



Government of Ontario IT Standard (GO-ITS)

GO-ITS Number 80.0

**Cabling and Wiring for Voice/Data Communications
in Government Buildings**

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Prepared for the Information Technology Standards Council (ITSC) under the delegated authority of the Management Board of Cabinet

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1. Foreword

Government of Ontario Information Technology Standards (GO-ITS) are the official publications on the guidelines, preferred practices, standards and technical reports adopted by the Information Technology Standards Council (ITSC) under delegated authority of the Management Board of Cabinet (MBC). These publications support the responsibilities of the Ministry of Government Services (MGS) for coordinating standardization of Information & Information Technology (I&IT) in the Government of Ontario. Publications that set new or revised standards provide enterprise architecture guidance, policy guidance and administrative information for their implementation. In particular, GO-ITS describe where the application of a standard is mandatory and specify any qualifications governing the implementation of standards.

2. Introduction

Amendment Notice (August 2011)

The reader should note that this version of the Standard has been modified over the previous release of January 2001 by the insertion of changes which are approved by the relevant governance bodies in the OPS prior to public release. These changes reflect updates, and amendments to existing national and international standards incorporated into GO-ITS 80 as well as new standards ratified since 2001.

2.1. Background & Purpose

This standard defines the requirements for the cabling and wiring of data and voice communications in Government of Ontario buildings.

It defines the design and minimum technical and quality requirements for the wiring of voice and data communications in all buildings that are managed by, or on behalf of, the Government of Ontario for the provision of government services by its Clusters and/or Ministries and all former Schedule I and IV provincial government agencies under their present classification (Advisory, Regulatory, Adjudicative, Operational Service, Operational Enterprise, Trust or Crown Foundation).

This GO-ITS defines specific categories of cabling, components, transmission performance, system models and measurement procedures needed for verification of cabling performance which are to be used at a minimum for any new or major retrofit wiring of data and voice communications in existing Government of Ontario buildings. These requirements are defined in the following core cabling and wiring standards;

1. ANSI/EIA/TIA-568-C.0-2009 "Generic Telecommunications Cabling for Customers Premises";
2. ANSI/EIA/TIA-568-C.1-2009 "Commercial Building Telecommunications Cabling Standard";
3. ANSI/EIA/TIA-568-C.2-2009 "Balanced Twisted-Pair & Cabling Components Standard";
4. ANSI/EIA/TIA-568-C.3-2009 "Optical Fiber Cabling Component Standard"

In addition, coverage of the GO-ITS 80.0 standard has been broadened to reference new developments and updates in cabling plant such as Power Over Ethernet (PoE) data center specific standards, cabling for wireless access points and the administration standard for cabling plant management.

This GO-ITS:

1. Includes data centers that are managed by or on behalf of the Government of Ontario. The purpose of inclusion is to provide requirements and guidelines for the design and installation of a data center or computer room. These requirements and guidance are to be found in ANSI/EIA/TIA-942-2 "Telecommunications Infrastructure Standard for Data Centers".
2. Includes the cabling of buildings for wireless access points. The purpose of inclusion is to provide requirements and guidelines on the installation of a customer premises cabling system infrastructure for an array of coverage areas that form a wireless network grid within a building. These requirements and guidance are to be found in CAN/CSA-ISO/IEC TR 24704:06 "Customer Premises Cabling for Wireless Access Points" and TIA TSB-162 "Telecommunications Cabling Guidelines for Wireless Access Points".
3. Specifies adherence to the IEEE 802.3at standard for the implementation of Power Over Ethernet within the cabling plant owned by, or managed on behalf of, the Government of Ontario. The relevant standard is IEEE 802.3at "Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications - Data Terminal Equipment (DTE) Power Via Media Dependent Interface (MDI)".

4. Specifies a uniform administration approach to the management of a telecommunications cabling system as found in ANSI/EIA/TIA-606-A "Administration Standard for Commercial Telecommunications Infrastructure".

This GO-ITS applies only to all new or major retrofit wiring of data and voice communications in existing Government of Ontario buildings.

The objectives of the standard are to:

1. Provide safe, reliable, uniform and up-to-date facilities for the convenient connection of telephones, computers, computer terminals and other communications related technologies utilizing cabling and wiring in government offices.
2. Achieve significant cost-savings in the rearrangement of government offices and the relocation of government services and personnel. by uniform and flexibly arranged communications connections
3. Increase the value of the investment in the cabling infrastructure by reducing the labour expense of maintaining the system, extending the useful life of the system and providing effective service to users.

2.2. Scope

2.2.1. In Scope

- Horizontal & Vertical (Backbone) Structured Cabling Platforms
- Data Centre Structured Cabling Platforms
- In-building facilities including:
 - Main Telecommunications Room
 - Telecommunications Rooms
 - Workstations

2.2.2. Out of Scope

- Hydro and Electrical Cabling

2.3. Applicability Statements

2.3.1. Organization

Government of Ontario IT Standards and Enterprise Solutions and Services apply (are mandatory) for use by all ministries/clusters and to all former Schedule I and IV provincial government agencies under their present classification (Advisory, Regulatory, Adjudicative, Operational Service, Operational Enterprise, Trust or Crown Foundation) according to the current agency classification system.

Additionally, this applies to any other new or existing agencies designated by Management Board of Cabinet as being subject to such publications, i.e. the GO-ITS publications and enterprise solutions and services - and particularly applies to Advisory, Regulatory, and Adjudicative Agencies (see also procurement link, OPS paragraph). Further included is any agency which, under the terms of its Memorandum of Understanding with its responsible Minister, is required to satisfy the mandatory requirements set out in any of the Management Board of Cabinet Directives (cf. Operational Service, Operational Enterprise, Trust, or Crown Foundation Agencies).

As new GO-IT standards are approved, they are deemed mandatory on a go-forward basis (Go-forward basis means at the next available project development or procurement opportunity).

When implementing or adopting any Government of Ontario IT standards or IT standards updates, ministries and I&IT Cluster must follow their organization's pre-approved policies and practices for ensuring that adequate change control, change management and risk mitigation mechanisms are in place and employed.

For the purposes of this document, any reference to ministries or the Government includes applicable agencies.

2.3.2. Codes, Standards & Regulations

All work must conform to industry accepted practices, manufacturers' component installation guidelines, the Ontario building code, the Canadian Electrical Code, and all applicable standards. The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

2.4. Requirements Levels

Within this document, certain wording conventions are followed. There are precise requirements and obligations associated with the following terms:

Must	This word, or the terms "REQUIRED" or "SHALL", means that the statement is an absolute requirement.
Should	This word, or the adjective "RECOMMENDED", means that there may exist valid reasons in particular circumstances to ignore the recommendation, but the full implications (e.g., business functionality, security, cost) must be understood and carefully weighed before

2.5. Contact Information

2.5.1. Roles and Responsibilities

Accountable Role Definition

The individual ultimately accountable for the process of developing this standard. There must be exactly one accountable role identified. The accountable person also signs off as the initial approver of the proposed standard before it is submitted for formal approval to ITSC and ARB. (Note: in the OPS this role is at a CIO/Chief or other senior executive level)

Accountable Role:

Title: Director, Telecommunications Services Branch
Ministry/Cluster: Ministry of Government Services
Division: Infrastructure Technology Services

Responsible Role Definition

The organization responsible for the development of this standard. There may be more than one responsible organization identified if it is a partnership/joint effort. (Note: the responsible organization provides the resource(s) to develop the standard)

Responsible Organization:

Ministry/Cluster: Ministry of Government Services
Division: Infrastructure Technology Services
Branch: Telecommunications Services Branch

Support Role Definition

The support role is the resource(s) to whom the responsibility for actually completing the work and developing the standard has been assigned. There may be more than one support role identified. If there is more than one support role identified, the following contact information must be provided for each of them. If there is more than one support role, the first role identified should be that of the editor – the resource responsible for coordinating the overall effort.

Support Role (Editor):

Ministry/Cluster: Ministry of Government Services
Division: Infrastructure Technology Services
Branch: Telecommunications Services Branch
Section: Technical Services

Job Title: Senior Manager, Technical Services
 Name: Michael Hipwell
 Phone: 416-325-1869
 Email: Michael.Hipwell@ontario.ca

The above individual will be contacted by the Standards Section once a year, or as required, to discuss and determine potential changes and/or updates to the standard (including version upgrades and/or whether the standard is still relevant and current).

2nd Support Role (if applicable):

Section: Enterprise Strategic Planning, Design & Services
 Job Title: Senior Manager, Enterprise Planning & Services
 Name: Jackie Jones
 Phone: 416-327-5892
 Email: jackie.jones@ontario.ca

3rd Support Role (if applicable):

Section: Enterprise Strategic Planning, Service & Architecture Section
 Job Title: Technical Architect
 Name: David Lin
 Phone: 416-212-3133
 Email: david.lin@ontario.ca

Consulted

Please indicate who was consulted as part of the development of this standard. Include individuals (by role and organization) and committees, councils and/or working groups.

(Note: consulted means those whose opinions are sought, generally characterized by two-way communications such as workshops):

Organization Consulted (Ministry/Cluster)	Division	Branch	Date
Ministry of Government Services	Infrastructure Technology Services	Enterprise Solutions	March 7, 2011
Ministry of Government Services	Infrastructure Technology Services	ESPDS Branch	February 15, 2011
Ministry of Government Services	Infrastructure Technology Services	Guelph Data Centre Project Team	March 2011
Ministry of Government Services	Infrastructure Technology Services	DCO	March 8, 2011
Ministry of Government Services	Infrastructure Technology Services	Corporate Services	January - June 2011
Ministry of Government Services	Infrastructure Technology Services	Telecommunications Services Branch	January - June 2011
Ministry of Government Services	I&IT Innovation, Controllershship and Strategy	Corporate Architecture Branch	April 2011

Committee/Working Group Consulted	Date
Technology Architecture Domain Working Group	Feb 22, 2011
Security Architecture Domain Working Group	March 8, 2011
ITS Architecture Core Team	March 18, 2011
ITS Senior Management Team (ITS ARB)	April 2011

Informed

Please indicate who was informed during the development of this standard. Include individuals (by role and organization) and committees, councils and/or working groups.

(Note: informed means those who are kept up-to-date on progress, generally characterized by one-way communication such as presentations):

Organization Informed (Ministry/Cluster)	Division	Branch	Date
Ontario Realty Corp.			May 2011

Committee/Working Group Informed	Date
IT Service Management Leads Forum	March 24, 2011
Solutions Delivery Leadership Council	May 26, 2011

2.6. Recommended Versioning and/or Change Management

The original standard, approved June 1995, is version 1.0 of GO-ITS 80.0 Wiring Topology for Government Buildings, Voice and Data Telecommunications. The second version, version 2.0, was completed July 1996 and the third version, version 3.0 was completed January 2001. The current version 4.0 was completed in January 2011.

This standard should be revised every 3 years to ensure its currency or prior to that if required by changes to technology or infrastructure. For instance, new technology such a 10GB Ethernet has appeared over the last five years and requires special cabling specification in both copper and fibre. Revisions to the standard are managed by the technical network services coordinator in consultation with Corporate Strategy, Corporate Architecture and ITS.

Changes (i.e., all revisions, updates, versioning) to the standard require authorization from the “responsible” organization.

Once a determination has been made by the responsible organization to proceed with changes, the I&IT Strategy, Policy and Planning Branch will coordinate and provide assistance with respect to the approval process.

The approval process for changes to standards will be determined based on the degree and impact of the change. The degree and impact of changes fall into one of two categories:

Minor changes - requiring communication to stakeholders. No presentations required. No ITSC or ARB approvals required. Changes are noted in the “Document History” section of the standard;

Major changes - requiring a presentation to ITSC for approval and ARB for approval (Note: ARB reserves the right to delegate their approval to ITSC).

Below are guidelines for differentiating between minor and major changes:

Major:

- represents a major version change to one or more specifications
- impacts procurement
- requires configuration changes to current solutions
- impacts other standards
- responds to legislative, policy or procurement changes

Minor:

- represents incremental version changes to one or more specifications
- does not impact procurement (other than informational)
- does not require configuration changes to current solutions
- does not impact other standards
- is not related to legislative, policy, or procurement changes

2.7. Publication Details

All approved Government of Ontario IT Standards (GO-ITS) are published on the ITSC Intranet web site. Please indicate with a checkmark below if this standard is also to be published on the public, GO-ITS Internet Site.

Standard to be published on both the OPS Intranet and the GO-ITS Internet web site (available to the public, vendors etc.)	<input checked="" type="checkbox"/>
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**3. Compliance Requirements**

As new GO-IT standards are approved, they are deemed mandatory on a go-forward basis (Go-forward basis means at the next available project development or procurement opportunity).

When implementing or adopting any Government of Ontario IT standards or IT standards updates, ministries and I&IT Cluster must follow their organization's pre-approved policies and practices for ensuring that adequate change control, change management and risk mitigation mechanisms are in place and employed.

4. Technical Specifications**4.1. General**

The contractor must provide a complete and operating Structured Cabling Platform to support existing and future communications systems in Government facilities. This includes all horizontal cabling for Voice/Data applications as well as backbone (if required). Active equipment and accessories are NOT included in the scope of work.

The Horizontal Structured Cabling Platform that is installed must meet or exceed the Channel requirements for Voice/Data transmissions as defined by ANSI/EIA/TIA-568-C.2.

Any Structured Cabling Platform installed in a Data Centre must follow the mandatory requirements, guidelines and best practices for data centre cabling systems, pathways and design considerations found in ANSI/EIA/TIA-942-2 "Telecommunications Infrastructure Standard for Data Centers - Addendum 2- Additional Media and Guidelines for Data Center". Category 6A (500 Mhz) cabling must be used as the minimum rated twisted pair cable.

Recognized cables, associated connecting hardware, jumpers, patch cords, equipment cords and zone area cords shall meet all applicable requirements specified in ANSI/EIA/TIA-568-C.2 and ANSI/EIA/TIA-568-C.3.

The recognized media are:

- 100 ohm twisted-pair cable (ANSI/EIA/TIA-568-C.2), Category 6 (minimum) & Category 6A (recommended)
- Multimode optical fibre cable, either OM1 or OM2 (ANSI/EIA/TIA-568-C.3). OM3 (laser optimized) is recommended (ANSI/EIA/TIA-568-C.3);
- Single-mode optical fibre cable (ANSI/EIA/TIA-568-C.3)

Any Structured Cabling installation must be planned to enable the deployment of a wireless infrastructure as per the guidance supplied in CAN/CSA-ISO/IEC TR 24704:06 "Customer Premises Cabling for Wireless Access Points" and TIA TSB-162 "Telecommunications Cabling Guidelines for Wireless Access Points".

Cabling plant that supplies Power over Ethernet (PoE) must be wired as per the guidance supplied in IEEE standard 802.3at-2009 "Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications - Data Terminal Equipment (DTE) Power Via Media Dependent Interface (MDI)".

4.1.1. Telecommunications Rooms

Telecommunications Rooms provide many different functions for the cabling system and are treated as a distinct sub-system within a hierarchical cabling system. Standards coverage of this area of a structured cabling system is provided by ANSI/EIA/TIA-568-C.1 (Commercial Building Telecommunications Standard).

Telecommunications Rooms must be designed and commissioned according to the requirements of ANSI/EIA/TIA-569-B. Additional design considerations for grounding and bonding requirements in telecommunications and equipment rooms that must be followed are found in ANSI-J-STD-A-2002.

In the case of data centre installs, the requirements listed in ANSI/EIA/TIA-942-2 must be followed. Section 5 (Data Center Telecommunications Spaces and Related Topologies) provides data centre specific guidance for Telecommunications Rooms in regards to design, HVAC and electric power requirements.

4.1.2. Documentation

Documentation related to the installation, maintenance and disposal of cabling plant must be created and maintained by the parties responsible for installing and maintaining the cabling infrastructure on behalf of the Government of Ontario. This administration of the cabling plant is governed by the mandatory use of the standard TIA-606-A "Update to Administration for the Telecommunications Infrastructure" and the labelling conventions described in Section 4.3.7 of this document.

The following line items describe individual requirements that are to be applied to all Communications Cabling projects. The line items are meant to serve as a guideline for the Government of Ontario requirements.

Installation will be to locations identified by the Cluster/Ministry (Customer) who authorises the work.

All horizontal cabling must be installed from the workstation location on to modular patch panels installed in to racks or cabinets. For small sites, the Customer can specify wall-mounted patch panels in lieu of racks.

The cabling contractor will supply multi-pair backbone cabling including terminating hardware for a complete functioning Voice backbone (where required). Similarly, the Cabling Contractor will supply, install and test all fibre backbone and UTP copper cabling between Telecommunications Rooms for a complete functioning backbone.

4.1.3. Construction Requirements: The CSI/CSC MasterFormat (2010)

Construction must conform to the relevant Divisions and Sections of the MasterFormat 2010 document in its most updated form as applicable

4.1.4. Allowances

Devices, racks, cabinets, backboards or outlets may be relocated, prior to installation, from the location shown on the Contract Drawings, to a maximum distance of 3.05m (10'-0") without adjustment to the Contract price.

4.1.5. Dimensions & Quantities

Dimensions shown on all drawings are considered approximate. All dimensions shall be verified by making reference to shop drawings and field measurements. Quantities or lengths indicated in any Contractual Documentation are approximations and shall not be held to gauge or limit the work.

The cabling contractor shall be responsible for making any necessary changes or additions to routing of cables, pathways to accommodate structural, mechanical, electrical and architectural conditions. Where pathways or cables are shown diagrammatically run them parallel to building columns. If it is necessary to run cables

otherwise to accommodate acceptable cable lengths, written permission must be obtained from the Project Manager prior to installation.

4.1.6. Applicable Codes, Standards and Regulations

Equipment, material and installation shall conform to the latest version of the applicable Codes, Standards and regulations of authorities having jurisdiction. All references to Codes, Standards and regulations should first be made with respect to Canadian documents. In the case of conflict or discrepancy the more stringent code shall apply.

4.1.7. System Description

The Cabling Contractor must supply and install a complete Structured Cabling Platform based on a physical star wiring topology that is designed in accordance with and supported by a manufacturer backed Certification as specified herein. The Cabling Contractor shall include all communication outlets, terminating hardware and selected connectivity devices as outlined in this Specification.

4.1.8. Performance Requirements

The Cabling Contractors proposed solution offered must meet, at a minimum, all of the performance parameters as defined in the tables in ANSI/EIA/TIA-568-C.2 'Balanced Twisted-Pair Telecommunications Cabling and Components Standard', and, where optical cabling is installed, ANSI/EIA/TIA-568-C.3 'Optical Fiber Cabling Components Standard'.

4.1.9. Connectivity Database

The Cabling Contractor will be required to provide all patching for complete connectivity as indicated below. The Cabling Contractor must provide a complete end to end mapping of all connectivity (including horizontal and vertical) at the end of each phase in both hard and soft copy format. Initial data capture will be using **Microsoft Excel**, enabling subsequent upload of the data to a relational database, for information storage and profile generation.

For Voice connectivity, this is to include but not be limited to horizontal cable number, backbone pair, service provider demarcation pair(s), DID and LEN. For data connectivity, this is to include but not be limited to horizontal cable number, copper backbone cable (if required) and active equipment port. Also included will be fibre backbone connectivity.

4.1.10. Codes, Permits and Inspections

Any structured cabling installation must comply with the Ontario Hydro Electrical Safety Code, all local, provincial and federal laws, where applicable, and with requirements of the Canadian Standards Association (CSA). The Cabling Contractor is responsible for making any changes or alterations required by the authorised inspector of the authority having jurisdiction. The Cabling Contractor must obtain and pay for permits and inspection required for work performed.

Where materials are specified which require special inspection and approval of CSA and/or local authorities, obtain such approval for the particular installation with the co-operation of the material supplier.

4.1.11. Delivery, Storage and Handling

The Cabling Contractor must arrange for the delivery of materials related to Contract and related items, including unloading of supplier's truck, elevator scheduling and placement on Customer premises as indicated on Contract drawings. The Contractor is also responsible for complete storage, handling, delivery, and installation of all materials used in the performance of the work. Arrangements are to be made for the delivery and storage of all materials used for the project with the General Contractor/Site Superintendent.

The Contractor is permitted to store job boxes on the site during construction. The tools and the job box are the responsibility of the Contractor. The Customer and his representative are in no way responsible or liable for any tools of the Cabling Contractor.

The Contractor is responsible for the assembly of equipment/materials and protection of the above equipment and related items until project Cut Over. Any damage to equipment will be the liability of the Contractor. All damage must be repaired or at the Customer's request, the equipment must be replaced at no extra charge to the Customer.

4.1.12. Waste Management and Disposal

The Cabling Contractor must remove and dispose of all existing inactive horizontal Voice, Data and coaxial cabling. If the Cabling Contractor is unsure of the status of a cable(s), they must confirm the removal with the Customer prior to performing and work.

4.1.13. Warranty and Certification

From the date of issuance of a 'Certificate of Substantial Performance', all equipment, materials and workmanship must be unconditionally Warranted for a period of one (1) year, or such longer periods as may be provided in the Warranty of the manufacturer of individual components, whichever is longer.

Provide a manufacturer written certificate and Warranty that the Structured Cabling Platform is installed and fully operating in accordance with this and the manufacturers specifications.

The manufacturer is required to provide a minimum 20 year parts and labour Warranty for the entire Structured Network Cabling System, including, but not limited to, UTP copper, UTP backbone and fibre. In addition, the manufacturer will be required to provide a lifetime application Warranty that covers any current or future Category 6 and/or 6A applications recognised by standards bodies and user forums for use over ANSI/EIA/TIA 568-C.2 component and Channel specifications.

The Warranty must guarantee that the design or installation negligence on the part of the Cabling Contractor will not negate or void any portion of the certified system. The manufacturer must guarantee that all material, components and labour are covered in this circumstance for the full certification period. It must also guarantee that in the event a Cabling Contractor is no longer able to service the Warranty, the full certification remains valid and is responsibility of the manufacturer.

If a Warranty issue arises for the cabling the Warrantor must make arrangements to undertake the repair or replacement of Warranty issues within 24 hours of notification. This may require the repair/replace of cabling components outside regular working hours at no additional cost.

The Warranty for the Cabling must be such that the cable meets or exceeds the requirements of ANSI/EIA/TIA 568-C.2 'Balanced Twisted Pair Telecommunications Cabling and Components Standard' including all industry standards stated in this document.

The Structured Cabling Platform certification request form(s) must be forwarded to the proper authority. A Plaque and Certificate must be issued to the Customer along with the Structured Cabling Platform user manual. The successful bidder will provide a certification number within two weeks of award of this project. Please note that the Plaque/Certificate must have the Customer name on the Plaque/Certificate.

The Cabling Contractor will provide letter(s) of Certification within two weeks of substantial completion of the project to the Customer. This document will include the following: verification of the performance of the installed system, identification of the installation by location and project number and a copy of the Warranty.

Upon award of contract, the Cabling Contractor shall forward copies of the Structured Cabling Platform Request for Certification form complete with certification number(s) for the project to Customers office within 7 days of the award of contract.

Upon request and at no additional cost to the Customer the Cabling Contractor must provide a manufacturer's technical representative to conduct an on-site visit to ensure complete technical compliance.

The Cabling Contractor must supply a copy of an unexecuted Warranty statement (at the time of bidding) including all related terms and conditions. This copy will be the Standard to which the Warranty will be held. No changes will be accepted unless it is deemed to benefit the Customer. Any proposed changes to the Warranty must be submitted in writing to the Customer/their representative for review. The changes will then be accepted or declined by the Customer at their discretion. This is to remain valid for the entire Warranty period.

All cable Cabling Contractor technicians on site must be trained by the manufacturer of the Structured Cabling Platform being installed. Any defective or improperly installed products shall be replaced, or correctly reinstalled at no cost to the Customer.

4.1.14. Testing and Commissioning

Provide two copies of testing and commissioning documentation for all items and their related components to the Project Manager prior to the completion of the project or at the Project Manager's request. Include maintenance manuals, operating instructions for Customer's staff use.

4.2. Product Specifications

4.2.1. General

This document specifies the use of an end to end Structured Cabling Platform as manufactured and Warranted by a Single Manufacturer. No alternatives will be accepted except where noted or where supply of the materials would compromise the schedule. If the supply of the materials is such that the schedule will be compromised, written permission of the Project Manager must be obtained before alternatives are purchased or installed. Bidders must identify alternative products with their bids including Manufacturer and Part Number.

The Cabling Contractor shall terminate a pre-determined number of horizontal cables to each specified user workstation location, or office as shown on the floor plans provided by the Customer. Every horizontal cable that is pulled must be terminated and tested.

4.2.2. Manufacturers

The Structured Cabling Platform in each individual building/site must be manufactured and warranted by a single manufacturer for all components of the Structured Cabling Platform including backbones.

The successful bidder must install a complete Structured Cabling Platform that is manufactured and warranted by a single vendor. The successful bidder must be currently authorised by the cable vendor to install and Warranty the system. If a sub-Contractor is being used for the installation, it is mandatory that the sub-Contractor be currently authorised to install and Warranty the system.

4.2.3. Horizontal Cabling (Voice & Data):

All horizontal cabling must be at a minimum Category 6, UTP, 4 pair, 23 AWG cabling. For larger scale, long term cabling plants Category 6A, UTP, 4 pair, 23 AWG is recommended.

All horizontal cabling must support the following requirements:

The full end to end 100 meter channel that includes a worst case of four terminations (including consolidation point and cross connect) must meet all of the criteria (as a minimum) as defined in Section 4.1.10. The Channel performance specifications for all of the parameters in Section 4.1.10 must be tested (and published) up to and including 500 MHz and Warrantable up to and including 500 MHz for a minimum period of 20 years.

All future reference to 'Voice Cable' shall refer to the requirements as stated in this section. The cable must meet or exceed the requirements of EIA/TIA-568-C.2. The cable must be CSA certified and stamped accordingly.

All cables pulled and terminated for Servers are to be treated exactly the same as other horizontal cabling.

Note: For cabling implementations that exceed the maximum specified distance of twisted-pair cabling, in Data Centres or where other business/design requirements dictate, fibre optic cabling may be used for horizontal cabling.

4.2.4. Backbone Cabling

Note: The following items are to be installed only if the Customer requires them

4.2.4.1. Multi-pair Category 3 Backbone Cable for Voice Applications

The multi-pair Voice backbone cable shall be Category 3, riser grade cable. The cable must have the following attributes:

- o 24 AWG solid copper conductors formed into 25-pair bundle groups.
- o Sheath must be CMP/CMR riser rated (FT6/FT4) and be made of an ALVYN (ALPAST). It must have a longitudinally applied, transversely corrugated aluminum shield that is bonded to an outer jacket of PVC.
- o The cable must meet or exceed requirements of EIA/TIA-568-A for (Category 3). The cable must be CSA certified and stamped accordingly.

4.2.4.2. Optical Cabling Backbone

All optical cable installed must meet the specifications of ANSI/EIA/TIA-472C000-B-2005 (fibre optic communications cables intended for use in the buildings of communications users) or ANSI/EIA/TIA-472D000-B-2005 (covers fibre optic communications cables intended for use in outside plant) as appropriate.

OM1 fibre Backbone must adhere to ANSI/EIA/TIA-492AAAA-A (Detail Specification for 62.5-mm Core Diameter/125-mm Cladding Diameter Class 1a Multimode, Graded-Index Optical Waveguide Fibers).

Each fibre backbone shall have a minimum of 12 strands (24 strands preferred) of OM1 distribution type fibre. The OM1 distribution type fibre will perform as per industry standards over the required distance defined for the site. Alternatively, if distance limitations and/or application necessitate, a OM3 or OS1 distribution type fibre installation may be required.

OM3 Fibre Backbone for Data Applications must adhere to ANSI/EIA/TIA-492AAAB (Detail Specification for 50.0-mm Core Diameter/125-mm Cladding Diameter Class 1a Multimode, Graded-Index Optical Waveguide Fibres).

Each fibre backbone shall have a minimum of 12 strands (24 strands preferred) of OM3 distribution type fibre.

4.2.4.3. UTP Copper Backbone for Data Applications

All vertical 4-pair UTP copper backbone cable between each Telecommunications Room and the Main Telecommunications Room shall be the same product as horizontal cabling specified in this standard. The UTP copper backbone must be terminated in the same manner as all of the horizontal cables in the Telecommunications Room (i.e. following the TIA/EIA 568-C.1 standard). However, a separate 48 port modular patch panel is to be supplied and installed in each closet for the UTP backbone. All unused modular ports are to be filled with blanks.

4.2.5. Termination Hardware – Workstation End

All UTP male connectors and female jacks shall be an 8 pin modular jack wired in T-568A sequence. The jacks must accept either RJ45 or RJ11 male plugs without causing any damage or degradation to the connectors.

The UTP modules must be matched appropriately with the horizontal cables to ensure that end to end Vendor Warranties will be applicable.

Outlet Module Position:

The orientation of the modules located at the workstations from the perspective of the user is as indicated below:

Data Port	Left or Top
Voice Port	Right or Middle
Additional Port	Left or Bottom

Note: The cabling contractor must provide blank filler plates for all unused modular jack positions on faceplates/outlets.

4.2.6. Termination Hardware – Remote Distribution Terminal

Remote Distribution Terminal (RDT) concept is to be used in areas where access flooring is provided, and also in open office spaces where open systems furniture is expected to be moved or reconfigured routinely.

Provide and install all materials for the installation of Voice/Data bayboxes as described herein.

The bayboxes shall consist of assemblies of the following components:

All cables are to be terminated on 8 pin UTP modules, inserted into 24/48 port modular patch panels (compatible with standard 19" equipment racks) and placed in communications racks in the Telecommunications Room for that floor. The 24/48 port modular patch panel should minimise the rack space used, it cannot exceed 3 rack units in height. A total of 24 horizontal cables are to be connected to the Telecommunications Room from the Remote Distribution Terminal.

Provide an environmentally sealed metal enclosure, complete with hinged lids with neoprene sponge and frame to house and protect the 24/48 port patch panel from dust and/or water hazards.

The metal enclosure shall be constructed with a minimum of 16 gauge galvanized steel, it shall be equipped with feet or offsets to raise the box above the concrete floor. The enclosure shall be complete with a grommeted cable entrance opening, cable tie hole, labels showing baybox zone number and port designations. The enclosures shall be designed to be installed in the ceiling space and/or in access flooring to suit the project requirements.

4.2.7. Communication Outlets and Accessories

The use of single gang Decora Style straps (insert plates), Surface Mounted Boxes or Furniture Adapters are allowed. The initial intended use of outlets is described below:

4.2.8. Wall Outlets / Floor Boxes

All horizontal cabling installed using wall outlets / floor boxes are to use single gang Decora style straps. The colour of the Decora style strap is to be Ivory. The cover plates are to be single gang (or double gang if required - assume worst case) and they are to match the Decora straps. Each Decora style strap is to have a minimum of 3 positions for communications modules. Each outlet is to be equipped with the appropriate modules as indicated in Section 4.2.5. Any unused communication positions in wall outlets must be filled with a blank. The colours of the UTP modules and furniture adapter plates may be changed at the discretion of the Project Manager.

4.2.9. Workstation Outlets

All horizontal cabling that is to be installed into furniture must use flush furniture plate(s), supplied and installed by the Cabling Contractor. If surface mounted boxes are required they must have a minimum of 2 positions (but not more than four). The colour of the surface mount boxes is to be Black. Each outlet is to be equipped with the appropriate modules as indicated in Section 4.2.8. Any unused communication positions in workstation outlets must be filled with a blank. The colours of the UTP modules and furniture adapter plates may be changed at the discretion of the Project Manager.

4.2.10. Dust Covers & Icons

All Communications modules must be installed with Dust Covers and labels. Any unused communication positions in workstation outlets must be filled with a blank.

4.2.11. Termination Hardware – Telecommunications Room(s)

4.2.11.1. Horizontal Cables

All horizontal cables are to be terminated on 8 pin UTP modules, inserted into 24/48 port modular patch panels (compatible with standard 19" equipment racks) and placed in communications racks in the Telecommunications Room for that floor. The 24/48 port modular patch panel should minimise the rack space used, it cannot exceed 3 rack units in height.

4.2.11.2. Multi-pair Backbone Cable for Voice Applications

All Multi-pair Category 3 Backbone Cable is to be terminated on the Backboard in the Telecommunications Room for that floor. All pairs are to be terminated using IDC termination mounts with the ability to terminate a minimum of 250 pairs of Multi-pair Category 3 Backbone Cable on termination connectors. The termination connectors must be double sided (one side terminates Multi-pair Category 3 Backbone cable and the other side connects to cross connect wire). The termination connectors must be able to terminate 23/24 AWG conductors. The termination mount must be capable of feeding the Multi-pair Category 3 Backbone cable to the termination connectors from behind the connector.

Cable management in the form of Distribution Rings must be provided between columns (2 rings) and rows (2 rings) of IDC mounts to support cross-connect management.

4.2.11.3. Fibre Patch Panel(s) (Telecommunications Room(s))

If required by the Customer, the total number of strands to be supplied and installed is to be a minimum of 12, but preferably 24. . The Project Manager will determine, in consultation with the Customer, the quantity and type of fibre to be installed.

All Fibre Backbone is to be terminated using a fibre patch panel on a communications rack. The 12/24 strands of fibre, as indicated in Section 4.2.4, must be installed in the fibre patch panel (compatible with standard 19" equipment racks and cabinets) and placed in a rack in the Telecommunications Room for that floor. The fibre patch panel should minimise the rack space used, it cannot exceed 3 rack units in height (3U). The fibre patch panel must be serviceable from the front by allowing the fibre patch panel to slide or pivot away from the rack. The fibre patch panels are to be mounted at the upper most position on the racks of each floor.

Provide all necessary accessories for a complete fibre patch panel including but not limited; to clear cover plates, mounting brackets and hardware, SC duplex fibre bulkheads (adapter sleeves-plates/couplers), SC connectors and fibre cable management. .

The 12/24 strands of fibre must be terminated using SC connectors that is consistent with the fibre being installed. All 12/24 strands are to be terminated at both ends and the terminated fibres must be connected to SC Duplex bulkheads in the fibre patch panels.

The physical fibre optic cabling topology and the type of fibre connectors (SC) to be used on site prior to ordering or installing is to be determined.

Note: If fibre cabling is being installed, one additional fibre patch panel for the Main Telecommunications Room is to be installed. This is to include all components described in this Section.

4.2.12. Connectivity Items

4.2.12.1. Cross Connect Wire (4-pair)

Supply and install ANSI/EIA/TIA-568-C.2 compliant Cross-Connect Jumper Wire for Voice equipment fields to the distribution fields.

The Cabling Contractor must provide a complete end to end mapping of all connectivity (including horizontal and vertical) at the end of each phase in both hard and soft copy format.

4.2.12.2. Patch Cords (Telecommunications Room(s))

One patch cord per outlet on site is to be installed. The patch cords will be 8 pin modular/8 pin modular patch cords. The patch cords are to be Category 6 or Category 6A (depending on what type of horizontal cabling has been installed) and have 23/24 AWG stranded copper conductors (straight through mapping) consisting of 4 pairs that are twisted to form a cable core. The patch cords are to be CMR rated FT4 and stamped accordingly. The 8 pin modular/8 pin modular patch cords are to be consistent with the grade and manufacturer of the cable that is being warranted.

The Project Manager shall determine the modular patch cord lengths.

If Channel Performance Warranty requires solid conductors for the patch cords, these must be used to maintain the Warranty.

4.2.12.3. Patch Cords (Workstations)

Workstation line cords do not form part of the scope of this work.

4.2.12.4. Fibre Patch Cords

All Fibre Patch Cords shall be connected to the Customer supplied active equipment using SC duplex zip cords. The Fibre Patch Cords are to be CMR rated FT4 and stamped accordingly. SC duplex zip cords are to be consistent with the grade and manufacturer of the Fibre cable that is being warranted.

The Customer reserves the right to switch the above Fibre Patch Cords connector types to SC/ST or SC/SFF configuration as required, at no extra cost, 10 days prior to delivery to site.

4.2.13. Communications Racks & Cabinets

All racks and cabinets to be supplied and installed are to be free standing, 19" floor mounted with 44U of rack mounting space. Both racks and cabinets must be tapped (both front and back) with mounting holes as per EIA-310-C, size 10-32, as well as include a ground lug to accept a #6 AWG grounding wire.

In addition to the specifications above cabinets should include:

- Minimum dimensions of: 30"W x 42"D x 84"H
- Front and rear rails (back rails moveable for depth to accommodate various equipment)
- Two 8" cable managers
- Two Power Distribution Units
- Ventilated and reversible front & rear doors

Each cabinet and/or rack supplied must come complete with the following:

Vertical Cable Managers:

Each cabinet and/or rack shall come complete with two vertical cable managers installed (one mounted on each side). The vertical cable managers must run the full height of the rack mounting space and provide 8 inches wide x 7 inches deep of cable management space. The vertical cable manager must have hinged front door(s), back and side cut outs to allow for Patch Cords. It must also have lancets along the back of the cable manager to allow for the fastening of the horizontal cable to the outside of the manager itself.

Overhead Cable Managers and Chimneys:

Each cabinet and/or rack shall come complete with a hinged overhead cable manager installed, with minimum dimensions of 8 inches wide x 7 inches deep. Where racks are ganged, the overhead cable manager is to be continuous across the gang of racks; both ends of the ganged racks are to be completed with end caps. At the right side of each rack a cable management chimney must be installed. They must extend from the top of the overhead cable manager to the underside of the ladder tray/ceiling tile above.

Horizontal Cable Managers

For all cabinets and/or racks containing, horizontal structured cabling, horizontal cable managers (compatible with standard 19" equipment racks) are to be provided. The horizontal cable managers are to be hinged at the front with vertical access to the patch panel above and below. Each horizontal cable manager is to be 2 rack units (2U) in height. For each cabinet and/or rack a total of two horizontal cable managers, per patch panel, is to be supplied plus one additional horizontal cable manager.

Equipment Shelves

Each cabinet and/or rack is to be supplied with, at a minimum, one equipment shelf; this is to be installed at the direction of the Customer. The equipment shelf is to be centre mounted and have a minimum of 18 inches of depth.

Power Bars

Each cabinet and/or rack is to come complete with two vertical power bars mounted to the back of the rack. Each power bar is to have a minimum of 8 outlets. Power bars will be rated at a minimum of 110V, 20A. The power bars are to have a minimum power cord length of 6 feet. The power bars are **not** to have reset breakers or an on/off switch.

The Customer may require additional power requirements over and above what is detailed above. It is the responsibility of the Project Manager to provide these requirements to the Cabling Contractor.

4.2.14. Wall Mount Network Shelves & Cabinets

Wall mounted shelves should be a minimum of 18"D and 20"W. Wall Mounted Cabinets based on space allowance minimum 14U. Inside Cabinet measurements should be a minimum 24.5"H x 19"W x 14"D.

4.3. Miscellaneous Hardware and Materials

4.3.1. Cable Support

Caddy hangers are to be installed at 3 foot intervals (maximum). Attaching to any T-bar support rods is not acceptable. Anchors for hangers must not be drilled into post tensioned beams under any circumstances. The sizes of the J-hooks are to suit quantity of cables in runs used for distribution.

4.3.2. Velcro tie wraps

It should be noted that only Velcro tie-wraps are acceptable, under no circumstance are traditional ty-wraps to be used. Velcro tie-wraps are to be used to neatly dress cables; they are to be placed at a maximum of 3 foot intervals for horizontal distribution.

Velcro tie-wraps are also to be used to dress horizontal cables into racks. For each row of the patch panel cables are to be dressed horizontally (from the middle to the left and the right) to the vertical cable manager (maximum spacing of 3 inches). Maximum spacing of Velcro for horizontal cables into or along vertical cable managers is to be no more than 6 inches; this includes cabling dropped from the ladder tray or ceiling above.

4.3.3. Spiral Wrap

Cables running from system furniture feed points to the system furniture shall be neatly wrapped. Match colour of spiral wrap with systems furniture manufacturer's power feed. Spiral wrap to be butted so that no cables are exposed. Size the spiral wrap according to quantity of cables being fed into system furniture. Split duct style of wrap is not acceptable.

4.3.4. Inner-Duct

Non plenum rated cables passing through an air plenum must be run through an Inner-duct to a minimum of 6 inches on either side of the plenum space. The Inner-duct must be securely fastened to the wall on either side of the plenum space. The Inner-duct must be solid and may not be greater than 1 inch in outside diameter.

All fibre optic cables must be pulled through inner-duct as they exit the EMT conduit system and are routed to the fibre patch panel. The inner-duct must extend the entire length of the fibre. The Inner-duct must be solid and may not be greater than 1 inch in outside diameter.

Inner-duct must be used for all fibre optic cable that is pulled through conduits that are 2 inches or greater in diameter.

4.3.5. Backboard (All Telecommunications Room(s))

Backboards, shall be constructed of 2 - 4' x 8' (3/4 inch) fire rated plywood sheets. Each plywood sheet must be placed vertically and the sheets must be placed immediately adjacent to each other. The backboard shall be mounted on 2 inch x 6 inch studs to offset it from the room wall.

4.3.6. Riser Backboard (All Telecommunications Room(s))

Riser Backboards, shall be constructed of a minimum of 1 - 4' x 8' (3/4 inch) plywood sheet (or sized to suit location). The plywood sheet should be placed vertically. The backboard is to be painted with 2 coats of white fire retardant paint and mounted directly on the wall.

4.3.7. Labelling

All labelling shall adhere to ANSI/EIA/TIA-606-A and ANSI/EIA/TIA-568-C.1 guidelines for colour coding. All adhesive cable labels shall meet the legibility, defacement, and adhesion requirements specified in UL 969 (Ref. D-16). In addition the labels shall meet the general exposure requirements in UL 969 for indoor use.

Cable Labels shall be of self-laminating vinyl construction with a white printing area and a clear tail that self laminates the printed area when wrapped around a cable. The clear area should be of sufficient length to wrap around the cable at least one and one-half times. All labels must be machine printed using a laser/inkjet printer. Hand-written labels are not permitted.

The Cabling Contractor shall supply and install 15 additional labels (per floor) of ½ inch lettering height (up to 25 letters each label) for use on cabinets, racks, patch panels or active equipment to be used at the Project Manager's discretion.

4.4. Execution

4.4.1. General

The Project Manager will determine, with the concurrence of the Customer, if the Communications Cabling will be running through plenum or non-plenum spaces. Where the installation is into a plenum space, in part or whole, the Project Manager will specify that FT6 (CMP) rated cables must be used unless they are installed in an end to end EMT conduit system that extends beyond the plenum on both sides. Otherwise, FT4 rated cables will be acceptable.

At least two cables will be pulled down and terminated at each communication outlet unless otherwise specified. All cabling will run through office furniture, where necessary, to the point of termination.

All cables and components are to be supplied, installed, tested and terminated in accordance with the requirements outlined in this document for Category 6, Category 6A, and optical cabling. Particular attention must be given to maintaining the integrity of the pair twists, bend radius and ensuring proper distance is kept from fluorescent light fixtures, electrical cables or any other source of EMI.

Ensure installation practices detailed in ANSI/EIA/TIA-568-C.2, ANSI/EIA/TIA-568-C.3, ANSI/EIA/TIA-942 and ANSI/EIA/TIA-942-2, as applicable, are followed. Cables are to be combed and bundled in a neat and organised manner. The maximum horizontal run length is not to exceed 90-metres.

All cables and pathways such as conduits, cable tray or other systems used for communication cable distribution to be run parallel or perpendicular to building lines.

Any deviation from the cable routing, outlet and equipment locations shown on drawings must be approved by the Project Manager and documented on as-built drawings.

Provide 3.0 m (10'-0") of slack at both ends of each cable to permit future outlet relocation. Neatly coil slack in ceiling space.

Utilize all indicated and available cable pathways such as cable tray, conduits, ducts, raceways and furniture system channels except where otherwise noted. Exercise caution when pulling cables in such pathways to avoid damage to any existing cables and follow manufacturer's maximum pull-force and minimum bend radii. Cable pulls must be made continuous and steady between pull points. Do not interrupt the pull unless necessitated by excessive tension on the cable.

4.4.2. Installers

All products installed must meet or exceed all local, provincial and federal building, fire, health, safety and electrical codes.

4.4.3. Examination

Before acceptance by the Project Manager, all the equipment and cabling must be cleaned and tested. At points of termination, all cabling and terminations must be free of any cable pulling lubricants before acceptance by the Project Manager.

4.4.4. Installation

All cabling must be terminated using ANSI/EIA/TIA 568-C.2 configuration parameters and connecting hardware meeting IEC 60603-7-7 electrical and mechanical specifications, unless specifically noted otherwise. All cabling must be bundled using Velcro tie-wraps.

The Cabling Contractor must supply and install cabling as detailed on floor plan(s). Where the cables leave the cable tray and extend to the termination point they shall use the J-hooks specified in this document or conduit provided.

Locate racks as shown on contract drawing, anchor racks securely to the floor (all four corners). Bolts/anchors used to mount must be made flush and any sharp edges must be removed. Mount equipment in racks or cabinets as shown on detailed sketches

Ground racks, patch panels, cabinets, metal raceways and equipment to building ground busbars (provided by others) using minimum #6 AWG insulated ground wire. Ground cables shall be insulated green jacket, braided copper wire installed in each Telecommunications Room that connects to the building ground system. Minimum wire size shall be #6 AWG for Telecommunications Rooms and #1/0 for Main Building Communications Room.

Grounding system for Main Building Communications Room shall be designed such that the individual grounding runs to each piece of equipment does not exceed 5' from the main loop. Grounding is to tie into a single ground point only.

If any walls on site have security mesh, cables are to be installed through the walls containing security mesh with an EMT sleeve through the secure wall. The EMT is to extend to a minimum of 4 inches on either side of the security wall. The EMT shall be between 2 and 4 inches in diameter (size to suit) and it must be securely anchored to the slab above. Sound proof/fire stopping material is to be installed to re-establish the integrity of the barrier in the wall after all cables have been installed.

When bundling Category 6 or Category 6A cables, installers must comply with manufacturer's recommended bundling practices for installation. Ensure that excess pressure is not placed on the cable at any point that may result in the compression or deformation of the cable jacket and internal pair/conductor geometry. Neatly bundle and tie-wrap all cables using Velcro tie-wraps.

Proper installation and termination practices shall be followed for Category 6 and Category 6A cabling (as per ANSI/EIA/TIA and other related industry standards. Do not kink or exceed the cable minimum bend radius or maintain a minimum of four (4) times cable diameter as a bend radii if no bend radius is specified by the manufacturer. For fibre optic cables maintain a minimum of ten (10) times the cable diameter or 30 mm (1.2 inch) whichever is larger for a bend radius.

All cables and components shall be grounded to manufacturer's specifications and standard practices. All pairs of cables shall be terminated. All spare cables shall be terminated in the Telecommunications Room and the service point shall be stored in a neat coil in the ceiling space.

4.4.5. Labelling

Labels should be attached to the front of the workstation faceplate, one to the front of the distribution connector/IDC field or patch panel, and one at each end of the cable (within 4 inches of end). Cables should also be labelled at the grid point just before the cable coil.

The cable labelling scheme for all horizontal cables at both ends shall be as follows:

Horizontal Cable: D/VaX-z

- D/V Indicates Data or Voice
 a Indicates the floor ID (2 digits). Add alphabetical closet identifier for multi-closet floors.
 X Indicates the Telecommunications Room identifier (A or B) if more than one TC per floor (optional).
 z Indicates the cable number.

Example (Data): D04-019

- D Indicates Data
 04 Indicates 4th Floor.
 019 Indicates the 19th cable.

Example (Voice): V04-020

- V Indicates Voice
 04 Indicates 4th Floor.
 020 Indicates the 20th cable.

Inter-floor Cable (Fibre): C-z

- C Indicates the originating floor.
 z Indicates the strand number.

Example: 02.06

- 02 Indicates the 2nd Floor.
 06 Indicates the 6th strand

Inter-floor Cable (UTP Copper Backbone): (IF-a-z)

- IF Indicates Inter-floor Cabling.
 a Indicates the originating floor.
 z Indicates the cable number.

Example: IF.04.06

- IF Indicates Inter-floor Cabling.
 04 Indicates the 4th Floor.
 06 indicates the 6th cable

Inter-Building Cable (UTP Fibre Backbone): (IBF-z)

- IBF Indicates Inter-Building Fibre Cabling.
 z Indicates the strand number.

Example: IBF.06

- IBF Indicates Inter-Building Fibre Cabling.
 06 Indicates the 6th strand.

Inter-Building Cable (UTP Copper Backbone): (IBC-z)

- IBC Indicates Inter-Building Copper Cabling.
 z Indicates the pair number.

Example: IBC.100

- IBC Indicates Inter-Building Copper Cabling.
 100 Indicates the 100th pair.

4.4.6. Working Drawing and Documents

Where the word 'HOLD' appears on Drawings and other Contract Documents, the work is included in the Contract. Execute the work only after verification of dimensions and materials and obtain Project Manager's written permission to proceed.

4.4.7. Special Techniques

- Avoid scraping, denting, or otherwise damaging cables, before, during or after installation.

- Ensure that all cable lengths are sufficient to allow for slack, vertical runs, wastage, connectorization and future moves.
- Bush, ream and remove any sharp projections on all conduits prior to installation of communications cables.
- When terminating copper cables remove only enough cable jacket to perform termination, untwist pairs a maximum of 13 mm (1/2 inch) for Cat 6A cables.
- Apply manufacturer's recommended lubricant to cables to reduce friction between the cable and the duct.
- Cable grip to be attached to the sheath and its strength members so that no direct force is applied to the conductors/fibres. The cable grip shall have a ball bearing swivel to prevent the cable from twisting during pulling.
- Station personnel at each access point (i.e. Handhole, manhole, etc.) to observe and lubricate the cables being pulled.
- Cable passing through manholes to have sufficient slack for expansion/contraction and to be mounted with clips to prevent sagging.
- Do not exceed the copper/fibre cables maximum tensile rating during installation. Monitor tension of the cable during installation.
- Minimum bend radius to be as per manufacturer's recommendations.

4.4.8. Co-ordination with Other Work

Carefully examine work and Drawings of all related trades and thoroughly plan the work so as to avoid conflict or interference with other services. All defects that would adversely affect work must be reported. Do not commence installation until defects have been corrected.

Co-ordinate work of this Contract such that items will properly interface with the work of other Contracts. Prepare installation drawings of critical locations and submit to the Project Manager for review.

Cables cannot at any point rest on acoustic ceiling grid panels, lighting, mechanical devices or supports. Ensure the EMI/RFI separation distances are maintained.

Cables in the ceiling shall be installed above sprinkler systems, and shall not rest on or obscure any valves, fire alarm cables, or other mechanical or control devices.

4.4.9. Duct & Conduit

Each section of duct must be cleaned out by pulling a steel wire brush and mandrel of the correct size through the duct before pulling cables. When cleaning ducts, if obstructions are encountered which cannot be removed, the Project Manager must be notified of the problems encountered. Cables in underground duct banks must be pulled in continuous lengths, splicing of any kind will not be permitted.

Cables must be pulled through bottom ducts first, leaving top ducts for future use.

4.4.10. Site Tolerances

To minimise any possibilities of disruption maintain the following minimum clearances from electrical and heat sources, pipes and conduits when routing cables.

Item Clearance:	Minimum:
Motor	1.2 m (4'-0")
Transformers	1.2 m (4'-0")
Conduit and cables used for electrical distribution less than 1kV	0.3 m (1'-0")
Conduit and cables used for electrical distribution greater than 1kV	1.0 m (3'-0")

Fluorescent Luminaries and ballasts	12 cm (0'-5")
Pipes (gas, oil, water, etc.)	30 cm (1'-0")
HVAC (equipment, ducts, etc.)	15 cm (0'-6")

4.4.11. Repair and Restoration

Damages include chipping, breaking or fingerprints. Final decisions for any damage to ceiling tiles will be made by the Project Manager.

Cables through the full height walls are to be installed. Openings through every wall are required to pass cables through. Sound proof/fire stopping material to re-establish the integrity of the wall sound barrier are to be installed. The maximum opening size is to be 3" x 3". Cables cannot be passed between the deck pan and the top of a wall unless there is a 3" x 3" opening.

4.4.12. Field Quality Control

Submit tension pull calculation for installation of cables to the Project Manager. Use a dynamometer to record installation tension. Use a tension limiting device to prevent the exceeding of maximum pulling tension specifications during installation. The tension limit shall be set at or below the manufacturer's limit. The cable to be taken up at intermediate pulling points with an intermediate take-up device as approved by the Project Manager, to prevent over tension on the cable.

4.4.13. Site Tests and Inspection

The Customer prior to the commencement of all field-testing may perform a visual inspection. The installation will be validated for compliance with industry standards. Particular attention will be given to the following criteria:

Cable jacket removal and connector termination.

Routing and pathway supports.

Cable bend radius and cable tie slack.

Neatness, clamping, and harnessing of cabling and wiring.

Wire and cable identification and labelling.

Nameplates, identification, plates, and markings.

The Project Manager must approve the testing procedure prior to testing commencing and may request to be present during the initial testing.

A Level 3 tester that is capable of testing the specified cable to the performance level(s) indicated in this document is to be used. The tester is to use the latest version of firmware and software to test the UTP cabling system and an Optical Loss test set for all fibre optic testing.

Test patch cords to portable tester must be designed for testing by the manufacturer. Patch cords must be factory made, field assembled patch cords will not be accepted. Field testers must use the appropriate jack/tester adapter specified for use with the cabling jack(s) specified within this document.

The nominal velocity of propagation (NVP) must be set specific to each cable manufacturer before testing. The portable tester used is to be calibrated at a minimum on an annual basis.

Testing of all horizontal cables is to be completed in accordance with the following test criteria. The testing must be completed on the Channel Level. Testing is to be completed from both ends of the installed cable. Cables specified in this document are to be tested according to the applicable standards.

Testing of the cabling must conform to the following Standards:

- ANSI/EIA/TIA 568-C.2 Category 6A 'Balanced Twisted –Pair Telecommunications Cabling and Components Standard'.

Test each strand of fibre with an Optical Time Domain Reflectometer for length and attenuation. Performance test must be below the total return loss budget for the cable connectors. Provide comprehensive optical time

domain reflectometry (OTDR) testing for fibre runs greater than half a kilometre. Include a hard copy chart recording with the test documentation

Test each strand of fibre with a Power Meter / Light Source combination operating at wavelengths of 850 nm and 1300 nm for multimode fibres and 1310 nm and 1550 nm for single mode fibres. Perform these tests in both directions. These tests are to be completed after cable installation, splicing and connectors are installed. Tabulate and include test results with test documentation.

A test report based on the cable schedules is to be produced. The report should indicate for each cable the values of all measured parameters, when it was tested successfully and the signature of the technician that performed the test, location, cable type, cable number and tester make and model. Correct all cable faults. Splicing of any cables will not be permitted, for any reason, unless prior authorisation is received in writing from the Project Manager.

4.4.14. Protection

Following the installation of all cables, all duct entrances into the building to be sealed with duct sealing compound to prevent ingress of moisture, foreign material and rodents. Exposed cable ends must be protected from moisture ingress.

4.4.15. Schedules

All work is to be performed during normal working hours when possible. Some work will be permitted after hours and on weekends, or only at certain times of the year, upon Customer approval.

Security clearance for personnel from a contractor with a valid vendor id must be obtained before commencement of work. Many Government locations deal with highly sensitive information and/or have a requirement to ensure that anyone working on that Site has a security clearance at the proper level. In no case may an individual work at designated sensitive Sites without this security clearance being by the relevant OPS authority.

4.4.16. Cut Over Support

The Project Manager will identify in advance of each Cut-Over how many technicians are required on which day(s). The technicians must be available to provide services to the Customer as required. This may involve additional testing, relocation or pulling down/up of cables or other tasks as required.

4.4.17. Fire Stopping

Follow the criteria set by ULC Standard CAN4-S115 for fire stopping requirements. Supply and install non-permanent CSA approved intumescent fire stopping, to cap all empty sleeves and around cabling passing through sleeves or walls. All fire stopping must maintain a minimum one hour rating and must meet applicable Federal, Provincial and Local building/fire codes.

5. Related Standards

5.1. Impacts to Existing Standards

Identify any Standards that reference or are referenced by this Standard and describe the impact.

GO-IT Standard	Impact	Recommended Action
<i>GO-ITS 80.00 - Cabling & Wiring for Voice/Data Communications in Government Buildings (2001)</i>	Need to: Update the existing industry standards (ANSI/EIA/TIA-568-C Standards) Add general Data Centre specifications Add Cabling specifications for Wireless Access Points Add Power Over Ethernet specifications Add Category 6 cabling as minimum cabling specification Add Category 6a as the recommended cabling specification Revise fibre specification and related nomenclature	<i>Update GO-ITS 80.00</i>
<i>GO-ITS 80.00A RFQ Wiring Topology Template</i>	RFQ template no longer used.	<i>Retire GO-ITS 80.00A</i>

5.2. Impacts to Existing Environment

Impacted Infrastructure	Impact	Recommended Action
<i>No impacts to Existing Infrastructure</i>		

6. Appendix

6.1. Appendix A: Reference Sites

Government of Ontario Information & Technology Standards:

<http://www.itstandards.gov.on.ca>

American National Standards Institute

<http://www.ansi.org>

Canadian Standards Association

<http://www.csa.ca>

Construction Specifications Institute/Construction Specifications Canada

<http://www.masterformat.com>

European Committee for Electrotechnical Standardization (ECES)

<http://www.cenelec.eu/Cenelec/Homepage.htm>

International Electrotechnical Commission (IEC)

<http://www.iec.ch>

International Organization for Standardization

<http://www.iso.ch/iso/en/ISOOnline.frontpage>

Internet Engineering Task Force

<http://www.ietf.org>

IEEE

<http://www.ieee.org>

Ontario Realty Corporation

<http://www.orc.on.ca/site3.aspx>

Telecordia Technologies Inc.

<http://telecom-info.telecordia.com>

Telecommunications Industry Association

<http://www.tiaonline.org>

Underwriters Laboratories Inc.

<http://www.ul.com>

6.2. Appendix B: Industry Standards

Standard	Title
ANSI/EIA/TIA/ICEA	
ANSI-J-STD-607-A-2002	Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
ANSI/EIA/TIA-455-B	Fibre Optic Test Procedures
ANSI/EIA/TIA 455-34-2002	Fibre Optics-Interconnection Device Insertion Loss Test
ANSI/EIA/TIA-472C000-B-2005	Standard for Optical Fiber Premises Distribution Cable
ANSI/EIA/TIA-472D000-B-2009	Standard for Optical Fiber Outside Plant Communications Cable
ANSI/EIA/TIA-492AAAA-B-2009	Detail Specification for 62.5-mm Core Diameter/125-mm Cladding Diameter Class 1a Graded-Index Multimode, Optical Fibres.
ANSI/EIA/TIA-492AAAB-A-2009	Detail Specification for 50.0-mm Core Diameter/125-mm Cladding Diameter Class 1a Graded-Index Multimode, Optical Fibres.
ANSI/EIA/TIA-492BAAA-98	Detail Specification for Class IVa Dispersion-Unshifted Singlemode Optical Waveguide Fibres Used In Communications Systems.
ANSI/EIA/TIA-568-C.0-2009	Generic Telecommunications Cabling for Customers Premises
ANSI/EIA/TIA-568-C.1-2009	Commercial Building Telecommunications Cabling Standard
ANSI/EIA/TIA-568-C.2-2008	Balanced Twisted-Pair & Cabling Components Standard
ANSI/EIA/TIA-568-C.3-2008	Optical Fiber Cabling Component Standard
ANSI/EIA/TIA-569-B-1-2009	Addendum 1 – Temperature & Humidity Requirements for Telecommunications Spaces.
ANSI/EIA/TIA-598-C (2005)	Optical Fibre Cable Color Coding
ANSI/EIA/TIA-570-B (2004)	Residential Telecommunications Wiring Standard.
ANSI/EIA/TIA-604-3-B (2004)	FOCIS 3 Fibre Optic Connector Interchangeability Standard
ANSI/EIA/TIA-606-A (2007)	Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.
ANSI/EIA/TIA-942-2 (2010)	Telecommunications Infrastructure Standard for Data Centers, Addendum 2 – Additional Media and Guidelines for Data Centers
ANSI/EIA/TIA-942-1 (2008)	Data Center Coaxial Cabling Specifications and Application Distances
ANSI/ICEA S-80-576 (2002)	Category 1 & 2 individually unshielded twisted pair indoor cables (with or without an overall shield) for use in communication wiring system technology requirements.
ANSI/ICEA S-83-596 (2001)	Fibre Optic Premises Distribution Cable.
ANSI/ICEA S-87-640 (2006)	Fibre Optic Outside Plant Communications Cable.
ANSI/NECA/BICSI 568 (2006)	Installing Commercial Building Telecommunications Cabling
TI/ATSB 162 (2006)	Telecommunications Cabling Guidelines for Wireless Access Points
BICSI	
BICSI TDMM 12 th Ed., 2009	BICSI Telecommunications Distribution Methods Manual
CAN/CSA/ISO	
CSA-C22.1-09 (R2009)	Canadian Electric Code Part I: Safety Standards for Electrical Installations.
CSA-C22.2 No. 214-08 (2008)	Canadian Electric Code Part II: Wiring Products (Communications Cables) – Bi-national standard, with UL 444
CSA-C22.2 No. 182.4-M90 (R2006)	Plugs, Receptacles, and Connectors for Communication Systems.
CSA-C22.2 No. 214-08 (2008)	Communications Cables. (Bi-national Standard with UL444)
CSA-C22.2 No. 232-09 (2009)	Canadian Electric Code Part II: Optical Fibre Cables.

Standard	Title
CSA-C22.2 #0.4M (R2009)	Bonding for Telecommunications in Commercial Buildings.
CSA T568.1-05 (2005)	Commercial Building Telecommunications Cabling Standard - Part 1: General Requirements (Adopted ANSI/EIA/TIA-568-B.1-2001)
CSA T568.1-1-05 (2005)	Commercial Building Telecommunications Cabling Standard - Part 1: General Requirements - Addendum 1 - Minimum 4-Pair UTP and 4-Pair ScTP Patch Cable Bend Radius (Adopted ANSI/EIA/TIA-568-B.1-1-2001)
CSA T568.1-2-05	Commercial Building Telecommunications Cabling Standard - Part 1: General Requirements - Addendum 2 - Grounding and Bonding Specifications for Screened Balanced Twisted-Pair Horizontal Cabling (Adopted ANSI/EIA/TIA-568-B.1-2-2003)
CSA T568.1-3-05 (2005)	Commercial Building Telecommunications Cabling Standard - Part 1: General Requirements - Addendum 3 - Supportable Distances and Channel Attenuation for Optical Fiber Applications by Fiber Type (Adopted ANSI/EIA/TIA-568-B.1-3-2003)
CSA T568.1-4-05 (2005)	Commercial Building Telecommunications Cabling Standard - Part 1: General Requirements - Addendum 4 - Recognition of Category 6 and 850 nm Laser-Optimized 50/125 um Multimode Optical Fiber Cabling (Adopted ANSI/EIA/TIA-568-B.1-4-2003)
CSA T568.2-05 (2005)	Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted-Pair Cabling Components (Adopted ANSI/EIA/TIA-568-B.2-2001)
CSA T568.2-2-05 (2005)	Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted Pair Cabling Components - Addendum 2 (Adopted ANSI/EIA/TIA-568-B.2-2-2001)
CSA T568.2-3-05 (2005)	Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted Pair Cabling Components - Addendum 3 - Additional Considerations for Insertion Loss and Return Loss Pass/Fail Determination (Adopted ANSI/EIA/TIA-568-B.2-3-2002)
CSA T568.2-4-05 (2005)	Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted Pair Cabling Components - Addendum 4 - Solderless Connection Reliability Requirements for Copper Connecting Hardware (Adopted ANSI/EIA/TIA-568-B.2-4-2002)
CSA T568.2-5-05	Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted-Pair Cabling Components - Addendum 5 - Corrections to TIA/EIA-568-B.2 (Adopted ANSI/EIA/TIA-568-B.2-5-2003)
CSA T568.3 (2005)	Optical Fiber Cabling Components Standard (Adopted ANSI/EIA/TIA-568-B.3-2000)
CSA T568.3-1-05 (2005)	Optical Fiber Cabling Components Standard - Addendum 1 - Additional Transmission Performance Specifications for 50/125 um Optical Fiber Cables (Adopted ANSI/EIA/TIA-568-B.3-1-2002)
CAN/ISO/IEC 11801-04 (2004)	Generic Cabling for Customer Premises.
CAN/CSA-ISO/IEC 18010:04 (2004)	Pathways and Spaces for Customer Premises Cabling
CAN/CSA-ISO/IEC 18010:04 Amendment 1:2006 (2006)	Pathways and Spaces for Customer Premises Cabling – Amendment 1
CAN/CSA-ISO/IEC TR 24704:06 (2006)	Customer Premises Cabling for Wireless Access Points
CAN/CSA-ISO/IEC 11801A – 04 (2004)	Amendment 1: 2009 to CAN/CSA-ISO/IEC 11801-04, Information Technology – Generic Cabling for Customer Premises

Standard	Title
ECES	
CENELEC EN 50173-1 (2007)	Information technology - Generic cabling systems - Part 1: General requirements
IEC	
IEC 60603-7-7 (2006)	Detail specification for 8-way, shielded, free and fixed connectors, for data transmissions with frequencies up to 600 MHz
IEEE	
IEEE 802.3at (2009)	Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications - Data Terminal Equipment (DTE) Power Via Media Dependent Interface (MDI)
CSI/CSC	
MasterFormat 2010	Division 21 Fire Suppression
	Division 26 Electrical
	Division 27 Communications
	Division 28 Electronic Safety and Security
Federal Communications Commission Authorities	
Canadian Radio-Television & Telecommunications Commission CRTC	
FCC Part 68 Requirements	Rationale and Measurement Guidelines
Ontario Regulations	
O Reg. 213/07	Ontario Fire Code
O Reg. 315/10	Ontario Building Code
Ontario Realty Corporation, Property Development Division	
	Architectural and Electrical Master Specifications
Telcordia Technologies Inc. (Bellcore)	
GR-20-CORE (2008)	Generic Requirements of Optical Fiber and Optical Fiber Cable.
GR-409 (2008)	Generic Requirements for Premises Fiber Optic Cable
GR2961 (1998)	Generic Requirements for Multi-purpose Fiber Optic Cable
Underwriters Laboratories Inc.	
UL 13 (2007)	Standard for Safety Power-Limited Circuit Cables
UL 94-V2 (1996)	Standard for Safety Test for Flammability of Plastic Materials for Parts in Devices and Appliances
UL1863 (2004)	Standard for Safety Communications Circuit Accessories
UL 444 (2008)	Communications Cables
ULC Standard CAN4-S115	Standard Method of Fire Tests of Firestop Systems

7. Glossary

7.1. Definitions

7.1.1. Cabling Contractor

The successful bidder to the Tender Document is responsible for the supply and installation of the Structured Cabling Platform and the Copper and Fibre backbones (if required).

7.1.2. Project Manager

All references to Project Manager are to an individual or group who is to oversee the Structured Cabling Platform installation. This person will be determined on a project by project basis. An "Integrator" engaged by the Government of Ontario to deliver Network Access Service to the Ontario Public Service may be assigned this role.

7.1.3. Customer

The Project Managers' Customer (usually Cluster/Ministry) will hereafter be referred to as the 'Customer, the Customer will own the Structured Cabling Platform at the end of the Project.

7.1.4. Project

Supply and install a complete Horizontal Structured Cabling Platform, and Copper and Fibre backbone (if required) to support Voice and Data applications as described in this document.

7.1.5. Telecommunications Room(s)

The Telecommunications Room is where horizontal cabling is terminated for every floor. Floors may contain multiple Telecommunications Rooms depending on building size and requirements.

7.1.6. Main Telecommunications Room(s)

The Main Telecommunications Room is where the primary telecommunications equipment is housed for the facilities operation. This is also the room where all external connections (circuits and or trunking) are located. Each of the Telecommunications Rooms has their backbone cabling fed back to the Main Telecommunications Room.