

BID #1203 - Sealed bids for voice and data cabling at the District Professional Development Center in the Capital School District will be accepted until 3:00 pm Eastern Time on Friday, March 30, 2012 at Capital School District, 945 Forest Street, Dover, DE 19904, at which time they will be opened, read, and recorded. A pre-bid meeting will be held at 3:00 on Friday, March 16 in the District Office, 945 Forest Street, Dover, DE 19904. Bid Specifications can be obtained at the aforementioned address or by calling (302) 672-1512.

**Instructions to Bidders**  
**Capital School District**  
**Voice and Data Cabling – Professional Center**  
**Bid # 1203**

- 1) Sealed bids to furnish the products described in the specifications will be received by the Capital School District at Capital School District Administrative Offices, 945 Forest Street, Dover, DE 19904 until 3:00 p.m. Eastern time on Friday, March 30, 2012.
- 2) Bids must be submitted in sealed opaque envelopes bearing on the outside the name and address of the bidder, clearly marked “**Bid # 1203 - Voice and Data Cabling – Professional Center.**” If forwarded by mail or other service, the sealed envelope marked as above, must be enclosed in another envelope and addressed to the District Office.
- 3) A Pre-Bid Meeting will be held at 3:00pm on Friday, March 16, 2012 in the Administrative Offices at 945 Forest Street, Dover, DE 19904. This meeting is not mandatory.
- 4) Quailified Bids will contain:
  - a. The Proposal Form provided by the district
  - b. The Non-Collusion Statement provided by the district
  - c. Copy of the vendor’s Delaware Business License
  - d. Proof of Insurance
- 5) All applicable provisions of Title 29, Chapter 69, Delaware Code, shall be as binding as though quoted herein. **Bid Bond is waived. Performance Bond is waived.**
- 6) Prevailing Wage is applicable and must be paid in accordance with State and County requirements.
- 7) Bid price shall include all costs.
- 8) All work performed must be in accordance with applicable codes.
- 9) The district may extend the time and place for opening of bids from that described in the advertisement on not less than two (2) calendar days notice, by certified delivery, facsimile machine or other electronic means to those bidders who obtained copies of the specifications.
- 10) The District reserves the right to waive any informalities in or to reject any or all bids.
- 11) No bidder may withdraw his bid within sixty (60) days after the actual date of opening thereof.
- 12) A formal contract is required and must be executed prior to the issuance of a purchase order.
- 13) The district will authorize and process for payment any invoices for delivered goods within (30) days of presentment.
- 14) In setting forth the enclosed specifications, it is the intention of the buyer to offer equal opportunity to all bidders.
- 15) Bidders requiring additional information may contact Mr. Sean Sokolowski, Business Manager, at (302) 672-1512.

**Capital School District  
Non-Collusion Statement  
Voice and Data Cabling – Professional Center  
Bid # 1203**

The above costs are submitted in accordance with the General Instructions to Bidders, and the Specifications. Any exceptions to these are to be listed below; otherwise, I agree to complete the contract as per the General Instructions and Specifications.

\_\_\_\_\_  
NAME OF COMPANY SUBMITTING PROPOSAL

\_\_\_\_\_  
STREET ADDRESS

\_\_\_\_\_  
CITY, STATE AND ZIP

THE UNDERSIGNED BIDDER CERTIFIES THAT NEITHER HE NOR ANY REPRESENTATIVE OF HIS COMPANY HAS, EITHER DIRECTLY OR INDIRECTLY ENTERED INTO ANY AGREEMENT, PARTICIPATED IN ANY COLLUSION, OR OTHERWISE TAKEN ANY ACTION IN RESTRAINT OF FREE COMPETITIVE BIDDING IN CONNECTION WITH THIS PROPOSAL.

\_\_\_\_\_  
SIGNATURE OF AUTHORIZED REPRESENTATIVE

\_\_\_\_\_  
DATE

\_\_\_\_\_  
NAME OF LOCAL REPRESENTATIVE (PRINT)

\_\_\_\_\_  
FAX NUMBER

\_\_\_\_\_  
TELEPHONE NUMBER

\_\_\_\_\_  
E.I. NUMBER

**Bid Opening: Friday, March 30, 2012 at 3:00 p.m. Eastern Time**

**BIDS NOT RECEIVED BY THIS TIME SHALL NOT BE CONSIDERED.  
NO EXCEPTIONS WILL BE MADE.**

Proposal Page #1  
Capital School District  
Bid # 1203

Voice and Data Cabling - Professional Center

Vendor	Equipment	Waranty Period	Total Installed Price
			\$



**Capital School District Voice and Data Cabling RFP**  
***Administration and Professional Development Center Building***

**March 2012**



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## Acronyms

AHJ	Authority having jurisdiction	LC	Limited combustible
ANEXT	Alien near-end crosstalk	LSOH	Low smoke zero halogen
ANSI	American National Standards Institute	LSZH	Low smoke zero halogen
ASTM	American Society for Testing and Materials	m	Meter(s)
AWG	American wire gauge	MHz	Megahertz
BICSI	Building Industry Consulting Service International	mm	Millimeter(s)
C	Celsius	N	Newton(s)
CDT	Cable Design Technologies	NEXT	Near-end crosstalk
CMP	Communications plenum	nF	Nanofarad(s)
CMR	Communications riser	ns	Nanosecond(s)
CP	Consolidation point	NVP	Nominal velocity of propagation
CSC	Construction Specifications Canada	OD	Outside diameter
CSI	The Construction Specifications Institute	PCB	Printed circuit board
CSV	Certified System Vendor	PE	Professional Engineer
dB	Decibel(s)	pF	Picofarad(s)
DC	Direct current	PSACRF	Power-sum attenuation-to-crosstalk ratio far-end
EF	Entrance facility	PSAACRF	Power-sum attenuation-to-alien crosstalk ratio far-end
EIA	Electronic Industries Alliance	PSANEXT	Power-sum alien near-end crosstalk
ELFEXT	Equal level far-end crosstalk	PSELFEXT	Power-sum equal level far-end crosstalk
ER	Equipment room	PSNEXT	Power-sum near-end crosstalk
F	Fahrenheit	RFQ	Request for quote
ft	Foot/feet	TBB	Telecommunications bonding backbone
Gb/s	Gigabits per second	TDR	Time domain reflectometer
IBDN	Integrated Building Distribution Network	TE	Telecommunications enclosure
IDC	Insulation displacement contact	TGB	Telecommunications grounding busbar
IEC	International Electrotechnical Commission	TIA	Telecommunications Industry Association
IEEE	Institute of Electrical and Electronics Engineers	TMGB	Telecommunications main grounding busbar
in	Inch(es)	TO	Telecommunications outlet/connector
ISO	International Organization for Standardization	TR	Telecommunications room
kg	Kilogram(s)	U	Rack unit [45 mm (1.75 in)]
lb	Pound(s)	UL	Underwriters Laboratories
lbf	Pound-force	WA	Work area

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## **DIVISION 27 – COMMUNICATIONS**

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### **27 00 00 Communications**

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#### **27 05 00 Common Work Results for Communications**

##### **27 05 26 Grounding and Bonding for Communications Systems**

###### **27 05 26.01 GENERAL**

**27 05 26.01.A** The facility shall be equipped with a telecommunications bonding backbone (TBB). This backbone shall be used to ground all telecommunications cable shields, racks, cabinets, raceways, and other associated hardware that has the potential to act as a current-carrying conductor. The TBB shall be installed independent of the building's electrical and building ground and shall be designed in accordance with the recommendations found in ANSI-J-STD-607-A, *Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications*.

**27 05 26.01.B** The main entrance facility/equipment room (EF/ER) in each building shall be equipped with a telecommunications main grounding busbar (TMGB). Each telecommunications enclosure (TE) and/or telecommunications room (TR) shall be provided with a telecommunications grounding busbar (TGB). The TMGB shall be connected to the building electrical entrance grounding facility. The intent is to provide a telecommunications grounding system that is equal in potential to the building electrical grounding system. This will minimize ground loop current potential between telecommunications equipment and the electrical system that supplies power to the equipment.

**27 05 26.01.C** All metal equipment racks, cabinets, backboards, cable shields, strength members, splice cases, cable trays, and the like entering or residing in TEs/TRs/ERs/EFs shall be grounded to the appropriate TGB/TMGB using a minimum 6 AWG stranded copper bonding conductor and compression connectors.

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27 05 26.01.D All wires used for telecommunications grounding purposes shall be identified with green insulation or green tape. Non-insulated wires shall be identified at each termination point using green tape. All cables and busbars shall be identified and labeled in accordance with ANSI-J-STD-607-A.

27 05 26.02 **GROUNDING AND BONDING SYSTEM INSTALLATION**

27 05 26.02.A The TBB shall be designed and/or approved by a qualified Professional Engineer (PE), licensed in the jurisdiction where the work is to be performed. The TBB shall adhere to the recommendations found in ANSI-J-STD-607-A and shall be installed in accordance with industry best practices.

27 05 26.02.B A licensed electrical contractor shall perform the installation and termination of the main bonding conductor to the building service entrance ground.

27 05 26.02.C Prevailing wage is applicable for the entire project and all workers must be paid in accordance with State and County requirements.

27 05 26.02.D All work for the entire project will be complete by May 25, 2012. Award of the contract will be made on April 26, 2012.

27 05 53 **Identification for Communications Systems**

27 05 53.01 **GENERAL**

27 05 53.01.A Labeling shall be in accordance with the recommendations found in TIA/EIA-606-A, the manufacturer's recommendations/installation guides, and industry best practices.

27 05 53.01.B Label stock shall be polyester-base material self-laminating for cables (wrap-around), wall outlets, terminal blocks and patch panels. It shall be durable and must be smudge and smear resistant as soon as they are made, will not fade over time or rub off, will not peel or loosen and will withstand specific component temperature and humidity requirements.

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## **27 08 00 Commissioning of Communications**

### **27 08 01 System Documentation**

#### **27 08 01.01 GENERAL**

**27 08 01.01.A** Upon completion of the installation, the successful bidder shall provide three comprehensive sets of documentation to the owner of the Belden IBDN System 2400 for approval. Documentation shall include the items detailed below.

**27 08 01.01.B** Documentation shall be submitted within 10 working days of the completion of each testing phase (e.g., subsystem, area, floor). This includes all test results and draft as-built drawings. Draft drawings may include hand-written annotations. Printer-generated (final) copies of all drawings shall be submitted within 30 working days of the completion of each testing phase. At the request of the owner of the Belden IBDN System 2400, the successful bidder shall provide copies of the original test results in electronic format, for example a Fluke Networks (\*.flw) Linkware file or a Microsoft Excel (\*.xls) file.

**27 08 01.01.C** The owner of the Belden IBDN System 2400 may request a 10% random field re-test of the installed cabling system (at no additional cost) to verify documented findings. If the re-test findings contradict the documentation submitted by the successful bidder, additional testing can be requested to the extent deemed necessary by the owner of the Belden IBDN System 2400, including a 100% re-test. This testing shall be at no additional cost to the owner of the Belden IBDN System 2400.

### **27 08 02 Test Results Documentation**

#### **27 08 02.01 GENERAL**

**27 08 02.01.A** The test equipment shall meet the requirements found in the TIA/EIA-568-C series of standards.

- 27 08 02.01.B Test documentation shall be provided on permanent media within three weeks after the completion of the project. The media shall be clearly marked on the outside front cover with the words "Project Test Documentation", the project name, and the date of completion (month and year). The results shall include a record of test frequencies, cable type, conductor pair and cable (or connector) ID, measurement direction, reference setup, and technician name(s). The test equipment name, manufacturer, model number, serial number, software version, and last calibration date will also be provided. Unless the manufacturer specifies a more frequent calibration cycle, proof of annual calibration must be documented for all test equipment used in this installation.
- 27 08 02.01.C Printouts generated for each cable by the test equipment shall be submitted as part of the documentation package. Alternately, the successful bidder may furnish this information in electronic format on permanent media. The media shall contain the electronic equivalent of the test results as defined by the bid specification, in a file format such as Fluke (\*.flw) Linkware file format or compatible with Microsoft Word 2007 or Microsoft Excel 2007.
- 27 08 02.01.D When repairs and re-tests are performed, the problem(s) found and the corrective action(s) taken shall be noted. Both the failed and passed test results shall be documented.

### 27 08 03 As-Built Drawings

#### 27 08 03.01 GENERAL

- 27 08 03.01.A Drawings must include cable routes and telecommunications outlet/connector (TO) locations. Each TO location shall be referenced by its unique identifier. Numbering, icons, and drawing conventions used shall be consistent throughout all documentation provided. The owner of the Belden IBDN System 2400 will provide floor plans in paper and electronic (DWG, AutoCAD Release 14) formats, to which as-built construction information can be added. These documents will be modified accordingly by the successful bidder to denote as-built information as defined above and returned to the owner of the Belden IBDN System 2400.
- 27 08 03.01.B The successful bidder shall annotate the base drawings and provide both print (same plot size as originals) and electronic (AutoCAD Release 14) versions of the modified files.
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## 27 10 00 Structured Cabling

### 27 10 01 Scope

- A. This specification shall cover the installation, materials, testing, and warranty coverage of media used for the transmission of voice, data, and video. All cabling shall meet TIA/EIA 568B (Category 6) and TIA/EIA 569 Standards. The work shall be done by skilled mechanics under the direction and supervision of the Contractor.
- B. Provide cable for each outlet shown and as required by the Owner on the provided diagrams. Exact locations will be on the drawings provided by EDIS. Should any discrepancies be found with the "C" Outlet Configuration on those plans, or as built in the field, and the overview map provided, this should be reported to Capital School Districts Office of Technology immediately.
- C. Provide additional cables and outlets to each security, fire panel and elevator per owner and as required for those systems to function.
- D. Cable shall be extended from each outlet to the local IDF or MDF. Each cable shall have a service loop installed allowing for future changes and adjustments. This service loop shall be in the wall or ceiling as necessary. Each IDF shall have a service loop on all cables allowing for future changes or adjustments.
- E. Provide all communications wire, cable, devices and related facilities installed complete as shown or as implied on the Contract Documents for a fully functional communications system, including but not limited to:
1. Backbone and devices
  2. Horizontal cabling and devices
  3. Racks, cable trays, raceways, and cable management
  4. Patch panels and punchdown blocks
  5. Interface with auxiliary systems (Security System, Fire System, etc.)
  6. Sleeves, hangers, and fire-stopping
  7. Installing, Mounting, and cabling MERU Wireless Access Points as indicated by Owner.
- F. Coordination - Coordinate device locations with furnishings, equipment and Owner. Projector locations need to be coordinated with EDIS and Awarded Audio/Visual Contractor. This includes placement
- G. Provide patch panels, vertical and horizontal cable management in each rack.
- H. Provide the following between the IDF 134 and IDF 202, including terminations:
1. Fiber Optic Cabling: Provide 12 strand fiber optic-based backbone cabling infrastructure equipped 50/125 multi-mode fibers between the IDF's. The multi-mode fibers shall be terminated with fusion-spliced, factory-polished, SC pigtailed.
  2. 100 pair CAT-3e voice cable between IDF 134 and IDF 202 terminated on 110 blocks.
  3. Provide two 1" innerducts between IDF 134 and IDF 202.
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- I. Provide the following between the PDC IDF 134 and the Technology / Maintenance MDF, including terminations.
  1. Fiber Optic Cabling: Provide 12 strand OSP fiber optic-based backbone cabling infrastructure equipped 50/125 multi-mode fibers between the IDF 202 and Tech MDF. The multi-mode fibers shall be terminated with fusion-spliced, factory-polished, SC pigtails.
  2. Provide and install 150 pair OSP CAT-3e voice cable terminated on 110 blocks
- J. Provide audio cabling to connect main Multipurpose Room (101) Primary Sound System to Digital Telephone System provided by Collins Business Systems (CBS). The coordination of the type of cable and final connections must be made with CBS prior to the start of work.

#### 27 10 01.01 GENERAL

- 27 10 01.01.A This document describes the requirements for furnishing and installing a telecommunications cabling infrastructure at (*Capital School District Office*). A balanced twisted-pair cabling system capable of supporting Gigabit Ethernet networking is described.
- 27 10 01.01.B All cables and related support, termination, and grounding hardware shall be furnished, installed, tested, labeled, and documented by the successful bidder as detailed in this document.
- 27 10 01.01.C General product specifications, design considerations, and installation guidelines are provided in this document. Specific site-related requirements are provided as an attachment to this document. In case of conflict, this document shall take precedence. The successful bidder shall meet or exceed all requirements for the cabling system described in this document.

#### 27 10 02 Regulatory References

- 27 10 02.01 GENERAL
- 27 10 02.01.A All workmanship and materials shall be in full conformance with applicable building, electrical, and other codes, as determined by the authority having jurisdiction (AHJ).
- 27 10 02.01.B All cabling system components shall be Underwriters Laboratories (UL) or ETL Listed and shall be marked as such.
- 27 10 02.02 REFERENCE LIST
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27 10 02.02.A

The product specifications, design considerations, and installation guidelines provided in this document are in part derived from recommendations found in recognized telecommunications industry standards. The following are used as reference:

1. Spaces and Pathways
    - ISO/IEC 18010:2002 – *Pathways and Spaces for Customer Premises Cabling*
    - TIA-569-B (2004) – *Commercial Building Standard for Telecommunications Pathways and Spaces*
    - TIA-942 (2005) – *Telecommunications Infrastructure Standard for Data Centers*
  2. Grounding
    - ANSI-J-STD-607-A (2002) – *Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications*
  3. Cabling Systems
    - ISO/IEC 11801 2nd Edition 12/07/07 *Information Technology – Generic cabling for Customer Premises*
    - TIA-568-C.1 (2009) and associated Addenda – *Commercial Building Telecommunications Cabling Standard, Part 1: General Requirements*
    - TIA-568-C.2 (2009) and associated Addenda – *Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted-Pair Cabling Components*
    - TIA-862 (2002) – *Building Automation Systems Cabling Standard for Commercial Buildings*
    - TIA-942 (2005) – *Telecommunications Infrastructure Standard for Data Centers*
  4. Cabling Administration
    - ISO/IEC 14763-1:1999 – *Implementation and Operation of Customer Premises Cabling – Part 1: Administration*
    - TIA/EIA-606-A (2002) – *Administration Standard for Commercial Telecommunications Infrastructure*
  5. Networking
    - IEEE Standard 802.3an – *10GBASE-T (10 Gb/s Ethernet operations over balanced twisted-pair cabling)*
  6. Design
    - BICSI *Telecommunications Distribution Methods Manual (TDMM) – 12<sup>th</sup> edition (2009)*
-

## 7. Installation

BICSI *Information Transport Systems Installation Manual (ITSIM)* –  
4<sup>th</sup> edition (2004)

27 10 02.02.B In cases where product specifications, design considerations, and installation guidelines provided in this document are in conflict with the references listed above, the more stringent requirements shall apply. All references listed above were current during development of this publication. The bidder is responsible for referencing to the most recent releases when developing bid proposals.

27 10 02.02.C This document does not take precedence over any code, either partially or wholly.

## 27 10 03 General Condition – Approved Vendor

27 10 03.01 GENERAL

27 10 03.01.A Alternate structured cabling systems will be considered based upon their ability to provide the functions and features of the specified equipment and as hereinafter specified. Any proposed equal item offered shall be substantiated fully to provide equality and the decision of the owner or his properly designated representative as to the equality will be final.

If the contractor proposes to use an alternate manufacturer, he shall submit the system and obtain written approval at least ten days prior to the bid date. The submission shall consist of a diagram and console or rack elevation drawings for evaluation of the alternate system by the engineer. Failure of the submittal to meet or exceed the specified requirements, and/or to obtain written approval at least ten days prior to the bid date shall be sufficient cause for the refusal to consider further submittals of this manufacturer or alternate listed manufacturers.

**All submittals must conform to the state of Delaware K12 wiring standards, please refer to this link for additional details:**  
**<http://dti.delaware.gov/pdfs/pp/CablingAndWiringStandard-K12.pdf>**

27 10 03.01.B The bidder shall demonstrate proven expertise in the implementation of network cabling. Expertise can be illustrated through the inclusion of details of at least three projects involving the design and installation of a Category 5e, Category 6, or Augmented Category 6 (Category 6A) balanced twisted-pair cabling system within the past two-year period. Names and contact information for each of the three projects shall be included.

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- 27 10 03.01.C The successful bidder shall hereinafter be referred to as the Vendor.
- 27 10 03.01.D The Vendor shall accept complete responsibility for the design, installation, acceptance testing, and certification of the Belden IBDN System 2400.
- 27 10 03.01.E The Vendor shall provide proof of its current CSV status and shall deliver Belden Inc. System Certification for the installed Belden IBDN System 2400.
- 27 10 03.01.F The bidder must be an authorized Belden IBDN Certified System Vendor (CSV) of the Belden IBDN System 2400.
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27 10 04      General Condition – Approved Installer

27 10 04.01      GENERAL

27 10 04.01.A      The installation of the Belden IBDN System 2400 shall be performed by employees of the Vendor only. The chosen vendor employment documentation must be provided to the owner prior to being awarded the contract.

27 10 04.01.B      All installation and testing shall be performed by certified BISCII level 2 technicians and supervised by individuals qualified to install and test the Belden IBDN System 2400, in accordance with Belden Inc. requirements. The supervisor(s) shall have successfully completed Belden IBDN installation training provided by Belden Inc.

27 10 05      General Condition – Approved Products

27 10 05.01      APPROVED PRODUCTS

27 10 05.01.A      Approved balanced twisted-pair cable: Belden Inc. 2400 Cable Series <http://www.belden.com/pdfs/Prodbull/NP289.pdf> or approved equal per the Delaware State cabling system contract.

27 10 05.01.B      Approved connectors: Belden Inc. GigaFlex PS6+ MDVO-style Modules <http://www.belden.com/pdfs/techinfo/DSGigaFPS6+.pdf> or KeyConnect Modules <http://www.belden.com/pdfs/Prodbull/NP302.pdf> or approved equal per the Delaware State cabling system contract.

27 10 05.01.C      Approved patch panels: Belden Inc. Flex Patch Panels [http://www.belden.com/pdfs/techinfo/DS\\_Flex\\_Patch\\_Panels.pdf](http://www.belden.com/pdfs/techinfo/DS_Flex_Patch_Panels.pdf) or KeyConnect Patch Panels <http://www.belden.com/pdfs/Prodbull/NP277.pdf> or AngleFlex™ Patch Panels <http://www.belden.com/pdfs/Prodbull/NP276.pdf>

27 10 05.01.D      Approved cordage: Belden Inc. CAT6+ Bonded-Pair Modular Cords and CAT6+ Bonded-Pair Pigtailes <http://www.belden.com/pdfs/Prodbull/NP279.pdf> or approved equal per the Delaware State cabling system contract.

27 10 05.02      EQUIVALENT PRODUCTS

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27 10 05.02.A To qualify for System Certification, only products made or approved by Belden Inc. shall be used to ensure the end-to-end performance of the Belden IBDN System 2400. The Belden Inc. 25-Year Component Warranty and Lifetime Application Assurance can only be provided to installations consisting of products supplied by Belden Inc. for the Belden IBDN System 2400.

27 10 07 Work Included

27 10 07.01 GENERAL

27 10 07.01.A The work included consists of all labor, equipment, products, and supplies required to design, install, test, and certify the Belden IBDN System 2400 in compliance with project specifications.

27 10 07.01.B The work included consists of (but is not limited to) the following:

1. Pre-registration of project with Belden Inc. as a Belden IBDN Certified Project.
  2. Furnishing and installation of a complete balanced twisted-pair telecommunications cabling infrastructure capable of supporting Gigabit networking.
  3. Furnishing, installation of, and termination of all cabling runs.
  4. Furnishing and installation of all TOs, patch panels, and cordage.
  5. Furnishing and installation of all required cabinets and/or racks in TEs, TRs, and/or ERs.
  6. Furnishing of any other material required to implement a complete system.
  7. Testing all installed cabling runs and furnishing a summary report confirming the Pass status of each run.
  8. Furnishing all test and labeling information in both electronic and paper formats.
  9. Providing training and complete documentation, including the Belden IBDN User Manual, Application Guidelines, and as-built drawings.
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## 27 10 08 Drawings Specifications

### 27 10 08.01 GENERAL

27 10 08.01.A All drawings and plans provided with this document are diagrammatic. They are included to show the scope of the project in order to assist in the development of bid documents. The Vendor shall make allowances in the bid proposals to cover the work required to comply with the intent of the drawings and plans.

27 10 08.01.B The Vendor shall verify all dimensions at the site and is responsible for their accuracy. It will be the successful contractor's responsibility to perform a site survey of the existing conditions to determine what conduit pathways and spaces have been installed and what floor-boxes and poke through boxes are installed. However, all equipment and cabling to support the function of the cabling system will be the responsibility of the successful contractor to ensure that all systems are fully functional and complete. It will be the responsibility of the winning contractor to coordinate any needed conduits, pathways, and any other required supporting architecture for the successful installation and functionality of the equipment.

Full electrical plans can be retrieved at:

<http://Bids.ediscompany.com>

Username is: csdpc Password is: edis0413

27 10 08.01.C Prior to submitting a bid, the Vendor shall indicate:

1. Any specified materials the Vendor believes to be inadequate.
2. Any necessary items of work omitted from the bid specification.

## 27 10 09 Pre-Project Submittals

### 27 10 09.01 GENERAL

27 10 09.01.A Under the provisions of this document and prior to the start of work, the Vendor shall:

1. Submit proof of manufacturer's certification status of their company and the names of all individuals that will be performing the installation and testing to the owner of the Belden IBDN System 2400.
  2. Submit details of all cabling system products to be used to the owner of the Belden IBDN System 2400.
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27 10 09.01.B Work shall not be performed without the written approval of the submitted items by the owner of the Belden IBDN System 2400.

27 10 09.01.C The Vendor must obtain approval from Belden Inc. and from the owner of the Belden IBDN System 2400 for any substitution of submitted products. No substituted items shall be installed without written approval.

## 27 10 11 Structured Cabling Overview

### 27 10 11.01 GENERAL

27 10 11.01.A The system chosen shall meet the following specifications:

1. The balanced twisted-pair cable shall be available in Bonded pair and non-Bonded pair configurations.
2. The balanced twisted-pair cabling system shall support Gigabit Ethernet networking and shall provide additional performance margin up to 550 MHz for a 4-connector, 100 m (328 ft) channel. Manufacturer's cable must be tested from 1 to 550 mhz. Test results for

NOTE: 4-connector refers to one TO, one consolidation point (CP), and two cross-connect panels in a TE/TR/ER (one for horizontal cables and one for equipment pigtails).

27 10 11.01.B At a minimum, the balanced twisted-pair cabling system shall exceed the key performance parameters for Cat 6 found in ANSI/TIA/EIA-568-C.2 (2009) Category 6 standard over the specified frequency ranges by the values listed below. The balanced twisted-pair cabling system shall also meet all the requirements of ISO/IEC 11801 Edition 2.0 2002-09.

PSNEXT = Power-sum near-end crosstalk

PSACR-F = Power-sum attenuation-to-crosstalk ratio far-end

PSACRN = Power-sum attenuation-to-crosstalk ratio near-end

(a) = applies to bonded-pair cables and cords

(b) = extrapolated values using Category 6 limit line equations

## 27 10 12 Testing and Acceptance

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## 27 10 12.01 GENERAL

27 10 12.01.A All terminated cabling runs shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements found in the TIA/EIA-568-C series of standards. All pairs in each installed cable shall be verified prior to system acceptance. Any defect in the cabling system installation, including (but not limited to) cables, connectors, patch panels, and cordage shall be repaired or replaced in order to ensure 100% usability of all installed runs.

## 27 10 12.02 COPPER CHANNEL TESTING

27 10 12.02.A All balanced twisted-pair cable links shall be tested for basic continuity and length, as indicated below. Additional testing shall be performed to verify compliance with Category 6 performance for the parameters listed in Section 27 10 11.01.B of this document. The extent of testing shall be in accordance with the end-customer's testing requirements. Belden recommends 100% testing of permanent links for Insertion Loss, Return Loss, NEXT, PSNEXT and PSACRF. These tests are performed at the same time as the Continuity test using an automated tester, such as the Fluke DTX1800.

27 10 12.02.B Continuity – Each pair in every installed cabling run shall be tested using a test set that detects and identifies opens, shorts, polarity and pair reversals, crossed pairs, and split pairs. The results shall be recorded as Pass/Fail (as indicated by the test set) and referenced to the appropriate cable identification number and circuit/pair number. Any fault shall be corrected and the run re-tested prior to final acceptance.

27 10 12.02.C Length – Every installed cabling run shall be tested for installed length using a time domain reflectometer (TDR) device. The cable length shall not exceed 90 m (295 ft). The cable length shall be recorded, referencing the cable identification number and circuit/pair number. Utilize the Fluke DTX-1800 for testing the length of the cable.

27 10 12.02.D Category 6 performance testing shall be done according to the published standards.

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## 27 10 13 Warranty and Services

### 27 10 13.01 QUALIFICATION OF SYSTEM

- 27 10 13.01.A The installed Belden IBDN System 2400 shall be covered by Belden IBDN System Certification, issued by Belden Inc. and delivered by the CSV.
- 27 10 13.01.B Telecommunications spaces and pathways in new buildings or in those buildings having undergone major renovations in the preceding three years should conform to the recommendations outlined in TIA/EIA-569-B. In cases of installation in restrictive spaces and pathways (where it is not possible to implement the standards-based recommendations), no cabling run shall exceed 90 m (295 ft) in length nor be installed in any manner that limits the performance of the Belden IBDN System 2400.
- 27 10 13.01.C The installed Belden IBDN System 2400 shall conform to all applicable local building and electrical codes and or approved equal per the Delaware State cabling system contract.

### 27 10 13.02 CERTIFICATION

- 27 10 13.02.A To qualify for System Certification, the Belden IBDN System 2400 shall be designed, installed, and tested by a level 2 BICSI technician.
- 27 10 13.02.B To qualify for System Certification, the installed cabling system shall fully comply with all relevant Belden IBDN design and applications guidelines, including any pre-approved deviations as specified in the latest release of the Belden IBDN Certification Guide.
- 27 10 13.02.C To qualify for System Certification, only products made or approved by Belden Inc. shall be used to ensure the end-to-end performance of the Belden IBDN System 2400. The Belden Inc. 25-Year Component Warranty and Lifetime Application Assurance can only be provided to installations consisting of products supplied by Belden Inc. for the Belden IBDN System 2400.
- 27 10 13.02.D Belden Inc. will not provide certification or warranty coverage for products manufactured by other entities.
-

27 10 13.03 25-YEAR COMPONENT WARRANTY

27 10 13.03.A The Belden IBDN System Certification shall provide a twenty-five (25) year warranty for all Belden IBDN passive components used in the installed Belden IBDN System 2400. Defective and/or improperly installed products shall be replaced and/or reinstalled at no cost to the owner of the Belden IBDN System 2400.

27 10 13.04 LIFETIME APPLICATION ASSURANCE

27 10 13.04.A The Belden IBDN System Certification shall provide the assurance that all present and future commercially available applications engineered for the performance level of the installed cabling system in accordance published standards will work for the lifetime of the certified Belden IBDN System 2400.

27 10 13.04.B Should the certified Belden IBDN System 2400 fail to support the networking technologies designed to operate over it—at the time of cutover, during subsequent use, or after upgrading active network devices (e.g., migrating to Gigabit Ethernet switches from 100 Mb/s switches)—Belden Inc. and the Vendor shall take prompt corrective action.

27 10 13.05 OWNER RESPONSIBILITY

27 10 13.05.A The Vendor shall provide a Belden IBDN User Manual to the owner of the Belden IBDN System 2400. This document describes essential system elements and specifies the owner's responsibilities for maintaining the integrity of the installed cabling system over time. The Belden IBDN User Manual contains guidelines for cabling system modifications (e.g., relocations, additions, changes to services), in addition to labeling and record-keeping maintenance requirements.

27 10 13.05.B The owner of the Belden IBDN System 2400 accepts that the benefits offered by System Certification are revoked if non-approved products are introduced to the installed Belden IBDN System 2400. To regain System Certification in such cases, a CSV must apply and validate all corrective modifications deemed necessary by Belden Inc.

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## **27 11 00 Communications Equipment Room Fittings**

### **27 11 13.01 COPPER CABLE PROTECTION UNITS**

- 27 11 13.01.A All copper circuits shall be provided with an entrance cable protector panel for electrical protection. All building-to-building circuits shall be routed through this protector. The protector shall be equipped with a 6 AWG copper bonding conductor between the protector ground lug and the approved ground point.

## **27 11 16 Communications Cabinets, Racks, Frames, and Enclosures**

### **27 11 16.01 RACKS**

- 27 11 16.01.A All racks shall provide cable management and support elements for cordage at the front of the rack. They shall also provide cable management, support, and protection elements for the cables and/or equipment pigtails placed along the legs of the rack.

- 27 11 16.01.B Any free-standing rack shall be a knock-down rack assembly equipped with two vertical and two universal channels.

### **27 11 16.02 RACK INSTALLATION**

- 27 11 16.02.A Racks shall be securely attached to the concrete floor using a minimum 9.5 mm (0.375 in) hardware or as required by local codes.

- 27 11 16.02.B Racks shall be placed with a minimum of 914 mm (36 in) clearance from the walls on all sides of the rack. When mounted in a row, there shall be a minimum of 914 mm (36 in) clearance from the wall behind the racks, in front of the row of racks, and from the walls at the ends of the row.
-

- 27 11 16.02.C All racks shall be grounded to the TGB in accordance with Section 27 05 26 of this document.
- 27 11 16.02.D Rack-mount fasteners not used for installing patch panels and other hardware shall be bagged and left with the rack upon completion of the installation.
- 27 11 16.02.E Rack-mount termination equipment shall be installed in accordance with the manufacturer's recommendations and installation guides.

## 27 11 19 Communications Termination Blocks and Patch Panels

### 27 11 19.01 TERMINATION BLOCKS

- 27 11 19.01.A The termination block system shall provide a centralized termination, identification, and service assignment point for Cat 6 cabling and cordage in TEs/TRs/ERs.
- 27 11 19.01.B The termination blocks used to terminate the 4-pair balanced twisted-pair cable shall have the following characteristics:
1. Utilizes an extremely compact connector equipped with double-sided Insulation Displacement Connection (IDC) clips in a symmetrical construction which allows termination of high-performance cables on one side and cross-connect wires or patch cords on the other.
  2. Possesses mounting positions for 72 station cables (or 48 station cables with rack mounted option)
  3. Provides space behind connector to maintain the correct bend radii of terminated cables.
  4. Have accommodations for either patchcords or jumper wire for service assignments.
  5. Have the possibility of mounting the connectors on the wall or in a cross-connect frame for front-to-back cross-connect arrangement.
  6. Exceeds Category 6 performance as defined in TIA-568-C.2 (2009).
-

27 11 19.03 PATCH PANELS

27 11 19.03.A The patch panel system shall provide a centralized termination, identification, and service assignment point for Cat 6 cabling and cordage in TEs/TRs/ERs.

27 11 19.03.B The patch panels used to terminate the 4-pair balanced twisted-pair cable shall have the following characteristics:

1. The patch panels shall be available in 24-port 1U, 48-port 1U, 48-port 2U, and 72-port 2U configurations.
2. The cord management system for the patch panel shall not occupy additional rack space [i.e., zero (0) U].
3. The patch panels shall be equipped with 24, 48, or 72 connectors. The connectors shall have the characteristics described in Section 27 15 43 03 of this document.
4. The transmission characteristics of the patch panels shall be guaranteed to 250 MHz for all ports.

27 11 19.05 COPPER TERMINATION HARDWARE INSTALLATION

27 11 19.05.A Cables shall be dressed and terminated in accordance with standards-based recommendations, the manufacturer's recommendations/installation guides, and industry best practices.

27 11 19.05.B The twisted pairs shall be guided, positioned and secured at the connector termination point using a termination bar that locks the pairs in place to prevent untwisting of pairs into the cable when terminating the conductors.

27 11 19.05.C The termination bar holding the wires in place at the IDC termination shall withstand a tensile force of 20 lbs minimum applied to the cable without dislodging the IDC connection

27 11 19.05.D Cables shall be neatly bundled, dressed, and routed to their respective termination connectors. Each patch panel shall terminate a cable bundle separated and dressed back to the point of cable entrance into the equipment cabinet or rack.

27 11 19.05.E Each cable shall be clearly labeled on the cable jacket behind the patch panel at a location that can be viewed without removing the bundle support element(s). Labels obscured from view shall not be acceptable.

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## **27 13 00    Communications Backbone Cabling**

### **27 13 13    Communications Copper Backbone Cabling**

#### **27 13 13.01    BACKBONE CABLES**

27 13 13.01.A    The backbone cabling is the portion of the cabling system that links the termination fields in different TEs/TRs/ERs within a building (and between buildings in a campus environment). It is commonly installed between floors in a vertical orientation.

#### **27 13 13.02    BACKBONE CABLE INSTALLATION**

27 13 13.02.A    Backbone cables shall be installed in accordance with standards-based recommendations, the manufacturer's recommendations/installation guides, and industry best practices.

27 13 13.02.B    A plastic or nylon pull cord with a minimum test rating of 90 kg (200 lb) shall be co-installed with the cable in any conduit.

27 13 13.02.C    Where cables are routed using conduits, the backbone and horizontal cables shall be installed in separate conduits.

27 13 13.02.D    Where cables are installed in an air return plenum, any non-plenum cable shall be installed in metallic conduit.

27 13 13.02.E    Where backbone cables and horizontal cables are installed in a cable tray or wireway, backbone cables shall be installed first and segregated from the horizontal cables.

27 13 13.02.F    All backbone cables shall be securely fastened to a wall of the TE/TR/ER served.

27 13 13.02.G    Backbone cables spanning more than three floors shall be securely attached at the top of the cable run with a wire mesh grip as well as on alternating floors or as required by local codes.

27 13 13.02.H    Vertical cable runs shall be supported by messenger strand, cable ladder, or any other method that provides adequate support for the weight of the cable.

27 13 13.02.I    Large bundles of backbone cables and/or heavy cables shall be attached to support elements using metal clamps and/or metal banding.

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## 27 15 00 Communications Horizontal Cabling

### 27 15 13 Communications Copper Horizontal Cabling

#### 27 15 13.01 TOPOLOGY

27 15 13.01.A The horizontal cabling shall be installed using a star topology, typically extending from centralized TRs to individual TOs in work areas (WAs).

27 15 13.01.B The cabling system shall provide (*A MINIMUM OF TWO*) cabling runs to the TO in each WA. All runs will terminate in designated TEs/TRs/ERs. No run shall exceed 90 m (295 ft), as measured from the cable termination point at each end. An additional 10 m (33 ft) is allowed for cordage at both ends, for a maximum allowable end-to-end or channel length of 100 m (328 ft).

#### 27 15 13.02 HORIZONTAL CABLES

27 15 13.02.A The 4-pair balanced twisted-pair cables shall be available in Bonded pair and non-Bonded pair configurations. The characteristics listed below shall apply to both configurations.

27 15 13.02.B The cables will be available in plenum (CMP), non-plenum (CMR), low smoke zero halogen (LSOH/LSZH), and limited combustible (LC) versions. The minimum recommended installation temperature shall be 5 °C (40 °F). The temperature rating shall be 60 °C (140 °F).

27 15 13.02.C The cable conductors shall be 23 AWG solid copper.

27 15 13.02.D The effective cable OD shall be 5.45 mm (0.215 in) for CMR-rated cable and 5.33 mm (0.21 in) for CMP-rated cable. The effective cable OD is the diameter of a six-around-one cable bundle divided by 3.

27 15 13.02.E The minimum bend radius shall be 25 mm (1 in) for CMR-rated cable and CMP-rated cable.

27 15 13.02.F The guaranteed values for the primary transmission characteristics of the cable are as follows:

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Maximum DC resistance (at 20 °C)	9.38 ohms/100 m (328 ft)
Maximum DC resistance unbalance	5 %
Maximum mutual capacitance	5.6 nF/100 m (328 ft)

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Maximum capacitance unbalance (pair to ground)	330 pF/100 m (328 ft)
Maximum propagation delay skew	25 ns/100 m (328 ft)
NVP – plenum	72% @ 10 MHz
NVP – non-plenum	68% @ 10 MHz

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DC = Direct current

NVP = Nominal velocity of propagation

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- 27 15 13.03 HORIZONTAL CABLE INSTALLATION
- 27 15 13.03.A Horizontal cables shall be installed in accordance with standards-based recommendations, the manufacturer's recommendations/installation guides, and industry best practices.
- 27 15 13.03.B A plastic or nylon pull cord with a minimum test rating of 90 kg (200 lb) shall be co-installed with the cable in any conduit.
- 27 15 13.03.C Cable raceways shall not be filled greater than the TIA/EIA-569-B recommended maximum fill for the particular raceway type, or 40%.
- 27 15 13.03.D Cables shall be installed in continuous lengths from origin to destination. An exception is made for one CP in any cabling run.
- 27 15 13.03.E Where cables are installed in an air return plenum, any non-plenum cable shall be installed in metallic conduit.
- 27 15 13.03.F If CPs are used, they shall be placed in accessible locations and housed in enclosures intended and suitable for that purpose.
- 27 15 13.03.G If a J-hook or trapeze system is used to support cable bundles, all horizontal cables shall be supported at every 1.2 m to 1.5 m (48 in to 60 in) intervals. It is recommended that the support surface is rounded without any sharp edges and at least 2 inches wide. At no point shall cable(s) rest on acoustic ceiling grids or panels.
- 27 15 13.03.H Horizontal cables shall be bundled in groups of no more than 50 cables. Cable bundle quantities in excess of 50 cables may cause deformation of the bottom cables within the bundles, which will degrade the performance of those cables.
- 27 15 13.03.I Cable shall be installed above fire-sprinkler systems and shall not be attached to such systems or any associated ancillary equipment or hardware. The cabling system and its associated pathways shall be installed so that they do not obscure any valves, fire alarm conduit(s), boxes, or other control devices.
- 27 15 13.03.J Cables shall not be attached to ceiling grid or lighting fixture wires. Where support for horizontal cable is required, the Vendor shall install appropriate carriers to support the cabling.
- 27 15 13.03.K Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the Vendor prior to final acceptance at no cost to the owner of the Belden IBDN System 2400.
-

27 15 13.03.M      Balanced twisted-pair cable shall be installed so that there are no bends smaller than 4 times the OD of the cable at any point in the run or at the termination points.

27 15 13.03.N      The pulling tension on any 4-pair balanced twisted-pair cable shall not exceed 110 N (25 lbf).

## 27 15 43      Communications Faceplates and Connectors

### 27 15 43.01      GENERAL

27 15 43.01.A      Each horizontal cable shall be terminated at its designated WA in a modular connector assembly using an MDVO or KeyConnect module designed to snap into a faceplate.

27 15 43.01.B      The WA modular connector assembly/faceplate shall accommodate:

1. A minimum of two cabling runs.
2. Blank fillers, to be installed in any outlet port in the faceplate that is not occupied by a modular connector assembly.

27 15 43.01.C      Multiple WA outlets that are in close proximity on drawings (and not separated by physical barriers) may be combined in a single faceplate. The Vendor shall be responsible for determining the optimum compliant configuration.

27 15 43.01.D      The same orientation and positioning of modular connector assemblies on faceplates shall be used throughout the project. Prior to installation, the Vendor shall submit the proposed configuration(s) for WA modular connector assemblies/faceplates for approval by the owner of the Belden IBDN System 2400.

27 15 43.01.E      All WA outlets shall accommodate printed label strips for outlet identification purposes. Printed labels shall be permanent and shall comply with TIA/EIA-606-A. Handwritten labels shall not be accepted.

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27 15 43.02 FACEPLATES

27 15 43.02.A The faceplate housing the modular connector assemblies shall provide a symmetrically centered appearance for the modules.

27 15 43.02.B The faceplate housing the modular connector assemblies shall have no visible mounting screws.

27 15 43.02.C The faceplate housing the modular connector assemblies shall have built-in labeling windows to facilitate outlet identification.

27 15 43.03 CONNECTORS

27 15 43.03.A The modular connector assemblies using MDVO or KeyConnect modules to terminate the 4-pair balanced twisted-pair cable shall have the characteristics listed below.

27 15 43.03.B The connectors shall be modular in form, with available mounting options for TOs, CPs, rack-mount panels, and wall-mount panels. The dimensions of the connectors shall not exceed:

1. 20 mm (0.79 in) in height.
2. 17 mm (0.67 in) in width.
3. 40 mm (1.57 in) in depth.

27 15 43.03.C The connectors shall use an encapsulated lead frame technology ensuring long-term reliability as well as stable transmission performance.

27 15 43.03.D The connectors shall use a plastic element to position and hold each cable pair at a right angle to its corresponding IDC termination point.

27 15 43.03.E The connectors shall incorporate crosstalk compensation and impedance matching circuitry ensuring additional NEXT, FEXT, insertion loss and return loss margin beyond minimum Category 6 requirements to guarantee transmission performance up to 250 MHz.

27 15 43.03.F The transmission characteristics of a mated connection when measured at 100 MHz with Belden CAT6+ plugs shall be as follows:

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<b>Parameter</b>	<b>Minimum Average</b>
NEXT	55.1 dB
PSNEXT	52.0 dB

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FEXT	49.8 dB
PSFEXT	46.9 dB
Insertion Loss	0.10 dB
Return loss	27.0 dB

NEXT = Near-end crosstalk

PSANEXT = Power-sum alien near-end crosstalk

#### 27 15 43.04 WORK AREA INSTALLATION

- 27 15 43.04.A Work area TOs shall be installed in accordance with standards-based recommendations, the manufacturer's recommendations/installation guides, and industry best practices.
- 27 15 43.04.B Cables shall be dressed and terminated in accordance with standards-based recommendations, the manufacturer's recommendations/installation guides, and industry best practices.
- 27 15 43.04.C Slack cable shall be coiled in flush or surface-mount TOs if adequate space is provided to house the cable coil without exceeding the manufacturer's bend radius limitations. In hollow-wall installations where box eliminators are used, cable slack can be stored in the wall. No more than 300 mm (12 in) of slack shall be stored in a TO, modular furniture raceway, or insulated wall. Excess slack may be loosely coiled and stored in the ceiling above each WA.
- 27 15 43.04.D The twisted pairs shall be guided, positioned and secured at the connector termination point using a termination bar that locks the pairs in place to prevent untwisting of pairs into the cable when terminating the conductors.
- 27 15 43.04.E Bend radius of the cable in the termination area shall not be less than 4 times the OD of the cable.
- 27 15 43.04.F Data outlets (unless otherwise noted in drawings) shall occupy the bottom positions on faceplates. Data outlets in horizontally oriented faceplates shall occupy the right-most positions.
- 27 15 43.04.G Voice outlets (unless otherwise noted in drawings) shall occupy the top positions on faceplates. Voice outlets in horizontally oriented faceplates shall occupy the left-most positions.

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## **27 16 00 Communications Connecting Cords, Devices, and Adapters**

### **27 16 19 Communications Patch Cords, Station Cords, and Cross-Connect Wire**

#### **27 16 19.01 CORDAGE**

**27 16 19.01.A** The work area cords, patch cords, and equipment cords/pigtails shall meet TIA/EIA-568-C.2 (2009) Category 6 standard and ISO/IEC 11801:2002 Class E standard for component compliance. The modular cords shall also meet reliability requirements of the previous version of standard (TIA/EIA-568-B.2), Normative Annex F.4.3.1, with a minimum Return Loss margin of 3 dB throughout each step of the mechanical stress test procedure.

**27 16 19.01.B** The modular cord shall use minimum 24 AWG solid copper conductors and shall be made with bonded-pair cable to provide structural integrity and stable transmission performance in environments where frequent moves, adds, and changes are routine. A crossweb element shall be used for consistent pair separation and minimal NEXT coupling. The nominal cable diameter of the modular cord shall be 6.0 mm (0.24 in).

**27 16 19.01.C** The modular shall be built with a flexible boot and strain relief for optimum protection in high-density installations

**27 16 19.01.D** The modular cords shall be available in standard colors (Brown, Red, Orange, Yellow, Green, Blue, Purple, Gray, White, Black) and also TIA 606-A Pantone colors (Red, Orange, Yellow, Green, Blue, Purple).

**27 16 19.01.E** The management bar technology of the modular cord shall have tightly controlled and centered plug NEXT performance. The tolerance on de-embedded plug NEXT shall be within half the range specified in ANSI/TIA/EIA-568-C.2 (Category 6) standard for the 3-6 / 4-5 pair combination.

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## ANNEX A: ADDITIONAL INFORMATION

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### 07 84 00 Firestopping

#### 07 84 13 Penetration Firestopping

##### 07 84 13.01 FIRESTOP SYSTEM

- 07 84 13.01.A A firestop system consists of the item or items penetrating the fire-rated barrier, the opening in the barrier, and the materials used to seal and restore the fire integrity of the penetrated barrier. Firestop systems serve as an effective block against fire, smoke, heat, vapor, and pressurized water streams.
- 07 84 13.01.B All penetrations through fire-rated building structures (e.g., walls, floors) shall be sealed with an appropriate firestop system. This requirement applies to "through" penetrations (complete penetration) as well as "membrane" penetrations (through one side of a hollow structure). Any penetrating items (e.g., riser slots and sleeves, cables, conduits, cable trays, raceways) shall be properly firestopped.
- 07 84 13.01.C Firestop systems shall be UL Classified to ASTM E814 – *Standard Test Method for Fire Tests of Through-Penetration Fire Stops* (UL 1479) and shall be approved by a qualified PE licensed in the jurisdiction where the work is to be performed. One or more drawings illustrating the deployment of the proposed firestop system(s), stamped or embossed by the PE, shall be provided to the owner of the Belden IBDN System 2400 prior to installing the firestop system(s).
-

07 84 13.02

**FIRESTOP SYSTEM INSTALLATION**

07 84 13.02.A

All firestop systems shall be installed in accordance with the manufacturer's recommendations/installation guides and shall be available for inspection by the local AHJ prior to acceptance.

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# DISTRICT OFFICE FIRST FLOOR PAGE 2 OF 2

## ICON LEGEND

- 1 DATA
- 1 DATA / 1 VOICE
- 2 DATA
- 2 DATA / 1 VOICE
- WALL MOUNTED PHONE

## DEVICE LOCATIONS ONLY

● PRINTER

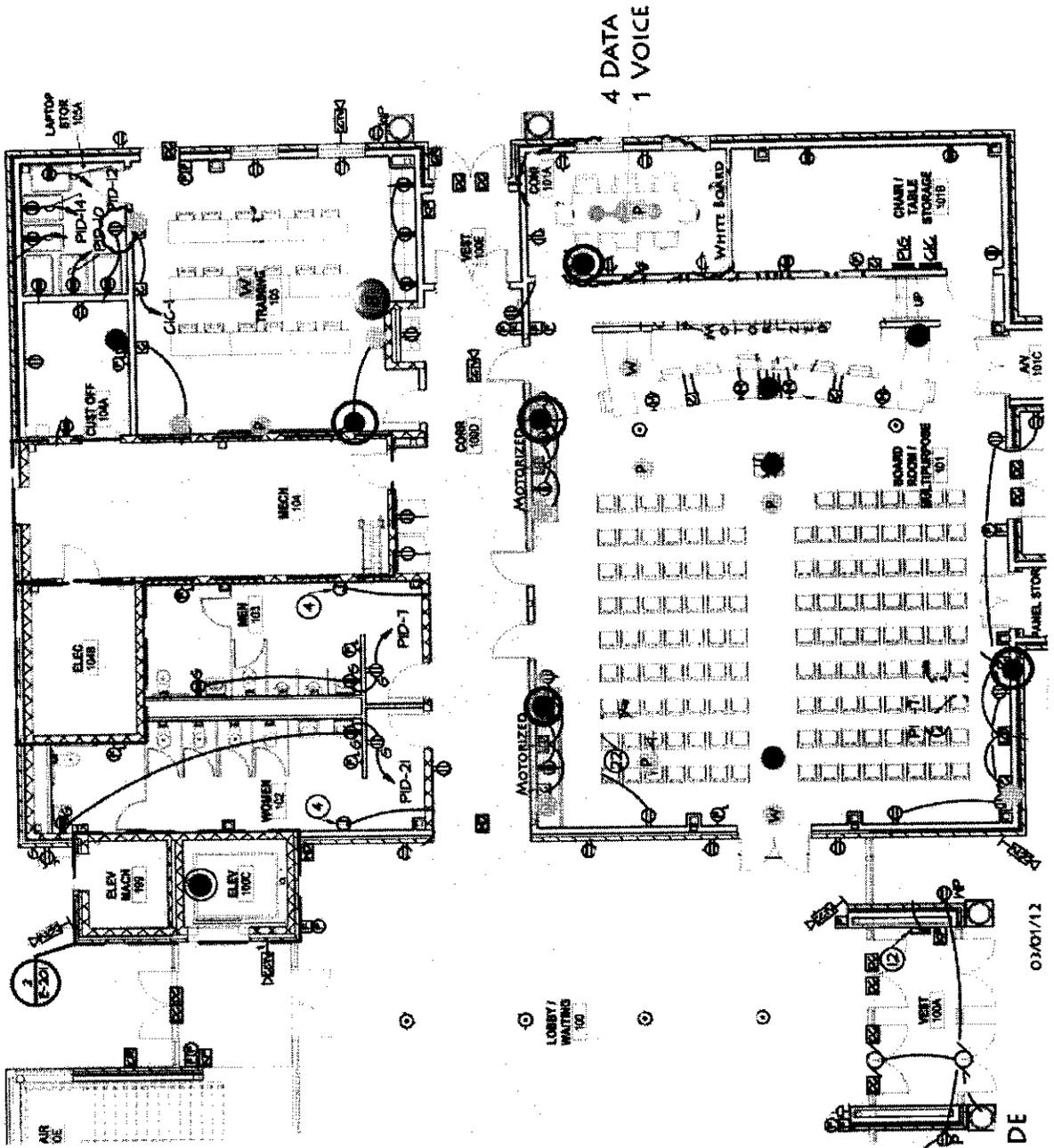
● FAX

○ PROJECTOR SCREEN

○ CONFERENCE ROOM TABLE TOP  
LAYOUTS (SEE ATTACHED DRAWING  
VOICE AND DATA)

TOTAL VOICE: 11  
TOTAL DATA: 23

TOTAL WAP'S: 3



03/01/12

4 DATA  
1 VOICE

# DISTRICT OFFICES SECOND FLOOR

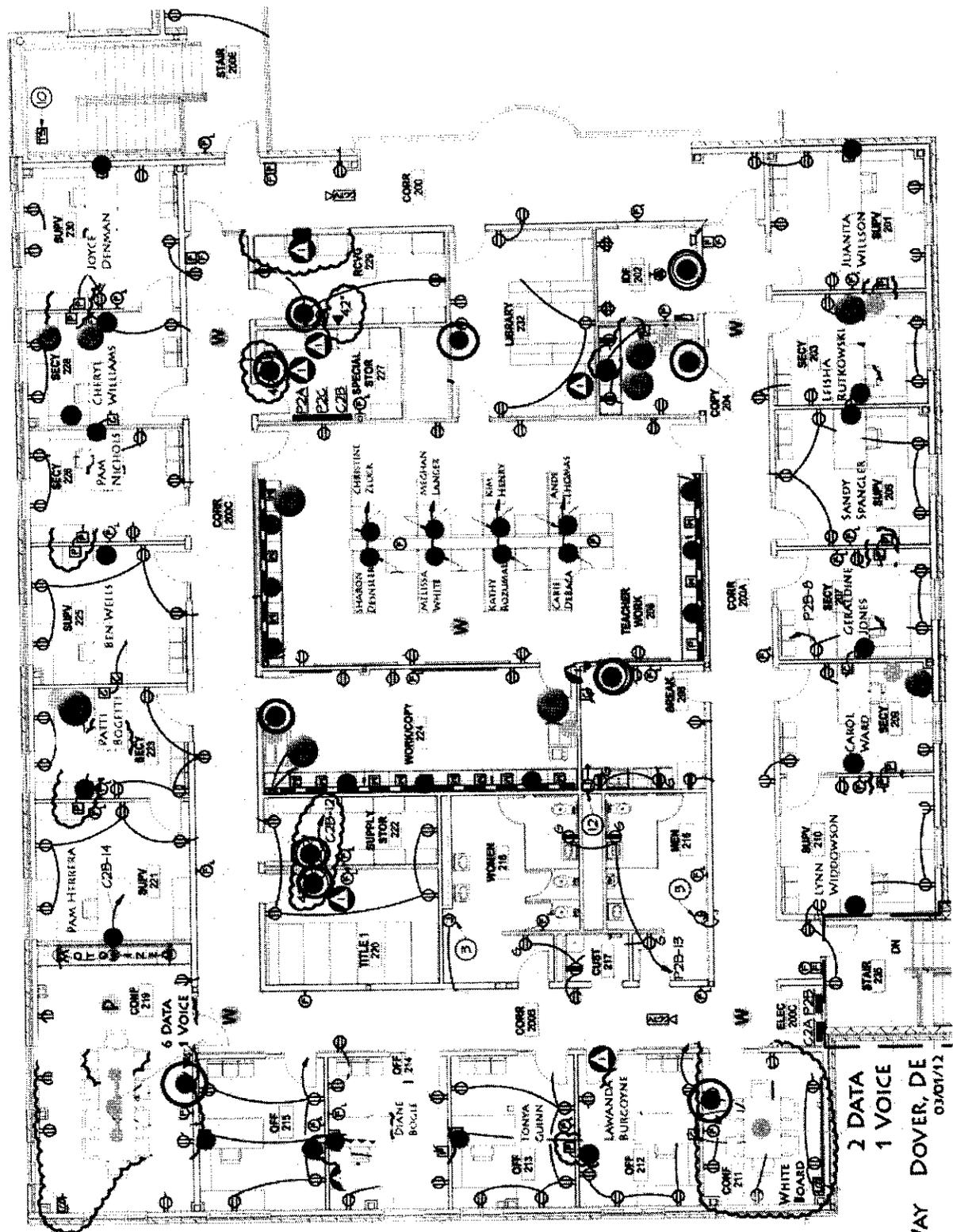
## ICON LEGEND

- 1 DATA
- 1 DATA / 1 VOICE
- 2 DATA
- 2 DATA / 1 VOICE
- WALL MOUNTED PHONE
- DEVICE LOCATIONS ONLY
- PRINTER
- FAX
- PROJECTOR SCREEN

CONFERENCE ROOM TABLE TOP  
LAYOUT ON ATTACHED DRAWING  
(VOICE AND DATA)

TOTAL VOICE: 50  
TOTAL DATA: 61

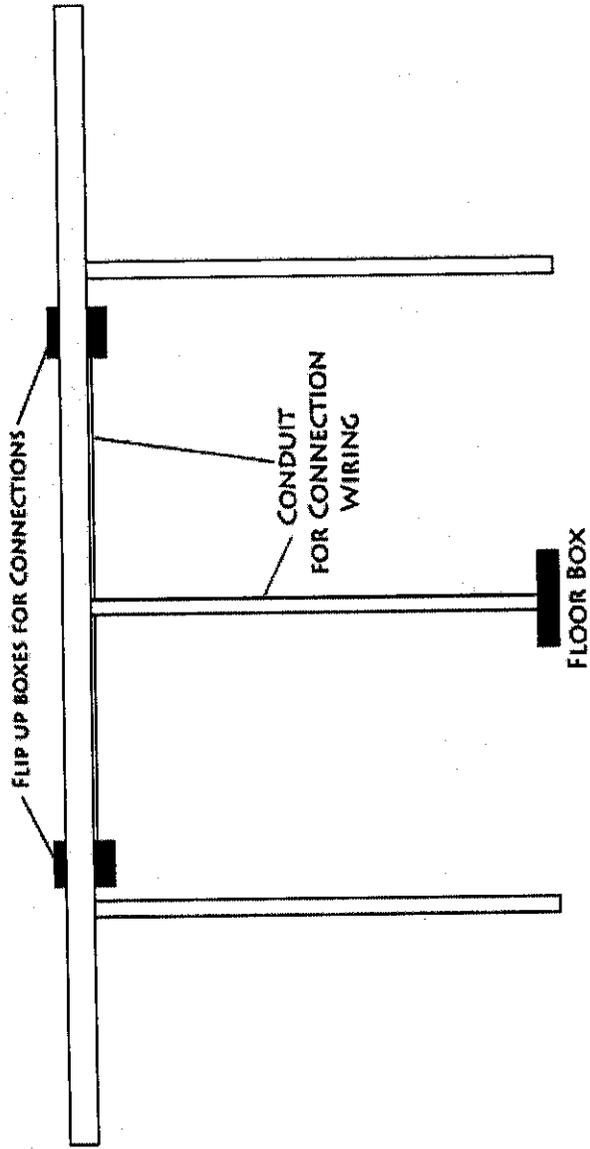
TOTAL WAP'S: 5



2 DATA  
1 VOICE

CAPITAL 198 COMMERCE WAY DOVER, DE 03/07/12

# LARGER CONFERENCE TABLE SIDE VIEW



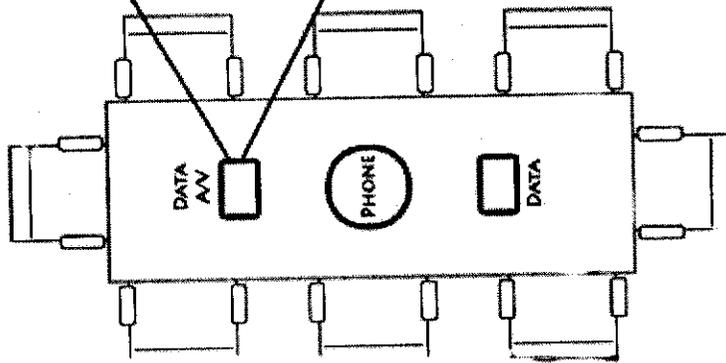
\* CONNECTIONS WOULD NEED TO COME UP FROM THE FLOOR IN CONDUIT TO THE BOTTOM OF THE FURNITURE. WE WOULD NEED TO WORK WITH THE FURNITURE PROVIDER/DESIGNER TO FIGURE OUT THE BEST SOLUTION.

\* APPROXIMATE REPRESENTATION OF CONDUIT / BOX LOCATIONS. FINAL PLACEMENT AND DESIGN WOULD NEED TO BE DISCUSSED WITH THE FURNITURE PROVIDER.

\* COULD ALSO RUN CONDUIT ON FURNITURE LEGS, THIS WOULD BE DEPENDANT ON FURNITURE DESIGN. ADJUST AS NEEDED.

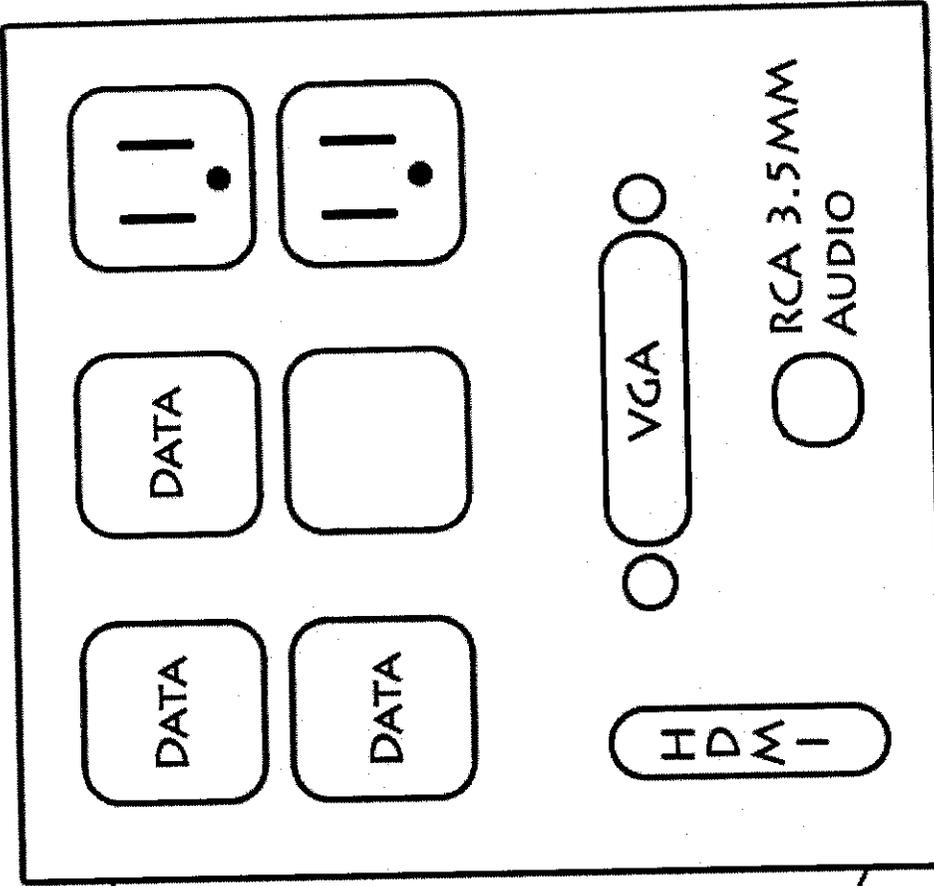
# VIEW - LARGER CONFERENCE ROOMS

PROJECTION SCREEN LOCATION



- APPROXIMATE LOCATIONS ON TOP OF TABLE
- CONFERENCE PHONE CENTERED ON TABLE
- ALL WIRING WOULD BE UNDER TABLE IN CONDUIT BUILT ONTO FURNITURE PROVIDED FOR EACH CONFERENCE ROOM
- SEE SIDE VIEW FOR REPRESENTATION.
- AV WIRING CONNECTIONS SHOULD BE PLACED ON TABLE ON SIDE CLOSEST TO THE SCREEN LOCATION. THIS SHOULD BE COORDINATED WITH CAPITAL SCHOOL DISTRICT TECHNOLOGY OFFICE BEFORE FINAL INSTALLATION.

## SYMBOLIC REPRESENTATION ONLY



\* REPRESENTATION OF PROPOSED DESKTOP OUTLET LAYOUTS. NEED TO HAVE:

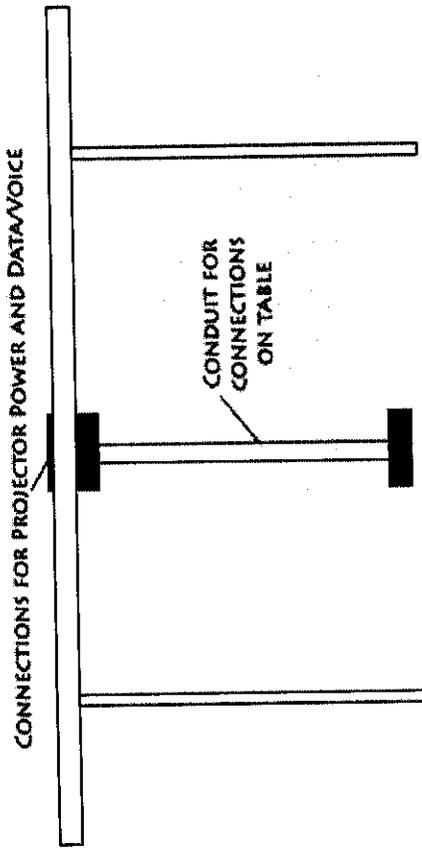
- 3 DATA CONNECTIONS
- 1 HDMI CONNECTION
- 1 VGA CONNECTION
- 1 RCA 3.5 MM AUDIO CONNECTION

\* SECOND FACEPLATE (OPPOSITE ON TABLE) WILL HAVE SAME DATA / VOICE LAYOUT AND NO AV CONNECTIONS (SINGLE GANG BOX)

\* AC POWER CONNECTIONS (2 DUPLEX) WILL BE LOCATED ON FLOOR UNDER TABLE AND AT (DUPLEX)

\* FLIP UP STYLE BOX ON TOP OF TABLE

# SMALLER CONFERENCE TABLE SIDE VIEW

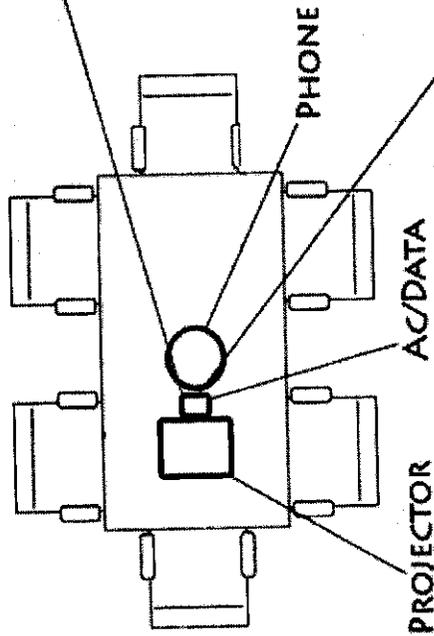


NECTIONS WOULD NEED TO COME UP FROM THE FLOOR IN CONDUIT TO THE BOTTOM OF THE FURNITURE. WOULD NEED TO WORK WITH THE FURNITURE PROVIDER/DESIGNER TO FIGURE OUT THE BEST SOLUTION.

OXIMATE REPRESENTATION OF CONDUIT / BOX LOCATIONS. FINAL PLACEMENT AND DESIGN WOULD NEED TO BE DISCUSSED WITH THE FURNITURE PROVIDER.

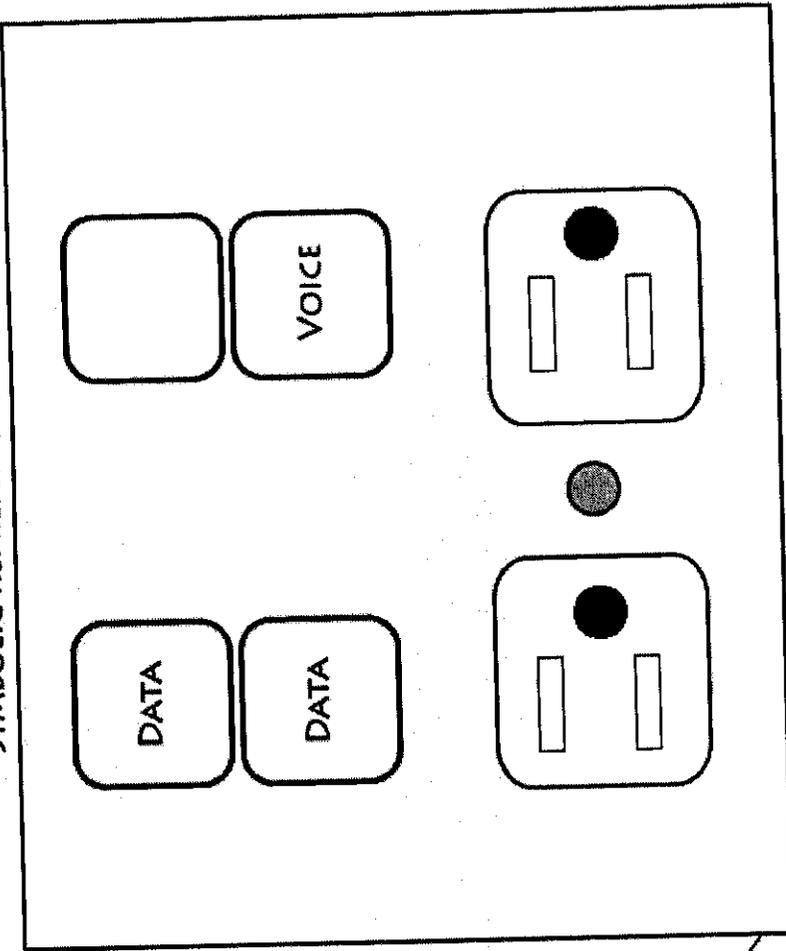
OULD ALSO RUN CONDUIT ON FURNITURE LEGS, THIS WOULD BE DEPENDANT ON FURNITURE DESIGN. ADJUST AS NEEDED.

# TOP VIEW - SMALLER CONFERENCE TABLE



- APPROXIMATE LOCATIONS ON TOP OF TABLE
- CONFERENCE PHONE CENTERED ON TABLE
- ALL WIRING WOULD BE UNDER TABLE IN CONDUIT BUILT ONTO FURNITURE PROVIDED FOR EACH CONFERENCE ROOM
- SEE SIDE VIEW FOR REPRESENTATION.
- WIRING CONNECTIONS SHOULD BE PLACED ON TABLE ON SIDE CLOSEST TO THE SCREEN LOCATION
- EXCLUDES CONFERENCE ROOM 107 AND 128

## SYMBOLIC REPRESENTATION ONLY



- \* APPROXIMATE REPRESENTATION OF REQUIRED CONNECTIONS
- 2 DATA
- 1 VOICE (CONFERENCE PHONE)
- 2 AC POWER CONNECTIONS (DUPLEX)
- SHOULD BE IN A FLIP UP TYPE BOX