SQUAMISH
HARDWIRED *for* ADVENTURE

R2020-13 Addendum #1

Competition No:	**R2020-13**
Title:	**Design Assist Trades New Firehall**
Addendum Issue Date:	**March 16, 2020**

This Addendum forms part of the RFP and is to be read, interpreted and coordinated with all other parts. Please acknowledge the Addendum in Appendix B the Submission Form.

Questions in black Answers in Purple

Q1. Project Area Calculation and FSR Summary in Sq Meters or Square Feet (required for Class C Estimate and Bonding confirmation) (Mandatory Submission item E.2. Page 20)

Metric – FSR 1,753 SM. See attached drawings.

Q2. Preliminary Schedule identifying construction start and completion dates for the project required for Proof of Bonding (Mandatory Submission item E.3. Page 20)

Key dates for this Project:

1. March 2020 - DP SUBMISSION
2. April - September 2020 - DESIGN DEVELOPMENT
3. September 2020 - ISSUE FOR CONSTRUCTION DRAWINGS
4. Late October - November 2020 - TENDER
5. December 8-14, 2020 AWARD
6. December 15 2020 to May16 2022 – CONSTRUCTION

Q3. Contractors Warranty Duration expected following Substantial Performance (required for Class C Estimate and Bonding confirmation Mandatory Submission item E.2 and E.3. Page 20)

12 months.

Thank you

Anthony Jeffery
Manager of Procurement
Email: procurement@squamish.ca

205 – 38026 2nd Ave
Squamish, BC V8B 0C3
604-898-1093

District of Squamish
37955 Second Ave, PO Box 310
Squamish, BC V8B 0A3

December 20, 2018
File: 1142

Attention: Mr. Jesse Morwood

Re: Off-site Geotechnical Investigation Report, 2019 Sewer Forcemain Replacement Project, Guildford Drive & Judd Road, Squamish, BC

1.0 INTRODUCTION

We understand that as part of the District of Squamish 2019 Sewer Forcemain Replacement Project it is proposed to replace two sanitary forcemains; one along Judd Road and one in Valleycliffe. Further we understand that direction drilling is being contemplated for a portion of the Valleycliffe forcemain beneath the Little Stawamus Creek crossing.

SFA completed a geotechnical investigation of the site along the two alignments on December 10, 2018. This report presents the findings of our investigation and makes general recommendations for the design and construction of the proposed improvements.

This report has been prepared exclusively for the District of Squamish, for their use, the use of others on the design team in the construction process, however it remains the property of SFA Geotechnical Inc.

2.0 SITE DESCRIPTION

We understand that the new Judd Road forcemain is to be located on the south side of Judd Road from Lawson Road to approximately 115 m east of Cottonwood Road. The road is two-lane asphalt with gravel shoulders. The road is relatively flat with elevations ranging from roughly 9.9 to 10.7 m geodetic with the highest elevations occurring near the Horse Creek crossing.

The Valleycliffe forcemain is proposed along the north side of Guildford Drive from Clarke Drive to the east before crossing Valley Drive where it is aligned through municipal forested wetlands and under the Little Stawamus Creek to the south end of Westway Avenue. Guildford Drive slopes down in the eastern direction with elevations ranging between 29.1 to 15.6 m before flattening out within the wetland area with elevations ranging from 15.6 to 13.7 m.

3.0 FIELD INVESTIGATION

We carried out a geotechnical investigation on December 10, 2018, which included 7 test holes along the two alignments. The test holes were completed with a truck mounted solid stem auger drill owned and operated by Southland Drilling and were advanced to depths of 6.1 m below grade. Dynamic cone penetration test (DCPT) soundings were advanced in 3 of the test holes to help quantify density of the soil.

The soil stratigraphy was logged in the field by SFA Geotechnical staff. The test holes were backfilled immediately after drilling and the asphalt was patched.

The test hole logs are included in Appendix A and the test hole locations are shown on our Drawing No. 1142-1 included following the text of this report.

4.0 SUBSURFACE CONDITIONS

4.1 Soil Stratigraphy & Groundwater Conditions

4.1.1 Judd Road Alignment

Local geology, as described by the Geological Survey of Canada Map 5323, "Surficial geology and landslide inventory of the middle sea to sky corridor", consists of sand and silt, commonly including organic materials and underlain, in many places, by gravel.

In total 4 test holes were advanced along the Judd Road sewer alignment. The general soil profile at our test hole locations is described below.

ASPHALT

Asphalt, approximately 50 mm thick, was encountered in two of the test holes.

SAND/ SAND & GRAVEL (Fill)

Sand and gravel or gravelly sand fill was identified to approximately 0.6 to 3.0 m below grade. The fill generally contained trace to no silt and appeared to be relatively compact. The thick amount of fill found at TH18-05 is anticipated to be associated with the existing retaining wall backfill for Horse Creek.

SAND

The granular fill is underlain by native sand deposits. The sand ranges from fine to medium grained with varying amounts of silt (silty to trace silt) and trace gravel. The sand was inferred to be loose to compact and extended to depths ranging from 1.5 to 4.5 m.

Gravelly SAND

Coarse grained gravelly sand with trace to some cobbles was encountered in all of the test holes below depths of 1.5 to 4.5 m. The gravelly sand deposit was interpreted to be compact to dense.

The groundwater table was interpreted to be at depths of approximately 1.5 to 3.0 m below grades during our test hole investigation.

Please refer to the test hole logs included in Appendix A for detailed soil descriptions.

4.1.2 Valleycliffe Alignment

Local geology, as described by the Geological Survey of Canada Map 5322, "Surficial geology and landslide inventory of the lower sea to sky corridor", consists of sand and gravel glaciomarine terrace sediments along the eastern half of the alignment and sand and silt floodplain sediments along the western

half of the alignment.

In total, 3 test holes were advanced along the Valleycliffe alignment. The general soil profile at our test hole locations is described below.

SAND/ SAND & GRAVEL (Fill)

Sand and gravel or gravelly sand fill was identified to approximately 0.6 to 0.9 m below grade. The fill generally contained trace to no silt and was compact to dense.

Silty SAND

Fine grained silty sand was encountered in test holes TH17-01 and TH17-03. The sand contained trace gravel and extended to depths of 0.9 to 1.4 m. The sand was generally loose to compact.

PEAT

A 0.6 m thick peat layer was encountered at TH17-02 below a depth of 0.9 m. The peat was noted to be dark brown, soft and silty.

SAND

Compact to dense sand was encountered in all three test holes at depths below 1.2 to 1.4 m. The sand was generally gravelly with trace to some cobbles and compact to dense in TH17-01 & 17-03. The sand within TH17-02 contained trace gravel with no cobbles until a depth of 3.8 m.

SILT

Stiff clayey silt with trace sand was encountered within TH17-02 & TH17-03 at depth of 4.6 to 5.5 m.

The groundwater table was interpreted to be at depths of approximately 1.4 to 1.5 m below grades in TH17-01 and TH17-02 at the time of our test hole investigation. The groundwater table was interpreted to be at a depth of 4.6 m within the TH17-03 near the top of Guildford Drive.

Please refer to the test hole logs included in Appendix A for detailed soil descriptions.

5.0 DISCUSSION

5.1 General Discussion

The project includes the construction of two new sewer forcemains; one along Judd Road in Brackendale, and the second in Valleycliffe. At the time of preparation of this report, design elevations for the new water mains had not yet been established, however we expect that the pipe will have a minimum of 1.2 m cover from existing grades. We understand that the Judd Road alignment is to run over the Horse Creek culvert which is at a depth of approximately 1.5 m. The Valleycliffe forcemain, where directionally drilled, is to be installed 1.0 to 2.0 m below the bottom of the Little Stawamus Creek

Our review indicates that the Judd Road alignment will likely be founded in the native sand deposits. The sand deposits range from fine to medium grained with varying amounts of silt. The area has a high water table and the underlying sand deposits are highly permeable. Therefore, if excavations extend below the

water table they will be prone to sloughing and collapse. It is expected that dewatering may be necessary to allow for construction of the water main where it is below the water table and to help ensure that the sand provides a stable base during construction.

In regards to the Valleycliffe forcemain alignment, it is anticipated that the majority of the forcemain will be founded in the native sand deposits. Directional drilling beneath Little Stawamus creek is anticipated to occur through the native compact to dense gravelly sand deposits with trace to some cobbles. It will be necessary that any peat encountered is removed from below the pipe alignment.

5.2 Dewatering

The water table was estimated at depths ranging from 1.5 to 3.0 m below existing site grades along the Judd Road alignment at the time of our investigation. The water table along the Valleycliffe alignment was estimated at depths of 1.4 to 1.5 m within the 2 testholes near the existing forested wetlands and at 4.6 m within the testhole on Guildford Drive.

Therefore, depending on the design elevation of the sewer forcemains the water table may be encountered during excavation.

If the water table is encountered it should be expected that the highly permeable underlying soils will produce a high volume of water into excavations.

Based on recent projects in the area, we have observed shallow services installed without the use of well point de-watering in the summer months when the groundwater level is generally lower. If a manageable amount of groundwater is encountered we expect that conventional sumps and pumps would be sufficient to dewater the excavation.

If it is necessary to install the sewer forcemains below the water table, it is recommended to utilize well-point dewatering prior to excavating below the water. The water table should be lowered to at least 0.6 m below the underside of the pipe trench prior to excavating to minimize the potential for heaving, softening, or seepage at the excavation base. In addition, local sump pumps may be necessary.

The design of the dewatering system should be carried out by the contractor. The contractor should be asked to submit their dewatering plan sufficiently prior to construction for concept review.

Perched water table conditions are possible even if well point dewatering techniques are used. If encountered, seepage from these sources are expected to be light to moderate and could be controlled using localized sump pumps.

5.3 Excavation

Open cut excavations above the water table are expected to be temporarily stable at slopes of 1H:1V or flatter. Temporary cut slopes should be covered in polyethylene sheeting to help reduced erosion and sloughing. If excavations are advanced below the water table, the cut slopes are expected to be unstable and will be prone to sloughing and could lead to undermining of the adjacent unsaturated soils. Therefore, it should be demonstrated by standpipe or similar, that the water level has been sufficiently lowered prior to excavating below the natural water level.

We expect that pre-engineered steel trench shoring cages will be used to ensure worker safety during construction. All work must be carried out in accordance with WorkSafe BC regulations.

5.4 Specifications for Granular Fill and Compaction

Backfill materials will be required within the pipe trench to provide support for the pipe within the pipe zone and to ensure an adequate subgrade beneath all road pavement sections.

Base preparation beneath the pipes and manholes should be completed with 19 mm minus crushed rock lightly compacted in place.

Backfill within the pipe zone should be completed with 19 mm minus crushed rock compacted to a minimum of 95% Modified Proctor maximum dry density.

Bulk backfill materials should consist of well graded sand or sand and gravel fill compacted to a minimum of 95% Modified Proctor maximum dry density.

The contractor should be asked to provide density reports confirming that the specified level of compaction has been achieved.

5.5 Pavement Section

It will be necessary to restore the pavement along any sections of road where removed to allow for construction. Any areas where the asphalt has been undermined should have the asphalt removed and replaced. These areas should be prepared as required for new road sections in accordance with District of Squamish bylaws.

We expect that the following pavement structure, which meets the requirements of the District of Squamish's "Industrial Local, Collector, and Arterial" road classifications, would be sufficient to support the anticipated traffic.

- Sub-Base (75 mm minus) – 300 mm
- Base (19 mm minus) – 150 mm
- Asphalt – 100 mm (60 mm base course, 40 mm surface course)

All pavement section materials should conform to the gradations described in the Master Municipal Construction Documents (MMCD). All sub-base and base materials should be compacted to a minimum of 95% Modified Proctor maximum dry density while at a moisture content within 2% of compaction.

5.6 Re-Use of Site Soils

We expect that some of existing granular fill material may be suitable for re-use as general pipe trench backfill, however, any silty fill encountered is not considered unless it can be excavated and placed and compacted in dry conditions. The natural soils anticipated within the excavation are anticipated to be relatively silty and are not considered suitable for re-use as backfill.

Re-use may not be possible due to logistics, schedule, and the constraints of working on an active roadway. However, it could be considered to stockpile these materials for future use.

5.7 Little Stawamus Creek Crossing Considerations

We understand it is being proposed to install the new sewer forcemain below the Little Stawamus Creek crossing. We expect this will be completed using horizontal directional drilling methods with an HDPE

pipe. Test holes were advanced at either end of the proposed creek crossing; refer to our test holes TH18-01 and TH18-02 for a detailed description of the soil conditions encountered.

The soil conditions in the two test holes on either side of the creek were generally consistent and comprised of 0.6 to 0.9 m of compact to dense granular fill overlying loose floodplain deposits consisting of silty fine sand or peat to a depth of 1.4 to 1.5 m overlying loose to dense gravelly sand with trace to some cobbles.

Based on our past experience, wood debris such as large stumps and logs can be present within the floodplain deposits. As such, the specialty sub-contractor should be made aware of the possibility of obstructions in these materials for their consideration when proposing an installation method.

Special care must be taken to ensure that voids are not formed around the carried pipe and that soils are not disturbed to the extent that the disturbance causes settlement.

6.0 FIELD REVIEWS

SFA Geotechnical Inc. will carry out sufficient field reviews during construction to ensure that the Geotechnical Design recommendations contained within this report have been adequately communicated to the design team and to the contractors implementing the design. These field reviews are not carried out for the benefit of the contractors and therefore do not in any way effect the contractor's obligations to perform under the terms of his/her contract.

It is the contractors' responsibility to advise SFA Geotechnical Inc. (a minimum of 48 hours in advance) that a field review is required. Field reviews are normally required at the time of the following activities:

1. Stripping	Review of stripping depth beneath the forcemain alignments.
2. Excavation	Review of temporary slopes and soil conditions.
3. Engineered Fill	Review of material, placement and compaction for the pipe zone and trench backfill

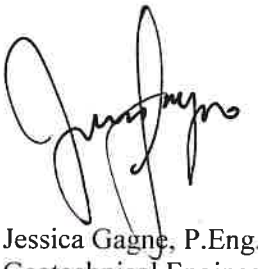
It is critical that these reviews are carried out to ensure that our intentions have been adequately communicated. It is also critical that contractors working on the site view this document in advance of any work being carried out so that they become familiarised with the sensitive aspects of the works proposed. It is the responsibility of the developer to notify SFA Geotechnical Inc. when conditions or situations not outlined within this document are encountered.

7.0 CLOSURE

This report is prepared exclusively for reference by our client and their design team for this project as described to the general standards of similar work for similar projects in this area and no other warranty of any kind is expressed or implied. SFA Geotechnical Inc. accepts no responsibility for any other use of this report.

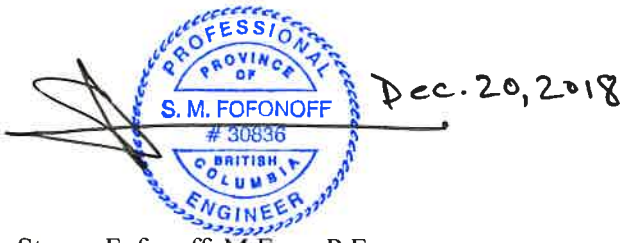
We are pleased to assist you with this project and we trust this information is helpful and sufficient for your purposes at this time. Please contact the undersigned if you should require any clarification or additional details.

For:
SFA Geotechnical Inc.



Jessica Gagne, P.Eng.
Geotechnical Engineer

Reviewed by:



Steven Fofonoff, M.Eng., P.Eng.
Principal

LEGEND:

TH# - # Test Hole(TH) Location

SITE PLAN
NTS

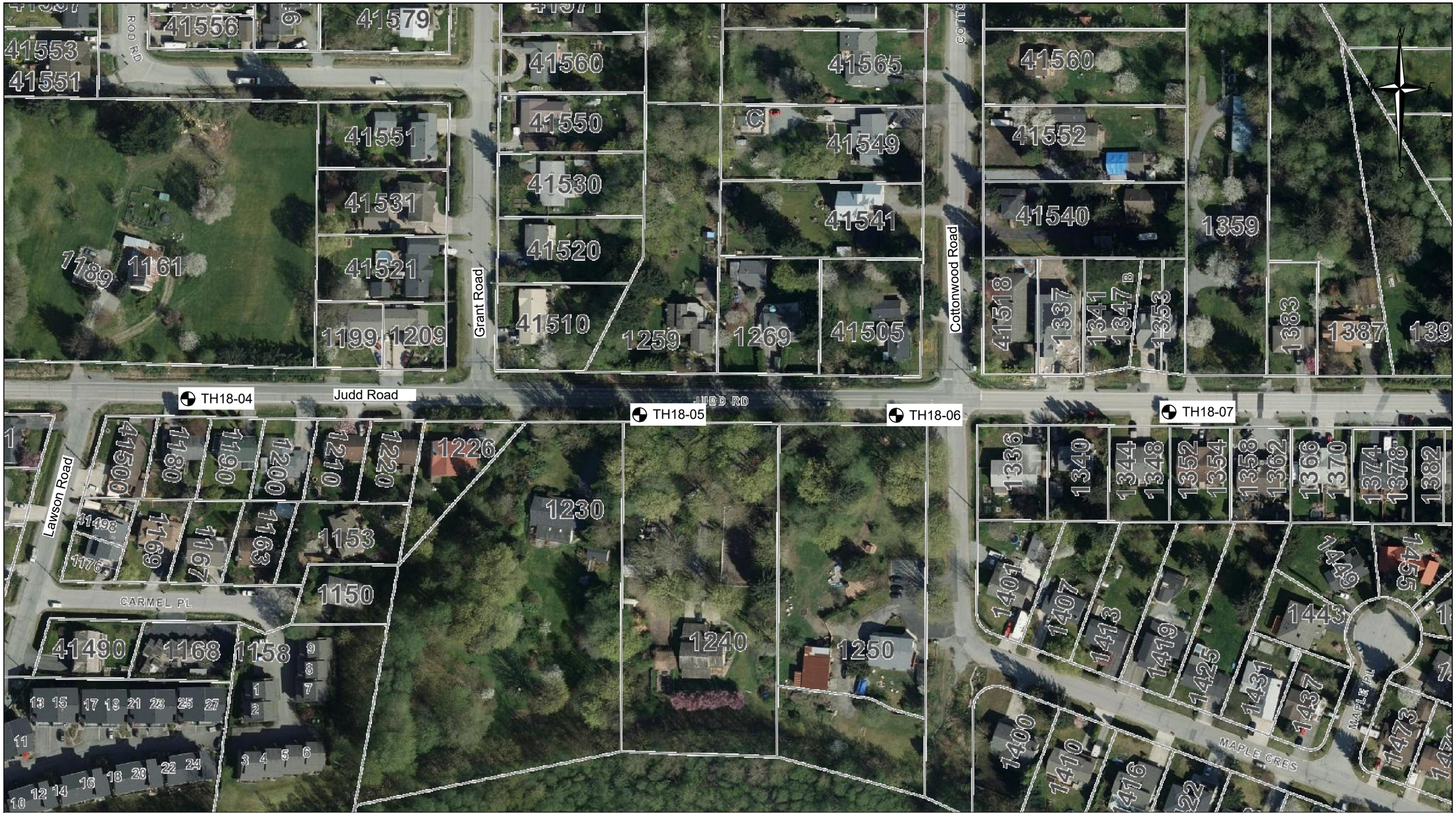
SFA GEOTECHNICAL
SFA Geotechnical Inc.
205-38026 2nd Ave
Squamish, BC
V8B 0C3
604-898-1093

TEST HOLE SITE PLAN (1/2)
Guilford Drive - Squamish BC

Drawn: JG
Checked: SF
Date: 17-12-2018

Revision Number:	Description:	Date:

Project Number: 1142
Drawing Number: 1142-1



LEGEND:

TH# - # Test Hole(TH) Location

SITE PLAN
NTS

SFA GEOTECHNICAL ENGINEERING

SFA Geotechnical Inc.
205-38026 2nd Ave
Squamish, BC
V8B 0C3
604-898-1093

TEST HOLE SITE PLAN (2/2)
Judd Road - Squamish BC

Drawn: JG
Checked: SF
Date: 17-12-2018

Revision number:	Description:	Date:

Project Number: 1142

Drawing Number: 1142-2

SFA GEOTECHNICAL INC.

PROJECT: 2019 Sewer Forcemain Replacement Project
LOCATION: Judd Rd & Guildford Drive
JOB NO.: 1142
GROUND SURFACE (RL):

TESTPIT NO.: TH18-01
DATE DRILLED: December 10, 2018
DRILLED USING: Trucked Auger
LOGGED BY: JG

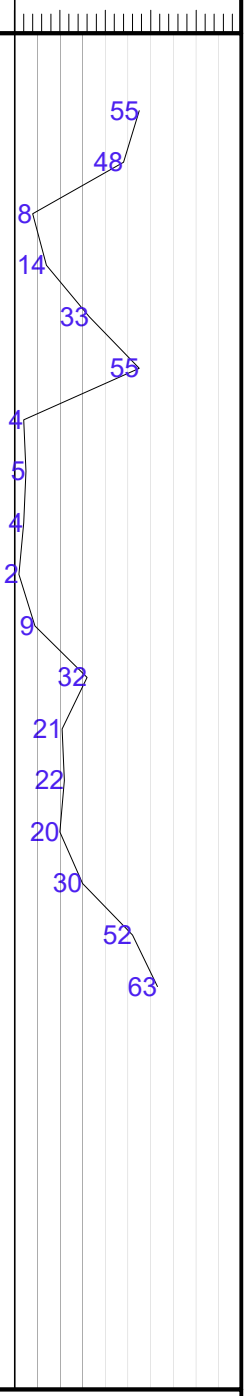
DEPTH (m)	DESCRIPTION OF STRATA
0.00	Fill - brown, sand and gravel, trace silt, moist
0.61	SAND - brown, compact, fine grained, silty to some silt, moist
1.37	SAND - brown, compact to dense, coarse grained, gravelly trace to some cobbles, wet - becomes medium grained with some gravel below 4.5 m depth
6.08	End of Hole - desired depth

LEGEND

DEPTH (m): 0.0, 2.0, 4.0, 6.0

MOISTURE CONTENT (%)

DCPT blows / 0.3 m



SFA GEOTECHNICAL INC.

PROJECT: 2019 Sewer Forcemain Replacement Project
LOCATION: Judd Rd & Guildford Drive
JOB NO.: 1142
GROUND SURFACE (RL):

TESTPIT NO.: TH18-02
DATE DRILLED: December 10, 2018
DRILLED USING: Trucked Auger
LOGGED BY: JG

DEPTH (m)	DESCRIPTION OF STRATA
0.00	Fill - brown, dense, sand, gravelly, moist
0.91	PEAT - dark brown, loose, silty, trace sand, organics
1.52	SAND - grey, dense, medium to coarse grained, gravelly, trace to some cobbles, wet
3.65	SAND - grey, dense, fine grained, silty, trace gravel, wet
4.56	SILT - grey, stiff, clayey, trace sand, wet
5.17	SAND - grey, dense, coarse grained, gravelly, trace to some cobbles, wet
6.08	End of Hole - Desired depth

LEGEND

DEPTH (m): 0.0, 2.0, 4.0, 6.0

MOISTURE CONTENT (%)

DCPT blows / 0.3 m (0, 20, 40, 60, 80, 100)

21, 27, 6, 2, 26, 26, 30, 34, 21, 68, 39, 35, 38, 38, 48, 48, 47, 55, 50

SFA GEOTECHNICAL INC.

PROJECT: 2019 Sewer Forcemain Replacement Project
TESTPIT NO.: TH18-03
LOCATION: Judd Rd & Guildford Drive
DATE DRILLED: December 10, 2018
JOB NO.: 1142
DRILLED USING: Trucked Auger
GROUND SURFACE (RL):
LOGGED BY: JG

DEPTH (m)	DESCRIPTION OF STRATA
0.00	Topsoil
0.08	FILL - brown, sand, gravelly, moist
0.91	SAND - grey, compact, silty, trace gravel, moist
1.22	SAND - grey, compact, medium grained, trace silt, trace gravel, moist
3.80	SAND - brown, dense, gravelly, trace cobbles, trace silt, moist - wet at 4.6 m
5.47	SILT - brown, stiff, sandy, clayey
6.08	End of Hole - Desired depth

LEGEND

DEPTH (m): 0.0, 2.0, 4.0, 6.0

MOISTURE CONTENT (%)

DCPT blows / 0.3 m: 0, 20, 40, 60, 80, 100

SFA GEOTECHNICAL INC.

PROJECT: 2019 Sewer Forcemain Replacement Project
TESTPIT NO.: TH18-04
LOCATION: Judd Rd & Guildford Drive
DATE DRILLED: December 10, 2018
JOB NO.: 1142
DRILLED USING: Trucked Auger
GROUND SURFACE (RL):
LOGGED BY: JG

DEPTH (m)	DESCRIPTION OF STRATA
0.00	Fill - brown, sand and gravel, trace silt, moist
0.61	SAND - brown, compact, fine grained, silty, moist (wet at 1.4 m)
1.52	SAND - grey, compact to dense, coarse grained, gravelly, trace to some cobbles, wet
6.08	End of Hole - desired depth

LEGEND

DEPTH (m): 0.0, 2.0, 4.0, 6.0

MOISTURE CONTENT (%)

DCPT blows / 0.3 m: 0, 20, 40, 60, 80, 100

SFA GEOTECHNICAL INC.

PROJECT: 2019 Sewer Forcemain Replacement Project
TESTPIT NO.: TH18-05
LOCATION: Judd Rd & Guildford Drive
DATE DRILLED: December 10, 2018
JOB NO.: 1142
DRILLED USING: Trucked Auger
GROUND SURFACE (RL):
LOGGED BY: JG

DEPTH (m)	DESCRIPTION OF STRATA	LEGEND	DEPTH (m)	MOISTURE CONTENT (%)	DCPT blows / 0.3 m (0 20 40 60 80 100)
0.00	Asphalt - 50 mm thick		0.0		
0.05	Fill - brown to grey, sand, gravelly, trace silt, moist (silty zone from 2.1 to 2.5 m)		2.0		
3.04	SAND - grey, compact, silty, fine grained, trace wood, wet		4.0		
4.56	SAND - grey, compact to dense, gravelly, trace to some cobbles, wet		6.0		
6.08	End of Hole - desired depth				

▼ Water level

SFA GEOTECHNICAL INC.

PROJECT: 2019 Sewer Forcemain Replacement Project
LOCATION: Judd Rd & Guildford Drive
JOB NO.: 1142
GROUND SURFACE (RL):

TESTPIT NO.: TH18-06
DATE DRILLED: December 10, 2018
DRILLED USING: Trucked Auger
LOGGED BY: JG

DEPTH (m)	DESCRIPTION OF STRATA
0.00	Fill - brown, sand and gravel, trace silt, moist
0.91	SAND - brown, loose to compact, fine grained, trace silt, moist - silty lense from 1.2 to 1.4 m
2.13	SAND - grey, compact, medium grained, wet
3.65	SAND - grey, compact to dense, coarse grained, gravelly, trace cobbles, wet
6.08	End of Hole - desired depth

LEGEND

DEPTH (m): 0.0, 2.0 ▼, 4.0, 6.0

MOISTURE CONTENT (%)

DCPT blows / 0.3 m

0 20 40 60 80 100

46
16
15
2
2
2
9
14
11
11
14
46
100
100

SFA GEOTECHNICAL INC.

PROJECT: 2019 Sewer Forcemain Replacement Project
LOCATION: Judd Rd & Guildford Drive
JOB NO.: 1142
GROUND SURFACE (RL):

TESTPIT NO.: TH18-07
DATE DRILLED: December 10, 2018
DRILLED USING: Trucked Auger
LOGGED BY: JG

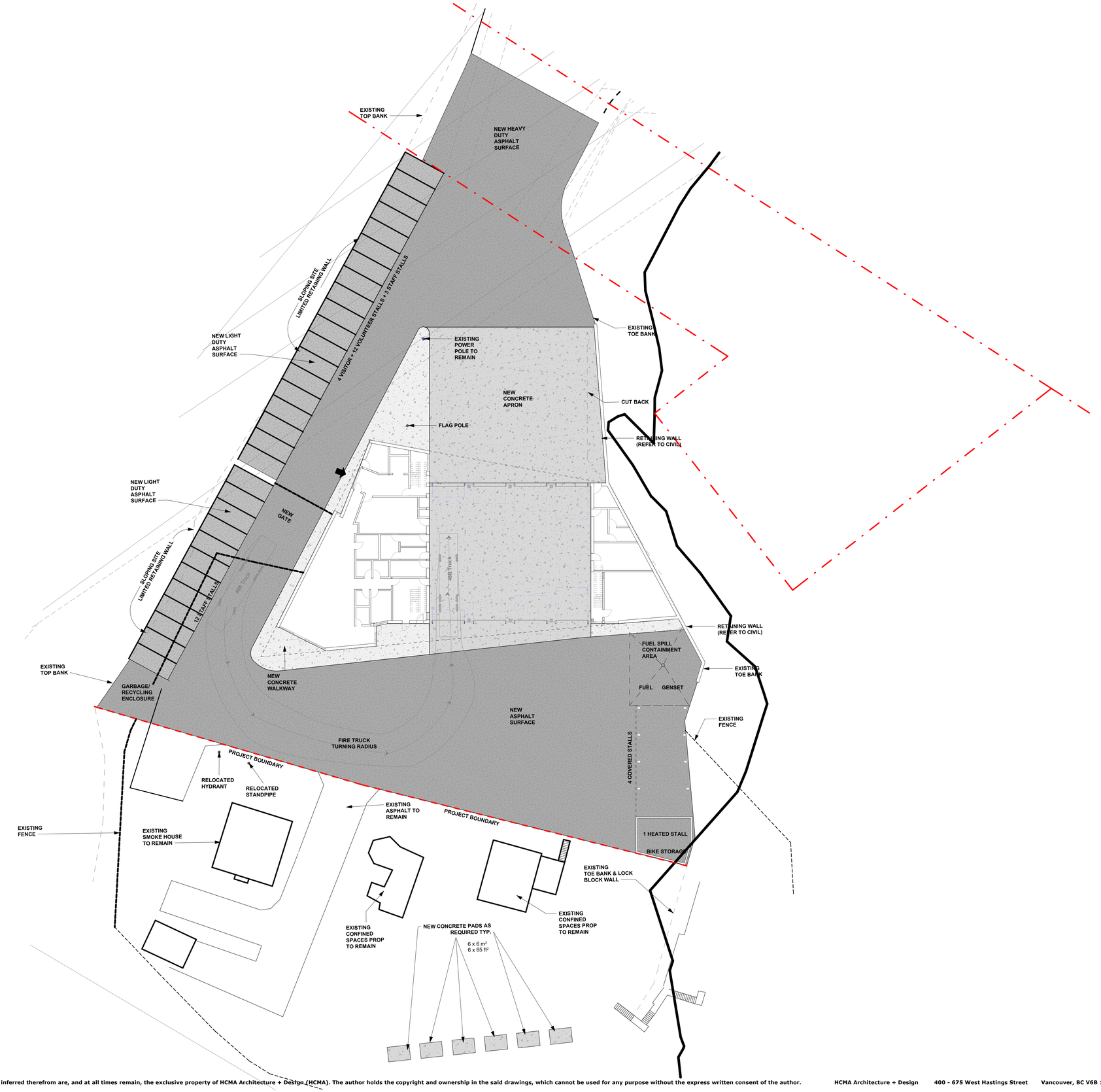
DEPTH (m)	DESCRIPTION OF STRATA
0.00	Asphalt - 50 mm thick
0.05	Fill - brown, sand and gravel, trace silt, moist
0.91	Silty SAND to Sandy SILT - grey, compact/stiff, moist
1.22	SAND - brown, medium grained, moist - becomes grey and wet at 1.8 m - silty lense from 4.1 to 4.3 m
3.95	SAND - grey, compact to dense, coarse grained, gravelly, trace cobbles, wet
6.08	End of Hole - Desired depth

LEGEND

DEPTH (m): 0.0, 2.0, 4.0, 6.0

MOISTURE CONTENT (%)

DCPT blows / 0.3 m: 0, 20, 40, 60, 80, 100



HCMA

#	DESCRIPTION	DATE
2	ISSUED FOR SD/ CLASS C COST.EST	18 FEB 2020

PROFESSIONAL SEAL

SQUAMISH FIRE HALL

37890 CLARKE DR.
SQUAMISH, BC

PROJECT #: 19053

SITE PLAN

A100

SCALE: 1 : 250

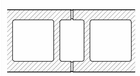
HCMA Architecture + Design 400 - 675 West Hastings Street Vancouver, BC V6B 1N2 Canada T 604.732.6620

1 LEVEL 1 FLOOR PLAN
1 : 100

ROOF TYPES

TAG	R-VALUE	U-VALUE	CONSTRUCTION DETAIL	ASSEMBLY DESCRIPTION
R#1	36			TPO ROOFING 2mm SINGLE PLY FULLY ADHERED TPO ROOFING MEMBRANE 5mm PROTECTION BOARD 152mm 2 LAYERS OF 75mm RIGID INSULATION w/ STAGGERED JOINTS - AIR/ VAPOUR BARRIER 175mm CLT/DLT ROOF (REFER TO STRUCTURAL)

EXTERIOR BACK UP WALL TYPES

TAG	FRR	STC	CONSTRUCTION DETAIL	ASSEMBLY DESCRIPTION
EW#1				WOOD STUD BACK-UP WALL 16mm EXT. GRADE GWB SHEATHING 140mm 2x6 WOOD STUDS 16mm GWB
EW#2	-	-		CMU BACKUP WALL 190mm CMU - REFER TO STRUCTURAL

EXTERIOR CLADDING WALL TYPES

TAG	FRR	STC	CONSTRUCTION DETAIL	ASSEMBLY DESCRIPTION
CL#1				VERTICAL METAL CLADDING 50mm VERTICAL METAL SIDING (STANDING SEAM OR SIM, PROFILE TBD) 25mm AIR SPACE 125mm SEMI-RIGID INSULATION INSULATION - CONTINUOUS SELF-ADHERED AIR/VAPOUR BARRIER
CL#2				SEALED RUNNING BOND BRICK VENEER 90mm SEALED RUNNING BOND BRICK VENEER 38mm AIR SPACE 100mm SEMI-RIGID INSULATION - SELF-ADHERED AIR/VAPOUR BARRIER
CL#3				FIBRE CEMENT BOARD CLADDING 12mm FIBRE CEMENT BOARD 25mm AIR SPACE - GALVANIZED Z-GIRTS c/w 125mm SEMI-RIGID INSULATION - SELF-ADHERED AIR/VAPOUR BARRIER

FIRE RESISTANCE RATING LEGEND:

0 HR	
0.75 HR	
1 HR	
1.5 HR	
2 HR	
3 HR	
4 HR	
WATER CURTAIN	

HCMA

#	DESCRIPTION	DATE
2	ISSUED FOR SD/ CLASS C COST.EST	18 FEB 2020

PROFESSIONAL SEAL

SQUAMISH FIRE HALL

37890 CLARKE DR.
SQUAMISH, BC

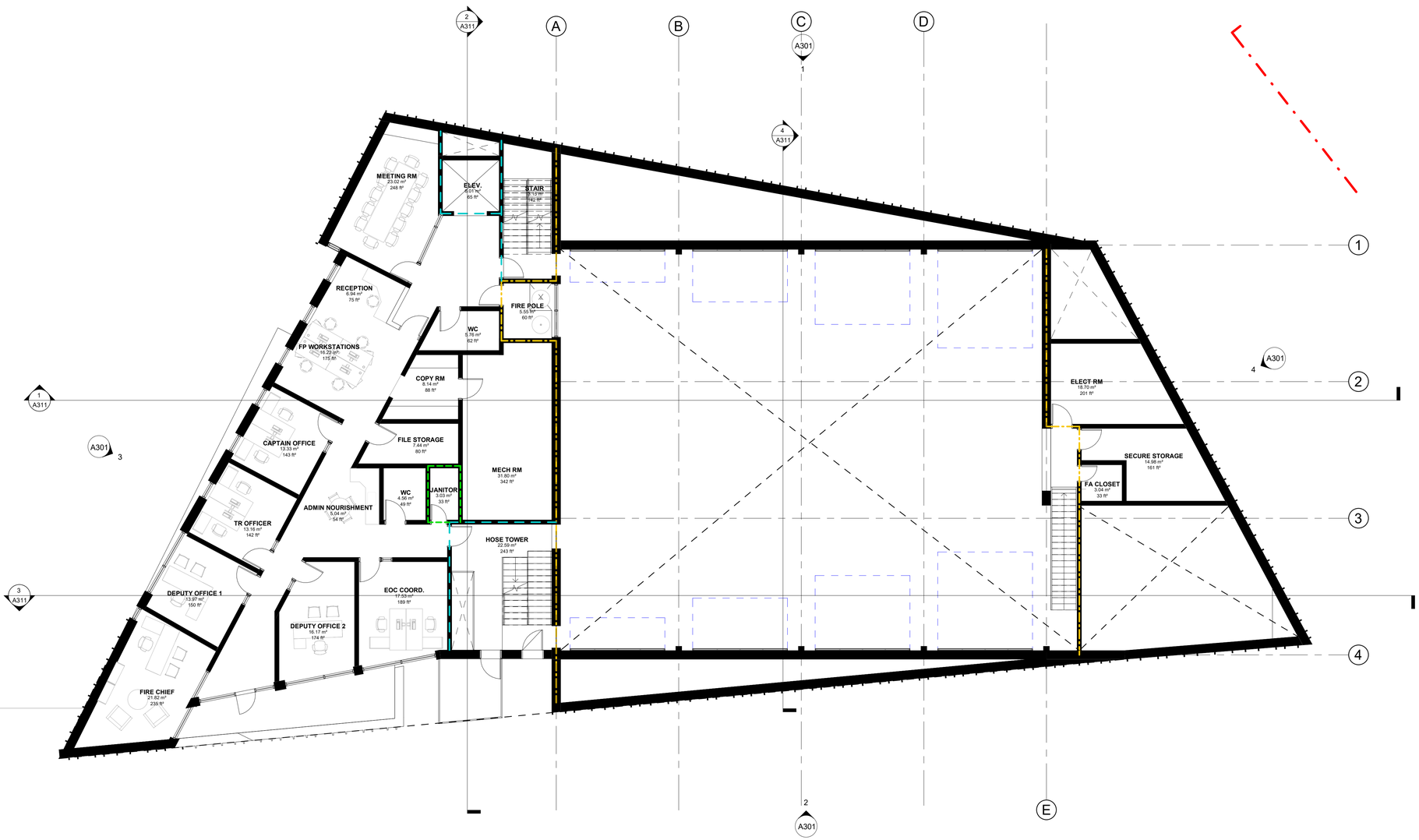
PROJECT #: 19053

FLOOR PLAN - LEVEL 1

A211

SCALE: 1 : 100

HCMA Architecture + Design 400 - 675 West Hastings Street Vancouver, BC V6B 1N2 Canada T 604.732.6620

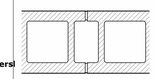


1 LEVEL 2 FLOOR PLAN
1 : 100

ROOF TYPES

TAG	R-VALUE	U-VALUE	CONSTRUCTION DETAIL	ASSEMBLY DESCRIPTION
R#1	36			TPO ROOFING 2mm SINGLE PLY FULLY ADHERED TPO ROOFING MEMBRANE 5mm PROTECTION BOARD 152mm 2 LAYERS OF 75mm RIGID INSULATION w/ STAGGERED JOINTS - AIR/ VAPOUR BARRIER 175mm CLT/DLT ROOF (REFER TO STRUCTURAL)

EXTERIOR BACK UP WALL TYPES

TAG	FRR	STC	CONSTRUCTION DETAIL	ASSEMBLY DESCRIPTION
EW#1				WOOD STUD BACK-UP WALL 16mm EXT. GRADE GWB SHEATHING 140mm 2x6 WOOD STUDS 16mm GWB
EW#2	-	-		CMU BACKUP WALL 190mm CMU - REFER TO STRUCTURAL

EXTERIOR CLADDING WALL TYPES

TAG	FRR	STC	CONSTRUCTION DETAIL	ASSEMBLY DESCRIPTION
CL#1				VERTICAL METAL CLADDING 50mm VERTICAL METAL SIDING (STANDING SEAM OR SIM, PROFILE TBD) 25mm AIR SPACE 125mm SEMI-RIGID INSULATION INSULATION - CONTINUOUS SELF-ADHERED AIR/VAPOUR BARRIER
CL#2				SEALED RUNNING BOND BRICK VENEER 90mm SEALED RUNNING BOND BRICK VENEER 38mm AIR SPACE 100mm SEMI-RIGID INSULATION - SELF-ADHERED AIR/VAPOUR BARRIER
CL#3				FIBRE CEMENT BOARD CLADDING 12mm FIBRE CEMENT BOARD 25mm AIR SPACE - GALVANIZED Z-GIRTS c/w 125mm SEMI-RIGID INSULATION - SELF-ADHERED AIR/VAPOUR BARRIER

FIRE RESISTANCE RATING LEGEND:

0 HR	
0.75 HR	
1 HR	
1.5 HR	
2 HR	
3 HR	
4 HR	
WATER CURTAIN	

HCMA

#	DESCRIPTION	DATE
2	ISSUED FOR SD/ CLASS C COST.EST	18 FEB 2020

PROFESSIONAL SEAL

SQUAMISH FIRE HALL

37890 CLARKE DR. SQUAMISH, BC

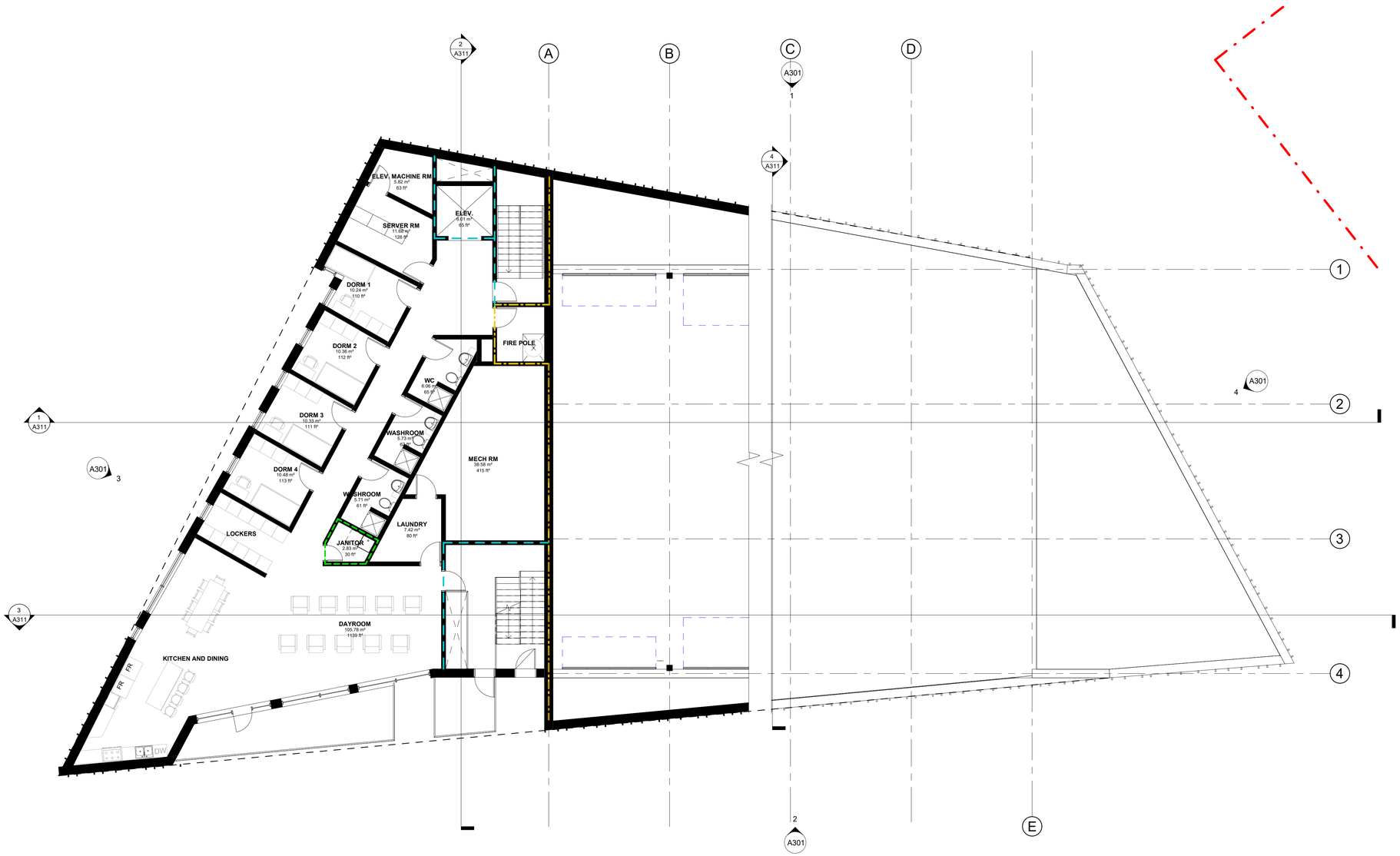
PROJECT #: 19053

FLOOR PLAN - LEVEL 2

A212

SCALE: 1 : 100

HCMA Architecture + Design 400 - 675 West Hastings Street Vancouver, BC V6B 1N2 Canada T 604.732.6620

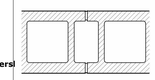


1 LEVEL 3 FLOOR PLAN
1 : 100

ROOF TYPES

TAG	R-VALUE	U-VALUE	CONSTRUCTION DETAIL	ASSEMBLY DESCRIPTION
R#1	36			TPO ROOFING 2mm SINGLE PLY FULLY ADHERED TPO ROOFING MEMBRANE 5mm PROTECTION BOARD 152mm 2 LAYERS OF 75mm RIGID INSULATION w/ STAGGERED JOINTS - AIR/ VAPOUR BARRIER 175mm CLT/DLT ROOF (REFER TO STRUCTURAL)

EXTERIOR BACK UP WALL TYPES

TAG	FRR	STC	CONSTRUCTION DETAIL	ASSEMBLY DESCRIPTION
EW#1				WOOD STUD BACK-UP WALL 16mm EXT. GRADE GWB SHEATHING 140mm 2x6 WOOD STUDS 16mm GWB
EW#2	-	-		CMU BACKUP WALL 190mm CMU - REFER TO STRUCTURAL

EXTERIOR CLADDING WALL TYPES

TAG	FRR	STC	CONSTRUCTION DETAIL	ASSEMBLY DESCRIPTION
CL#1				VERTICAL METAL CLADDING 50mm VERTICAL METAL SIDING (STANDING SEAM OR SIM, PROFILE TBD) 25mm AIR SPACE 125mm SEMI-RIGID INSULATION - INSULATION - CONTINUOUS SELF-ADHERED AIR/VAPOUR BARRIER
CL#2				SEALED RUNNING BOND BRICK VENEER 90mm SEALED RUNNING BOND BRICK VENEER 38mm AIR SPACE 100mm SEMI-RIGID INSULATION - SELF-ADHERED AIR/VAPOUR BARRIER
CL#3				FIBRE CEMENT BOARD CLADDING 12mm FIBRE CEMENT BOARD 25mm AIR SPACE - GALVANIZED Z-GIRTS c/w 125mm SEMI-RIGID INSULATION - SELF-ADHERED AIR/VAPOUR BARRIER

FIRE RESISTANCE RATING LEGEND:

0 HR	
0.75 HR	
1 HR	
1.5 HR	
2 HR	
3 HR	
4 HR	
WATER CURTAIN	

HCMA

#	DESCRIPTION	DATE
2	ISSUED FOR SD/ CLASS C COST.EST	18 FEB 2020

PROFESSIONAL SEAL

SQUAMISH FIRE HALL

37890 CLARKE DR.
SQUAMISH, BC

PROJECT #: 19053

FLOOR PLAN - LEVEL 3

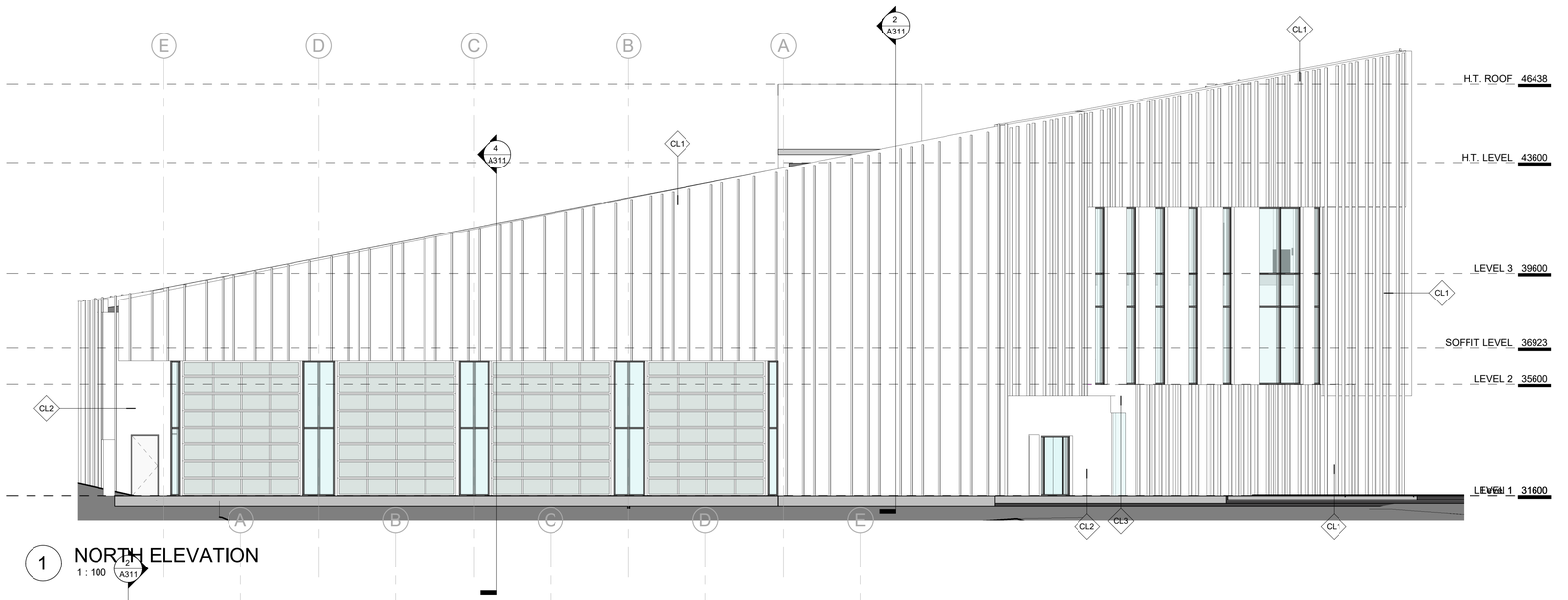
A213

SCALE: 1 : 100

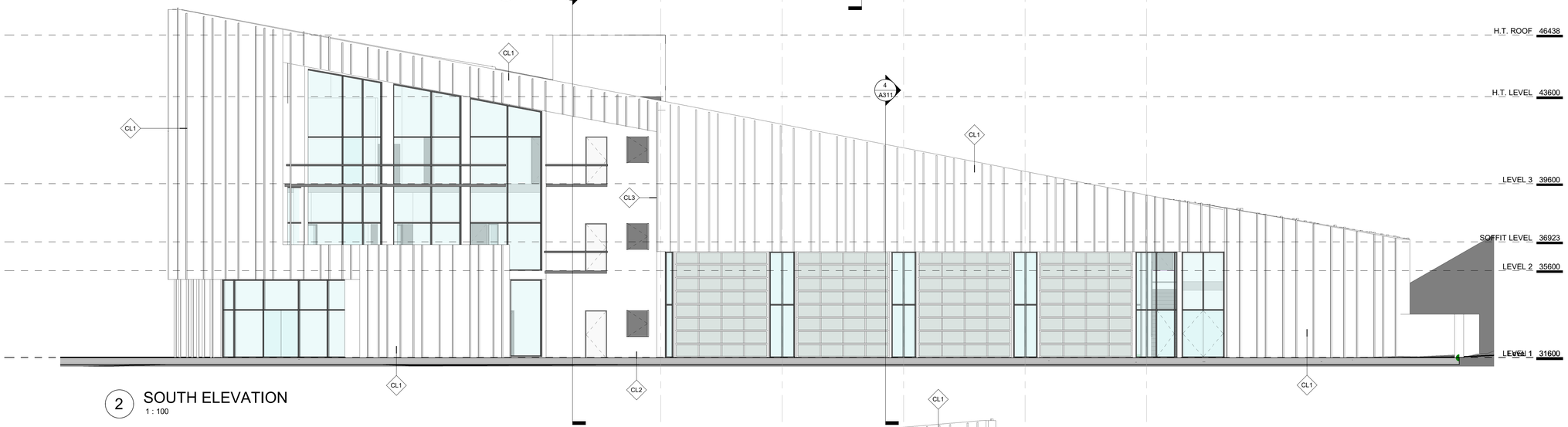
HCMA Architecture + Design 400 - 675 West Hastings Street Vancouver, BC V6B 1N2 Canada T 604.732.6620

EXTERIOR CLADDING WALL TYPES

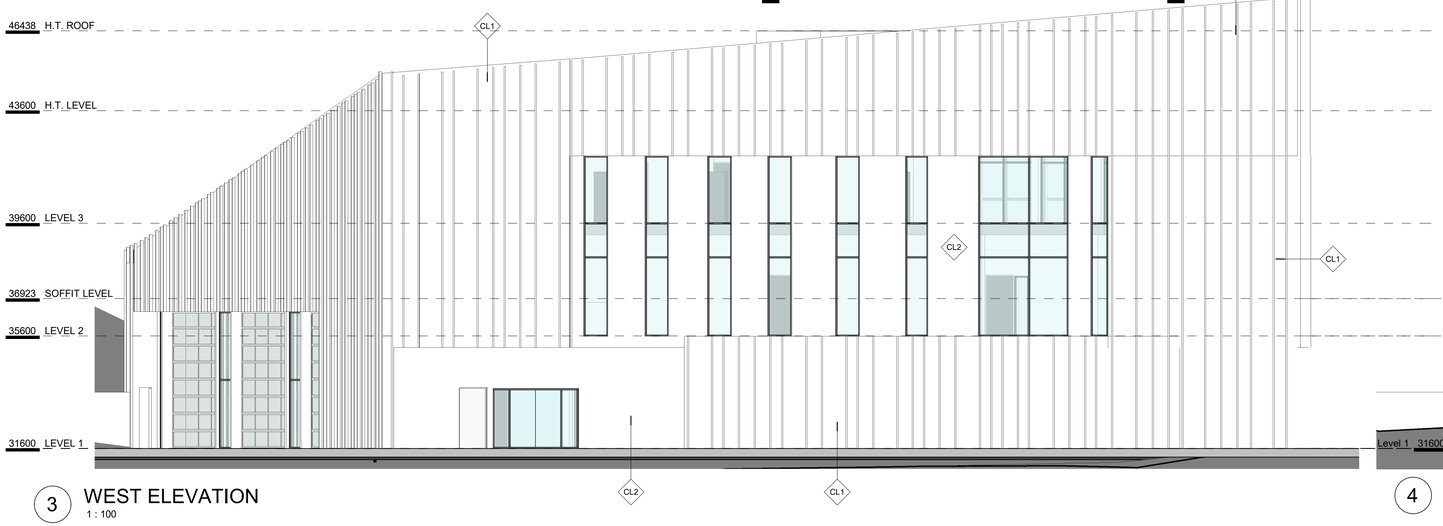
TAG	FRR	STC	CONSTRUCTION DETAIL	ASSEMBLY DESCRIPTION
CL#1				VERTICAL METAL CLADDING 50mm VERTICAL METAL SIDING (STANDING SEAM OR SIM, PROFILE TBD) 25mm AIR SPACE 125mm SEMI-RIGID INSULATION - CONTINUOUS SELF-ADHERED AIR/VAPOUR BARRIER
CL#2				SEALED RUNNING BOND BRICK VENEER 90mm SEALED RUNNING BOND BRICK VENEER 38mm AIR SPACE 100mm SEMI-RIGID INSULATION - SELF-ADHERED AIR/VAPOUR BARRIER
CL#3				FIBRE CEMENT BOARD CLADDING 12mm FIBRE CEMENT BOARD 25mn AIR SPACE - GALVANIZED Z-GIRTS c/w 125mm SEMI-RIGID INSULATION - SELF-ADHERED AIR/VAPOUR BARRIER



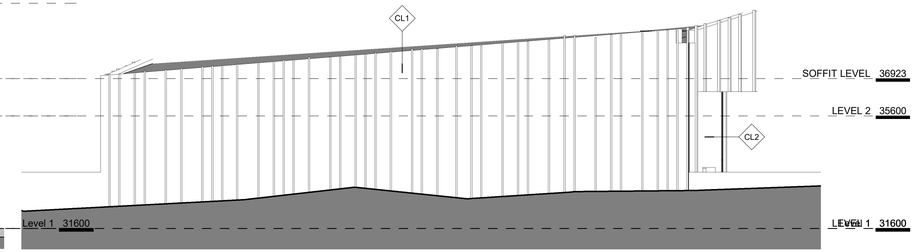
1 NORTH ELEVATION
1 : 100



2 SOUTH ELEVATION
1 : 100



3 WEST ELEVATION
1 : 100



4 EAST ELEVATION
1 : 100

HCMA Architecture + Design 400 - 675 West Hastings Street Vancouver, BC V6B 1N2 Canada T 604.732.6620

HCMA

#	DESCRIPTION	DATE
2	ISSUED FOR SD/ CLASS C COST.EST	18 FEB 2020

PROFESSIONAL SEAL

SQUAMISH FIRE HALL

37890 CLARKE DR. SQUAMISH, BC

PROJECT #: 19053

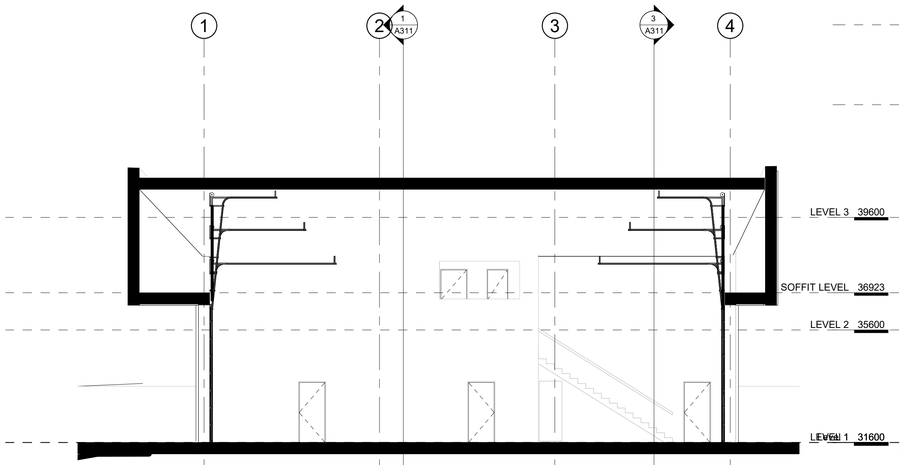
BUILDING ELEVATIONS

A301

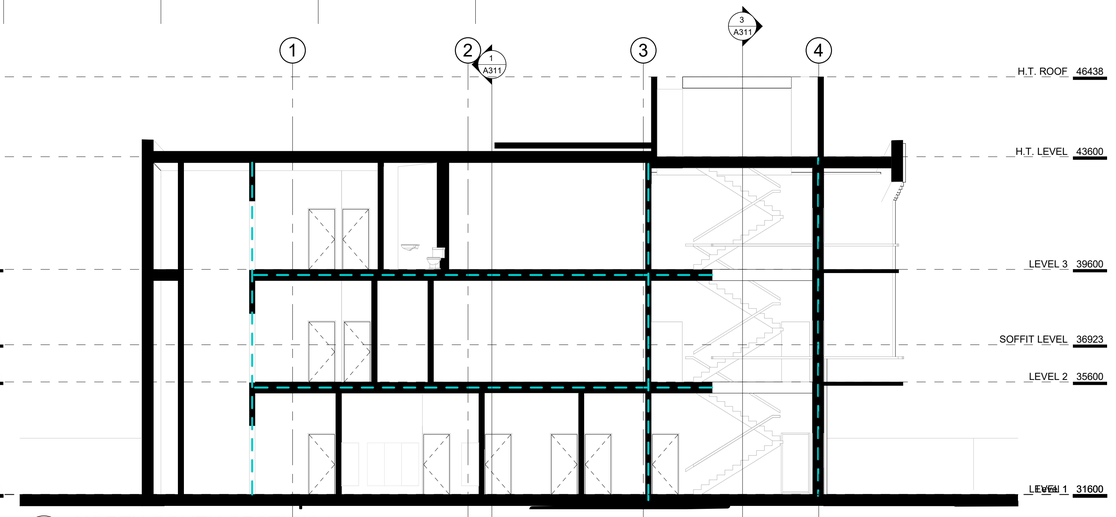
SCALE: 1 : 100

1 EAST-WEST SECTION 1
1 : 100

3 EAST-WEST SECTION 2
1 : 100



4 NORTH-SOUTH SECTION 2
1 : 100



2 NORTH-SOUTH SECTION 1
1 : 100

FIRE RESISTANCE RATING LEGEND:

0 HR	
0.75 HR	
1 HR	
1.5 HR	
2 HR	
3 HR	
4 HR	
WATER CURTAIN	

#	DESCRIPTION	DATE
2	ISSUED FOR SD/ CLASS C COST.EST	18 FEB 2020

PROFESSIONAL SEAL

SQUAMISH FIRE HALL

37890 CLARKE DR.
SQUAMISH, BC

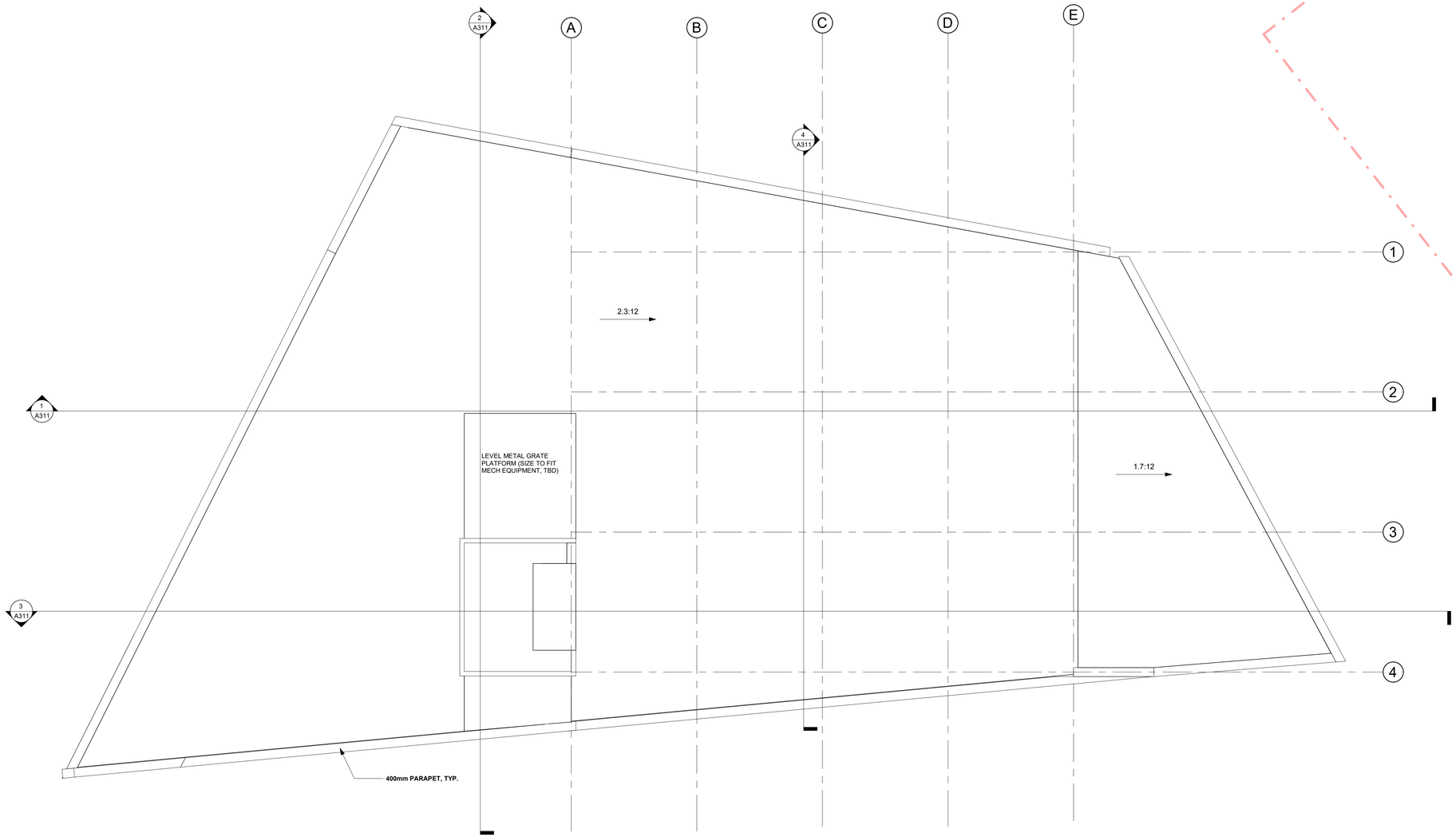
PROJECT #: 19053

BUILDING SECTIONS

A311

SCALE: 1 : 100

HCMA Architecture + Design 400 - 675 West Hastings Street Vancouver, BC V6B 1N2 Canada T 604.732.6620



HCMA

#	DESCRIPTION	DATE
2	ISSUED FOR SD/ CLASS C COST.EST	18 FEB 2020

PROFESSIONAL SEAL

SQUAMISH FIRE HALL

37890 CLARKE DR.
SQUAMISH, BC

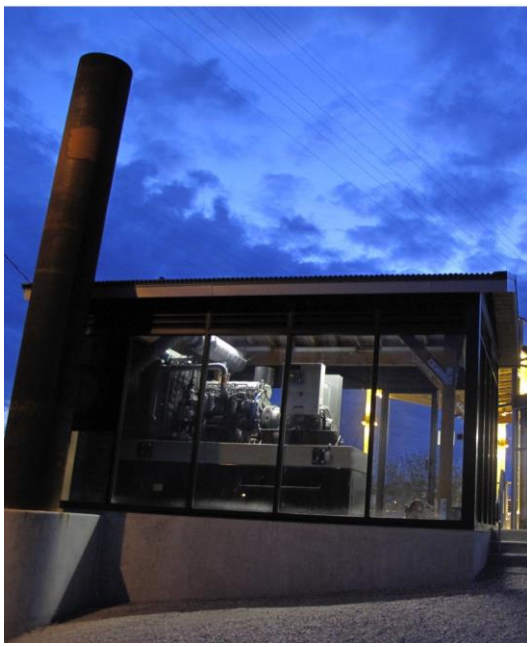
PROJECT #: 19053

ROOF PLAN

A204

SCALE: 1 : 100

HCMA Architecture + Design 400 - 675 West Hastings Street Vancouver, BC V6B 1N2 Canada T 604.732.6620


SQUAMISH FIREHALL No.1 (ALEX MUNRO) - SCHEMATIC DESIGN REPORT

For the proposed Development:
37890 Clarke Drive, Squamish, BC

Project No: 19-5100
February 10, 2020
Aplin & Martin Consultants Ltd.

APLIN MARTIN
ENGINEERING ARCHITECTURE PLANNING SURVEYING

TABLE OF CONTENTS

APPENDICIES

1.0 INTRODUCTION

The project is part of District of Squamish's initiative to replace its two existing firehalls. For the Alex Munro Firehall No. 1 on 37890 Clarke Drive, Garibaldi Highlands (off Sea-to-Sky Highway, or Highway 99), the District plans to rebuild the existing firehall building to house the new administration offices and emergency operations centre (EOC).

The site of this firehall is perched at the northwest foot of the Stawamus Chief rock escarpment range and the Stawamus River, and is located at higher ground just off Highway 99. To the east and northeast of the site sits the Stawamus Elementary school play field on higher ground. At present, part of the slope at the back portion of the Firehall yard is held up by a lock block wall. The existing building and the front portion asphalt paved areas meet the a heavily vegetated slope that leads up to the elementary school play field. The west of the site slopes down to Highway 99. The slope is heavily vegetated with a gravel walking path going along it. The north end of the site is bounded by the access roadway, Clarke Drive, coming up south from Highway 99 at its switchback point before it turns north towards the elementary school. The south portion of the site is relatively flat and is kept by the current firehall primarily as a storage yard. The yard is bounded by a forest beyond the fenced demarcation (See Grading Plan).

At present, existing water and sanitary sewer mains, as well as above-ground BC-Hydro transmission utility lines go through the site along a number of statutory rights-of-way (See Servicing Plan). The existing firehall building is serviced by service connections from these mains. Except for the existing sanitary line which conflicts with the proposed building, we do not foresee the watermain and overhead utility lines to be relocated. However, a proposed storm main is to be installed to better manage the onsite stormwater. Also, service connections need to be re-established due to the shape and location of the new building.

2.0 CIVIL SERVICING - WATER

An existing 250mm dia. watermain cuts through the site in the Southwest-Northeast direction, servicing the Stawamus Indian Reserve 24 residential area across the highway and two commercial lots south of the Firehall at Valley Drive. At the moment, the current firehall has a 150mm dia. water service connection from the 250mm dia. water main.

In order to service the proposed building, two proposed single 150mm dia. water service connections from the existing water main will be provided for the new building and onsite water hydrant (See Servicing Plan). We anticipate that there will be adequate flows from the adjacent watermain to provide for the proposed building sufficient domestic and fire protection flows. This analysis is to be confirmed upon receiving updated hydraulic information of the surrounding area and/or after sufficient water pressure test have been conducted. Other onsite fire hydrants are to be removed or returned to the District of Squamish.

An existing fire hydrant on the Firehall site on the northeast corner of the site near Clarke Drive will be retained (See Servicing Plan).

3.0 CIVIL SERVICING – SANITARY SEWER

An existing 75mm dia. sanitary forcemain cuts through the site in the Southwest-Northeast direction, servicing the Stawamus Indian Reserve 24 residential area across the highway and two commercial lots south of the Firehall at Valley Drive. It channels pumped sewer to an existing manhole onsite, before connecting to a 200mm dia. gravity sanitary pipe towards Highway 99. At the moment, the existing firehall has a sanitary service connection to the transition manhole between the forcemain and gravity main.

As the forcemain, gravity main and transitioning manhole conflict with the proposed firehall building structure, parts of the onsite sanitary sewer line need to be rerouted (See Servicing Plan). This includes the transitioning of the sanitary forcemain at an existing service box and deflecting the line at an angle allowing it to head north to a proposed transitioning manhole, before a new 200mm dia. gravity pipe continues to channel flow northwards to connect further downstream to an existing sanitary manhole (See Servicing Plan). To service the new firehall building, a new 150mm dia. sanitary connection is proposed at the new transitioning manhole between the forcemain and gravity line.

4.0 CIVIL SERVICING – STORM SEWER SYSTEM

At present rainwater falling onsite is split into two catchment areas in the north and south halves of the site. On the northern pavement, rain or stormwater is drained via two existing storm catch-basins located close to the Clarke Drive switchback. As for stormwater landing at the back area of the firehall, it is either infiltrated into the ground through the gravel surface, or flowing into the forested area south of the site or over the escarpment on the western flange.

For stormwater to be better managed, a new 300mm dia. storm pipe is proposed along the new parking area. This pipe will carry all the stormwater falling on the re-developed portion of the site. This includes the asphalt paved and concrete areas, as well as the roof-top of the proposed building. A series of proposed catch-basins will be installed to drain stormwater into this proposed storm pipe. Water is channeled along the pipe in a south-northern direction to an oil/grit separation and sediment manhole, before entering a flow control manhole located close to the Clarke Drive entranceway. The flow control device will restrict stormwater flow leaving the site, with excess water stored temporarily in a storage facility to be built below the asphalt surface (See Servicing Plan). Based on a 5-year storm-return intensity calculation, with post-development matching pre-development storm outflow rates, the required detention volume for the tank is calculated to be approximately 42.0m^3 (See Stormwater Catchment Plan & Calculation Sheet). Beyond the flow control manhole, an outflow pipe that has the capacity to hold overflowing volume of rainwater is connected to an existing storm culvert along Clarke Drive. This 300mm dia. culvert discharges stormwater at the ditch beside Highway 99.

Please note that the volume determination of the detention tank is preliminary, and the sizing of the detention tank is approximate. The final volume and tank type will be subjected to changes in the overall building and landscaping design, as well as District of Squamish requirements to adhere to.

5.0 ONSITE GRADING

The aim of the grading is to minimize the amount of retaining walls to be used onsite despite having an expanded footprint of useable area.

On the eastern edge, a cast-in-place concrete wall in front of the new building will be constructed, while the existing lock-block at the back of the building will be retained.

On the western edge, a row of thirty-one vertical parking stalls line the edge of the lot. This expansion of the asphalt area means that a retaining wall of approximately one metre tall at the highest points will have to be constructed above the vegetated slope (See Grading Plan). A metre wide of landscaped or concrete strip will be included to allow the installation of wall railings if required (See West Slope Sections Dwg).

Asphalt paving on the north and south of the site are both tied into existing asphalt-paved grounds.

APPENDIX A

CIVIL DESIGN DRAWINGS (4 SHEETS)

PROP. RETAINING WALL C/W HANDRAILS. SEE SHEET 2 FOR WALL & SLOPE SECTIONS (TYP.)

PROP. ASPHALT DRIVEWAY & PARKING STALL PAVING (TYP.)

PROP. CONCRETE BARRIER CURB & REVERSE GUTTER

PROP. CONCRETE BARRIER CURB & GUTTER

PROP. CONCRETE WALKWAY

EX. CATCH BASIN TO REMAIN

EX. ASPHALT PAVING TO BE REMOVED, REGRADED & REPAVED (TYP.)

EX. FIRE HYDRANTS TO BE REMOVED OR RELOCATED (TYP.)

PROPOSED FIREHALL 1 BUILDING MFE=32.10m

EX. TRAINING STRUCTURE TO REMAIN

EX. HYDRO POWER POLES & LINES TO BE RELOCATED (TYP.)

EX. DRIVEWAY PAVING, CURB & SIDEWALK TO BE REMOVED

PROP. CONCRETE BARRIER CURB & GUTTER (TYP.)

EX. CATCH BASIN TO REMAIN

PROP. RETAINING WALL (TYP.)

PROP. CONCRETE FIRE TRUCK DRIVEWAY PAVING

EX. FIREHALL STRUCTURE TO BE DEMOLISHED

EX. TRAINING STRUCTURE TO REMAIN

EX. CONCRETE PADS & STRUCTURES TO BE REMOVED (TYP.)

EX. TRAINING STRUCTURE TO REMAIN

PROP. CONCRETE PADS AS REQUIRED (TYP.)

PROP. CONCRETE FIRE TRUCK DRIVEWAY PAVING

PROP. ASPHALT DRIVEWAY & PARKING STALL PAVING (TYP.)

EX. STAIRS & LOCK BLOCK WALLS TO REMAIN

PROP. GATE

SEA-TO-SKY HIGHWAY

CLARKE DRIVE

REM B PLAN 12335

REM Bk 5 PLAN 11687

REM Bk 3 PLAN 9930

REM Bk 4 PLAN 11320

BCH & PA R/W REF PLAN 2280

SRW PLAN LMP40628

SRW PLAN LMP40627

SRW PLAN LMP40

SRW PLAN LMP41906

4266

DL

TRANSMISSION LINES

LEGEND:

MFE=08.50m	MINIMUM FLOOR ELEVATION
●	MANHOLE
◪	CATCH BASIN
◐	LAWN BASIN
◆M	FIRE HYDRANT
■	BLOWOFF
═══	CONCRETE CURB
- - -	RETAINING WALL
———	EDGE OF ASPHALT
	ASPHALT SURFACE
	GRAVEL SURFACE
	CONCRETE SURFACE
	CONCRETE SIDEWALK
	LANDSCAPE AREA
	UNDERGROUND INFILTRATION TANK
	RAIN GARDEN/ BIOSWALE
(D1)	MANHOLE ID

NOTICE TO CONTRACTOR

IT IS THE RESPONSIBILITY OF THE CONTRACTOR'S SURVEYOR TO VERIFY THAT ALL LEGAL SURVEY DIMENSIONS SHOWN ON THE ENGINEERS DRAWINGS AGREE WITH THOSE ON THE REGISTERED LEGAL SURVEY PLAN. SHOULD THERE BE ANY DISCREPANCIES, THEN IMMEDIATELY NOTIFY THE ENGINEER OF RECORD

LEGAL DESCRIPTION: ON LOT B, EXCEPT PART IN PLAN 17066, SECONDLY PART DEDICATED ROAD ON PLAN BCP30210, DISTRICT LOT 4266 & 4267, GROUP 1, NEW WESTMINSTER DISTRICT, PLAN 12335.

B.M. MONUMENT NO. – ELEVATION: –
LOCATED AT

REV. NO.	DESCRIPTION	DR	CH	DATE	APP
01	SCHEMATIC DESIGN – DRAFT 1	VG	DRS	FEB 10/20	DRS
02	SCHEMATIC DESIGN – DRAFT 2	VG	DRS	FEB 12/20	DRS
03	SCHEMATIC DESIGN REPORT	VG	DRS	FEB 18/20	DRS

APLIN MARTIN
ENGINEERING ARCHITECTURE PLANNING SURVEYING

Aplin & Martin Consultants Ltd.
#1818 – 1177 West Hastings Street, Vancouver, B.C. V6E 2K3
Tel: (604) 678-9434, Fax: (604) 597-9061, Email: general@aplinmartin.com

CLIENT:
HUGHES CONDON MARLER ARCHITECTS (HCMA)
#400 - 675 W HASTINGS STREET, VANCOUVER V6B 1N2
PH. (604) 732-6620

PROJECT:
SQUAMISH FIREHALL 1
8989 CLARKE DRIVE
SQUAMISH, BC

The location of existing underground utilities are shown in an approximate way only & have not been independently verified by the owner or its representative. The contractor shall determine the exact location of all existing utilities before commencing work, and agrees to be fully responsible for any and all damages which might be occasioned by the contractor's failure to exactly locate and preserve any and all underground utilities.

TITLE: **GRADING PLAN**

DESIGN: VG CHECK: DRS
DRAWN: VG APPR: DRS

A & M FILE: **19-5100**

PROJECT NO. .

SCALE : HORZ. 1: 250 VERT. N/A

DRAWING DATE: **FEBRUARY 2020**

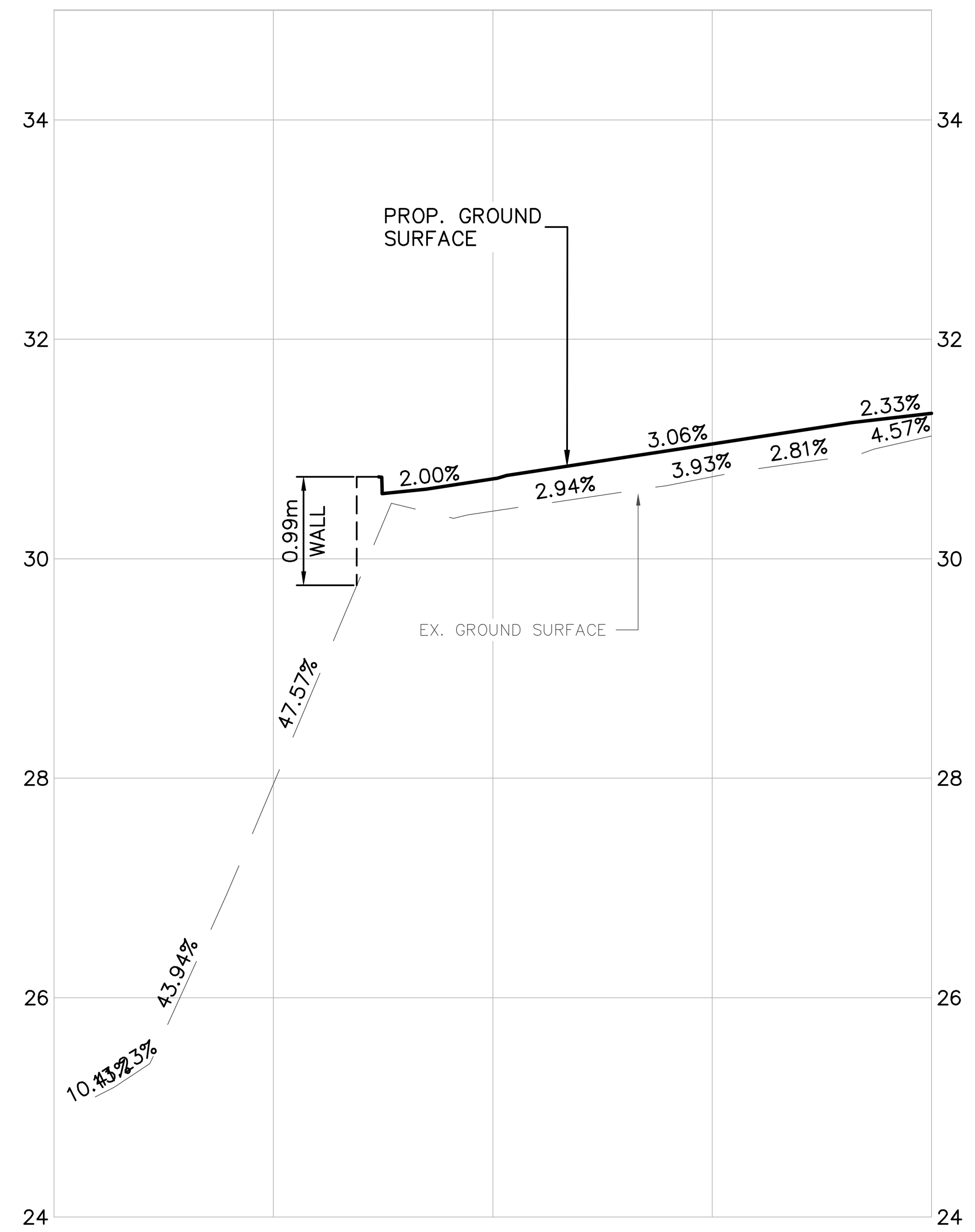
DRAWING NO. .

A & M DRAWING NO. **19-5100-01**

SHEET NO. **01 OF 04**

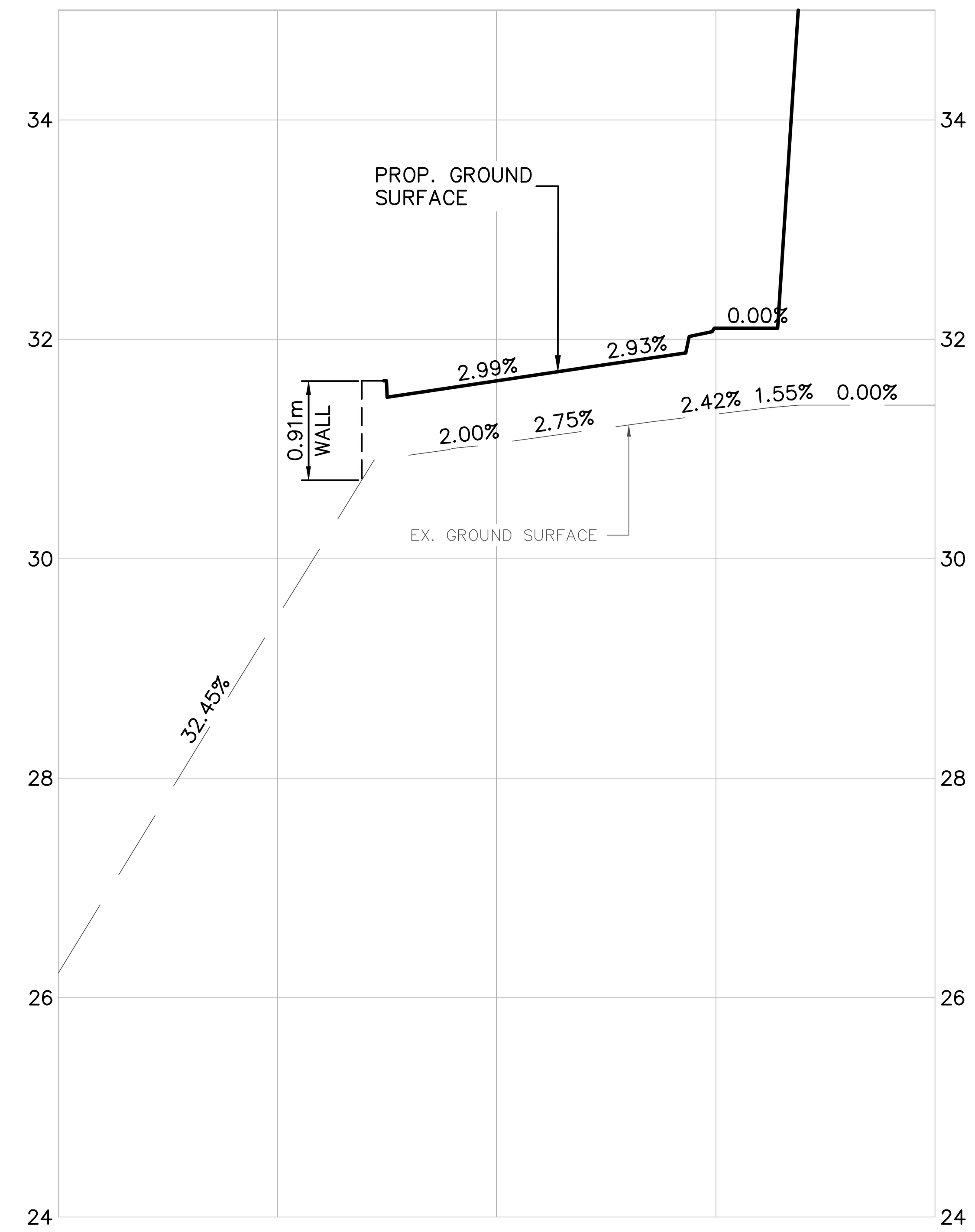
REV. **03**

0 2 1:250 12m



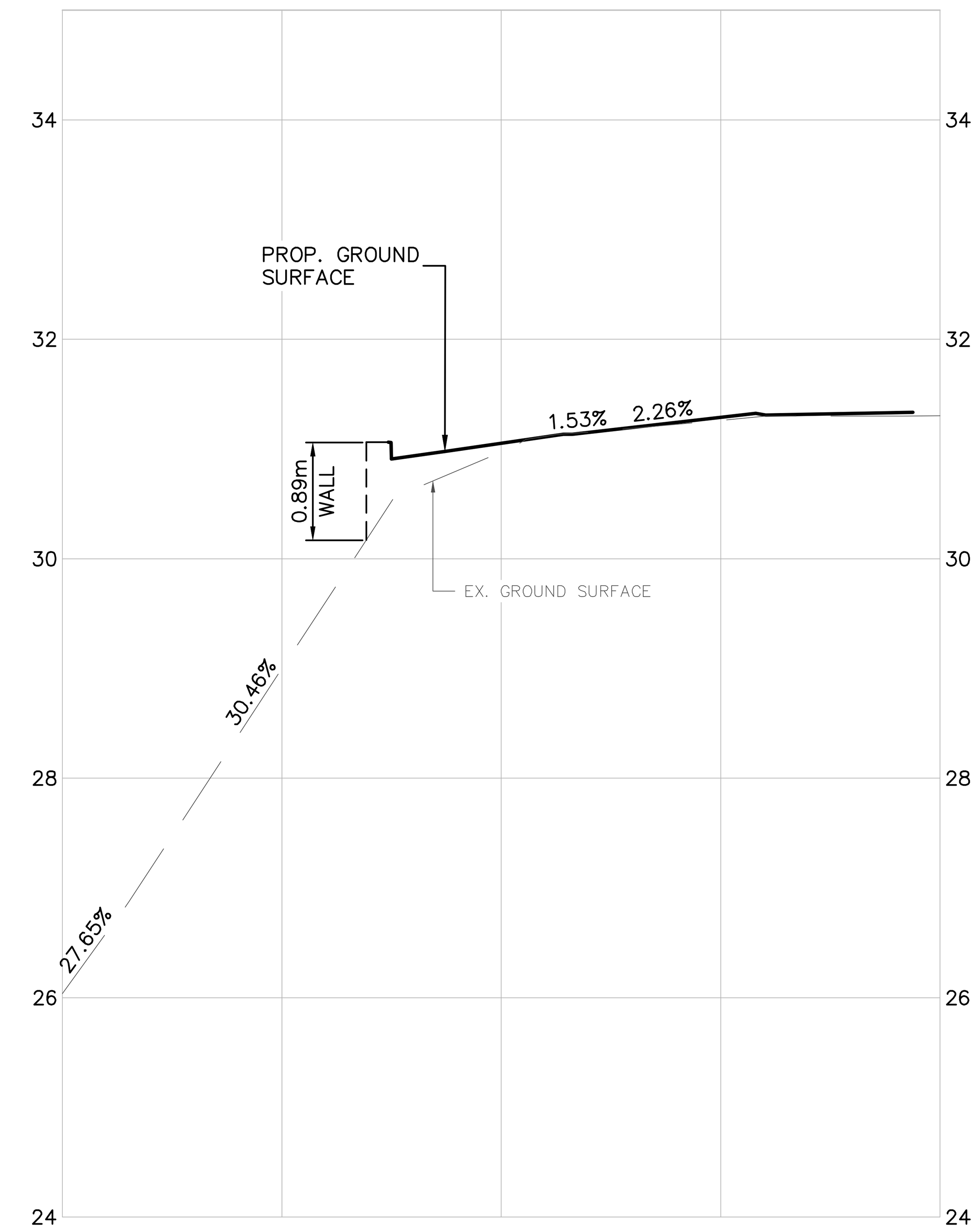
CENTRELINE ROAD ELEVATIONS					
EXISTING		27.95	30.43	30.75	31.12
PROPOSED			30.73	31.05	31.33
CHAINAGE	2+000	2+010	2+020	2+030	2+040

WEST SLOPE FRONT SECTION
1:250 HOR.
1:50 VERT.



CENTRELINE ROAD ELEVATIONS					
EXISTING	26.22	29.47	31.05	31.32	31.40
PROPOSED			31.62	32.10	46.87
CHAINAGE	3+000	3+010	3+020	3+030	3+040

WEST SLOPE MID SECTION (NEAR GATE)
1:250 HOR.
1:50 VERT.



CENTRELINE ROAD ELEVATIONS					
EXISTING	26.04	29.00	30.97	31.26	31.30
PROPOSED			31.05	31.29	
CHAINAGE	4+000	4+010	4+020	4+030	4+040

WEST SLOPE BACK SECTION
1:250 HOR.
1:50 VERT.

NOTICE TO CONTRACTOR

IT IS THE RESPONSIBILITY OF THE CONTRACTOR'S SURVEYOR TO VERIFY THAT ALL LEGAL SURVEY DIMENSIONS SHOWN ON THE ENGINEERS DRAWINGS AGREE WITH THOSE ON THE REGISTERED LEGAL SURVEY PLAN. SHOULD THERE BE ANY DISCREPANCIES, THEN IMMEDIATELY NOTIFY THE ENGINEER OF RECORD

LEGAL DESCRIPTION: ON LOT B, EXCEPT PART IN PLAN 17066, SECONDLY PART DEDICATED ROAD ON PLAN BCP30210, DISTRICT LOT 4266 & 4267, GROUP 1, NEW WESTMINSTER DISTRICT, PLAN 12335.

B.M. MONUMENT NO. _ ELEVATION: _
LOCATED AT

REV. NO.	DESCRIPTION	DR	CH	DATE	APP
01	SCHEMATIC DESIGN - DRAFT 1	VG	DRS	FEB 10/20	DRS
02	SCHEMATIC DESIGN - DRAFT 2	VG	DRS	FEB 12/20	DRS
03	SCHEMATIC DESIGN REPORT	VG	DRS	FEB 18/20	DRS

APLIN MARTIN
ENGINEERING ARCHITECTURE PLANNING SURVEYING

Aplin & Martin Consultants Ltd.
#1818 - 1177 West Hastings Street, Vancouver, B.C. V6E 2K3
Tel: (604) 678-9434, Fax: (604) 597-9061, Email: general@aplinmartin.com

CLIENT:
HUGHES CONDON MARLER ARCHITECTS (HCMA)
#400 - 675 W HASTINGS STREET, VANCOUVER V6B 1N2
PH. (604) 732-6620

PROJECT:
SQUAMISH FIREHALL 1
8989 CLARKE DRIVE
SQUAMISH, BC

The location of existing underground utilities are shown in an approximate way only & have not been independently verified by the owner or its representative. The contractor shall determine the exact location of all existing utilities before commencing work, and agrees to be fully responsible for any and all damages which might be occasioned by the contractor's failure to exactly locate and preserve any and all underground utilities.

TITLE:
WEST SLOPE SECTIONS

DESIGN: VG CHECK: DRS
DRAWN: VG APPR: DRS

A & M FILE: **19-5100**

PROJECT NO. .

SCALE :
HORZ. 1:250
VERT. 1:50

DRAWING DATE: **FEBRUARY 2020**

DRAWING NO. .

A & M DRAWING NO. **19-5100-02**

SHEET NO. **02 OF 04**

REV. **03**

0 2 1:250 12m

NOTICE TO CONTRACTOR

IT IS THE RESPONSIBILITY OF THE CONTRACTOR'S SURVEYOR TO VERIFY THAT ALL LEGAL SURVEY DIMENSIONS SHOWN ON THE ENGINEERS DRAWINGS AGREE WITH THOSE ON THE REGISTERED LEGAL SURVEY PLAN. SHOULD THERE BE ANY DISCREPANCIES, THEN IMMEDIATELY NOTIFY THE ENGINEER OF RECORD

LEGAL DESCRIPTION: ON LOT B, EXCEPT PART IN PLAN 17066, SECONDLY PART DEDICATED ROAD ON PLAN BCP30210, DISTRICT LOT 4266 & 4267, GROUP 1, NEW WESTMINSTER DISTRICT, PLAN 12335.

B.M. MONUMENT NO. _ ELEVATION: _
LOCATED AT

REV. NO.	DESCRIPTION	DR	CH	DATE	APP
01	SCHEMATIC DESIGN – DRAFT 1	VG	DRS	FEB 10/20	DRS
02	SCHEMATIC DESIGN – DRAFT 2	VG	DRS	FEB 12/20	DRS
03	SCHEMATIC DESIGN REPORT	VG	DRS	FEB 18/20	DRS

APLIN MARTIN
ENGINEERING ARCHITECTURE PLANNING SURVEYING

Aplin & Martin Consultants Ltd.
#1818 – 1177 West Hastings Street, Vancouver, B.C. V6E 2K3
Tel: (604) 678-9434, Fax: (604) 597-9061, Email: general@aplinmartin.com

CLIENT:
HUGHES CONDON MARLER ARCHITECTS (HCMA)
#400 - 675 W HASTINGS STREET, VANCOUVER V6B 1N2
PH. (604) 732-6620

PROJECT:
SQUAMISH FIREHALL 1
8989 CLARKE DRIVE
SQUAMISH, BC

The location of existing underground utilities are shown in an approximate way only & have not been independently verified by the owner or its representative. The contractor shall determine the exact location of all existing utilities before commencing work, and agrees to be fully responsible for any and all damages which might be occasioned by the contractor's failure to exactly locate and preserve any and all underground utilities.

TITLE:
SERVICING PLAN

DESIGN: VG CHECK: DRS
DRAWN: VG APPR: DRS

A & M FILE: **19-5100**

PROJECT NO. .

SCALE :
HORZ. 1: 250
VERT. N/A

DRAWING DATE: **FEBRUARY 2020**

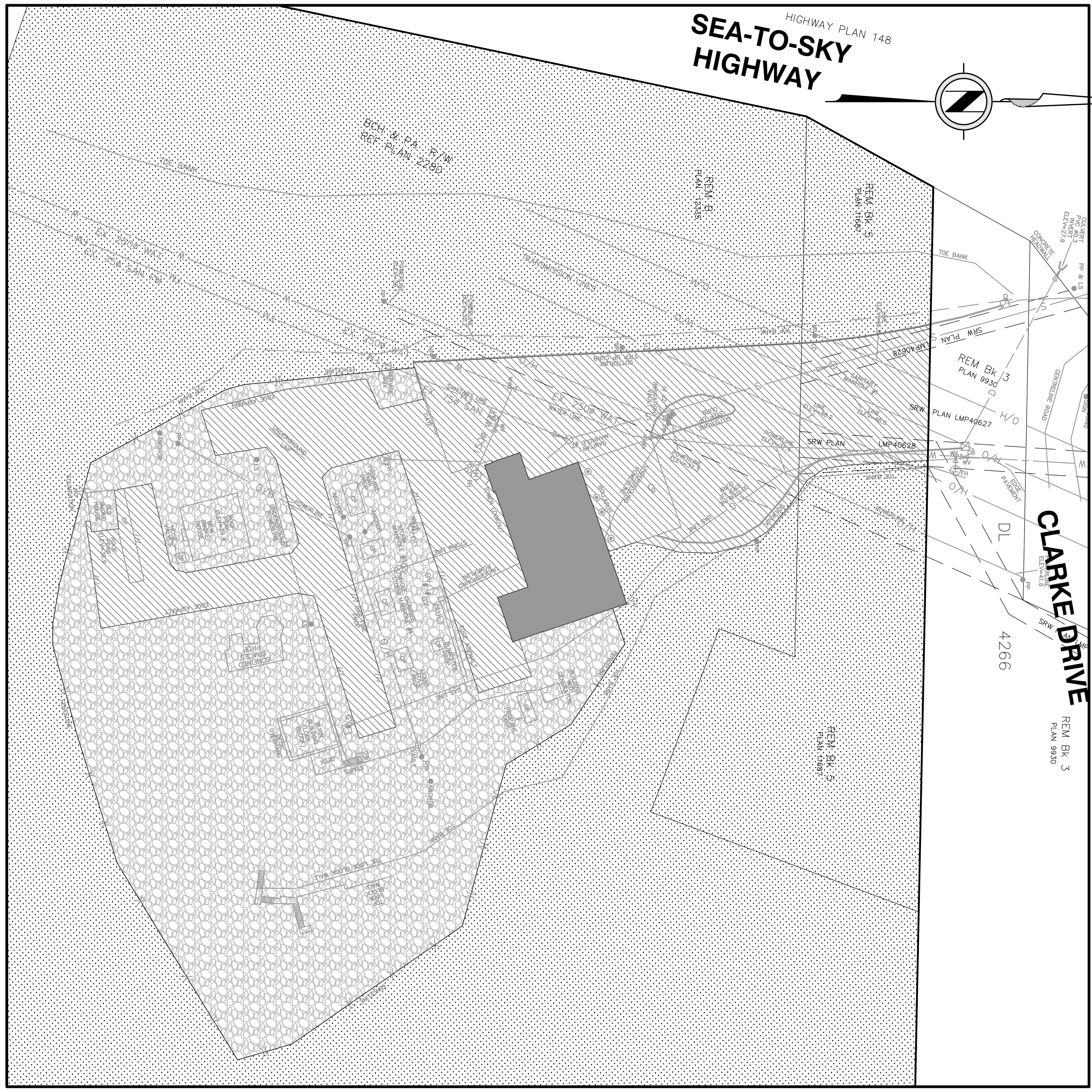
DRAWING NO. .

A & M DRAWING NO. **19-5100-03**

SHEET NO. **03 OF 04**

REV. **03**

0 2 1:250 12m



LEGEND:

BUILDING ROOF

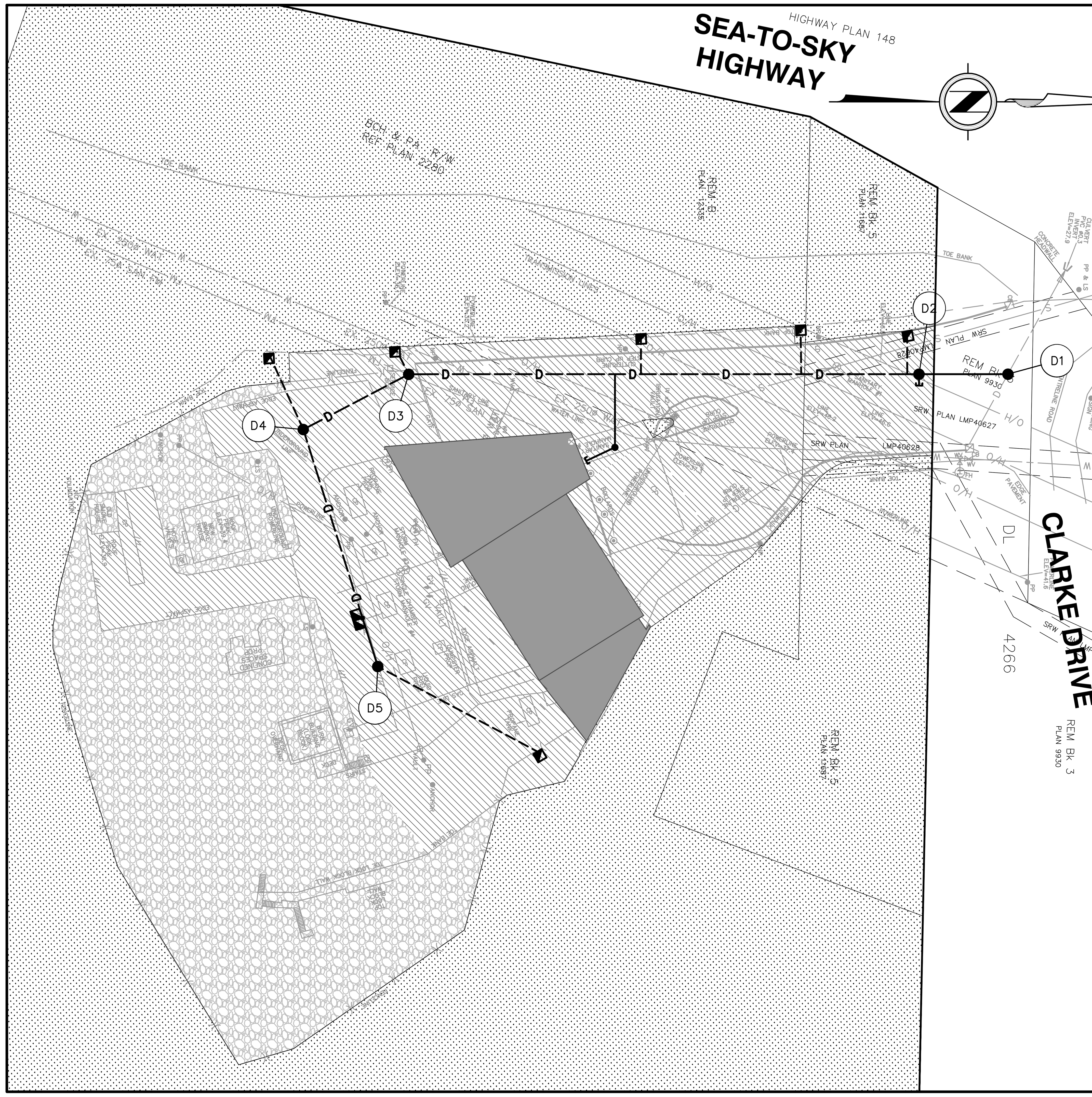
ASPHALT/CONCRETE

GREENSPACE

GRAVEL SURFACE

PRE-CONSTRUCTION ONSITE RUN-OFF COEFFICIENT				
Lot Area (m^2)	Concrete/Asphalt	Building Roof	Greenspace	Gravel Surface
56380	3168.2	379.7	48189.5	4642.6
	0	0	0	0
A (ha)	0	0	0	0
5.638	0	0	0	0
Total A (m^2)	3168.2	379.7	48189.5	4642.6
R (Runoff Coefficient)	0.95	0.95	0.3	0.65
A*R	3009.79	360.715	14456.85	3017.69
			Average R =	0.37

PRE-CONSTRUCTION STAGE - CATCHMENT AREAS & RUNOFF COEFFICIENTS



LEGEND:

BUILDING ROOF

ASPHALT/CONCRETE

GREENSPACE

GRAVEL SURFACE

POST-CONSTRUCTION ONSITE RUN-OFF COEFFICIENT				
Lot Area (m^2)	Concrete/Asphalt	Building Roof	Greenspace	Gravel Surface
56380	3205.1	934.2	48792.9	3447.8
	0	0	0	0
A (ha)	0	0	0	0
5.638	0	0	0	0
Total A (m^2)	3205.1	934.2	48792.9	3447.8
R (Runoff Coefficient)	0.95	0.95	0.4	0.65
A*R	3044.845	887.49	19517.16	2241.07
			Average R =	0.46

POST-CONSTRUCTION STAGE - CATCHMENT AREAS & RUNOFF COEFFICIENTS

NOTICE TO CONTRACTOR

IT IS THE RESPONSIBILITY OF THE CONTRACTOR'S SURVEYOR TO VERIFY THAT ALL LEGAL SURVEY DIMENSIONS SHOWN ON THE ENGINEERS DRAWINGS AGREE WITH THOSE ON THE REGISTERED LEGAL SURVEY PLAN. SHOULD THERE BE ANY DISCREPANCIES, THEN IMMEDIATELY NOTIFY THE ENGINEER OF RECORD

LEGAL DESCRIPTION: ON LOT B, EXCEPT PART IN PLAN 17066, SECONDLY PART DEDICATED ROAD ON PLAN BCP30210, DISTRICT LOT 4266 & 4267, GROUP 1, NEW WESTMINSTER DISTRICT, PLAN 12335.

B.M. MONUMENT NO. _ ELEVATION: _
LOCATED AT

REV. NO.	DESCRIPTION	DR	CH	DATE	APP
01	SCHEMATIC DESIGN – DRAFT 1	VG	DRS	FEB 10/20	DRS
02	SCHEMATIC DESIGN – DRAFT 2	VG	DRS	FEB 12/20	DRS
03	SCHEMATIC DESIGN REPORT	VG	DRS	FEB 18/20	DRS

APLIN MARTIN
ENGINEERING ARCHITECTURE PLANNING SURVEYING

Aplin & Martin Consultants Ltd.
#1818 – 1177 West Hastings Street, Vancouver, B.C. V6E 2K3
Tel: (604) 678-9434, Fax: (604) 597-9061, Email: general@aplinmartin.com

CLIENT:
HUGHES CONDON MARLER ARCHITECTS (HCMA)
#400 - 675 W HASTINGS STREET, VANCOUVER V6B 1N2
PH. (604) 732-6620

PROJECT:
SQUAMISH FIREHALL 1
8989 CLARKE DRIVE
SQUAMISH, BC

The location of existing underground utilities are shown in an approximate way only & have not been independently verified by the owner or its representative. The contractor shall determine the exact location of all existing utilities before commencing work, and agrees to be fully responsible for any and all damages which might be occasioned by the contractor's failure to exactly locate and preserve any and all underground utilities.

TITLE: **STORMWATER CATCHMENT PLAN**

DESIGN: VG CHECK: DRS
DRAWN: VG APPR: DRS

A & M FILE: **19-5100**

PROJECT NO. .

SCALE : HORZ. 1:500 VERT. N/A

DRAWING DATE: **FEBRUARY 2020**

DRAWING NO. .

A & M DRAWING NO. **19-5100-04**

SHEET NO. **04 OF 04**

REV. **03**

0 5 1:500 25m

APPENDIX B

STORMWATER DETENTION VOLUME CALCULATION SHEET

Squamish Firehall 1 **19-5100**
8989 Clarke Drive, Squamish **18-Feb-20**

5 Year Peak Flow Calculations

	Tc min	Runoff coeffecient %	Area Ha	Intensity mm	n	Q m^3/s
Q_{Pre}	10	0.37	5.638	40	0.00278	0.234
Q_{Post}	10	0.46	5.638	40	0.00278	0.291

Storage Volume Required (Modified Rational Method)

Storage Volume = $T_r (Q_{p2} - Q_{rel}) + 0.5 \times T_c \times Q_{rel}^2 (1/Q_{p2} - 1/Q_{p1})$

T_r = Duration of storm, in seconds
T_c = Time to concentration, in seconds
Q_{p1} = Peak flow for storm, $T_r = T_c$, m^3/s
Q_{p2} = Peak flow for storm specified, m^3/s
Q_{rel} = Maximum release rate, m^3/s

Maximum Storage Required = **41.03 m^3 (20% F.S.)**

Rainfall Duration Tr min	Rainfall Intensity I mm	Peak Flow Q_{p1} m^3/s	Peak Flow Q_{p2} m^3/s	Required Storage m^3
3	77	0.291	0.552	30
5	58	0.291	0.421	39
10	40	0.291	0.291	34
20	28	0.291	0.202	-14
25	25	0.291	0.179	-47
30	23	0.291	0.163	-84
31	22	0.291	0.160	-92
32	22	0.291	0.157	-100
33	21	0.291	0.154	-108
34	21	0.291	0.152	-116
35	21	0.291	0.150	-124
50	17	0.291	0.124	-255
65	15	0.291	0.108	-397

APLIN MARTIN

ENGINEERING ARCHITECTURE PLANNING SURVEYING

APLIN & MARTIN CONSULTANTS LTD.

1818 – 1177 WEST HASTINGS STREET, VANCOUVER, BC V6E 2K3 | WWW.APLINMARTIN.COM | (604) 678-9434

STRUCTURAL SCHEMATIC DESIGN REPORT
SQUAMISH FIRE HALL
PROJECT NO. 19211
FEB 14, 2020

1. GENERAL

This report has been prepared by Wicke Herfst Maver Structural Engineers (WHM) to outline the structural intent and configuration for the Squamish Fire Hall. This report is for the exclusive use of HCMA Architecture + Design, the associated design team and the District of Squamish (Client).

2. DESIGN METHODOLOGY

2.1. Introduction

WHM is providing structural consulting services for developing the structural intent for the Squamish Fire Hall. The architectural layout has been developed by HCMA Architecture + Design. The facility is a three-storey structure with 4 truck bays. The majority of the main level consists of the truck bays but also include locker rooms, rooms for services, washroom, various storage rooms, gear room, electrical and mechanical rooms, training room, hose storage and radio room. The second level consists of offices, server room, mechanical and electrical rooms, administration room, washrooms, storage. The area above the apparatus bays is open to below. The third level consist of dorms, lockers, laundry room, mechanical and electrical rooms, dayroom, kitchen and dining. Two stairs and an elevator provide access to Level 2 and Level 3.

2.2. Codes and Standards

The primary building structure will be designed in accordance with the BC Building Code 2018 (henceforth referred to as the "Code") and referenced design standards applicable to primary building structure as follows:

Wood	CSA O86-09
Concrete	CSA A23.3-14
Steel	CSA S16-09

Environmental loads are based on climatic conditions listed in Appendix C "Climatic Data" of the Code. The building loads will be based on a 'Post-Disaster' Importance category as indicated in Table 4.1.2.1 of the Code.

2.3. Design assumptions

The facility will be designed to the following criteria as outlined in the Code:

2.3.1. Live Loads

a. Apparatus Bays	12.0 kPa
b. Ground floor	4.8 kPa (other areas)
c. Training room	4.8 kPa
d. Storage areas	4.8 kPa
e. Mechanical/Electrical Rooms	3.6 kPa
f. Kitchen and Dining	4.8 kPa
g. Dorms	1.9 kPa
h. Offices	2.4 kPa

WICKE HERFST MAVER STRUCTURAL ENGINEERS

WEB
info@whmengineers.com
www.whmengineers.com
2227 Douglas Road,
Burnaby, BC V5C 5A9
T 604.484.2859
F 604.484.2861

2.3.2. Snow and Rain Loads

a. Ss	2.8 kPa
b. Sr	0.7 kPa
c. Is (ULS)	1.25
d. Is (SLS)	0.9

2.3.3. Seismic Loads

a. Sa(0.2)	0.600
b. Sa(0.5)	0.517
c. Sa(1.0)	0.314
d. Sa(2.0)	0.200
e. Sa(5.0)	0.069
f. Sa(10.0)	0.024
g. PGA	0.266
h. PGV	0.404
i. Site Class	“D” (per geotechnical report)
j. F(0.2), F(0.5), F(1.0), F(2.0)	1.03,1.234,1.3371,1.387
k. F(PGA), F(PGV)	1.027,1.234
l. Ie	1.5
m. Rd	2.0
n. Ro	1.5

2.3.4. Wind Loads

a. q 1/10	0.39 kPa
b. q 1/50	0.50 kPa
c. Iw (ULS)	1.25
d. Iw (SLS)	0.75

3. STRUCTURAL SYSTEM

3.1. Structural Description

3.1.1. Foundations

A soil investigation has been performed by the SFA Geotechnical Engineering and a report dated August 7, 2019 was provided for our reference. Based on the geotechnical investigation report, the foundations can be designed using conventional spread and strip footings with a serviceability limit state (SLS) bearing pressure of 150kPa and ultimate limit state (ULS) bearing pressure of 300kPa. Site Category falls under Site Class D.

3.1.2. Level 1 Floor Level

The Level 1 floor system will consist of reinforced concrete slab on grade. The slab on grade in the apparatus bays will be 150mm thick while the other areas of the main level will be 100mm thick. High wear areas such as entrance lobbies and apparatus bays will be specified with an integrated concrete hardener.

3.1.3. Level 2 and Level 3 Floor Levels

The Level 2 and Level 3 floors will consist of lightweight TJI joists framing supported on wood stud load bearing walls and parallam beams or glulam beams. The floors will be sheathed with 16thk plywood and 40mm concrete topping will be allowed for as additional floor loading.

3.1.4. Roof Structure

The roof structure over the apparatus bays will consist of Cross Laminated Timber (CLT) or Dowel Laminated Timber (DLT) roof panels supported on glulam (and parallam beams) and by the load bearing stud walls on the sides of the apparatus bays. The underside of these CLT or DLT panels on the apparatus bays will be exposed.

The roof over the dorms and kitchen areas on the west of the apparatus bays and storage area on the east of the apparatus bays will be framed with TJI jojsts supported by wood stud load bearing walls and parallam beams or glulam beams. The roof on the areas framed by TJI's will be sheathed with 12mm thk plywood.

3.1.5. Lateral System

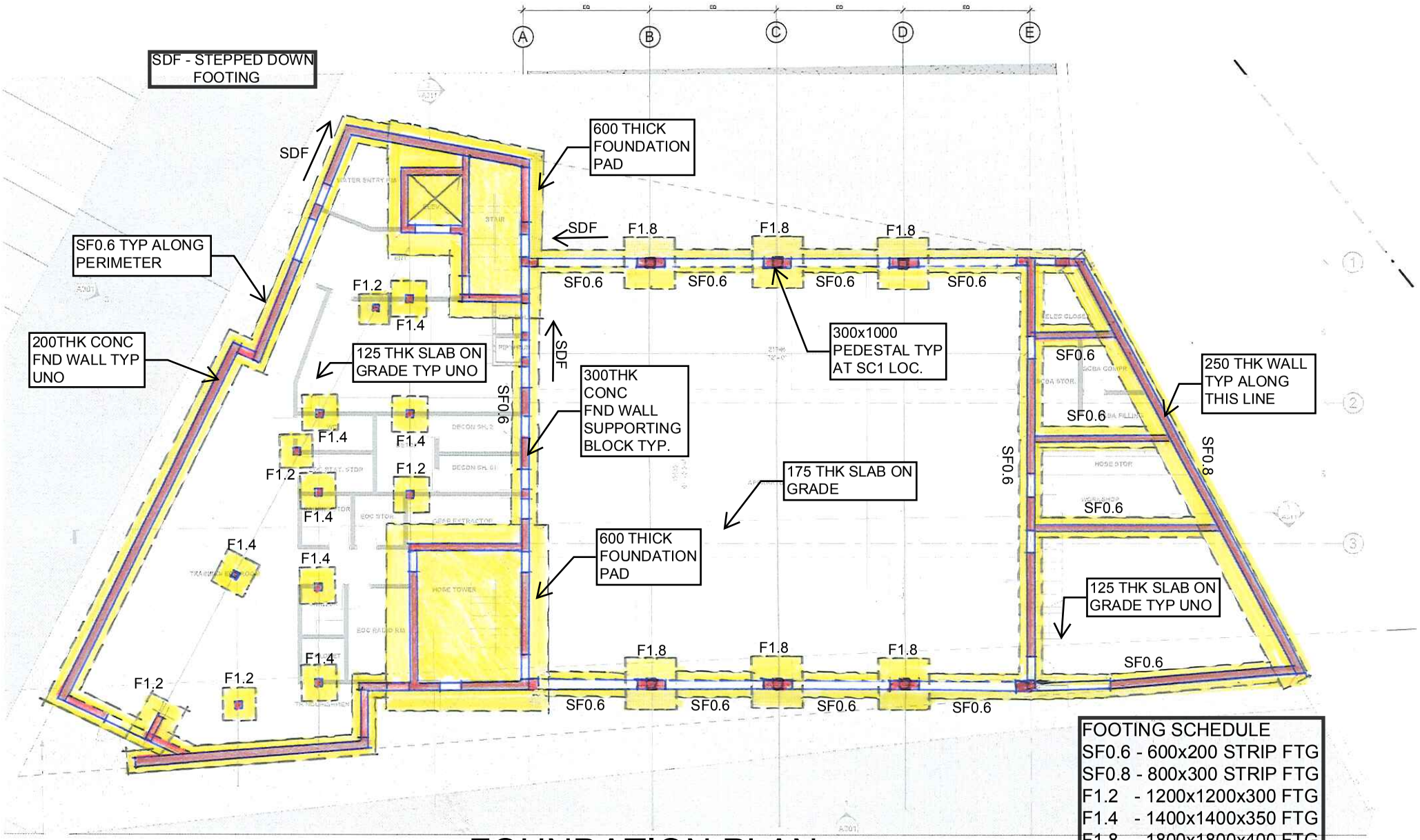
The lateral system will consist of a combination of plywood wood panel shearwalls and reinforced concrete masonry block shearwalls where these are described on these texts. Since the firehalls will be designed as post-disaster structure, the block shearwalls are going to require special detailing for the extra reinforcements for the ductility requirements. The plywood panel shearwalls will also require additional nailing, straps and hold-downs since they will be designed for higher forces as a post-disaster structure.

3.1.6. Hose Tower, Stair/Elevator Cores and Side Walls of the Apparatus Bays

The hose tower, stair and elevator cores and the first lift (main level to level 2) of the side walls of the apparatus bays will be constructed of 300 thick reinforced concrete masonry block walls. The blockwall construction of the hose tower, elevator and stair cores will continue up to the underside of the roof level while the side walls of the apparatus bays will stop at Level 2.

Note: See attached sketches of the schematic framing plans for more information.

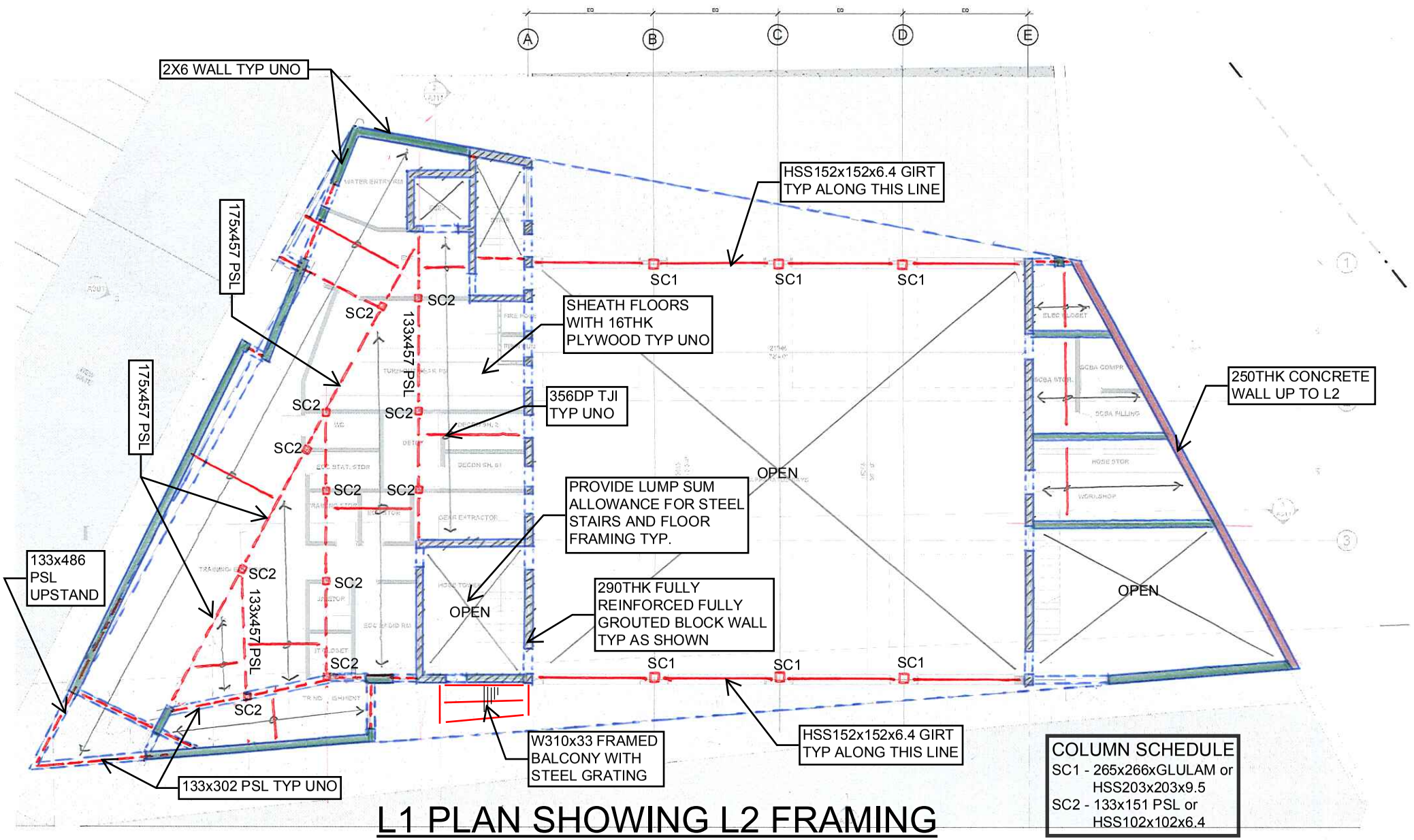
End of Structural Schematic Design Report.



FOUNDATION PLAN

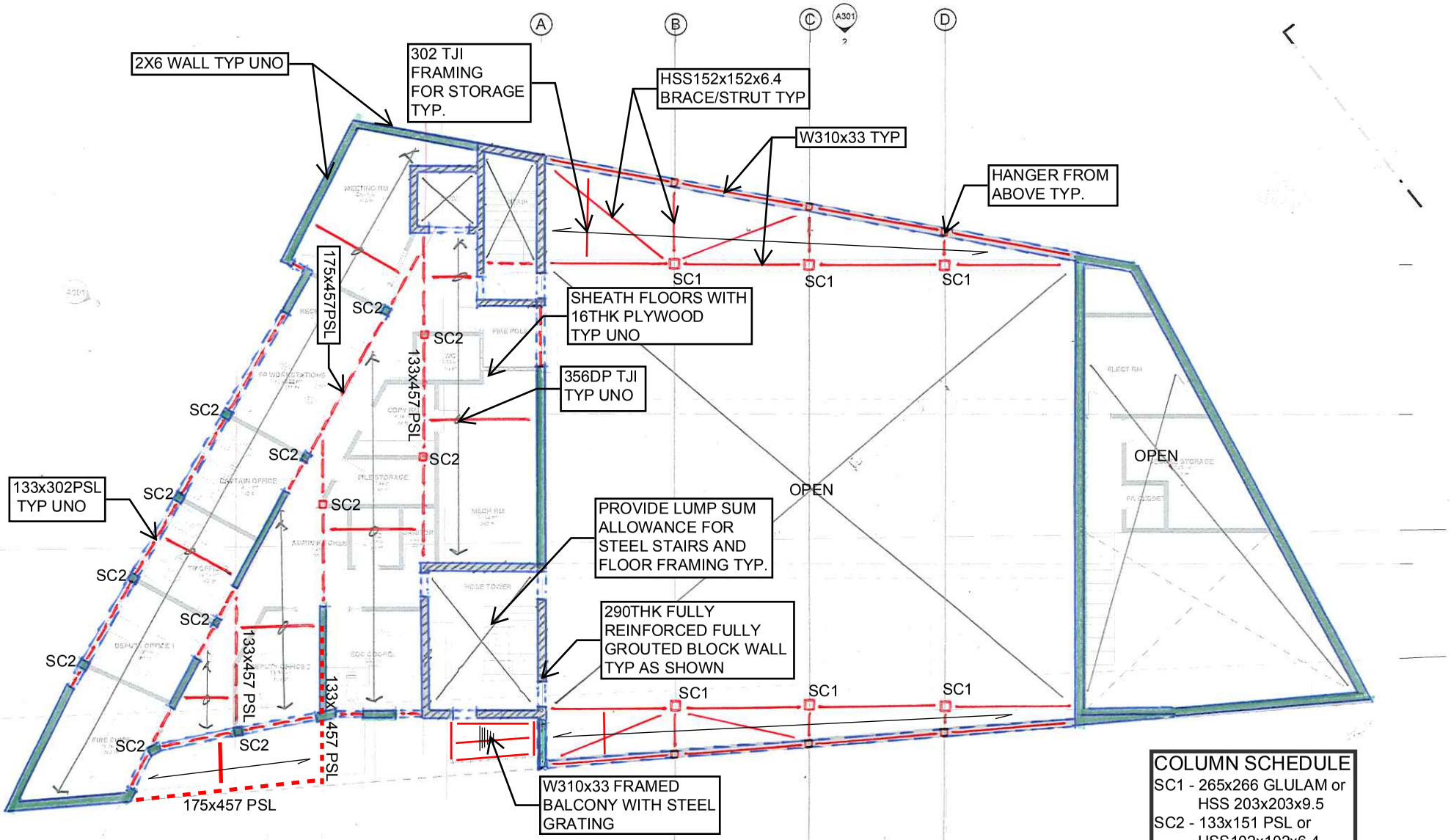
FOOTING SCHEDULE
SF0.6 - 600x200 STRIP FTG
SF0.8 - 800x300 STRIP FTG
F1.2 - 1200x1200x300 FTG
F1.4 - 1400x1400x350 FTG
F1.8 - 1800x1800x400 FTG

SK1



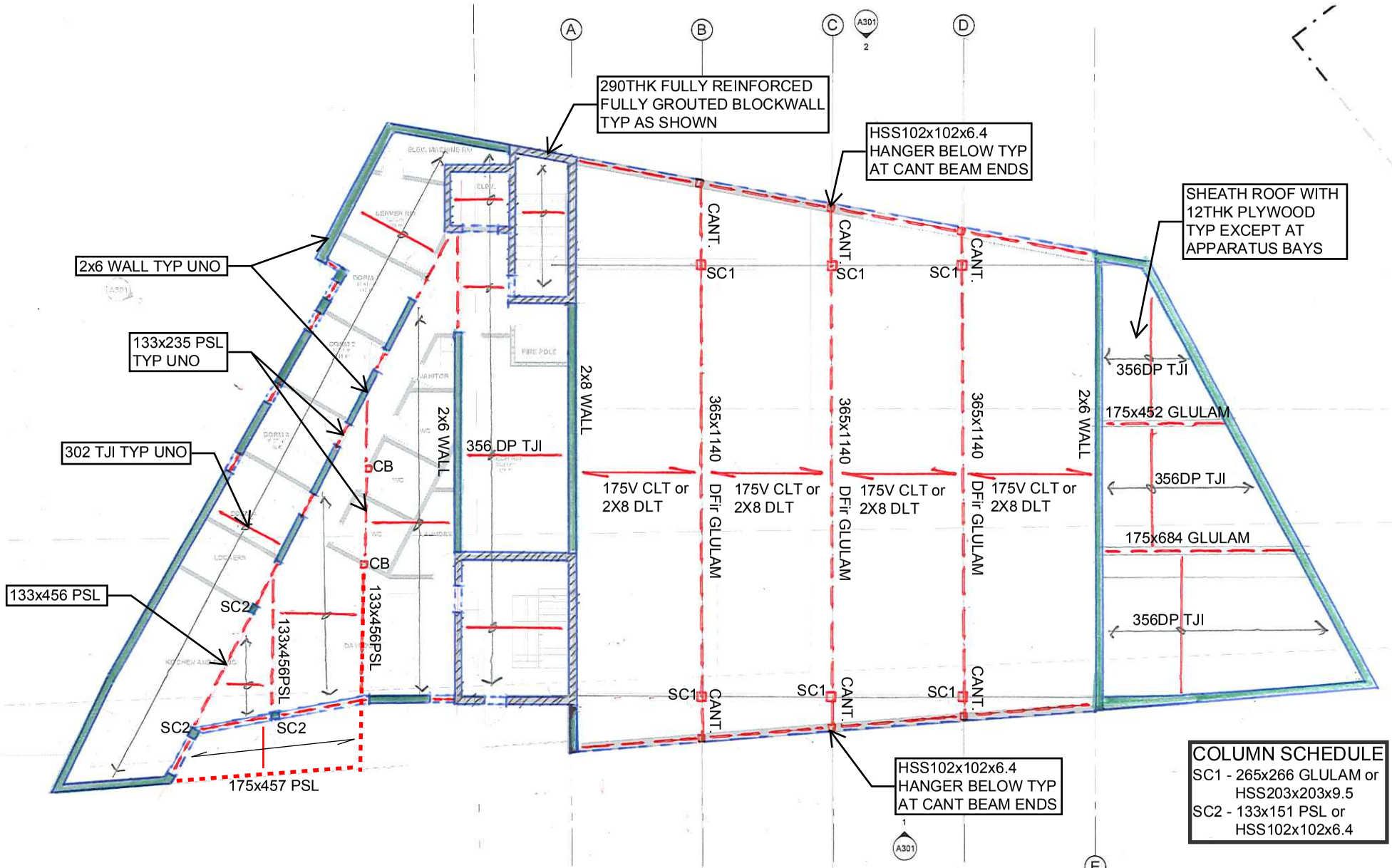
L1 PLAN SHOWING L2 FRAMING

SK2



L2 PLAN SHOWING L3 FRAMING

SK3



LEVEL 3 PLAN SHOWING ROOF FRAMING

SK4

Mechanical + Electrical Schematic Design Report

Squamish Fire Hall No.1 Replacement

Prepared for:

HCMA Architecture + Design
#400 – 675 West Hastings Street
Vancouver, BC V6B 1N2

Developed by:

Integral Group
Suite 180 - 200 Granville Street
Vancouver, BC V6C 1S4

Project No: 151985.000

February 14, 2020

TABLE OF CONTENTS

INTRODUCTION

The intent of this report is to evaluate the mechanical / electrical system design options and recommend concepts that best meets the overall performance and capital cost requirements of the Squamish Fire Hall #1 (Squamish Fire Hall) replacement project. This report describes the methodology used to evaluate the options and outlines system specifications to assist the cost consultant in developing their cost evaluation for the project.

1. PROJECT SUMMARY

The project site is located at 37890 Clark Drive, in the District of Squamish (DoS). The intent behind the new Squamish Fire Hall will be to construct a modern firehall for Squamish Fire Rescue while keeping the existing training facility functioning:

- The District of Squamish's Fire and Rescue Services' headquarters and administration are currently located at the site of the new Squamish Fire Hall. A temporary fire hall will be provided nearby to serve the Squamish Fire department during construction of the new fire hall.
- Also included in the renovation is the relocation of the District Emergency Operations Center (EOC) and main IT system.

The purpose of this report is to summarize the mechanical, plumbing, fire protection and electrical systems that are proposed for the construction of the new Squamish Fire Hall building.

1.1 Project Goals

The District of Squamish has stated that the following project goals are desired for the Squamish Fire Hall:

1. The project is targeting LEED v4 Gold certification, meaning it must achieve a minimum of 60 points.
2. Reduction of greenhouse gas emissions by moving towards a mechanical system that does not consume fossil fuels for heating. This project goal will drive the design to one utilizing electricity as the primary heating and cooling source.
3. Existing training facilities are to remain accessible and functional while the new fire hall is being constructed. A temporary fire hall will be located on a nearby site to house staff and volunteers, but the training facilities must remain in place.

1.2 Codes and Standards

The project will, at a minimum, be designed to meet the following applicable codes and standards:

1. British Columbia Building Code 2018
2. British Columbia Plumbing Code 2018
3. British Columbia Fire Code 2018
4. NFPA 13 – 2013 Standard for Installation of Sprinkler Systems
5. NFPA 10 – 2013 Standard for Portable Fire Extinguishers
6. ASHRAE 55 – 2010 Thermal Environmental Conditions
7. ASHRAE 62 – 2001 Ventilation for Acceptable Indoor Air Quality – Except Addendum N
8. ASHRAE 90.1 – 2016 Energy Standard for Buildings Except Low-Rise Residential Buildings
9. CAN/ULC S-524 Standard for the Installation of Fire Alarm System
10. CSA C22.1 – 18 Canadian Electrical Code
11. IESNA Lighting Handbook (latest edition)

12. TIA/EIA Communication Standards
13. CSA B44-16 Safety Code for Elevators and Escalators
14. CaGBC LEED Green Building Rating System v4

1.3 Mechanical HVAC Design Criteria

1. Design Conditions

Outdoor Design Condition	Recommended Design Conditions
Winter Outdoor Temperature	-11 °C
Summer Outdoor Temperature	29 °C db, 20 °C wb
Winter Indoor Operative Temperature (Office + Dorm Areas)	22 °C db
Winter Indoor Operative Temperature (Apparatus Bays)	10 °C db
Summer Indoor Operative Temperature	24 °C db

2. LEED Gold

The following criteria have been identified as relevant to the mechanical systems in order to meet the LEED Gold v4 requirement:

Table 1: LEED References

Description	Reference
Water efficient plumbing fixtures targeting 40% water use reduction compared to baseline	LEED WE Credit 2
Water metering for domestic hot water, domestic cold water, apparatus bay and irrigation	LEED WE Credit 4
Exceed ASHRAE 90.1-2010 by 5%	LEED EA Prereq 2
Exceed ASHRAE 90.1-2010 by 24%	LEED EA Credit 2
Select equipment with refrigerant types and quantities to minimise ozone depletion and global warming potential	LEED EA Credit 6
Comply with ASHRAE 62.1 – 2010 ventilation rates and provide airflow monitoring	LEED EQ Prereq 1
Design HVAC systems to meet requirements of ASHRAE 55 - 2010	LEED EQ Credit 5
Provide CO2 monitoring throughout the building	LEED EQ Credit 2

3. Internal HVAC Design Criteria

Space	Cooling Design	Heating Design	Ventilation Rate - Person (Rp)	Ventilation Rate - Area (Ra)	Exhaust Rate	Noise Criteria
Apparatus Bays	-	10°C	-	0.12 l/s*m^2	283 l/s per apparatus	-
Hose Tower	-	10°C	-	-	10 l/s*m^2	-

Space	Cooling Design	Heating Design	Ventilation Rate - Person (Rp)	Ventilation Rate - Area (Ra)	Exhaust Rate	Noise Criteria
Office Spaces	24°C	22°C	2.5 l/s*p	0.3 l/s*m^2		35
Meeting Rooms	24°C	22°C	2.5 l/s*p	0.3 l/s*m^2		30
Training / Classrooms	24°C	22°C	3.8 l/s*p	0.3 l/s*m^2		30
Multipurpose / Day Rooms	24°C	22°C	2.5 l/s*p	0.3 l/s*m^2		30
Dorm Rooms	22°C	18°C	2.5 l/s*p	0.3 l/s*m^2		30
Fitness Room	20°C	18°C	10 l/s*p	0.3 l/s*m^2		-
Gear Storage Room	-	22°C		8 ACH	8 ACH	-
Locker Rooms	-	22°C	-	-	2.5 l/s·m^2	-
Storage Rooms	-	22°C	2.5 l/s*p	0.3 l/s*m^2		-
Kitchen	24°C	22°C	-	3.0 l/s*m^2	3.0 l/s·m^2	-
Circulation Spaces	24°C	22°C	-	0.30 l/s·m^2	-	40
Laundry Rooms	-	22°C	-	-	5.0 l/s·m^2	-
Janitor Rooms	-	15°C	-	-	5.0 l/s·m^2	-
Washrooms - Private	-	22°C	-	-	12.5 l/s per fixture	35
Washrooms - Public	-	22°C	-	-	25 l/s per fixture	35
Staircases / Vestibules	-	15°C (min)	-	-	-	-
Communication / IT Rooms	24°C	-	-	0.3 l/s*m^2	-	-
Mechanical / Electrical Room	30°C	15°C (min)	-	0.3 l/s*m^2	-	-

4. Cooling Load Allowance

Space	People	Lighting	Plug Load
Office & Meeting Spaces	72 W sensible / 50 W latent	8.96 W/m^2	15 W/m^2
Apparatus Bays	87 W sensible / 133 W latent	4.8 W/m^2	20 W/m^2
Fitness Rooms	140 W sensible / 125 W latent	6.24 W/m^2	20 W/m^2
Dorm Rooms	68 W sensible / 35 W latent	2.16 W/m^2	15 W/m^2
Storage Spaces	-	5.44 W/m^2	10 W/m^2
Circulation Spaces	87 W sensible / 50 W latent	5.68 W/m^2	10 W/m^2
Washrooms	-	8.4 W/m^2	-
Locker Rooms	-	6.48 W/m^2	-
Mechanical Room	-	8.16 W/m^2	15 W/m^2
Communication/IT Room*	-	8.16 W/m^2	TBD*
Electrical Room*	-	8.16 W/m^2	TBD*

** Cooling load allowances for Electrical and Communication rooms will be dependent on the specific equipment installed within these rooms and their heat dissipation rates.*

1.4 Electrical Design Criteria

1. LEED Gold

The following criteria have been identified as relevant to the Electrical systems in order to meet the LEED Gold v4 requirement:

Table 2: LEED References

Description	Reference
EV Charging for 3 vehicles	LEED LT Credit 8
BUG Ratings for Exterior luminaires including training area*	LEED SS Credit 6
Exceed ASHRAE 90.1-2010 by 5%	LEED EA Prereq 2
Provide building level metering	LEED EA Prereq 3
Establish an energy performance target	LEED EA Credit 2
Provide metering for separate systems which use 10% or more of total annual energy consumption	LEED EA Credit 3
Design building for participation in demand response programs through load shedding/shifting	LEED EA Credit 4
Provide lighting control within each space	LEED EQ Credit 6
Select 4 strategies for lighting quality. Proposed strategies are: A. For all spaces, fixtures shall have <2,500 cd/m2 between 45-90deg from nadir B. Fixtures shall be 80CRI or higher C. L70 > 24,000 hours for 75% of load D. Use direct-only lighting for <25% of connected lighting load	LEED EQ Credit 6

2. Electrical Code Load Summary

Table 3: Preliminary Electrical Load Summary

CODE PRESCRIBED LOADING			
Description	**Watts per Square Meter**	**Service Conductor Demand Factors**	**Feeder Demand Factors**
Office – First 930 m2	50	90%	100%
Office – All in excess of 930 m2	50	70%	90%
Garage	10	100%	100%
Commercial	25	100%	100%
Sleeping quarters (8-208 Hotels, dorms, etc.)	20	80%	100%

* Demand and Code values are based on the C.E.C. 2018 Table 14. Includes basic lighting loads and general loads.

REMAINING LOADS		
Description	**Watts**	**Demand Factors**
Electric Vehicle Chargers	6.7Kw / Station	100%
Mechanical Loads	See SKE E03	80-100% as appropriate
Elevator	20HP*	95%
Equipment Loads	11 W/m^2 *	80%
Future	25% future capacity	100%

* Loads are based on RSMeans/BSRIA Rules of thumb

Based on square footage, preliminary power requirement calcs are per below:

Table 4: Preliminary load calcs

See SKE E03

3. Voltage drop on conductors is required to meet the following:
    1. Feeder connections, maximum 2% voltage drop
    2. Branch circuit conductors, maximum 3% voltage drop
    3. Overall system, maximum 5% voltage drop

1.5 Lighting Design Criteria

1. Lighting energy target: ASHRAE 90. 2016 requirements or better
2. All luminaires shall be high efficacy (lumens/watt)
3. Interior Building Spaces

Space	Illumination Levels (foot candles)	Target Lighting Power Density
Office & Meeting Spaces	40 fc	8.96 W/m^2
Apparatus Bays	50 fc	4.8 W/m^2
Fitness Rooms	35 fc	6.24 W/m^2
Dorm Rooms	25 fc	2.16 W/m^2
Storage Spaces	15 fc	5.44 W/m^2
Circulation Spaces	20 fc	5.68 W/m^2
Washrooms	25 fc	8.4 W/m^2
Locker Rooms	25 fc	6.48 W/m^2
Mechanical Room	40 fc	8.16 W/m^2
Communication/IT Room*	40 fc	8.16 W/m^2
Electrical Room*	40 fc	8.16 W/m^2

** Lighting shall be capable for bi-level lighting to allow for dimming controls and off-peak hour reductions.*

4. Exterior Building Spaces

Space	Illumination Levels (foot candles)	Lighting Power Density
Uncovered Parking *	3 fc	n/a
Egress Doors *	5 fc	n/a
Exterior Pathways *	1 fc	n/a
Training Yard	50 fc, or as required	n/a

** Lighting shall be capable for bi-level lighting to allow for off peak hour reductions and be Dark Sky compliant, with proper BUG ratings to meet the intent of LEED v4 Gold.*

2. HEATING AND COOLING SYSTEMS

Based on the discussions to date, the District of Squamish is looking for mechanicals system which balance the following imperatives for the new Squamish Fire Hall:

- Reduction of greenhouse emissions and use of low carbon solutions for heating systems
- Requirement for resilient systems with the ability to continue operations during post-disaster conditions
- The LEED scorecard is currently targeting 10 points for Energy Optimization (EAc1) which represents a 24% improvement over the baseline scenario.
- Cost effective systems that minimizes system complexity, and allow for ease of use for facilities managers

To achieve this approach, three mechanical plant approaches were initially proposed for DOS's consideration:

1) Air-to-Water Heat Pumps (Air Source Heat Pumps)
2) Ground source heat pumps (water-to-water) for heating and chilled water distribution coupled with closed-loop vertical geoexchange boreholes.
3) Air-to-Refrigerant Heat Pumps via use of Variable Refrigerant Flow (VRF System)

Budgetary constraints removed the ground source heat pump option from consideration. Squamish's relatively mild climate and extended shoulder seasons allow air source heat pump technology to operate at high efficiencies throughout the year. Both options listed above utilize air source heat pumps technology to provide heating and cooling, though each system presents its own separate sets of benefits and challenges.

After considering the three system types, the project team had agreed to moving forward with option 1 which consists of air-to-water heat pumps as the primary mechanical plant for heating and cooling.

2.1 Heating & Cooling Plant: Air-to-Water Heat Pumps (Air Source Heat Pumps)

Air-to-water heat pumps, located on the roof of the building, are capable of supplying both heating and chilled water for distribution to the building's heating and cooling terminal units.

A summary of the benefits and challenges of this option have been summarized in the following table:

System Type	Benefits	Challenges
Air Source Heat Pumps (Air-to-Water)	• Ability to pre-heat domestic hot water • Hydronic system offers ability for more efficient equipment to be retrofitted • Refrigerant gas limited to within roof mounted equipment, and not distributed around the building • Increased flexibility with terminal units compared to VRF system	• Costlier system to implement compared to VRF • Availability of viable/reliable equipment to provide true competitive tendering • Additional space required for mechanical equipment when compared to VRF • Additional back-up heating required during peak heating season; this is a double negative as the systems will normally rely on natural gas for back-up which runs contrary to the GHG reduction policy • Commissioning • Custom DDC controls, which are more complex, when compared to VRF option • Increased system maintenance compared to VRF option • Defrost cycle not included in many manufacturer's performance data or well resolved

Two (2) 20 ton air source heat pumps (ASHPs) will be responsible for producing hydronic heating and chilled water to serve the heating and cooling requirements of the new building. The ASHP will comprise of a 4-pipe configuration allowing for both heating and chilled water to be produced on demand. Due to the limitations of the air-to-water heat pump technology during low ambient air conditions, electric back-up heating boilers are required to supplement heating requirements for the building during the peak heating season. Electric boilers were chosen over gas fired boilers in response to the DOS's request to reduce greenhouse gas emissions for the new facility while avoiding the need to use fossil fuels as a fuel source. One (1) 162 kW electric boiler capable of fulfilling the peak heating load requirements is recommended to provide peak heating capacity and redundancy.

Two primary (2) heating and two (2) chilled water pumps, arranged in duty/standby configuration, will pump chilled and heating water between from the ASHPs to be stored in their respective buffer tanks. Buffer tanks provide several benefits for the operation of the hydronic system; including reduced ASHP compressor run times, increased equipment service life and on-demand heating and chilled water for low-mass terminal units. Two secondary (2) heating and two (2) chilled water pumps, arranged in a duty/standby configuration, will be installed downstream of each buffer tank and controlled via integrated variable frequency drives to provide heating and chilled water to terminal units throughout the building.

The intent is to house the hydronic system components within the level 3 mechanical room, and to run services down through a central mechanical shaft/space from level 3 down to level 1 within the building. Heating and chilled water pipework will distribute from this shaft out to terminal units throughout the floorplates.

Refer to the attached hydronic schematic for further detail on the hydronic system.

2.2 Terminal Units & Space Heating/Cooling Requirements

1. Apparatus Bay Areas

Apparatus bays will be provided with heating only. Heating will be supplied via radiant in-slab pipework throughout the apparatus bays and broken into two thermal zones: West (Apparatus Bays 1 & 2) and East (Apparatus Bays 3 & 4), served by radiant manifolds. The apparatus bays will be supplemented with hydronic air curtains at each bay door, which will be interlocked with the bay doors to provide heat only when doors are closed so that heat loss to the environment is minimized when bay doors are left open during extended periods of time. The Turn-Out Gear Room, Hose Tower, and Decontamination spaces will be heated via radiant in-slab pipework and zoned such that each individual space's temperature control is independent from one another. Radiant in-slab heating offers comfortable and thermal stable heating and offers the benefit of drying slabs to improve slip-free working conditions within the bays and adjacent spaces.

2. Headquarter Offices, Training Areas, Dorm Areas, and Living Areas

The remainder of the spaces within Squamish Fire Hall will be provided with both heating and cooling as per the programming requirements of the fire hall. The proposed terminal units for the above-mentioned spaces will consist of fan coil units utilizing electrically commutated motors (ECM), change-over coils, and a filter section. Utilizing change-over coils allows for air to be heated and cooled using one coil rather than using a separate heating and cooling coil in more traditional fan coil systems. This scheme offers the following benefits to be realized:

- Reduction in fan power due to lower air pressure drop through fan coil unit.
- Reduction in noise due smaller fan motor required.
- Use of multi-row coil for heating allowing reduced water temperatures which in turn improves heat pump efficiency.
- Reduction in number of branch pipework and control valves to terminal units by half the number typically used.
- Avoiding instances of simultaneous heating and cooling within space.
- Faster response time to temperature fluctuations in space.

Each individual dormitory space on Level 3 will be provided with its own fan coil unit to accommodate individual temperature control.

In some spaces, fan coil units will be ducted separately from ventilation air to limit the unit's operation to meeting space temperature setpoints, rather than running the fan purely for ventilation air. This scheme further improves upon the

annual fan energy savings. Supply and return ductwork from the fan coils will be acoustically lined to meet noise criteria requirements.

3. Electrical and Communication Rooms

Communication and IT rooms will be served by cooling-only fan coil units to maintain room temperature setpoints ideal for communication and IT equipment rooms. It is understood that other DoS facilities will be housing their communications equipment at the new Fire Hall, therefore we recommend that split AC units be provided as backup cooling for communication and IT rooms for redundancy in the event that the hydronic plant fails. Electrical rooms will be served by transfer fans to maintain room temperature setpoints; depending on the potential heat dissipation loads within electrical rooms, cooling-only fan coil units may be required to provide supplemental cooling.

4. Out-Buildings

The site for the new fire hall will include out-buildings for vehicle and equipment storage. Part of the building will be a simple covered parking structure, and part of the building will be insulated and will require heating for freeze protection. Heating for the insulated portion of the outbuilding will be provided by electric resistance heat, sized to maintain temperatures above freezing based on the layout and construction of the insulated portion.

3. VENTILATION SYSTEMS

3.1 Apparatus Bays

General background ventilation will be provided to the apparatus bays via high efficiency energy recovery ventilators which will actively supply fresh outdoor air while exhausting stale indoor air. The type of energy recovery proposed is an air-to-air energy recovery system via a rotary heat wheel that will remove heat from the stale exhaust air and transfer it to incoming outdoor air with higher heat recovery efficiencies (80%+ efficiency rating) than standard ERVs available in the marketplace. The rotary heat wheel motor will have the ability to slowdown or shut off the wheel's rotation to allow for free-cooling opportunities during shoulder seasons. The units will also include high effectiveness supply and exhaust filter sections, and fan sections utilizing high efficiency EC motors. The units will be located within the Level 3 Mechanical Room or in a partial mezzanine located in the Apparatus Bay. The ERV will ducted such that supply and exhaust air promote cross ventilation across all four Apparatus Bays. These units will also be responsible for providing the general ventilation requirements for adjacent spaces including the workshop and SCBA storage. Careful consideration of the air balances between the Apparatus Bays spaces will be paramount in avoiding the risk of transferring potentially noxious gases between the Apparatus Bays and the adjacent occupancies.

A high efficiency heat recovery ventilator will be provided to solely serve the Turn-Out Gear Room, Detox Room, Hose Storage and Gear Extractor areas primarily due to the nature of the toxic contaminants that are embedded within firefighter's personal protective equipment. The high air change rate (6 ACH) typically required within gear turnout rooms make the use of HRVs ideal to provide ventilation and exhaust to the space, while reducing heating energy consumption. Supply is routed to low level ductwork strategically located below gear lockers to blow air onto gear with high level exhaust to extract stratified stale air. This proposed scheme will reduce gear drying times, whist ensuring the room contaminants are not transferred to adjacent occupancies. Due to the similar nature of the adjacent spaces, the Detox and Gear Extractor spaces will also be served by the same HRV. See below for a preliminary HRV list:

HRU-1 (Apparatus Bay)	350 L/s
HRU-2 (Main Building/General Exhaust)	1180 L/s
HRU-3 (Decon/Detox)	610 L/s
HRU-4 (Fitness)	250 L/s

A Nederman vehicle exhaust extraction system will be utilized to serve the vehicles stored at Squamish Fire Hall. The system will comprise of an exhaust fan complete with a variable frequency drive and silencers the outlet of the fan to minimize noise concerns. The exhaust fan will be located within the Level 3 Mechanical room and ducted to serve the individual bays. The proposed back-in configuration of the apparatus bays will allow for a total of four (4) Nederman

Magnarail systems, extending the length of the bays. Three of the Magnarail systems will utilize one (1) extraction nozzle per rail system and one will utilize two (2) nozzles for a total of five (5) extraction nozzles. The vehicle exhaust extraction will be controlled through a vehicle ignition interlock, in addition to manual push button switches located within each apparatus bay coupled with motion/photo sensors at apparatus bay entrances. A noxious gas monitoring system with sensors throughout the apparatus bays will actively monitor CO/NO_2 levels and will manually override the vehicle exhaust extraction fan to operate and purge the space should the system reach alarm setpoints. Outside air louvers complete with ultra-low leakage motorized dampers will be interlocked with the noxious gas monitoring system to provide fresh air and avoid excessive negative pressurization of the Apparatus Bays compared to adjacent occupancies, if the bay doors are not open when the fan is operational.

The SCBA compressor room will be provided with a dedicated exhaust fan to ensure safe operation of the owner supplied compressor during peak bottle filing operations and to prevent the compressor from overheating.

3.2 Headquarter Offices, Training Areas, Dorm Areas, and Living Areas

Ventilation requirements for the above-mentioned areas will be provided via high efficiency energy recovery ventilators. Supply air will be ducted directly to the occupiable spaces, independent of the fan coil units, to ensure adequate ventilation is supplied to each space and prevent the operation of the fan coils units when not required. Exhaust air will be ducted directly from washrooms, janitor rooms, storage rooms, and other areas where odors or stale air will be of concern, back to the ERVs as per ASHRAE 62.1 requirements. Careful consideration will be placed in the air balance within these spaces to ensure supply and exhaust volumes remain equal to avoid infiltration from the adjacent apparatus bays and the exterior. The ERVs will be located within the Level 3 Mechanical room. The units will also be fitted with a heating/cooling change-over coils to temper supply air temperature to the spaces to maintain a comfortable equilibrium temperature state and avoid the need to run fan coil units outside of peak load scenarios.

A high-end range hood is recommended to serve the electric range in the Level 2 Kitchen. An ultra-low leakage motorized damper will be installed on the exhaust air duct to ensure infiltration is minimized.

3.3 Fitness Area

Due to the relatively remote location, lower cooling setpoint, higher outdoor air requirements and higher latent loads typically associated with the fitness studios, it is recommended to provide a dedicated energy recovery ventilation unit to serve the fitness area. The unit can be located on a mezzanine above the fitness area, adjacent to the secure storage. Providing a dedicated ventilation unit for the fitness area will reduce ductwork runs through the apparatus bay, increase free cooling usage and ensure sufficient fresh air is provided to occupants using the fitness area.

3.4 Out-Buildings

The insulated portion of the out-building as described in section 3.2.4 will be provided with an exhaust fan to prevent overheating and to extract stale air via reverse-acting thermostat.

4. PLUMBING SYSTEMS

4.1 Domestic Cold Water Systems

Based on the current program requirements, a 150mm combined water service will be required to serve both the domestic cold water and fire protection requirements for the building. The combined water main will enter the Water Entry room located in the south west corner of the Apparatus Bays and branch off to a 100mm domestic cold water service to serve the potable and non-potable water requirements of the building. The 100mm domestic cold water service complete with water meter will be branch off to serve the following loads:

- Non-potable cold water service will serve a series of four (4) 65mm hose bibb connections for truck filling, and four (4) 20mm hose bibb connections for truck washing. These hose bibbs will be located in tandem between the overhead bay doors been Apparatus Bays 1 & 2 as well as Apparatus Bays 3 &4, on both east and west walls to offer flexibility and avoid tripping hazards. Premise isolation will be provided via the use of a reduced pressure backflow assembly. A water meter will be installed on this branch and connected to the building automation system to track water usage specific to these end uses.

- Potable cold water service will serve the remainder of the building's cold water requirements as indicated within the functional program. These spaces will include washrooms, kitchens, bar sinks, janitor rooms, and laundry rooms. Premise isolation will be provided as required for the various end uses such as janitor chemical injection systems, coffee brewers, and other systems required direct connection into the potable water system. A water meter connected to the building automation system will be provided on this branch to track water usage.

- Irrigation connection for landscaping. Premise isolation will be provided via the use of a reduced pressure backflow assembly.

The building will utilize the following flow and flush fixtures:

- Dual-flush flush valve water closets: 3 LPF / 4.8LPF
- Manually-operated lavatories (Level 1& 2 WC / Shower rooms only): 1.9 LPM
- Sensor-operated lavatories (Level 1 & 3 WC rooms): 1.9 LPM
- Manually-operated kitchen sinks: 1.9 LPM
- Showers: 5.7 LPM
- Janitor Mop Sink: 8.4 LPM

The following fixture types are recommended for the mix of public and private spaces seen in this facility and will be reviewed with the architect and client prior to working drawings:

- Water Closets:
    - All toilets to be wall-mounted flush valve type water closets.
    - Manual dual flush valve to be used in the L3 dorm washrooms.
    - Automatic flush valves to be used for all public washrooms (i.e. L1, L2 office area)
- Lavatories
    - Manual type lavatories to be utilized in the L3 dorm washrooms.
    - Automatic lavatories utilizing self-generating turbine technology to be utilized for all public washrooms (i.e. L1, L2 office area)

4.2 Domestic Hot Water Systems

The proposed strategy to meet the domestic hot water load requirements for the firehall will consist of a two-stage approach whereby domestic hot water tanks utilizing tank-mounted air source heat pump technology will provide the first stage of heating and a supplementary electric hot water tank will provide the second stage of heating during periods of peak domestic hot water usage often associated with fire halls. The tank mounted air source heat pump provides the additional storage and capacity required to meet the higher than average domestic hot water requirements associated with fire halls, while providing higher efficiency when compared to a standard electric tank during periods of average usage. Two (2) 80-gallon, 3 kW hybrid hot water tanks and one (1) 85 gallon, 18 kW electric hot water tank will be located within the L2 Mechanical room.

Potable domestic hot water will be piped throughout the building to serve the programming requirements for the fire hall. A Grundfos Alpha domestic hot water recirculation pump will be utilized to recirculate domestic hot water back to the domestic hot water tanks to ensure hot water is available on demand, and to mitigate cycling the domestic hot water tanks.

Eye wash stations will be provided in the Apparatus Bays and adjacent spaces as required and will include tempered mixing valves to deliver tepid water at the fixture.

4.3 Sanitary Systems

Based on the programming requirements, a 150mm sanitary main will be required to serve this various plumbing building. Cast iron piping will be used for above grade drainage and ABS piping will be used for below grade drainage. The apparatus bays will utilize linear trench drains running the length of the bays and positioned below the vehicles. Catch basins will utilized to allow for dirt and other debris to be captured before draining to sanitary. The sanitary lines serving the trench drains in the apparatus

bays will be connected to an oil interceptor with complete with an internal storage tank to intercept any hydrocarbons prior to discharging into the building's sanitary systems.

A sump pit complete with backwater valve will be required to serve the elevator shaft. At this time, it is unclear if a hydraulic elevator is being proposed. Should a hydraulic elevator be proposed, an oil interceptor will be required to intercept any potential hydraulic fluids prior to discharging into the building's sanitary systems. Gravity drainage is proposed for the elevator drainage, and it will be confirmed with the Civil consultant that the elevator pit depths will allow for gravity drainage to be fulfilled.

4.4 Stormwater Systems

Based on the current architectural layout, the expected new building roof area will be approximately 1,055 m^2. This will have a peak stormwater drainage requirement of 10,550 L. The building's storm water load will be served by a 150mm stormwater main at the west end of the building.

Perimeter drain tile piping will be installed to protect the building's foundations from groundwater fluctuations and will comprise of 150mm perforated PVC pipe encircling the building's footprint. The drain tile piping will drain into a sediment sump pit in order to separate sediment prior to the stormwater effluent entering the District's stormwater systems.

4.5 Compressed Air Systems

A compressed air system will be utilized within the apparatus bays to serve air brakes and for typically shop use within the workshop area. The proposed compressed air system will include a two-stage compressor mounted onto a vertical storage tank. The air compressor will be located within the above the workshop area, and distribution main will be looped around the apparatus bays to equalize pressure throughout the system. A total of four (4) compressed air drops will be provided within the apparatus bays between bays to serve for tire filling. One (1) compressed air outlet complete with a combination filter and regulator will be provided within the Workshop room for typical shop use.

An SCBA compressor will be required for breathing apparatus bottle refilling operations. The SCBA compressed air system will consist of a compressor, filling station, and storage rack system. It is our understanding that these components will be provided by the owner. Compressed air pipework and fittings between the SCBA fill station and compressor will utilize 316 stainless steel. Special attention will be paid to the location of the air intake location for the SCBA compressor to reduce the risk of contaminants from entering the system. Refer to ventilation section for further ventilation provisions.

5. FIRE PROTECTION SYSTEM

Based on the current program requirements, a 150mm combined water service will be required to serve both the domestic cold water and fire protection requirements for the building. The combined water main will enter the Water Entry room and branch off to a 150mm fire main to serve the building's fire protection requirements. The new automatic sprinkler fire protection systems will be designed, installed and tested in accordance with the requirements set out by the British Columbia Fire Code 2018, and NFPA 13-2013.

Hydrant flow testing information was forwarded from the Civil consultant for review and consideration to determine whether adequate pressure will be available for fire flows. Based on the site location and building layout, it is assumed that adequate pressure will be available to meet the fire flows for the proposed facility and will not require provisions for a fire pump. Integral will coordinate with the civil consultant to confirm that a fire pump is not required.

The building will be split into separate fire zones to meet the different requirements of the building and space classifications. The proposed fire zones and their respective space classification and system types have been listed below as defined under NFPA 13-2013:

- Wet Sprinkler System Zone #1: Level 1 Areas
    - Training, Fitness, and Operational Areas - Light Hazard
    - Apparatus Bays - Ordinary Hazard Group 2
    - SCBA and workshop areas: Ordinary Hazard Group 1
- Wet Sprinkler System Zone #2: Level 2 areas
    - Administration, Offices, and Operational areas: Light Hazard
    - Mechanical Room: Ordinary Hazard Group 1

- Wet Sprinkler System Zone #3: Level 3 areas
    - Living and Dormitory areas: Light Hazard
    - Mechanical Room: Ordinary Hazard Group 1
- Dry Sprinkler System Zone #1: Various Areas
    - Area below soffit/canopy spaces located above Apparatus Bay overhead doors – Ordinary Hazard Group 1
- Pre-Action Sprinkler System Zone #1: Comms Rooms
    - Communications Room: Light Hazard

The sprinkler zone control valves will be located centrally within the Water Entry room and arranged in a manner such that it facilitates personnel training of the systems. The pre-action system for the communications room shall be located in the level 2 mechanical room adjacent to the proposed server room location.

A fire department connection will be provided on the nearby the face of the building at the north entrance. This new proposed location for the fire department connection will be located in such a manner that it is within 45 m of the nearest fire hydrant.

Fire extinguishers will be provided throughout the building as per the requirements of NFPA 10 – 2010.

6. BUILDING AUTOMATION AND CONTROLS

The building will be provided with a complete direct digital controls (DDC) system that will fully integrate mechanical controls. The controls systems will consist of BACnet compatible, open protocol platform with a preference for Reliable or Delta Controls systems and connected to DOS's main network for DOS Operations and Facilities Management to monitor the building's automation systems. The use of third-party and/or proprietary control systems will be minimized.

7. ELECTRICAL DISTRIBUTION SYSTEMS

7.1 Site Services

1. The complex will be serviced via a new BC Hydro owned exterior unit PMT (Assuming 500KVA), which will provide secondary service at 120/208V Volt 3-phase 4-wire. Coordination with the utility company will be undertaken to ensure the most efficient and economic method of power provision is secured.
2. Telecommunication and television services will be coordinated with the local utilities and two (2) 4" ducts will be provided from the edge of the property to the Main Telecommunication Room. An additional three (3) 4" ducts will be run to the site property line and interconnect to DOS fibre system.

7.2 Power Distribution System

1. From the new exterior pad mounted transformer, a new 120/208V service will be brought in underground to the Main Electrical Room on the first floor. The room will be required to have exterior door access as this is a requirement for Hydro, as well the entry to the room shall have no steps leading into the room.
2. From the main floor electrical room, it would be recommended to have electrical panels located in central locations) to serve the space loads. The power distribution will be organized to facilitate metering and monitoring of different load types, i.e. life safety, lighting, mechanical, and general-purpose loads.
3. Surge protection will be provided at Main Distribution Board to protect the building's critical equipment.
4. General Distribution
    1. Distribution for lighting and convenience power circuits will be provided utilizing bolt on circuit breaker panel boards and will be located to suit the architectural arrangement and equipment loads of the project. The power distribution will be organized to facilitate metering and monitoring of different load types, i.e. lighting, mechanical, and general purpose loads.
    2. Power for mechanical and Owner's equipment will be provided at 208 volt, 3 phase
    3. Conductors:
        1. Copper RW90 with 600V insulation, aluminum will be considered for distribution panel main feeders larger than #1/0, provided that feeds are not run in wet locations.

2. Minimum wire size shall be #12
3. Wire size #10 or larger shall be stranded

4. In order to suit potential VFD equipment, a dedicated Mechanical distribution panel and starter backboard shall be provided in lieu of a motor control centre for the Mechanical Equipment Room to provide starters, overload and over current protection, and interlocks to suit the designated equipment.
5. The distribution throughout the project will be sized to ensure twenty-five percent (25%) future capacity.
6. Harmonic treatment transformers or power conditioners will be installed where there is a high concentration of VFD and filters are not installed on VFDs.
7. As the building will be have designated areas as Post Disaster, any electrical connections or services in the designated shall complete with adequate supports, flexible loops.
8. Where expansion joints are present, and electrical raceways cross, flexible raceways are to be installed to address the building's expansion and contraction.
9. DoS has expressed a preference for Eaton or Schneider equipment.

5. Grounding System
    1. Grounding / bonding system shall be provided to meet code standards. All grounding / bonding conductors shall be copper.
    2. Specific specialty systems that will require grounding is the Owners antenna system (location to be determined)
    3. Separate ground/bonding cabling to run in all raceways forming part of emergency/standby power system.
    4. Separate ground wire shall be installed in each conduit for bonding, i.e. conduit shall not be used as bonding.
6. Wiring Methods
    1. Feeders to sub-distribution panel boards, motor control centres as well as all branch circuit conductors to be R90 copper. Aluminum feeders could be used for panel feeders only.
    2. Main panel feeders and branch circuit home-runs shall be in EMT conduit or TECK cabling. No coreline shall be used unless approved by the engineer. No NMD wiring will be permitted.
7. Receptacles, Mechanical and Equipment
    1. All receptacles shall be specification grade c/w stainless steel cover plates and weatherproof in use covers to be used in all exterior building and in the Apparatus Bays.
        1. Convenience receptacles will be provided throughout to suit the equipment to be provided.
        2. Cleaning outlets will consist of 15 amp and 20 amp receptacles installed approximately 9-meter (30 ft) on center.
        3. GFCI outlets will be installed in all exterior locations and in location within 1.5 meter (5 ft) from plumbing fixtures.
        4. 20A service receptacles will be installed by exterior mechanical units at +750mm.
        5. One dedicated circuit 15A, 120V to be installed at Locution location
        6. General receptacles will be located by each bed in the Sleeping quarters.
    2. Drop cord reels (5-20R) will be installed in the Apparatus Bays to allow for the truck charging system. Drop cord system will be designed to allow for future connection flexibility.
    3. Power connections will be provided to suit the Owners' equipment and building mechanical system equipment.
8. Digital Information Metering
    1. Digital information meters will be installed to monitor the building's energy consumption. Distribution panels will try to be organized to isolate and consolidate basic lighting, power and mechanical loads where possible. The grouping of similar loads to the same panel will facilitate measurement and verification of the Building Performance.
    2. The digital meters shall be capable to connect mechanical metering loads (gas, water, etc.) and be able to tie into the central building integration control panel to allow the data to be shared, monitored and analyzed via BACnet
9. Mechanical System

1. All required power provisions, associated controls and interfacing with the fire alarm system will be coordinated with the mechanical design.

10. Electric Vehicle Charging Station
    1. The intent has expressed interest to install three (3) level 2 charging stations on the site.
11. Photovoltaic System
    1. Solar photovoltaic arrays are not currently in the programming / scope / budget. A capped off empty conduit will be provided to the roof for future installations.
12. Uninterruptible Power Supply (UPS)
    1. A UPS system will be required for the building IT rooms and workstations supplies and installed by the DoS. There will be a minimum of 3x 3kVA 208V 1Ph rack mounted UPS systems within the room.

8. GENERATOR SYSTEM DISTRIBUTION

1. An exterior diesel generator mounted in a weatherproof critical grade sound proof enclosure will be installed on the exterior of the site to supply the site with standby power to specific building systems. The building generator is intended to serve the majority of the building loads, but the final scope is being confirmed with the District which will affect the final size and downstream distribution. The generator shall have the following characteristics:
    1. 347/600 V.
    2. Rated/certified for emergency power supply according to CSA 282.
    3. Enclosure to be weatherproof and sound proof enclosure (Level II) complete with critical grade muffler.
    4. Fuel belly tank to be provided with capabilities to maintain a 72-hr runtime at 100% load. An expansion tank shall be provided to provide enough supply for, at minimum, 1 week at full load.
    5. Installation of the generator and the associated equipment to be rated for Post Disaster.
    6. Have an integral electrical panel to supply power to the enclosure lighting, heating and other required generator loads.
    7. Control panel capable to connect to building management system (BACnet) and the building fire alarm system.
    8. Remote annunciator panel to be installed in the building in the main command centre office.
2. The generator power distribution will provide standby power to the site systems as noted below. Load shedding of equipment that are not required to be running during power failure will be reviewed to help minimize the final size of the generator.
    1. Any additional loads as required by client: heating systems, cooling plant equipment, ventilation equipment, etc.
    2. Plug loads
    3. Lighting
    4. Security Systems
    5. Data/Communication Systems
    6. Locution System (if required)
    7. Sump Pump (if required)
3. Generac/Kohler gensets shall not be specified due to past issues. MTU or gensets utilizing John Deere parts are to be specified
4. Separate battery packs will be provided as the life safety system for remote lighting heads and exit signs.

9. LIFE SAFETY SYSTEMS

9.1 Fire Alarm System

1. Fire alarm system will be designed based on low rise requirement. The system will be addressable single stage type system with required pull stations, smoke detectors, heat detector and signals devices strategically located to code complying locations will be used. Fire alarm zoning will follow the sprinkler system zoning.

2. Fire alarm control panel will be located in the main Electrical room with fire alarm annunciator located in the main entrance lobby. The fire alarm annunciator will consist of active graphic panel and an LCD display/control panel. Panel will have 24-hr battery backup.
3. Fire Alarm horn/strobes will be located throughout to provide 65 dB of audible signal. Additional strobe will be provided in mechanical rooms or machine rooms with high ambient noise level.
4. Smoke detectors will be located at the top of stairs shaft, in service rooms and in the IT Room. The it room smoke detectors will be tied into the pre-action system
5. Smoke alarms c/w CO sensing capabilities and strobe signal units will be located in all dorm / sleeping quarters. Smoke alarms shall be interlocked together and come complete with battery backup.
6. Egress control release shall be as per governing building code or equivalency standards.
7. Graphic annunciator panel will be provided at the designated building main entrance area.

9.2 Exit Signs

1. Pictogram LED type exit lights with self contained batteries will be used and connected to AC power source (120V). LED light source not more than 2.5W power consumption. Exit lights will be strategically located to clearly identify all exit doors and exit routes.
2. Exit signs shall be:
    1. Edge lit exit sign will be installed in public area.
    2. Weatherproof rated, NEMA 3R exit signs in the apparatus bays and any required exterior areas.
    3. Metal housing exit signs will be installed in service area and all other areas.

9.3 Emergency Lights

1. Emergency lighting will be provided by lighting connected to centralized battery packs to provide minimum of 30-minute emergency lighting run time.
2. Additional self-testing 24 volt battery power supplies and remote 5 watt LED dual heads in selected area for supplementary backup. Where remote heads are used, they will be provided with overall Lexan covers or wire guards where necessary for protection and security. Interlocks will be provided between each power supply and appropriate lighting circuits to ensure operation maintained per code requirements.

10. LIGHTING AND CONTROL SYSTEMS

10.1 Lighting System

1. The lighting designs throughout the project will follow the recommendations of the Illuminating Engineering Society of North America, ASHRAE 90.1 2016, the rules and regulations of the Work Safe BC, and BC Building Code Energy Management/use recommendations.
2. Day lighting will be used to supplement the lighting in the building to maximize energy savings. Glare control and day light distribution device will be installed improve penetration into building and minimize glare from direct day light. Glazing will be selected to provide a balance of day light transmission and R value.
3. The general lighting will be provided by using LED lighting sources. All lighting products will be commercial grade or better. LED luminaires will have:
    1. Full spectrum 2700K color temperature, CRI 90+ and rated for min 50,000+ hours in Dorms.
    2. All other areas will have 3500 K color temperature, CRI 80+ and rated for min 50,000+ hours.
4. Office areas will be equipped with high performance, volumetric, low glare recessed and/or direct/indirect LED linear luminaires with some select down/spot lights for displays. Lighting layout will be based on open office area. LED task lighting will be suggested to be used to provide additional illumination to the workplace surfaces for staff that desire higher lighting levels.
5. The Service and Apparatus Bays will utilize industrial style LED fixtures, with protective lenses and high reflective louvers, low glare fixtures. In designated areas, hazardous grade fixtures will be required to be used.

6. In the Sleeping quarters, bed lights will be required to be installed to provide localized control.
7. Specialty/feature lighting will be provided in the main entry lobbies, meeting rooms and exterior art work/signage.
8. All exterior luminaires will be “Dark Sky” compliant and will be vandal resistant and positioned to illuminate dark recesses for security protection purposes. Note: The use of “Dark Sky Compliant” site luminaries will necessitate a greater quantity of products when compared to standard products on the higher poles.
9. Exterior site lighting will be mounted away from the building, as practical, with LED type, sharp cut-off luminaires located throughout the project site. The “area” lighting source will be pole-mounted LED lamps.
    1. Pole height for the parking area at 5 meters (16 feet).
    2. The sharp cut-off post top luminaires will ensure light trespass onto neighboring properties is minimal.
10. Exterior lighting shall be provided for the training area. Coordination is required to determine lighting level requirements for the training.
11. Perimeter building lighting at outside exits will be provided utilizing wall mounted LED dark sky compliant fixtures as applicable. Soffit style fixtures will only be used in those areas where an adequate mounting height is not available at the exit locations.

10.2 Lighting Controls

1. An advanced lighting control system will be installed in the building to control the facility lighting and will have the following characteristics:
    1. The main control panel will be installed in the Main Electrical Room, to facilitate the control for the total building lighting system.
    2. Lighting control devices (sensors, exterior photocells, time clocks, switches) will be tied and/or integrated to the lighting control / relay panels.
    3. All areas will come equipped with intelligent modules tied back to the building lighting control system to provide addressable devices that can be programmed to any device and/or setting.
    4. Allow for monitoring of the building luminaires ballasts and lamps for facilities management.
    5. System to have battery backup capabilities and/or connect to building standby power
    6. All lighting shall meet ASHRAE 90.1-2016 requirements
2. All interior perimeter spaces with window/glazing shall be have daylight sensors installed, approximately every 225 ft2, which will control the lighting in the area. Daylight sensor to be tied to the lighting fixture to provide dimming control.
3. All open office areas will have combination daylight/occupancy sensors installed. Occupancy sensors in open areas to be grouped together (i.e. lighting zones to be created, to help avoid on/off switching).
4. All enclosed building spaces will have occupancy sensors installed. With exception to the ceiling mounted sensors, all sensors to be programmed to be manual on, automatic off and be self-learning. Manual override wall stations will be provided in spaces as identified by the DOS for required operations (i.e. Meeting Rooms, Offices, etc..) and where required by Code.
    1. Washrooms and Locker Rooms will have ultrasonic style occupancy sensors installed.
    2. Dual technology type sensors will be installed in larger enclosed spaces.
    3. All other areas will use passive infrared technology sensors.
5. Corridor lights (excluding fire fighter response routes) will be configured that 1/2 of the lights will be de-energized when there is no occupant. Luminaires in these areas will have either built in or standalone occupancy sensors installed. Areas where natural day lighting will be present will have a daylight/occupancy combination sensor installed, in which it will shut off the lights if enough lighting is present.
6. In the dorm / sleep quarters localized control will be provided at the head of the bed. In the event of an alarm, dorm area lighting shall transition to full on.
7. Individual local dimming control system, similar to Lutron Grafik Eye system will be installed in the lounge, meeting and training rooms. The systems will be capable to integrate with the AV control system.

8. Exterior lighting will be capable to provide either step-level dimming control to provide two lighting levels (50/100) for different periods of the night. This will provide additional energy reductions to the site and will reduce site illumination at later periods of the night which may be more accommodating to the neighboring houses. Site lighting standards equipped with occupancy sensors to control area lighting feasibility to be reviewed.
9. The occupancy sensors of the lighting systems will be used to de-energize the lighting circuits when the rooms/areas are unoccupied and will be interfaced with building management system to deactivate the mechanical system in the area.
10. Emergency lighting will be controlled to avoid having unnecessary lighting on, and in these location emergency shunt relays shall be installed.

11. TECHNOLOGY

11.1 Telecommunication System

1. Telecommunication system will be designed and installed in accordance with a questionnaire in lieu of DoS standards (still under development) along with site specific requirements from the users.
2. The building being a multi storey building will require multiple areas located through out the building. In general terms horizontal cabling running from the telecom rooms to the work area outlets need to be within 90m. This being the case it is recommended to have the Main Telecom Room located in a more central location on the floor plate with additional Telecom Rooms located on the floors above, ideally all the rooms shall be stacked above each other.
3. Structured cabling system shall be a certified system c/w warranty and all horizontal cabling will be Category 6. All cabling will be plenum rated and each outlet to receive 2 data drops unless otherwise noted. Building systems that will require cabling drops to include:
    1. Any location requiring Phone and/or PC
    2. Location locations, Smart sign locations (inside and outside as required)
    3. Future Wi-Fi Access Points located in apparatus bays and staff area
    4. Any DDC or energy monitoring equipment location
    5. Any network cameras locations
    6. Fuel pump location
    7. Fire alarm control panels
    8. Security control panels
    9. Generator control panel
    10. Lighting control panel
4. All communication cabling will run within complete system raceways, where in the office areas would utilize cable tray and in all other areas would utilize conduit home runs. In additional to this pathways will need to be provide for the antennas which will be mounted on the building.

11.2 Security System

1. No intrusion alarm or camera provisions are required for this building
2. Door access control shall be provided. Keyscan system shall be the preferred system.

11.3 Speciality Systems

1. Additional speciality system requirements that will be required to be developed further on with assistance from the project team are as follows:
    1. E-Comm / Locution (if required)
    2. Readers Boards (if required)
    3. Counter Clocks (if required)
    4. Seismic Control for Overhead Door (if required)

12. CLOSURE

We trust that the foregoing provides the information required at this time to provide an understanding of the proposed mechanical / electrical systems for the Squamish Fire Hall Replacement.

Should you have any questions or require additional information, please do not hesitate to contact the undersigned.

LIMITING CONDITIONS

The recommendations presented in this report represent professional opinions of Integral Group in light of the terms of reference, scope of work, and any limiting conditions noted herein. Any use of the report, reliance on the report, or decisions based upon the report, by a third party are the responsibility of those third parties unless authorized in writing by Integral Group. The **District of Squamish** and **HCMA Architecture + Design** have copy-right permission for reproduction and distribution of this report.

The contents of this report are confidential and may be legally privileged. This report is intended solely for the named customer(s) **District of Squamish** and **HCMA Architecture + Design.** Integral Group makes no guarantees, representations or warranties with respect to the contents of this report, either express or implied, arising by law or otherwise, including, but not limited to effectiveness, completeness, accuracy, or fitness for purposes beyond the scope and limitations of this report. In no event will Integral Group be liable for any indirect, special incidental, consequential or other similar damages or loss, whether in contract, tort, breach of warranty, or otherwise, or for any loss of data, use, profits, or goodwill as related to the contents of this report being used for purposes beyond the specific scope and limitations of this report.

INTEGRAL GROUP

Scott Ghomeshi, P.Eng., CPHD, LEED AP BD+C
Project Manager

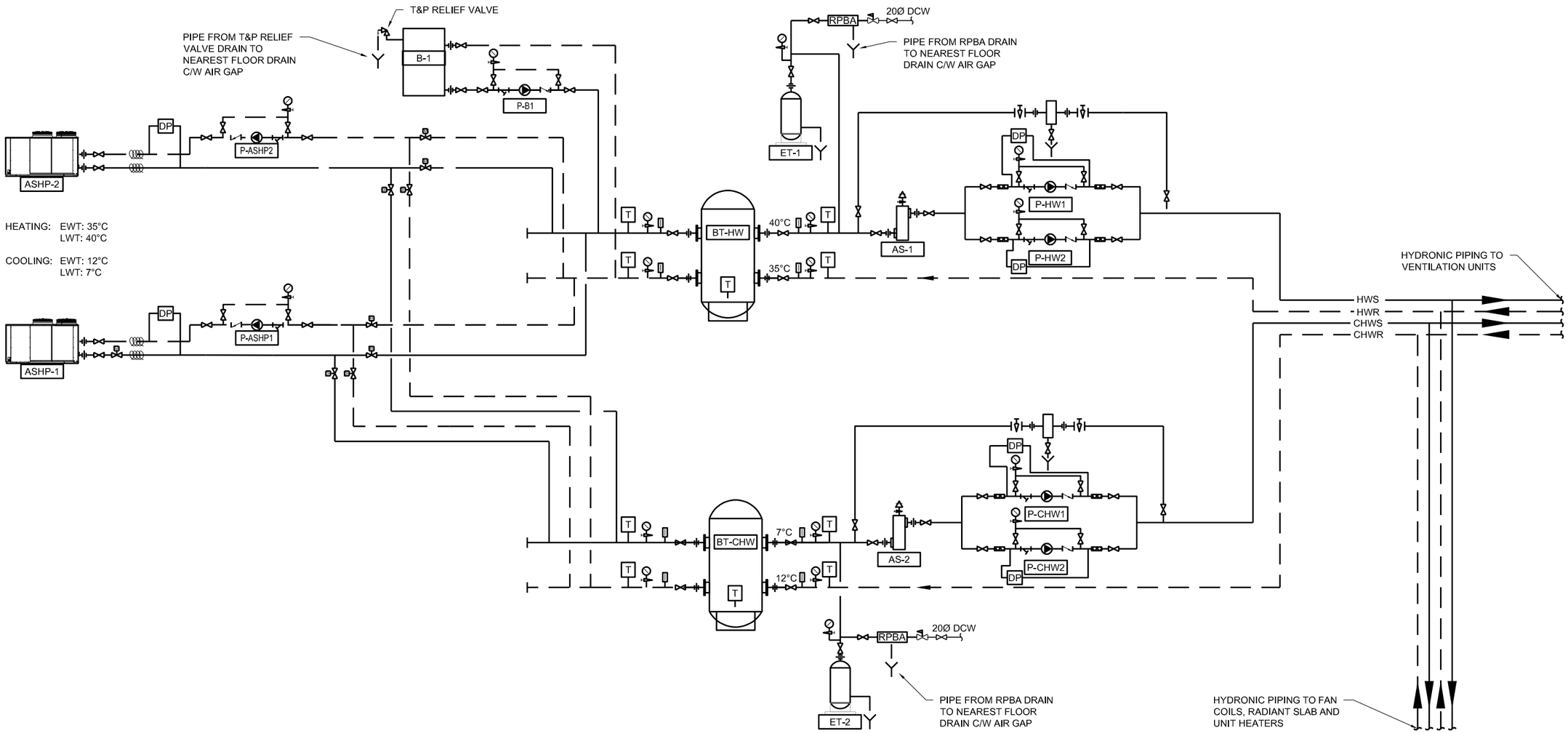
Bryan Uemoto, Dipl. Tech, LEED AP
Associate Principal, Reviewer

Connell Frey, P.Eng.
Senior Mechanical Designer

Jose Luis Lopez, P.Eng. LC CFPE
Associate. Electrical Engineer

SEALED

13. APPENDIX: MECHANICAL AND ELECTRICAL SKETCHES



HYDRONIC SCHEMATIC

PROJECT SQUAMISH FIREHALL #1

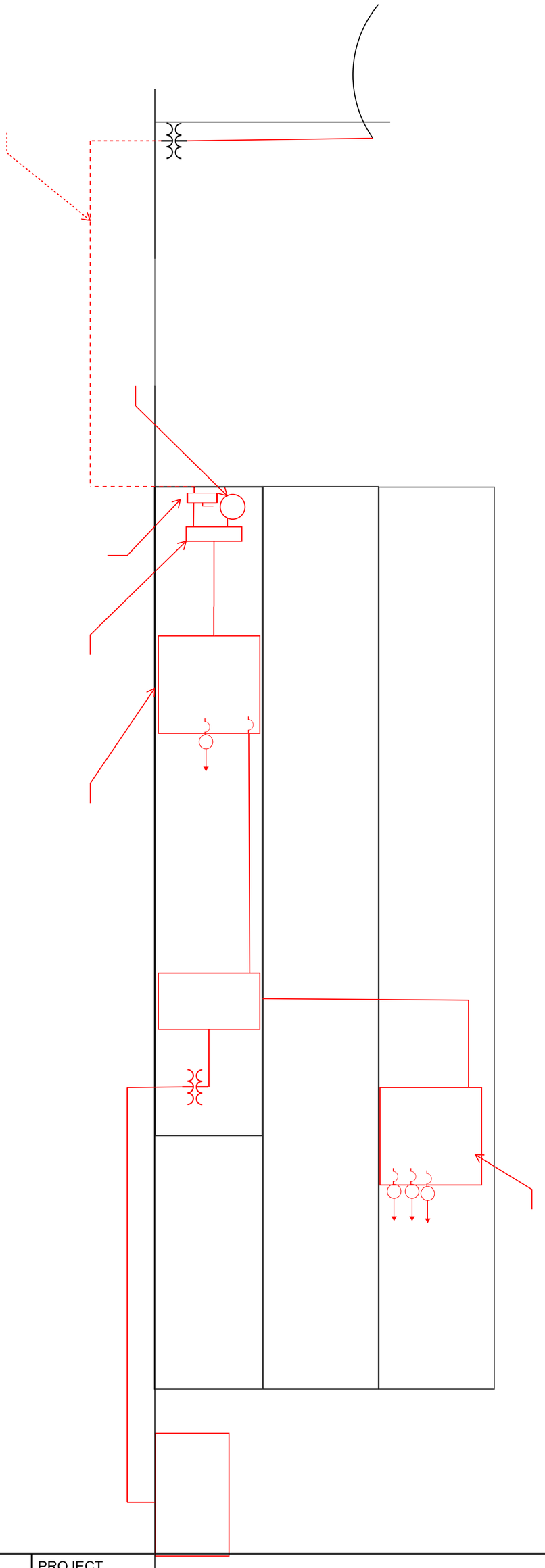
SKETCH No. SKM-SD-1

JOB No. 151985.000

DATE FEB 10, 2020

INTEGRAL GROUP
Suite 180 - 200 Granville Street
Vancouver BC Canada V6C 1S4
TEL: 604.687.1800
FAX: 604.687.1802
E-Mail: info@integral-group.ca

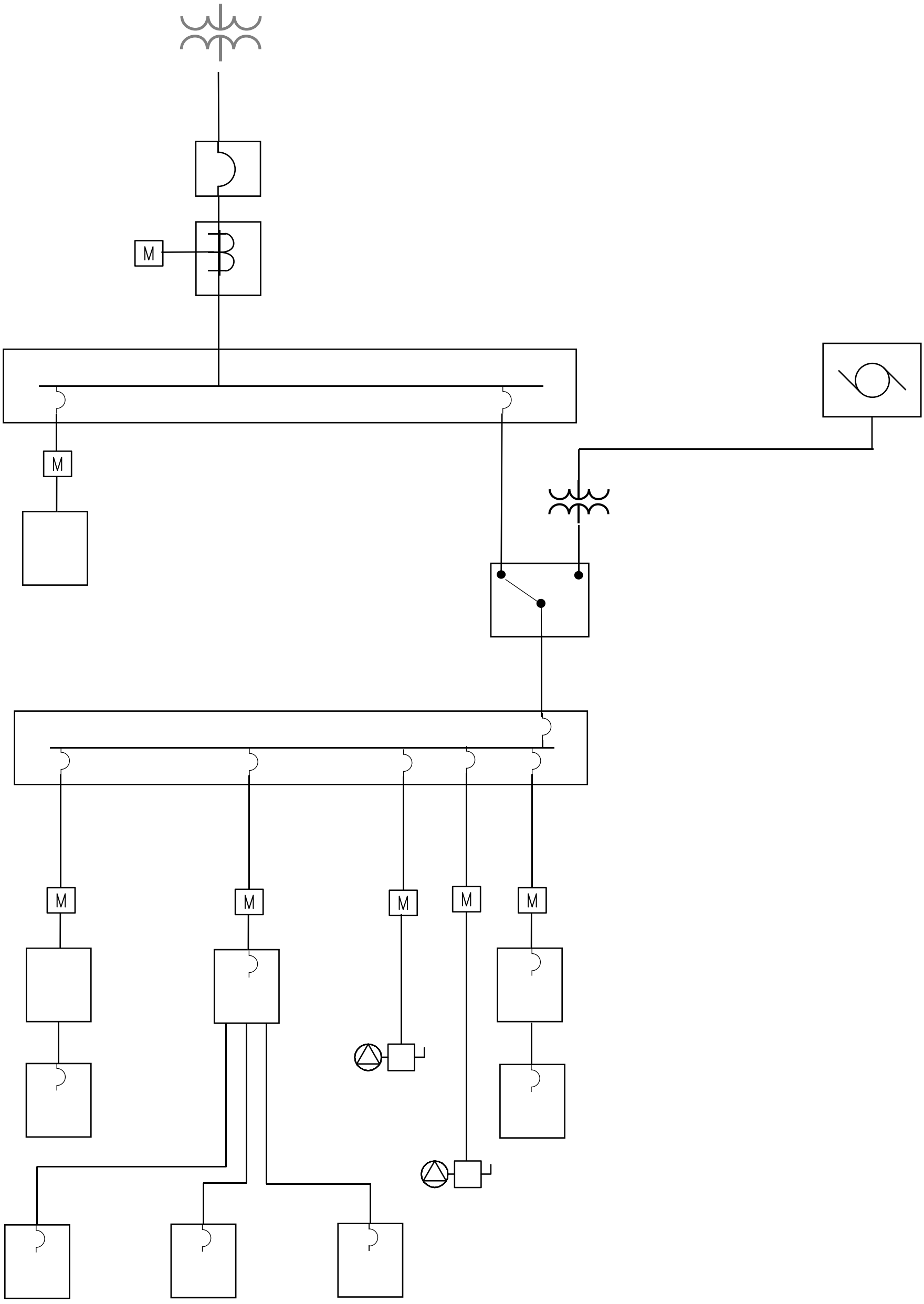
INTEGRAL GROUP



INTEGRAL GROUP
Suite 180 - 200 Granville Street
Vancouver BC Canada V6C 1S4
TEL: 604.687.1800
FAX: 604.687.1802
E-Mail: info@integral-group.ca

PROJECT
SQUAMISH FIREHALL #1

DATE	JOB No.		SKETCH No.
	151985.000		



INTEGRAL GROUP
Suite 180 - 200 Granville Street
Vancouver BC Canada V6C 1S4
TEL: 604.687.1800
FAX: 604.687.1802
E-Mail: info@integral-group.ca

PROJECT
SQUAMISH FIREHALL #1

DATE	JOB No.		SKETCH No.
	151985.000		

LOAD SUMMARY - MIXED USE			
LOCATION NAME.	SQUAMISH FIREHALL 1		
ADMIN SQ M	440		
FIRE SUPPRESSION SQ M	700		
QUARTERS/ DORM SQ M	500		
PUBLIC SQ M	250		
		TOTAL SQ M	1890
DESIGN LOAD DATA – MAIN BUILDING			
	WATTS	DEMAND FACTOR	DEMAND WATTS
BASIC LOAD – ADMIN (CEC TABLE 14 – OFFICE)	22000	0.90	19800
BASIC LOAD – FIREFIGHTING (CEC TABLE 14 – GARAGE)	7000	1.00	7000
BASIC LOAD – DORM (CEC 8-208 DORMS)	10000	0.80	8000
BASIC LOAD – PUBLIC (CEC TABLE 14 – COMMERCIAL)	6300	1.00	6300
ELECTRICAL BOILER (30% OF LOAD IS STANDBY FOR ASHP)	162000	0.8	129600
AIR SOURCE HEAT PUMPS	60000	1.00	60000
OTHER MECH	101400	0.80	81120
MISC EQUIPMENT ALLOWANCE	20000	0.80	16000
ELEVATOR	20000	0.95	19000
EV CHARGERS	20100	1.00	20100
25% EXPANSION			42700
		TOTAL WATTS	409620
		WATTS/SQ m	930 95
		AMPS @ 3ϕ4W 120/208V	1137.0
		x1.25	1421
		MIN. SERVICE REQUIRED	1500A
		PROVIDED SERVICE SIZE	1500A

PROPOSED LOADS

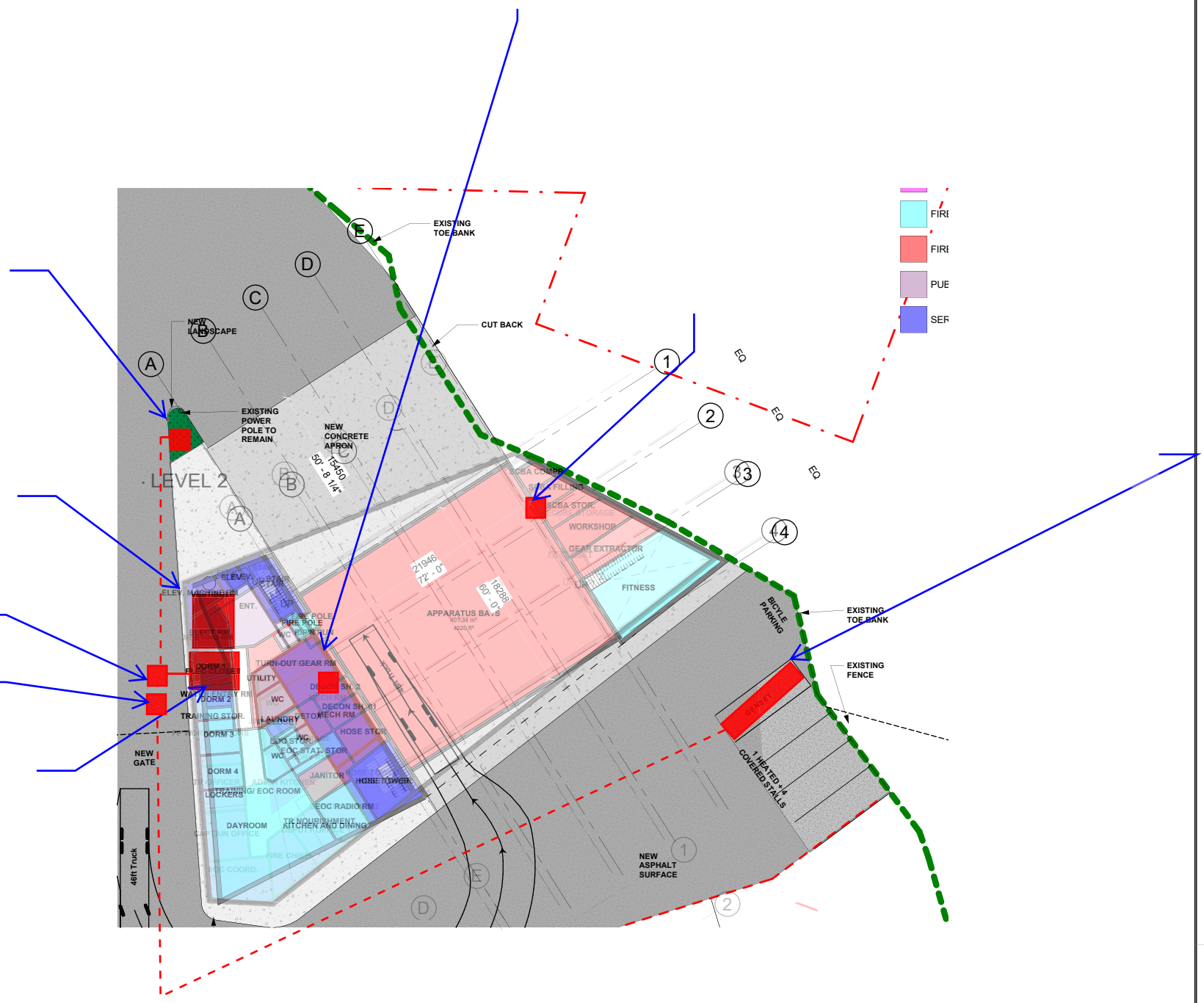
INTEGRAL GROUP
Suite 180 - 200 Granville Street
Vancouver BC Canada V6C 1S4
TEL: 604.687.1800
FAX: 604.687.1802
E-Mail: info@integral-group.ca

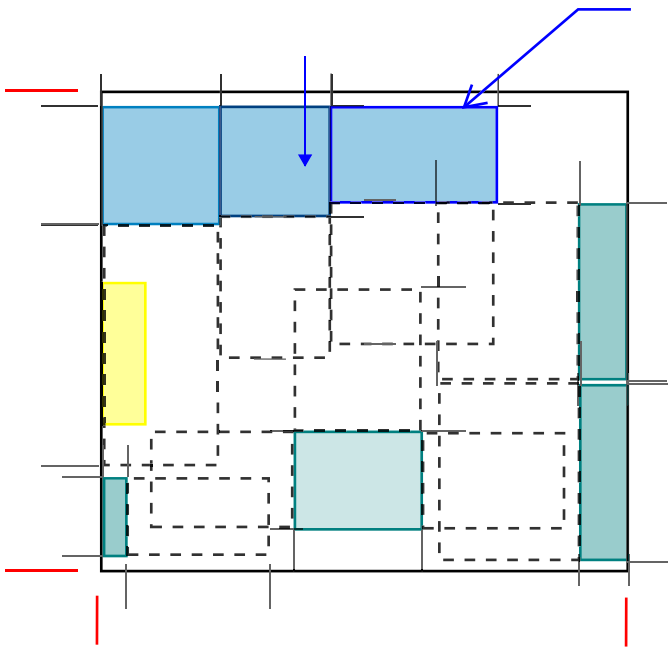
PROJECT
SQUAMISH FIREHALL #1

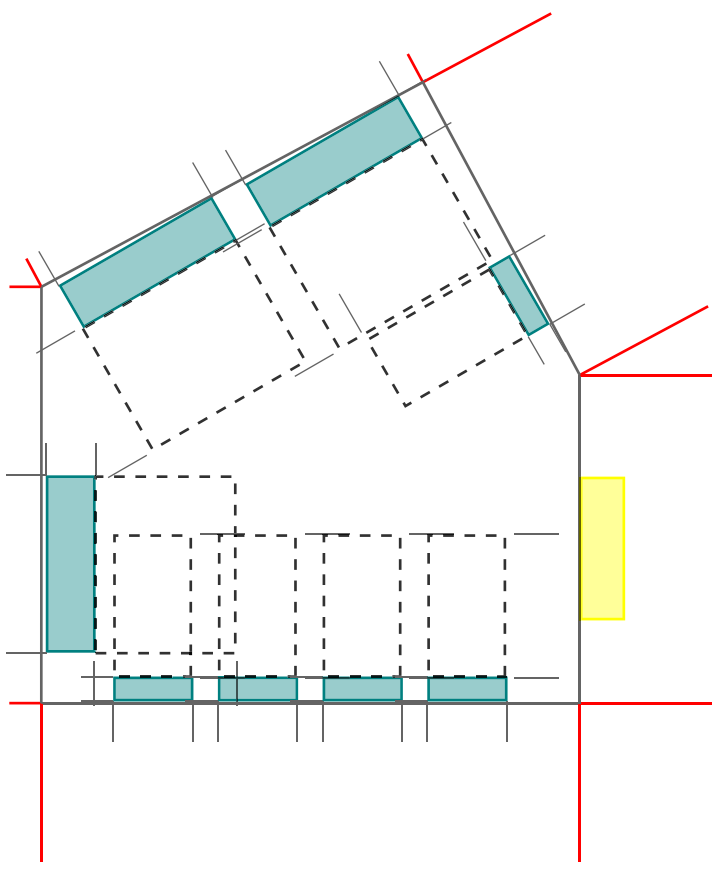
DATE

JOB No. 151985.000

SKETCH No. **SKE-202002-E03**



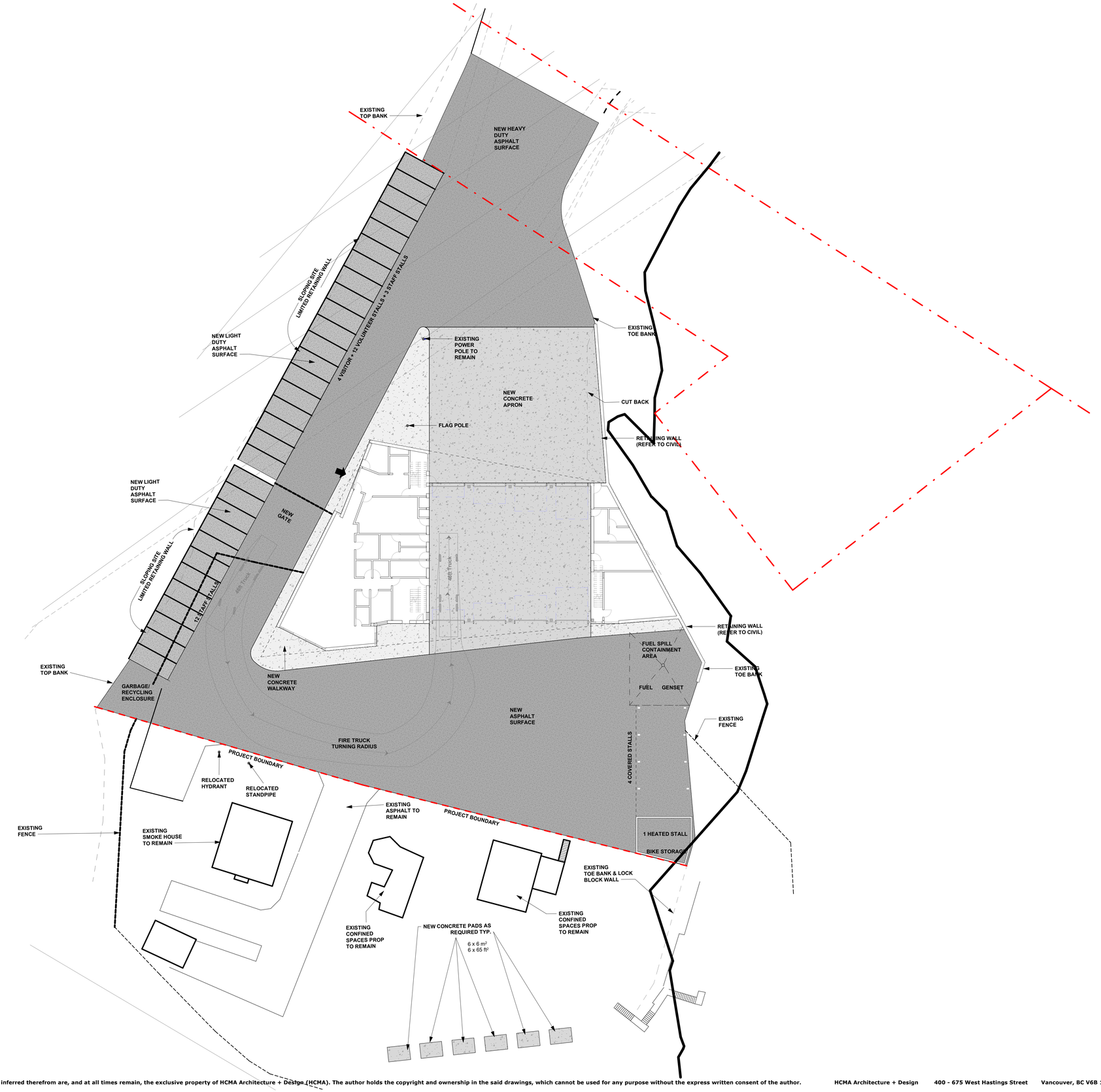




INTEGRAL GROUP
Suite 180 - 200 Granville Street
Vancouver BC Canada V6C 1S4
TEL: 604.687.1800
FAX: 604.687.1802
E-Mail: info@integral-group.ca

PROJECT
SQUAMISH FIREHALL #1

DATE	JOB No.		SKETCH No.
	151985.000		



HCMA

#	DESCRIPTION	DATE
2	ISSUED FOR SD/ CLASS C COST.EST	18 FEB 2020

PROFESSIONAL SEAL

SQUAMISH FIRE HALL

37890 CLARKE DR.
SQUAMISH, BC

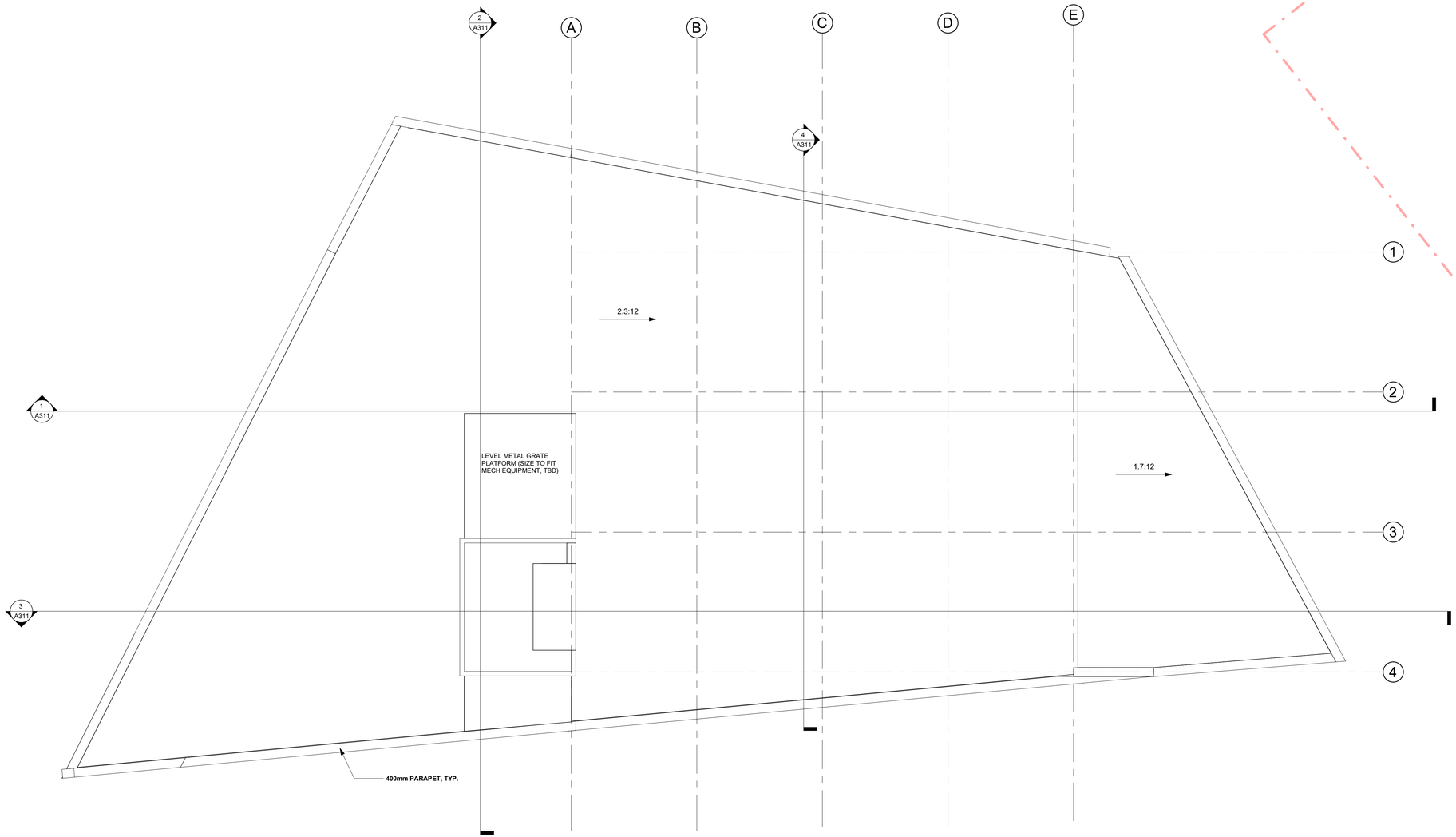
PROJECT #: 19053

SITE PLAN

A100

SCALE: 1 : 250

HCMA Architecture + Design 400 - 675 West Hastings Street Vancouver, BC V6B 1N2 Canada T 604.732.6620



HCMA

#	DESCRIPTION	DATE
2	ISSUED FOR SD/ CLASS C COST.EST	18 FEB 2020

PROFESSIONAL SEAL

SQUAMISH FIRE HALL

37890 CLARKE DR.
SQUAMISH, BC

PROJECT #: 19053

ROOF PLAN

A204

SCALE: 1 : 100

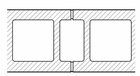
HCMA Architecture + Design 400 - 675 West Hastings Street Vancouver, BC V6B 1N2 Canada T 604.732.6620

1 LEVEL 1 FLOOR PLAN
1 : 100

ROOF TYPES

TAG	R-VALUE	U-VALUE	CONSTRUCTION DETAIL	ASSEMBLY DESCRIPTION
R#1	36			TPO ROOFING 2mm SINGLE PLY FULLY ADHERED TPO ROOFING MEMBRANE 5mm PROTECTION BOARD 152mm 2 LAYERS OF 75mm RIGID INSULATION w/ STAGGERED JOINTS - AIR/ VAPOUR BARRIER 175mm CLT/DLT ROOF (REFER TO STRUCTURAL)

EXTERIOR BACK UP WALL TYPES

TAG	FRR	STC	CONSTRUCTION DETAIL	ASSEMBLY DESCRIPTION
EW#1				WOOD STUD BACK-UP WALL 16mm EXT. GRADE GWB SHEATHING 140mm 2x6 WOOD STUDS 16mm GWB
EW#2	-	-		CMU BACKUP WALL 190mm CMU - REFER TO STRUCTURAL

EXTERIOR CLADDING WALL TYPES

TAG	FRR	STC	CONSTRUCTION DETAIL	ASSEMBLY DESCRIPTION
CL#1				VERTICAL METAL CLADDING 50mm VERTICAL METAL SIDING (STANDING SEAM OR SIM, PROFILE TBD) 25mm AIR SPACE 125mm SEMI-RIGID INSULATION INSULATION - CONTINUOUS SELF-ADHERED AIR/VAPOUR BARRIER
CL#2				SEALED RUNNING BOND BRICK VENEER 90mm SEALED RUNNING BOND BRICK VENEER 38mm AIR SPACE 100mm SEMI-RIGID INSULATION - SELF-ADHERED AIR/VAPOUR BARRIER
CL#3				FIBRE CEMENT BOARD CLADDING 12mm FIBRE CEMENT BOARD 25mm AIR SPACE - GALVANIZED Z-GIRTS c/w 125mm SEMI-RIGID INSULATION - SELF-ADHERED AIR/VAPOUR BARRIER

FIRE RESISTANCE RATING LEGEND:

0 HR	
0.75 HR	
1 HR	
1.5 HR	
2 HR	
3 HR	
4 HR	
WATER CURTAIN	

HCMA

#	DESCRIPTION	DATE
2	ISSUED FOR SD/ CLASS C COST.EST	18 FEB 2020

PROFESSIONAL SEAL

SQUAMISH FIRE HALL

37890 CLARKE DR.
SQUAMISH, BC

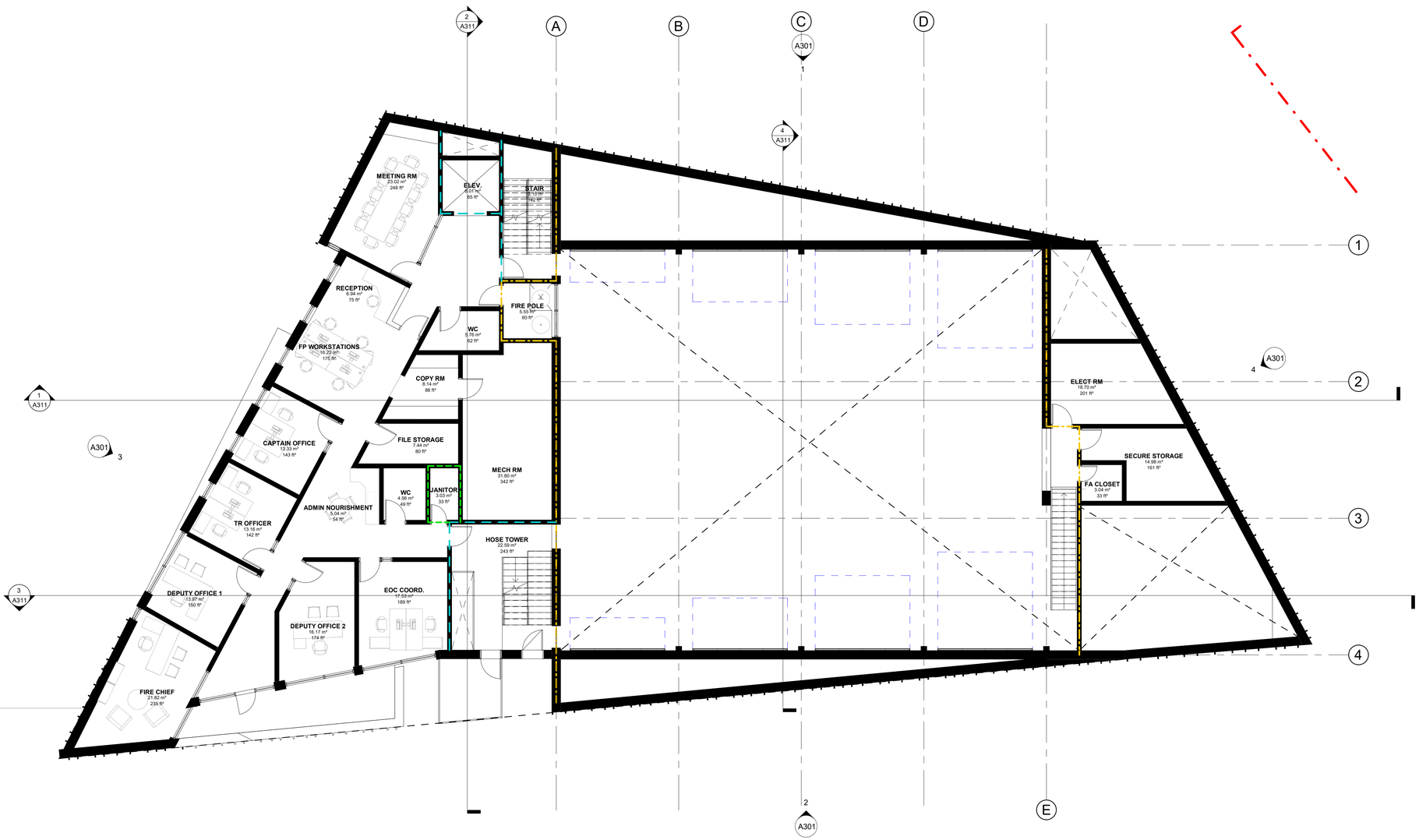
PROJECT #: 19053

FLOOR PLAN - LEVEL 1

A211

SCALE: 1 : 100

HCMA Architecture + Design 400 - 675 West Hastings Street Vancouver, BC V6B 1N2 Canada T 604.732.6620

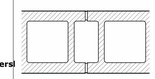


1 LEVEL 2 FLOOR PLAN
1 : 100

ROOF TYPES

TAG	R-VALUE	U-VALUE	CONSTRUCTION DETAIL	ASSEMBLY DESCRIPTION
R#1	36			TPO ROOFING 2mm SINGLE PLY FULLY ADHERED TPO ROOFING MEMBRANE 5mm PROTECTION BOARD 152mm 2 LAYERS OF 75mm RIGID INSULATION w/ STAGGERED JOINTS - AIR/ VAPOUR BARRIER 175mm CLT/DLT ROOF (REFER TO STRUCTURAL)

EXTERIOR BACK UP WALL TYPES

TAG	FRR	STC	CONSTRUCTION DETAIL	ASSEMBLY DESCRIPTION
EW#1				WOOD STUD BACK-UP WALL 16mm EXT. GRADE GWB SHEATHING 140mm 2x6 WOOD STUDS 16mm GWB
EW#2	-	-		CMU BACKUP WALL 190mm CMU - REFER TO STRUCTURAL

EXTERIOR CLADDING WALL TYPES

TAG	FRR	STC	CONSTRUCTION DETAIL	ASSEMBLY DESCRIPTION
CL#1				VERTICAL METAL CLADDING 50mm VERTICAL METAL SIDING (STANDING SEAM OR SIM, PROFILE TBD) 25mm AIR SPACE 125mm SEMI-RIGID INSULATION INSULATION - CONTINUOUS SELF-ADHERED AIR/VAPOUR BARRIER
CL#2				SEALED RUNNING BOND BRICK VENEER 90mm SEALED RUNNING BOND BRICK VENEER 38mm AIR SPACE 100mm SEMI-RIGID INSULATION - SELF-ADHERED AIR/VAPOUR BARRIER
CL#3				FIBRE CEMENT BOARD CLADDING 12mm FIBRE CEMENT BOARD 25mm AIR SPACE - GALVANIZED Z-GIRTS c/w 125mm SEMI-RIGID INSULATION - SELF-ADHERED AIR/VAPOUR BARRIER

FIRE RESISTANCE RATING LEGEND:

0 HR	
0.75 HR	
1 HR	
1.5 HR	
2 HR	
3 HR	
4 HR	
WATER CURTAIN	

HCMA

#	DESCRIPTION	DATE
2	ISSUED FOR SD/ CLASS C COST.EST	18 FEB 2020

PROFESSIONAL SEAL

SQUAMISH FIRE HALL

37890 CLARKE DR. SQUAMISH, BC

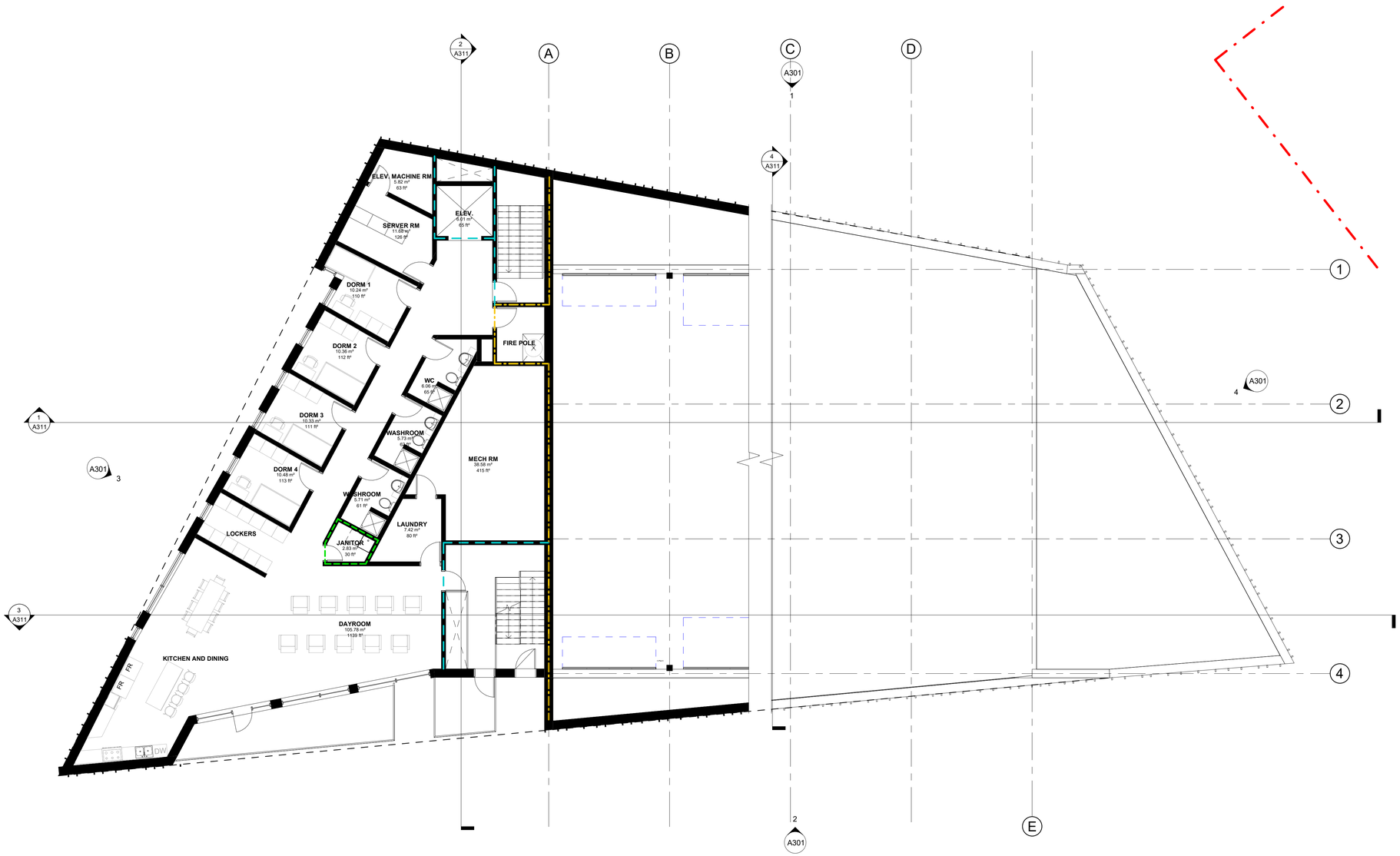
PROJECT #: 19053

FLOOR PLAN - LEVEL 2

A212

SCALE: 1 : 100

HCMA Architecture + Design 400 - 675 West Hastings Street Vancouver, BC V6B 1N2 Canada T 604.732.6620

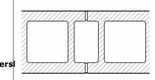


1 LEVEL 3 FLOOR PLAN
1 : 100

ROOF TYPES

TAG	R-VALUE	U-VALUE	CONSTRUCTION DETAIL	ASSEMBLY DESCRIPTION
R#1	36			TPO ROOFING 2mm SINGLE PLY FULLY ADHERED TPO ROOFING MEMBRANE 5mm PROTECTION BOARD 152mm 2 LAYERS OF 75mm RIGID INSULATION w/ STAGGERED JOINTS - AIR/ VAPOUR BARRIER 175mm CLT/DLT ROOF (REFER TO STRUCTURAL)

EXTERIOR BACK UP WALL TYPES

TAG	FRR	STC	CONSTRUCTION DETAIL	ASSEMBLY DESCRIPTION
EW#1				WOOD STUD BACK-UP WALL 16mm EXT. GRADE GWB SHEATHING 140mm 2x6 WOOD STUDS 16mm GWB
EW#2	-	-		CMU BACKUP WALL 190mm CMU - REFER TO STRUCTURAL

EXTERIOR CLADDING WALL TYPES

TAG	FRR	STC	CONSTRUCTION DETAIL	ASSEMBLY DESCRIPTION
CL#1				VERTICAL METAL CLADDING 50mm VERTICAL METAL SIDING (STANDING SEAM OR SIM, PROFILE TBD) 25mm AIR SPACE 125mm SEMI-RIGID INSULATION - INSULATION - CONTINUOUS SELF-ADHERED AIR/VAPOUR BARRIER
CL#2				SEALED RUNNING BOND BRICK VENEER 90mm SEALED RUNNING BOND BRICK VENEER 38mm AIR SPACE 100mm SEMI-RIGID INSULATION - SELF-ADHERED AIR/VAPOUR BARRIER
CL#3				FIBRE CEMENT BOARD CLADDING 12mm FIBRE CEMENT BOARD 25mm AIR SPACE - GALVANIZED Z-GIRTS c/w 125mm SEMI-RIGID INSULATION - SELF-ADHERED AIR/VAPOUR BARRIER

FIRE RESISTANCE RATING LEGEND:

0 HR	
0.75 HR	
1 HR	
1.5 HR	
2 HR	
3 HR	
4 HR	
WATER CURTAIN	

HCMA

#	DESCRIPTION	DATE
2	ISSUED FOR SD/ CLASS C COST.EST	18 FEB 2020

PROFESSIONAL SEAL

SQUAMISH FIRE HALL

37890 CLARKE DR.
SQUAMISH, BC

PROJECT #: 19053

FLOOR PLAN - LEVEL 3

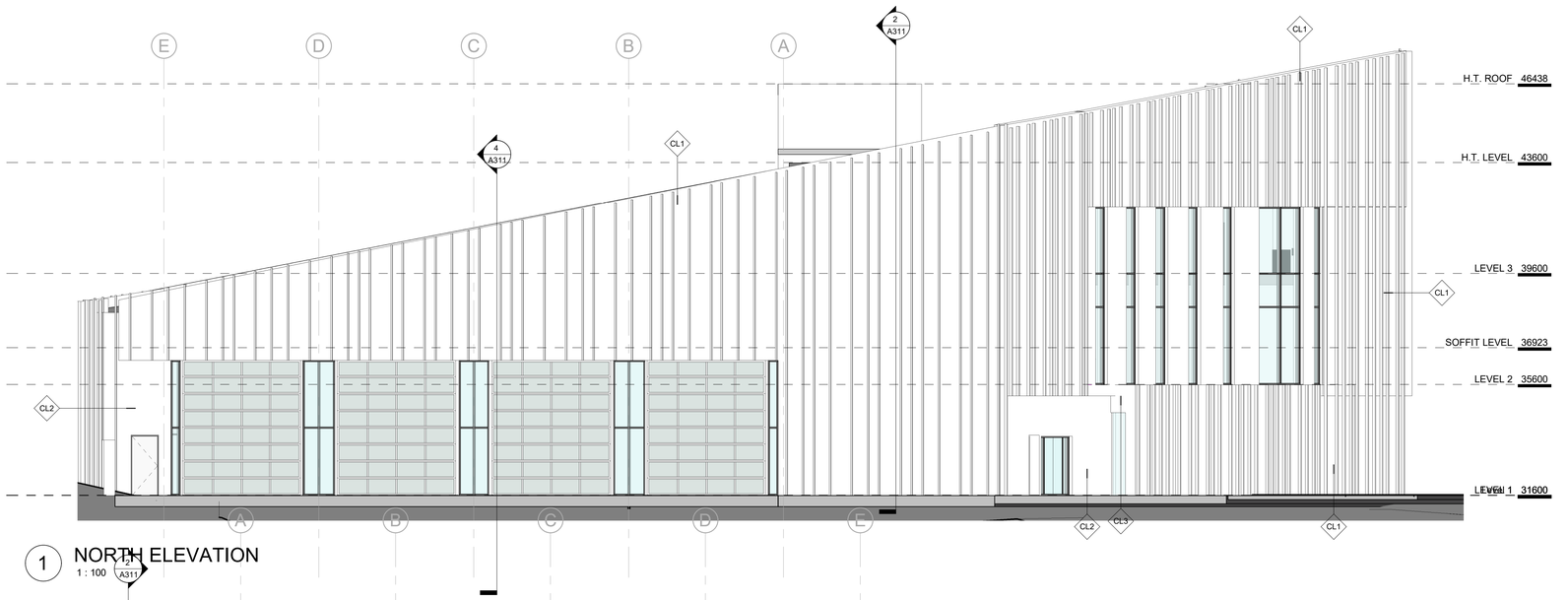
A213

SCALE: 1 : 100

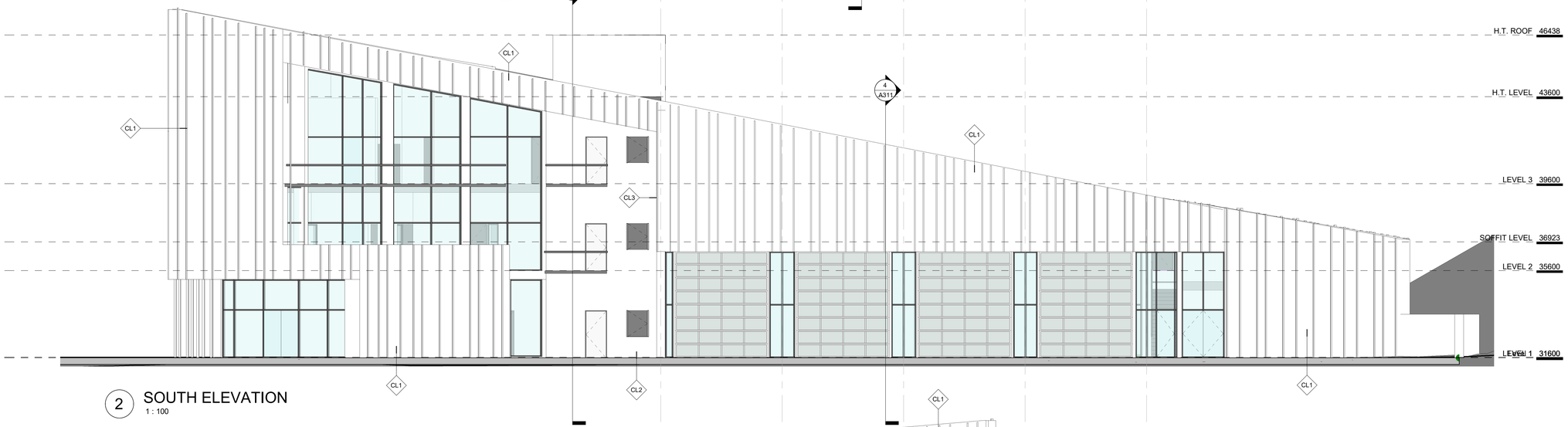
HCMA Architecture + Design 400 - 675 West Hastings Street Vancouver, BC V6B 1N2 Canada T 604.732.6620

EXTERIOR CLADDING WALL TYPES

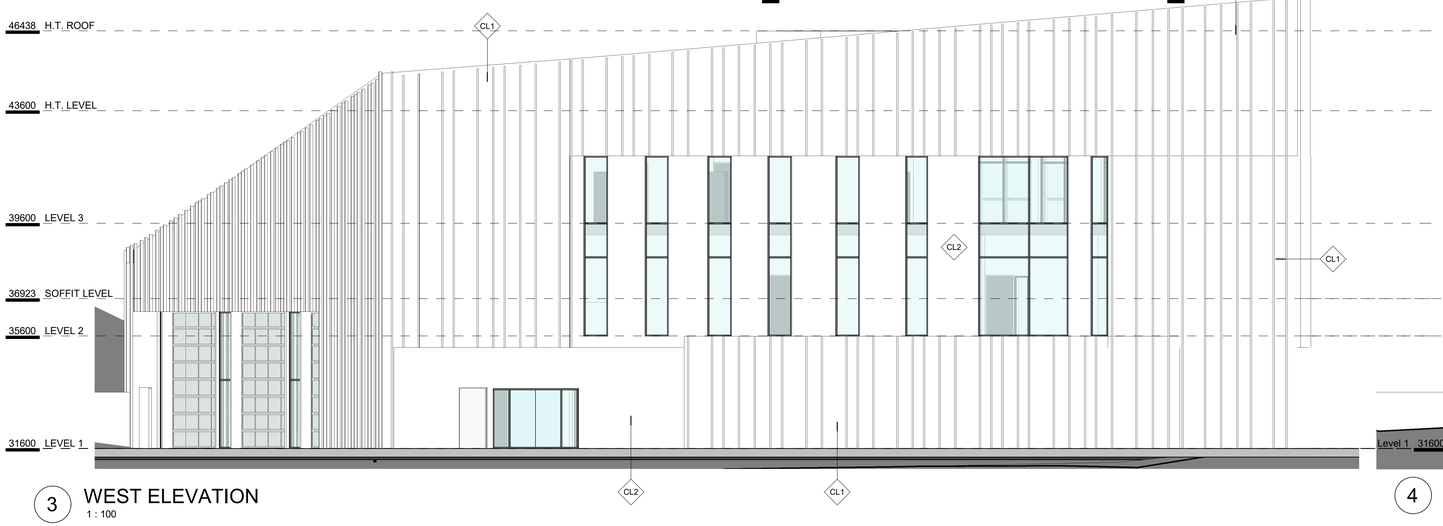
TAG	FRR	STC	CONSTRUCTION DETAIL	ASSEMBLY DESCRIPTION
CL#1				VERTICAL METAL CLADDING 50mm VERTICAL METAL SIDING (STANDING SEAM OR SIM, PROFILE TBD) 25mm AIR SPACE 125mm SEMI-RIGID INSULATION - CONTINUOUS SELF-ADHERED AIR/VAPOUR BARRIER
CL#2				SEALED RUNNING BOND BRICK VENEER 90mm SEALED RUNNING BOND BRICK VENEER 38mm AIR SPACE 100mm SEMI-RIGID INSULATION - SELF-ADHERED AIR/VAPOUR BARRIER
CL#3				FIBRE CEMENT BOARD CLADDING 12mm FIBRE CEMENT BOARD 25mn AIR SPACE - GALVANIZED Z-GIRTS c/w 125mm SEMI-RIGID INSULATION - SELF-ADHERED AIR/VAPOUR BARRIER



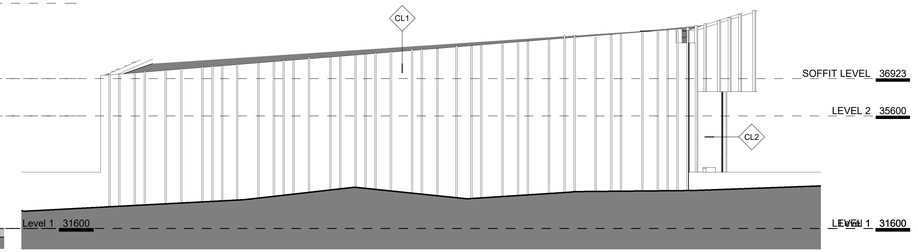
1 NORTH ELEVATION
1 : 100



2 SOUTH ELEVATION
1 : 100



3 WEST ELEVATION
1 : 100



4 EAST ELEVATION
1 : 100

HCMA Architecture + Design 400 - 675 West Hastings Street Vancouver, BC V6B 1N2 Canada T 604.732.6620

HCMA

#	DESCRIPTION	DATE
2	ISSUED FOR SD/ CLASS C COST.EST	18 FEB 2020

PROFESSIONAL SEAL

SQUAMISH FIRE HALL

37890 CLARKE DR. SQUAMISH, BC

PROJECT #: 19053

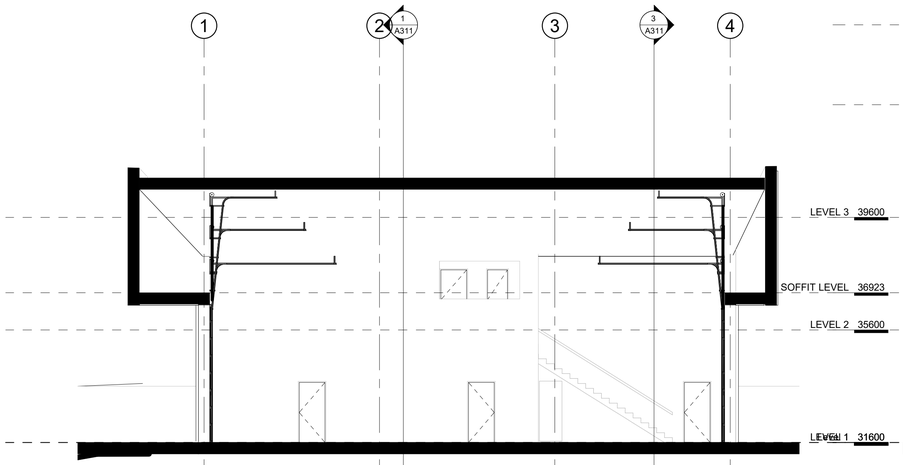
BUILDING ELEVATIONS

A301

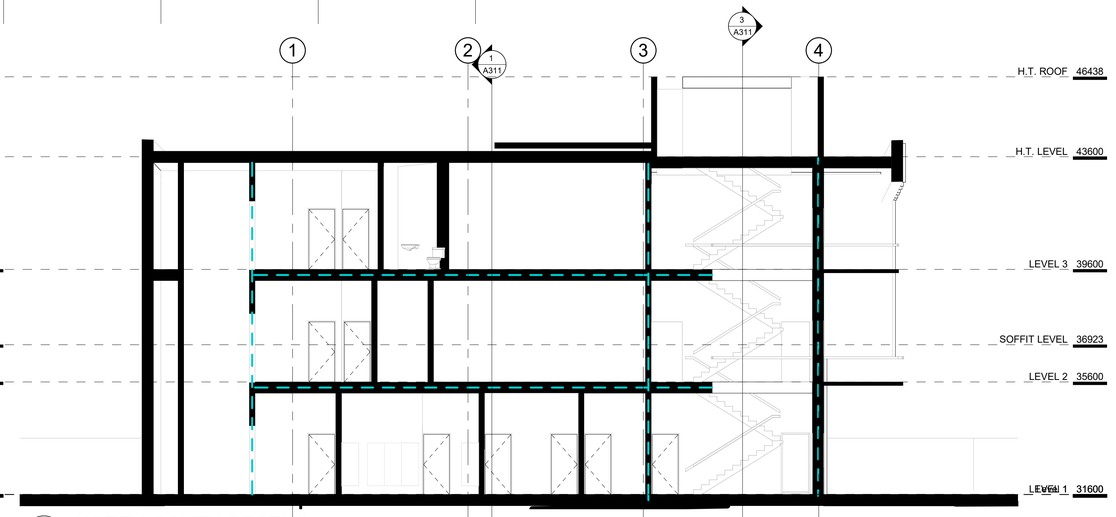
SCALE: 1 : 100

1 EAST-WEST SECTION 1
1 : 100

3 EAST-WEST SECTION 2
1 : 100



4 NORTH-SOUTH SECTION 2
1 : 100



2 NORTH-SOUTH SECTION 1
1 : 100

FIRE RESISTANCE RATING LEGEND:

0 HR	
0.75 HR	
1 HR	
1.5 HR	
2 HR	
3 HR	
4 HR	
WATER CURTAIN	

#	DESCRIPTION	DATE
2	ISSUED FOR SD/ CLASS C COST.EST	18 FEB 2020

PROFESSIONAL SEAL

SQUAMISH FIRE HALL

37890 CLARKE DR.
SQUAMISH, BC

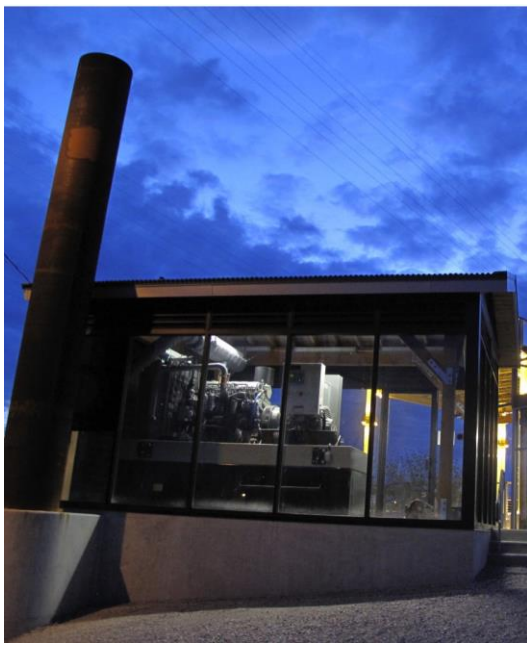
PROJECT #: 19053

BUILDING SECTIONS

A311

SCALE: 1 : 100

HCMA Architecture + Design 400 - 675 West Hastings Street Vancouver, BC V6B 1N2 Canada T 604.732.6620


SQUAMISH FIREHALL No.1 (ALEX MUNRO) - SCHEMATIC DESIGN REPORT

For the proposed Development:
37890 Clarke Drive, Squamish, BC

Project No: 19-5100
February 10, 2020
Aplin & Martin Consultants Ltd.

APLIN MARTIN
ENGINEERING ARCHITECTURE PLANNING SURVEYING

TABLE OF CONTENTS

APPENDICIES

1.0 INTRODUCTION

The project is part of District of Squamish's initiative to replace its two existing firehalls. For the Alex Munro Firehall No. 1 on 37890 Clarke Drive, Garibaldi Highlands (off Sea-to-Sky Highway, or Highway 99), the District plans to rebuild the existing firehall building to house the new administration offices and emergency operations centre (EOC).

The site of this firehall is perched at the northwest foot of the Stawamus Chief rock escarpment range and the Stawamus River, and is located at higher ground just off Highway 99. To the east and northeast of the site sits the Stawamus Elementary school play field on higher ground. At present, part of the slope at the back portion of the Firehall yard is held up by a lock block wall. The existing building and the front portion asphalt paved areas meet the a heavily vegetated slope that leads up to the elementary school play field. The west of the site slopes down to Highway 99. The slope is heavily vegetated with a gravel walking path going along it. The north end of the site is bounded by the access roadway, Clarke Drive, coming up south from Highway 99 at its switchback point before it turns north towards the elementary school. The south portion of the site is relatively flat and is kept by the current firehall primarily as a storage yard. The yard is bounded by a forest beyond the fenced demarcation (See Grading Plan).

At present, existing water and sanitary sewer mains, as well as above-ground BC-Hydro transmission utility lines go through the site along a number of statutory rights-of-way (See Servicing Plan). The existing firehall building is serviced by service connections from these mains. Except for the existing sanitary line which conflicts with the proposed building, we do not foresee the watermain and overhead utility lines to be relocated. However, a proposed storm main is to be installed to better manage the onsite stormwater. Also, service connections need to be re-established due to the shape and location of the new building.

2.0 CIVIL SERVICING - WATER

An existing 250mm dia. watermain cuts through the site in the Southwest-Northeast direction, servicing the Stawamus Indian Reserve 24 residential area across the highway and two commercial lots south of the Firehall at Valley Drive. At the moment, the current firehall has a 150mm dia. water service connection from the 250mm dia. water main.

In order to service the proposed building, two proposed single 150mm dia. water service connections from the existing water main will be provided for the new building and onsite water hydrant (See Servicing Plan). We anticipate that there will be adequate flows from the adjacent watermain to provide for the proposed building sufficient domestic and fire protection flows. This analysis is to be confirmed upon receiving updated hydraulic information of the surrounding area and/or after sufficient water pressure test have been conducted. Other onsite fire hydrants are to be removed or returned to the District of Squamish.

An existing fire hydrant on the Firehall site on the northeast corner of the site near Clarke Drive will be retained (See Servicing Plan).

3.0 CIVIL SERVICING – SANITARY SEWER

An existing 75mm dia. sanitary forcemain cuts through the site in the Southwest-Northeast direction, servicing the Stawamus Indian Reserve 24 residential area across the highway and two commercial lots south of the Firehall at Valley Drive. It channels pumped sewer to an existing manhole onsite, before connecting to a 200mm dia. gravity sanitary pipe towards Highway 99. At the moment, the existing firehall has a sanitary service connection to the transition manhole between the forcemain and gravity main.

As the forcemain, gravity main and transitioning manhole conflict with the proposed firehall building structure, parts of the onsite sanitary sewer line need to be rerouted (See Servicing Plan). This includes the transitioning of the sanitary forcemain at an existing service box and deflecting the line at an angle allowing it to head north to a proposed transitioning manhole, before a new 200mm dia. gravity pipe continues to channel flow northwards to connect further downstream to an existing sanitary manhole (See Servicing Plan). To service the new firehall building, a new 150mm dia. sanitary connection is proposed at the new transitioning manhole between the forcemain and gravity line.

4.0 CIVIL SERVICING – STORM SEWER SYSTEM

At present rainwater falling onsite is split into two catchment areas in the north and south halves of the site. On the northern pavement, rain or stormwater is drained via two existing storm catch-basins located close to the Clarke Drive switchback. As for stormwater landing at the back area of the firehall, it is either infiltrated into the ground through the gravel surface, or flowing into the forested area south of the site or over the escarpment on the western flange.

For stormwater to be better managed, a new 300mm dia. storm pipe is proposed along the new parking area. This pipe will carry all the stormwater falling on the re-developed portion of the site. This includes the asphalt paved and concrete areas, as well as the roof-top of the proposed building. A series of proposed catch-basins will be installed to drain stormwater into this proposed storm pipe. Water is channeled along the pipe in a south-northern direction to an oil/grit separation and sediment manhole, before entering a flow control manhole located close to the Clarke Drive entranceway. The flow control device will restrict stormwater flow leaving the site, with excess water stored temporarily in a storage facility to be built below the asphalt surface (See Servicing Plan). Based on a 5-year storm-return intensity calculation, with post-development matching pre-development storm outflow rates, the required detention volume for the tank is calculated to be approximately 42.0m^3 (See Stormwater Catchment Plan & Calculation Sheet). Beyond the flow control manhole, an outflow pipe that has the capacity to hold overflowing volume of rainwater is connected to an existing storm culvert along Clarke Drive. This 300mm dia. culvert discharges stormwater at the ditch beside Highway 99.

Please note that the volume determination of the detention tank is preliminary, and the sizing of the detention tank is approximate. The final volume and tank type will be subjected to changes in the overall building and landscaping design, as well as District of Squamish requirements to adhere to.

5.0 ONSITE GRADING

The aim of the grading is to minimize the amount of retaining walls to be used onsite despite having an expanded footprint of useable area.

On the eastern edge, a cast-in-place concrete wall in front of the new building will be constructed, while the existing lock-block at the back of the building will be retained.

On the western edge, a row of thirty-one vertical parking stalls line the edge of the lot. This expansion of the asphalt area means that a retaining wall of approximately one metre tall at the highest points will have to be constructed above the vegetated slope (See Grading Plan). A metre wide of landscaped or concrete strip will be included to allow the installation of wall railings if required (See West Slope Sections Dwg).

Asphalt paving on the north and south of the site are both tied into existing asphalt-paved grounds.

APPENDIX A

CIVIL DESIGN DRAWINGS (4 SHEETS)

PROP. RETAINING WALL C/W HANDRAILS. SEE SHEET 2 FOR WALL & SLOPE SECTIONS (TYP.)

PROP. ASPHALT DRIVEWAY & PARKING STALL PAVING (TYP.)

PROP. CONCRETE BARRIER CURB & REVERSE GUTTER

PROP. CONCRETE BARRIER CURB & GUTTER

PROP. CONCRETE WALKWAY

EX. CATCH BASIN TO REMAIN

EX. ASPHALT PAVING TO BE REMOVED, REGRADED & REPAVED (TYP.)

EX. FIRE HYDRANTS TO BE REMOVED OR RELOCATED (TYP.)

PROPOSED FIREHALL 1 BUILDING MFE=32.10m

EX. TRAINING STRUCTURE TO REMAIN

EX. HYDRO POWER POLES & LINES TO BE RELOCATED (TYP.)

EX. DRIVEWAY PAVING, CURB & SIDEWALK TO BE REMOVED

PROP. CONCRETE BARRIER CURB & GUTTER (TYP.)

EX. CATCH BASIN TO REMAIN

PROP. RETAINING WALL (TYP.)

PROP. CONCRETE FIRE TRUCK DRIVEWAY PAVING

EX. FIREHALL STRUCTURE TO BE DEMOLISHED

EX. TRAINING STRUCTURE TO REMAIN

EX. CONCRETE PADS & STRUCTURES TO BE REMOVED (TYP.)

EX. TRAINING STRUCTURE TO REMAIN

PROP. CONCRETE PADS AS REQUIRED (TYP.)

PROP. CONCRETE FIRE TRUCK DRIVEWAY PAVING

PROP. ASPHALT DRIVEWAY & PARKING STALL PAVING (TYP.)

EX. STAIRS & LOCK BLOCK WALLS TO REMAIN

PROP. GATE

SEA-TO-SKY HIGHWAY

CLARKE DRIVE

REM B PLAN 12335

REM Bk 5 PLAN 11687

REM Bk 3 PLAN 9930

REM Bk 4 PLAN 11320

BCH & PA R/W REF PLAN 2280

SRW PLAN LMP40628

SRW PLAN LMP40627

SRW PLAN LMP40

SRW PLAN LMP41906

4266

DL

TRANSMISSION LINES

LEGEND:

MFE=08.50m	MINIMUM FLOOR ELEVATION
●	MANHOLE
◪	CATCH BASIN
◐	LAWN BASIN
◆M	FIRE HYDRANT
■	BLOWOFF
═══	CONCRETE CURB
- - -	RETAINING WALL
———	EDGE OF ASPHALT
	ASPHALT SURFACE
	GRAVEL SURFACE
	CONCRETE SURFACE
	CONCRETE SIDEWALK
	LANDSCAPE AREA
	UNDERGROUND INFILTRATION TANK
	RAIN GARDEN/ BIOSWALE
(D1)	MANHOLE ID

NOTICE TO CONTRACTOR

IT IS THE RESPONSIBILITY OF THE CONTRACTOR'S SURVEYOR TO VERIFY THAT ALL LEGAL SURVEY DIMENSIONS SHOWN ON THE ENGINEERS DRAWINGS AGREE WITH THOSE ON THE REGISTERED LEGAL SURVEY PLAN. SHOULD THERE BE ANY DISCREPANCIES, THEN IMMEDIATELY NOTIFY THE ENGINEER OF RECORD

LEGAL DESCRIPTION: ON LOT B, EXCEPT PART IN PLAN 17066, SECONDLY PART DEDICATED ROAD ON PLAN BCP30210, DISTRICT LOT 4266 & 4267, GROUP 1, NEW WESTMINSTER DISTRICT, PLAN 12335.

B.M. MONUMENT NO. – ELEVATION: –
LOCATED AT

REV. NO.	DESCRIPTION	DR	CH	DATE	APP
01	SCHEMATIC DESIGN – DRAFT 1	VG	DRS	FEB 10/20	DRS
02	SCHEMATIC DESIGN – DRAFT 2	VG	DRS	FEB 12/20	DRS
03	SCHEMATIC DESIGN REPORT	VG	DRS	FEB 18/20	DRS

APLIN MARTIN
ENGINEERING ARCHITECTURE PLANNING SURVEYING

Aplin & Martin Consultants Ltd.
#1818 – 1177 West Hastings Street, Vancouver, B.C. V6E 2K3
Tel: (604) 678-9434, Fax: (604) 597-9061, Email: general@aplinmartin.com

CLIENT:
HUGHES CONDON MARLER ARCHITECTS (HCMA)
#400 - 675 W HASTINGS STREET, VANCOUVER V6B 1N2
PH. (604) 732-6620

PROJECT:
SQUAMISH FIREHALL 1
8989 CLARKE DRIVE
SQUAMISH, BC

The location of existing underground utilities are shown in an approximate way only & have not been independently verified by the owner or its representative. The contractor shall determine the exact location of all existing utilities before commencing work, and agrees to be fully responsible for any and all damages which might be occasioned by the contractor's failure to exactly locate and preserve any and all underground utilities.

TITLE: **GRADING PLAN**

DESIGN: VG CHECK: DRS
DRAWN: VG APPR: DRS

A & M FILE: **19-5100**

PROJECT NO. .

SCALE : HORZ. 1: 250 VERT. N/A

DRAWING DATE: **FEBRUARY 2020**

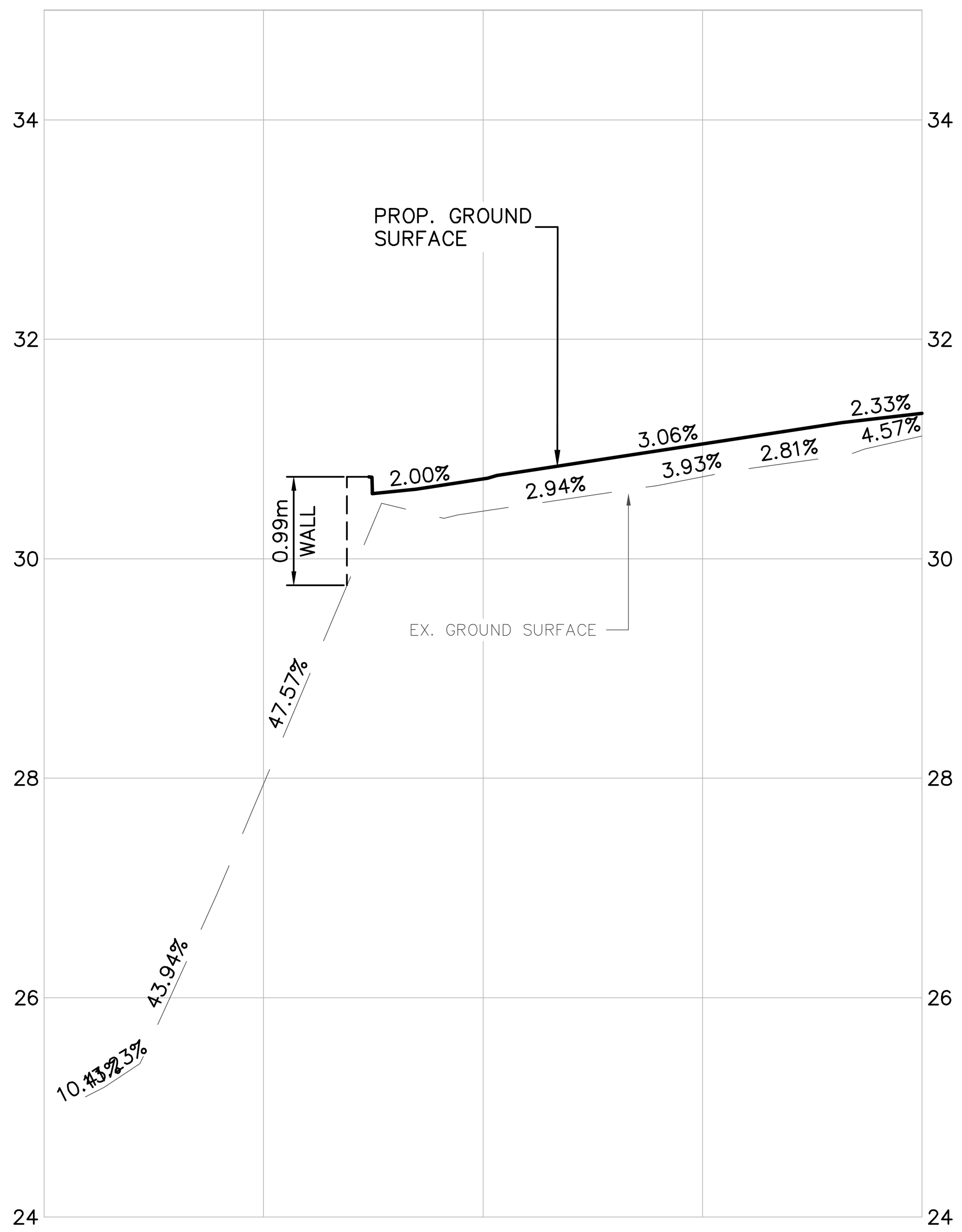
DRAWING NO. .

A & M DRAWING NO. **19-5100-01**

SHEET NO. **01 OF 04**

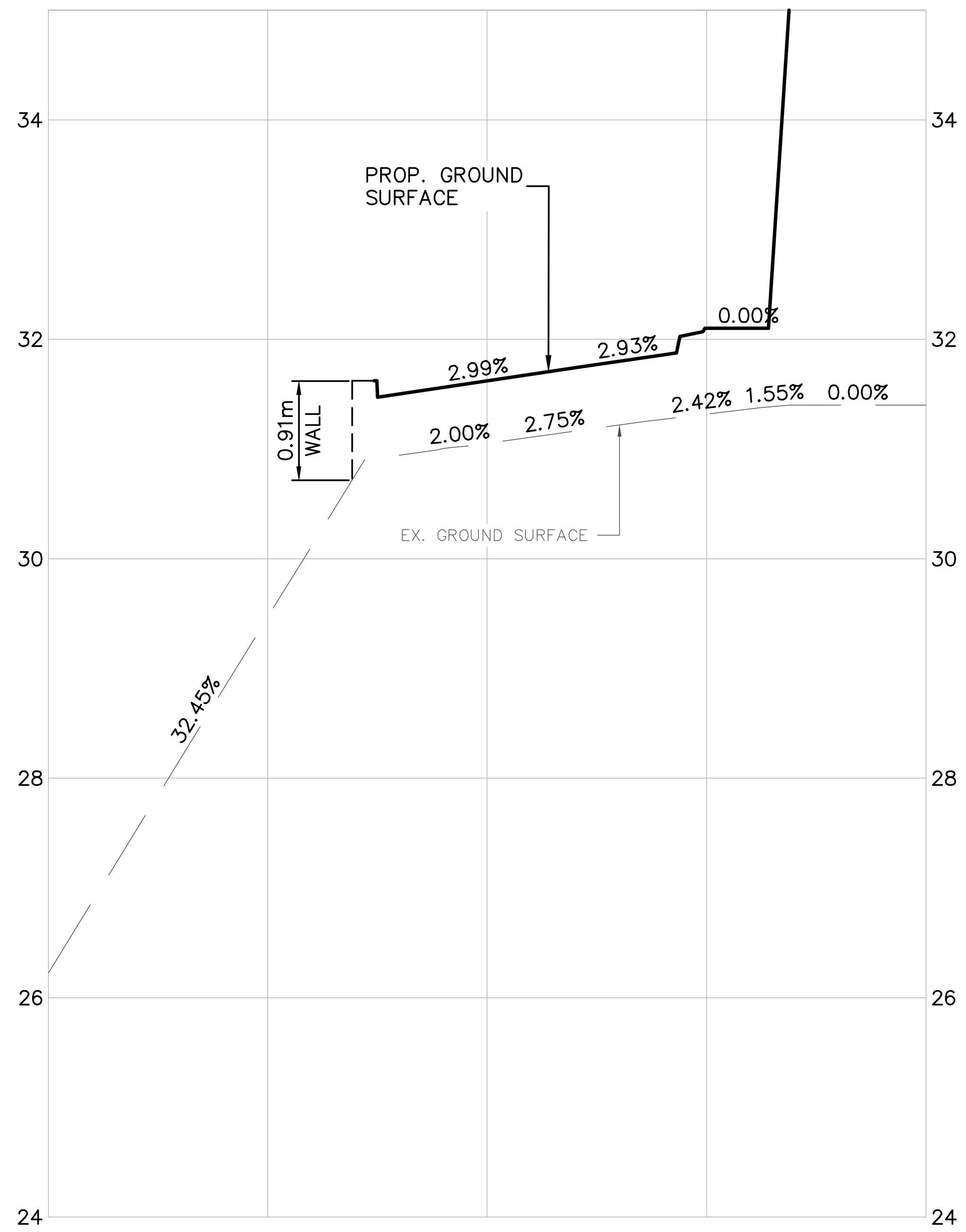
REV. **03**

0 2 1:250 12m



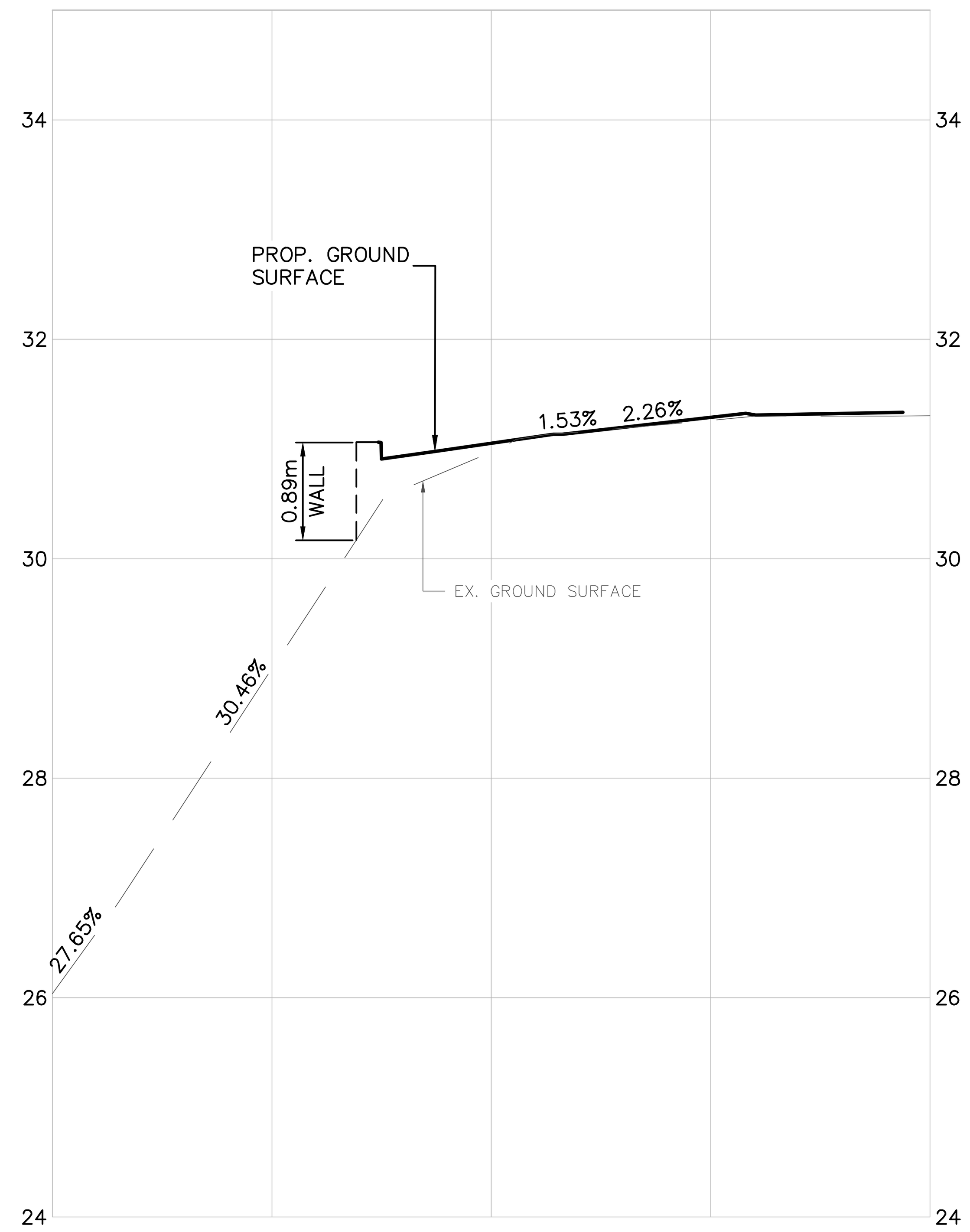
CENTRELINE ROAD ELEVATIONS (EXISTING / PROPOSED)		27.95	30.43 / 30.73	30.75 / 31.05	31.12 / 31.33
CHAINAGE	2+000	2+010	2+020	2+030	2+040

WEST SLOPE FRONT SECTION
1:250 HOR.
1:50 VERT.



CENTRELINE ROAD ELEVATIONS (EXISTING / PROPOSED)	26.22	29.47	31.05 / 31.62	31.32 / 32.10	31.40 / 46.87
CHAINAGE	3+000	3+010	3+020	3+030	3+040

WEST SLOPE MID SECTION (NEAR GATE)
1:250 HOR.
1:50 VERT.



CENTRELINE ROAD ELEVATIONS (EXISTING / PROPOSED)	26.04	29.00	30.97 / 31.05	31.26 / 31.29	31.30
CHAINAGE	4+000	4+010	4+020	4+030	4+040

WEST SLOPE BACK SECTION
1:250 HOR.
1:50 VERT.

NOTICE TO CONTRACTOR

IT IS THE RESPONSIBILITY OF THE CONTRACTOR'S SURVEYOR TO VERIFY THAT ALL LEGAL SURVEY DIMENSIONS SHOWN ON THE ENGINEERS DRAWINGS AGREE WITH THOSE ON THE REGISTERED LEGAL SURVEY PLAN. SHOULD THERE BE ANY DISCREPANCIES, THEN IMMEDIATELY NOTIFY THE ENGINEER OF RECORD

LEGAL DESCRIPTION: ON LOT B, EXCEPT PART IN PLAN 17066, SECONDLY PART DEDICATED ROAD ON PLAN BCP30210, DISTRICT LOT 4266 & 4267, GROUP 1, NEW WESTMINSTER DISTRICT, PLAN 12335.

B.M. MONUMENT NO. _ ELEVATION: _
LOCATED AT

REV. NO.	DESCRIPTION	DR	CH	DATE	APP
01	SCHEMATIC DESIGN – DRAFT 1	VG	DRS	FEB 10/20	DRS
02	SCHEMATIC DESIGN – DRAFT 2	VG	DRS	FEB 12/20	DRS
03	SCHEMATIC DESIGN REPORT	VG	DRS	FEB 18/20	DRS

APLIN MARTIN
ENGINEERING ARCHITECTURE PLANNING SURVEYING
Aplin & Martin Consultants Ltd.
#1818 – 1177 West Hastings Street, Vancouver, B.C. V6E 2K3
Tel: (604) 678-9434, Fax: (604) 597-9061, Email: general@aplinmartin.com

CLIENT:
HUGHES CONDON MARLER ARCHITECTS (HCMA)
#400 - 675 W HASTINGS STREET, VANCOUVER V6B 1N2
PH. (604) 732-6620

PROJECT:
SQUAMISH FIREHALL 1
8989 CLARKE DRIVE
SQUAMISH, BC

The location of existing underground utilities are shown in an approximate way only & have not been independently verified by the owner or its representative. The contractor shall determine the exact location of all existing utilities before commencing work, and agrees to be fully responsible for any and all damages which might be occasioned by the contractor's failure to exactly locate and preserve any and all underground utilities.

TITLE:
WEST SLOPE SECTIONS

DESIGN: VG CHECK: DRS
DRAWN: VG APPR: DRS

A & M FILE: 19-5100

PROJECT NO. .
SCALE: HORZ. 1:250 VERT. 1:50
DRAWING DATE: FEBRUARY 2020

DRAWING NO. .
A & M DRAWING NO. 19-5100-02
SHEET NO. 02 OF 04
REV. 03

0 2 1:250 12m

NOTICE TO CONTRACTOR

IT IS THE RESPONSIBILITY OF THE CONTRACTOR'S SURVEYOR TO VERIFY THAT ALL LEGAL SURVEY DIMENSIONS SHOWN ON THE ENGINEERS DRAWINGS AGREE WITH THOSE ON THE REGISTERED LEGAL SURVEY PLAN. SHOULD THERE BE ANY DISCREPANCIES, THEN IMMEDIATELY NOTIFY THE ENGINEER OF RECORD

LEGAL DESCRIPTION: ON LOT B, EXCEPT PART IN PLAN 17066, SECONDLY PART DEDICATED ROAD ON PLAN BCP30210, DISTRICT LOT 4266 & 4267, GROUP 1, NEW WESTMINSTER DISTRICT, PLAN 12335.

B.M. MONUMENT NO. _ ELEVATION: _
LOCATED AT

REV. NO.	DESCRIPTION	DR	CH	DATE	APP
01	SCHEMATIC DESIGN – DRAFT 1	VG	DRS	FEB 10/20	DRS
02	SCHEMATIC DESIGN – DRAFT 2	VG	DRS	FEB 12/20	DRS
03	SCHEMATIC DESIGN REPORT	VG	DRS	FEB 18/20	DRS

APLIN MARTIN
ENGINEERING ARCHITECTURE PLANNING SURVEYING
Aplin & Martin Consultants Ltd.
#1818 – 1177 West Hastings Street, Vancouver, B.C. V6E 2K3
Tel: (604) 678-9434, Fax: (604) 597-9061, Email: general@aplinmartin.com

CLIENT:
HUGHES CONDON MARLER ARCHITECTS (HCMA)
#400 - 675 W HASTINGS STREET, VANCOUVER V6B 1N2
PH. (604) 732-6620

PROJECT:
SQUAMISH FIREHALL 1
8989 CLARKE DRIVE
SQUAMISH, BC

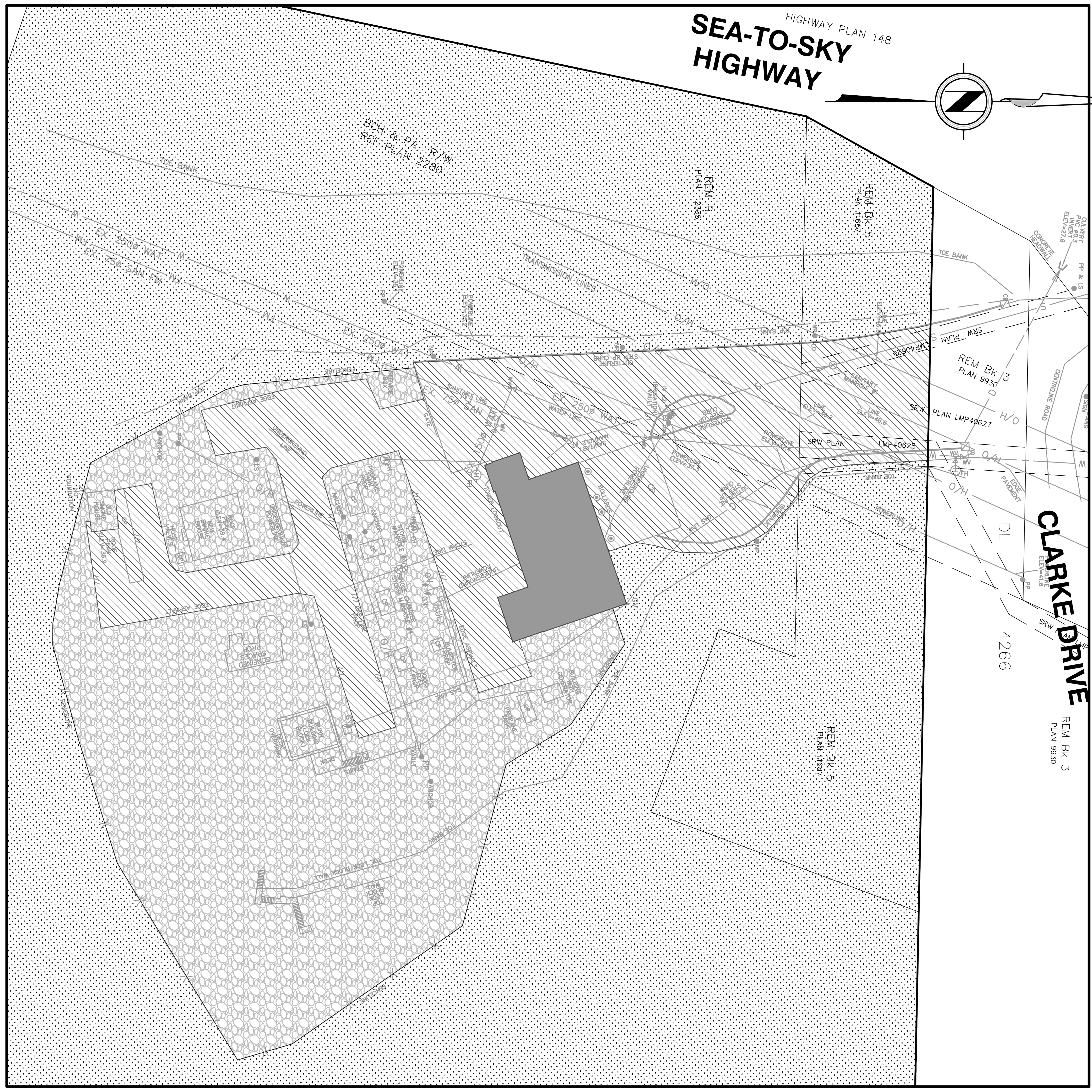
The location of existing underground utilities are shown in an approximate way only & have not been independently verified by the owner or its representative. The contractor shall determine the exact location of all existing utilities before commencing work, and agrees to be fully responsible for any and all damages which might be occasioned by the contractor's failure to exactly locate and preserve any and all underground utilities.

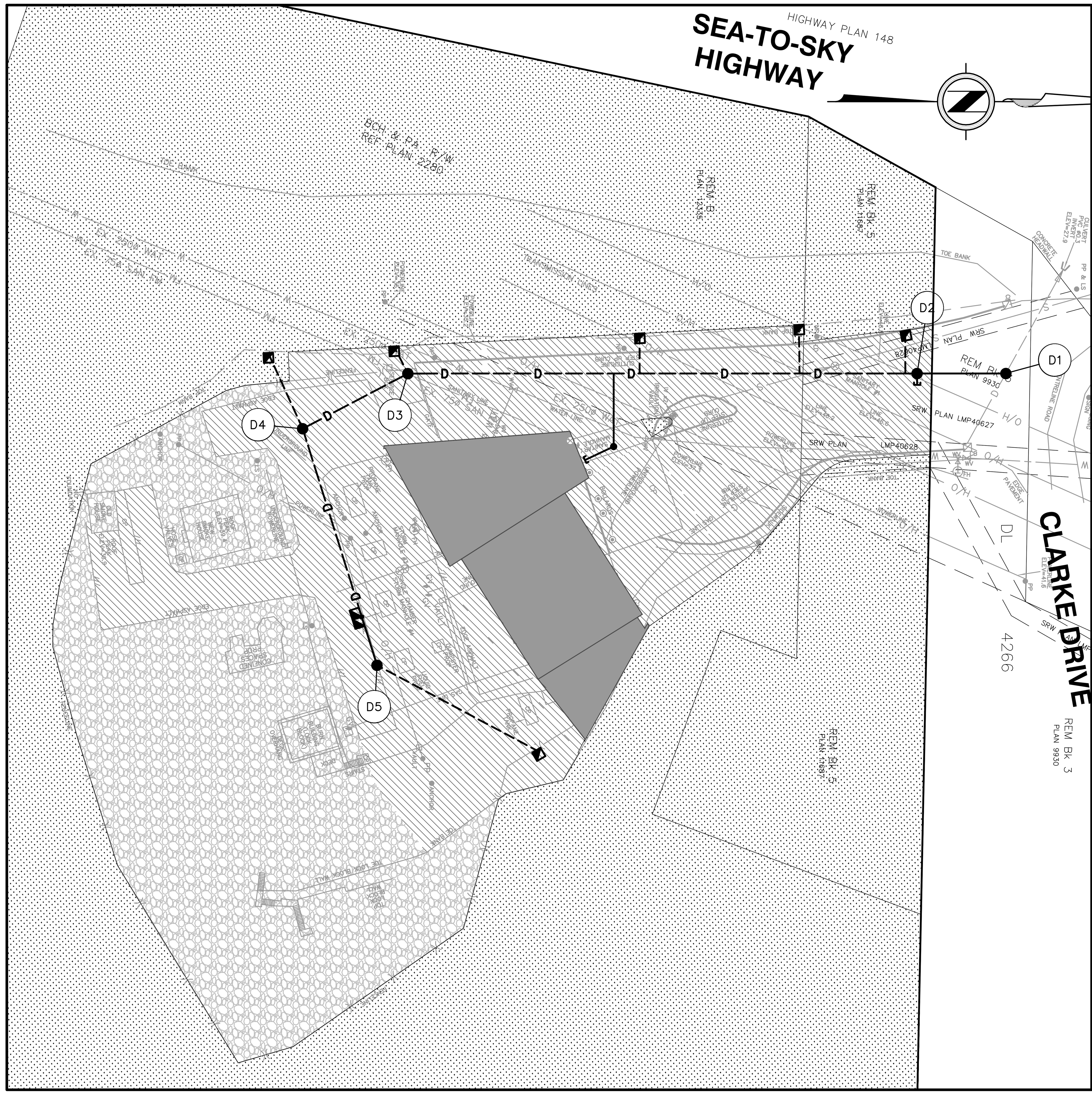
TITLE:
SERVICING PLAN

PROJECT NO. .
DRAWING NO. .
SCALE : HORZ. 1: 250 VERT. N/A
A & M DRAWING NO. 19-5100-03

DESIGN: VG CHECK: DRS
DRAWN: VG APPR: DRS
A & M FILE: 19-5100
DRAWING DATE: FEBRUARY 2020
SHEET NO. 03 OF 04
REV. 03

0 2 1:250 12m





LEGEND:

- BUILDING ROOF
- ASPHALT/CONCRETE
- GREENSPACE
- GRAVEL SURFACE

PRE-CONSTRUCTION ONSITE RUN-OFF COEFFICIENT

Lot Area (m^2)	Concrete/Asphalt	Building Roof	Greenspace	Gravel Surface
56380	3168.2	379.7	48189.5	4642.6
	0	0	0	0
A (ha)	0	0	0	0
5.638	0	0	0	0
Total A (m^2)	3168.2	379.7	48189.5	4642.6
R (Runoff Coefficient)	0.95	0.95	0.3	0.65
A*R	3009.79	360.715	14456.85	3017.69
			Average R =	0.37

PRE-CONSTRUCTION STAGE - CATCHMENT AREAS & RUNOFF COEFFICIENTS

LEGEND:

- BUILDING ROOF
- ASPHALT/CONCRETE
- GREENSPACE
- GRAVEL SURFACE

POST-CONSTRUCTION ONSITE RUN-OFF COEFFICIENT

Lot Area (m^2)	Concrete/Asphalt	Building Roof	Greenspace	Gravel Surface
56380	3205.1	934.2	48792.9	3447.8
	0	0	0	0
A (ha)	0	0	0	0
5.638	0	0	0	0
Total A (m^2)	3205.1	934.2	48792.9	3447.8
R (Runoff Coefficient)	0.95	0.95	0.4	0.65
A*R	3044.845	887.49	19517.16	2241.07
			Average R =	0.46

POST-CONSTRUCTION STAGE - CATCHMENT AREAS & RUNOFF COEFFICIENTS

NOTICE TO CONTRACTOR

IT IS THE RESPONSIBILITY OF THE CONTRACTOR'S SURVEYOR TO VERIFY THAT ALL LEGAL SURVEY DIMENSIONS SHOWN ON THE ENGINEERS DRAWINGS AGREE WITH THOSE ON THE REGISTERED LEGAL SURVEY PLAN. SHOULD THERE BE ANY DISCREPANCIES, THEN IMMEDIATELY NOTIFY THE ENGINEER OF RECORD

LEGAL DESCRIPTION: ON LOT B, EXCEPT PART IN PLAN 17066, SECONDLY PART DEDICATED ROAD ON PLAN BCP30210, DISTRICT LOT 4266 & 4267, GROUP 1, NEW WESTMINSTER DISTRICT, PLAN 12335.

B.M. MONUMENT NO. _ ELEVATION: _
LOCATED AT

REV. NO.	DESCRIPTION	DR	CH	DATE	APP
01	SCHEMATIC DESIGN – DRAFT 1	VG	DRS	FEB 10/20	DRS
02	SCHEMATIC DESIGN – DRAFT 2	VG	DRS	FEB 12/20	DRS
03	SCHEMATIC DESIGN REPORT	VG	DRS	FEB 18/20	DRS

APLIN MARTIN
ENGINEERING ARCHITECTURE PLANNING SURVEYING
Aplin & Martin Consultants Ltd.
#1818 – 1177 West Hastings Street, Vancouver, B.C. V6E 2K3
Tel: (604) 678-9434, Fax: (604) 597-9061, Email: general@aplinmartin.com

CLIENT: HUGHES CONDON MARLER ARCHITECTS (HCMA)
#400 - 675 W HASTINGS STREET, VANCOUVER V6B 1N2
PH. (604) 732-6620

PROJECT: SQUAMISH FIREHALL 1
8989 CLARKE DRIVE
SQUAMISH, BC

The location of existing underground utilities are shown in an approximate way only & have not been independently verified by the owner or its representative. The contractor shall determine the exact location of all existing utilities before commencing work, and agrees to be fully responsible for any and all damages which might be occasioned by the contractor's failure to exactly locate and preserve any and all underground utilities.

TITLE: STORMWATER CATCHMENT PLAN

DESIGN: VG CHECK: DRS
DRAWN: VG APPR: DRS

A & M FILE: 19-5100

PROJECT NO. .

SCALE : HORZ. 1:500 VERT. N/A

DRAWING DATE: FEBRUARY 2020

DRAWING NO. .

A & M DRAWING NO. 19-5100-04

SHEET NO. 04 OF 04

REV. 03

0 5 1:500 25m

Feb 18 2020 – 4:53pm C:\Users\vgan\appdata\local\temp\AcPublish_3372\19-5100 – C04 SWCP.dwg/SWCP

APPENDIX B

STORMWATER DETENTION VOLUME CALCULATION SHEET

Squamish Firehall 1 **19-5100**
8989 Clarke Drive, Squamish **18-Feb-20**

5 Year Peak Flow Calculations

	Tc min	Runoff coeffecient %	Area Ha	Intensity mm	n	Q m^3/s
Q_{Pre}	10	0.37	5.638	40	0.00278	0.234
Q_{Post}	10	0.46	5.638	40	0.00278	0.291

Storage Volume Required (Modified Rational Method)

Storage Volume = $T_r (Q_{p2} - Q_{rel}) + 0.5 \times T_c \times Q_{rel}^2 (1/Q_{p2} - 1/Q_{p1})$

T_r = Duration of storm, in seconds
T_c = Time to concentration, in seconds
Q_{p1} = Peak flow for storm, $T_r = T_c$, m^3/s
Q_{p2} = Peak flow for storm specified, m^3/s
Q_{rel} = Maximum release rate, m^3/s

Maximum Storage Required = **41.03 m^3 (20% F.S.)**

Rainfall Duration Tr min	Rainfall Intensity I mm	Peak Flow Q_{p1} m^3/s	Peak Flow Q_{p2} m^3/s	Required Storage m^3
3	77	0.291	0.552	30
5	58	0.291	0.421	39
10	40	0.291	0.291	34
20	28	0.291	0.202	-14
25	25	0.291	0.179	-47
30	23	0.291	0.163	-84
31	22	0.291	0.160	-92
32	22	0.291	0.157	-100
33	21	0.291	0.154	-108
34	21	0.291	0.152	-116
35	21	0.291	0.150	-124
50	17	0.291	0.124	-255
65	15	0.291	0.108	-397

APLIN MARTIN

ENGINEERING ARCHITECTURE PLANNING SURVEYING

APLIN & MARTIN CONSULTANTS LTD.

1818 – 1177 WEST HASTINGS STREET, VANCOUVER, BC V6E 2K3 | WWW.APLINMARTIN.COM | (604) 678-9434


SEA-TO-SKY HIGHWAY
CLARKE DRIVE
RETAINING WALL #1
ALLAN BLOCK WALL-
MAX HEIGHT 1.0m
PROP. 1.00–0.80m HIGH ALLAN BLOCK RETAINING WALL C/W HANDRAILS.
RETAINING WALL #2
ALLAN BLOCK WALL-
MAX HEIGHT 1.5m
PROP. 1.50m HIGH ALLAN BLOCK RETAINING WALL C/W HANDRAILS.
RETAINING WALL #3
GABION WALL-
MAX HEIGHT 1.6m
PROP. 1.60m HIGH GABION RETAINING WALL (TYP.)
PROP. ASPHALT DRIVEWAY & PARKING STALL PAVING (TYP.)
PROP. CONCRETE WALKWAY
PROP. CONCRETE BARRIER CURB & GUTTER
EX. CATCH BASIN TO REMAIN
CONTOUR ELEVATION 30.50m
MUST MAINTAIN ELEVATION TO TIE INTO EX. ASPHALT WITHIN WORK ZONE
PROP. 31.50m (TYP.)
PROP. 31.00 (TYP.)
PROP. 30.20 (TYP.)
PROP. GATE
PROP. CONCRETE BARRIER CURB & REVERSE GUTTER
EX. FIRE HYDRANTS TO BE REMOVED OR RELOCATED (TYP.)
PROPOSED FIREHALL 1 BUILDING MFE=31.40m
PROP. CONCRETE FIRE TRUCK DRIVEWAY PAVING
EX. TRAINING STRUCTURE TO REMAIN
EX. HYDRO POWER POLES & LINES TO BE RELOCATED (TYP.)
EX. WORK AREA GRADES TO BE MAINTAINED
EX. CONCRETE PADS & STRUCTURES TO BE REMOVED (TYP.)
PROP. CONCRETE PADS AS REQUIRED (TYP.)
EX. DRIVEWAY PAVING, CURB & SIDEWALK TO BE REMOVED
PROP. CONCRETE CURB & GUTTER (TYP.)
PROP. CONCRETE FIRE TRUCK DRIVEWAY PAVING
EX. FIREHALL STRUCTURE TO BE DEMOLISHED
EX. STAIRS & LOCK BLOCK WALLS TO REMAIN
SECTION A
SECTION B
SECTION C
SECTION D
REM B PLAN 12335
REM Bk 5 PLAN 11687
REM Bk 4 PLAN 11320
REM Bk 3 PLAN 9930
BCH & PA R/W PLAN 2280
SRW PLAN LMP40627
SRW PLAN LMP41906
DL 4266
LEGEND:
MFE=08.50m MINIMUM FLOOR ELEVATION
MANHOLE
CATCH BASIN
LAWN BASIN
FIRE HYDRANT
BLOWOFF
CONCRETE CURB
RETAINING WALL
EDGE OF ASPHALT
ASPHALT SURFACE
GRAVEL SURFACE
CONCRETE SURFACE
CONCRETE SIDEWALK
LANDSCAPE AREA
UNDERGROUND INFILTRATION TANK
RAIN GARDEN/ BIOSWALE
D1 MANHOLE ID

NOTICE TO CONTRACTOR

IT IS THE RESPONSIBILITY OF THE CONTRACTOR'S SURVEYOR TO VERIFY THAT ALL LEGAL SURVEY DIMENSIONS SHOWN ON THE ENGINEERS DRAWINGS AGREE WITH THOSE ON THE REGISTERED LEGAL SURVEY PLAN. SHOULD THERE BE ANY DISCREPANCIES, THEN IMMEDIATELY NOTIFY THE ENGINEER OF RECORD

LEGAL DESCRIPTION: ON LOT 8, EXCEPT PART IN PLAN 17066, SECONDLY PART DEDICATED ROAD ON PLAN BCP30210, DISTRICT LOT 4266 & 4267, GROUP 1, NEW WESTMINSTER DISTRICT, PLAN 12335.

B.M. MONUMENT NO. _ ELEVATION: _
LOCATED AT

REV. NO.	DESCRIPTION	DR	CH	DATE	APP
01	UPDATED LAYOUT AS PER ARCH DISCUSSION	VG	DRS	MAR 10/20	DRS

APLIN MARTIN
ENGINEERING ARCHITECTURE PLANNING SURVEYING
Aplin & Martin Consultants Ltd.
#1818 – 1177 West Hastings Street, Vancouver, B.C. V6E 2K3
Tel: (604) 678-9434, Fax: (604) 597-9061, Email: general@aplinmartin.com

CLIENT:
HUGHES CONDON MARLER ARCHITECTS (HCMA)
#400 - 675 W HASTINGS STREET, VANCOUVER V6B 1N2
PH. (604) 732-6620

PROJECT:
SQUAMISH FIREHALL 1
8989 CLARKE DRIVE
SQUAMISH, BC

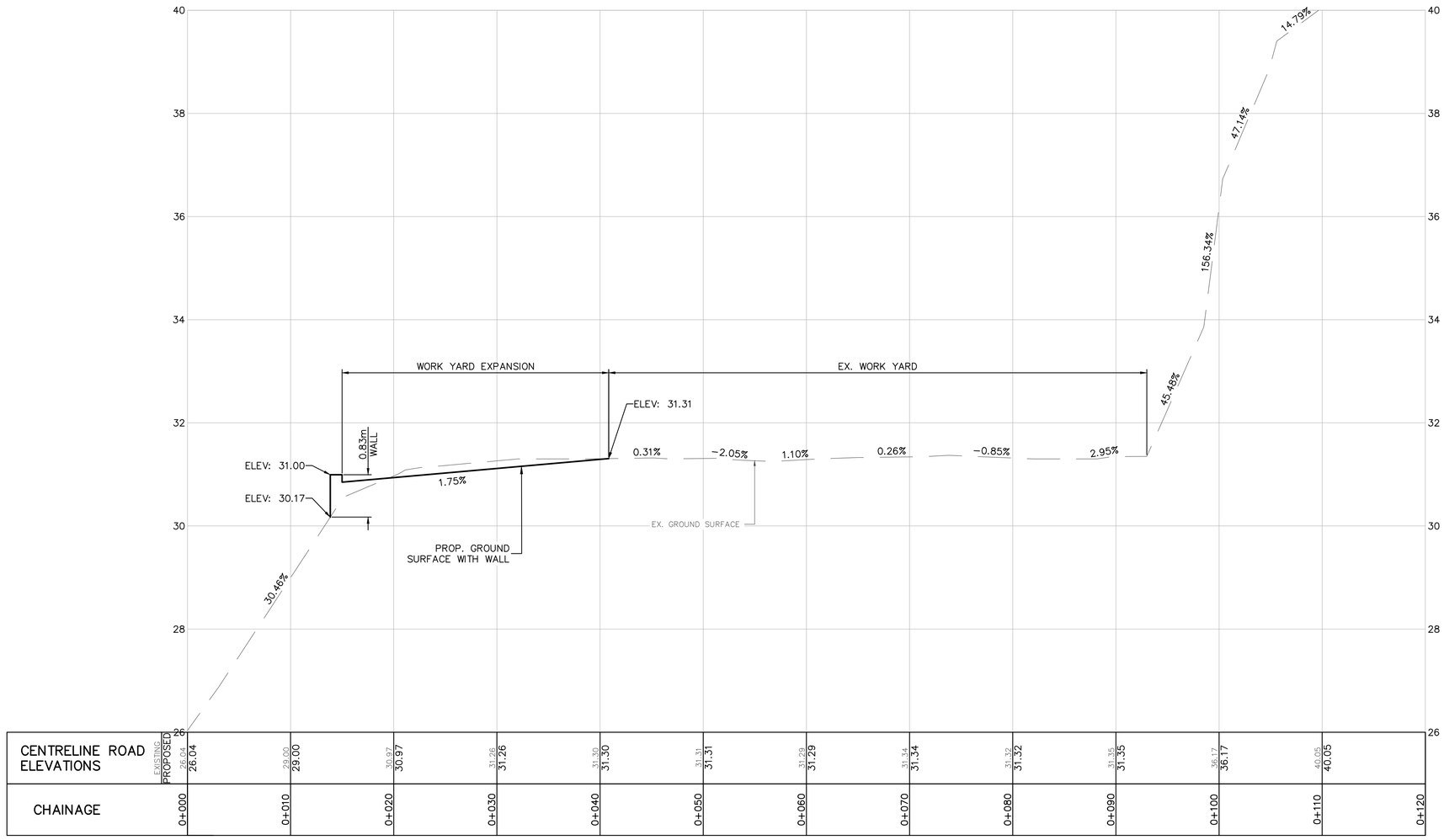
The location of existing underground utilities are shown in an approximate way only & have not been independently verified by the owner or its representative. The contractor shall determine the exact location of all existing utilities before commencing work, and agrees to be fully responsible for any and all damages which might be occasioned by the contractor's failure to exactly locate and preserve any and all underground utilities.

TITLE:
GRADING PLAN

PROJECT NO. .
DRAWING NO. .

SCALE: HORZ. 1:250 VERT. N/A
A & M DRAWING NO. 19-5100-JDSsk01

DESIGN: VG CHECK: DRS
DRAWN: VG APPR.: DRS
A & M FILE: 19-5100
DRAWING DATE: FEBRUARY 2020
SHEET NO. 01 OF 05
REV. 01



WEST SLOPE SECTION A

1:250 HOR.
1:50 VERT.

NOTICE TO CONTRACTOR

IT IS THE RESPONSIBILITY OF THE CONTRACTOR'S SURVEYOR TO VERIFY THAT ALL LEGAL SURVEY DIMENSIONS SHOWN ON THE ENGINEERS DRAWINGS AGREE WITH THOSE ON THE REGISTERED LEGAL SURVEY PLAN. SHOULD THERE BE ANY DISCREPANCIES, THEN IMMEDIATELY NOTIFY THE ENGINEER OF RECORD

LEGAL DESCRIPTION: ON LOT B, EXCEPT PART IN PLAN 17066, SECONDLY PART DEDICATED ROAD ON PLAN BCP30210, DISTRICT LOT 4266 & 4267, GROUP 1, NEW WESTMINSTER DISTRICT, PLAN 12335.

B.M. MONUMENT NO. _ ELEVATION: _
LOCATED AT

REV. NO.	DESCRIPTION	DR	CH	DATE	APP
01	UPDATED LAYOUT AS PER ARCH DISCUSSION	VG	DRS	MAR 10/20	DRS

APLIN MARTIN
ENGINEERING ARCHITECTURE PLANNING SURVEYING

Aplin & Martin Consultants Ltd.
#1818 – 1177 West Hastings Street, Vancouver, B.C. V6E 2K3
Tel: (604) 678-9434, Fax: (604) 597-9061, Email: general@aplinmartin.com

CLIENT:
HUGHES CONDON MARLER ARCHITECTS (HCMA)
#400 - 675 W HASTINGS STREET, VANCOUVER V6B 1N2
PH. (604) 732-6620

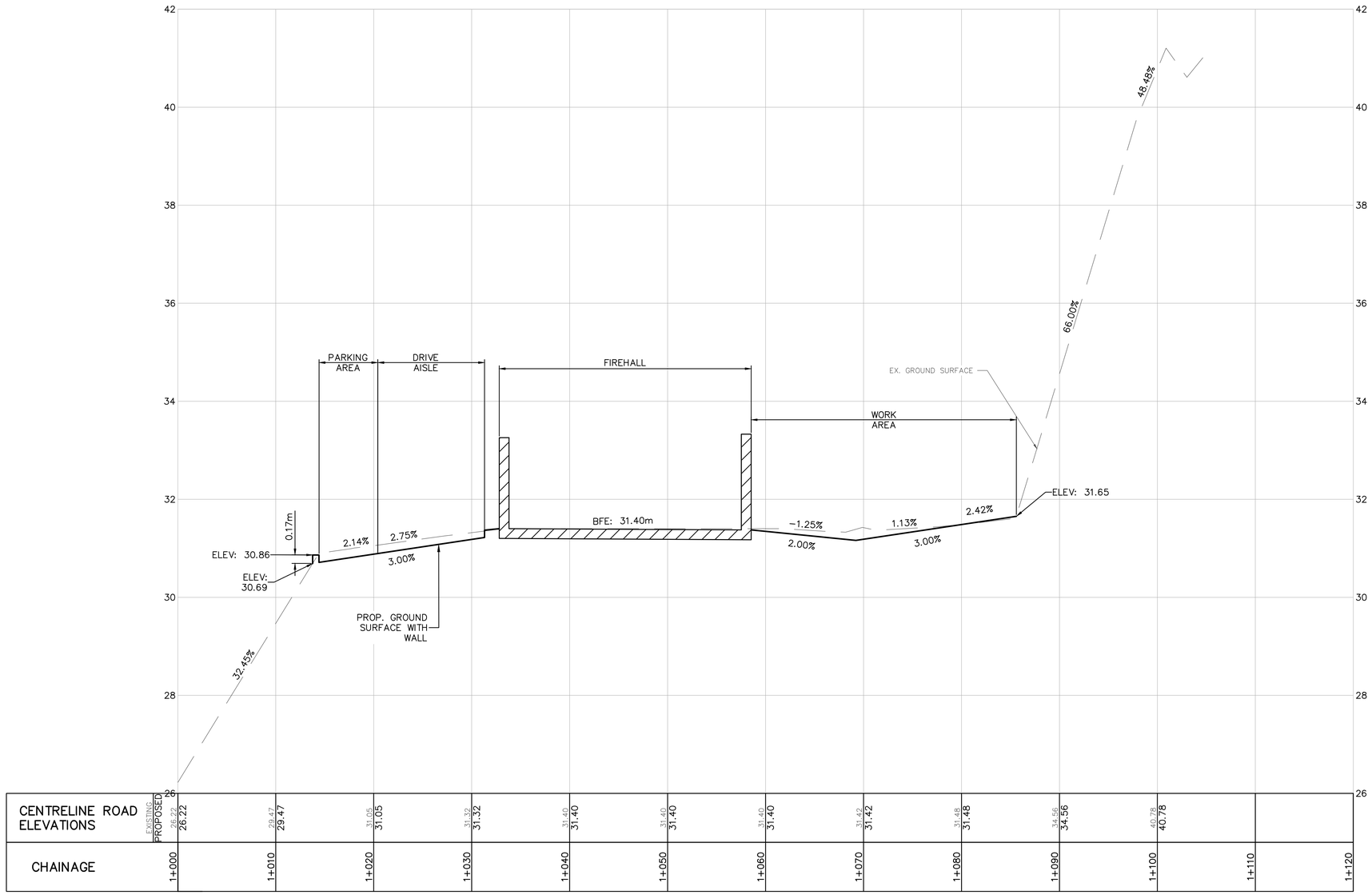
PROJECT:
SQUAMISH FIREHALL 1
8989 CLARKE DRIVE
SQUAMISH, BC

The location of existing underground utilities are shown in an approximate way only & have not been independently verified by the owner or its representative. The contractor shall determine the exact location of all existing utilities before commencing work, and agrees to be fully responsible for any and all damages which might be occasioned by the contractor's failure to exactly locate and preserve any and all underground utilities.

TITLE: **SECTION A**

DESIGN: VG CHECK: DRS
DRAWN: VG APPR: DRS
A & M FILE: **19-5100**
PROJECT NO. .
SCALE : HORZ. 1:250 VERT. 1:50
DRAWING DATE: **FEBRUARY 2020**
DRAWING NO. .
A & M DRAWING NO. **19-5100-JDSsk01**
SHEET NO. **02 OF 05**
REV. **01**

0 2 1:250 12m



SECTION B
1:250 HOR.
1:50 VERT.

NOTICE TO CONTRACTOR

IT IS THE RESPONSIBILITY OF THE CONTRACTOR'S SURVEYOR TO VERIFY THAT ALL LEGAL SURVEY DIMENSIONS SHOWN ON THE ENGINEERS DRAWINGS AGREE WITH THOSE ON THE REGISTERED LEGAL SURVEY PLAN. SHOULD THERE BE ANY DISCREPANCIES, THEN IMMEDIATELY NOTIFY THE ENGINEER OF RECORD

LEGAL DESCRIPTION: ON LOT B, EXCEPT PART IN PLAN 17066, SECONDLY PART DEDICATED ROAD ON PLAN BCP30210, DISTRICT LOT 4266 & 4267, GROUP 1, NEW WESTMINSTER DISTRICT, PLAN 12335.

B.M. MONUMENT NO. – ELEVATION: –
LOCATED AT

REV. NO.	DESCRIPTION	DR	CH	DATE	APP
01	UPDATED LAYOUT AS PER ARCH DISCUSSION	VG	DRS	MAR 10/20	DRS

APLIN MARTIN
ENGINEERING ARCHITECTURE PLANNING SURVEYING

Aplin & Martin Consultants Ltd.
#1818 – 1177 West Hastings Street, Vancouver, B.C. V6E 2K3
Tel: (604) 678-9434, Fax: (604) 597-9061, Email: general@aplinmartin.com

CLIENT:
HUGHES CONDON MARLER ARCHITECTS (HCMA)
#400 - 675 W HASTINGS STREET, VANCOUVER V6B 1N2
PH. (604) 732-6620

PROJECT:
SQUAMISH FIREHALL 1
8989 CLARKE DRIVE
SQUAMISH, BC

The location of existing underground utilities are shown in an approximate way only & have not been independently verified by the owner or its representative. The contractor shall determine the exact location of all existing utilities before commencing work, and agrees to be fully responsible for any and all damages which might be occasioned by the contractor's failure to exactly locate and preserve any and all underground utilities.

TITLE: **SECTION B**

DESIGN: VG CHECK: DRS
DRAWN: VG APPR: DRS

A & M FILE: **19-5100**

PROJECT NO. .

SCALE : HORZ. 1:250 VERT. 1:50

DRAWING DATE: **FEBRUARY 2020**

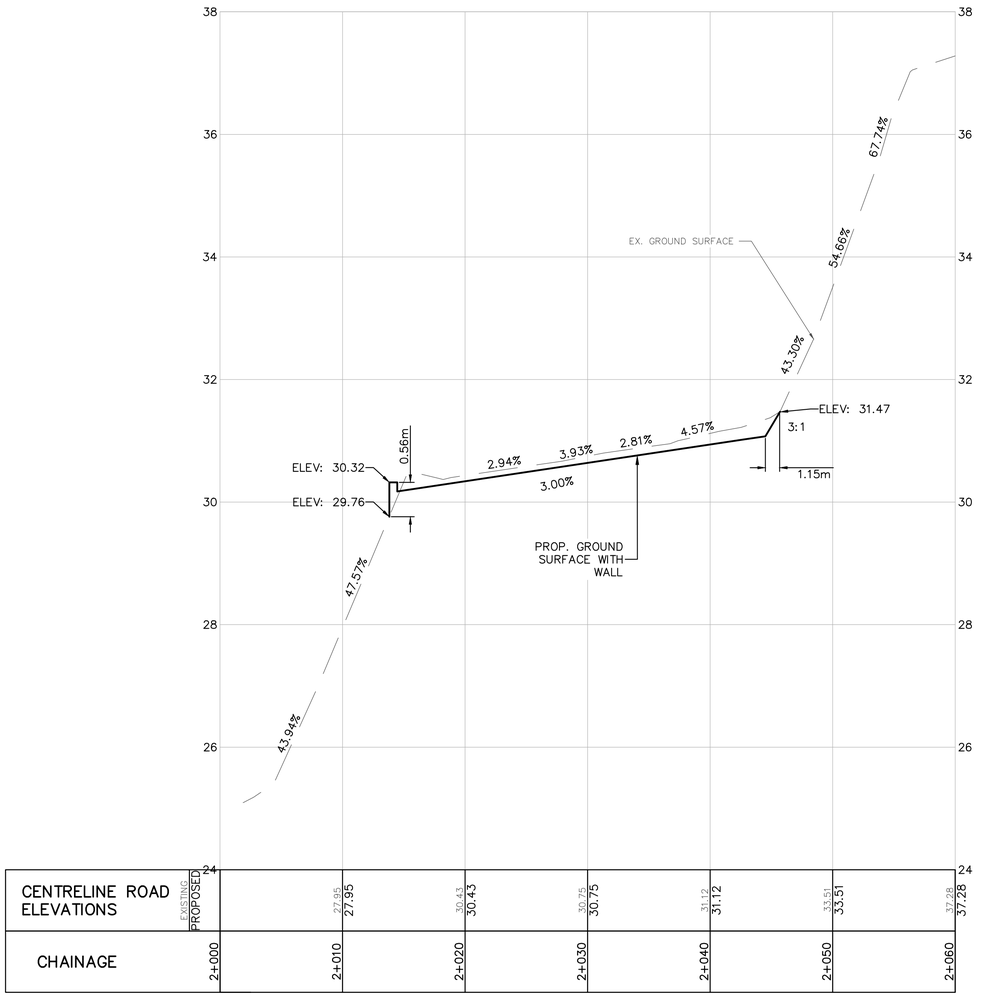
DRAWING NO. .

A & M DRAWING NO. **19-5100-JDSsk01**

SHEET NO. **03 OF 05**

REV. **01**

0 2 1:250 12m



SECTION C

1:250 HOR.
1:50 VERT.

NOTICE TO CONTRACTOR

IT IS THE RESPONSIBILITY OF THE CONTRACTOR'S SURVEYOR TO VERIFY THAT ALL LEGAL SURVEY DIMENSIONS SHOWN ON THE ENGINEERS DRAWINGS AGREE WITH THOSE ON THE REGISTERED LEGAL SURVEY PLAN. SHOULD THERE BE ANY DISCREPANCIES, THEN IMMEDIATELY NOTIFY THE ENGINEER OF RECORD

LEGAL DESCRIPTION: ON LOT B, EXCEPT PART IN PLAN 17066, SECONDLY PART DEDICATED ROAD ON PLAN BCP30210, DISTRICT LOT 4266 & 4267, GROUP 1, NEW WESTMINSTER DISTRICT, PLAN 12335.

B.M. MONUMENT NO. _ ELEVATION: _
LOCATED AT

REV. NO.	DESCRIPTION	DR	CH	DATE	APP
01	UPDATED LAYOUT AS PER ARCH DISCUSSION	VG	DRS	MAR 10/20	DRS

APLIN MARTIN
ENGINEERING ARCHITECTURE PLANNING SURVEYING

Aplin & Martin Consultants Ltd.
#1818 – 1177 West Hastings Street, Vancouver, B.C. V6E 2K3
Tel: (604) 678-9434, Fax: (604) 597-9061, Email: general@aplinmartin.com

CLIENT:
HUGHES CONDON MARLER ARCHITECTS (HCMA)
#400 - 675 W HASTINGS STREET, VANCOUVER V6B 1N2
PH. (604) 732-6620

PROJECT:
SQUAMISH FIREHALL 1
8989 CLARKE DRIVE
SQUAMISH, BC

The location of existing underground utilities are shown in an approximate way only & have not been independently verified by the owner or its representative. The contractor shall determine the exact location of all existing utilities before commencing work, and agrees to be fully responsible for any and all damages which might be occasioned by the contractor's failure to exactly locate and preserve any and all underground utilities.

TITLE: **SECTION C**

DESIGN: VG CHECK: DRS
DRAWN: VG APPR: DRS

A & M FILE: **19-5100**

PROJECT NO. .

SCALE : HORZ. 1:250 VERT. 1:50

DRAWING DATE: **FEBRUARY 2020**

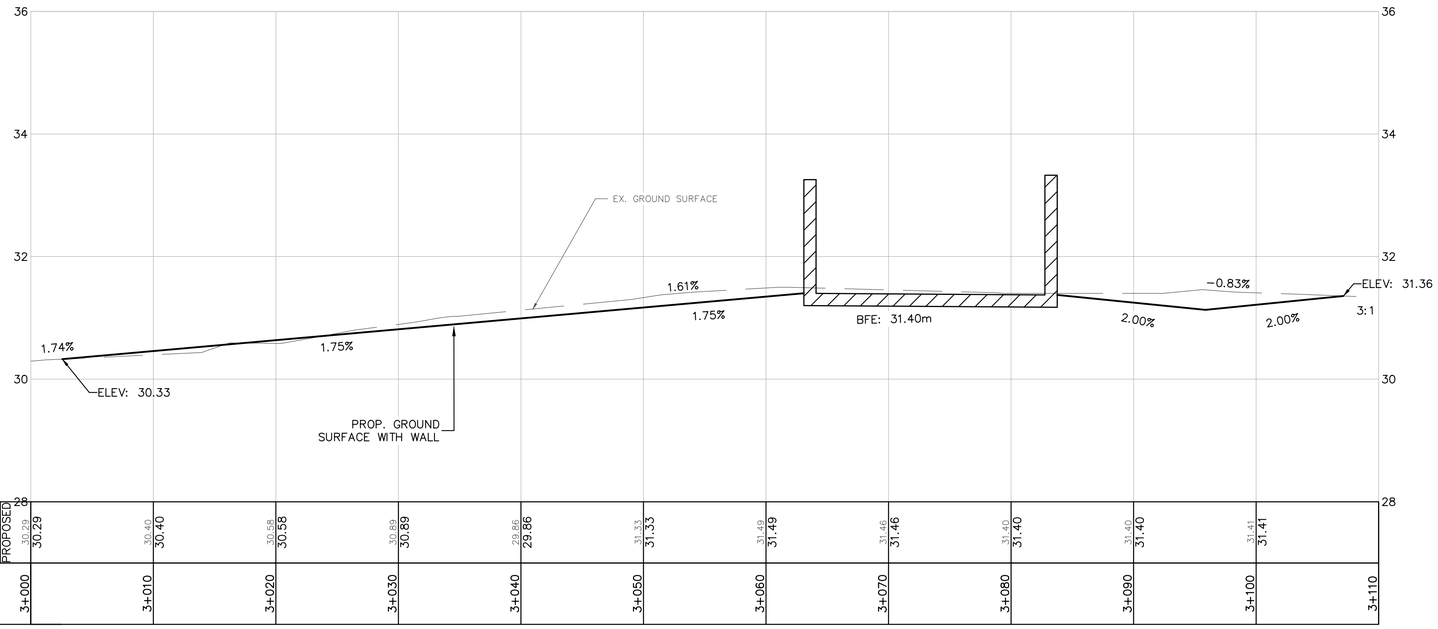
DRAWING NO. .

A & M DRAWING NO. **19-5100-JDSsk01**

SHEET NO. **04 OF 05**

REV. **01**

0 2 1:250 12m



SECTION D

1:250 HOR.
1:50 VERT.

NOTICE TO CONTRACTOR

IT IS THE RESPONSIBILITY OF THE CONTRACTOR'S SURVEYOR TO VERIFY THAT ALL LEGAL SURVEY DIMENSIONS SHOWN ON THE ENGINEERS DRAWINGS AGREE WITH THOSE ON THE REGISTERED LEGAL SURVEY PLAN. SHOULD THERE BE ANY DISCREPANCIES, THEN IMMEDIATELY NOTIFY THE ENGINEER OF RECORD

LEGAL DESCRIPTION: ON LOT B, EXCEPT PART IN PLAN 17066, SECONDLY PART DEDICATED ROAD ON PLAN BCP30210, DISTRICT LOT 4266 & 4267, GROUP 1, NEW WESTMINSTER DISTRICT, PLAN 12335.

B.M. MONUMENT NO. _ ELEVATION: _
LOCATED AT

REV. NO.	DESCRIPTION	DR	CH	DATE	APP
01	UPDATED LAYOUT AS PER ARCH DISCUSSION	VG	DRS	MAR 10/20	DRS

APLIN MARTIN
ENGINEERING ARCHITECTURE PLANNING SURVEYING
Aplin & Martin Consultants Ltd.
#1818 – 1177 West Hastings Street, Vancouver, B.C. V6E 2K3
Tel: (604) 678-9434, Fax: (604) 597-9061, Email: general@aplinmartin.com

CLIENT:
HUGHES CONDON MARLER ARCHITECTS (HCMA)
#400 - 675 W HASTINGS STREET, VANCOUVER V6B 1N2
PH. (604) 732-6620

PROJECT:
SQUAMISH FIREHALL 1
8989 CLARKE DRIVE
SQUAMISH, BC

The location of existing underground utilities are shown in an approximate way only & have not been independently verified by the owner or its representative. The contractor shall determine the exact location of all existing utilities before commencing work, and agrees to be fully responsible for any and all damages which might be occasioned by the contractor's failure to exactly locate and preserve any and all underground utilities.

TITLE: **SECTION D**

DESIGN: VG CHECK: DRS
DRAWN: VG APPR: DRS
A & M FILE: **19-5100**
PROJECT NO. .
SCALE : HORZ. 1:250 VERT. 1:50
DRAWING DATE: **FEBRUARY 2020**
DRAWING NO. .
A & M DRAWING NO. **19-5100-JDSsk01**
SHEET NO. **05 OF 05**
REV. **01**

0 2 1:250 12m

Apr 16 2020 - 12:51pm M:\2019\19-5100_JDS\04_CAD\02_ONSITE PRODUCTION_WORKING DWGS\19-5100-JDSsk01 - DRAWING PLAN not Paying\SECTION D (no wall).dwg

Mechanical + Electrical Schematic Design Report

Squamish Fire Hall No.1 Replacement

Prepared for:

HCMA Architecture + Design
#400 – 675 West Hastings Street
Vancouver, BC V6B 1N2

Developed by:

Integral Group
Suite 180 - 200 Granville Street
Vancouver, BC V6C 1S4

Project No: 151985.000

February 14, 2020

TABLE OF CONTENTS

INTRODUCTION

The intent of this report is to evaluate the mechanical / electrical system design options and recommend concepts that best meets the overall performance and capital cost requirements of the Squamish Fire Hall #1 (Squamish Fire Hall) replacement project. This report describes the methodology used to evaluate the options and outlines system specifications to assist the cost consultant in developing their cost evaluation for the project.

1. PROJECT SUMMARY

The project site is located at 37890 Clark Drive, in the District of Squamish (DoS). The intent behind the new Squamish Fire Hall will be to construct a modern firehall for Squamish Fire Rescue while keeping the existing training facility functioning:

- The District of Squamish's Fire and Rescue Services' headquarters and administration are currently located at the site of the new Squamish Fire Hall. A temporary fire hall will be provided nearby to serve the Squamish Fire department during construction of the new fire hall.
- Also included in the renovation is the relocation of the District Emergency Operations Center (EOC) and main IT system.

The purpose of this report is to summarize the mechanical, plumbing, fire protection and electrical systems that are proposed for the construction of the new Squamish Fire Hall building.

1.1 Project Goals

The District of Squamish has stated that the following project goals are desired for the Squamish Fire Hall:

1. The project is targeting LEED v4 Gold certification, meaning it must achieve a minimum of 60 points.
2. Reduction of greenhouse gas emissions by moving towards a mechanical system that does not consume fossil fuels for heating. This project goal will drive the design to one utilizing electricity as the primary heating and cooling source.
3. Existing training facilities are to remain accessible and functional while the new fire hall is being constructed. A temporary fire hall will be located on a nearby site to house staff and volunteers, but the training facilities must remain in place.

1.2 Codes and Standards

The project will, at a minimum, be designed to meet the following applicable codes and standards:

1. British Columbia Building Code 2018
2. British Columbia Plumbing Code 2018
3. British Columbia Fire Code 2018
4. NFPA 13 – 2013 Standard for Installation of Sprinkler Systems
5. NFPA 10 – 2013 Standard for Portable Fire Extinguishers
6. ASHRAE 55 – 2010 Thermal Environmental Conditions
7. ASHRAE 62 – 2001 Ventilation for Acceptable Indoor Air Quality – Except Addendum N
8. ASHRAE 90.1 – 2016 Energy Standard for Buildings Except Low-Rise Residential Buildings
9. CAN/ULC S-524 Standard for the Installation of Fire Alarm System
10. CSA C22.1 – 18 Canadian Electrical Code
11. IESNA Lighting Handbook (latest edition)

12. TIA/EIA Communication Standards
13. CSA B44-16 Safety Code for Elevators and Escalators
14. CaGBC LEED Green Building Rating System v4

1.3 Mechanical HVAC Design Criteria

1. Design Conditions

Outdoor Design Condition	Recommended Design Conditions
Winter Outdoor Temperature	-11 °C
Summer Outdoor Temperature	29 °C db, 20 °C wb
Winter Indoor Operative Temperature (Office + Dorm Areas)	22 °C db
Winter Indoor Operative Temperature (Apparatus Bays)	10 °C db
Summer Indoor Operative Temperature	24 °C db

2. LEED Gold

The following criteria have been identified as relevant to the mechanical systems in order to meet the LEED Gold v4 requirement:

Table 1: LEED References

Description	Reference
Water efficient plumbing fixtures targeting 40% water use reduction compared to baseline	LEED WE Credit 2
Water metering for domestic hot water, domestic cold water, apparatus bay and irrigation	LEED WE Credit 4
Exceed ASHRAE 90.1-2010 by 5%	LEED EA Prereq 2
Exceed ASHRAE 90.1-2010 by 24%	LEED EA Credit 2
Select equipment with refrigerant types and quantities to minimise ozone depletion and global warming potential	LEED EA Credit 6
Comply with ASHRAE 62.1 – 2010 ventilation rates and provide airflow monitoring	LEED EQ Prereq 1
Design HVAC systems to meet requirements of ASHRAE 55 - 2010	LEED EQ Credit 5
Provide CO2 monitoring throughout the building	LEED EQ Credit 2

3. Internal HVAC Design Criteria

Space	Cooling Design	Heating Design	Ventilation Rate - Person (Rp)	Ventilation Rate - Area (Ra)	Exhaust Rate	Noise Criteria
Apparatus Bays	-	10°C	-	0.12 l/s*m^2	283 l/s per apparatus	-
Hose Tower	-	10°C	-	-	10 l/s*m^2	-

Space	Cooling Design	Heating Design	Ventilation Rate - Person (Rp)	Ventilation Rate - Area (Ra)	Exhaust Rate	Noise Criteria
Office Spaces	24°C	22°C	2.5 l/s*p	0.3 l/s*m^2		35
Meeting Rooms	24°C	22°C	2.5 l/s*p	0.3 l/s*m^2		30
Training / Classrooms	24°C	22°C	3.8 l/s*p	0.3 l/s*m^2		30
Multipurpose / Day Rooms	24°C	22°C	2.5 l/s*p	0.3 l/s*m^2		30
Dorm Rooms	22°C	18°C	2.5 l/s*p	0.3 l/s*m^2		30
Fitness Room	20°C	18°C	10 l/s*p	0.3 l/s*m^2		-
Gear Storage Room	-	22°C		8 ACH	8 ACH	-
Locker Rooms	-	22°C	-	-	2.5 l/s·m^2	-
Storage Rooms	-	22°C	2.5 l/s*p	0.3 l/s*m^2		-
Kitchen	24°C	22°C	-	3.0 l/s*m^2	3.0 l/s·m^2	-
Circulation Spaces	24°C	22°C	-	0.30 l/s·m^2	-	40
Laundry Rooms	-	22°C	-	-	5.0 l/s·m^2	-
Janitor Rooms	-	15°C	-	-	5.0 l/s·m^2	-
Washrooms - Private	-	22°C	-	-	12.5 l/s per fixture	35
Washrooms - Public	-	22°C	-	-	25 l/s per fixture	35
Staircases / Vestibules	-	15°C (min)	-	-	-	-
Communication / IT Rooms	24°C	-	-	0.3 l/s*m^2	-	-
Mechanical / Electrical Room	30°C	15°C (min)	-	0.3 l/s*m^2	-	-

4. Cooling Load Allowance

Space	People	Lighting	Plug Load
Office & Meeting Spaces	72 W sensible / 50 W latent	8.96 W/m^2	15 W/m^2
Apparatus Bays	87 W sensible / 133 W latent	4.8 W/m^2	20 W/m^2
Fitness Rooms	140 W sensible / 125 W latent	6.24 W/m^2	20 W/m^2
Dorm Rooms	68 W sensible / 35 W latent	2.16 W/m^2	15 W/m^2
Storage Spaces	-	5.44 W/m^2	10 W/m^2
Circulation Spaces	87 W sensible / 50 W latent	5.68 W/m^2	10 W/m^2
Washrooms	-	8.4 W/m^2	-
Locker Rooms	-	6.48 W/m^2	-
Mechanical Room	-	8.16 W/m^2	15 W/m^2
Communication/IT Room*	-	8.16 W/m^2	TBD*
Electrical Room*	-	8.16 W/m^2	TBD*

** Cooling load allowances for Electrical and Communication rooms will be dependent on the specific equipment installed within these rooms and their heat dissipation rates.*

1.4 Electrical Design Criteria

1. LEED Gold

The following criteria have been identified as relevant to the Electrical systems in order to meet the LEED Gold v4 requirement:

Table 2: LEED References

Description	Reference
EV Charging for 3 vehicles	LEED LT Credit 8
BUG Ratings for Exterior luminaires including training area*	LEED SS Credit 6
Exceed ASHRAE 90.1-2010 by 5%	LEED EA Prereq 2
Provide building level metering	LEED EA Prereq 3
Establish an energy performance target	LEED EA Credit 2
Provide metering for separate systems which use 10% or more of total annual energy consumption	LEED EA Credit 3
Design building for participation in demand response programs through load shedding/shifting	LEED EA Credit 4
Provide lighting control within each space	LEED EQ Credit 6
Select 4 strategies for lighting quality. Proposed strategies are: A. For all spaces, fixtures shall have <2,500 cd/m2 between 45-90deg from nadir B. Fixtures shall be 80CRI or higher C. L70 > 24,000 hours for 75% of load D. Use direct-only lighting for <25% of connected lighting load	LEED EQ Credit 6

2. Electrical Code Load Summary

Table 3: Preliminary Electrical Load Summary

CODE PRESCRIBED LOADING			
Description	**Watts per Square Meter**	**Service Conductor Demand Factors**	**Feeder Demand Factors**
Office – First 930 m2	50	90%	100%
Office – All in excess of 930 m2	50	70%	90%
Garage	10	100%	100%
Commercial	25	100%	100%
Sleeping quarters (8-208 Hotels, dorms, etc.)	20	80%	100%

* Demand and Code values are based on the C.E.C. 2018 Table 14. Includes basic lighting loads and general loads.

REMAINING LOADS		
Description	**Watts**	**Demand Factors**
Electric Vehicle Chargers	6.7Kw / Station	100%
Mechanical Loads	See SKE E03	80-100% as appropriate
Elevator	20HP*	95%
Equipment Loads	11 W/m^2 *	80%
Future	25% future capacity	100%

* Loads are based on RSMeans/BSRIA Rules of thumb

Based on square footage, preliminary power requirement calcs are per below:

Table 4: Preliminary load calcs

See SKE E03

3. Voltage drop on conductors is required to meet the following:
    1. Feeder connections, maximum 2% voltage drop
    2. Branch circuit conductors, maximum 3% voltage drop
    3. Overall system, maximum 5% voltage drop

1.5 Lighting Design Criteria

1. Lighting energy target: ASHRAE 90. 2016 requirements or better
2. All luminaires shall be high efficacy (lumens/watt)
3. Interior Building Spaces

Space	Illumination Levels (foot candles)	Target Lighting Power Density
Office & Meeting Spaces	40 fc	8.96 W/m^2
Apparatus Bays	50 fc	4.8 W/m^2
Fitness Rooms	35 fc	6.24 W/m^2
Dorm Rooms	25 fc	2.16 W/m^2
Storage Spaces	15 fc	5.44 W/m^2
Circulation Spaces	20 fc	5.68 W/m^2
Washrooms	25 fc	8.4 W/m^2
Locker Rooms	25 fc	6.48 W/m^2
Mechanical Room	40 fc	8.16 W/m^2
Communication/IT Room*	40 fc	8.16 W/m^2
Electrical Room*	40 fc	8.16 W/m^2

** Lighting shall be capable for bi-level lighting to allow for dimming controls and off-peak hour reductions.*

4. Exterior Building Spaces

Space	Illumination Levels (foot candles)	Lighting Power Density
Uncovered Parking *	3 fc	n/a
Egress Doors *	5 fc	n/a
Exterior Pathways *	1 fc	n/a
Training Yard	50 fc, or as required	n/a

** Lighting shall be capable for bi-level lighting to allow for off peak hour reductions and be Dark Sky compliant, with proper BUG ratings to meet the intent of LEED v4 Gold.*

2. HEATING AND COOLING SYSTEMS

Based on the discussions to date, the District of Squamish is looking for mechanicals system which balance the following imperatives for the new Squamish Fire Hall:

- Reduction of greenhouse emissions and use of low carbon solutions for heating systems
- Requirement for resilient systems with the ability to continue operations during post-disaster conditions
- The LEED scorecard is currently targeting 10 points for Energy Optimization (EAc1) which represents a 24% improvement over the baseline scenario.
- Cost effective systems that minimizes system complexity, and allow for ease of use for facilities managers

To achieve this approach, three mechanical plant approaches were initially proposed for DOS's consideration:

1) Air-to-Water Heat Pumps (Air Source Heat Pumps)
2) Ground source heat pumps (water-to-water) for heating and chilled water distribution coupled with closed-loop vertical geoexchange boreholes.
3) Air-to-Refrigerant Heat Pumps via use of Variable Refrigerant Flow (VRF System)

Budgetary constraints removed the ground source heat pump option from consideration. Squamish's relatively mild climate and extended shoulder seasons allow air source heat pump technology to operate at high efficiencies throughout the year. Both options listed above utilize air source heat pumps technology to provide heating and cooling, though each system presents its own separate sets of benefits and challenges.

After considering the three system types, the project team had agreed to moving forward with option 1 which consists of air-to-water heat pumps as the primary mechanical plant for heating and cooling.

2.1 Heating & Cooling Plant: Air-to-Water Heat Pumps (Air Source Heat Pumps)

Air-to-water heat pumps, located on the roof of the building, are capable of supplying both heating and chilled water for distribution to the building's heating and cooling terminal units.

A summary of the benefits and challenges of this option have been summarized in the following table:

System Type	Benefits	Challenges
Air Source Heat Pumps (Air-to-Water)	• Ability to pre-heat domestic hot water • Hydronic system offers ability for more efficient equipment to be retrofitted • Refrigerant gas limited to within roof mounted equipment, and not distributed around the building • Increased flexibility with terminal units compared to VRF system	• Costlier system to implement compared to VRF • Availability of viable/reliable equipment to provide true competitive tendering • Additional space required for mechanical equipment when compared to VRF • Additional back-up heating required during peak heating season; this is a double negative as the systems will normally rely on natural gas for back-up which runs contrary to the GHG reduction policy • Commissioning • Custom DDC controls, which are more complex, when compared to VRF option • Increased system maintenance compared to VRF option • Defrost cycle not included in many manufacturer's performance data or well resolved

Two (2) 20 ton air source heat pumps (ASHPs) will be responsible for producing hydronic heating and chilled water to serve the heating and cooling requirements of the new building. The ASHP will comprise of a 4-pipe configuration allowing for both heating and chilled water to be produced on demand. Due to the limitations of the air-to-water heat pump technology during low ambient air conditions, electric back-up heating boilers are required to supplement heating requirements for the building during the peak heating season. Electric boilers were chosen over gas fired boilers in response to the DOS's request to reduce greenhouse gas emissions for the new facility while avoiding the need to use fossil fuels as a fuel source. One (1) 162 kW electric boiler capable of fulfilling the peak heating load requirements is recommended to provide peak heating capacity and redundancy.

Two primary (2) heating and two (2) chilled water pumps, arranged in duty/standby configuration, will pump chilled and heating water between from the ASHPs to be stored in their respective buffer tanks. Buffer tanks provide several benefits for the operation of the hydronic system; including reduced ASHP compressor run times, increased equipment service life and on-demand heating and chilled water for low-mass terminal units. Two secondary (2) heating and two (2) chilled water pumps, arranged in a duty/standby configuration, will be installed downstream of each buffer tank and controlled via integrated variable frequency drives to provide heating and chilled water to terminal units throughout the building.

The intent is to house the hydronic system components within the level 3 mechanical room, and to run services down through a central mechanical shaft/space from level 3 down to level 1 within the building. Heating and chilled water pipework will distribute from this shaft out to terminal units throughout the floorplates.

Refer to the attached hydronic schematic for further detail on the hydronic system.

2.2 Terminal Units & Space Heating/Cooling Requirements

1. Apparatus Bay Areas

Apparatus bays will be provided with heating only. Heating will be supplied via radiant in-slab pipework throughout the apparatus bays and broken into two thermal zones: West (Apparatus Bays 1 & 2) and East (Apparatus Bays 3 & 4), served by radiant manifolds. The apparatus bays will be supplemented with hydronic air curtains at each bay door, which will be interlocked with the bay doors to provide heat only when doors are closed so that heat loss to the environment is minimized when bay doors are left open during extended periods of time. The Turn-Out Gear Room, Hose Tower, and Decontamination spaces will be heated via radiant in-slab pipework and zoned such that each individual space's temperature control is independent from one another. Radiant in-slab heating offers comfortable and thermal stable heating and offers the benefit of drying slabs to improve slip-free working conditions within the bays and adjacent spaces.

2. Headquarter Offices, Training Areas, Dorm Areas, and Living Areas

The remainder of the spaces within Squamish Fire Hall will be provided with both heating and cooling as per the programming requirements of the fire hall. The proposed terminal units for the above-mentioned spaces will consist of fan coil units utilizing electrically commutated motors (ECM), change-over coils, and a filter section. Utilizing change-over coils allows for air to be heated and cooled using one coil rather than using a separate heating and cooling coil in more traditional fan coil systems. This scheme offers the following benefits to be realized:

- Reduction in fan power due to lower air pressure drop through fan coil unit.
- Reduction in noise due smaller fan motor required.
- Use of multi-row coil for heating allowing reduced water temperatures which in turn improves heat pump efficiency.
- Reduction in number of branch pipework and control valves to terminal units by half the number typically used.
- Avoiding instances of simultaneous heating and cooling within space.
- Faster response time to temperature fluctuations in space.

Each individual dormitory space on Level 3 will be provided with its own fan coil unit to accommodate individual temperature control.

In some spaces, fan coil units will be ducted separately from ventilation air to limit the unit's operation to meeting space temperature setpoints, rather than running the fan purely for ventilation air. This scheme further improves upon the

annual fan energy savings. Supply and return ductwork from the fan coils will be acoustically lined to meet noise criteria requirements.

3. Electrical and Communication Rooms

Communication and IT rooms will be served by cooling-only fan coil units to maintain room temperature setpoints ideal for communication and IT equipment rooms. It is understood that other DoS facilities will be housing their communications equipment at the new Fire Hall, therefore we recommend that split AC units be provided as backup cooling for communication and IT rooms for redundancy in the event that the hydronic plant fails. Electrical rooms will be served by transfer fans to maintain room temperature setpoints; depending on the potential heat dissipation loads within electrical rooms, cooling-only fan coil units may be required to provide supplemental cooling.

4. Out-Buildings

The site for the new fire hall will include out-buildings for vehicle and equipment storage. Part of the building will be a simple covered parking structure, and part of the building will be insulated and will require heating for freeze protection. Heating for the insulated portion of the outbuilding will be provided by electric resistance heat, sized to maintain temperatures above freezing based on the layout and construction of the insulated portion.

3. VENTILATION SYSTEMS

3.1 Apparatus Bays

General background ventilation will be provided to the apparatus bays via high efficiency energy recovery ventilators which will actively supply fresh outdoor air while exhausting stale indoor air. The type of energy recovery proposed is an air-to-air energy recovery system via a rotary heat wheel that will remove heat from the stale exhaust air and transfer it to incoming outdoor air with higher heat recovery efficiencies (80%+ efficiency rating) than standard ERVs available in the marketplace. The rotary heat wheel motor will have the ability to slowdown or shut off the wheel's rotation to allow for free-cooling opportunities during shoulder seasons. The units will also include high effectiveness supply and exhaust filter sections, and fan sections utilizing high efficiency EC motors. The units will be located within the Level 3 Mechanical Room or in a partial mezzanine located in the Apparatus Bay. The ERV will ducted such that supply and exhaust air promote cross ventilation across all four Apparatus Bays. These units will also be responsible for providing the general ventilation requirements for adjacent spaces including the workshop and SCBA storage. Careful consideration of the air balances between the Apparatus Bays spaces will be paramount in avoiding the risk of transferring potentially noxious gases between the Apparatus Bays and the adjacent occupancies.

A high efficiency heat recovery ventilator will be provided to solely serve the Turn-Out Gear Room, Detox Room, Hose Storage and Gear Extractor areas primarily due to the nature of the toxic contaminants that are embedded within firefighter's personal protective equipment. The high air change rate (6 ACH) typically required within gear turnout rooms make the use of HRVs ideal to provide ventilation and exhaust to the space, while reducing heating energy consumption. Supply is routed to low level ductwork strategically located below gear lockers to blow air onto gear with high level exhaust to extract stratified stale air. This proposed scheme will reduce gear drying times, whist ensuring the room contaminants are not transferred to adjacent occupancies. Due to the similar nature of the adjacent spaces, the Detox and Gear Extractor spaces will also be served by the same HRV. See below for a preliminary HRV list:

HRU-1 (Apparatus Bay)	350 L/s
HRU-2 (Main Building/General Exhaust)	1180 L/s
HRU-3 (Decon/Detox)	610 L/s
HRU-4 (Fitness)	250 L/s

A Nederman vehicle exhaust extraction system will be utilized to serve the vehicles stored at Squamish Fire Hall. The system will comprise of an exhaust fan complete with a variable frequency drive and silencers the outlet of the fan to minimize noise concerns. The exhaust fan will be located within the Level 3 Mechanical room and ducted to serve the individual bays. The proposed back-in configuration of the apparatus bays will allow for a total of four (4) Nederman

Magnarail systems, extending the length of the bays. Three of the Magnarail systems will utilize one (1) extraction nozzle per rail system and one will utilize two (2) nozzles for a total of five (5) extraction nozzles. The vehicle exhaust extraction will be controlled through a vehicle ignition interlock, in addition to manual push button switches located within each apparatus bay coupled with motion/photo sensors at apparatus bay entrances. A noxious gas monitoring system with sensors throughout the apparatus bays will actively monitor CO/NO_2 levels and will manually override the vehicle exhaust extraction fan to operate and purge the space should the system reach alarm setpoints. Outside air louvers complete with ultra-low leakage motorized dampers will be interlocked with the noxious gas monitoring system to provide fresh air and avoid excessive negative pressurization of the Apparatus Bays compared to adjacent occupancies, if the bay doors are not open when the fan is operational.

The SCBA compressor room will be provided with a dedicated exhaust fan to ensure safe operation of the owner supplied compressor during peak bottle filing operations and to prevent the compressor from overheating.

3.2 Headquarter Offices, Training Areas, Dorm Areas, and Living Areas

Ventilation requirements for the above-mentioned areas will be provided via high efficiency energy recovery ventilators. Supply air will be ducted directly to the occupiable spaces, independent of the fan coil units, to ensure adequate ventilation is supplied to each space and prevent the operation of the fan coils units when not required. Exhaust air will be ducted directly from washrooms, janitor rooms, storage rooms, and other areas where odors or stale air will be of concern, back to the ERVs as per ASHRAE 62.1 requirements. Careful consideration will be placed in the air balance within these spaces to ensure supply and exhaust volumes remain equal to avoid infiltration from the adjacent apparatus bays and the exterior. The ERVs will be located within the Level 3 Mechanical room. The units will also be fitted with a heating/cooling change-over coils to temper supply air temperature to the spaces to maintain a comfortable equilibrium temperature state and avoid the need to run fan coil units outside of peak load scenarios.

A high-end range hood is recommended to serve the electric range in the Level 2 Kitchen. An ultra-low leakage motorized damper will be installed on the exhaust air duct to ensure infiltration is minimized.

3.3 Fitness Area

Due to the relatively remote location, lower cooling setpoint, higher outdoor air requirements and higher latent loads typically associated with the fitness studios, it is recommended to provide a dedicated energy recovery ventilation unit to serve the fitness area. The unit can be located on a mezzanine above the fitness area, adjacent to the secure storage. Providing a dedicated ventilation unit for the fitness area will reduce ductwork runs through the apparatus bay, increase free cooling usage and ensure sufficient fresh air is provided to occupants using the fitness area.

3.4 Out-Buildings

The insulated portion of the out-building as described in section 3.2.4 will be provided with an exhaust fan to prevent overheating and to extract stale air via reverse-acting thermostat.

4. PLUMBING SYSTEMS

4.1 Domestic Cold Water Systems

Based on the current program requirements, a 150mm combined water service will be required to serve both the domestic cold water and fire protection requirements for the building. The combined water main will enter the Water Entry room located in the south west corner of the Apparatus Bays and branch off to a 100mm domestic cold water service to serve the potable and non-potable water requirements of the building. The 100mm domestic cold water service complete with water meter will be branch off to serve the following loads:

- Non-potable cold water service will serve a series of four (4) 65mm hose bibb connections for truck filling, and four (4) 20mm hose bibb connections for truck washing. These hose bibbs will be located in tandem between the overhead bay doors been Apparatus Bays 1 & 2 as well as Apparatus Bays 3 &4, on both east and west walls to offer flexibility and avoid tripping hazards. Premise isolation will be provided via the use of a reduced pressure backflow assembly. A water meter will be installed on this branch and connected to the building automation system to track water usage specific to these end uses.

- Potable cold water service will serve the remainder of the building's cold water requirements as indicated within the functional program. These spaces will include washrooms, kitchens, bar sinks, janitor rooms, and laundry rooms. Premise isolation will be provided as required for the various end uses such as janitor chemical injection systems, coffee brewers, and other systems required direct connection into the potable water system. A water meter connected to the building automation system will be provided on this branch to track water usage.

- Irrigation connection for landscaping. Premise isolation will be provided via the use of a reduced pressure backflow assembly.

The building will utilize the following flow and flush fixtures:

- Dual-flush flush valve water closets: 3 LPF / 4.8LPF
- Manually-operated lavatories (Level 1& 2 WC / Shower rooms only): 1.9 LPM
- Sensor-operated lavatories (Level 1 & 3 WC rooms): 1.9 LPM
- Manually-operated kitchen sinks: 1.9 LPM
- Showers: 5.7 LPM
- Janitor Mop Sink: 8.4 LPM

The following fixture types are recommended for the mix of public and private spaces seen in this facility and will be reviewed with the architect and client prior to working drawings:

- Water Closets:
    - All toilets to be wall-mounted flush valve type water closets.
    - Manual dual flush valve to be used in the L3 dorm washrooms.
    - Automatic flush valves to be used for all public washrooms (i.e. L1, L2 office area)
- Lavatories
    - Manual type lavatories to be utilized in the L3 dorm washrooms.
    - Automatic lavatories utilizing self-generating turbine technology to be utilized for all public washrooms (i.e. L1, L2 office area)

4.2 Domestic Hot Water Systems

The proposed strategy to meet the domestic hot water load requirements for the firehall will consist of a two-stage approach whereby domestic hot water tanks utilizing tank-mounted air source heat pump technology will provide the first stage of heating and a supplementary electric hot water tank will provide the second stage of heating during periods of peak domestic hot water usage often associated with fire halls. The tank mounted air source heat pump provides the additional storage and capacity required to meet the higher than average domestic hot water requirements associated with fire halls, while providing higher efficiency when compared to a standard electric tank during periods of average usage. Two (2) 80-gallon, 3 kW hybrid hot water tanks and one (1) 85 gallon, 18 kW electric hot water tank will be located within the L2 Mechanical room.

Potable domestic hot water will be piped throughout the building to serve the programming requirements for the fire hall. A Grundfos Alpha domestic hot water recirculation pump will be utilized to recirculate domestic hot water back to the domestic hot water tanks to ensure hot water is available on demand, and to mitigate cycling the domestic hot water tanks.

Eye wash stations will be provided in the Apparatus Bays and adjacent spaces as required and will include tempered mixing valves to deliver tepid water at the fixture.

4.3 Sanitary Systems

Based on the programming requirements, a 150mm sanitary main will be required to serve this various plumbing building. Cast iron piping will be used for above grade drainage and ABS piping will be used for below grade drainage. The apparatus bays will utilize linear trench drains running the length of the bays and positioned below the vehicles. Catch basins will utilized to allow for dirt and other debris to be captured before draining to sanitary. The sanitary lines serving the trench drains in the apparatus

bays will be connected to an oil interceptor with complete with an internal storage tank to intercept any hydrocarbons prior to discharging into the building's sanitary systems.

A sump pit complete with backwater valve will be required to serve the elevator shaft. At this time, it is unclear if a hydraulic elevator is being proposed. Should a hydraulic elevator be proposed, an oil interceptor will be required to intercept any potential hydraulic fluids prior to discharging into the building's sanitary systems. Gravity drainage is proposed for the elevator drainage, and it will be confirmed with the Civil consultant that the elevator pit depths will allow for gravity drainage to be fulfilled.

4.4 Stormwater Systems

Based on the current architectural layout, the expected new building roof area will be approximately 1,055 m^2. This will have a peak stormwater drainage requirement of 10,550 L. The building's storm water load will be served by a 150mm stormwater main at the west end of the building.

Perimeter drain tile piping will be installed to protect the building's foundations from groundwater fluctuations and will comprise of 150mm perforated PVC pipe encircling the building's footprint. The drain tile piping will drain into a sediment sump pit in order to separate sediment prior to the stormwater effluent entering the District's stormwater systems.

4.5 Compressed Air Systems

A compressed air system will be utilized within the apparatus bays to serve air brakes and for typically shop use within the workshop area. The proposed compressed air system will include a two-stage compressor mounted onto a vertical storage tank. The air compressor will be located within the above the workshop area, and distribution main will be looped around the apparatus bays to equalize pressure throughout the system. A total of four (4) compressed air drops will be provided within the apparatus bays between bays to serve for tire filling. One (1) compressed air outlet complete with a combination filter and regulator will be provided within the Workshop room for typical shop use.

An SCBA compressor will be required for breathing apparatus bottle refilling operations. The SCBA compressed air system will consist of a compressor, filling station, and storage rack system. It is our understanding that these components will be provided by the owner. Compressed air pipework and fittings between the SCBA fill station and compressor will utilize 316 stainless steel. Special attention will be paid to the location of the air intake location for the SCBA compressor to reduce the risk of contaminants from entering the system. Refer to ventilation section for further ventilation provisions.

5. FIRE PROTECTION SYSTEM

Based on the current program requirements, a 150mm combined water service will be required to serve both the domestic cold water and fire protection requirements for the building. The combined water main will enter the Water Entry room and branch off to a 150mm fire main to serve the building's fire protection requirements. The new automatic sprinkler fire protection systems will be designed, installed and tested in accordance with the requirements set out by the British Columbia Fire Code 2018, and NFPA 13-2013.

Hydrant flow testing information was forwarded from the Civil consultant for review and consideration to determine whether adequate pressure will be available for fire flows. Based on the site location and building layout, it is assumed that adequate pressure will be available to meet the fire flows for the proposed facility and will not require provisions for a fire pump. Integral will coordinate with the civil consultant to confirm that a fire pump is not required.

The building will be split into separate fire zones to meet the different requirements of the building and space classifications. The proposed fire zones and their respective space classification and system types have been listed below as defined under NFPA 13-2013:

- Wet Sprinkler System Zone #1: Level 1 Areas
    - Training, Fitness, and Operational Areas - Light Hazard
    - Apparatus Bays - Ordinary Hazard Group 2
    - SCBA and workshop areas: Ordinary Hazard Group 1
- Wet Sprinkler System Zone #2: Level 2 areas
    - Administration, Offices, and Operational areas: Light Hazard
    - Mechanical Room: Ordinary Hazard Group 1

- Wet Sprinkler System Zone #3: Level 3 areas
    - Living and Dormitory areas: Light Hazard
    - Mechanical Room: Ordinary Hazard Group 1
- Dry Sprinkler System Zone #1: Various Areas
    - Area below soffit/canopy spaces located above Apparatus Bay overhead doors – Ordinary Hazard Group 1
- Pre-Action Sprinkler System Zone #1: Comms Rooms
    - Communications Room: Light Hazard

The sprinkler zone control valves will be located centrally within the Water Entry room and arranged in a manner such that it facilitates personnel training of the systems. The pre-action system for the communications room shall be located in the level 2 mechanical room adjacent to the proposed server room location.

A fire department connection will be provided on the nearby the face of the building at the north entrance. This new proposed location for the fire department connection will be located in such a manner that it is within 45 m of the nearest fire hydrant.

Fire extinguishers will be provided throughout the building as per the requirements of NFPA 10 – 2010.

6. BUILDING AUTOMATION AND CONTROLS

The building will be provided with a complete direct digital controls (DDC) system that will fully integrate mechanical controls. The controls systems will consist of BACnet compatible, open protocol platform with a preference for Reliable or Delta Controls systems and connected to DOS's main network for DOS Operations and Facilities Management to monitor the building's automation systems. The use of third-party and/or proprietary control systems will be minimized.

7. ELECTRICAL DISTRIBUTION SYSTEMS

7.1 Site Services

1. The complex will be serviced via a new BC Hydro owned exterior unit PMT (Assuming 500KVA), which will provide secondary service at 120/208V Volt 3-phase 4-wire. Coordination with the utility company will be undertaken to ensure the most efficient and economic method of power provision is secured.
2. Telecommunication and television services will be coordinated with the local utilities and two (2) 4" ducts will be provided from the edge of the property to the Main Telecommunication Room. An additional three (3) 4" ducts will be run to the site property line and interconnect to DOS fibre system.

7.2 Power Distribution System

1. From the new exterior pad mounted transformer, a new 120/208V service will be brought in underground to the Main Electrical Room on the first floor. The room will be required to have exterior door access as this is a requirement for Hydro, as well the entry to the room shall have no steps leading into the room.
2. From the main floor electrical room, it would be recommended to have electrical panels located in central locations) to serve the space loads. The power distribution will be organized to facilitate metering and monitoring of different load types, i.e. life safety, lighting, mechanical, and general-purpose loads.
3. Surge protection will be provided at Main Distribution Board to protect the building's critical equipment.
4. General Distribution
    1. Distribution for lighting and convenience power circuits will be provided utilizing bolt on circuit breaker panel boards and will be located to suit the architectural arrangement and equipment loads of the project. The power distribution will be organized to facilitate metering and monitoring of different load types, i.e. lighting, mechanical, and general purpose loads.
    2. Power for mechanical and Owner's equipment will be provided at 208 volt, 3 phase
    3. Conductors:
        1. Copper RW90 with 600V insulation, aluminum will be considered for distribution panel main feeders larger than #1/0, provided that feeds are not run in wet locations.

2. Minimum wire size shall be #12
3. Wire size #10 or larger shall be stranded

4. In order to suit potential VFD equipment, a dedicated Mechanical distribution panel and starter backboard shall be provided in lieu of a motor control centre for the Mechanical Equipment Room to provide starters, overload and over current protection, and interlocks to suit the designated equipment.
5. The distribution throughout the project will be sized to ensure twenty-five percent (25%) future capacity.
6. Harmonic treatment transformers or power conditioners will be installed where there is a high concentration of VFD and filters are not installed on VFDs.
7. As the building will be have designated areas as Post Disaster, any electrical connections or services in the designated shall complete with adequate supports, flexible loops.
8. Where expansion joints are present, and electrical raceways cross, flexible raceways are to be installed to address the building's expansion and contraction.
9. DoS has expressed a preference for Eaton or Schneider equipment.

5. Grounding System
    1. Grounding / bonding system shall be provided to meet code standards. All grounding / bonding conductors shall be copper.
    2. Specific specialty systems that will require grounding is the Owners antenna system (location to be determined)
    3. Separate ground/bonding cabling to run in all raceways forming part of emergency/standby power system.
    4. Separate ground wire shall be installed in each conduit for bonding, i.e. conduit shall not be used as bonding.
6. Wiring Methods
    1. Feeders to sub-distribution panel boards, motor control centres as well as all branch circuit conductors to be R90 copper. Aluminum feeders could be used for panel feeders only.
    2. Main panel feeders and branch circuit home-runs shall be in EMT conduit or TECK cabling. No coreline shall be used unless approved by the engineer. No NMD wiring will be permitted.
7. Receptacles, Mechanical and Equipment
    1. All receptacles shall be specification grade c/w stainless steel cover plates and weatherproof in use covers to be used in all exterior building and in the Apparatus Bays.
        1. Convenience receptacles will be provided throughout to suit the equipment to be provided.
        2. Cleaning outlets will consist of 15 amp and 20 amp receptacles installed approximately 9-meter (30 ft) on center.
        3. GFCI outlets will be installed in all exterior locations and in location within 1.5 meter (5 ft) from plumbing fixtures.
        4. 20A service receptacles will be installed by exterior mechanical units at +750mm.
        5. One dedicated circuit 15A, 120V to be installed at Locution location
        6. General receptacles will be located by each bed in the Sleeping quarters.
    2. Drop cord reels (5-20R) will be installed in the Apparatus Bays to allow for the truck charging system. Drop cord system will be designed to allow for future connection flexibility.
    3. Power connections will be provided to suit the Owners' equipment and building mechanical system equipment.
8. Digital Information Metering
    1. Digital information meters will be installed to monitor the building's energy consumption. Distribution panels will try to be organized to isolate and consolidate basic lighting, power and mechanical loads where possible. The grouping of similar loads to the same panel will facilitate measurement and verification of the Building Performance.
    2. The digital meters shall be capable to connect mechanical metering loads (gas, water, etc.) and be able to tie into the central building integration control panel to allow the data to be shared, monitored and analyzed via BACnet
9. Mechanical System

1. All required power provisions, associated controls and interfacing with the fire alarm system will be coordinated with the mechanical design.

10. Electric Vehicle Charging Station
    1. The intent has expressed interest to install three (3) level 2 charging stations on the site.
11. Photovoltaic System
    1. Solar photovoltaic arrays are not currently in the programming / scope / budget. A capped off empty conduit will be provided to the roof for future installations.
12. Uninterruptible Power Supply (UPS)
    1. A UPS system will be required for the building IT rooms and workstations supplies and installed by the DoS. There will be a minimum of 3x 3kVA 208V 1Ph rack mounted UPS systems within the room.

8. GENERATOR SYSTEM DISTRIBUTION

1. An exterior diesel generator mounted in a weatherproof critical grade sound proof enclosure will be installed on the exterior of the site to supply the site with standby power to specific building systems. The building generator is intended to serve the majority of the building loads, but the final scope is being confirmed with the District which will affect the final size and downstream distribution. The generator shall have the following characteristics:
    1. 347/600 V.
    2. Rated/certified for emergency power supply according to CSA 282.
    3. Enclosure to be weatherproof and sound proof enclosure (Level II) complete with critical grade muffler.
    4. Fuel belly tank to be provided with capabilities to maintain a 72-hr runtime at 100% load. An expansion tank shall be provided to provide enough supply for, at minimum, 1 week at full load.
    5. Installation of the generator and the associated equipment to be rated for Post Disaster.
    6. Have an integral electrical panel to supply power to the enclosure lighting, heating and other required generator loads.
    7. Control panel capable to connect to building management system (BACnet) and the building fire alarm system.
    8. Remote annunciator panel to be installed in the building in the main command centre office.
2. The generator power distribution will provide standby power to the site systems as noted below. Load shedding of equipment that are not required to be running during power failure will be reviewed to help minimize the final size of the generator.
    1. Any additional loads as required by client: heating systems, cooling plant equipment, ventilation equipment, etc.
    2. Plug loads
    3. Lighting
    4. Security Systems
    5. Data/Communication Systems
    6. Locution System (if required)
    7. Sump Pump (if required)
3. Generac/Kohler gensets shall not be specified due to past issues. MTU or gensets utilizing John Deere parts are to be specified
4. Separate battery packs will be provided as the life safety system for remote lighting heads and exit signs.

9. LIFE SAFETY SYSTEMS

9.1 Fire Alarm System

1. Fire alarm system will be designed based on low rise requirement. The system will be addressable single stage type system with required pull stations, smoke detectors, heat detector and signals devices strategically located to code complying locations will be used. Fire alarm zoning will follow the sprinkler system zoning.

2. Fire alarm control panel will be located in the main Electrical room with fire alarm annunciator located in the main entrance lobby. The fire alarm annunciator will consist of active graphic panel and an LCD display/control panel. Panel will have 24-hr battery backup.
3. Fire Alarm horn/strobes will be located throughout to provide 65 dB of audible signal. Additional strobe will be provided in mechanical rooms or machine rooms with high ambient noise level.
4. Smoke detectors will be located at the top of stairs shaft, in service rooms and in the IT Room. The it room smoke detectors will be tied into the pre-action system
5. Smoke alarms c/w CO sensing capabilities and strobe signal units will be located in all dorm / sleeping quarters. Smoke alarms shall be interlocked together and come complete with battery backup.
6. Egress control release shall be as per governing building code or equivalency standards.
7. Graphic annunciator panel will be provided at the designated building main entrance area.

9.2 Exit Signs

1. Pictogram LED type exit lights with self contained batteries will be used and connected to AC power source (120V). LED light source not more than 2.5W power consumption. Exit lights will be strategically located to clearly identify all exit doors and exit routes.
2. Exit signs shall be:
    1. Edge lit exit sign will be installed in public area.
    2. Weatherproof rated, NEMA 3R exit signs in the apparatus bays and any required exterior areas.
    3. Metal housing exit signs will be installed in service area and all other areas.

9.3 Emergency Lights

1. Emergency lighting will be provided by lighting connected to centralized battery packs to provide minimum of 30-minute emergency lighting run time.
2. Additional self-testing 24 volt battery power supplies and remote 5 watt LED dual heads in selected area for supplementary backup. Where remote heads are used, they will be provided with overall Lexan covers or wire guards where necessary for protection and security. Interlocks will be provided between each power supply and appropriate lighting circuits to ensure operation maintained per code requirements.

10. LIGHTING AND CONTROL SYSTEMS

10.1 Lighting System

1. The lighting designs throughout the project will follow the recommendations of the Illuminating Engineering Society of North America, ASHRAE 90.1 2016, the rules and regulations of the Work Safe BC, and BC Building Code Energy Management/use recommendations.
2. Day lighting will be used to supplement the lighting in the building to maximize energy savings. Glare control and day light distribution device will be installed improve penetration into building and minimize glare from direct day light. Glazing will be selected to provide a balance of day light transmission and R value.
3. The general lighting will be provided by using LED lighting sources. All lighting products will be commercial grade or better. LED luminaires will have:
    1. Full spectrum 2700K color temperature, CRI 90+ and rated for min 50,000+ hours in Dorms.
    2. All other areas will have 3500 K color temperature, CRI 80+ and rated for min 50,000+ hours.
4. Office areas will be equipped with high performance, volumetric, low glare recessed and/or direct/indirect LED linear luminaires with some select down/spot lights for displays. Lighting layout will be based on open office area. LED task lighting will be suggested to be used to provide additional illumination to the workplace surfaces for staff that desire higher lighting levels.
5. The Service and Apparatus Bays will utilize industrial style LED fixtures, with protective lenses and high reflective louvers, low glare fixtures. In designated areas, hazardous grade fixtures will be required to be used.

6. In the Sleeping quarters, bed lights will be required to be installed to provide localized control.
7. Specialty/feature lighting will be provided in the main entry lobbies, meeting rooms and exterior art work/signage.
8. All exterior luminaires will be “Dark Sky” compliant and will be vandal resistant and positioned to illuminate dark recesses for security protection purposes. Note: The use of “Dark Sky Compliant” site luminaries will necessitate a greater quantity of products when compared to standard products on the higher poles.
9. Exterior site lighting will be mounted away from the building, as practical, with LED type, sharp cut-off luminaires located throughout the project site. The “area” lighting source will be pole-mounted LED lamps.
    1. Pole height for the parking area at 5 meters (16 feet).
    2. The sharp cut-off post top luminaires will ensure light trespass onto neighboring properties is minimal.
10. Exterior lighting shall be provided for the training area. Coordination is required to determine lighting level requirements for the training.
11. Perimeter building lighting at outside exits will be provided utilizing wall mounted LED dark sky compliant fixtures as applicable. Soffit style fixtures will only be used in those areas where an adequate mounting height is not available at the exit locations.

10.2 Lighting Controls

1. An advanced lighting control system will be installed in the building to control the facility lighting and will have the following characteristics:
    1. The main control panel will be installed in the Main Electrical Room, to facilitate the control for the total building lighting system.
    2. Lighting control devices (sensors, exterior photocells, time clocks, switches) will be tied and/or integrated to the lighting control / relay panels.
    3. All areas will come equipped with intelligent modules tied back to the building lighting control system to provide addressable devices that can be programmed to any device and/or setting.
    4. Allow for monitoring of the building luminaires ballasts and lamps for facilities management.
    5. System to have battery backup capabilities and/or connect to building standby power
    6. All lighting shall meet ASHRAE 90.1-2016 requirements
2. All interior perimeter spaces with window/glazing shall be have daylight sensors installed, approximately every 225 ft2, which will control the lighting in the area. Daylight sensor to be tied to the lighting fixture to provide dimming control.
3. All open office areas will have combination daylight/occupancy sensors installed. Occupancy sensors in open areas to be grouped together (i.e. lighting zones to be created, to help avoid on/off switching).
4. All enclosed building spaces will have occupancy sensors installed. With exception to the ceiling mounted sensors, all sensors to be programmed to be manual on, automatic off and be self-learning. Manual override wall stations will be provided in spaces as identified by the DOS for required operations (i.e. Meeting Rooms, Offices, etc..) and where required by Code.
    1. Washrooms and Locker Rooms will have ultrasonic style occupancy sensors installed.
    2. Dual technology type sensors will be installed in larger enclosed spaces.
    3. All other areas will use passive infrared technology sensors.
5. Corridor lights (excluding fire fighter response routes) will be configured that 1/2 of the lights will be de-energized when there is no occupant. Luminaires in these areas will have either built in or standalone occupancy sensors installed. Areas where natural day lighting will be present will have a daylight/occupancy combination sensor installed, in which it will shut off the lights if enough lighting is present.
6. In the dorm / sleep quarters localized control will be provided at the head of the bed. In the event of an alarm, dorm area lighting shall transition to full on.
7. Individual local dimming control system, similar to Lutron Grafik Eye system will be installed in the lounge, meeting and training rooms. The systems will be capable to integrate with the AV control system.

8. Exterior lighting will be capable to provide either step-level dimming control to provide two lighting levels (50/100) for different periods of the night. This will provide additional energy reductions to the site and will reduce site illumination at later periods of the night which may be more accommodating to the neighboring houses. Site lighting standards equipped with occupancy sensors to control area lighting feasibility to be reviewed.
9. The occupancy sensors of the lighting systems will be used to de-energize the lighting circuits when the rooms/areas are unoccupied and will be interfaced with building management system to deactivate the mechanical system in the area.
10. Emergency lighting will be controlled to avoid having unnecessary lighting on, and in these location emergency shunt relays shall be installed.

11. TECHNOLOGY

11.1 Telecommunication System

1. Telecommunication system will be designed and installed in accordance with a questionnaire in lieu of DoS standards (still under development) along with site specific requirements from the users.
2. The building being a multi storey building will require multiple areas located through out the building. In general terms horizontal cabling running from the telecom rooms to the work area outlets need to be within 90m. This being the case it is recommended to have the Main Telecom Room located in a more central location on the floor plate with additional Telecom Rooms located on the floors above, ideally all the rooms shall be stacked above each other.
3. Structured cabling system shall be a certified system c/w warranty and all horizontal cabling will be Category 6. All cabling will be plenum rated and each outlet to receive 2 data drops unless otherwise noted. Building systems that will require cabling drops to include:
    1. Any location requiring Phone and/or PC
    2. Location locations, Smart sign locations (inside and outside as required)
    3. Future Wi-Fi Access Points located in apparatus bays and staff area
    4. Any DDC or energy monitoring equipment location
    5. Any network cameras locations
    6. Fuel pump location
    7. Fire alarm control panels
    8. Security control panels
    9. Generator control panel
    10. Lighting control panel
4. All communication cabling will run within complete system raceways, where in the office areas would utilize cable tray and in all other areas would utilize conduit home runs. In additional to this pathways will need to be provide for the antennas which will be mounted on the building.

11.2 Security System

1. No intrusion alarm or camera provisions are required for this building
2. Door access control shall be provided. Keyscan system shall be the preferred system.

11.3 Speciality Systems

1. Additional speciality system requirements that will be required to be developed further on with assistance from the project team are as follows:
    1. E-Comm / Locution (if required)
    2. Readers Boards (if required)
    3. Counter Clocks (if required)
    4. Seismic Control for Overhead Door (if required)

12. CLOSURE

We trust that the foregoing provides the information required at this time to provide an understanding of the proposed mechanical / electrical systems for the Squamish Fire Hall Replacement.

Should you have any questions or require additional information, please do not hesitate to contact the undersigned.

LIMITING CONDITIONS

The recommendations presented in this report represent professional opinions of Integral Group in light of the terms of reference, scope of work, and any limiting conditions noted herein. Any use of the report, reliance on the report, or decisions based upon the report, by a third party are the responsibility of those third parties unless authorized in writing by Integral Group. The **District of Squamish** and **HCMA Architecture + Design** have copy-right permission for reproduction and distribution of this report.

The contents of this report are confidential and may be legally privileged. This report is intended solely for the named customer(s) **District of Squamish** and **HCMA Architecture + Design.** Integral Group makes no guarantees, representations or warranties with respect to the contents of this report, either express or implied, arising by law or otherwise, including, but not limited to effectiveness, completeness, accuracy, or fitness for purposes beyond the scope and limitations of this report. In no event will Integral Group be liable for any indirect, special incidental, consequential or other similar damages or loss, whether in contract, tort, breach of warranty, or otherwise, or for any loss of data, use, profits, or goodwill as related to the contents of this report being used for purposes beyond the specific scope and limitations of this report.

INTEGRAL GROUP

Scott Ghomeshi, P.Eng., CPHD, LEED AP BD+C
Project Manager

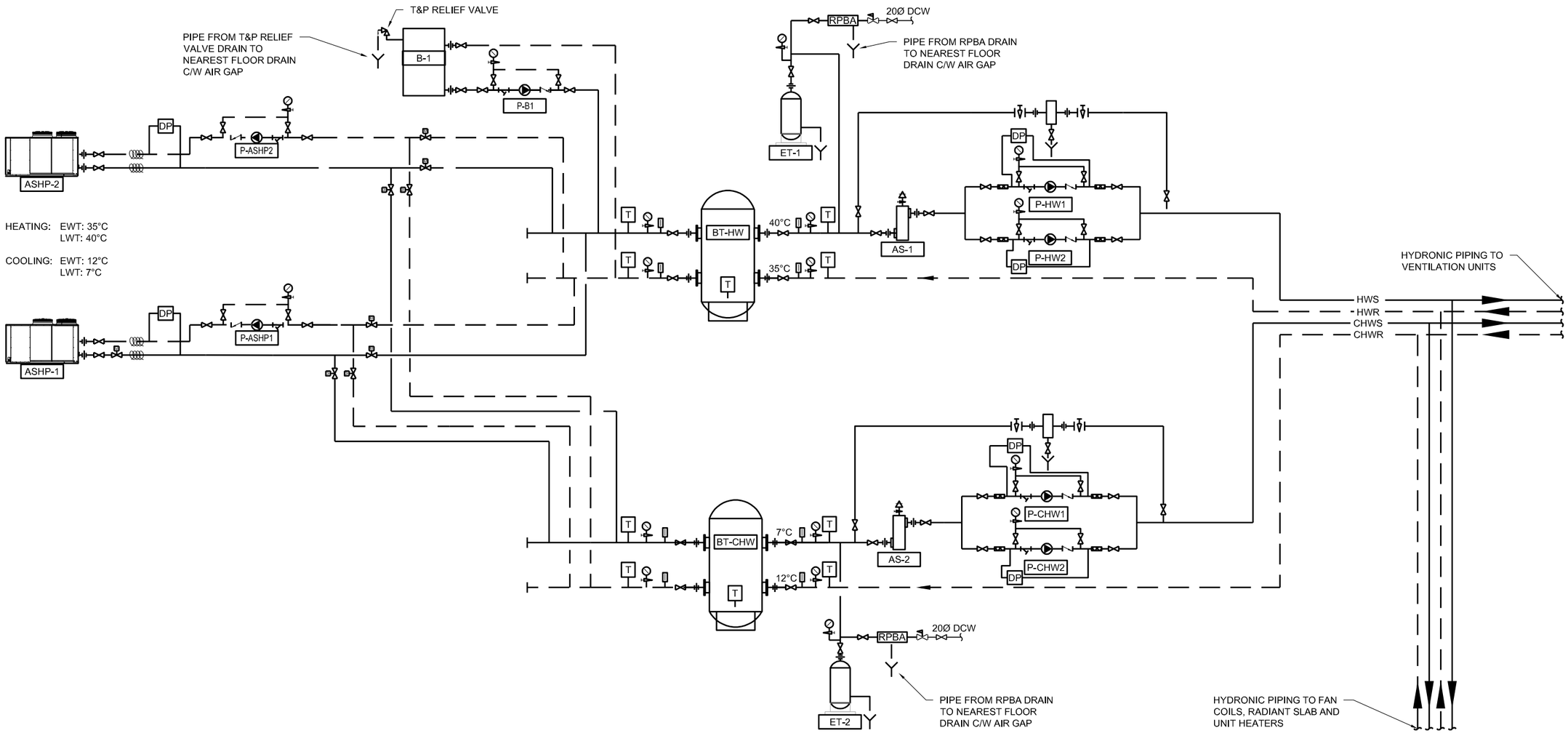
Bryan Uemoto, Dipl. Tech, LEED AP
Associate Principal, Reviewer

Connell Frey, P.Eng.
Senior Mechanical Designer

Jose Luis Lopez, P.Eng. LC CFPE
Associate. Electrical Engineer

SEALED

13. APPENDIX: MECHANICAL AND ELECTRICAL SKETCHES



HYDRONIC SCHEMATIC

PROJECT SQUAMISH FIREHALL #1

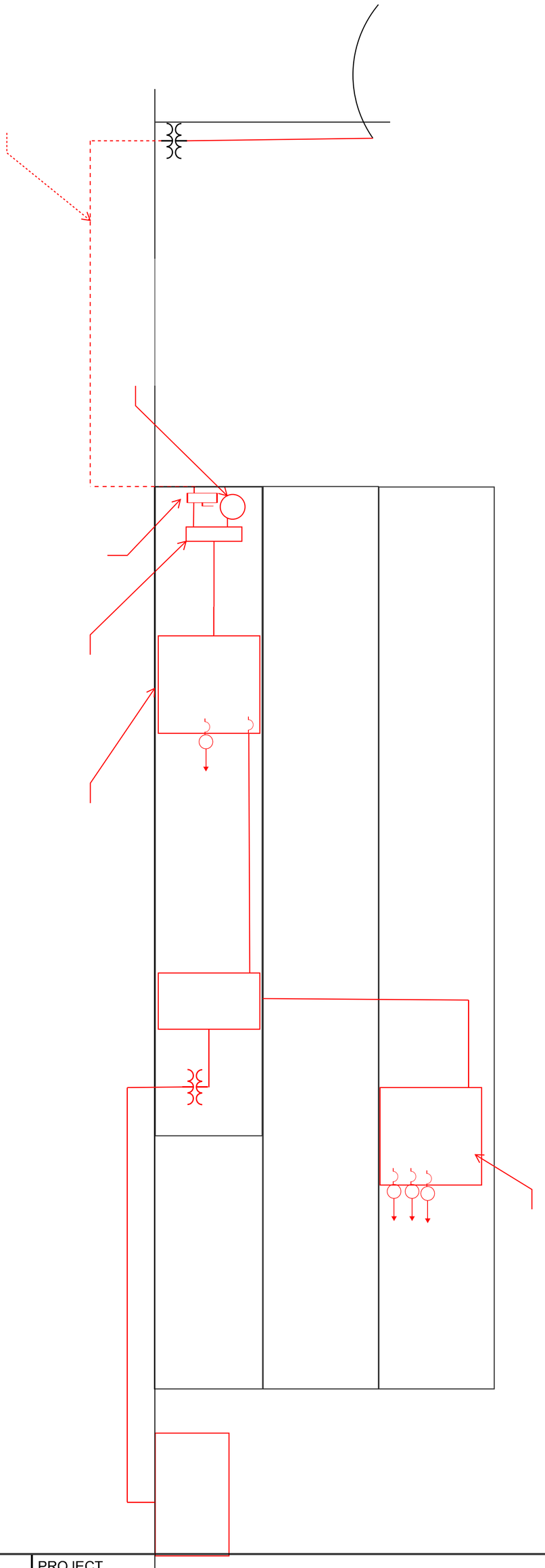
SKETCH No. SKM-SD-1

JOB No. 151985.000

DATE FEB 10, 2020

INTEGRAL GROUP
Suite 180 - 200 Granville Street
Vancouver BC Canada V6C 1S4
TEL: 604.687.1800
FAX: 604.687.1802
E-Mail: info@integral-group.ca

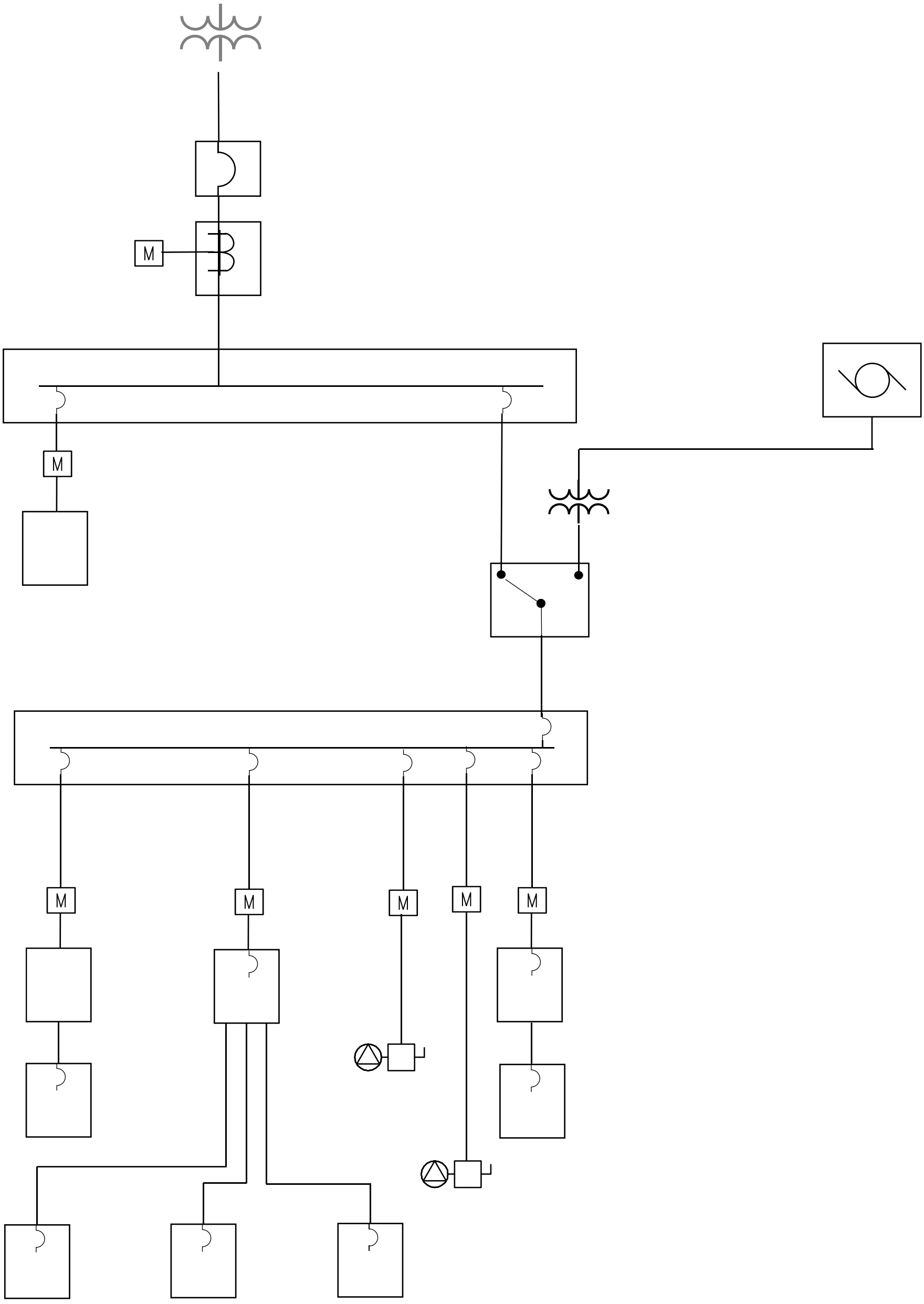
INTEGRAL GROUP



INTEGRAL GROUP
Suite 180 - 200 Granville Street
Vancouver BC Canada V6C 1S4
TEL: 604.687.1800
FAX: 604.687.1802
E-Mail: info@integral-group.ca

PROJECT
SQUAMISH FIREHALL #1

DATE	JOB No.		SKETCH No.
	151985.000		



INTEGRAL GROUP
Suite 180 - 200 Granville Street
Vancouver BC Canada V6C 1S4
TEL: 604.687.1800
FAX: 604.687.1802
E-Mail: info@integral-group.ca

PROJECT
SQUAMISH FIREHALL #1

DATE	JOB No.		SKETCH No.
	151985.000		

LOAD SUMMARY - MIXED USE			
LOCATION NAME.	SQUAMISH FIREHALL 1		
ADMIN SQ M	440		
FIRE SUPPRESSION SQ M	700		
QUARTERS/ DORM SQ M	500		
PUBLIC SQ M	250		
		TOTAL SQ M	1890
DESIGN LOAD DATA – MAIN BUILDING			
	WATTS	DEMAND FACTOR	DEMAND WATTS
BASIC LOAD – ADMIN (CEC TABLE 14 – OFFICE)	22000	0.90	19800
BASIC LOAD – FIREFIGHTING (CEC TABLE 14 – GARAGE)	7000	1.00	7000
BASIC LOAD – DORM (CEC 8-208 DORMS)	10000	0.80	8000
BASIC LOAD – PUBLIC (CEC TABLE 14 – COMMERCIAL)	6300	1.00	6300
ELECTRICAL BOILER (30% OF LOAD IS STANDBY FOR ASHP)	162000	0.8	129600
AIR SOURCE HEAT PUMPS	60000	1.00	60000
OTHER MECH	101400	0.80	81120
MISC EQUIPMENT ALLOWANCE	20000	0.80	16000
ELEVATOR	20000	0.95	19000
EV CHARGERS	20100	1.00	20100
25% EXPANSION			42700
		TOTAL WATTS	409620
		WATTS/SQ m	930 95
		AMPS @ 3ϕ4W 120/208V	1137.0
		x1.25	1421
		MIN. SERVICE REQUIRED	1500A
		PROVIDED SERVICE SIZE	1500A

PROPOSED LOADS

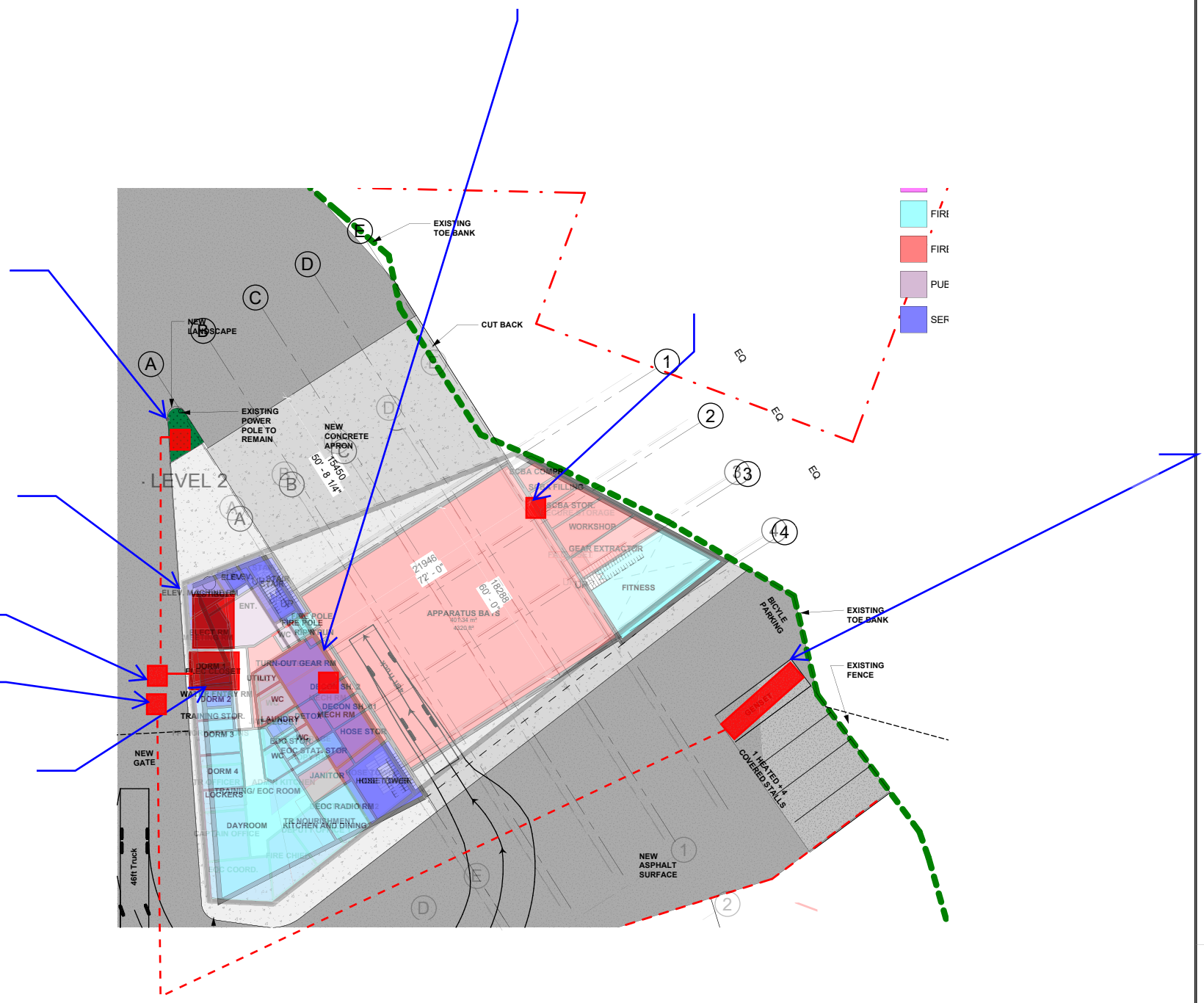
INTEGRAL GROUP
Suite 180 - 200 Granville Street
Vancouver BC Canada V6C 1S4
TEL: 604.687.1800
FAX: 604.687.1802
E-Mail: info@integral-group.ca

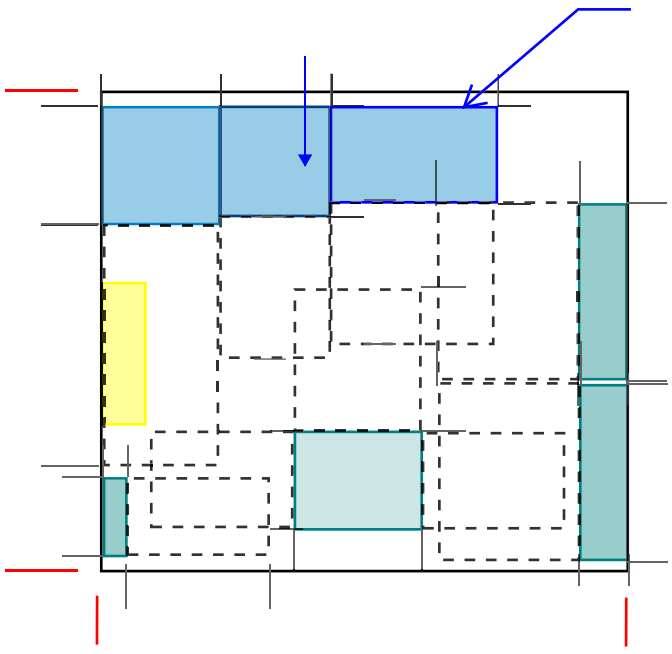
PROJECT
SQUAMISH FIREHALL #1

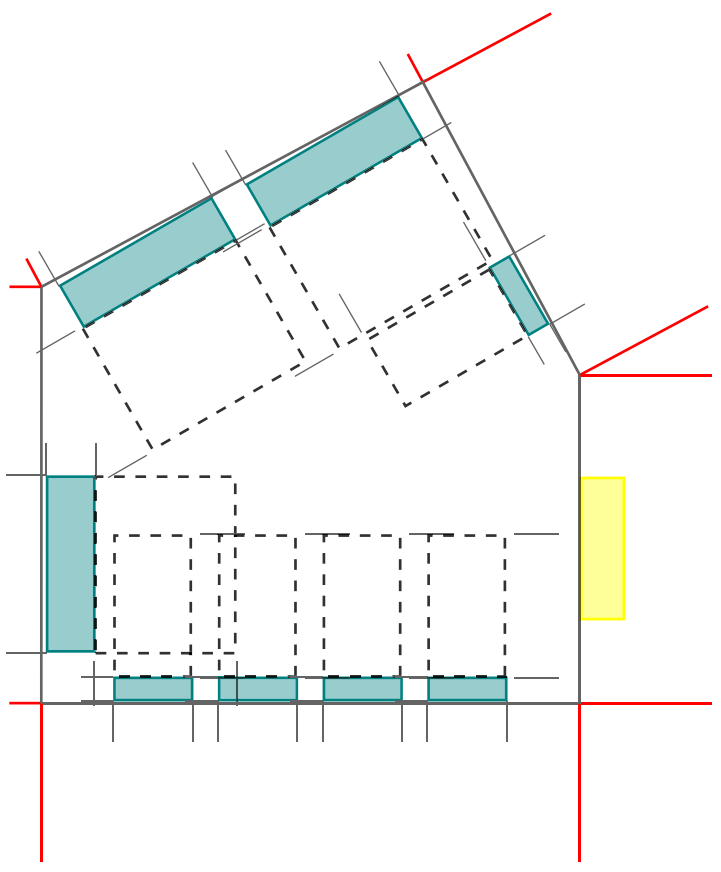
DATE

JOB No. 151985.000

SKETCH No. **SKE-202002-E03**







INTEGRAL GROUP
Suite 180 - 200 Granville Street
Vancouver BC Canada V6C 1S4
TEL: 604.687.1800
FAX: 604.687.1802
E-Mail: info@integral-group.ca

PROJECT
SQUAMISH FIREHALL #1

DATE	JOB No.		SKETCH No.
	151985.000		

STRUCTURAL SCHEMATIC DESIGN REPORT
SQUAMISH FIRE HALL
PROJECT NO. 19211
FEB 14, 2020

1. GENERAL

This report has been prepared by Wicke Herfst Maver Structural Engineers (WHM) to outline the structural intent and configuration for the Squamish Fire Hall. This report is for the exclusive use of HCMA Architecture + Design, the associated design team and the District of Squamish (Client).

2. DESIGN METHODOLOGY

2.1. Introduction

WHM is providing structural consulting services for developing the structural intent for the Squamish Fire Hall. The architectural layout has been developed by HCMA Architecture + Design. The facility is a three-storey structure with 4 truck bays. The majority of the main level consists of the truck bays but also include locker rooms, rooms for services, washroom, various storage rooms, gear room, electrical and mechanical rooms, training room, hose storage and radio room. The second level consists of offices, server room, mechanical and electrical rooms, administration room, washrooms, storage. The area above the apparatus bays is open to below. The third level consist of dorms, lockers, laundry room, mechanical and electrical rooms, dayroom, kitchen and dining. Two stairs and an elevator provide access to Level 2 and Level 3.

2.2. Codes and Standards

The primary building structure will be designed in accordance with the BC Building Code 2018 (henceforth referred to as the "Code") and referenced design standards applicable to primary building structure as follows:

Wood	CSA O86-09
Concrete	CSA A23.3-14
Steel	CSA S16-09

Environmental loads are based on climatic conditions listed in Appendix C "Climatic Data" of the Code. The building loads will be based on a 'Post-Disaster' Importance category as indicated in Table 4.1.2.1 of the Code.

2.3. Design assumptions

The facility will be designed to the following criteria as outlined in the Code:

2.3.1. Live Loads

a. Apparatus Bays	12.0 kPa
b. Ground floor	4.8 kPa (other areas)
c. Training room	4.8 kPa
d. Storage areas	4.8 kPa
e. Mechanical/Electrical Rooms	3.6 kPa
f. Kitchen and Dining	4.8 kPa
g. Dorms	1.9 kPa
h. Offices	2.4 kPa

WICKE HERFST MAVER STRUCTURAL ENGINEERS

WEB
info@whmengineers.com
www.whmengineers.com
2227 Douglas Road,
Burnaby, BC V5C 5A9
T 604.484.2859
F 604.484.2861

2.3.2. Snow and Rain Loads

a. Ss	2.8 kPa
b. Sr	0.7 kPa
c. Is (ULS)	1.25
d. Is (SLS)	0.9

2.3.3. Seismic Loads

a. Sa(0.2)	0.600
b. Sa(0.5)	0.517
c. Sa(1.0)	0.314
d. Sa(2.0)	0.200
e. Sa(5.0)	0.069
f. Sa(10.0)	0.024
g. PGA	0.266
h. PGV	0.404
i. Site Class	“D” (per geotechnical report)
j. F(0.2), F(0.5), F(1.0), F(2.0)	1.03,1.234,1.3371,1.387
k. F(PGA), F(PGV)	1.027,1.234
l. Ie	1.5
m. Rd	2.0
n. Ro	1.5

2.3.4. Wind Loads

a. q 1/10	0.39 kPa
b. q 1/50	0.50 kPa
c. Iw (ULS)	1.25
d. Iw (SLS)	0.75

3. STRUCTURAL SYSTEM

3.1. Structural Description

3.1.1. Foundations

A soil investigation has been performed by the SFA Geotechnical Engineering and a report dated August 7, 2019 was provided for our reference. Based on the geotechnical investigation report, the foundations can be designed using conventional spread and strip footings with a serviceability limit state (SLS) bearing pressure of 150kPa and ultimate limit state (ULS) bearing pressure of 300kPa. Site Category falls under Site Class D.

3.1.2. Level 1 Floor Level

The Level 1 floor system will consist of reinforced concrete slab on grade. The slab on grade in the apparatus bays will be 150mm thick while the other areas of the main level will be 100mm thick. High wear areas such as entrance lobbies and apparatus bays will be specified with an integrated concrete hardener.

3.1.3. Level 2 and Level 3 Floor Levels

The Level 2 and Level 3 floors will consist of lightweight TJI joists framing supported on wood stud load bearing walls and parallam beams or glulam beams. The floors will be sheathed with 16thk plywood and 40mm concrete topping will be allowed for as additional floor loading.

3.1.4. Roof Structure

The roof structure over the apparatus bays will consist of Cross Laminated Timber (CLT) or Dowel Laminated Timber (DLT) roof panels supported on glulam (and parallam beams) and by the load bearing stud walls on the sides of the apparatus bays. The underside of these CLT or DLT panels on the apparatus bays will be exposed.

The roof over the dorms and kitchen areas on the west of the apparatus bays and storage area on the east of the apparatus bays will be framed with TJI jojsts supported by wood stud load bearing walls and parallam beams or glulam beams. The roof on the areas framed by TJI's will be sheathed with 12mm thk plywood.

3.1.5. Lateral System

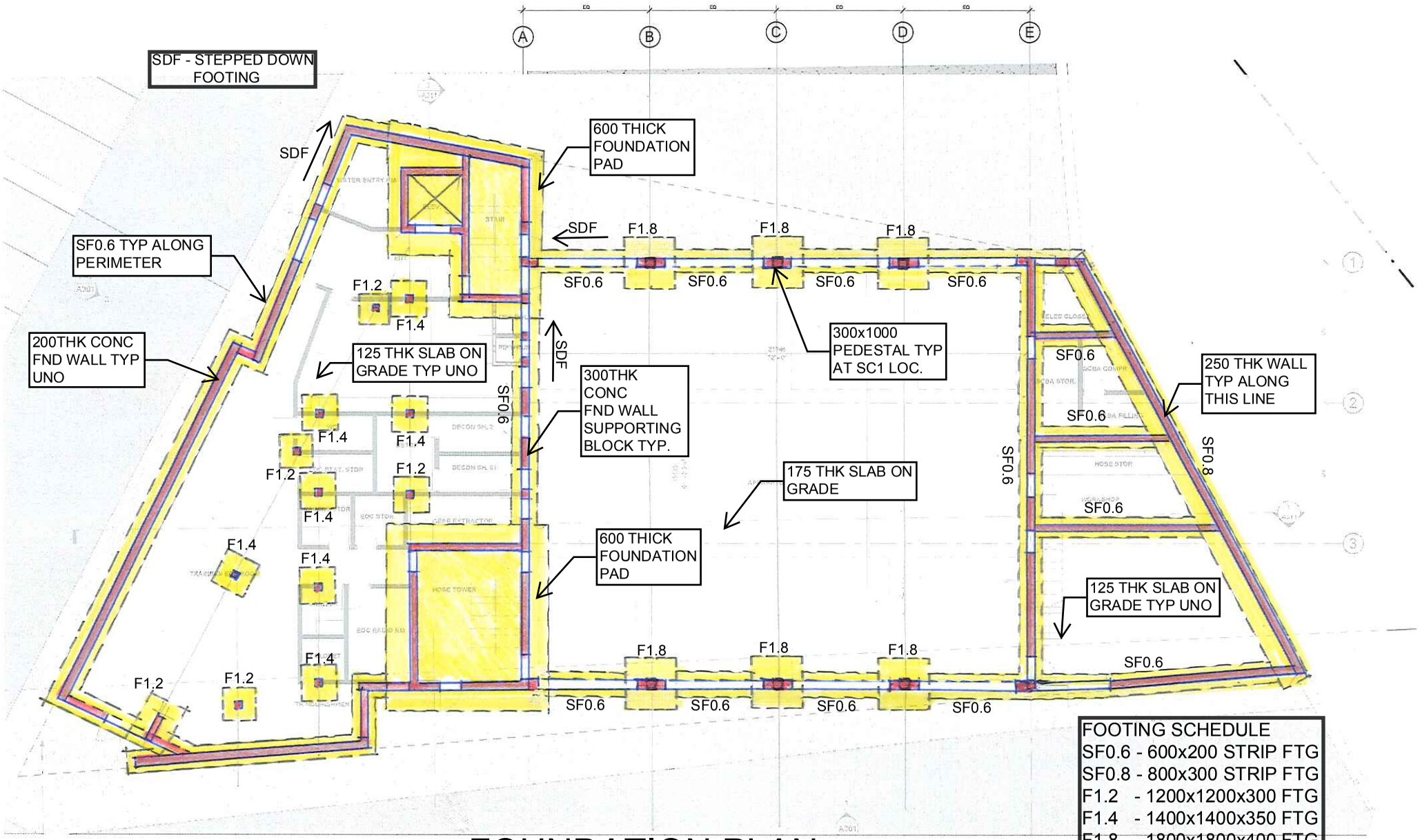
The lateral system will consist of a combination of plywood wood panel shearwalls and reinforced concrete masonry block shearwalls where these are described on these texts. Since the firehalls will be designed as post-disaster structure, the block shearwalls are going to require special detailing for the extra reinforcements for the ductility requirements. The plywood panel shearwalls will also require additional nailing, straps and hold-downs since they will be designed for higher forces as a post-disaster structure.

3.1.6. Hose Tower, Stair/Elevator Cores and Side Walls of the Apparatus Bays

The hose tower, stair and elevator cores and the first lift (main level to level 2) of the side walls of the apparatus bays will be constructed of 300 thick reinforced concrete masonry block walls. The blockwall construction of the hose tower, elevator and stair cores will continue up to the underside of the roof level while the side walls of the apparatus bays will stop at Level 2.

Note: See attached sketches of the schematic framing plans for more information.

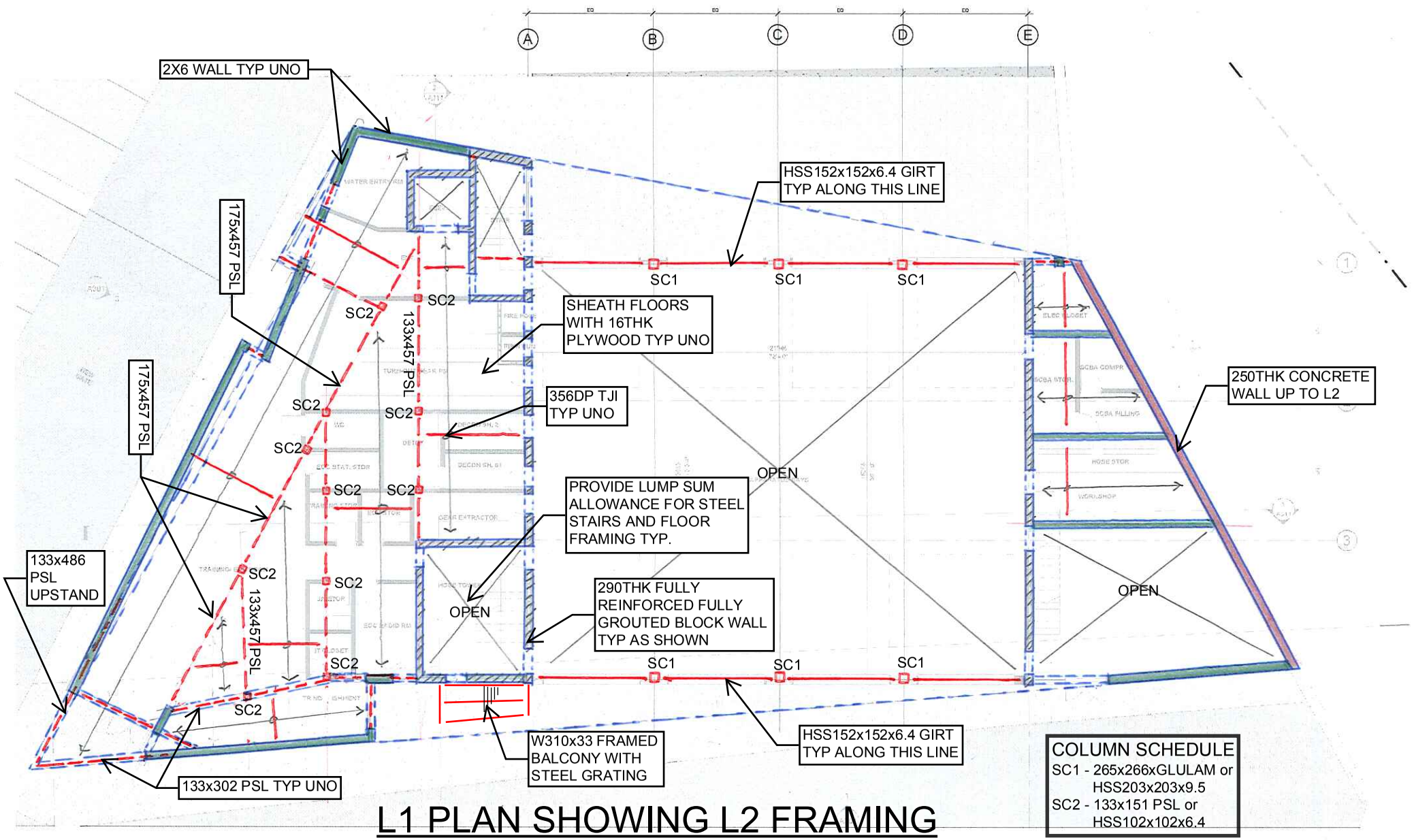
End of Structural Schematic Design Report.



FOUNDATION PLAN

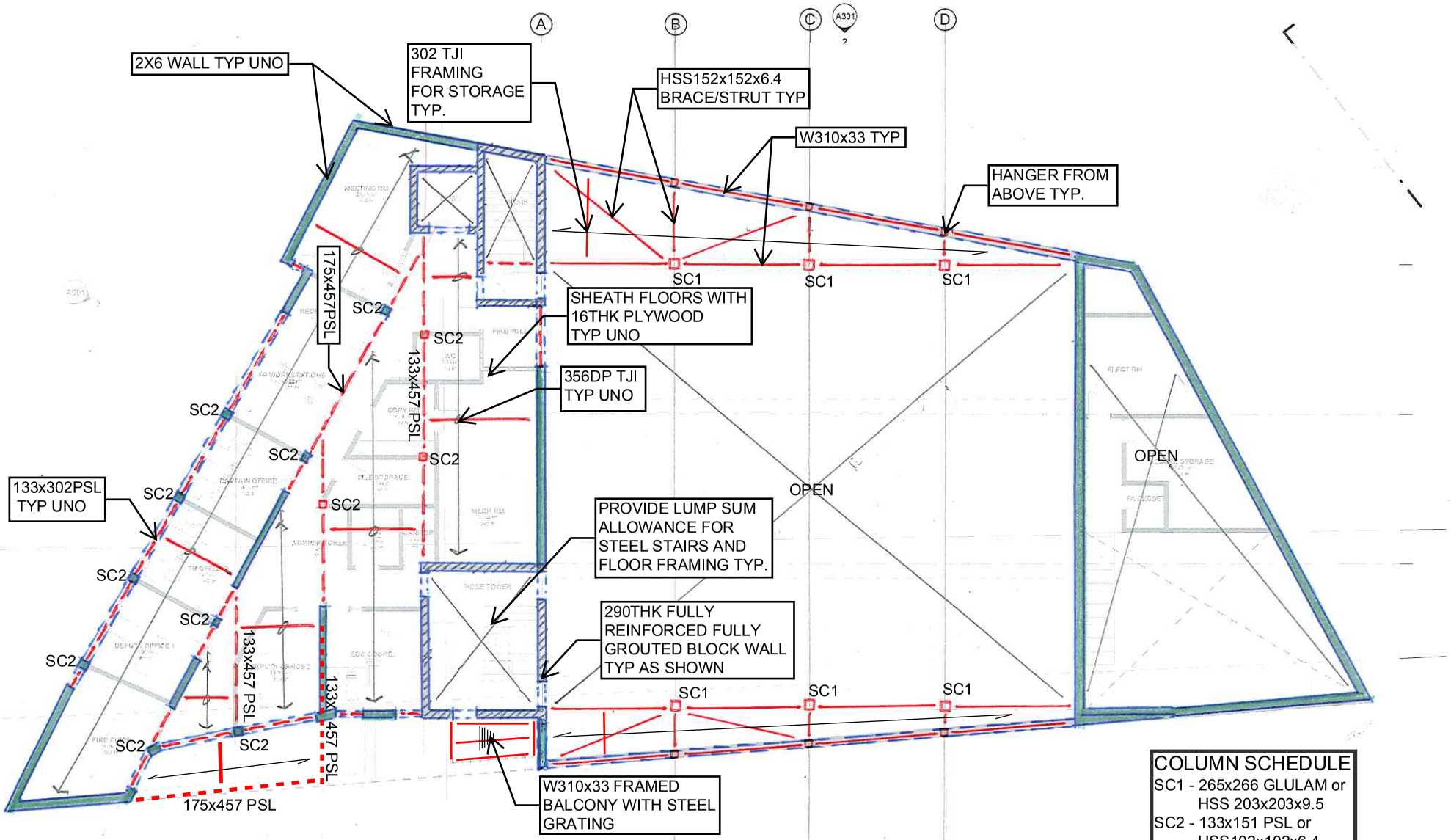
FOOTING SCHEDULE
SF0.6 - 600x200 STRIP FTG
SF0.8 - 800x300 STRIP FTG
F1.2 - 1200x1200x300 FTG
F1.4 - 1400x1400x350 FTG
F1.8 - 1800x1800x400 FTG

SK1



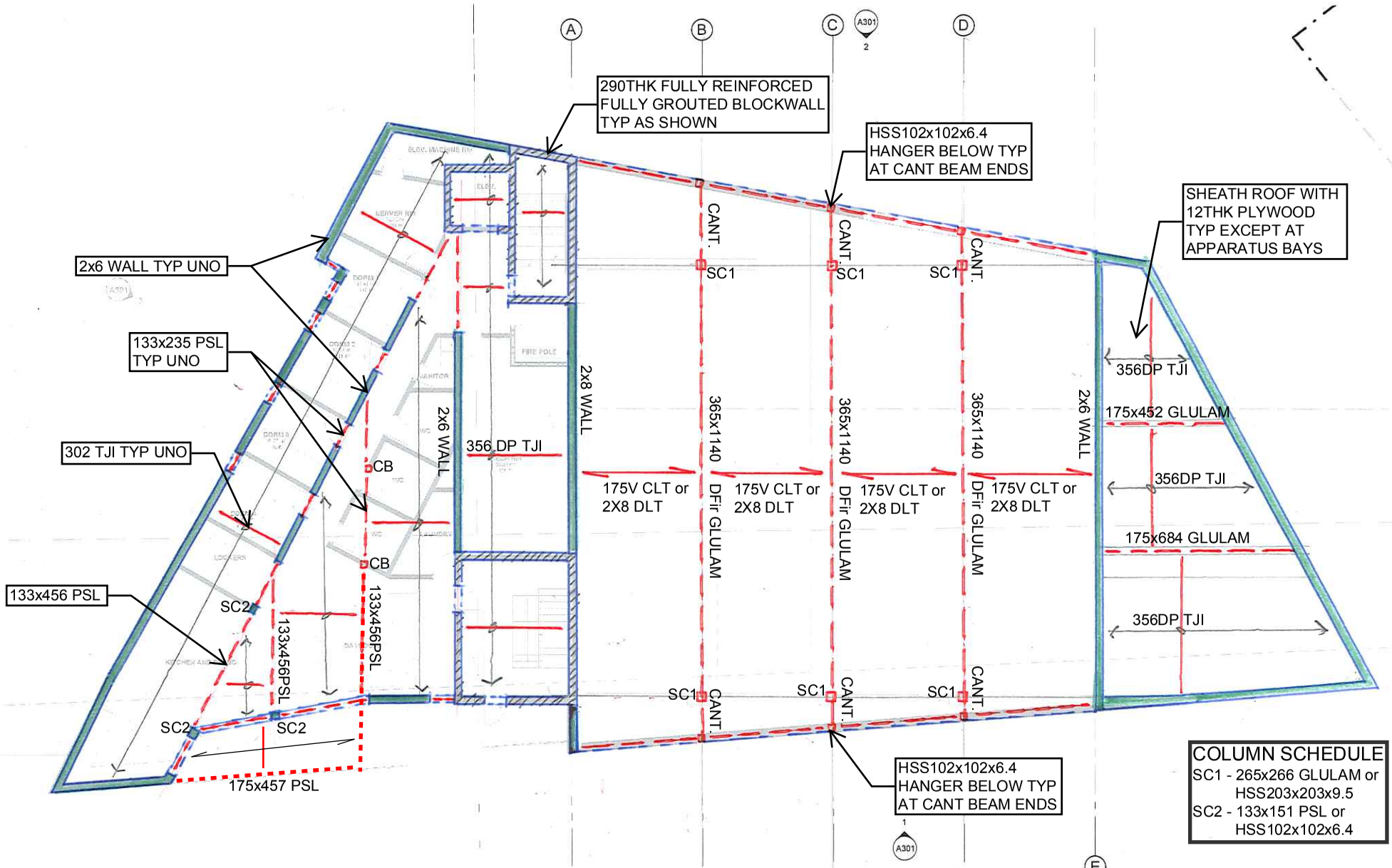
L1 PLAN SHOWING L2 FRAMING

SK2



L2 PLAN SHOWING L3 FRAMING

SK3



LEVEL 3 PLAN SHOWING ROOF FRAMING

SK4