

# **University of Manitoba Integrated Voice-Data Master Specification**

*January, 2006*

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University of Manitoba Integrated Voice-Data Master Specification  
Introduction

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## Introduction

The University of Manitoba (U of M) used an Integrated Cable Plant to distribute voice (telephones, faxes, etc.) and data (network) services. This document will describe the standards and specifications for the installation of an Integrated Cable Plant into a new building or an addition to the existing Integrated Cable Plant at the U of M.

Only experienced data installation contractors, approved by the University of Manitoba, Information Services & Technology (IST) will be considered for the work. Contractors must be able to provide evidence of having performed work on a similar type as specified. Refer to clause entitled "Qualified Voice/Data Contractors" (Section 16741 Clause 3.4 = Copper Cable; Section 16742 Clause 3.2 = Fibre Optic Cable).

These standards and specifications have been developed jointly by Information Services and Technology (IST), Academic Computing and Networking (ACN) and Architectural and Engineering Services (AES), University of Manitoba.

**NO SUBSTITUTIONS or deviations from this standard will be accepted without the prior authorization of the University of Manitoba, IST/ACN**

This document supersedes all previous versions. The most current version is dated January, 2006. A copy of this document is available in the Standards and Practices section (PDF format): [umanitoba.ca/acn/reports/cable\\_plant\\_standard\\_jan2006.pdf](http://umanitoba.ca/acn/reports/cable_plant_standard_jan2006.pdf)

Also refer to Physical Plant Master Specification:  
[umanitoba.ca/campus/physical\\_plant/departments/A&E\\_services.html](http://umanitoba.ca/campus/physical_plant/departments/A&E_services.html)

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**1.1 Related Work**

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| .1 | Electrical General Provisions         | Section 16010 |
| .2 | Basic Electrical Material & Methods   | Section 16050 |
| .3 | Conduit, Tray, Miscellaneous Supports | Section 16112 |

**1.2 Codes And Standards**

- .1 CAN/CSA-T529 (EIA/TIA568-A) - Electrical Installations
- .2 CAN/CSA-T528 (EIA/TIA 606) - Wiring Systems Administration
- .3 CAN/CSA-T527 (EIA/TIA 607) - Telecommunications Pathways and Spaces
- .4 CAN/CSA-T527 (EIA/TIA 607) - Commercial Building Grounding/Bonding/Requirements Standard
- .5 EIA/TIA, IEEE, FCC Standards - Data System Performance Standards
- .6 IEEE Standard 1100 - Powering and Grounding Sensitive Electronic Equipment
- .7 Manitoba Building Codes (Fire Ratings, Wall Penetration, etc.)
- .8 CAN/CSA C22.1 Section 60.
- .9 Obtain work permits as required by authority having jurisdiction for all communication structured cabling system installations.
- .10 University of Manitoba Integrated Voice-Data Master Specification.

**1.3 Contractor Qualification**

- .1 Only University of Manitoba Qualified Communication Installation Contractors will be considered for the work (see section 16741-3.4 for list). Contractors may be asked to provide evidence of having performed work of a similar type as specified. Subcontracting of electrical installation must be requested and approved (if acceptable) in writing prior to tender/bid closing.
- .2 Contractor shall be trained and authorized by the manufacturer they represent. Include evidence of certification and references with bids. Sub-contracting of the certification must be requested and approved (if acceptable) in writing prior to tender/bid closing.
- .3 Own and maintain tools and test equipment for the successful installation and testing of the copper and fibre cabling system. Provide list of the type and manufacturer of all test equipment to be used. Include with bid.

**1.4 Tendered Equipment List**

- .1 Prepare a printed form listing the various materials, as well as the manufacturers name, catalogue numbers, if any, and the supplier's name, upon which this bid was prepared.

Include with bid. All product utilized shall be approved by Consultant and University of Manitoba IST personnel.

- .2 Identify any and all sub-contractors used to assist in the completion of this work on the Tendered Equipment List.

### 1.5 Record Drawings

- .1 Supply "record" drawings to Client within fourteen (14) working days after confirmation by University of Manitoba IST/Engineer that the construction is complete and the deficiencies (if any) have been corrected.

### 2.1 Cabling (Copper)

- .1 For all unshielded twisted pair; Category 6 cabling, see Specification 16741 - University of Manitoba Integrated Voice-Data Master Specification.

### 2.2 Building Entrance Cable (Copper WAN)

- .1 Refer to Appendixes for manufacturer material details.
- .2 Outdoor Applications - typically installed via buried ducts. (**see section 16740 Appendix C for specific manufacturer part numbers**). This cable is not FT4 rated. Use of this cable will typically mean that the cable will be terminated via 'lightning protection' terminals at each end of the completed cable path. The source and destination of this cable is typically in a Building's Main Distribution Closet (MDC).
- .3 where cable termination point is >50ft from where underground (non-FT4) cable enters a building or service tunnel, provide splice enclosure to transition from underground (non-FT4) gel filled multi-pair cable to FT4 rated armoured multi-pair cable. The location of the transition will be confirmed by UofM IST and Physical Plant.
- .4 where cable termination point is <50ft from where underground (non-FT4) cable enters a building or service tunnel, provide EMT conduit entrance facilities for the underground (non-FT4) cable from the point the cable enters the building or service tunnel to the Main Distribution Closet (MDC).

### 2.3 Lightning Protection

- .1 Lightning protection as manufactured by CIRCA Telecom shall be required at both ends of the copper building entrance cable when cable enters through an underground duct or direct buried. (**see section 16740 Appendix D for specific manufacturer part numbers**)
- .2 Solid state protection modules: CIRCA Model #CT3B1S (CIRCA order #714013) (**see section 16740 Appendix D for specific manufacturer part numbers**)

### 2.4 Riser Cabling (Copper)

- .1 The following cable information shall be used for all multi-pair copper cable installations. Selection of the cable types shall be shown on drawings and on approval of ACN/IST

University of Manitoba and Electrical Consultant.

- .2 Copper Cable: All copper cable shall be manufactured by NORDX/CDT (**see Section 16740 Appendix A for specific manufacturer part numbers**).
- .3 Indoor application (soft jacket) shall be used only when the cable path will provide protection to the cable. For example, this cable would typically be installed using conduit. (**see section 16740 Appendix B for specific manufacturer part numbers**)
- .4 Indoor application (armoured jacket) shall be used when the cable path will not necessarily provide protection to the cable. (**see Section 16740 Appendix B for specific manufacturer part numbers**) for example, this cable would typically be installed in cable tray where other cables may be pulled over or beside it, etc. or with J-hook type of installation. Armoured riser cable will be grounded (with a 6AWG ground wire) at the designated source end only. Contact UofM Electrical Shop for specific details regarding grounding standard.

## 2.5 Approvals

- .1 Routing of all riser cables and associated support materials shall be approved by the University of Manitoba Electrical Trade Shop and IST/ACN University of Manitoba prior to installation.
- .2 The Contractor shall provide the University of Manitoba Electrical Trade Shop and IST with a list showing the manufacturer for each type of cable used on the project. All like materials shall be from one manufacturer to ensure compatibility.

## 2.6 Data Terminations (Copper)

- .1 See Specification 16741 for all termination and part numbers associated with non WAN or non Riser type cable.

## 2.7 WAN & Riser Cable Terminations (Copper)

- .1 All cables will be terminated to BIX and BICSI standards.
- .2 See Appendix E for NORDX/CDT materials list.
- .3 Multi-pair copper shall be terminated on BIX assemblies at locations indicated on drawings.
  - .1 For ACO applications, the 25 pair voice distribution system cables, where required, shall be terminated in the V/D Room BIX field (BIX-1A's) and in the rack frame on BIX 36B's. Connections shall be configured to provide 1 pair per circuit. Provide 25pr indoor "D" type cable from wall mounted BIX 1A's to 36B's which are on the BIX boards that are mounted on the rack frame. Provide 1 pr for each voice circuit plus 25%. The 25<sup>th</sup> pair is to be terminated on the 2<sup>nd</sup> 36B port 12, 2<sup>nd</sup> pair. See DETAIL DE20.
  - .2 For Keystone applications, the 25 pair voice distribution system cables, where required, shall be terminated in the VDR BIX field (BIX-1A's) and in the rack frame on NORDX/CDT AX100464 24 port patch panels. Connections shall be

configured to provide 1 pair per circuit. Provide 25pr indoor "D" type cable from wall mounted BIX 1A's to rack frame AX100464. Provide 1 pr for each analog voice circuit plus 25%. The 25<sup>th</sup> pair is to be terminated on the 24<sup>th</sup> port, 2<sup>nd</sup> pair. See DETAIL DE20.

- .3 For other (than voice) distribution requirements, such as cash registers, 4 wire circuits, DSL, etc, contact the IST telephone office.
- .4 The location and specific layout of BIX field in Voice Data Room (VDR) will be designated by IST telephone office voice technician. See DETAIL DE20.

### 3.0 Labelling

- .1 Multi-pair cables will be labeled with designation strips (BIX QSBIX20A) as follows:  
Red = house cable  
Blue = jumper cable or riser cable  
White = 36B's + miscellaneous cables

### 3.1 Installation

- .1 Supply and install all communication cables and associated termination components as previously specified.
- .2 Ensure that all plenum cabling is kept clear of all power equipment and lighting fixtures as follows:

#### INSTALLATION GUIDELINES

- TRANSFORMERS UP TO 5 kVA . 1m
- POWER LINES (120V Systems) . 300mm
- FLUORESCENT LIGHTING . 300mm
- POWER LINES (600V Systems) . 1m
- ELECTRICAL MOTORS . 1m

- .3 Identify all cables with numbered markers at both ends. Transfer identity number on to mark-up drawing for record purposes.
- .4 Ensure that all equipment is constructed to the Standards specified above. All like materials shall be by a single manufacturer.
- .5 No splicing, tapping or bridging devices will be used between specified connecting hardware and outlet assemblies.
- .6 Protect all cable installations from mechanical damage.
- .7 Label all cables generally as indicated on drawings and adhere to University of Manitoba labelling standard.
- .8 Fit all conduit ends including vertical stubs with insulated grommets or bushings.
- .9 Use approved cable clips or hangers at 2' centre to effectively support all horizontal multi-

- cable harnessing. All vertical cables shall be secured with approved strain relief equipment. Support bundles of cables splitting off of the harness with Velcro straps, or wirewraps.
- .10 During installation, do not suspend data cable coils from the structure by means of nylon ties or equivalent. Properly support these coils to prevent damage.
  - .11 Avoid excessive slack in cable as this increases run length.
  - .12 Prior to installation, review the drawing with the person(s) in charge on site and walk through to confirm exact locations of all construction components. If there are any major discrepancies, contact the Engineer.
  - .13 Bond (and 'ground') all metallic enclosures and metallic cables associated with the Cable installation in compliance with C.E.C. Section 10 and C.S.A. T527. Check with Engineering regarding 'ground loops'.
  - .14 The riser system shall be as specified to link the Main Distribution Closet (MDC) to each of the Intermediate Distribution Closets (IDC). The total riser system shall be cabled in Star Topology. It shall consist of the riser transmission media between the above locations and the associated hardware terminating media.
  - .15 Adequate riser sleeve space will be available and/or will be re-enterable in all communication closets.
  - .16 The Contractor shall ensure the appropriate fire stopping of these sleeves installed in compliance with Manitoba Building Code and M.F.P.A. regulations.
  - .17 Complete layout documentation of all wire closets and the cross connect frame shall be provided to the design engineer upon substantial completion of the project.
  - .18 Manufacturers recommended bending radius for the cable, during installation and after installation must be complied with.
  - .19 Carefully monitor cable tensions during installation. Observe manufacturer recommended maximum pulling tension for each type of cable installed.
  - .20 Vertical riser cables shall be secured at frequent intervals as specified on detailed drawings of approved strain relief equipment. Frequency of vertical support shall depend on the number of floors spanned.
  - .21 After installation is complete there should be no tensile forces on the cable. The only exception to this is for riser installation, where the only allowable tensile force on the cable is that of its own weight.
  - .22 During installation protect the cable from kinks, crimps, sharp edges or any area where the cable may be crushed.
  - .23 Do not route cable unsupported over (or support cable by) pipes, conduit, ceiling grid, or other cabling.

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- .24 Do not run fibre optic cable in same conduit or sleeve as copper wiring.
  - .25 Do not pull cables through LB fittings. Where changes of direction are necessary within raceways proper radius bends shall be used. Install pull boxes in straight sections of conduit.
  - .26 Bond all metallic enclosures associated with the cable installation in compliance with C.E.C. Section 10.

### 3.2 Testing WAN & Riser Cabling (Copper)

- .1 An experienced communication installer in compliance with Clause 1.3.1 shall perform the testing.
- .2 Contractor will test for continuity, pair placement, pair reversal and incorrectly terminated cables.
- .3 Contactor will test and provide test results for each pair as follows:
  - Wire map
  - Length
  - Propagation delay
  - Delay skew
  - NEXT + FEXT
  - NEXT @remote
  - Attenuation
  - Resistive impedance.
  - Power sum and return loss testing for all pairs.
- .4 Test and record the length in meters of all horizontal and backbone communication structured cabling.
- .5 Test to Channel Level II compliance in accordance with EIA/TIA 568A-TSB-67.
- .6 Provide full test output in electronic (test-file) format using the latest version of application software (MS WORD, MS XCEL, Adobe Acrobat, etc.) Also provide test summary sheets on paper. Identify which drops are backbone on the summary sheets.

### 3.3 Warranty

- .1 The Installation Contractor shall support the above system for a period of two years from the date of acceptance by the University of Manitoba. The response time to troubleshoot and begin repairs of reported failures will be four (4) hours within the City of Winnipeg. If the failure is a result of installation and/or performance of structured cabling, the failure will be repaired within 24 hours from the time of the report. If the failure is not installation and/or performance of structured cabling, the Contractor shall contact the Building Manager to confirm and get approval to proceed. The Contractor shall make the effort to co-ordinate and get approval to proceed prior to any site visit.



**Appendix A**

NORDX/CDT PART #		DESCRIPTION
25pr	24501858	D-Series CAT3 indoor cable
50pr	24571235	D-Series CAT3 indoor cable
100pr	24571250	D-Series CAT3 indoor cable
200pr	24571265	D-Series CAT3 indoor cable

Other pair counts are available from NORDX/CDT. Use of higher pair counts will be permitted on written authorization by ACN/IST, University of Manitoba.

**Appendix B**

NORDX/CDT Part #		DESCRIPTION
25pr	22713010	Armoured riser CAT3 cable
50pr	22713020	Armoured riser CAT3 cable
100pr	22713030	Armoured riser CAT3 cable
200pr	22713040	Armoured riser CAT3 cable

Other pair counts are available from NORDX/CDT. Use of higher pair counts will be permitted on written authorization by ACN/IST, University of Manitoba.

**Appendix C**

NORDX/CDT Part #		DESCRIPTION
25pr	NE-BJMB-25	Filled outside plant CAT3 cable
50pr	NE-BJMB-50	Filled outside plant CAT3 cable
100pr	NE-BJMB-100	Filled outside plant CAT3 cable
200pr	NE-BJMB-200	Filled outside plant CAT3 cable

Other pair counts are available from NORDX/CDT. Use of higher pair counts will be permitted on written authorization by ACN/IST, University of Manitoba.

**Appendix D**

	<b>CIRCA MODEL #</b>	<b>CIRCA ORDER #</b>	<b>DESCRIPTION</b>
25pr	2100SP-25S-25		W/O CABLE
25pr	2100SD-15	206008B15	inc. 15FT unshielded cable
50pr	2250SBP-50S-50		W/O CABLE
50pr	2251B-50	218029B15	inc. 15FT unshielded cable
100pr	2211BCSA-100	230036B15	inc. 15FT unshielded cable
100pr	2200SBP-100		W/O CABLE
200pr	*(2x) 2200SBP-100		W/O CABLE
200pr	*(2x) 2211BCSA-100	(2x) 230036B15	inc. 15FT unshielded cable

\*200pr cable will require 2-2211BCSA-100 terminals.

**Appendix E**

<b>Manufacturer</b>	<b>Part Number</b>	<b>DESCRIPTION</b>
NORDX/CDT	AX100464	PS5E HD-BIX 24 PORT PATCH PANEL
NORDX/CDT	AX101173	CABLE TIE BAR
NORDX/CDT	A0330863	QCBIX36B 12 PORT USOC 6 POS, 4 PIN
NORDX/CDT	A0399038	QCBIX46DI 6 PORT T568A-ISDN, CAT5
NORDX/CDT	A0266828	QCBIX1A DISTRIBUTION CONNECTOR
NORDX/CDT	A0393146	QCBIX1A4 DISTRIBUTION CONNECTOR
NORDX/CDT	A0340836	QMBIX12E BIX MOUNT, 300 PR
NORDX/CDT	A0270164	QCBIX10A BIX MOUNT, 250 PR
NORDX/CDT	A0284798	QMBIX10C BIX MOUNT, 50 PR
NORDX/CDT	A0270168	QRBIX19A DISTRIBUTION RING
NORDX/CDT	A0270169	QSBIX20A WHITE DESIGNATION STRIP
NORDX/CDT	P0679239	WHITE LABEL FOR BIX36B
NORDX/CDT	P0698718	WHITE LABEL FOR BIX46DI
NORDX/CDT	P0748006	BLUE LABEL FOR BIX1A4
NORDX/CDT	P0588406	WHITE LABEL FOR BIX1A – 25PR
NORDX/CDT	P0748021	BLUE LABEL FOR BIX1A –J.C.

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**1.1 Integrated System**

- .1 The following specification sections for Voice-Data systems shall be strictly adhered to. No deviations from these specifications shall occur unless directed by University of Manitoba Information Services and Technology department (IST).
- .2 Provide a complete integrated Voice-Data system complete with TYCO/A.M.P. ACO Type II or CAT6 Keystone termination components.

**1.2 Related Work**

- .1 Basic Electrical Materials and Methods Section 16050

**1.3 Codes & Standards**

- .1 CAN/CSA-T529 (Electrical Installations).
- .2 CAN/CSA-T528 (Wiring Systems Administration)
- .3 CAN/CSA-T530 (Telecommunication Pathways and Spaces)
- .4 IEEE Std. 1100 (Powering and Grounding Sensitive Electronic Equipment).
- .5 EIA/TIA, IEEE, FCC Standards (Data System Performance Standards).
- .6 Manitoba Building Codes (Fire Ratings, Wall Penetration, etc.)
- .7 CAN/CSA C22.1 Section 60.

**1.4 Contractor**

- .1 Coordinate with the U of M Project Coordinator to verify if necessary permits are to be obtained.
- .2 Only experienced data installation Contractors, approved by the University of Manitoba Information Services and Technology (IST) shall be considered for the work. Contractors shall be able to provide evidence of having performed work on a similar type as specified.
- .3 Contractors shall submit names of on-site installers to be used for the contract and copy of each person's AMP certification, confirming completion of the following training:
  - .1 AMP Act 1 for cable installers and cable terminators.
  - .2 AMP Act 1 and AMP Act 2 for those performing the testing and certificate of the installed cable plant.
- .4 Refer to clause entitled 'Qualified Voice-Data Contractors'. (Section 16741 clause 3.4)
- .5 Contractor shall be trained and authorized by the manufacturers they represent. All bidders shall submit evidence of their certification and references upon request. Contractor shall own and maintain tools necessary for the complete installation of the Cat.6 Communications System and all personnel shall be trained in the use of such equipment.
- .6 Any and all Sub-Contractors used to assist in the completion of this work shall be identified on the Tendered Equipment List.

**1.5 350 M/BS Standard**

- .1 All wiring, components and installation procedures shall be approved, for and capable of, supporting

data transmission rates of a minimum - 350 Mbps.

**1.6 Tendered Equipment List**

- .1 All termination components shall be TYCO/A.M.P. ACO Type II or TYCO/AMP CAT6 Keystone. Prepare a printed form listing the various materials, as well as the manufacturer's name, catalogue numbers, if any, and the suppliers name of all other equipment used in the tender. This list shall be submitted upon request.
- .2 Telephone handsets shall be supplied and installed by University of Manitoba
- .3 All cable routes shall be identified and entered on 'record' final drawings and all fibre patch panels shall be labelled as indicated by ACN and shown on route/cable plan.

**2.1 Material Cabling**

- .1 Cabling: Unshielded Twisted Pairs. Generally, the U.T.P. Media specifications contained in this section reflect the physical characteristics consistent with the UTP media, commonly known as Category 6. The industry standard I.E.E.E. 802.3 100BaseT will apply. Cable shall be Category 6 AMP yellow jacket reel-in-a-box TYCO/AMP Part #219560-8.
- .2 Construction: Eight single, solid conductors, 23 gauge (AWG), 100% fluorinated ethylene propylene (FEP) insulated, formed into 4 individually twisted pairs and enclosed by an overall plenum-rated jacket (FT4). Cable construction to be determined by the manufacturer to ensure compliance with the cross-talk requirements of the above standard.
- .3 Twenty-five Pair: The use of this cable to distribute high speed data (Ethernet) is not allowed. The use of the cable for data distribution other than specified shall be undertaken only as a special case considering system engineering guidelines as specified by ACN/IST.
- .4 Polarization: Generally arranged in compliance with Standard CSA-T529A. Each of eight (8) conductors, when used in conjunction with RJ45 modular plugs, or their corresponding jacks, shall be arranged in accordance with the following table:

<u>Conductor ID</u>	<u>Pin ID</u>	<u>Colour Code</u>
Pair 1	5	White/Blue (T)
Pair 1	4	Blue/White (T)
Pair 2	3	White/Orange (T)
Pair 2	6	Orange/White (T)
Pair 3	1	White/Green (T)
Pair 3	2	Green/White (T)
Pair 4	7	White/Brown (T)
Pair 4	8	Brown/White (T)

(T) denotes coloured tracer for identification.

**2.2 Copper Cabling Specifications**

- .1 The following non-DATA applications shall be a minimum of CAT5e:
  - .1 Alarms - Bertek Part #CM00424BKTE-5U-03 (red jacket)
  - .2 Audio/Visual - Anixter #CM00424DNX-7UP-04 (green jacket)
  - .3 Payphones – TYCO/AMP p/n219560-8 (yel jkt CAT6)
  - .4 DELTA System – white jacket. See also Sections 167747 + 15910.
  - .5 CARDACC System – purple jacket. See Section 16534.

### 2.3 Performance Data

- .1 Category 6 cable performance is intended for high-speed LAN applications ( $\geq 350$  Mbps). Category 6 Commercial Building Standard Specification for horizontal UTP cables. This specification places limits on the horizontal distances to assure minimum boundaries of performance. The cable run from the communication closet to the work area outlet is limited to 90 meters. An additional 3 meters is allowed from the outlet to the terminal and up to 7 meters allowance for patching on the cabinet patch panel to switching equipment.
- .2 Testing shall be to CAT6 standards and will be according to LINK test specifications only. LINK is defined as the installed CAT6 cable between the VDR Patch Panel and the office Communication Outlet (max length = 90 meters) and includes the test equipment patch cords (maximum of 4 meters total) at each end.
- .3 For reference only, note that testing will NOT be according to CHANNEL test specifications. CHANNEL is defined as the installed CAT6 cable between the VDR Patch Panel and the office Communication Outlet (max length = 90 meters) and includes the test equipment patch cords and the user equipment cords (maximum of 10 meters total).

### 2.4 Copper Riser System-Voice

- .1 See Section 16740.

### 2.5 Wall Mount Telephones (Copper)

- .1 See Section 16746 Copper Wall Phone Systems. See DE15, DE16, DE17

### 2.6 Materials - Cords & Connectors (see Appendix A, B, C)

- .1 Unless otherwise specified by the project, the contractor shall provide all materials according to the details specified below.
- .2 Data Patch Cords: Colour blue for data use (in voice-data room) shall be provided unless otherwise specified in project details. Four twisted pair Category 6 type stranded cable configuration indicated under 'Polarization' previously shown. (Section 2.1.4) Cords are required to be equipped with strain relief sleeves (yellow) over the jacks. All cords shall be labelled as to their manufacture, category level, and length. Engineer shall request batch testing information if doubt exists as to cable quality. Final cord length shall be determined after Client has assembled the cabinets. Allow seven meters for pricing purposes. For specific approved part numbers see APPENDIX C.
- .3 Data Line Cords: As detailed above for data patch cords except to be used in conjunction with workstation (office). Length required - 3 meters, colour blue with yellow boot. For specific approved part numbers see APPENDIX C.
- .4 Voice patch Cords: As detailed above except colour grey and 3 pair cable Category 3. Terminate cords with RJ12 non-keyed modular plugs. Allow 7 meters for pricing purposes. See attached Copper Cable List for details. Provide one (1) modular line cord and one (1) Cat 6 data patch cord for each keystone jack and ACO Data insert as per attached communication outlet schedule plus 10%. Provide one (1) voice patch cord for each ACO Voice insert as per attached communication outlet schedule plus 10%. For specific approved part numbers see APPENDIX C.
- .5 **Materials: ACO INSERTS**
  1. The actual quantities of each type of insert will be determined by IST/ACN after consulting with the Client. IST/ACN shall then supply an insert schedule to the contractor. The contractor shall install inserts to IST/ACN according to this schedule.
  2. The contractor shall provide and price for 2 inserts for every ACO CAT 6 cable (one for each end) installed with a ratio of 70% DATA inserts, 30% Voice inserts and 75% of total # of cables for Blank Inserts."

3. The Contractor shall supply total number of inserts to each Voice-Data Room.
4. Inserts that are not installed into patch panels as per the attached CO schedule, shall remain in each Voice-Data Room for use by IST for future Moves, Adds, Changes (MACs) in the building.

.6 **Cords: CAT6 ACO terminations**

1. Unless otherwise specified by the project, contractor shall supply cordage based on the percentages of actual CAT6 cables installed. The communication outlet (CO) schedules are for information and installation use only.
2. The cordage owed will be calculated on the total CAT6 installed for each Voice-Data Room and shall be delivered to each individual Voice-Data Room by the contractor. The contractor shall ensure that they inform Priority Electronics that the cordage is for the UofM.
3. The total cordage will be calculated:
  - total data patch cords = 60% of total CAT6 installed (ACO terminated)
  - total data line cords = 60% of total CAT6 installed (ACO terminated)
  - total voice patch cords = 35% of total CAT6 installed (ACO terminated). This shall be further broken down as: 60%=6ft, 40%=8ft.
4. IST shall provide to the contractor a further, detailed percentage breakdown of the cordage owed. This further breakdown will show the percentages of each cable length required. This further percentage breakdown detail shall be provided to the contractor after the contractor informs IST when they are within 4 weeks of completing the testing of the CAT6 cable plant. Cables shall be delivered by the contractor to each Voice-Data Room.

.7 **Cords: CAT6 KEYSTONE terminations**

1. Contractor shall supply a data patch cord for each keystone port installed regardless of whether the port is initially utilized or not.
2. Contractor shall supply a data line cord for each keystone port installed regardless of whether the port is initially utilized or not.
3. IST shall provide to the contractor a further, detailed percentage breakdown of the cordage owed. This further breakdown will show the percentages of each cable length required. This further percentage breakdown shall be provided to the contractor after the contractor informs IST when they are within 4 weeks of completing their testing of the CAT6 cable plant. Cables shall be delivered by the contractor to each Voice-Data Room.

**3.1 Installation**

- .1 Communications Outlet Assemblies (CO): Refer to Detail Drawing. Outlet assemblies at each workstation shall be as indicated on drawings to accommodate the required jack arrangement. This assembly shall be mounted either as a wall outlet (**vertical orientation @36" A.F.F.**) or on a dedicated communications floor pedestal (**install kit oriented to the right**), both complete with the associated face plate. Where floor pedestals are required use Walker Cat. #500 series, Part #500B plus #500 ACO complete with A.M.P. ACO II installation kit. CO's shall either have 2 Cat. 6 cables (dual outlet - CO2) or 4 Cat. 6 cables (quad outlet - CO4). Surface mount applications shall require the use of a Wiremold #VC5744-2 box (see DE5a + DE7)
- .2 Supply and install all communication cables and associated termination components as previously specified.
- .3 Ensure that all plenum cabling is kept clear of all power equipment and lighting fixtures.

INSTALLATION GUIDELINES

- . TRANSFORMERS UP TO 5kVA = > 1M (39")
- . POWER LINES (120V Systems) = > 300mm (12")
- . FLUORESCENT LIGHTING = > 300mm (12")
- . POWER LINES (600V Systems) = > 1M (39")
- . ELECTRICAL MOTORS = > 1M (39")

- .4 Identify all cables with numbered markers at both ends. Transfer identity number on to mark-up drawing for record purposes.
  - .1 alarm (RED JKT) cables, elevator phone line cables, CAT6 cables run for wall phones or payphones, shall be labeled, with a unique number, on the outer jacket, at both ends. The label used will include the room#'s for both the VDR and end location.
- .5 Ensure that all equipment is constructed to the Standards specified above. All like materials shall be by a single manufacturer.
- .6 No splicing, tapping or bridging devices will be used between specified connecting hardware and outlet assemblies.
- .7 Cabling should be installed over corridor areas and/or along lines parallel to building structures. Penetrations through full-height wall partitions should be made through pre-established horizontal openings or sleeves.
- .8 Cabling installed in ceiling plenum spaces shall be installed in a clip wireway as on detailed sheet attached. Support by cable ties to existing structures will only be approved by written consent of the Engineer.
- .9 All cable installations shall be protected from mechanical damage.
- .10 Cable should be free from tension over the entire length of each run.
- .11 Cable installation and termination methods shall be completed in a manner that will not degrade the cable specification. All I.D.C. terminations shall be inserted by the use of the proper tool. Use of the "dust cap" to effect insertion will not be considered adequate. Bundling, supporting, stripping of outer jacket, and retention of wiring twist will be subject to the final approval of the U of M. Work not meeting the above criteria will be re-done.
- .12 Cables dropped in wall cavity shall have insulated bushings fitted to the top wall plate.
- .13 All cables shall be labelled generally as indicated on drawings and shall adhere to EIA/TIA 606 Standard and University of Manitoba IST/ACN Standards.
- .14 All fire separation penetrations shall be fire stopped in compliance with Manitoba Building Code and N.F.P.A. regulations.
- .15 All conduit ends, including vertical stubs in wall cavities, shall be fitted with insulated grommets.
- .16 Where the use of surface conduit must be used a minimum box size for data/voice termination shall be 4 x 4 x 2 1/4 inches (WIREMOLD #VC5744-2), complete with either a single gang or double gang mud-ring as required by number of drops specified.
- .17 Use approved cable clips or hangers (2" J-Hook = B-Line #BCH32) at 2'-0" centres to effectively support all multi-cable harnessing. See DETAIL DE10.
- .18 Small numbers of cables splitting off the harness to individual room drops shall be supported by either Velcro straps or combined Panduit wirewraps/nylon ties (see detail).
- .19 Where installation is arranged in a hollow wall construction, MP1 or MP2 plates shall be used to allow maximum cable space in wall cavity.
- .20 Orientation of all faceplates shall be vertical for all installations. (Minimum of 36" AFF) Note: In the case of Walker Floor Pedestals, right hand orientation is required.

- .21 Where numbers warrant, centre hung cable tray shall be installed to support major harnessing, preferably over corridor areas. See DETAIL DE10.
- .22 Carefully monitor cable tension during installation. Do not exceed manufacturer's recommended pulling tension.
- .23 Cable tray drop-off chutes shall be fitted in all instances where cable exits this tray downward.
- .24 During installation data cable coils shall not be suspended from the structure by nylon ties or equivalent. Proper support of coils to prevent damage is essential.
- .25 One small loop of cable shall be arranged in the cable before entering the wall cavity. Excessive slack cable should be avoided as this increases run length. See detail.
- .26 Bundle data cable in transition areas between conduit and tray runs. Utilize data grade velcro ties for bundling only and not to support weight.
- .27 Cables shall be bundled in Groups of 8 for ACO installation and groups of 12 for keystone installation which equals one-half patch panel. Groups of eight or 12 shall alternate between left and right entry into each rack.
- .28 Contractor shall maintain communication outlet (CO) schedules in Excel format for the entire construction period. Request the electronic documentation from Consultant prior to commencement of construction.

### 3.2 Testing

- .1 Testing will be to CAT6 standards (LINK only). See also Section 16741 Clauses 2.3.2 + 2.3.3.
- .2 Test and record in tabular form the following for each outlet:
  - Wire Map
  - Length
  - Attenuation
  - Near End Crosstalk (NEXT)
  - Return Loss
  - PSNEXT,FEXT(including ELFEXT and PSELFEXT measurements)
  - Propagation Delay
  - Delay Skew
- .3 Test and record the length of all horizontal data field wiring from the wire management panel to the workstation outlet assembly.
- .4 Test results shall be submitted in electronic and shall include the date the tests were recorded, the installer's name and the test equipment used. Format of data file shall be .flw (assuming the use of FLUKE DSP4000 series test equipment). Other formats will be approved by ACN/IST on request.
- .5 An experienced data installer in compliance with Clause 1.4.2 shall perform the above testing.
- .6 Specify on tender documents, type of test instrument to be used to complete above test procedures.

### 3.3 Warranty

- .1 The installation Contractor shall support the installed system for a period of two years from the date of acceptance by the Owner. The response time to repair reported failures shall be four (4) hours within

the City of Winnipeg.

- .2 Contractor shall be responsible for obtaining all documentation necessary to achieve TYCO/AMP 15 year warranty
- .3 The installation Contractor shall indicate a willingness to enter into a Maintenance Agreement at the termination of the above warranty period as indicated in 3.3.1. The response time required shall be as under warranty above.

### 3.4 Qualified Voice-Data Contractors

- .1 The Electrical Contractor shall employ one (1) of the following qualified Voice-Data Installation Contractors for the supply and installation of the entire Voice-Data System including any required fibre optic cables:
  - .1 Wescan Electric - Tim Asmundson or Gary Kingsland - 786-3384.
  - .2 McCaine Electric - John Schubert - 786-2435.
  - .3 Static Electric - Richard Robertson -783-3236.
  - .4 Tri-Star Technical Ltd. - Rob Semchyshyn -788-4006.
  - .5 Len Andrews Enterprises - Len Andrews - 338-5174.
  - .6 Kingston Electric – Brian - 477-1405.
  - .7 ALLCO Electric – Ken Smith – Phone: (204) 697-1000.
  - .8 University of Manitoba Electrical Shop - Bruce Hancock - 474-6309.

**APPENDIX A - KEYSTONE INSTALLATIONS**

ITEM#	MANUFACTURER	PART NUMBER	DESCRIPTION
1	TYCO/AMP	558329-1	1.75" CABLE MANAGEMENT PANEL
2	TYCO/AMP	1375014-1	24 PORT CAT6 KEYSTONE PATCH PANEL
3	TYCO/AMP	558301-1	CABLE MANAGEMENT SUPPORT BAR
4	TYCO/AMP	1375055-2	RJ45 CAT6 KEYSTONE JACK (BLK)
5	TYCO/AMP	557505-1	2 PORT SINGLE GANG FACEPLATE
6	TYCO/AMP	558088-1	4 PORT SINGLE GANG FACEPLATE
7	TYCO/AMP	83935-1	4 PORT DOUBLE GANG FACEPLATE
8	TYCO/AMP	83936-1	6 PORT DOUBLE GANG FACEPLATE
9	TYCO/AMP	406339-1	BLANK INSERT (KEYSTONE FACEPLATE)
10			
11			
12			
13	*NORDX/CDT	AX100464	24 PORT RJ45 PATCH PANEL
14	*NORDX/CDT	AX101173	CABLE SUPPORT BAR FOR AX100464 (2 REQ'D FOR EACH AX100464)
15	*ATL	HCM-1D	CABLE MGMT D-RING HORZ PANEL (1RU)
15	TYCO/AMP	219560-8	305M BOX YEL JKT CAT6 CABLE

\*for voice distribution only.

**Note: ICONS are not required for keystone installations.**

**APPENDIX B - ACO INSTALLATIONS**

ITEM #	MANUFACTURER	PART #	DESCRIPTION
1	MIDDLE ATLANTIC (vendor = ANIXTER)	HCM-1D (ANIXTER P/N 231109)	1.75" CABLE MANAGEMENT PANEL
2	TYCO/AMP	406359-1	16 PORT PATCH PANEL
3	TYCO/AMP	406091-1	DUAL AC02 INSTALL KITS
4	TYCO/AMP	558510-1	SINGLE GANG ICONABLE FACEPLATE
5	TYCO/AMP	558512-1	DUAL GANG ICONABLE FACEPLATE
6	TYCO/AMP	4-556340-1	DUAL GANG (1 side blank) FACEPLATE
7	TYCO/AMP	557280-1	CAT5e DATA INSERT
8	TYCO/AMP	555611-1	CAT3 VOICE INSERT
9	TYCO/AMP	555644-1	BLANK INSERT
10	TYCO/AMP	557280-1	DUAL CAT5e DATA INSERT
11	TYCO/AMP	555614-1	DUAL CAT3 VOICE INSERT
12	TYCO/AMP	1711000-1	QUAD CAT3 VOICE INSERT
13			
14			
15	TYCO/AMP	219560-8	305M BOX YEL JKT CAT6 CABLE

**APPENDIX C - CORDAGE**

ITEM #	MANUFACTURER	PART #	DESCRIPTION
1	PRIORITY	P97-9349	1M RJ45 568A BLUE CAT6 W/YEL BOOTS
2	PRIORITY	P97-9350	2M RJ45 568A BLUE CAT6 W/YEL BOOTS
3	PRIORITY	P97-9351	3M RJ45 568A BLUE CAT6 W/YEL BOOTS
4	PRIORITY	P97-9347	5' RJ45 568A BLUE CAT6 W/YEL BOOTS
5	PRIORITY	P97-9348	7' RJ45 568A BLUE CAT6 W/YEL BOOTS
6	PRIORITY	P97-5353-xx	RJ45 568A BLUE CAT6 W/YEL BOOTS x= length, > = ft, M= meters
7			
8	PRIORITY	P97-9243-8'	8' RJ12 GREY for VOICE
9	PRIORITY	P-97-9243-XX'	RJ12-RJ45 GREY for VOICE XX = length, > = ft, M= meters
10			

\*\*\*

**1.1 Related Work**

- |    |                                       |               |
|----|---------------------------------------|---------------|
| .1 | Electrical General Provisions         | Section 16010 |
| .2 | Basic Electrical Material & Methods   | Section 16050 |
| .2 | Conduit, Tray, Miscellaneous Supports | Section 16112 |

**1.2 Code and Standards**

- .1 CAN/CSA - T529 (Electrical Installations).
- .2 CAN/CSA - T528 (Wiring Systems Administration).
- .3 CAN/CSA - T530 (Telecommunication Pathways and Spaces).
- .4 IEEE Std. 1100 (Powering and Grounding Sensitive Electronic Equipment).
- .5 EIA/TIA, IEEE, FCC Standards (Data System, Performance Standards).
- .6 Manitoba Building Codes (Fire Ratings, Wall Penetration, etc.).
- .7 CAN/CSA C22.1 Section 60.

**1.3 Contractor Qualification**

- .1 Coordinate with the U of M Project Coordinator to verify if necessary permits are to be obtained.
- .2 Only University of Manitoba Qualified Communication Installation Contractors will be considered for the work (see section 16742-3.2.3 for list). Contractors may be asked to provide evidence of having performed work of a similar type as specified. Subcontracting of electrical installation must be requested and approved (if acceptable) in writing prior to tender/bid closing.
- .3 Contractor shall be trained and authorized by the manufacturer they represent. Include evidence of certification and references with bids. Sub-contracting of the certification must be requested and approved (if acceptable) in writing prior to tender/bid closing.
- .4 Own and maintain tools and test equipment for the successful installation and testing of the copper and fibre cabling system. Provide list of the type and manufacturer of all test equipment to be used. Include with bid.
- .5 Refer to Section 16742 clause 3.2.3 'Qualified Voice-Data Contractor'.

**1.4 Scope of Work**

- .1 This specification is intended to cover the supply and installation of the Fibre Optic Cables detailed below and all associated pull boxes, splice closures, wall mounted interconnect units, patch panels and fibre termination equipment.
- .2 The actual operating characteristics of the optical fibre cable shall be determined by the System Designer. The selection of all active components and their ordination is outside the scope of this specification. Close co-ordination of design, specification and installation is

necessary to ensure that the selected cable meets not only performance requirements but also the mechanical construction of the media to withstand the installation environment.

## 1.5 Approvals

- .1 Equipment and routing of all cables shall be approved by the University of Manitoba Electrical Shop prior to installation.

## 2.1 Building Entrance Cable (Fibre Optic WAN)

- .1 The Fibre Optic (data) building entrance cable shall be an UltraFox product as manufactured by Optical Cable Corporation (OCC). The specific part number shall be specified by ACN/IST.

See Appendix at the back of section 16742.

- .2 Fiber Optic Cable that is installed via underground ducts, shall have a copper wire included in the overall sheath. This cable shall be specified by ACN/IST. Alternate method would be to install a #6 Green insulated cable which is pulled into the duct at the same time as the FO cable. The method used will depend on the cable type specified. These details will be specified by ACN on a project by project basis.

## 2.2 Riser Cable (Fibre Optic)

- .1 The Fibre Optic (Data) riser cables required shall be an UltraFox product as manufactured by Optical Cable Corporation (OCC). The specific part number shall be specified by ACN/IST. See Appendix at the back of section 16742.
- .2 The riser system shall be fibre, as specified, to link the Main Distribution Closet (MDC) to each of the Intermediate Distribution Closets (IDC). The total riser system shall be cabled in a Star Topology. It shall consist of the riser transmission media between the above locations and the associated hardware terminating the media.

## 2.3 Materials (See Appendix at the back of section 16742)

- .1 Connectors shall be ST compatible type, no epoxy/no polish, clean only connector with ceramic ferrule. The maximum optical attenuation per each mated connector pair shall not exceed 0.5db.
- .2 Patch Panels shall be as follows:  
Each rack mount or wall mount patch panel shall consist of the materials shown in Appendix C +/- D and will be assembled as per drawings as supplied.
- .3 Supply Fibre Optic Patch Cords as specified for each project. See Appendix E.

## 2.4 Installation

- .1 Adequate riser sleeve space shall be available and/or shall be re-enterable in all Communications Closets such that no additional drilling or sleeving is necessary.
- .2 The Contractor shall ensure the appropriate fiber stopping sleeves are installed in compliance with Manitoba Building Code and N.F.P.A regulations.
- .3 Manufacturers recommended bending radius for cable during installation and after installation

- shall be complied with.
- .4 Carefully monitor cable tensions during installation. Observe manufacturer recommended maximum pulling tension fore each type of cable installed.
  - .5 Identify all raceways and cable trays every 50' with appropriate warning labels to indicate presence of Fiber Optic Cable. Where cable is visible on tray it should be identified with a caution tag (plastic) secured with nylon tie-wraps every 50'. Do not over tighten tie-wraps.
  - .6 Vertical riser cables shall be secured at each floor level with approved strain relief equipment.
  - .7 After installation is complete there should be no tensile forces on the cable. The only exception to this is for riser installations, where the only allowable tensile force on the operating cable is that of its own weight.
  - .8 During installation protect the cable from kinks, crimps, sharp edges or area where the cable may be crushed.
  - .9 Do not route cable unsupported over (or support cable by) pipes, conduit, ceiling grid, or other wiring.
  - .10 Reduce pull friction by cleaning and lubricating cables at the raceway point of entry. Use only approved lubricants for this purpose.
  - .11 Do not run Fiber Optic Cable in same raceway as copper wiring. Carlon raceway (FT4 rating) may be required for all tray. Run fibre cable in raceway to provide protection and isolation.
  - .12 Do not pull cables through LB conduit fittings. Where practical, when raceway changes direction install a maximum 12" x 12" x 6" pull box. Conduit shall enter and leave the box in the same direction. No more than two quarter bends are allowed between boxes.
  - .13 Cables dropped in wall cavity shall have insulated bushings fitted to the top wall plate.
  - .14 Where installation is arranged in a hollow wall construction (preferred), MP1 and MP2 plates shall be used to allow maximum cable space in wall cavity. (Vertical orientation at 36" AFF)
  - .15 All conduit ends, including vertical studs in wall cavities, shall be fitted with insulated grommets.
  - .16 Bond all metallic enclosures associated with the cable installation in compliance with C.E.C. Section 10.
  - .19 Dust caps shall be utilized whenever cables or devices are not immediately connected.
  - .20 Cable labeling: refer to Section 3.0 for specifications. Labelling shall be provided as follows:
    - at all points where cables enter or leave conduits or cable trays.
    - at termination points
    - at intervals (shall be determined) on long runs of exposed cables
  - .21 All cables shall be labelled generally as indicated on drawings and shall adhere generally to EIA/TIA 606 Standard and more specifically to University of Manitoba standard, where they enter the building with coded identification to show the department and function of the cable.

- .22 The Contractor is responsible for the total clean-up of all fibre cable debris at each termination site. All jacket, conductor casing and cleaved fibre remnants shall be carefully bagged and removed from the site. Disposal in garbage containers within the building will not be allowed.

**2.5 Fibre Terminations**

- .1 Termination of all fibre shall be completed by qualified University of Manitoba Voice/Data Fibre Contractor as outlined in Section 16742 clause 3.2.3.
- .2 Splices, where required and authorized, shall be of fusion type only. Splices will be approved only by University of Manitoba ACN/IST Department.
- .3 Mechanical splices will **NOT** be allowed at the University of Manitoba.

**2.6 Testing (Fibre Optic Cable)**

- .1 Measure of cable plant segments per EIA/TIA-526-14 Method A.

Part 1 : Acceptance of test results

A. Each cabling link shall be in compliance with the following test limits:

1. Optical loss testing:

Backbone (multimode and singlemode) link

- The link attenuation shall be calculated by the following formulas as specified in ANSI/TIA/EIA-568-B.1.
  - Link Attenuation (dB) = Cable\_Attn (dB) + Connector\_Attn (dB) + Splice\_Attn (dB)
  - Cable\_Attn (dB) = Attenuation\_Coefficient (dB/km) \* Length (Km)
  - Connector\_Attn (dB) = number\_of\_connector\_pairs \* connector\_loss (dB)
  - Maximum allowable connector\_loss = 0.75 dB
  - Splice\_Attn (dB) = number\_of\_splices \* splice\_loss (dB)
  - Maximum allowable splice\_loss = 0.3 dB
  - The values for the Attenuation\_Coefficient (dB/km) are listed in the table below:

Type of Optical Fiber	Wavelength (nm)	Attenuation coefficient (dB/km)	Wavelength (nm)	Attenuation coefficient (dB/km)
Multimode 62.5/125 µm	850	3.5	1300	1.5
Multimode 50/125 µm	850	3.5	1300	1.5
Single-mode (Inside plant)	1310	1.0	1550	1.0
Single-mode (Outside plant)	1310	0.5	1550	0.5

2. OTDR testing

- Reflective events (connections) shall not exceed 0.75 dB.
- Non-reflective events (splices) shall not exceed 0.3 dB.

## 3. Magnified endface inspection

- Fiber connections shall be visually inspected for endface quality.
- Scratched, pitted or dirty connectors shall be diagnosed and corrected.

B. All installed cabling links and channels shall be field-tested and pass the test requirements and analysis as described in Part II

Any link or channel that fails these requirements shall be diagnosed and corrected. Any corrective action that must take place shall be documented and followed with a new test to prove that the corrected link or channel meets performance requirements. The final and passing result of the tests for all links and channels shall be provided in the test results documentation in accordance with OPTICAL FIBER CABLE TESTING.

C. Acceptance of the test results shall be given in writing after the project is fully completed and tested in accordance with the specifications and to the satisfaction of the Univ. of Manitoba.

## Part II: OPTICAL FIBER CABLE TESTING

A. Field-test instruments shall have the latest software and firmware installed.

B. Link and channel test results from the OLTS and OTDR shall be recorded in the test instrument upon completion of each test for subsequent uploading to a PC in which the administrative documentation (reports) may be generated.

C. Fiber endfaces shall be inspected at 250X or 400X magnification. 250X magnification is suitable for inspecting multimode and singlemode fibers. 400X magnification may be used for detailed examination of singlemode fibers. Scratched, pitted or dirty connectors shall be diagnosed and corrected.

D. Testing shall be performed on each cabling segment (connector to connector).

E. Testing of the cabling shall be performed using high-quality test cords of the same fiber type as the cabling under test. The test cords for OLTS testing shall be between 1 m and 5 m in length. The test cords for OTDR testing shall be approximately 100 m for the launch cable and at least 25 m for the receive cable.

G. Optical loss testing

- Multimode backbone links shall be tested at 850 nm and 1300 nm in accordance with ANSI/EIA/TIA-526-14A, Method B, One Reference Jumper or the equivalent method.
- Singlemode backbone links shall be tested at 1310 nm and 1550 nm in accordance with ANSI/TIA/EIA-526-7, Method A.1, One Reference Jumper or the equivalent method.
- Link attenuation does not include any active devices or passive devices other than cable, connectors, and splices, i.e. link attenuation does not include such devices as optical bypass switches, couplers, repeaters, or optical amplifiers.
- Use the One Reference Jumper Method specified by ANSI/TIA/EIA-526-14A, Method B and ANSI/TIA/EIA-526-7, Method A.1 or the equivalent method. The user shall follow the procedures established by these standards or application notes to accurately conduct performance testing.

## H. OTDR Testing

- Backbone links shall be tested at the appropriate operating wavelengths for anomalies and to ensure uniformity of cable attenuation and connector insertion loss.
  - Backbone multimode: 850 nm and 1300 nm
  - Backbone singlemode: 1310 nm and 1550 nm
- Each fiber link and channel shall be tested in one direction.
- A launch cable shall be installed between the OTDR and the first link connection.
- A receive cable shall be installed after the last link connection.

## I. Magnified Endface Inspection

- Fibers shall be inspected at 250X or 400X magnification. 250X magnification is suitable for inspecting multimode and singlemode fibers. 400X magnification may be used for detailed examination of singlemode fibers.

## J. Length Measurement

- The length of each fiber shall be recorded.
- It is preferable that the optical length be measured using an OLTS or OTDR.

## K. Polarity Testing

- Paired duplex fibers in multi-fiber cables shall be tested to verify polarity in accordance with subclause 10.3 of ANSI/TIA/EIA-568-B.1. The polarity of the paired duplex fibers shall be verified using an OLTS.

- .3 The Contractor shall be trained and equipped to properly test the multimode and single mode optical fibre cable plant. (Refer to Section 16742 clause 3.2.3, Qualified Voice-Data Contractors). This term is used to indicate fibre cable, connectors, mounting panels, jumper cables and other passive components, but does not include active components.
- .4 Contractors test documents shall include copies of the fibre manufacturers Reel Labelling information for future reference.
- .5 An experienced data installer in compliance with Section 16742 Clause 3.2.3 shall perform the above testing.
- .6 Test results shall be submitted electronically in .PDF format. Contact IST/ACN for specific format of test result report.

**3.0 Labeling** - The following cable labelling shall be provided:

- .1 WAN Fibre Optic (FO) and Copper (CU) Cable owned by non-UofM departments will be labeled with unique labels as supplied by the owner of said cable and as approved by UofM IST and Physical Plant. Labels will be applied per Clause 3.4.
- .2 Labels will be installed per Clause 3.4 for all WAN FO and CU cables owned by IST as follows:
  - GREEN w/white print: **UofM Network CU**
  - BLUE w/white print: **UofM Network FO**

- .3 All labels for IST University Departments shall be purchased at cost from U of M, ACN/IST.
- .4 Labeling shall be installed as follows:
  - at all points where cables enter or leave conduits or cable trays
  - at termination points
  - at intervals (shall be determined) on long runs or exposed cables

### 3.1 Warranty

- .1 The Installation Contractor shall support the installed system for a period of two years from the date of acceptance by the Owner. The response time to repair reported failures shall be four (4) hours within the City of Winnipeg.
- .2 Contractor shall be responsible for obtaining all documentation necessary to achieve A.M.P. 15-year warranty.
- .3 The Installation Contractor shall indicate a willingness to enter into a Maintenance Agreement at the termination of the above warranty period as indicated in 3.3.1. The response time required shall be as under warranty above.

### 3.2 Qualified Voice-Data Contractors

- .1 On-site installers used by the Contractor shall have completed the approved AMP training and certification. The Contractor shall submit the name of on-site installers to be used for the contract as well as a copy of each persons AMP certification. The required training shall be:
  - AMP ACT1 for cable installers and cable terminators
  - AMP ACT1 + AMP ACT2 for those performing the testing and certification of the installed cable plant.
- .2 The Electrical Contractor shall employ one (1) of the following qualified Voice-Data Installation Contractors for the supply and installation of the entire Voice-Data system including any required fibre optic cables:
  - .1 Wescan Electric, Tim Asmundson or Gary Kingsland - 786-3384.
  - .2 McCaine Electric, John Schubert - 786-2435.
  - .3 Static Electric, Richard Robertson -783-3236.
  - .4 Tri-Star Technical Ltd., Rob Semchyshyn - 788-4006.
  - .5 Len Andrews Enterprises, Len Andrews - 338-5174.
  - .6 Kingston Electric, Terry Moffat - 477-1405
  - .7 Allco Electric - Ken Smith - 697-1000
  - .8 University of Manitoba Electrical Shop, Bruce Hancock - 474-6309.
- .3 The Electrical Contractor shall employ one (1) of the following qualified Voice-Data Installation Contractors for the termination and testing of all required fibre optic cables:
  - .1 Tri-Star Technical Ltd. - Rob Semchyshyn - 788-4006.

**APPENDIX A - FIBRE OPTIC CABLE**

Indoor/outdoor application - Optical Cable Corporation (OCC) UltraFOX cable is suitable for both indoor and outdoor applications. Outdoor applications shall require cable to be installed via a duct per University of Manitoba Standards. This cable is FT4 rated.

	<b>OCC Part# (MultiMode)</b>	<b>OCC Part # (SingleMode)</b>
6 strand	BX06-095D-W3SB/1UC/900-OFNR	BX06-095D-SYMC/YMD/900-OFNR
12 strand	BX12-125D-W3SB/1UC/900-OFNR	BX12-125D-SYMC/YMD/900-OFNR
24 strand	BX24-175D-W3SB/1UC/900-OFNR	BX24-175D-SYMC/YMD/900-OFNR

*Maximum pair count used for fibre optic cable at the U of M = 24. Written approval required from ACN/IST for fibre optic cable exceeding 24 strands.*

**APPENDIX B - FIBRE OPTIC CABLE CONNECTORS**

For Multimode cable: Corning/Siecor 95-000-50 UNICAM ST/MM

For Singlemode cable: Corning/Siecor 95-200-52 UNICAM ST/SM

**APPENDIX C – RACK MOUNT PATCH PANELS**

**Rack mount** applications (1 complete patch panel assembly is required at each end of the cable)

Multi Mode Fibre Optic Cable (for 6, 12, or 24 strand cables)

- 1 Ortronics OR-615MMC-36P Cabinet complete with:
- \*\*6 Ortronics OR-61500020 blank connector panels
- 24 Corning TER-529 ST SM/MM Adaptors

Single Mode Fibre Optic Cable (for 6, 12 or 24 strand cables)

- 1 Ortronics OR-615MMC-36P Cabinet complete with:
- \*\*6 Ortronics OR-61500020 blank connector panels.
- 24 Corning TER-529 ST SM/MM Adaptors

\*\*mounting holes shall be punched into these panels to accommodate the adaptors. See DE11.

**APPENDIX D - WALL MOUNT PATCH PANELS**

**Wall mount** applications (1 complete patch panel assembly is required at each end of the cable)

MultiMode Fibre Optic Cable

- 1 Corning/Siecor WIC-012 wall mount panel complete with:
- 1 Corning/Siecor WIC-GUARD
- 1 Corning/Siecor WIC-CP1-15 adaptor panel complete with 6 ST/MM adaptors (6 strand cable)
- 1 Corning/Siecor WIC-CP1-15 adaptor panel complete with 12 ST/MM adaptors (12 strand cable)

SingleMode Fibre Optic Cable

- 1 Corning/Siecor WIC-012 wall mount panel complete with:
- 1 Corning/Siecor WIC-GUARD
- 1 Corning/Siecor WIC-CP1-19 adaptor panel complete with 6 ST/SM adaptors (6 strand cable)
- 2 Corning/Siecor WIC-CP1-19 adaptor panel complete with 12 ST/SM adaptors (12 strand cable)

**APPENDIX E - FIBRE OPTIC CABLE PATCH CORDS**

1. fibre optic patch cords shall be manufactured by Priority Electronics.
2. Multimode cords shall have an orange jacket.
3. SingleMode cords shall have a yellow jacket.
4. Cords with SC or LC connectors shall have the connectors clipped together at the ends where SC or LC connectors are installed.

Priority Part # (MultiMode)		Priority Part # (SingleMode)
Duplex ST/ST	D33MXX (XX=length, >=ft, M=meters)	P97-9369-XX (XX=length, >=ft, M=meters)
Duplex ST/SC	P97-9364-XX (XX=length, >=ft, M=meters)	P97-9366-XX (XX=length, >=ft, M=meters)
Duplex SC/SC	P97-9365-XX (XX=length, >=ft, M=meters)	P97-9368-XX(XX=length, >=ft, M=meters)
Duplex LC/LC	P97-9751-XX (XX=length, >=ft, M=meters)	
Duplex ST/LC	P97-9749-XX (XX=length, >=ft, M=meters)	P97-9758-XX(XX=length, >=ft, M=meters)
Duplex SC/LC	P97-9750-XX (XX=length, >=ft, M=meters)	P97-9757-XX(XX=length, >=ft, M=meters)
Duplex MTRJ/ST	P97-9759-XX (XX=length, >=ft, M=meters)	
*Simplex ST/ST	S33MXX-grey (XX=length, >=ft, M=meters)	

\*Simplex cords specified for video applications shall have a grey jacket.

\*\*\*

### 1.0 General

- .1 Access to Voice-Data Rooms (VDRs) will be restricted to authorized personnel as per IST/ACN Security Policy
- .2 No equipment or materials can be installed into a Voice-Data room without prior authorization of IST/ACN.
- .3 Installation shall comply with the following codes and standards:
  - .1 EIA/TIA569 (Telecom Pathways and Spaces)
  - .2 EIA/TIA 607 (Grounding & Bonding Requirements)
  - .3 Manitoba Building Codes (fire ratings, wall penetrations, etc.)
- .4 Voice-Data rooms shall be located within a maximum installed cable length of 90 meters of the Communications Outlets (CO's) it will serve.
- .5 The number of Voice-Data rooms shall be determined by the total size (square footage) of the construction.
- .6 The minimum size of a Voice-Data room will be 10' x 12'.
- .7 The final size and equipment layout of each Voice-Data room shall be confirmed by IST/ACN. See DETAIL DE8.
- .8 Each Voice-Data room shall have its own environmental control (heating, cooling and humidity) that will be separate from any other room. Temperature is to be maintained at a maximum of 20 deg. C. 24hrx365days. See Section 15000 (mechanical) for details.
- .9 Each Voice-Data room will be supplied with positive air pressure. See Section 15000 (mechanical) for details.
- .9 Where sprinkler heads are installed into a Voice-Data room, they shall be of the "dry charged" or pre-action type. See Section 15000 (mechanical) for details.

### 2.0 Construction Details

- .1 All walls of the Voice-Data room shall be lined with 3/4" G.I.S. plywood installed to 96" AFF level. Paint with light coloured fire retardant paint.
- .2 The Voice-Data room entrance door size shall be 3'-0" wide. The door will be oriented to one corner of the room. The door shall be fitted with an automatic closure device.
- .3 Provide two (2) entrance controls on the door to the Voice-Data room.
  - Lock set will be E'PLEX (formally UNICAN) Model #E5031
  - card swipe by CARDAC Systems. Confirm with IST/ACN for details.
- .4 Adequate work area lighting will be installed to a minimum of 540 lux (50 foot candles).

NOTE:

Lighting should not be powered from the same distribution panel as the telecommunications equipment in the room. Dimmer switches shall not be used in the Voice-Data room.

### 3.0 Equipment Details

- .1 12" centre hung cable tray shall be installed wall-to-wall within the Voice-Data room, centered above the equipment racks. Cable "drop-outs" will be installed at all locations where cable drops down from

cable tray.

- .2 Isolated ground, surge protected AC duplex receptacles will be installed on equipment racks. See DETAIL DRAWINGS.
- .3 An isolated ground, surge protected AC duplex receptacle will be installed on the same wall as the BIX field @72" O/C A.F.F. either left or right of the BIX field.
- .4 Final positioning of electrical outlets will be confirmed on-site by IST/ACN.
- .5 The main Voice-Data Room (sometimes referred to as the Main Distribution Closet or MDC) will have one surge protected "emergency generator" power (where available) receptacle and one isolated ground surge protected power receptacle installed to the "actives" distribution equipment rack. Where emergency power is not available, both receptacles will be of the isolated ground surge protected type. See DE3, DE4, DE13.
- .6 Install floor mounted equipment racks (Priority Part # P97-9025) and securely bolt to floor using all 4 mounting holes on the base of the racks. See DE3, DE4, DE13.
- .7 A ground bar, bonded to building ground, will be installed on the same wall as the BIX field @66" O/C A.F.F and below the power receptacle installed @clause 3.3. See DETAILS DE14 and DE20.
- .8 A #6AWG green insulated bonding conductor will be installed from ground lug on each rack and cable trays and connect to the Telecommunications Ground Bus as per University of Manitoba Standards. Detail drawing. See DETAIL DE14.
- .9 Final equipment layout of the Voice-Data room shall be confirmed by IST/ACN only after an on-site meeting between the Contractor and IST/ACN. Equipment racks will be positioned 36" O.C. from the designated "back wall" and "butted up to" the wall of the room that is furthest from the entrance door.

**APPENDIX A – TYPICAL VDR MATERIALS**

PRIORITY PART#	DESCRIPTION
*P97-9025	19" OPEN TOP EQUIPMENT RACK
P97-9032	4" VERTICAL CABLE MANAGEMENT
P97-9301	8" VERTICAL CABLE MANAGEMENT
** 1585T8A1	48", 8 RECEPTACLE POWER BAR
P97-9155	NYLON MOUNTING HARDWARE FOR 1585T8A1 POWER BAR
P97-9161	BIX BOARD ASSEMBLY W/2X12E'S
P97-9030	CENTRE MOUNT SHELF

\* Each P97-9025 EQUIPMENT RACK comes w/RU#'s embossed on mounting rails.  
 Each RACK also comes with 100-10-32 x 1/2in Truss Head Philips S/S M/S which will be given to IST for each rack delivered and installed at the University of Manitoba.

\*\* Power bars will be installed using P97-9155 nylon mounting hardware.

**1.0 CCTV cable**

.1 see also Section 16765.

.2 Unless otherwise specified (by IST), the following cable types are to be used for all CCTV and video applications (no substitutions):

- Indoor = BELDEN #8281B precision video coax
- Indoor = BELDEN #8451 single pair cable 24VAC power.
- Outdoor = BELDEN #8461 high-conductivity single pair Copper Cable 24VAC power.

\*\*\*

**1.0 Wall Mount Telephones (Copper)**

- .1 Wall mount telephones shall be mounted at 48" O/C A.F.F. See DETAILS DE15, DE16, DE17.
- .2 Typical wall phone mounting detail for existing construction into hallways and open areas. Supply and install one (1) Cat 6 cable to assigned Voice/Data room and patch panel location. Label, terminate and test both ends. See DETAILS DE-16 and DE17.
- .3 Typical wall phone mounting detail for new construction into hallways and open areas. Mount a deep rectangle electrical box on a stud at 48" O/C. A.F.F. Provide and install one (1) Cat 6 cable from assigned VDR patch panel location. At the Phone end, install a keystone RJ45 jack and install a SEMTROM Part# 1-ORE-LEV-PHONE cover plate. Label, terminate and test both ends. See DETAILS DE-16 and DE17.
- .4 If a wall phone is requested for an office, install a typical Communication Outlet (CO2) at 36 O/C A.F.F. at the location where the wall phone will be installed. The phone office will install the phone using a mounting cord to the phone from the regular Communication outlet.
- .5 Emergency Phone Mount for existing construction. Provide and install one (1) Red Cat 5e or better from backboard location to the nearest Voice/Data BIX field. Label both ends. IST to terminate. See DETAIL DE -15
- .6 Emergency Phone Mount for NEW CONSTRUCTION. Mount an electrical outlet box on a stud at 48" O/C A.F.F. Provide and install one (1) Red Cat 5E from electrical outlet to the nearest Voice/Data Room BIX field. Label both ends. IST to Terminate.

\*\*\*

**1.0 DELTA SYSTEM Copper Cable**

- .1 See SECTION 15910 for complete details.
- .2 Cable used shall be **white** jacket, minimum CAT5e (TYCO/AMP #57826-2).
- .3 Termination materials for cable @VDR TYCO/AMP P/N 406390-1, 12 port CAT5e wall mount keystone patch panel. Location of patch panel in VDR will be confirmed on-site by ACN/IST.
- .4 Termination materials at DELTA panels will be surface mount TYCO/AMP CAT5e (minimum) keystone box. Delta keystone surface mount box = TYCO/AMP 1116697-1 w/ 1x CAT5e RJ45 jack TYCO/AMP #1375191-2 (black).

\*\*\*

**1.0 General**

- .1 IST will be responsible for clearly identifying all obsolete cables to be removed. Typically this would include cutting all such cables away from their interconnect blocks.
- .2 DIV16 will NOT make any field decisions when it comes to deciding whether a particular cable or cables need to be removed, they will at all times contact IST for a decision.
- .3 DIV16 will include the removal of all obsolete in-building cables as identified by IST regardless of what has been identified in the design drawings. 'In-building' cables are defined as all cables that do not leave a building.
- .4 DIV16 will include the removal of all obsolete 'between-building' cables as identified by IST regardless of what has been identified in the design drawings. 'Between-building' cables are defined as cables that originate in one building and terminate in a different building.
- .5 DIV16 will include the removal of all telephone jacks that are accessible without having to move furniture, filing cabinets, etc. Final confirmation, that all accessible jacks that can be removed have been removed, will be by IST. If the jacks are via an electrical box or caddy plate, electrical shop will sup/ins a blank cover plate. If the jacks are via surface mount jack assemblies, the jack will be carefully removed. All jacks removed will be returned to the IST telephone office.
- .6 where bundles of cable that are secured with cable ties contain some cables that are part of the removal and some cables that must remain, where practicable, the remaining bundles will be re-secured with the use of Velcro straps rather than with the use of cable ties. If cable ties must be used, then care will be taken to not over-cinch the cable ties. Over-cinching of cable ties may damage cables, especially if there are fibre optic cables in the bundle.
- .7 DIV16 will be responsible for removing and disposing of all cables removed. See Section 16742 Clause 2.4.22 for specific instructions re: disposal of fibre optic materials.

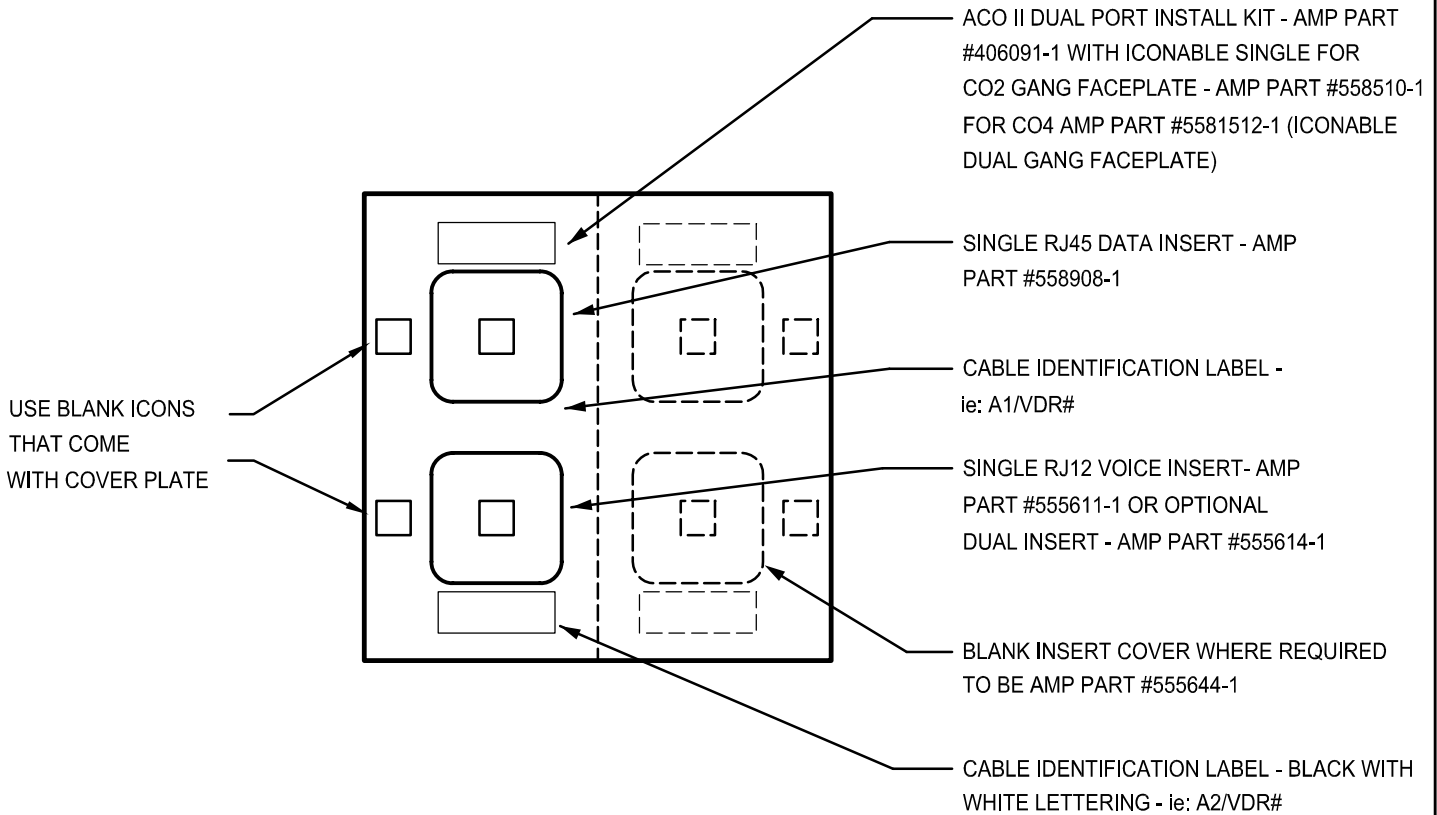
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1.0 **General**

- .1 All Communication Outlets (CO's) and AC power outlets specified for installation into computer labs will be installed per Section 16741.
- .2 In general, all CO's and AC power outlets will be installed on the underside of the tables.
- .3 Where CO's are designated specifically for laptop use in computer labs, the CO's and AC power outlets will be installed above table tops.
- .4 Where a printer room is specified, CO's and AC power outlets for the computer lab printer room will be installed @36" A.F.F.
- .5 Where an advisor's office is specified, the CO's and AC power outlets will be installed @36" A.F.F.
- .6 Specific details (locations for CO's, etc) for items 1.2, 1.3, 1.4, 1.5 will be provided on a project basis by IST.

\*\*\*





## COMMUNICATION OUTLET

N.T.S.

NOTES:

1 - COMMUNICATION OUTLETS TO BE INSTALLED VERTICALLY AT 36" o/c A.F.F. TYPICALLY - ALL CABLE TERMINATIONS, COVERPLATES AND INSERTS TO BE SUPPLIED, INSTALLED, WIRED, CONNECTED AND TESTED BY ELECTRICAL CONTRACTOR UNLESS OTHERWISE NOTED.

2 - ALL SURFACE MOUNTED COMMUNICATION OUTLETS TO BE 2 GANG DEEP WIREMOLD BOX # VC5744-2.



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SCALE: N.T.S.

DRAWN BY: E.V.

DATE: JAN 2006

REQ. NO.: C00000

DRAWING TITLE:

**PROJECT**

SHEET TITLE:

TYPICAL COMM. OUTLET DETAIL - ACO

PROJECT NO.:

**15-P-0001**

DWG. NO.:

**DE-2**

1.75" CM PANEL  
MIDDLE ATLANTIC HCM-1D  
ANIXTER P/N 231109

TYPICAL 7FT. OPEN TOP 19"  
EQUIPMENT RACK, PRIORITY  
PART #P97-9025.

HAMMOND P/N 1585T8A1  
48", 8 RECEPTACLE  
POWER BAR INSTALL  
USING PRIORITY P/N  
P97-9155 NYLON  
MOUNTING HW

MAXIMUM 8  
PATCH PANELS

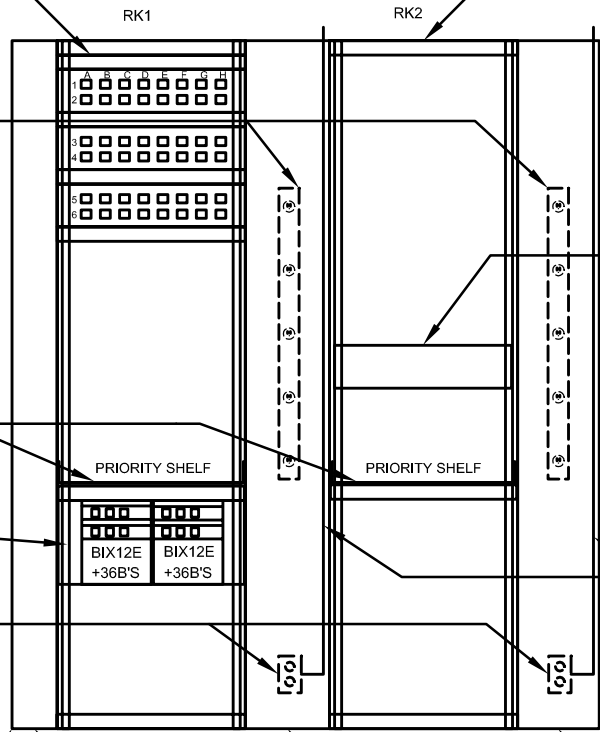
PRIORITY PART  
#P97-9030

PRIORITY PART  
#P97-9161 BIX BOARD.

DUPLEX 15A 125VAC I.G.  
RECEPTACLE 12" AFF BY E.C.  
SEPERATE CIRCUITS FOR  
EACH

TYPICAL 1" FROM WALL

7FT VERTICAL CABLE MANAGEMENT  
BOX (4"), PRIORITY PART #P97-9032  
WITH HINGE SIDE ORIENTATED AS  
SHOWN ON DE-4.



24 PORT F.O. PATCH  
PANEL SEE MASTER  
SPECIFICATION FOR  
DETAILS

21.5"

CONDUIT TO RECEPTACLES  
TO RUN ALONG END OF CABLE  
MANAGEMENT BOX TO PANEL.

22.5"

7FT VERTICAL CABLE  
MANAGEMENT BOX (8"),  
PRIORITY PART #P97-9301  
WITH HINGE SIDE ORIENTATED  
AS SHOWN ON DE-4.

## TYPICAL EQUIPMENT RACK MOUNTING DETAIL

N.T.S.



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SCALE: N.T.S.

DATE: JAN 2006

DRAWN BY: E.V.

REQ. NO.: C00000

DRAWING TITLE:

PROJECT

SHEET TITLE:

TYPICAL RACK LAYOUT - ACO

PROJECT NO.:

15-P-0001

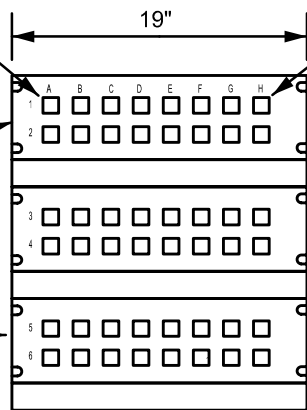
DWG. NO.:

DE-3

MATRIX IDENTIFICATION  
TO BE SHOWN ON  
EVERY PORT.

PATCH PANEL  
IDENTIFICATION  
TO CONTINUE  
VERTICALLY

16 PORT PATCH PANEL,  
AMP #406359-1



DATA INSERTS - AMP PART  
#558908-1 OR VOICE INSERTS -  
AMP PART #555611-1

WIRE MANAGEMENT PANELS -  
MIDDLE ATLANTIC HCM-1D  
ANIXTER P/N 231109

## TYPICAL 16 PORT PATCH PANEL

N.T.S.



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SCALE: N.T.S.

DRAWN BY: S.W.

DATE: JAN 2006

REQ. NO.: C00000

DRAWING TITLE:

**PROJECT**

SHEET TITLE:

TYPICAL ACO PATCH PANEL LAYOUT

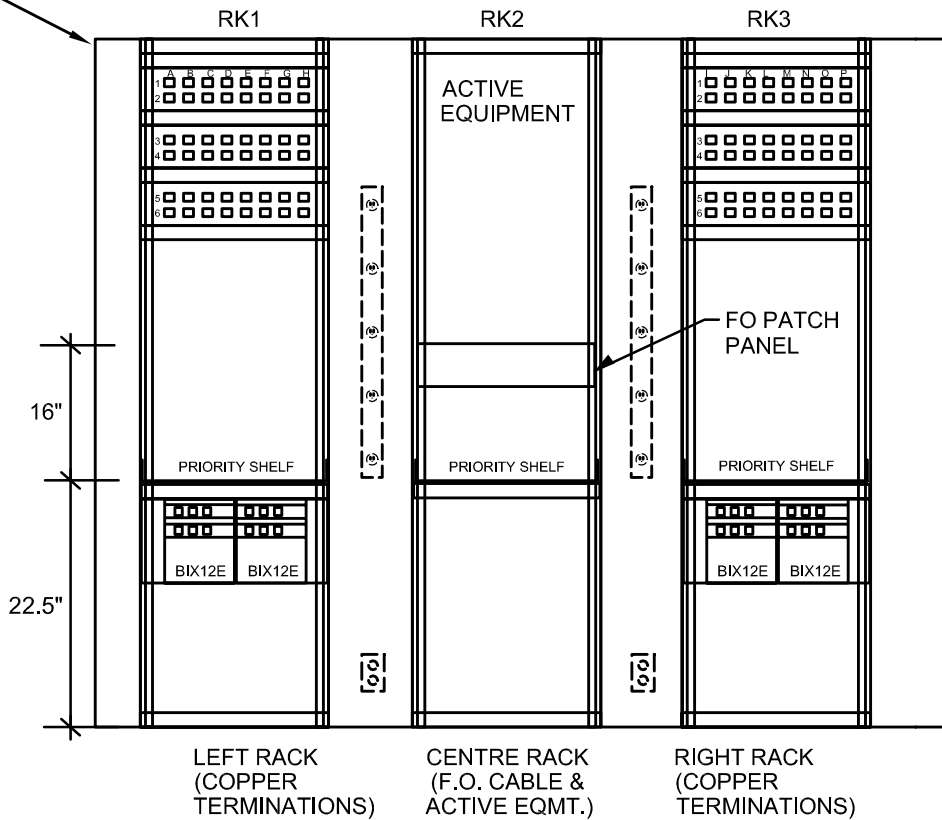
PROJECT NO.:

**15-P-0001**

DWG. NO.:

**DE-3a**

TYPICAL  
1" FROM WALL

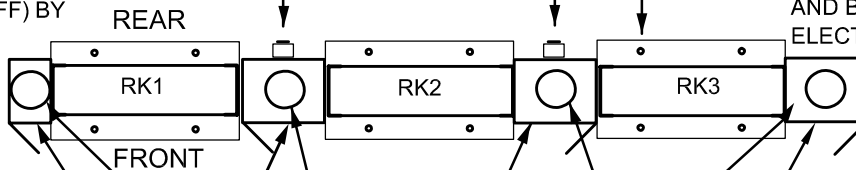


**FRONT VIEW**  
N.T.S.

WHERE AVAILABLE  
DUPLX IG/SP RECEPTACLE  
ON EMERGENCY POWER ON REAR OF  
CABLE MGMT. (12" A.F.F.) BY ELEC.  
CONTRACTOR. OTHERWISE AS (1).

(1) DUPLEX ISOLATED GROUND  
RECEPTACLE ON REAR OF CABLE  
MANAGEMENT BOX (12" AFF) BY  
ELECT. CONTRACTOR

19" RACKS - PRIORITY PART  
#P97-9025. BOLTING TO FLOOR  
AND BONDING TO GROUND BY  
ELECT. CONTRACTOR



VERTICAL CABLE MANAGEMENT  
BOX (8")  
PRIORITY PART #P97-9301

HOLES THROUGH FLOOR C/W 4"  
PVC SLEEVE ( 1" ABOVE FL.)  
BELOW EACH RACK FOR CABLE  
ENTRY BY ELEC. CONTRACTOR

**NOTE:**  
EQUIPMENT RACKS, PATCH  
PANELS, RACK CABLING, ETC. TO  
BE SUPPLIED AND INSTALLED  
BY CONTRACTOR EXCEPT AS NOTED.

VERTICAL CABLE MANAGEMENT  
BOX (4") PRIORITY PART #P97-9032

**PLAN VIEW**  
N.T.S.



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**Physical Plant Department**  
89 Freedman Crescent Winnipeg, MB



SCALE: N.T.S.

DATE: JAN 2006

DRAWN BY: E.V.

REQ. NO.: C00000

DRAWING TITLE:

**PROJECT**

SHEET TITLE:

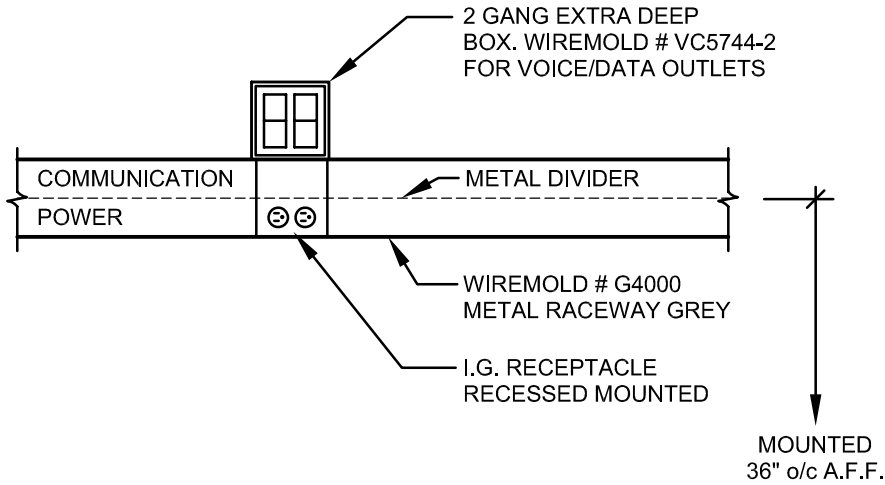
**TYPICAL THREE RACK DETAIL - ACO**

PROJECT NO.:

**15-P-0001**

DWG. NO.:

**DE-4**



## WIREMOLD RACEWAY DETAIL

N.T.S.

### RACEWAY NOTES

1. PROVIDE "WIREMOLD" G4000 OR G6000 SERIES SURFACE MOUNTED RACEWAY WHERE SHOWN FOR POWER, VOICE AND DATA WIRING COMPLETE WITH ALL NECESSARY COMPONENTS FOR A COMPLETE AND CSA APPROVED INSTALLATION CONSISTING OF BUT NOT LIMITED TO THE FOLLOWING:



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SCALE: N.T.S.

DRAWN BY: E.V.

DATE: JAN 2006

REQ. NO.: C00000

DRAWING TITLE:

**PROJECT**

SHEET TITLE:

TYPICAL RACEWAY DETAIL

PROJECT NO.:

**15-P-0001**

DWG. NO.:

**DE-5**





































