,000	40-60	92/8	7	5
30-35.5	2-Lane Outer Rural Arterial (near the extremities of the City) (2-RAU)	10,000	50-80	92/8	7	5
20-30	2-Lane Urban Collector (2-UCU)	8,000	40-50	92/8	7	5

[1] The MOE Vehicle Classification definitions should be used to estimate automobiles, medium trucks and heavy trucks.
[2] The number of lanes is determined by the future mature state of the roadway.

Schedules & Maps

The next service change is on Sunday, June 20.

Schedule times are based on typical driving conditions and may vary. Please arrive at your stop a few minutes early to allow for any fluctuations in schedule.

1 Tunney's Pasture

Thu, Jun 17

[a] From Thursday, June 17 to Wednesday, June 30, O-Train Line 1 service will end each night at 7 pm to perform seasonal track maintenance. This work will result in better train service for customers. Full O-Train Line 1 service will resume at 5 am on weekdays, 6 am on Saturdays, and 8 am on Sundays. Read more

BLAIR O-TRAIN WEST / OUEST	CYRVILLE O-TRAIN WEST / OUEST	ST-LAURENT O-TRAIN WEST / OUEST	TREMBLAY O-TRAIN WEST / OUEST	HURDMAN O-TRAIN WEST / OUEST	LEES O-TRAIN WEST / OUEST	UOTTAWA O-TRAIN WEST / OUEST	RIDEAU O-TRAIN WEST / OUEST	PARLIAMENT / PARLEMENT O-TRAIN WEST / OUEST	LYON O-TRAIN WEST / OUEST	PIMISI O-TRAIN WEST / OUEST	BAYVIEW O-TRAIN WEST / OUEST	TUNNEY'S PASTURE O-TRAIN
								05:00	05:02	05:04	05:06	05:08
			05:00	05:03	05:05	05:07	05:09	05:10	05:12	05:14	05:16	05:18
05:00	05:02	05:04	05:05	05:08	05:10	05:12	05:14	05:15	05:17	05:19	05:21	05:23
05:08	05:10	05:12	05:13	05:16	05:18	05:20	05:22	05:23	05:25	05:27	05:29	05:31
05:16	05:18	05:20	05:21	05:24	05:26	05:28	05:30	05:31	05:33	05:35	05:37	05:39
05:24	05:26	05:28	05:29	05:32	05:34	05:36	05:38	05:39	05:41	05:43	05:45	05:47
05:32	05:34	05:36	05:37	05:40	05:42	05:44	05:46	05:47	05:49	05:51	05:53	05:55
05:40	05:42	05:44	05:45	05:48	05:50	05:52	05:54	05:55	05:57	05:59	06:01	06:03
05:48	05:50	05:52	05:53	05:56	05:58	06:00	06:02	06:03	06:05	06:07	06:09	06:11
			05:58	06:01	06:03	06:05	06:07	06:08	06:10	06:12	06:14	06:16
05:56	05:58	06:00	06:01	06:04	06:06	06:08	06:10	06:11	06:13	06:15	06:17	06:19
			06:07	06:10	06:12	06:14	06:16	06:17	06:19	06:21	06:23	06:25
06:04	06:06	06:08	06:09	06:12	06:14	06:16	06:18	06:19	06:21	06:23	06:25	06:27
			06:14	06:17	06:19	06:21	06:23	06:24	06:26	06:28	06:30	06:32
06:11	06:13	06:15	06:16	06:19	06:21	06:23	06:25	06:26	06:28	06:30	06:32	06:34
			06:21	06:24	06:26	06:28	06:30	06:31	06:33	06:35	06:37	06:39
06:18	06:20	06:22	06:23	06:26	06:28	06:30	06:32	06:33	06:35	06:37	06:39	06:41
			06:28	06:31	06:33	06:35	06:37	06:38	06:40	06:42	06:44	06:46
06:25	06:27	06:29	06:30	06:33	06:35	06:37	06:39	06:40	06:42	06:44	06:46	06:48
06:29	06:31	06:33	06:34	06:37	06:39	06:41	06:43	06:44	06:46	06:48	06:50	06:52
06:33	06:35	06:37	06:38	06:41	06:43	06:45	06:47	06:48	06:50	06:52	06:54	06:56
06:36	06:38	06:40	06:41	06:44	06:46	06:48	06:50	06:51	06:53	06:55	06:57	06:59
06:40	06:42	06:44	06:45	06:48	06:50	06:52	06:54	06:55	06:57	06:59	07:01	07:03
06:43	06:45	06:47	06:48	06:51	06:53	06:55	06:57	06:58	07:00	07:02	07:04	07:06
06:47	06:49	06:51	06:52	06:55	06:57	06:59	07:01	07:02	07:04	07:06	07:08	07:10
06:51	06:53	06:55	06:56	06:59	07:01	07:03	07:05	07:06	07:08	07:10	07:12	07:14
06:55	06:57	06:59	07:00	07:03	07:05	07:07	07:09	07:10	07:12	07:14	07:16	07:18
06:58	07:00	07:02	07:03	07:06	07:08	07:10	07:12	07:13	07:15	07:17	07:19	07:21
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BLAIR O-TRAIN WEST / OUEST	CYRVILLE O-TRAIN WEST / OUEST	ST-LAURENT O-TRAIN WEST / OUEST	TREMBLAY O-TRAIN WEST / OUEST	HURDMAN O-TRAIN WEST / OUEST	LEES O-TRAIN WEST / OUEST	UOTTAWA O-TRAIN WEST / OUEST	RIDEAU O-TRAIN WEST / OUEST	PARLIAMENT / PARLEMENT O-TRAIN WEST / OUEST	LYON O-TRAIN WEST / OUEST	PIMISI O-TRAIN WEST / OUEST	BAYVIEW O-TRAIN WEST / OUEST	TUNNEY'S PASTURE O-TRAIN
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18:19	18:21	18:23	18:24	18:27	18:29	18:31	18:33	18:34	18:36	18:38	18:40	18:42
18:23	18:25	18:27	18:28	18:31	18:33	18:35	18:37	18:38	18:40	18:42	18:44	18:46
18:30	18:32	18:34	18:35	18:38	18:40	18:42	18:44	18:45	18:47	18:49	18:51	18:53
18:35	18:37	18:39	18:40	18:43	18:45	18:47	18:49	18:50	18:52	18:54	18:56	18:58
18:40	18:42	18:44	18:45	18:48	18:50	18:52	18:54	18:55	18:57	18:59	19:01	19:03
18:45	18:47	18:49	18:50	18:53	18:55	18:57	18:59	19:00	19:02	19:04	19:06	19:08
18:50	18:52	18:54	18:55	18:58	19:00	19:02	19:04	19:05	19:07	19:09	19:11	19:13
18:55	18:57	18:59	19:00	19:03	19:05	19:07	19:09	19:10	19:12	19:14	19:16	19:18
19:00	19:02	19:04	19:05	19:08	19:10	19:12	19:14	19:15	19:17	19:19	19:21	19:23

APPENDIX

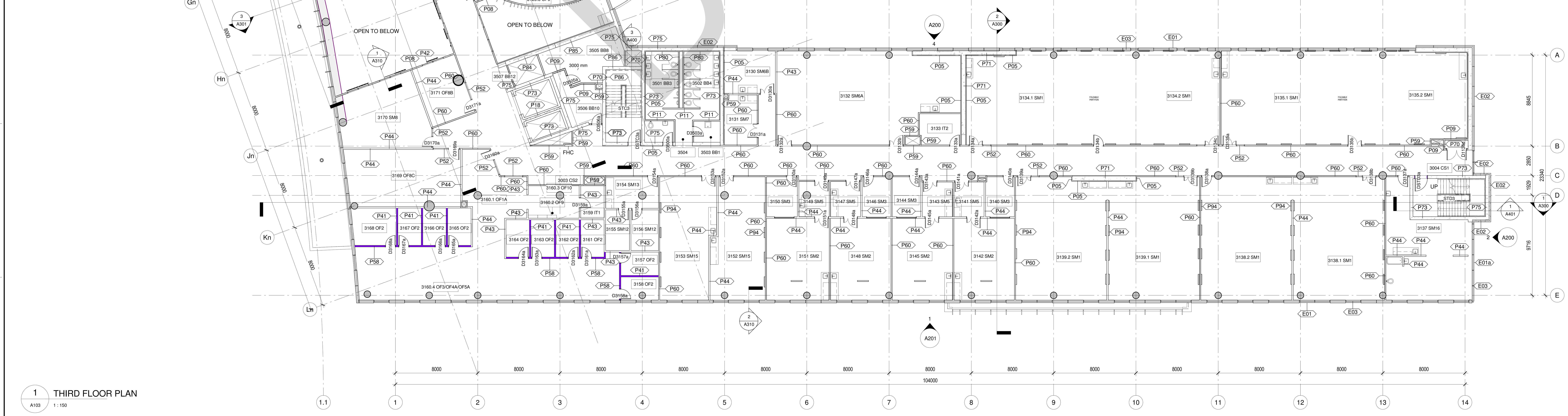
C SAMPLE CALCULATIONS

```
STAMSON 5.0        NORMAL REPORT        Date: 18-06-2021 22:37:40
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: UOA.te               Time Period: Day/Night 16/8 hours
Description: Location A


RT/Custom data, segment # 1: LRT (day/night)
--------------------------------------------
1 - CLRV:
Traffic volume    :   234/44    veh/TimePeriod
Speed             :    50 km/h

Data for Segment # 1: LRT (day/night)
-------------------------------------
Angle1   Angle2           : -90.00 deg   25.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      2       (Reflective ground surface)
Receiver source distance  : 132.00 / 132.00 m
Receiver height           :  22.20 / 22.20  m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: LRT (day)
------------------------------

Source height = 0.50 m

RT/Custom (0.00 + 50.93 + 0.00) = 50.93 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------
   -90     25   0.00  62.32  -9.44  -1.95   0.00   0.00   0.00  50.93
----------------------------------------------------------------------

Segment Leq : 50.93 dBA

Total Leq All Segments: 50.93 dBA

Results segment # 1: LRT (night)
--------------------------------

Source height = 0.50 m

RT/Custom (0.00 + 46.68 + 0.00) = 46.68 dBA
Angle1 Angle2  Alpha RefLeq  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------
   -90     25   0.00  58.07  -9.44  -1.95   0.00   0.00   0.00  46.68
----------------------------------------------------------------------
Segment Leq : 46.68 dBA

Total Leq All Segments: 46.68 dBA
TOTAL Leq FROM ALL SOURCES (DAY): 50.93
                         (NIGHT): 46.68
```

APPENDIX

D

DRAWINGS



1 THIRD FLOOR PLAN
A103 1 : 150

LEGEND

E01 - EXTERIOR STEEL STUD ALUMINIUM PARTITION

- PRE-PAINTED ALUM. PANEL ON
- THERMALLY BROKEN FURRING
- MIN 25MM AIR SPACE
- 100MM (MIN) MINERAL WOOL INSULATION
- AIR BARRIER
- 15MM EXTERIOR SHEATHING
- STEEL STUD WALL W/
- 50MM SPRAY FOAM INSULATION (VAP. BAR.)
- 16MM GYP. BD.
- PAINT FINISH

E01a - EXTERIOR STEEL STUD ALUMINIUM PARTITION

- PRE-PAINTED ALUM. PANEL ON
- THERMALLY BROKEN FURRING
- MIN 25MM AIR SPACE
- 100MM (MIN) MINERAL WOOL INSULATION
- AIR BARRIER
- CONCRETE SHEAR WALL

E02 - EXTERIOR MASONRY PARTITION

- MASONRY VENEER
- MIN 25MM AIR SPACE
- 100MM (MIN) MINERAL WOOL INSULATION
- MASONRY BLOCK WALL

E02a - EXTERIOR MASONRY PARTITION

- MASONRY VENEER
- MIN 25MM AIR SPACE
- 100MM (MIN) MINERAL WOOL INSULATION
- MASONRY BLOCK WALL

E03 - EXTERIOR ALUMINIUM CURTAIN WALL

- THERMALLY BROKEN ALUMINUM CURTAIN WALL
- 25MM IGU – TINTED GLASS, SOLARBAN60, ARGON FILLED THERMALLY BROKEN SPACER
- SPANDREL GLASS W/100MM MINERAL WOOL INSULATION W/ STL. STUD & GYP. BD BACK-UP WALL

P01 - 64mm CH STEEL STUD PARTITION
(FOR RATED 1hr FRR ULC DESIGN NO. W452 or SIMILAR)

- 16mm GYPSUM BOARD SHEATHING - TYPE X
- 64mm CH STEEL STUD @ 400mm O.C.
- 25mm GYPSUM BOARD SHEATHING - TYPE X

P03 - 22mm FURRING CHANNEL PARTITION
ONE SIDED

- 16mm GYPSUM BOARD SHEATHING
- 22mm STEEL FURRING @ 400 O.C.

P04 - 41mm STEEL STUD PARTITION

- 16mm GYPSUM BOARD SHEATHING
- 41mm STEEL FURRING @ 400 O.C.

P04 - 41mm STEEL STUD PARTITION

- 16mm GYPSUM BOARD SHEATHING
- 41mm STEEL FURRING @ 400 O.C.

P05 - 64mm STEEL STUD PARTITION

- 16mm GYPSUM BOARD SHEATHING
- 64mm STEEL STUD @ 400mm O.C.

P07 - 92mm STEEL STUD PARTITION
ONE SIDED

- 16mm GYPSUM BOARD SHEATHING
- 92mm STEEL STUD @ 400mm O.C.

P08 - 92mm STEEL STUD PARTITION
(FOR RATED 1hr FRR ULC DESIGN NO. 407 or SIMILAR)

- 16mm GYPSUM BOARD SHEATHING - TYPE X
- 92mm STEEL STUD @ 600mm O.C.
- FILL CAVITY w/ACOUSTIC BATT INSULATION
- 16mm GYPSUM BOARD SHEATHING - TYPE X

P09 - 92mm STEEL STUD PARTITION
(FOR RATED 2hr FRR ULC DESIGN NO. 453 or SIMILAR)

- 16mm GYPSUM BOARD SHEATHING - TYPE X
- 16mm GYPSUM BOARD SHEATHING - TYPE X
- 92mm STEEL STUD @ 600mm O.C.
- FILL CAVITY w/ACOUSTIC BATT INSULATION
- 16mm GYPSUM BOARD SHEATHING - TYPE X
- 16mm GYPSUM BOARD SHEATHING - TYPE X

P11 - 92mm STEEL STUD PARTITION

- 16mm GYPSUM BOARD SHEATHING
- 92mm STEEL STUD @ 600mm O.C.
- FILL CAVITY w/ACOUSTIC BATT INSULATION
- 16mm GYPSUM BOARD SHEATHING

P18 - CONCRETE MASONRY UNIT

- 190mm CONCRETE MASONRY UNIT

P25 - 190mm CONCRETE MASONRY UNIT

- 16mm GYPSUM BOARD SHEATHING
- 64mm STEEL STUD @ 400mm O.C.
- 190mm CONCRETE MASONRY UNIT

P26 - 254mm CONCRETE MASONRY UNIT

- 16mm GYPSUM BOARD SHEATHING
- 64mm STEEL STUD @ 400mm O.C.
- 254mm CONCRETE MASONRY UNIT

P41 - DEMOUNTABLE PARTITION

REFER TO MANUFACTURER

P42 - INTERIOR GLAZED WALL
(1hr FRR)

REFER TO MANUFACTURER

P43 - 92mm STEEL STUD PARTITION
45 STC

TO BE DETERMINED

P44 - 92mm STEEL STUD PARTITION
50 STC

TO BE DETERMINED

P45 - 92mm STEEL STUD PARTITION
52 STC

TO BE DETERMINED

P46 - 92mm STEEL STUD PARTITION
53 STC

TO BE DETERMINED

P47 - 92mm STEEL STUD PARTITION
55 STC

TO BE DETERMINED

P48 - 92mm STEEL STUD PARTITION
58 STC

TO BE DETERMINED

P49 - 92mm STEEL STUD PARTITION
60 STC

TO BE DETERMINED

P50 - CURTAIN WALL ASSEMBLY

TO BE DETERMINED

P52 - ALUMINUM FRAME

REFER TO MANUFACTURER

P53 - PC350 ALUMINIUM FRAME

REFER TO MANUFACTURER

P56 - 254mm CONCRETE MASONRY UNIT

- 254mm CONCRETE MASONRY UNIT

P58 - PC350 PARTITION

REFER TO MANUFACTURER

P59 - 102mm SHAFT PARTITION
(FOR RATED 1hr FRR ULC DESIGN)

- 16mm GYPSUM BOARD SHEATHING - TYPE X
- 102mm CH STEEL STUD @ 600mm O.C.
- 25mm GYPSUM BOARD SHEATHING - TYPE X

P60 - 92mm STEEL STUD PARTITION

- 16mm GYPSUM BOARD SHEATHING
- 92mm STEEL STUD @ 600mm O.C
- FILL CAVITY w/ACOUSTIC BATT INSULATION.
- 16mm GYPSUM BOARD SHEATHING

P70 - 102mm SHAFT PARTITION
(FOR RATED 2hr FRR ULC DESIGN)

- 16mm GYPSUM BOARD SHEATHING - TYPE X
- 102mm CH STEEL STUD @ 600mm O.C.
- 25mm GYPSUM BOARD SHEATHING - TYPE X

P71 - 400mm STRUCTURAL CONCRETE PARTITION

- 400mm STRUCTURAL CONCRETE

P73 - 300mm STRUCTURAL CONCRETE PARTITION
(FOR RATED 1hr FRR ULC DESIGN)

- 300mm STRUCTURAL CONCRETE

P75 - 300mm STRUCTURAL CONCRETE PARTITION

- 300mm STRUCTURAL CONCRETE

P78 - EXTERIOR STEEL STUD ALUMINIUM PANELS

- 16mm GYPSUM BOARD
- 92mm STEEL STUDS
- 100mm SEMI-RIGID INSULATION
- 65mm ALUMINIUM PANEL

P80 - 102mm SHAFT PARTITION

- 16mm GYPSUM BOARD SHEATHING
- 102mm CH STEEL STUD @ 600mm O.C.
- 25mm GYPSUM BOARD SHEATHING

P84 - 400mm STRUCTURAL CONCRETE PARTITION
(FOR RATED 1hr FRR ULC DESIGN)

- 400mm STRUCTURAL CONCRETE

P85 - 400mm STRUCTURAL CONCRETE PARTITION
(FOR RATED 2hr FRR ULC DESIGN)

- 400mm STRUCTURAL CONCRETE

P86 - 300mm STRUCTURAL CONCRETE PARTITION
(FOR RATED 2hr FRR ULC DESIGN)

- 300mm STRUCTURAL CONCRETE

P88 - 254mm CONTAINMENT CURB

- TO BE DETERMINED

P89 - 254mm CONCRETE MASONERY UNIT
(FOR RATED 2hr FRR ULC DESIGN)

- 254mm CONCRETE MASONERY UNIT

P90 - 254mm CONCRETE MASONERY UNIT
(FOR RATED 1hr FRR ULC DESIGN)

- 254mm CONCRETE MASONERY UNIT

P91 - 152mm STEEL STUD PARTITION

- 16mm GYPSUM BOARD SHEATHING
- 152mm STEEL STUD @ 600 O.C.
- 16mm GYPSUM BOARD SHEATHING

P92 - 194mm SANDBLASTED CONCRETE PARTITION

- 16mm GYPSUM BOARD SHEATHING
- 64mm STEEL STUD @ 400.O.C
- 194mm SANDBLASTED CONCRETE

P94 - 92mm STEEL STUD NURSING HEADWALL

- 16mm GYPSUM BOARD SHEATHING
- 92mm STEEL STUD @ 600.O.C

P95 - 254mm CONCRETE MASONERY UNIT
(FOR RATED 3hr FRR ULC DESIGN)

- 254mm CONCRETE MASONERY UNIT

GENERAL NOTES

- ALL STUD PARTITIONS ARE DIMENSIONED TO FACE OF STEEL STUD UNLESS NOTED OTHERWISE.
- ALL CONCRETE MASONRY PARTITIONS ARE DIMENSIONED TO FACE OF CONCRETE MASONRY, UNLESS NOTED OTHERWISE.
- ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHER WISE NOTED.

Name / Elevation	DATUM ELEVATION TAG
0	GRID BUBBLE
	NORTH ARROW
	RAMP DIRECTION
1t	WALL TAG
Room name / 101 Program Code / 150 m2	ROOM TAG
DXXXa	DOOR TAG
A	KEYNOTE
1 / A101 Ref	BUILDING SECTION
Ref 1 / A101	CALLOUT
1 / A101 Ref	WALL SECTION
A101 201	INTERIOR ELEVATION TAG
A101 201	EXTERIOR ELEVATION TAG
A1 View Name / A101 View Scale	SHEET TITLE
3000	CEILING MATERIAL & HEIGHT TAG
℄	CENTER LINE

ARCHITECTURE 49
1000-150 ISABELLA STREET
OTTAWA (ONTARIO) CANADA K1S 1V7
Phone: 613-238-0440 | Fax: 613-238-6597 | WWW.ARCHITECTURE49.COM

wsp
2611 Queensview Dr, Suite 300
Ottawa, Ontario, K2B 8K2 Canada
T 613-829-2800 | F 613-829-8299 | www.wsp.com

PCL CONSTRUCTION
49 Auriga Drive
Ottawa, Ontario, K2E 8A1 Canada
T 613-978-5398 | www.pcl.com

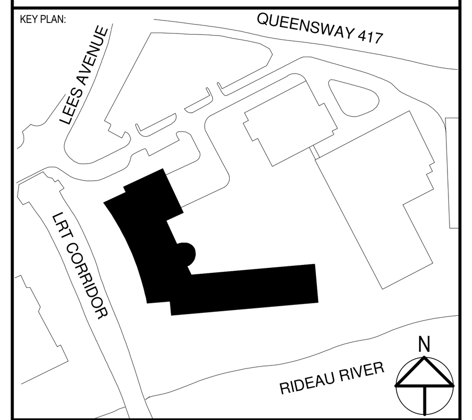
SEAL:

CLIENT:
uOttawa

RFP #: 2020-40369 CLIENT REF. #: BT20-18477

PROJECT:
University of Ottawa - Faculty of Health Sciences Building

KEY PLAN:



ISSUED FOR - REVISION:

IS	RE	DATE	DESCRIPTION
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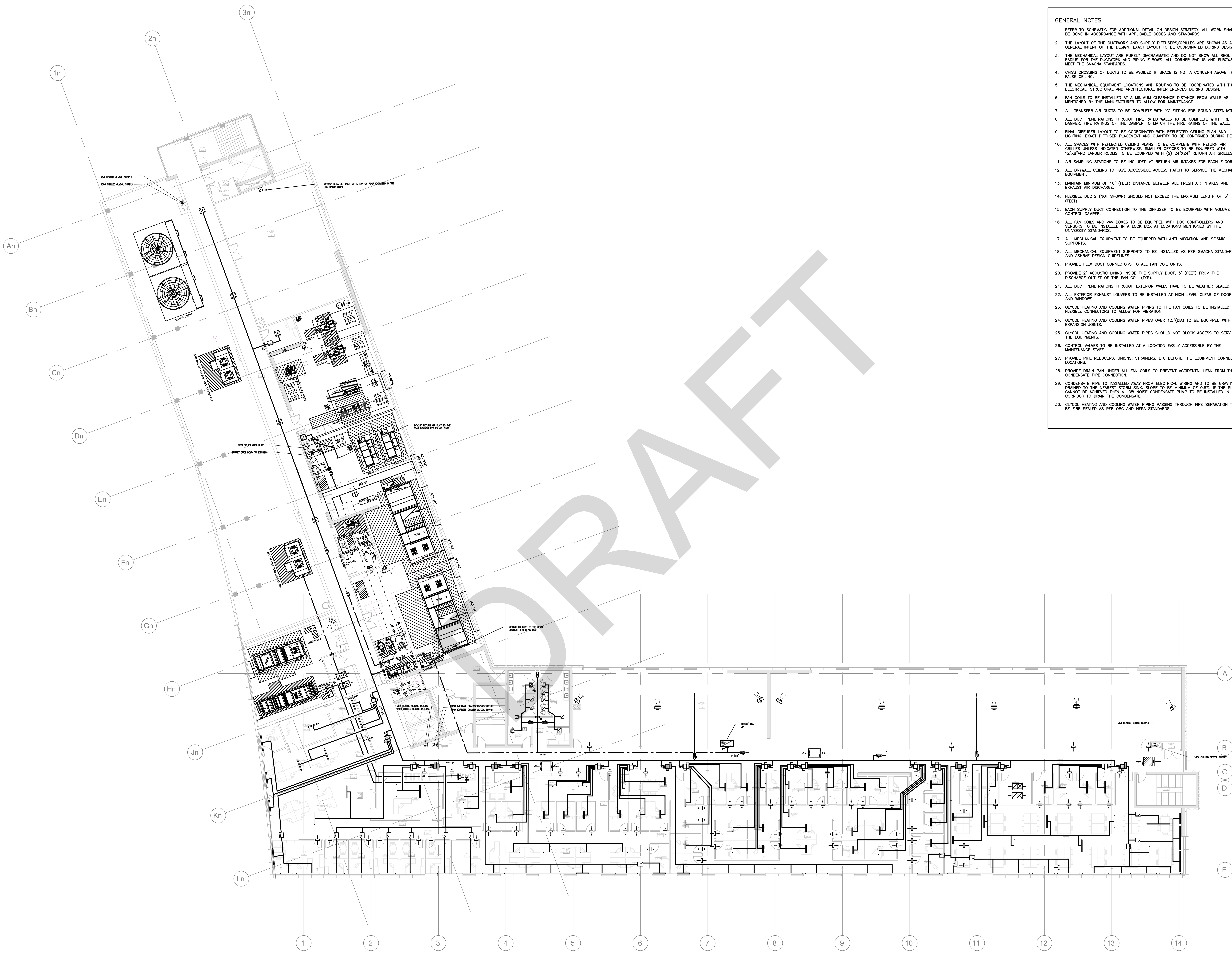
PROJECT NO: 211-01094-00
DATE: 2021-04-15
ORIGINAL SCALE: As indicated
IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
25mm
DESIGNED BY: WP
DRAWN BY: EV
CHECKED BY: WP / MK
DISCIPLINE:

TITLE:
THIRD FLOOR PLAN

SHEET NUMBER:
A103
SHEET #: OF
ISSUE: REV #
DATE OF:

DRAFT



GENERAL NOTES:

1. REFER TO SCHEMATIC FOR ADDITIONAL DETAIL ON DESIGN STRATEGY. ALL WORK SHALL BE DONE IN ACCORDANCE WITH APPLICABLE CODES AND STANDARDS.
2. THE LAYOUT OF THE DUCTWORK AND SUPPLY DIFFUSERS/GRILLES ARE SHOWN AS A GENERAL INTENT OF THE DESIGN. EXACT LAYOUT TO BE COORDINATED DURING DESIGN.
3. THE MECHANICAL LAYOUT ARE PURELY DIAGRAMMATIC AND DO NOT SHOW ALL REQUIRED RADIUS FOR THE DUCTWORK AND PIPING ELBOWS. ALL CORNER RADIUS AND ELBOWS TO MEET THE SMACNA STANDARDS.
4. CRISS CROSSING OF DUCTS TO BE AVOIDED IF SPACE IS NOT A CONCERN ABOVE THE FALSE CEILING.
5. THE MECHANICAL EQUIPMENT LOCATIONS AND ROUTING TO BE COORDINATED WITH THE ELECTRICAL, STRUCTURAL AND ARCHITECTURAL INTERFERENCES DURING DESIGN.
6. FAN COILS TO BE INSTALLED AT A MINIMUM CLEARANCE DISTANCE FROM WALLS AS MENTIONED BY THE MANUFACTURER TO ALLOW FOR MAINTENANCE.
7. ALL TRANSFER AIR DUCTS TO BE COMPLETE WITH 'C' FITTING FOR SOUND ATTENUATION.
8. ALL DUCT PENETRATIONS THROUGH FIRE RATED WALLS TO BE COMPLETE WITH FIRE DAMPER. FIRE RATINGS OF THE DAMPER TO MATCH THE FIRE RATING OF THE WALL.
9. FINAL DIFFUSER LAYOUT TO BE COORDINATED WITH REFLECTED CEILING PLAN AND LIGHTING. EXACT DIFFUSER PLACEMENT AND QUANTITY TO BE CONFIRMED DURING DESIGN.
10. ALL SPACES WITH REFLECTED CEILING PLANS TO BE COMPLETE WITH RETURN AIR GRILLES UNLESS INDICATED OTHERWISE. SMALLER OFFICES TO BE EQUIPPED WITH 12"X8"AND LARGER ROOMS TO BE EQUIPPED WITH (2) 24"X24" RETURN AIR GRILLES.
11. AIR SAMPLING STATIONS TO BE INCLUDED AT RETURN AIR INTAKES FOR EACH FLOOR.
12. ALL DRYWALL CEILING TO HAVE ACCESSIBLE ACCESS HATCH TO SERVICE THE MECHANICAL EQUIPMENT.
13. MAINTAIN MINIMUM OF 10' (FEET) DISTANCE BETWEEN ALL FRESH AIR INTAKES AND EXHAUST AIR DISCHARGE.
14. FLEXIBLE DUCTS (NOT SHOWN) SHOULD NOT EXCEED THE MAXIMUM LENGTH OF 5' (FEET).
15. EACH SUPPLY DUCT CONNECTION TO THE DIFFUSER TO BE EQUIPPED WITH VOLUME CONTROL DAMPER.
16. ALL FAN COILS AND VAV BOXES TO BE EQUIPPED WITH DDC CONTROLLERS AND SENSORS TO BE INSTALLED IN A LOCK BOX AT LOCATIONS MENTIONED BY THE UNIVERSITY STANDARDS.
17. ALL MECHANICAL EQUIPMENT TO BE EQUIPPED WITH ANTI–VIBRATION AND SEISMIC SUPPORTS.
18. ALL MECHANICAL EQUIPMENT SUPPORTS TO BE INSTALLED AS PER SMACNA STANDARDS AND ASHRAE DESIGN GUIDELINES.
19. PROVIDE FLEX DUCT CONNECTORS TO ALL FAN COIL UNITS.
20. PROVIDE 2" ACOUSTIC LINING INSIDE THE SUPPLY DUCT, 5' (FEET) FROM THE DISCHARGE OUTLET OF THE FAN COIL (TYP).
21. ALL DUCT PENETRATIONS THROUGH EXTERIOR WALLS HAVE TO BE WEATHER SEALED.
22. ALL EXTERIOR EXHAUST LOUVERS TO BE INSTALLED AT HIGH LEVEL CLEAR OF DOORS AND WINDOWS.
23. GLYCOL HEATING AND COOLING WATER PIPING TO THE FAN COILS TO BE INSTALLED WITH FLEXIBLE CONNECTORS TO ALLOW FOR VIBRATION.
24. GLYCOL HEATING AND COOLING WATER PIPES OVER 1.5"(DIA) TO BE EQUIPPED WITH EXPANSION JOINTS.
25. GLYCOL HEATING AND COOLING WATER PIPES SHOULD NOT BLOCK ACCESS TO SERVICE THE EQUIPMENTS.
26. CONTROL VALVES TO BE INSTALLED AT A LOCATION EASILY ACCESSIBLE BY THE MAINTENANCE STAFF.
27. PROVIDE PIPE REDUCERS, UNIONS, STRAINERS, ETC BEFORE THE EQUIPMENT CONNECTION LOCATIONS.
28. PROVIDE DRAIN PAN UNDER ALL FAN COILS TO PREVENT ACCIDENTAL LEAK FROM THE CONDENSATE PIPE CONNECTION.
29. CONDENSATE PIPE TO INSTALLED AWAY FROM ELECTRICAL WIRING AND TO BE GRAVITY DRAINED TO THE NEAREST STORM SINK. SLOPE TO BE MINIMUM OF 0.5%. IF THE SLOPE CANNOT BE ACHIEVED THEN A LOW NOISE CONDENSATE PUMP TO BE INSTALLED IN THE CORRIDOR TO DRAIN THE CONDENSATE.
30. GLYCOL HEATING AND COOLING WATER PIPING PASSING THROUGH FIRE SEPARATION TO BE FIRE SEALED AS PER OBC AND NFPA STANDARDS.

ARCHITECTURE 49
1000-150 ISABELLA STREET
OTTAWA (ONTARIO) CANADA K1S 1V7
Phone: 613-238-0440 | Fax: 613-238-6597 | WWW.ARCHITECTURE49.COM

wsp
2611 Queensview Dr, Suite 300
Ottawa, Ontario, K2B 8K2 Canada
T 613-829-2800 | F 613-829-8299 | www.wsp.com

PCL CONSTRUCTION
49 Auriga Drive
Ottawa, Ontario, K2E 8A1 Canada
T 613-978-5398 | www.pcl.com

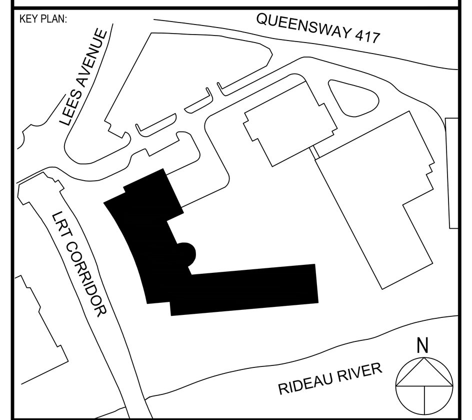
SEAL:

CLIENT:
uOttawa

RFP #: 2020-40369 CLIENT REF #: BT20-18477

PROJECT:
University of Ottawa - Faculty of Health Sciences Building

KEY PLAN:



ISSUED FOR - REVISION:

IS	RE	DATE	DESCRIPTION
1		2021-04-15	ISSUED FOR TECHNICAL SUBMISSION

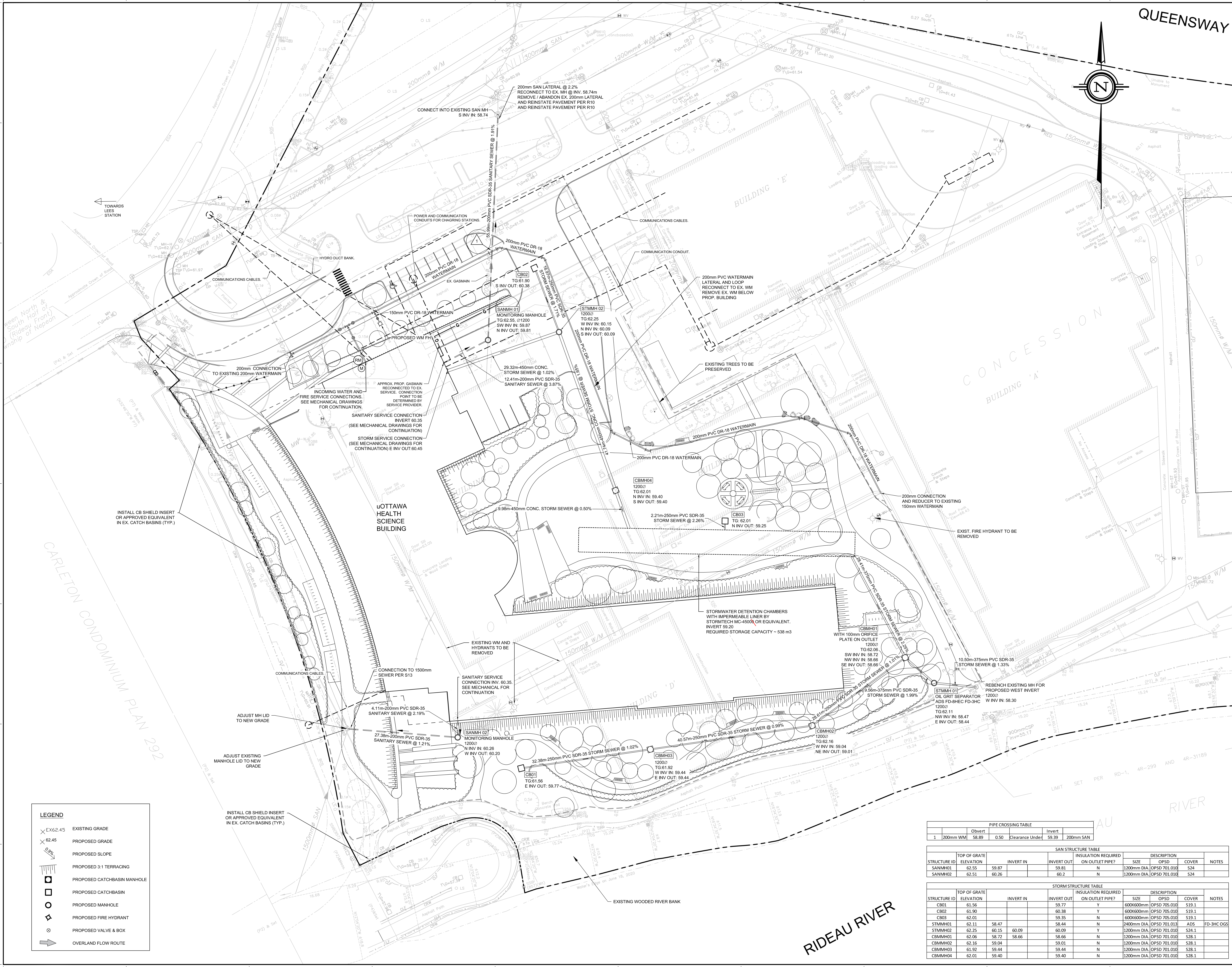
PROJECT NO: 211-01094-00	DATE: 2021-04-15
ORIGINAL SCALE: 1:150	IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
DESIGNED BY: P.A. / A.S. / J.B.	
DRAWN BY: P.A. / A.S. / J.B.	
CHECKED BY: M.E.	25mm

DISCIPLINE: MECHANICAL

TITLE:
HVAC FIFTH FLOOR PLAN

SHEET NUMBER: M305
SHEET #: 15 OF 21

ISSUE: ISSUED FOR TECHNICAL SUBMISSION
DATE OF: 2021-04-15
REV #: 1



PIPE CROSSING TABLE						
		Obvert			Invert	
1	200mm WM	58.89	0.50	Clearance Under	59.39	200mm SAN

SAN STRUCTURE TABLE

STRUCTURE ID	TOP OF GRATE ELEVATION	INVERT IN			INVERT OUT	INSULATION REQUIRED ON OUTLET PIPE?	DESCRIPTION SIZE	OPSD	COVER	NOTES
SANMH01	62.55	59.87			59.81	N	1200mm DIA.	OPSD 701.010	S24	
SANMH02	62.51	60.26			60.2	N	1200mm DIA.	OPSD 701.010	S24	

STORM STRUCTURE TABLE

STRUCTURE ID	TOP OF GRATE ELEVATION	INVERT IN			INVERT OUT	INSULATION REQUIRED ON OUTLET PIPE?	DESCRIPTION SIZE	OPSD	COVER	NOTES
CB01	61.56				59.77	Y	600X600mm	OPSD 705.010	S19.1	
CB02	61.90				60.38	Y	600X600mm	OPSD 705.010	S19.1	
CB03	62.01				59.35	N	600X600mm	OPSD 705.010	S19.1	
STMMH01	62.11	58.47			58.44	N	2400mm DIA.	OPSD 701.013	ADS	FD-3HC OGS
STMMH02	62.25	60.15	60.09		60.09	Y	1200mm DIA.	OPSD 701.010	S24.1	
CBMMH01	62.06	58.72	58.66		58.66	N	1200mm DIA.	OPSD 701.010	S28.1	
CBMMH02	62.16	59.04			59.01	N	1200mm DIA.	OPSD 701.010	S28.1	
CBMMH03	61.92	59.44			59.44	N	1200mm DIA.	OPSD 701.010	S28.1	
CBMMH04	62.01	59.40			59.40	N	1200mm DIA.	OPSD 701.010	S28.1	

ARCHITECTURE 49
1000-150 ISABELLA STREET
OTTAWA (ONTARIO) CANADA K1S 1V7
Phone: 613-238-0440 | Fax: 613-238-6597 | WWW.ARCHITECTURE49.COM

wsp
2611 Queensview Dr, Suite 300
Ottawa, Ontario, K2B 8K2 Canada
T 613-829-2800 | F 613-829-8299 | www.wsp.com

PCL CONSTRUCTION
49 Auriga Drive
Ottawa, Ontario, K2E 8A1 Canada
T 613-978-5398 | www.pcl.com

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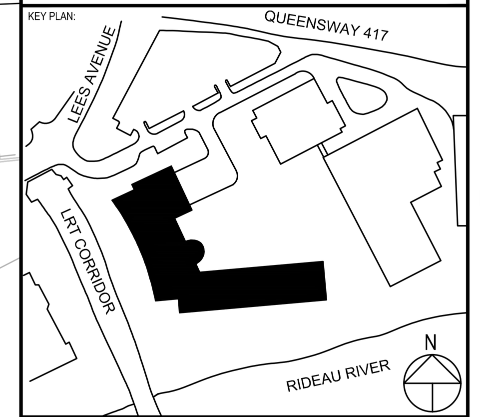
CLIENT: uOttawa

RFP #: 2020-40369 CLIENT REF. #: BT20-18477

PROJECT:

University of Ottawa - Faculty of Health Sciences Building

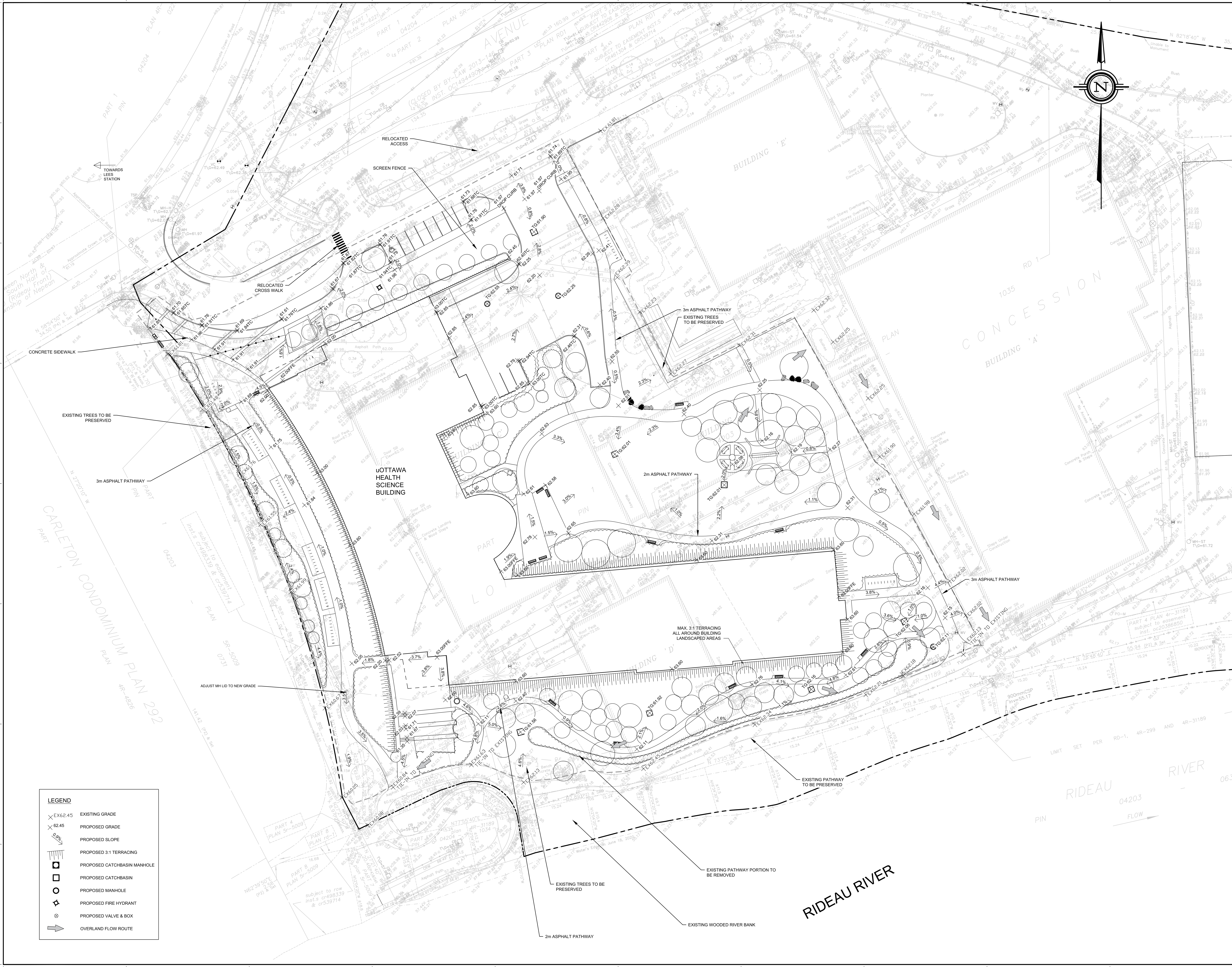
KEY PLAN:



ISSUED FOR - REVISION:

IS	RE	DATE	DESCRIPTION
2		2021-06-21	ISSUED FOR SITE APPLICATION
1		2021-04-15	ISSUED FOR TECHNICAL SUMBMISSION

PROJECT NO: 211-01094-01
DATE: 2021-06-21
ORIGINAL SCALE: 1:300
IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
25mm
DESIGNED BY: BN
DRAWN BY: AM
CHECKED BY: JJ
DISCIPLINE: CIVIL
TITLE: SERVICING PLAN
SHEET NUMBER: C-001
SHEET #: 1 OF 4
ISSUE: ISSUED FOR SITE APPLICATION
REV #: 2
DATE OF: 2021-06-21



ARCHITECTURE 49

1000-150 ISABELLA STREET
OTTAWA (ONTARIO) CANADA K1S 1V7
Phone: 613-238-0440 | Fax: 613-238-6597 | WWW.ARCHITECTURE49.COM

wsp

2611 Queensview Dr, Suite 300
Ottawa, Ontario, K2B 8K2 Canada
T 613-829-2800 | F 613-829-8299 | www.wsp.com

PCL CONSTRUCTION

49 Auriga Drive
Ottawa, Ontario, K2E 8A1 Canada
T 613-978-5398 | www.pcl.com

SEAL:

CLIENT:

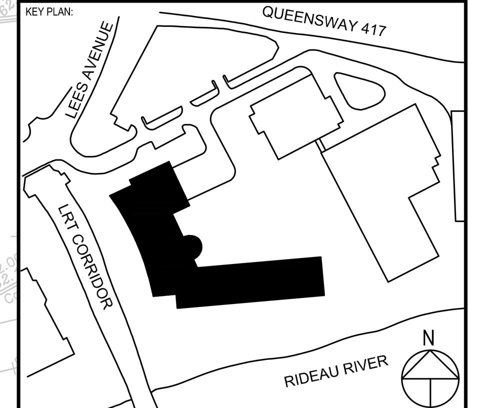
uOttawa

RFP #: 2020-40369 CLIENT REF. #: BT20-18477

PROJECT:

University of Ottawa - Faculty of Health Sciences Building

KEY PLAN:



ISSUED FOR - REVISION:

IS	RE	DATE	DESCRIPTION
2		2021-06-21	ISSUED FOR SITE APPLICATION
1		2021-04-15	ISSUED FOR TECHNICAL SUMBMISSION

PROJECT NO: 211-01094-01	DATE: 2021-06-21
ORIGINAL SCALE: 1:300	IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
DESIGNED BY: SM	
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DISCIPLINE: CIVIL

TITLE: GRADING PLAN

SHEET NUMBER: C-002

SHEET #: 2 OF 4

ISSUE: ISSUED FOR SITE APPLICATION

REV # 2

DATE OF: 2021-06-21

NOTES: EROSION AND SEDIMENT CONTROL

** CONTRACTOR IS RESPONSIBLE FOR ALL INSTALLATION, MONITORING, REPAIR AND REMOVAL OF ALL EROSION AND SEDIMENT CONTROL FEATURES. **

1. PRIOR TO START OF CONSTRUCTION:

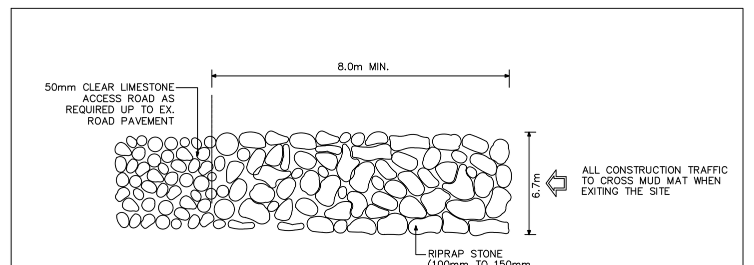
1.1. INSTALL SILT FENCE IN LOCATION SHOWN.
1.2. INSTALL MUD MAT AT CONSTRUCTION ENTRANCES.
1.3. INSTALL FILTER FABRIC OR SILT SACK FILTERS IN ALL THE CATCHBASINS AND MANHOLES TO REMAIN DURING CONSTRUCTION WITHIN THE SITE (SEE TYPICAL DETAIL). INSTALL CHECK DAM.
1.4. INSPECT MEASURES IMMEDIATELY AFTER INSTALLATION.

2. DURING CONSTRUCTION:

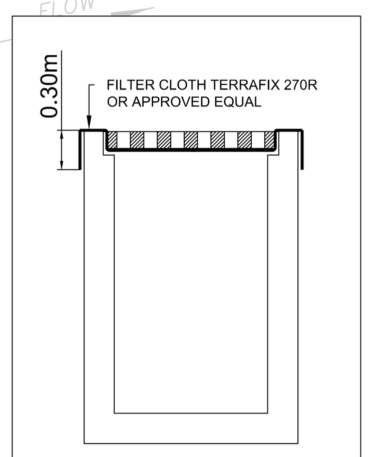
2.1. MINIMIZE THE EXTENT OF DISTURBED AREAS AND THE DURATION OF EXPOSURE AND IMPACTS TO EXISTING GRADING.
2.2. PERIMETER VEGETATION TO REMAIN IN PLACE UNTIL PERMANENT STORM WATER MANAGEMENT IS IN PLACE. OTHERWISE, IMMEDIATELY INSTALL SILT FENCE WHEN THE EXISTING SITE IS DISTURBED AT THE PERIMETER.
2.3. PROTECT DISTURBED AREAS FROM OVERLAND FLOW BY PROVIDING TEMPORARY SWALES TO THE SATISFACTION OF THE FIELD ENGINEER. TIE-IN TEMPORARY SWALE TO EXISTING CB'S AS REQUIRED.
2.4. PROVIDE TEMPORARY COVER SUCH AS SEEDING OR MULCHING IF DISTURBED AREA WILL NOT BE REHABILITATED WITHIN 30 DAYS.
2.5. INSPECT SILT FENCES, FILTER FABRIC FILTERS AND CATCH BASIN SUMPS WEEKLY AND WITHIN 24 HOURS AFTER A STORM EVENT. CLEAN AND REPAIR WHEN NECESSARY.
2.6. DOWNSTREAM STORM INFRASTRUCTURE SHALL BE PROTECTED FROM UNFILTERED RUNOFF DURING DEMOLITION OF STORM INFRASTRUCTURE ON SITE.
2.7. DRAWING TO BE REVIEWED AND REVISED AS REQUIRED DURING CONSTRUCTION.
2.8. EROSION CONTROL FENCING TO BE ALSO INSTALLED AROUND THE BASE OF ALL STOCKPILES.
2.9. DO NOT LOCATE TOPSOIL PILES AND EXCAVATION MATERIAL CLOSER THAN 2.5m FROM ANY PAVED SURFACE, OR ONE WHICH IS TO BE PAVED BEFORE THE PILE IS REMOVED. ALL TOPSOIL PILES ARE TO BE SEEDED IF THEY ARE TO REMAIN ON SITE LONG ENOUGH FOR SEEDS TO GROW (LONGER THAN 30 DAYS).
2.10. CONTROL WIND-BLOWN DUST OFF SITE BY SEEDING TOPSOIL PILES AND OTHER AREAS TEMPORARILY (PROVIDE WATERING AS REQUIRED AND TO THE SATISFACTION OF THE ENGINEER).
2.11. NO ALTERNATE METHODS OF EROSION PROTECTION SHALL BE PERMITTED UNLESS APPROVED BY THE FIELD ENGINEER.
2.12. CITY ROADWAY AND SIDEWALK TO BE CLEANED OF ALL SEDIMENT FROM VEHICULAR TRACKING AS REQUIRED.
2.13. DURING WET CONDITIONS, TIRES OF ALL VEHICLES/EQUIPMENT LEAVING THE SITE ARE TO BE SCRAPED.
2.14. ANY MUD/MATERIAL TRACKED ONTO THE ROAD SHALL BE REMOVED IMMEDIATELY BY HAND OR RUBBER TIRE LOADER.
2.15. TAKE ALL NECESSARY STEPS TO PREVENT BUILDING MATERIAL, CONSTRUCTION DEBRIS OR WASTE BEING SPILLED OR TRACKED ONTO ABUTTING PROPERTIES OR PUBLIC STREETS DURING CONSTRUCTION AND PROCEED IMMEDIATELY TO CLEAN UP ANY AREAS SO AFFECTED.
2.16. ALL EROSION CONTROL STRUCTURE TO REMAIN IN PLACE UNTIL ALL DISTURBED GROUND SURFACES HAVE BEEN STABILIZED EITHER BY PAVING OR RESTORATION OF VEGETATIVE GROUND COVER.
2.17. THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES, TO PROVIDE FOR PROTECTION OF THE AREA DRAINAGE SYSTEM AND THE RECEIVING WATERCOURSE, DURING CONSTRUCTION ACTIVITIES. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.

LEGEND

- SF — LIGHT DUTY SILT FENCE AS PER OPSD 219.110
- FILTER CLOTH PLACED UNDER CB AND CBMH COVER
- STRAW BALE CHECK DAM PER OPSD 219.180
- MUD MAT



MUD MAT
(NTS)



FILTER CLOTH CATCHBASIN OR MANHOLE SEDIMENT CONTROL DEVICE
(NTS)

ARCHITECTURE 49
1000-150 ISABELLA STREET
OTTAWA (ONTARIO) CANADA K1S 1V7
Phone: 613-238-0440 | Fax: 613-238-6597 | WWW.ARCHITECTURE49.COM

wsp
2611 Queensview Dr, Suite 300
Ottawa, Ontario, K2B 8K2 Canada
T 613-829-2800 | F 613-829-8299 | www.wsp.com

PCL CONSTRUCTION
49 Auriga Drive
Ottawa, Ontario, K2E 8A1 Canada
T 613-978-5398 | www.pcl.com

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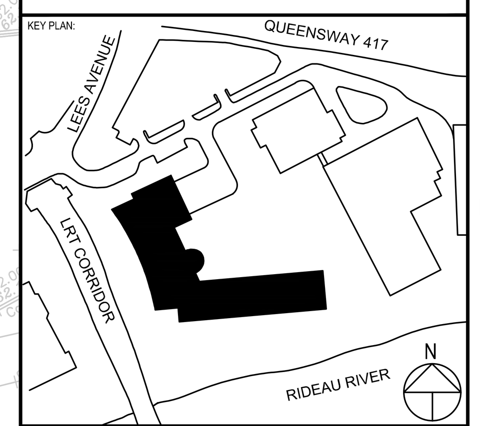

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TITLE: EROSION AND SEDIMENT CONTROL PLAN

SHEET NUMBER: C-003

SHEET #: 3 OF 4

ISSUE: ISSUED FOR SITE APPLICATION

DATE OF: 2021-06-21

REV #: 1

NOTES: <u>GENERAL</u>

1. DRAWINGS TO BE READ IN CONJUNCTION WITH ARCHITECTURAL AND LANDSCAPE DRAWINGS
2. ALL SERVICES, MATERIALS, CONSTRUCTION METHODS AND INSTALLATIONS SHALL BE IN ACCORDANCE WITH THE LATEST STANDARDS AND REGULATIONS OF THE: CITY OF OTTAWA STANDARD SPECIFICATIONS AND DRAWINGS, ONTARIO PROVINCIAL SPECIFICATION STANDARD SPECIFICATION (OPSS) AND ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD), UNLESS OTHERWISE SPECIFIED, TO THE SATISFACTION OF THE CITY AND THE CONSULTANT
3. THE POSITION OF EXISTING POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND ABOVEGROUND UTILITIES, STRUCTURES AND APPURTENANCES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWING, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL SATISFY HIMSELF OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES, AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM DURING THE COURSE OF CONSTRUCTION. ANY RELOCATION OF EXISTING UTILITIES REQUIRED BY THE DEVELOPMENT OF SUBJECT LANDS IS TO BE UNDERTAKEN AT CONTRACTOR'S EXPENSE.
4. THE CONTRACTOR MUST NOTIFY ALL EXISTING UTILITY COMPANY OFFICIALS FIVE (5) BUSINESS DAYS PRIOR TO START OF CONSTRUCTION AND HAVE ALL EXISTING UTILITIES AND SERVICES LOCATED IN THE FIELD OR EXPOSED PRIOR TO THE START OF CONSTRUCTION, INCLUDING BUT NOT LIMITED TO POWER, COMMUNICATION AND GAS LINES.
5. ALL TRENCHING AND EXCAVATIONS TO BE IN ACCORDANCE WITH THE LATEST REVISIONS OF THE OCCUPATIONAL HEALTH AND SAFETY ACT AND REGULATIONS FOR CONSTRUCTION PROJECTS AND AS PER THE RECOMMENDATIONS INCLUDED IN THE GEOTECHNICAL REPORT.
6. REFER TO ARCHITECTS PLANS FOR BUILDING DIMENSIONS, LAYOUT AND REMOVALS. REFER TO LANDSCAPE PLAN FOR LANDSCAPED DETAILS AND OTHER RELEVANT INFORMATION. ALL INFORMATION SHALL BE CONFIRMED PRIOR TO COMMENCEMENT OF CONSTRUCTION.
7. TOPOGRAPHIC SURVEY COMPLETED AND PROVIDED BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD. DATED JULY 21, 2020. CONTRACTOR TO VERIFY IN THE FIELD PRIOR TO CONSTRUCTION OF ANY WORK AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES.
8. ALL ELEVATIONS ARE GEODETIC AND UTILIZE METRIC UNITS. VERIFY THAT JOB BENCHMARKS HAVE NOT BEEN ALTERED OR DISTURBED.
9. ALL GROUND SURFACES SHALL BE EVENLY GRADED WITHOUT PONDING AREAS AND WITHOUT LOW POINTS EXCEPT WHERE APPROVED SWALE OR CATCH BASIN OUTLETS ARE PROVIDED.
10. ALL EDGES OF DISTURBED PAVEMENT SHALL BE SAW CUT TO FORM A NEAT AND STRAIGHT LINE PRIOR TO PLACING NEW PAVEMENT. PAVEMENT REINSTATEMENT SHALL BE WITH STEP JOINTS OF 500mm WIDTH MINIMUM.
11. ALL DISTURBED AREAS OUTSIDE PROPOSED GRADING LIMITS TO BE RESTORED TO ORIGINAL ELEVATIONS AND CONDITIONS UNLESS OTHERWISE SPECIFIED. ALL RESTORATION SHALL BE COMPLETED WITH THE GEOTECHNICAL REQUIREMENTS FOR BACKFILL AND COMPACTION.
12. ABUTTING PROPERTY GRADES TO BE MATCHED UNLESS OTHERWISE SHOWN.
13. CONTRACTOR SHALL OBTAIN AND PAY FOR ALL NECESSARY PERMITS AND APPROVALS FROM THE MUNICIPAL AUTHORITIES PRIOR TO COMMENCING CONSTRUCTION, INCLUDING WATER PERMIT AND ROAD CUT PERMIT.
14. MINIMIZE DISTURBANCE TO EXISTING VEGETATION DURING THE EXECUTION OF ALL WORKS.
15. REMOVE FROM SITE ALL EXCESS EXCAVATED MATERIAL UNLESS OTHERWISE DIRECTED FROM THE ENGINEER. EXCAVATE AND REMOVE ALL ORGANIC MATERIAL AND DEBRIS LOCATED WITHIN THE PROPOSED BUILDING, PARKING AND ROADWAY LOCATIONS.
16. AT PROPOSED UTILITY CONNECTION POINTS AND CROSSINGS (I.E. STORM SEWER, SANITARY SEWER, WATER, ETC.) THE CONTRACTOR SHALL DETERMINE THE PRECISE LOCATION AND DEPTH OF EXISTING UTILITIES AND REPORT ANY DISCREPANCIES OR CONFLICTS TO THE ENGINEER BEFORE COMMENCING WORK.
17. CONTRACTOR TO OBTAIN POST-CONSTRUCTION TOPOGRAPHIC SURVEY, COMPLETED BY OLS OR P.ENG CONFIRMING COMPLIANCE WITH DESIGN GRADING AND SERVICING. SURVEY IS TO INCLUDE LOCATION AND INVERTS FOR BURIED UTILITIES.
18. ABIDE BY RECOMMENDATIONS OF GEOTECHNICAL REPORT. REPORT ANY VARIATIONS IN OBSERVED CONATIONS FROM THOSE INCLUDED IN REPORT.
19. PROVIDE CCTV INSPECTION REPORT FOR ALL SEWERS AND CATCHBASIN LEADS 200mm DIAMETER AND LARGER. REPEAT CCTV INSPECTION FOLLOWING RECTIFICATION OF ANY DEFICIENCIES.

NOTES: <u>PARKING LOT, ROADWAY, AND WORK IN PUBLIC RIGHTS OF WAY</u>

1. CONTRACTOR TO REINSTATE ROAD CUTS AS PER CITY OF OTTAWA DETAIL R10.
2. REFER TO GEOTECHNICAL INVESTIGATION REPORT PREPARED BY GOLDER ASSOCIATES DATED APRIL 2020 FOR GEOTECHNICAL RECOMMENDATIONS.
3. CONTRACTOR TO PREPARE SUBGRADE, INCLUDING PROOFROLLING, TO THE SATISFACTION OF THE GEOTECHNICAL CONSULTANT PRIOR TO THE COMMENCEMENT OF PLACEMENT OF GRANULAR B MATERIAL.
4. FILL TO BE PLACED AND COMPACTED PER THE GEOTECHNICAL REPORT REQUIREMENTS.
5. CONTRACTOR TO SUPPLY, PLACE AND COMPACT GRANULAR B MATERIAL IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE GEOTECHNICAL CONSULTANT. CONTRACTOR TO PROVIDE CONSULTANT WITH SAMPLES OF GRANULAR B MATERIAL FOR TESTING AND CERTIFICATION FROM THE GEOTECHNICAL CONSULTANT THAT THE MATERIAL MEETS THE GRADATION REQUIREMENTS SPECIFIED IN THE GEOTECHNICAL REPORT.
6. GRANULAR A MATERIAL TO BE PLACED ONLY UPON APPROVAL BY THE GEOTECHNICAL CONSULTANT OF GRANULAR B PLACEMENT.
7. CONTRACTOR TO SUPPLY, PLACE AND COMPACT GRANULAR A MATERIAL IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE GEOTECHNICAL CONSULTANT. CONTRACTOR TO PROVIDE CONSULTANT WITH SAMPLES OF GRANULAR A MATERIAL FOR TESTING AND CERTIFICATION FROM THE GEOTECHNICAL CONSULTANT THAT THE MATERIAL MEETS THE GRADATION REQUIREMENTS SPECIFIED IN THE GEOTECHNICAL REPORT.
8. ASPHALT MATERIAL TO BE PLACED ONLY UPON APPROVAL BY THE GEOTECHNICAL CONSULTANT OF GRANULAR A PLACEMENT.
9. CONTRACTOR TO SUPPLY, PLACE AND COMPACT ASPHALT MATERIAL IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE GEOTECHNICAL CONSULTANT. CONTRACTOR TO PROVIDE CONSULTANT WITH SAMPLES OF ASPHALT MATERIAL FOR TESTING AND CERTIFICATION FROM THE GEOTECHNICAL CONSULTANT THAT THE MATERIAL MEETS THE REQUIREMENTS SPECIFIED IN THE GEOTECHNICAL REPORT.
10. CONTRACTOR IS RESPONSIBLE FOR ESTABLISHING LINE AND GRADE IN ACCORDANCE WITH THE PLANS, AND FOR PROVIDING THE CONSULTANT WITH VERIFICATION PRIOR TO PLACEMENT.
11. ALL EXCESS MATERIAL TO BE HAULED OFFSITE AND DISPOSED OF AT AN APPROVED DUMP SITE. SHOULD THE CONTRACTOR DISCOVER ANY HAZARDOUS MATERIAL, CONTRACTOR IS TO NOTIFY CONSULTANT. CONSULTANT TO DETERMINE APPROPRIATE DISPOSAL METHOD/LOCATION.
12. PAVEMENT STRUCTURE (MATERIAL TYPES AND THICKNESS) TO BE AS SPECIFIED BY THE GEOTECHNICAL CONSULTANT.

NOTES: <u>STORM SEWERS AND STRUCTURES</u>

1. ALL STORM SEWER MATERIALS AND CONSTRUCTION METHODS SHALL CONFORM TO THE CURRENT CITY OF OTTAWA STANDARDS AND SPECIFICATIONS. PROVIDE CCTV INSPECTION REPORTS FOR ALL NEW STORM SEWERS, SERVICES AND CB LEADS.
2. STORM SEWERS 450mm DIAMETER AND SMALLER SHALL BE PVC SDR-35, WITH RUBBER GASKET PER CSA A-257.3.
3. STORM SEWER LARGER THAN 450mm SHALL BE REINFORCED CONCRETE CLASS 100.
4. SEWER BEDDING AS PER CITY OF OTTAWA DETAIL S6.
5. ALL STORM MANHOLES TO BE AS PER STORM STRUCTURE TABLE.
6. ANY NEW OR EXISTING STORM SEWER WITH LESS THAN 2.0m COVER REQUIRES THERMAL INSULATION AS PER CITY OF OTTAWA STANDARD W22, OR APPROVED BY THE ENGINEER.
7. ALL CATCHBASIN LEADS TO BE MINIMUM 200mm DIAMETER AT MINIMUM 1.0% SLOPE UNLESS OTHERWISE SPECIFIED.
8. STORM CATCHBASINS AS PER OPSD 705.010 AND FRAME/COVER AS PER CITY STANDARD DRAWINGS S19. STORM CBMH'S AS INDICATED IN TABLE WITH SUMP, ADJUSTMENT SECTIONS SHALL BE AS PER OPSD 704.010.
9. INSTALLATION OF FLOW CONTROL ICD'S TO BE VERIFIED BY QUALITY VERIFICATION ENGINEER RETAINED BY CONTRACTOR.

NOTES: <u>SANITARY SEWER AND MANHOLES</u>

1. ALL SANITARY SEWER, SANITARY SEWER APPURTENANCES AND CONSTRUCTION METHODS SHALL CONFORM TO THE CURRENT CITY OF OTTAWA STANDARDS AND SPECIFICATIONS. PROVIDE CCTV INSPECTION REPORTS FOR ALL NEW SANITARY PIPING. PROVIDE DYE TESTING FOR NEW SERVICES.
2. SANITARY SEWER PIPE SIZE 150mm DIAMETER AND GREATER TO BE PVC SDR-35 (UNLESS SPECIFIED OTHERWISE) WITH RUBBER GASKET TYPE JOINTS IN CONFORMANCE WITH CSA B-182.2,3,4.
3. SEWER BEDDING AS PER CITY OF OTTAWA DETAIL S6.
4. ALL SANITARY MANHOLES 1200mm IN DIAMETER TO BE AS PER OPSD 701.01. FRAME AND COVER TO BE AS PER CITY OF OTTAWA STANDARD S25 AND S24.
5. MAINTENANCE HOLE BENCHING AND PIPE OPENING ALTERNATIVES AS PER THE OPSD 701.021
6. ANY SANITARY SEWER WITH LESS THAN 2.0m COVER REQUIRES THERMAL INSULATION AS PER CITY OF OTTAWA STANDARD W22, OR APPROVED BY THE ENGINEER.

NOTES: <u>WATERMAIN</u>

1. ALL WATERMAIN AND WATERMAIN APPURTANANCES, MATERIALS, CONSTRUCTION AND TESTING METHODS SHALL CONFORM TO THE CURRENT CITY OF OTTAWA AND MINISTRY OF ENVIRONMENT STANDARDS AND SPECIFICATIONS.
2. ALL WATERMAIN 300mm DIAMETER AND SMALLER TO BE POLY VINYL CHLORIDE (PVC) CLASS 150 DR 18 MEETING AWWA SPECIFICATION C900.
3. ALL WATERMAIN TO BE INSTALLED AT MINIMUM COVER OF 2.4m BELOW FINISHED GRADE. WHERE WATERMAINS CROSS OVER OTHER UTILITIES, A MINIMUM 0.30m CLEARANCE SHALL BE MAINTAINED; WHERE WATERMAINS CROSS UNDER OTHER UTILITIES, A MINIMUM 0.50m CLEARANCE SHALL BE MAINTAINED. WHERE THE MINIMUM SEPARATION CANNOT BE ACHIEVED, THE WATERMAIN SHALL BE INSTALLED AS PER CITY OF OTTAWA STANDARDS W25 AND W25.2. WHERE 2.4m MINIMUM DEPTH CANNOT BE ACHIEVED, THERMAL INSULATION SHALL BE PROVIDED AS PER CITY OF OTTAWA STANDARD W22. WHERE A WATERMAIN IS IN CLOSE PROXIMITY TO AN OPEN STRUCTURE, THERMAL INSULATION SHALL BE PROVIDED AS PER CITY OF OTTAWA STANDARD W23.
4. CONCRETE THRUST BLOCKS AND MECHANICAL RESTRAINTS ARE TO BE INSTALLED AT ALL TEES, BENDS, HYDRANTS, REDUCERS, ENDS OF MAINS AND CONNECTIONS 100mm AND LARGER, IN ACCORDANCE WITH CITY OF OTTAWA STANDARDS W25.3 & W25.4.
5. CATHODIC PROTECTION REQUIRED FOR ALL IRON FITTINGS AS PER CITY OF OTTAWA STANDARD W40 & W42.
6. ALL VALVES AND VALVE BOXES AND CHAMBERS, HYDRANTS, AND HYDRANT VALVES AND ASSEMBLES SHALL BE INSTALLED AS PER CITY OF OTTAWA STANDARD
7. FIRE HYDRANT LOCATION AND INSTALLATION AS PER CITY OF OTTAWA STANDARD W18 & W19. CONTRACTOR TO PROVIDE FLOW TEST AND PAINTING OF NEW HYDRANT IN ACCORDANCE WITH CITY STANDARDS.
8. IF WATER MAIN MUST BE DEFLECTED TO MEET ALIGNMENT, ENSURE THAT THE AMOUNT OF DEFLECTION USED IS LESS THAN HALF THAT RECOMMENDED BY THE MANUFACTURER.

PAVEMENT COMPONENT- HEAVY DUTY TRAFFIC	
SUPERPAVE 12.5 SURFACE COURSE	50mm
SUPERPAVE 19.mm BASE COURSE	70mm
OPPS GRANULAR A BASE	150mm
OPPS GRANULAR B TYPE II SUBBASE	450mm

ARCHITECTURE 49
1000-150 ISABELLA STREET
OTTAWA (ONTARIO) CANADA K1S 1V7
Phone: 613-238-0440 | Fax: 613-238-6597 | WWW.ARCHITECTURE49.COM

wsp
2611 Queensview Dr, Suite 300
Ottawa, Ontario, K2B 8K2 Canada
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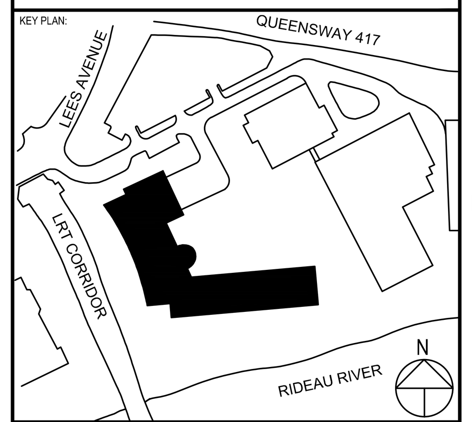

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CHECKED BY: JJ	

DISCIPLINE: CIVIL

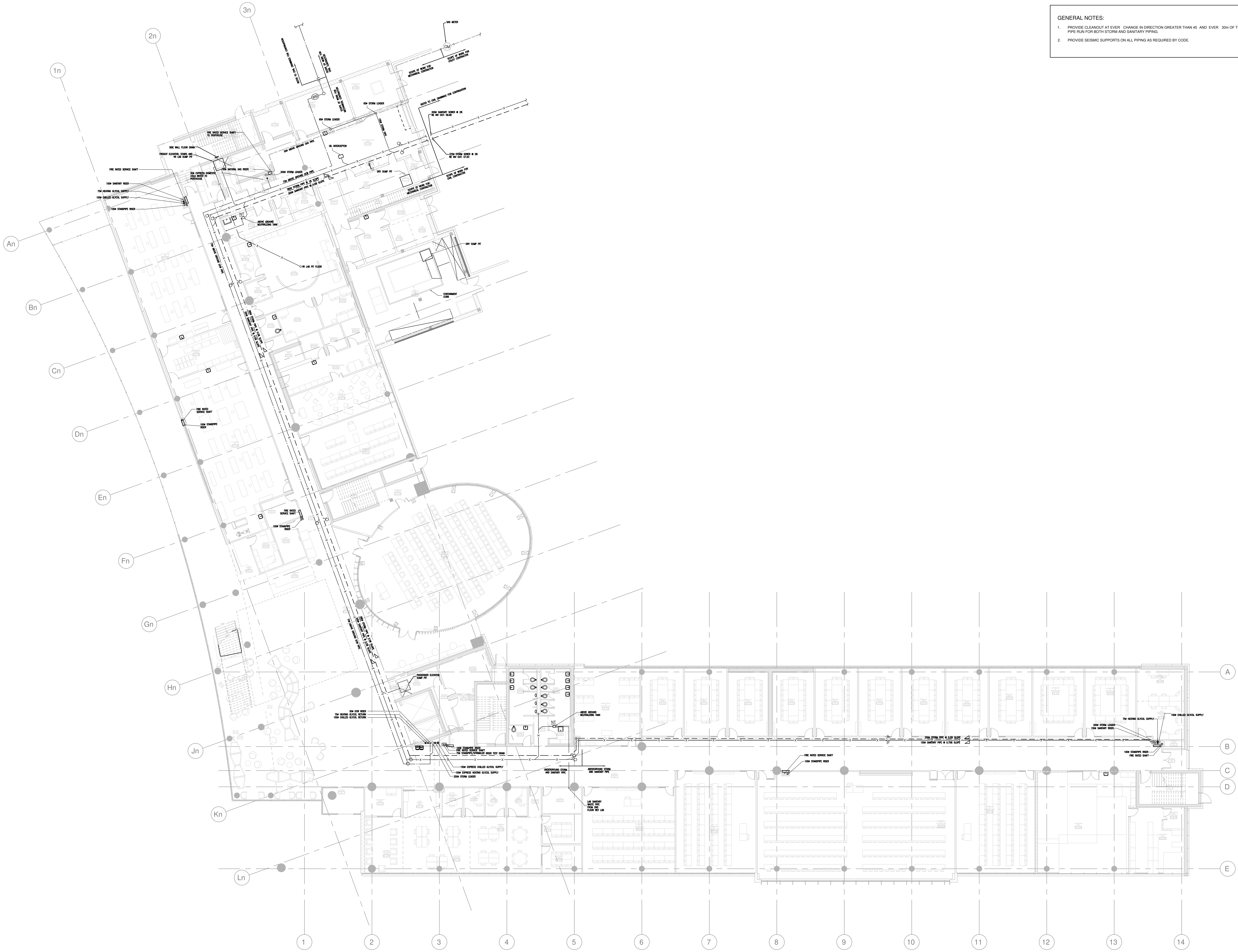
TITLE: GENERAL NOTES & DETAILS

SHEET NUMBER: C-004

SHEET #: 1 OF 4

ISSUE: ISSUED FOR SITE PLAN APPLICATION REV # 1

DATE OF: 2021-06-21



GENERAL NOTES:

1. PROVIDE CLEANOUT AT EVER CHANGE IN DIRECTION GREATER THAN 45 AND EVER 30m OF THE PIPE RUN FOR BOTH STORM AND SANITARY PIPING.
2. PROVIDE SEISMIC SUPPORTS ON ALL PIPING AS REQUIRED BY CODE.

ARCHITECTURE 49

1000-150 ISABELLA STREET
OTTAWA (ONTARIO) CANADA K1S 1V7
Phone: 613-238-0440 | Fax: 613-238-6597 | WWW.ARCHITECTURE49.COM

wsp

2611 Queensview Dr, Suite 300
Ottawa, Ontario, K2B 8K2 Canada
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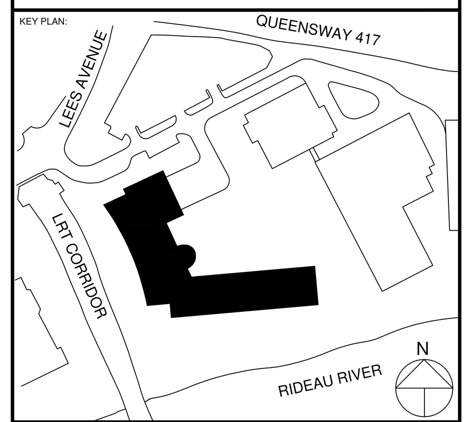

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25mm

DESIGNED BY: P.A. / A.S. / J.B.

DRAWN BY: P.A. / A.S. / J.B.

CHECKED BY: M.E.

DISCIPLINE: MECHANICAL

TITLE:

SITE PLAN - MECHANICAL

SHEET NUMBER: M001

SHEET #: 2 OF 21

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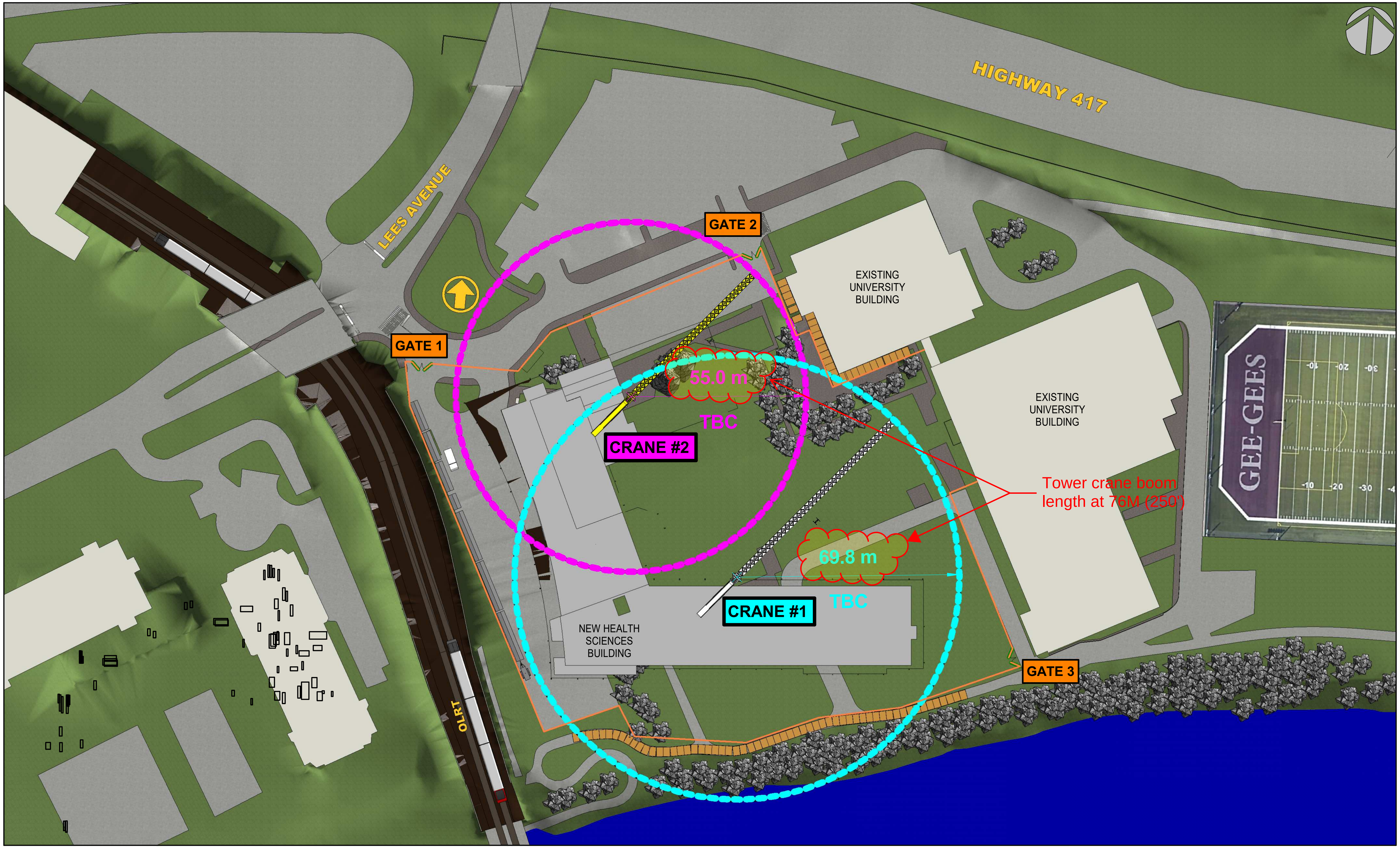

1 TOWER CRANE LAYOUT
1 : 1200

PCL CONSTRUCTION

Ottawa Buildings
49 Auriga Drive
Nepean, ON K2E 8A1
T: (613) 225-6130
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REV	DATE	BY	DESCRIPTION
1	03-11-2021	AK	Draft

SCALE:	1 : 1200
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CHECKED BY:	SW
PCL PROJECT #:	BE200026

Project Name
OTTAWA UNIVERSITY HEALTH SCIENCE

Sheet Name
TOWER CRANE LAYOUT

Dwg No. **SK-01** Rev. **1**

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11" x 17"

University of Ottawa - Faculty of Health Sciences Building

RFP #2020-40369
Client Ref: #BT20-18477
Address: 200 Lees Avenue
Ottawa, ON
K1N 6N5

SHEET LIST

Sheet Number	Sheet Name
SS-01	SITE SIGNAGE AND LOGISTICS PLAN
SL-01.A	SITE SETUP / DEMO
SL-01.B	PILING / EXCAVATION
SL-01.C	SUBSTRUCTURE
SL-01.D	SUPER STRUCTURE
SL-01.E	ROOFING / EXTERIOR WALLS

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ARCHITECTURE 49

wsp

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CONSTRUCTION

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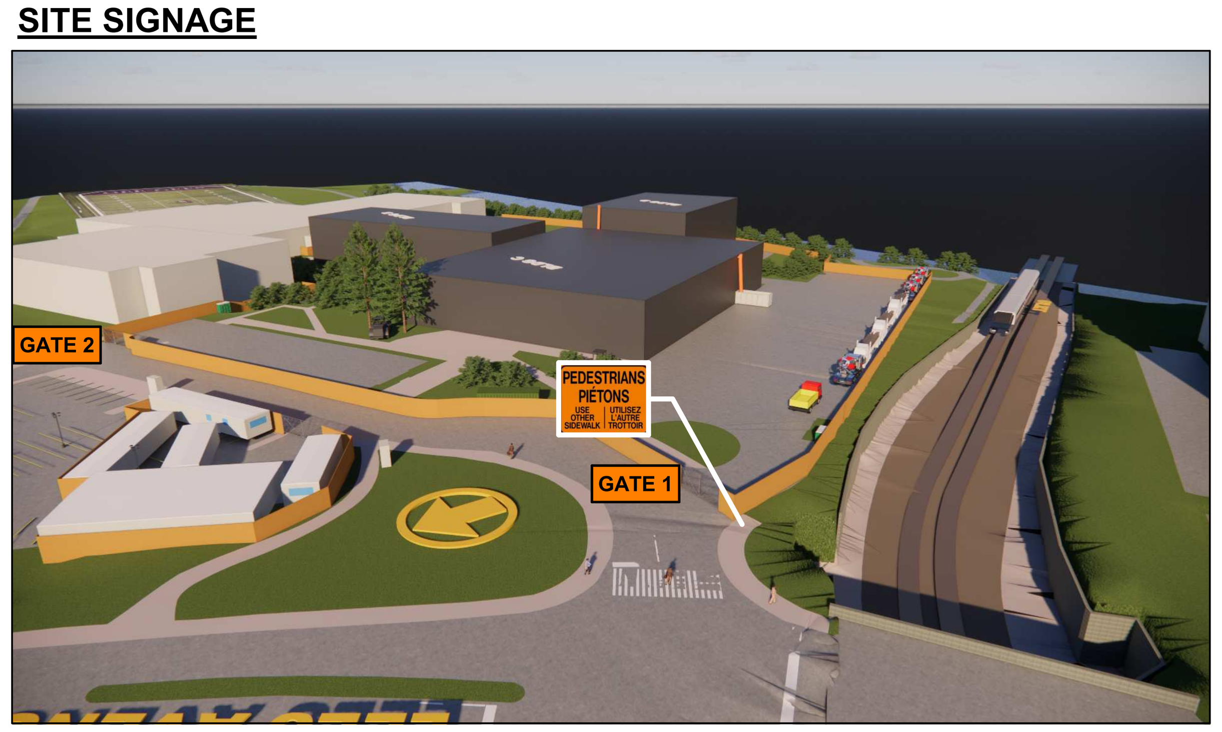
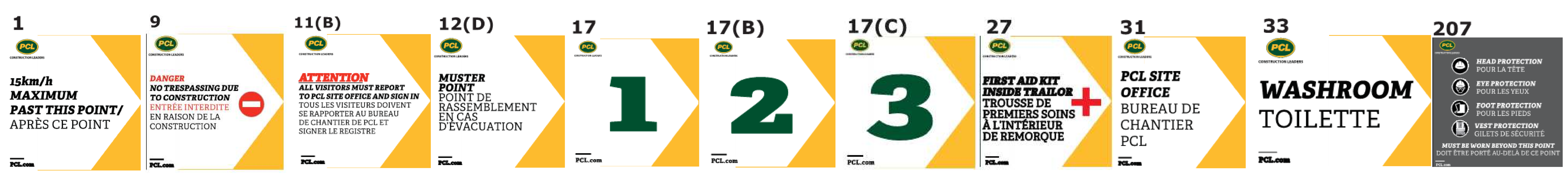
SUBMISSION

SITE SIGNAGE





The signage plan is the minimum standard set out for this project.
Purpose is to provide wayfinding and education by providing information to workers, delivery drivers and the public.
Signage will be posted in both official languages (FR & EN) and will conform to the standards shown within.
Additional signage may be necessary and the plan will be updated as necessary.

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LEGEND

REV	DATE	BY	DESCRIPTION
1	APR-2021	SW	FOR TECHNICAL SUBMISSION

SCALE:	1 : 1
DATE:	04/05/21
DRAWN BY:	AK
CHECKED BY:	MM
PCL PROJECT #:	BE200026

Project Name
UNIVERSITY OF OTTAWA - FACULTY OF HEALTH SCIENCES BUILDING

Sheet Name
SITE SIGNAGE AND LOGISTICS PLAN

Dwg No. SS-01 Rev. 1

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SITE SETUP / DEMOLITION

- Enclosed and secured perimeter with controlled access points.
- Construction entrances have been strategically placed to allow flow on any given day as well as to eliminate the need for reversing on the project.
- Erosion and sediment control measures in place to protect the rivers edge, the OLRT as well as existing site services.
- Construction Trailers are placed in the allowable 20 parking spots to free up and maximize the site for Construction vehicular staging and activities.
- Due to the proximity to the residential area as well as the ongoing operation needs of the University, PCL has located the site trailers off the physical site to create a space for construction vehicular staging and to eliminate vehicular traffic strain on the adjacent roadways.
- Staging of the demolition has been strategically planned in concert with the salvage/decanting, abatement and relocation of designated services/equipment.
- Demolition activities that create dust will be controlled with the use of a fire hose serviced by a water tanker.
- Spotters and the possible use of overhead protection will be employed during the controlled demolition of the south east corner of Building D to ensure the highest level of safety to the public at all times.

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- SK SPILL KIT
- MS DS MATERIAL SAFETY DATA SHEET
- AED DEFIBRILLATOR
- SAFETY HORN ALARM BELL
- FIRST AID
- FE FIRE EXTINGUISHER
- EYES EYE WASH STATION
- PSI PSI FORM
- MUSTER STATION
- DIRECTIONAL ARROW
- WASHROOM
- PEDESTRIAN TRAFFIC ARROW

REV	DATE	BY	DESCRIPTION
1	APR-2021	SW	FOR TECHNICAL SUBMISSION

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UNIVERSITY OF OTTAWA - FACULTY OF HEALTH SCIENCES BUILDING

SITE SETUP / DEMO

SL-01.A 1

PILING / EXCVATION

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PCL PROJECT #: BE200026

Project Name
UNIVERSITY OF OTTAWA - FACULTY OF HEALTH SCIENCES BUILDING

Sheet Name
PILING / EXCAVATION

Dwg No. SL-01.B
Rev. 1

SUBSTRUCTURE

- Dust generating activities will be controlled with the use of a fire hose serviced by a water tanker.
- Washout stations have been placed around the site to allow flow and directional traffic without created vehicular backups that would create issues outside of the construction gates.
- TCP personnel will be utilized when necessary to ensure the highest level of safety to the public at all times.
- Street cleaning activities will be completed as necessary to maintain surrounding areas and public roadways free from hazardous conditions.

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Project Name

UNIVERSITY OF OTTAWA - FACULTY OF HEALTH SCIENCES BUILDING

Sheet Name

SUBSTRUCTURE

Dwg No. **SL-01.C**

Rev. **1**

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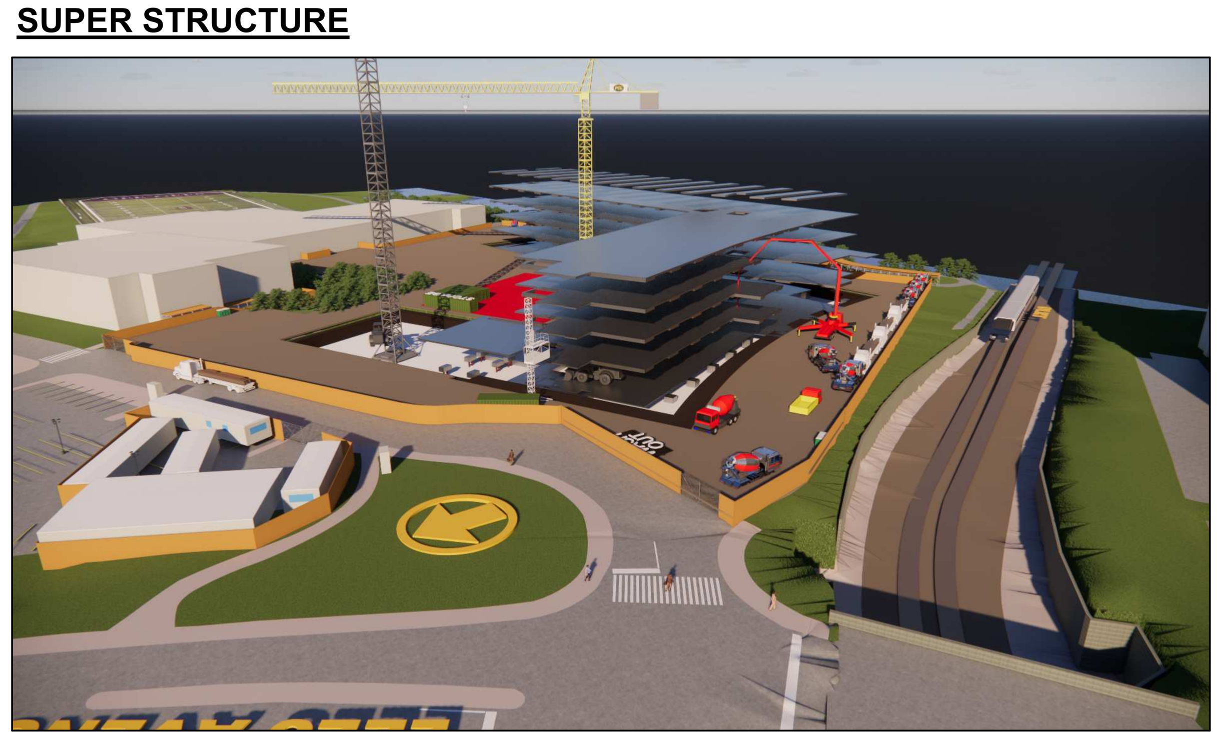
SUPER STRUCTURE



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1	APR-2021	SW	FOR TECHNICAL SUBMISSION

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PCL PROJECT #:	BE200026

Project Name
UNIVERSITY OF OTTAWA - FACULTY OF HEALTH SCIENCES BUILDING

Sheet Name
SUPER STRUCTURE

Dwg No. SL-01.D

Rev. 1

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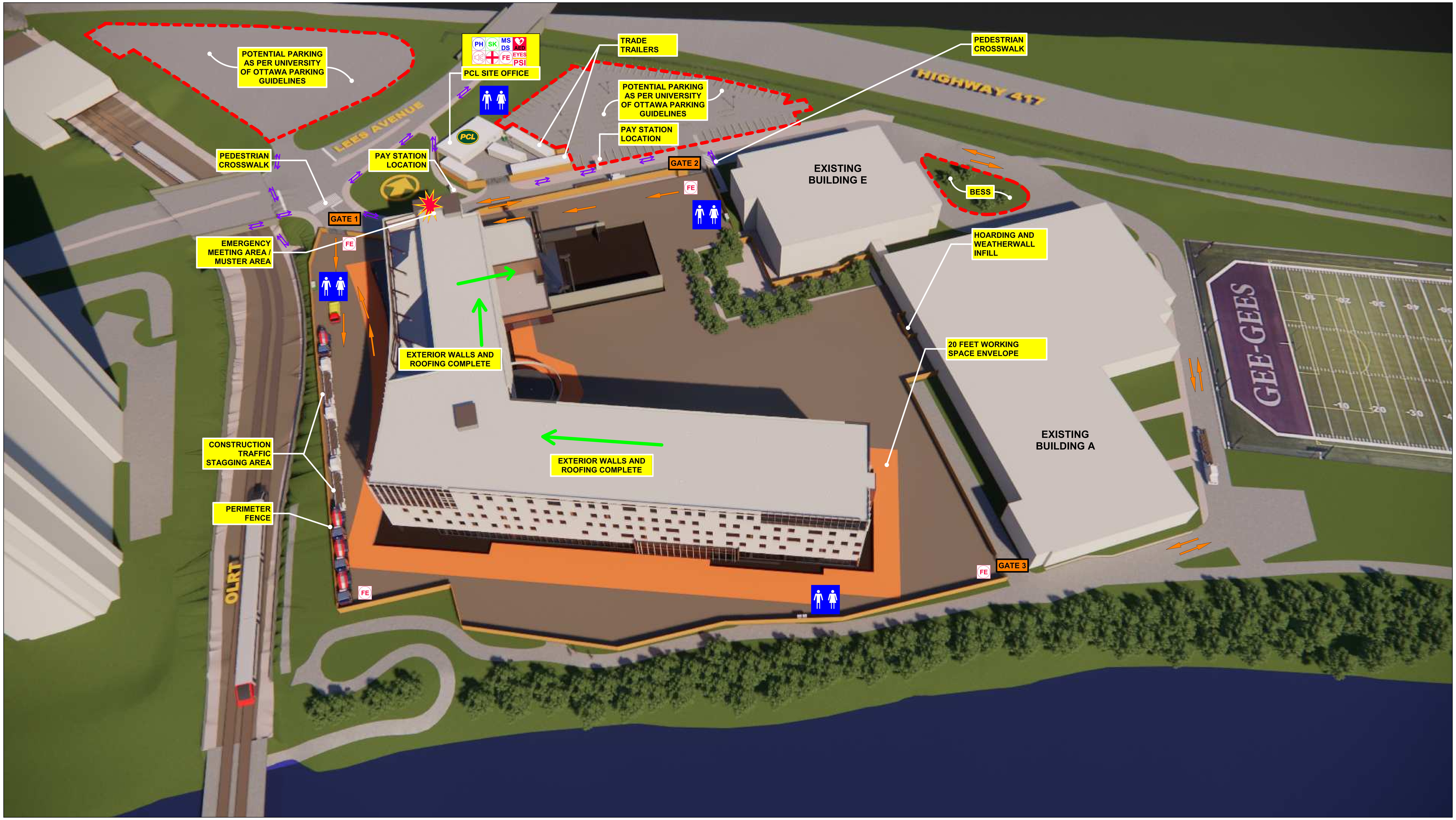
ARCH D



ROOFING / EXTERIOR WALLS

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PCL PROJECT #:	BE200026

Project Name
UNIVERSITY OF OTTAWA - FACULTY OF HEALTH SCIENCES BUILDING

Sheet Name
ROOFING / EXTERIOR WALLS

Dwg No. **SL-01.E** Rev. **1**

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APPENDIX D

Proximity Assessment:

Report PG5656-LET.01 dated June 25, 2021

patersongroup

Consulting Engineers

154 Colonnade Road South
Ottawa, Ontario
Canada, K2E 7J5
Tel: (613) 226-7381
Fax: (613) 226-6344

Geotechnical Engineering
Environmental Engineering
Hydrogeology
Geological Engineering
Materials Testing
Building Science
Noise & Vibration Studies

www.patersongroup.ca

June 25, 2021
Report: PG5656-LET.01

PCL Constructors Canada Ltd.
49 Auriga Drive
Ottawa, Ontario
K2E 8A1

Attention: **Mr. David Wroblewski**

Subject: **Proximity Assessment**
Proposed University of Ottawa Health Science Building
200 Lees Avenue - Ottawa

Dear Sir,

Further to your request and authorization, Paterson Group (Paterson) prepared the current letter report to summarize construction issues which could occur due to the proximity of the proposed building to the subject alignment of the Confederation Line Light Rail. The following letter should be read in conjunction with the Paterson Group Supplemental Geotechnical Investigation Report PG5656-LET.01 dated June 24, 2021 and the Geotechnical Investigation Report prepared by Golder Associates Ltd. (Report Number 20144766 dated September 8, 2020).

1.0 Background Information

The proposed development at 200 Lees Avenue will consist of a multi-storey institutional building placed approximately 16 m away from the property boundary along the LRT. It is understood that the subject alignment is located above ground, running in an approximate north-south direction adjacent to the west side of the subject site.

The following sections summarize available soils information and construction precautions for the proposed building, which may impact the subject alignment of the Confederation Line.

It should be noted that the information submitted as part of the current Proximity Study will be supplemented with construction plans issued for construction, pile and caisson shop drawings, and field monitoring program as described in the application conditions.

2.0 Subsurface Conditions

Based on existing geotechnical information, the subsurface conditions in the immediate area of the subject site and subject Confederation Line alignment generally consist of the following:

- ❑ Existing surface grade is at an elevation of approximately 62 to 63 m.
- ❑ The overburden thickness is approximately 14 to 15 m.
- ❑ Bedrock surface elevation is at approximately 48 m.
- ❑ The bedrock underlying the site consists of a good quality shale bedrock.
- ❑ The groundwater level is present at approximate depths of 7 to 8 m below the existing ground surface.

Rail Location

The GeoOttawa Rail Alignment O-Train tool indicates that an approximate setback of 10 m is present between the property line and the proposed Confederation Line. It is understood that the proposed building will be placed approximately 16 m away from the west property line adjacent to the LRT property. Therefore, an approximate, minimum horizontal separation of 26 m is present between the subject alignment of the Confederation Line and the proposed building at 200 Lees Avenue.

Based on grading and drainage design drawings of the OLRT issued in 2016, the top of rail is at an approximate geodetic elevation of 57 to 60 m along the subject alignment, with a horizontal separation of at least 26 m between the rail and the proposed building. There is an associated concrete retaining wall located along the east side of the rail near the north-west property boundary.

3.0 Construction Precautions and Recommendations

Influence of Proposed Development on Rail

Based on existing soils information and building design details, the foundations of the proposed building will consist of deep foundations extending to the bedrock surface. Therefore, lateral loads due to the building foundations will be transferred directly into the bedrock by the deep foundations. Based on the information provided for the subject alignment and the proposed building location, the proposed building at 200 Lees Avenue will therefore not cause additional loading on the subject alignment of the Confederation Line or the associated concrete retaining wall.

Excavation and Temporary Shoring

Due to the building being slab-on-grade founded upon deep foundations, no significant excavation depth of the building footprint or temporary shoring installation will be undertaken for the proposed development.

Access, Operational and Expansion Impacts to the LRT

Based on concept plans for the site layout during construction presented in Appendix C of Paterson Group Report PG5656-1 dated June 25, 2021, there will be no interruptions to LRT access. Site offices will be located to the north of the site, away from the rail line. Construction traffic will be kept clear of LRT infrastructure within a gated area with access points from the site office area. The two tower cranes to be installed at the site will be placed such that the swing radius does not extend over the Confederation Line alignment as shown on the crane layout plan presented in Appendix C of the above-mentioned report.

Further, there are no negative impacts anticipated on a permanent basis for LRT access and operation. Based on information provided in the Draft Transportation Impact Assessment prepared by IBI Group in 2020, it is understood that the existing intersection at Lees Avenue will remain as the property access point. Further, there is expected to be a decrease in vehicle traffic accessing the subject site upon completion of the proposed building due to an increase in alternative transportation modes such as bicycle, pedestrian and LRT transportation.

It should also be noted that the LRT infrastructure located adjacent to the subject site consists solely of a rail alignment, which would not require access for the use of the LRT. Lees Station is located further north-west of the subject site and as such its access will not be impacted by the construction or presence of the proposed building.

Pre-Construction Survey

A pre-construction survey will be required for the rail structure. Any existing structures in the immediate area of the proposed building will also undergo a pre-construction survey as per standard construction practices, where deep foundation installations are to occur.

Groundwater Control

The building will consist of slab-on-grade construction with deep foundations, and only localized excavation will be completed for the proposed development which is not anticipated to extend below the groundwater level. Therefore, no groundwater lowering effects due to the proposed development are anticipated with respect to the Confederation Line.

Rail Line Waterproofing System

Due to the above ground nature of the rail construction in the vicinity of the subject site, it is anticipated that there is no waterproofing system installed at the rail line, therefore no impacts to any associated waterproofing systems will occur. Further, due to the distance of 26 m between the proposed building and the rail, if any waterproofing system was present, it would not be impacted by the construction of the proposed building.

4.0 Conclusions and Recommendations

Based on the currently available information for the subject alignment of the proposed building and the existing soils information, the proposed building will not negatively impact the Confederation Line alignment or associated retaining wall. It should be noted that the information submitted as part of the current Proximity Study will be supplemented with construction plans issued for construction, pile and caisson shop drawings and field monitoring program as described in the application conditions.

Best Regards,

Paterson Group Inc.

Nicole R.L. Patey, B.Eng.

LICENSED PROFESSIONAL ENGINEER
June 25, 2021
S. S. DENNIS
100519516
PROVINCE OF ONTARIO

Scott S. Dennis, P.Eng.