Part 1 General

1.1 Objective

1.1.1 This document provides deployment standards and design specifications for the voice/data, security and other low voltage and optical telecommunications infrastructure at Ryerson University. The objective of these design standards is to ensure that the University's communications infrastructure is reliable, secure from unauthorized tampering and minimizes the on-going maintenance costs by standardizing on a design approach, and the use of the materials and equipment throughout the University.

1.1.2 It shall be mandatory that these standards and specifications, for communications infrastructure related work on the University campus, are adhered to stringently by all Ryerson University staff and external contractors.

1.1.3 All work associated with these specifications shall comply with the Canadian Electrical Code (part 1), Ontario Electrical Safety Code (OESC) and the Ontario Building Code.

1.1.4 Wiring standards are dynamic and constantly changing due to continually evolving networking standards. Computing and Communication Services (CCS) holds the responsibility for approving changes to these specifications and all parties shall be responsible for acquiring the latest approved copy of these standards for use on any project.

1.1.5 These standards cover the basic requirements for all projects in new and existing buildings and includes, entrance ducts, communications rooms, riser system between floors, a horizontal distribution system and building wiring as defined in this document.

1.1.6 The department, Communications Services of CCS, Computing and Communications Services is responsible for the communications infrastructure at the University. CCS in consultation with building occupants are to be involved in the design process.

Table 1: Contacts

Department	Name	Phone Number	E-mail Address
CCS	Mourad Michael Assistant Director	416-979-5000 Ext. 554050	michael@ryerson.ca
CCS	David Lester, RCDD Manager, Communication Infrastructure Services	416-979-5000 Ext. 557239	dwlester@ryerson.ca

1.1.7 The above individuals or their appointed designates shall be consulted during the design and construction phases, and must approve all the designs prior to the construction phase. CCS is to be consulted as questions arise during the construction phase.

1.2 General Intent

1.2.1 The general intent of this document is to provide the architect, interior designer, engineers, Registered Communications Distribution Designer (RCDD) and Communications Contractor the tools necessary to ensure that all Ryerson University standard telecommunications requirements are met were it relates to spaces and services.

1.2.2 Ryerson University reserves the right to modify these requirements based on the needs of a particular project, however, the requirements outlined in this document shall represent the initial design requirements for any new project unless advised otherwise by Ryerson University.

1.2.3 Standard Telecommunications Room designs and layouts will be provided by Ryerson University and shall be used by the architect, interior designer and engineer to reserve the necessary spaces and services to support the telecommunications systems.

1.2.4 The standard Telecommunications Room designs and layouts provided by Ryerson University represent the required room dimensions, equipment quantities and backboard dimensions required to support the telecommunications systems.

1.2.5 Where the architect, interior designer, corporate real estate or engineer wish to deviate from the Ryerson University Communications Design Standards prior written approval shall be obtained from Ryerson University. Deviations from the standard include but are not limited to changes in room dimensions, rack layouts, quantity of cables to be terminated, etc.

1.2.6 Conform to the requirements of Divisions 0 and 1 and additional general information as prepared by the RCDD or Ryerson University which apply to and form part of all sections of work.

1.3 Related Documents

Construction Specifications Canada (CSC) Divisions 16, 27 and 28 specifications shall be complied with.

1.4 Agencies, Reference Standards and Codes

A. Agencies

1. ANSI American National Standards Institute
2. BICSI Building Industry Consulting Service International
3. EIA Electronics Industry Alliance
4. FOTP Fiber Optic Testing Procedure
5. IEEE Institute of Electrical and Electronic Engineers
6. OBC Ontario Building Code
7. NFPA National Fire Protection Agency
8. CEC Canadian Electrical Code
9. OESC Ontario Electrical Safety Code
10. TIA Telecommunications Industry Association

11. UL Underwriters Laboratories

B. Codes and Standards

The following list highlights the typical applicable standards. All national and local codes and standards not listed for Products, Buildings, Fire, Health and Safety and Electrical will also apply.

ANSI/TIA 568-C.0	-	Generic Telecommunications Cabling for Customer Premises
ANSI/TIA 568-C.1	-	Commercial Building Telecommunications Cabling Standard
ANSI/TIA 568-C.2	-	Balanced Twisted Pair Cabling Telecommunications Cabling and Components Standard
ANSI/TIA 568-C.3	-	Optical Fibre Cabling Components Standard
ANSI/TIA/EIA 569-D	-	Telecommunications Pathways and Spaces.
ANSI/TIA/EIA 598-A	-	Optical Fibre Cable Color Coding
ANSI/TIA 570-B	-	Residential Telecommunications Infrastructure Standard
ANSI/TIA/EIA 604	-	Fibre Optic Connector Intermateability Standard (FOCIS 3/5/10)
ANSI/TIA 606-B	-	Administration Standard for Telecommunications Infrastructure
ANSI/TIA 607-B	-	Generic telecommunications Bonding and Grounding (Earthing) for Customer Premises
ANSI/TIA 758-B	-	Customer Owned Outside Plant Telecommunications Infrastructure Standard
TIA TSB 162	-	Telecommunications Cabling Guidelines for Wireless Access Points
CSA C22.1-12	-	Canadian Electric Code Part I: Safety Standards for Electrical Installations
CSA C22.2 No. 181.4	-	Plugs, Receptacles, and Connectors for Communication Systems
CSA C22.2 No. 214	-	Communications Cables
CSA C22.2 No. 0	-	Canadian Electric Code Part II: General Requirements (Communications Cables)
CSA C22.2 232 M1998	-	Canadian Electric Code Part II: Optical Fibre Cables
BICSI ITSIMM	-	Information Transport System Installation and Methods Manual (6th edition)
BICSI TDMM	-	Telecommunications Distribution Methods Manual (12th edition)
BICSI OPDRM	-	Outside Plant Design Reference Manual (5th edition)
ANSI/NECA/BICSI 568-2006	-	Standard for Installing Commercial Building Telecommunications Cabling
NECA/BICSI 607-2011	-	Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings
CAN/ULC S115	-	Standard Method of Fire Tests of Firestop Systems
CAN/ULC S101	-	Standard Method of Fire Endurance Tests of Building Construction and Materials

CAN/ULC S102	-	Standard Method of Testing for Surface Burning Characteristics of Building Materials and Assemblies
TIA-222	-	Structural Standards for Steel Antenna Towers and Antenna Supporting Structures
TIA-942	-	Telecommunications Infrastructure Standards for Data Centers
CEC, Part 1	-	The Canadian Electrical Code, Part 1 2012
OESC	-	Ontario Electrical Safety Code 2012
O.R. 213/07	-	Ontario Fire Code
O.R. 350/06	-	Ontario Building Code
IEEE 802.3	-	Information Technology – Telecommunications and Information Exchange Between Systems – Local and Metropolitan Area Networks p Specific Requirements Part 3 Carrier Sense Multiple Access with Collision
IEEE 802.11	-	Local and Metropolitan Area Networks – Specific Requirements Part 11: Wireless LAN Medium Access Control and Physical Specifications
ANSI/ICEA S-80-576	-	Communication Cables
ANSI/ICEA S-83-596	-	Fibre Optic Premises Distribution Cable
ANSI/ICEA S-83-640	-	Fibre Optic Outside Plant Communications Cable
ANSI/ICEA Z136.2	-	American Standards for the Safe Operation of Optical Fibre Communication Systems Utilizing Laser Diode and LED Sources
ANSI/TIA/EIA 455	-	Fibre Optic Test Procedures
ANSI/TIA/EIA 492AAAA	-	Detail Specification for 62.5-mm Core Diameter/125-mm Cladding Diameter Class Ia Multimode, Graded-Index Optical Waveguide Fibres
ANSI/TIA/EIA 492AAAB	-	Detail Specification for 50.0-mm Core Diameter/125-mm Cladding Diameter Class Ia Multimode, Graded-Index Optical Waveguide Fibres
ANSI/TIA/EIA 492BAAA	-	Detail Specification for Class IVa Dispersion-Unshifted Singlemode Optical Waveguide Fibres Used In Communications Systems
ANSI/TIA/EIA 472CAAA	-	Detail Specification for All-Dielectric (Construction 1) Fibre Optic Communications Cable for Indoor Plenum Use, Containing Class Ia, 62.5 mm Core Diameter/125 Cladding Diameter Optical Fibre(s)
ANSI/TIA/EIA 472DAAA	-	Detail Specification for All-Dielectric Fibre Optic Communications Cable for Outside Plant Use, Containing Class Ia, 62.5 mm Core Diameter/125 mm Cladding Diameter/250 mm Coating Diameter Optical Fibre(s)
ANSI INCITS 263	-	Information Technology – Fibre Distributed Data Interface (FDDI) – Token Ring Twisted Pair Physical Layer Medium Dependent (TP-PMD)
CENELEC EN 50173	-	Performance Requirements for Generic Cabling Schemes
FIPS PUB 174	-	Commercial Building Telecommunications Wiring Standard. Federal Information Publication Standard
ICEA S-90-661	-	Individually Unshielded Twisted Pair Indoor Cable for Use in Communications Wiring Systems

IEC 603-7, Part 7	-	Detailed Specifications for Connectors, 8-Way, Including Fixed and Free Connectors with Common Mating Schemes
ISO/IEC IS 11801A	-	Generic Cabling for Customer Premises
NEMA WC 63	-	Performance Standard for Field Testing of Unshielded Twisted-Pair Cabling System
OHSA	-	Occupational Health and Safety Act - R.S.O. 1990, c. 0-1
UL 444 and 13	-	Adopted Test and Follow-Up Service Requirements For The Optional Qualification of 100Ω Twisted-Pair
NCTA	-	National Cable Television Association
NCTA-02/89 rev. 93	-	NCTA Recommended Practices for Measurements on Cable Television Systems

Definitions and Abbreviations

The following definitions may be used in this document, as well as in any project documents such as but not limited to Addenda, Contemplated Change Notices, Change Orders, and Site Instructions:

Addendum	-	Normative document used to provide additional requirements and recommendations to a published document (e.g., standards, contracts). When published, an addendum effectively becomes part of the document that it supports.
Bonding	-	The permanent joining of metallic parts to form an electrically conductive path that will ensure electrical continuity and the capacity to conduct safely any current likely to be imposed.
Bonding Conductor (BC)	-	A conductor used specifically for the purpose of bonding.
Building Entrance Facility	-	The room or space inside a building where telecommunications cables enter and leave the building.
Category	-	A rating that defines the performance of cabling components and systems. Describes mechanical properties and transmission characteristics of balanced twisted-pair cabling and provides a numbered designation.
Change Notice	-	Normative document approved to provide additional requirements and recommendations that describes and authorizes the implementation of an engineering change to the product and its approved configuration documentation.
Client	-	Ryerson University

Communications Contractor	-	The successful bidder to this Specification responsible for the supply and installation of the Structured Cabling Solution as described in this Specification and shown on Drawings provided under separate cover.
Contemplated Change Notice	-	Normative document to provide additional requirements and recommendations that describes the implementation of an engineering change to the product and its approved configuration documentation for the purposes of pricing. This document does not authorize the implementation of a change to the product and its approved configuration documentation.
Cut Over	-	The live date(s) when the Client will occupy the space as indicated by date and/or phasing.
Grounded Conductor	-	A system or circuit conductor that is intentionally grounded.
Grounding System	-	A system of hardware and wiring that provides an electrical path from a specified location to an earth ground point.
Modular Copper Patch Panel	-	A patch panel that allows each RJ-45 outlet (or port) to be removed individually.
Project	-	Supply and installation of a complete Structured Cabling Solution to support Voice, Data and/or Video applications as described in this document.
Provide	-	Supply and install.
Workstation	-	Systems Furniture Workstation, Office, Meeting Room, Boardroom, Classroom, etc. Any Voice or Data cable originating in a Telecom, LAN, Computer Room or Consolidation Point that is not terminated on a patch panel / IDC Block at the other end.

Acronyms and Abbreviations

A	-	Ampere
ac	-	Alternating current
ACR	-	Attenuation to Cross-Talk Ratio
ADC	-	Analog to Digital Converter
ADSL	-	Asymmetric Digital Subscriber Line
A/E	-	Architect or Engineer
AFF	-	Above Finished Floor
AHJ	-	Authority Having Jurisdiction
ALPETH	-	Aluminum Polyethylene

AME	-	Architectural, Mechanical, Electrical
AN	-	Access Node
ANSI	-	American National Standards Institute
AP	-	Access Point
ARPAP	-	Resin-coated Aluminum, Polyethylene Aluminum, Polyethylene
ASCII	-	American Standard Code for Information Interchange
ASP	-	Aluminum Steel Polyethylene
ASTM	-	American Society for Testing and Materials
ATD	-	Asynchronous Time Division
ATDM	-	Asynchronous Time Division Multiplexing
ATM	-	Asynchronous Transfer Mode
Attn	-	Attenuation
AV	-	Audiovisual
AWG	-	American Wire Gauge
BAS	-	Building Automation System
BC	-	Bonding Conductor
BCD	-	Backbone Conduit
BCT	-	Bonding Conductor for Telecommunications
BEF	-	Building Entrance Facility
BER	-	Bit Error Rate
BERT	-	Bit Error Rate Test
BFOC	-	Bayonet Fibre Optic Connector
BIC	-	Building Industry Consultant
BICSI®	-	Building Industry Consulting Service International
bit	-	Binary Digit
BOM	-	Bill Of Material
b/s	-	Bit per Second
BWA	-	Broadband Wireless Access
CA	-	Cable
CACSP	-	Coated Aluminum Coated Steel Polyethylene
CAD	-	Computer Aided Design
CATV	-	Community Antenna Television (Cable Television)
CBN	-	Common Bonding Network
CCIA	-	Computer Communications Industry Association
CCN	-	Contemplated Change Notice
CCTV	-	Closed Circuit Television
CD	-	Compact Disc
CD	-	Change Directive (same as Change Notice and Change Order)
CEC	-	Canadian Electrical Code
CEF	-	Cable Entrance Facility
cm	-	Centimetre
CMP	-	Communications Plenum
CMR	-	Communications Riser
CN	-	Change Notice (same as Change Directive and Change Order)
CO	-	Change Order (same as Change Notice and Change Directive)
coax	-	Coaxial Cable
CO-OSP	-	Customer-Owned Outside Equipment
CP	-	Consolidation Point
CPU	-	Central Processing Unit
CPVC	-	Chlorinated Polyvinyl Chloride
CSA	-	Canadian Standards Institute
CSC	-	Construction Specifications Canada

CSI	-	Construction Specifications Institute
CT	-	Cable Tray
Cu	-	Copper
c/w	-	Complete With
dB	-	Decibel
dB/km	-	Decibel per Kilometre
dBm	-	Decibel milliwatt
dBmV	-	Decibel millivolt
demarc	-	Demarcation Point
D-ring	-	Distribution Ring
DSL	-	Digital Subscriber Line
EF	-	Entrance Facility
EIA	-	Electronics Industry Alliance
ELFEXT	-	Equal Level Far-End Crosstalk
e-mail	-	Electronic Mail
EMI	-	Electromagnetic Interference
EMI/RFI	-	Electromagnetic Interference / Radio Frequency Interference
ER	-	Equipment Room
ESD	-	Electrostatic Discharge
e/w	-	Equipped With
FC	-	Fibre Connector
FCC	-	Federal Communications Commission
FDDI	-	Fibre Distributed Data Interface
FEP	-	Fluorinated Ethylene Propylene
FEXT	-	Far-End Crosstalk
FOTP	-	Fibre Optic Test Procedure
ft	-	Foot / Feet
ft2	-	Square Foot / Feet
FTTD	-	Fibre To The Desk
FT 1 / FT 3	-	Fractional T 1 / Fractional T 3
G	-	Giga
Gb	-	Gigabit
GB	-	Gigabyte
Gb/s	-	Gigabit per Second
GC	-	General Contractor
GHz	-	Gigahertz
HC	-	Horizontal Cross-connect
Hz	-	Hertz
I	-	Current
IC	-	Intermediate Closet
IC	-	Intermediate Cross-connect
ID	-	Identification
ID	-	Inside Diameter
IDC	-	Insulation Displacement Connection
IDC	-	Insulation Displacement Connector
IDC	-	Insulation Displacement Contact
IDF	-	Intermediate Distribution Frame
IEEE®	-	Institute of Electrical and Electronics Engineers, Inc. ®
IG	-	Isolated Ground
in	-	Inch
in2	-	Square Inch
I/O	-	Input / Output (Device)

IOR	-	Index Of Refraction
ISDN	-	Integrated Services Digital Network
ISO	-	International Organization for Standardization
IT	-	Information Technology
kb	-	Kilobit
kB	-	Kilobyte
kg	-	Kilogram
km	-	Kilometre
kV	-	Kilovolt
kVA	-	Kilovoltampere
kW	-	Kilowatt
kWh	-	Kilowatt hour
LAN	-	Local Area Network
laser	-	Light Amplification by Stimulated Emission of Radiation
lb	-	Pound
LED	-	Light Emitting Diode
LO	-	Laser Optimized
LSZH	-	Low Smoke Zero Halogen
m	-	Metre
m2	-	Square Metre
mA	-	Milliampere
MAC	-	Move, Add, or Change
MAN	-	Metropolitan Area Network
Mb	-	Megabit
MB	-	Megabyte
Mb/s	-	Megabit per Second
MB/s	-	Megabyte per Second
MC	-	Main Cross-connect
MDF	-	Main Distribution Frame
MGB	-	Main Grounding Busbar
MHz	-	Megahertz
mi	-	Mile
MIMS	-	Mineral Insulated Metal Sheathed
min	-	Minute
mm	-	Millimetre
MM	-	Multimode
MMF	-	Multimode Fibre
Misc	-	Miscellaneous
MPP	-	Modular Patch Panel
ms	-	Millisecond
MSDS	-	Material Safety Data Sheet
MUTO	-	Multi-user Telecommunications Outlet
MUTOA	-	Multi-user Telecommunications Outlet Assembly
mW	-	Milliwatt
MW	-	Megawatt
NBCC	-	National Building Code of Canada
NESC	-	National Electrical Safety Code
NEXT	-	Near-end Crosstalk
NIC	-	Network Interface Card
NIR	-	Near-end crosstalk-to-Insertion loss Ratio
NRCC	-	National Research Council of Canada
OD	-	Outside Diameter

OEM	-	Original Equipment Manufacturer
OF	-	Optical Fibre
OSP	-	Outside Plant
PBX	-	Private Branch Exchange
PDU	-	Power Distribution Unit
PP	-	Patch Panel
PSACR	-	Power Sum Attenuation to Crosstalk Ratio
PSELFEXT	-	Power Sum Equal Level Far-End Crosstalk
PSNEXT	-	Power Sum Near-End Crosstalk
PVC	-	Polyvinyl Chloride
QA	-	Quality Assurance
QC	-	Quality Control
QoS	-	Quality of Service
Qty	-	Quantity
RCDD®	-	Registered Communications Distribution Designer
RF	-	Radio Frequency
RFI	-	Radio Frequency Interference
RJ	-	Registered Jack
rms	-	Root Mean Square
RU	-	Rack Unit (1.75″)
RX	-	Receive
RX	-	Receiver
SAN	-	Storage Access Network
SC	-	Single Fibre Coupling Optical Fibre Connector
SCC	-	Standards Council of Canada
SCS	-	Structured Cabling System
ScTP	-	Screened Twisted Pair
SFTP	-	Screened Foiled Twisted Pair
SI	-	International System of Units (Le Système International d'Unités)
SLA	-	Service level Agreement
SM	-	Singlemode
SMF	-	Singlemode Fibre
SNMP	-	Simple Network Management Protocol
SNR	-	Signal-to-Noise Ratio
STALPETH	-	Steel Aluminum Polyethylene
STP	-	Shielded Twisted Pair
STP-A	-	Shielded Twisted Pair A
T 1	-	Trunk Level 1
TBB	-	Telecommunications Bonding Backbone
TBBIBC	-	Telecommunications Bonding Backbone Interconnecting Bonding Conductor
TC	-	Telecommunications Closet
TDD	-	Telecommunications Device for the Deaf
TGB	-	Telecommunications Grounding Busbar
TGR	-	Telecommunications Grounding Rod
TIA	-	Telecommunications Industry Association
TMGB	-	Telecommunications Main Grounding Busbar
TP	-	Twisted Pair
TR	-	Telecommunications Room
TS	-	Technical Standard
TSB	-	Telecommunications Systems Bulletin (formerly Technical Systems Bulletin)

TTY	-	Teletypewriter / Text Telephone
TV	-	Television
TX	-	Transmit
TX	-	Transmitter
U	-	(When preceded by a numeral) Rack Unit (equal to 1.75")
UD	-	Underfloor Duct
UL®	-	Underwriters Laboratories Inc.®
ULC	-	Underwriters Laboratories of Canada
UPC	-	Universal Product Code
UPS	-	Uninterruptible Power Supply
UTP	-	Unshielded Twisted Pair
V	-	Volt
VA	-	Volt-Ampere
VCSEL	-	Vertical Cavity Surface Emitting Laser
VLAN	-	Virtual Local Area Network
VoIP	-	Voice over Internet Protocol
VPN	-	Virtual Private Network
W	-	Watt
WAN	-	Wide Area Network
WAP	-	Wireless Application Protocol
WiFi	-	Wireless Fidelity
Wi-Fi	-	Wireless Fidelity
WLAN	-	Wireless Local Area Network
WMAN	-	Wireless Metropolitan Area Network
WS	-	Workstation
WWAN	-	Wireless Wide Area Network
x	-	Mathematical Operation (Multiplication)
X	-	Cross-connect
XC	-	Cross-connect
XLPE	-	Cross-linked Polyethylene
XPE-PVC	-	Expanded Polyethylene Polyvinyl Chloride

1.5 Administrative Requirements

1.5.1 Shop Drawings

.1 Provide 5 copies of manufacturer prepared shop drawings identifying complete technical specifications for each product being supplied as part of the end to end solution including fire stopping, pathways and other miscellaneous products.

.2 Shop drawings shall be stamped and signed "For Review" complete with date submitted.

.3 Manufacturers shop drawings showing various model or styles shall be labelled with identification arrows showing which items are being proposed. Arrows shall be reproducible through standard photocopying.

.4 Shop drawings shall be approved by the client's RCDD prior to starting installation and the Communications Contractor will be responsible for the cost of replacing of all installed product not approved.

.5 Approved shop drawings shall be included in the Project Manual for this project.

1.5.2 Project Documentation

.1 The Communications Contractor shall provide hand marked record drawings showing all cable numbers on floor plans, rack elevations, backboard layouts and cable routing at the completion of the project. Drawings shall include all architectural and project changes. Provide within ten (10) days of completion of the project two (2) hard copies for use by the communications consultant.

.2 The Communications Contractor RCDD shall prepare the final record drawings and coordination of record documentation. The Communications Contractor RCDD will coordinate and provide final delivery of record documentation to the Client.

.3 The Communications Contractor shall prepare a complete certification test report for each cable identifying a successful test on each cable, complete with the technician's signature and date. Test reports shall be full test reports in the testing software format and with one page per cable. Provide 1 soft copy on CD of test results with appropriate viewing software to the Client within ten (10) days of project completion for approval. Marginal pass results are not acceptable.

.4 At the completion of the project the Communications Contractor shall be prepared to submit 3 copies of a project manual in a 3 ring binder to the Client for review and approval. This project manual shall include:

a. Contractor's Name, contact information and lead installer/foreman's contact info
b. Letter detailing, total cost of project (including changes), square footage, number of cable drops, project highlights, Architect/Interior Designer and Client name and contact information.
c. Final bill of materials
d. Approved shop drawings
e. WIMS data sheets on all applicable materials including fire stopping
f. Maintenance and/or operation manuals for all equipment
g. Test results
h. Record drawings
i. Letter of 1 year installation warranty
j. Manufacturer's 20 year Certification and warranty documentation

.5 Final documentation not provided within 30 days of project completion and with reasonable notification may result in the commissioning of another agent to prepare such documents. Costs for this work will be deducted from all Holdback amounts available to the Communications Contractor.

.6 Response time for warranty items is to be 24 hours. The Communications Contractor may be required to repair deficient cabling system components outside regular working hours.

1.5.3 Site Documentation

.1 The Communications Contractor shall be responsible for maintaining a complete set of record marked up drawings on site for Client review at all times. Drawings shall be up to date with all architectural and project changes.

.2 Maintain a log of date, time and reason for any delays in performing the installation. Details shall include names, conditions and specific reason for delay.

1.6 Work Results

1.6.1 In order for the University to cost effectively deploy a communications infrastructure in new buildings; a program of Co-Location has been instituted to accommodate the networks of all departments. The Telecommunication Rooms are designed such that only CCS approved staff can enter these areas. For further information, please refer to, Telecommunications Infrastructure Co-Location at Ryerson University**,** available from the CCS representative

1.6.2 An important part of the telecommunications infrastructure in the buildings is the secure communications rooms. These rooms must be secure, properly powered, environmentally conditioned and cleaned before contractors and CCS personnel can work in them. In particular, all penetrations shall be completed and sealed (e.g. capped) before CCS work can proceed in these environments.

1.6.3 Telecommunications Design Requirements

.1 All telecommunications products required for any project will meet the specifications included in all sections of this document and project specific specifications provided by the Client for each project.

1.6.4 Horizontal Cabling Requirements

.1 Quantity of horizontal copper cabling required per workstation varies depending on the type of facility as noted in the table below. Cabling may be Category 5e, Category 6 or Category 6A depending on the facility.

.2 All cables will be considered data as voice backbone will be represented on a patch panel. Green 7 foot patch cords are required for voice patching.

Facility	Quantity
Individual Offices	Two data per office
Shared Office	Two data per occupant
General Classroom	Four data per room
PT Classroom	Determined on room by room basis
Computer Lab	Determined on room by room basis

1.6.5 Voice Tie Cable Requirements

.1 Copper voice tie cables shall be required within each Telecommunications Room from the Rack(s) to the backboard.

.2 All tie cables shall be 100 pair (4 x 25 pair) UTP copper Category 3.

.3 Each 100 pair (4 x 25 pair) UTP copper Category 3 tie cable shall be terminated on one (1) copper patch panel at one (1) pairs per jack leaving the last pair of each 25 pair cable unused.

.4 Number of patch panels and the number of 100 pair Category 3 tie cables shall meet the required voice lines for the space being serviced.

1.6.6 Backbone Cabling Requirements

.1 Provide OS-2 single-mode fiber from Building ER to each Building TR in a dual redundant pathway. Sizing shall be determined by CCS. Fiber cable shall meet or exceed the mechanical and transmission performance specifications in ANSI/TIA/EIA-568-C.3.

.2 Provide vertical/horizontal copper backbone cabling consisting of unshielded twisted pair Category 3 copper cables from the Main cross-connect field in ER to each TR

rooms cross-connect field. Sizing shall be determined by CCS. Copper cable shall meet or exceed the mechanical and transmission performance specifications in ANSI/TIA/EIA-568-C.2.

.3 Copper and fiber cable shall be provided as required for the application for which it is intended. Ratings required are plenum for indoor, indoor/outdoor and outdoor only)

.4 All copper backbone cables shall have a minimum 10ft service loop, and all fiber backbone cables shall have a minimum 20ft service loop.

.5 Multi-mode fiber optic cabling is no longer installed for network use at Ryerson University except in the Data Centre.

1.6.7 Architectural / Interior Design Requirements

.1 Telecommunications Rooms (TR) are special purpose rooms that house telecommunications equipment. These rooms have stringent requirements due to the nature, size, expense and complexity of the equipment housed therein. TRs will vary in size depending on the size of a building, number of floors, occupancy, applications and telecommunications services required. The future needs of the building and the end users must be considered in the design and sizing of the TRs.

.2 All buildings shall have an Equipment Room (ER) generally located in the lower level. The ER serves as a secure space and maintains suitable operating environments for large communications systems and/or equipment. ERs are generally considered to serve a building, where TRs generally serves only one or multiple floors of a building. ERs are the distribution point for voice and data to the rest of the building and shall be secure to protect the integrity of the systems within. Grounding and bonding shall be provided in the ER in strict accordance with the EIA/TIA 607 standard and extended to all TRs as described in the building.

.3 The voice distribution shall be mounted on the walls of the ER, in accordance with the EIA/TIA 569 standard. The ER also serves as the fiber distribution point for the building and will house the building-level data switch. In medium and large buildings, no other equipment shall be housed in the ER. In small buildings, where the ER is the only communications room, departmental switches may be co-located along with those from other departments, including CCS.

.4 The minimum size for an ER is ten (10) feet by twelve (12) feet. Racks installed in the ER will be used for the fibre distribution panels, building data switch(s) and associated UPS. The ER shall also accommodate the telephone distribution system; these are to be wall-mounted. In addition, the ER may also contain a local PBX and the associated UPS.

.5 The actual size of the Telecommunication Rooms will be determined during the design phase of the project when more information, pertinent to the size and application of the building is available. CCS will determine the appropriate size of the TR.

1.6.8 The size of the Telecommunications Room depends on the function and total area served. Telecommunication Rooms shall have a minimum inside dimension of 10ft. x 10ft. If these rooms require additional square footage based on additional requirements, the size shall be determined on a case-by-case basis.

Equipment Outlets Served	Minimum Room Size
Small Room (limited equipment outlets)	1.3 m (4.5 ft) X 1.3 m (4.5 ft)
Shallow Closet (limited equipment outlets)	0.6 m (2 ft) X 2.6 m (8.5 ft)
Up to 100	3 m (10 ft) X 3 m (10 ft)
101 to 200	3 m (10 ft) X 4.5 m (15 ft)
201 to 800	6 m (20 ft) X 6 m (20 ft)
801 to 1600	6 m (20 ft) X 12 m (40 ft)
1601 to 2400	9 m (30 ft) X 12 m (40 ft)

.1 All four (4) walls shall be floor to deck and have a 2-hour fire rating.

.2 One (1) wall (or part of) shall be covered with two 4'x8' x ¾" exterior grade AC void free plywood. Plywood shall be fire-rated to meet applicable codes. To reduce warping, fire-rated plywood shall be kiln-dried to maximum moisture content of 15%. Plywood shall be painted on all 6 sides with a white fire retardant paint (fire rating stamp shall not be painted over). Mount plywood 4" above the finished floor with the top of plywood ending at 8' 4" above finished floor. Plywood shall be mounted on studs to offset plywood no less than 5.5" from wall.

.3 Telecommunication Rooms shall not have a false ceiling to permit maximum use of cable pathways both vertically and horizontally. In such cases where fire-proofing may be sprayed onto the exposed ceiling, the fire-proofing shall be treated to mitigate airborne dust.

.4 The height between the finished floor and the lowest point of the ceiling should be a minimum of 3 m (10 ft). Suspended ceilings are not recommended in Telecommunications Rooms; in some instances due to the site conditions the use of a T-bar ceiling tile and grid system will be acceptable, when approved by CCS. The recommended minimum ceiling height is 8' 6". Preferred ceiling height is 9' 6" to allow the mounting of cable tray at 8' 4" with adequate access to tray from above.

.5 Floors, walls, and ceiling shall be treated to eliminate dust. Finishes shall be light in color to enhance room lighting. Floor covering shall be a vinyl anti-static material. Color shall be determined on a case-by-case basis.

.6 Doors shall be a minimum of 0.9 m (36 in) wide and 2 m (80 in) high, without door sill, hinged to open outward (code permitting) or slide side-to-side, or be removable. Consideration should be given to using double doors with a removable center-post.

.7 The door(s) shall be fitted with a lock which is keyed for a MEDECO key CCS will provide the key number to be used. In the event that the TRs are used in a co-location scenario, the doors are to also have card readers in addition to the locks. In situations where the room is split into a collocation scenario the cage door is to have a padlock with the same CCS Medeco key.

.8 As part of the construction phase all CCS TR's must be roughed in for card access, this includes the card reader box, pizo mount, door contacts etc. All this information must be shown on the electrical drawings and covered by the electrical bid. CCS will determine when the readers will be installed.

.9 The Telecommunication Rooms shall be located on floor areas designed with a minimum floor loading of 4.8 kPa (50lbf/ft2). The project structural engineer shall verify that concentrations of proposed equipment do not exceed the floor-loading limit.

.10 Floors shall be VCT (Variegated Composite Tile) or sealed concrete. Carpet is not allowed.

.11 Signage, if used, should be developed within the security plan of the building. Room # signage shall be preapproved by Ryerson University.

.12 The Telecommunication Rooms shall be protected from contaminants and pollutants that could affect operation and material integrity of the installed equipment.

.13 The Telecommunication Rooms shall accommodate the applicable seismic zone requirements.

.14 Telecommunications Room Location

a. In any building, the size of the Telecommunication Rooms shall be determined in consultation with CCS. In medium to large buildings the ER is typically located on the lower ground or basement floor, where telecommunications enters the building, in an area central to the locations of the TRs. However, in small buildings, the ER may be located in the centre of the building, and on the middle floor if multiple floors exist. In buildings susceptible to flooding, the ER and all TRs should be located on the first floor, and not in the basement. Note that if data is served out of the ER.
b. There must be at least one Equipment Room in every building with a minimum of one Telecommunications Room on each floor. Telecommunication Rooms must be designed so that no cable originating in a Telecommunications Room and terminating at a workstation exceeds 295ft (90m). If meeting this requirement is not possible, more than one telecommunication room is required. The 295ft cable length includes cable lengths through vertical walls, conduits, cable tray and other pathways between the patch panels in the Telecommunication Room to the telecommunications outlet). Cable shall be installed along building lines and this distance must be used in calculations. Patch cords at the work area and telecom room shall be included for a 100m end to end channel.
c. The telecommunications rooms should be vertically aligned or stacked in multi-story buildings. They must be accessible from the building exterior, public hallway or other common areas.
d. Telecommunications Rooms must be dedicated to telecommunications. They must not contain electrical and mechanical equipment, fire alarm panels, slop sink for janitors, etc. Equipment not related to the Telecommunication Room such as piping, duct work, building column and distribution of building power must not be located in or pass through the Telecommunication Room.
e. Telecommunications Rooms shall be located a minimum of 4 meters away from sources of electromagnetic interference and at a distance which will reduce the electrical interference to 3V/M and reduce the magnetic interference at 60Hz to 1A/M. Special attention shall be given to electrical power supply transformers, motors and generators, x-ray equipment, photocopy equipment, elevator equipment, microwave oven and induction devices.
f. Access to the Rooms shall be 24 hours-per-day, 365 days-per-year basis (24x7).

1.6.9 Electrical Design Requirements

.1 Lighting shall be a minimum of 500 lux (50 foot candles) measured 1 m (3 ft) above the finished floor, mounted 8′ 5″ minimum above the finished floor. Light fixtures must be independently supported from the building structure. Light fixtures shall not be mounted to, or supported by the cable tray. Lighting fixtures should not be powered from the same electrical distribution panel as the Telecommunication

Room. Dimmer switches shall not be used and emergency lighting and signs should be properly placed such that an absence of primary lighting will not hamper emergency exit.

.2 Each Telecommunication Room shall contain an electrical sub panel for the Telecommunication Room. Telecommunication Rooms shall be fed from the sub panel so that all outlets in all Telecommunication Rooms are on emergency power.

.3 The electrical sub panel shall be fed from the building emergency electrical power system. The panel shall be sized to accommodate the Telecommunication Rooms that will be serviced by it. The panel shall have a laser printed directory to indicate rooms served by bolt on style breakers.

.4 Each Telecommunication Room shall contain two (2) electrical sub panels for the Telecommunication Room. Telecommunication Rooms shall be fed from the sub panel so that half the outlets in all Telecommunication Rooms are on emergency power and the other half on local power.

One electrical sub panel shall be fed from the building emergency electrical power system, the other from local power. The panel shall be sized to accommodate the Telecommunication Rooms that will be serviced by it. The panel shall have a laser printed directory to indicate rooms served by bolt on style breakers.

.5 Telecommunication Rooms shall be equipped with a minimum of two (2) dedicated 208V, 30A circuits for each relay rack or cabinet. Outlets shall be 208V, 30A outlets designed for twist-lock plugs. One (1) NEMA L6-30R and one (1) NEMA L21-30R. Outlets shall be mounted on the cable tray. All outlets shall have a laser printed circuit identifiers affixed to it indicating the panel room number, panel ID and circuit number. Additional outlets may be required on a case-by-case basis. One receptacle will be on emergency power, the other on local power.

.6 Telecommunication Rooms shall be equipped with four (4) convenience outlet placed on each wall of the TR for uses other than network equipment (i.e. power tools, testing equipment). This outlet shall be run from a separate electrical panel. All outlets shall have a laser printed circuit identifiers affixed to it indicating the panel room number, panel ID and circuit number. Additional outlets may be required on a case-by-case basis.

.7 Equipment Rooms shall have a TMGB installed to which all TGBs in Telecommunication Rooms, equipment, conduits, cable shields, cable trays, sleeves, etc. shall be bonded. The TMGB shall be connected to the main electrical service ground of the building. The conductor size shall be based on the distance between the items being bonded and the conductor upstream from it. The TMGB shall also be bonded to building structural steel. All grounding requirements shall meet applicable codes and section 27 05 26 of this specification.

1.6.10 Heating, Ventilation and Air Conditioning (HVAC) Design Requirements

.1 The HVAC shall be available on a 24 hours-per-day, 365 days-per-year basis. A standalone unit should be considered for Telecommunications Rooms.

.2 If a standby power source is available in the building, consideration should be given to also connecting the HVAC system serving the Telecommunications Rooms to the standby supply.

.3 The temperature and humidity shall be controlled to provide continuous operating ranges of 18 °C (64 °F) to 27 °C (81 °F) with maximum relative humidity (RH) of 60%. Minimum dew point: 5.5 ºC (42 ºF). Maximum dew point: 15 ºC (59 ºF). The

ambient temperature and humidity shall be measured at a distance of 1.5 m (5 ft) above the floor level, after the equipment is in operation, at any point along an equipment aisle centerline.

.4 A positive pressure differential with respect to surrounding areas should be provided with a minimum of one air change per hour.

.5 Mechanical Engineer shall acquire equipment list and heat load for each room to determine HVAC requirements. Typically for planning purposes each rack/cabinet dissipates approximately 7.5 KW of heat.

.6 Mechanical vibration coupled to equipment or the cabling infrastructure can lead to service failures over time. A common example of this type of failure would be loosened connections. If there is a potential for vibration within the building that will be conveyed to the Telecommunication Room via the building structure, the project structural engineer should design in safeguards against excessive Telecommunication Room vibration.

.7 Mechanical fixtures (e.g., piping, ductwork, pneumatic tubing electrical conduits) not related to the support of Telecommunication Room shall not be installed in, pass through, under or enter the Telecommunication Room. In addition, the area adjacent to the exterior of the Telecommunication Room walls shall remain clear for cable pathways entering the Telecommunication Room.

1.6.11 Fire Protection Design Requirements

.1 All Telecommunications Rooms shall be designed with pre-action fire suppressions systems (the space remains water free until both heat and smoke detectors are activated). Fire alarms should be installed in accordance with the Design Standards. Portable fire extinguishers should be located in the room as close to the entrance as possible. A minimum of a 2 hour fire rating should be provided with a fire sprinkling system exterior to the room.

.2 Fire Protection of the Telecommunications Rooms, if required, shall be provided as per applicable code. If sprinklers are required within the spaces, the heads shall be provided with wire cages to prevent accidental operation. Drainage troughs shall be placed under the sprinkler pipes to prevent leakage onto the equipment within the room. For some applications, consideration should be given to the installation of alternate fire-suppression systems.

.3 The Telecommunications Rooms shall not be located below water level unless preventive measures against water infiltration are employed. The room shall be free of water or drain pipes not directly required in support of the equipment within the room. A floor drain shall be provided within the room if risk of water ingress exists

1.6.12 Outside Plant Design Requirements

.1 This section provides the necessary guidelines to install service entrances to buildings, and information for the termination of cables entering buildings. All outside plant voice, data, and video cabling and conduit shall be designed and approved by CCS as described in this document.

.2 Prior approval and coordination with CCS is necessary when the situation requires pulling cable through a conduit occupied by other cables. Existing cables are to be disconnected prior to installation of all new cabling if and when approved by CCS. All cables associated with the campus telecommunications network (telephone, data, LAN, WAN, Security, cable television, fibre optics) shall be connected and disconnected by CCS only.

.3 Only those cables specified within this document will be installed in Ryerson facilities. There shall be no cable with voltages higher than 48 volts in communications conduits or ducts.

.4 Damages incurred to any cable are the responsibility of the party involved. All damages shall be reported immediately to CCS.

.5 Service Entrance conduit sizing and quantities between buildings shall be determined by CCS. Minimum requirements are outlined in the following paragraphs.

.6 Each building shall have dual/redundant fiber optic entrance cables. These cables should be located a minimum of 20 metres (66 feet) apart for diversity.

.7 When conduits pass through exterior foundation walls of a facility, the entrance shall be watertight. Wall sleeves at service entrances must be sized to provide a minimum of ½ inch clearance around the conduit to allow for proper sealing of the penetration.

.8 At the University, telecommunications typically enter the building in the Equipment Room (ER); therefore the Building Entrance and the Equipment Room are one and the same.

.9 Two types of conduit are accepted for underground conduit systems.

a. Rigid galvanized steel conduit with threaded fittings – This conduit shall be installed with reinforced concrete casing.
b. Schedule 40 PVC conduit - This conduit shall be installed with reinforced concrete casing.

.10 Direct burial of any conduit will not be permitted unless approved in writing by the CCS representative identified in this document.

.11 Gas pipe and water pipe shall not be used for conduit under any circumstances.

.12 All new buildings will be required to meet the minimum conduit requirements for voice and data, each building shall receive three (3) 4 inch conduits.

a. EIA/TIA 569 shall be strictly observed for the building entrance.
b. Every precaution is to be taken to ensure watertight integrity through the length of the conduits.
c. Each conduit is to be installed with a nylon pull string and tied off in each conduit.
d. Service entrance conduits should enter the ER, assuming the ER has a wall to the outside. If the ER is NOT located at the service entrance, the conduits passing through the building foundation shall terminate inside building no more than 18 inches in length. The conduits with bushings will spill into an open ladder cable tray that will connect to the ER location.
e. Underground conduits entering a building shall be dedicated to telecommunications and no more than 25% full by volume.
f. Copper and fibre cables shall be brought into the building in separate conduits.
g. No more than a total of 180 degrees of bends, using long radius sweeps, shall exist in conduit runs. Absolutely no elbows or LB's are allowed in any conduit route inside or outside plant, junction boxes are not to be used as 90 degree bends.

1.6.13 Cable Pathways Requirements

.1 Conduits and sleeves should extend 4- 6" into the Telecommunications Rooms. If the conduits or sleeves are subject to water intrusion they must drain away from the room and be watertight. All conduits and sleeves must have the ends plugged upon installation to keep debris from entering the conduits and sleeves. Cable tray shall not be run through walls. Conduits and sleeves must have bushings install at all ends and at all pull boxes.

.2 Conduit pathways built for telecommunication cabling have more stringent bending and pull box requirements than electrical cabling and must be adhered to. Install telecommunications conduit runs to achieve the best direct route (usually parallel to building lines) with no bends greater than 90 degrees or an aggregate of bends in excess of 180 degrees between pull points or pull boxes. Contain no continuous section longer than 30.5m (100ft), for runs that total more than 30.5m (100ft) in length, pull boxes should be inserted so that no segment between boxes exceed 30.5m (100ft) and a total conduit run should be kept to 45.8m (150ft) or less (including the sections through the poll boxes).

.3 A minimum 4” deep x 12” wide Cable tray shall be installed for the distribution of cabling inside the room. The rack shall be mounted 7'0" from finished floor to the bottom of the tray. There shall be no other equipment, lights, conduits, fixtures etc. attached to, mounted on, running through or on the cable tray except those needed to support the cable tray systems. Cable tray may not be run through walls.

.4 The quantity of horizontal sleeves installed in each Telecommunications Room for horizontal cabling shall be three (3) 4" sleeves. The sleeves shall be a minimum 8'-0" AFF to the bottom of the sleeves. Sleeves that are installed above 9'-0" AFF must have vertical cable tray installed from the bottom of the sleeve to the top of the cable tray for lashing of cables in the vertical run.

.5 Sleeves shall have an insulated bushing installed prior to the installation of telecommunications cabling. Sleeves must have the ends plugged upon installation to keep debris from entering them. Sleeves used at wall transition points for cable tray systems shall be 4". Quantity of sleeves shall be equal to the capacity of the cable tray. Sleeves for distribution of horizontal cable in renovated areas not having conduits to the cable tray shall be sized so that when all cables have been installed at the completion of the project, the sleeve will be at 50% capacity of the sleeves maximum fill (maximum fill is based on using a UL listed fire rated assembly [40%]). All sleeves shall have a minimum 2-hour UL listed fire rated assembly installed regardless if the wall or floor is not fire rated or has a rating of lesser value. If the wall or floor has a fire rating greater than 2 hours the sleeve shall have an equal rating in all cases. The minimum sleeve size installed for any penetration shall be 4".

.6 In a multi-store building where Telecommunications Rooms are stacked to form a riser, a minimum of four (4) -4” sleeves shall be installed between the stacked Telecommunications Rooms. Cable tray can be used for Inter-building Backbone distribution only with the use of properly sized innerduct or by the installation of a physical separation for the protection of the Backbone cables from general cable installation.

.7 If the Telecommunications Rooms are not vertically stacked, backbone pathways in the form of four (4)-4" conduits shall be installed between the Telecommunications Rooms. All conduits and innerducts are to be threaded with a pull rope with footage markers.

1.7 Quality Assurance

1.7.1 The Communications Contractor shall install all equipment and material in accordance with the standards aforementioned in this section.

1.7.2 Quality and workmanship shall be at the highest of professional tradesman levels to be accepted for completion. The Communications Consultant shall have the sole right to reject any work not in accordance with industry standards.

1.7.3 All work shall also be performed in accordance with the latest BICSI installation standards and best practices.

1.7.4 Communications Contractors shall provide installers trained in all applicable codes, standards, regulations and installation standards as well as have structured cabling industry certification, such as BICSI or NCS.

1.7.5 All installers shall have successfully completed the approved manufacturer's installation training program .The Client reserves the right to receive written proof of such training at any time during the project. If such proof is not provided the Communications Contractor will remove the installer from the site immediately and replace the installer within 24 hours.

1.7.6 The maximum horizontal run length shall not exceed 90-meters. If the 90 meter constraint cannot be met, the Communications Contractor shall notify the CCS immediately (prior to installation).

Part 2 Product

2.1 General

2.1.1 All equipment and products supplied shall be new and free of all manufacturer defects and delivery or installation damage.

2.1.2 All equipment and products supplied shall meet all manufacturer listed characteristics as identified in the latest manufacturer catalogue.

2.1.3 All products shall meet all applicable codes and standards and bare the UL/ULC label, be CSA approved and meet FCC/CRTC Regulations.

2.1.4 All products shall be provided in accordance with local, provincial and national fire ratings for the installation on this project.

2.1.5 The only acceptable Manufacturers for installed end to end structured cabling systems will be the following, unless otherwise specified in this document.

Panduit
Hubbell
Corning (fiber systems)

2.2 Metric Conversions

2.2.1 Conform to Canadian Metric Practice Guide CSA-CAN3-2234-1-89.

Part 3 Execution

3.1 General

3.1.1 The Communications Contractor shall supply all materials, labour, tools and equipment to provide a complete warranted installation as outlined in the contract documents and suitable to the approval of the Client, Communications Consultant and inspection bodies having jurisdiction.

3.1.2 The Communications Contractor shall be responsible for installing and providing pulling strings, ropes and fishing walls wherever conduit is not installed or conduit is installed without these provisions.

3.1.3 Provide continuity of all existing services while completing the specified installation. Losses due to interruption of services will be the responsibility of the Communications Contractor.

3.1.4 Arrange for all shutdowns (1) week prior in writing with the Project Manager and those in control of services shall be disrupted. All overtime costs, fees, security and other requirements shall be the full responsibility of the Communications Contractor.

3.1.5 Should services be interrupted accidentally the Communications Contractor shall provide material and labour to re-establish services immediately and shall continue without stoppage until all services have been re-established. All material and labour costs including overtime shall be borne solely by the Communications Contractor. Any material and/or labour costs including overtime associated with other trades and/or the General Contractor to assist in any way the Communications Contractor in re-establishing services shall be borne solely by the Communications Contractor.

3.2 Labour

3.2.1 The Communications Contractor shall provide only skilled, trained tradesmen experienced in the installation of a certified installation. Sub-contractors, if used, must be approved by the Client before the commencement of the project.

3.3 Installation

3.3.1 Adequate space and provisions shall be left for removal of components and servicing of equipment, with minimum inconvenience to the operation of systems.

3.3.2 Communications Cabling shall not touch or be supported from piping, ductwork, conduits, ceiling supports or any other service / equipment. Communications Cabling shall be supported by approved j-hooks, cable slings, ladder / basket tray and/or conduit as outlined in this document.

3.4 Coordination

3.4.1 Work causing noise, dust and/or odour shall be performed during evenings and/or weekends to prevent disturbance to the operation of the Client's or surrounding businesses. Work shall be performed at agreed times and in coordination with each party. All damages caused for work performed not in compliance with this item shall be the responsibility of the Communications Contractor.

3.4.2 Communications Contractor shall coordinate with Ryerson University to ensure the protection of the active LAN Hardware from dust and debris.

3.5 Site Conditions

3.5.1 The Communications Contractor is responsible for maintaining a clean work environment and is responsible for the removal of all debris on a daily basis. Debris and removed materials shall be disposed of in conformance with all local by laws and regulations. Failing to comply and after reasonable time and written notice the General Contractor reserves the right to hire cleaners to complete the cleaning and back charge the Communications Contractor.

3.5.2 The Communications Contractor shall be responsible for the removal and reinstallation of all floor or ceiling tiles, hatch ways or access panels. All items shall be removed and replaced on a daily basis and left in the original condition. Special caution shall be taken to not break, chip or discolour with dirt or finger prints any such items. The Communications Contractor will be fully responsible for repair or replacement of all damaged pieces at the discretion of the Project Manager or Client.

3.5.3 All materials and installation throughout the project will remain the responsibility of the Communications Contractor until final completion for the project is accepted by the Client. Damages to any item installed shall be replaced or repaired by the Communications Contractor to provide a complete final installation at no additional cost to the Client.

3.6 Safety

3.6.1 The Communications Contractor shall adhere to all safety laws, rules and regulations issued by the authorities having jurisdiction, General Contractor, Project Manager and the Client.

3.6.2 At all times maintain clear fire exits, emergency routes and access to emergency equipment including fire hose cabinets, fire extinguishers and stand pipe connections.

3.6.3 Smoking and combustion of any materials is strictly prohibited on all sites.

3.6.4 Provide protection as required by the authorities having jurisdiction to all employees for work performed in typically inaccessible or concealed spaces.

3.7 Site Adjustments

3.7.1 Locations or all equipment, outlets or devices prior to installation may be revised to within (3) meters without any additional cost or change request.

3.7.2 Portions of the project may be at any time identified in writing to be "On Hold". Work in these areas shall not be started, continued or completed until further direction is received. No additional cost shall be accepted by the Client for areas put on hold.

3.8 Substitutions

3.8.1 Substitution of any product shall be prior approved in writing by only Ryerson CCS and the Communications Consultant.

3.8.2 The procedure for substitution approval will include the written submission by the Communications Contractor including the following:

.1 Original specified product

.2 Proposed product being substituted

.3 Reason for substitution

.4 Shop drawings indicating all technical specifications

.5 Financial advantage

.6 Schedule delivery date

.7 Written approval from certifying system manufacturer

3.8.3 Based on the review of the information requested above, the Client and/or Communications Consultant reserve the right to reject any proposed substitution without delay or cost to the project or the Client.

3.9 Material Handling

3.9.1 The Communications Contractor is responsible for the delivery of all materials to site and transportation to the work place in accordance with all safety regulations and procedures.

3.9.2 Make arrangements and schedule all hoisting with Building Management and the General Contractor.

3.9.3 Provide and be responsible for lockable storage for all tools and material required to complete the installation through the duration of the project. Once the project is complete remove all tools and excess materials within 2 business days.

3.9.4 The Client and its representatives shall in no way be held liable for any missing material, equipment or tools required to complete the installation.

3.10 Cutting, Patching and Repairing

3.10.1 It is the responsibility of the Communications Contractor to perform all cutting, patching and repair related to the Communications Cabling work including any penetrations through walls or floors.

3.11 Firestopping

3.11.1 The Communications Contractor is required to properly fire-stop any penetrations through fire barriers utilized for the placement of telecom cabling. Provide fire resistant intumescent materials to restore fire ratings to wall, floor, or ceiling penetrations according to local, provincial and national codes.

3.11.2 Fire stop systems shall meet the requirements of ULC Standard CAN/ULC-S115.

3.12 Hoisting Facilities

3.12.1 This Division shall provide its own hoisting facilities regardless of height required to perform work.

3.12.2 Hoisting facilities may be provided by the General Contractor, although the General Contractor may at its own discretion not allow the Communications Contractor to make use of such.

3.13 Sealing Concrete

3.13.1 The General Contractor is responsible for sealing the concrete floor.

3.13.2 The following procedure should be followed:

The procedure for the application of the Statguard polish is as follows;

1. Vacuum floor surface (using HEPA filtered vacuum)

2. Clean floor with Staticide anti static solution, rinse off (if proceeding to step 3*).

3. Spray Muriatic Acid solution (4:1 dilution) onto wet floor surface. Leave for 2-4 minutes, keeping damp.

4. Scrub surface with blue pad using rotary buffing machine.
5. Immediately rinse/neutralize floor with Alkaline cleaner (if using acid solution).
6. Allow to dry 24 hours
7. Apply 1 coat concrete sealer and 2 coats Statguard polish
8. Allow to dry min 6 hours.

*rinsing is not necessary if going to step 4.

This would be the procedure for an un-etched concrete floor.

On a regular etched or vinyl surface the procedure does not include Step 3 or require the use of an Alkaline cleaner.

NOTE: THE ABOVE PROCEDURE CONTAINS HAZARDOUS CHEMICALS. THE CONTRACTOR SHALL FOLLOW ALL RYERSON UNIVERSITY HEALTH AND SAFETY PROCEDURES AS WELL AS COMPLY WITH THE OCCUPATIONAL HEALTH AND SAFETY ACT FOR ONTARIO.

End of Section 27 05 00