APPENDIX A to ANNEX A

TECHICAL SPECAFICATION

FOR

DEPARTMENT OF FINANCE
NEW HEADQUARTERS
AUDIO VISUAL SYSTEMS

Revision: March 07, 2014

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1. GENERAL CONDITIONS

1.1 Introduction

.1 Department of Finance is moving into new offices at 90 Elgin Street in Ottawa, Ontario Canada. This document, associated drawings and information herein describes the scope of work required for the Audio Visual systems in the new facilities.

3.2 Definition of Terms

.1 Shared Services Canada/Department of Finance is referred to as the "Owner" for the purpose of this document.

The "Audio Visual Contractor" or "AV Contractor" refers to the Audio, Video, and Control Systems contractor whose scope of work is defined within this document. The AV Contractor may carry other Sub-Contractors under their scope of supply which become part of the total responsibility under the contract of the AV Contractor.

.*2* The terms: "Alternate" or "Equivalent" or "Equal" designate that if a substitution is proposed for the particular specified item, it will be listed as such at each line item and the specifications provided proving that the item meets or exceeds the specifications of the specified product. Substitutions that are equal or better would be considered. *If AV Contractor proposes a substitution that is accepted by the Owner the AV Contractor shall update the functional drawings incorporating the substitution.*

.3 The terms: "Install", "Supply and Install", and "Provide" mean that the AV Contractor shall supply and install, inclusive of all labour, materials, necessary components or add-ons, connections, installation, testing and commissioning for the item or items referred to in the specification.

.4 The term "Sub-Contractor" for the purpose of this tender, shall be defined as any firm or person or freelance worker that is not under the direct payroll as defined by the Laws or Canada and gainfully full time employed by the AV Contractor. This includes the contractors that must be used for the wire pulling, electrical, and millwork. Any of the above must be listed and included within the bid submission. If a Sub-Contractor as such is needed, or added after award of contract, written approval shall be obtained from Owner before commencing on-site labour.

3.3 AV Contractor Performance

.1 It is the responsibility of the AV Contractor to provide a complete and working system to comply with the operational capabilities, design and standards of quality stated in this document. The AV Contractor shall furnish all equipment, labour and material required to provide the specified systems, except as noted in this specification.

.2 The work shall be deemed complete when the systems are:

.1 Fully functional

.2 Tested and commissioned by the AV Contractor, and approved by Owner.

.3 Complete with the system manuals, as built drawings having passed review and acceptance by Owner.

.4 All work stipulated in Section Two (SOW) of this document has been completed

.5 Ready for operation by the Owner

.3 Acceptance of the systems and performance shall be at the sole discretion of the Owner.

.4 The AV Contractor shall confirm all dimensions, distances and placement prior to the installation of equipment. Report any discrepancies to the Owner prior to installation.

.5 For each stage of the work plan, the AV Contractor shall coordinate with the General Contractor and receive approval of all required submittals prior to proceeding to the next steps of the work plan.

.6 The AV Contractor shall organize a programming workshop at the client's facility. The AV Contractor's system engineer and principal programmer will be required to attend this workshop. This workshop will be used to develop the functional requirements of all rooms control system.

.7 If the systems do not fulfill all aspects of this Specification, the AV Contractor must make any adjustments or any other changes required, to bring the installation into conformance with the specification at no additional cost to the Owner

.8 The AV Contractor shall fabricate and install all items in accordance with manufacturers' recommendations and the specifications herein and shall coordinate and consult Owner in order to provide an installation to industry best practices.

.9 The AV Contractor shall furnish the equipment, installation material and labour required to fulfill the requirements of this document.

.10 The AV Contractor shall fully test and align the systems as outlined in this Specification and according to accepted trade practices to the satisfaction of the Owner.

.11 The AV Contractor shall correct deficiencies, should there be violations or non-compliance to the Codes, at no cost to the Owner. The AV Contractor shall correct the violations within ten days of being notified of the violations.

.12 The AV Contractor shall closely coordinate with the General Contractor regarding any element of the installation of the conduit, raceway and back boxes to ensure it meets the needs of the system specified herein.

3.4 Errors and Omissions

.1 It is importation that the bidders read this document in its entirety as to not miss important requirements. This document should be read in conjunction with the provided documents /drawings which provide detail design functional diagrams.

.2 Omissions and / or errors in the proposal documents not reported at the time of response shall not relieve the AV Contractor of the responsibility for providing properly functioning systems as specified in the Contract Documents.

.3 The AV Contractor shall provide the equipment, installation material and labour required to fulfill the requirements and intent of the Specification whether or not depicted or enumerated explicitly.

.4 All cabling, wiring, terminations, adapter assemblies, patch cords (including AV, telephone and data network connected to AV systems), and power supplies related to equipment functions are required to be provided whether specifically enumerated herein or not.

.5 Upon award of contract, the AV Contractor shall review all reference drawings and site conditions and report any discrepancies, including conduit routing and sizing, to the Owner.

3.5 Permits, Regulations & Codes

.1 The AV Contractor must ensure that where applicable; all provincial, local laws and permits must be obtained as required by the work to be performed and it is the sole responsibility of the AV Contractor to ensure that all laws, codes, regulations are adhered to and the costs of such permits shall be carried within the price of the project. It is also the responsibility of the AV Contractor that the same applies to any Sub-Contractors that are providing work or services under the same contract. The AV Contractor, where applicable, shall provide proof that final inspections have been adhered to and are completely satisfactory and clear with regards to the authority having jurisdiction. This includes any work performed by any and all Sub-Contractors.

3.6 Site Access

.1 The successful bidder is responsible to contact the Owner's Representative in regards to:

.1 Access to the site will be granted only at the discretion of the Owner. Coordinate closely with the Owner security service to ensure unobstructed access to the site.

.2 Acceptable hours to perform work as to minimize disruptions of daily operations

.3 Site procedures – for example: sign in (if applicable)

.2 Security Procedures

.1 Parking location; if applicable, fees shall remain the AV Contractors responsibility.

.2 Material Storage; AV Contractor shall remain solely responsible for material security.

.3 Sanitary Facilities

.4 Garbage disposal and associated fees; if applicable, fees are at AV Contractors expense.

3.7 Materials Control And Conduct Of Work

.1 Provide own secured job box for all parts and tools.

.2 The AV Contractor is responsible for loss of any and all system equipment until it is permanently fastened to the building or signed over to the Owner and in the Owner's secure storage area.

.3 Maintain an orderly work area and ensure conditions meet industry standards and statutes for safety and work procedures.

.4 Except as noted, the AV Contractor is responsible for all cutting and patching related to the specified work and shall make good on all damages to the site that result from the AV Contractor's activities.

.5 Ensure replacement and or restoration to original condition any damage or alteration to floors,

ceiling, walls, furniture etc. caused by the installation process.

.6 The AV Contractor is responsible for removal from the site of all garbage resulting from his or her installation, at no additional cost to the client.

.7 Access to the site will be granted only at the discretion of the Owner. Coordinate closely with the Owner security service to ensure unobstructed access to the site.

.8 The AV Contractor shall make every effort possible to recycle all waste items such as cardboard, metal, plastic etc.

.9 As Built Information

.1 The As Built information will be in the form of three (3) hard copies and one (1) soft copy.

.2 The As Built information shall include all documents including any corrections and amendments.

.3 The following information shall be included under a separate tab and sheet for each:

.4 Designations and settings for all signal processing equipment, gain, zone, and all controls.

.5 Performance data from test results on the completed systems.

.6 Loudspeakers tap values as applicable.

.7 Each custom item must have full information including terminal and connection layouts and particulars. This includes terminal strips, switches, and floor plug connections.

.8 Warranty Certificate Statement; a list of manufacturers' warranties and a statement of completion.

.9 Step by step procedures for room configurations

.10 Troubleshooting procedures; including remedial actions.

.11 List of Key Company contacts for service including 24/7 service contact numbers.

.12 All un-compiled source code for all software programming shall be provided.

.10 Each Operation and Maintenance Manual shall include a complete soft copy on either CD or DVD as required. Digital medium shall be formatted as such to be accessible on both Windows™ and Macintosh™ operating systems. All documents shall be in PDF format for universal viewing.

2. SCOPE OF WORK

4.1 Site and Conditions

.1 This specification and information provided herein describe the systems and scope of work for the Audio Visual Systems in the new headquarters of Department of Finance at 90 Elgin St., Ottawa.

4.2 Objectives

.1 The facility is a corporate office environment in which the Department of Finance mandate is to provide a fully functional, easy to operate technology environment for the staff. Department of Finance facilities are supported by an IT department with knowledge of AV equipment.

4.3 Summary of Work Required

.1 The project includes programming and installation of all AV systems described herein and on AV-600 Series drawings.

.2 In addition to providing the services and materials described herein, the AV Contractor shall deliver the following services and perform the following on-site work:

.1 Coordinate all AV system components with the project and construction team as required;

.2 Coordinate and ensure all AV system related raceways are suitably implemented to support all AV related cabling;

.3 Coordinate and ensure all AV system related millwork is correctly implemented to house AV systems;

.4 Pre-build and test all or as many of the systems possible prior to delivery to the project site;

.5 Test, commission and report deficiencies to Owner and/or appointed representative;

.6 Coordinate AV infrastructure required for projector, loudspeakers, display mounts and brackets prior to installation.

.7 Coordinate and ensure all structural support, blocking and infrastructure required to support all AV components is provided by others;

.8 On-going project management and coordination among trades related to AV work, including site meetings;

.9 Final device installation and system configurations after construction site “dust free” hand-over;

.10 Final system testing, commissioning and training;

.11 Warranty support

3. M18. APPENDIX 2: MEETING ROOMS

4.1 Summary

.1 On all floors there are meeting rooms which include audio visual support. See chart below for room configuration. Bidders must ensure that their bid response on Annex B includes but is not limited to all of the hardware requirements itemize within this table as part of their AV/VC solution.

				Wall Display 65”	Wall Display 80”	Blu-Ray	Room PC	Table Laptop	Wall Laptop	Ceiling Projector	VC
Type	Room Size	Floor Level	Room No.	Quantity							
1a	2 x Medium	9	9029	1	na	1	4	1	na	1	1
1	2 x Medium	10	10089	1	na	1	4	1	na	1	na
2	large	11	11073	na	1	1	2	1	na	1	na
2	large	12	12069	na	1	1	2	1	na	1	na
2	large	13	13078	na	1	1	2	1	Na	1	na
2	large	14	14077	na	1	1	2	1	na	1	na
2	large	15	15072	na	1	1	2	1	na	1	na
2	large	16	16056	na	1	1	2	1	na	1	na
2	large	17	17055	na	1	1	2	1	na	1	na
3	medium	9	9012	1	na	na	2	1	na	na	na
3	medium	10	10138	1	na	na	2	1	na	na	na
3	medium	11	11011	1	na	na	2	1	na	na	na
3	medium	13	13014	1	na	na	2	1	na	na	na
3	medium	14	14015	1	na	na	2	1	na	na	na
3	medium	15	15014	1	na	na	2	1	na	na	na
3	medium	16	16011	1	na	na	2	1	na	na	na
4	medium	12	12014	1	na	na	2	1	na	na	na
5	Drafting	17	17116	na	na	na	2	1	na	2	na
5	Drafting	17	17090	na	na	na	2	1	na	2	na
6	HR training room	10	10087	2	na	1	2	na	1	2	na
7	N/A	N/A	N/A	na	1	1	2	1	na	1	1
8	N/A	N/A	N/A	1	na	1	2	1	na	1	1
9	large	16	16030	na	1	1	2	1	na	1	1
10	large	17	17038	na	1	1	2	1	na	1	1

11	library collaborative	9	9017	1	na	na	na	na	1	na	na

.2 The following table identifies the requirements for each room and the associated technologies.

Location	***Technical Requirements***	***Notes***
Rooms	- Wall Display(s) - Ceiling Projector(s) - Wall Projector Screen(s) - Table Laptop Connection - Wall Laptop Connection - Camera for VC rooms only	
Room Rack	- Central equipment location for most AV equipment	- installation and equipment by AV Contractor

4.2 Quality of Installation

.1 The workmanship with reference to this project is to be of the highest industry standards applicable. This applies to all work including the Millwork and Electrical, as well as all AV work.

.2 The AV Contractor must provide properly trained, qualified, professional installation technicians and trades people throughout the duration of this project. They must observe and obey all building codes applicable, workplace safety rules & regulations, and the general rules for the Building as directed.

4.3 Displays

.1 General

.1 Provide wall mounted display(s) to display all video signals throughout facility.

.2 Images are scaled to wall display native resolution regardless of sources' resolution.

.3 CATV feed will be connected to wall display.

.4 Provide wall mounting hardware.

.2 Installation

.1 Coordinate mounting location(s) and verify infrastructure required to support display(s) with the Owner and other trades.

.2 Coordinate wall mount(s) manufacturer to ensure proper fit of display(s) and that installation fits within the site conditions.

.3 Note that all CATV feed are provided and installed behind the display locations. In the event that the display does not have a TV tuner integrated into it an external unit will be provided. The external TV Tuner will be mounted in the AV rack. CATV feed will need to be rerouted from behind the display to the AV rack.

.4 Mount wall display(s) at:

.1 Rooms with no VC camera; at 1067mm to bottom of display (above fin. Floor?)

.2 Rooms with VC camera below display; at 1245mm to bottom of display (above fin. Floor?)

.3 Equipment

Description	***Model or Equal***	***Qty.***
65" Display: Image: Dia. 65 - 16:9 LED Native Resolution: 1920 x 1080P Installed Orientation: Landscape Built-in Digital Tuner Wall mount: VESA 400mm or approved equivalent	Panasonic TH-65LRU60 or approved equivalent	28 See chart, section (4.1) for room configuration
80" Display: Image: Dia. 80 - 16:9 LED Native Resolution: 1920 x 1080P Installed Orientation: Landscape Wall mount: VESA 400mm or approved equivalent	Panasonic TH-80LF50 or approved equivalent	9 See chart, section (4.1) for room configuration
TV Tuner for 80" display DTV Standards: (1080i/ 29.97/ Hz/720p/480p/480i) IR Remote HDMI out	Contemporary Research 232-ATSC+1 or approved equivalent	9
TV Tuner Single unit Rack Kit	Contemporary Research RK1 or approved equivalent	9
Display wall mounting hardware	Chief, Peerless or approved equivalent	37

4.4 Projectors

.1 General

.1 Provide ceiling mounted video projector(s) to display all video signals throughout facility.

.2 Images are scaled to projector native resolution regardless of sources' resolution.

.3 Provide operational programming described under the AV Control System.

.4 Provide calibration and alignment of projector(s).

.5 Provide ceiling mounting hardware.

.2 Installation

.1 Coordinate mounting location(s) and verify infrastructure required to support projector(s) with the Owner and other trades.

.2 Coordinate projector mount(s) manufacturer to ensure proper fit of projector(s) and that installation fits within the site conditions.

.3 Equipment

Description	***Model or Equal***	***Qty.***
Projector w/lens and bulbs 6,000 lumens DLP Native Resolution: 1,280 x 800 Dual-lamp system Standard Lens or Optional Lens	Panasonic PT-DW640 or approved equivalent	18 See chart, section (4.1) for room configuration
Projector ceiling mounting hardware	Chief, Peerless or approved equivalent	18

4.5 Projection Screens

.1 General

.1 Provide wall non-tensioned manual projection screen(s).

.2 All room with single screen will have a 60" x 96" projection screen.

.3 All room with dual screens will have a 50" x 80" projection screen.

.4 Some rooms will have displays or Smartboards on walls where screen are to be installed. The AV Contractor shall provide longer mounting brackets to clear these devices.

.2 Installation

.1 Coordinate mounting location(s) and verify infrastructure required to support the projection screen(s) with the GC and other trades.

.2 Projection screen(s) must be installed rigidly to building structure.

.3 Equipment

Description	***Model or Equal***	***Qty.***
Projection Screen 16:10 Screen Image size 60" x 96 " Included all mounting hardware	Da-lite Model C with CSR 34730 or approved equivalent	12 See chart section (4.1) for room configuration

Description	*Model or Equal*	*Qty.*
Projection Screen 16:10 Screen Image size 50" x 80" Included all mounting hardware	Da-lite Model C with CSR 34726 or approved equivalent	6 See chart section (4.1) for room configuration

4.6 Loudspeakers

.1 General

.1 Provide 2 x ceiling loudspeakers per room. Note that not all rooms have loudspeakers. (A reference note is required to direct the bidder to view drawings as the schedules in the spec.do not include this information)

.2 Provide all loudspeaker mounting hardware and fixtures.

.2 Installation

.1 Install loudspeakers onto ceiling tiles.

.3 Equipment

Description	*Model or Equal*	*Qty.*
5" Ceiling Loudspeaker back box 70V White	Tannoy CMS 501DC BM or approved equivalent	See Drawing AV-600 series for Qty

4.7 Video Conferencing

.1 General

.1 Provide video conferencing system.

.2 Provide mounting hardware for codec and camera.

.2 Installation

.1 Locate video conferencing codec in equipment rack.

.2 Calibrate and align conferencing unit.

.3 No programming needed users will use the device remote to operate system.

.4 Camera control and pre-sets shall be initiated from VC system remote

.5 Locate camera below room wall display at 1067mm AFF to bottom of mount.

.6 Provide connection between LAN connection and Video conferencing codec.

.3 Equipment

Description	*Model or Equal*	*Qty.*
Video conferencing system 12x Precision HD or approved equivalent 2 x Performance Microphone 20 Premium Resolution option Multisite Option	Cisco TelePresence SX20 Quick Set or approved equivalent	4 See chart section (4.1) for room configuration
Thin Profile Wall Mount Bracket for CISCO Precision HD	Viddio 535-2000-217 or approved equivalent	4
Optional 8" touch panel for VC system	Cisco TelePresence Touch 8 or approved equivalent	4
5 Port LAN Switch for VC touch panel	Cisco, Crestron or approved equivalent	4

4.8 Other Sources

.1 General

.1 Provide a Blu-Ray playback system.

.2 Provide mounting hardware.

.2 Installation

.1 Install Blu-ray in AV Rack.

.2 No programming needed users will use the device IR remote to operate unit.

.3 Equipment

Description	*Model or Equal*	*Qty.*
Blu-Ray/DVD Player	Pioneer BDP-53FD or approved equivalent	13 See chart section (4.1) for room configuration
OCAP - Vented Clamping Rack shelf, 2RU, 14" - Blu-Ray mounting shelf	Middle Atlantic OCAP-2 or approved equivalent	13

4.9 AV Control System

.1 General

.1 Provide a centralized AV control system for the room. This system is intended for the control of all AV system devices for all AV equipment.

.2 Provide a complete functioning control system.

.3 Provide all software programming tools and software applications.

.4 Provide all interface hardware and electronics to communicate with all AV system components with external control capability.

.5 The system shall be easy to use by users

.6 Provide a FlipTop™ Control Center which shall have the ability to control the system in its entirety.

.1 AV Contractor to provide cut-out on table for FlipTop.

.2 Coordinate mounting location and verify with the Owner and other trades.

.7 For functional diagram for each room types, see chart section 4.1, for room type for each rooms see AV-600 series drawings.

.2 Installation

.1 Locate AV control system controller in the equipment rack.

.3 Equipment

Description	***No Substitution***	***Qty.***
Controller DigitalMedia™ Presentation System 200 or approved equivalent HD System Switcher Routing for up to 6 sources and 2 displays Rack mounted	Crestron DMPS-200-C or approved equivalent	See Drawing AV-600 series for Qty
Controller DigitalMedia™ Presentation System 300 or approved equivalent HD System Switcher Routing for up to 7 sources and 4 displays Rack mounted	Crestron DMPS-300-C or approved equivalent	See Drawing AV-600 series for Qty
FlipTop Control Center Integrated Keypad Cable Storage Compartment Dual AC Power Outlets	Crestron C2N-FTB-D or approved equivalent	36

Description	*No Substitution*	*Qty.*
Media Presentation Button 10 programmable buttons with LED feedback Customizable backlit button labels Volume control knob and LED barograph Black	Crestron MP-B10-B-T or approved equivalent	1
TableTop Kit for MP, MPC, and IPAC Black Textured or approved equivalent	Crestron TTK-MP/MPC/IPAC-B-T or approved equivalent	1
DigitalMedia 8G+™ Receiver & Room Controller w/Scaler - includes PW-2407WU 24VDC power supply	Crestron DM-RMC-SCALER-C or approved equivalent	See Drawing AV-600 series for Qty
Wall Plate DigitalMedia 8G+™ Transmitter 200, Black Textured or approved equivalent	Crestron DM-TX-200-C-2G-B-T or approved equivalent	See Drawing AV-600 series for Qty
DigitalMedia 8G+™ Transmitter 201, Black Textured or approved equivalent	Crestron DM-TX-201-C or approved equivalent	See Drawing AV-600 series for Qty
48V Power Pack for PoDM	PW-4818DU or approved equivalent	See Drawing AV-600 series for Qty
Miscellaneous hardware and cabling required for interconnect and mounting of AV control devices	Custom or approved equivalent	As Req'd

4.10 Programming

.1 General

.1 The controller will control source switching and destination only as specified in this document.

.2 All system functionality will be integrated on this panel and present the user a unified interface for operations of the sub systems within the room(s).

.3 The following functions will be available from the user interface;

.1 System off

.2 Video Source Selection

.3 Projector or Wall Display Destination Selection

.4 Volume control of in room sound

4.11 Programming Software and Programs

.1 All control and any programming tools shall be registered to Owner as directed.

.2 All systems programming and any code produced shall become the property of the Owner. Any changes or adjustments to any programming will be updated immediately and provided to the Owner. At the conclusion of the project, the Proponent shall provide a copy of the un-compiled

code to the Owner.

.3 The programming for this project is to be considered confidential and must not be distributed in whole or part to any other party unless directly involved and listed as part of the AV Contractor or their Sub-Contractors.

4.12 Digital Media Transmitter and Receiver/Scaler configuration

.1 Summary

.1 Set Transmitter EDID to be set for AUTO.

.2 Set Receiver/Scaler to device native resolution.

.3 Maintain aspect ratio throughout the signal path.

4.13 Floor, Wall and Table Boxes

.1 General

.1 Floor boxes to be provided and installed by others.

.2 AV wall boxes to be provided and installed by others. Every wall display will have an AV wall box behind it.

.2 Installation

.1 Coordinate capacity, panel placement and connectivity with other trades.

.3 Equipment

Description	***Model***	***Qty.***
Floor Box in Medium Rooms	Wire mold EFB6S or approved equivalent	1 per room (By Others) See chart section (4.1) for room configuration
Floor Box in Large Rooms	FSR FL-500P or approved equivalent	1 per room (By Others) See chart section (4.1) for room configuration
AV Wall Box	2-Gang electrical box or approved equivalent	1 per room (By Others) See chart section (4.1) for room configuration
Plates and panels	custom	As Req'd

4.14 Equipment Racks

.1 General

.1 Provide floor equipment rack.

.1 Provide all racking systems as required.

.2 Conduit systems and equipment rack power circuits by the Electrical Contractor. (Ref. found at: http://en.wikipedia.org/wiki/16_Divisions)

.3 Provide power distribution within racks.

.2 Installation

.1 Coordinate AV equipment rack location with other trades as required.

.2 Coordinate power requirements for rack with other trades.

.3 Equipment

Description	***Model or Equal***	***Qty.***
AV Rack Cart 20-RU rack rails, 41.5" H x 26" D x 24" W Locking, well vented and removable back for easy access to equipment Heavy-duty 4" casters; Cable management system Tinted Plexiglas front door with lock Color TBD	Middle Atlantic RA-200 or approved equivalent	1 per room
Power Strip rack mount 8-outlet includes surge and spike protection, EMI filtering, 9-ft cord with 15-A plug	Middle Atlantic PD-815R-PL or approved equivalent	1 per rack
Drawer provide one 3 RU steel pull out drawer in each rack.	Middle Atlantic UD3 or approved equivalent	As Req'd
1 position 1RU rack mount decora size cut-out panel	Middle Atlantic DECP-1X1 or approved equivalent	As Req'd
2 position 1RU rack mount decora size cut-out panel	Middle Atlantic DECP-1X2 or approved equivalent	As Req'd

Description	***Model or Equal***	***Qty.***
OCAP - Vented Clamping Rackshelf, 2RU, 14" - Blu-Ray mounting shelf	Middle Atlantic OCAP-2 or approved equivalent	As Req'd
UFA Shelves, 1-3/4" (1 space), 17-1/4"w x 8"d - Crestron DM-TX-201-C and VC Codec mounting shelf	Middle Atlantic UFA-8 or approved equivalent	As Req'd
Accessories supply – cable tie bars for all horizontal cable transitions and vertical lacing bars		As Req'd
Blank Panels fill all empty rack space with blank panels, each rack to contain – 1 RU blank 2 RU blank 3 RU blank	Middle Atlantic EB Series or approved equivalent	As Req'd
Provide all mounting hardware and rack screws with nylon washers.	-	As Req'd
All system wiring, wire harnesses, termination and connectors	-	As Req'd
Infrastructure and all required hardware, fasteners, accessories, patch cables and cabling for fixed installation	-	As Req'd

4.15 Cable Plant

.1 General

.1 Provide a commercial grade professional cable plant with sufficient bandwidth capacity to meet or exceed all equipment provided herein. Product selection should anticipate future upgrades.

.2 Provide premium high resolution video cables to ensure maximum transmission distances.

.3 Provide all wire and cable required to interconnect all systems and devices.

.4 Provide all Data paths and connectivity directly related to AV systems.

.5 Provide all cable management devices beyond cable raceways supplied by others.

.6 Provide all connectors and termination of AV equipment.

.7 Provide extension of Data connections from local LAN point provided.

.2 Installation

.1 Install all cable and wire to best industry practice.

.2 Install cables into conduit, raceways and cable paths provided.

.3 Facility Data connection points are provided under a separate Communication contract. Coordinate Data requirements with the Owner and Communication Contractor. (This information will be provided at contract award)

.4 Coordinate AV/VC pathways with the AV/VC Designer and Base building facility best practices (criteria not defined).

.5 Coordinate cable paths and ensure all wire provided throughout is installed to regulatory codes and requirements.

.6 Coordinate all cable paths and raceways with other trades to ensure cables are installed per manufacturer's specifications.

.3 Equipment

Description	***Model***	***Qty.***
Cable and wire	See section 4 General Specifications	As Req'd.
Connectors	See section 4 General Specifications	As Req'd.
Cable fasteners, hardware and cable management	-	As Req'd.

4. QUALITY ASSURANCE

4.1 General

.1 The AV Contractor shall be responsible for the execution of the methods, requirements and testing described herein.

.2 All equipment shall be installed to prevent safety hazards to the public, to operating personnel, to equipment and to other trades.

.3 Materials and equipment required for a complete system but not specified herein as to quality shall be of high commercial standard and quality.

.4 Fabricate and install all items in accordance with manufacturers' recommendations and specifications herein and shall consult with trades doing adjoining work and coordinate with the Owner in order to provide an installation of first class quality. Workmanship is as important as functionality.

.5 Software Standards

.1 All software programming shall meet manufacturer's recommendations, the Owner's standards and best software industry engineering practices. The AV Contractor can expect that the manufacturer shall be requested by the Owner to review the AV Contractor's programming. At the discretion of the Owner, the AV Contractor may be directed to modify the program as recommended by the manufacturer.

.2 Before the system is deemed complete and ready for final acceptance, all software and hardware issues shall be rectified by the AV Contractor and reviewed by the Owner.

.3 Ensure that all software programming is performed by the manufacturer and / or manufacturer authorized personnel.

.4 During software development, ensure that all software submissions are accompanied by documentation describing the following:

.1 The intent of the program

.2 Table of pre-sets

.3 Logic function table

.4 Any problems related to the software and proposed solutions

.5 Ensure that all software storage medium and storage containers are clearly labelled with the following:

.6 Project

.7 Date

.8 Program

.9 Contents and revision date

.6 Control and Interface Hardware

.1 Various systems and components shall be controlled directly from a panel or via a dedicated control system. These devices are key components in delivering a usable system. Therefore, their successful implementation is of great importance.

.2 All software standards and the review process as described previously shall apply to these systems.

.3 All hardware components used to control and interface with the computer system or other hardware components shall be tested and fully functional prior to installation on site.

.4 Unless otherwise noted, software programs that control operable machinery must require tally from the mechanism being controlled. The software program shall report the status of the mechanism to the user via a graphic display. Where injury or damage to equipment may occur, the control program must include safety features that reverse motion or stop movement until the problem is rectified.

.7 Wiring and Cable Termination

.1 The AV Contractor shall take all necessary precautions to prevent electromagnetic and electrostatic interference in both the long and the short term. Care should be taken in wiring and installation to prevent damage to wire or equipment.

.2 All terminations of shielded twisted pair cables, regardless of location, shall consist of a Teflon, PVC or neoprene sleeve covering the shield drain wire and an overall heat shrink or elastic neoprene sleeve covering the point at which the cable jacket and shield end. (This makes it very difficult to inadvertently ground a shield and is an important aspect of audio system wiring.) At the termination the unshielded leads shall be less than 50 mm in length.

.3 All wiring entering the racks shall have a 2-meter service loop (slack) folded after the cable has been terminated, allowing future rewiring. This slack wire shall be neatly harnessed into place.

.4 All cable and cable bundles shall be neatly and logically routed and organised. Bundles of varying signal level shall be spaced at least 10 cm apart and secured to dedicated tie bars. Wiring in racks shall not be left unsupported.

.5 No splices in shielded twisted pair or coaxial cable are allowed – all runs shall be continuous.

.6 Audio terminations shall be made with rosin-core solder or an approved mechanical connector. Temperature controlled soldering stations are recommended. Crimp only with manufacturer's recommended crimping tool having a controlled crimp cycle.

.7 RF terminations shall be made with screw-on BNC connectors on cables and isolated thru-panel BNC-BNC connectors on panels.

.8 The AV Contractor shall ensure the appropriate cables and distribution amplifiers are selected to guarantee the quality of the signal delivery over long distances.

.8 Audio Interconnection

.1 Ensure the following:

.1 All microphone and line level wiring extending beyond racks shall be balanced and floating, unless otherwise indicated.

.2 All microphone and line level wiring to be balanced, except where specified equipment has unbalanced terminations.

.3 Unless otherwise noted, all field microphone and line level connections to be via XLR connectors.

.4 Where audio signal cables may share a conduit with control cables, take appropriate precautions to prevent pops, clicks and noise in the system. Control circuits that require a reference shall not use audio shields as their reference.

.5 All shielded signal cables shall have their shields isolated from both the conduit system and any other shielded cables. Unless otherwise specified, shields shall be continuous from source to input points. Line level cable shields shall be connected at input (load) end only, with shields lifted at the output (source). Microphone wiring shall have continuous shields from the microphone outlet to the microphone patching point. If the microphone wiring is passed through a normal jack, to a console microphone input, it shall be continuous from the patch point to the jack as well from the microphone input to the jack. This is to supply a safety ground for microphones and other equipment that users may come in contact with. No "doubling up" of ground points on multi-pin connectors or terminal blocks shall be allowed. Pin 1 on XLR type connectors shall not be connected to the connector case. Tie line patches shall have continuous shield connections from one patch to another, with no permanent connection to the chassis ground.

.6 If equipment is not fitted with XLR connectors, or if direct XLR connection contributes to a noise problem, supply XLR adapter to match. Wiring modifications are made in this adapter only and shall be appropriately identified.

.7 Unless otherwise specified herein, as indicated by an equipment model number, all audio line output impedances shall be less than or equal to 200 ohms and shall be capable of driving loads of 600 ohms. All audio line input impedances shall be greater than or equal to 600 ohms, and preferably ten times greater than the source impedance. Similarly, all microphone output impedances shall be less than or equal to 200 ohms and capable of driving loads of 1000 ohms or greater. All microphone input impedances shall be greater than or equal to 1000 ohms. The values specified here are measured rather than "nominal" values.

.8 The polarity convention for connectors in balanced circuits shall be defined as follows. This polarity convention shall be clearly noted on each wiring diagram and in the manuals. The polarity and/or pin assignment schemes of all other connectors shall be detailed in the approval drawings.

	Shield	Hot (+)	Return (-)
XLR type connectors	pin 1	pin 2	pin 3
One-quarter inch phone plugs and jacks	sleeve	tip	ring

.9 Video Interconnection

.1 Ensure the following:

.1 All BNC type video connectors shall be of high quality with a crimp style strain relief

.2 All other "line level" type video connectors shall be of high quality with the opposing mating surfaces composed of similar metal types.

.3 Ensure that all video transmission paths are properly terminated with the appropriate device.

.10 RF Interconnection

.1 Ensure the following:

.1 All BNC type RF connectors shall be of high quality with a screw on style strain relief.

.2 All other "line level" type RF connectors shall be of high quality with the opposing mating surfaces composed of similar metal types.

.3 Ensure that all RF transmission paths are properly terminated with the appropriate device.

.11 Control and Data Interconnection

.1 Ensure the following:

.1 All data and control connectors shall be of high performance and quality.

.2 All opposing mating surfaces shall be of similar metals

.3 All connections shall maintain telecommunication industry defined impedances for that particular circuit type and connection.

.4 All Data and Digital transmission paths are properly terminated with the appropriate impedance device.

.12 Fibre Optic Connections (Where Provided)

.1 Ensure the following:

.1 All connectors shall be of premium quality and performance.

.2 All terminations shall be made by field-experienced personnel using the fused pigtail approach. (Contradiction!)

.3 Only industry standard connection methods shall be permitted.

4.2 Marking

.1 Equipment

.1 Ensure the following:

.1 Label all equipment as per drawings, so that every patch point can be immediately associated with a specific piece of equipment. The connector shall be identified with the device to which it is normally mated.

.2 All operating controls, switches, jacks and plugs shall be permanently marked in a clear logical manner utilizing engraved, laser etched, screened, or lamacoid label strips. Dymo or similar label strips -Hand printed labels are not acceptable.

.2 Network Cabling

.1 Ensure all new network cable naming and marking conventions are consistent with the building infrastructure. Stringently adhere to all methods of physical installation and identification currently used by the Owner.

4.3 Equipment Packaging

.1 General

.1 Ensure that, unless otherwise noted, all equipment shall be securely mounted and fastened into racks using the original manufacturer's rack mounting kits or custom fitted mounting kits. Unless otherwise noted, it shall be unacceptable to put equipment loosely on shelves or stacked on top of other rack-mounted equipment. Bidders shall refer to Part 7, 7.37 Packaging Recycling section of the RFP for specific requirements

.2 Loudspeakers

.1 Unless otherwise noted, all loudspeaker colour and finishes shall be coordinated with the Owner.

.2 All exposed hardware such as rigging fixtures shall be finished to match the loudspeaker. The finish must not impede the proper operation of the loudspeaker or the rigging components.

.3 Unless otherwise noted where multiple tap loudspeakers are installed, tap selection shall remain accessible after the loudspeaker is installed.

.3 Fasteners

.1 Ensure all exposed screws, such as rack and panel mounting hardware, shall be of quality finish, such as stainless steel or nickel plate. Standard Zinc plating is unacceptable. The fasteners shall be of premium grade Philips, Robertson, hex (Allen) head fasteners only. Black oxide finish is preferred. Nylon washers of equivalent colour shall be used to protect the front face of all rack-mounted equipment.

.4 Connector Mounting

.1 Ensure the following:

.1 XLR connectors shall be inserted into panels from the rear. Ensure that labelling strips do not interfere with operation of the connector release mechanisms. Holes shall be sized to suit male or female shell interchangeably.

.2 On a given panel, all XLR latches shall be oriented to the top or to the left, as required.

.3 All RF connectors shall maintain the nominal circuit impedance required for the application in which they are used.

.4 On a given panel, all connectors shall be oriented with the alignment key up.

.5 Multi-channel Cables (where specified)

.1 Where specified ensure the following:

.1 All multi-channel cables for audio, video and RF shall incorporate an individual jacket with shield for each circuit and an overall flexible outer jacket.

.2 Where cables enter racks, secure the cable with strain relief grip mounted in a 16 C.R.S. panel, with top and bottom folded back ½", finished in black enamel consistent with other panels in the system.

.3 Where cables enter connectors, supply strain relief affixed to the connector housing that extend a minimum of 6" out from the connector along the length of the cable.

.6 Multi-pin Connectors

.1 All multi-pin connectors specified herein shall include a protective cap to protect the connector when not in use. Each cap shall be affixed to the same panel as the connector with a flexible chain or wire rope. The chain or rope shall not share fasteners with those used to mount the connector to the panel.

.2 Where two mated multi-pin contacts are used, both contacts shall be of the same material.

.3 All multi-pin cables shall be rated for the function they are to perform. They shall meet or exceed the required current, data throughput, bandwidth, voltage and general construction strength for which they shall be used.

.4 All inline multi-pin connectors shall contain an integrated cable strain relief.

.5 Unless otherwise specified all multi-connectors shall have field replaceable crimp style pins and sockets.

4.4 Power

.1 Although all AC power cable and wiring installation on site, except within racks, is not the responsibility of the AV Contractor, verify that it is serving the needs of the systems and report any concerns to the Owner prior to the final acceptance testing.

.2 The equipment rack(s) shall be wired to dedicated AC circuits.

.3 AC power distribution within racks is the responsibility of the AV Contractor. In the case of fixed

racks, this distribution shall be accomplished by means of junction boxes for supply termination and plug strips that shall be free of switches, fuses and circuit breakers (as found on some power bars, for example). AC circuits shall be exclusively switched and protected by the AC Breaker in the Panel board serving the rack.

.4 All power cords of rack-mounted equipment shall be neatly bundled so that the plug can be immediately associated with a particular piece of equipment. If this is not possible, tag the plug to identify the equipment.

.5 Coordinate with the Owner the location of AV cabling to ensure that AC cabling does not interfere with AV signals.

4.5 AV System Grounding

.1 It is imperative that the grounding method adopted be consistent throughout the entire installation.

.2 Ensure that the Electrical Contractor permanently bonds all conduits containing audio and visual systems wiring to the electrical safety ground.

.3 Where isolated technical power systems are provided ensure that all racks are isolated from conduit, building steel and all other conducting elements. Racks shall be grounded only by the isolated fine braid 2 AWG ground wires, which accompany the power wiring.

.4 All portable electronic equipment shall exclusively receive its technical ground via the equipment ground conductor run to all AC outlets.

.5 Ensure that all Multimedia cabling systems are properly grounded and shielded to maintain isolation and prevent interference from other systems, e.g. AC power.

4.6 Rigging and Overhead Equipment

.1 Ensure that system elements which are suspended overhead, use load-rated metallic fittings, to achieve a designed load safety factor of five or greater. All fasteners shall be minimum grade 8 steel.

.2 Where the total suspended mass exceeds 90 kg, ensure that a structural Engineer having jurisdiction in the province of that installation shall approve all custom-built rigging fixtures used for overhead suspension.

4.7 Testing and Adjustments

.1 General

.1 The tests performed are to ensure that a fully functional and operational system is delivered to the Owner, and which reflect best industry practices. To achieve this objective the Owner supplies this document as a minimum standard.

.2 These adjustments and tests described herein are to be completed by the AV Contractor using their own test equipment, supplied at their expense.

.3 The Owner may elect to perform additional testing during the system commissioning, with the assistance of the AV Contractor.

.2 Testing

.1 Testing of Power, Cable Systems and Isolated Ground Integrity

.1 The AV Contractor is responsible for ensuring the Electrical Contractor has installed a tested fully functioning electrical system. Once the Electrical Contractor has performed their system tests and notified the AV Contractor in writing that the electrical system is ready for use, verify Technical Power System ground integrity.

.2 THESE TESTS must BE PERFORMED BEFORE EQUIPMENT IS CONNECTED and POWER APPLIED

.3 Test all AC outlets for correct phase, neutral and ground wiring.

.4 With power removed from racks and system, mains power switched off and locked down; perform a ground isolation test to verify isolated ground system integrity.

.5 Test each wire in raceway, conduit within racks and shall document results using a report format as described previously. Technician is to initial chart while testing. Submit photocopies of the resulting document as part of the test report.

.3 Software Testing

.1 All software programs and their associated hardware components must be fully installed, programmed and configured. Where a network system is used all connections to the hardware and software must be tested and fully operational.

.2 All software shall be fully tested on the AV Contractor's premises prior to testing on-site. A report shall be submitted regarding this shop testing. The Owner may choose to witness the testing or have the shop testing repeated, at his/her discretion.

.3 All software programs must be fully functional and tested for interoperability and compatibility, which includes standalone PCs and or those operating across a network.

.4 Testing Control and Switching Systems

.1 Verify each path of the switching and muting equipment. Verify logic functions.

.2 Confirm communication and control functions between panels and switchboards for all controllable devices and sub systems.

.3 Verify all camera lens and pan/tilt remote control functions.

.4 Confirm software operational logic.

.5 Testing Video System (where required)

.1 Check all video lines (including trunks) for continuity and shield integrity and confirm end-to-end specifications of typical paths.

.2 Perform equipment alignment and timing calibration.

.3 Optimize and align viewing characteristics of monitors, projectors and screens.

.4 Check and adjust distribution amplifiers for unity gain and cable length equalization.

.5 Configure all switchers and controls with basic operational setups. Confirm switcher continuity by testing path and switching performance from all inputs to one output, then from one output

to all inputs.

.6 Confirm switcher operation by testing all cross points.

.7 Perform any other tests and adjustments recommended by the equipment manufacturers to optimize the overall performance.

.8 Perform end-to-end tests on several typical paths.

.9 Check all paths for differential gain and differential phase

.10 Document all tests performed with results, identifying signal paths, test signals and test conditions etc. to ensure repeatability of future tests.

.11 Test all cross points and signal routes to verify signal arrival and that all combinations are compliant with video encryption and copyright standards

.6 Testing Network Cable Systems

.1 All cables and termination hardware shall be completely tested for defective installation and verify installed cable performance.

.2 Category 6 data cable shall be performance verified using an automated test set.

.3 Test results shall be automatically evaluated by the test set using TIA/EIA standards (currently TIA/EIA-568-B.2) and present the result as a pass or fail.

.4 Test results shall be printed directly from the test set or as download file using an application included by the test instrument manufacturer.

.5 The test document shall include all tests performed, the target test result and the actual test result achieved.

.6 Verify end-to-end channel performance with Fluke model DSP-4000 or similar.

END of SPECIFICATION