

SCHEDULE 1

STATEMENT OF REQUIREMENTS

NEW WESTMINSTER SECONDARY SCHOOL

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STATEMENT OF REQUIREMENTS

1. INTERPRETATION

1.1 General/Overview

- 1.1.1** The Statement of Requirements, including all Appendices, describes key physical, functional and technical requirements of the Design and Construction. The requirements are written in the imperative form and except where otherwise expressly stated within the Statement of Requirements, all work described in or required by the Statement of Requirements will be an obligation of the Design-Builder. All things to be provided, delivered, performed or done by the Design-Builder as prescribed within the Statement of Requirements are deemed to be read and to be interpreted as “Design-Builder will”.
- 1.1.2** The documents forming this Schedule are intended to be complementary and interpreted in harmony and in a manner consistent with Good Industry Practice.

1.2 The Project Overview

- 1.2.1** The purpose of this Project is to relocate the New Westminster Secondary School currently located at 835 8th Street, in New Westminster, BC to the new Facility, a purpose-built building at the Site located on Sixth Street between Eighth Avenue and Tenth Avenue, New Westminster, BC. The existing Maintenance/IT services will also be relocated to a new purpose-built building, separate yet adjacent, to the School.
- 1.2.2** The School will provide a state-of-the-art learning environment. It will be designed to optimize the use of flexible learning spaces to maximize collaboration and active learning; this will include technology that enriches the learning process, multi-purpose spaces and modern career technology education areas, as well as contemporary visual and performing arts spaces. It will also meet today’s and future standards for modern learning, safety and accessibility, and incorporate the latest sustainable energy and waste management systems.
- 1.2.3** The Facility will be built adjacent to the existing New Westminster Secondary School, Massey Theatre, Mercer Stadium, Moody Arena and Thornbridge Gardens seniors residences, all of which will remain fully operational. The Design and Construction of the Facility must avoid disturbance to these and as required be coordinated to minimize and mitigate any potential impacts.
- 1.2.4** The Owner has conducted investigations into the history of the property they own around the location of the Site; reports are available in the data room. Approximately two hectares in the northwest corner of the property were determined to have a high probability of burials and therefore designated as

cemetery. A further (approximately) four hectares are protected under the Heritage Conservation Act and geophysical investigations have been completed to determine the extent of possible burial areas. All work within the protected areas, including Site services, is subject to monitoring by the Owner's archeologist.

1.3 Introduction

- 1.3.1** New Westminster Secondary School will be a design that meets the needs of all learners both for today and in the future while honouring the heritage of the surrounding community.
- 1.3.2** As the only secondary school in the City of New Westminster, and one of the largest schools in British Columbia, the School is committed to offering an inclusive, diverse, and state of the art education experience for all learners.
- 1.3.3** The new facility will be located as noted in the Design-Build Agreement.

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2. GENERAL

2.1 Standards of Design and Construction

- 2.1.1 The Design and Construction is to be completed in accordance with the standards set out in this Statement of Requirements, Functional Program and appendices, including requirements of all authorities having jurisdiction;
- 2.1.2 Unless expressly stated otherwise, each reference to a standard in this document will be deemed to mean the latest version of that standard as of the Financial Submission date;
- 2.1.3 The requirements of all applicable CSA standards;
- 2.1.4 [UNUSED];
- 2.1.5 All applicable Laws;
- 2.1.6 If the Design-Builder wishes to make reference to a code or standard from a jurisdiction outside of Canada, then the Design-Builder will demonstrate to the Owner's satisfaction that such code or standard meets or exceeds the requirements of this Schedule and other applicable governing bodies;
- 2.1.7 The Facility shall be designed to have a design service life of at least 50 years. Individual building components and systems shall have a design service life consistent with Good Industry Practice or such longer period as may be expressly specified in this Schedule;
- 2.1.8 The Design and Construction is to be performed in compliance with the latest applicable Standards regardless of whether they appear in this document or not, including:
- 2.1.9 Reference Standards:
 - 2.1.9.1 AAMA Field Testing Specifications
 - 2.1.9.2 AATCC-134: Electrostatic Propensity of Carpets
 - 2.1.9.3 AATTCC-174: Parts 2 and 3: Antimicrobial Activity Assessment of Carpets;
 - 2.1.9.4 ACI: American Concrete Institute
 - 2.1.9.4(1) ACI 315: Details and Detailing Concrete Reinforcement
 - 2.1.9.4(2) ACI 315R: Manual of Engineering and Placing Drawings for Reinforced Concrete Structures

- 2.1.9.5 AISC: American Institute of Steel Construction
- 2.1.9.6 ANSI/ASHRAE:
 - 2.1.9.6(1) 52.2: Method of Testing General Ventilation Air-Cleaning Devices for Removal of Efficiency by Particle Size;
 - 2.1.9.6(2) 55: Thermal Environmental Conditions for Human Occupancy;
 - 2.1.9.6(3) 62.1-2001: Ventilation for Acceptable Air Quality;
 - 2.1.9.6(4) 90.1: Energy Efficient Design for New Buildings Except Low-Rise Residential Buildings;
 - 2.1.9.6(5) 111: Practices for Measurement, Testing, Adjusting & Balancing of Building HVAC Systems;
 - 2.1.9.6(6) 135: Data Communication Protocol for Building Automation & Control Networks;
 - 2.1.9.6(7) 0-2005: The Commissioning Process;
 - 2.1.9.6(8) S12.2: Criteria for Evaluating Room Noise;
 - 2.1.9.6(9) Handbooks: HVAC Applications, HVAC Systems and Equipment, Fundamentals, Refrigeration;
 - 2.1.9.6(10) Design of Smoke Control Systems;
 - 2.1.9.6(11) ASHRAE Guidelines 12 – Minimizing the Risk of Legionellosis Associated with Building Water Systems;
 - 2.1.9.6(12) Drop Advanced Energy Design Guides 50 Percent K-12 School Building; and
 - 2.1.9.6(13) ASHRAE Guideline 1 – The HVAC Commissioning process.
- 2.1.9.7 ANSI/ASME/AISA:
 - 2.1.9.7(1) B31.1 Power Piping code, for steam systems;
 - 2.1.9.7(2) Section IX: Welding Qualifications;
 - 2.1.9.7(3) Unfired pressure vessels.
- 2.1.9.8 AWS D1.3: Structural Welding Code- Sheet Steel;
- 2.1.9.9 ASPE: Plumbing Engineering Design Handbook, Vol. 1-4;

2.1.9.10 ASTM:

- 2.1.9.10(1) ASTM A27- Specification for Structural;
- 2.1.9.10(2) ASTM A775 – Specification for epoxy coated Reinforcing Steel;
- 2.1.9.10(3) ASTM C309 – Specification for Liquid Membrane Forming Compounds for Curing Concrete;
- 2.1.9.10(4) ASTM E1155 – Standard Test Method for Determination of FF Floor Flatness and FL Floor Levelness Numbers;
- 2.1.9.10(5) ASTM A307 – Specification for Carbon Steel Bolts and Studs (60,000psi tensile);
- 2.1.9.10(6) ASTM A325 – Specification for Structural Bolts Heat-treated 120/105 KSI Minimum Tensile Strength;
- 2.1.9.10(7) ASTM A653 – Specification for Steel Sheet Zinc coated (galvanized) or Zinc-Iron Alloy Coated (galvannealed) by hot dip process;
- 2.1.9.10(8) ASTM A792 – Specification for Sheet Steel 55% Aluminum – Zinc Alloy coated by hot dip process;
- 2.1.9.10(9) ASTM A955 – Standard specification for Load Bearing (transverse and axial) Steel Studs, Runners (tracks) and bracing or Bridging for screw application of Gypsum Panel products;
- 2.1.9.10(10) ASTM C1396- Standard Specification for Gypsum Board.
- 2.1.9.10(11) ASTM E90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions & Elements
- 2.1.9.10(12) ASTM E96 Standard Test Methods for Water Vapour Transmission of Materials
- 2.1.9.10(13) ASTM E2307 Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi Story Test Apparatus
- 2.1.9.10(14) ASTM E2190 Standard Specification of Insulating Glass Unit Performance Evaluation
- 2.1.9.10(15) ASTM F710-11 – Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring;

- 2.1.9.10(16) ASTM F1647 – Standard Test Methods for Organic Matter Content on Athletic Field root zone mixes;
- 2.1.9.10(17) ASTM F1869-11- Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using anhydrous Calcium Chloride;
- 2.1.9.10(18) ASTM F1815 Standard Test Methods for Saturated Hydraulic Conductivity, Water Retention, Porosity and Bulk Density of Athletic Field Root zones;
- 2.1.9.10(19) ASTM B221M-07 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric);
- 2.1.9.10(20) ASTM F1233 Test Method for Security Glazing Materials and Systems;
- 2.1.9.10(21) ASTM C635 Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings;
- 2.1.9.10(22) ASTM C1036, Flat Glass;
- 2.1.9.10(23) ASTM C1048, Heat Treated Flat Glass;
- 2.1.9.10(24) ASTM C1349, Architectural Flat Glass Clad Polycarbonate;
- 2.1.9.11 AISI:
 - 2.1.9.11(1) AISI S100 – North American Specification for Design of cold formed Steel Structural Members (including commentary);
 - 2.1.9.11(2) AISI 200 – North American Standard for Cold Formed Steel Framing (general provisions);
 - 2.1.9.11(3) AISI 201 – North American Standard for Cold Formed Steel Framing (Product Data).
- 2.1.9.12 ANSI Z97.1, Safety Glazing Materials Used in Buildings;
- 2.1.9.13 AWCC: Association of Wall and Ceiling Contractors;
- 2.1.9.14 AWMAC: Architectural Woodwork Manufacturers Association of Canada;
- 2.1.9.15 BCBC;

- 2.1.9.16 BCICA Quality Standards Manual for Mechanical Insulation, latest edition.
- 2.1.9.17 BCSLA and BCLNA:
 - 2.1.9.17(1) BCLNA - British Columbia Landscape & Nursery Association:
 - 2.1.9.17(1)(a) Plant Materials;
 - 2.1.9.17(1)(b) Growing Medium;
 - 2.1.9.17(1)(c) Landscape Maintenance;
 - 2.1.9.17(1)(d) Irrigation Design.
- 2.1.9.18 BC Supplement to TAC Geometric Design Guide, latest edition;
- 2.1.9.19 CAN/CGSB:
 - 2.1.9.19(1) CAN/CGSB-4.129-93 CORR.2 – Carpet for Commercial Use;
 - 2.1.9.19(2) CAN/CGSB- 12.1-2017 Tempered or Laminated Safety Glass;
 - 2.1.9.19(3) CAN/CGSB 69.17 86 Bored and Preassembled Locks and Latches;
 - 2.1.9.19(4) CAN/CGSB 69.18 90 / ANSI/BHMA A156.1 81 Butts and Hinges;
 - 2.1.9.19(5) CAN/CGSB 69.19 93 / ANSI/BHMA A156.3 94 Exit Devices;
 - 2.1.9.19(6) CAN/CGSB 69.20 90 / ANSI/BHMA A156.4 86 Door Controls (Closers);
 - 2.1.9.19(7) CAN/CGSB 69 21 90 / Auxiliary Locks and Associated Products;
 - 2.1.9.19(8) CAN/CGSB 69.22 90 / ANSI/BHMA A156.6 96 Architectural Door Trim;
 - 2.1.9.19(9) CAN/CGSB 69.29 93 / ANSI/BHMA A156.13 Mortise Locks and Latches;
 - 2.1.9.19(10) CAN/CGSB 69.30 93 / ANSI/BHMA A156.14 99 Sliding and Folding Door Hardware;
 - 2.1.9.19(11) CAN/CGSB 69.35 89 / ANSI/BHMA A156.19 84 Power Assist and Low Energy Power Operated Doors;
 - 2.1.9.19(12) CAN/CGSB-1.5.01-M- Method for Permeance of Coated Wall Board.

2.1.9.20 CAN/CSA:

2.1.9.20(1) CAN/CSA-G164- M92 Hot Dip Galvanizing Of Irregular Shaped Articles.

2.1.9.21 CEC Canadian Electrical Code;

2.1.9.22 CEMA Canadian Electrical Manufacturers Association;

2.1.9.23 CGSB-4 GP-129-93 Standards for Carpets;

2.1.9.24 CISCA (Ceilings and Interior Systems Contractors Association) - Ceiling Systems Handbook;

2.1.9.25 CISC Canadian Institute of Steel Construction;

2.1.9.26 CLA Canadian Lumberman's Association;

2.1.9.27 CMHA "The Rain Screen Wall System" document;

2.1.9.28 CRCA Canadian Roofing Construction Association;

2.1.9.29 CSA:

2.1.9.29(1) C22.1-15 – Canadian Electrical Code;

2.1.9.29(2) B355 Lift for Persons with Physical Disabilities;

2.1.9.29(3) B44 Safety Code for Elevators;

2.1.9.29(4) AAMA/WDMA/CSA 101/I.S.2/A440-08 - NAFS – North American Fenestration Standard/Specification for Windows, Doors, and Skylights;

2.1.9.29(5) A440S1-09 Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440, NAFS – North American Fenestration Standard/Specification for Windows, Doors, and Skylights;

2.1.9.29(6) B52: Mechanical Refrigeration Code;

2.1.9.29(7) B149.1: Natural Gas and Propane Installation Code;

2.1.9.29(8) B651-95: Barrier Free Design;

2.1.9.29(9) W186-M1990 (R2002) - Welding of Reinforcing Bars in Reinforced Concrete Construction;

2.1.9.29(10) A370-14 - Connectors for Masonry;

- 2.1.9.29(11) A23.1-14/A23.2-14 - Concrete Materials and Methods of Concrete Construction / Methods of Test and Standard Practices for Concrete;
- 2.1.9.29(12) S832-06 – Seismic Risk Reduction of Operational and Functional Components (OFCS of Buildings);
- 2.1.9.29(13) A23.3-14 – Design of Concrete Structures;
- 2.1.9.29(14) S16-14 – Design of Steel Structures;
- 2.1.9.29(15) O86-14 – Engineering Design in Wood;
- 2.1.9.29(16) 0.115-1967;
- 2.1.9.29(17) S136-07 – North American Specification for the Design of Cold-Formed Steel Structural Members;
- 2.1.9.29(18) S157-05 – Strength Design in Aluminum;
- 2.1.9.29(19) S304.1-14 – Design of Masonry Structures;
- 2.1.9.29(20) CSA B44 – Elevator Code;
- 2.1.9.29(21) S478 – Guidelines for Durability in Buildings Structures (Design);
- 2.1.9.29(22) A266.1 - Air Entraining Admixtures in Concrete;
- 2.1.9.29(23) A266.2 - Chemical Admixtures for Concrete;
- 2.1.9.29(24) A266.4 - Guidelines for use of admixtures in concrete;
- 2.1.9.29(25) A371 – Masonry Construction for Buildings;
- 2.1.9.29(26) A3000 – Cementitious Materials Compendium;
- 2.1.9.29(27) W47.1 – Certification of companies for Fusion Welding of Steel Structures;
- 2.1.9.29(28) W59 – Welded Steel Construction; and
- 2.1.9.29(29) W55.3 – Resistance Welding Qualifications Code for Fabricators of Structural members used in Buildings.
- 2.1.9.30 DHI Door and Hardware Institute;
- 2.1.9.31 IDA International Dark Sky Association;

- 2.1.9.32 LEED Green Building Rating System for New Construction and Major Renovations 2009 (CaGBC).
- 2.1.9.33 MFCSI Master Floor Covering Standards Institute.
- 2.1.9.34 National Floor Covering Association – NFCA Reference Manual.
- 2.1.9.35 Ministry of Education Province of British Columbia:
 - 2.1.9.35(1) Accessible School Facilities A Resource for Planning;
 - 2.1.9.35(2) Standards for Digital Learning Content.
- 2.1.9.36 MPI:
 - 2.1.9.36(1) Master Painters Institute (MPI) Architectural Specification Standards Manual.
- 2.1.9.37 NAAMM- National Association of Architectural Metal Manufacturers;
- 2.1.9.38 National Research Council Canada
 - 2.1.9.38(1) National Energy Code of Canada for Buildings 2011 (NECB)
- 2.1.9.39 NEMA:
 - 2.1.9.39(1) NEMA4; Waterproof Enclosures;
 - 2.1.9.39(2) NEMA 4X and IP 66 (IP66 extends NEMA4 to include some protection from corrosion); and
 - 2.1.9.39(3) NEMA LS 1 – Low Voltage Surge Protective Devices.
- 2.1.9.40 NFPA:
 - 2.1.9.40(1) 10: Standard for Portable Fire Extinguishers;
 - 2.1.9.40(2) 13: Standard for the Installation of Sprinkler Systems;
 - 2.1.9.40(3) 14 Standard for the Installation of Standpipe & Hose Systems;
 - 2.1.9.40(4) 20 Standard for the Installation of Stationary Pumps for Fire Protection;
 - 2.1.9.40(5) 80 Standard for Fire Doors & Other Opening Protectives;
 - 2.1.9.40(6) 90A - Current Edition: Standard for Installation of Air Conditioning and Ventilation Systems;

- 2.1.9.40(7) 92A - Current Edition: Standard for Smoke-Control Systems Utilizing Barriers and Pressure Differences;
- 2.1.9.40(8) 101 - Current Edition: Life Safety Code.
- 2.1.9.41 RCABC: Roofing Association of British Columbia;
- 2.1.9.41(1) RCABC Roofing Practices Manual.
- 2.1.9.42 STA: Sports Turf Association Athletic Field Construction Manual;
- 2.1.9.43 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA);
- 2.1.9.44 TTMAC: Terrazzo, Tile, Marble Specifications, Standards & Testing;
- 2.1.9.45 TAC: Manual of Uniform Traffic Control Devices and Signage;
- 2.1.9.46 UL:
- 2.1.9.46(1) 300 Standard for Fire Testing of Fire Extinguishing Systems for Protection of Commercial Cooking Equipment;
- 2.1.9.46(2) UL 972-06 Standard for Burglary Resisting Glazing Material.
- 2.1.9.47 ULC:
- 2.1.9.47(1) CAN/ULC S101 Fire Endurance Tests of Building Construction Materials
- 2.1.9.47(2) CAN/ULC S102 Standard Method of Test for Surface Burning Characteristics of Building Materials & Assemblies
- 2.1.9.47(3) CAN/ULC S104 Standard method for Fire Test of Door Assemblies
- 2.1.9.47(4) CAN/ULC S106 Standard Method for Fire Tests of Window & Glass Block Assemblies
- 2.1.9.47(5) CAN/ULC S107 Methods of Fire Tests of Roof Coverings
- 2.1.9.47(6) CAN/ULC S109 Flame Tests of Flame Resistant Fabrics & Films;
- 2.1.9.47(7) CAN/ULC S114- Standard Method of Fire Tests for Determination of Non-combustibility in Building materials;
- 2.1.9.47(8) CAN/ULC S115 Standard Method of Fire Tests of Fire stop Systems;

- 2.1.9.47(9) CAN/ULC S134 Standard Method of Fire Test of Exterior Wall Assemblies;
- 2.1.9.47(10) CAN/ULC S135 Standard Test Method for the Determination of Combustibility of Building Materials using an Oxygen Consumption Calorimeter.
- 2.1.9.48 Workers Compensation Act, RSBC 1996, c.492 including the Occupational Health and Safety Regulations, BC Reg. 296/97.
- 2.1.9.49 BC Safety Standards Act/ BC Safety Authority Regulations: BC Reg. 134/2009 & BC Elevating Device Safety Regulation BC Reg. 210/2015;
- 2.1.9.50 BC Lien Act (SBC 1997) Chapter 45.

2.1.10 Life Cycle Costing

2.1.10.1 The Design-Builder is to:

- 2.1.10.1(1) Minimum useful life of selected architectural, structural, mechanical and electrical systems will meet or exceed the durations set out in the table below:

Facility Component	Minimum Useful Life
Substructure	50 years
Structure	50 years
Building Envelope	25 years
Interior Floor Finishes	10 years
Interior Wall Finishes	7 years
Interior Ceiling Finishes	20 years
Interior Fittings and Fixtures	20 years
Major Electrical Systems	25 years
Lighting Systems	15 years
Plumbing Systems	25 years
Fire Protection Systems	25 years
Communication Systems	15 years
Heating, Ventilation & Air Conditioning Systems	25 years
Elevators	25 years
Exterior Paving	20 years

2.2 Technical Acronyms

2.2.1 The following technical acronyms are applicable to these Design and Construction specifications:

- 2.2.1.1 AAMA – American Architectural Manufacturers Association;
- 2.2.1.2 AAS – Aluminum Association Standards;
- 2.2.1.3 AIBC – Architectural Institute of British Columbia;
- 2.2.1.4 ACI – American Concrete Institute;
- 2.2.1.5 AFF – Above Finished Floor;
- 2.2.1.6 AHC- Architectural Hardware Consultant;
- 2.2.1.7 AHJ – Authority Having Jurisdiction;
- 2.2.1.8 AISI- American Iron and Steel Institute;
- 2.2.1.9 AMCA- Air Movement and Control Association;
- 2.2.1.10 ANSI – American National Standards Institute;
- 2.2.1.11 APEGBC – Association of Professional Engineers and Geoscientist of BC;
- 2.2.1.12 ARI- Air Conditioning and Refrigeration Institute;
- 2.2.1.13 ASCC – American Society of Concrete Contractors;
- 2.2.1.14 ASHRAE – American Society of Heating, Refrigerating and Air-Conditioning Engineers;
- 2.2.1.15 ASME – American Society of Mechanical Engineers;
- 2.2.1.16 ASPE- American Society of Plumbing Engineers;
- 2.2.1.17 ASTM – American Society of Testing and Materials;
- 2.2.1.18 AWWA Standards – American Water Works Association;
- 2.2.1.19 AWCC – Association of Wall and Ceiling Contractors;
- 2.2.1.20 AWMAC - Architectural Woodwork Manufacturer’s Association of Canada;
- 2.2.1.21 AWPA – American Wood Protection Association;

- 2.2.1.22 AWWA- American Water Works Association;
- 2.2.1.23 BCBC – British Columbia Building Code;
- 2.2.1.24 BCICA – British Columbia Insulation Contractors Association;
- 2.2.1.25 BCLNA – British Columbia Landscape & Nursery Association;
- 2.2.1.26 BCSLA – British Columbia Society of Landscape Architects;
- 2.2.1.27 BICSI – Building Industry Consulting Services International;
- 2.2.1.28 BMS – Building Management System;
- 2.2.1.29 CAC – Ceiling Attenuation Class;
- 2.2.1.30 CaGBC – Canada Green Building Council;
- 2.2.1.31 CCI – Canadian Carpet Institute;
- 2.2.1.32 CCTV – Closed Circuit Television;
- 2.2.1.33 CEC – Canadian Electrical Code;
- 2.2.1.34 CGA – Compressed Gas Association;
- 2.2.1.35 CGSB – Canadian General Standards Board;
- 2.2.1.36 CISC- The Canadian Institute of Steel Construction;
- 2.2.1.37 CISCA – Ceiling Interior Systems Construction Association;
- 2.2.1.38 CLS – Collaborative Learning Spaces;
- 2.2.1.39 CMCA – Canadian Masonry Contractors Association;
- 2.2.1.40 CPMA – Canadian Paint Manufacturers Association;
- 2.2.1.41 CPU – Central Processing Unit;
- 2.2.1.42 CPTED – Crime Prevention through Environmental Design;
- 2.2.1.43 CRTC – Canadian Radio-television and Telecommunications Commission;
- 2.2.1.44 CRI – Canadian Rug Institute;
- 2.2.1.45 CSA – Canadian Standards Association;

- 2.2.1.46 CSDFMA – Canadian Steel Door and Frame Manufacturers Association;
- 2.2.1.47 CSSBI – Canadian Sheet Steel Building Institute;
- 2.2.1.48 CTE – Career and Technology Education;
- 2.2.1.49 CTI- Cooling Technology Institute;
- 2.2.1.50 CWB – The Canadian Welding Bureau;
- 2.2.1.51 dB- Decibels;
- 2.2.1.52 dBA – A-Weighted sound pressure level;
- 2.2.1.53 DDC – Direct Digital Controls;
- 2.2.1.54 DHI – Door and Hardware Institute;
- 2.2.1.55 ESS – Electronic Safety & Security;
- 2.2.1.56 FACP – Fire Alarm Control Panel;
- 2.2.1.57 FM- Facility Maintenance;
- 2.2.1.58 GCA – Glazing Contractors Association of BC;
- 2.2.1.59 HAZMAT – Hazardous Materials;
- 2.2.1.60 HEPA – High Efficiency Particulate Air;
- 2.2.1.61 HVAC – Heating, Ventilating and Air-Conditioning;
- 2.2.1.62 IEEE – Institute of Electrical and Electronic Engineers;
- 2.2.1.63 IABC – Irrigation Association of British Columbia;
- 2.2.1.64 IGMAC – Insulating Glass Manufacturers Association of Canada;
- 2.2.1.65 ICPI – Interlocking Concrete Pavement Institute;
- 2.2.1.66 IIC – Impact Isolation Class;
- 2.2.1.67 IP – Internet Protocol;
- 2.2.1.68 ISTRC – International Sports Turf Research Centre;
- 2.2.1.69 LCD- Liquid Crystal Display;
- 2.2.1.70 LED- Light Emitting Diode;

- 2.2.1.71 LEED – Leadership in Energy and Environmental Design;
- 2.2.1.72 MEP – Mechanical, Electrical and Plumbing;
- 2.2.1.73 MFMA-FJ – Maple Flooring Manufacturers Association Finger- Jointed Tongue and Grooved;
- 2.2.1.74 MMCD – Master Municipal Construction Documents;
- 2.2.1.75 MPI – Master Painters Institute;
- 2.2.1.76 NAFS North American Fenestration Standard;
- 2.2.1.77 NAAMM – National Association of Architectural Metal Manufacturers;
- 2.2.1.78 NC – Noise Criteria;
- 2.2.1.79 NEMA – National Electrical Standards Association (see CSA);
- 2.2.1.80 NFCA – National Floor Covering Association of Canada;
- 2.2.1.81 NFPA – National Fire Protection Association;
- 2.2.1.82 NHLA – National Hardwood Lumber Association;
- 2.2.1.83 NIC – Noise Isolation Class;
- 2.2.1.84 NLGA – National Lumber Grading Association;
- 2.2.1.85 NRC – Noise Reduction Coefficient;
- 2.2.1.86 NTSC – National Television Standards Committee;
- 2.2.1.87 OC – On Centre;
- 2.2.1.88 OD – Outside Dimension;
- 2.2.1.89 OS&Y – Open Stem and Yoke;
- 2.2.1.90 PBX – Private Branch Exchange;
- 2.2.1.91 PHE – Physical and Health Education;
- 2.2.1.92 PoE – Power Over Ethernet;
- 2.2.1.93 RCABC – Roofing Contractors Association of BC;
- 2.2.1.94 SBS – Modified Bitumen Roofing System;
- 2.2.1.95 STA – Sports Turf Association;

- 2.2.1.96 STC – Sound Transmission Class;
- 2.2.1.97 STI – Speech Transmission Index;
- 2.2.1.98 TAC- Transportation Association of Canada;
- 2.2.1.99 TIA – Telecommunications Industry Association;
- 2.2.1.100 TTMAC – Terrazzo and Tile Manufacturers Association of Canada;
- 2.2.1.101 TVOC – Total Volatile Organic Compounds;
- 2.2.1.102 UBC – University of British Columbia;
- 2.2.1.103 ULC – Underwriters’ Laboratories of Canada;
- 2.2.1.104 UPS – Uninterruptible Power Supply;
- 2.2.1.105 USGBC – United States Green Building Council;
- 2.2.1.106 VFD – Variable Frequency Drive;
- 2.2.1.107 VLAN – Virtual Local Area Network;
- 2.2.1.108 VOC – Volatile Organic Compounds;
- 2.2.1.109 VoIP- Voice Over Internet Protocol;
- 2.2.1.110 WH- Warnock Hersey;
- 2.2.1.111 WHMIS – Workplace Hazardous Material Information System;
- 2.2.1.112 WSBC – Work Safe British Columbia.

2.3 Glossary of Terms

2.3.1 In this Schedule, in addition to the definitions set out in Section 1 of the Agreement:

2.3.1.1 “BC Building Code” means the British Columbia Building Code;

2.3.1.2 “Ceiling Height” means the height from the finished floor to the underside of the interior ceiling finish without any projection into the clear height and/or, in the case of exposed structure ceiling, the underside of structure;

2.3.1.3 “Classrooms” means spaces, including the following:

2.3.1.3(1) Learning Neighbourhood Classrooms;

- 2.3.1.3(2) Physical Health Education Classroom
 - 2.3.1.3(3) Career Technical Education Classroom
 - 2.3.1.3(4) Culinary Arts Classroom;
 - 2.3.1.3(5) Science laboratories;
 - 2.3.1.3(6) Friendship Centre.
- 2.3.1.4 “Common Areas” means spaces that are part of Gross Areas. These spaces may be located between Functional Program components and within components. Common Areas include the following:
- 2.3.1.4(1) Primary and Secondary corridors including alcoves, nooks and niches;
 - 2.3.1.4(2) Mechanical, Electrical and IT service spaces:
 - 2.3.1.4(3) Janitorial/Custodial spaces.
- 2.3.1.5 “CPTED” or “Crime Prevention Through Environmental Design” means a multi-disciplinary approach to deterring undesirable and criminal activity and behaviour through environmental design;
- 2.3.1.6 “Daylighting Direct” means access to natural light that:
- 2.3.1.6(1) Is transmitted through an exterior window measuring not less than 1.7 square metres unless otherwise noted in this Schedule; and
 - 2.3.1.6(2) Reaches the centre of the relevant space from a light radius of no more than 10 metres, if the space is over 45 square metres in size, or 8 metres for all other spaces, as measured from the entire length of the window.
- 2.3.1.7 “Daylight Indirect” means light that is transmitted to an interior space through a window and that comes from the adjacent space having direct natural light;
- 2.3.1.8 “Direct Adjacency” mean spaces that are immediately beside each other and have internal connections not through a corridor;
- 2.3.1.9 “Direct Connection” means immediate internal access from one space to another space;

- 2.3.1.10 “Drop cable” or “drop” (in telecommunications section) means the cable linking an outlet/connector to telecommunication patch panel or communication or security equipment;
- 2.3.1.11 “End-Use Equipment/User Equipment” means any device used directly by an end-user to communicate;
- 2.3.1.12 “End User” means the owner or user of the building cabling system;
- 2.3.1.13 “Equipment Outlet” means the outermost connection facility in a hierarchical star topology;
- 2.3.1.14 “Formal Learning Spaces” means traditional physical spaces within the School such as classrooms, laboratories, shops and gymnasium;
- 2.3.1.15 “Front of School” means the two exterior building faces parallel to Eighth Avenue and parallel to Eighth Street.
- 2.3.1.16 “Functional Program” means the Appendix 1A Functional Program;
- 2.3.1.17 “Good Industry Practice” means the exercise of the degree of skill and care, diligence, prudence and foresight which would be reasonably and consistently expected from a skilled and experienced professional and contractor;
- 2.3.1.18 “Human scale” means the measure of the size of the building and its parts in relation to the person or people using it. The human scale is perceivable and relatable in relation to the size of a person. Human scale is a scale that feels comfortable and appropriate to a person, for example, steps, doorways, canopies are sized to feel comfortable (not oversized to induce a feeling of being small or undersized to induce a feeling of being large in relation to the built form);
- 2.3.1.19 “Indirect Connection” means secondary/ancillary access between two spaces which may include corridor access and in the case of the Learning Commons to Grand Commons may include a visual connection where one space overlooks and is open to the space below;
- 2.3.1.20 “Indirect Daylighting” means light that is transmitted to an interior space through a window and that comes from the adjacent space having direct natural light;
- 2.3.1.21 “Informal Learning Spaces” means spaces that are non-discipline specific spaces inside or outside of the School used by students for the purpose of learning activities such as learning commons, hallways, corridors and breakout rooms;

- 2.3.1.22 “Intuitive Wayfinding” means the designed environment that can be easily perceived and understood in order to reach one’s destination;
- 2.3.1.23 “IT Systems” refers to the data communications systems equipment provided by either the Owner or the Design-Builder including: systems described in this Schedule; data networks and equipment; wireless infrastructure; wireless staff communication system; telephony; video conferencing; user information systems; wireless communications system; and all related equipment, printers, fax machines, servers, cabling and other related hardware, software and applications;
- 2.3.1.24 “Maintenance/IT Building” means the component that is referred to in Appendix 1A Functional Program and includes related structures, utility connections, landscaping and other improvements to be constructed by the Design-Builder;
- 2.3.1.25 “Modular Jack” means a female telecommunications connector that may be keyed or unkeyed and may have 6 or 8 contact positions, but not all positions need be equipped with jack contacts;
- 2.3.1.26 “Net Area” or “Net Square Meters” or “NSM” means the horizontal area of space assigned to a specific function. The net area of rooms is measured to the inside face of finished wall surfaces;
- 2.3.1.27 “NWSS” means the School and Maintenance/IT Building;
- 2.3.1.28 “Operational Philosophy” has the meaning set out in section 3.3 of this Schedule;
- 2.3.1.29 “Outlet Box” means a housing to hold telecommunications outlet/connectors;
- 2.3.1.30 “Outlet/connector” means the fixed connector on an equipment outlet;
- 2.3.1.31 “Owner IT Representatives” is the person identified by the Owner as being responsible for IT;
- 2.3.1.32 “Port” means each location of telecommunication outlet. Each port must have a minimum of two drops cables fully terminated;
- 2.3.1.33 “Post and Beam” means heavy wood frame structure.
- 2.3.1.34 “Primary Corridors” means the main circulation routes that lead to components of the School;
- 2.3.1.35 “Program Requirements” has the meaning set out in Appendix 1A Functional Program;

- 2.3.1.36 “Project Guiding Principles” has the meaning set out in section 3.2 of this Schedule;
- 2.3.1.37 “Project North” for the purposes of this project, project north shall be Sixth Street;
- 2.3.1.38 “Project Vision” has the meaning set out in section 3.1 of this Schedule;
- 2.3.1.39 “Rain-Screen Principles” has the meaning set out in section 4.8.1.5 of this Schedule;
- 2.3.1.40 “Room Data Sheets” has the meaning set out in Appendix 1B Room Data Sheets to the Statement of Requirements;
- 2.3.1.41 “School” means the components that are referred to in Appendix 1A Functional Program and includes related structures, utility connections, landscaping and other improvements to be constructed by the Design-Builder;
- 2.3.1.42 “Secondary Corridors” means circulation routes that are within the component spaces of the School;
- 2.3.1.43 “Space (telecommunications)” means an area used for housing the installation and termination of telecommunications equipment and cable;
- 2.3.1.44 “TAB” means testing, adjusting and balancing;
- 2.3.1.45 “Telecommunications Outlet” refer to Outlet Box;
- 2.3.1.46 “Universally accessible” means to provide access to all exterior and interior spaces to all individuals regardless of their level of mobility;
- 2.3.1.47 “Void Space” means space which is trapped between walls and/or structure and is not intended to be finished or used;
- 2.3.1.48 “West Coast Modernism” means an architectural style that incorporates the local natural environment and local regional natural materials to achieve a harmonious relationship with the surrounding landscape. Refer to section 4.4.1 of this Schedule.

3. DESIGN PRINCIPLES

3.1 Mission and Vision Statement

- 3.1.1 The Owner’s vision for the Project includes the following:

- 3.1.1.1 The mission of the New Westminster Secondary School is to develop responsible citizens and lifelong learners who respect learning, the environment, themselves, and others;
- 3.1.1.2 The vision for New Westminster Secondary School is to be a diverse and inclusive school that will provide a state-of-the-art learning environment. The School will be designed to optimize the use of flexible and visible learning spaces to maximize collaboration and active learning; this will include technology that enriches the learning process, multi-purpose spaces and modern career technology education areas, as well as contemporary visual and performing arts spaces.

3.2 Guiding Principles and Critical Success Factors

3.2.1 Project Aspirations

- 3.2.1.1 The Owner developed 10 project aspirations for designing and building the new learning environment.
 - 3.2.1.1(1) Build a school that will support the evolving learning environment.
 - 3.2.1.1(1)(a) The goal is to offer personalized learning experiences for all learners, and the facility will reflect this pedagogical shift. By incorporating spaces for both large groups and one-on-one instruction, the space will support the flexibility needed for individualized learning.
 - 3.2.1.1(2) Create a school with the flexibility to meet the needs of a rapidly changing society.
 - 3.2.1.1(2)(a) Learning happens everywhere. Focusing on student-centred learning requires the environment to respond adaptively to this principle. Students must have an opportunity to interact with one another, with teachers, and with the community. The facility will respond to this by offering places of collaboration for idea sharing and community interaction.
 - 3.2.1.1(3) Develop a sustainable design that will minimize impacts on the environment.
 - 3.2.1.1(4) The building will be designed to not only minimize the impact of its footprint on the environment, but it will actually support good citizenship. The space will promote the understanding of sustainable design and sustainable living. Paired with a

curriculum that encourages global and cultural understanding, and personal and social responsibility, the environment will help support the interdisciplinary curriculum for all learners.

- 3.2.2** Develop a design with an emphasis on healthy students, teachers and staff.
 - 3.2.2.1 The environment will be one that emphasizes wellness and promotes lifelong health. Holistic design for the physical, social and emotional needs of all stakeholders is key in promoting wellbeing.
- 3.2.3** Respect, protect and preserve the historical and cultural significance of the site.
 - 3.2.3.1 Honouring the history and the culture of the surrounding community, the site will acknowledge the heritage of the First Nations community, the Chinese community and other communities who have ancestors buried on or near the property. Staying committed to protecting the memorialization of burial areas, the Owner and building team will work with an advisory committee to continue to honour the history of the adjoining Owner and City site.
- 3.2.4** Create adaptive spaces that consider the role of rapidly changing technology in the ways students learn.
 - 3.2.4.1 The new learning environment will respond to the rapidly changing technology landscape by providing a flexible learning space to meet the needs of all learners.
- 3.2.5** Create opportunities for school community engagement.
 - 3.2.5.1 Engagement and interaction promotes a sense of community among learners. The new facility will create places of collaboration for teachers, students, community members, staff and parents. By placing flexible spaces throughout the building, and maintaining safe and secure entryways, the School will feel open, and accessible, for all learners.
- 3.2.6** Create learning spaces where students and staff interact outside of the traditional classroom environment.
 - 3.2.6.1 The whole School will become a classroom. Honouring the notion that learning does happen everywhere, students will have the opportunity to learn across multiple spaces. Commonly referred to as “caves,” “watering holes,” and “campfires,” the facility will provide variety in the space in order to encourage levels of interaction outside of the traditional, primary learning space.
- 3.2.7** Make teaching and learning spaces visible.

3.2.7.1 Transparency creates curiosity; curiosity sparks learning. By making teaching and learning spaces visible, the school community will become interactive. The spaces will incorporate natural light at every opportunity as well as creating connection to nature.

3.2.8 Design a school that inspires and nourishes creativity.

3.2.8.1 Creative curiosity is a foundational need for all learners. The environment will be one that encourages interaction and awakens inspiration in learners.

3.2.9 Critical Success Factors

3.2.9.1 The Design-Builder will provide a building area that satisfies the area requirements of Appendix 1A Functional Program;

3.2.9.2 Net area requirements for the Facility shall be considered to be a minimum requirement;

3.2.9.3 The Design-Builder shall meet the requirements for the adjacencies and relationship as described in Appendix 1A Functional Program and associated diagrams;

3.2.9.4 The following spaces, as described in Appendix 1A Functional Program, shall have direct at grade access;

3.2.9.4(1) Grand Commons;

3.2.9.4(2) Student Support;

3.2.9.4(3) Administration;

3.2.9.4(4) Career Technology Education (excluding Engineering Lab);

3.2.9.4(5) Performing Arts;

3.2.9.4(6) Gymnasium;

3.2.9.4(7) Physical and Health Education change rooms

3.2.9.4(8) .

3.2.9.5 The Maintenance/IT component shall be located as a separate building as set out in the Design-Build Agreement;

3.2.9.6 The Facility must function in secure zones such that the following zones are independently securable at times deemed appropriate by the Owner:

- 3.2.9.6(1) Zone 1 - Physical and Health Education component shall have direct access from the exterior and shall have access to public washrooms within the secure zone;
 - 3.2.9.6(2) Zone 2- Performing Arts component shall have direct access from the exterior and shall have access to public washrooms within secure zone;
 - 3.2.9.6(3) Zone 3 – Grand Commons and Culinary Arts components shall have direct access from the exterior and shall have access to public washrooms within secure zone and shall also access to Zone 2; and
 - 3.2.9.6(4) Zone 4 – UBC Counseling and Wellness Centre components shall have direct access from the exterior and shall have a secondary interior access to the School for use during regular school hours.
- 3.2.9.7 The Design-Builder shall provide the Learning Neighbourhood pod arrangement as described in Appendix 1A Functional Program.

3.2.10 Guiding Principles

- 3.2.10.1 The Design-Builder will design the Facility in accordance with the following overarching principles:
 - 3.2.10.1(1) The School will be designed to optimize the use of flexible and adaptable learning spaces to maximize collaboration and active learning. It will meet the collaborative learning environment as described in this Schedule.
 - 3.2.10.1(2) The School design requirements will include flexibility for future adaptability.
- 3.2.10.2 The Design and Construction of this project shall not impact the existing New Westminster Secondary School and surrounding city facilities which will continue to operate during the construction of the School;
- 3.2.10.3 The construction area shall be secured from the rest of the existing school and city facility site boundaries as set out in the Design-Build Agreement.

3.3 Operational Philosophy

- 3.3.1 The Facility will be designed and constructed such that it will function and can be operated as a secondary school. The Facility shall provide:

3.3.1.1 Delivery of educational programs that promote the education of the student population;

3.3.1.2 An environment that is safe and secure;

3.3.1.3 An environment that is energy efficient and easy to maintain.

3.3.2 The Facility will be designed and constructed to:

3.3.2.1 Meet Appendix 1A Functional Program performance requirements;

3.3.2.2 Serve the needs of the diverse student body and place the educational needs of the students at the centre;

3.3.2.3 Provide ease of maintenance such that disruption caused by maintenance and repairs is minimized; and

3.3.2.4 Provide a Facility that is durable and resists malicious damage.

3.4 School Hours of Operations

3.4.1 Hours of Use

3.4.1.1 The Facility opens at 6:00 am and closes at 12:00 am;

3.4.1.2 New Westminster Secondary School presently operates on a two semester schedule with four eighty minute classes each day starting at 8:25 am and finishing at 3:05 pm;

3.4.1.3 The School will be designed to be used for both day and after hours use by the students, staff and community for teaching and extracurricular activities;

3.4.1.4 The School is available for rent by the community in the evenings (generally 6 to 10 pm) and on the weekends and shall be zoned as per section 3.2.9.6 of this schedule;

3.4.1.5 The Maintenance/IT Building is open twenty-four(24) hours and seven (7) days per week.

3.5 Design Capacity

3.5.1 The School will be designed and constructed to accommodate a minimum 1900 students and 200 staff as further described in Appendix 1A Functional Program.

3.5.2 The Maintenance/IT Building will be designed and constructed to accommodate a minimum of 27 staff as further described in Appendix 1A Functional Program.

3.6 Site Design Principles

3.6.1 The Design-Builder will:

- 3.6.1.1 Locate and plan the School to integrate into the existing neighbourhood;
- 3.6.1.2 Locate the building setback from neighbouring developments;
- 3.6.1.3 Provide for on-site roadway, walkways, open spaces adjacent to the Facility, and vehicle and bike parking areas to be lit during darkness to ensure safe vehicle, pedestrian, and bike traffic in respect to collisions, personal safety, and building access and egress.
- 3.6.1.4 Provide lighting that shall be sympathetic to the proposed building on site and designed to not spill over into neighbouring properties nor glare on-or-offsite;
- 3.6.1.5 Provide electrical, and telecommunication services to support the Facility;
- 3.6.1.6 Incorporate the following into the Design:
 - 3.6.1.6(1) Physical safety and security;
 - 3.6.1.6(2) Crime Prevention through Environmental Design;
 - 3.6.1.6(3) Safe and well-lit spaces for wheelchair bound individuals planned in conjunction with other outdoor areas.

3.7 Sustainable Design Principles

- 3.7.1 The Project will be designed and built to meet the necessary prerequisites, credits and points required to achieve LEED Gold Certification.
- 3.7.2 The Owner has registered this project for LEED 2009. The Design-Builder will become the main contact with the LEED Authority. The Design-Builder will submit all documentation for the project to achieve LEED Gold certification.
- 3.7.3 The Design-Builder is to assign a professional LEED coordination consultant for the project that will be responsible for the preparation of the LEED credits table submission documents.
- 3.7.4 In addition to achieving LEED Gold Certification, the Design-Builder will:
 - 3.7.4.1 design and construct the Facility using design methods, building materials, operational practices, energy and life cycle considerations that promote environmental quality, social benefits and economic vitality throughout the construction and operation of the Facility,

including by minimizing the Owner's operating costs (for example in relation to utilities and carbon taxes);

3.7.5 The Design-Builder shall use:

- 3.7.5.1 Local materials that are regionally available;
- 3.7.5.2 Materials and products that are suitable for the project climatic conditions;
- 3.7.5.3 Materials that are of quality and durability that reflects the School's role as a landmark civic building;

3.7.6 The Design-Builder shall give priority to:

- 3.7.6.1 efficient use of resources;
- 3.7.6.2 protection of health and indoor environmental quality;
- 3.7.6.3 materials that are beneficial (and not detrimental) to human health.

3.7.7 The Design-Builder is to design the facility in such a way (placement of spaces for passive shading and thermal mass principles) in order to minimize heat gains and hence temperature in summer.

3.8 Landscape Design Principles for the School

- 3.8.1** The Design-Builder is to provide landscaped surfaces in addition to hard surfaced circulation and paved areas.
- 3.8.2** Exterior spaces shall be linked and integrated with the surrounding streets, sidewalks, and pathway systems of the greater neighbourhood and adjacent sites.
- 3.8.3** All outdoor spaces shall allow for unobstructed visual access for safe viewing to, from and within the site.
- 3.8.4** Clearly define the onsite open spaces through the use of architecture (building), and landscape elements (walls and structures) to create a clearly defined sense of space.
- 3.8.5** Clearly defined arrival points shall be provided and reinforced by use of appropriate site features and landscape elements.
- 3.8.6** Provide a variety of useable outdoor learning and gathering spaces that are designed to the specific site microclimate.

- 3.8.7 Active sports elements should relate to one another and remaining passive spaces and staging areas should be well balanced and dispersed evenly on the site.
- 3.8.8 Pedestrian pathways and traffic movement shall be designed with CPTED principles throughout the site.
- 3.8.9 Grassed areas are to be sodded;
- 3.8.10 No soft landscape slopes (turf or planting areas) shall exceed a 3:1 horizontal to vertical cross slope for maintenance reasons. Slopes less than 1% soft landscaping are not acceptable.
- 3.8.11 Provide an evenly graded transition from new site and landscape to existing landscape and site conditions.
- 3.8.12 Site design shall include responsible management of onsite water by means of slopes, swales, ditches and or fixed surface collection elements such as catch basins and/or area drains. All fixed elements must ultimately lead to approved municipal connection point/outfall location.
- 3.8.13 Design parking and other paved areas to minimize negative impacts on surface runoff volume and quality.
- 3.8.14 Minimize reliance on underground storm water collection systems, instead use sustainable systems.

3.9 Safety and Security Principles

- 3.9.1 The Facility will be designed and constructed to achieve the following objectives related to the safety and security of students and staff:
 - 3.9.1.1 Provide security from criminal activity, such as personal assault or theft of property;
 - 3.9.1.2 Safety from environmental hazards;
 - 3.9.1.3 Protection of physical privacy and personal dignity;
 - 3.9.1.4 Safety from equipment hazards;
 - 3.9.1.5 Protection of staff from physical hazards;
 - 3.9.1.6 Mitigation of occupational hazards for common staff activities in each area of the Facility;
 - 3.9.1.7 Protection of personal information;

- 3.9.1.8 Emergency preparedness and management of emergency conditions;
and
 - 3.9.1.9 Protection of the students and staff.
- 3.9.2** Incorporate the following:
- 3.9.2.1 CPTED principles in Site layout, Facility design, landscape development and lighting;
 - 3.9.2.2 Provide a Design that responds to CPTED principles through the following:
 - 3.9.2.2(1) Have a particular regard for limiting theft, mischief and vandalism in the design of the Facility;
 - 3.9.2.2(2) Minimize opportunities for graffiti through the use of paint repellent breathable sealer;
 - 3.9.2.2(2)(a) At a minimum provide paint and pen repellent breathable sealer on all exterior exposed surfaces from floor to 2.4 metres height;
 - 3.9.2.2(2)(b) At a minimum provide paint and pen repellent breathable sealer on the following interior concrete and concrete block walls from floor to 2.4 metres height;
 - (b).1 Corridors leading to the following components:
 - (b).1.1 Grand Commons;
 - (b).1.2 Physical and Health Education;
 - (b).1.3 Performing Arts; and
 - (b).1.4 Career and Technical Education; and
 - (b).1.5 Stairwells.
 - 3.9.2.2(2)(c) Paint and pen repellent breathable sealer shall:
 - (c).1 not alter the look of materials such as concrete/concrete block and prevents graffiti from curing into the pours of the material;
 - (c).2 enable paint repellent cleaners to lift and remove graffiti stains without ghosting;
 - (c).3 withstand commercial cleaners without fading or staining; and
 - (c).4 withstand repeated cycles;
 - 3.9.2.2(2)(d) At hard landscaping and site furniture features such as concrete benches and walls;

- 3.9.2.2(3) Minimize opportunities for hiding spaces in both the interior and exterior spaces;
- 3.9.2.2(4) Provide site lighting in the parking areas to ensure safety; and
- 3.9.2.2(5) Minimization of the visibility of security devices in the student areas.
- 3.9.2.3 Access control at entrances, exits and in other areas, as well as video surveillance coverage throughout the facility. Refer to section 6.20.4 of this Schedule; and
- 3.9.2.4 Provide qualified 3rd party review and CPTED report to show compliance with CPTED principles.
- 3.9.3** The Facility will utilize the latest available technology and most effective systems to meet the Owner functionality.
- 3.9.4** Incorporate the following in the exterior design:
 - 3.9.4.1 Provide exterior lighting near Facility entrances, exits, walkways, public areas, staff and client outdoor spaces and parking areas. Lighting will not cause glare, shadow, or high contrast with surrounding areas and will not flood onto neighboring areas or properties and will address IDA (International Dark Sky) principles. All outdoor light fixtures shall meet IDA Fixture Seal of Approval program requirements and be certified as dark sky friendly as well as meeting all local requirements;
 - 3.9.4.2 Lighting of outdoor spaces which creates an unobtrusive, human scale lighting concept, with a hierarchy of fixture types designed according to functional and security needs (including CPTED), and reflecting the hierarchy of pedestrian corridors and outdoor spaces;
 - 3.9.4.3 Shrubbery within 2m of walkways will not exceed 1m in height;
 - 3.9.4.4 Provide video surveillance of all exterior areas including Facility entrances, exits, walkways, outdoor spaces and parking areas. Arrange camera locations to facilitate viewing as required to meet the functional requirements as determined through the User Consultation Process. Avoid dead spots and corners. Arrange lighting to avoid backlighting of camera views, and provide adequate vertical illuminance for acceptable video in low light conditions; and
 - 3.9.4.5 Provide wired panic duress stations in all parking areas. Duress stations shall be placed in well-lit areas, spaced such that no spot may be more than a maximum of 30m from a duress station, maximum of 15m from the parking area edge, and at all parking area entrances.

3.9.5 Incorporate the following in the interior design:

- 3.9.5.1 Video surveillance at locations as outlined in section 6.20.4 Video Surveillance. Surveillance equipment shall be visible to people entering the area. Cameras shall be positioned to provide surveillance sufficient for facial identification of persons entering and exiting;
- 3.9.5.2 Card access and intrusion detection of all exterior entrances, program entrances, and other areas as per section 6.20.3 Access Control, and section 6.20.2 Intrusion Detection. The Card Access System will have the capability of having multiple Areas, Groups, Access Levels; and
- 3.9.5.3 All wall mounted television monitors shall be and securely encased with a vandal resistant tamper proof lexan protective cover designed to allow air flow for device cooling. Mounting height of television monitors shall be as determined by the Owner.

3.10 Flexibility Principles

3.10.1 The Design-Builder will:

- 3.10.1.1 Provide clear and open spaces to allow for future flexibility. Locate fixed elements to be easily relocated. Design building systems to optimize future flexibility.

3.10.2 External and Internal Components

- 3.10.2.1 To maximize flexibility to permit adaptability to external support of internal program components;
- 3.10.2.2 To maximize flexibility to permit adaptability of the following internal components, if required to suit future process revisions;
 - 3.10.2.2(1) Grand Commons,
 - 3.10.2.2(2) Career and Technology Education;
 - 3.10.2.2(3) Learning Neighbourhoods;
 - 3.10.2.2(4) Student Support; and
 - 3.10.2.2(5) Administration:
 - 3.10.2.2(5)(a) Workplaces in the Administration area shall be designed to support collaborative methods of working, respond to diverse work styles (such as hoteling and job-sharing), and optimize flexibility and space utilization. A key element to the development of an integrated workplace

is the provision of physical environments that support varied workplace strategies. Accordingly, the Design-Builder will design and construct such workplaces to provide floor lay-outs that accommodate teams as well as individuals, and that support mobile employees who require flexibility and use of portable technology.

3.11 Use of Wood

- 3.11.1** As contemplated by the Wood First Act (British Columbia), the Design-Builder shall incorporate wood products into the Design and Construction of the Facility to the extent that the use of wood products is consistent with the requirements of this Schedule.
- 3.11.2** The use of wood as features such as structural beams and columns, floors, walls and ceilings in primary locations is acceptable;
- 3.11.3** The use of wood is acceptable as a material feature in key locations such as:
 - 3.11.3.1 Commons;
 - 3.11.3.2 Gymnasium;
 - 3.11.3.3 Theatre;
 - 3.11.3.4 Study nooks;
 - 3.11.3.5 Primary corridors areas;
 - 3.11.3.6 Building entrances; and
 - 3.11.3.7 Gathering spaces.
- 3.11.4** The use of wood as a feature ceiling element in the Commons is acceptable.

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4. ARCHITECTURAL DESIGN PRINCIPLES

4.1 Location and Siting

4.1.1 The demarcation boundary shall be the Site property line as noted in Schedule 10 of the Design-Build Agreement.

4.1.2 The Facility Siting:

4.1.2.1 Site Planning and Layout

4.1.2.1(1) The percentage of the soft landscaping within the footprint of the site shall not be less than 5%.

4.1.2.1(2) Minimize impacts of the new Facility existing adjacent neighbours by providing landscape buffers and/or screens and by careful placement of services such as loading, garbage, recycling, generator, and transformers.

4.2 Access to Daylight and Views

4.2.1 Design-Builder to provide a Facility interior design that maximizes natural light and views to the outside throughout the Facility.

4.2.2 Students and staff must be provided with visible access to daylight and unobstructed views (long and short) to the outside, including views of nature, to improve overall experience and educational learning outcomes.

4.2.3 Provide the following minimum requirements for access to daylighting and views:

4.2.3.1 All primary and secondary circulation routes, including corridors accessing learning, administration and support areas;

4.2.3.2 Glazed doors at entrances from and to the exterior along primary corridors;

4.2.3.3 Windows in corridors located on the perimeter of the Facility;

4.2.3.4 Provide unobstructed view without impediments, within a 9 metre horizontal view line, 90 degrees to the glazing.

4.2.4 At minimum, the following rooms will have direct natural light:

4.2.4.1 Learning neighbourhoods;

4.2.4.2 Informal learning areas;

- 4.2.4.3 Administration;
 - 4.2.4.4 Gymnasium and weight room;
 - 4.2.4.5 Grand Commons and Learning Commons;
 - 4.2.4.6 Visual Art studios;
 - 4.2.4.7 Career and Technical Education areas, except CTE classroom;
 - 4.2.4.8 Student Support areas.
 - 4.2.4.9 Refer to Appendix 1B Room Data Sheets for additional locations.
- 4.2.5** As noted within this schedule the following minimum indirect natural light criteria shall be met:
- 4.2.5.1(1) The centre of any such interior space requiring indirect natural light will fall within a 10 metre light radius, if the area is over 45 square metres or otherwise within an 8 metre light radius.
- 4.2.6** Provide glare control and minimize heat gain with the provision of sun shades and other solar control measures at windows as required;
- 4.2.7** Provide exterior shading devices designed to shade during the summer and provide solar access during the winter. These shading devices include roof overhangs, fixed exterior fins and interior light shelves.
- 4.2.8** Outdoor public spaces should be designed to maximize sunlight and views. Access to outdoor spaces should be designed to create an easy flow from indoors to outdoors.

4.3 Building Configuration and Circulation

- 4.3.1** Site and Facility identity and Access
- 4.3.1.1 The Facility exterior signage shall clearly indicate access for students and staff and the community, as well as for service providers and suppliers;
 - 4.3.1.2 The entrance to the Facility for students and staff and the community shall be clearly designed;
 - 4.3.1.3 Physical education program areas shall be located and designed to take advantage of the surrounding sports fields and outdoor activity areas;

- 4.3.1.4 The Facility siting, form and massing shall maintain and respond to adjacent existing neighbouring buildings and site amenities as well as maintain existing views, pathways and interconnections;
- 4.3.1.5 Elevator penthouses and telecommunications elements shall be screened and integrated into the overall building architectural expressions;
- 4.3.1.6 Provide organized rooftop mechanical and service equipment. Ensure all roof top equipment is fully integrated with the building design; Screen and incorporate rooftop mechanical equipment and systems into architectural elements as per City of New Westminster requirements.
- 4.3.1.7 All at-grade mechanical and service equipment and kiosks shall be located away from the main roadway, main entrances and away from public areas and screened from public, student and staff views.

4.3.2 Circulation and Adjacencies (Pedestrian and Vehicular)

- 4.3.2.1 Site circulation will co-ordinate, separate and emphasize safety in the movements of vehicles (including students, staff and service), bicycles, pedestrians and wheelchairs.
- 4.3.2.2 Provide a three (3) meter, two-way, divided bike-lane from southwest corner of School to Sixth Street egress point with connections to existing sidewalks.

4.3.3 Pedestrian Walkways

- 4.3.3.1 Integrate pedestrian circulation across and around the Site, the overall existing Site pedestrian pathways and minimize conflict with vehicles and bicycle zones.
- 4.3.3.2 Design pathways to provide universal access to:
 - 4.3.3.2(1) all exterior entrances and exits;
 - 4.3.3.2(2) all exterior and outdoor recreation areas;
 - 4.3.3.2(3) adjacent neighbouring amenities.
- 4.3.3.3 Provide smooth, non-skid walking surfaces and gentle grades. There may be changes in the grade of walkways from the building to the public street.
- 4.3.3.4 Provide continuous concrete sidewalks to meet the following requirements:

- 4.3.3.4(1) In front of the School, provide a minimum four metre depth, for length of School front façade, a continuous concrete sidewalk for students to gather. Include sitting areas complete with skateboard and graffiti resistant benches;
- 4.3.3.4(2) Sidewalk shall have a minimum 150 mm concrete curb with let downs to allow for accessibility;
- 4.3.3.4(3) Sidewalk in front of School shall have bollards that include lighting;
- 4.3.3.4(4) The school bus layby shall include a continuous sidewalk, 4 metres wide complete with landscape and trees (minimum eight trees spaced equally apart) and 150mm curbs with bollards and lights;
- 4.3.3.4(5) 2.5 metre pedestrian sidewalk along western and southern School frontage and connect to existing Sixth Street sidewalk. This new sidewalk shall be part of the walkway in front of School as noted in section 4.3.3.4(1)

4.3.4 Pathways and sidewalks will be configured as follows:

- 4.3.4.1 All sidewalks will be concrete with a minimum width of 3 metres;
- 4.3.4.2 All sidewalk will have a maximum grade of 5.0% with a cross slope maximum of 3%.

4.3.5 Vehicular Access and Parking

- 4.3.5.1 The Design-Builder will:
 - 4.3.5.1(1) Provide on-site parking that at minimum meets the requirements set out in this Schedule;
 - 4.3.5.1(2) Provide primary vehicle exit at Sixth Street with opportunity of student drop off and secondary vehicle access from Eighth Avenue;
 - 4.3.5.1(3) Provide main vehicle exit of the School onto Sixth Street;
 - 4.3.5.1(4) Provide one main identifiable entry to the School with secondary identifiable entries for the following:
 - 4.3.5.1(4)(a) Gymnasium;
 - 4.3.5.1(4)(b) Theatre;

- 4.3.5.1(4)(c) CTE shops;
- 4.3.5.1(4)(d) UBC counseling centre;
- 4.3.5.1(4)(e) School loading service aisle; and
- 4.3.5.1(4)(f) Maintenance/IT loading;
- 4.3.5.1(4)(g) 6th Street access
- 4.3.5.1(5) Integrate access to parking with the design of the building;
- 4.3.5.1(6) Provide one main vehicle aisle that meets the following requirements:
 - 4.3.5.1(6)(a) Path of travel
 - (a).1 One way vehicle and two way bicycle traffic on the School site;
 - (a).2 Limits front door drop off access during school hours;
 - (a).3 Provide one lay by on opposite side of School entry sized for ten cars and also appropriate to accommodate three school buses including student with accessibility requirements drop off;
 - (a).4 Provide traffic calming strategies including speed bumps to limit speed on site;
 - (a).5 Provide a minimum of four speed bumps, strategically located to support traffic calming;
- 4.3.5.1(7) Provide pedestrian and cyclist activated signals on Sixth Street adjacent to new one way egress from School site. Provide efficient number of sidewalk crossings for pedestrians and vehicular traffic;
- 4.3.5.1(8) Integrate vehicular circulation with layout of pedestrian and bicycle zones to provide visible connections, to promote safe travel, and to minimize conflict between vehicles and other modes of travel;
- 4.3.5.1(9) Plan and delineate pedestrian, cyclist, truck and vehicular traffic with landscape and painted lines to outline pathways and identify crossing areas;
- 4.3.5.1(10) Plan on-site parking and circulation to minimize potential traffic conflicts at heavy traffic periods on site;

- 4.3.5.1(11) Conform to the recommendations of available final Transportation Study September 12, 2017, including but not limited to vehicle traffic impacts from School site entry/exit points, bus stop , traffic signalization, roadway between Massey Theatre and Moody Arena, and parking and impacts on street traffic flows;
- 4.3.5.1(12) Provide safe, convenient parking for vehicles, motorcycles and bicycles as per the agreement between the City of New Westminster and the Owner. Provide a minimum of the following vehicle parking stalls:
 - 4.3.5.1(12)(a) 75 parking stalls;
 - (a).1 Including three (3) school bus parking stalls (also sized to accommodate 10 car parking stalls) including Inclusive Education vehicle.
- 4.3.5.2 Maintain maintenance vehicle access to existing sports and playing field;
- 4.3.5.3 Provide convenient paved loading access for delivery/receiving of bulk items in the continuous service loading areas for the following:
 - 4.3.5.3(1) Career and Technical Education shops;
 - 4.3.5.3(2) Culinary Arts;
 - 4.3.5.3(3) Performing Arts;
 - 4.3.5.3(4) Gymnasium;
 - 4.3.5.3(5) Grand Commons.
- 4.3.5.4 Loading aisle shall connect to outdoor concrete pad areas of program spaces;
- 4.3.5.5 Loading aisle shall be simultaneously multi-functional and aesthetically appealing;
- 4.3.5.6 Ensure access to loading aisles does not hinder nor impede parking traffic flows on the rest of the site or adjacent streets;
- 4.3.5.7 Provide all required turning movements for a 5 ton cube truck in order to permit full access to the loading service aisle;

- 4.3.5.8 Provide an integrated loading service aisle to program area exterior concrete apron areas for seamless delivery of materials and exterior program delivery areas;
- 4.3.5.9 Provide one loading space for each, covered from inclement weather, that is a minimum 1.2 metre depth:
 - 4.3.5.9(1) Maintenance/IT;
 - 4.3.5.9(2) School loading aisle complete with loading area adjacent to program spaces in the following two components:
 - 4.3.5.9(2)(a) Career and Technical Education Shops; and
 - 4.3.5.9(2)(b) Performing Arts.
- 4.3.5.10 Provide a loading bay for the Maintenance/IT Building that provides the functional requirements necessary to unload five(5) ton trucks. Provide a recessed scissor lift to meet the unloading needs;
- 4.3.5.11 Loading areas shall be separated and screened from parking lot areas, pedestrian walkways, and vehicular access routes to the Site and to the Facility;
- 4.3.5.12 Drive aisles are to be a minimum of 4 m;
- 4.3.5.13 Provide separate vehicular parking from the pick-up/drop-off area to ensure the traffic flows smoothly;
- 4.3.5.14 Parking spaces are to be delineated by line paint markings;
- 4.3.5.15 Parking areas within 10 metres of the School building are to be integrated with landscape buffers complete with trees to provide shade to the lot. Provide a minimum of 1 landscape parking island for every 5 parking stalls. Minimum dimension of the landscaped parking buffer shall be 1.5m width and 3.5m depth. Trees shall be standardized to 1.8m;
- 4.3.5.16 Provide parking for student, staff and visitor bicycles, including secured storage, as per the City of New Westminster;
 - 4.3.5.16(1) Provide at minimum four groups of covered, secured, long term with access controlled enclosures bike parking areas for a minimum quantity of 150 student and staff commuter bicycles;
 - 4.3.5.16(2) Provide parking areas with canopy and internal canopy drainage for rain water;

- 4.3.5.16(3) Provide, at minimum, groups of four bicycle racks per area;
- 4.3.5.16(4) Locate long the length of the front of the School a minimum of nine metres apart;
- 4.3.5.16(5) One grouping to be visible from administration office reception area.
- 4.3.5.16(6) Remaining groupings to be passively supervised from the School.
- 4.3.5.16(7) Provide fifty(50) short term bicycle parking spaces on hard, well drained surface as follows
 - 4.3.5.16(7)(a) Forty-four (44) near the existing play field; and
 - 4.3.5.16(7)(b) Six (6) near the School entrance.
- 4.3.5.17 In addition, provide CTE metal fabrication shop secured and covered bicycle storage;
 - 4.3.5.17(1) Bicycle storage shall be located on the secure metal fabrication shop concrete pad for a minimum 40 bicycles;
 - 4.3.5.17(2) Maximum stacking to be two tiers;
- 4.3.5.18 Provide an enclosed lockable garbage, composting and recycling area near the loading service aisle.
 - 4.3.5.18(1) This garbage area shall be situated and enclosed in order to minimize visual to and odor impacts for the rest of the site. Provide fixed foundation slab, sloped to drain, to support garbage, composting and recycling containers.
- 4.3.5.19 Provide an exterior gravel area, in close proximity to the CTE shops and discretely located away from the main entry, sized to accommodate four future (supplied by Owner) storage containers (container size 8'-0" x 40'-0"). This gravel area shall be accessible from the loading service aisle.

4.3.6 Landscape

- 4.3.6.1 The Design-Builder will:
 - 4.3.6.1(1) Provide exterior landscape spaces and material to reflect the local character of the area and to convey a distinctive West Coast Modernism design to complement the architecture of the new facility.

- 4.3.6.1(2) Provide a contiguous, dedicated open landscape space system on Site with vegetation to provide wildlife food sources;
- 4.3.6.1(3) Provide roof location for Science Beekeeping program (school provided bees and hives);
- 4.3.6.1(4) Preserve biodiversity and wildlife connectivity;
- 4.3.6.1(5) Minimize opportunities for birds, pests and animals to perch and nest;
- 4.3.6.1(6) Use plant species that are native to the area and appropriate for the specific location. All plant material to be suitable for the specific plant hardiness zone for the site. Use robust plant species that are sustainable for a school environment;
- 4.3.6.1(7) Shall not use invasive plants;
- 4.3.6.1(8) Concentrate planting in clustered groupings and reflect natural plant communities and avoid sparse tree planting;
- 4.3.6.1(9) Use mulching, low flow drip irrigation, temporary watering for plant establishment, recycled or non-potable water strategies;
- 4.3.6.1(10) Use planting to moderate the temperature and create shade at the building, parking and gathering places; and
- 4.3.6.1(11) Use plant material and installation that meets or exceeds the BC Landscape Standard.

4.4 Form and Character

4.4.1 Facility Design

- 4.4.1.1 The form and massing of the Facility shall showcase high level design, creativity and innovation while delivering all the program requirements;
- 4.4.1.2 West Coast Modernism, initiated from the principles of:
 - 4.4.1.2(1) Streamline;
 - 4.4.1.2(2) Efficient;
 - 4.4.1.2(3) Functional;
 - 4.4.1.2(4) Flexible;
 - 4.4.1.2(5) Open plan;

- 4.4.1.2(6) Cost efficient design using local, natural materials; and
- 4.4.1.2(7) Interwoven into the surrounding site and landscape through:
 - 4.4.1.2(7)(a) Horizontal building and landscape elements;
 - 4.4.1.2(7)(b) Connection between indoors and outdoors through the use of glazing and floor to grade continuous transitions;
 - 4.4.1.2(7)(c) Connection of interior and exterior materials.
- 4.4.1.3 West Coast Modernism includes the following characteristics:
 - 4.4.1.3(1) Rainfall: generous roof overhangs, flat roofs, large overhangs on the south façade to control the summer sun while allowing for passive solar heating in winter as a form of energy conservation;
 - 4.4.1.3(2) Sunshine: extensive use of glazing, where reasonable, allowing the integration of the Facility into its surrounding landscape. Use of exterior canopies as overhangs to provide shading and interior light shelves to assist natural light into the interior;
 - 4.4.1.3(3) View and Aspect: accentuated and maximize views through building orientation and the use of large windows to connect the exterior and interior spaces;
 - 4.4.1.3(4) Materials: use of local natural materials such as wood and architectural concrete, both on the exterior and in the interior. Use glass and wood canopies to cover sidewalks, providing shelter from the rain while allowing sunlight through use of large expanses of glazing;
 - 4.4.1.3(5) Plan: use open floor plans, minimal and carefully considered use of interior partitions to foster flexibility, and adaptability of interior spaces;
 - 4.4.1.3(6) Structure: use of concrete and wood post and beam construction with cantilevered/protruding floors and large roof overhangs to provide canopies. Use wood post and beam construction at key entries and as design features.
- 4.4.1.4 Provide a variation in the building form, for example, where corridors meet the exterior façade, indent, extend and undulate portions of the building, to provide opportunity for variety of form;
- 4.4.1.5 Primary entries shall be of human scale;

- 4.4.1.6 Reduce perceived bulk and scale of the Facility by dividing the building mass into smaller components;
- 4.4.1.7 Provide canopies/building cantilevers/protrusions that are:
 - 4.4.1.7(1) Integral to the building to provide coverage for length of pedestrian traffic area along front façades of building;
 - 4.4.1.7(2) Provide canopies that are a minimum two metres in depth for length of coverage and allow for shelter from rain and allow daylight to filter through;
 - 4.4.1.7(3) Provide canopies for exterior program project areas as follows:
 - 4.4.1.7(3)(a) All CTE shops;
 - 4.4.1.7(3)(b) Maintenance/IT loading area.
 - 4.4.1.7(4) Provide coverage for exterior travel between program areas as follows:
 - 4.4.1.7(4)(a) Band, music, dance, to Theatre for transport of musical equipment;
 - 4.4.1.7(4)(b) Visual arts and Theatre for transport of theatrical sets;
 - 4.4.1.7(4)(c) CTE shops and Theatre for transport of theatrical sets and props;
 - 4.4.1.7(4)(d) Provide canopies at primary building entries to the following program areas:
 - (d).1 Grand Commons;
 - (d).2 Theatre;
 - (d).3 Physical Education and Health;
 - (d).4 Wellness Centre;
 - (d).5 UBC Counselling Centre.
 - 4.4.1.7(5) Provide entry canopy at the following entries:
 - 4.4.1.7(5)(a) Main building entries including 6th Street entry.
- 4.4.1.8 Materials and Appearance
 - 4.4.1.8(1) The Facility will have a simple palette of materials that conveys the West Coast Modernism principles of design;
 - 4.4.1.8(2) The Design-Builder will use a minimum of 65% of the following as primary exterior materials for the School Facility:

- 4.4.1.8(2)(a) Architectural concrete;
- 4.4.1.8(2)(b) Glazing;
- 4.4.1.8(2)(c) Wood feature elements;
- 4.4.1.8(2)(d) The Design-Builder may use a maximum of 35% of the following acceptable secondary materials for the School building:
 - (d).1 Metal paneling
 - (d).2 Composite wood cladding
- 4.4.1.8(3) The Design-Builder will use the following exterior materials for the Maintenance/IT Building:
 - 4.4.1.8(3)(a) Metal paneling (maximum 70%);
 - 4.4.1.8(3)(b) Architectural concrete (minimum 30%);
- 4.4.1.8(4) For both buildings, all exterior and interior materials shall be located/positioned in a horizontal orientation to accentuate West Coast Modernism architectural elements;
- 4.4.1.8(5) Both buildings shall achieve a complementary balance of form and materials with one another;
- 4.4.1.8(6) Material colour selections shall be muted earth tones and natural colour palettes that are durable, weather well, and do not stain, streak, or discolour, nor grow algae or fungus;
- 4.4.1.8(7) Adjacent materials shall be coordinated, integrated and compatible in proportions, sizes and alignment of material, joint lines and control joints. An overall appearance concept shall be evident and contribute to the exterior and interior design concept.
- 4.4.1.8(8) All architectural concrete shall be sealed with a clear coat sealer colour; and
- 4.4.1.8(9) Coloured concrete is not acceptable.

4.5 Quality of Space (Exterior and Interior)

4.5.1 The Design-Builder will:

- 4.5.1.1 Maximize the sense of space both in width and height in interior entry areas, common and circulation areas;
- 4.5.1.2 Maximize opportunities for access to natural light, views and natural ventilation through the use of operable windows;
- 4.5.1.3 Provide views and/or direct or indirect natural light at ends of corridors;
- 4.5.1.4 Use glazed canopies, windows, doors and clerestory windows to bring natural daylighting in to exterior and interior spaces;
- 4.5.1.4(1) Skylights shall not be used.
- 4.5.1.5 Design Facility access and interior circulation systems which provide intuitive wayfinding;
- 4.5.1.6 Provide optimized lines of sight between administration and areas of public entries, corridors and student areas;
- 4.5.1.7 Provide direct line of sight between Administration and the main School entry;
- 4.5.1.8 Provide optimal positioning of program spaces by ensuring columns and mechanical shafts do not interfere with the intended function and/or flexibility of the space;
- 4.5.1.9 Ensure that Formal Learning Spaces are sufficiently isolated from the acoustic ramifications of mechanical rooms, electrical rooms and elevator shafts;
- 4.5.1.10 Provide a variety of outdoor and indoor student social spaces.

4.6 Acoustics

4.6.1 General Requirements

- 4.6.1.1 Provide acoustic separation zones as indicated in Appendix 1C Acoustic and Noise Control Ratings;
- 4.6.1.2 Engage a professional Acoustic Engineer to provide acoustic direction to meet the acoustic requirements, including enhanced acoustic requirements for specialty spaces, as noted in Appendix 1A Functional Program and Appendix 1C Acoustic and Noise Control Ratings;

- 4.6.1.3 Satisfactory acoustical performance is critical within the Facility, including but not limited to classrooms, the theatre, music, dance, black box and learning commons. Furthermore, areas such as the gymnasium and service rooms, including the mechanical and electrical rooms and the generator room, all present unique challenges to minimize transmission of sound to adjoining spaces. Care must be taken throughout the design development phase and during Construction to ensure that the level of design and workmanship achieves and maintains the required room acoustic conditions, sound isolation performance of the assemblies and appropriate background noise level ratings;
- 4.6.1.4 The Design-Builder may develop assemblies in consultation with their Acoustic Engineer. The suitability of the proposed assembly will be scrutinized throughout design development and the final constructed assembly may be subjected to in-situ testing to determine the Apparent Sound Transmission Class (ASTC) by an independent agency prior to or after occupancy. In situ testing shall record a maximum of five (5) points below the STC target requirement

4.7 Wayfinding and Signage (Exterior and Interior)

- 4.7.1 The Design-Builder is to provide a design that provides for intuitive wayfinding to all internal and external components, through spatial cues and views, where people can reach their intended destination.
- 4.7.2 Provide clear logic and articulation of building elements and spaces such as pathways, entries, gathering spaces and circulation routes.
- 4.7.3 Provide exterior and interior signage to support wayfinding strategies.
- 4.7.4 Use universal symbols and standard colours.
- 4.7.5 Exterior Wayfinding and Signage
- 4.7.5.1 Exterior Signage
- 4.7.5.1(1) Exterior signage will be provided to clearly identify the following:
- 4.7.5.1(1)(a) School name sign;
- (a).1 Minimum 900 mm high individual letters, with street address in minimum 200 mm high letters.
- (a).2 Reference construction: polished stainless steel letters and numbers, with school name installed in a location acceptable to the Owner. Signage to be lit from behind.

- 4.7.5.1(2) Provide location for address signage at Sixth Street entry.
- 4.7.5.1(3) Provide pole mounted reflective traffic and parking control signage to meet municipal and BC Building Code standards.
- 4.7.5.1(4) All designated drive lanes, parking stalls, parking bays, bus parking lanes and no parking zones are to be clearly delineated with appropriate line painting, pavement markings, and signage, designed and constructed to the requirements of the Manual Uniform Traffic Control Devices and Signage issued by the Transportation Association of Canada.
- 4.7.5.1(5) The site works are to include appropriate identification and directional signage on all roads and driveways.
- 4.7.5.1(6) Site signage shall include identification of designated fire lanes, no-parking zones, and parking stall signs.
- 4.7.5.1(7) Signage must be legible for drivers at an adequate distance that they can safely slow down and enter appropriately for drop-off and parking areas.

4.7.6 Interior Wayfinding and Signage

4.7.6.1 Interior Signage

- 4.7.6.1(1) Provide interior signage, and coordinate with the Owner;
- 4.7.6.1(2) Provide door signage and an individual room name and number for each room entry door including signage for universal accessibility. Room number shall be located on the door frame;
- 4.7.6.1(3) Washroom signage shall have universal gender neutral or inclusive signage depicted by international symbol. Exact graphics to be reviewed and preapproved with the Owner prior to installation.

4.7.6.2 Signage

- 4.7.6.2(1) Provide a schedule showing type, configuration, numbering and wording for all rooms;
- 4.7.6.2(2) Schedule to be submitted for approval by the Owner;
- 4.7.6.2(3) Design-Builder to coordinate room numbering with mechanical and electrical equipment numbering;

- 4.7.6.2(4) Name and number plates to be cast acrylic, 225mm x 225mm x 6mm with 130mm high screen-printed numbers or symbols, sandwich paneled units with integral slots.

4.8 Building Envelope

- 4.8.1.1 Building Envelope design shall be in conformance with BCBC Building Envelope Separation as noted in Part 5;
- 4.8.1.2 Design exterior walls in accordance with the 'rain-screen principles' as described by the CMHC document "The Rain Screen Wall System";
- 4.8.1.3 Design building envelope to comply with ASHRAE or NECB;
- 4.8.1.4 Utilize a licensed professional Building Envelope consultant throughout Design and Construction. The envelope design shall be reviewed by the Building Envelope consultant working directly with the Design-Builder's Architect in the design and construction of the building envelope. The building envelope consultant shall perform an independent building envelope review noting specific provisions for the control of moisture, mold growth and deterioration inside the wall assembly;
- 4.8.1.5 The Design-Builder will design and construct the building envelope using rain screen principles as defined in the following:
 - 4.8.1.5(1) "Rain-Screen Principles" means that the applicable wall cladding system incorporates: a means to drain all accumulated water to the exterior of the building; materials installed to shed precipitation; means of preventing moisture penetration through the exterior of the wall assembly; and flashings, drips or overhangs, sufficient to deflect accumulated water away from the building face;
 - 4.8.1.5(2) Ensure continuation of the air barrier, vapour barrier, thermal barrier and rain barrier across the entire envelope including foundations, wall and roofs;
 - 4.8.1.5(3) Design building envelope details to avoid thermal bridging;
 - 4.8.1.5(4) The continuity of the weather-tight plane including air, moisture, and vapor barriers insulation, plus drainage and ventilation of assembly voids shall be clearly and graphically depicted in the working drawings and applicable shop drawings;
 - 4.8.1.5(5) Construct the building envelope in accordance with best practices.
 - 4.8.1.5(6) Exterior insulated finishing systems (EIFS) or similar face sealed wall assemblies are not acceptable;

- 4.8.1.5(7) All components of the assembly exterior to the weather-tight plane shall be resistant to the deteriorating effect of exposure to the elements including water and sunlight, consistent with the services life of the building;
- 4.8.1.5(8) Eliminate direct paths of heat conduction by use of insulation, air space or other acceptable means. Window and door frames to be thermally broken;
- 4.8.1.5(9) Pay particular attention to foundation/wall, roof/wall, window/wall and structure/wall connections, changes in plane; including, Intersections of walls and roofs, changes in cladding materials; and window and door heads/sills.
- 4.8.1.6 The Design-Builder will:
 - 4.8.1.6(1) Complete all Design and Construction so as to prevent the accumulation and stagnation of rain, snow, ice and dirt on the sloped horizontal and vertical surfaces of the Facility's building envelope in the climate in which the Facility is, including but not limited to the installation of:
 - 4.8.1.6(1)(a) drains with cleanouts; and
 - 4.8.1.6(1)(b) access panels and/or heat tracing to keep passageways flowing continuously.
 - 4.8.1.6(2) ensure that water, snow and ice sheds safely from exterior surfaces and is not trapped in the assembly where it may cause deterioration or staining, or present a danger to the safety of any person.
- 4.8.1.7 Ensure that materials and systems employed in wall and roof assemblies contribute to reducing heat gain and loss with minimal decline in performance over their expected 50 year lifespan;
- 4.8.1.8 Provide a roof that, unless otherwise stated in this schedule, is inaccessible to students and the public and not climbable;
- 4.8.1.9 When visible from within program areas, roof areas shall be designed to enhance the overall design experience and be aesthetically pleasing in appearance;
- 4.8.1.10 House mechanical/electrical equipment indoors either in penthouses on the roof or internal plantrooms with suitable maintenance access compatible with the exterior building design;

- 4.8.1.11 Screen and incorporate small scale rooftop exhaust fans into architectural elements as per requirements of the City of New Westminster;
- 4.8.1.12 Design the building envelope of the Facility, including any structure and structural components, to minimize effects of malicious damage, corrosion and deterioration due to environmental impacts, by use of measures such as:
 - 4.8.1.12(1) concrete crack control joints and expansion/contraction joints;
 - 4.8.1.12(2) high strength concrete mixes, proportioned to durability requirements for exposure and use;
 - 4.8.1.12(3) reinforcing of concrete for crack control;
 - 4.8.1.12(4) hot-dip galvanize or paint with a two part epoxy paint system all exposed steel; and
 - 4.8.1.12(5) embedded steel protection angles and skid plates for service areas;
- 4.8.1.13 Design and construct the building envelope, including all wall and roof assemblies and systems, to prevent intrusion;
- 4.8.1.14 Construct the secure exterior building envelope of systems of materials that, when combined, create a secure enclosure;
- 4.8.1.15 Design and construct exterior walls to be vandal proof to a minimum of 4 metres from the ground;
- 4.8.1.16 Design and construct walls and facades to prevent climbing and accessing the roof and terraces;
- 4.8.1.17 Use of projections/overhangs/cantilevers to shield wall assemblies and glazing is encouraged;
- 4.8.1.18 The Design-Builder will design and construct a building envelope in accordance with the following:
 - 4.8.1.18(1) Except for exposed architectural concrete walls, in accordance with pressure equalized rain-screen wall design principles with an exterior insulated wall assembly and demonstrate that the proposed details fulfill the Rain-Screen Principles;
 - 4.8.1.18(2) Insulate the wall assembly primarily exterior to the interior wythe or back-up wall;

- 4.8.1.18(3) Provide exposed architectural concrete exterior walls with an integral waterproofing in the concrete ensuring all joints are treated to ensure a waterproof construction;
- 4.8.1.18(4) For exposed architectural concrete exterior walls, provide insulation on the interior side of the wall with a thermal separation from interior wall framing and finishes;
- 4.8.1.18(5) Having a predicted service life that exceeds 50 years as defined in CSA S478-95, and with components having a service life as follows:
 - 4.8.1.18(5)(a) For components and assemblies whose categories of failure are 6, 7, or 8 in Table 3 in CSA S478-95, use a design service life equal to the design service for the Facility;
 - 4.8.1.18(5)(b) For components and assemblies whose categories of failure are 4 or 5 in Table 3 in CSA S478-95, use a design service life equal to at least half of the design service life of the Facility; and
 - 4.8.1.18(5)(c) Where component and assembly design service lives are shorter than the design service life of the Facility, design and construct so they can be readily replaced.
- 4.8.1.18(6) Provide building envelope assemblies that separate spaces exposed to differing environmental conditions by controlling the flow of air, vapour, wind and water;
- 4.8.1.18(7) Provide a building envelope that maximizes durability and lifecycle and minimizes maintenance requirements;
- 4.8.1.18(8) Ensure that condensation within building envelope assemblies or on interior surfaces does not occur under any operational condition;
- 4.8.1.18(9) Accommodate differential movement due to temperature variations, and structural movement;
- 4.8.1.18(10) Design the below-grade assembly to resist the ingress of water;
- 4.8.1.18(11) Ensure back-up walls for outer cladding consist of concrete masonry units, precast concrete, poured in place reinforced concrete or structural stud backup system.

4.8.2 The Design-Builder will submit building envelope test results to the Owner verifying that the building envelope meets all requirements.

4.8.3 Sheathing

4.8.3.1 Options include Portland cement concrete, concrete masonry, treated exterior grade plywood, cement board, and glass-fiber-faced silicone-impregnated gypsum board;

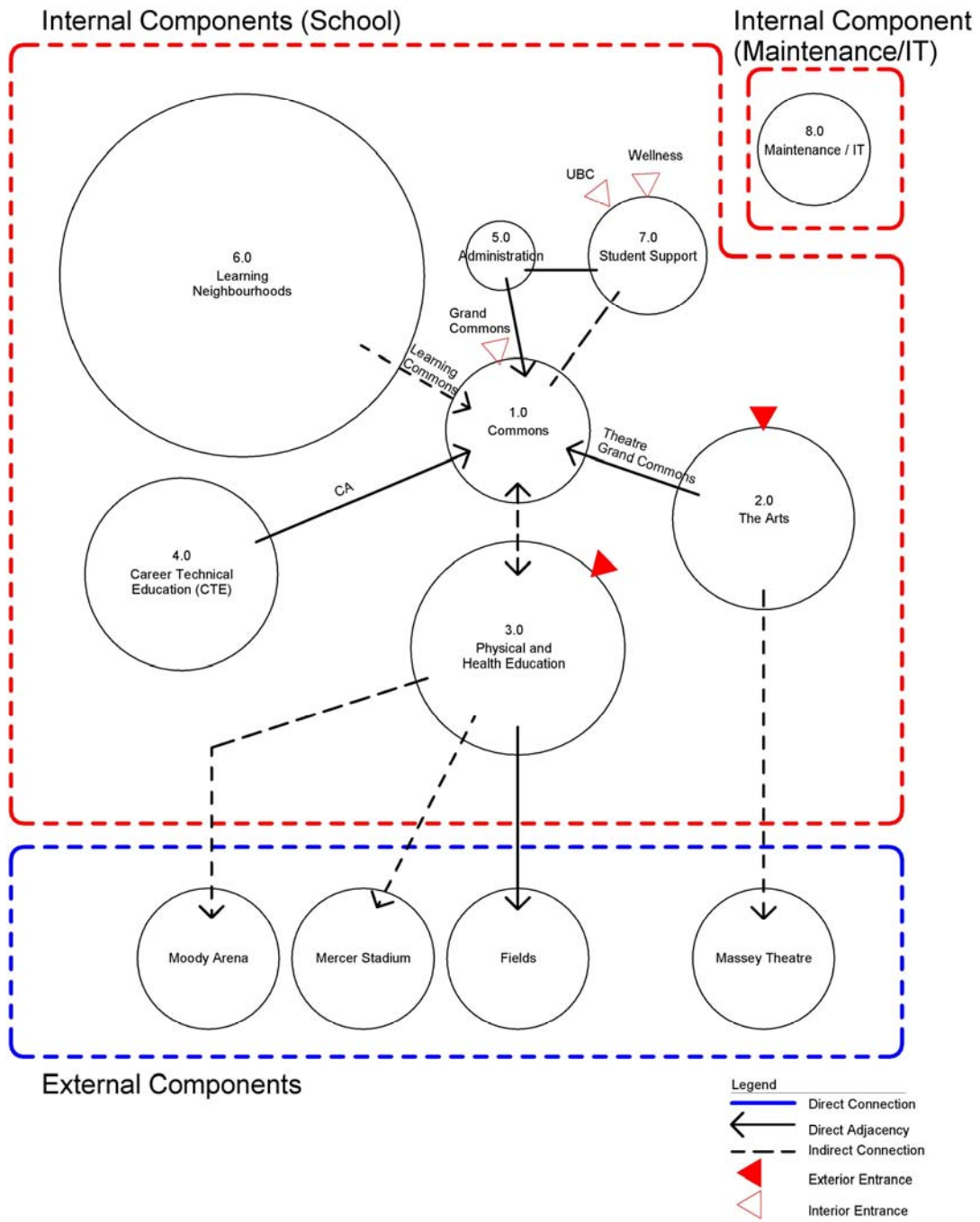
4.8.3.2 Do not use oriented strand board (OSB) in any application sensitive to moisture exposure, condensation or mold growth. Acceptable options include Portland cement concrete, concrete masonry, treated exterior grade plywood, cement board, and glass fiber faced silicone impregnated gypsum board.

4.8.4 Cladding

4.8.4.1 Wall cladding materials are to be durable, suitable for weather exposure and aesthetically integrated with the overall elevation appearance of the building(s) as a whole;

4.8.4.2 Wall cladding materials are to align with West Coast Modernism architecture using natural local materials as noted in section 4.4 of this schedule;

4.9 Facility Components



4.9.1 Internal Components:

4.9.1.1 The School is comprised of the following interconnected Internal Components listed below and as further described within this

Schedule, Appendix 1A Functional Program and Appendix 1B Room Data Sheets;

- 4.9.1.2 The internal components cohesively make up the function of the School. These components interconnect and integrate holistically, visibly and collaboratively with each other;
- 4.9.1.3 The Facility design shall not be departmentalized and shall encourage and promote collaboration;
- 4.9.1.4 All Internal Components will be included within the Site;
- 4.9.1.5 Commons:
 - 4.9.1.5(1) Commons consists of the Grand Commons and the Learning Commons.
 - 4.9.1.5(1)(a) Grand Commons – forms a communal welcoming and gathering space for the school and the community. It is the hub that connects and links the entire school together. This space is adaptive and flexible for accommodating informal and formal learning and community events. It is the main entrance to the School and is both physically and visually connected by two outdoor plazas; one plaza shall be at the front of the School and the second plaza shall be visually connected to the Mercer stadium.
 - 4.9.1.5(1)(b) Amphitheatre Stair – provide a grand stair, as a gathering space, for a minimum of 100 students for the purpose of providing seating for informal learning. Seating shall be identifiable wood seating and shall accommodate viewing of school and community presentations and performances. It shall be directly connected to the Grand Commons.
 - 4.9.1.5(1)(c) Learning Commons – shall have a direct visual connection to the Grand Commons via an opening with glazed sliding panels.
 - 4.9.1.5(1)(d) External Gathering Spaces – at the front entrance of the Grand Common and on the Mercer Stadium side of the Grand Commons. Allow for 150 people to gather.
- 4.9.1.6 The Arts

- 4.9.1.6(1) The Arts Education curriculum strives to galvanize students' artful habits of mind through engaged arts learning.
- 4.9.1.6(2) The curriculum includes a general arts program as well as four core discipline-specific programs: dance, drama, music, and visual arts, that capture the language, activities, and experiences unique to each of those disciplines.
- 4.9.1.6(3) The Arts Education curriculum promotes the arts as a means of self-expression and understanding of identity, and as a place in which to connect with artists, art processes, artwork, and arts learning in one's own community.
- 4.9.1.6(4) Performing Arts
- 4.9.1.6(4)(a) Dance Studio, Black Box and Theatre
- (a).1 This component is comprised of three spaces which have strong ties to one another. The Dance, Drama and Music Departments will use the theatre for rehearsals and performances with all their performing arts classes. The Black Box Space will be used as both a Drama teaching space, a Dance teaching space and a music rehearsal room. This space will be used for in-class performances and break out spaces for smaller groups.
- (a).2 The Drama program develops students' personal skills through group work, movement, voice, improvisation and play building. Project work includes writing and presenting monologues, improvisation, rehearsing scripted scenes and one act plays for performance and introduction to lighting, sound and stage production. These activities will take place in both the theatre and the Black Box space.
- (a).3 For set construction, the Black Box and Theatre need to have easy access to the Career and Technical Education shops (woodshop and metal shop). Proximity and ease of movement of large constructed sets and prop pieces. Large overhead doors shall be provided.
- (a).4 The Dance program develops students' personal skills through collaborative projects, develops dance technique and body awareness, and facilitates growth in students' confidence while

developing control of movement, stage presence and life-long fitness. Project work includes creating group choreography with the purpose of rehearsing and performing finished works, cross-floor and centre based technique development, and development of physical abilities through warm ups, workouts, floor work and improvisational activities. Students are introduced to staging, lighting and stage craft with the intent for performance.

- (a).5 The Drama, Dance and Music programs often work collaboratively, creating larger works which include both dramatic and dance elements as well as live music and at times staging of live music performers.
- (a).6 The Black Box, theatre and dance studio are used for extracurricular activities, hosting a variety of dance and drama clubs, as well as being available for community events.

4.9.1.6(4)(b)

Future direction: Drama and Dance

- (b).1 The Drama and Dance departments will work collaboratively to incorporate more use of technology in their productions and presentations. In addition, the departments will facilitate students' education to incorporate more stagecraft elements, such as lighting, sound, and stage production elements while incorporating technology. Students will learn on equipment that mirrors Massey Theatre so that when larger productions are moved into that space, students can design and operate all aspects of production, while recognizing the differences between the two (2) theatres (fly tower/tension grid). To increase student-creation of sets and props, access and flow from theatre/black box/storage to shop areas is essential.
- (b).2 The Design-Builder shall provide a dance studio that is rectilinear in shape and proportioned for the purpose it is intended;
- (b).3 The Design-Builder shall provide at minimum 15 metre long (uninterrupted including no doors) full wall with a 4 metre high mirror from finished floor. Provide wood sprung dance floor;

- 4.9.1.6(4)(c) Band Room, Choir/Orchestra Room, Black Box and auxiliary music spaces (recording studio and practice rooms).
- (c).1 The component is comprised of two larger spaces (band room, choir/orchestra room) and several smaller spaces that have strong ties to one another. These spaces have ties with the black box space. The black box will be used as a music ensemble rehearsal room in addition to a drama teaching space, dance teaching space and performance space;
 - (c).2 The music department is comprised of approximately 15 performing ensembles including 4 concert bands, 4 jazz bands, 5 choirs, a string orchestra and a musical-theatre orchestra. These ensembles range in size from 20 to 70 students. Non-performance courses include guitar and Music Composition and Technology. Many courses are scheduled outside of the regular timetable, either before or after school. In addition, there are many student-led ensembles that rehearse outside of regular class time under the guidance of the music staff. Students regularly use the School spaces for personal individual practice before school, at lunch, during spare blocks and after school;
 - (c).3 The music department is highly engaged in extra-curricular activities. Easy access to spaces outside of class time, including evenings and weekends, is needed.
 - (c).4 Larger equipment is moved between rooms as well as between the theatre and black box. Doors and hallways must encourage ease of movement of equipment and minimum 30 students per class. Proximity of these spaces is key. Rooms are used for warm-up and holding areas on performance nights. Rooms are also used for casual smaller performances. Equipment and students often need to be transported outside of the School for performances/festivals/tours, so large vehicle access to outside doors is required. Often these events are taking place outside of regular school hours;

- (c).5 Storage spaces need to accommodate daily movement of minimum 30 students and equipment per class.
- (c).6 Entrances/exits to these spaces need to be configured in a manner to avoid bottle necking and crowding. Access and flow between rooms is paramount to security, safety and efficiency;
- (c).7 All storage spaces adjacent to high ceiling spaces shall have high ceilings to match adjoining related spaces;
- (c).8 Rooms are used simultaneously and shall be soundproofed, including practice spaces and offices.
- (c).9 Recording studio will be multi-functional, serving as a small rehearsal space as well as recording studio;
- (c).10 The music rooms also host regular rehearsals of community groups including Royal City Alumni Band, New Westminster Symphony Orchestra, New Westminster District Jazz Band and Royal City Musical Theatre. These community organizations regularly (weekly) use the music rooms for rehearsals.
- (c).11 The music rooms also provide storage for some community organizations equipment and libraries. These groups use school-owned equipment and furniture for rehearsals and for concerts.
- (c).12 The music, drama and dance department often work in collaboration. All of these areas have strong adjacency needs to one another.

4.9.1.6(4)(d)

Future direction: Music Department

- (d).1 The music department will increase collaboration with drama and dance programs and will increase opportunities for collaboration between community partners, arts professionals and students.
- (d).2 Use of technology in regular classes and in productions/performance is a goal, including increased opportunities for students in technology related to live sound production and recording.
- (d).3 Priority will be given to student use.

- 4.9.1.6(4)(e) Theatre
- (e).1 The Design-BUILDER will provide a certified Theatre consultant to work with the Owner to design the spatial, acoustic and technical aspects of the School theatre. The theatre consultant will be retained and be available through all stages of the process;
 - (e).2 The Theatre shall have fixed raked theatre seating;
 - (e).3 The Theatre shall have an elevated stage for optimal audience site lines;
 - (e).4 The Theatre shall have vestibule light traps and acoustic traps at house entry points;
 - (e).5 The Theatre stage shall be universally accessible from both the stage and the audience area;
 - (e).6 The control booth and the theatre house shall be universally accessible;
 - (e).7 The theatre stage flooring shall be black colour sheet flooring;
 - (e).8 Theatre set apparatus shall be a replica of the Massey Theatre (acknowledging differences in wire tension grid versus fly tower set up) to ensure the consistent delivery of the technical theatre program.
- 4.9.1.6(4)(f) Band Room
- (f).1 The Band room shall be located at grade, be located adjacent to the theatre and have direct outside covered access to the theatre. Indirect access to the exterior, for loading purposes, from the band room via a Primary Corridor that provides with plywood wall protection and that accommodates a four (4) metre wide turning radius, is acceptable;
 - (f).2 The Band room shall have high ceiling with mezzanine storage for the storage of sheet music library and marching band equipment;
 - (f).3 The Band room shall have clerestory windows complete with blinds;
 - (f).4 The Band room shall have special purpose acoustic flooring for band rooms;
 - (f).5 The Band room shall have student instrument storage. Acceptable product: Wenger or

approved equivalent. Refer to Appendix 1A Functional Program for musical instrument list.

4.9.1.6(4)(g)

Black Box

- (g).1 The Design-Builder shall provide a black box space that is adjacent to the theatre and, connected to the dressing rooms;
- (g).2 The black box shall have a high ceiling complete with a pipe grid suspended from the ceiling (approximately 1500mm below ceiling) for the lighting grid;
- (g).3 The black box shall be painted black, have black flooring and be outfitted with a black theatrical curtain around all four walls.

4.9.1.6(5) Visual Arts

4.9.1.6(5)(a)

The Visual Arts Education curriculum promotes the arts as a means of self-expression and understanding of identity, and as a place in which to connect with artists, art processes, artwork, and arts learning in one's own community. Students express themselves through the use of hands on two dimensional and three dimensional media in art studios and through the use of technology in the graphic arts lab;

4.9.1.6(5)(b)

The visual arts spaces shall be adjacent to each other, and shall have access to direct natural daylight (requirement for north light) and shall have direct access to the exterior. Indirect north light in addition to direct south light is acceptable.;

4.9.1.6(5)(c)

The Graphic arts studio shall be located to be near to or overlook the Engineering Lab. Indirect access from the Graphic Arts studio to the Engineering Lab is acceptable.

4.9.1.7 Physical and Health Education

4.9.1.7(1)

The physical and health education curriculum focuses on well-being and the connections between physical, intellectual, mental, and social health.

4.9.1.7(2) The physical and health education is designed to develop the knowledge, skills, and understandings that students need for lifelong physical health and mental well-being.

4.9.1.8 Career and Technological Education (CTE)

4.9.1.8(1) The Career and Technical Education curriculum supports students in the process of becoming successful, educated citizens by providing them with opportunities to explore a variety of careers and options for their future.

4.9.1.9 Administration

4.9.1.9(1) The administration shall support the healthy, safe, open, accessible and visible learning environment;

4.9.1.9(2) The administration shall be the welcoming, first community access point to the facility;

4.9.1.9(3) The administration area shall be located adjacent to the Grand Commons and main entry of the School;

4.9.1.9(4) The administration area shall have a fully glazed wall floor to ceiling to provide a visual connection to the building main entrance;

4.9.1.9(5) The administration area shall be located so as to have maximized passive visual connection to the Grand Commons, main entry, main floor primary corridors and the amphitheatre;

4.9.1.9(6) The counseling area shall be located in close proximity to the administration offices for student support;.

4.9.1.10 Learning Neighbourhoods

4.9.1.10(1) Designed to facilitate collaborative learning opportunities for all learners and offer a place for experience and opportunities to collaborate and explore in a safe community;

4.9.1.10(2) Design to facilitate studying: independent or within a group. This space will be separate from the “active” spaces;

4.9.1.10(3) Design to support studio activities: a separate space for pullout work or specific work with technology integration to be utilized as needed;

4.9.1.10(4) Design to facilitate seminars: for group work and/or small group lecture;

- 4.9.1.10(5) Design to support exhibits: spaces are located throughout for students to post up their work and share what they are working on;
- 4.9.1.10(6) Design to support gathering: spaces for larger groups and interaction for the sharing and collaboration of student projects;
- 4.9.1.10(7) Design to facilitate presenting: provide a platform for the teacher and/or students as needed to instruct, demonstrate, deliver information to the entire room;
- 4.9.1.10(8) Learning Neighbourhoods consist of:
 - 4.9.1.10(8)(a) Formal learning spaces;
 - 4.9.1.10(8)(b) Science laboratories;
 - 4.9.1.10(8)(c) Collaborative learning spaces;
 - 4.9.1.10(8)(d) Inclusive education spaces;
 - 4.9.1.10(8)(e) Breakout rooms;
 - 4.9.1.10(8)(f) Teacher preparation areas;
 - 4.9.1.10(8)(g) Refer to Appendix 1A Functional Program for more detail;
- 4.9.1.10(9) Learning Neighbourhoods
 - 4.9.1.10(9)(a) Shall have direct access to natural daylights, have a visual connection to the other spaces within the neighbourhood;
 - 4.9.1.10(9)(b) All General Classrooms, Computer lab, and Science labs shall have an acoustically glazed window wall viewing into the common learning space, that is full height, full width glazing (minimum 6.5 m wide x 3m high) and glazed doors. In the case of Science Labs, the 6.5m minimum glazing width may be reduced. The Design-Builder will make every effort to maximize the glazing width;
 - 4.9.1.10(9)(c) The Inclusive Learning Support classroom and Breakout room shall have one glazed wall facing the collaborative learning space. The glazed wall shall be from finished floor to finished ceiling and extend from wall to wall

- 4.9.1.10(9)(d) Classrooms and Science labs shall have direct access to the Collaborative Learning Spaces;
- 4.9.1.10(9)(e) Classrooms shall have visual connection to the Learning Neighbourhoods:
- (e).1 Exterior windows shall have operable casement or awning windows, push to open;
 - (e).2 Minimum size of operable window opening shall be not less than 10% of the overall glazed area and not be less than 1 m²;
 - (e).2.1 A maximum of two (2) quantity windows may create the operable 1 m² window per classroom.
 - (e).3 Refer to exterior and interior glazing section of this Schedule;
 - (e).4 Design-Builder to ensure blinds work with window function;
 - (e).5 Within each neighbourhood, two Classrooms shall have a shared moveable acoustic partition between them to allow for two pair of connected/collaborative classrooms.
- 4.9.1.10(9)(f) Classrooms shall be column free, projection free and shall provide full viewing of the full height, full wall width teachable, writeable wall for all 30 students;
- 4.9.1.10(9)(g) Classroom shape shall be rectilinear and shall be proportioned so that main teachable wall is located on the longest classroom wall. Classroom A1 on Level 2 and Level 3 may be an exception;
- 4.9.1.10(9)(h) Classrooms shall have televisions located on the teachable wall. Design-Builder to provide backing for television locations;
- 4.9.1.10(9)(i) Each classroom shall have two separate classroom doors to the Secondary Corridor connecting to the collaborative learning spaces;
- (i).1 Home Economics classrooms shall have two separate doors from the corridor;
- 4.9.1.10(9)(j) Learning Neighbourhoods shall have two (2) stainless steel counter mounted sinks with faucets. strainers and in recessed alcove with enclosed lockable screen integral with millwork cabinets;

- 4.9.1.10(9)(k) Collaborative Learning Spaces shall be surrounded by Secondary Corridor for access to all Classrooms within the Learning Neighbourhood ;
- 4.9.1.10(9)(l) Teacher planning areas shall directly connect to the collaborative learning spaces and are directly connected to two learning neighbourhoods;
 - (l).1 Teacher planning areas shall have half height walls, maximum 1220 mm wall with glazing above (no internal blinds) to finished ceiling for visual connection to learning neighbourhoods;
 - (l).2 Teacher planning areas have fully glazed doors with no internal blinds on the doors.
- 4.9.1.10(10) Inclusive education spaces shall be integrated into the learning neighbourhoods;
 - 4.9.1.10(10)(a) Inclusive education spaces shall have a visual glazed wall connection to the collaborative learning spaces;
 - 4.9.1.10(10)(b) One grouping of inclusive education spaces shall be visually connected through glazed walls to one learning neighbourhood.
- 4.9.1.10(11) Science labs, like classrooms shall have fully glazed visual connection to collaborative learning spaces;
 - 4.9.1.10(11)(a) Science Labs shall have full writeable, erasable wall behind the teacher demonstration area;
 - 4.9.1.10(11)(b) Refer to Appendix 1A Functional Program for further information.
- 4.9.1.10(12) Design-Builder to provide the following:
 - 4.9.1.10(12)(a) Direct access to natural daylight;
 - (a).1 Visual connect via internal acoustical double glazed full height and width walls and glazed doors between every learning classroom and lab and the collaborative learning space;
- 4.9.1.11 Student Support
 - 4.9.1.11(1) Student support spaces shall be all located together;

- 4.9.1.11(2) Separate exterior access shall be provided to the Wellness Centre and the UBC Counseling Centre for afterhours public access and for during school hours.
- 4.9.1.11(3) Counseling
- 4.9.1.11(3)(a) Shall have its own entrance separate from administration and shall be a welcoming, accessible area for students;
- 4.9.1.11(3)(b) Shall be near to:
(b).1 the Wellness Centre.
- 4.9.1.11(4) Inclusive Education
- 4.9.1.11(4)(a) Shall be located near to the Wellness Centre so that students can have access to medical support;
- 4.9.1.11(4)(b) Shall be located on the ground floor to provide accessible access.
- 4.9.1.11(5) Wellness Centre
- 4.9.1.11(5)(a) Health clinic for students and community;
- 4.9.1.11(5)(b) Shall be adjacent to Inclusive Education for student support;
- 4.9.1.11(5)(c) The Wellness Centre has direct access to the UBC Counseling Centre.
- 4.9.1.11(6) UBC Counseling Centre
- 4.9.1.11(6)(a) Mental health counseling for students and the community provided by UBC internship programs;
- 4.9.1.11(6)(b) UBC shall have its own separate external entrance;
- 4.9.1.11(6)(c) Provide two way mirrors between counseling rooms and offices.
- 4.9.1.11(7) Friendship Centre
- 4.9.1.11(7)(a) Aboriginal education welcome space for daily drop-in and other gatherings for students and elders;
- 4.9.1.11(7)(b) Shall be located near the Grand commons;
- 4.9.1.11(8) Student Leadership

- 4.9.1.11(8)(a) Shall be a located in the Performing Arts Ticket Booth, connected to the Grand Commons for displaying and selling of goods and will accommodate a minimum of four (4) students for operating. The booth shall include lockable storage units for goods. The booth shall have lighting and power supply.

4.9.1.12 Maintenance/IT

- 4.9.1.12(1) Located as a separate standalone building located on the Site as noted in the Design-Build Agreement.
- 4.9.1.12(2) This facility provides IT and maintenance services to the whole school district.
- 4.9.1.12(3) The building shall be complimentary in form, character and materials to the School.

4.9.2 External Components

- 4.9.2.1 The External Components sit within the overall Owner's site as described in the Design-Build Agreement and form part of the overall master plan for the Site. The Internal Components are also supported by the external components of the Owner and the City of New Westminster.
- 4.9.2.2 The New Westminster Secondary School is an integral part of the community and plays a feature role in the centrally located site including the surrounding City amenities such as the existing Mercer sports Stadium, Massey community theatre and the Moody ice arena.
- 4.9.2.3 Massey Theatre
- 4.9.2.3(1) Existing Theatre that will continue to support the School.
- 4.9.2.3(2) The Massey Theatre, currently owned by the Owner, is a place for student, community and professional performing artists can perform.
- 4.9.2.3(3) The theatre is comprised of a full size stage, seats for 1260 and a visual art gallery. The School Performing Arts program performs regularly at the Massey Theatre.
- 4.9.2.4 Mercer Stadium
- 4.9.2.4(1) The Mercer stadium, owned by the City of New Westminster, is 12.5 acres artificial turf professional quality playing surface for

soccer, football and field lacrosse as well as track and field events with 8 lane track. The track is used by the school students as well as the three community track and field clubs. The stadium accommodates up to 1,000 spectators and offers community washroom access all year round. The design for the triangular piece of land between the School site and the Mercer Stadium shall meet all access connection, landscaping features and design element requirements set out in this Schedule.

4.9.2.5 The Playing Fields

4.9.2.5(1) The existing north play field supports the school and community uses for such sports as soccer, and field hockey and offers outdoor green space. The north playing field, owned by the Owner, will remain operational during construction. The Design-Builder will maintain existing Mercer field fence and allow existing school program field access during construction. A future west play field will be incorporated by the Owner. Refer to the site plan in the Design-Build Agreement.

4.9.2.6 Moody Arena

4.9.2.6(1) Moody Arena houses one ice rink and four change rooms on a 5 acre site. The area serves as a year round sports facility for the community and a recreational area for students for field trips.

4.9.2.7 Both Internal Components and External Components support the delivery of the curriculum to the students. The School will be interwoven into the fabric of the community hub of recreation, culture, and community amenities and open green space.

4.9.3 School Site Components include the following:

4.9.3.1 Parking

4.9.3.2 Bike Storage

4.9.3.3 Pick-up Drop-off Zones

4.9.3.4 Exterior work areas – continuous concrete pad

4.9.3.4(1) All CTE Shops shall have external covered work areas;

4.9.3.4(1)(a) Access to an outdoor dedicated concrete pad with partially covered weather protection. The minimum 45 m² concrete pad shall be the width of the shop. The concrete pad shall be adjacent to other CTE concrete

pads to form a continuous concrete pad. The concrete pad will be used for loading and receiving goods as well as student preparation of projects. The concrete pad shall not be used as a drive aisle;

4.9.3.5 Plaza Waiting Areas

4.9.3.5(1) Provide a continuous plaza/walkway along the entire front of the School for student gathering during peak hours for pickup and drop off.

4.9.3.6 School bus zone/student pickup/drop off;

4.9.3.7 Outdoor Learning

4.9.3.8 Storage Container

4.9.3.9 Roof/Deck Spaces

4.9.3.9(1) Limited and secured roof top access for students and staff for the purpose of student involvement in bee hive keeping.

4.9.3.9(1)(a) Provide a 4 m x 4 m roof top area;

4.9.3.9(1)(b) Roofing assembly shall be protected from bee infestation.

4.10 Building Systems

4.10.1 The Design-Builder will design and construct the Facility's interior building components in accordance with the following:

4.10.1.1 The interior walls and partition systems will:

4.10.1.1(1) provide acoustic separations as required for the specific functions to be carried out in the spaces affected. Refer to Appendix 1C Acoustics and Noise Control Ratings;

4.10.1.1(2) provide all separations required for fire safety and protection.

4.10.1.2 Seismic resistance capabilities will conform to the requirements of CSA S832-06 Guidelines for Seismic Risk Reduction of Operational and Functional Components of Buildings;

4.10.1.3 In addition, seismic restraint of wall mounted cabinetry, millwork and shelving shall be provided, designed, installed and reviewed as per the supervision and review of a registered professional structural engineer;

- 4.10.1.4 Conform to Ministry of Education guideline, refer to data room;
- 4.10.1.5 Interior walls and partitions, partition systems and interior finishes will be designed and selected to comply with and optimize the following criteria as may be relevant for the particular or specific functions enclosed;
 - 4.10.1.5(1) Easily cleanable and maintainable;
 - 4.10.1.5(2) Permanence and durability including impact resistance;
 - 4.10.1.5(3) Flexibility and adaptability of services;
 - 4.10.1.5(4) Low VOC emissions so as to minimize adverse impact on indoor air quality and indoor environmental quality;
 - 4.10.1.5(5) Aesthetic and design qualities to provide a positive environment for students and staff;
 - 4.10.1.5(6) Wall finishes, in the vicinity of plumbing fixtures, will be smooth and water resistant and will be washable wall protection using the Owner's grade disinfectant. Refer to data room for products;
 - 4.10.1.5(7) Resistant to damage due to normal wear and resistant to damage due to collision in high use/traffic areas;
 - 4.10.1.5(8) Permanence and durability including impact resistance;
 - 4.10.1.5(9) Incorporate corner and wall protection resistance as per Room Data sheet;
 - 4.10.1.5(10) Non-toxic/ non-allergenic;
 - 4.10.1.5(11) Void Space must be incorporated into the usable room/area if the Void Space is not of a size which can be outfitted in the future for a usable sole purpose. Void Space along corridors must be made available as completed alcoves;
 - 4.10.1.5(12) The completion of Void Spaces will not be deemed a cost to the Owner;
- 4.10.1.6 Provide a variety of secure display opportunities for student work or sports trophies.
- 4.10.1.7 Provide at a minimum two wood display cases for each of the following:
 - 4.10.1.7(1) Main entry;

- 4.10.1.7(2) Grand Commons;
- 4.10.1.7(3) Physical Education/Gymnasium entry;
- 4.10.1.7(4) Theatre entry;
- 4.10.1.7(5) Size of the display to be a minimum 1800 mm long x 1800 mm high;
- 4.10.1.7(6) Refer to millwork section of this schedule for additional information.

4.10.2 Formal and Informal Learning Spaces

- 4.10.2.1 Provide spaces that meet the program requirements delivery including room proportion, placement of windows, doors and lines of sight that support the student learning and staff teaching environment;
- 4.10.2.2 Locate and orient learning spaces into pods as described in Appendix 1A Functional Program.

4.10.3 Corridors

- 4.10.3.1 Provide primary and secondary corridors
 - 4.10.3.1(1) Primary corridors shall have:
 - 4.10.3.1(1)(a) Visual connection between floors;
 - 4.10.3.1(1)(b) Interconnection via stairs between floors;
 - 4.10.3.1(1)(c) All walls shall have clear sealed birch or fir plywood from finished floor to 2400 mm above finished floors for durability;
 - 4.10.3.1(1)(d) Wood acoustic ceilings
 - (d).1 Removable panels in sections not more than 3 m² for removal for mechanical and electrical IT access;
 - 4.10.3.1(1)(e) Exterior walls with continuous glazing; and
 - 4.10.3.1(1)(f) Primary corridors shall not be carpeted.
 - 4.10.3.1(2) Secondary corridors shall have:
 - 4.10.3.1(2)(a) Exterior windows at the end of every corridor;
 - 4.10.3.1(2)(b) Interior windows into program areas and study nooks;

- 4.10.3.1(2)(c) Seating benches shall be designed and constructed of proportions, dimensions and materials that support seating comfort,
- 4.10.3.2 Provide corridors of adequate width to manage peak volumes of student flows typically experienced at class change. Unless otherwise demonstrated primary corridors shall be a minimum four (4) m wide and secondary corridors shall be a minimum three (3) m wide to all areas within the Facility;
- 4.10.3.3 Provide study and student gathering nooks along corridors with passive supervision sightlines,
- 4.10.3.4 Passive supervision shall be provided to all student accessible areas;
- 4.10.3.5 Provide corridors that widen at interior high traffic areas;
- 4.10.3.6 Provide corridors with extensive exposure to direct daylighting with exterior views at multiple locations;
- 4.10.3.7 Provide internal views from corridors to the Grand Commons (as well as from program spaces such as Learning Commons) to the Grand Commons;
- 4.10.3.8 Design-Builders shall not provide long, straight, corridors;
- 4.10.3.9 Design-Builder shall not provide corridors with views of blank, dark end walls;
- 4.10.3.10 In addition to the minimum corridor width noted above, the size of the corridor ceiling space is to be designed to accommodate all mechanical and electrical services that require maintenance access. Access panels must meet the maximum size set out in this schedule and arrangement of access panels must be visually organized to support the interior design aesthetic;
- 4.10.3.11 Access panels for feature walls shall be a maximum 600 mm x 1220 mm;
- 4.10.4 Stairs**
- 4.10.4.1 The Design-Builder will provide feature stairs and exit stairs in key and easily found locations as visual focal points and unifying elements for students and staff;
- 4.10.4.2 Locate stairs to provide convenient, easily accessible circulation routes;

- 4.10.4.3 Locate stairs along perimeter walls to allow for natural daylighting and exterior views;
- 4.10.4.4 Locate to enhance planning flexibility;
- 4.10.4.5 Incorporate visual access to exterior and interior views for health benefits and passive supervision;
- 4.10.4.6 Exit stairs
 - 4.10.4.6(1) Provide exit stairs to meet Code exiting requirements;
 - 4.10.4.6(2) Locate strategically for the convenience and safety of students and staff;
 - 4.10.4.6(3) All walls, unless walls are exposed architectural concrete or glazed, shall have clear sealed birch or fir plywood from finished floor to 2400 mm above finished floors for durability;
 - 4.10.4.6(3)(a) Ensure 19 mm(3/4") thick, veneer, routed exposed edges on every wall;
 - 4.10.4.6(4) Full height guard rails and interior stair dividers shall allow for:
 - 4.10.4.6(4)(a) Safe and secure students and staff egress;
 - 4.10.4.6(4)(b) Natural daylighting light to pass through;
 - 4.10.4.6(4)(c) Passive supervision from above and below;.
 - 4.10.4.6(5) Exit stairs shall be made of architectural concrete;
 - 4.10.4.6(6) Materials shall be resistant to heavy use, and be impact resistant;
 - 4.10.4.6(6)(a) Acceptable materials for interior guard and interior stair dividers include glazing and architectural metal mesh.
 - (a).1 Plexiglas is not an acceptable material.
 - 4.10.4.6(6)(b) Materials, colours, patterns to be approved by Owner.
- 4.10.4.7 Feature and convenience stairs
 - 4.10.4.7(1) Provide feature and convenience stairs for student and staff use;
 - 4.10.4.7(2) Feature stair treads shall be a combination of architectural concrete and durable, warm in colour, wood appearing materials;

4.10.4.7(3) All walls shall have clear sealed birch or fir plywood from finished floor to 2400mm above finished floors durability;

4.10.4.8 Amphitheatre stairs

4.10.4.8(1) Provide feature stair in or near Grand Commons to allow for student seating to view performances and presentations in the Grand Commons, refer to section 4.9.1.5.1 of this schedule;

4.10.4.8(2) Use materials that are comfortable to seat on for the extent of a performance;

4.10.5 Washrooms

4.10.5.1 Provide washrooms as per the following:

4.10.5.1(1) At minimum fifty-six (56) washrooms (toilets/urinals) which includes the following:

4.10.5.1(1)(a) Code required washroom count:

4.10.5.1(1)(b) Gymnasium change room washroom counts:

(b).1 To accommodate six (6) classes of thirty (30) students equaling 180 students (90 male and 90 female);

4.10.5.1(1)(c) Washrooms in the Learning Neighbourhoods:

(c).1 Learning Neighbourhood washroom counts shall be based on Learning Neighbourhood occupant load:

4.10.5.1(1)(d) Separate Staff washrooms:

(d).1 Minimum two (2) per main floor:

(d).2 Minimum two (2) per Learning Neighbourhood floors;

(d).3 Locate adjacent to Teacher preparation areas.

4.10.5.1(1)(e) At minimum three (3) student gender-neutral washroom to be distributed evenly throughout the School;

(e).1 Locate one of the gender neutral washroom near the Performing Arts program;

4.10.5.1(1)(f) Washrooms as indicated in Appendix 1A Functional Program requirements;

4.10.5.1(2) Design as per building code requirements;

4.10.5.1(3) :

“Gender-neutral restrooms/washrooms” or “Inclusive washrooms” means a lockable restroom designed for a single individual which specifies through signage that it is designed for all genders. These washrooms provide individual privacy complete with floor to ceiling walls, a full height door and a single toilet and sink;

- 4.10.5.1(3)(a) Gender neutral washrooms and program washrooms to be individual rooms with floor to ceiling walls and full doors. Each washroom to have one toilet and one sink.
- 4.10.5.1(3)(b) All gender neutral washrooms to be fully accessible;
- 4.10.5.1(4) All other student washrooms to be designed with no doors, minimum touch points, direct access to general circulation, with no sightlines into washrooms;
- 4.10.5.1(5) Refer to section 3.2.9.6 regarding Facility zones and requirement for washrooms counts to serve each zone.
- 4.10.5.1(6) Provide infrastructure provisions for two future community washrooms, accessible from the exterior, adjacent to the existing play field.
 - 4.10.5.1(6)(a) These future washrooms are not included in the overall washroom count.
- 4.10.5.1(7) Provide infrastructure provision for two (2) future washrooms within the Wellness Centre.
 - 4.10.5.1(7)(a) These future washrooms are not included in the overall washroom count.
- 4.10.5.2 Custodial/Janitor Rooms
 - 4.10.5.2(1) The Design-Builder will provide the following:
 - 4.10.5.2(1)(a) Custodial rooms as noted in Appendix 1A Functional Program.
 - 4.10.5.2(1)(b) In addition, five custodial rooms spaced evenly throughout the School; .
 - 4.10.5.2(2) Each custodial room will be a minimum of 10 m2. Provide at least one custodial room per floor Each room to accommodate the following:
 - 4.10.5.2(2)(a) Floor scrubber machine,

- 4.10.5.2(2)(b) Custodial cart,
- 4.10.5.2(2)(c) Mop sink;
- 4.10.5.2(2)(d) Adjustable shelving for storage of janitorial supplies, minimum 2 m high and 2 m long; and
- 4.10.5.2(2)(e) Six hooks for brooms, mops and dustpans.

4.10.5.3 Backing

- 4.10.5.3(1) Provide fittings, attachments and internal bracing/backing as required to accommodate and support wall-mounted fixtures, storage systems and equipment, including equipment for video conferencing and other applicable rooms;
- 4.10.5.3(2) Provide solid wood backing in all framed walls for solid connection to all wall mounted fixtures, storage systems and equipment including videoconferencing equipment, monitors and white boards;
- 4.10.5.3(3) Minimum backing to be 19 mm plywood;
- 4.10.5.3(4) Refer to Appendix 1B Room Data Sheets for locations. Final locations within each room to be approved by the Owner prior to covering up;
- 4.10.5.3(5) At a minimum, Design-Builder will provide wall backing:
 - 4.10.5.3(5)(a) Full width and height of walls as required to support wall mounted dumbbells and weights in exercise room;
 - 4.10.5.3(5)(b) For MDF and gypsum board surfaced wall assemblies, provide a 19 mm high x 12.7 mm thick strip of pressure treated plywood at the wall/floor interface. Where serving dual purpose for backing and wall finish, as per Appendix 1B Room Data Sheets, provide birch or fir plywood for aesthetics.
 - 4.10.5.3(5)(c) Provide concrete curb protection against water damage in spaces that contain equipment or services;
 - 4.10.5.3(5)(d) Provide cementitious backer board in wet areas. Backer board shall be installed in accordance with the manufacturers written instructions to the full height of the tiling or other wall finish. The substrate shall be protected with a 0.15 mm thick sheet of polyethylene

installed behind the backer board and extending the full area of the backer board without joints.

4.10.6 Line of Sight

4.10.6.1 Lines of sight provide the ability to see what is important from where a person is located both sitting and standing. The location and design of interior walls and columns will minimize disruption of exterior and interior views and line of sight;

4.10.6.2 The Design-Builder will design the Facility using:

4.10.6.2(1) Glazed walls and corridors and doorways that line up and provide clear lines of sight; and

4.10.6.2(2) Locate walls, furniture and equipment so as to provide clear lines of sight.

4.10.6.3 The Design-Builder will provide passive direct line of sight;

4.10.6.3(1) Passive direct lines of sight shall be provided, as per Appendix 1A Functional Program. Some of those passive supervision locations will include the following:

4.10.6.3(1)(a) Administration office to main entry, Grand Commons and exterior areas;

4.10.6.3(1)(b) Gymnasium offices to the gymnasium;

4.10.6.3(1)(c) CTE offices to the shop;

4.10.6.3(1)(d) CTE shops to the other CTE shop;

4.10.6.3(1)(e) CTE shops to CTE exterior work areas;

4.10.6.3(1)(f) Formal and informal learning spaces to each other within the Learning Neighbourhoods;

4.10.6.3(1)(g) Primary corridors areas to the Grand Commons;

4.10.6.3(1)(h) Learning Commons to the Grand Commons;

4.10.6.3(1)(i) Grand Commons to the main entry;

4.10.6.3(2) Support space must be arranged to provide passive direct line of sight as per the Functional Program.

4.10.7 Gymnasium

- 4.10.7.1 Provide three courts within the gymnasium that meet FIBA court standards for basketball, volleyball and badminton courts;
- 4.10.7.2 Provide a gymnasium wall divider curtain to separate all three courts;
- 4.10.7.3 Provide fully retractable bleachers with capacity for 500 seats (two (2) sets of 250 seats).

4.10.8 Learning Commons

- 4.10.8.1 Provide passive visual connection to Grand Commons with acoustic separation of the space with full height and full width of space large glazed wall and door sliders, for flexibility and adaptability. Dimensions shall be a minimum of 10 m wide by 4 m high;
- 4.10.8.2 Provide enhanced structural floor over the entire Reading Room space to accommodate stationary library book shelves for a minimum of twelve (12) quantity 1220 mm wide x 1220 mm high book shelves
- 4.10.8.3 Provide adequate ventilation for the photocopy area within the Learning Commons workroom area to support the extensive (approximately three hundred thousand pages per month) of photocopying.

4.10.9 Surfaces

- 4.10.9.1 Surfaces will have the following characteristics, consistent with their functional purpose:
 - 4.10.9.1(1) resistant to microbial spread and growth;
 - 4.10.9.1(2) non-porous or smooth;
 - 4.10.9.1(3) durable;
 - 4.10.9.1(4) seamless;
 - 4.10.9.1(5) resilient and impact resistant;
 - 4.10.9.1(6) nontoxic/ non allergenic;
 - 4.10.9.1(7) presenting minimal glare;
 - 4.10.9.1(8) chemical resistant in areas using chemicals;
 - 4.10.9.1(9) constructed in a way that will not soak up or harbour moisture; and

- 4.10.9.1(10) water impermeable in areas where water or dampness can occur.

4.10.10 Ceilings

- 4.10.10.1 The ceiling system will be considered as part of the interior spaces and may be accessible or inaccessible in total or in part as required to comply with each room's requirements as set out in Appendix 1B Room Data Sheets;
- 4.10.10.2 Accessible ceiling systems must provide access to the ceiling spaces throughout the system. Ceiling services in corridors will be grouped together so that two or three services are installed on one ceiling tile allowing greater access to ceiling spaces;
- 4.10.10.3 Access panels size shall be a minimum 600 mm x 600 mm. Access panels shall not be accessible by students;
- 4.10.10.4 Ceiling systems will comprise a major component of the acoustic or sound attenuation function as required in the spaces in which they are installed and will conform to the requirements of Appendix 1C Acoustics and Noise Control Ratings;
- 4.10.10.5 Ceiling finishes will comply with and optimize the following criteria as may be relevant to the particular or specific functions of the space:
- 4.10.10.5(1) Easily cleanable and maintained;
 - 4.10.10.5(2) Flexible and allowing access to the spaces above;
 - 4.10.10.5(3) Compatible with mechanical, plumbing, electrical, and communications services and fixtures;
 - 4.10.10.5(4) Producing low VOC emissions so as to minimize adverse impact on indoor air quality and indoor environmental quality;
 - 4.10.10.5(5) Having aesthetic and design qualities to provide a positive environment for students and staff;
 - 4.10.10.5(6) Provide ceilings and ceiling heights, with materials and finishes, as noted in Appendix 1B Room Data Sheets.

4.10.11 Floor Finishes

- 4.10.11.1 The floor and floor systems will be considered as part of the interior spaces and will be finished to be complementary and integral to the functional and aesthetic requirements of the interior space;

- 4.10.11.2 Floor finishes will be selected to suit the types of activities and concentration of pedestrian and vehicular/wheel traffic anticipated;
- 4.10.11.3 Provide floor systems from a manufacturer to suit performance level required and selected from readily available stock;
- 4.10.11.4 Floor finishes will be provided as indicated in Appendix 1B Room Data Sheets and acceptable to the Owner;
- 4.10.11.5 The following criteria will apply to the selection of floor finishes:
 - 4.10.11.5(1) Easily cleanable and maintained finishes;
 - 4.10.11.5(2) Minimize the frequency and ensure the quality of joints and provide ease of replacement if and when required;
 - 4.10.11.5(3) Provide butterfly joints at outside corners of cove base;
 - 4.10.11.5(4) Ensure imperviousness to concentrations of moisture anticipated to be existing on the floors and duration of that moisture;
 - 4.10.11.5(5) Permanence, durability and resistance to concentrated service traffic both pedestrian and vehicular;
 - 4.10.11.5(6) Aesthetic and design qualities to provide a positive environment for students and staff;
 - 4.10.11.5(7) Low VOC emissions so as to minimize adverse impact on indoor air quality and indoor environmental quality;
 - 4.10.11.5(8) Patterns and textures compatible with the requirements for pedestrian safety;
 - 4.10.11.5(9) Non-skid flooring will be used in wet areas, wash and change rooms;
 - 4.10.11.5(10) Refer to Appendix 1B Room Data Sheets for all floor finishes.

4.11 Interior Design

4.11.1 The Design-Builder will:

- 4.11.1.1 employ a professional registered interior designer to design the interiors for this Project;
- 4.11.1.2 ensure the interior design reflects the values of the Facility;

- 4.11.1.3 ensure the overall exterior and interior design throughout the Facility is integrated;
- 4.11.1.4 provide a distinct character for the Facility which relates to its purpose and the Owner, students, staff and the community using the Facility;
- 4.11.1.5 ensure the interior design is appropriate for a next generation secondary school educational Facility;
- 4.11.1.6 provide student centric design elements that support student learning;
- 4.11.1.7 ensure that the interior design is an extension of a contemporary West Coast Modernism next generational learning Facility;
- 4.11.1.8 coordinate the interior design with intuitive wayfinding and wayfinding design concepts.

4.12 Ergonomic Design

4.12.1 The Design-Builder will provide:

- 4.12.1.1 detailed design features, which expressly facilitate the physical activities of the students and staff to increase their safety, efficiency and general wellbeing, and assist in eliminating ergonomic risk factors; and
- 4.12.1.2 ergonomic design, consistent with good industry practice, of all spaces including millwork, modular casework, furniture, lighting, and finishes to eliminate strain and injury to students and staff.

4.13 Colour

4.13.1 The Design-Builder will:

- 4.13.1.1 Provide three exterior and interior options for the colour and materials scheme, consistent with this Schedule, for the Owner's selection;
- 4.13.1.2 The School colour scheme will be appropriate for the emotional and psychological needs of students and staff;
 - 4.13.1.2(1) Use natural colour palettes that contribute to the learning environment;
 - 4.13.1.2(2) Use warm tones including warm whites;
 - 4.13.1.2(3) Use natural earth tones specifically for the Inclusive Education program areas;

- 4.13.1.3 Choose materials and colour palettes that are durable and do not show dirt, scuffing and marking;
 - 4.13.1.3(1) In maintenance, service and CTE shop areas, use industrial, commercial grade colours that hide dirt as well as wear and tear;
- 4.13.1.4 Use accent colours on areas, such as walls, that are easy to maintain and change for future flexibility;
- 4.13.1.5 Glazing colours shall be clear. Coloured glazing shall not be permitted;
- 4.13.1.6 Provide distribution of ambient full spectral colour lighting within student and staff environments; and
- 4.13.1.7 Provide anti-glare creating finishes.

5. ENGINEERING DESIGN PRINCIPLES

5.1 Structural Engineering

5.1.1 General Requirements

- 5.1.1.1 The structural design shall be in accordance with the requirements of the current British Columbia Building Code, the applicable CSA material standards and codes, municipal bylaws, Owner's requirements and the criteria or principles stated in this document.
- 5.1.1.2 The structural design, including minimum design loads and general provisions and material specifications, shall satisfy the requirements of the current BCBC, local by-laws, other applicable or referenced design standards, loading criteria required by equipment suppliers or construction technique and the performance requirements detailed in this Section;
- 5.1.1.3 The design loads and material specifications outlined in the British Columbia Building Code and this document are minimum requirements to which the design of the structure must conform. Where stricter requirements of higher loads may be specified, the structure shall be designed to accommodate these conditions to ensure the structure is suitable for the proposed uses;
- 5.1.1.4 The engineering design, preparation of related documents and contract administration for the structure shall be carried out by and/or under the direct supervision of a Structural Engineer of Record in accordance with the requirements of the BC Building Code and "Guidelines for Professional Structural Engineering Services for Part 3

Building Projects” published by the Association of Professional Engineers and Geoscientists of British Columbia (APEGBC);

- 5.1.1.5 The Structural Engineer of Record shall be a Designated Structural Engineer with “Struct Eng” standing with APEGBC and licensed to practice in British Columbia with demonstrated experience in the field of structural engineering for building projects similar in size and complexity to the Facility in the Province of British Columbia;
- 5.1.1.6 The Design-Builder will provide an independent concept review of the structural design. An independent concept review of the structural design shall be performed by another structural engineer in accordance to the “Quality Management Guidelines: Documented Independent Review of Structural Designs” published by APEGBC. This review engineer shall be registered as a Professional Engineer in the province of British Columbia;
- 5.1.1.7 The Structural Engineer of Record or a qualified person directly responsible to him shall perform sufficient field review and supervision during the construction phase to verify that the building structure has been constructed in accordance with the structural design documents.

5.1.2 Structural Design Principles

- 5.1.2.1 Unless otherwise specified, clear areas are necessary for the School design and no interior columns are allowed unless as shown on plans.

5.1.2.1(1) No interior columns are allowed in the following rooms:

- 5.1.2.1(1)(a) The Grand Commons;
 - 5.1.2.1(1)(b) The Theatre house;
 - 5.1.2.1(1)(c) The Gymnasium;
 - 5.1.2.1(1)(d) CTE workshop spaces including wood shop, discovery shop, metal shop and Electronics Robotics etc.;
- (d).1 Except,
- (d).1.1 columns may extend 305 mm (1'-0”) from face of wall into the shops where:
 - (d).1.2 Mezzanine spaces are used; and
 - (d).1.3 Circulation to the shops are located;
 - (d).1.4 Columns are permitted under mezzanine with a minimum clear span of 7.5 m.

- 5.1.2.1(1)(e) The Learning Commons, formal and informal learning areas;
 - 5.1.2.1(1)(f) Visual arts studios;
 - 5.1.2.1(1)(g) Classrooms.
- 5.1.2.1(2) Each as described in the Schedule.
- 5.1.2.2 Design and construct the Facility so that the long term differential foundation settlement does not exceed an angular distortion of 1/500.
- 5.1.2.3 Slabs on Grade
- 5.1.2.3(1) The slab-on-grade will be constructed of cast-in-place concrete slab bearing on top of minimum 150mm thick well compacted granular material. Provide 10mil vapour barrier under slab-on-grade.
- 5.1.2.4 Floor Construction
- 5.1.2.4(1) If the building floors are to be constructed of cast-in-place concrete, the floors are to be flat plate suspended slabs with beams as required. Other floor systems including steel structure and/or wood structure are acceptable. Vibration check is required for all suspended floor slabs.
- 5.1.2.5 Roof Construction
- 5.1.2.5(1) The roof will be constructed of either cast-in-place concrete flat plate suspended slabs or steel deck on top of OWSJs supported on steel beams, or wood planking on heavy timber beams.
- 5.1.2.6 Columns and Walls
- 5.1.2.6(1) All columns supporting floors will be cast-in-placed concrete columns and all columns supporting roof will be either concrete columns or steel columns;
 - 5.1.2.6(2) Steel columns are acceptable where floors are steel construction.
- 5.1.2.7 Cast-in-place concrete shearwalls will be provided as a lateral force resisting system for all concrete floors.
- 5.1.2.8 Steel, maybe be used for lateral force resisting system, where steel construction is used;

- 5.1.2.8(1) If located inside walls, bracing configuration shall allow for future installation of 1.2 m wide x 2.2 m high opening. Inverted “V” Chevron form is not acceptable.
- 5.1.2.8(2) If located outside of walls:
 - 5.1.2.8(2)(a) Locate outside glazed stair wells;
 - 5.1.2.8(2)(b) Bracing shall be natural finished steel tensile cable or tension rods with architectural design fittings.
- 5.1.2.9 All load-bearing walls around choir orchestra, band room, dance studio, black box theatre, gymnasium shall be concrete masonry block walls or cast-in place concrete providing as both gravity load and lateral force resisting system;
- 5.1.2.10 Tilt-up concrete panel construction is acceptable for the Maintenance/IT Building.

5.1.3 Design Loads

- 5.1.3.1 The structure shall be designed to support all reasonably possible short term and long term effect of imposed loads including but not limited to the self-weight of the structure, electrical and mechanical equipment and fixtures, concrete equipment pads, partitions, finishes, furniture, occupancy loads, forces and displacement of generated by wind and seismic events and expansion and contraction due to temperature variations outlined in the BC Building Code;
- 5.1.3.2 Roofs and exterior canopies shall be designed for specified snow load for New Westminster 1/50 snow loads;
 - 5.1.3.2(1) The design values are to be confirmed with the City of New Westminster Building Department when design commences;
 - 5.1.3.2(2) The effects of snow accumulation from various roof elevations in the building and from nearby adjacent structures shall be considered in the design;
 - 5.1.3.2(3) Where roofs may be occupied, they shall also be designed for their intended use and occupancy as a floor structure.
- 5.1.3.3 Floors shall be designed for their intended use, occupancy and for any additional specific requirements by the Owner during the Design and Construction phases of the project. This shall include superimposed dead loads (partition allowance) where appropriate. All elements of the floor and roof structure shall be designed for the worse case affects

from either uniformly distributed live loads or concentrated live load.
The following minimum floor live loads shall apply:

- 5.1.3.3(1) Uniformly distributed live loads:
- 5.1.3.3(1)(a) Gymnasium/Theatre/Theatre house = 4.8kPa
 - 5.1.3.3(1)(b) Balconies, mezzanines, open PBL areas = 4.8kPa
 - 5.1.3.3(1)(c) Classrooms = 3.6kPa
 - 5.1.3.3(1)(d) Labs = 3.6Pa
 - 5.1.3.3(1)(e) Equipment areas = 3.6kPa
 - 5.1.3.3(1)(f) Exits and fire escapes = 4.8kPa
 - 5.1.3.3(1)(g) Foyers, corridors, aisles and halls = 4.8kPa
 - 5.1.3.3(1)(h) Kitchens = 4.8kPa
 - 5.1.3.3(1)(i) Learning Commons = 7.2kPa
 - 5.1.3.3(1)(j) Office (1st storey) = 4.8kPa
 - 5.1.3.3(1)(k) Office (above 1st storey) = 3.6kPa
 - 5.1.3.3(1)(l) Storage areas = 4.8kPa
 - 5.1.3.3(1)(m) In addition to the requirements of Code and the specified loading above, the structural components of the Facility shall be designed at minimum floor design live loads of 7.2kPa for the following:
 - (m).1 entire Level 1,
 - (m).2 the Weight room,
 - (m).3 the CTE shops and storage,
 - (m).4 the Book Room,
 - (m).5 the Theatre stage, and
 - (m).6 the Band/Choir rooms.
 - 5.1.3.3(1)(n) Program areas that shall support existing library shelving shall be designed to support these loads. Existing library shelving shall be located in the following locations:
 - (n).1 Learning Common reading room and book room.

- 5.1.3.4 Where the use and occupancy of the space is not listed above, the Structural Engineer of Record shall determine the design load by analysis of the weight of the probable assembly of person, probable accumulation of equipment and furnishings and probable storage of materials;
- 5.1.3.5 The overall building structure and its structural elements shall be designed to withstand the effects of wind and seismic forces according to the Codes;

5.1.4 Coordination

- 5.1.4.1 Coordinate the structural members with the architectural finishes to have adequate thickness, cover and reinforcing to satisfy the fire protection and durability requirements;
- 5.1.4.2 Coordinate all structural members with other disciplines to avoid utility interferences and to ensure adequate architectural headroom and clearances;
- 5.1.4.3 Coordinate structure with equipment requirements for slab depressions and cast-in hardware. Provide adequate depth of slab depressions to avoid the need for ramp.

5.1.5 Deflection Limits

- 5.1.5.1 The structure shall be designed with consideration for the effects of deflection, sway and displacement due to short term and long term loading and long term creep in structural materials;
- 5.1.5.2 The deflection, sway and displacement of the structural elements shall be with the limits specified in the BC Building Code and material standards pertaining to that used for the structure. Where the architectural finishes and/or the intended use of the area require limits exceeding those specified by the BC Building Code and materials' standards the more stringent criteria shall apply. Notwithstanding the above, the deflection limit will not exceed the levels specified in this Section:
 - 5.1.5.2(1) For typical concrete floor or roof construction, irrespective of the ceiling types, the maximum deflection occurring after the installation of non-structural elements due to all sustained loads, including long-term creep deflection and live load deflection, will not exceed span/480.
 - 5.1.5.2(2) For steel floor construction, the maximum live load deflection will not exceed span/480 with the total load deflection not exceeding

span/360. The total load deflection is to include effects of shrinkage of concrete topping slabs.

- 5.1.5.2(3) For steel roof construction, where the roof construction supporting or attached to non-structural elements likely to be damaged by large deflection, the maximum live load deflection will not exceed span/480 with the total load deflection will not exceed span/360. Where the roof construction supporting or attached to non-structural elements not likely to be damaged by large deflection, the maximum live load deflection will not exceed span/360 with the total load deflection not exceeding span/240.
- 5.1.5.2(4) For wood floor construction, the maximum total load deflection will not exceed span/360.
- 5.1.5.2(5) For wood roof construction, the maximum total load deflection will not exceed span/360 where plastered or gypsum ceilings are applied. Where no plastered or gypsum ceilings are applied, the maximum live load deflection will not exceed span/360 and the total load deflection not exceeding span/240.
- 5.1.5.3 In addition to the above design deflection limits, the structure must conform to specific deflection requirements for specialty equipment as recommended by the supplier or manufacturer of that equipment;
- 5.1.5.4 In addition to the above design deflection limits, the deformations of the structure under service loads must be compatible with the architectural finishes and cladding system.

5.1.6 Vibration Mitigation

- 5.1.6.1 The building structure shall be designed to mitigate the potential for annoyance to the occupants due to structural vibration arising from equipment, human movement and rhythmic activities. Vibration is to be limited to acceptable levels for the use and occupancy of the floors and the requirements of this Section. An acoustic and vibration consultant will be retained by the Design-Builder. The consultant will be a Professional Engineer registered in the Province of B.C. with demonstrated experience in providing recommendations and analysis for acoustic and vibration performance of buildings;
- 5.1.6.2 Mitigation of the potential for annoyance due to vibration from equipment, human movement and rhythmic activities shall be undertaken at the concept design stage when the general arrangement of the structural system is established;

- 5.1.6.3 Structural systems susceptible to vibration shall be designed so that vibrations will have no significant adverse effects on the intended occupancy of the building;
 - 5.1.6.4 Commentary D in the “User’s Guide – NBC 2010 Structural Commentaries (Part 4 of Division B)” shall be used as a minimum guideline for the design and evaluation of the vibration characteristics of the structure as a whole and its elements;
 - 5.1.6.5 Select and design floor structural systems to have a vibration acceleration maximum limit of 0.5%g with a damping ratio of 0.02 when an excitation force of 0.29kN is applied;
 - 5.1.6.6 In areas where vibration-sensitive testing equipment will be installed, design the structural system to provide vibration limitation in accordance with the specific manufacturer requirements for that equipment;
 - 5.1.6.7 Roof top mechanical units shall have vibration isolation devices and be supported on a concrete pad. Mechanical penthouse floors shall be constructed with concrete. Mechanical room floor shall be constructed with cast in place concrete. Other means of providing sufficient mass in the structure to dampen equipment vibration will be considered;
 - 5.1.6.8 Upon completion of the structure and application of the architectural finishes that may dampen vibrations, the structure shall be reviewed by the consultants and owners to assess the acceptability of any vibrations that may exist in the building. Where vibrations are deemed to be noticeable and cause an annoyance by the Owner, the vibration shall be mitigated.
- 5.1.7 Durability and Maintenance**
- 5.1.7.1 Basic Requirements
 - 5.1.7.1(1) The building structure and structural components shall be designed for a minimum 50 year life span.
 - 5.1.7.1(2) Safe means of access shall be provided to all exposed structural elements requiring periodic maintenance.
 - 5.1.7.2 Quality Requirements
 - 5.1.7.2(1) The building structure shall be designed in accordance with the BC Building Code (latest Edition) and the applicable material standards and CSA S478 Guideline on Durability of Buildings.

5.1.7.3 Performance Requirements

- 5.1.7.3(1) The building structure and structural components design and detailing shall minimize deterioration due to exposure to the environment and use. The following shall be considered:
- 5.1.7.3(1)(a) Adequate concrete and masonry crack control joints and expansion/contraction joints, Caulk exposed joints.
 - 5.1.7.3(1)(b) Concrete mixes proportioned to CSA A23-1/A23-2 durability requirements for exposure class. For sustainability purposes, uses hydraulic cement: Portland-Limestone type GUL for all concrete mixes.
 - 5.1.7.3(1)(c) Reinforce concrete and masonry for crack control. The maximum allowable crack width is per ACI and CSA A23.3. Repair exposed cracks.
 - 5.1.7.3(1)(d) Chamfer corners of exposed concrete.
 - 5.1.7.3(1)(e) Hot-dip galvanize or powder-coat exterior exposed steel.
 - 5.1.7.3(1)(f) Add corrosion inhibitors to exterior reinforced concrete pavement subject to vehicle traffic.

5.1.8 Concrete

5.1.8.1 Basic Requirements

- 5.1.8.1(1) Reinforced concrete construction for cast-in-place, tilt-up concrete, and precast concrete, that meets or exceeds current Canadian Standards and practice as set out in this division, may be considered for building elements and systems, where appropriate.

5.1.8.2 Quality Requirements

- 5.1.8.2(1) Project concrete works shall comply with all Applicable Standards including, but not limited to, the BC Building Code (Latest Edition).
- 5.1.8.2(2) Inspection and testing of cast-in-place and tilt-up concrete and concrete materials shall be carried out by a testing laboratory in accordance with CAN/CSA-A23.1, Non-destructive Methods for Testing Concrete shall comply with CAN/CDA-A23.2.
- 5.1.8.2(3) Inspection and testing of precast concrete materials and workmanship shall be carried out by the precast concrete

subcontractor as part of its quality control program in accordance with CAN/CSA-A23.2. Maintain plant records and a quality control program as required by CSA-A25.1.

5.1.8.3 Performance Requirements

- 5.1.8.3(1) All concrete formwork shall comply with CAN/CSA-S269 series of standards, and Worksafe BC regulations, construct forms to produce finished concrete conforming to smoothness, shape, dimensions, locations, and levels indicated within tolerances as per CAN/CSA-A23.1. Tolerances shall not be cumulative.
- 5.1.8.3(2) Concrete reinforcing work shall comply with CAN/CSA-A23.1 and the American Concrete Institute (ACI) Manual of Engineering and Placing Drawings for Reinforced Concrete Structures.
- 5.1.8.3(3) Cast-in-place concrete work shall comply with CAN/CSA-A23.1, CAN/CSA-A23.2, and CSA-S413. Minimize honeycombing or patching in exposed architectural concrete.
- 5.1.8.3(4) Where tilt-up concrete is used, design, fabricate and install tilt-up concrete members and connections to conform to the requirements of the BC Building Code, CAN/CSA-A23.1. A professional engineer (lift design engineer) registered in the Province of British Columbia, experienced in tilt-up panel erection, shall design panels for erection stresses and for bracing until structure with permanent bracing is in place. The lift design engineer shall also review the design of the slab on grade floor and under slab fills for all tilt up panel construction loads including crane loads, bracing anchorage, and stack-cast panel loads.
- 5.1.8.3(5) Where panel concrete is used, design, fabricate and install precast concrete members and connections to conform to the requirements of the BC Building Code, CAN/CSA-A23.4, and the PCI Design Handbook, under direct supervision of a professional engineer registered in the Province of British Columbia, fully experienced in design of precast concrete structural units. The manufacturer of precast concrete elements shall be certified to precast concrete products under CSA-A251 for the type of product being supplied.

5.1.9 Masonry

5.1.9.1 Basic Requirements

5.1.9.1(1) Masonry construction may be considered for exterior walls and wall systems where permanence of finishes both visually and functionally, and ease of maintenance are primary considerations in the exterior fabric of the Facility. Concrete block masonry may be considered for both independent exterior walls and in exterior wall systems as back up to other finish materials or systems.

5.1.9.1(2) Masonry construction may be considered for interior walls and wall systems when priorities include, permanence and maintenance, sound transmission control, fire resistance and separation requirements and security.

5.1.9.2 Quality Requirements

5.1.9.2(1) Concrete block masonry practices and work standards shall comply with Canadian Masonry Contractors Association (CMCA) Masonry Practices Manual, and with CSA-S304.1 and CSA-A371.

5.1.9.2(2) Inspection and testing of masonry materials and workmanship shall be carried out sufficiently to confirm conformance with design specifications.

5.1.9.3 Performance Requirements

5.1.9.3(1) Materials, workmanship and application procedures shall comply with standards and references listed in Quality Requirements above. Where masonry construction is used for exterior walls, appropriate measures against moisture ingress shall be taken.

5.1.10 Metals

5.1.10.1 Structural Steel and Steel Joists

5.1.10.1(1) Basic Requirements

5.1.10.1(1)(a) Structural steel and/or steel joists may be considered as a viable structural system or components of a structural system and shall conform to the standards of material and construction specified below.

5.1.10.1(2) Quality Requirements

5.1.10.1(2)(a) Structural steel and steel joists shall comply with CAN/CSA-S16.

5.1.10.1(2)(b) Fabricators and Erectors shall be certified by the Canadian Welding Bureau under Division 1 or 2.1 of CSA-W47.1 for fusion welding for steel structures and/or CSA-W55.3 for resistance welding of structural components.

5.1.10.1(2)(c) Inspection and testing of material and workmanship shall be carried out by an approved testing laboratory. Use testing procedures as specified in CSA-S16 to verify soundness of representative shop and field welds.

5.1.10.1(3) Performance Requirements

5.1.10.1(3)(a) Conform to the requirements of the BC Building Code and the CISC Code of Standard Practice.

5.1.10.2 Steel Deck

5.1.10.2(1) Basic Requirements

5.1.10.2(1)(a) Steel deck may form an integral part of the horizontal load bearing structural system and floors and/or roofs and shall conform to the standards of materials and construction specified.

5.1.10.2(1)(b) All metal deck is to be fastened to supporting structure with purpose designed puddle welds or mechanical fasteners. All roof deck side laps are to be button punched or screwed.

5.1.10.2(2) Quality Requirements

5.1.10.2(2)(a) Design and fabrication of steel deck shall comply with CAN/CSA-S136 and the Canadian Sheet Steel Building Institute Standards (CSSBI – 101M).

5.1.10.2(2)(b) Fabricators and Erectors shall be certified in accordance with CSA-W47.1.

5.1.10.2(2)(c) Inspection and testing of material and workmanship shall be carried out by an approved testing laboratory.

5.1.10.2(3) Performance Requirements

5.1.10.2(3)(a) Deflection under live load only shall not exceed 1/360 of span for roofs and 1/480 of span for floors.

5.1.10.2(3)(b) The spacing of members supporting concrete topped steel deck for floors shall be established to minimize vibration.

5.1.10.3 All exposed exterior structural and architectural steel to be sandblasted to SP-6 and coated with EXT 5.1H pigmented polyurethane over inorganic zinc and epoxy.

5.1.11 Wood / Heavy Timber

5.1.11.1 Basic Requirements

5.1.11.1(1) Wood products and procedures required in the construction process and as integral components of the building shall conform to the requirements set out in this division.

5.1.11.1(2) Rough carpentry work including, but not limited to: wood blocking, backing and fasteners, forming, bracing, scaffolding shall be provided as required for the construction of the building.

5.1.11.2 Quality Requirements

5.1.11.2(1) Wood elements and their construction shall comply with all applicable Standards including, but not limited to, the BC Building Code and CSA-O86, Engineering Design in Wood.

5.1.11.2(2) Exposed natural timber elements shall be designed with consideration for its dimensional instability due to moisture content change during its service life.

5.1.11.3 Performance Requirements

5.1.11.3(1) Wood products and procedures used in the construction process as part of the building structure shall conform to the requirements applicable codes and good trade practice.

5.1.11.3(2) Proven state of the art measures for protection of exposed timber from ultraviolet light and moist degradation shall be specified and applied.

5.2 Mechanical Engineering

5.2.1 General Requirements

5.2.1.1 As a Design-Build project, the type of HVAC system is open to consideration and the mechanical engineer may propose alternatives for the review of the Owner and the Owner's consultant with the understanding of the following:

- 5.2.1.1(1) HVAC System Performance must conform to the temperature, ventilation and acoustic criteria prescribed in Appendix 1B Room Data Sheets and in Section 2 of this document. The temperature requirements in the Room Data Sheets are to be considered as minimums in winter and target temperatures in summer.
- 5.2.1.1(2) Outside air is considered an important element in the performance of students and the ability to learn and concentrate. Designs should look to provide outside air in excess of that required by ASHRAE or in a form of delivery which will increase ventilation effectiveness. Designs should address this need. If displacement ventilation is not utilized, then the Design-Builder shall increase ventilation by a factor of 20% to compensate.
- 5.2.1.1(3) Conceal pipes and ducts in floor, wall and ceiling construction unless called for being exposed in Appendix 1B Room Data Sheets or unless a proposed architectural feature.
- 5.2.1.2 The Design-Builder shall propose systems that are energy efficient as the building is required to attain LEED Gold Certification. Submitted designs will be reviewed by the Compliance team for quality, energy performance and maintainability.
- 5.2.1.3 Provide new, complete, operational, tested and commissioned mechanical systems for heating, ventilation, comfort cooling, controls, plumbing and fire protection systems as described herein and in full conformance with applicable codes standards and ordinances;
- 5.2.1.4 Provide all labour, materials and products as specified to accomplish the mechanical design;
- 5.2.1.5 The Design-Builder is to develop an energy model in line with "LEED Canada Reference Guide for Green Building Design and Construction 2009" and identify the number of LEED Energy Points achieved relative to ASHRAE Standard 90.1-2007 as defined in the tables under EA Credit 1. The Design-Builder is to provide the following in line with CaGBC LEED 2009 on technical submission
- 5.2.1.5(1) energy model input summary
- 5.2.1.5(2) a completed EAc1 LEED Letter template
- 5.2.1.6 The energy model input summary and completed EAc1 LEED Letter template provided under 5.2.1.6(2) is to be updated through the major milestones of the project as highlighted in Schedule 8 of the Design-Build Agreement:

- 5.2.1.7 All equipment requiring maintenance is to be mounted in a plantroom. Safe access is to be provided via staircase where necessary. Roof hatches will not be acceptable as maintenance access. All equipment should be able to be maintained without entering classrooms or other learning or administration areas.
- 5.2.1.8 All pumps, boilers, and water heaters are to have redundancy such that a failure of one component does not impact the capacity of the system to provide the full design duty to the system;
- 5.2.1.9 Toilet and Kitchen exhaust systems are to have 100% redundancy built in by having run and standby fans with auto changeover;
- 5.2.1.10 Server rooms and IT critical areas are to be provided with cooling units with N+1 redundancy capable of 24/7 operation
- 5.2.1.11 Systems must be capable of night setback with the ability to recover from night setback in 2 hours or less on a design winter day;
- 5.2.1.12 In General the following will be acceptable to the owner:
 - 5.2.1.12(1) Central air handling systems with zone control for individual classrooms and groups of smaller spaces if the latter have common exposures. However, it should be noted that the client sees advantages in decoupling heating from ventilation.
 - 5.2.1.12(2) Displacement Ventilation in conjunction with central AHUs. Displacement designs must include separate space heating equipment in perimeter areas.
 - 5.2.1.12(3) Mechanical Design can include Air Source heat pumps, solar heating, or other methods of conditioning as long as the benefits are clearly identified in the proposal.
 - 5.2.1.12(4) The Owner has a requirement for HVAC systems that provide the benefit of free cooling by the use of outside air. No mechanical cooling is to be provided to any area in the School other than IT Server rooms as described in 5.2.1.11.
 - 5.2.1.12(5) The submitted design shall identify how N+1 redundancy has been built in to the cooling design for IT Server rooms.
- 5.2.1.13 The following will NOT be acceptable to the owner:
 - 5.2.1.13(1) Packaged rooftop gas fired units.

- 5.2.1.13(2) Packaged room units such as Max-air type as they will not comply with section 5.2.1.7.
- 5.2.1.13(3) Modular equipment such as fan coil units or water to air heat pumps due to noise and maintenance concerns except for small areas such as server rooms or individual areas remote from the central plant that require cooling.
- 5.2.1.13(4) Full or partial geo-exchange designs.
- 5.2.1.13(5) Natural Ventilation design unless part of a hybrid natural-mechanical ventilation strategy that also utilizes air handling equipment with filtration and tempering coils.
- 5.2.1.13(6) Any equipment that results in acoustic noise levels in excess of those specified in Appendix 1B Room Data Sheets and in Section 2.
- 5.2.1.13(7) Underfloor radiant heating.

5.2.2 Quality Requirements

- 5.2.2.1 Manufacturer equipment that the Owner believes meets the quality requirements are listed in the data room. It is for the Design-Build contractor to satisfy themselves that the equipment provided will satisfy the quality requirements and design life specified and the proposal should detail the checking procedure that has been carried out to establish alternative equals in line with that outlined elsewhere in this document.

5.3 Electrical Engineering

- 5.3.1 The Facility shall be designed and constructed in accordance with the local code, applicable guidelines, best practice as well as industry standards.
- 5.3.2 The Facility shall be designed and constructed to be highly energy efficient, minimize greenhouse gas emissions and incorporate innovative, low-impact energy sources.
- 5.3.3 All electrical components of one system shall be provided from one manufacturer unless authorized otherwise by Owner.
- 5.3.4 Provide lighting that is energy efficient and environmentally friendly and convenient to operate for different expected tasks and use scenarios in each area.

- 5.3.5** Fixtures, luminaires, fittings and devices must suit the category of the respective areas, which are tamper resistant, vandal resistant, robust, anti-ligature (in Inclusive Education, Quiet Room) and must suit the particular task and its function.
- 5.3.6** Lighting control system shall allow daylight harvesting to be utilized and energy savings achieved via automatic dimming and switching off the luminaires within these areas. Local override for daylight harvesting shall be provided in every room and space utilizing Daylight harvesting.
- 5.3.7** The lighting controls system shall be design and constructed to allow for flexibility including remote and local override for receptacle control and daylight harvesting.
- 5.3.8** All areas receiving natural daylight will be provided with suitable motorized blinds to control the amount of light entering the space unless noted otherwise in Appendix 1B Room Data Sheet.
- 5.3.9** The Facility will be designed to achieve the daylighting requirements as noted in Schedule 1 Statement of Requirements and as per Appendix 1B Room Data Sheets.
- 5.3.10** Daylight average factor is the average indoor illuminance (from daylight) on the working plane within the room, expressed as a percentage of the simultaneous outdoor illuminance on a horizontal plane under an unobstructed CIE Standard Overcast Sky.
- 5.3.11** Where daylighting is required in the Facility, it shall comply with IES guidelines and recommendations for daylighting factor and continuous daylight autonomy. Only areas with a uniformity (minimum illuminance/average illuminance) of 0.4 or greater will be considered daylighting factor calculations as being compliant. All areas receiving natural daylight will be provided with intelligent sensors to harvest lighting as per the Owner requirement.
- 5.3.12** Compliance will be demonstrated through light simulation modelling software (IES Virtual Environment Flucs DL) for two different times of day and is to be used during the procurement and at all stages of design and certification process. The Design-Builder shall provide a drawing minimum 1:100 scale showing all areas which achieve the criteria plus results for each room in tabulated form.
- 5.3.13** Create a quality secondary school environment that exemplifies best practices in student focused and adaptable learning environments.

- 5.3.14** Changes in educational delivery require considerable flexibility in interior spaces. The Design-Builder will incorporate best practices with respect to next generation learning environments, including the following:
- 5.3.14.1 The Facility will allow for spaces, laboratories and studios that are designed to capture and enhance the public circulation space;
 - 5.3.14.2 Major public circulation is considered as flexible and collaborative student space;
 - 5.3.14.3 Spaces will provide flexibility as well as meet requirements of Users;
 - 5.3.14.4 Breakout spaces will be connected to circulation routes.
- 5.3.15** Provide power distribution systems with redundancy protection, continuity of service, without power interruption and with spare capacity for future loads. Major equipment to be located in secure service rooms.
- 5.3.16** Design-Builder will ensure that data and power locations and densities are aligned so that sufficient quantities are provided.
- 5.3.17** Design-Builder will provide adequate power and network drops for the Owner supplied equipment and will coordinate all locations during design development.
- 5.3.18** Provide communications systems which can be adapted as the School changes to meet technological growth.
- 5.3.19** Integrate all communications systems where this integration provides an efficiency advantage, operational advantage, and cost advantage to the Owner to provide minimum life-cycle cost.
- 5.3.20** Ensure a safe environment for both staff and students by proper utilization of all systems including Access Control, Video Surveillance, and lighting.
- 5.3.21** Conceal wiring in floor, wall and ceiling construction of finished areas – unless for a proposed architectural feature as indicated in Appendix 1B Room Data Sheets.

5.4 Civil Engineering

5.4.1 General Requirements

- 5.4.1.1 The Design-Builder will provide, as necessary, adequate and reliable infrastructure and necessary municipal services to the Facility;
- 5.4.1.2 All on-site works required for excavation, exposing, backfill and surface restoration of all proposed water, storm and sanitary sewer, as well as

the connection of each service to the municipal system, will be the responsibility of the Design-Builder;

- 5.4.1.3 Off-site works and services located outside the boundaries of the Owner's property, including any work located in City easements and statutory rights-of-way, as determined by the City, utility company and/or other approving authority having jurisdiction, as either being required to support the proposed project or a mandatory condition of development approval. The off-site works and services include any underground storm, sanitary, and water services, utility company services (BC Hydro, City of New Westminster electrical, telephone and communication), roadworks (including pavement, curbs, sidewalks, street lighting, and street trees) and all other related work. Some or all of the aforementioned work may be required;
- 5.4.1.4 All off-site works required for the Design and Construction of all storm drainage, sanitary sewers and water infrastructure will be the responsibility of the Design-Builder. The Design-Builder shall be responsible to complete the separated storm and sanitary sewers from Site A through to Eight Avenue between Moody Arena and Massey Theatre, but the cost of this work will be cost-shared between the City and the Owner;
- 5.4.1.5 All on-site works shall be designed and constructed in accordance with the latest edition of the MMCD;
- 5.4.1.6 All on-site works shall be designed and constructed in accordance with the latest edition of the BC Building Code;
- 5.4.1.7 All off-site works shall be designed and constructed in accordance with the latest edition of the City of New Westminster's Subdivision and Development Control Bylaw No 7142;
- 5.4.1.8 All interlocking concrete pavement products and installation methods shall comply with ICPI Standards;
- 5.4.1.9 All works and services to be designed for convenient maintenance access and to minimize maintenance costs;
- 5.4.1.10 Roads and fire access routes shall be designed for a 20 year life span;
- 5.4.1.11 Coordinate all the deep and shallow underground utility lines with the requirements of landscape planting design;
- 5.4.1.12 Where a conflict arises in any standards or requirements, the more stringent standard shall apply.

5.4.2 Watermain and Appurtenances

- 5.4.2.1 Provide a looped watermain system capable of providing domestic and firefighting capacity for the Facility;
- 5.4.2.2 Provide reduced pressure backflow preventer(s) to protect the municipal system and onsite facilities from contaminants;
- 5.4.2.3 Provide adequate fire hydrants around the site in accordance with NFPA-24 and the City of New Westminster Fire Department requirements.
- 5.4.2.4 Provide a watermain system of diameter, grade and depth to safely meet the demand and fire flow requirements;
- 5.4.2.5 The water system will include the pipes, valves, hydrants, fittings and all other required appurtenances;
- 5.4.2.6 The water system will include a water meter chamber at the property line or a water meter assembly inside the building mechanical room per City of New Westminster;
- 5.4.2.7 Provide one new water service connection to the Facility from the municipal system capable of providing all required institution demands and firefighting capacity and redundancy for the Facility. The extent to which provision for on-site pumping will be required (to suit either domestic demand or fire-fighting demand, or both) will be determined, in part, by the available system pressures, the final building floor area and building height;
- 5.4.2.8 Provide a Siamese connection, located away from the main entrance(s) to support the function of the exterior plaza(s).
- 5.4.2.9 Firefighting volumetric demands are to be calculated using the Fire Underwriters Survey (FUS) method, unless alternates are otherwise approved by the applicable Authority Having Jurisdiction;
- 5.4.2.10 If required to meet the FUS fire flow demands, the Design-Builder will provide back-up permanent fire-fighting equipment;
- 5.4.2.11 The watermain systems will include approved backflow preventers necessary to protect the municipal system and on-site facilities from contaminants based on the hazard level of the Facility.
- 5.4.2.12 Connection to the existing 200 mm water line on Sixth Street, run parallel to the one-way egress laneway and loop from the southwest

corner of the School site along the two-way access/egress onto the Eighth Avenue connection.

5.4.3 Sanitary Sewer

- 5.4.3.1 The sanitary sewer system will include the pipes, manholes, quality testing and all other required appurtenances;
- 5.4.3.2 Provide sanitary sewers of diameter, grade and depth to safely convey all effluent from the Facility;
- 5.4.3.3 If a gravity sanitary sewer system is not feasible, provide one or more lift stations, consisting of redundant grinder pumps, which discharge sanitary drainage from the Facility to the municipal sewer system via force main;
- 5.4.3.4 The sanitary system will include the pipes, manholes and all other required appurtenances;
- 5.4.3.5 Remove and dispose of offsite all existing abandoned and/or redundant sewers beneath the new School building footprint.
- 5.4.3.6 Provide split sanitary/storm lines from the School to the closest Sixth Street connection point and along the frontage of Sixth Street and then reconnect to City of New Westminster combined sanitary/storm line at the end of the property line on Sixth Street frontage.

5.4.4 Storm Sewers and Drainage

- 5.4.4.1 The storm sewer system will include the pipes, manholes, and all other required appurtenances;
- 5.4.4.2 Flooding/ponding are not permitted within the project site;
- 5.4.4.3 Utilize best management practices for stormwater management.
- 5.4.4.4 Provide storm sewers, stormwater management strategies and drainage network (minor and major):
 - 5.4.4.4(1) Where “minor system” refers to a piped storm conveyance system and “major system” refers to the combination of piped systems, channels, retention or detention basins, roadways and overland flow routes;
 - 5.4.4.4(2) Of a size, grade and depth to safely convey and manage all storm water on-site to the receiving system;

- 5.4.4.4(3) Which, at minimum, maintains the pre-construction discharge flow rates to meet the City of New Westminster's integrated stormwater management plan;
 - 5.4.4.4(4) Which, at minimum, are capable of managing the difference in pre-construction vs. post-construction discharge rates and volumes;
 - 5.4.4.4(5) Which include storm water oil and grit separation devices or other water quality treatment devices, capturing and treating runoff from all road and parking area surfaces.
 - 5.4.4.5 Coordinate the stormwater management design with the landscape architecture site design;
 - 5.4.4.6 Provide storm sewer connection to the Facility after treatment in the onsite best management practices and discharge to the municipal storm system.
- 5.4.5 Roadworks**
- 5.4.5.1 Performance Requirements
 - 5.4.5.1(1) Access roadways are to be designed with longitudinal gradients no greater than 8%.
 - 5.4.5.1(2) Parking areas and drive aisles are to have minimum and maximum cross-falls of 2% and 5% respectively.
 - 5.4.5.2 All on-Site road works will meet the requirements of the standards and guidelines of the Geometric Design Guide for Canadian Roads, as published by the Transportation Association of Canada;
 - 5.4.5.3 Design and construct on-site roadways, including the pavement, curbs and gutters, sidewalks, walkways, signage, pavement markings, and traffic calming devices, that are accessible to Persons with Disabilities, and provide safe passage between parking areas, loading areas, emergency vehicle areas and drop off areas without requiring the driver to enter the municipal roadway;
 - 5.4.5.4 Provide a one-way vehicle egress laneway (3.1 metre wide) from southwest corner of School to connect to Sixth Street (right turn on to Sixth Street).;
 - 5.4.5.5 Pavement structure will meet recommendations by a geotechnical engineer;

- 5.4.5.6 Use site surfacing materials which will meet intended use and minimize the 'heat island' effect;
 - 5.4.5.7 Provisions for on-site roadways will be required to account for snow removal machinery and methods in winter snowfall months;
 - 5.4.5.8 Roadways and paved areas must have positive drainage to shed rain water quickly to a storm drainage facility.
- 5.4.6 Street Lighting**
- 5.4.6.1 Provide lighting for on-site roadways, walkways and parking areas to ensure safe vehicle and pedestrian traffic with respect to collisions, personal safety, and building access/egress. Provide lighting sympathetic to all neighboring properties.
- 5.4.7 Electrical, Telecommunications, Gas Service**
- 5.4.7.1 Provide adequate electrical, telecommunication and natural gas services to the Facility.
- 5.4.8 Off-Site Requirements**
- 5.4.8.1 All offsite works and upgrades shall be designed and constructed in accordance with the City of New Westminster's Subdivision & Development Control Bylaw No 7142.
 - 5.4.8.2 Provide two (2) bus stop on Sixth Street, north of the Sixth Street exit:
 - 5.4.8.2(1) The east bus stop shall include a concrete pad;
 - 5.4.8.2(2) The west bus stop shall be complete with:
 - 5.4.8.2(2)(a) concrete pad; and
 - 5.4.8.2(3) a cantilevered, single back wall, single bench bus shelter.
- 5.4.9 Painted Pavement Markings**
- 5.4.9.1 Basic Requirements
 - 5.4.9.1(1) Provide temporary and permanent painted pavement markings.
 - 5.4.9.1(2) All pavement markings to be in accordance with the latest edition of TAC Manual of Uniform Traffic Control Devices.
- 5.4.10 Manholes and Catch Basins**
- 5.4.10.1 Basic Requirements

5.4.10.1(1) Provide monolithic concrete manholes with transition to lid frame, covers, anchorage, and accessories

5.4.10.1(2) Provide modular precast concrete manhole sections with tongue and groove joints with masonry transition to lid frame, covers, anchorage, and accessories

5.4.10.2 Performance Requirements

5.4.10.2(1) Locate and size manholes and catch basins in accordance with MMCD and BC Building Code. Avoid catch basins in walking areas.

5.4.10.2(2) All joints will be watertight.

5.4.10.2(3) All manholes and catch basin lids, frames and grates in vehicle traffic areas to be designed for H20 traffic loading.

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6. TECHNICAL SPECIFICATIONS

6.1 Existing Conditions (Div. 2)

6.1.1 Sitework

6.1.1.1 General

- 6.1.1.1(1) Working hours as directed by governing authorities when connecting to existing services;
- 6.1.1.1(2) Locate existing utilities and protect from damage during construction;
- 6.1.1.1(3) Cap off inactive services as approved by authorities having jurisdiction; stake and record location;
- 6.1.1.1(4) New service locations, rerouting or tie-ins to the current Facility must be approved by the Owner;
- 6.1.1.1(5) The Design-Builder will maintain all services to the existing school to ensure its continuing operation during the construction period;
- 6.1.1.1(6) Maintain the health of all neighbourhood trees surrounding the site. Prepare a tree protection plan;
- 6.1.1.1(7) Provide thirty days advance notice for planned service interruptions. No interruptions permitted while Facility in operation without Owner's permission;
- 6.1.1.1(8) Service tie-ins must be performed during times acceptable to the Owner (i.e. during summer closure etc.);
- 6.1.1.1(9) Record locations of existing, relocated and abandoned service lines;
- 6.1.1.1(10) Survey Reference Points
 - 6.1.1.1(10)(a) Locate and protect property markers and vertical control points prior to starting site work. Preserve permanent reference points.
 - 6.1.1.1(10)(b) Inform the Owner when a reference point requires replacement or relocation. B.C. Land Surveyor to place points in accordance with original survey.
- 6.1.1.1(11) Survey Requirements

6.1.1.1(11)(a) Establish permanent bench marks on site referenced to established bench marks by survey control points. Record locations, with horizontal and vertical data, in Project Record Documents.

6.1.1.1(11)(b) Provide a legal survey of completed property at completion showing all site improvements including School driveways and roadways.

6.1.1.1(12) Submittal

6.1.1.1(12)(a) Provide B.C. Land Surveyor certificate that completed work is in conformance with the Design-Build Agreement.

6.2 Site Preparation (Div. 2)

6.2.1 Aggregate Base Course

6.2.1.1 Basic Requirements

6.2.1.1(1) Utilize granular sub-base for stability of surface treatment through freeze thaw cycles and for its ability to store moisture;

6.2.1.1(2) Place granular sub-base and base only on an underlying subgrade that has been properly compacted and approved by the geotechnical engineer;

6.2.1.1(3) The granular sub-base and base course will consist of crushed rock, gravel and sand consisting of hard, clean durable material, free from coatings of silt, clay or other deleterious materials and containing no organic matter acceptable to the Geotechnical Engineer.

6.2.1.2 Performance Requirements

6.2.1.2(1) Design the depths of aggregate base courses to exceed limits defined by regional average freeze thaw cycles averaged over a twenty-year period;

6.2.1.2(2) Design aggregate base courses to meet or exceed the specifications of the pavement structure design for intended loads and climate conditions found on site;

6.2.1.2(3) The Design-Builder shall submit satisfactory compaction test results for review and approval prior to installation of subsequent layers.

6.2.2 Site Infrastructure

6.2.2.1 Asphalt Paving

6.2.2.1(1) Basic Requirements

- 6.2.2.1(1)(a) Place hot mix asphalt only on an underlying base course that has been compacted and approved by the Geotechnical Engineer.
- 6.2.2.1(1)(b) Design asphalt mix for the intended load and climate conditions found on the site.
- 6.2.2.1(1)(c) Asphalt paving to be minimum 75 mm thick.

6.3 Concrete (Div. 3)

6.3.1 Basic Requirements

6.3.1.1 Exposed architectural concrete, with no finish materials, to be sealed:

- 6.3.1.1(1) Silicate-based sealers: At parking lot, and areas of exposed concrete, provide sodium or potassium silicate products that react chemically with the calcium in the concrete to densify, seal, and dustproof the concrete at the end of a 3 day wet cure period. Design-Builder will certify compliance with manufacturer's printed installation instructions for use as curing agent or as concrete sealer, as applicable.

6.3.1.2 Overriding Principles

- 6.3.1.2(1) Design and construct cast in place concrete of required properties for the intended use in accordance with the requirements of all applicable codes and specifications.

6.3.1.3 Performance Requirements

- 6.3.1.3(1) Concrete floors will be finished with a smooth, dense, steel trowel finish with a Class A Flatness Classification in accordance with CSA A23.1. Overlay toppings to level floors will not be used;
- 6.3.1.3(2) Cracks in concrete floors and walls will be repaired to suit the floor finish and long-term serviceability requirements of the floor;
- 6.3.1.3(3) Foundation walls for below-grade occupied spaces will be designed to prevent groundwater ingress by the use of a waterproofing chemical admixture added to the concrete mix at the batching or mixing stage to create a permanent self-sealing,

corrosion free concrete waterproofing system. Construction joints will have purpose-made water stops. A perimeter draining system will be installed around the exterior of the earth-retained building foundation; and

6.3.1.3(4) Exposed architectural concrete will comply with CAN/CSA A23.1- 14 Section 8.3.

6.3.1.4 All interior and exterior painted concrete surfaces to be sand-blasted and primed to ensure proper finish adhesion. All cast-in-place or precast concrete to receive abrasive blasting within 25-72 hours after concrete is poured depending on curing requirements. Design-Builder to designate minimum 10 square meter sample panel for the Owner's review and acceptance prior to proceeding. Finish to be SF1 (brush finish) and finish painted using INT 3.1C high performance architectural latex and EXT 3.1A latex (over alkali primer) to the Owner's approval.

6.3.1.5 Cast in Place Concrete

6.3.1.5(1) Concrete Curbs

6.3.1.5(2) Basic Requirements

6.3.1.5(2)(a) Provide 150 mm concrete curbs with gutter along the perimeter of asphalt surfaces, unless otherwise noted in this schedule.

6.3.1.5(2)(b) All concrete works are to meet or exceed Best Practice requirements for load and climate conditions found on site.

6.3.1.5(3) Interlocking Concrete Pavers

6.3.1.5(3)(a) Basic Requirements

(a).1 Thickness of interlocking concrete pavers shall vary according to application:

(a).1.1 Pedestrian areas shall be paved with 60mm (min.) thick units, (max. size 200 mm).

(a).1.2 Vehicular areas shall be paved with 80mm (min.) thick interlocking units.

6.4 Wood Plastics and Composites (including Millwork) (Div. 6)

6.4.1 Millwork and Architectural Woodwork

6.4.1.1 General Requirements:

- 6.4.1.1(1) The Design-BUILDER shall adhere to the AWMAC quality and standards by following the AWMAC GIS (guarantee and inspection service) program;
- 6.4.1.1(2) Provide a two (2) year AWMAC Guarantee certificate as part of the program;
- 6.4.1.1(3) Provide as a minimum, millwork as indicated in Appendix 1B Room Data Sheets;
- 6.4.1.1(4) Design millwork to be simple in form and minimal moldings and trims;
- 6.4.1.1(5) Do not use products containing added urea formaldehyde in the Facility. The intent is prevent the use of wood products such as particleboard made with formaldehyde-based resins and binders;
- 6.4.1.1(6) Provide rough carpentry, wood backing materials, backing board for mechanical rooms, and electrical/communications rooms (minimum 8'-0" AFF);
- 6.4.1.1(7) Provide plywood to the following:
 - 6.4.1.1(7)(a) Exit stair;
 - 6.4.1.1(7)(b) Corridors;
 - 6.4.1.1(7)(c) As noted in Appendix 1B Room Data Sheets;
- 6.4.1.1(8) Provide plywood that is;
 - 6.4.1.1(8)(a) Clear fir or birch veneer;
 - 6.4.1.1(8)(b) Clear finished;
 - 6.4.1.1(8)(c) Minimal knots and imperfections;
 - 6.4.1.1(8)(d) 19 mm (3/4") thick;
 - 6.4.1.1(8)(e) Routed all edges;
- 6.4.1.1(9) Selected material and veneer must be consistent throughout the facility;

6.4.1.1(10) Provide seismic restraint for all millwork, shelving, science lab shelving and learning commons and book room millwork and shelving.

6.4.1.2 Prescriptive Requirements

6.4.1.2(1) Hardwood plywood: to CSA 0.115-1967, 19 mm C2 Whole piece Face (C2WPF) 7 ply NOVA #2SSG OS HPVA HP-1, select natural fir or birch, good one or two sides as required;

6.4.1.2(2) Hardwood lumber: Domestic plywood only (no imported to National Hardwood Lumber Association (NHLA) requirements, moisture content of maximum 6% for interior work., select fir or white birch, to AWMAC custom grade, selected to match fir or birch plywood;

6.4.1.2(3) Filler strip: All cabinets to be installed with filler strip where and contacts the wall;

6.4.1.2(4) Interior trim: AWMAC custom grade select natural fir or birch;

6.4.1.2(5) Finish hardware: to CGSB 69-GP-8M and to match door hardware finish. RPC # 37626D only. Cabinet pulls to be 100 mm rectangular shaped Richelieu # 255;

6.4.1.2(6) Drawer slide: commercial grade full extension to be installed on all drawers, reference product Accuride C38320C20P or acceptable equivalent;

6.4.1.2(7) Door catches: (large) Richelieu BP65292G and (small) Richelieu BP6032G or acceptable equivalent;

6.4.1.2(8) Radius all exposed plastic laminated edges and corners;

6.4.1.2(9) Cabinet Edging: 3mm PVC-T Mold or wood tape or acceptable equivalent;

6.4.1.2(10) Cabinet Shelves: to be adjustable unless specified otherwise. All adjustable shelves shall be seismically restrained by the use of notches and surface mounted standards. Shelf standards: KV255 or acceptable equivalent;

6.4.1.2(11) Cabinet Tops: All cabinets and bookcases with the top less than 1625 mm above finished floor shall have the top surface finished with plastic laminate or equivalent wearing surface upon approval of the Owner and continuous over gables to ensure safety of possible seated persons on millwork;

- 6.4.1.2(12) Glass and glazing shall be to CGSB Can 2-12.3-M76;
- 6.4.1.2(13) All exposed exterior natural wood surfaces to be coated with an aliphatic urethane coating system acceptable to the Owner.
- 6.4.1.2(14) Finishing
 - 6.4.1.2(14)(a) Shop finished in accordance with Section 1500 of AWMAC architectural woodwork quality standards. Shelves and drawer front within cabinets shall be considered exposed for finish application;
 - 6.4.1.2(14)(b) Millwork is to be clear finished;
 - 6.4.1.2(14)(c) Finish system: Conversion Varnish, custom grade.
- 6.4.1.2(15) Plastic Laminate
 - 6.4.1.2(15)(a) To CAN3-A172-M79 1.2 mm thick, (GPR), all smooth finishes;
 - 6.4.1.2(15)(b) Science instruction millwork in classrooms to be acid and chemical resistant;
 - 6.4.1.2(15)(c) Use Standard Wilsonart laminate (colour Nebula Grey or black) or acceptable equivalent;
 - 6.4.1.2(15)(d) Cabinet locks: to match keying in classroom door;
- 6.4.1.2(16) Showcase locks: Hewi or acceptable equivalent. Premium track with metal rollers. Track lock and tack finger pulls keyed alike;
- 6.4.1.2(17) Mockup: Provide full scale mock-up of typical cabinet complete with door, catch, drawer, shelving and pull (mock-up to be based on Owner sample);
- 6.4.1.2(18) Loading: Design millwork to withstand edge load of 100 kg per lineal metre of counter. All perimeter counters to be floor mounted.

6.5 Thermal and Moisture Protection (Div. 7)

6.5.1 Basic Requirements

6.5.1.1 The Design-Builder will:

- 6.5.1.1(1) Design construction assemblies according to building envelope principles outlined in this Schedule;

- 6.5.1.1(2) Design construction assemblies to prevent the ingress of moisture or water vapour from the exterior through the building envelope and the passage of air through the building envelope from the interior spaces to the exterior and vice versa;
- 6.5.1.1(3) Design construction assemblies to prevent the ingress of moisture through foundation walls below grade, both subject and not subject to hydrostatic pressure.

6.5.2 Roofing

6.5.2.1 General

- 6.5.2.1(1) All roofing systems and associated flashing systems shall conform to the requirements of RCABC Roofing Practices Manual and the Design-Builder will provide a 5 year RCABC guarantee for all roof systems.
- 6.5.2.1(2) The Design-Builder will make all arrangements and pay all service to provide a five (5) year RCABC roofing guarantee for all roofing systems for this Project.
- 6.5.2.1(3) Connect roof drainage system to the on-site drainage system;
- 6.5.2.1(4) Provide stair and man-door access to roof tops for mechanical and electrical equipment maintenance (size as per typical exterior door). Ladders and hatches are not acceptable;
- 6.5.2.1(5) Provide roof tie-offs as per WCB requirements where required for equipment maintenance;
- 6.5.2.1(6) Provide overhangs to ensure protection from rain at all exterior doors and windows;
- 6.5.2.1(7) Roof and roof deck areas shall
 - 6.5.2.1(7)(a) Use pavers for areas accessible to students and staff;
 - 6.5.2.1(7)(b) Where visible from the Learning Neighbourhoods, Learning Commons and Primary and Secondary corridors, provide aesthetically pleasing design concept;
- 6.5.2.1(8) Acceptable roofing systems include:
 - 6.5.2.1(8)(a) 2 ply SBS membrane roofing system with 2.2 mm base and 3.0 mm cap sheets;
 - 6.5.2.1(8)(b) Complete architectural metal roof system.

6.5.2.2 Fall Protection and Window Washing

6.5.2.2(1) Provide a complete system with safety tie-back, life line anchors, horizontal life line system and associated equipment for safe building maintenance operations including window-washing.

6.5.2.2(1)(a) Provide window washing roof anchors and rigging system;

6.5.2.2(1)(b) Provide easy access for window cleaning

6.5.3 Roofing Drains, Gutters and Downspouts

6.5.3.1 Ensure water from all roof areas are directed away from the property by roof drains, gutters and downspouts connected to the on-site drainage system;

6.5.3.2 Ensure snow shedding and removal of snow from roofs does not cause injury and damage property from sliding ice and snow. Adequate structural support shall be provided for roof projection such as vents, chimneys and canopies so as to resist shear forces resulting from sliding snow.

6.6 Openings (Div. 8)

6.6.1 Door Types include the following:

6.6.1.1 Type A – solid door for washrooms, counselling, services spaces;

6.6.1.2 Type B – slot glazing;

6.6.1.3 Type C – half glazing;

6.6.1.4 Type D – fully glazed – formal learning spaces;

6.6.1.5 Type E – fully glazed interior sliders for Learning Commons;

6.6.1.6 Type F – fully glazed exterior sliders for Grand Commons;

6.6.1.7 Type G – Overhead exterior doors;

6.6.1.8 Type H – Interior security grille for Servery;

6.6.1.9 Type I – Acoustically rated operable walls for Gymnasium;

6.6.1.10 Type J – Operable walls for formal learning spaces;

6.6.1.11 Type K – acoustic;

6.6.1.12 Type L – Overhead interior doors;

6.6.2 Exterior Metal doors

6.6.2.1 Entrance and Exit doors:

- 6.6.2.1(1) Shall be commercial exterior grade and glazed insulated metal doors;
- 6.6.2.1(2) Shall be a minimum 900 mm wide and 2134 mm high;
- 6.6.2.1(3) Shall be hung in well-anchored frames suited to the type of door;
- 6.6.2.1(4) Main entry doors shall be powered-operated, activated by accessible switches;
- 6.6.2.1(5) Door frames shall be pre-plumbed complete with conduit and strike plates for future card-lock system at all exterior doors;
- 6.6.2.1(6) Provide exit and egress doors with vision panels;
- 6.6.2.1(7) Provide a minimum of half-light glazing to main and secondary entrance doors;
- 6.6.2.1(8) Exterior doors shall be 45 mm thick, fabricated from 14 gauge (1.6 mm) steel with core composed of rigid modified polyisocyanurate, closed cell type; minimum 32 kg/m³ and RSI 1.9. Top of door shall be fitted with weather cap. Frames shall be insulated, thermally broken, fully molded type fabricated from 14 gauge (1.6 mm) galvanized steel. Provide weather – stripping. Spot weld all seams and hinge plates;
- 6.6.2.1(9) Mortised, reinforced, drilled and tapped to fit hardware manufacture’s templates;
- 6.6.2.1(10) Galvanize frames with mitered and welded corner joints, ground, filled and dressed smooth. Provide additional reinforcing at door closer mounting locations;
- 6.6.2.1(11) Double door frames to be free from dividing piece in middle of open doors;
- 6.6.2.1(12) Glaze with pre-formed pre-shimmed butyl bedding tape;
- 6.6.2.1(13) Glaze with insulated laminated safety glass.

6.6.2.2 Commercial Steel Doors and Frames

- 6.6.2.2(1) Fabricate to Canadian Steel Door and Frame Manufacturers' Association (CSDFMA) specification for steel doors and frames;
- 6.6.2.2(2) Fabricate from commercial grade sheet steel, Class 1 with ZF075 zinc coating to ASTM A525-87;
- 6.6.2.2(3) Knock down frames are not permitted;
- 6.6.2.2(4) Fire rating shall be identified by labels conformance with CAN 4S014-M80 (revised 1985) and Can4 S105M-M85;
- 6.6.2.2(5) Minimum 45 mm thick, fabricated from minimum 1.21 mm (18 gauge) heavy duty galvanized steel, with steel stiffeners at 150 mm o.c. interior steel frames to be fully welded units, fabricated from 1.52 mm (16 gauge) galvanized steel;
- 6.6.2.2(6) Mortised, reinforce, drilled and tapped to fit hardware manufacturer's templates and glazed where required;
- 6.6.2.2(7) Provide vision panels to exit and egress doors;
- 6.6.2.2(8) Provide additional reinforcing at door closer locations;
- 6.6.2.2(9) Transom glass sections should be no greater than 1200mm in width. Provide additional mullion to ensure that the top door jamb is properly supported to minimize sagging and the associate door binding.

6.6.2.3 Overhead Rolling Service Doors:

- 6.6.2.3(1) The Design-Builder will:
 - 6.6.2.3(1)(a) Provide overhead doors between spaces such as:
 - (a).1 Between the exterior and the Career and Technology Education (CTE) shops;
 - (a).2 On the interior between CTE shops;
 - (a).3 From the black box theatre to associated exterior theatre loading area;
 - (a).4 From the gymnasium to the exterior;
 - (a).5 Between the band room and the costume area to the exterior;
 - (a).6 Between two groups of two classrooms;
 - (a).7 Refer to Appendix 1A Functional and Appendix 1B Room Data Sheets for additional locations.
 - 6.6.2.3(1)(b) Provide insulated steel sectional upward acting type;

- 6.6.2.3(1)(c) Provide 600 mm x 200 mm vision panels double glazed with 6 mm polished laminated glass in one horizontal section;
(c).1 Wired glass is not an acceptable material.
- 6.6.2.3(1)(d) Provide full perimeter weather stripping on exterior overhead rolling service doors;
- 6.6.2.3(1)(e) Design panels to withstand wind load of 0.83 kN/m² with a maximum horizontal deflection of 1/240 of opening width. Door sections shall be roll-formed. 76 mm continuous steel coil, hot-dipped galvanized (G-90), pre-painted with baked on primer. Back panel to be 0.45 mm steel with baked on white primer. Insulate panels with AF530 Fibreglass or equivalent insulation 50 mm thick, RSI 1.4;
- 6.6.2.3(1)(f) Box (hat) shaped muntins and end stiles shall be formed of .91 mm hot-dipped galvanized steel;
- 6.6.2.3(1)(g) Bottom sections shall have a tubular neoprene astragal held by a continuous PVC retainer fitted to bottom section;
- 6.6.2.3(1)(h) Electrically operated with remote operation and chain-driven manual override. Track is to be 76 mm heavy duty trolley type lift with high-cycle springs rated at a minimum 1000,000 cycles. Doors shall be locked with a cylinder lock compatible with other door hardware;
- 6.6.2.3(1)(i) Standard of acceptance: Richard Wilcox Canada or acceptable equivalent.

6.6.2.4 Coiling Counter Shutter – Metal

- 6.6.2.4(1) Provide rolling counter shutter as manufactured by Kinnear Industries Corp or acceptable equivalent;
- 6.6.2.4(2) Operation by hand. Provide continuous extruded aluminum lifting strop on inside face of shutter bottom;
- 6.6.2.4(3) Curtain: extruded aluminum interlocking slat sections. Finish to be clear anodized finish, length and height as shown on drawings. Provide continuous vinyl bumper to bottom bar;
- 6.6.2.4(4) Guides: extruded aluminum, 5mm thick, finished as curtain;

- 6.6.2.4(5) Hood: enclosure counterbalance assembly with aluminum brake formed sheet hood finished as curtain;
- 6.6.2.4(6) Counter balance: Provide an enclosed torsion spring balance assembly with 25% overload factor, encased in settle tube to support curtain with a maximum deflection of 1/360th of opening width. Provide adjusting wheel, accessible for setting;
- 6.6.2.4(7) Locking: Equip shutters with lockable slide bolts on the inside
- 6.6.2.4(8) The coiling counter shutter shall provide the required fire rating.

6.6.2.5 Coiling Security Screen

- 6.6.2.5(1) Reference product: Cookson Rolling grille or acceptable equivalent;
- 6.6.2.5(2) Grill curtain shall be design G15014, aluminum, 7.9 mm horizontal rods and hinged vertical connecting links on 152 mm centres. The bottom bar shall be tubular in shape. Curtain shall be locked in closed position with self-activating lock.
- 6.6.2.5(3) Guides: extruded aluminum with return loop to prevent felt from pulling out of guides. Guides to be completed with wear strip to eliminate metal to metal contact.
- 6.6.2.5(4) Brackets: fabricated from steel plate not less than 6.4 mm thick;
- 6.6.2.5(5) Barrel to be not less than 152 mm diameter steel tubing and design to limit maximum, deflection to 2.5 mm per linear metre of opening width. Grille curtain to be counter balanced by oil tempered springs;
- 6.6.2.5(6) Operation: Electric motor operation with key operated push button control. Motor size to suit size and width of screen;
- 6.6.2.5(7) Hood shall be formed to fit the curvature of the bracket;
- 6.6.2.5(8) Finish Aluminum, clear anodized.

6.6.3 Interior Doors and Grilles

6.6.3.1 Basic Requirements

- 6.6.3.1(1) Door frames to be "pre-plumbed" complete with conduit and strike plates for a future card-lock system at the following locations:

- 6.6.3.1(1)(a) Interior doors separating School components from community use areas within the School.

6.6.4 Insulated Metal Doors

6.6.4.1 Basic Requirements:

- 6.6.4.1(1) Shall be commercial grade and glazed insulated metal doors;
- 6.6.4.1(2) Shall be a minimum 900 mm wide and 2134 mm high, unless noted otherwise;
- 6.6.4.1(3) Shall be hung in well-anchored frames suited to the type of door;
- 6.6.4.1(4) Main entry doors shall be powered-operated, activated by accessible switches.

6.6.5 Wood Doors

6.6.5.1 The Design-Builder will:

- 6.6.5.1(1) Provide exit and egress doors between interior portions of the School with vision panels;
- 6.6.5.1(2) Provide half-light glazing to all doors to administration areas, staff offices and staff office areas;
- 6.6.5.1(3) Acceptable materials and fabrication to AWMAC quality standards, section 1300. Custom grade to CSA Q132.2 M1977 with 12 mm minimum. Thick vertical edge strips to match face veneer;
- 6.6.5.1(4) Solid core flush: 45 mm thick, particleboard core, birch or fir veneer face,.

6.6.6 Finish Hardware

6.6.6.1 General Requirements

6.6.6.1(1) The Design-Builder will:

- 6.6.6.1(1)(a) Provide all necessary Facility hardware, including door hardware, millwork hardware, and security hardware;
- 6.6.6.1(1)(b) Prepare a representative hardware schedule to identify quality standard for each type of hardware on the project, including a list of each items manufacturer, size code, number and finish;

- 6.6.6.1(1)(c) Prepare and submit complete hardware schedule for all items, fully itemized after contract award for the Owner's approval;
- 6.6.6.1(1)(d) Provide and submit a master keyed system and a grand master keyed system to the Owner for approval;
- 6.6.6.1(1)(e) Use one manufacturer's product for all similar items;
- 6.6.6.1(1)(f) Provide all exterior hardware through-bolted;
- 6.6.6.1(1)(g) Provide galvanized steel bollards as door stops on all exterior doors complete with neoprene stopper security fastened to bollard at point of contact;
- 6.6.6.1(1)(h) Provide all exterior doors fully weather stripped;
- 6.6.6.1(1)(i) Provide all exterior weather stripping fully rodent proof;

6.6.6.2 Door Hardware:

6.6.6.2(1) Door Locks and Latches

- 6.6.6.2(1)(a) All exterior doors latches shall be protected by a guard plate or other intrusion shielding device;
- 6.6.6.2(1)(b) All exterior double doors to be provided with removable mullions. Mullions to be secured with screws only – no keyed lock;

6.6.6.2(2) Locks, Latch Sets and Cylinders

- 6.6.6.2(2)(a) Bored and pre-assembled locks to CAN.CGSB-69.17, heavy-duty commercial hardware to ANSI Series 4000, Grade 1, designed for appropriate function, with full return lever handles. Strikes, box type, lip projection not beyond jamb. Cylinders, keying system to be compatible with existing Owner standard. Finish: C26D. Product shall be Schlage D Series, with Rhodes levers;
- 6.6.6.2(2)(b) The following lock types are not approved for outside doors: magnetic, pins, padlock, non-supervised code operated, combination lock, and disc tumbler.

- 6.6.6.2(3) Locksets shall be: Schlage D Series, Rhodes ASA 626. All locksets to be the following function to approved Owner standard locksets as listed:

- 6.6.6.2(3)(a) Type 1 lockset D70 Pd;
 - 6.6.6.2(3)(b) Type 2 lockset D53 Pd;
 - 6.6.6.2(3)(c) Type 3 locksets D80 PD;
 - 6.6.6.2(3)(d) Type 4 locksets D25 Pd;
 - 6.6.6.2(3)(e) Type 5 locksets D10 S;
 - 6.6.6.2(3)(f) Type 6 deadlock B463;
 - 6.6.6.2(3)(g) Type 7 dummy trim D170;
 - 6.6.6.2(3)(h) Type 8 cylinder 901 KA x MKD;
 - 6.6.6.2(3)(i) Type 9 privacy lock D53 Pd;
 - 6.6.6.2(3)(j) Type 10 locksets D60 Pd;
 - 6.6.6.2(3)(k) Type 11 indicator bold-Falcon D970K occupied-vacant, ASA 626;
 - 6.6.6.2(3)(l) Type 12 deadlock B462 P;
 - 6.6.6.2(3)(m) Classrooms: ND 75;
 - 6.6.6.2(3)(n) Backset. All locksets and latch set shall have 69.8 mm backset;
 - 6.6.6.2(3)(o) Strikes: All locksets and latch sets shall be supplied with Falcon ASA strikes;
 - 6.6.6.2(3)(p) All cabinet locks to be keyed the same as the space they are located in;
 - 6.6.6.2(3)(q) Display cases to have track mounted showcase lock;
 - 6.6.6.2(3)(r) Shutters: Provide key switch in public areas (not required in secure classrooms);
 - 6.6.6.2(3)(s) Provide Allen key lock down for panic hardware.
- 6.6.6.2(4) Butts: doors shall be equipped with 1-1/2 pairs, 115 mm ball-bearing butt hinges, minimum, non-removable pins, to CAN/CSB-69.18, brass or bronze plated, finish C26D;

- 6.6.6.2(5) Exit devices: to CAN.CGSB-69.19, type modern and be externally mounted. Product shall be: Von Duprin, series XP 98/99 or acceptable equivalent;
- 6.6.6.2(6) Where electric strike or door monitoring is required, provide the appropriate Von Duprin hardware;
- 6.6.6.2(7) Exterior door kick plates: 1.27 mm thick stainless steel, to CGSB 69-GP-6M type 6-320, 250 mm high x width of door (less 40 mm on push side, 25 mm on pull side);
- 6.6.6.2(8) Thresholds: extruded aluminum, full width of door opening, mill finish at all exterior doors, and at interior doors at changes of floor finish and where otherwise required. To be suitable for handicapped accessibility where required. Product shall be Pemko or acceptable equivalent;
- 6.6.6.2(9) Door pulls: aluminum, finished to C26D, or stainless steel, finish to 630. Provide oversize push plates at each location;
- 6.6.6.2(10) Weather-stripping
- 6.6.6.2(10)(a) Head and jamb seal: extruded aluminum frame and solid hollow closed cell neoprene insert, clear anodized finish;
- 6.6.6.2(10)(b) Door and bottom seal: extruded aluminum frame and solid closed cell neoprene, surface mounted with drip cap;
- 6.6.6.2(10)(c) Door bumpers: grey neoprene.
- 6.6.6.2(11) Sound Seals
- 6.6.6.2(11)(a) All doors through walls where significant sound isolation is required shall be provided with perimeter seals as follows:
- (a).1 Pemko 281-CM magnetic seal for metal doors.
Pemko 319-CN for wood doors or acceptable equivalent.
- 6.6.6.2(11)(b) Automatic door bottoms, shall be: Pemko 430-CR or acceptable equivalent.
- 6.6.6.2(12) Door Closers
- 6.6.6.2(12)(a) Shall be: Exterior LCN Smoothie 4040xp crush & door spring load door opening device or acceptable

equivalent. Size to suit doors, aluminum finish with through bolts at wood doors. Where required for accessibility, delayed action to be provided.

6.6.6.2(13) Astragals

6.6.6.2(13)(a) Wood doors: Shall be Pemko 357C, full height of doors or acceptable equivalent;

6.6.6.2(13)(b) Metal doors: Full height, fully welded steel astragals;

6.6.6.2(13)(c) Removable mullions: provide for double doors.

6.6.6.2(14) Automatic swing door operator: surface mounted, self-contained unit, in housing to match width of frame, electrically operated, with two square stainless steel push plate switches. Unit shall function as a manual door closer in event of power failure, and shall operate at all other times as either manual or automatic device. Provide key-operated remote on/off switch in administration area. Unit, accessories and signs and labels to meet all requirements for accessibility. Product shall be Nabco Gyrotech (500 Geminis) or acceptable equivalent.

6.6.6.3 Door Operation

6.6.6.3(1) Provide automatic door swing operators as required by BCBC;

6.6.7 Windows

6.6.7.1 Glazing systems selection, specifications and installation shall follow "Glazing Systems Specifications Manual" recommendations as published by the Glazing Design-Builders Association of B.C. Provide screening and sun-shading to minimize heat gain within the rooms.

6.6.7.2 Windows are to be of commercial grade meeting requirements of CAN/CSA-A440-M90. Minimum allowable rating for windows shall be A3, B3, C3, I60.

6.6.7.3 Window frames shall be clear anodized aluminum.

6.6.7.4 System Design

6.6.7.4(1) Allow no water infiltration into the building.

6.6.7.4(2) Ensure no condensation forms on interior surfaces of aluminum before exposed areas of sealed glazing units reach dew point.

6.6.7.4(3) Accommodate thermal and structural expansion and contraction.

- 6.6.7.4(4) Avoid through-joints at window sills, heads, jambs, and interconnections.
- 6.6.7.4(5) Reliance on caulking for weatherproofing is not acceptable.
- 6.6.7.4(6) Maintain continuity of air and vapour seals as part of wall construction.
- 6.6.7.4(7) Use of glass block walls in any wall system is not acceptable.
- 6.6.7.4(8) Give consideration to argon filled windows.
- 6.6.7.4(9) Give consideration to ease of maintenance and glass replacement.
- 6.6.7.5 High Performance (low "E") shall be minimum standard used in the design.
- 6.6.7.6 Provide laminated safety glass to all exterior doors, sidelights, transoms, to glazing above all exits, and glazed openings within 900 mm above the finished floor. Tempered glass will not be accepted.
- 6.6.7.7 Glazing design to be performed in conjunction with analysis of energy requirements and environmental loading on HVAC systems.
- 6.6.7.8 Exterior Glazing
 - 6.6.7.8(1) Minimum Glazing Requirements
 - 6.6.7.8(1)(a) Provide exterior (and interior) glazing to spaces as noted in Appendix 1B Room Data Sheets as Daylighting Direct and Daylighting Indirect.
 - 6.6.7.8(2) The maximum sill height to be 305 mm, unless clerestory windows, in locations as set out in this Schedule;
 - 6.6.7.8(3) Width of windows to be a minimum of 1800 mm and no windows shall be less than 1800 mm.
 - 6.6.7.8(4) The following spaces with exterior walls shall have a minimum 30% glazing:
 - 6.6.7.8(4)(a) All CTE spaces;
 - 6.6.7.8(4)(b) All Learning Neighbourhoods;
 - 6.6.7.8(4)(c) The Commons;

- 6.6.7.8(4)(d) Performing Arts;
 - (d).1 Not including the Black box, Theatre and changing rooms;
- 6.6.7.8(4)(e) The following spaces with exterior walls shall have a minimum 65% glazing:
- 6.6.7.8(4)(f) Classrooms;
- 6.6.7.8(4)(g) Science Labs;
- 6.6.7.8(4)(h) Art Studios;
- 6.6.7.8(4)(i) Weight room;
- 6.6.7.8(5) Clerestory windows
 - 6.6.7.8(5)(a) Shall be provided in the following:
 - (a).1 Gymnasium; and
 - (a).2 The Band room.
- 6.6.7.8(6) Blinds/roller shades
 - 6.6.7.8(6)(a) Provide motorized blinds/roller shades to all exterior windows, except at entry windows immediately adjacent to glazed doors;
 - (a).1 Including provide motorized blinds/roller shades to all clerestory windows; and
 - (a).2 Refer to exterior window coverings in section 6.8.10; and
 - (a).3 Provide commercial grade, heavy duty, durable product.
- 6.6.7.8(7) Glass and Glazing
 - 6.6.7.8(7)(a) Minimum requirement: Factory sealed double glazing with minimum 12mm air space (minimum).
 - 6.6.7.8(7)(b) Meet requirements of IGMAC (Insulating Glass Manufacturer's Association of Canada).
 - 6.6.7.8(7)(c) Glazing tape, where employed, shall be pre-formed, preshimmed butyl such as Tremco Polyshim II, corners sealed with acrylic-based sealant.
 - 6.6.7.8(7)(d) Glazing gaskets shall be neoprene or EPDM.
 - 6.6.7.8(7)(e) Glazing shall be clear;

6.6.7.8(7)(f) Glazing colours are not permitted.

6.6.7.9 Fixed Windows

6.6.7.9(1) Provide windows in all locations as noted as Daylight Direct or Daylight Indirect as noted in Appendix 1B Room Data Sheets.

6.6.7.10 Operable Windows

6.6.7.10(1) Provide minimum two (2) operable windows in each space as noted in Appendix 1B Room Data Sheets;

6.6.7.10(2) Provide operable windows for all spaces on exterior walls, unless otherwise noted below:

6.6.7.10(2)(a) Services spaces such as mechanical and electrical rooms; and

6.6.7.10(2)(b) Storage rooms;

6.6.7.10(3) Provide operable windows in Primary Corridors, above 2135 mm, out of reach of students;

6.6.7.10(4) Provide secured insect screens on all operable windows;

6.6.7.10(5) Operable windows shall not interfere with security shutters;

6.6.7.10(6) All operable windows must be lockable and secure when not open;

6.6.7.10(7) Minimum operable window size shall be .5 m², or not less than 10% of the glazed area within the room.

6.6.7.11 Weather-stripping:

6.6.7.11(1) Operable windows shall be fully weather-stripped using heavy duty EPDM or neoprene material.

6.6.7.12 Window/wall interface:

6.6.7.12(1) The perimeter of the window rough opening shall be completely sealed off with a rubberized asphalt peel and stick membrane. Ensure that the membrane enhances rather than impede the integrity and drainage of the weather-tight plane of the wall assembly. Finish all voids with glass fibres or foam insulation.

6.6.7.12(2) Flashings must be of a suitable corrosion-resistant material and where exposed shall be of pre-finished metal.

- 6.6.7.12(3) Exterior window sills shall be flashed and sloped away from the window and shall have a projection drip. The backs and ends of sill shall be turned up to form a three-sided pan. Ends, laps and intersection of sill flashings shall be made watertight. Flashing edges shall be treated so as not form a safety hazard at the exterior.
- 6.6.7.12(4) Provide flashing at window heads.
- 6.6.7.12(5) Provide manufacturer's two year warranty against leakage, defects and malfunction.
- 6.6.7.13 Sealed glazing units shall be guaranteed for a minimum of five years.

6.6.8 Interior Windows and Glazing

6.6.8.1 Basic Requirements

- 6.6.8.1(1) The Design-Builder will:
 - 6.6.8.1(1)(a) Provide laminated safety glass for all interior glazing;
 - 6.6.8.1(1)(b) Provide full height and room width of glazing on formal learning spaces and laboratories walls between these spaces and collaborative learning spaces. Fully glazed doors to match extent of wall glazing;
 - 6.6.8.1(1)(c) Provide fully glazed Administration offices and reception walls to provide passive visual supervision;
 - 6.6.8.1(1)(d) Provide fully glazed interior wall to all offices for principal and vice principal offices (complete with blinds);
 - 6.6.8.1(1)(e) Provide a minimum of 1 m² interior glazing to staff offices and office areas to adjacent supervised space or corridor;
 - 6.6.8.1(1)(f) Provide interior glazing sill heights and sidelights at a maximum of 305 mm height above finished floor. Sidelight head height to match adjacent door;
 - 6.6.8.1(1)(g) Provide limited interior glazing for privacy in counselling, and first aid rooms;
 - 6.6.8.1(1)(h) Provide mid span (300 mm off the finished floor to 1800 mm above finished floor) opaque glazing frosting to areas requiring additional level of privacy;

- (h).1 Areas include meeting rooms, test rooms, offices that are located in high traffic areas;
- (h).2 Exact locations to be reviewed and approved by Owner.

6.7 Finishes (Div. 9)

6.7.1 Basic Requirements

- 6.7.1.1 The Design-Builder will provide finishes that align with the Owner for approval of the interior design concept;
- 6.7.1.2 The Design-Builder will provide durable finish materials able to withstand damage and that are easily replaceable and repairable in easily manageable sections, if damage does occur;
- 6.7.1.3 Provide finishes and colours that prevent glare and minimize artificial lighting effects;
- 6.7.1.4 Present exterior and interior materials and finishes design concept complete, complete with labelled samples in large sizes, to the Owner for review and approval;
- 6.7.1.5 Selected finishes and materials shall be appropriate for the intended use; for example, acid resistant finishes shall be specified for the science laboratories;
- 6.7.1.6 Stainless steel surfaces will be provided, as required for intended use as described in Appendix 1B Room Data Sheets.

6.7.2 Ceilings

6.7.2.1 General Requirements

- 6.7.2.1(1) Provide suspended ceilings, generally to all formal and informal learning spaces, administration offices, corridors and circulation spaces, storage rooms, janitor rooms, washrooms and change rooms, unless otherwise noted in Appendix 1B Room Data Sheets. Washrooms, change rooms and custodial rooms to generally be suspended gypsum board. All other ceilings to be commercial quality suspended acoustic lay-in T-bar system;
- 6.7.2.1(2) Provide mylar acoustic panels in the Culinary Arts ceilings;
- 6.7.2.1(3) Painted exposed structure, complete with acoustic treatment, where required, maybe used in gymnasiums, large instructional spaces, multi-purpose room and lobbies;

- 6.7.2.1(4) Painted, exposed structure is acceptable in mechanical, electrical rooms and services spaces;
- 6.7.2.1(5) Provide compatible material and aesthetic systems selected from readily available stocks.
- 6.7.2.1(6) Provide coordinated and integrated sized lighting fixtures and mechanical grilles with ceiling systems.

6.7.2.2 Suspended Acoustic T-bar Ceiling

6.7.2.2(1) Suspension System:

- 6.7.2.2(1)(a) Completed suspension system to support superimposed loads. Maximum deflection of suspended acoustical ceiling assembly: 1/360th of span to ASTM C635 deflection test.
- 6.7.2.2(1)(b) Intermediate duty system to ASTM C6535, commercial quality cold rolled steel, type 1 suspension system, non-fire rated one directional exposed 19 mm T-bar grid. Die cut component with interlocking connections. Exposed T-bar grid components pre-finished stain sheen. Hanger wire: galvanized soft annealed steel wire to diameter required by loading;

6.7.2.2(2) Accessories:

- 6.7.2.2(2)(a) Hanger isolator: Vibron limited VHSK-25mm or acceptable equivalent with rated loads and spring selection in accordance with manufacturers design tables;
- 6.7.2.2(2)(b) Acoustic insulation: sound attenuation blankets to 50 mm thickness or as required to meet STC or NRC noise stop requirement;
- 6.7.2.2(2)(c) Access doors: panels of bonderized steel, prime painted, 1.519 mm thick frame, 97 mm thick door, flush door hinge design;
- 6.7.2.2(2)(d) Acoustic tile: Armstrong fine fissured # 1729 or acceptable equivalent. Panels 610 mm x 1219 mm x 16 mm (5/8") thin, mineral fibre, non-directional with a minimum NRC of 50-55 and CAC 30-34 (ASTM E84). Light reflective LR-1, rated class 25 (non-combustible) under flame spread index section of federal specification

SS-S-118a , class 1 flame spread rating to ASTM E84 (tunnel test method). Labeled and listed by underwriter laboratory in ULC for a flame spread of 0-25 under the hazard classification.

6.7.2.3 Suspended Gypsum Ceiling

6.7.2.3(1) Suspension System:

- 6.7.2.3(1)(a) Provide completed suspension system to support superimposed loads. Maximum deflection of suspend gypsum board ceiling assembly: 1/360th of span to ASTM C645 deflection test;
- 6.7.2.3(1)(b) Main runners cold formed steel channels, protect with rust inhibited coating not less than 38 mm 12.7 mm x 1.37 mm thickness. Cross furring shall be hot shaped furring channels. Inserts shall be able to develop full-strength of hangers, suitable for attachment to surfaces where required. Hanger wire, galvanized soft annealed steel wire to diameter required by loading.

6.7.2.3(2) Accessories:

- 6.7.2.3(2)(a) Access doors: panels of bonderized steel, prime painted, 1.519 mm thick frame, 1.897 mm thick door, flush door hinge design;
 - 6.7.2.3(2)(b) Screws to STM C646;
 - 6.7.2.3(2)(c) Stud adhesives to CGSB-1 GP-25M;
 - 6.7.2.3(2)(d) Gypsum board
- 6.7.2.3(3) Gypsum board to CSA A82.27, Type x, 16 mm thick x 1218 mm wide x maximum practical length, ends cut square, edges tapered with round edge to internal finishes;
- 6.7.2.3(4) Finish gypsum board in accordance with levels of finish as prescribe in section 9.6 of the AWCC manual as follows:
- 6.7.2.3(4)(a) Level 1 finish: use for complete hidden areas including under plywood wall protection;
 - 6.7.2.3(4)(b) Level 2 finish: use for storage or service areas;
 - 6.7.2.3(4)(c) Level 5 finish: use for areas receive semi-gloss finish except for janitor rooms;

6.7.2.3(4)(d) Paint in accordance with painting.

6.7.3 Wall Finishes

6.7.3.1 Basic Requirements

- 6.7.3.1(1) Provide wear-resistant, low maintenance wall finishes appropriate for various uses of the interior spaces;
- 6.7.3.1(2) Use of gypsum board is not allowed in public and educational areas prone to wear;
- 6.7.3.1(3) Paint all gypsum board surfaces;
- 6.7.3.1(4) Concrete and concrete masonry surfaces are to be filled and painted.

6.7.3.2 Gypsum board:

6.7.3.2(1) General Requirements:

- 6.7.3.2(1)(a) Gypsum board work to meet CSA A82.31 1977 except when specified otherwise;
- 6.7.3.2(1)(b) Gypsum board to meet CSA A82.27 M1977, type X, 15.9 mm thick;
- 6.7.3.2(1)(c) Finish gypsum board in accordance with the levels of finish as described as follows:
 - (c).1 Level 1 finish: use for completely hidden areas
 - (c).2 Level 5 finish: use for areas receiving eggshell or semi-gloss finish.

6.7.3.3 Wall Protection

- 6.7.3.3(1) Provide 19 mm x 180 mm C/S clear finished birch or fir plywood, or acceptable equivalent, with aluminum retainer corner guard on area of heavy abuse and servicing. Refer to Appendix 1B Room Data Sheets for locations;
- 6.7.3.3(2) Wall protection can either be fir or birch and shall be consistent throughout the facility.

6.7.3.4 Ceramic Wall Tile:

- 6.7.3.4(1) The Design-Builder will:

- 6.7.3.4(1)(a) Provide ceramic wall tile to meet Tile, Terrazzo, an Marble Association of Canada c/o the Ceramic Tile Design-Builders and Industry Association of BC performance standards;
- 6.7.3.4(1)(b) Affix tiles with low toxicity cement. Grout to be complementary colour with the tile.
- 6.7.3.4(1)(c) White is not an acceptable colour.
- 6.7.3.4(2) For heavy use areas, provide external angle bull nosed sanded superblend or acceptable equivalent.
- 6.7.3.4(3) Performance Requirements
 - 6.7.3.4(3)(a) CAN-75.1-M77, Type 5, class MR-4, 108 x 108 x 6.4 mm size, cushioned edges, glazed pattern. Colours to be reviewed with and approved by the Owner.
 - 6.7.3.4(3)(b) Acceptable standards:
 - (b).1 Ames Bros. "Lanka, Olympia "Maple Leaf" or acceptable equivalent.
- 6.7.3.5 Plywood Paneling
 - 6.7.3.5(1) The Design-Builder will:
 - 6.7.3.5(1)(a) Meet CSA 0115, 11 mm thick plywood panel unless noted otherwise;
 - 6.7.3.5(1)(b) Provide plain sliced veneer face, veneer core, good one side, AWMAC custom grade, warehouse matched. Select natural fir or birch for clear finish or acceptable equivalent
- 6.7.3.6 Medium Density Fiberboard Paneling
 - 6.7.3.6(1) The Design-Builder will:
 - 6.7.3.6(1)(a) Meet ANSI A208.2;
 - 6.7.3.6(1)(b) Provide 12.5 minimum thickness indicated for paint finish and with a maximum flame spread rating less than 150;
 - 6.7.3.6(1)(c) Acceptable standard: as manufactured by Canwest or acceptable equivalent.
- 6.7.3.7 Acoustic Wall Panel

6.7.3.7(1) The Design-Builder will:

- 6.7.3.7(1)(a) Provide cementitious wood fibre acoustic units, to meet CAN2-92.1 M77;
- 6.7.3.7(1)(b) Provide standard units: 1213 mm wide x 38 mm thick, bevel, edged, standard white with NRD designation of 0.40. Flame-spread rating of 25, smoke developed 50 or less.
- 6.7.3.7(1)(c) Provide adhesive, type recommended by acoustic unit manufacturer;
- 6.7.3.7(1)(d) Acceptable standard:
 - (d).1 Tectum interior panels or acceptable equivalent.

6.7.4 Flooring

6.7.4.1 General Requirements

6.7.4.2 Performance Requirements

6.7.4.2(1) Hardwood flooring (gymnasium and dance studio sprung wood floor):

- 6.7.4.2(1)(a) Flooring to be hard maple flooring on one layer of 19 mm sheathing plywood, or anchored. Bio Channel steel encased plywood sleeper, on polyethylene membrane, on concrete floor slab;
- 6.7.4.2(1)(b) Hard maple flooring: 19.8 mm thick x 57 mm wide continuous strip SL, tongue and groove edges, No. 2 and better grade to MFMA-FJ grading rules;
- 6.7.4.2(1)(c) Cushion system: Shall be Bio-Channel Classic as manufactured by Robbins Sports or acceptable equivalent;
- 6.7.4.2(1)(d) Vented base: 75 x 100 mm, molded rubber, with ventilation holes;
- 6.7.4.2(1)(e) Membrane: 0.15 mm polyethylene film, to CGSB 70-GP-1A, Type 2;
- 6.7.4.2(1)(f) Finish: Clear moisture-cure two-part polyurethane to CGSB 1-GP-180 M, Type 1, MPI gloss level 6; MPI # 31. Moisture cured urethane coated Spenkel M37-A6X-42 OAE. Minimum 4 coats, sanded between coats. Provide the Owner access to view between each coat;
- 6.7.4.2(1)(g) Provide MPI QAA two (2) year guarantee or maintenance bond;
- 6.7.4.2(1)(h) Provide written guarantee that wood flooring system is guaranteed against faulty material and workmanship for two (2) years after Substantial completion;
- 6.7.4.2(1)(i) Provide painted games lines. Epoxy game line marking to MPI 6.5F, MPI # 77. Court centre circle to include school logo.
 - (i).1 Provide game lines for badminton, volleyball and basketball.

- 6.7.4.2(1)(j) Games lines layouts to be approved by Owner by review draft and prior to final installation;
- 6.7.4.2(1)(k) Dance studio sprung wood flooring shall be cushioned with neoprene foam cushion;
- 6.7.4.2(1)(l) Acceptable dance studio wood flooring manufacturer's Harlequin, Robin Luluna Maplewood sprung floors or approved equivalent.

6.7.4.2(2) Concrete Finish

- 6.7.4.2(2)(a) Performance Requirements
 - (a).1 Steel trowel finish; to CSA CAN 3-A23.1 with a final finish to suit covering or treatment;
 - (a).2 Clear sealer: to MPI Architectural Painting Specifications Manual, Concrete floor Sealer, INT 3.2F;
 - (a).3 Sandblast; all floor surfaces used as casting beds.

6.7.4.2(3) Carpet and Carpet Tile

- 6.7.4.2(3)(a) Refer to Appendix 1B Room Data Sheets for carpet locations;
- 6.7.4.2(3)(b) Performance Requirements;
 - (b).1 Modular Tile, 610 mm x 610 mm
 - (b).2 Yarn: Struttura by Aquafil, 100% Solution dye
 - (b).3 Antimicrobial: Intersept, Lifetime Antimicrobial
 - (b).4 Yarn: 18 oz., 2.4 mm thickness, 6.968 pile density;
 - (b).5 Acceptable products: Shall be Interface, style "cubic" or acceptable equivalent.

6.7.4.2(4) Textile floor covering (for band room);

- 6.7.4.2(4)(a) Provide acoustic, washable, anti-microbial textile floor covering for use in band rooms;
 - (a).1 Acceptable products: Shall be Forbo Flotex or acceptable equivalent.

6.7.4.2(5) Resilient Sheet Flooring – Rubber and Vinyl

- 6.7.4.2(5)(a) Rubber sports flooring (weight room)
 - (a).1 Acceptable product: Robbins sports surfaces or approved equivalent;

- 6.7.4.2(5)(b) Rubber stair (commercial grade):
- (b).1 Provide heavy duty treads with diamond pattern, 6mm thick, aluminum square nose;
 - (b).2 Provide tactile warning strips: 3mm thick, 1000mm x 1000 mm tile,
 - (b).3 Acceptable reference standard: Johnsonite or acceptable equivalent.

- 6.7.4.2(5)(c) Rubber Base:
- (c).1 Provide throughout except where noted otherwise, commercial grade rubber base;
 - (c).2 Rubber base to be 3 mm thick, 100 mm high; unless otherwise noted 150 mm in locations noted in Appendix 1B Room Data Sheets;
 - (c).3 Provide coved vinyl base where sheet vinyl floor is located such as washrooms and other wet areas;
 - (c).4 Provide molded rubber base, 75 x 100 with 10 mm ventilation holes for wood flooring locations.

6.7.4.2(6) Sheet Vinyl

- 6.7.4.2(6)(a) Product: Shall be Armstrong Corlon Connections, Tarket or acceptable equivalent.
- 6.7.4.2(6)(b) Conform to CSA 126.3 Type II Grade 1 to minimum gauge 2.16 mm (.085").
- 6.7.4.2(6)(c) Welded seams to run parallel to longest wall space.
- 6.7.4.2(6)(d) Arrange sheets to ensure fewest seams.

6.7.4.2(7) Antistatic (for server room)

- 6.7.4.2(7)(a) Product; Shall be Armstrong Electrostatic Dissipative commercial space flooring or approved equivalent;

6.7.4.2(8) Ceramic Tile

- 6.7.4.2(8)(a) The Design-Builder will:
 - (a).1 Provide in accordance with the performance standard of the Tile, Terrazzo, and Marble Association of Canada, c/o the Ceramic Tile Design-Builder and Industry Association of BC performance standards;
 - (a).2 Install with low toxicity cement;
 - (a).3 Grout to be a complimentary colour with the tile.

(a).4 White is not an acceptable colour.

6.7.4.2(8)(b) Performance Requirements

(b).1 Can2-75.1-M77, Type 1, class MR-1, cushioned edges, matte finish, with matching covered base and other special shapes as required. Colours to be reviewed with the Owner.

6.7.4.2(9) Culinary Arts/kitchen flooring:

(a).1 Refer to section 6.10.8 of this Schedule.

6.7.5 Painting and Protective Coatings

6.7.5.1 General Requirements;

6.7.5.1(1) All exterior and interior painting and decorating work shall be in accordance with MPI Painting Manual premium grade requirements and shall be inspected by the local MPI Accredited Quality Assurance Association's Paint Inspection Agency (inspector). The cost for such inspections, and for either the local MPI Accredited Quality Assurance Association's Guarantee, or the Maintenance Bond, shall be the Design-Builder's responsibility;

6.7.5.1(2) Generally, exposed walls and exposed ceilings shall be painted with High Performance Architectural Latex, to MPI Gloss Level 3 (eggshell) throughout. MPI Gloss Level 5 (semi-gloss) to be used at janitor rooms, washrooms, shower rooms, and other high-moisture areas including all corridor and foyer walls and below chair rails in teaching spaces and offices.

6.7.5.1(3) All exterior and interior concrete surfaces to be sealed with high performance sealer.

6.7.5.1(4) Provide line painting for interior basketball courts, badminton courts, and volleyball courts;

6.7.5.1(5) Provide all exterior parking stalls, driving aisles and other hard surface areas painted lines; and

6.7.5.1(6) Provide 4 litres of each type and colour of paint for maintenance purposes.

6.8 Specialties (Div. 10)

6.8.1 Basic Requirements

- 6.8.1.1 The Design-Builder will:
- 6.8.1.1(1) Provide specialty products manufactured for the specific purposes intended, and installed in strict accordance with the manufacturer's specifications.
- 6.8.1.2 Writeable walls
- 6.8.1.2(1) Provide writeable erasable wall surfaces for each learning space as required to support the programs and functions described in the room data sheets and functional program;
 - 6.8.1.2(2) Provide writeable erasable walls for all the following:
 - 6.8.1.2(2)(a) General classrooms;
 - 6.8.1.2(2)(b) Computer Labs;
 - 6.8.1.2(2)(c) Inclusive Education classrooms;
 - 6.8.1.2(2)(d) Inclusive Education breakout rooms;
 - 6.8.1.2(2)(e) Teacher preparation rooms;
 - 6.8.1.2(3) All acoustic separation moveable walls in formal and informal learning spaces shall have writeable walls except in the gymnasium;
 - 6.8.1.2(4) Provide writeable walls from finished floor to finished ceiling full length of wall to form teaching wall;
- 6.8.1.3 All classrooms shall have a teaching wall that shall be a writeable wall surface. The teaching wall shall be visible by all students in the classroom. The teaching wall shall be the entire longest wall of each teaching space, and extend wall to wall. The teaching wall shall be the entire longest wall of each teaching space, and extend wall to wall. The teaching wall on Classroom A1 on Level 2 and Level 3 maybe an exception;
- 6.8.1.4 Maximize all 30 student visibility of the writeable wall ensuring that sightlines are column free;
- 6.8.1.5 Writeable walls commercial grade high quality surfaces to be writeable, erasable, and shall not stain from felt type writing instruments and allow ease of cleaning, maintaining and erasing with minimal effort;
- 6.8.1.6 Wall paper or paint products are not acceptable;

6.8.1.7 Use non-toxic, water based lamination adhesive for writeable wall surface fastening.

6.8.2 Miscellaneous Washroom Accessories

6.8.2.1 General Requirements:

6.8.2.1(1) Supply and install:

6.8.2.1(1)(a) Flat mirrors: 610 mm wide x 764 mm high stainless steel frame with vandal resistant concealed mounting. Mirror of 6 mm polished float glass. Bobrick B-1661830 or acceptable equivalent. Install at each washroom lavatory; install tilt mirrors where required by building code;

6.8.2.1(1)(b) Grab bars:
(b).1 Tilt up shower grab bar

6.8.2.1(1)(c) Deodorant block holder;

6.8.2.1(1)(d) Sanitary napkin disposal bins;

6.8.2.1(1)(e) Recessed paper towel dispensers

6.8.2.1(1)(f) Shower rod;

6.8.2.1(1)(g) Shower seat;

6.8.2.1(2) Install and provide adequate space and backing for the following accessories supplied by the Owner:

6.8.2.1(2)(a) Shower curtain;

6.8.2.1(2)(b) Toilet paper dispenser that holds more than one roll: At every toilet;

6.8.2.1(2)(c) Soap dispenser: At every washroom;

6.8.2.1(2)(d) Refuse containers: Provide adequate space in every washroom.

6.8.3 Flag Pole

6.8.3.1 The Design-Builder is to provide and install one flag pole;

6.8.3.2 Provide sectional shaft flagpoles with taper-blend joints, 8,000 mm high;

- 6.8.3.3 Aluminum: Pole aluminum alloy AA 6351-T6 seamless extruded aluminum tubing. Base cover aluminum alloy AA 6061;
- 6.8.3.4 Fabricate flagpoles as complete unit including tilt hinge, base, anchorage and fittings. Make joints air and water tight. Welding to CSA standard;
- 6.8.3.5 Finial: 150 mm diameter ball of aluminum, colour to match flagpole finish;
- 6.8.3.6 Internal Halyard: Manufacturers' standard system. Exposed parts to match flagpole finish. Include lockable cleat box.
- 6.8.3.7 Flagpole Finishes
 - 6.8.3.7(1) Galvanized finish: hot dipped galvanizing with a minimum coating of 0.61 kg/m² to CSA G164-1985 (R1972);
 - 6.8.3.7(2) Exposed aluminum components to be clear anodic finish;
 - 6.8.3.7(3) Isolation coating: alkali-resistant bituminous paint or epoxy-resin solution. Shop to apply to metal surfaces of flagpole and base that will be encased in concrete;
 - 6.8.3.7(4) Fabricate ground-set foundation assembly for tilt installation of flagpole, including lug on tilt pole.
- 6.8.4 Gymnasium bleachers**
 - 6.8.4.1 The Design-Builder will:
 - 6.8.4.1(1) Provide fully retractable gymnasium bleachers for a minimum of 500 seats;
 - 6.8.4.1(1)(a) Bleachers, when retracted, shall be safely enclosed or recessed and flush with interior face of the gymnasium wall to ensure student and player safety.
- 6.8.5 Basketball hoops**
 - 6.8.5.1 Provide motorized ceiling mounted retractable basketball back stops and goals at each end of the basketball court including the side courts. Viking Alexander Metal Products Ltd. Model or acceptable equivalent;
 - 6.8.5.2 Provide side swing basketball stops;
 - 6.8.5.3 Side swing basketball backstops to be equipped with heavy duty squared steel tubing frame;

- 6.8.5.4 Provide main basketball court to have glass rectangular board regulation size with regulation size goal of 15.9 mm diameter round steel, painted with orange enamel and heavy duty nylon net;
 - 6.8.5.5 Provide backboard mounted to backstop with adjustable frame which allows adjustment of goal height from 2.4 to 3.0 metres above floor;
 - 6.8.5.6 Provide seismic cable stays, complete with pulleys. Product shall be Viking Alexander Metal Products Ltd, model Sandy B # 140 or acceptable equivalent;
- 6.8.6** Gymnasium floor sockets
- 6.8.6.1 Provide floor sockets in gymnasium with anchor projections and bronze cap, for volleyball and badminton;
 - 6.8.6.2 Provide sockets in storage room to suit equipment for layouts.
- 6.8.7** Weight room equipment
- 6.8.7.1 Provide wall mounted adjustable chinning bar, cold drawn, round heavy tube, minimum diameter 30 mm length, 2400 mm projecting 400 mm minimum from wall. Wall pads shall be 1140 mm minimum long and permit adjustment of bar height at 150 intervals. Product shall be Viking Alexander Metal Products LTD Sand B or acceptable equivalent.
- 6.8.8** Gymnasium Divider Walls
- 6.8.8.1 The Design-Builder will:
 - 6.8.8.1(1) Provide heavy duty, spatial separation gymnasium dividers complete with electronic motor, for the purpose of separating the gyms into three individual game/activity courts;
 - 6.8.8.1(2) All dividers shall be fully lifted (clear of game required clearance) towards the ceiling when retracted;
- 6.8.9** Room Dividers / Operable Walls
- 6.8.9.1 The Design-Builder will:
 - 6.8.9.1(1) Provide room dividers. Refer to Appendix 1B Room Data Sheets for locations;
 - 6.8.9.1(2) Typical steel, individual panels, manually operated, expandable jamb closure. Minimum STC 52 rating to ASTM E90. Finish:

painted MDF face panel (Modernfold 931 or acceptable equivalent).

- 6.8.9.1(3) For gymnasium, provide electronically operated wall roll up gym divider curtains lower section of curtain shall be solid vinyl coated polyester (18 oz. Per square metre/yard) and upper section shall be average nine(9) ounce per square metre/yard vinyl coated polyester mesh.. Acceptable manufacturers: Draper or approved equivalent,

6.8.10 Exterior Window Coverings

6.8.10.1 The Design-Builder will:

- 6.8.10.1(1) Provide exterior window coverings on all windows, without security shutter except at entries windows immediately adjacent to glazed entry doors;
- 6.8.10.1(2) Provide commercial grade, heavy duty, durable, coverings;
- 6.8.10.1(3) Provide motorized controls for all locations;
- 6.8.10.1(4) Refer to blinds/roller shades in section 6.6.7.8 (6) of this Schedule;
- 6.8.10.1(5) Refer to Appendix 1B Room Data Sheets for window coverings type.

6.8.11 Exterior Metal Shutters

6.8.11.1 The Design-Builder will:

- 6.8.11.1(1) Provide the infrastructure for outside face mounted, electrically operated rolling shutters on windows and door side lights within four (4) metres of grade and/or accessible from grade, with exception of main entries;
- 6.8.11.1(2) Provide the infrastructure for exterior shutters to CTE shop windows;
- 6.8.11.1(3) Ensure all rolling shutters can be easily removed and repaired by the Owner's maintenance team;
- 6.8.11.1(4) In the exceptional circumstance where exterior metal shutters will not be appropriate, the Design-Builder will provide and impact resistant glazing system.

6.8.12 Metal Lockers

6.8.12.1 The Design-Builder will:

- 6.8.12.1(1) Provide half size metal lockers for School areas;
- 6.8.12.1(2) Provide full size metal lockers for Maintenance/IT Building;
- 6.8.12.1(3) Not locate student lockers on ground floor, unless otherwise noted in this schedule;
 - 6.8.12.1(3)(a) Lockers may be located outside CTE areas;
- 6.8.12.1(4) School lockers are to be constructed as per the following;
 - 6.8.12.1(4)(a) Double stacks: built-in, recessed, flush with corridor walls:
 - (a).1 Provide a minimum 50% double stacked;
 - 6.8.12.1(4)(b) Single stack islands: single stack built-in with millwork finished sides, back and top, not more than 1200 mm high;
 - (b).1 Provide a minimum 30% single stacked;
 - (b).2 Provide, in addition to the data outlets noted in Appendix 1B Room Data Sheets, at minimum four (4) electronic device electrical charging and data outlet stations in each millwork island. Locate at charging and data outlets at both ends of millwork island.
- 6.8.12.1(5) Full height Culinary Arts, Maintenance/IT lockers; free standing with sloped tops;
- 6.8.12.1(6) Provide lockers quantities as per the following:
 - 6.8.12.1(6)(a) 1000 student lockers in appropriate locations to suit student access with minimum disruption to other activities. Student lockers are not to be located in the Learning Neighbourhoods. Student lockers are to be located adjacent to academic areas and not accessible after regular school hours;
 - (a).1 200 student gymnasium lockers outside changing rooms, visible to the students from the gymnasium;
 - 6.8.12.1(6)(b) Culinary Arts office: 4 staff full height lockers;
 - 6.8.12.1(6)(c) Maintenance/IT shop (full height)
 - (c).1 3 quantity in Electrical shop;

- (c).2 3 quantity in Plumbing shop;
- (c).3 3 quantity in Wood shop;
- (c).4 4 quantity (in the break room) for Landscape;
- (c).5 7 quantity in IT work bench area;

6.8.12.1(6)(d) Band instrument lockers, to be proprietary product music lockers, refer to Appendix 1A Functional Program for instrument types and quantities.

6.8.13 Washroom/change room Partitions

6.8.13.1 The Design-Builder is to provide impact resistant, vandal resistant, durable and damage resistant washroom/change room partitions;

6.8.13.1(1) Wood Partitions

6.8.13.1(1)(a) Materials:

- (a).1 Wood toilet partitions shall be fabricated from G2S grade, 19mm (3/4") thick Birch or Douglas Fir Plywood. Stain grade suitable for clear finish.
- (a).2 Rails and frames for toilet partitions shall be fabricated from solid stock hemlock or fir.
- (a).3 Doors shall be fabricated from two layers 16mm G2S grade Birch or Douglas Fir plywood, stain grade suitable for clear finish, complete with 6mm minimum solid edge grain fir edges.
- (a).4 Stainless Steel (satin finish) support stanchions (25mm I.D.).
- (a).5 Coat Hook: stainless steel, bumper hook: Bobrick B-212 or acceptable equivalent.

6.8.13.1(1)(b) Installation:

- (b).1 Before fabrication check that plumbing rough-in is at same centres as shown on drawings for toilet stalls.

6.8.13.1(2) Sheet steel: commercial grade, stretcher leveled sheet steel to ASTM A526-71 (1975) with G 90 zinc coating to ANSI/ASTM A525-70. Minimum base steel thickness:

6.8.13.1(2)(a) Panels and doors: 0.8 mm

6.8.13.1(2)(b) Pilasters: 0.9 mm

6.8.13.1(2)(c) Reinforcement: 3.0 mm

6.8.13.1(2)(d) Head rails: 1.0 mm

- 6.8.13.1(2)(e) Stainless steel sheet: To ASTM A666-72 1979 type 3.6 with No. 4 finish.
- 6.8.13.1(3) Attachment: stainless steel tamperproof type screws and bolts.
- 6.8.13.1(4) Hardware
 - 6.8.13.1(4)(a) Hinges: continuous hinge running full height of door. Stainless steel, satin finish, 1.6 mm (16 ga.) self-closing.
 - 6.8.13.1(4)(b) Latch set: extra-heavy duty institutional sliding door latch with shock-resistant nylon track, one-piece 4.4 mm (8 ga.) stainless steel keeper.
 - 6.8.13.1(4)(c) Wall and connecting brackets: chrome casting or anodized aluminum extrusion.
 - 6.8.13.1(4)(d) Coat hook: combination hook and bumper, chrome plated non-ferrous.
 - 6.8.13.1(4)(e) Door pull: type suited for out-swinging doors.
- 6.8.13.1(5) Doors and panels: 25 mm minimum thickness; 22 ga sheet steel faces bonded using waterproof thermal setting adhesive to honeycomb core, 610mm wide x 1473 mm high for standard compartment.
- 6.8.13.1(6) Pilasters: 32 mm thick, 1830 mm high, constructed same as door.
- 6.8.13.1(7) Head rails: Extruded Aluminum 25 x 41 mm. w/6063-T5 finish clear anodized.
- 6.8.13.1(8) Pilaster shoes: 75 mm high, die formed stainless steel.
- 6.8.13.1(9) Provide internal reinforcement at areas of attached hardware and fittings.
- 6.8.13.1(10) Product shall be: Hovick O.B. (overhead braced) with concealed latches, full length door stops and U-Channel supports or acceptable equivalent.

6.8.14 Shower Partitions

- 6.8.14.1 Provide shower partitions in the boys changing room showers;
- 6.8.14.2 Showers in the girls changing rooms shall be individual, fully enclosed walls with full doors;

- 6.8.14.3 Showers in the Physical Education and Health office spaces shall be individually fully enclosed walls and doors;
- 6.8.14.4 Shower in the Inclusive Education washroom shall have a privacy track and curtain;
- 6.8.14.5 All other showers shall have partition walls as per the following:
- 6.8.14.6 Materials
 - 6.8.14.6(1) Shower doors shall be Solid Phenolic Melamine H.D. as manufactured by Shanahan's Manufacturing Panel Products or acceptable equivalent;
 - 6.8.14.6(2) Panels: solid phenolic melamine, colour as approved by the Owner;
 - 6.8.14.6(3) Edges: panel edges to be beveled and rounded, black colour.
- 6.8.14.7 Hardware
 - 6.8.14.7(1) Brackets: continuous aluminum extrusion full panel height. Finish to be clear anodized.
 - 6.8.14.7(2) Headrail: continuous aluminum extrusion incorporating anti-grip and curtain track. Finish to be clear anodized.

6.8.15 Curtains

- 6.8.15.1 Provide heavy duty privacy circular curtain and track for change rooms (one each) in Textiles and Home EC classrooms;
- 6.8.15.2 Provide heavy duty privacy curtain and track inside Inclusive Education washroom for both the shower and toilet area;
- 6.8.15.3 Provide hardware and materials that are intended for commercial, heavy use, and wet use for washroom, in order to serve the function of the space;
- 6.8.15.4 Provide fabrics that are launderable to a temperature not less than 160 deg F (71 deg C); and
- 6.8.15.5 Provide fabrics that are flame resistant.

6.9 Equipment (Div. 11)

6.9.1 Basic Requirements

6.9.1.1 Locate equipment, fixtures and distribution systems to provide:

- 6.9.1.1(1) Good access to intended use;
- 6.9.1.1(2) Good access for maintenance;
- 6.9.1.1(3) Good flexibility for changes; and
- 6.9.1.1(4) Minimum interference with functionality.

6.9.2 Theatre and Blackbox curtains

- 6.9.2.1 Provide theatre curtains, both front of house and sides of stage, to meet functional needs of the new theatre
- 6.9.2.2 Provide acoustical blackbox curtains to meet the functional needs of the new blackbox space on all four sides, floor to ceiling.

6.9.3 Exterior Trash Receptacles

- 6.9.3.1 Provide exterior trash receptacles for site areas immediately adjacent to the Facility;
- 6.9.3.2 Model and colour to be approved by the Owner.

6.9.4 Traffic Control

- 6.9.4.1 Provide traffic control devices to deny unauthorized vehicle access to the playfields, access roads, driveways, site entry points and School grounds. Include steel swing gates, traffic fencing and steel bollards are required;
- 6.9.4.2 Bollards
 - 6.9.4.2(1) Provide steel bollards at Maintenance loading dock and School loading aisle at each roll up loading door;
 - 6.9.4.2(2) Provide steel lighting bollards at front of School walkway and plaza areas;
 - 6.9.4.2(3) Bollards shall be vehicle impact resistant, consist of lighting within and be placed a maximum of seven metres apart unless noted otherwise in this schedule;
 - 6.9.4.2(4) Steel bollards; 914 mm high x 150 mm steel bollards, concrete filled set in concrete foundations.

6.9.4.2(5) Shall be designed for concentrated load of 22kN applied horizontally at any point 500 mm above the grade or floor elevation, in accordance with 4.1.5.15 of BC Building Code.

6.9.4.3 Traffic control fence

6.9.4.3(1) Provide 620 mm high wood rail fence, with 200mm x 200mm pressure-treated posts with 150 mm x 200 mm rails between parking and street, posts set in concrete.

6.9.4.4 Steel swing gates

6.9.4.4(1) Provide lockable steel swing gated complete with tie-back posts, to Owner standards, posts set in concrete.

6.9.5 Garbage and Recycling Container Enclosure

6.9.5.1 Provide garbage and recycling enclosure, with concrete pad. Enclosure to be constructed of materials consistent with the Facility exterior. Locate enclosure to provide easy access for disposal trucks, convenient to a School exit for custodial staff and in conformance with City of New Westminster bylaws. Provide space within the enclosure for recycle containers in accordance with the Owner's waste management provider.

6.9.5.2 Enclosures to accommodate at minimum the following:

6.9.5.2(1) Garbage:

6.9.5.2(1)(a) Five existing City garbage bins for the School building;
(a).1 Size: 7 ft x 6 ft x 4 ft

6.9.5.2(1)(b) One existing City garbage bin for the Maintenance/IT Building;
(b).1 Size: 7 ft x 6 ft x 4 ft

6.9.5.2(1)(c) Two existing cardboard disposal containers:
(c).1 One size– 6 ft x 5 ft x 7 ft;
(c).2 One size- 6 ft x 4 ft x 5 ft;

6.9.5.2(2) Recycling:

6.9.5.2(2)(a) Thirty existing recycling and organics containers for the School:

6.9.5.2(2)(b) One existing recycling and organics containers for the Maintenance/IT Building;

6.9.5.2(2)(c) Size: 3 ft x 2 ft x 4 ft.

6.10 Food Services and Equipment (Div. 11)

6.10.1 Basic Requirements

- 6.10.1.1 As part of the design process provide the following in relation to food services:
- 6.10.1.1(1) Food service equipment plans
 - 6.10.1.1(2) Food service equipment connection point drawings
 - 6.10.1.1(3) Building conditions drawing(s) for food service equipment
 - 6.10.1.1(4) Elevations and section details for custom fabricated food service equipment items
 - 6.10.1.1(5) Itemized food service equipment specifications
 - 6.10.1.1(6) Catalogue specifications sheets for all manufactured equipment items
- 6.10.1.2 Provide a commercial foodservice area with equipment manufactured for the specific purposes intended and installed in strict accordance to the manufacturers' standards and directions.

6.10.2 Performance Criteria

- 6.10.2.1 The model of operation of the Facility is to promote confidence, experience, career choice, and foodservice production experience for each student who chooses to enter the foodservice field. The foodservices operation takes these factors into account in providing a facility to train the prospective student for the industry and provide an excellent food product for the students;
- 6.10.2.2 Within the School, there is to be a commercial Teaching kitchen providing for the production of hot and cold food for service to the adjacent servery and a high end training facility approved for implementation of the ACE-IT Chef's Training Program;
- 6.10.2.3 Provide commercial foodservice equipment as required for the Teaching Kitchen operation of the Facility for the student and staff population.

6.10.3 Functional Areas

6.10.3.1 The Facility will be designed mainly as a training facility with work stations set up for specific preparation and cooking methods of the foodservice operation;

6.10.3.2 Provide areas for the following functional requirements:

- Classroom
- Washroom
- Laundry
- Janitor and chemical storage
- Office
- Receiving
- Dry Storage
- Refrigerated / Frozen Storage
- Preparation
- Cold Station
- Hot Station (2)
- Entrée Station
- Bake Station
- Warewashing
- Servery line (2)

6.10.4 Equipment Criteria

6.10.4.1 Provide commercial foodservice equipment as set out in Appendix 1E Furniture, Fixture and Equipment List;

6.10.4.2 All foodservice equipment is to be fabricated and installed to the current codes and requirements and the requirements of the Authority Having Jurisdiction at the time of installation including SMACNA Guidelines for Seismic Restraint of Commercial Kitchen Equipment;

6.10.4.3 All electrical equipment must conform to the Canadian Hydro Electrical Code, the Electrical Inspection Department Bulletins, the British Columbia Hydro Electric Safety Code and the Canadian Standards Association. All equipment must have a C.S.A. approval label:

6.10.4.3(1) Electrical work related to all food service equipment will be in liquid tight flexible conduit and concealed within building walls or ceilings wherever possible.

6.10.4.3(2) Supply and installation of all internal wiring on custom fabricated items will be concealed.

6.10.4.4 Mechanical work and electrical work related to the food service equipment, will be concealed within building walls or ceilings wherever possible;

6.10.4.5 Gas equipment will conform to the Canadian Gas Association, the Gas Utilization Code of the Department of Energy and Resources Management, British Columbia and Canadian Standard Association standards;

6.10.4.6 Plumbing or drainage systems will conform to the BC Plumbing Code;

- 6.10.4.7 Equipment is to be in compliance, but not limited to, the current applicable section of NSF/ANSI Standard for Foodservice Equipment;
- 6.10.4.8 Equipment is to meet or exceed the current energy saving guidelines in effect at the time of installation;
- 6.10.4.9 Equipment is to be installed as such to provide for adequate servicing and cleaning per current codes and requirements and the requirements of the Authority Having Jurisdiction at the time of installation;
- 6.10.4.10 Service counter customer side to meet with the décor requirements of the project and the functional/cleaning requirements of the area;
- 6.10.4.11 Finished work must be perfectly true and plumb with no warping, buckling or open seams. All edges, hidden or exposed, must be ground smooth and rounded. Rivet heads, weld marks, or other imperfections are not acceptable;
- 6.10.4.12 Materials for fixed surfaces will be impervious to moisture, corrosion resistant, smooth and able to withstand regular cleaning and sanitizing.
- 6.10.4.13 Stainless steel will be ASTM-A167-81A, (18-8 Analysis) type 304 cold rolled and annealed, No. 4 finish one side, 180 grit finish, and free of buckles, pits, warps and imperfections. Ensure that the direction of grain matches throughout the units;
- 6.10.4.14 All welding will conform to the requirements of CSA specifications and be performed by fabricators who are approved by the Canadian Welding Bureau and CSA standards. Exposed welds will be filed or ground smooth and flush and polished to match surfaces. All exposed welds will be continuous;
- 6.10.4.15 The gauge of metal and methods of construction will in all cases be adequate for the intended purposes of the equipment or structure. Finished equipment will be rigid when assembled and installed;
- 6.10.4.16 Manufactured Equipment
 - 6.10.4.16(1) Equipment is to be from a recognized manufacturer of commercial foodservice equipment with local service representation.
 - 6.10.4.16(2) Cabinet type equipment to have locks.
 - 6.10.4.16(3) Refrigeration equipment to have integral digital thermometers and alarm systems.

- 6.10.4.16(4) Equipment is to be on casters with brakes where possible.
- 6.10.4.16(5) Gas equipment to have quick disconnects with swivel and integral shut-off valves and restraining cords.
- 6.10.4.16(6) Mobile (Gas) cooking equipment under the exhaust hoods to have positional brackets; placed and secured for back casters.

6.10.4.17 Custom Millwork

- 6.10.4.17(1) Custom fabricated millwork equipment to be from a company specializing in commercial millwork cabinetry;
- 6.10.4.17(2) Cabinet type equipment to have commercial grade plastic laminate finish; swing doors, concealed hinges with locks; drawers with locks; internal adjustable shelves; base to have stainless steel finish;
- 6.10.4.17(3) Provide custom fabricated millwork, counters, cabinet, units as required to meet the fully functional commercial kitchen representation.

6.10.4.18 Custom Stainless Steel work

- 6.10.4.18(1) Custom fabricated stainless steel equipment to be from a company specializing in commercial foodservice equipment with local service representation.
- 6.10.4.18(2) Provide custom fabricated stainless steel work tables, counters, cabinet, sink units and shelving as required to meet the fully functional commercial kitchen representation.
- 6.10.4.18(3) Cabinet type equipment and drawers to have locks.
- 6.10.4.18(4) Stainless steel utilized is to be Type 304, Number 4 finish, 180 grit, free from pits and imperfections. 14 gauge or better, unless otherwise accepted in written agreement from the Owner.
 - 6.10.4.18(4)(a) 16 gauge (1.587 mm) - Utilized for all free-standing sinks, dishtables, countertops, overshelves, single pan doors, stainless steel slides, stainless steel grids and undershelves over 1220 mm long. Hat sections/channels; unexposed galvanized, exposed stainless steel. Exposed shelf brackets Sheet material for counter tops, tables, shelves and similar forms will be straight lengths in one continuous sheet (unless over 3 meters long).

- 6.10.4.18(4)(b) 16 gauge(1.587 mm) - Utilized for all undershelves less than 1220 mm long, stainless steel bins (fixed or mobile), counter top sinks and vertical surfaces. Ducts; unexposed galvanized, exposed stainless steel.
- 6.10.4.18(4)(c) 18 gauge(1.27 mm) - Utilized for the chassis of all fixtures, double pan doors and drawer fronts.
- 6.10.4.18(4)(d) 20 gauge (0.96 mm) - Utilized for all drawer bodies and door linings, refrigerator linings, drawer pans with 2B finish, dishwasher ducts, or a specified.
- 6.10.4.18(4)(e) Tubing 16 gauge (1.58mm) wall.
- 6.10.4.18(5) Sheet material for counter tops, tables, shelves and similar forms will be straight lengths in one continuous sheet (unless over 3 metres long).
- 6.10.4.18(6) Tables and counters over 1800mm in length will have a minimum of 4 legs.
- 6.10.4.18(7) For pot sink or dish tables, work tops to slope toward the sinks or dishwasher as required at a slope of 8mm per metre. The front edge to be level with the floor.
- 6.10.4.18(8) Backsplashes to be an integral section of table or counter top turned up on a 19mm radius to the height specified, then boxed or splayed. Enclose, fill and weld all exposed ends and back. Exposed backs at upturns and splash backs to be closed with stainless steel back panel to the bottom of the backsplash. Panels to be removable as required for access to mechanical and electrical work. Backsplashes to be sealed to the wall with food safe clear silicone.
- 6.10.4.18(9) Legs and bracing to be industry standard 41mm O.D. stainless steel tubular. Leg spacing to be a maximum of 1600mm apart, 760mm front to back with adjustable bullet feet.
- 6.10.4.18(10) Sink bowls to be 2.0mm stainless steel integrally welded into the table or counter. All welded, all coved, radiused 19mm both vertically and horizontally and polished. Slope sink bottom to drain. Multiple sinks to have 18 gauge stainless steel apron to conceal gap between bowls.
- 6.10.4.18(11) Faucets to be from the same manufacturer.

6.10.4.18(12) Maple tops to be laminated Eastern Maple, glued and bolted, 45 mm tops with 100 mm riser.

6.10.4.19 Exhaust Hood(s) and Fire Suppression System(s)

6.10.4.19(1) Provide NFPA96 & ULC listed low air volume hood(s) with demand ventilation (control) system(s) and integral wet chemical fire suppression system(s) as required by current codes and requirements and the requirements of the Authority Having Jurisdiction at the time of installation.

6.10.4.19(2) The Fire Suppression System(s) is to be interconnected with the building system(s).

6.10.4.19(3) Provide hand held fire extinguishing unit(s) as required for area.

6.10.4.20 Prefabricated Walk-ins and Refrigeration Systems

6.10.4.20(1) All temperature controlled rooms shall be constructed of prefabricated, walk-in type ULC listed wall, floor and ceiling panels meeting the requirements of the current BC Building Code, between exterior and interior metal skins

6.10.4.20(2) Custom prefabricated modular panel walk-ins to be from a company specializing in commercial walk-in equipment with local service representation.

6.10.4.20(2)(a) Insulation will be foamed-in-place polyurethane injected into the panels to form a rigid wall without the use of wood or metal structural members. Insulation to be rated as self-extinguishing, fire retardant type.

6.10.4.20(2)(b) All panels, wall, ceiling and floor will be a minimum of 100mm thickness.

6.10.4.20(2)(c) Units to be full box; walls, ceiling and floor.

6.10.4.20(2)(d) Supply and install an alarm system for each prefabricated walk-in refrigerated and frozen storage room.

6.10.4.20(3) Units are to have a flush floor / sill with the kitchen area with interior flooring finish as the kitchen area.

6.10.4.20(4) All units to have insulated floor.

6.10.4.20(4)(a) Minimum 200 mm floor depressions to be provided in the floor slab at all walk-ins to accommodate integral walk-in

panel floor with concrete topping to provide flush floor finish, finish per kitchen, to kitchen floor.

- 6.10.4.20(4)(b) Provide heat trace in leveling bed under insulated floor if walk-in location is slab-on-grade.
- 6.10.4.20(5) Units to include but not limited to:
 - 6.10.4.20(5)(a) internal and external bumpers as required; door and exposed wall.
 - 6.10.4.20(5)(b) low temperature LED lights.
 - 6.10.4.20(5)(c) enclosure panels from top of unit to finished ceiling. Colour and finish to match unit.
- 6.10.4.20(6) Door hardware: self-closing, heavy duty stainless steel offset pivot hinges with magnetic gaskets, stainless steel door frame and tamper proof cylinder locks.
- 6.10.4.20(7) Refrigeration systems are to be from a commercial refrigeration company, installed and made operational by a qualified Refrigeration Mechanic for foodservice equipment and as required by current codes and requirements and the requirements of the Authority Having Jurisdiction at the time of installation. Design operating temperatures: Freezer -24°C (-10°F), Cooler 2°C (35°F).
 - 6.10.4.20(7)(a) Each individual system will be sized to suit the internal space, ambient temperatures and humidity levels of surrounding areas, product type and load, heat infiltration and temperature of incoming product in order to maintain the specified holding temperatures.
 - 6.10.4.20(7)(b) Walk-ins to be equipped with ceiling hung packaged evaporator units. Condensing units will be air cooled or water cooled if a designated chilled water loop is available all year long. Condensing units to be situated in easily serviceable locations.
 - 6.10.4.20(7)(c) All mechanical refrigeration systems will be supplied with safety relief valves, shut-off valves for each piece of equipment, refrigerant leak detectors and other safety guards required by law.

6.10.5 Equipment Requirements

- 6.10.5.1 All equipment will be inspected by the local hydro authority and carry CSA and ULC approval;
- 6.10.5.2 Each piece of equipment will be accompanied by a label or certificate of approval;
- 6.10.5.3 Equipment design and fabrication must conform with guidelines of the National Sanitation Foundation and per the Authority Having Jurisdiction (including the local Environmental Health Office);
- 6.10.5.4 Where possible, mobile equipment will be used to allow for movement/repositioning, ease of replacement and ease of cleaning;
- 6.10.5.5 Functional areas to contain equipment as noted on Appendix 1X.

6.10.6 Existing Equipment

- 6.10.6.1 Services and space to be allocated for the potential reuse of existing equipment;
- 6.10.6.2 Existing equipment to be obtained from the Owner;
- 6.10.6.3 Minimal work required to be but not limited to:
 - 6.10.6.3(1) Steam cleaning
 - 6.10.6.3(2) Replacement worn gaskets
 - 6.10.6.3(3) Replacement of worn casters/bumpers
 - 6.10.6.3(4) Replacement of worn power cords
- 6.10.6.4 Inspect equipment; provide written report if work required is greater than noted.

6.10.7 Equipment by Owner or Operator

- 6.10.7.1 Services and space to be allocated for the following equipment supplied by the Owner or Operator:
 - Computer
 - Washer
 - Cash register(s) (POS units)
 - Dryer
- 6.10.7.2 Small wares and tools-of-the-trade are to be supplied by the Operator.

6.10.8 Culinary Arts / Kitchen

- 6.10.8.1 All surfaces are to meet the current codes and requirements of a commercial foodservice establishment and the authority having jurisdiction at the time of installation;
- 6.10.8.2 Area to be vermin resistant;
- 6.10.8.3 Sight Lines: maximization of open sight lines of the areas for the supervising staff is critical;
- 6.10.8.4 Floor: Fully sealed, water-impermeable, acid resistant, slip resistant heavy duty floor material i.e. slip resistant epoxy or sheet vinyl, with integral coved wall base. Installation as to provide for no pooling of water under equipment or toward building or walk-in walls:
 - 6.10.8.4(1) Provide all floor depressions as required for the foodservice equipment i.e. walk-in insulation/floor depression, floor drain pans etc.
 - 6.10.8.4(2) Supply and install in-fill concrete topping inside prefabricated, insulated walk-in refrigerated and frozen room assemblies. All walk-ins to have depressed prefabricated insulated floor panels or approved custom extruded styrofoam so as to make floor level with outside floors.
 - 6.10.8.4(3) Supply and install specified flooring finishes inside prefabricated walk in units; coved up inside and outside of prefabricated walls.
- 6.10.8.5 Walls: smooth, water tight, washable. Fiberglass Reinforced Panels (FRP) at all exposed building walls. Stainless steel insulated panels from the underside of the hood to the architectural wall base or stainless steel service wall at cooking banks. All exposed wall corners are to be protected with stainless steel corner guards;
- 6.10.8.6 Ceiling: smooth, washable, acoustic consideration. Provide for access to ceiling area for service to service lines / ducting;
- 6.10.8.7 Light levels: to meet all work environment conditions for area;
- 6.10.8.8 Room Ventilation: area to have sufficient efficient artificial ventilation / make-up air, air movement, and cooling for use of area and the number of staff / students working in the area;
- 6.10.8.9 Door(s): access doors/doorways are to be adequately sized for the installation and removal of equipment;
- 6.10.8.10 Security: area to be fully secured from adjacent areas to ensure no after hour, untrained/unsupervised use.

6.11 Furnishings (Div. 12)**6.11.1 Outdoor Seating**

6.11.1.1 The Design-Builder to provide outdoor seating areas in the following areas:

- 6.11.1.1(1) Outside principle entry areas;
- 6.11.1.1(2) In southern exposed landscape areas;
- 6.11.1.1(3) Adjacent to sports fields and playfields.

6.11.2 Landscape Benches

6.11.2.1 Provide landscape benches on School property:

- 6.11.2.1(1) Acceptable benches are Contoured benches, 32" h x 21" d x 17.5" seat height by Wishbone Industries, model PBC-6 .. Although discontinued for new clients, the Owner is an existing client therefore orders will be filled. Bench construction to be skateboard proof and recycled plastic lumber boards attached using stainless steel hardware to powdered coated welded aluminum frame. Colour to be selected by Owner.

6.11.2.2 All landscape benches are to be installed to 2200 mm x 1200 mm concrete pads.

6.12 Special Construction (Div. 13)
[NOT USED]

6.13 Conveying Equipment (Div. 14)

6.13.1 Conveying Equipment Basic Requirements

6.13.1.1 General

6.13.1.2 Performance Requirements for Elevators

6.13.1.2(1) General Requirements:

- 6.13.1.2(1)(a) Elevator to conform to all applicable codes and regulations;
- 6.13.1.2(1)(b) Design-Builder to provide an Elevator Consultant to design elevator access for both the School and the Maintenance/IT Building (if on multiple levels);
- 6.13.1.2(1)(c) Elevator consultant to provide an elevator capacity and usage report for approval of the Owner;
- 6.13.1.2(1)(d) Platform size: at minimum suitable for wheelchair disabled person and stretcher access and use (compliant with Code and health requirements);
- 6.13.1.2(1)(e) Operation: Elevator requires key switch operation; return to ground function and PA system connection & in-car phone;
- 6.13.1.2(1)(f) Finish: Plastic laminate cab with stainless steel buttons and moving blankets for School building and MDF plywood for Maintenance/IT Building (if on multiple levels). Flooring to be non-slip rubber flooring;
- 6.13.1.2(1)(g) Provide access control proximity reader outside of each cab at each floor.
- 6.13.1.2(1)(h) Provide elevator access to all floors except for service access such as mechanical, electrical and control booth areas.
- 6.13.1.2(1)(i) Provide a vertical platform lift within the scope of CSA B355 for universal access to the theatre control booth.

6.14 Fire Suppression (Div. 21)

6.14.1 Fire Protection**6.14.1.1 Basic Requirements**

- 6.14.1.1(1) The sprinkler system and equipment will be designed to the occupancy classification and risk level that it protects.
- 6.14.1.1(2) Future flexibility will be in the form of larger capacity through pipe main sizing, fire pump sizing etc. This is to provide a system that can be adjusted, redistributed and added to without requirement of replacing mains or equipment.
- 6.14.1.1(3) Provide on the sprinkler system take-off from water supply an approved detector type double check valve assembly with approved listed OS&Y gate valves on both sides complete with tamper switches.
- 6.14.1.1(4) Locate zone shut-off valves in tamper-proof cabinets with no glass or plastic viewing panel. Cabinets will be constructed with minimum 10 gauge steel, adjustable front, reinforced door, complete with concealed hinges, and with security mechanical deadbolt locks. Cabinets will be located so they are visible and accessible from the floor in corridor with key lock. Do not conceal from view. Do not locate in janitor rooms, storage rooms, or stairwells. All valves controlling water flow will be monitored.
- 6.14.1.1(5) The fire pump, if required, will be provided by the Design-Builder and will require emergency power supply and will have a transfer switch which is part of the fire pump controller, package mounted in separate mechanically attached enclosure to form one assembly, specifically approved for the purpose as a complete unit. Fire pump will have 20% future capacity at design flow.
- 6.14.1.1(6) Sprinklers subject to freezing temperatures will be supplied by a dry system. This will include all components related to the system such as, but not limited to, an air compressor, automatic air maintenance, and control power. Alternatively, the use of non-freeze heads, fed from a wet system, is also acceptable.
- 6.14.1.1(7) Quick response concealed type sprinklers will be provided throughout, with temperature ratings to suit the specific hazard area.
- 6.14.1.1(8) Provide a double interlocked, cross zoned pre-action supplied sprinkler system to all rooms with sensitive equipment such as

main IT rooms and server rooms as called for in Appendix 1B Room Data Sheets

- 6.14.1.1(9) Each fire extinguisher will be located per relevant codes and to the satisfaction of the Owner and the inspection department of any authority having jurisdiction and each fire extinguisher will be approved for the hazard and classification of the space it serves
- 6.14.1.1(10) Future capacities will be proven through submission of design documents clearly showing design flows and sizing as well as the design + 20% flows and sizing.
- 6.14.1.1(11) Fire department connection to be located within 45m of fire hydrant.

6.14.2 Performance Criteria

- 6.14.2.1 All fire protection systems will be hydraulically sized to NFPA standards. Including NFPA 31 and 45 where applicable.
- 6.14.2.2 All equipment and installation will be in accordance with manufacturers' requirements.
- 6.14.2.3 All equipment will be ULC approved.
- 6.14.2.4 A qualified contractor licensed and regularly engaged in such installations will install all fire protection systems and equipment.
- 6.14.2.5 Provide backflow protection on all fire protection systems in accordance with local jurisdiction and CSA requirements.
- 6.14.2.6 Locate manually operated zone shut-off valves so they are visible and accessible from the floor in corridor with key lock. Do not conceal from view and do not locate in janitor rooms, storage rooms, or stairwells. All valves controlling water flow will be monitored.
- 6.14.2.7 Fire department connection will be installed at a location approved by the local authorities having jurisdiction.
- 6.14.2.8 Install fire extinguishers in a fully recessed cabinet. Cabinets will be of suitable for the risk level of the area it services.

6.15 Common Requirements (Mechanical Div. 22 and 23)

6.15.1 Scope of Work

- 6.15.1.1 The intent of these Sections is to outline requirements for mechanical, plumbing and drainage for the Facility that are not otherwise covered

by applicable codes and standards. It is not intended as a substitute for good engineering practice or fundamental design principles.

6.15.1.2 The intent is to provide systems that are reliable, flexible, maintainable and expandable to suit the needs of an educational facility over the life of the building.

6.15.1.3 The intent is that the Facility is economical to build, efficient to operate and sustainable when measured on a life cycle cost basis.

6.15.2 References

6.15.2.1 Compliance with applicable Codes and Standards is considered a minimum requirement. The appropriate level of design and specification in these documents may be higher to meet the Planning and Design Objectives and to follow the Mechanical Guiding Principles. The following list shall not be used to exclude any applicable legislation, code, standard or authority not listed.

6.15.3 Design and Performance Requirements

6.15.3.1 For the purpose of the Mechanical Systems section, the following definitions shall apply:

6.15.3.1(1) Air handling system: used to describe the complete system including equipment, distribution components, controls and associated power supply.

6.15.3.1(2) Essential area: An area of the Facility that must remain either fully or partially operational in order for the Facility to function effectively.

6.15.3.1(3) Essential loads: Any load that is required to operate, during a utility power outage, in order for the School Facility to function effectively, irrespective of the duration of the outage.

6.15.3.1(4) Load: The maximum peak load expected on a mechanical system or an item of mechanical distribution equipment. The load shall include a safety factor of 10%.

6.15.3.1(5) Nonessential load: Any load that, if unavailable for an indefinite period of time, would not jeopardize the ability of the School Facility to operate effectively.

6.15.3.1(6) Objectionable noise level: Noise generated from mechanical equipment that is disturbing to the occupants of the building, to neighbours of the Facility or disruptive to the functions performed

within the building. The specific sound pressure level deemed objectionable will vary with the specific area.

6.15.3.2 Mechanical Guiding Principles

6.15.3.2(1) The following Mechanical Guiding Principles shall be used in the development of mechanical systems:

6.15.3.2(1)(a) Flexibility and adaptability of the mechanical systems are key factors in the long term use of the School.

6.15.3.2(1)(b) Performance and reliability of the mechanical systems are paramount to the ongoing operations of the School.

6.15.3.2(1)(c) Mechanical systems must be maintainable to allow them to continue to serve their purpose. The serviceability of each system and component shall be factored into the design and installation. The mechanical systems shall be conceived, designed and installed to enable and encourage predictive, preventative and demand maintenance.

6.15.3.2(1)(d) The concept of sustainability shall be incorporated into all aspects of the mechanical systems. Minimizing Energy consumption is fundamental to sustainability, and the mechanical systems are a significant contributor to energy use in the Facility.

6.15.3.2(1)(e) Life cycle cost analysis shall be used to make decisions regarding the mechanical systems and equipment to be used.

6.15.3.2(2) Sustainability and Energy

6.15.3.2(2)(a) Comply with the sustainability requirements including energy use outlined in the Design-Build Agreement Schedule 8.

6.15.3.2(2)(b) Energy use shall be modeled at each stage of the design process on a progressively more detailed basis. Initial calculations for the purpose of evaluating system options may be based on methods that use bin or simplified weather data. Calculations for design development Stage or later shall use full year hourly analysis calculation methods.

6.15.3.2(3) Facility Operation and System Shutdown

- 6.15.3.2(3)(a) The systems shall be designed to permit maintenance, repair and replacement of most equipment without requiring a shutdown of an essential area.
- 6.15.3.2(3)(b) The systems shall be designed to permit the shutdown, isolation, or reset for purpose of conservation of energy for non-essential areas while allowing other non-essential areas to operate during off peak hours as required. The systems design shall minimize the impact of energy use during this condition.
- 6.15.3.2(3)(c) Equipment essential to the operation of the Facility should be located and protected so as to minimize exposure to hazards that could jeopardize continued operation.

6.15.3.2(4) Commissioning

- 6.15.3.2(4)(a) Commissioning includes the whole mechanical installation.
- 6.15.3.2(4)(b) The process to be followed shall ensure what has been constructed operates in accordance with the intent of the design.
- 6.15.3.2(4)(c) Sufficient time shall be built into the schedule for commissioning including resolution of outstanding issues.
- 6.15.3.2(4)(d) Compliance with the commissioning specification shall be verified by a representative independent of the constructor.
- 6.15.3.2(4)(e) Commissioning shall involve operating personnel to provide a link to the ongoing operations of the Facility.

6.15.3.3 Commissioning Agency

- 6.15.3.3(1) The work of this section will be as defined in the Design-Build Agreement Section 33. This includes the work required for both Fundamental Commissioning (EA Prerequisite1) and enhanced commissioning (EA Credit 3)
- 6.15.3.3(2) The Design-Builder's responsibility will be to coordinate the timing for the Commissioning Agents work when it is required and to cooperate with commissioning processes. This will include assistance with:

- 6.15.3.3(2)(a) The controls subcontractor will provide documentation confirming physical end to end checks on all control points have been performed
- 6.15.3.3(2)(b) When requested, the controls subcontractor will assist the commissioning agency in verifying software programming language.
- 6.15.3.3(2)(c) When requested, the Controls subcontractor will assist the commissioning agency in simulating system operation by opening and closing valves and dampers and enabling motor driven mechanical equipment.
- 6.15.3.3(2)(d) Submit to the commissioning agency and LEED Commissioning Authority 180 days prior to the scheduled Substantial performance, a detailed and comprehensive installation completion/start-up testing schedule including all subcontractors and suppliers involved.
- 6.15.3.3(2)(e) Attend and enforce attendance by all sub-trades requested by the commissioning agent at meetings during the commissioning process.
- 6.15.3.3(2)(f) Provide in Word format for review by the owner and their review consultants a summary of the design intent of the project.
- 6.15.3.3(2)(g) Coordinate and supervise the start-up of the various pieces of equipment and systems. Utilize the startup services of the manufacturers.
- 6.15.3.3(2)(h) Ensure that all the equipment is operating in a satisfactory manner.
- 6.15.3.3(2)(i) Resolve inter-subcontractor co-ordination problems. Where problems become apparent during the commissioning process work at the identification and resolution of these problems.

6.16 Plumbing (Div. 22)

6.16.1 Domestic Water

- 6.16.1.1 Provide domestic water services to plumbing fixtures and equipment;
- 6.16.1.2 References

- 6.16.1.2(1) American Society of Mechanical Engineers (ASME).
- 6.16.1.2(2) ASME B16.18 2001, Cast Copper Alloy Solder Joint Pressure Fittings.
- 6.16.1.2(3) ASME B16.22 2001, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- 6.16.1.2(4) ANSI/ASME BPVC IX-2007 – BPVC Section IX – Welding and Brazing Qualifications.
- 6.16.1.2(5) American Society for Testing and Materials International, (ASTM).
- 6.16.1.2(6) ASTM B32 08, Standard Specification for Solder Metal.
- 6.16.1.2(7) ASTM B88 03, Standard Specification for Seamless Copper Water Tube.
- 6.16.1.2(8) ASTM B664 90(06), Standard Specification for 80% Silver 20% Graphite Sliding Contact Material.
- 6.16.1.2(9) ASTM C547 07e1, Standard Specification for Mineral Fiber Pipe Insulation.
- 6.16.1.2(10) ASTM D2846/D2846M-06, Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems.
- 6.16.1.2(11) ASTM F437-06, Standard Specification for Threaded Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
- 6.16.1.2(12) ASTM F438-04, Standard Specification for Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40.
- 6.16.1.2(13) ASTM F439-06, Standard Specification for Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
- 6.16.1.2(14) ASTM F441/F441M-02, Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80.
- 6.16.1.2(15) ASTM F877-07, Standard Specification for Crosslinked Polyethylene (PEX) Plastic Hot- and Cold-Water Distribution Systems.

- 6.16.1.2(16) ASTM F1807-08, Standard Specification for Metal Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing.
- 6.16.1.2(17) American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).
- 6.16.1.2(18) ASHRAE 90.1 2007, Energy Standard for Buildings Except Low Rise Residential Buildings.
- 6.16.1.2(19) Plumbing and Drainage Institute (PDI).
- 6.16.1.2(20) PDI WH201 2006, Water Hammer Arrester Standard.
- 6.16.1.3 Design and Performance Requirements
 - 6.16.1.3(1) The incoming domestic water service shall be sized based on domestic water requirements, fire protection, and future loads.
 - 6.16.1.3(2) Water distribution systems shall maintain pressures at the point of use within established parameters.
 - 6.16.1.3(3) Water Pressure at any Outlet: minimum 140 kPa under flow conditions between 300 and 500 kPa static pressure.
 - 6.16.1.3(4) Size piping and select fittings to local plumbing code requirements.
 - 6.16.1.3(5) Type M copper pipe is not acceptable.
 - 6.16.1.3(6) Submit product data sheets for fixtures and equipment.
 - 6.16.1.3(7) Provide domestic water distribution system, including fittings required to service fixtures and equipment.
 - 6.16.1.3(8) Piping Installation:
 - 6.16.1.3(8)(a) Provide drain capability at low points.
 - 6.16.1.3(8)(b) Install piping to conserve headroom and space.
 - 6.16.1.3(8)(c) Route above grade piping parallel to walls.
 - 6.16.1.3(8)(d) Where practical, group piping at common elevations.
 - 6.16.1.3(8)(e) Install concealed pipes close to building structure to keep furring to a minimum.

6.16.1.3(8)(f) Joints in piping below grade will not be allowed; use continuous length pipe.

6.16.1.3(8)(g) Insulate hot and cold water piping to meet design temperature requirements in accordance with the National Energy Code for Buildings (MNECB) or ASHRAE 90.1 whichever is most stringent, and to prevent condensation.

6.16.1.3(9) Isolation Valves:

6.16.1.3(9)(a) Provide isolation valves for a maximum of 12 fixtures or 150 square metres, whichever is more stringent.

6.16.1.3(9)(b) Locate in accessible locations, to facilitate maintenance.

6.16.1.3(9)(c) Locate at supply piping to fixtures, or group of fixtures, and equipment.

6.16.1.3(9)(d) Locate at branch take offs and vertical risers.

6.16.1.3(9)(e) Locate where water shut off may be required.

6.16.1.3(9)(f) Locate at each individual appliance and faucet.

6.16.1.3(10) Water Hammer Arresters:

6.16.1.3(10)(a) Locate water hammer arresters in supply water lines at each fixture or group of fixtures, to prevent discernable water hammer during normal fixture operation.

6.16.1.3(10)(b) Provide water hammer arresters with accessible isolation valve for replacement of hammer arrestor devices. Water hammer arrestors shall not be the piston type or site fabricated air chambers.

6.16.1.4 Domestic Hot Water

6.16.1.4(1) Domestic hot water generation shall be via natural gas or heating hot water. Electric heating shall be limited to small local loads or limited local boosting of temperature. Solar preheating of water may be considered.

6.16.1.4(2) The relative economics of domestic hot water storage tanks shall be evaluated against instantaneous domestic hot water heaters. Instantaneous heaters may be fired with boiler heating hot water.

- 6.16.1.4(3) Except for small electric type systems used for local loads, the tanks shall be cleanable and be constructed from stainless steel or utilize fully bonded linings.
- 6.16.1.4(4) Domestic hot water recirculation piping shall be sized and arranged to ensure continuous flow in all branches of the piping system.
- 6.16.1.4(5) The maximum length of insulated piping from a recirculated main to a point of use shall be 6 metres or as required to provide hot water at system operating temperature within 15 seconds of initiation.

6.16.1.5 Water Filtration

- 6.16.1.5(1) Provide multi-stage filtration for safe drinking water with a minimum of a 5 micron cartridge filter for sediment, dirt, rust, and suspended matter and a separate carbon cartridge to reduce chlorine, taste and odours. Where filtration is centralized, provide sufficient redundancy to maintain the provision of filtered water during a failure or routine maintenance.
- 6.16.1.5(2) Filtered Water shall be provided at each domestic water fixture providing water that is consumed or processed for consumption. As a minimum, provide filtration at Lunch Rooms, Coffee Counters, Kitchenettes, and Ice Machine Alcoves for refrigerator drinking water/ice machine connections, dedicated drinking water taps (spigots), coffee machines, drinking fountains, ice machines, or similar type equipment, etc.
- 6.16.1.5(3) Filtration units shall be accessible for maintenance and changing of filters.

6.16.2 Drainage

6.16.2.1 Scope of Work

- 6.16.2.1(1) Waste and Vent Piping Systems
- 6.16.2.1(2) Cast iron soil pipe.
- 6.16.2.1(3) Epoxy coated cast iron soil pipe.
- 6.16.2.1(4) Copper pipe.
- 6.16.2.1(5) Acid resistant pipe for Science labs.
- 6.16.2.1(6) ABS pipe for buried pipe.

- 6.16.2.1(7) PVC pipe for buried pipe.
- 6.16.2.1(8) Waste Piping Specialties
- 6.16.2.1(9) Clean outs and clean out access covers.
- 6.16.2.1(10) Floor drains.
- 6.16.2.1(11) Area drains.
- 6.16.2.1(12) Planter drains.
- 6.16.2.1(13) Sumps.
- 6.16.2.1(14) Grease traps.
- 6.16.2.1(15) Roof Drains
- 6.16.2.1(16) Waste Piping Insulation.

6.16.2.2 References

- 6.16.2.2(1) American National Standards Institute (ANSI)
- 6.16.2.2(2) ANSI B16.18 2001, Cast Copper Alloy Solder Joint Pressure Fittings.
- 6.16.2.2(3) ANSI B16.22 2001, Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.
- 6.16.2.2(4) American Society for Testing and Materials (ASTM)
- 6.16.2.2(5) ASTM B32 08, Standard Specification for Solder Metal.
- 6.16.2.2(6) ASTM B306 02, Standard Specification for Copper Drainage Tube (DWV).
- 6.16.2.2(7) ASTM B664 90(2006), Standard Specification for 80% Silver 20% Graphite Sliding Contact Material.
- 6.16.2.2(8) ASTM C564 03a, Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- 6.16.2.2(9) ASTM D1002 0599, Standard Test Method for Apparent Shear Strength of Single Lap Joint Adhesively Bonded Metal Specimens by Tension Loading (Metal to Metal).

- 6.16.2.2(10) ASTM D2235 0496a, Standard Specification for Solvent Cement for Acrylonitrile Butadiene Styrene (ABS) Plastic Pipe and Fittings.
 - 6.16.2.2(11) ASTM D2564 04e1, Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
 - 6.16.2.2(12) ASTM D3138 04, Standard Specification for Solvent Cements for Transition Joints Between Acrylonitrile Butadiene Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Non Pressure Piping Components.
 - 6.16.2.2(13) ASTM G17 07, Standard Test Method for Penetration Resistance of Pipeline Coatings (Blunt Rod).
 - 6.16.2.2(14) Canadian General Standards Board (CGSB)
 - 6.16.2.2(15) CAN/CGSB 51 GP 52Ma [89], Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
 - 6.16.2.2(16) Canadian Standards Association (CSA)
 - 6.16.2.2(17) CAN/CSA B70 06, Cast Iron Soil Pipe, Fittings and Means of Joining.
 - 6.16.2.2(18) CAN/CSA B181.1 02, ABS Drain, Waste and Vent Pipe and Pipe Fittings.
 - 6.16.2.2(19) CAN/CSA B181.2 02, PVC Drain, Waste and Vent Pipe and Pipe Fittings.
 - 6.16.2.2(20) CAN/CSA B182.11 02, Recommended Practice for the Installation of Thermoplastic Drain, Storm and Sewer Pipe and Fittings.
 - 6.16.2.2(21) CAN/CSA B281 M90, Aluminum Drain, Waste and Vent Pipe and Components.
 - 6.16.2.2(22) National Plumbing Code of Canada 2015
 - 6.16.2.2(23) BC Building Code 2016
- 6.16.2.3 Design and Performance Requirements
- 6.16.2.3(1) Design sanitary waste systems and rain water drainage systems and install components in accordance with applicable regulations of the National Plumbing Code of Canada and the BC Building Code.

- 6.16.2.3(2) Provide acid waste pipework in all Science classrooms.
- 6.16.2.3(3) Provide drainage connections to all fixtures and equipment in the building where required for a complete and operational system.
- 6.16.2.3(4) Route pipes in an orderly manner to maximize flexibility in the layout of space and maintain proper grades.
- 6.16.2.3(5) Locate storm drain risers adjacent to fixed elements such as stairwells, shafts and columns.
- 6.16.2.3(6) Design piping routing located above grade and in visible locations parallel to walls and adjacent building elements.
- 6.16.2.3(7) Concealed piping shall be routed close to building structure to keep furring to a minimum. Where practical, group piping at common elevations.
- 6.16.2.3(8) Locate cleanouts for access from corridors or public spaces. Cleanouts shall not be located in classrooms.
- 6.16.2.3(9) Cleanouts, floor drains, access doors, interceptors, specialty drainage products shall be high quality institutional grade.
- 6.16.2.3(10) Oil interceptors, sediment tanks and neutralizing tanks (as required) shall be located in a room that allows for servicing.
- 6.16.2.3(11) The cleaning and pumping out of grease traps is minimized with enzymes but not eliminated. Allow sufficient access and space. Ensure generous location of cleanouts and sizing of discharge piping.
- 6.16.2.3(12) Provide a waterproof installation for floor drains located over occupied areas.
- 6.16.2.3(13) Provide dedicated trap primer systems to floor drains. Connections to water closet flush valves shall not be accepted.
- 6.16.2.3(14) Provide dedicated drains for equipment in Mechanical Rooms.
- 6.16.2.3(15) Drain piping subject to sweating shall be insulated including horizontal storm drains and air intake plenum drains. Insulate closest 1500mm length of piping from roof drains including roof drain sump. In exposed areas provide ULC listed PVC molded type jacketing material complying with the all applicable Codes and Standards.

- 6.16.2.3(16) Roof and floor drains shall be located to ensure that they are at the low points with a positive slope to the drain. The deflection of the structure must be considered.
 - 6.16.2.3(17) Secondary drain pans shall be provided under drain lines above food preparation areas, high tech equipment and critical storage spaces.
 - 6.16.2.3(18) Do not run piping containing water through Electrical Rooms or IT server rooms.
 - 6.16.2.3(19) Floating slabs shall be designed and installed to permit drainage of the void should water enter.
 - 6.16.2.3(20) Consideration shall be given to grey water storage and reuse.
- 6.16.2.4 Plumbing Fixtures
- 6.16.2.4(1) All plumbing fixtures shall be of institutional quality and bear stamp indicating CSA approval.
 - 6.16.2.4(2) All fixtures and equipment for handicapped use shall be in accordance with all applicable codes and regulations.
 - 6.16.2.4(3) Fixtures shall be free from flaws or blemishes. Surfaces shall be clear, smooth and bright and have dimensional stability. Visible parts of the fixture supply trim shall be chrome-plated, unless otherwise noted.
 - 6.16.2.4(4) Fixtures indicated for handicapped use shall be in accordance with section 3.7 of the 2012 British Columbia Building Code.
 - 6.16.2.4(5) Exposed trim, supplies, traps, tubing, escutcheons and valves to sanitary fixtures shall be chrome-plated finish.
 - 6.16.2.4(6) Supply and install all hangers, supports, brackets, reinforcement, 14 gauge steel back-up plates, floor flanges and all accessory piping and fittings, for the proper installation and support of all fixtures and their respective supply fittings.
 - 6.16.2.4(7) Waterless urinals are not to be used on the project.
 - 6.16.2.4(8) Provide non-freeze type, flush mounted hose bibs at 30-metre intervals around the perimeter of the building, one of which is to be at the garbage area.

- 6.16.2.4(9) Provide a hose-bibb in each mechanical room, in CTE wood, metal shops, and exterior locations every 10 metres on all faces of the building.
- 6.16.2.4(10) The Owner has requirement for self-closing, push-button faucets and shower valves and infrared flush urinals and water closets. Faucets in washrooms should be touchless type and vandal resistant.

6.16.3 Drinking Fountains

- 6.16.3.1 Provide drinking fountains complete with bottle fill and filtration on the site at the following locations: One total outside washroom and change room located near and intended to serve the gymnasium, weight room, theatre and band area, dance area and career technical education area; Provide one per classroom floor. Provide water service with backflow preventer with access in drywall. Alternatively, provide centralized filtration with a central backflow preventer, omitting the provision of point of use filtration; and
- 6.16.3.2 In addition, provide every Learning Neighbourhood with two (2) stainless steel counter mounted 560 mm x 430 mm x 200 mm sinks complete with faucet, and strainer with recessed alcoves complete with roll down lockable screen enclosure integral to millwork.

6.16.4 Natural Gas System

6.16.4.1 Basic Requirements

- 6.16.4.1(1) Before any work on the installation of the natural gas system commences, submit drawings, applicable sections of specifications and detailed drawings to the authority having jurisdiction as required to obtain approval. Approvals must be received prior to installation work commencing.
- 6.16.4.1(2) Provide natural gas distribution piping to equipment and appliances as required in Appendix 1B room data sheets.
- 6.16.4.1(3) Provide flow and pressure regulation and lockable shut-off in a secure location, away from public access, before entry into the Facility.
- 6.16.4.1(4) Below ground exterior piping will be polyethylene pipe, CSA certified.

- 6.16.4.1(5) Provide tracer wire alongside buried pipe work. Provide warning tape above buried pipe work. Survey and record as-built buried pipe routing and alignment.
- 6.16.4.1(6) Above ground piping will be Schedule 40 seamless Carbon Steel to ASTM A53 and CSA B-63.
- 6.16.4.1(7) Fittings will comply with the following criteria:
 - 6.16.4.1(7)(a) Screwed fittings will be malleable iron with beaded ends. Dielectric type will be used where a buried service enters and connects to building piping;
 - 6.16.4.1(7)(b) Welded will be forged steel of the same weight as the connecting pipe; and
 - 6.16.4.1(7)(c) Unions will be malleable iron with ground joints.

6.16.4.2 Joint Materials

6.16.4.2(1) Screwed: Thread lubricant.

6.16.4.2(2) Flanged: Full faced gasket materials, flanged steel weld neck, raised face type, carbon steel (ASTM A307) square headed bolts with hexagon nuts, bolts bull diameter of bolt holes

6.16.4.3 Pipe materials and joint methods will conform with the Canadian Standards Association, CSA B149.1, Natural Gas and Propane Installation Code.

6.16.4.4 Valves will satisfy the following:

6.16.4.4(1) BC Safety Authority approved and suitable for temperature to which they are exposed.

6.16.4.4(2) Provide a seismic actuated automatic shut-off valve, 20 to 150mm: C.G.A., UL and State of California certified seismic gas shutoff check valve with acceleration trigger mechanism, soft seat construction, visual open/close indicator and a manual reset capable of operating between -23°C and 66°C . The valve will actuate the shut off within 5 seconds when subjected to a horizontal sinusoidal oscillation having a peak acceleration of 0.3 G (2.94 m/s²) and a period of 0.4 seconds;

6.16.4.4(3) Gas pressure reducing valves will be: corrosion resistant; high performance reducing pounds to inches.

6.16.4.4(4) Interior gas service - screw or weld up to 50 mm, weld 65 mm and larger.

6.16.4.4(5) Interior gas service in unvented space, in supply or return air ceiling plenum, or operating at 35 kPa pressure - weld all sizes.

6.16.4.4(6) Exterior gas service - weld all sizes except for polyethylene pipe which will have no joints other than those allowed in NSC CAN/CGA-B149.1.

6.16.4.4(7) All branch connections except those less than half the diameter of the main will be made with welding tees.

6.16.4.4(8) Branch connections less than half the diameter of the main may be made with weldolets or thredolets.

6.16.4.4(9) Dielectric isolating couplings are not to be painted.

- 6.16.4.4(10) Heat shrink factory extruded polyethylene sleeves to be used over bare metallic pipe at welds.
- 6.16.4.4(11) Employ an independent testing agency to test the continuity of the polyethylene jacket, when metallic piping is buried, using a 12,000 volt Holiday Detector. Repair any breaks in polyethylene jacket with two layers of polyken tape. Submit report from testing agency certifying continuity of polyethylene jacket.
- 6.16.4.4(12) Install unions or flanges in connections to all equipment and specialty components.
- 6.16.4.4(13) Arrange piping connections to allow ease of access and removal of equipment.
- 6.16.4.4(14) Align and independently support piping connections to prevent piping stresses being transferred to equipment.
- 6.16.4.4(15) Install gas shut-off valves complete with handle at the following locations:
 - 6.16.4.4(15)(a) At the service entry point to the building immediately prior to entry; and
 - 6.16.4.4(15)(b) At each branch to an individual item of equipment or appliance.
- 6.16.4.4(16) All Facility isolation valves will possess locking lugs. Provide seismic valve at Facility main.
- 6.16.4.4(17) Terminate vent outlets to atmosphere at the following minimum lateral distances:
 - 6.16.4.4(17)(a) 3.0 m from any door, operable window or building opening.
 - 6.16.4.4(17)(b) 4.6 m from any air intake.
- 6.16.4.4(18) Allow for expansion with suitable anchors, guides and expansion loops to prevent undue stress on any part of the system. All piping will be welded with approved flexible connectors at point of connection to equipment.
- 6.16.4.4(19) Installation and testing will be in accordance with the Canadian Standards Association, CSA B149.1/2, Natural Gas and Propane Installation Code/Propane Storage and Handling Code.

6.17 Heating, Ventilating and Air (Div. 23)**6.17.1 Scope of Work**

6.17.1.1 Environmental design conditions, interior and exterior;

6.17.1.2 Energy conservation requirements.

6.17.2 References

6.17.2.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE);

6.17.2.2 ASHRAE/IESNA 90.1 07, Energy Efficient Design of New Buildings Except Low Rise Residential Buildings;

6.17.2.3 Canadian Commission on Building and Fire Codes National Research Council of Canada;

6.17.2.4 Model National Energy Code for Buildings (MNECB), 1997.

6.17.3 Design and Performance Requirements

6.17.3.1 Design complete and operational HVAC and water systems to achieve the required space environmental criteria in accordance with the Room Data requirements in Appendix 1B;

6.17.3.2 The HVAC system shall be integral in the overall building design in realizing reduction in design energy cost relative to a building constructed to the requirements of the Model National Energy Code of Canada for Buildings (MNECB) and achieving a Gold rating in accordance with the LEED Canada-NC, 2009 green building rating system;

6.17.3.3 Provide telecommunications rooms, server room and similar areas with dedicated 24 hour year round or free cooling when outdoor temperatures are suitable;

6.17.3.4 Ambient Design Conditions:

6.17.3.4(1) Exterior:

6.17.3.4(1)(a) Winter: To BC Building Code for project location, 1% January design temperature and wind velocity of 4.6 m/s.

6.17.3.4(1)(b) Summer: To BC Building Code for project location, 2.5% July design day and wet bulb temperature, wind velocity of 2.3 m/s.

6.17.3.4(2) Interior:

6.17.3.4(2)(a) As Room Data sheets.

6.17.3.5 Acoustic Requirements:

6.17.3.5(1) Maximum sound level at any occupied space in the project shall be in accordance with the Acoustics performance criteria indicated on the Space Data.

6.17.3.5(2) Select equipment and perform acoustic duct and transmission calculations using SMACNA and ASHRAE handbooks to meet or exceed design sound requirements.

6.17.3.6 Air Quality and Ventilation:

6.17.3.6(1) Carbon Dioxide: It is required to limit maximum occupied carbon dioxide levels to a set point of 850 ppm as measured within the high occupancy area. This is the absolute level to be used as an initial control set point; however it is considered adjustable to suit the ambient conditions and the calculated control levels in accordance with ASHRAE Standard 62;

6.17.3.6(2) Minimum outdoor air: not less than required by ASHRAE Standard 62 and depending on system proposed as described in section 5.2.1.1(2) of this Schedule, minimum outdoor air increased over ASHRAE requirements by 20% for a non-displacement system;

6.17.3.6(3) Locate outdoor air intakes to prevent contamination by external sources such as road traffic, smoke stacks or exhaust outlets.

6.17.3.6(4) Provide ventilation as indicated in Appendix 1B Room Data Sheets.

6.17.3.7 Energy Supply – Scope of Work

6.17.3.7(1) Gas from meter to equipment.

6.17.3.8 References

6.17.3.8(1) Canadian Standards Association (CSA)

6.17.3.8(2) CAN/CSA B139 04, Installation Code for Oil Burning Equipment.

6.17.3.8(3) CAN/CGA B149.1 05, Natural Gas and Propane Installation Code.

6.17.3.8(4) Canadian Council of Ministers of the Environment (CCME).

6.17.4 Design and Performance Requirements

6.17.4.1 Fuel Source

6.17.4.1(1) Natural Gas: Provide meters and regulators at buildings to ensure adequate gas supply to building.

6.17.4.2 Install systems in accordance with latest codes and standards. Install fuel oil storage tanks and other oil equipment to CAN/CSA B139 and to approval of authorities having jurisdiction;

6.17.4.3 Provide required connections and piping at mains, including necessary valves and service vaults from main to equipment;

6.17.4.4 Long runs of gas piping through buildings should be avoided;

6.17.4.5 Install natural gas pipe and equipment to CAN/CGA B149.1, and to utility requirements;

6.17.4.6 Equipment Location:

6.17.4.6(1) With the exception of specialized exhaust fans (i.e. kitchen exhaust) all equipment shall be located indoors, and positioned to allow for regular servicing without the use of temporary apparatus

6.17.5 Scope of Work

6.17.5.1 Boilers;

6.17.5.2 Heat Exchangers, Pumps;

6.17.5.3 Evaporative Coolers and Dry Condensers;

6.17.5.4 Direct Expansion Systems;

6.17.5.5 Refrigeration Piping;

6.17.5.6 Heat pumps.

6.17.6 References

6.17.6.1 Air Conditioning and Refrigeration Institute (ARI);

- 6.17.6.2 ARI 270 95, Sound Rating of Outdoor Unitary Equipment;
 - 6.17.6.3 American Gas Association (AGA);
 - 6.17.6.4 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE);
 - 6.17.6.5 ASHRAE 90.1 07, Energy Efficient Design of New Buildings Except Low Rise Residential Buildings;
 - 6.17.6.6 ASHRAE 15 07, Safety Standard for Refrigeration Systems;
 - 6.17.6.7 American Society of Mechanical Engineers (ASME);
 - 6.17.6.8 ASME B31.5 06, Refrigeration Piping and Heat Transfer Components;
 - 6.17.6.9 American Society for Testing and Materials (ASTM);
 - 6.17.6.10 ASTM B280 08, Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service;
 - 6.17.6.11 Canadian Standards Association (CSA);
 - 6.17.6.12 CSA B52 05, Mechanical Refrigeration Code;
 - 6.17.6.13 CSA O80 Series 08, Wood Preservation;
 - 6.17.6.14 Environment Canada (EC);
 - 6.17.6.15 Environmental Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems 1996.
- 6.17.7 Design and Performance Requirements**
- 6.17.7.1 Design Calculations
 - 6.17.7.1(1) Provide equipment, piping and accessories to provide necessary refrigeration capacity.
 - 6.17.7.1(2) Follow design guidelines and select equipment to guidelines in the EC Environmental Code of Practice.
 - 6.17.7.1(3) Minimum performance standard: to ASHRAE 90.1.
 - 6.17.7.1(4) Ventilation and Refrigerant Monitoring Requirements to CAN/CSA B52 and ASHRAE 15.
 - 6.17.7.2 Direct Expansion Systems: minimum performance standard: ASHRAE 90.1. Use environmentally accepted refrigerant;

- 6.17.7.3 Insulate refrigeration piping, to equipment manufacturer's recommendations;
- 6.17.7.4 Insulation shall be sufficient insulating value to prevent sweating of piping system at ambient temperature of 32 0C at 50% RH;
- 6.17.7.5 Outdoor Steel Supports and Ladders shall be hot dipped galvanized steel;
- 6.17.7.6 Wood shall be treated to CAN/CSA O80;
- 6.17.7.7 Insulation shall be suitable type and thickness to meet design requirements, with vapour barrier;
- 6.17.7.8 Cooling Towers, Evaporative Coolers and Dry Condensers: Use life cycle analysis to determine system type, or as recommended by chiller manufacturer and to suit project site conditions;
- 6.17.7.9 Equipment: CTI certified;
- 6.17.7.10 Provide piping and insulation to meet local code requirements;
- 6.17.7.11 Ensure or provide necessary structural support for large, heavy equipment;
- 6.17.7.12 Install outdoor equipment on supports approved by manufacturer. Provide additional structural support required;
- 6.17.7.13 Provide for access to outdoor units for maintenance and repair.

6.17.8 Heating Generation and Distribution

6.17.8.1 General Requirements

6.17.8.1(1) Sizing of Heating Plant

- 6.17.8.1(1)(a) Heating systems shall be designed to meet the peak coincident load of the Facility.
- 6.17.8.1(1)(b) Heating systems shall be designed so that 100% of the load may be maintained with the failure of a single boiler.
- 6.17.8.1(1)(c) When considering the capacity for which redundancy is required, the sizing should be based on the peak coincident load, however loads that are entirely discretionary and do not impact operations need not be considered provided a contingency plan has been developed to isolate the non-essential loads.

- 6.17.8.1(1)(d) The selection of individual heating source unit sizes shall take into account part loads including shoulder seasons to avoid running large boilers at low efficiency.
- 6.17.8.1(1)(e) The heat made available from a cogeneration machine or heat pump may be considered as if it was from a boiler provided it has the ability to operate on demand as a heating source.
- 6.17.8.1(1)(f) A sequence shall be in place to automatically shed heating loads when all equipment is not available (predetermined load shed).

6.17.8.2 Heating Plant Configuration

- 6.17.8.2(1) A hot water based plant shall be utilized to meet building heating requirements.

6.17.8.3 Types of Boilers

- 6.17.8.3(1) Low water content steam boilers shall be considered to minimize the need for additional operating staff.
- 6.17.8.3(2) Condensing boilers shall be considered for low temperature hot water applications.
- 6.17.8.3(3) Primary systems shall be staged to pump through only those components that are contributing heat to the system. Constant flow shall be maintained through operating boilers where required by manufacturers specifications.

6.17.8.4 Sizing of Plant

- 6.17.8.4(1) Redundancy capacity sizing should be based on the peak load, however loads that are entirely discretionary and do not impact School operations need not be considered provided a contingency plan has been developed to isolate these loads.

6.17.8.5 24/7 Cooling Loads

- 6.17.8.5(1) The 24/7 cooling loads in the IT Rooms will be maintained by means of in row cooling. Other areas requiring cooling may be:
 - 6.17.8.5(1)(a) Elevators machine rooms
 - 6.17.8.5(1)(b) Computer rooms
 - 6.17.8.5(1)(c) Communications closets

6.17.8.5(1)(d) UPS Rooms

6.17.8.5(2) plant.

6.17.8.6 Chillers and Operation

6.17.8.6(1) Consider the use of variable speed compressors.

6.17.8.6(2) Consider the use of a variable primary flow arrangement.

6.17.8.6(3) Consider the use of air cooled packaged units utilizing scroll, screw or small centrifugal compressors for 24/7 loads.

6.17.8.6(4) Chiller selection including type of refrigerant (HFC or HCFC) shall be based on minimizing the impact on the environment. Factors to be considered include LEED, energy use, ozone depletion, greenhouse gases, and carbon footprint.

6.17.8.6(5) Chillers and chilled water systems shall be configured to maximize the effective use of heat recovery.

6.17.8.6(6) Distribution systems and terminal units must be designed to utilize the lower temperature provided by heat pump systems.

6.17.8.7 Plant Replacement Strategy

6.17.8.7(1) The strategy for future plant and equipment replacement shall be imbedded in the design.

6.17.8.7(2) The repair and replacement of any part of a system shall not impact the operation of other systems.

6.17.8.7(3) A plan and report shall be written that documents the steps necessary to effect the replacement of all plant and equipment and submitted with the completed design. The documentation shall include all special equipment

6.17.8.7(4) The mechanical systems shall be designed to facilitate regular inspection and periodic maintenance.

6.17.8.7(5) Code mandated inspections shall be clearly stated so that this requirement is captured by Facility Management.

6.17.9 Scope of Work

6.17.9.1 Provide a complete and operational HVAC and water system, designed to achieve required space environment criteria;

- 6.17.9.2 Air distribution systems;
- 6.17.9.3 Hydronic distribution systems;
- 6.17.9.4 Other HVAC distribution systems.

6.17.10 References

- 6.17.10.1 Air Moving and Control Association International, Inc. (AMCA);
- 6.17.10.2 Air Conditioning and Refrigeration Institute (ARI);
- 6.17.10.3 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE);
- 6.17.10.4 ASHRAE 90.1 07, Energy Efficient Design of New Buildings Except Low Rise Residential Buildings;
- 6.17.10.5 American Society for Testing and Materials (ASTM);
- 6.17.10.6 ASTM A53/A53M 07, Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc Coated, Welded and Seamless;
- 6.17.10.7 National Fire Protection Association (NFPA);
- 6.17.10.8 NFPA 90A 02, Standard for the Installation of Air Conditioning and Ventilating Systems;
- 6.17.10.9 NFPA 96 08, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations;
- 6.17.10.10 National Electrical Manufacturers Association (NEMA);
- 6.17.10.11 NEMA MG 1 06 (R2007), Motors and Generators;
- 6.17.10.12 Sheet Metal and Air Conditioning Contractors National Association (SMACNA);
- 6.17.10.13 SMACNA HVAC Duct Construction Standards Metal and Flexible, 3rd Edition, 2005;
- 6.17.10.14 Underwriters Laboratories Inc. (UL).

6.17.11 Design and Performance Requirements

- 6.17.11.1 Fluid Distribution Systems
 - 6.17.11.1(1) Systems pipe shall be designed to ASTM A53/A53M.

- 6.17.11.1(2) Provide piping materials and select pipe size recommended by ASHRAE for associated medium and to suit design conditions.
- 6.17.11.1(3) Allow for system thermal expansion, to prevent structural failure or fluid leakage. Calculate location of anchors, guides and supports/hangers to minimize pipe flexing.
- 6.17.11.1(4) Install various HVAC distribution piping along similar routing where possible, to share pipe support structures. Locate pipe labels in similar locations.
- 6.17.11.1(5) Install piping to conserve space in buildings and to keep furring to a minimum.
- 6.17.11.1(6) Insulate to meet ASHRAE 90.1 or MNECB whichever is more stringent. Select saddles and rollers for hangers to protect insulation.
- 6.17.11.1(7) The arrangement of hydronic heating piping shall provide for logical isolation of systems. The location of isolation valves shall be well marked, and access shall be without removal of other equipment.
- 6.17.11.1(8) Propylene glycol with inhibitors shall be used.

6.17.11.2 Fluid Distribution System Pumps:

- 6.17.11.2(1) Pumps shall be selected for optimum efficiency over the design operating pressure range.
- 6.17.11.2(2) Provide system distribution pumps to pump chilled water, hot water, glycol, etc. from source supply pipe through distribution system and back to source return pipe.
- 6.17.11.2(3) Provide redundancy to meet operational requirements consistent with the redundancy requirements of the heating or cooling plant. Redundancy shall be provided for all heating pumps to allow heating systems to perform their intended function with one pump out of service.
- 6.17.11.2(4) Heating distribution systems shall be arranged for variable flow through the loads (coils, heat exchangers, terminal units). Pumps shall be fully modulating variable speed where the motors are above 2.0 kW, however this does not limit variable speed operation on smaller pumps.

6.17.11.3 Terminal Devices

- 6.17.11.3(1) Provide air and water terminal devices, sized and located to achieve required design environment.
- 6.17.11.3(2) Select and design terminal devices to meet full design load established based on 100% occupancy including 100% electronic equipment on at any one time for all rooms. Provide heating and cooling calculations where applicable.
- 6.17.11.3(3) Provide similar equipment from one manufacturer.
- 6.17.11.4 Variable and Constant Volume Terminal Units
 - 6.17.11.4(1) Terminal units shall be used on all supply air systems.
 - 6.17.11.4(2) Size and capacity to achieve design air flow. Select and locate units to achieve zone control as specified.
- 6.17.11.5 Control System: Direct digital controllers;
- 6.17.11.6 Operation: Duct pressure independent air flow control between minimum volume and maximum volume. Series type fan powered units where required for constant air delivery in a zone;
- 6.17.11.7 Reheat: Electric or hot water coils, operated independently of perimeter heating;
- 6.17.11.8 Ductwork downstream of boxes shall be equipped with engineered silencers to achieve design room acoustic criteria. Insulation within box shall be fibre-free;
- 6.17.11.9 Perimeter heating shall be provided by hot water radiant panels or wall fin radiation;
- 6.17.11.10 Perimeter heating may be provided via an all air system through local hot water heating coils. This shall be considered acceptable where heat loads are minimized and terminal units are operated independent of running the air handling systems;
- 6.17.11.11 Air Distribution Systems:
 - 6.17.11.11(1) Ducts shall be to the appropriate SMACNA HVAC Duct Construction Standards, Metal and Flexible. Joints sealed with duct tape shall not be considered acceptable construction standards.
 - 6.17.11.11(2) Balancing Dampers: Splitter dampers or balancing dampers where possible on larger main branches; duct balancing

dampers on small branches. Use outlet balancing devices only where branch balancing is not possible.

6.17.11.11(3) Fire and smoke dampers shall be located so that access for maintenance and testing can be performed without removal of systems or components other than access doors. Test protocols shall be developed and records kept of the maintenance performed.

6.17.11.11(4) Flexible Duct Connectors to diffusers shall be Maximum length 2 metres, ULC listed, rated for design system pressure. Flexible duct connectors shall not be used for terminal box inlets.

6.17.11.12 Grille & Diffuser Selection

6.17.11.12(1) Selections shall be based on maintaining occupant comfort.

6.17.11.12(2) Selections shall take into account target room noise levels.

6.17.11.13 Specific criteria for Classrooms:

6.17.11.13(1) Avoid drafts in the area of the occupants;

6.17.11.13(2) Acceptable methods for Supply air shall be via ceiling diffusers, low level displacement, or under floor supply where access floor can be fully utilized for this purpose;

6.17.11.13(3) Acoustic duct lining shall be used on exhaust systems only, to meet specified sound levels and/or room sound levels recommended by ASHRAE. Provide silencers for all supply air systems to meet specified sound levels.

6.17.11.13(4) Insulation shall be provided on exhaust ductwork where condensation can occur (i.e.: inlet to roof mounted exhaust fan)

6.17.11.13(5) Insulation shall be secured using insulation weld pins. Adhesive pins shall not be used.

6.17.11.13(6) Drain Pans shall be non-ferrous, non-corrosive externally insulated to prevent sweating at design conditions, sloped to drain at low point. Install deep seal P trap on drain line.

6.17.11.13(7) Consider the use of heat recovery equipment.

6.17.11.13(8) Fans shall be selected for optimum efficiency over the design operating pressure range.

6.17.11.13(9) Low velocity ductwork shall be used to minimize fan energy consumption.

6.17.11.14 Perform duct sizing calculations in accordance with SMACNA and/or ASHRAE guidelines;

6.17.11.15 Provide AMCA or ARI certified equipment where possible.

6.17.11.15(1) Test air distribution ductwork to SMACNA Duct Leakage Test Manual.

6.17.11.15(2) Duct distribution systems shall be clean before being operated and turned over for use. A pre-occupancy inspection shall be made to confirm duct cleanliness. Duct cleaning shall be performed before occupancy on all supply and return air systems. Air handling systems shall only be operated with the required level of filtration unless full cleaning of the ductwork is contemplated.

6.17.11.16 Exhaust Systems

6.17.11.16(1) In addition to anticipated building expansion, allowances shall be made in the design of air handling systems to add general exhaust capacity at a later date. Designated routes including vertical shafts and horizontal clearances shall be defined to allow for future exhausts to be added. Each floor shall allow for a minimum of 5% of the total air volume for the floor or 250 L/s whichever is greater.

6.17.11.16(2) Shower exhaust and similar high humidity areas shall be water tight aluminum or stainless steel up to dilution point;

6.17.11.16(3) Dishwasher exhaust duct shall be independent of other types of exhaust and constructed of non-corrosive aluminum or stainless steel.

6.17.11.17 Air Distribution Systems Plant Equipment

6.17.11.17(1) Air Handling Systems may be designed as:

6.17.11.17(1)(a) Systems supplying 100% outdoor air (once through ventilation);

6.17.11.17(1)(b) Systems supplying a mix of outdoor air and recirculated air;

- 6.17.11.17(1)(c) Systems that supply only recirculated air. These systems are normally only used to provide cooling on a local basis, or for the transfer of air from one location to another. (e.g.: transfer of air from Dining Room to Kitchen).
- 6.17.11.17(1)(d) Systems that supply a mix of outdoor air and recirculated air shall ensure that the percentage of outdoor air meets the requirements of the most stringent space that the system serves.
- 6.17.11.17(2) Where supply system volumes to a space are varied, the minimum outdoor air component shall be maintained during occupancy.
- 6.17.11.17(3) Heat recovery shall be provided on all air handling systems supplying 100% outdoor air.
- 6.17.11.17(4) Heat recovery shall be investigated for all air handling systems. Considerations include enthalpy wheels, hydronic heat transfer coils, and heat pipes.
- 6.17.11.17(5) Size air handling units to provide constant volume or variable volume at design air supply volume and pressures. Provide variable volume operation through use of variable frequency drives on motors. Select fans and motors to match variable frequency drive.
- 6.17.11.17(6) Enthalpy control shall be provided for all air handling units over 4720 L/s where air handling units mix return and outdoor air.
- 6.17.11.17(7) Mixing sections shall be specifically designed to ensure that the air leaving the chamber is well blended and not stratified. The use of de-stratification devices should be considered.
- 6.17.11.17(8) Design heating coils with capacity and the layout of plenums designed to avoid stratification under all conditions, particularly on morning start up.
 - 6.17.11.17(8)(a) Locate access doors away from building columns, coil piping and other interferences so they can be opened and access to components is achieved.
 - 6.17.11.17(8)(b) Exposed or unprotected glass fibers shall not be used in an air handling unit. Glass fiber may be used provided it is protected by a perforated liner and a protective film.

- 6.17.11.17(8)(c) Drains shall be provided in mixing sections, after condensing heat recovery components and after cooling coils. Drains may be considered in all sections of air handling units, and shall be provided in AHUs designed for internal wash down.
- 6.17.11.17(8)(d) Drains from AHUs shall be trapped to prevent air from the area surrounding the air handling unit to enter or leave the unit.

6.17.11.17(9) Air Filtration

- 6.17.11.17(9)(a) All outdoor and recirculated air supplied to any area of the Facility shall be filtered to remove contaminants at a level appropriate to the area being supplied. Areas shall include all service rooms, mechanical rooms, etc. with the exception of Diesel Generator rooms.
- 6.17.11.17(9)(b) Minimum filter efficiencies shall be as per LEED requirements. Higher levels may be considered based on local requirements.
- 6.17.11.17(9)(c) The types of filters, capital costs and replacement frequency shall be taken into account.
- 6.17.11.17(9)(d) Filters shall have a maximum design face velocity: 2.5 m/s. Provide pre filters and after filters as required to maintain air cleanliness design parameters.
- 6.17.11.17(9)(e) Consider additional filter area to reduce pressure drop and energy consumption.
- 6.17.11.17(9)(f) Rigid cartridge filters are required.
- 6.17.11.17(9)(g) Filters shall not be located directly downstream of devices that could cause the filters to become wet. This may include cooling coils, humidifiers, and heat recovery devices.
- 6.17.11.17(9)(h) Filter holding frames shall be sealed so not to bypass air around the filtration media. Filters other than prefilters shall be positively secured in place with continuous pressure against a gasket or seal. Individual filter frames with upstream access as required.
- 6.17.11.17(9)(i) All filter racks shall incorporate pressure monitoring.

6.17.11.17(9)(j) All air filters shall be located in serviceable locations.

6.17.11.17(10) Arrangement of Air Distribution Systems

6.17.11.17(10)(a) The zoning of air handling systems is an important consideration that must take into account a number of factors including:

6.17.11.17(10)(b) Relative locations of departments or functional areas with consideration for anticipated operating hours;

6.17.11.17(10)(c) Physical subdivisions of the building;

6.17.11.17(10)(d) The ability to distribute supply, return and exhaust air through shafts and ceiling spaces from the air handling unit location to the point of use;

6.17.11.17(10)(e) The requirement for recirculating air from one area to another;

6.17.11.17(10)(f) Future expansion and flexibility provisions;

6.17.11.17(10)(g) Fire and smoke management strategy including locations of separations as required. Compartmentalize architectural design and zone air handling systems to minimize the number of fire and smoke dampers;

6.17.11.17(10)(h) Zoning of the smoke control and/or smoke venting systems where required shall be coordinated with fire alarm and sprinkler zoning.

6.17.11.17(10)(i) Compartmentalization using the functional or department boundaries is a logical solution where economic selection of air handling units is possible.

6.17.11.17(10)(j) Air distribution systems shall allow for the shutdown of unoccupied areas. Operation of systems for outside of normal hours shall be considered for such reasons as occasional occupancy, after hours work, cleaning staff, etc.

6.17.11.17(10)(k) Zoning in larger or open plan areas to maintain temperature control shall take into consideration the size of the space, differences in heat gain and heat loss, and the nature of the occupancy.

6.17.11.17(10)(l) Terminal units shall be located in the ceiling space in the corridor or above the room, avoid adjacent rooms where possible.

6.17.11.17(11) Location and Accessibility for Maintenance of Air Distribution Plant

6.17.11.17(11)(a) Air handling plant shall be located to facilitate access for maintenance and repair.

6.17.11.17(11)(b) Stair access shall be provided as a minimum. Air handling plant shall be indoors with the exception of specialized exhaust fans (i.e. kitchen exhaust).

6.17.11.17(11)(c) The location and access to the air handling plant shall take into consideration the labour, consumable materials, tools and parts necessary to maintain and repair all components of the plant.

6.17.11.17(11)(d) Minimum access requirements shall be specified for all components that may have to be replaced or the life of the air handling unit.

6.17.11.17(11)(e) Sufficient space shall be provided beside all air handling units to remove and replace coils, humidifiers and fans without having to shut down other air handling units.

6.17.11.17(12) Outdoor Air Intakes and Exhausts

6.17.11.17(12)(a) The location of outdoor air intakes shall consider all sources of contaminants.

6.17.11.17(12)(b) The levels of contaminants entering a Facility through the ventilation system must meet health and safety requirements.

6.17.11.17(12)(c) Outdoor air intakes shall be located as remote as possible from accessible areas to limit the potential for ingestion of harmful or toxic contaminants. Minimum height above grade, platforms, accessible roofs, or other areas accessible by the public shall be 4 metres.

6.17.11.17(12)(d) Outdoor air intakes shall be located to minimize the possible of ingestion of common contaminants. Factors to consider include:

- 6.17.11.17(12)(e) Vehicle exhausts, particularly loading docks, delivery bays, transit stops, parking garages or adjacent roadways;
- 6.17.11.17(12)(f) Exhausts from adjacent structures (on site) ;
- 6.17.11.17(12)(g) Exhausts from spaces such as sanitary exhaust and general exhausts;
- 6.17.11.17(12)(h) Vents including combustion equipment discharges, emergency generator exhausts, kitchen vents, plumbing vents, relief vents, chiller vents;
- 6.17.11.17(12)(i) Sources of dust or standing water including green roofs;
- 6.17.11.17(12)(j) The location of air intakes shall take into account the potential for drifting of snow and vandalism.
- 6.17.11.17(12)(k) The location of exhausts shall minimize the possibility of contamination reaching:
 - (k).1 Air intakes;
 - (k).2 Ground level;
 - (k).3 Elevated roof areas designed for occupancy such as roof gardens, balconies or exercise yards;
 - (k).4 Opening windows where applicable;
 - (k).5 Adjacent occupancies.
- 6.17.11.17(13) Storm proof louvers shall be used, and shall be selected at an appropriate velocity to minimize the amount of water drawn in through outdoor air intakes. Drains shall be provided in all intake and exhaust plenums where positive drainage through the louver is not possible.
- 6.17.11.17(14) Verification:
 - 6.17.11.17(14)(a) Operate equipment and verify that performance requirements specified in this section has been achieved.
- 6.17.11.17(15) Commissioning
 - 6.17.11.17(15)(a) Test and adjust equipment and systems. Prove that equipment operates in the manufacturer's published operating range for selected model.
- 6.17.11.18 Scope of Work

6.17.11.18(1) Heaters, Hydronic and Gas Fired.

6.17.11.18(2) Make Up Air Units.

6.17.11.18(3) Infrared Radiant Heating.

6.17.11.18(4) Indirect Gas Fired Furnaces.

6.17.11.19 References

6.17.11.19(1) Air Moving and Control Association International, Inc. (AMCA)

6.17.11.19(2) AMCA 210 07, Laboratory Methods of Testing Fans for Aerodynamic Performance Rating

6.17.11.19(3) American National Standards Institute (ANSI)

6.17.11.19(4) ANSI Z83.6 90, Gas Fired Infrared Heaters.

6.17.11.19(5) Air Conditioning and Refrigeration Institute (ARI)

6.17.11.19(6) ARI 430 99 (R2002), Central Station Air Handling Units.

6.17.11.19(7) American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

6.17.11.19(8) ASHRAE 90.1 07, Energy Efficient Design of New Buildings Except Low Rise Residential Buildings.

6.17.11.19(9) Canadian Gas Association (CGA)

6.17.11.19(10) Canadian Standards Association (CSA)

6.17.11.19(11) CSA B149.2 05, Propane Storage and Handling Code.

6.17.11.19(12) CSA O80 Series 08, Wood Preservation.

6.17.11.19(13) National Fire Protection Association (NFPA)

6.17.11.19(14) NFPA 90A 02, Standard for the Installation of Air Conditioning and Ventilating Systems.

6.17.11.19(15) NFPA 90B 06, Standard for the Installation of Warm Air Heating and Air Conditioning Systems.

6.17.11.20 Design and Performance Requirements

6.17.11.20(1) Select equipment to maintain design space environmental requirements.

- 6.17.11.20(2) Select and design terminal and packaged units to meet full design load established based on 100% occupancy including 100% electronic equipment on at any one time for all rooms. Provide heating and cooling calculations where applicable.
- 6.17.11.20(3) Select and size equipment to operate at best efficiency points, to ASHRAE 90.1.
- 6.17.11.20(4) Drain Pans shall be non-ferrous, non-corrosive externally insulated to prevent sweating at design conditions, sloped to drain at low point. Install deep seal P trap on drain line.
- 6.17.11.20(5) Coils shall be ARI certified.
- 6.17.11.20(6) Install equipment to manufacturer's written instructions.

6.17.11.21 Supports

- 6.17.11.21(1) Locate outdoor equipment on supports recommended by manufacturer.
- 6.17.11.21(2) Provide proper load bearing support.

6.17.11.21(2)(a) Steel supports and ladders used outdoors shall be hot dipped galvanized.

6.17.11.22 Provide access to equipment for maintenance. Maintenance access for systems in the ceiling space shall be located outside of classrooms.

6.17.12 Specialty Exhaust Equipment

- 6.17.12.1 For Home Economics classrooms stove installations provide kitchen range hoods with baked enamel finish, resiliently mounted direct driven fan, three speed plug-in type motor with permanently lubricated bearings, control rocker switches for light and fan, dual 40-watt light sockets and bulbs, washable , removable aluminum mesh filter, backdraft damper and wall cap or roof cap as required. Hoods to be mounted so that clear line of sight is still available from the teacher's desk. Hoods shall NOT be the recirculating type.
- 6.17.12.2 For the Carpentry and Metalworking Shops provide separate non-recirculating dust extraction system, including dust collector, final filter bank, air diverting assembly, photohelic pressure gauges, silencer, manufacturer provided control panel, seismic restraints, shaker mechanism and dust containers;

- 6.17.12.3 For the Science classrooms provide a fume cupboard exhaust system either individual or combined to discharge at roof level. ;
- 6.17.12.4 For the kitchen provide a fire rated exhaust system with no fire dampers from a canopy supplied under the kitchen equipment package. Fan to be speed controllable and gas to ranges and equipment under the canopy should not become live until air flow is proved to the canopy;
- 6.17.12.5 For the CTE metal working area, provide for a purpose designed and supplied welding exhaust system capable of portable capture of welding fumes at source;
- 6.17.12.6 For the Maintenance/IT Building, the paint shop (8.04) shall have a paint spray booth complete with sprinklers, compressed air supply, filtration and exhaust to outside. Dimensions shall be approximately 3m x 2 m x 2.2 m high.

6.17.13 DDC Systems

- 6.17.13.1 Installation of all controls hardware, wiring and programming of software as required for a completely operational, commissioned control and monitoring installation for the mechanical systems described herein;
- 6.17.13.2 The HVAC control system shall be based on Direct Digital Control, hard-wired with electronic sensors and actuators;
- 6.17.13.3 The system provided shall comply with the requirements of the latest version of ANSI/ASHRAE Standard 135 "Data Communication Protocol for Building Automation and Control Networks";
- 6.17.13.4 The Owner's requirement is the system installed will be manufactured by Delta and installed by ESC Automation. The Owner is also open to a Reliable Controls installation, installed by a contracting firm licensed as a Reliable vendor as an Alternate, if a worthwhile cost saving is available;
- 6.17.13.5 It is the Owner's requirement the digital controls installation also controls building lighting systems;
- 6.17.13.6 The controls subcontractor shall coordinate the requirements of all mechanical and electrical equipment to be controlled and be responsible for the coordination and interface requirements between the Controls, HVAC and Electrical Systems, as well as existing conditions;

- 6.17.13.7 All new DDC controllers to be BTL listed;
- 6.17.13.8 All new electrical control components shall be CSA and ULC approved;
- 6.17.13.9 The DDC system shall simultaneously accommodate more than one operator working on the system;
- 6.17.13.10 Provide complete dynamic color graphical user interface;
- 6.17.13.11 Provide one additional RC-WB-A WebView site connection license which will be added to the existing District WebServer running the WebView Software. The controls subcontractor is responsible to setup the site onto the District WebView Server as per existing sites.
- 6.17.13.12 Wiring
 - 6.17.13.12(1) Provide all control wiring, whether line or low voltage, all system components, devices, actuators, relays, etc. as necessary for operation of the system.
 - 6.17.13.12(2) Include for all wiring associated with the heating boilers, including low water cut-offs and high temperature limits
 - 6.17.13.12(3) Include for line voltage wiring and required switches for manually controlled exhaust fans.
 - 6.17.13.12(4) Include for all wiring and pneumatic controls requirement of dust extraction systems.
 - 6.17.13.12(5) All wiring shall conform to the requirements of Division 16000 and the Canadian Electrical Code.
 - 6.17.13.12(6) Control wiring to be a minimum of 18 gauge, run in conduit or as plenum rated cable where described below.
- 6.17.13.13 Commission the control system installed, including:
 - 6.17.13.13(1) VISUAL end-to-end checks on all actuated devices.
 - 6.17.13.13(2) Provide verification and calibration check sheets for all actuated devices for inclusion in the Operation and Maintenance manual.
 - 6.17.13.13(3) Cooperate with the Testing, Adjusting and Balancing (TAB) agency for the following operations:
 - 6.17.13.13(3)(a) Actuating of control valves and dampers to assist with air and water systems balancing.

- 6.17.13.13(3)(b) Provide access to programming and software code for review.
- 6.17.13.13(3)(c) Assist with random end-to-end checks for verification of controls operation.
- 6.17.13.13(3)(d) Provide remote access to the TAB agency for the duration of the warranty period.
- 6.17.13.14 Provide training and instruction to the Owner's maintenance personnel. This should occur in two phases - 15 hours after completion and 10 hours after 3 months of operation, at mutually agreeable times;
- 6.17.13.15 The subcontractor is to include for two service visits during the warranty period, one at the start of the first heating season and one at the start of the first cooling season after substantial completion;
- 6.17.13.16 Provide for inclusion of the Operation and Maintenance manual complete As Built control drawings, sequences of operation, product data sheets for all newly installed products and end-to-end verification check sheets. Control drawings are to completely replace all existing control drawings for projects undergoing retrofit;
- 6.17.13.17 Provide and install point labels / baggage tags for all connected DDC points;
- 6.17.13.18 The controls subcontractor is to coordinate all shutdowns and system switchovers with the Owner prior to the activity taking place. Allow 2 weeks' notice to allow adequate time for the Owner to coordinate the activity.

6.17.14 System Description

6.17.14.1 General Requirements

- 6.17.14.1(1) The Control System shall be an on-line network of distributed, communicating microprocessor based stand-alone controllers, field sensors, control devices, enclosures and Interconnecting conduit and wire.
- 6.17.14.1(2) The networked components of the system shall make up a BACNet network – including at least a high speed and/or other LAN's interconnecting BACNet devices. Those devices on the BACNet inter- network shall communicate utilizing the BACNet protocol on BACNet LAN types.

- 6.17.14.1(3) Actuation of control devices shall be electronic. Fail-safe actuation shall be provided on all control dampers and primary equipment valves when property damage is possible without fail-safe operation.

6.17.15 Basic System Architecture

6.17.15.1 The system components shall include but not be limited to:

- 6.17.15.1(1) Operator Workstation with operating software (B-OWS)
- 6.17.15.1(2) Third Party Application Software
- 6.17.15.1(3) Building Controllers (B-BC)
- 6.17.15.1(4) Advanced Application Controllers (8-AAC)
- 6.17.15.1(5) Application Specific Controllers (B-ASC)
- 6.17.15.1(6) Panels and Enclosures
- 6.17.15.1(7) Field Sensors
- 6.17.15.1(8) Controlled Devices
- 6.17.15.1(9) Interconnecting Wire & Cabling
- 6.17.15.1(10) Network LAN's & Communication Protocols
- 6.17.15.1(11) Interfaces for Hardwire Connection to Variable Frequency Controls, Chillers and Lighting
- 6.17.15.1(12) Serial interface to other system listed below:
- 6.17.15.1(13) Field Sensors and Control Devices shall connect to peer-to-peer, fully programmable 8-BC, 8-AAC, & B-ASC as required to achieve the point monitoring and control sequences specified by the Consultant.
- 6.17.15.1(14) All devices are to be monitored by B-OWS. Controlled devices are to be electronically actuated.
- 6.17.15.1(15) Each mechanical system shall have a controller that shall be connected to all field sensors and control devices for that system.
- 6.17.15.1(16) Sensors and Control devices shall be UL listed.

6.17.16 Quality Assurance

- 6.17.16.1 Control System components shall be manufactured by firms regularly engaged in manufacture of equipment of the types and sizes required;
- 6.17.16.2 The controls subcontractor shall be a licensed subcontractor specializing and experienced in control system installations for no less than 5 years and with experience in networked microprocessor based commercial HVAC and Electrical control systems installation with point counts equal to this project;
- 6.17.16.3 All employees of the controls subcontractor involved in the engineering, programming and commissioning of the DDC system shall have successfully completed the manufacturer's classes on the control system. Provide proof of certification copies through to the Design Authority or to the Owner if requested;
- 6.17.16.4 The BACNet inter-network shall be based on the manufacturer's standard integrated hardware and software product offering, which has been installed and fully operational in similar service for not less than 2 years;
- 6.17.16.5 To the extent practical, all equipment of the same type serving the same function shall be identical and from the same manufacturer.

6.17.17 System Performance

- 6.17.17.1 The system shall conform to the following performance standards:
 - 6.17.17.1(1) Graphics shall display with a minimum of 50 dynamic current data points and within 2 seconds of the request.
 - 6.17.17.1(2) The maximum time between the command of a binary object by the operator and the reaction by the device shall be 2 seconds. Analog objects shall start to adjust within 2 seconds of being commanded to change.
 - 6.17.17.1(3) All changes of state or change of analog values shall be transmitted such that no reporting of a value is more than 2 seconds old.
 - 6.17.17.1(4) The maximum time from when an object goes into alarm to when it is annunciated at the B-OWS shall not exceed 2 seconds.
 - 6.17.17.1(5) B-BC, B-AAC, & B-ASC shall be able to execute control loops at a selectable frequency at least 5 times every second. The controller shall scan and update the process value and output generated by this calculation at this same frequency.

6.18 Electrical (Div. 26)

6.18.1 General

6.18.1.1 Basic Requirements

- 6.18.1.1(1) The Design-Builder shall supply and install all material necessary to complete and make operational the electrical systems.
- 6.18.1.1(2) Refer to Appendix 1G Systems Responsibility Matrix.
- 6.18.1.1(3) Refer to Section 6.6 Openings for hardware requirements.
- 6.18.1.1(4) Refer to Schedule 2A of the Design-Build Agreement for submittal requirements.
- 6.18.1.1(5) The Design-Builder shall comply with all requirements in this section as well as all the electrical requirements in other sections and associated appendices.
- 6.18.1.1(6) All electrical systems, materials, and equipment in the Facility shall be new, and of a type and quality intended for use in a permanent educational facility. Remanufactured or refurbished equipment will not be permitted. All equipment and their components shall have a visible manufacturer's nameplate, indicating the manufacturer's name, model number, serial number, cUL listing, capacity, electrical characteristics and approval stamps. The electrical systems shall provide proper protection, continuity of service and a safe working environment for staff and students.
- 6.18.1.1(7) The Design-Builder shall be responsible for all coordination of all electrical or systems interfaces with all divisions involved.
- 6.18.1.1(8) The Design-Builder shall identify on electrical drawings for all locations of all fire-rated partitions and smoke separations.
- 6.18.1.1(9) The Design-Builder shall comply with the latest editions and revisions of all applicable Standards including, but not limited to, those standards listed in Section 2.1 Standards and the following:
- 6.18.1.1(9)(a) American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) 90.1;
 - 6.18.1.1(9)(b) Canadian Electrical Code and BC Electrical Safety Branch Regulations and Bulletins;

- 6.18.1.1(9)(c) British Columbia Fire Code including the requirements of the local Owner having jurisdiction;
 - 6.18.1.1(9)(d) National Energy Code of Canada for Buildings;
 - 6.18.1.1(9)(e) National Fire Protection Association (NFPA) Standards;
 - 6.18.1.1(9)(f) CAN/ULC S524 Standard for the Installation of Fire Alarm Systems;
 - 6.18.1.1(9)(g) CAN/ULC S537 Standard for the Verification of Fire Alarm Systems;
 - 6.18.1.1(9)(h) EIA/TIA 568 Telecommunication Cabling Standard;
 - 6.18.1.1(9)(i) All Electrical Safety Branch Directives and Bulletins;
 - 6.18.1.1(9)(j) British Columbia Building Code; current edition.
- 6.18.1.1(10) The Design-Builder shall provide duplex receptacles in accordance to Appendix 1E Furniture Fixtures & Equipment List, and additional duplex receptacles every 5m for convenience in Common Area.
- 6.18.1.2 Performance Requirements
- 6.18.1.2(1) The Design-Builder shall:
- 6.18.1.2(1)(a) Install every electrical system in a fixed and permanent manner;
 - 6.18.1.2(1)(b) Install equipment to strategically occupy spaces;
 - 6.18.1.2(1)(c) Provide sufficient space for future additions;
 - 6.18.1.2(1)(d) Locate Electrical and Telecommunication rooms to provide easy access for maintenance and inspections of equipment;
 - 6.18.1.2(1)(e) Provide record drawings and operation and maintenance manuals in accordance with the Design-Build Agreement, Project Binder and Record Drawings.
- 6.18.1.2(2) The Design-Builder shall select the appropriate firestop assembly to suit that type of penetration and shall comply with the selection criteria specified herein.

- 6.18.1.2(2)(a) Follow all of the manufacturer's documentation, including but not limited to the approved shop drawings, for proper installation of each firestop product and system. All firestop assemblies shall be installed in accordance with the manufacturer's written instructions in order to maintain the specific rating assigned by the applicable independent testing laboratory.
- 6.18.1.2(2)(b) In all finished areas make good the surface area surrounding firestop penetrations to match finished quality of adjoining surfaces.
- 6.18.1.2(2)(c) Provide damming materials, plates, wires, restricting collars, and any other devices necessary for proper installation of the firestop product or system.
- 6.18.1.2(2)(d) Remove all combustible installation aids after firestopping material has cured.
- 6.18.1.2(2)(e) Remove excess materials and debris and clean adjacent surfaces immediately after application of firestop products.
- 6.18.1.2(3) The following products are approved for use only in the specific applications for which they are rated and tested. Additional products will be considered for approval, provided that they are produced by an approved manufacturer.
- 6.18.1.2(3)(a) Sealants
- (a).1 Hilti FS-ONE Intumescent Firestop Sealant
 - (a).2 STI LCI Intumescent Sealant
- 6.18.1.2(3)(b) Plugs
- (b).1 Hilti CP 658 Firestop Plug
 - (b).2 STI SpecSeal Series FP Intumescent Firestop Plugs
- 6.18.1.2(3)(c) Fire Blocks
- (c).1 Hilti FS 657 Fire Block
- 6.18.1.2(3)(d) Pillows
- (d).1 STI Series SSB Firestop Pillows
- 6.18.1.2(3)(e) Putty
- (e).1 Hilti CP 617 Firestop Putty Pad
 - (e).2 Hilti CP 618 Firestop Putty Stick
 - (e).3 STI SpecSeal SSP Intumescent Putty

- 6.18.1.2(3)(f) Fire Rated Pathways (to be used for Cable Tray penetrations)
 - (f).1 Wiremold FlameStopper Thru-Wall Fittings
 - (f).2 Specified Technologies EZ-Path

6.18.1.2(4) The Design-Builder shall allow for 200 workstations distributed throughout the Facility in addition to the requirements of Schedule 1 and all appendices. Each workstation shall be on normal power and require at least two(2) duplex receptacles and two(2) UTP drops (one(1) data and one(1) for telephone). The exact locations of the workstations will be finalized with Owner during design development.

6.18.2 Load Classification and Identification

6.18.2.1 Performance Requirements

6.18.2.1(1) The Design-Builder shall provide a detailed load calculation showing the UPS load.

6.18.2.1(2) The Design-Builder shall provide identification as follows:

- 6.18.2.1(2)(a) All main distribution switches, breakers, panels, transformers, generators, control devices, disconnect switches and other major electrical equipment with Lamicaid plates. Use black lettering on white face. Lettering on name tags shall be sized as follows:

Equipment	Height of Letters
Main Distribution Panel (MDP)	12.7mm (.5")
Overcurrent Protection Devices in MDP	6.4mm (.25")
Branch Circuit Panelboards	6.4mm (.25")
Disconnect Switches (200A or less)	6.4mm (.25")
Disconnect Switches (Greater than 200A)	12.7mm (.5")
Motor Starters	6.4mm (.25")

- 6.18.2.1(2)(b) In terminal cabinets for control wiring, sound wiring, telephone and/or data cable, fire alarm wiring, and similar systems, identify terminal strips and other similar equipment with 4.8mm (3/16") roll adhesive back embossed type name tags (clear adhesive with black lettering). Include a wiring diagram in the cover for each terminal cabinet.

- 6.18.2.1(2)(c) Typewritten panel directories for each circuit, referencing the room in which the equipment served is located. Include the room number and room description in the reference (e.g. "PE – Gym 100 North Wall"). Similar method shall be utilized for Data and security equipment and outlets.
- 6.18.2.1(2)(d) Disconnect Switches, Starters and Contactors: Indicate equipment being controlled, location by room number, voltage, and phase (e.g., "EF-10, WC A120, 120V, 1gi").
- 6.18.2.1(2)(e) Terminal Cabinets: Indicate system and voltage.
- 6.18.2.1(2)(f) Remote On/Off Switches: Indicate area(s) being served by room number.
- 6.18.2.1(3) Design-Builder shall use the room numbers that will be used by the occupants, not the room numbers used in the contract documents. Confirm actual room numbers with Owner and Coordinating Consultant prior to creating labels.

6.18.3 Electrical and Utility Services

6.18.3.1 Basic Requirements

- 6.18.3.1(1) The Design-Builder shall coordinate all power, telecommunication, and CATV utility services with City of New Westminster, TELUS and Shaw. Design-Builder shall conduct the construction in accordance with the relevant utility standards and requirements, including the City of New Westminster utility standards.
- 6.18.3.1(2) The Design-Builder shall provide type DB2 utility service entrance ducts, or as required by the local utility. Provide drainage of ducts in accordance with utility standards.

6.18.3.2 Performance Requirements

- 6.18.3.2(1) The Design-Builder shall provide:
 - 6.18.3.2(1)(a) Two underground electrical services (one for the School and one for the Maintenance/IT Building) from the City of New Westminster facility to the Main Electrical Rooms within the Facility. The switchgear for these incoming services shall be rated for 600V.

- 6.18.3.2(1)(b) Sufficient capacity of the utility connections, cable and incoming high voltage switchgear for the connected load requirements plus 25% spare capacity.
- 6.18.3.2(1)(c) Separate underground service ducts as required by TELUS and Shaw to the services Entrance Facility in the School building Main Telecommunications Room and to the services Entrance Facility in the Maintenance/IT Building Server Room.
- 6.18.3.2(1)(d) Concrete encasement, location marking, and other means to guard against accidental disruption of utility connections by on-site or near-site activities. The installation shall be in accordance with the individual utility company standards and requirements.
- 6.18.3.2(2) The Design-Builder shall pay for all the utility costs and related work with no additional cost to the Owner.
- 6.18.3.2(3) The Design-Builder shall ensure the location of utility ducts will not interfere with any known future expansion of the Facility.

6.18.4 Seismic Requirements for Electrical Systems

6.18.4.1 Basic Requirements

- 6.18.4.1(1) The Design-Builder shall provide seismic restraint for all electrical equipment and components of electrical systems including telecommunication racks and low voltage systems.
- 6.18.4.1(2) The Design-Builder shall submit shop drawings including details of all connections, bracing, and restraints for equipment requiring seismic restraint and/or vibration isolation. Shop drawings submitted shall bear the Seismic Engineer's Seal.
- 6.18.4.1(3) Where drilling of the structure is required for anchorage details, the drilling shall be subject to the approval of the Structural Engineer of Record for the project.
- 6.18.4.1(4) The Design-Builder shall provide the following underground service components as per the following requirements:
 - 6.18.4.1(4)(a) Primary ducts and secondary ducts, whether concrete encased or directly buried, shall be rigid type DB2 polyvinyl chloride conduit conforming to the latest edition of CSA C22.2 No 211.1.

- 6.18.4.1(4)(b) Install underground utility service boxes as directed by Utility "For Construction" drawings.
 - 6.18.4.1(4)(c) All other underground junction boxes shall be manufactured by West Coast Engineering or Armtec.
 - 6.18.4.1(4)(d) Provide drainage rock pit below all junction boxes.
 - 6.18.4.1(4)(e) Bell ends, couplings, adapters, bends and other fittings shall be of the same material as the duct. Solvent recommended by manufacturer shall be used.
 - 6.18.4.1(4)(f) Only factory bends are acceptable.
 - 6.18.4.1(4)(g) Plastic Warning Tape Trace: 150mm (6") wide yellow polyvinyl tape.
- 6.18.4.1(5) The Design-Builder shall provide and install ductbanks as per the following:
- 6.18.4.1(5)(a) Contact and coordinate with each utility prior to installation of any underground services to ensure full coordination with the utility's "For Construction" drawings and all civil site and offsite servicing drawings.
 - 6.18.4.1(5)(b) Install on undisturbed soil where possible. Provide sand cover and backfill as indicated in conduit section in drawings.
 - 6.18.4.1(5)(c) Clean ducts with full size mandrel and swab all ducts. Install 7mm (¼") nylon pull cord in all ducts.
 - 6.18.4.1(5)(d) All service ducts to be installed not less than 1m (3'), and not more than 1.8m (6'), below finished grade.
 - 6.18.4.1(5)(e) Rigid threaded galvanized steel conduit shall extend not less than 3m (10') from building.
 - 6.18.4.1(5)(f) Halfway between ductbank and finished grade, supply and install 150mm (6") wide polyvinyl warning tape for entire length of each ductbank on site.
 - 6.18.4.1(5)(g) Clean ductbanks before installation. Cap ends of ducts during construction and after installation to prevent entrance of foreign materials.
- 6.18.4.1(6) The Design-Builder shall install primary & secondary services ducts to comply with all regulations and by-laws of the supply

and inspection authorities. General routing to be coordinated with new and existing underground services.

- 6.18.4.1(7) The Design-Builder shall install the telephone service as per the following requirements:
- 6.18.4.1(7)(a) Install underground telephone services as required by Telus. General routing to be coordinated with new and existing underground services.
 - 6.18.4.1(7)(b) Install two (2) 100mm (4") rigid PVC duct from the main telephone terminal board (MTTB) to the service point as directed by Telus.
 - 6.18.4.1(7)(c) Provide nylon pull cord in each and every telephone service duct.
 - 6.18.4.1(7)(d) Telephone service cables to be supplied and installed by Shaw Cablesystems.
 - 6.18.4.1(7)(e) Design-Builder to arrange and coordinate telephone service requirements with Owner and telephone supply authority. Coordinate and schedule all work and inspections to be completed by Telus.
- 6.18.4.1(8) The Design-Builder shall install the television service as per the following requirements:
- 6.18.4.1(8)(a) Install new underground cable television service as detailed on the drawings and as required by Shaw Cablesystems. General routing to be coordinated with new and existing underground services.
 - 6.18.4.1(8)(b) Install one (1) 100mm (4") rigid PVC duct from the main television terminal board (MTVTB) to the service point as directed by Shaw Cablesystems.
- 6.18.4.1(9) Primary service ductbank to slope to low point adjacent to building for drainage purposes.
- 6.18.4.1(10) The Design-Builder shall provide:
- 6.18.4.1(10)(a) T fittings and drain pipe to rock pit for each service duct;
 - 6.18.4.1(10)(b) Drainage rock pit for each T-Drain.
- 6.18.4.1(11) The Design-Builder shall provide seismic restraint systems and methods that comply with the following:

- 6.18.4.1(11)(a) Facilitates ease of maintenance and ease of replacement and reconfiguration of electrical equipment and systems and other equipment and the Facility components.
- 6.18.4.1(11)(b) Coordinates with the building architecture and finishes. Components of seismic restraints shall, wherever practicable, be concealed from public view. Where concealment is not practicable the systems shall be designed to complement the building architecture and finishes.
- 6.18.4.1(11)(c) Meets or exceeds the requirements of the current edition of the BCBC and National Building Code.
- 6.18.4.1(11)(d) Follows the recommended practices published in the Seismic Restraint Standards Manual (AIBC) as adopted by the Electrical Contractors Association of BC and CSA S832-06 Guide/lines for Seismic Risk Reduction of Operational and Functional Components.

6.18.4.2 Performance Requirements

- 6.18.4.2(1) The seismic restraint systems and structural capacity, or, where an identified pre-designed standard restraint device or system exists for a particular item, shall be designed by a professional engineer registered in British Columbia.

6.18.5 Grounding and Bonding

6.18.5.1 Basic Requirements

- 6.18.5.1(1) The Design-Builder shall properly bond and ground all electrical equipment and systems in the Facility in accordance with the most current edition of the Canadian Electrical Code, TIA Standards, and local codes and by-laws.
- 6.18.5.1(2) The Design-Builder shall provide grounding and bonding for safety of personnel and for protection against damage to equipment or property in the case of a fault occurring in any of the equipment or systems.

6.18.5.2 Performance Requirements

- 6.18.5.2(1) The Design-Builder shall ensure all conductors and conducting components which form part of the grounding and bonding systems in the Facility shall be of non-alloyed copper.

- 6.18.5.2(2) The Design-Builder shall provide grounding grid consisting of minimum three 20mm (3/4") x 3m (10') copper clad steel driven rods (or the amount necessary to obtain acceptable levels) with #3/0 bare stranded copper interconnecting cable. Install two cables from the grid to the main ground bus in the electrical room.
- 6.18.5.2(3) The Design-Builder shall provide a ground bus adjacent to the main distribution panel install a continuous main ground bus, of hard drawn copper, flat, 50 mm (2") wide x 6 mm (1/4") thick, length as required. Mount on insulating standoffs. Install complete with lugs suitable for grounding cables.
- 6.18.5.2(4) The Design-Builder shall provide cable connections to ground rods shall be made with approved exothermic welds or Thomas & Betts ground system compression connectors. Also provide #3/0 bare copper ground conductor between all wall mounted ground busses on the same power distribution system
- 6.18.5.2(5) The Design-Builder shall provide the following:
- 6.18.5.2(5)(a) One #4/0 bare ground conductor in 25mm (1") conduit from ground bus to service ground lug on main distribution panel.
 - 6.18.5.2(5)(b) One #4/0 insulated ground conductor in 25mm (1") conduit from Main Electrical Room ground bus to water main with approved ground clamp ahead of water meter. Install one #3/0 ground conductor jumper of flexible copper strapped around water meter and associated unions and valves to ground building side of water system.
 - 6.18.5.2(5)(c) Grounding bushings, grounding studs and grounding jumpers at all distribution centres, pullboxes, meter centres, and panelboards where separate grounding conductors are indicated.
 - 6.18.5.2(5)(d) Bonding conductors to lugs on boxes, tubs and other conductive enclosures. Use conductors with green insulation, sized by CEC Table 16. Connection to neutral to be made only at service neutral bar with a dedicated lug.

- 6.18.5.2(5)(e) Bonding wire in all flexible conduits. Connect wire at each end to a grounding bushing, solderless lug, clamp, cup washer and screw.
- 6.18.5.2(5)(f) All interior metallic gas piping to be made electrically continuous and to be bonded in accordance with the requirements of the current edition of the Canadian Electrical Code.
- 6.18.5.2(5)(g) Each metallic waste water piping system in the building to be grounded by bond to the interior metallic water supply system with copper bonding jumper of not less than #6 AWG as per the current edition of the Canadian Electrical Code.
- 6.18.5.2(5)(h) Ground applicable communication systems as follows:
 (h).1 Telephone & Data:
 (h).2 One #6 TWH in 20mm (3/4") conduit from main ground bus to main telecommunications ground bus.
 (h).3 One #12 TWH from telecommunications ground bus to all metal conduits terminating at backboard.
- 6.18.5.2(5)(i) Fire Alarm:
 (i).1 One #8 TWH in 16mm (1/2") conduit to main ground bus.
- 6.18.5.2(5)(j) Television Distribution System:
 (j).1 One #6 TWH in 20mm (3/4") conduit from main ground bus to main telecommunications bus.
- 6.18.5.2(5)(k) Security Systems:
 (k).1 One #8 TWH in 16mm (1/2") conduit to main ground bus.
- 6.18.5.2(5)(l) Sound & PA Systems:
 (l).1 One #8 TWH in 16mm (1/2") conduit to main ground bus.
- 6.18.5.3 Each feeder and branch circuit shall have a separate green insulated equipment bonding conductor.
- 6.18.5.3(1) Main Electrical Room and all Telecommunication Rooms shall be provided with a copper ground bus bar.

- 6.18.5.3(2) A 4/0 AWG grounding conductor in conduit shall be extended from the main building ground for each building to the Main Electrical Room and from there to each additional sub-distribution room.
- 6.18.5.3(3) A 4/0 AWG grounding conductor in conduit shall be extended from the main building ground for each building to the Main Telecommunications Room and from there to each Telecommunications Room.
- 6.18.5.3(4) All panelboards shall be fitted with a branch circuit grounding terminal bus firmly bonded to the inside of the panelboard case and consisting of a length of copper grounding bus with one terminal for each circuit position available in the panel. Branch circuit equipment grounding conductors shall terminate at the ground bus.
- 6.18.5.3(5) The Design-Builder shall commission an approved testing agency to perform a main system ground test and provide a report confirmation to the Owner.

6.18.6 Power Quality

6.18.6.1 Basic Requirements

- 6.18.6.1(1) The Design-Builder shall provide an overall power quality which assures suitable conditions for operation of all electrical and electronic equipment throughout the Facility.
- 6.18.6.1(2) The Design-Builder shall provide equipment and systems, which meet applicable codes and standards to prevent electrical equipment and systems from being harmed or impaired either by external events or conditions, such as lightning and disturbances on the utility service, or by Facility generated internal events or conditions.

6.18.6.2 Performance Requirements

- 6.18.6.2(1) The Design-Builder shall provide equipment specifically designed to meet applicable codes and standards to control and remove all adverse power quality conditions that could damage or impair function of any of the electrical or electronic equipment, which will be in use in the Facility. Adverse power quality conditions to be addressed include, but are not limited to voltage spikes, dips and droops, transients, harmonics, power factor and radio frequency interference.

- 6.18.6.2(2) The Design-Builder shall provide power factor correction to ensure overall Facility power factor does not fall below 90% lagging or leading, and that the utility does not apply a power factor penalty.

6.18.7 Backup Power

- 6.18.7.1 The Design-Builder shall provide a stand-by diesel generator for the Maintenance/IT Building for backup power for all IT equipment and systems. The generator shall be sized to support all service rooms and systems specified by the Owner including the in-row cooling system. The generator shall be sited in a discrete and unobtrusive locations
- 6.18.7.2 The Design-Builder shall provide at least 25% spare generator load capacity.
- 6.18.7.3 The Design-Builder shall provide 8kW of backup power to each telecommunications rack.
- 6.18.7.4 The Design-Builder shall provide all equipment required to ensure the system is fully functional under partial loading conditions
- 6.18.7.5 The Design-Builder shall provide fuel supplies sufficient for twelve hours of operation at full load. The fuel storage tanks are not to be underground dual wall sub-base fuel tanks.
- 6.18.7.6 The Design-Builder shall provide a fuel tank filling station with access for fuel truck for ease of delivery.
- 6.18.7.7 The Design-Builder shall provide infrastructure in a suitable location to the Owner that can house a portable generator and associated equipment in the future, including a lockable box and manual power transfer function on the main switchboard for temporary generator connection to the School building.
- 6.18.7.8 The Design-Builder shall provide all the capacity, provisions and equipment to operate at least one third of the electrical series via portable generator. Exact loads, final design, and locations shall be determined in consultation with Owner during design development. The portable generator load shall include the following loads:
- 6.18.7.8(1) All IT equipment and systems;
- 6.18.7.8(2) All DDC panels and associated equipment;
- 6.18.7.8(3) One third of lighting;

- 6.18.7.8(4) All emergency lighting;
- 6.18.7.8(5) All life safety and UPS;
- 6.18.7.8(6) All mechanical systems required to operate when building is occupied (including ventilation, heating and exhausting);
- 6.18.7.8(7) Walk-in freezers and coolers in Culinary Arts;
- 6.18.7.8(8) Specimen fridges in the Science Labs;
- 6.18.7.8(9) One fourth of the receptacles and powered connections; and
- 6.18.7.8(10) Other systems determined in consultation with the Owner.

6.18.8 Uninterruptible Power Supply and Centralized Emergency Power Source

6.18.8.1 Basic Requirements

- 6.18.8.1(1) The Design-Builder shall provide Uninterruptible Power Supplies (UPS) and Centralized Emergency Power Source for equipment and life safety systems that requires continuous source of power. Units shall be freestanding , located adjacent to the supplied equipment and rated for the connected load plus at least 25%.
- 6.18.8.1(2) The Design-Builder shall provide systems which conform to all applicable standards of CSA and ULC, and shall be ULC labelled. In addition it shall comply with the requirements of ULC 1778.
- 6.18.8.1(3) The Design-Builder shall network and integrate both systems to alert the Facility operation staff to the loss of power and low battery status.
- 6.18.8.1(4) The Design-Builder shall provide UPS power to required rooms and equipment including the following:
 - 6.18.8.1(4)(a) Computer network equipment;
 - 6.18.8.1(4)(b) Public address systems;
 - 6.18.8.1(4)(c) Telephone systems;
 - 6.18.8.1(4)(d) Intrusion detection system
 - 6.18.8.1(4)(e) Main Telecommunications Room;
 - 6.18.8.1(4)(f) Server Room;

- (f).1 The exact load will be confirmed during design development. However, the Design-Builder shall allow for at least 5kW of server load for the main telecommunication room and at least 5KW of server load for the server room (8.10) in the Maintenance/IT Building.

- 6.18.8.1(4)(g) Main Electrical Room;
 6.18.8.1(4)(h) Panic duress system;
 6.18.8.1(4)(i) Access control system;
 6.18.8.1(4)(j) Video surveillance system; and
 6.18.8.1(4)(k) Intercommunication system.

6.18.8.1(5) The Design-Builder shall provide stationary batteries for the UPS system.

6.18.8.1(6) The Design Builder shall provide a centralized emergency power source for all life safety systems and associated components for the School including the following:

- 6.18.8.1(6)(a) Fire alarm system; and
 6.18.8.1(6)(b) Emergency lighting system.

6.18.8.2 Performance Requirements

6.18.8.2(1) Input ratings

- 6.18.8.2(1)(a) Voltage: nominal 120/208V, 4-wire plus ground
 6.18.8.2(1)(b) Frequency: 45 to 65 Hz
 6.18.8.2(1)(c) Power Factor: 0.99 typical
 6.18.8.2(1)(d) Current Distortion: 5% THD maximum at full rated linear load
 6.18.8.2(1)(e) Surge Protection:
 (e).1 Line to Line 180J
 (e).2 Line to Ground 450J

6.18.8.2(2) Output Ratings

- 6.18.8.2(2)(a) Voltage: nominal 120/208V, 4-wire plus ground

- 6.18.8.2(2)(b) Voltage regulation: +/-2% of selected output voltage in steady state
- 6.18.8.2(2)(c) Voltage THD:
(c).1 2% Total Harmonic Distortion (THD) maximum phase to neutral into a maximum rated linear load (5% phase to phase)
(c).2 5% THD maximum phase to neutral into a maximum rated non-linear load (7% phase to phase)
- 6.18.8.2(2)(d) Nominal Frequency: 60 Hz
- 6.18.8.2(2)(e) Bypass:
(e).1 Automatic bypass shall provide an alternate path to power in the case of overload, inverter failure or other system failures.
(e).2 External Maintenance Bypass can be utilized with the systems to allow servicing.
- 6.18.8.2(2)(f) All materials and components of both systems shall be new, of current manufacture, and shall not have been in prior service except as required during factory testing. The systems shall be constructed of replaceable subassemblies. All active electronic devices shall be solid-state.
- 6.18.8.2(2)(g) The system shall include rectifiers, battery chargers, inverters, bypass, and batteries consisting of the appropriate number of sealed battery modules, and shall be housed in a single freestanding enclosure. The system's cabinets shall be cleaned, primed, and painted with the manufacturer's standard color. Casters and leveling feet shall be provided as standard.
- 6.18.8.2(3) The Design-Builder shall provide a Valve Regulated Lead Acid (VRLA), minimum two-year warranted float service life at 25 degrees C.
- 6.18.8.2(4) Distributed (not centralized) UPS is permitted for the telecommunications rooms only provided the UPS is housed in the telecommunications room it is feeding and shall have expansion capability for additional matching batteries consisting of a minimum of six battery strings (108 battery blocks) for each power module.

- 6.18.8.2(5) Extended Holdover Time (Runtime): Each UPS system shall have capability for addition of extra matching battery cabinets (in two cabinet configurations) to increase the total holdover time.
- 6.18.8.2(6) Battery Recharge Time: Base UPS system consisting of six (6) battery strings will have a recharge time of max. 1.75 hours to 95% usable capacity @ nominal line after full load discharge (30kVA).
- 6.18.8.2(7) Bus Voltage: Nominal bus voltage is 216 VDC. Each string consists of 18 battery blocks in series with 9Ah capacity.
- 6.18.8.2(8) Short Circuit Protection: Over-current protection shall protect the batteries from all short circuit fault conditions.
- 6.18.8.2(9) Battery Module Protection: Internal battery circuit breaker shall be provided.
- 6.18.8.2(10) Battery operation shall be terminated when the battery voltage drops to the 1.67 VPC set point.
- 6.18.8.2(11) Protective shutdown voltage: Inverter shall shutdown after 1 minute when the voltage drops below 1.7 VPC volts-per-cell typical.
- 6.18.8.2(12) Over-voltage Protection: If the UPS system's battery bus voltage exceeds the predetermined set point then the UPS will disable the charger and alarm a high battery condition.
- 6.18.8.2(13) The units shall be rated for a minimum of 30 minutes at full rated load. All system units shall automatically transfer the load to and from the normal power supply without any interruption or disturbance of supply to the load.

6.18.9 Power Distribution Design

6.18.9.1 Basic Requirements

- 6.18.9.1(1) The Design-Builder shall satisfy the following design requirements for the power distribution system:
 - 6.18.9.1(1)(a) Submit site plan and single line diagram detailing power service requirements to the building.
 - 6.18.9.1(1)(b) Supply and install interior pad mounted unit substation. Interior transformer locations shall be coordinated to minimize vibration and noise.

- 6.18.9.1(1)(c) All distribution equipment shall be off the ground on a concrete pad.
- 6.18.9.1(1)(d) Supply and install all underground primary ducts from the service entry point to the unit substation and secondary ducts from the unit substation to the main distribution panel within the building. Provide underground duct installation as directed by City of New Westminster.
- 6.18.9.1(1)(e) Supply and install primary service conductors from the utility connection point (junction box) to the unit substation.
- 6.18.9.1(1)(f) Supply and install secondary service conductors from the unit substation to the main over current protective device in the building.
- 6.18.9.1(1)(g) Coordinate exact routing of underground services with supply authorities prior to installation.
- 6.18.9.1(1)(h) Provide electrical power from the main source of supply, to each load requiring supply of power, and to convenience and special purpose outlets.
- 6.18.9.1(1)(i) Distribution equipment and systems shall be robust, reliable, easily operated and maintained and be designed with extra capacity to accommodate load growth, equipment additions, and changes.
- 6.18.9.1(1)(j) Distribution equipment shall be of a "specification grade" and "institutional" or "industrial" quality and not of a "light duty" or "commercial" quality.
- 6.18.9.1(1)(k) Appropriate drip shields or sprinkler proof enclosures shall be provided for all electrical equipment located in areas protected by a sprinkler fire protection system.
- 6.18.9.1(1)(l) All secondary power distribution equipment shall be from the same manufacturer.
- 6.18.9.1(2) Acceptable manufacturers: Schneider, Eaton Cutler-Hammer, and Siemens.
- 6.18.9.1(3) The Design-Builder shall provide:

- 6.18.9.1(3)(a) Lamicoïd name tag "MDP". Also provide lamicoïd name tags indicating name of building, name of manufacturer, contractor and date installed.
- 6.18.9.1(3)(b) Shock and arc flash protection and warning labels on all electrical distribution equipment in compliance with the latest editions of C.E.C. 2-206 and NFPA 70E and ANSI Z535.4.
- 6.18.9.1(3)(c) Short circuit calculations for the distribution centre based on actual feeder lengths and sizes. Obtain available fault level information from power supply authority for the short circuit calculations as required.
- 6.18.9.1(4) The Design-Builder shall provide a power system study that includes a short-circuit study, protective device coordination study, and an arc flash incident energy analysis.
- 6.18.9.1(5) The Design-Builder shall be responsible to provide an arc flash study for all distribution including panel boards complete with field labeled warnings of potential electrical shock and arc flash hazards per rule 2-306 on each panel.
- 6.18.9.1(6) The Design-Builder shall provide a coordination study as per the following requirements:
 - 6.18.9.1(6)(a) Produced by the manufacturer of the switchgear. Coordination study must be submitted and approved prior to shop drawing submission of primary and secondary breaker types.
 - 6.18.9.1(6)(b) Include the main primary feeder protective devices in the utility system, transformer damage curves, and all proposed main and secondary breakers for the distribution system in order that complete selective coordination of the system shall be demonstrated.
 - 6.18.9.1(6)(c) Plot on log graph paper with the base voltage shown and shall be accompanied by individual time current trip curves of each device in order to enable the Engineer to verify the ratings and settings selected. Switchgear manufacturer to indicate the ratings and settings selected.
 - 6.18.9.1(6)(d) Submissions and approval will verify the ratings and settings of all protective devices. Approval will not

eliminate the responsibility of the Design-Builder and manufacturer to provide proper selective coordination.

- 6.18.9.1(6)(e) Submit the coordination study in report form and printed in full colour.
- 6.18.9.1(6)(f) Power system coordination study must be submitted prior to distribution shop drawings. No distribution shop drawings will be reviewed until a satisfactory coordination study is submitted.
- 6.18.9.1(6)(g) Prior to final inspection, Design-Builder shall arrange for switchgear manufacturer to visit the site and check all settings to ensure that they are in accordance with coordination study values. Provide results of the manufacturer review to the Owner in report form.

6.18.9.2 Performance Requirements

- 6.18.9.2(1) The Design-Builder shall provide and install major electrical equipment, which includes but is not limited to high voltage distribution, transformers, main distribution centres, transfer switches, mechanical distribution panels, and power factor correction equipment which satisfies the following:
 - 6.18.9.2(1)(a) Equipment is grouped together in a configuration that allows for addition or expansion of each type of equipment, logical arrangement in terms of the interconnection, operation and maintenance of the equipment. Electrical equipment shall be located with the intention of minimizing length of feeders and branch circuits, and shall be located so as to provide a clean, dry, safe, accessible installation protected from unauthorized access.
 - 6.18.9.2(1)(b) The high voltage power transformer and associated high voltage distribution equipment shall be located inside the building, and rated for 12.5kV. Power transformer shall be dry type, ANN/ANF, 3 phase, c/w copper windings.
 - 6.18.9.2(1)(c) The main distribution centre shall be rated at 600 volts, 3-phase. Provide at least one(1) 600 volt, 3-phase panel (42 circuits) on every floor from the main distribution centre and allow for 600 volt future equipment. Distribution transformers shall be harmonic mitigating

type. Sub- distribution panels and branch panelboards shall be rated at 120/208 volt, 3-phase, 4-wire.

- 6.18.9.2(1)(d) Mechanical distribution equipment to be rated at 600 and/or 208 volt, 3-phase, 3-wire. Motor starters shall be combination circuit breaker type, CEMA or NEMA rated (IEC rated starters are not acceptable).
- 6.18.9.2(1)(e) Lighting, receptacle and mechanical equipment shall be on separate distribution panelboards for the purpose of metering. All lighting to be 120 volt. Motors 0.5HP and larger to be 3-phase, 208 or 600 volt.
- 6.18.9.2(1)(f) Shop equipment shall be served by a dedicated panelboard, controlled via a contactor and key operated switch and remote red emergency “mushroom head” pushbuttons located strategically around the room. In addition to the emergency shut-off controls, shop equipment which is served by a dust collection system shall be interlocked with the dust collector control panel to prevent the operation of the shop equipment until the dust collection system is running. General power and non-shop equipment loads are to be served by a separate, non-contactor-controlled panelboard.
- 6.18.9.2(1)(g) All components of power distribution systems shall be selected, configured, located, and installed to minimize the transmission of noise, vibration and unwanted heat into other parts of the Facility.
- 6.18.9.2(1)(h) Protection and coordination of protection equipment shall be designed and installed so that the initial electrical installation, and future additions and modifications to the installation will be properly protected and fully coordinated. In the event of a fault or overload, protective devices shall act to isolate only the faulty portion of the system and areas downstream, leaving all other portions of the system fully operational. Protection equipment shall adequately protect against injury to persons and damage to property. Only breakers shall be used for power distribution over current devices.
- 6.18.9.2(1)(i) Provide a short circuit analysis and coordination study based on actual distribution equipment proposed for the Facility, including the unit substation, main distribution, transformers, panelboards, and feeders. Provide a copy

of the completed study to the Owner or their representatives for review.

- 6.18.9.2(1)(j) Where required by system characteristics or operational requirements, special shielding, isolation, grounding, bonding, harmonic filtration or other treatment shall be provided to prevent interference between systems or degradation of performance of an individual system.
- 6.18.9.2(1)(k) Distribution centres are located with due regard to future expansion and provide 20% extra space in distribution centres.
- 6.18.9.2(1)(l) Components of the power distribution systems which are in any public, administrative or staff area shall be of a type which gives both long life expectancy without perceptible deterioration, good appearance, and shall be designed, selected, and installed to permit easy and complete cleaning. These components include but are not limited to recessed electrical panels and wiremold, light switches, occupancy sensors, receptacles, wire ways, equipment grounding points, and status displays.
- 6.18.9.2(1)(m) Single phase 120VAC grounding receptacles conforming to CEC and specifically to CSA Configuration 5-15R shall be provided at each location where electrical equipment requiring a supply of power will be plug connected. Provide 20 ampere, CSA configuration 5-20R receptacles in corridors and housekeeping areas, at a maximum spacing of 5 m.
- 6.18.9.2(1)(n) All receptacles shall be specification grade and shall be provided with stainless steel cover plates. Grouped receptacles shall have a single cover plate covering the entire group. Receptacles shall be white colour or as determined in consultation with the Owner.
- 6.18.9.2(1)(o) Coordinate all locations and quantity of switched receptacles with the Owner to meet the intended functionality. All switched receptacles shall be clearly identified by the receptacle manufacture.
- 6.18.9.2(1)(p) All switched receptacles shall not be controlled by occupancy or daylight sensing. Time-clock or security panel control is permitted.

- 6.18.9.2(1)(q) Line voltage switches shall be specification grade, 120 volt, 20 ampere. All switches shall be provided with stainless steel cover plates. Grouped switches shall have a single cover plate covering the entire group. Switches shall be white colour or as determined in consultation with the Owner.
- 6.18.9.2(1)(r) All switches, receptacles, panelboards, and motor starters shall be suitably identified. Panelboards shall be supplied with type-written directories. All receptacles and light switches shall be permanently marked with machine printed labels (clear label with black lettering) identifying the circuit and panel number. Lamicoid nameplates shall be provided for all distribution equipment including but not limited to switchboards, panelboards, transformers, motor control centres, disconnect switches, motor starters, and contactors.
- 6.18.9.2(1)(s) Identify concrete duct banks, main service conduits for telephone and power and other spare raceways where they enter or leave the Facility with engraved stainless steel marker plates. Install marker plates on the exterior wall immediately above the point of entry.
- 6.18.9.2(2) The Design-Builder shall provide the main switchboard to be a fully integrated assembly consisting of an incoming service wire way, main breaker, utility compartment, and distribution panel. The switchboard shall be rated 347/600 volt, 3 phase, 4 wire, amperage to suit calculated load plus 15% spare capacity, of solid neutral design. All the components of the switchboard shall be by the same manufacturer. The complete switchboard shall be factory assembled and tested prior to delivery to site.
- 6.18.9.2(3) Approved Manufacturers: Schneider, Siemens, Eaton Cutler-Hammer, General Electric.
- 6.18.9.2(4) The Design-Builder shall provide incoming wireway. Comply with City of New Westminster power authority requirements and regulations.
- 6.18.9.2(5) The Design-Builder shall provide the main breaker as per the following requirements:
- 6.18.9.2(5)(a) 3-pole, moulded case circuit breaker, rated as required.

- 6.18.9.2(5)(b) Breaker to be complete with handle projecting through front cover; provide with lock-off facility.
- 6.18.9.2(5)(c) Line terminals of main breaker to have lugs as required to receive parallel incoming service conductors. From load terminals of the main breaker, bus connection to be made to the utility and distribution panel sections.
- 6.18.9.2(5)(d) Main breaker to be complete with RMS sensing digital trip unit with adjustable settings for long, short and instantaneous trips, complete with ground fault protection (if required by Code).
- 6.18.9.2(6) The Design-Builder shall comply with City of New Westminster power authority requirements and regulations.
- 6.18.9.2(7) The Design-Builder shall provide Distribution as per the following requirements:
 - 6.18.9.2(7)(a) Distribution panel to consist of an assembly of moulded case circuit breakers of the frame size, trip rating, and number of poles required to suit the project. Provide two 3P- 100 amp, and two 3P-200 amp spare breakers.
 - 6.18.9.2(7)(b) All breakers shall have an interrupting capacity of not less than the calculated RMS symmetrical fault current at 208 volts.
 - 6.18.9.2(7)(c) At least 20% of the distribution panel space shall be left empty, provisioned for future installation of additional breakers.
- 6.18.9.2(8) The Design-Builder shall provide the main bus bar connections and risers to be clearly identified with phase markings A, B and C throughout. Bussing to be rectangular section, tin plated copper. All joints to be securely bolted to manufacturer's recommendations. All bussing to be braced for a minimum 50,000 amps RMS symmetrical fault.
- 6.18.9.2(9) The Design-Builder shall provide enclosures as per the following requirements:
 - 6.18.9.2(9)(a) The switchboard shall be totally enclosed in sheet metal panels with front panels of formed type construction. Internal barriers to be provided to separate the various compartments. The enclosure shall be of uniform height, depth and width throughout.

- 6.18.9.2(9)(b) Provide suitable bushed ports or buspads in barriers between compartments.
 - 6.18.9.2(9)(c) Enclosure to be provided complete with drip shield.
 - 6.18.9.2(9)(d) Flush and/or surface mounted as indicated complete with panel trim having concealed hinges and trim mounting screws.
 - 6.18.9.2(9)(e) All panels shall have a hinged lockable door with flush catch.
 - 6.18.9.2(9)(f) Provide two (2) keys for each panel, interchangeable with panels of same voltage.
 - 6.18.9.2(9)(g) Provide sprinkler drip protection for all surface mounted panels
 - 6.18.9.2(9)(h) Eighty-four circuit double tubs (i.e. side by side) are not acceptable unless specifically shown. Eighty-four circuit panels must be stacked vertically.
 - 6.18.9.2(9)(i) All surface mounted tubs to be finished in enamel over corrosion-resistant primer. Finish colour shall be ASA 61 Grey.
- 6.18.9.2(10) The Design-Builder shall provide panelboards as per the following requirements:
- 6.18.9.2(10)(a) Unless indicated otherwise, all panelboards shall be 120/208V, 3 phase, 4 wire, solid neutral design with sequence style bussing and full capacity neutral, composed of an assembly of bolt-in-place moulded case circuit breakers as indicated with thermal and magnetic trip and trip free position separate from either the "On" or the "Off" positions.
 - 6.18.9.2(10)(b) Two and three pole breakers to have common simultaneous trip.
 - 6.18.9.2(10)(c) Surface or flush mounted to suit. Locate all panels in designated Electrical or other Service Rooms. Panels are not to be located in Corridors, Classrooms, Janitor Rooms or Storage Rooms.
 - 6.18.9.2(10)(d) Provide all mounting brackets, busbar drillings and filling pieces for spaces.

- 6.18.9.2(10)(e) Affix typewritten directory to the inside cover of panelboard indicating loads controlled by each circuit.
- 6.18.9.2(10)(f) Provide three 25mm (1") empty conduit stubs from flush panels to accessible cabling space (t-bar ceiling or crawlspace as dictated per project) for future connections.
- 6.18.9.2(11) The Design-Builder shall provide over current protection devices as per the following requirements:
 - 6.18.9.2(11)(a) Install over current protective devices in accordance with manufacturer's written instructions.
 - 6.18.9.2(11)(b) Fasten over current protective devices without causing mechanical stresses, twisting or misalignment of equipment in final position.
 - 6.18.9.2(11)(c) Provide manufacturer's product data for all devices.
 - 6.18.9.2(11)(d) Shop drawings shall include the following information:
 - (d).1 Fault interrupting capability of each device in symmetrical amperes at applied voltage.
 - (d).2 Confirmation from the manufacturer that any devices used in series to obtain a specified fault current interrupting capacity are rated for such use.
 - (d).3 Motor control over current protective device characteristics and curves.
- 6.18.9.2(12) Supply all molded case circuit breakers by a single manufacturer and as per the following:
 - 6.18.9.2(12)(a) CSA C22.2 No. 5-M1986.
 - 6.18.9.2(12)(b) Trip Type: Thermal/magnetic.
 - 6.18.9.2(12)(c) Voltage: To suit project requirements.
 - 6.18.9.2(12)(d) Poles: To suit.
 - 6.18.9.2(12)(e) Interrupting Capacity: To suit.
 - 6.18.9.2(12)(f) Mounting: Bolt-in place.
 - 6.18.9.2(12)(g) Normal Operation: In 40°C ambient.
 - 6.18.9.2(12)(h) Features:

- (h).1 Thermal and instantaneous magnetic trip.
- (h).2 Trip free, toggle type operation.
- (h).3 Quick-make, quick-break action.
- (h).4 Positive handle trip indication.
- (h).5 Trip rating visible with panel trim installed.

6.18.9.2(13) The Design-Builder shall provide Plug and Cartridge Standard (STD) Fuses to CSA C22.2 No. 59.1-M1987 and as follows:

6.18.9.2(13)(a) Standard fuse interrupting ratings shall be 10 kA symmetrical unless otherwise indicated.

6.18.9.2(13)(b) HRC fuses: to CSA C22.2 No. 106-M1985 and as follows:

(b).1 HRC fuse interrupting ratings: 200 kA symmetrical.

(b).2 HRCI-J time delay.

6.18.9.2(13)(c) Voltage: to suit project requirements.

6.18.9.2(13)(d) Ampacity: to suit.

6.18.9.2(13)(e) Fuse Types: to suit.

6.18.9.2(14) The Design-Builder shall provide Surge Protective Devices (SPD) at the service entrance and throughout the power distribution system as per the following requirements:

6.18.9.2(14)(a) Comply with the following standards:

(a).1 ANSI/IEEE C.62.41 and C62.45

(a).2 UL 1449 – 2nd Edition

(a).3 UL 1283

(a).4 NEC – NFPA 70

(a).5 NEMA LS1

(a).6 NFPA

6.18.9.2(14)(b) No audible noise shall be generated.

6.18.9.2(14)(c) No appreciable magnetic fields shall be generated. System shall be capable of use directly in computer rooms in any location without danger to data storage systems or devices.

6.18.9.2(14)(d) Operating Conditions shall be -1°C to 54°C (30°F to 130°F), 2 15% to 85% Humidity Non-Condensing

- 6.18.9.2(14)(e) The unit shall have a heavy duty NEMA 12 dust-tight, drip-tight enclosure unless specified otherwise. Enclosure shall be wall mountable. Integral panelboard SPD devices shall exhibit performance as detailed in this specification and shall include a barrier device to separate the SPD from the panelboard interior.
- 6.18.9.2(14)(f) All panels shall have SPDs and shall be rerated for 60 Hertz. The system and shall be connected to the power distribution system per the manufacturer's recommendations.
- 6.18.9.2(14)(g) The manufacturer shall be ISO 9001 certified, demonstrating world-class quality systems for the design and manufacture of the SPD units. Certifications shall be as listed above.
- 6.18.9.2(14)(h) Each surge suppression element (MOV) shall be individually fused so that a failure of one element and/or fuse shall not affect other surge suppression elements. SPD shall have a short-circuit rating of 200kAIC.
- 6.18.9.2(14)(i) Unit shall include solid-state, long-life externally mounted LED visual status indicators that indicate the on-line status and operational integrity of each phase of the unit.
- 6.18.9.2(14)(j) Unit shall have a Form C summary alarm output contact rated for at least 1 amp at 120VAC for remote annunciation of SPD status by the DDC system. Coordinate with DDC contractor to provide commissioning and testing of the SPD system interface with the DDC system for inclusion in the O&M manuals.
- 6.18.9.2(14)(k) Acceptable Manufacturers: Liebert: Interceptor
- 6.18.9.2(14)(l) Current Technology: CurrentGuard 200 Series
- 6.18.9.2(14)(m) The SPD will be modular in design. Separate and replaceable suppression modules will protect each mode (L-N, L-G, and N-G).
- 6.18.9.2(14)(n) The service entrance SPD will be capable of surviving 15,000 ANSI/IEEE, Category C3 (10kA) impulses without failure or degradation of original performance characteristics of more than 10%

- 6.18.9.2(14)(o) Unit shall have a maximum surge current rating of 125,000 amperes L-N, 125,000 amperes L-G, and 125,000 amperes N-G, based on ANSI/IEEE C62.41 standard 8 by 20 microsecond current waveform. Manufacturers shall provide a higher maximum surge current rated device if required to meet the requirements. .5 Unit shall be UL 1283 listed as an electromagnetic interference filter and provide 50 Ohm noise attenuation of at least 40 dB at 100 kHz, 30 dB at 1 MHz, 35 dB at 10 MHz, and 50 dB at 100 MHz.
- 6.18.9.2(14)(p) Unit shall include a built-in, push-to-test feature that tests the integrity of all modules, MOVs and fuses in the system. Manufacturers that require an external test device to perform this feature will include the test set in this quotation.
- 6.18.9.2(14)(q) The unit shall include an integral fused and safety interlocked disconnect switch located in the unit enclosure with an externally mounted manual operator. The switch shall disconnect all ungrounded circuit conductors from the distribution system to enable testing and maintenance without interruption of power to the Facility's distribution system. The switch shall be rated for 600VAC. Each current-carrying ungrounded circuit conductor connected to the Facility's distribution system shall be individually fused with 200,000 AIC rated fuses in order to provide maximum fault current protection. The unit shall be UL 1449 listed with the integral fused disconnect switch and the UL 1449 Suppression Rating for this configuration shall be provided.
- 6.18.9.2(14)(r) Unit shall have an audible alarm with an alarm on/off switch to silence the alarm and a push-to-test switch to test the alarm function.
- 6.18.9.2(14)(s) A resettable counter shall be provided to totalize transient voltage surges in both the normal and common mode.
- 6.18.9.2(14)(t) The readout shall be at least a six-digit LCD located on the unit front cover and provided with a 10-year battery back-up to maintain counts in the event of power loss.
- 6.18.9.2(14)(u) Provide an equipment manual with installation, operation and maintenance instructions for inclusion in the

Operation & Maintenance Manuals. Instructions shall include a list of all customer-replaceable spare parts, part #'s and ordering information.

- 6.18.9.2(14)(v) The unit shall be thoroughly factory-tested before shipment. Testing of each unit shall include but shall not be limited to quality assurance checks, MCOV and clamping voltage verification tests. A copy of the test results shall be shipped with product and shall be included in the maintenance manuals.
- 6.18.9.2(14)(w) Manufacturer shall provide a product warranty for a period of not less than 10 years from date of commissioning. Warranty shall cover unlimited replacement of system protection modules during warranty period. The first 5 years of this warranty will include any field labor required to perform repair or replacement work.
- 6.18.9.2(14)(x) Install suppression system immediately adjacent to the Main Distribution Centre.
- 6.18.9.2(14)(y) Conductors between suppressor and point of attachment to service equipment shall be sized in accordance with manufacturer's Shop Drawings and conductor lengths shall be as short as possible, shall not exceeding 24".
- 6.18.9.2(14)(z) Suppressor ground shall be bonded to the equipment grounding conductor and service entrance ground.

6.18.10 Service Rooms

6.18.10.1 Basic Requirements

- 6.18.10.1(1) The Design-Builder shall coordinate space requirements and the installation of mechanical and electrical work and shall maximize accessibility for other installations, maintenance, and repairs.
- 6.18.10.1(2) The Design-Builder shall provide space in service rooms to ensure adequate service clearances are maintained as per the CEC and BCBC to provide periodic maintenance as well as allow future replacement of equipment without the removal of other non-associated equipment or services.
- 6.18.10.1(3) The Design-Builder shall comply to the clearance requirement and recommendations for all equipment and systems including TIA and BICSI.

6.18.10.1(4) The Design-Builder shall follow the manufacturer recommended clearances for all equipment.

6.18.10.1(5) The Design-Builder shall provide at least stair access to service rooms and roof areas. Ships ladders and hatches are not acceptable. Where maintenance or replacement of large equipment is foreseen, the Design-Builder shall provide an optimum means for access and removal of the equipment.

6.18.10.2 Performance Requirements

6.18.10.2(1) The Design-Builder shall provide minimum two hour fire rating for Main Electrical Room and Main Telecommunications Room.

6.18.11 Metering

6.18.11.1 Basic Requirements

6.18.11.1(1) The Design-Builder shall provide detailed power quality and power consumption information at key points throughout the Facility via digital metering.

6.18.11.1(2) The Design-Builder shall provide a networked metering system, with terminals for maintenance and plant administration, and data transfer to the Building Management System.

6.18.11.1(3) Metering shall be integrated into the Owner's network.

6.18.11.2 Performance Requirements

6.18.11.2(1) The Design-Builder shall provide a metering system that meets the following requirements:

6.18.11.2(1)(a) Easy to read, locally displayed information for all distribution at primary voltage and for all distribution switchboards.

6.18.11.2(1)(b) Historical data from the metering system network shall be stored and will be capable of recalling data for a minimum of a week.

6.18.11.2(1)(c) The metering system shall not be dependent on power from the metered circuit for its operation, and shall be supported by a backup power source or sources, which ensures operation when the metered circuit is de-energized.

- 6.18.11.2(1)(d) The electrical sub-metering system shall include, but not limited to: Total building electrical consumption, individual lighting panelboards, mechanical loads, elevator(s), and individual power and receptacle panelboards.
- 6.18.11.2(1)(e) The system shall include at least one intelligent controls meter complete with internet communication IP module. Provide BACnet output to connect to DDC for remote reading of all the 7650 meter's functions through the DDC system. Acceptable manufacturers: Power Logic ION PM7650 or acceptable equivalent.
- 6.18.11.2(1)(f) Meters shall incorporate Web service, built-in modem, direct data transfer, BACnet and Ethernet ports.
- 6.18.11.2(1)(g) Meters shall have built-in power line communications (PLC) for remote meter reading, RS-485 and BACnet, 5 amp current transformers. Acceptable manufacturers: Quadlogic RSM-5 single load meter, MiniCloset MC-5c Multi-load meter, or acceptable equivalent.

6.18.12 Wiring Methods and Materials

6.18.12.1 Basic Requirements

- 6.18.12.1(1) The Design-Builder shall utilize wiring methods and materials to provide safe, reliable and flexible electrical power, control, communication, data, and life safety systems in the Facility.
- 6.18.12.1(2) The Design-Builder shall check drawings of all other trades for proper coordination of electrical outlet locations.
- 6.18.12.1(3) Mounting heights are from finished floor level to centre line of device outlet, unless noted otherwise.
- 6.18.12.1(4) All electrical fittings, supports, hanger rods, pullboxes, channel frames, conduit racks, outlet boxes, brackets, clamps, etc., shall have galvanized finish or enamel paint finish over corrosion-resistant primer.
- 6.18.12.1(5) All panelboards and similar equipment to be factory finished in glass air dry enamel applied over corrosion-resistant primer. Matte or flat-type finish paint not acceptable. Factory finished units that are scratched or marked during installation or shipping to be touched up with matching spray-on air dry lacquer or, if

required to provide a satisfactory appearance, completely refinished.

- 6.18.12.1(6) The Design-Builder shall ensure all wiring is neatly and securely installed in such a way that it is protected from damage, not in conflict with mechanical or architectural components of the building and allows for future changes for the life of the Facility.
- 6.18.12.1(7) Design-Builder shall provide emergency shut off switch and strobe light in every shop to kill power for all equipment and outlets in the shop. The location of the switch and strobe shall be determined in consultation with the Owner.

6.18.12.2 Performance Requirements

- 6.18.12.2(1) The Design-Builder shall provide conductors with a minimum conductor size to be #12 AWG. All conductors #8 AWG and larger shall be stranded.
- 6.18.12.2(2) The Design-Builder shall provide three (3) exterior rated lockable boxes near the shops exterior roll-up doors. Each exterior box shall be connected via 104mm (4") conduit infrastructure to the nearest electrical room for future. Final boxes location shall be coordinated with Owner.
- 6.18.12.2(3) The Design-Builder shall provide control cable for Class 2 remote control and signal circuits as follows:
 - 6.18.12.2(3)(a) Conductor – copper;
 - 6.18.12.2(3)(b) Insulation - 300V insulation, rated 60EC.;
 - 6.18.12.2(3)(c) Individual conductors twisted together, shielded and covered with a PVC jacket;
 - 6.18.12.2(3)(d) Wiring for fire alarm, security systems and public address systems as recommended by system manufacturer.
- 6.18.12.2(4) The Design-Builder shall provide:
 - 6.18.12.2(4)(a) Conduit or cable tray of all intrusion alarm and door access control wiring.
 - 6.18.12.2(4)(b) Conduit for wiring for equipment and devices in corridors and in masonry walls.
 - 6.18.12.2(4)(c) Copper grounding conductors and straps.

- 6.18.12.2(4)(d) All ground conductors to have green insulation jacket.
 - 6.18.12.2(4)(e) T90 insulation is acceptable for use for grounding conductors only.
 - 6.18.12.2(4)(f) Power and infrastructure for two washroom lifts.
 - 6.18.12.2(4)(g) Clip groups of feeder conductors at all distribution centres, pullboxes and termination points.
- 6.18.12.2(5) The routing of conduit shown on the drawings is a proposal only. The exact routing and lengths shall be coordinated by the Design-Builder on site, taking into account all ceiling types, dropped bulkheads, beams, mechanical equipment, ducts and piping.
- 6.18.12.2(6) All voltage drop calculations shall be based on the latest edition of the Canadian Electrical Code, Part I, and shall assume a current of 80% of the rating of the circuit overcurrent protection device specified for each respective circuit. (e.g., for a circuit with a 15A breaker, assume a 12A current for the voltage drop calculations).
- 6.18.12.2(7) When exact run lengths are determined for all branch circuits, and prior to installation of the conductors, ensure that the maximum voltage drop does not exceed 3%. In any case, unless noted otherwise or proven acceptable by proper voltage drop calculation, the minimum wire size for 120 volt branch circuits shall be as follows:
- 6.18.12.2(7)(a) 0-30m (0-100') long - #12 AWG.
 - 6.18.12.2(7)(b) 30-50m (100'-165') long - #10 AWG.
 - 6.18.12.2(7)(c) 50-80m (165'-265') long - #8 AWG.
- 6.18.12.2(8) The Design-Builder shall provide FT6 rated wiring in all air plenums as required by the local AHJ. Confirm plenum locations with Mechanical prior to rough-in.
- 6.18.12.2(9) The Design-Builder shall provide switches as per the following requirements:
- 6.18.12.2(9)(a) Unless noted otherwise, line voltage switches shall be rated for 120 volt, 15 amp operations with quiet, quick make/break toggle movement and totally enclosed case. 3-way and 4-way switches to be of matching type.

- 6.18.12.2(9)(b) Colour to be white or as determined in consultation with the Owner.
 - 6.18.12.2(9)(c) Service and unfinished areas: Pass & Seymour #CSB15AC1 or equal.
 - 6.18.12.2(9)(d) Finished areas: Pass & Seymour #2601 or approved equivalent.
 - 6.18.12.2(9)(e) Line voltage switches with integral occupancy sensors: 120 volt, push button operation, time delay of 15 seconds to 30 minutes, built-in light level sensor (10 to 150 foot candles), LED indicator. Wire for immediate automatic on and automatic off after 20 minutes of no motion.
 - 6.18.12.2(9)(f) Install Quiet Room switches outside the room.
 - 6.18.12.2(9)(g) Coordinate switch mounting heights with architectural detail and adjust, if required, to coordinate with paneling, dados, and masonry course lines.
 - 6.18.12.2(9)(h) Mount switches according to heights indicated later in this section.
- 6.18.12.2(10) All conductors and all conducting components of electrical equipment, which form part of the wiring systems in the Facility, shall be:
- 6.18.12.2(10)(a) Non-alloyed copper, except conductors and conducting components equal to or larger than 150 amp or 1/0, aluminum is permitted.
 - 6.18.12.2(10)(b) R90 cross-linked polyethylene.
 - 6.18.12.2(10)(c) Sized to ensure a voltage drop of not more than 2% for feeders and 3% for branch circuits.
 - 6.18.12.2(10)(d) Installed in conduit. Type AC-90 armoured cable shall be used for final connections to light fixtures (3m maximum length). Daisy-chaining of AC-90 cables between luminaires is not permitted.
 - 6.18.12.2(10)(e) In exposed ceiling areas, all wiring shall be in conduit painted out to match ceiling.
 - 6.18.12.2(10)(f) Neutral conductors shall be fully rated.

- 6.18.12.2(10)(g) Concealed except in service rooms.
- 6.18.12.2(10)(h) Protected from mechanical damage throughout each wiring system. Entry or accumulation of moisture into any wire, cable, or wire way shall be prevented.
- 6.18.12.2(10)(i) Suitable to the application used for. Wiring for systems of different voltages and from different sources of supply shall be separated. Interference between wiring of power supply systems and wiring of data and telecommunication systems shall be prevented by maintaining adequate separation and shielding throughout.
- 6.18.12.2(10)(j) Components which are in any public, administrative or staff area shall be of a type which gives both long life expectancy without perceptible deterioration, good appearance, and shall be designed, selected, and installed to permit easy and complete cleaning.
- 6.18.12.2(10)(k) Clearly labelled at both ends.
- 6.18.12.2(11) The Design-Builder shall provide receptacles and branch circuit wiring throughout the building. The locations and quantity of receptacles are to be provided for convenience and equipment in accordance with the RFP and layouts developed in consultation with the Owner.
- 6.18.12.2(12) The Design-Builder shall provide while-in-use covers for all exterior outlets and receptacles.
- 6.18.12.2(13) The Design-Builder shall provide connections for wayfinding signage including perimeter signage to enter the Facility.
- 6.18.12.2(14) The Design-Builder shall provide drop cords receptacles with twist-lock connectors as determined in consultation with the Owner to suit layout.
- 6.18.12.2(15) The Design-Builder shall provide 20 amp CSA 5-20RA (T-slot) configuration housekeeping receptacles in all corridors, circulation and other common areas spaced at approximately 15m on centre.
- 6.18.12.2(16) The Design-Builder shall provide a minimum of one 4-plex receptacle adjacent to the telephone/data outlet at every staff work or teacher station. Additional receptacles shall be provided for convenience power in accordance with the RFP.

- 6.18.12.2(17) The Design-Builder shall provide receptacles and components as per the following requirements:
- 6.18.12.2(17)(a) All receptacles accessible to students shall have two connectors for USB3.1. One (1) connection to be type A and one (1) connection to be type C.
 - 6.18.12.2(17)(b) 30 amp and 50 amp receptacles in the Gymnasium for use of portable production dimming and sound equipment.
 - 6.18.12.2(17)(c) One (1) duplex receptacle and 25mm (1”) conduit for future structured cabling to each TV location as per Appendix 1B Room Data Sheet unless noted otherwise.
 - 6.18.12.2(17)(d) Infrastructure for overhead projectors in locations identified in Appendix 1B Room Data Sheet.
 - 6.18.12.2(17)(e) Full gang size, captive nylon face, polarized, duplex, parallel blade, U-grounding slot, triple wipe, brass power contacts, rated at 15 amp, 125 volt. Receptacles to have plug & tail for quick installation connection: Pass & Seymour PT5262 (15A) or PT5362 (20A t-slot) or approved equivalent.
 - 6.18.12.2(17)(f) The Design-Builder shall provide a minimum of 10 duplex receptacles and 10 data outlets in the Wellness Centre.
 - 6.18.12.2(17)(g) Tamper-resistant receptacles: Pass & Seymour PTTR5262 (15A) or PTTR5362 (20A t-slot) or approved equivalent.
 - 6.18.12.2(17)(h) GFCI receptacles: Pass & Seymour PT1595 (15A) or PT2095 (20A t-slot) or approved equivalent.
 - 6.18.12.2(17)(i) Red receptacles on emergency or UPS power.
 - 6.18.12.2(17)(j) White receptacles in all other areas or as determined in consultation with the Owner.
 - 6.18.12.2(17)(k) Receptacles mounted above or within millwork to be coordinated with millwork details and millwork contractor.
 - 6.18.12.2(17)(l) All cover plates for flush-mounted wiring devices in areas with drywall walls shall be nylon, colour should

match colour of device, colour specified by the Architect.
Other plates shall be of type 430 stainless steel.

- 6.18.12.2(17)(m) All steel components shall be hot dip galvanized to CSA Standards.
 - 6.18.12.2(17)(n) Stainless Steel: Type 430, No. 4 finish, 1 mm thick, accurately die cut, smooth rolled outer edges and protective release film complete with stainless steel screws.
 - 6.18.12.2(17)(o) Bakelite or Nylon: Completely smooth heavy duty service type.
 - 6.18.12.2(17)(p) Cast Metal: Die cast profile, ribbed for strength, flash removed, primed with grey enamel finish and complete with four mounting screws to box.
 - 6.18.12.2(17)(q) Gaskets: Resilient rubber or close cell foam urethane.
 - 6.18.12.2(17)(r) Flush Mounting Plates: Beveled type with smooth rolled outer edge, plain design.
 - 6.18.12.2(17)(s) Outlet cover plates for wall mounted handsets shall be stainless steel complete with steel mounting studs. Confirm coverplate is suitable for handsets to be installed prior to ordering.
 - 6.18.12.2(17)(t) Surface Box Plates: Beveled, pressure formed for smooth edge free fit to box.
 - 6.18.12.2(17)(u) Weatherproof Plates: Cast metal gasketed coverplates for receptacles, spring loaded cast gasketed doors. Double doors for standard duplex receptacles. Coverplates to fasten to box by four screws.
 - 6.18.12.2(17)(v) Approved Manufacturers: Pass and Seymour, Thomas & Betts.
 - 6.18.12.2(17)(w) Install coverplates on all wiring device boxes.
- 6.18.12.2(18) Mounting Height Requirements
- 6.18.12.2(18)(a) Wall receptacles shall be mounted 356mm (14") above finished floor. Generally, outlets installed above counters or work tables shall be mounted 150mm (6") above the

finished surface. Outlets shall be either entirely within or above splashboards.

- 6.18.12.2(18)(b) Fire alarm audio signaling devices shall be mounted 2440mm (96") above finished floor or 300mm (12") below the ceiling, whichever is lower. Where signaling devices are mounted adjacent to other surface mounted devices, the centres shall be aligned.
- 6.18.12.2(18)(c) Fire alarm visual signaling devices shall be mounted 2000mm (78") above finished floor or 300mm (12") below the ceiling, whichever is lower. Where signaling devices are mounted adjacent to other surface mounted devices, the centres shall be aligned.
- 6.18.12.2(18)(d) Fire alarm manual pull stations shall be mounted 1200mm (47") or 1150mm (45") above finished floor to comply with accessibility requirements.
- 6.18.12.2(18)(e) Emergency lighting battery units shall be mounted 2440mm (96") above finished floor to the centre of the device or 300mm (12") below the ceiling, whichever is lower.
- 6.18.12.2(18)(f) Wall mounted occupancy sensors shall be mounted at 1050mm (41") above finished floor.
- 6.18.12.2(18)(g) Emergency lighting remote fixtures shall be mounted 2440mm (96") above finished floor or 300mm (12") below the ceiling, whichever is lower.
- 6.18.12.2(18)(h) Motor starters and disconnect switches shall be mounted 1800mm (41") above finished floor where wall mounted or on channel iron supports.
- 6.18.12.2(18)(i) Local branch circuit lighting switches shall be mounted 1050mm (50") above finished floor. Local lighting switches shall be installed on the strike side of the door.
- 6.18.12.2(18)(j) Telephone outlets shall be mounted 356mm (14") above finished floor. Wall mounted telephone handset outlets shall be mounted 1400mm (55") above finished floor. Coordinate location so handset cords do not drape over light switches or other devices.
- 6.18.12.2(18)(k) Data and CATV outlets shall be mounted 356mm (14") above finished floor.

- 6.18.12.2(18)(l) Security keypads and proximity readers shall be wall mounted 1400mm (55") above finished floor.
- 6.18.12.2(18)(m) Thermostats shall be mounted 1500mm (60") above finished floor or as coordinated with Mechanical.
- 6.18.12.2(18)(n) Branch circuit panelboards shall be mounted 1800mm (70") above finished floor to the top of the panel.
- 6.18.12.2(18)(o) The Owner reserves the right to change location of outlets to within 3m (10') of points indicated on the Technical Proposal plans without extra charge provided Electrical is advised prior to installation.
- 6.18.12.2(19) Where two or more outlets are shown in the same proximity, they shall be either centered on a vertical line or centered on a common horizontal line, whichever is most appropriate.
- 6.18.12.2(20) The Design-Builder shall provide raceway infrastructure for the Art Studio as follows:
 - 6.18.12.2(20)(a) Infrastructure including junction box and conduits to the Art Studio from the closest panel. Allow space for at least three (3) single pole 20 amp breakers;
 - 6.18.12.2(20)(b) Power and low voltage conduit infrastructure, including junction box and conduits to roof for future exhaust fan.

6.18.13 Junction Boxes and Raceways

6.18.13.1 Basic Requirements

- 6.18.13.1(1) The Design-Builder shall provide institutional or industrial quality cables, connectors, conduit systems, fittings and hardware. The Design-Builder shall select and install such equipment to provide for high levels of reliability, durability and ease of maintenance of the equipment.
- 6.18.13.1(2) All pullboxes and junction boxes shall be of code gauge steel construction and/or cast corrosion-resistant type, conforming to Canadian Electrical Code, with screw-on or hinged cover.
- 6.18.13.1(3) All pullboxes, junction boxes and conduits shall be identified with purpose-manufactured durable and clearly legible marking to identify the function and voltage of the system.

- 6.18.13.1(4) The Design-Builder shall not exceed 50% of the maximum fill for back boxes and junction boxes.
- 6.18.13.1(5) Approved fire stopping shall be installed and maintained at all fire separations and at any locations required by Code or by the local authority.
- 6.18.13.1(6) The Design-Builder shall provide and install raceways for wiring and cabling to support, protect and organize wiring and cabling systems throughout the Facility.
- 6.18.13.1(7) The Design-Builder shall design and install raceways in such a way to provide ease of access, capacity for expansion and change, and in accordance with the requirements of the equipment and systems that they serve.
- 6.18.13.1(8) Surface conduits shall run parallel or perpendicular to building lines in flanged portion of structural steel. Group conduits wherever possible on suspended or surface channels. Conduits shall not pass through structural beams.

6.18.13.2 Performance Requirements

- 6.18.13.2(1) The Design-Builder shall:
 - 6.18.13.2(1)(a) Provide pullboxes and junction boxes as required to suit job conditions.
 - 6.18.13.2(1)(b) Locate pullboxes and junction boxes above removable ceilings, in electrical rooms, utility rooms or storage areas. All pullboxes must be positioned and installed in such a way that they are within 1m of an accessible ceiling area or hatchway.
 - 6.18.13.2(1)(c) Provide overlapping covers with flush head cover retaining screws, prime coated and painted to match wall or ceiling finish where pullboxes are flush mounted.
 - 6.18.13.2(1)(d) Install junction boxes in areas that are accessible through luminaire openings and/or access panels.
 - 6.18.13.2(1)(e) Provide matching type and gasketed covers on cast corrosion-resistant boxes.
 - 6.18.13.2(1)(f) Provide lamicaid name tags to box covers with 9.5mm (0.35") lettering identifying system on pullboxes and/or junction boxes that are not a standard 100mm square or

octagon box, over and above paint identification for system.

- 6.18.13.2(1)(g) Support all pullboxes and junction boxes directly from building structure using one or a combination of the following devices:
 - (g).1 Galvanized screws
 - (g).2 Galvanized bolts
 - (g).3 Galvanized rods
 - (g).4 Approved box clip
- 6.18.13.2(1)(h) Provide bushings on all conduit ends.
- 6.18.13.2(1)(i) Cap all unused conduits.
- 6.18.13.2(1)(j) Where cable tray is installed, provide the following:
 - (j).1 Minimum 25mm (1") EMT conduit from each communications outlet box stubbed into cable tray or accessible cabling space.
 - (j).2 12 tagged pull cords in cable tray for future use by Owner.
- 6.18.13.2(1)(k) Where cable tray is not installed, provide the following:
 - (k).1 Minimum 25mm (1") EMT conduit from each communications outlet box stubbed into cabling space.
- 6.18.13.2(2) The Design-Builder shall provide a minimum of 3 x 103mm riser sleeves or ducts for all Electrical Rooms and Telecommunication Rooms ("TR") from Main respective rooms. Where group of rooms are stacked, provide one additional 103mm riser sleeve or duct for every additional room serviced from a riser stack. For example: Where there are 3 TRs in a riser stack, one on each level where level 1 is the beginning of the riser and level 3 is the end; provide the following telecommunications riser:
 - 6.18.13.2(2)(a) Level 1 – provide 5 x 103mm riser sleeves or ducts
 - 6.18.13.2(2)(b) Level 2 – provide 4 x 103mm riser sleeves or ducts
 - 6.18.13.2(2)(c) Level 3 – provide 3 x 103mm riser sleeves or ducts
- 6.18.13.2(3) The Design-Builder shall not exceed 28% conduit-fill as well as no more than two (2) 90-degree bends (or equivalent) in any conduits.

- 6.18.13.2(4) The Design-Builder shall provide conduits according to the following requirements:
- 6.18.13.2(4)(a) Conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
 - 6.18.13.2(4)(b) Conceal conduits except in mechanical and electrical service rooms.
 - 6.18.13.2(4)(c) Use rigid galvanized steel threaded conduit in areas as shown on drawings.
 - 6.18.13.2(4)(d) Use epoxy coated conduit in corrosive areas.
 - 6.18.13.2(4)(e) Minimum conduit size for lighting and power circuits: 21 mmC.
 - 6.18.13.2(4)(f) Bend conduit cold.
 - 6.18.13.2(4)(g) Replace conduit if kinked or flattened more than 1/10th of its original diameter.
 - 6.18.13.2(4)(h) Mechanically bend steel conduit over 19 mm diameter.
 - 6.18.13.2(4)(i) Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
 - 6.18.13.2(4)(j) Run 3-25 mm spare conduits up to ceiling space and 2-25 mm spare conduits down to ceiling space from each flush panel.
 - 6.18.13.2(4)(k) Terminate these conduits in 152 x 152 x 102 mm junction boxes in ceiling space or in case of an exposed concrete slab, terminate each conduit in flush concrete surface type box.
 - 6.18.13.2(4)(l) Remove and replace blocked conduit sections.
 - 6.18.13.2(4)(m) Do not use liquids to clean out conduits.
 - 6.18.13.2(4)(n) Dry conduits out before installing wire.
 - 6.18.13.2(4)(o) Run surface conduits parallel or perpendicular to building lines. Locate conduits behind infrared or gas fired heaters with 1.5 m clearance. Run conduits in flanged portion of structural steel. Group conduits wherever possible on suspended or surface channels.

Do not pass conduits through structural members except as indicated. Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

- 6.18.13.2(4)(p) Run concealed conduits parallel or perpendicular to building lines. Do not install horizontal runs in masonry walls. Do not install conduits in terrazzo or concrete toppings.
- 6.18.13.2(4)(q) Locate conduits in cast-in-place concrete to suit reinforcing steel. Install in centre one third of slab. Protect conduits from damage where they stub out of concrete. Install sleeves where conduits pass through slab or wall. Provide oversized sleeve for conduits passing through waterproof membrane, before membrane is installed. Use cold mastic between sleeve and conduit. Conduits in slabs: minimum slab thickness 4 times conduit diameter. Encase conduits completely in concrete with minimum 25 mm concrete cover. Organize conduits in slab to minimize cross-overs.
- 6.18.13.2(5) Run conduits in cast-in-place slabs on grade 25 mm and larger below slab and encase in 75 mm concrete envelope. Provide 50 mm of sand over concrete envelope below floor slab.
- 6.18.13.2(6) Slope underground conduits to provide drainage. Waterproof joints (pvc excepted) with heavy coat of bituminous paint.
- 6.18.13.2(7) Seal conduits wherever they leave a heated area and enter an unheated area. Provide 12mm (1/2") minimum duct seal in addition to other sealants.
- 6.18.13.2(8) Provide necessary flashing and pitch pockets to make watertight joints where conduits pass through roof or exterior walls.
- 6.18.13.2(9) Utilize approved expansion fittings complete with grounding jumper where conduit, wireways, and raceways,., installed in concrete slabs or masonry walls cross building expansion and seismic joints. Install feeder runs of conduit in suspended ceiling spaces in such a manner that there is a bend or off-set adjacent to the major building expansion or seismic joint to take up building movement. In lieu of this, utilize approved expansion fitting.

6.18.13.2(10) The Design-Builder shall provide conduit supports as per the following requirements:

- 6.18.13.2(10)(a) Single Runs: Galvanized conduit straps or ring bolt type hangers.
- 6.18.13.2(10)(b) Multiple Runs (three or more): Conduit rack with 25% spare capacity.
- 6.18.13.2(10)(c) Except where otherwise noted, support conduit and cables utilizing clips, spring loaded bolts, or cable clamps designated as accessories to base channel members.
- 6.18.13.2(10)(d) Where inserts are required in concrete, expansion inserts, lead inserts or plastic inserts shall be used in drilled holes. Wood or fibre plugs are not permitted. Shot driven pins shall not be used.
- 6.18.13.2(10)(e) Install to maintain headroom, neat mechanical appearance, and to support equipment loads required plus 25% spare load capacity.
- 6.18.13.2(10)(f) Supporting devices to be connected directly to building structure.
- 6.18.13.2(10)(g) Support exposed conduit and conduit installed in space above suspended ceilings utilizing hangers, clamps or clips.
- 6.18.13.2(10)(h) Support conduit on each side of bends and on spacing in accordance with Canadian Electrical Code.
- 6.18.13.2(10)(i) Do not fasten supports to piping, ductwork, mechanical equipment, or other conduit.
- 6.18.13.2(10)(j) Install surface mounted cabinets and panelboards with minimum of four anchors.
- 6.18.13.2(10)(k) Bridge studs top and bottom with channels to support.

6.18.13.2(11) The Design-Builder shall provide outlet boxes as per the following requirements:

- 6.18.13.2(11)(a) All metal boxes shall be hot dip galvanized steel, conforming to CSA Standards.

- 6.18.13.2(11)(b) Outlet boxes in non-combustible construction shall be galvanized steel, gangable sectional type sized to suit the number of conductors.
- 6.18.13.2(11)(c) Outlet boxes on exterior walls shall be cast corrosion-resistant deep type, Crouse Hinds FS and/or FD series, air tight with approved vapor barrier device, gasketed and sealed.
- 6.18.13.2(11)(d) Boxes for ceiling to be Thomas & Betts No. 54151 receiving at least two (2) 21mm (3/4") conduit; otherwise, No. 54171.
- 6.18.13.2(11)(e) Boxes for flush mounted switches, receptacles, and low tension outlet devices, except in masonry walls, to be Thomas & Betts No. 1104 or 52171 with matching plaster cover for single or two gang outlets. For larger boxes use GSB solid type or special units as required. In masonry work use Thomas & Betts CIMBS series boxes.
- 6.18.13.2(11)(f) Boxes for surface mounted switches, receptacles, and low tension devices to be 100mm (4") square Thomas & Betts 52151 or 52171 with 8300 series tailor covers or 2020 series with matching cover.
- 6.18.13.2(11)(g) Communication system (Voice & Data) and A/V system (Audio/Visual) outlet boxes shall be two-gang, minimum 90mm deep masonry outlet boxes (MBD-2) or deep dual gang surface mount outlet boxes. When it is necessary to mount an outlet box in a wall depth of 65mm, a 65mm deep masonry shallow two-gang outlet box (MBS-2) shall be used. Unless specified to the contrary, an electrical box with a ``mud ring`` is not acceptable. Approved low voltage Communication rings can be used where specified.
- 6.18.13.2(11)(h) Flush floor boxes must be specifically designed to accommodate high performance communications outlets. Selection must be confirmed with the Owner during the design phase.
- 6.18.13.2(11)(i) Unless noted otherwise, flush floor outlets for power, communications and video in a floating floor shall be T&B #68S series c/w volleyball socket deck plate and cap.

- 6.18.13.2(11)(j) All outlet boxes to be flush mounted, except in service rooms and in spaces above removable ceilings. Flush mounted outlets shall be mounted flush to the surface of the wall and all gaps at the edges of the outlet box shall be filled and finished.
 - 6.18.13.2(11)(k) Adjust position of outlets in finished masonry walls to suit masonry course lines. Coordinate cutting of masonry walls to achieve neat openings for all boxes. All cutting of masonry work for installation of electrical fittings to be done using rotary cutting equipment. Coordinate with Masonry contractor.
 - 6.18.13.2(11)(l) Where a two gang box is required for single gang device, provide plate with one gang opening designed to fit over a two gang box.
 - 6.18.13.2(11)(m) No sectional or handy boxes unless specifically requested.
 - 6.18.13.2(11)(n) For outlets mounted in exterior walls ensure that there is insulation behind outlet boxes to prevent condensation through boxes
 - 6.18.13.2(11)(o) For outlets mounted above counters, benches, or splashbacks, coordinate location and mounting heights with built-in units.
 - 6.18.13.2(11)(p) Back boxes for all low tension system equipment to be provided in accordance with specific manufacturer's recommendations and as specified in the low tension sections of these specifications.
 - 6.18.13.2(11)(q) Separate outlet boxes located immediately alongside one another to be mounted at exactly the same height above the finished floor. Where the outlet boxes contain devices of the same system, gang the boxes together.
 - 6.18.13.2(11)(r) Where outlet boxes penetrate through a fire separation, ensure that they are tightly fitted with non-combustible material to prevent passage of smoke or flame in the event of a fire.
 - 6.18.13.2(11)(s) For concrete slabs and tilt walls, the outlet boxes shall be recess mounted flush in the concrete.
- 6.18.13.2(12) The Design-Builder shall provide conduit fasteners as follows:

- 6.18.13.2(12)(a) One hole steel straps to secure surface conduits 50mm and smaller.
 - 6.18.13.2(12)(b) Two hole steel straps to secure surface conduits larger than 50mm.
 - 6.18.13.2(12)(c) Beam clamps to secure conduits to exposed steel work.
 - 6.18.13.2(12)(d) Chanel type supports for two or more conduits at 1m on centre.
 - 6.18.13.2(12)(e) Threaded rods, 6mm diameter, to support suspended channels.
- 6.18.13.2(13) The Design-Builder shall provide conduit fittings as follows:
- 6.18.13.2(13)(a) Comply with CAN/CSA C22.2 No. 18, manufactured for use with conduit specified. Coating same as conduit.
 - 6.18.13.2(13)(b) All EMT conduit fittings to be steel, set screw type. No die-cast.
 - 6.18.13.2(13)(c) All connectors to have plastic bushing.
 - 6.18.13.2(13)(d) Use only WP fittings for conduit installation exposed to weather.
- 6.18.13.2(14) The Design-Builder shall provide Expansion fittings for rigid conduit as follows:
- 6.18.13.2(14)(a) WP expansion fittings with internal bonding assembly suitable for 100mm linear expansion.
 - 6.18.13.2(14)(b) Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19mm deflection.
 - 6.18.13.2(14)(c) WP expansion fittings for linear expansion at entry to panel.
- 6.18.13.2(15) The Design-Builder shall provide and install raceways that comply with applicable codes and shall:
- 6.18.13.2(15)(a) Utilize EMT but rigid PVC conduit shall be used in/below concrete slabs for underground services or to serve floor mounted devices. The use of Electrical non-metallic tubing (ENT) is not acceptable.

- 6.18.13.2(15)(b) Utilize flexible metallic conduit for vibration isolation of equipment such as motors and transformers. Liquid tight flexible metallic conduit shall be used for mechanical equipment in damp or wet locations and for kitchen equipment connections.
 - 6.18.13.2(15)(c) Provide barriers to appropriately separate cables and conductors of different voltages or system types.
 - 6.18.13.2(15)(d) Provide maximum 25% fill in cable trays, in-floor tray or duct systems.
 - 6.18.13.2(15)(e) Provide matching empty raceways equal to minimum 50% of the total installed group wherever multiple raceways are required in a group, such as a duct bank interconnecting two or more major areas
 - 6.18.13.2(15)(f) Facilitate easy access to other systems and equipment, including but not limited to mechanical equipment, building systems access ways, and architectural building components which require periodic inspection or maintenance.
 - 6.18.13.2(15)(g) Be designed and installed without sharp edges or sharp bends so that cables can be pulled in or laid in and removed without damage to the cables. Manufacturer's maximum bend radii shall be observed.
 - 6.18.13.2(15)(h) Be continuously bonded with a bonding conductor installed in raceway.
- 6.18.13.2(16) The Design-Builder shall provide:
- 6.18.13.2(16)(a) Pullstrings in all conduits.
 - 6.18.13.2(16)(b) Communications junction boxes shall be minimum 300mm x 300mm x 150mm deep.
 - 6.18.13.2(16)(c) 2x78mm conduit from the electrical room to the roof for future photo-voltaic system panels. Provide approved roof jacks or other approved roof penetration.
 - 6.18.13.2(16)(d) A 78mm conduit from electrical and communication rooms to the parking lot for future power and data cabling to parking meters.

6.18.14 Lighting

6.18.14.1 The Design-BUILDER shall provide a lighting system that complies with the following:

- 6.18.14.1(1) Optimize the use of daylight achieved through a combination of natural light and luminaires complete with controls.
- 6.18.14.1(2) All spaces shall have a manual override for daylight harvesting.
- 6.18.14.1(3) All spaces used by renters after hours shall have programmable override lighting switches that allow for at least two (2) hours override.
- 6.18.14.1(4) Light programming shall comply with the Owner’s requirements.
- 6.18.14.1(5) Exterior and interior lighting shall create a safe and secure environment for students and staff.
- 6.18.14.1(6) Lighting will comply with all characteristics recommended by the Illuminating Engineering Society of North America (IESNA).
- 6.18.14.1(7) Required Lighting Levels

Teaching Areas:	Average
Regular classrooms kindergarten, Libraries, seminar rooms:	400 — 500 lux
Stack areas of Learning Commons: Laboratories, Shops, Drafting, Sewing rooms:	300 lux 750 lux
Gymnasium:	400 — 500 lux
Washrooms, change rooms, shower:	200 lux
Mechanical/Boiler/Electrical rooms:	300 lux
Offices:	400 — 500 lux
Storage Rooms:	150 lux
Hallways, Stairs:	250 — 300 lux

6.18.15 Luminaire Construction and Lighting Components

6.18.15.1 The Design-BUILDER shall provide luminaires and light sources meeting the following requirements and standards:

- 6.18.15.1(1) Selection of luminaires and light sources shall meet the stated energy efficiency and quality and quantity requirements, but shall also meet the objective of providing both a comfortable working environment and an environment conducive to learning and education.

- 6.18.15.1(2) Luminaires in all areas shall be constructed to require minimal cleaning, and will permit practical and easy access and disassembly. All lighting components will be institutional grade.
- 6.18.15.1(3) Luminaires with integrated daylight harvesting sensors shall not be permitted.

6.18.16 Exterior Lighting

6.18.16.1 The Design-Builder shall provide LED exterior lighting according to the following requirements:

- 6.18.16.1(1) Exterior luminaires shall be vandal resistant type c/w LED light source.
- 6.18.16.1(2) Exterior luminaries to comply with Light Intrusion Bylaw and to be provided with “full cut-off” distribution as required by LEED.
- 6.18.16.1(3) Lighting in Parking Areas shall be Area Light, single or multi-head pole mounted, dark sky compliant. Die cast aluminum housing, corrosion resistant polyester powder painted minimum 2 mil. thickness, structured LED arrays and optical assembly to optimize application efficiency and minimize glare, 70 CRI at 3000K, 50,000 hours at L85, IP65 rated optical enclosure Acceptable Manufacturers - Philips EcoForm Series or acceptable equivalent.
- 6.18.16.1(4) Lighting in pedestrian & circulation areas shall be Post Top, single post-top indirect area light, dark sky compliant. Die cast aluminum base and body housing, one piece spun aluminum top upper housing, corrosion resistant polyester powder painted minimum 2 mil. thickness, structured LED arrays and optical assembly to optimize application efficiency and minimize glare, 70 CRI at 4000K, rated life 100,000 hours. Acceptable Manufacturers — Philips UrbanScape MPTC luminaire or acceptable equivalent.
- 6.18.16.1(5) Lighting in building mounted area/flood lighting shall be wall mounted area light, dark sky compliant. Cast aluminum housing, corrosion resistant polyester powder painted minimum 2 mil. thickness, structured LED arrays and optical assembly to optimize application efficiency and minimize glare, 70 CRI at 3000K, 50,000 hours at L85, IP65 rated optical enclosure. Acceptable Manufacturers — Philips EcoFormSeries or acceptable equivalent.

- 6.18.16.1(6) Lighting under canopies shall be surface mounted area light, dark sky compliant. Die cast aluminum housing, opal polycarbonate lens, corrosion resistant polyester powder painted minimum 2 mil. thickness. Acceptable Manufacturers — Kenall MR13FFL Series, Luminaire Lighting ARV13-21.5W Series, Design Plan Ring Series, Cooper top-tier, or acceptable equivalent.

6.18.17 Interior Lighting

- 6.18.17.1 The Design-Builder shall provide and install interior lighting as per the following requirements:

- 6.18.17.1(1) Lighting in areas where computer terminals and similar screens will be used shall be specifically designed to eliminate direct and indirect glare and will meet or exceed the IES recommended cut off for VDT luminaires.
- 6.18.17.1(2) Luminaires in classrooms and administrative office areas shall be linear LED indirect/direct type.
- 6.18.17.1(3) Suspended linear luminaires shall be used (unless noted otherwise) where ceiling height permits. Acceptable manufacturers: Ledalite, Pinnacle, LiteControl, Finelite.
- 6.18.17.1(4) Where ceiling height is not suitable for suspended linear in section 6.18.17.1(3): Recessed 1220mm (4') length 610 (2') or 305mm (1') width, one piece enclosure hinges down as an assembly for easy access, T-hinges for secure retention, guide-post loaded latches, curved acrylic lens. Acceptable manufacturers: Philips Daybrite Soft Trace series, Pinnacle CJ series.
- 6.18.17.1(5) Acrylic lensed recessed or surface luminaires shall be used in other areas such as corridors, storage rooms, and stairwells. Prismatic lenses will be minimum 3mm thick.
- 6.18.17.1(6) Suspended linear luminaire shall include the following: direct-indirect optics, extruded aluminium housing, perforated housing, blade louver or semi-specular reflector down light optical control, length to suit, white or silver powder coat finish, suspended on aircraft cable.
- 6.18.17.1(7) Service rooms shall be provided with industrial LED luminaires c/w spring loaded lamp holders, wireguard, and minimum 10% uplight.

6.18.17.1(8) LED recessed downlights shall be considered for supplemental lighting in public areas, staff rooms and meeting rooms.

6.18.17.2 The Design-Builder shall provide lighting in the gymnasium with the following specifications:

6.18.17.2(1) LED Industrial High—Bay, die cast aluminum driver housing, Solite tempered glass lens with molded silicone rubber gasket sealing the optical compartment, polyester powder finish on all die cast parts, field replaceable LED light engine and driver, 0-10V control dimming driver, 100,000 hours at 45 degrees C ambient at L70 lifetime. Acceptable manufacturers: Philips Daybright HBL Series or acceptable equivalent.

6.18.17.3 The Design-Builder shall provide lighting in the Storage, Mechanical, and Ancillary spaces with the following specifications:

6.18.17.3(1) Utilize standard specification grade commercial LED products. Generally, recessed 1220 mm (4') length 610mm (2') or 305 mm (1') width, steel framed, 0.125" acrylic lens with hinges and positive action cam latches. Acceptable manufacturers — Peerless, Philips, Metalux, Thomas, CFI.

6.18.17.4 The Design-Builder shall provide lighting where suitable with the following specifications:

6.18.17.4(1) LED Troffers: Philips Daybright, Lithonia, or Metalux acceptable equivalent.

6.18.17.4(2) LED Downlights: Philips Lightolier Calculite, Portfolio, acceptable equivalent.

6.18.17.5 The Design-Builder shall allow for feature lighting to emphasize art throughout the Facility and in the following areas:

6.18.17.5(1) Grand Commons,

6.18.17.5(2) Primary corridors,

6.18.17.5(3) Gathering spaces (i.e. theatre entry),

6.18.17.5(4) Visual arts spaces,

6.18.17.5(5) Learning Commons,

6.18.17.5(6) Areas identified by the Owner during the design phase.

6.18.18 Exit Lights**6.18.18.1 Basic Requirements**

- 6.18.18.1(1) The Design-Builder shall mount exit lights to maximize visibility from all directions by adhering to the following:
 - 6.18.18.1(1)(a) Mount clear of mechanical ductwork and piping.
 - 6.18.18.1(1)(b) Wall mount above exit doors wherever possible, otherwise when ceiling mounted provide adequate support for the outlet box independent of the ceiling.
- 6.18.18.1(2) The Design-Builder shall provide Exit lights in accordance with BC Building Code requirements, CSA C-860, and Appendix 1B Room Data Sheets.

6.18.18.2 Performance Requirements

- 6.18.18.2(1) The Design-Builder shall provide Exit lights according to the following requirements:
 - 6.18.18.2(1)(a) Pictogram exit signs to be 120 to 347 volt universal AC dual tap with LED assemblies consuming a maximum total of 2 watts.
 - 6.18.18.2(1)(b) Housings to be extruded aluminum in all areas except:
 - 6.18.18.2(1)(c) Gymnasium shall have soft-edge high abuse PVC housing.
- 6.18.18.2(2) All emergency lighting shall be powered from the centralized emergency power source.
- 6.18.18.2(3) Provide 15 amp, 120 volt emergency circuit and single receptacle. Provide lock dog for circuit breakers.
- 6.18.18.2(4) Provide requirements for testing in framed glass for mounting in main electrical room in accordance with the latest edition of the Canadian Electrical Code requirements.
- 6.18.18.2(5) Provide identification on each remote head base indicating the Emergency Power Supply servicing the specific head. The labeling shall include the Unit (E1) name plus the room # in which the power supply is located; ie. "ELPS # 1 – Elec. B1234". Labels shall be machine printed (clear adhesive with black lettering) or Lamicoid.

- 6.18.18.2(6) Provide, and post, complete instructions within a framed glass display, on the operation and care of the emergency power supplies, including directives on mandatory testing at least once a month in compliance with CEC 46-102. These instructions are to be posted within the Main Electrical Room or other location as directed by the Owner's Maintenance Personnel.
- 6.18.18.2(7) Provide clear lexan or PVC vandal guards on all remote lamps.
- 6.18.18.2(8) Acceptable Manufacturers:
 - 6.18.18.2(8)(a) Beghelli
 - 6.18.18.2(8)(b) Lumacell
 - 6.18.18.2(8)(c) Ready-Lite

6.18.19 Lighting Control

6.18.19.1 Basic Requirements

- 6.18.19.1(1) Lighting controls will comprise a significant part of both of the energy management of the Facility and of the flexibility required to adjust lighting to suit functions and activities. Requirements for the low voltage lighting control system c/w local low voltage switches shall be provided as stated in the mechanical requirements to form a complete and operable system. Low voltage relay panels which are not located in electrical rooms shall be installed in a panelboard enclosure matching the adjacent lighting branch breaker enclosure and trim.
- 6.18.19.1(2) The Design-Builder shall provide master low voltage switches in the General Office for all corridors.
- 6.18.19.1(3) All relay panel interiors shall be pre-assembled complete with the necessary relays, transformers and devices. Relay panel interiors are to be separate from enclosure so as to permit easy mounting, conduit installation and wire pull to enclosures. Interiors to be inserted last and connections made.
- 6.18.19.1(4) The Design-Builder shall provide a complete programmed and commissioned low voltage lighting control system to control all interior and exterior luminaires. The system shall include all panels, relays, transformers, approved BACNet low voltage relay controllers, low voltage controller programming, and any other devices required for a complete and operable system.

Maintenance/IT Building can be conventional lighting control system.

- 6.18.19.1(5) The Design-Builder shall provide the entire low voltage system, including switches, relays, cabinets, lighting controllers, switch wiring and luminaire wiring. The system shall have a BACNet interface for the connection by the DDC contractor to the DDC system. All communication from the low voltage lighting system to the DDC system shall be via a BACNet interface. A point to point interface is not acceptable. Design-Builder to coordinate all work with DDC Contractor.
- 6.18.19.1(6) The Design-Builder shall integrate occupancy sensor controls in corridors and other circulation areas with the BMS as required.
- 6.18.19.1(7) Lighting control shall permit simple and integrated control of lighting; controls shall be easily operated and conveniently and appropriately located for each area and function.
- 6.18.19.1(8) All lighting in corridors, public, and administration areas shall be capable of being switched from the general office and the engineer's office. Install switching to allow for 50% of the general lighting to be turned off during low occupancy periods.
- 6.18.19.1(9) The BMS shall be used for remote control of the lighting.
- 6.18.19.1(10) Multi-level switching of luminaires shall be provided in classrooms, gymnasiums, and similar spaces to allow for lower lighting levels during presentations and similar events. Separate switches shall be provided for each row of luminaires on teaching walls and as determined in consultation with the Owner.
- 6.18.19.1(11) Design-Builder shall provide for Teaching Mode and Audio-Visual Mode illumination levels in each instructional space in accordance with IESNA Lighting Handbook 10th Edition. "All Off" will not be considered as an illumination level.
- 6.18.19.1(12) Integrate day-light harvesting and automatic dimming in instructional spaces, corridors and circulation areas where appropriate. Consider effective locations, mounting and ability to commission day light sensors.
- 6.18.19.1(13) Where occupancy sensors are installed, other than washrooms, local switches shall be provided in the room to allow the lights to be turned on manually, and turned off automatically or manually.

Automatic off after 15-30 minutes of room being vacated.
Confirm off time duration with the Owner during design phase.

- 6.18.19.1(14) Line voltage vacancy sensor control in small not regularly occupied rooms such as Janitor rooms, Storage rooms and Service rooms will be considered acceptable.
- 6.18.19.1(15) Exterior lighting shall be automatically controlled via a photocell and/or time clock, c/w manual override switches located in the general office and the building engineer's office.
- 6.18.19.1(16) The Design-Builder shall provide light programming as determined in consultation with the Owner.

6.18.19.2 Performance Requirements

- 6.18.19.2(1) The Design-Builder shall provide locked enclosures or key-operated switches to protect lighting controls located in publicly accessible areas from unauthorized operation.
- 6.18.19.2(2) The Design-Builder shall provide #18 AWG twisted pair cabling between all relay cabinets.
- 6.18.19.2(3) The Design-Builder shall coordinate switch and cabinet mounting heights with architectural details and adjust, if required, to coordinate with paneling, dados, and masonry course lines.
- 6.18.19.2(4) Switches installed in recessed boxes in Gymnasium and General Office shall have beveled, hinged latching covers.
- 6.18.19.2(5) Low voltage wiring shall be LVT jacketed type, No. 18 AWG, colour coded and installed in conduit.
- 6.18.19.2(6) Leads for line and low voltage connections shall be 254mm length minimum.
- 6.18.19.2(7) Strap or clip wiring into position.
- 6.18.19.2(8) Identify line voltage conductors of each relay and provide directory, attached to inside of cabinet door, correlating identification of conductor where area controlled by relay.
- 6.18.19.2(9) The entire DDC/low voltage lighting control system shall be commissioned by the DDC contractor in coordination with the Design-Builder. Provide a copy of the DDC commissioning reports and test in the Division 26 O&M manuals.
- 6.18.19.2(10) The Design-Builder shall provide a separate 4 hour demonstration for the lighting control system with the Owner's personnel.
- 6.18.19.2(11) The Design-Builder shall provide lighting controls rated for excessive moisture or chemicals that might cause deterioration where appropriate.
- 6.18.19.2(12) The Design-Builder shall zone and subdivide lighting in open and common areas to permit community use, energy management, and control of lighting levels.
- 6.18.19.2(13) Lighting control relays mounted in relay panels shall be full load relays suitable for all types of lamp loads up to 20 Amperes.

Load contacts shall be able to sustain 1500 amp fault currents for up to 20 milli-seconds.

- 6.18.19.2(14) Relays shall be contained in a molded case containing both low and high voltage terminals and shall have a built-in operating lever marked ON/OFF for manual switching at the relay panel.
- 6.18.19.2(15) Switching the relay shall be accomplished with ONE signal wire and a common return. The signal wire shall be able to signal ON and OFF and shall also carry status current that indicates if the relay is ON or OFF.
- 6.18.19.2(16) UL Listing 20A: 120 & 277 VAC; CSA 20A: 120,277 & 347 VAC
- 6.18.19.2(17) Approved manufacturer: Douglas WR-6161
- 6.18.19.2(18) The Design-Builder shall provide factory pre-assembled relay panels. The panel's enclosure shall be for surface of flush installation, with a screw-on cover or a hinged door assembly as required.
- 6.18.19.2(19) Where panels are provided in finished walls, the Design-Builder shall provide spare conduit and infrastructure from the panel to the accessible ceiling for ease of maintenance in the future.
- 6.18.19.2(20) Relay panels shall consist of the following:
 - 6.18.19.2(20)(a) UL/CSA approved
 - 6.18.19.2(20)(b) Suitable divider separating class 1 and class 2 compartments
 - 6.18.19.2(20)(c) Control transformer 40/75 VA, UL/CSA approved for class 2 circuits
 - 6.18.19.2(20)(d) Low voltage relays as required. Control devices as required
- 6.18.19.2(21) Approved manufacturer: Douglas PWEx Series or acceptable equivalent.
- 6.18.19.2(22) Two-Wire LED Switch shall be push-button type, with plastic cap to permit holding an identification label, with LED indicators. Press button once for ON, press again for OFF.
- 6.18.19.2(23) Approved Manufacturer: Douglas WSW-35 or acceptable equivalent.

- 6.18.19.2(24) Two-Wire Key Operated Switch: Douglas WSK-3502 or acceptable equivalent.
 - 6.18.19.2(24)(a) Switches to be used for corridor lights.
 - 6.18.19.2(24)(b) Switch to be momentary tumbler type.
 - 6.18.19.2(24)(c) Switches shall have a plastic cap to permit holding an identification label.
- 6.18.19.2(25) The Design-Builder shall provide standard decorator style plates for switches.
- 6.18.19.2(26) Low Voltage Controllers
 - 6.18.19.2(26)(a) Delta lighting controllers shall be used for the Bacnet control interface and shall be sized to suit the largest quantity of relays within a particular enclosure.
 - 6.18.19.2(26)(b) Controller selections shall be made based on the design requirements; Delta DLC-P1012 through DLC-P1036.
 - 6.18.19.2(26)(c) Bacnet connections and graphic representation of the lighting controllers shall be by the Controls Contractor.
- 6.18.19.2(27) Occupancy sensors shall be dual technology with passive infrared and microphonic technologies.
- 6.18.19.2(28) The Design-Builder shall provide wireguards for occupancy sensors in gyms and change rooms and areas subject to vandalism or damage.
- 6.18.19.2(29) Occupancy sensors in public areas shall be masked to prevent unwanted operation.
- 6.18.19.2(30) The Design-Builder shall provide mounting hardware as required to maximize coverage.
- 6.18.19.2(31) Approved Manufacturer: Sensor Switch or acceptable equivalent.
- 6.18.19.2(32) Coordinate switch and cabinet mounting heights with architectural details and adjust, if required, to coordinate with paneling, dados, and masonry course lines.
- 6.18.19.2(33) Switches installed in recessed boxes in Gymnasium and General Office to have beveled, hinged latching covers.

- 6.18.19.2(34) Low voltage wiring to be LVT jacketed type, No. 18 AWG, colour coded and installed in conduit.
- 6.18.19.2(35) Leads for line and low voltage connections to be 254mm length minimum.
- 6.18.19.2(36) Strap or clip wiring into position.
- 6.18.19.2(37) Identify line voltage conductors of each relay and provide directory, attached to inside of cabinet door, correlating identification of conductor where area controlled by relay.
- 6.18.19.2(38) The entire DDC/low voltage lighting control system shall be commissioned by the DDC contractor in coordination with the Design-Builder. Provide a copy of the DDC commissioning reports and test in the Electrical O&M manuals.

6.18.20 Theatre Lighting

- 6.18.20.1 The Design-Builder shall provide a theatrical lighting system for use in the Theatre.
- 6.18.20.2 Theatre lighting shall be designed by a theatre consultant, with the following minimum requirements:
 - 6.18.20.2(1) Three Electric battens over stage, one in front. All battens with lowering provision to allow instruments to be set, tested, and aimed from floor level.
 - 6.18.20.2(2) Side verticals with enclosed ladder.
 - 6.18.20.2(3) 96 2.4kW dimmers, 120 plug points.
 - 6.18.20.2(4) Dimmer systems shall be UL and cUL listed.
 - 6.18.20.2(5) Four DMX outlets on each batten.
 - 6.18.20.2(6) Dimming console in control room and integration with general lighting.
 - 6.18.20.2(7) Fully digital dimmer cabinets designed specifically for architectural and entertainment lighting applications.
 - 6.18.20.2(8) Wall mounted, convection cooled dimmer rack that does not require fans.
 - 6.18.20.2(9) Forced air-cooling shall not be acceptable.

- 6.18.20.2(10) Approved manufacturer: Philips Strand Lighting or acceptable equivalent.
- 6.18.20.2(11) The dimmer cabinet shall be a wall-mount, dead-front switchboard, substantially framed and enclosed with 16-gauge, formed steel panels. All cabinet components shall be properly treated and primed. The cabinet shall be sized to accommodate 9 power modules.
- 6.18.20.2(12) Dimmer module over-temperature sensing shall be provided for each module. Upon over-temperature condition, each module shall shut down until the temperature falls to within acceptable limits.
- 6.18.20.2(13) The cabinet shall be factory pre-wired and dressed. The Design-Builder shall provide and terminate all feed, load and control wiring on screw terminals fitted within the cabinet.
- 6.18.20.2(14) The cabinet shall be suitable for 60hz supplies of 120/208V, 3-phase, 4-wire, plus ground, and shall contain any combination of single, dual, or quad power modules of the appropriate supply voltage.
- 6.18.20.2(15) The dimmer rack shall ship with a dimmer bypass jumper installed on the load terminal blocks. This bypass jumper shall permit loads to be tested and operated from the dimmer rack circuit breakers prior to installation of the system control stations. These jumpers shall be removed at system commissioning. Systems not offering this feature will not be accepted.
- 6.18.20.2(16) Power modules shall be factory wired units of similar size and heavy duty metal construction, designed to be installed into the cabinet as a self-contained bolt-in assembly. Plastic power module chassis are not acceptable.
- 6.18.20.2(17) SCR dimming modules shall have an integral inductive torroidal filter designed to reduce the rate of rise of current such that the rise time shall not exceed 350 μ s at full load, measured between 10 - 90% of the load current waveform at a 90° conduction angle.
- 6.18.20.2(18) Provide 24 x 2.0 kW dimmers with over current protection at 20 Amps each. Dimmers shall be mounted behind secure panels that shall be opened for maintenance. Dimmers must be rated to supply 100% of all outputs continuously and simultaneously with a fully rated supply.

- 6.18.20.2(19) The control electronics shall provide the following control and communication inputs as standard:
- 6.18.20.2(19)(a) One optically isolated DMX512 control input:
 - 6.18.20.2(19)(b) An RS485 control input for Vision.net architectural control. Vision.net is a control system comprised of architectural style panels for recording and playback of presets in individual assigned "rooms".
 - 6.18.20.2(19)(c) There shall be two programmable panic inputs.
 - 6.18.20.2(19)(d) One RS232 serial programming port for remote programming using PC based configuration software.
- 6.18.20.2(20) Dimmer cabinet to be Strand a21 series, 9 space.
- 6.18.20.2(21) The control system (TL) is a dedicated DMX 512 network for the control of the dimmers, colour scrollers, moving lights, gobo rotators, etc. Primary control point (TL-1) is DMX-in located as agreed with the School District.
- 6.18.20.2(22) Provide wall mounted 8 button remote stations, located as agreed with the School District. This station recalls user-defined presets. Philips Strand Lighting Vision.net 63328 or acceptable equivalent.
- 6.18.20.2(23) Provide portable digital lighting consoles with 12 /24 channels, supporting up to 25 effects each with 99 steps, bump buttons on all channels and full DMX 512 operation with patch. Console to have provision for optional video display card and monitor port. Philips Strand Lighting 200 Series Console or acceptable equivalent.
- 6.18.20.2(24) Provide channel mount, heavy duty extruded aluminum, black anodized theatrical plugin strips with wire way. Factory pre-wired to junction box for field connections. All internal wiring to the terminal block shall be #12 AWG and complete from the receptacle to the terminal strip. Channel mount to include DMX-out receptacle.
- 6.18.20.2(25) Receptacles shall be 20 amp twist lock flush mounted. A permanent and distinctly legible circuit number shall identify each receptacle. Note that each receptacle requires separate, dedicated hot and neutral wires. Standard of acceptance Arkadium Channel Mount.

- 6.18.20.2(26) Provide single pipe hanger mounting hardware suitable for suspending channel mount by threaded rod and fittings to accommodate 38mm (1 1/2") schedule 40 instrument mounting pipe. Supply painted black instrument mounting pipe in lengths to match channel mount.
- 6.18.20.2(27) Provide two (2) 15-32 degree profile spotlights and ten (10) 23-50 degree profile spotlights. The luminaires shall have a precision optical zoom system designed around a dichroic reflector in combination with a high efficiency, low energy consumption, long life 575W lamp or 750W lamp.
- 6.18.20.2(27)(a) The housing shall rotate 360 degrees to provide optimum luminaire orientation at all times. The shutters shall be stainless steel. The shutters shall operate in three independent planes.
- 6.18.20.2(27)(b) Pattern and gobo size shall be B. Exterior finish shall be black epoxy powder coat. The rear housing assembly shall open for reflector cleaning.
- 6.18.20.2(27)(c) Strand LekoLite series.
- 6.18.20.2(28) Provide twelve (12) Fresnel lights 7" diameter. Each luminaire shall be a degree variable focus Fresnel spotlight designed to accommodate lamps in 575, 750, and 1000-watt sizes. Wide-angle coverage 1/2 peak angle 7° - 56° in one lens is required.
- 6.18.20.2(28)(a) Swing-down door for access to lamp with integral micro-switch to provide automatic disconnect of power when opening to re-lamp. Die cast aluminum accessory clips shall be screw retained to the lens door and shall be capable of holding a combination of a barn door and colour frames and/or scrims.
- 6.18.20.2(28)(b) The luminaire shall produce a defined cut in the projected beam when used with a barn door to control "light spill" on curtains, stage and scenery. Parabolic Aluminized Reflector (PAR) fixtures that do not provide this feature will not be accepted.
- 6.18.20.2(28)(c) Strand/Selecon Rama series or acceptable equivalent.

6.18.21 Mechanical Equipment Coordination

6.18.21.1 Basic Requirements

- 6.18.21.1(1) The Design-Builder shall provide electrical power to all mechanical equipment as required for proper operation, protection and maintenance of the equipment. Materials and installation methods shall result in safe reliable and serviceable mechanical equipment and systems in the Facility.
- 6.18.21.1(2) The Design-Builder shall confirm final connections, loads and locations of motors prior to installation.
- 6.18.21.1(3) Motors for mechanical equipment installed by Mechanical. Coordinate with final mechanical design drawings and shop drawings for locations and electrical requirements.
- 6.18.21.1(4) Provide motor protection starters switches where required, coordinate with Mechanical.
- 6.18.21.1(5) Single phase manual motor protection switches to be either toggle or key operated complete with pilot light. Flush or surface mounted as indicated; key operated where indicated.
- 6.18.21.1(6) In finished areas, provide flush mounted motor protection switches complete with stainless steel cover plates.
- 6.18.21.1(7) Select heaters to suit full load current of motors installed.
- 6.18.21.1(8) Provide a separate disconnect switch on the line side of each starter.
- 6.18.21.1(9) Provide disconnect switches for all equipment in accordance with CEC requirements.
- 6.18.21.1(10) Install motor and circuit disconnect switches as required by Code.
- 6.18.21.1(11) Install keyed switches in all public areas.
- 6.18.21.1(12) All disconnects to be complete with lamicoid name tags.

6.18.21.2 Performance Requirements

- 6.18.21.2(1) The Design-Builder shall:
 - 6.18.21.2(1)(a) Provide institutional or industrial quality cables, connectors, conduit systems, fittings and hardware used to make connection to mechanical equipment and shall be selected and installed to provide for a high level of reliability, durability and ease of maintenance of the equipment.

- 6.18.21.2(1)(b) Provide connections to sinks with electronic hands-free type faucets.
- 6.18.21.2(1)(c) Ensure connections made to motors and/or motor driven equipment or equipment with noticeable levels of vibration are of a type specifically designed to accommodate the vibration.
- 6.18.21.2(1)(d) Provide for the eventuality that equipment shall be replaced in the future with upgraded and dissimilar equipment types and design connections to mechanical equipment accordingly.
- 6.18.21.2(1)(e) Three Phase Motor Disconnect Switches shall be 3 pole, fused or unfused to suit, 250 volt as required in EEMAC Type 1, 3 and/or 4 enclosures.
- 6.18.21.2(1)(f) All exterior disconnects to be weatherproof.

6.18.22 Poles and Pole Bases

6.18.22.1 Basic Requirements

6.18.22.1(1) The Design-Builder shall ensure the following:

- 6.18.22.1(1)(a) All poles and pole bases shall be engineered to withstand local wind and ice loading conditions, as well as the weight of all equipment mounted on the pole
- 6.18.22.1(1)(b) Each pole shall be CSA approved and shall bear required marking(s).
- 6.18.22.1(1)(c) Pole finish to be non-corrosive type. Paint to be applied via powder coat method.
- 6.18.22.1(1)(d) Each pole base shall be precast reinforced concrete, and shall be of size and configuration suitable for associated pole and electrical equipment. Bases shall be Pyramid Style unless otherwise directed by the Engineer.

6.18.22.2 Performance Requirements

- 6.18.22.2(1) The Design-Builder shall install all poles complete with TCT Wiresentry anti-theft protection, manufactured by Trans Canada Traffic, White Rock, BC.
- 6.18.22.2(2) Approved Pole Manufacturer's: Foxfab Metal Works Inc.; Nova; West Coast Engineering Group.

6.18.23 Synchronized Clocks

6.18.23.1 Basic Requirements

- 6.18.23.1(1) The Design-Builder shall provide a complete and operating digital-network-synchronized clock system and shall integrate with the Public Address system throughout the Facility. Battery operated clocks will be permitted in the Maintenance/IT Building.
- 6.18.23.1(2) The Design-Builder shall provide a connection between the Central Clock and the Time Server and shall coordinate with the Owner IT Representative for the requirement for programming and commissioning.
- 6.18.23.1(3) The Design-Builder shall provide one wired 305mm diameter analog clock in all instructional spaces, General office and Staff Room, except the gymnasium shall have two wired 406mm diameter clocks c/w wireguards.
- 6.18.23.1(4) The Design-Builder shall provide recessed outlets for all clocks except for battery operated clocks.
- 6.18.23.1(5) All equipment supplied shall be the standard product of a single manufacturer of known reputation and minimum of 10 years' experience in the industry.
- 6.18.23.1(6) The Design-Builder shall provide a certificate of manufacturer's installation training with the submittal.
- 6.18.23.1(7) The Design-Builder shall coordinate clock locations and mounting heights with architectural details during design development and as per Appendix 1B Room Data Sheets.
- 6.18.23.1(8) Approved Manufacturer: Valcom or acceptable equivalent.

6.18.24 Operating and Maintenance Instructions

6.18.24.1 Requirements for Manuals

- 6.18.24.1(1) Design-Builder shall provide a minimum of three copies of complete and approved operating and maintenance instructions for all electrical equipment and systems supplied before substantial completion. Design-Builder shall provide additional copies if required under the General Requirements. In addition, the Design-Builder shall provide the Owner with a manual in a searchable PDF format on USB stick. As-Built Drawings to be included on the USB stick.
- 6.18.24.1(2) Binders shall be three-ring, hard-cover, loose-leaf type and identified on the binding edges as "Maintenance Instructions and Data Book", for New Westminster Secondary School.
- 6.18.24.1(3) Terminology used in all the sections shall be consistent.
- 6.18.24.1(4) Volume One shall contain the master index of all systems, the name of the subcontractor, Electrical subcontractors and the date of substantial performance for the Contract.
- 6.18.24.1(5) Volume One shall contain a section with all necessary warranty information.
- 6.18.24.1(6) Each binder shall have a complete index for all volumes.
- 6.18.24.1(7) Each binder shall be no more than half filled.
- 6.18.24.1(8) There shall be a separate section for all materials used on the project which fall under the WHMIS legislation. There shall be an MSDS, hazard data sheet, for each of the materials.
- 6.18.24.1(9) There shall be a separate section for all Insurance Certificates, Test Certificates, Verification Forms and Test Forms.
- 6.18.24.1(10) All relevant information relating to a system or product shall be contained within one binder.
- 6.18.24.1(11) The manual sections shall follow the specification sections.
- 6.18.24.1(12) Any diagrams, installation drawings, single line diagrams charts, etc. shall be mechanically reduced while maintaining full legibility to standard page size. If this cannot be achieved they shall be carefully folded and contained within a clear plastic wallet within the manual.
- 6.18.24.2 Data for Manuals
- 6.18.24.2(1) Equipment data provided by the Design-Builder shall contain:

- 6.18.24.2(1)(a) Operating instructions.
 - 6.18.24.2(1)(b) Operating conditions such as temperature and pressure.
 - 6.18.24.2(1)(c) Location of equipment.
 - 6.18.24.2(1)(d) Name and contact info of suppliers.
 - 6.18.24.2(1)(e) Maintenance instructions and schedules for one year routine.
 - 6.18.24.2(1)(f) Recommended list of spare parts.
 - 6.18.24.2(1)(g) Maintenance schedule.
 - 6.18.24.2(1)(h) A trouble shooting table showing where to look for problems under various conditions of malfunction.
 - 6.18.24.2(1)(i) All wiring diagrams.
 - 6.18.24.2(1)(j) Equipment operating curves.
 - 6.18.24.2(1)(k) Equipment nameplate data and serial numbers.
- 6.18.24.2(2) System data shall contain:
- 6.18.24.2(2)(a) A listing of all systems.
 - 6.18.24.2(2)(b) All panels, mechanical distribution panels, and fire alarm schedules and locations.
 - 6.18.24.2(2)(c) Equipment name tags.
 - 6.18.24.2(2)(d) Cleaning, maintaining and preserving instructions for all material, products and surfaces. Include warnings of harmful cleaning, maintaining and preserving practices.
- 6.18.24.2(3) Additional manuals shall be provided for:
- 6.18.24.2(3)(a) Switchboards and power distribution systems.
 - 6.18.24.2(3)(b) Lighting systems.
 - 6.18.24.2(3)(c) Emergency power systems.
 - 6.18.24.2(3)(d) Fire alarm systems.
- 6.18.24.2(4) As-Built documentation shall contain:

- 6.18.24.2(4)(a) Reviewed As-Built Shop Drawings.
- 6.18.24.2(4)(b) As-Built Construction Drawings.
- 6.18.24.2(4)(c) Originals of test forms.
- 6.18.24.2(4)(d) Originals of test certificates.

6.18.24.1 Operating Instructions

- 6.18.24.1(1) Instruct the Owner's representative in all aspects of the operation and maintenance of systems and equipment.
- 6.18.24.1(2) Instruct the Owner for a minimum of five (5) working days.
- 6.18.24.1(3) All instruction sessions to be video-taped and copy must be provided to the Engineer's Representative/Owner.
- 6.18.24.1(4) At the time of final review, Design-Builder shall provide a sheet for each system and piece of equipment showing the date instructions were given. Each sheet shall show the duration of instruction, name of persons receiving instruction, other persons present (manufacturer's representative, Engineer's Representative, etc.), system or equipment involved and signature of the Owner's staff stating that they understood the system installation, operating and maintenance requirements. This information shall be inserted in the manuals after all instructions have been completed.
- 6.18.24.1(5) Design-Builder shall review all information with the Owner's representative to ensure that all information required has been provided.
- 6.18.24.1(6) Electrical equipment and systems included in the instruction requirements, include but not limited to the following:
 - 6.18.24.1(6)(a) Switchboards and related power distribution equipment.
 - 6.18.24.1(6)(b) Emergency generator.
 - 6.18.24.1(6)(c) Automatic transfer switches.
 - 6.18.24.1(6)(d) Fire alarm systems.

6.18.24.2 Trial Usage

- 6.18.24.2(1) The Owner will be permitted trial usage of systems or parts of systems for the purpose of testing and learning operational

procedures. Trial usage shall not affect the warranties nor be construed as acceptance, and no claim for damage shall be made against the Owner for any injury or breakage to any part or parts due to the tests, where such injuries or breakage are caused by a weakness or inadequacy of parts, or by defective materials or workmanship of any kind.

6.18.25 Commissioning

6.18.25.1 General

6.18.25.1(1) In accordance with ASHRAE Guideline 0, The Commissioning Process, the term commissioning shall be taken in these specifications to mean a quality oriented process for achieving, verifying and documenting that the performance of Facility, systems, and assemblies meets defined objectives and criteria.

6.18.25.1(2) The term commissioning agent shall be taken in these specifications to mean the person or party responsible for commissioning a given system or piece of equipment.

6.18.25.1(3) The following systems shall be commissioned:

6.18.25.1(3)(a) Emergency lighting system

6.18.25.1(3)(b) Fire Alarm System

6.18.25.1(3)(c) Structured Cabling System

6.18.25.1(3)(d) Cable Television System

6.18.25.1(3)(e) Telephone System

6.18.25.1(3)(f) Main Distribution Panel

6.18.25.1(3)(g) Uninterruptible Power Supplies

6.18.25.1(3)(h) Generator

6.18.25.1(3)(i) SPD System

6.18.25.1(3)(j) Lighting Control System

6.18.25.1(3)(k) Security and Access Control System

6.18.25.1(3)(l) Security Shutters

6.18.25.1(3)(m) Public Address, Clock and Gymnasium Sound Systems

6.18.25.1(3)(n) CCTV system

6.18.25.1(3)(o) The Design-Builder shall include all commissioning costs in the tendered price.

6.18.25.2 Products

6.18.25.2(1) For each system, a separate report shall be submitted. Each report shall be in typewritten format, and shall clearly indicate each component and function tested and the corresponding test results for each test required by the specifications or by the commissioning agent. Prior to commissioning any system, the Design-Builder shall submit the proposed report format to the Engineer for approval. Any test results submitted in a format not approved by the Engineer will be rejected at the discretion of the Engineer.

6.18.25.2(2) Unless indicated otherwise, the above documents shall be submitted in either hard copy or PDF format. Word or Excel files are not acceptable. Scans are also not acceptable.

6.18.25.2(3) Each report shall indicate the name(s) of the personnel who performed the actual commissioning inspections and tests on site.

6.18.25.2(4) Each report shall include a cover letter, bearing the letterhead of the designated commissioning agent and signed by an authorized staff member of the agent, clearly stating for each system that it has been commissioned by the agent, that the results of the commissioning are documented in the attached commissioning report, and that, in the opinion of the agent, the system is fully functional as intended. If for any reason, in the opinion of the commissioning agent, the system is not fully functional, any and all deficiencies shall be clearly identified in the letter and a timeline given for their correction.

6.18.25.3 Execution

6.18.25.3(1) For each system and/or piece of equipment described below, a visual inspection shall be made of all components to ensure a good operating condition. This requirement is separate from other Project Commissioning Plans and undertakings.

6.18.25.3(2) For each system and/or piece of equipment described below: wherever deficiencies are observed, corrective measures shall be taken. In the report, include a description of each deficiency

and the corrective measure to be undertaken, including a schedule of dates for completion of the remedial work. Upon completion of the corrective measures, provide a subsequent written report to be added to the original submission.

- 6.18.25.3(3) Record all tests and observations. Where no written record is made in the report, it will be assumed that no test or observation was made.
- 6.18.25.3(4) Coordinate all Electrical systems commissioning to ensure all systems meet the requirements.
- 6.18.25.3(5) Emergency Lighting System
 - 6.18.25.3(5)(a) The commissioning agent for the Emergency Lighting System shall be the Electrical Contractor. Refer also to 6.18.25.3(4) above.
 - 6.18.25.3(5)(b) Each remote head, battery pack, emergency ballast, and exit sign shall be tested to verify that it functions as intended under loss of power to the lights in the respective areas served by this equipment. Voltage readings are to be taken at each remote head and associated source. Using these readings, the voltage drop shall be calculated at each remote head location, and shall be expressed as a percentage of the source voltage. Any device locations for which the voltage drop is shown to exceed the tolerances of the Electrical Code shall necessitate the upgrading of wiring to those locations as required complying with Code tolerances. Where wiring upgrades are made, test and verify again to ensure compliance. All costs associated with any remedial work shall be borne by the Design-Builder only. No extras will be considered.
 - 6.18.25.3(5)(c) For each space in which emergency illumination is provided, the Commissioning Agent shall turn off the breakers for all circuits, and only for those circuits, that provide power to the luminaires in the respective space. If the emergency lighting equipment in question illuminates to its full brightness that equipment shall receive a 'pass'; if not, a 'fail'.
 - 6.18.25.3(5)(d) The Commissioning Report for the interlock and operation of the emergency lighting systems shall individually identify all equipment tested, including

luminaire identification, location, breakers that were turned off, and test results. Any interlocks in on-compliance (fail) with proper operation as defined the Electrical Code shall necessitate the replacement and retesting / verification, including the required remedial work, without additional costs to the Owner; no extras will be considered.

6.18.25.3(6) Fire Alarm System

- 6.18.25.3(6)(a) The Commissioning Agent for the Fire Alarm System shall be the system manufacturer. Refer also to 6.18.25.3(4) above.
- 6.18.25.3(6)(b) Each component of the fire alarm system shall be tested in accordance with CAN/ULCS537-04.
- 6.18.25.3(6)(c) The Commissioning Report shall be formatted to the standard of CAN/ULC-S537-04 Appendix C.
- 6.18.25.3(6)(d) A final fire alarm verification certificate must also be provided with the commissioning report.
- 6.18.25.3(6)(e) The commissioning report shall indicate that, if applicable, the WAN connection and/or DDC connections have been tested and are working correctly.

6.18.25.3(7) Structured Cabling System

- 6.18.25.3(7)(a) The Commissioning Agent for the Structured Cabling System shall be the system installer. This installer shall be certified by the system manufacturer. Refer also to 6.18.25.3(4) above.
- 6.18.25.3(7)(b) Each permanent link shall be tested for all parameters necessary to verify conformance to the specified TIA system category and to the manufacturer's certification requirements.
- 6.18.25.3(7)(c) The commissioning report shall indicate each link tested, and for each shall include the link identifier, location, minimum passing value for each parameter, and actual measured value.
- 6.18.25.3(7)(d) The commissioning report shall be submitted in both hard and soft copy formats.

- 6.18.25.3(7)(e) A 25 year Warranty Certificate is also be provided by the manufacturer and shall be included in the commissioning report.

6.18.25.3(8) Cable Television System

- 6.18.25.3(8)(a) The Commissioning Agent for the Cable Television System shall be the system installer. This installer shall be certified by the system manufacturer. Refer also to 6.18.25.3(4) above.
- 6.18.25.3(8)(b) The installer shall align and balance the system in accordance with the manufacturer's recommendations.
- 6.18.25.3(8)(c) Each subscriber drop shall be tested for all parameters necessary to verify conformance to the manufacturer's recommendations.
- 6.18.25.3(8)(d) The commissioning report shall indicate each subscriber drop tested, and for each shall include the drop identifier, location, minimum passing value for each parameter, and actual measured value. Parameters tested shall include, but not be limited to distortion, signal uniformity, and signal to noise ratio. Final settings of the gain of each amplifier shall be included.
- 6.18.25.3(8)(e) The commissioning report shall be submitted in both hard and soft copy formats.

6.18.25.3(9) Telephone System

- 6.18.25.3(9)(a) The Commissioning Agent for the Telephone System shall be the system installer. This installer shall be certified by the system manufacturer. Refer also to 6.18.25.3(4) above.
- 6.18.25.3(9)(b) The installer shall program all features and extensions to the requirements of the Owner.
- 6.18.25.3(9)(c) Provide machine printed extension labels and listings for all phones.
- 6.18.25.3(9)(d) The commissioning report shall provide a description of each features and programming that has been installed for the system. The report shall indicate that all features and programs for all phones have been tested and are working correctly.

6.18.25.3(9)(e) The commissioning report shall be submitted in both hard and soft copy formats.

6.18.25.3(10) Main Distribution Panel

6.18.25.3(10)(a) The Commissioning Agent for the Main Distribution Panel (MDP) shall be the MDP manufacturer. Refer also to 6.18.25.3(4) above.

6.18.25.3(10)(b) Bus resistance shall be measured and recorded.

6.18.25.3(10)(c) Electrical and function tests shall be performed to verify that all components and systems perform as intended. Such tests shall include, but not be limited to the contact resistance of the main breaker, as well as its short, long, and ground fault delay pickup and delay time settings (where applicable), instantaneous pickup (where applicable), and a trip unit self-test.

6.18.25.3(10)(d) Feeder terminations shall be tested and voltage and amperage readings listed. Wherever readings do not comply with the tolerances of the Electrical Code the Design-Builder shall undertake remedial work, including, where necessary, replacement of connectors, fittings, and feeder wiring. Where replacements and/or other remedial work are required, test and verify again to ensure compliance. All costs associated with any remedial work shall be borne by the Design-Builder only. No extras will be considered.

6.18.25.3(10)(e) Insulation resistance shall be measured and recorded.

6.18.25.3(10)(f) All digital meters shall be commissioned and included as a separate section in the report. Indicate that all WAN connections and/or DDC connections have been tested and are working correctly.

6.18.25.3(11) Uninterruptible Power Supplies (UPS)

6.18.25.3(11)(a) The Commissioning Agent for the UPS shall be the UPS manufacturer.

6.18.25.3(11)(b) Electrical and function tests shall be performed to verify that all components and systems perform as intended.

6.18.25.3(11)(c) The commissioning process shall include a full load transfer to the UPS batteries.

6.18.25.3(11)(d) The commissioning process shall include, where applicable, review of the ventilation and cooling provided for the room(s) housing the UPS equipment. Verify that all necessary ventilation and cooling equipment functions adequately under emergency load conditions.

6.18.25.3(11)(e) The commissioning report shall indicate that the WAN connection and/or DDC connections have been tested and are working correctly.

6.18.25.3(12) Surge Protective Devices (SPD)

6.18.25.3(12)(a) The Commissioning Agent for the SPD shall be the SPD manufacturer.

6.18.25.3(12)(b) Electrical and function tests shall be performed to verify that all components and systems perform as intended.

6.18.25.3(12)(c) The commissioning report shall indicate that the WAN connection and/or DDC connections have been tested and are working correctly.

6.18.25.3(13) Low Voltage Lighting Control System

6.18.25.3(13)(a) The commissioning of the lighting control system shall be completed through the coordinated efforts of the installing contractor, the low voltage lighting control supplier, and the controls contractor.

6.18.25.3(13)(b) The Commissioning Agent for the Low Voltage Lighting Control System shall be the control system manufacturer. Refer also to 6.18.25.3(4) above.

6.18.25.3(13)(c) Electrical and function tests shall be performed to verify that all components and systems perform as intended.

6.18.25.3(13)(d) The commissioning process shall include a test of any provisions in the control system for operation of emergency lighting.

6.18.25.3(13)(e) The commissioning process shall include a test of any provisions in the control system for operation of interfaces with alarm systems as described in Appendix A of the Specifications.

6.18.25.3(13)(f) Each lighting zone shall be tested to ensure that it is controllable as intended. Where multiple points of

control, including but not limited to switches, dimming controls, occupancy sensors, and daylight sensors, are provided for a given zone, each control shall be tested. Controls that operate more than one zone shall be tested for each zone.

- 6.18.25.3(13)(g) Where the lighting control system includes dimming capability, each dimming control shall be tested to ensure that each applicable zone dims as intended.
- 6.18.25.3(13)(h) Where the lighting control system includes preset scenes, each instance of each preset scene shall be tested to ensure that it functions as specified.
- 6.18.25.3(13)(i) Where the lighting control system includes daylight sensors, the functionality of each sensor shall be tested to ensure that it functions as specified.
- 6.18.25.3(13)(j) The Commissioning Agent shall provide on-site training to designated members of the Owner's maintenance staff. Include a detailed description of the training given in the commissioning report.

6.18.25.3(14) Security and Access Control System

- 6.18.25.3(14)(a) The Commissioning Agents for the Security and Access Control System shall be the system installer.
- 6.18.25.3(14)(b) Electrical and function tests shall be performed to verify that all components and systems perform as intended.
- 6.18.25.3(14)(c) The commissioning report shall indicate that the WAN connection and/or DDC connections have been tested and are working correctly.

6.18.25.3(15) Security Shutters

- 6.18.25.3(15)(a) The Commission Agents for the Controls Contractor in cooperation with Div. 26. Div. 26 shall undertake required line voltage wiring to facilitate the shutter operation. The Controls Contractor shall undertake the low voltage wiring interconnections with the shutter operators in coordination with the Shutter Suppliers.
- 6.18.25.3(15)(b) The required wiring diagrams, contacts, and relays for the interlock features of the shutters are to be provided by the Shutter Suppliers as part of their package.

6.18.25.3(16) Public Address, Clock and Gymnasium Sound Systems

- 6.18.25.3(16)(a) The Commissioning Agents for the Communications systems shall be the representatives of the systems manufacturer.
- 6.18.25.3(16)(b) Electrical and function testing shall be undertaken to ensure the system components and operation meet the full intent of the documentation.
- 6.18.25.3(16)(c) The Commissioning Agent shall provide on-site training to designated members of the Owner's maintenance staff. Include a detailed description of the training given in the commissioning report.

6.18.25.3(17) CCTV System

- 6.18.25.3(17)(a) The Commissioning Agents for the Communications systems shall be the representatives of the systems manufacturer.
- 6.18.25.3(17)(b) Electrical and function testing shall be undertaken to ensure the system components and operation meet the full intent of the documentation.
- 6.18.25.3(17)(c) The Commissioning Agent shall provide on-site training to designated members of the Owner's maintenance staff. Include a detailed description of the training given in the commissioning report.

6.18.25.3(18) Demonstration Of Complete Electrical Systems

- 6.18.25.3(18)(a) At completion of the project, check through all electrical systems with Owner. This check to include instructing Owner in operating and maintenance procedures. Allow for eight (8) hours of on-site instruction after building occupancy at times selected by the Owner.
- 6.18.25.3(18)(b) Instructions to be carried out by Electrical project superintendent or other senior officials of Electrical as approved by the Coordinating Consultant.
- 6.18.25.3(18)(c) Final demonstrations are to be recorded on video recordings with four (4) copies provided with the Maintenance Manuals for reference by the Owner / User Groups.

6.18.25.3(19) Testing

- 6.18.25.3(19)(a) Test and check all portions of the electrical systems for satisfactory operation. All test results to be documented in the Operation and Maintenance Manuals.
- 6.18.25.3(19)(b) Before energizing any portion of the electrical systems, perform Megger tests on all feeders. Space results to conform to the Canadian Electrical Code, to the satisfaction of the authorized inspection authority and the Owner. Megger tests on all feeder conductors to be done in the presence of the Owner and/or his representative, suitably logged, tabulated, signed and included in the Operation and Maintenance Manuals.
- 6.18.25.3(19)(c) Upon completion of building and immediately prior to final inspection and takeover, check load balance on all feeders at panelboards. Tests to be carried out by turning on all possible loads and checking load current balance. If load unbalance exceeds 15 per cent, reconfigure circuits to balance load. Readings to be logged, tabulated and incorporated into the Operation and Maintenance Manuals.
- 6.18.25.3(19)(d) In cooperation with Mechanical, take clip-on ammeter readings on all phases of all mechanical equipment motors with motors running under full load condition. Readings to be logged, tabulated and incorporated into the Operation and Maintenance Manuals.

6.18.26 Maintenance/IT Building**6.18.26.1 Basic Requirements**

- 6.18.26.1(1) The Design-Builder shall utilize wiring methods and materials to provide safe reliable and flexible electrical power, control, communication, data, and life safety systems in the Facility.
- 6.18.26.1(2) The Design-Builder shall ensure all wiring is neatly and securely installed in such a way that it is protected from damage, is not in conflict with mechanical or architectural components of the building(s) and allows for future changes and additions such as additions, removals and relocations for the projected working life of the Facility.

- 6.18.26.1(3) The Design-Builder shall provide electrical power from the main source of supply, to each load requiring supply of power, and to convenience and special purpose outlets.
- 6.18.26.1(4) Distribution equipment and systems shall be robust, reliable, easily operated and maintained and be designed with extra capacity to accommodate load growth, equipment additions, and changes.
- 6.18.26.1(5) The Design-Builder shall coordinate space requirements and the installation of mechanical and electrical work and shall maximize accessibility for other installations, maintenance, and repairs.
- 6.18.26.1(6) The Design-Builder shall provide space in service rooms to ensure adequate service clearances are maintained as per the CEC and BCBC to provide periodic maintenance as well as allow for future replacement of equipment without the removal of other non-associated equipment or services
- 6.18.26.1(7) The Design-Builder shall observe manufacturer recommended clearances for all equipment.
- 6.18.26.1(8) The Design-Builder shall provide stair access to service rooms and roof areas. Ships ladders and hatches are not acceptable.
- 6.18.26.1(9) The Design-Builder shall provide all electrical raceway infrastructure required from the Maintenance/IT Building main electrical room to the exterior face of the building, conveniently located on the side closest to, for direct future access and connectivity to support to the existing and future playing fields.

6.18.26.2 Performance Requirements

- 6.18.26.2(1) The Design-Builder shall provide outlets and receptacles to all areas and spaces including offices, shops, and Server Room, including:
 - 6.18.26.2(1)(a) 2 receptacles per wall
 - 6.18.26.2(1)(b) Connections to all electric roll shutters.
 - 6.18.26.2(1)(c) 5 drop cords for wood shops.
- 6.18.26.2(2) All sub-sections under section 6.22 shall apply to the Maintenance/IT Building as well as the School, unless noted otherwise.

- 6.18.26.2(3) The Design-Builder shall provide battery operated clocks in this building.

6.19 Telecommunications & IT (Div. 27)

6.19.1 General

- 6.19.1.1 Refer to Appendix 1G Systems Responsibility Matrix for system's scope and responsibilities.
- 6.19.1.2 The Design-Builder shall provide conduit infrastructure from the street to the MTR for CATV.
- 6.19.1.3 The Design-Builder shall design the controls system as a building management system (BMS) which allows monitoring and operation of the entire Facility from a single location or through a remote internet connection.
- 6.19.1.4 The Design-Builder shall provide one (1) data drop to each power distribution unit (PDU) to enable remote management and control via the District network.
- 6.19.1.5 The Design-Builder shall provide 4 lines from the main telephone backboard ahead of the PBX and 4-pair category 6A telephone cable in 25mm conduit to the fire alarm monitoring equipment, intrusion alarm monitoring equipment and elevator monitoring equipment for remote monitoring station tie-in.
- 6.19.1.6 Refer to electrical requirements in this section (Div. 27) as well as all other applicable sections.
- 6.19.1.7 The conduits, pathways, room layouts, and design shall comply with the TIA/EIA-569-C Commercial Building Standard for Telecommunications Pathway and Spaces, latest edition.
- 6.19.1.8 The Design-Builder shall consult with the Owner and meet all of the Owner's policies and standards for all connections to the Owner's data, voice, audio, video and wireless networks.
- 6.19.1.9 The Design-Builder shall comply with the clearance requirement and recommendations for all equipment and systems including TIA and BICSI.
- 6.19.1.10 The Owner will coordinate with the Design-Builder as it relates to the design and implementation of all IT and Telecommunications infrastructure defined within this section of the SOR.

- 6.19.1.11 Design-Builder shall provide communication outlets in the Teaching Kitchen (Commercial Kitchen) in correspondence to Appendix 1X Equipment List.
- 6.19.1.12 Communications rooms shall be located away from wet areas and/or drainage pipes. Design-Builder shall provide water ingress mitigation measures for all communications rooms not only for flooding from outside the Facility but also from within the Facility.

6.19.2 Structured Cabling System

6.19.2.1 Basic Requirements

- 6.19.2.1(1) The Design-Builder shall provide and install a complete category 6 (unless noted otherwise) structured cabling solution throughout the Facility. Refer to Appendix 1B Room Data Sheet for minimum number of data drops.
- 6.19.2.1(2) The cabling infrastructure shall be designed by a Registered Certified Data Designer (RCDD) and shall be to the latest TIA/EIA standards including:
 - 6.19.2.1(2)(a) TIA/EIA 569-C
 - 6.19.2.1(2)(b) TIA/EIA 568-C.1, C.2 and C.3 Commercial Building Cabling Standards and Optical Fibre Cabling Standards
 - 6.19.2.1(2)(c) TIA/EIA 526-7-98 and TIA/EIA 526-14-A-98 Standards for Optical Power Loss measurement of single mode and multimode fibre cable plant
 - 6.19.2.1(2)(d) TIA/EIA 606 Standard the Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
 - 6.19.2.1(2)(e) TIA J-STD-607-C Standard Commercial Building Grounding and Bonding Requirements for Telecommunication
- 6.19.2.1(3) The structured cabling component shall be of the same manufacturer and shall be supplied and installed by a data subcontractor who is certified by the manufacturer's best warranty.
- 6.19.2.1(4) The Design-Builder shall provide 2 spare patch panel ports for each patch panel location. Spare ports are to be continuous

starting after the last wired data port of the last / lower Patch Panel in the column.

- 6.19.2.1(5) The Design-Builder shall provide sufficient telecommunications outlets and outlet/connectors in rooms that have or are anticipated to have data, phone, video, or other end-use devices.

6.19.2.2 Performance Requirements

- 6.19.2.2(1) The Design-Builder shall provide:

- 6.19.2.2(1)(a) A star wired cabling system to wire all telecommunication outlet locations back to Telecommunication Rooms ("TR") and all telecommunication rooms back to the main telecommunications room.
- 6.19.2.2(1)(b) Channels for each communication outlet as indicated on drawings. Provide blank inserts for all unused cover plate openings.
- 6.19.2.2(1)(c) Minimum of 2 category 6 (unless noted otherwise) cables fully terminated on RJ45's at each device location and will be run back to the TRs.
- 6.19.2.2(1)(d) Maximum 30% fill in all conduit pathways and maximum 25% fill in all cable trays, on opening day.
- 6.19.2.2(1)(e) Minimum, a 24 Strand OM4 Multi-Mode fiber from the MTR to each TR and EF. Additionally, provide single mode fiber cables to EF.
- 6.19.2.2(1)(f) Spare capacity in TRs as per TIA/EIA 569-C Commercial Building Standard for Telecommunications Pathways and Spaces. All cabling shall be run in conduit or cable tray. J-hooks shall not be permitted.
- 6.19.2.2(1)(g) Sufficient drops for specialized systems
- 6.19.2.2(1)(h) Record drawings, operation and maintenance manuals and test results in accordance with the Design-Build Agreement.
- 6.19.2.2(1)(i) Terminations all horizontal cable on standard density RJ45 rack mounted rack mounted patch panels in MTR and TRs and shall follow TIA/EIA T568A Pin

configuration. No horizontal cabling shall be permitted to terminate on IDC block.

- 6.19.2.2(1)(j) Standard (flat) front patch panels with a maximum of 24 ports per panel. Patch panel terminations shall be modular 8P8C jacks complying with ANSI/TIA-568-C.2 requirements for Category 6A.
- 6.19.2.2(1)(k) Supply and install front mount wire management accessories to permit neat cross connect to systems equipment and rear mount cable management for maintaining minimum bend radii. Front management should be configured for 1U for each 1U of patch panels.
- 6.19.2.2(1)(l) Sufficient quantity of patch cords for a complete and operational system. In particular, allow in tender for one (1) 10' patch cord for each cable drop. Confirm exact patch cord lengths with School District prior to placing order. Patch cords shall be provided to extend the permanent link performance to a guaranteed channel without the need for channel testing
- 6.19.2.2(1)(m) Terminations for all fibre optic cables on rack mounted enclosure. Fibre optic cables shall be terminated on both ends with LC type connector.
- 6.19.2.2(1)(n) PDUs shall be APC Switched Rack PDU series, model no. AP7930. This unit is rated for 20A at 120V, 1-phase and is furnished with 24 x 5-20 receptacles. It receives a 120V, 1phase input (NEMA L5-20P). This product shall only be used with an APC UPS.
- 6.19.2.2(1)(o) Alternate product: Eaton Switched ePDU series, model no. PW102SW0U151. This unit is rated for 20A at 120V, 1-phase and is furnished with 24 x 5-15R receptacles. It receives a 120V, 1-phase input (NEMA L5-20P). This product shall only be used with an Eaton UPS.
- 6.19.2.2(1)(p) Provide one (1) data drop to each PDU to enable remote management and control via the District network.
- 6.19.2.2(1)(q) Route all communications wiring by means of conduit and/or cable tray except where noted otherwise.

- 6.19.2.2(1)(r) Install cable along or at right angles to building lines unless impracticable to do so. Verify specific cases of deviation in advance with the Engineer.
- 6.19.2.2(1)(s) Size boxes and housings to accommodate cable population and minimum bending radii as listed in the EIA/TIA 569-B.
- 6.19.2.2(1)(t) All cables shall be installed free from defects, including kinks and excessively tight bends.
- 6.19.2.2(1)(u) Do not exceed manufacturer's recommended maximum pulling force.
- 6.19.2.2(1)(v) Where overhead distribution is used, provide 1m of excess cable in the accessible ceiling space above each communications outlet.
- 6.19.2.2(1)(w) Secure cables neatly into logically grouped bundles using Velcro strapping for all category rated cables.
- 6.19.2.2(1)(x) Cables shall be installed as per the following minimum requirements:
- (x).1 6" (127 mm) from power lines feeding loads no greater than 2 KVA.
 - (x).2 12" (300 mm) from power lines feeding loads between 2 and 5 KVA.
 - (x).3 24" (610 mm) from power lines feeding loads greater than 5 KVA.
 - (x).4 12" (300 mm) from fluorescent light fixtures.
 - (x).5 48" (1220mm) from distribution transformers.
 - (x).6 Where cables and/or power lines are installed in conduits, a nearer proximity is permitted. Refer to the BICSI Telecommunication Distribution Methods Manual, Eleventh Edition, or consult with the Engineer.
- 6.19.2.2(1)(y) Unless noted otherwise, in this section the term "cabling space" shall mean the readily accessible space above a t-bar ceiling.
- 6.19.2.2(2) Approved Manufacturers: AMP NETCONNECT, Belden, Leviton, Panduit, Electron Metal, APC, Middle Atlantic.

6.19.3 Telecommunications Racks and Cabinets

6.19.3.1 The Design-Builder shall:

- 6.19.3.1(1) Provide Cabinets that are code gauge steel, prime coated, with locking door, concealed flush hinges, flush lock and catch assembly;
- 6.19.3.1(2) Provide Terminal Strips that comply with the following requirements:
 - 6.19.3.1(2)(a) Below 50 volts - screw terminal type, Armaco T12-2 or Cinch Series 500.
 - 6.19.3.1(2)(b) Above 50 volts - 250 volt screw terminal type with barriers between each set of terminals with individual terminal points for each conductor.
- 6.19.3.1(3) Provide signage that identifies terminal strips with permanent numbers. Provide wiring diagram on inside of terminal cabinet door showing units and conductors connected to terminal cabinet.
- 6.19.3.1(4) Colour code cabinets in unfinished areas with two coats of enamel.
- 6.19.3.1(5) Paint cabinets in finished areas same colour as for adjacent wall finish in two coats of enamel of same sheen as adjacent finish.
- 6.19.3.1(6) Match Low Voltage Lighting Control Cabinet with panelboards c/w key lock hinged door and spare conduit to ceiling.
- 6.19.3.1(7) Conduit shall terminate in cabinet with lock nut and bushing and/or locknut and grounding bushing where required.
- 6.19.3.1(8) Shall terminate wiring on screw type terminal blocks or strips.
- 6.19.3.1(9) Provide minimum 20% spare capacity for expansion.
- 6.19.3.1(10) Fasten all cabinets directly to building structure using one or a combination of the following while providing ease of maintenance:
 - 6.19.3.1(10)(a) Galvanized screws
 - 6.19.3.1(10)(b) Galvanized bolts
 - 6.19.3.1(10)(c) Galvanized rods
 - 6.19.3.1(10)(d) Approved box clip

- 6.19.3.1(11) Locate all cabinets with proper clearance in front of all covers, cabinets installed without proper clearance shall be relocated as directed by the Owner.
- 6.19.3.1(12) Provide racks that are heavy duty enclosures, 48U, 750mm wide, minimum 1070mm deep, gangable with lockable perforated doors.
- 6.19.3.2 The Design-Builder shall provide the following for each rack:
 - 6.19.3.2(1) Two (2) dedicated 20A receptacles mounted at bottom of frame.
 - 6.19.3.2(2) Two (2) vertical power distribution unit bars mounted to the frame
 - 6.19.3.2(3) Empty bottom 1/3 of the rack. Racks shall only be filled in the top 2/3 of the rack.
 - 6.19.3.2(4) Bonding Lug.
 - 6.19.3.2(5) Hinged channels for vertical patch cord management and on relay frames on either side from top to bottom (no horizontal cables will be installed in the channel.) Where relay racks are to be ganged together, provide a minimum 6" wide hinged trough in between racks.
 - 6.19.3.2(6) Horizontal cable managers fabricated from steel, with standard 19" rack mounting, 1 RU in height and 4 D-rings each ring at 76mm x 89mm (3"x3.5").
 - 6.19.3.2(7) Horizontal cable managers placed above and below each patch panel.
 - 6.19.3.2(8) One additional horizontal cable manager for every patch panel installed
- 6.19.3.3 Approved product: APC NetShelter SX series or acceptable equivalent.
- 6.19.3.4 Rack elevation layout shall use the following scheme: patch panel, horizontal cable manager, edge switch, horizontal cable manager, patch panel, horizontal cable manager, edge switch, horizontal cable manager, etc.
- 6.19.3.5 Support of cabinets by conduit, pipes, ducts, wire or any other non-structural component is not acceptable.

6.19.4 Communications Rooms

6.19.4.1 Entrance Facility ("EF")

6.19.4.1(1) The Design-Builder shall provide an EF in the Facility that shall accommodate the following:

- 6.19.4.1(1)(a) The demarcation of the incoming telecommunications service;
- 6.19.4.1(1)(b) Minimum of two (2) 104mm (4") service ducts into the EF for the utility service box;
- 6.19.4.1(1)(c) Telephone;
- 6.19.4.1(1)(d) Data Network wide area network;
- 6.19.4.1(1)(e) CATV.

6.19.4.1(2) The Entrance Facility shall be designed in accordance with the TIA/EIA-569-C Standard.

6.19.4.2 Main Telecommunications Room ("MTR")(School building)

6.19.4.2(1) The Design-Builder shall provide an MTR in the Facility that shall accommodate the following:

- 6.19.4.2(1)(a) Core network switches that shall be connected to each TR;
- 6.19.4.2(1)(b) Edge switches;
- 6.19.4.2(1)(c) Servers;
- 6.19.4.2(1)(d) Space for minimum four (4) racks, two (2) shall be provided by the Design-Builder;
- 6.19.4.2(1)(e) Minimum one (1) meter clearance between wall mounted equipment and front, back and one side of rack rows;
- 6.19.4.2(1)(f) 19 mm (3/4") GIS birch or fir plywood backboard, painted with two coats of fire retardant white paint, on all MTR walls;
- 6.19.4.2(1)(g) Connection to UPS as well as normal power.

6.19.4.3 Telecommunications Room ("TR")

6.19.4.3(1) Design-Builder shall provide at least one (1) Telecommunications Room per floor. Design-Builder shall

provide additional TRs where required to conform to the 90 meter horizontal cabling limitation. The MTR can serve as a TR for the floor it is on or portion thereof.

- 6.19.4.3(2) TRs shall be stacked vertically above the MTR. Additional TRs on a floor shall be stack vertically in their respective areas.
- 6.19.4.3(3) The Design-Builder shall ensure each Telecommunication Room only serves the floor they are on and placed to maximize the area they serve.
- 6.19.4.3(4) The Design-Builder shall ensure the maximum cable distance from telecommunication outlet to TR patch panel termination is 90 meters.
- 6.19.4.3(5) The Design-Builder shall provide TR(s) in the Facility that shall accommodate the following:
 - 6.19.4.3(5)(a) Edge switches;
 - 6.19.4.3(5)(b) Space for minimum two (2) racks, one (1) shall be provided by the Design-Builder;
 - 6.19.4.3(5)(c) Minimum one (1) meter clearance between wall mounted equipment and front, back and one side of rack rows;
 - 6.19.4.3(5)(d) 19 mm (3/4") GIS birch or fir plywood backboard, painted with two coats of fire retardant white paint, on all telecommunications room walls;
 - 6.19.4.3(5)(e) Connection to UPS as well as normal power.

6.19.4.4 Server Room (Maintenance/IT Building)

- 6.19.4.4(1) The Design-Builder shall provide a server room in the Facility that shall accommodate the following:
 - 6.19.4.4(1)(a) Core network switches;
 - 6.19.4.4(1)(b) Edge switches:
 - 6.19.4.4(1)(c) Servers:
 - 6.19.4.4(1)(d) Space for minimum four(4) racks, two (2) shall be provided by the Design-Builder:
 - 6.19.4.4(1)(e) Minimum one (1) metre clearance between wall mounted equipment and front, back and one side of rack rows:

- 6.19.4.4(1)(f) 19 mm (3/4") GIS birch or fir plywood backboard, painted with two coats of fire retardant white paint, on all server room walls;
- 6.19.4.4(1)(g) Connection to UPS as well as backup power.
- 6.19.4.5 The Design-Builder shall ensure each telecommunication room only serves the floor it is on and placed to maximize the area it serves.
- 6.19.4.6 The Design –Builder shall ensure the maximum cable distance from telecommunication outlet to telecommunications room (TR) patch panel termination is ninety (90) metres.
- 6.19.4.7 The Design-Builder shall provide terminations for the following in rack mounted patch panels:
 - 6.19.4.7(1) Backbone fibre;
 - 6.19.4.7(2) Horizontal copper cabling.
- 6.19.4.8 The Design-Builder shall provide patch cords in sufficient quantity, based on Owner network design and approval, plus 10% spare.
- 6.19.4.9 Quantity of patch cords provided by Design-Builder shall be at least two (2) patch cables per port/outlet.
- 6.19.4.10 The Design-Builder shall ensure 1.5 metre, black patch cord and end use device cables are dressed and concealed, to standard approved by Owner.

6.19.5 Redundancy of Pathways and Spaces

- 6.19.5.1 The Design-Builder shall provide a cable tray for telecommunications and public address cabling throughout the building in areas with T-bar ceiling.
- 6.19.5.2 The cable tray design shall adhere to the following:
 - 6.19.5.2(1) Minimum 300 mm wide by 100 mm deep in hallways and TRs;
 - 6.19.5.2(2) Separate telecommunications and public address cabling using cable tray barrier;
 - 6.19.5.2(3) Basket type aluminum;
 - 6.19.5.2(4) Sized for cable density plus future expansion based on TIA/EIA standards;

- 6.19.5.2(5) Install cable tray with clearances for easy addition or removal of cables and in compliance with all Codes and Regulations;
 - 6.19.5.2(6) Remove any sharp edges, points or burrs;
 - 6.19.5.2(7) Provide cable tray firestop fittings at each firestop penetration. Fittings shall be sized to accommodate a 25% increase in cable capacity;
 - 6.19.5.2(8) Install seismic restraints for the cable tray according to ECABC Seismic Restraint Manual and Design-Builder's seismic restraint Engineer.
- 6.19.5.3 The Design-Builder shall provide a zone conduit system in areas where cable tray is not feasible.

6.19.6 Fibre Backbone

- 6.19.6.1 Data fibre backbone cabling shall be 24 strand OM4, 50/125 micron multimode fibre optic cable between the MTR, and each TR and EF.

6.19.7 Copper Backbone

- 6.19.7.1 Design-Builder shall provide copper backbone consisting of 5 cables of balanced twisted pair, 23 AWG solid copper, Plenum Rated FT-6/CMP or Riser Rated FT-4/CMR (as required by local codes) cable meeting all Category 6A transmission characteristics of ANSI/TIA/EIA-568-C.2 for data and voice backbone. If copper backbone distance exceeds 90 m, provide fibre backbone instead of copper backbone.
- 6.19.7.2 Where copper cabling is used, no cables shall be used with greater than 25 pairs.

6.19.8 Horizontal Cable

- 6.19.8.1 The Design-Builder shall provide 4-pair Category 6 UTP (unless noted otherwise), 24 AWG, 100 ohm, FT6 cables for horizontal cabling.
- 6.19.8.2 The Design-Builder shall provide horizontal cabling to connect telecommunications outlets/equipment with direct connect terminations back to the TR.
- 6.19.8.3 Horizontal cabling shall not exceed 90m in length and be continuous without any splices.

6.19.9 Targeted Cooling

- 6.19.9.1 The Design-Builder shall provide DX in-row cooling solution to monitor and control cooling and filtering functions for the conditioned space with N+1 redundancy in TRs. The solution shall be floor mounted and configured for horizontal airflow, with draw-through air pattern, and provide uniform air distribution over the entire face of the coil.
- 6.19.9.2 The system shall comply with all of the latest editions of the applicable standards.

6.19.10 Bonding

- 6.19.10.1 The Design-Builder shall provide a ground bus bar and appropriate bonding in each TR as per TIA J-STD-607 and the following requirements:
 - 6.19.10.1(1) Bond patch panel equipment rack to nearest telecommunications ground bus using an unbroken run from the rack to the bus.
 - 6.19.10.1(2) For each telecommunications grounding busbar (TGB), provide bonding connection to the ground terminal of the nearest AC electrical panelboard.
 - 6.19.10.1(3) In buildings of non-combustible construction: In addition to the bonding connection to the nearest AC panel, provide a bonding connection to the nearest structural steel member.
 - 6.19.10.1(4) For distances not exceeding 100 ft., use minimum #6 AWG copper wire for the telecommunications bond. For longer distances, consult with the Engineer.

6.19.11 Telecommunications Outlets**6.19.11.1 Basic Requirements**

- 6.19.11.1(1) Refer to Appendix 1B Room Data Sheets and Appendix 1G Systems Responsibility Matrix for system's scope.
- 6.19.11.1(2) The Design-Builder shall provide one (1) duplex receptacle adjacent to every data port except in Telecommunications Rooms, Wireless Access Point locations, and telephone locations.

6.19.11.2 Performance Requirements

- 6.19.11.2(1) The Design-Builder shall provide sufficient telecommunications outlets that comply with the following:

- 6.19.11.2(1)(a) Outlets shall be as per T568A Wire Map configuration, with modular 8P8C jacks;
 - 6.19.11.2(1)(b) Voice jacks shall be white;
 - 6.19.11.2(1)(c) Data jacks shall be blue;
 - 6.19.11.2(1)(d) Outlet plates shall be single gang;
 - 6.19.11.2(1)(e) Outlet coverplates for wall mounted telephone handset jacks shall be stainless steel complete with steel mounting studs;
 - 6.19.11.2(1)(f) Coverplates shall be suitable for handsets to be installed.
- 6.19.11.2(2) The Design-Builder shall provide a duplex receptacle on UPS power and a data port for each printer.

6.19.12 Uninterruptable Power Supply (UPS)

- 6.19.12.1 The Design-Builder shall provide uninterruptable power to Telecommunication Rooms, and spaces designated by the Owner.
- 6.19.12.2 The UPS design shall be coordinated with the Electrical division.
- 6.19.12.3 A 6kVA, single phase, distributed UPS shall be utilized for telecommunications closets with N+1 power module redundancy.
- 6.19.12.3(1) Acceptable product: Symmetra RM or acceptable equivalent.
- 6.19.12.4 A centralized UPS shall be utilized for the MTR.
- 6.19.12.5 UPS shall be sized to have a minimum runtime of 30 minutes.
- 6.19.12.6 One (1) UPS shall be provided for each rack.

6.19.13 Wireless Infrastructure

6.19.13.1 Basic Requirements

- 6.19.13.1(1) Refer to Appendix 1G Systems Responsibility Matrix for system's scope and responsibility.
- 6.19.13.1(2) Wireless infrastructure shall meet or exceed the latest industry standards including the latest editions of the following standards:
 - 6.19.13.1(2)(a) ANSI/TIA/EIA-568-C.0, Generic Telecommunications Cabling for Customer Premises

- 6.19.13.1(2)(b) ANSI/TIA/EIA-568-C.1, Commercial Building Telecommunications Cabling Standard
 - 6.19.13.1(2)(c) ANSI/TIA/EIA-568-C.2, Balanced Twisted Pair Telecommunications Cabling and Components
 - 6.19.13.1(2)(d) ANSI/J-STD-607-A-2002, Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
 - 6.19.13.1(2)(e) BICSI Telecommunications Distribution Methods Manual, Eleventh Edition
 - 6.19.13.1(2)(f) ANSI/TIA/EIA-569-B, Commercial Building Standard for Telecommunications Pathways and Spaces
 - 6.19.13.1(2)(g) ANSI/TIA/EIA-606-A, Administration Standard for Commercial Telecommunications Infrastructure
 - 6.19.13.1(2)(h) IEEE 802.11 Telecommunications and information exchange between systems local and metropolitan area networks
- 6.19.13.1(3) The Design-Builder shall provide a complete wireless network infrastructure throughout the Facility with no dead spots allowing wireless end-use devices access to the network and all its associated applications.
- 6.19.13.1(4) The Design-Builder shall conduct at least two post-deployment site surveys. One shall be conducted shortly after all wireless equipment is deployed and another at least one month after the Facility is fully operational and all sources of potential interference are active.
- 6.19.13.1(5) The Design-Builder shall provide structured cabling to connect the wireless access points to the local TRs.
- 6.19.13.2 Performance Requirements
- 6.19.13.2(1) The Design-Builder shall provide seamless Wireless Access Point (WAP) coverage by placing them in a 10.0 m x 10.0 m grid pattern.
 - 6.19.13.2(2) The Design-Builder shall provide testing of the wireless local area network (WLAN) to ensure proper speeds.

- 6.19.13.2(3) The Design-BUILDER shall provide reports showing signal strengths in all rooms and areas in the School.
- 6.19.13.2(4) The proposed solution shall be able to support the following criteria:
- 6.19.13.2(4)(a) Two (2) wireless end-use devices per staff/student in classrooms.
 - 6.19.13.2(4)(b) Two hundred and twenty five (225) wireless end-use devices in large common areas including Learning Commons and Grand Commons.
 - 6.19.13.2(4)(c) Three hundred and seventy five (375) wireless end-use devices in the theatre.
 - 6.19.13.2(4)(d) Additional 15% of total users for guests.
 - 6.19.13.2(4)(e) Each Wireless Access Point (“WAP”) shall have two (2) fully terminated Category 6A drops.
 - 6.19.13.2(4)(f) WAPs shall be Power-over-Ethernet (PoE).
 - 6.19.13.2(4)(g) The Owner will provide PoE switches as required. One Cisco 3560G PoE or acceptable equivalent in MTR where the WLAN meets the School LAN and additional Cisco 2960 PoE or acceptable equivalent switches as required to the remaining ports.
 - 6.19.13.2(4)(h) Provide record drawings and operation and maintenance manuals in accordance with the Design-Build Agreement.
- 6.19.13.2(5) Approved product: Cisco Aironet 3500 Series WAPs, or as otherwise directed by the Owner.

6.19.14 Network Equipment

6.19.14.1 Basic Requirements

- 6.19.14.1(1) Refer to Appendix 1G Systems Responsibility Matrix for system’s scope and responsibility.
- 6.19.14.1(2) The Design-BUILDER shall provide all equipment that is related to any systems they are required to provide. The Owner will provided the remaining equipment.

6.19.14.2 Performance Requirements

- 6.19.14.2(1) The Design-Builder shall provide sufficient infrastructure for the use of Chromebooks.

6.19.15 Audio Visual Systems

- 6.19.15.1 The Design-Builder shall provide and install conduit, outlet boxes, wiring, equipment, testing and commissioning for complete and operating performance of sound systems.

- 6.19.15.2 Sound systems shall be installed in the:

- 6.19.15.2(1) DanceStudio;
- 6.19.15.2(2) Recording rooms;
- 6.19.15.2(3) Theatre control booth;
- 6.19.15.2(4) Theatre;
- 6.19.15.2(5) Weight room;
- 6.19.15.2(6) Gymnasium;
- 6.19.15.2(7) Grand Commons;
- 6.19.15.2(8) Drama classroom/Black box theatre;
- 6.19.15.2(9) Theatre house;
- 6.19.15.2(10) Reading area, book stacks and circulation desk;
- 6.19.15.2(11) Stage/wings;
- 6.19.15.2(12) Weight room;
- 6.19.15.2(13) Administration Conference Room;
- 6.19.15.2(14) Band Room;
- 6.19.15.2(15) Culinary Arts Classroom.
- 6.19.15.2(16) Refer to Appendix 1A Functional Program and Appendix 1B Room Data Sheets for further locations.

- 6.19.15.3 The Design-Builder shall provide the following equipment in each space requiring Audio Visual (AV) systems:

- 6.19.15.3(1) Inputs:

- 6.19.15.3(1)(a) Provide AV inputs with HDMI, VGA and discrete audio input. Each input location will consist of power and data outlets;
- 6.19.15.3(1)(b) Input (audio and video) from local Owner computer where applicable;
- 6.19.15.3(1)(c) AV input location will be fed from a floor-box or wall mounted. Coordinate exact locations and integration with the Owner.

6.19.15.3(2) Outputs:

- 6.19.15.3(2)(a) Allow for wall mounted infrastructure, away from doors at height for comfortable viewing based on room design, dimensions, and site line analysis;
- 6.19.15.3(2)(b) Provide in wall seismic backing of all display mounts;
- 6.19.15.3(2)(c) Minimum four(4) ceiling mount speakers for video and AV presentations and speech reinforcement. Exact quantity to be determined in consultation with the Owner to suit the room layout;
- 6.19.15.3(2)(d) Provide ceiling mounted high fidelity speakers for playback of content studio; Audio signal will be capable of producing a maximum intelligible signal level of 35 dBA sound pressure level at a plane 2.5 metres above the floor.

6.19.15.3(3) AV switching and control system:

- 6.19.15.3(3)(a) A push-button control panel that will provide system on/off volume control, display control and input selection.

6.19.15.4 Infrastructure Requirements:

- 6.19.15.4(1) All AV cabling shall be in conduits. Conduits shall be in walls, ceilings and floors and shall not be visible;
- 6.19.15.4(2) All power and communications cabling and outlets shall be provided to support the AV systems;
- 6.19.15.4(3) No wiring will be visible.

6.19.15.5 The Design-Builder shall provide AV for menu boards and menu board systems where required.

- 6.19.15.6 The AV system shall include all head-end including amp-mixer and speakers. Approved Manufacturers: Bogen, Community, Crestron, TOA or acceptable equivalent.
- 6.19.15.7 Provide rough-in raceway / conduit for audio visual equipment from each teacher station to both ceiling and projection wall locations as shown in functional diagrams.
- 6.19.15.8 Provide adequate receptacles where required to suit system functionality.
- 6.19.15.9 The Owner will procure Chromecast head-end equipment and the Design-Builder shall install, test, and commission to the Owner requirements.
- 6.19.15.10 Refer to Appendix 1B Room Data Sheets for room requirements.
- 6.19.15.11 The Design-Builder shall provide an AV system with the following functionality in all rooms listed in section 6.19.15.2 of Schedule 1 Statement of Requirements:
- 6.19.15.11(1) Microphones;
 - 6.19.15.11(2) Music amplification;
 - 6.19.15.11(3) Designated faceplates for plug- in microphones;
 - 6.19.15.11(4) Loudspeakers:
 - 6.19.15.11(5) Microphones and auxiliary inputs;
 - 6.19.15.11(6) Control display;
 - 6.19.15.11(7) Provide background music for dedicated areas.
- 6.19.15.12 The Design-Builder shall provide wireless microphone as part of the AV system for the Gymnasium, Grand Commons and Theatre.
- 6.19.15.13 The Design-Builder shall provide the following functionality for the Culinary Arts Classroom;
- 6.19.15.13(1) The ability to film/video tape demonstrations performed at the demonstration counter at the front of the room;
 - 6.19.15.13(2) Two display monitors that shall have internet access and be used for viewing online and live/recorded demonstrations;

- 6.19.15.13(3) The display monitors shall be placed at the front of the room on each side of the demonstration counter, adjacent to or slightly behind the demonstrator's line of sight;
- 6.19.15.13(4) Refer to Appendix 1A Functional Program and Appendix 1B Room Data Sheets for further locations.
- 6.19.15.14 Lighting will be designed conducive to AV presentation systems with dimming fixtures and controllability to turn off fixture near the display to avoid glare or reflections on the display surface.
- 6.19.15.15 AV system will allow users to select an AV input to be shared in addition to the display of video.
- 6.19.15.16 AV system will use the structured cabling system and will be integrated with the Owner's data network.
- 6.19.15.17 Design-Build shall provide audio DSP (digital signal processor) to process audio signals . Employ echo cancellation on all microphone inputs.
- 6.19.15.18 AV system will allow users to select any AV input to be shared in addition to the display of video.
- 6.19.15.19 Video and audio quality will meet or exceed the ITU-T standards with a mean opinion score of 4.0 or greater and be suitable for evidentiary purposes.
- 6.19.15.20 The Design-Builder will meet with the Owner to determine exact specifications of equipment room configurations, set up and commissioning.
- 6.19.15.21 The Design-Builder will provide training for Facility staff of all AV equipment unless otherwise specified by the Owner. The training will commence at least one month prior to completion.

6.19.16 Theatre Sound System

- 6.19.16.1 Design performance sound reinforcement system as part of the theatre design.
- 6.19.16.2 Minimum system requirements:
 - 6.19.16.2(1) 24 channel digital mixer, with USB recording capability in sound booth.
 - 6.19.16.2(2) Digital signal processing, including equalization, compression, and feedback prevention.

6.19.16.2(3) Pre-programmed settings accessed from locked control on stage to provide basic functionality without access to mixing console.

6.19.16.2(4) 24 input points on stage, connected to sound booth.

6.19.17 Video Conferencing Systems

6.19.17.1 Refer to Appendix 1G Systems Responsibility Matrix for system's scope and responsibility.

6.19.17.2 Refer to Appendix 1B Room Data Sheets for room requirements.

6.19.17.3 The Design-Builder shall design, procure and install all infrastructure for full video conferencing systems and infrastructure in all rooms requiring audio/video conferencing including the following locations:

6.19.17.3(1) Administration Conference Room;

6.19.17.3(2) Maintenance/IT Meeting Room;

6.19.17.3(3) Refer to Appendix 1B Room Data Sheets for further locations.

6.19.17.4 The Design-Builder shall provide and install the following based on coordination with the Owner IT Representatives:

6.19.17.4(1) Provide a complete and fully operational push-button video conferencing control solution;

6.19.17.4(2) Provide minimum 1080 p full HD PTZ video conferencing camera.

6.19.17.4(3) Video conferencing system CODEC will;

6.19.17.4(3)(a) Be IP-based and communicate using industry standard H323 video conferencing communications protocol;

6.19.17.4(3)(b) Have teleconferencing card complete with both analogue and SIP ports;

6.19.17.4(3)(c) Employ automatic bandwidth management including adjustments of video resolution and/or compression in order to maintain required audio quality.

6.19.17.4(4) .

6.19.17.5 The audio/video conferencing systems shall comply with the latest IP based video conferencing standards including Infocomm.

- 6.19.17.6 The Design-Builder shall provide wiring infrastructure, connectors and any miscellaneous equipment required to make the video conference system functional and which are not listed in the Equipment Schedule.
- 6.19.17.7 The Design-Builder shall design the video conference and audiovisual rooms in accordance with industry standards including ANSI/INFOCOMM and IESNA.
- 6.19.17.8 Video conferencing systems will use the structured cabling system and will be integrated with Owner's data network. .
- 6.19.17.9 The Design-Builder will provide training for Facility staff of all video conferencing equipment unless otherwise specified by the Owner. The training will commence at least one month prior to completion.

6.19.18 Integration Requirements

6.19.18.1 The Design-Builder shall:

- 6.19.18.1(1) Design, procure, install, commission and integrate network architectures and telecommunication, security, and other Facility systems in accordance with Appendix 1G Systems Responsibility Matrix; and
- 6.19.18.1(2) Coordinate the design of such architecture and systems, including functionality, with the Owner's IT Representatives.

6.19.19 Telephone Equipment

6.19.19.1 Basic Requirements

- 6.19.19.1(1) Refer to Appendix 1G Systems Responsibility Matrix for system's scope and responsibility.
- 6.19.19.1(2) The Owner will supply and install all telephone equipment.
- 6.19.19.1(3) The Design-Builder shall provide integration with UPS.

6.19.19.2 Performance Requirements

- 6.19.19.2(1) The telephone systems shall have a full UPS system with enough capacity to operate the entire system for thirty (30) minutes.
- 6.19.19.2(2) The Design-Builder shall provide integration and interfacing with the Public Address (PA) system to permit paging from administrative telephones through the PA system.

6.19.19.2(3) Field Quality Control

6.19.19.2(3)(a) Make observations to verify that units and controls are properly labeled, and interconnecting wires and terminals are identified.

6.19.19.2(3)(b) Testing: thoroughly test system to verify that all system features are fully operational.

6.19.19.2(4) The Owner shall provide complete attendant and telephone user training as required to provide a successful operating system.

6.19.19.2(5) Provide a full year of warranty and service from date of Substantial Completion of the construction contract. All parts and labour to be provided at no charge. Provide same day service for regular service if call has been entered during the morning of the working day. Provide an emergency service call response of within two (2) hours for a major system breakdown or a total system failure.

6.19.19.2(6) The Design-Builder shall provide all the necessary telephone interface modules and paging zone modules to integrate with the public address system.

6.19.19.2(7) The incoming telephone service will be ordered by the Owner. The physical conduits and duct banks from the utility service to the Entrance Facility are to be provided.

6.19.19.2(8) The Design-Builder shall provide record drawings and operation and maintenance manuals in accordance with the Design-Build Agreement.

6.19.20 Public Address

6.19.20.1 Basic Requirements

6.19.20.1(1) Refer to Appendix 1G Systems Responsibility Matrix for system's scope and responsibility.

6.19.20.1(2) The Design-Builder shall provide and install all equipment to provide a fully operational public address system for the School building including but not limited to:

6.19.20.1(2)(a) Ceiling/wall mounted speaker assemblies;

6.19.20.1(2)(b) Paging horns;

6.19.20.1(2)(c) Call initiation switches;

- 6.19.20.1(2)(d) Built in master clock
- 6.19.20.1(2)(e) Amplifiers;
- 6.19.20.1(2)(f) Power supplies;
- 6.19.20.1(2)(g) Volume attenuators;
- 6.19.20.1(2)(h) Terminal equipment;
- 6.19.20.1(2)(i) Wiring;
- 6.19.20.1(2)(j) Program sources;
- 6.19.20.1(2)(k) Equipment racks and cabinets;

6.19.20.1(3) It shall be possible to readily connect the system to the PSTN (Public Switched Telephone Network) by connecting it to analog CO trunks.

6.19.20.2 Performance Requirements

6.19.20.2(1) The Design-Builder shall comply with the following:

- 6.19.20.2(1)(a) Field wiring shall be terminated on wall adjacent to rack using Telco 66 type blocks with labelling to indicate final architectural room number;
- 6.19.20.2(1)(b) Provide one (1) zone along each building elevation;
- 6.19.20.2(1)(c) Provide separate paging zones for common area speakers on different floors;
- 6.19.20.2(1)(d) Each classroom/instructional space shall be individually zoned;
- 6.19.20.2(1)(e) Provide public address in every room and space except for the Quiet Room and Sensory Rooms.
- 6.19.20.2(1)(f) All hallway speakers shall be tapped at 1 watt maximum;
- 6.19.20.2(1)(g) All classrooms speakers shall be tapped at ½ watt maximum;
- 6.19.20.2(1)(h) All outside horns shall be tapped at 7.5 watts maximum;
- 6.19.20.2(1)(i) Large rooms shall be tapped at 2 watts maximum;

- 6.19.20.2(1)(j) All major components shall be fully pluggable by means of multi-pin receptacles and matching plugs to provide for ease of maintenance and service;
- 6.19.20.2(1)(k) Cables within terminal cabinets, equipment racks shall be grouped and bundled as to type and laced with No. 12 cord waxed linen lacing twine or T&B "Ty-Rap" cable. Edge protection material shall be installed on edges of holes, lips of ducts or any other point where cables or harnesses cross metallic edge;
- 6.19.20.2(1)(l) Cable conductors shall be colour-coded and individual cables shall be individually identified;
- 6.19.20.2(1)(m) Cable shielding shall permit connection to common ground at point of lowest audio level and shall be free from ground at any other point;
- 6.19.20.2(1)(n) Cable shields shall be terminated in the same manner as conductors;
- 6.19.20.2(1)(o) The cable shields shall be grounded at the equipment end and insulated at the speaker end. Use heat shrink for insulation at speakers.
- 6.19.20.2(1)(p) The Design-Builder shall provide all necessary surge protection on the AC power feed and on all station lines leaving or entering the building.
- 6.19.20.2(1)(q) Install equipment in accordance with manufacturer's written instructions.
- 6.19.20.2(1)(r) It is only acceptable to run exposed low-voltage wiring above readily accessible, continuous ceiling areas.
- 6.19.20.2(1)(s) Ground equipment, conductor, and cable shields to eliminate shock hazard and to minimize to the greatest extent possible, ground loops, common mode returns, noise pickup, cross talk, and other impairments. Measure, record, and report ground resistance.
- 6.19.20.2(1)(t) The Design-Builder shall mount a main distribution frame behind the Integrated Electronic Communications Network console. All wires shall be laid down on terminal punch blocks and identified by the actual room location served. All the communications points shall be wired into this main distribution frame, laid down in sequence, and

identified by which line it is on and the point position it serves. The terminal punch blocks and wiring shall not be accessible without tools.

6.19.20.2(1)(u) Except where specifically noted otherwise, all equipment supplied shall be the standard product of a single manufacturer of known reputation and minimum of 10 years' experience in the industry. The supplying contractor shall have attended the manufacturer's installation and service school. A certificate of this training shall be provided with the Design-Builder's submittal.

6.19.20.2(1)(v) Where practicable, all system components shall be by Valcom, Inc.

6.19.20.2(2) Acceptable product: Valcom Multipath V2924A or acceptable equivalent.

6.19.20.2(3) Refer to Appendix 1B Room Data Sheets for locations requiring public address.

6.20 Electronic Safety and Security – ESS (Div. 28)

6.20.1 Fire Alarm

6.20.1.1 Basic Requirements

6.20.1.1(1) The fire alarm system shall be designed, supplied, installed, and commissioned by the Design-Builder to meet the latest applicable standards, including:

6.20.1.1(1)(a) CAN / ULC S524 Standard for Installation of Fire Alarm Systems

6.20.1.1(1)(b) CAN / ULC S537 Standard for Verification of Fire Alarm Systems

6.20.1.1(1)(c) Elevator Code CAN/CSA-B44

6.20.1.1(1)(d) ULC-S525 Audible Signal Appliances Fire Alarm

6.20.1.1(1)(e) CAN/ULC-S524 Control Units Fire Alarm Systems

6.20.1.1(1)(f) ULC-528 Manually Actuated Signaling Boxes

6.20.1.1(1)(g) CAN/ULS-S529 Smoke Detectors Fire Alarm Systems

- 6.20.1.1(1)(h) ULC-S530 Heat Actuated Fire Detectors
 - 6.20.1.1(1)(i) British Columbia Building Codes
 - 6.20.1.1(1)(j) Canadian Electrical Code
 - 6.20.1.1(1)(k) All requirements of the Authority Having Jurisdiction.
- 6.20.1.1(2) All equipment and components shall be new, and the manufacturer's current model.
 - 6.20.1.1(3) All equipment and components shall be installed in strict compliance with manufacturers' recommendations.
 - 6.20.1.1(4) Terminal Boxes, Junction Boxes and Cabinets shall be CSA/ULC listed for their purpose and use.
 - 6.20.1.1(5) Initiating circuits shall be arranged to serve like categories (manual, smoke, water flow). Mixed category circuitry shall not be permitted except on signaling line circuits connected to intelligent reporting devices.
 - 6.20.1.1(6) The FACP shall contain a microprocessor based Central Processing Unit (CPU). The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent detectors, addressable modules, printer, annunciators, and other system controlled devices.
 - 6.20.1.1(7) Provide a Universal Digital Alarm Communicator Transmitter (UDACT) for communicating digital information between a fire alarm control panel and a ULC Listed central station.
 - 6.20.1.1(8) Provide an Active Graphic LED Annunciator with LED Alphanumeric display and Graphic Zone Map
 - 6.20.1.1(9) Provide all waterflow, sprinkler, and stand pipe supervisory switches as per manufacturer's recommendations and switches shall annunciate separately.
- 6.20.1.2 Performance Requirements
- 6.20.1.2(1) Provide a fully addressable, single stage computer based fire alarm system throughout the Facility in accordance with all applicable codes and standards.
 - 6.20.1.2(2) The control panel shall be housed in a ULC listed cabinet suitable for surface or semi-flush mounting. Cabinet and front

shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish.

- 6.20.1.2(3) The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators.
- 6.20.1.2(4) All interfaces and associated equipment are to be protected so that they will not be affected by voltage surges or line transients.
- 6.20.1.2(5) The alphanumeric display annunciator shall be a supervised, back-lit LCD and LED active display containing a minimum of eighty (80) characters for alarm annunciation in clear English text.
- 6.20.1.2(6) The LCD annunciator shall display all alarm and trouble conditions in the system and shall be programmed to match graphic zone map labeling.
- 6.20.1.2(7) LCD display annunciators shall mimic the main control panel 80 character display and shall not require special programming.
- 6.20.1.2(8) The annunciator shall have switches which shall be programmed for System control such as, Global Acknowledge, Global Signal Silence and Global System Reset. Provide a keyed switch to disable these switch inputs on the front plate. Keying shall be to the Owner's requirements.
- 6.20.1.2(9) An active scaled, multi-color, high quality graphic floor plans indicating zone maps and key fire alarm information shall be integrated into the annunciator with LED lighting up the various alarm and trouble zones. Provide a duplicate passive zone map in a metal frame adjacent to the fire alarm control panel.
- 6.20.1.2(10) Submit the graphic zone map to the local Fire Department for approval prior to final production. Submit proof of acceptance by the Fire Department.
- 6.20.1.2(11) The FACP shall be addressable control panel. Acceptable manufacturer: Simplex 4100ES or acceptable equivalent.
- 6.20.1.2(12) Heat detectors shall be mechanical type c/w addressable modules. Acceptable product: Simplex or acceptable equivalent.
- 6.20.1.2(13) Smoke detectors shall be photoelectric type. Acceptable product: Simplex or acceptable equivalent.

- 6.20.1.2(14) Manual stations shall be pull lever, wall mounted, semi-flush type, non-coded, single stage addressable. Acceptable product: Simplex or acceptable equivalent.
- 6.20.1.2(15) Auto dialer shall be Maxsys #4020 or acceptable equivalent.
- 6.20.1.2(16) Strobe Lights shall be used for visible notification at 15/30/75/110 Candela, red with white lettering and synchronizing module as required by Simplex.
- 6.20.1.2(17) Audible Signal Devices including bells shall be continuous sounding in accordance with Owner's standards. Coordinate non-temporal pattern with the Owner and AHJ.
- 6.20.1.2(18) LED active graphic display remote annunciator shall be provided with an LCD display readout.
- 6.20.1.2(19) Provide 25% spare zones for future.
- 6.20.1.2(20) Provide indicators for trouble signals and silencing pushbutton.
- 6.20.1.2(21) Provide annunciators in electrical room and at main entrance at a minimum.
- 6.20.1.2(22) Provide record drawings, operation and maintenance manuals and fire alarm verification in accordance with the Design-Build Agreement.
- 6.20.1.2(23) The UDACT shall be a remote device and shall have the ability for remote mounting. Integral UDACT to the fire alarm control panel is not acceptable.
- 6.20.1.2(24) The UDACT shall transmit the following:
 - 6.20.1.2(24)(a) Alarm signal
 - 6.20.1.2(24)(b) Trouble signal
 - 6.20.1.2(24)(c) Automatic self-test report every 24 hours
- 6.20.1.2(25) The UDACT shall have 60 hours of standby power. An alarm output contact for alarm or dialer failure shall be connected to the fire alarm control panel to annunciate as "Dialer Trouble".
- 6.20.1.2(26) The UDACT shall be an Ademco V32FIREKT remote autodialer or a Simplex SafeLINC, DSC GS3060 communicator. Confirm with the Owner. The UDACT shall be compatible with the fire alarm control panel.

- 6.20.1.2(27) Manual pull stations in high abuse areas (such as gymnasiums) shall have tamper resistant covers and be recessed in a wall cavity.
- 6.20.1.2(28) Door holders shall be 120V AC, flush mounted where possible, Simplex 2088-0014-2 Series (Flush) or acceptable equivalent.
- 6.20.1.2(29) Initiation Device Circuits (IDC) shall be wired Class B.
- 6.20.1.2(30) Notification Device Circuits (NDC) shall be wired Class B.
- 6.20.1.2(31) Alarm signals arriving at the main FACP shall not be lost following a power failure (or outage) until the alarm signal is processed and recorded.
- 6.20.1.2(32) Power Supply:
 - 6.20.1.2(32)(a) Circuit # shall be clearly identified on both the electrical panel directory and on the fire alarm UDACT.
 - 6.20.1.2(32)(b) Install two telephone lines ahead of the PBX (from the telephone main terminal board) directly to the UDACT.
 - 6.20.1.2(32)(c) Provide a remote antenna in a secure location for the GSM communicator up to 100' away with wiring in conduit to maximize the signal strength for the communicator. Coordinate exact location with the Owner prior to rough-in.
 - 6.20.1.2(32)(d) The entire remote monitoring system shall be installed in accordance with CAN/ULC-S561 "Installation and Services for Fire Signal Receiving Centres and Systems".
 - 6.20.1.2(32)(e) Design-Builder shall coordinate with the Owner to set up an account with a remote ULC approved monitoring station. Design-Builder shall coordinate with the Owner to set up the cellular GSM telecommunications account for the UDACT.
 - 6.20.1.2(32)(f) The Power Supply shall operate on 120 VAC, 60 Hz, and shall provide all necessary power for the FACP.
 - 6.20.1.2(32)(g) It shall provide 5.0 amps of usable Notification appliance power, using a switching 24 VDC regulator.

- 6.20.1.2(32)(h) It shall provide a battery charger for 24 hours of standby using dual-rate charging techniques for fast battery recharge.
- 6.20.1.2(33) The fire alarm control panel shall provide dry contacts for shutdown, alarm, and trouble signals to the UDACT. The wire connections between the UDACT and the fire alarm control panel shall be supervised.
- 6.20.1.2(34) The Design-Builder shall provide Internet-Based Communications Link so the entire fire alarm system status can be monitored with password protection from a web browser through the internet. Incorporate the Simplex BACpac Ethernet module 4100-6069 or acceptable equivalent. Coordinate with the School District and obtain an IP address for the School District wide area network. Provide a patch cord to the adjacent data outlet. Program the system to email the appropriate maintenance personnel in the event of any alarm or trouble condition showing detailed information of the event. Provide testing and commissioning of the internet communications through the Owner's network. Include all testing and commissioning reports in the O&M manuals.
- 6.20.1.2(35) Provide the following form C output contact for the DDC contractor to connect to:
- 6.20.1.2(35)(a) System in alarm;
- 6.20.1.2(35)(b) System in trouble.
- 6.20.1.2(36) Coordinate with DDC contractor to provide commissioning and testing of the fire alarm system interface with the DDC system for inclusion in the O&M manuals.
- 6.20.1.2(37) Duct Smoke Detectors: Simplex 4098-9601 c/w 9707 duct housing or approved equivalent.
- 6.20.1.2(38) Waterflow Switches shall be supplied and installed by Mechanical and wired as per manufacturer's instructions by Electrical.
- 6.20.1.2(39) Sprinkler and Standpipe Valve Supervisory Switches shall be supplied and installed by Mechanical and wired as per manufacturer's instructions by Electrical.
- 6.20.1.2(40) All supervisory switches are to annunciate separately. Provide dedicated addressable modules.

- 6.20.1.2(41) Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC Class A or Class B branch. The isolator module shall limit the number of modules or detectors that shall be rendered inoperative by a short circuit fault on the SLC loop segment or branch. At least one isolator module shall be provided for each floor or fire compartment of the building.
- 6.20.1.2(42) The isolator module shall mount in a standard 4-inch (101.6 mm) deep electrical box or in a surface mounted backbox. It shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.
- 6.20.1.2(43) Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.
- 6.20.1.2(44) Cable must be separated from any open conductors of Power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors.
- 6.20.1.2(45) Wiring for 24 volt control, alarm notification, emergency communication and similar power-limited auxiliary functions shall be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with surge protective devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.
- 6.20.1.2(46) Conduits shall not enter the Fire Alarm Control Panel, or any other remotely mounted Control Panel equipment or backboxes, except where conduit entry is specified by the FACP manufacturer.
- 6.20.1.2(47) Conduit shall be 3/4 inch (19.1 mm) minimum.
- 6.20.1.2(48) All low tension and 120V for the fire alarm system wiring shall be installed in conduit.
- 6.20.1.2(49) Wiring shall be in accordance with local, provincial and federal standards. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG for initiating device circuits and signaling line circuits, and 14 AWG for notification circuits.

- 6.20.1.2(50) All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
- 6.20.1.2(51) Wiring used for the multiplex communication loop shall be twisted and shielded and support a minimum wiring distance of 10,000 feet (3,048 m). The system shall support up to 3,000 ft. (914 m) of untwisted, unshielded wire (loop 1 only). The system shall permit use of IDC and NAC wiring in the same conduit with the communication loop.
- 6.20.1.2(52) All field wiring shall be completely supervised. Provide colour-coding and identify cable markers at all cable ends. Provide identification on wiring identify function as alarm zone or signal circuiting; i.e. alarm zone #3 = A3, etc.
- 6.20.1.2(53) Wiring to door holders shall be in a designated conduit system and shall not contain other component wiring.

6.20.2 Intrusion Detection

6.20.2.1 Basic Requirements

- 6.20.2.1(1) Refer to Appendix 1G Systems Responsibility Matrix for system's scope and responsibilities.
- 6.20.2.1(2) The Intrusion Alarm System shall be designed, supplied, installed, and commissioned by the Design-Builder.
- 6.20.2.1(3) Refer to section 6.6 for electrical locking requirements.
- 6.20.2.1(4) The intrusion alarm system shall consist of a control panel, Passive Infrared Detectors (PIR), magnetic door alarm switches, programming keypads, and interior sirens.
- 6.20.2.1(5) Intrusion detection systems shall be installed in all areas where protection of physical assets is critical.

6.20.2.2 Performance Requirements

- 6.20.2.2(1) The intrusion detection system shall utilize Passive Infrared Detectors (PIR) to monitor activity. PIR's will be wall mounted on 4" x 4" outlet box c/w single gang mud ring.
- 6.20.2.2(2) PIR's shall be ceiling mounted dual element motion detectors c/w mounting. Acceptable Product: DSC-BV300DP c/w tamper and wire guards or acceptable equivalent.

- 6.20.2.2(3) Gym motion detection units to be DSC-BV300DP c/w tampers and wire guards or acceptable equivalent.
- 6.20.2.2(4) All PIR's shall be field adjusted as per manufacturer's specs.
- 6.20.2.2(5) All PIR's shall have the LED's disabled after the initial testing is done.
- 6.20.2.2(6) The Design-Builder shall provide all devices, wiring and pathways.
- 6.20.2.2(7) Magnetic door switches shall be flush mounted in door frames and shall be supervised by the Main Control Panel. Switches shall be supervised and individually wired to terminal cabinet. Door switches to be Sentrol 1078 or acceptable equivalent.
- 6.20.2.2(8) Sirens shall be DSC 3015 or acceptable equivalent. These shall be installed c/w siren drive and separate power supply. Install sirens in all interior building areas as required to provide suitable coverage. (Audible siren shall be easily heard at all exterior entrances from outside the building).
- 6.20.2.2(9) Wire and cable shall comply with the following requirements:
 - 6.20.2.2(9)(a) 6C#22 AWG "Z" stranded cable FT4 rated for all powered detection devices and 4C #22 AWG "Z" cable to all door contacts.
 - 6.20.2.2(9)(b) 2C#18 AWG stranded cable, FT4 rated for sirens.
- 6.20.2.2(10) PIR's shall be installed in all ground floor perimeter rooms, and all hallways.
- 6.20.2.2(11) Glass breaks shall be installed as required by CPTED and on all perimeter glazing near grade. Acceptable Product: CK 1625T c/w tamper or acceptable equivalent.
- 6.20.2.2(12) The intrusion detection system shall be armed and disarmed by keypads. Keypads are to be provided at a minimum one (1) in the main office, MTR, MER, Gym, entrances, exits, near main entrance and as per the room datasheets. Provide one (1) keypad next to alarm panel.
- 6.20.2.2(13) Acceptable keypad product: Maxsys LCD4501 c/w LCD display or acceptable equivalent.

- 6.20.2.2(14) All keypads except for the main control panel keypad shall have arming/disarming and programming capability turned off via programming and shall only be used for system status display.
- 6.20.2.2(15) The intrusion alarm panel shall be provided and installed adjacent to the fire alarm panel in the electrical room. The alarm panel shall be powered by a dedicated 120V, 15A circuit and be provided with batteries and UPS power. The alarm panel shall be enclosed in a BEL Products K Series, K201608, or acceptable equivalent, enclosure. A telecommunications outlet shall be provided adjacent to the alarm panel for monitoring purposes.
- 6.20.2.2(16) The security alarm control panel shall be Maxsys DSC-4020KT, or acceptable equivalent, CPU complete with additional DSC-PC4116, or acceptable equivalent, expansion boards for required zones and digital communicator for remote monitoring.
- 6.20.2.2(17) The Design-Builder shall be responsible for all programming.
- 6.20.2.2(18) School District shall supply all access codes and phone numbers to be programmed into the alarm system.
- 6.20.2.2(19) The panel shall be programmed in the standard CID (contact id) format.
- 6.20.2.2(20) The Design-Builder shall program the following:
- 6.20.2.2(20)(a) User code to bypass zones as well as installer codes, and user codes provided by the School District.
 - 6.20.2.2(20)(b) Periodic test transmission daily.
 - 6.20.2.2(20)(c) Bell restore after 4 minutes.
- 6.20.2.2(21) The Design-Builder shall not install a contractors lockout enable and shall not program the following without prior approval from the School District:
- 6.20.2.2(21)(a) Forced Arming;
 - 6.20.2.2(21)(b) Auto-Arming;
 - 6.20.2.2(21)(c) Auto-Disarming.
- 6.20.2.2(22) The Design-Builder shall not access the system either physically or remotely without School District approval.

- 6.20.2.2(23) The intrusion alarm system shall report independently from the fire alarm system.
- 6.20.2.2(24) Telephone line will be used for the primary monitoring method. Provide a GSM radio model GSM 3060 for back-up.
- 6.20.2.2(25) Provide programming for up to eight partitions. Coordinate required partitioning with the Owner.
 - 6.20.2.2(25)(a) Partitioning will typically involve establishing one partition consisting of the General Office, Learning Commons and Computer room operated by one reader located outside the General Office. One partition will include the remainder of the building in an secondary school application. A site may include one partition shared by both the gym and public use areas served by a distinct entry (if separated by corridor doors).
- 6.20.2.2(26) Provide Kantech Global edition software version #4.0.
- 6.20.2.2(27) Triad DCPC 4204 power supply and 16 volt, 37 VA ATCFT3716 transformer.
- 6.20.2.2(28) The panel power supply shall be a minimum 37 VA. It shall be hard wired to a dedicated, non-switched source (i.e.no plug-in type transformers) and the circuit # be clearly identified on both the electrical panel directory and on the alarm panel.
- 6.20.2.2(29) Provide the following form C contact points for the DDC contractor to connect to:
 - 6.20.2.2(29)(a) System armed (DDC system to sweep off all lights controlled by the low voltage lighting system 15 minutes after arming). Provide 7 points to monitor 7 partitions.
 - 6.20.2.2(29)(b) System disarmed (DDC system to turn on corridor lights). Provide 7 points to monitor 7 partitions.
 - 6.20.2.2(29)(c) System in alarm (DDC system to turn on all interior and exterior lights controlled by the low voltage lighting system). Provide 7 points to monitor 7 partitions.
 - 6.20.2.2(29)(d) Provide one point for School lockdown alarm.
 - 6.20.2.2(29)(e) Provide one point for monitoring intrusion alarm system trouble.

- 6.20.2.2(30) All field device wiring shall home run in conduit to a splitter box (24" x 6" x 4") located above the alarm panel enclosure. Daisy chains are not permitted. Adequate interconnecting conduits shall be provided between the splitter and alarm panel enclosure. All wiring shall be minimum 18 AWG, 4-conductor LVT. Red LVT is not permitted. Provide additional alarm panels if required to suit layout.
- 6.20.2.2(31) Provide record drawings and operation and maintenance manuals in accordance with the Design-Build Agreement.
- 6.20.2.2(32) The Design-Builder shall install the intrusion alarm system according to the following requirements:
- 6.20.2.2(32)(a) Install main control panel in the main electrical room and connect to UPS supplied ac power supply, and provide dc standby power. Coordinate for provision, and placing into service, of associated telephone line for remote monitoring and WAN connectivity.
 - 6.20.2.2(32)(b) Install proximity readers with remote system status LED indicators as shown on the drawings. Status LED's shall be clearly visible through the glazing adjacent to the main entry doors to each module. Wire the proximity readers with 6C #22 shielded stranded cable. Status LED indicators shall be LCD display keypads.
 - 6.20.2.2(32)(c) Wire the keypads with 4C#22.
 - 6.20.2.2(32)(d) Install door switches only on doors where other methods of protection are not feasible or practical or would be subject to damage or vandalism. Where installed, provide and coordinate rough-in with Design-Builder to ensure rough-in scheduling is coordinated with wall and door frame construction and installation. Door switches shall be flush mounted in door frames and shall be supervised by the main control panel. Wire door switches with 4C #22 shielded stranded cable. Red and black wires are twisted together for a tamper loop.
 - 6.20.2.2(32)(e) Passive infra-red detection units shall be ceiling or wall mounted and adjusted on site as recommended by the manufacturer and system installer. All P.I.R. units are to be individually wired to the terminal boards. Leave 6 m of slack cable at each detector location to permit adjustment of location. Manufacturer and installer to

review and advise on each device location prior to final installation. Wire passive infrared detection units with 6C#22 shielded stranded cable and installation height should be at minimum 2250 mm.

- 6.20.2.2(32)(f) All system devices shall be individually wired to the control panel in minimum 20mm EMT conduit.
- 6.20.2.2(32)(g) Terminate all wiring on BIX blocks. No compression splices are to be used.
- 6.20.2.2(32)(h) Security system circuit boards are to be installed in the minimum number of cabinets. Provide large cabinets for boards and terminations. The area shall have sufficient room to allow the equipment required to expand the final security system by 30%. Shop drawings shall include a scaled cad layout drawing of the interior of the cabinet showing cabinet dimensions, equipment locations, cable runs and cable management. Show equipment catalogue numbers on drawing.
- 6.20.2.2(32)(i) Allow for complete system programming of the system to meet the School District's requirements.
- 6.20.2.2(32)(j) Test each device to ensure correct operation and that wiring is properly supervised.
- 6.20.2.2(32)(k) Ensure devices (zones) are shown correctly on control panel and all annunciation devices.
- 6.20.2.2(32)(l) Provide certificate of installation and acceptance to the School District upon completion.

6.20.3 Access Control

- 6.20.3.1 The Access Control System shall be designed, supplied, installed, and commissioned by the Design-Builder.
- 6.20.3.2 The Design-Builder shall comply with the latest version of the BCBC.
- 6.20.3.3 The Design-Builder shall coordinate with Division 8 Openings to ensure hardware is compatible and meets the requirements.
- 6.20.3.4 Refer to section 6.6 for hardware electrical connection requirements.
- 6.20.3.5 The Design-Builder shall provide the following:

- 6.20.3.5(1) One (1) Kantech KT-300, or acceptable equivalent, door controller for every two (2) proximity keyfob readers.
- 6.20.3.5(2) RS-485 cable connection between all the door controllers.
- 6.20.3.5(3) Interconnection to security alarm control panel.
- 6.20.3.5(4) Power supply similar to security alarm control panel.
- 6.20.3.5(5) Kantech P325 XSF I/O, or acceptable equivalent, proximity reader system to scan, read and load code from user's key fob's or proximity cards and report back to the door controller. Mount behind dark tinted lexan flush to wall surface.
- 6.20.3.5(6) 250 Kantech ioProx P20DYE Proximity cards, or acceptable equivalent, fully programmed to the Owner's requirements.
- 6.20.3.5(7) Individually zoned and annunciated system devices.
- 6.20.3.5(8) Programmable control panels via the remote monitoring station's software or the system alpha-numeric keypad.
- 6.20.3.5(9) Arming and disarming of the systems shall be provided at the proximity reader keyfob access stations located throughout the building and the main intrusion keypads. Each event shall be monitored at the remote station for logging.
- 6.20.3.5(10) System installation and programming to disarm the intrusion alarm system and enter as follows:
 - 6.20.3.5(10)(a) Touch the keyfob to the reader;
 - 6.20.3.5(10)(b) Door will release and remain unlocked for 8 seconds;
 - 6.20.3.5(10)(c) If the door remains closed, the alarm will not be disarmed;
- 6.20.3.5(11) Provide programming system status to the Owner's requirements. Programming system status to the Owner's requirements. Programming must be completed by Kantech Global Certified installers. Kantech issued Certificate shall be verified prior to start of programming to insure ongoing support from Kantech manufacturer's representatives.
- 6.20.3.5(12) A connection from the door access control system to the fire alarm system to allow the School District to optionally release all electric door locking devices. Install connection to fire alarm system and get confirmation in writing from the School District if

the option is to be activated or not. Demonstrate to the School District that the option has been installed and works correctly when activated.

- 6.20.3.5(13) Operation of any alarm initiating device to:
 - 6.20.3.5(13)(a) Cause interior and exterior sirens to operate;
 - 6.20.3.5(13)(b) Transmit signal to remote monitoring station;
 - 6.20.3.5(13)(c) Display zone and alarm device on keypad display;
 - 6.20.3.5(13)(d) Display steady red and green at all system status LED's.

- 6.20.3.5(14) The system status LED's on keypad display shall display as follows:
 - 6.20.3.5(14)(a) Multi partition system will have displays indicating:
 - (a).1 "R" for Ready
 - (a).2 "A" for Armed
 - (a).3 "N" for Not ready

 - 6.20.3.5(14)(b) LED's on proximity readers will have displays indicating:
 - (b).1 Readers outside
 - (b).1.1 Remain red and are only green temporarily as access is granted.
 - (b).2 Readers inside
 - (b).2.1 System unarmed "Green"
 - (b).2.2 System armed "Red"
 - (b).2.3 System in alarm "Red Green"

- 6.20.3.5(15) The system shall be equipped for monitoring by the School District designated monitoring agency

- 6.20.3.6 The Design-Builder shall provide power and data connections for Maintenance PC for remote access to ESC panel.

- 6.20.3.7 The Design-Builder shall provide power connections to all roll shutters, blinds, and blackout curtains as per Appendix 1B Room Data Sheets.

- 6.20.3.8 Exterior roll shutters infrastructure shall be provided for windows on ground floor and accessible from grade and will be powered but key operated.

- 6.20.3.9 The Design-Builder shall program the access control system to turn on or turn off the security alarm system based on which proximity card reader is being activated. Coordinate all programming with the Owner.

- 6.20.3.10 The Design-Builder shall coordinate door strikes with door hardware installer as early as possible to ensure a coordinated system. No extra costs shall be considered for failure to coordinate door strikes with the door hardware installer.
- 6.20.3.11 The Design-Builder shall provide full-length, banded astragals on fire exits leading to outside. These doors to be "exit" only.
- 6.20.3.12 .
- 6.20.3.13 The Design-Builder shall provide card readers at the following locations:
 - 6.20.3.13(1) All entrances and exits;
 - 6.20.3.13(2) Principal, Vice Principal, and records offices;
 - 6.20.3.13(3) Service rooms including telecommunications, electrical, and mechanical
 - 6.20.3.13(4) Admin area;
 - 6.20.3.13(5) Areas identified by the Owner during the design phase.
- 6.20.3.14 The Design-Builder shall coordinate with the Owner during the design phase for all additional requirements.
- 6.20.3.15 The Design-Builder shall allow for special situations such as double doors in the Grand Commons.
- 6.20.3.16 The Design-Builder shall allow for flexibility in the security design including hardware and electronic safety and security requirements.

6.20.4 Video Surveillance (CCTV)

6.20.4.1 Basic Requirements

- 6.20.4.1(1) The Design-Builder shall provide a complete video surveillance system, hereinafter referred to as Close Circuit Television System (CCTV) monitoring system including cameras, camera enclosures, video recorder and video management software. Provide 6 inside cameras and 6 exterior cameras in locations to be determined in consultation with the Owner.

6.20.4.2 Performance Requirements

- 6.20.4.2(1) The Design-Builder shall provide

- 6.20.4.2(1)(a) A wall mounted rack style cabinet for all equipment in the MTR.
- 6.20.4.2(1)(b) Wiring shall consist of 4 pair CAT 6 UTP with purple jacket to each camera location and to the building LAN. Cabling shall be in 21mm (3/4”) conduit to the head-end equipment.
- 6.20.4.2(1)(c) Eight hours of training to Owner’s personnel showing the operations and programming functions of the system. Provide manuals for all the equipment in the system.
- 6.20.4.2(2) The Design-Builder shall install, wire and program the entire system. Program the system to enable remote access through a web browser from any Owner computer workstation. Adjust all camera settings and positions to the Owner’s satisfaction.
- 6.20.4.2(3) The Quiet Room shall not have CCTV cameras installed.
- 6.20.4.2(4) Acceptable camera manufacturer: Avigilon or acceptable equivalent.
- 6.20.4.2(5) The Design-Builder shall provide Cisco SGE2000P and Cisco SRW2008MP PoE gigabit switches or acceptable equivalent.
- 6.20.4.2(6) Sample of acceptable cameras (location dependent) will be as follows:

Type	Camera	Remarks	Mount
.1	1MP-HD-DOME-DN	Heater	Base mount
.2	1MP-HD-H264-DC1	3-9mm	Gooseneck/Pendant
.3	3MP-HD-DOME-DN	Heater	Pendant and Base mount
.4	2MP-HD-DOME-DN	3-9mm/htr	Gooseneck mount
.5	2MP-HD-H264-D1	Heater	Base mount

- 6.20.4.2(7) Approved Network Video Management system: Avigilon Control Centre or acceptable equivalent.

6.20.5 Panic Duress

6.20.5.1 The Design-Builder shall provide a panic duress system as per the following requirements:

- 6.20.5.1(1) Wired intercom panic duress stations in all parking areas. Duress stations shall be placed in well-lit areas, spaced such that no spot may be more than a maximum of 30 m from a duress

station, maximum of 15m from the parking area edge, and at all parking area entrances.

- 6.20.5.1(2) Duress system shall be supplied by UPS.
- 6.20.5.1(3) Activation of a panic duress button shall call the nearest fixed or PTZ cameras to zoom in on the activation location and increase record rate of cameras for duration of 90 seconds from time of activation. These cameras shall have ability to pop-up and prioritize live viewing on monitors determined in consultation with Owner.
- 6.20.5.1(4) Activation of a panic duress button shall be registered by the security system and an alarm shall be generated to the appropriate staff as determined in consultation with the Owner and to an off-site monitoring station.
- 6.20.5.1(5) Blue beacon/strobe light shall be above each station. The beacon light shall be illuminated at all times. And the strobe light shall flash only when panic duress station is in use.
- 6.20.5.1(6) The panic duress assembly shall be heavy-duty vandal proof construction and removal of the cover shall be monitored with a tamper switch.

6.20.6 Intercommunication System

6.20.6.1 Basic Requirements

- 6.20.6.1(1) Design-Builder shall provide a fully operational intercommunication system including all required components.
- 6.20.6.1(2) Intercom system shall provide fast 'duplex' (hands-free at both ends) voice communication as required to provide instant intercommunications for employees, emergency paging and signaling, alarm distribution and audio program distribution. System shall assist with personnel safety, facility security, security systems integration, operational efficiency and maintenance functions. The IP based intercom shall be fully integrated with the access control system, detention control system and CCTV system.
- 6.20.6.1(3) The intercom design shall comply with the following codes and standards:
 - 6.20.6.1(3)(a) Electronic Industry Association ANSI/EIA/TIA

- 6.20.6.1(3)(b) National Electrical Manufacturers Association (NEMA)
 - 6.20.6.1(3)(c) Underwriters Laboratories UL 294, UL 639, and UL 1037, UL 1076.
 - 6.20.6.1(3)(d) National Fire Protection Association (NFPA)
 - 6.20.6.1(4) Design-Builder shall provide and install all wiring for the intercom system as required and as recommended by the intercom system manufacturer.
 - 6.20.6.1(5) Design-Builder shall provide and install all intercom control units, ad-on control units and all miscellaneous hardware for a complete turnkey intercom system.
 - 6.20.6.1(6) The Design-Builder shall coordinate with the Owner, configure and program the intercom system as required to suite operations of the Facility as directed by the Owner.
- 6.20.6.2 Performance Requirements
- 6.20.6.2(1) The Design-Builder shall provide intercom system with built-in camera at the following locations as the minimum:
 - 6.20.6.2(1)(a) Main Entrance;
 - 6.20.6.2(1)(b) Receiving;
 - 6.20.6.2(1)(c) Locations required by the Owner.
 - 6.20.6.2(2) The Design-Builder shall interconnect intercom system and access control system for remote door release.
 - 6.20.6.2(3) Desk Mount Master station shall include the following controls: dialing buttons; Manual button for speech control and other functions; cancel button; privacy slide switch and variable volume control, speaker mounted in an acoustic baffle, microphone. Frequency response of input and output shall be 300 to 7 kHz. Master shall be in a modern housing, suitable for desk mounting, and have a six foot cord and plug with addition of a lightweight handset
 - 6.20.6.2(4) Wall Mount Standard Master station shall function exactly like a standard desk master but with all controls, speaker and microphone mounted on an extruded aluminum face plate, suitable for wall mounting.

- 6.20.6.3 Approved Manufacturer: Aiphone IX (Valcom multi-zone), or acceptable equivalent.

6.21 Earthworks (Div. 31)

6.21.1 Site Clearing

6.21.1.1 Basic Requirements

- 6.21.1.1(1) Selectively clear the site of shrubs and other vegetation to provide clear sitelines around the Facility and the site.
- 6.21.1.1(2) Remove any existing redundant underground utilities under the footprint of the new School building.
- 6.21.1.1(3) Request in writing permission from the Owner before removal of any existing site improvements and/or structure(s).

6.21.1.2 Performance Requirements

- 6.21.1.2(1) Clear and grub out stumps and roots to not less than 200mm below ground surface;
- 6.21.1.2(2) Prevent damage to existing trees and shrubbery which are determined to be retained;
- 6.21.1.2(3) Protect existing trees and shrubbery;
- 6.21.1.2(4) Selectively remove, prune and trim trees and shrubs to minimize tall foliage near pedestrian walkways;
- 6.21.1.2(5) Strip and stockpile topsoil before construction starts to avoid compaction and preserve and protect suitable topsoil for reuse and incorporation into finish grading and landscaping;
- 6.21.1.2(6) No burning debris on site and use of herbicides will be avoided;
- 6.21.1.2(7) Coordinate clearing work with utility companies as required;
- 6.21.1.2(8) Demolition and relocation of existing services will include installation of temporary and relocated services so that existing services are not disrupted.

6.21.2 Earth Moving

6.21.2.1 Basic Requirements

- 6.21.2.1(1) Perform earth moving activities including excavation, backfilling, soils compaction, and soils preparation as required for the construction of the Facility, including landscaping improvements
- 6.21.2.1(2) Repair roadways, sidewalks, and curbs that are required to be cut and restored during construction, or damaged by construction to the applicable municipal standards.
- 6.21.2.1(3) Conduct inspection and testing of soil compaction to be carried out by an approved testing laboratory.

6.21.2.2 Performance Requirements

- 6.21.2.2(1) Excavate, backfill and grade site as necessary to provide levels and elevations for foundations, Facility access, exterior improvements including roadways and walkways, service trenching, drainage, site contours, landscaping and other required improvements.
- 6.21.2.2(2) Refer to “Remediation Plan for New School Area: New Westminster Secondary School, 735 Eighth Street, New Westminster, BC (Golder Associates Ltd.)September 7, 2017 of the Environmental Reports. Based on the preliminary risk assessment results, the plan prescribes the following
 - 6.21.2.2(2)(a) For the School site and the Maintenance/IT Building site, near surface, shallow soils can be risk managed with soil remediation by excavation. The estimated areas requiring excavation in the top 1 metre is provided in this plan.
 - 6.21.2.2(2)(b) For roadway between the Massey Theatre and Moody Park Arena, risk managing the chloride and sodium impacted soil.
 - 6.21.2.2(2)(c) For the School site and Maintenance/IT Building site, the area with stockpiled material requiring excavation, transport and disposal.
- 6.21.2.2(3) The Design-Builder will determine the volume and mass of this prescribed top of contaminated material requiring disposal and will excavate, transport and dispose of this material including any material from the roadway that may require excavation and disposal.. The Design-Builder will ensure the Contaminants are disposed of at a facility authorized to accept the quality of the material.

- 6.21.2.2(4) It is noted that there are Contaminants that extend beyond the depth of 1 metre. The provisions of section 30.3 of the Design-Build Agreement will apply if Contaminants beyond the 1 metre depth require removal as part of the Design-Builder's excavation plan.

6.22 Site Improvements (Div. 32)

6.22.1 Property Fence

6.22.1.1 Basic Requirements

- 6.22.1.1(1) Meet City of New Westminster fencing bylaw requirements;
- 6.22.1.1(2) Provide vehicular traffic control gate at parking lot exit at Sixth (6th) Street.

6.22.1.2 Prescriptive Requirements

- 6.22.1.2(1) Provide 1.8m high chain link fencing along interior lot lines, with pedestrian-only access opening where required in consideration of pedestrian traffic to site;
- 6.22.1.2(2) Chain Link Fencing
- 6.22.1.2(2)(a) Fabric: chain link, 9 gauge galvanized steel wire woven in a 50 mm mesh. 1800 mm high unless otherwise noted, 25 mm above finished grade;
- 6.22.1.2(2)(b) Line posts: 60 mm outside diameter, (OD) schedule 40 galvanized steel pipe. Minimum width 4.04 kg per metre. Line post spaced at 3 m maximum o.c.;
- 6.22.1.2(2)(c) End, corner, and straining posts; 75 mm OD schedule 40 galvanized steel pipe; Gate posts: 89 mm ID schedule 40 galvanized steel pipe complete with suitable tops;
- 6.22.1.2(2)(d) Concrete footings: minimum 20.0 MPa concrete
Minimum dimension: 1 gate posts, terminal posts, and corner posts: 1060 mm deep, 300 mm OD, 2 line posts: 920 mm deep, 250 mm OD;
- 6.22.1.2(2)(e) Top and mid rails: 40 mm OD schedule 40 galvanized steel pipe. Top and mid rails to be installed with continuous electrically welded joints and hot dipped galvanized after welding;

- 6.22.1.2(2)(f) Braces: 41.2 mm schedule 40 galvanized steel pipe. Horizontal brace spaced midway between top rail and bottom fence and to extend from terminal;
 - 6.22.1.2(2)(g) Fittings: Hot dipped galvanized caps of suitable dimension to be installed on all posts. Eye tops to be pressed steel type;
 - 6.22.1.2(2)(h) Hardware to suit details;
 - 6.22.1.2(2)(i) Fabric bands: fabric is to be fastened with 3.77 mm (9 gauge) aluminum tie wire at each knuckle to top rail and at 183 mm on centre to end and line posts to within 200 mm above grade;
 - 6.22.1.2(2)(j) Tension wire: 4.8 mm (6 gauge) single strand 610 g/m² electrogalvanized wire shall be stretched taut along the bottom of fabric and attached to end and corner posts with a turnbuckle and fixed to chain link fabric with 4.8 m (6 gauge) aluminum hog rings at every 3rd knuckle;
 - 6.22.1.2(2)(k) Fabricate gates with continuous electrically welded joints and hot dipped galvanized after welding. Furnish gates with galvanized malleable iron hinges, latch and latch catch with provisions for padlock which can be attached and operated from either side of installed gate;
 - 6.22.1.2(2)(l) Galvanizing: 55 g/m² to ASTM for pipe for other fittings to CAN/CSA – G164. All welds to be painted with galvanized paint.
- 6.22.1.3 Coordinate existing and future field locations with site design requirements;
- 6.22.1.4 Future Playfield Irrigation Provision:
- 6.22.1.4(1) Provide future irrigation system provisions for future 45 m x 95 m playfield adjacent to new School building and new Maintenance/IT Building;
 - 6.22.1.4(2) System will meet the minimum standard set out in the 2008 edition of the “Standards for landscape irrigation system” by the Irrigation Association of British Columbia;
 - 6.22.1.4(3) Provisions for the system must be installed by an IABC (Irrigation Association of BC) certified subcontractor;

6.22.1.4(4) System will be designed to meet City of New Westminster Parks department irrigation specifications;

6.22.1.4(5) Required system components are to include but not limited to provisions for water service line.

6.22.1.5 Establishment Maintenance

6.22.1.5(1) The date of substantial completion, or the completion of landscape planting (whichever occurs last) shall constitute the beginning of twenty-four (24) month establishment maintenance period;

6.22.1.5(2) Maintenance during the 24 month period of establishment maintenance is essential to ensure the validity of the Design–Builder’s guarantee for the same period;

6.22.1.5(3) Replace for a period of 24 months beginning from completion of the landscape planting, all unsatisfactory plant material and continue to replace such plant material until the replacement is acceptable, at no cost to the Owner;

6.22.1.5(4) Establishment maintenance procedures apply to all new plants and planting as well as cultivate turf grass, seeded areas and all trees and shrubs;

6.22.1.5(5) A log book shall be kept in which maintenance activities are recorded. This will include a record of when and what operations are carried out, as well as notations about site conditions which require attention. A copy of this information shall be forward to the Owner each time a report is written. A minimum of three maintenance reports shall be made during each growing season;

6.22.1.6 Work Included

6.22.1.6(1) Maintenance all newly planted areas in a weed-free condition;

6.22.1.6(2) Fertilizing the planting areas and lawn areas;

6.22.1.6(3) Pruning;

6.22.1.6(4) Watering and temporary irrigation;

6.22.1.6(5) Replacement of dead and diseased plants; watering in sufficient quantities and frequency to maintain optimum soil moisture; lawn mowing;

- 6.22.1.6(6) Protect all pre-existing and newly planted trees, shrubs and other plant materials, site services, curbs, asphalt and structures against any damage throughout the establishment maintenance period;
 - 6.22.1.6(7) Lawn mowing shall be carried out at regular intervals to maintain grass at a maximum height of 60 mm (2.5"). Edges of sodded areas shall be straight and neatly trimmed;
 - 6.22.1.6(8) In March and June of the first growing season, fertilize all exterior planting areas with the fertilizer recommended by the Design-Builder's landscape architect. Repeat the fertilizer application in March of the second growing season.
- 6.22.1.7 The Design-Builder is responsible for all losses except those related to vandalism.

6.22.2 Site Retaining Walls

- 6.22.2.1 The Design-Builder shall provide retaining walls lower than 2.0m. Any elevation changes greater than 1.0m shall be accomplished by means of stacked/tiered wall systems. Horizontal separation between wall faces of min 1.2 m required. The Design-Builder shall provide planted areas rather than turf in these zones;
- 6.22.2.2 No walls greater than 1.2 m high will be acceptable along site boundaries/street frontages to promote site visibility;
- 6.22.2.3 All pre-cast walls to have a base course and a coping course;
- 6.22.2.4 Acceptable materials complement building exterior architectural materials of the building, including cast in place concrete and/or precast concrete walls with a split face pattern.

6.23 Utilities (Div. 33)**6.23.1 General**

- 6.23.1.1 All works shall be designed and constructed in accordance with the latest version of the BC Building Code;
- 6.23.1.2 All works shall be designed and constructed in accordance with the latest version of the City of New Westminister's Subdivision & Development Control Bylaw No 7142;
- 6.23.1.3 All works shall be designed and constructed in accordance with the latest edition of the MMCD;
- 6.23.1.4 See Section 5.4 Civil Engineering.

6.23.2 Liquid and Gas Site Utilities**6.24 Landscape Design**

- 6.24.1 Landscape design to be prepared by BCSLA registered Landscape Architect;
- 6.24.2 Work and materials are to meet requirements of the latest edition of the BC Landscape standard, prepare by the BC society of Landscape Architects and the BC Landscape and Nursery Association;
- 6.24.3 Landscape design must meet bylaw requirements of the City of New Westminister;
- 6.24.4 Planting and specimen trees are to be selected in consideration of the Owner's existing landscape maintenance procedures;
- 6.24.5 Provide drought resistant, low-maintenance plant material and tree species listed by the City of New Westminister for use as street trees and be of 150mm minimum caliper;
- 6.24.6 Locate deciduous trees on the south and west side of the Facility to provide shade in summer and to allow sunlight through in the winter to facilitate year round moderation of the internal building climate;
- 6.24.7 Use landscaping in and around surface parking and other paved areas to intercept precipitation, reduce surface heating, protect pedestrians from the elements and soften the views and reduce the visual scale of the parking from the sidewalk and street. Ensure that landscaping supports public safety through allowing visual surveillance of all site areas;
- 6.24.8 Design landscapes, including planters and decorative landscape areas to incorporate low impact storm water features that retain and or infiltrate run-off;

- 6.24.9** Use hardy, drought-tolerant, perennial species, reducing the need for maintenance, pesticide use and irrigation;
- 6.24.10** Excavated materials are to be approved by Geotechnical engineer before use as fill for site grading work. Keep top soil and fill material separate and protect from contamination. Soils containing topsoil, fill, large roots, stumps or organic debris are not suitable for use as fill;
- 6.24.11** Sand to be re-used on site is to be screened to remove rocks and roots. Re-used sand is to be blended with imported sand prior to placement;
- 6.24.12** Fill should be placed using end dump method and spread with tracked equipment. If construction traffic is to travel on stripped subgrade, a temporary access road of at least 300mm of imported granular fill shall be constructed.
- 6.24.13** Plants and Planting
- 6.24.13.1 Plant material shall be nursery grown, conforming to the Canadian Nursery Trades Association Landscape Canada “Metric Guide Specification for Nursery Stock” and to the “British Columbia Nursery Trades Standard for Container Grown Plants”;
- 6.24.13.2 Plant only during the season which are normal for such work, determined by weather conditions. Do not plant during freezing, abnormally hot, dry or wet weather.
- 6.24.14** Sodded Lawn
- 6.24.14.1 Sod shall be nursery grown, conforming to the latest edition of BC Landscape Standards;
- 6.24.14.2 Sod shall be class 1 No. 1 Premium Turf Grass. Sod grown in topsoil and free of disease, nematodes, soil-born insects, clover, stones and debris. Sod major species to be Kentucky Blue Grass for sunny areas and Fescues for shady areas;
- 6.24.14.3 Install sod in accordance with best practices, to be tested and Owner approved;
- 6.24.14.4 Amended topsoil growing medium shall be placed to a minimum depth of 300 mm;
- 6.24.14.5 Repair, regrade, top-dress, re-sod and maintain lawn areas (including temporary irrigation) as required to obtain an even, uniform stand of grass until established;

6.24.14.6 Sod shall be considered established when it is dense, rooted into the underlying soil, showing no signs of yellowing, and in a healthy condition;

6.24.14.7 Begin maintenance immediately after installation.

6.24.15 Concrete Walkways

6.24.15.1 Provide on-site walkways:

6.24.15.1(1) For secondary walkways, a minimum width of 3.0 metres, unless noted otherwise. Provide widened sidewalks at all entrances and drop-off locations;

6.24.15.1(2) For primary walkways, a minimum width of 3.0 metres, unless noted otherwise, is to be provided.

6.24.15.2 Concrete walks: 100 mm concrete on minimum 200 mm compacted granular base on prepared subgrade;

6.24.15.3 Provide broom finished typical walkways, with tooled edges and control joints at 2.4 m. Isolation joints at maximum 4.0 m;

6.24.15.4 Provide decorative surface treatment such as exposed aggregate concrete, large concrete pavers or acceptable equivalent for principle entries to the Facility;

6.24.15.5 Paver size and scoring pattern to align with the exterior and interior design dimensions of the new School building;

6.24.15.6 Large concrete paver and scoring pattern size to be a minimum 610 mm x 1220 mm;

6.24.15.7 All pedestrian walkways and sidewalks to be wheelchair ramp accessible.

6.24.16 Gravel Walkways

6.24.16.1 Excavate and install gravel walkways using 10mm screening (crushed dust) at 2,000 mm wide x 150 mm.

6.24.17 Bicycle Parking and Storage

6.24.17.1 Provide asphalt paved bicycle parking area with racks in conformance with City of New Westminster bylaws;

6.24.17.2 Provide secure bicycle storage complete with lighted canopies with drainage;

- 6.24.17.3 Bicycle racks to be located as per this Schedule. Owner to approve exact location;
- 6.24.17.4 Covered bicycle racks and enclosed and covered secure bicycle program storage to be installed on designated purpose concrete pad;
- 6.24.17.5 Acceptable bicycle racks are Blue Imp Playground Equipment Company, Urban Bike Rack BR 145, or acceptable equivalent.