ADDENDUM #2

DSA Appl. # 01-119293

CONTRA COSTA COMMUNITY COLLEGE DISTRICT

PROJECT: L-1161 CONFERENCE ROOM & COMMUNITY ROOM AUDIO-VISUAL UPGRADES
Los Medanos College
2700 East Leland Road, Pittsburg, CA 94565

Date: March 12, 2021

NOTICE TO ALL CONTRACTORS
You are hereby notified of the following changes, clarifications and/or modifications to the original Contract Documents, Project Manual, Drawings, Specifications and/or previous Addenda. This Addendum shall supersede the original Contract Documents and previous Addenda wherein it contradicts the same and shall take precedence over anything to the contrary therein. All other conditions remain unchanged. This Addendum forms a part of the Contract Documents and modifies the original Contract Documents dated ***February 19, 2021, and Addendum #1, dated March 10, 2021.*** Acknowledge receipt of this Addendum in space provided on the Bid Proposal Form. Failure to acknowledge may subject Bidder to disqualification.

Item:

1. **Revision:**
   Replace existing drawing set, in its entirety, with the attached drawing set.
   The Drawing Set in Addendum 2 includes the following revised drawing:
   G001 – Cover Sheet, showing updated drawing index with added sheet E0.2 (which was added by Addendum #2).

2. **Revision:**
   Replace existing technical specifications (Div. 02 – 33), in their entirety, with the attached technical specifications (Div. 02 – 33).

A. For questions regarding this Addendum, please contact:

Ben M. Cayabyab, Contracts Manager
Contra Costa Community College District
500 Court St., Martinez, CA 94553
Email: bcayabyab@4cd.edu;

All other terms and conditions of BID are to remain the same.

Attachments:

DSA-Stamped Drawing Set
DSA-Stamped Technical Specifications (Div. 02 – 33)

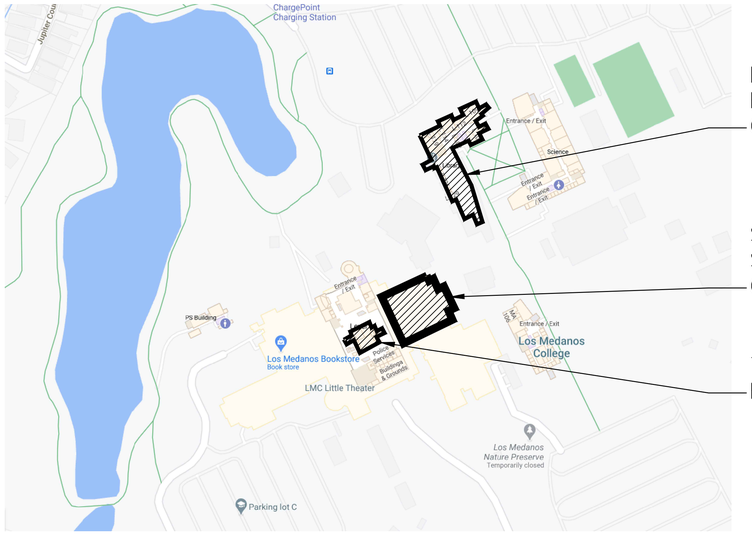
Andrew C. Chen
TECTONICS Architects / Planners / Engineers
1500 Park Ave
Emeryville, CA 94608
Tel: 510 740 2400

Architect of Record: **Andrew C. Chen**

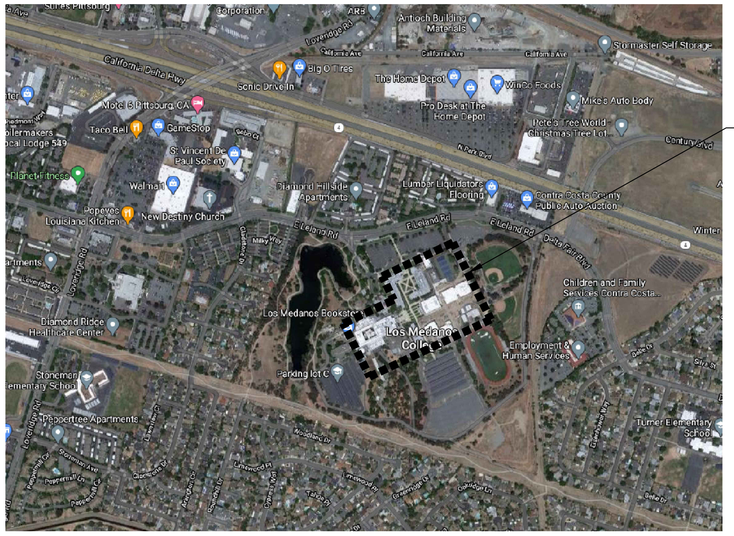
END OF ADDENDUM #2

COMMUNITY AND CONFERENCE ROOMS AV UPGRADES
LOS MEDANOS COLLEGE
2700 E. LELAND ROAD, PITTSBURG, CALIFORNIA

LOCATION MAP



VICINITY MAP



INDEX OF DRAWINGS

ABBREVIATIONS

&	AND
∠	ANGLE
@	AT
<	CENTERLINE
~	DIAMETER OR ROUND
#	POUND OR NUMBER
A.B.	ANCHOR BOLT
ABV	ABOVE
ADD'L	ADDITIONAL
ADJ.	ADJACENT
A.F.F.	ABOVE FINISHED FLOOR
AHU	AIR HANDLING UNIT
ALUM	ALUMINUM
APPROX	APPROXIMATE
ARCH	ARCHITECT
BD	BOARD
BEL	BELOW
BET	BETWEEN
BLDG	BUILDING
BLK'G	BLOCKING
BM	BEAM
B.O.	BOTTOM OF
BOT	BOTTOM
BR	BULLET RESISTANT
BS	BOTH SIDES
CJ	CONSTRUCTION JOINT
CO	CASED OPENING
COL	COLUMN
CONC	CONCRETE
CONST	CONSTRUCTION
CONT	CONTINUOUS OR CONTINUE
CONTR	CONTRACT(OR)
CPT	CARPET
CSWK	CASEWORK
CTSK	COUNTERSUNK
CWFP	CEMENTITIOUS WOOD FIBER PANEL
D	DEPTH OR DIAMETER
DBL	DOUBLE
DEMO	DEMOLITION OR DEMOLISH
DET	DETAIL
DIA	DIAMETER
DIM	DIMENSION
DN	DOWN
D.O.	DOOR OPENING
DR	DOOR
DTL	DETAIL
DWG	DRAWING
(E)	EXISTING
E	EAST
EA	EACH
ELEV	ELEVATION
ELEC	ELECTRICAL
EQ	EQUAL
EQUIP	EQUIPMENT
ETC.	ETCETERA
EXP	EXPANSION
EXT	EXTERIOR
FAST	FASTENED
F.F.	FINISH FLOOR
FIN	FINISH
FLR('G)	FLOOR(ING)
F.O.	FACE OF
FOC	FACE OF CONCRETE
FOF	FACE OF FINISH
FOS	FACE OF STUDS
FRMG	FRAMING
FT	FOOT OR FEET
FURR'G	FURRED, FURRING
GA	GAGE, GAUGE
GALV	GALVANIZED
G.C.	GENERAL CONTRACTOR
GL	GLASS, GLAZING
GWB	GYPSUM WALL BOARD
H	HIGH
HDR	HEADER
HDWE	HARDWARE
HT	HEIGHT
H.M.	HOLLOW METAL
HORIZ	HORIZONTAL
I.D.	INTERIOR DIAMETER
IN	INCH
INCL	INCLUDE (D) (ING)
INSUL	INSULATION
INT	INTERIOR
JT	JOINT
MAT'L	MATERIAL
MAX	MAXIMUM
MECH'LY	MECHANICALLY
MEMB	MEMBRANE
MFR	MANUFACTURER
MIN	MINIMUM
MISC	MISCELLANEOUS
MTD	MOUNTED
MTL	METAL
(N)	NEW
N	NORTH
NIC	NOT IN CONTRACT
NO.	NUMBER
NOM	NOMINAL
NTS	NOT TO SCALE
O/	OVER
O.C.	ON CENTER
O.D.	OUTSIDE DIAMETER
OFCI	OWNER FURNISHED CONTRACTOR INSTALLED
OFOI	OWNER FURNISHED OWNER INSTALLED
OH	OPPOSITE HAND
OPNG	OPENING
PERP	PERPENDICULAR
PLUMB	PLUMBING
PLYWD	PLYWOOD
PR	PAIR
PRTD	PRESSURE TREATED
PT	PAINT
PT'D	PAINTED
PTN	PARTITION
R	RISER
RA	RETURN AIR
RAD	RADIUS
RAF	RAISED ACCESS FLOOR(ING)
REINF	REINFORCE(D), (ING)
REV	REVISION OR REVISED
REQ'D	REQUIRED
REQMT	REQUIREMENT
RM	ROOM
R.O.	ROUGH OPENING
S	SOUTH
SA	SUPPLY AIR
S.B.	SOLID BLOCKING
S.C.	SOLID CORE
SCD	SEE COMMUNICATION DRAWINGS
SCHED	SCHEDULE
SED	SEE ELECTRICAL DRAWINGS
S.F.	SQUARE FEET
SHT	SHEET
SIM	SIMILAR
SLNT	SEALANT
SMD	SEE MECHANICAL DRAWINGS
SPA	SPACING
SPD	SEE PLUMBING DRAWINGS
SPECS	SPECIFICATIONS
SQ	SQUARE
SSD	SEE STRUCT'L DWGS
SSL	STAINLESS STEEL
STD	STANDARD
STL	STEEL
STOR	STORAGE
STRL	STRUCTURAL
SYS	SYSTEM
SYM	SYMMETRICAL, SYMMETRY
T	THICK/ TOP
TBD	TO BE DETERMINED
T&B	TOP AND BOTTOM
THK	THICK(NESS)
THRU	THROUGH
TME	TO MATCH EXISTING
T.O.	TOP OF
UON	UNLESS OTHERWISE NOTED
VERT	VERTICAL
VIF	VERIFY IN FIELD
W	WIDE, WIDTH
W	WEST
W/	WITH
WD	WOOD
WIC	WOODWORK INSTITUTE OF CALIFORNIA
WM	WIREMESH
W/O	WITHOUT
WT	WEIGHT

LEGEND/ SYMBOLS

- DRAWING (PLAN, DETAIL, SECTION, ELEVATION) IDENTIFICATION NUMBER
- SHEET ON WHICH DRAWING IS DRAWN
- SHEET(S) FROM WHICH DRAWING IS REFERENCED
- DETAIL IDENTIFICATION NUMBER
- SHEET ON WHICH DETAIL IS DRAWN
- SHEET FROM WHICH DETAIL IS TAKEN
- SECTION IDENTIFICATION LETTER
- SHEET ON WHICH SECTION IS DRAWN
- SHEET FROM WHICH SECTION IS TAKEN
- ELEVATION IDENTIFICATION NUMBER
- SHEET ON WHICH ELEVATION IS DRAWN
- SHEET FROM WHICH ELEVATION IS TAKEN
- THE SCHEDULED DOOR NO IS THE ROOM NUMBER INTO WHICH THE DOOR SWINGS FOLLOWED BY THE DOOR MARK.
- DOOR MARK
- THE SCHEDULED DOOR NO IS THE ROOM NUMBER FROM WHICH THE DOOR SWINGS FOLLOWED BY THE DOOR MARK.
- DOOR MARK
- OFFICE 120 — ROOM NAME AND NUMBER
- 3 — REVISION NUMBER–CORRESPONDS TO REVISION NUMBER ON SHEET TITLE BLOCK
- 3 — EXTENT OF REVISION
- 10 — KEYNOTE NUMBER
- 102 — ROOM/SPACE NUMBER AS SHOWN ON FLOOR PLANS
- A OR A2 — PARTITION TYPE (LETTER) VARIATION NUMBER (IF ANY)
- XXX — WOODWORK INSTITUTE CABINET DESIGN SERIES NUMBER
- ML — MATCH LINE
- 1 / A — GRID LINES

DEFINITIONS

"REPLACE" MEANS TO REMOVE EXISTING AND PROVIDE NEW AS SPECIFIED, OR IF NOT SPECIFIED, TO MATCH EXISTING. UNLESS OTHERWISE NOTED.
"FURNISH" MEANS TO PURCHASE NEW UNLESS OTHERWISE NOTED.
"PROVIDE" MEANS TO FURNISH AND INSTALL.
"REMOVE" MEANS TO REMOVE AND DISPOSE OF OFF SITE AND PREPARE EXISTING SURFACES TO RECEIVE NEW CONSTRUCTION UNLESS OTHERWISE NOTED.
"REMOVE AND SALVAGE" MEANS ITEMS INDICATED TO BE REMOVED AND SALVAGED REMAIN THE OWNER'S PROPERTY. REMOVE, CLEAN AND PACK OR CRATE ITEMS TO PROTECT AGAINST DAMAGE. IDENTIFY CONTENTS OF CONTAINERS AND DELIVER TO CONTRACTING OFFICER'S DESIGNATED STORAGE AREA.
"REMOVE AND REINSTALL" MEANS REMOVE, CLEAN AND SERVICE, AND OTHERWISE PREPARE THEM FOR REUSE. STORE AND PROTECT AGAINST DAMAGE. REINSTALL ITEMS WHERE INDICATED
"EXISTING TO REMAIN" MEANS PROTECT CONSTRUCTION INDICATED TO REMAIN AGAINST DAMAGE AND SOILING DURING SELECTIVE DEMOLITION.

APPLICABLE CODES & STANDARDS

APPLICABLE CODES AND STANDARDS INCLUDE BUT ARE NOT LIMITED TO:

2019 CALIFORNIA ADMINISTRATIVE CODE, TITLE 24, PART 1, CBSC
2019 CALIFORNIA BUILDING CODE, TITLE 24, PART 2, CBSC (2018 IBC & CALIFORNIA AMENDMENTS)
2019 CALIFORNIA ELECTRICAL CODE (CEC), PART 3, CBSC (2017 NATIONAL ELECTRICAL CODE & CALIFORNIA AMENDMENTS)
NECA 1–2017 STANDARD PRACTICE OF GOOD WORKMANSHIP IN ELECTRICAL CONSTRUCTION (ANSI)
IEEE 3001.5 PRACTICE FOR THE APPLICATION OF POWER DISTRIBUTION APPARATUS IN INDUSTRIAL & COMMERCIAL POWER SYSTEMS (2017)
IEEE 3003.2 PRACTICE FOR EQUIPMENT GROUNDING & BONDING IN INDUSTRIAL & COMMERCIAL POWER SYSTEMS (2017)
NATIONAL ELECTRICAL SAFETY CODE (2017)

OTHER CRITERIA AND REQUIREMENTS
2010 ADA STANDARDS FOR ACCESSIBLE DESIGN

GENERAL NOTES

1. UNLESS OTHERWISE INDICATED, PLAN DIMENSIONS ARE TO COLUMN GRID ON CENTERLINES, NOMINAL SURFACE OF MASONRY, FACE OF STUDS AND FACE OF CONCRETE WALLS.
2. ALL ITEMS SHOWN ON DRAWINGS ARE "NEW" UNLESS OTHERWISE LABELED AS "(E)"
3. PARTITIONS SHALL BE SEALED BOTH SIDES WITH ACOUSTIC SEALANT; TOP, BOTTOM, INTERSECTION, DOOR FRAMES, GLAZED OPENING FRAMES, AND OTHER PENETRATIONS.
4. VERIFY ALL ROUGH–IN DIMENSIONS FOR EQUIPMENT PROVIDED IN THIS CONTRACT, OR BY OTHERS.
5. VERIFY ALL DIMENSIONS IN FIELD, ACTUAL SITE CONDITIONS MAY VARY FROM THOSE INDICATED ON DRAWINGS.
6. PROVIDE METAL BLOCKING FOR ALL WALL MOUNTED ACCESSORIES, CASEWORK, FIXTURES, SHELVING STANDARDS, OFOI WALL MOUNTED ITEMS/SYSTEM FURNITURE AND OTHER WALL MOUNTED ITEMS INCLUDING AT (E) WALLS. PATCH FINISHES TME UON. SEE 9/A561
7. ALL NEW MATERIALS MUST MATCH EXISTING BUILDING STANDARDS OR AS NOTED ON PLANS. DEVIATION FROM EXISTING STANDARDS OR MATERIALS NOTED ON PLAN MUST RECEIVE WRITTEN APPROVAL PRIOR TO PURCHASE, FABRICATION, OR INSTALLATION FROM GSA BUILDING MANAGER'S OFFICE PRIOR TO MAKING CHANGE.
8. SALVAGED ITEMS NOT INDICATED FOR REUSE SHALL REMAIN ON SITE AND BE MOVED TO BE STORED PER AGREED LOCATION WITH BUILDING MANAGER.

BUILDING TYPE SUMMARY

INFORMATION RESOURCE CENTER:
CONSTRUCTION: TYPE II–1 HR NON–COMBUSTIBLE (EXISTING – NO CHANGE)
OCCUPANCY: 2–STORY (EXISTING – NO CHANGE) B EDUCATION ABOVE 12TH GRADE (304.1)
EXISTING BUILDING AREA: 32,455 SQ FT
SPRINKLERS: YES

CORE BUILDING:
CONSTRUCTION: TYPE I FIRE RESISTIVE BUILDING (EXISTING – NO CHANGE)
OCCUPANCY: 4–STORY (EXISTING – NO CHANGE) B EDUCATION ABOVE 12TH GRADE (304.1)
EXISTING BUILDING AREA: 15,312 SQ FT
SPRINKLERS: YES

STUDENT SERVICES CENTER:
CONSTRUCTION: TYPE I–B FIRE RESISTIVE BUILDING (EXISTING – NO CHANGE)
OCCUPANCY: 2–STORY (EXISTING – NO CHANGE) B EDUCATION ABOVE 12TH GRADE (304.1)
EXISTING BUILDING AREA: 38,110 SQ FT
SPRINKLERS: YES

PROJECT DESCRIPTION SCOPE

AV UPGRADES FOR THE LOS MEDANOS COLLEGE COMMUNITY AND CONFERENCE ROOMS AT INFORMATION RESOURCE CENTER, STUDENT SERVICES CENTER AND THE CORE BUILDING.

AFFECTED ROOMS ARE:

1. THE COMMUNITY ROOM ON THE FIRST FLOOR OF THE INFORMATION RESOURCE CENTER
   - PROVIDE NEW TV MONITOR
   - CEILING MOUNTED PROJECTOR AND PROJECTION SCREEN REPLACEMENT
   - AV CONNECTOR AND CABLING REPLACEMENT AT EXISTING FLOORBOX.
   - EXISTING AV RACK POSITION ADJUSTMENT
2. THE CONFERENCE ROOM L108/L109 ON THE FIRST FLOOR OF THE INFORMATION RESOURCE CENTER
   - MODIFY EXISTING CONFERENCE TABLE TO INSTALL AV FLIP–TOP CONTROLLER
   - MODIFY EXISTING BASE CABINET TO PROVIDE AIR VENTILATION FOR THE EXISTING AV RACK.
3. THE CONFERENCE ROOM 409 ON THE SECOND FLOOR OF THE STUDENT SERVICE CENTER (REFER TO TA SHEETS FOR WORK)
   - MODIFY EXISTING CONFERENCE TABLE TO INSTALL AV FLIP–TOP CONTROLLER
4. THE CONFERENCE ROOM 409 ON THE FOURTH FLOOR OF THE CORE BUILDING.
   - PROVIDE NEW SHORT–THROW PROJECTOR AND WHITEBOARD
   - EXISTING AV RACK POSITION ADJUSTMENT

THE INTERIOR IMPROVEMENTS INCLUDE ARCHITECTURAL AND ELECTRICAL SCOPE.

PROJECT TEAM

CLIENT

LOS MEDANOS COLLEGE
2700 EAST LELAND ROAD
PITTSBURG, CA 94565

MICHAEL SCHENONE,
CONSTRUCTION MANAGER
TEL: 209–224–6291
michael s@csipm.com

ARCHITECTURAL

TECTONICS
Architects/Planners/Engineers
1500 PARK AVE SUITE 129
EMERYVILLE, CA 94608
TEL: 510–740–2400

ANDREW C. CHEN, RA
PRINCIPAL IN CHARGE
achen@tectonics–ae.com

WENDY LEUNG
PROJECT MANAGER
wleung@tectonics–ae.com

ELECTRICAL

A&S ENGINEERS INC.
111 PINE STREET, SUITE 1315
SAN FRANCISCO, CA 94111
TEL: 415–398–0400

ALLEN ARBABARAGHI, PRINCIPAL
allena@asincs.com

AUDIO VISUAL

SMITH, FAUSE, AND MCDONALD, INC.
351 8TH STREET
SAN FRANCISCO, CA 94703
415–255–9140

THEODORE S. HARTMAN
AUDIOVISUAL SYSTEMS DESIGNER
theo@sfmi.com

CONTRA COSTA COLLEGE

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1500 PARK AVE
EMERYVILLE, CA 94608

Smith, Fause & McDonald Inc.
Communications Engineering Group
351 8th Street
San Francisco, Calforina 94103
(415) 255-9140 www.sfmi.com

SEALS AND SIGNATURES

LICENSED ARCHITECT — ANDREW C. CHEN — No. C 30872 — REN 8/2021 — STATE OF CALIFORNIA

ISSUE SCHEDULE	NO.	DATE
PLAN REVIEW SUBMITTAL V1		12/30/2020
PLAN REVIEW SUBMITTAL V2		02/03/2021
ADDENDUM #1	1	03/10/2021

LOS MEDANOS COLLEGE

COMMUNITY ROOM & CONFERENCE ROOM AV UPGRADES

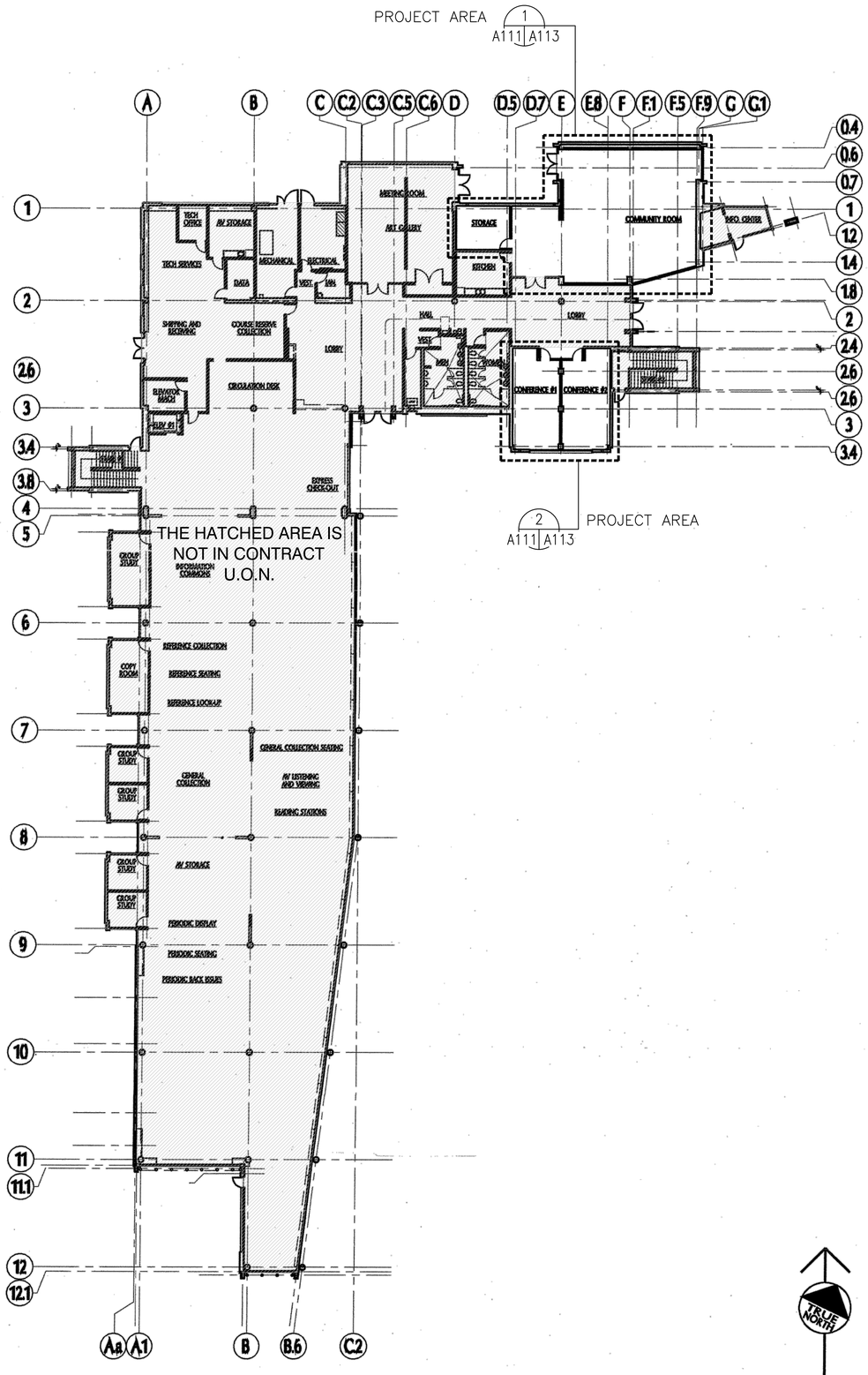
SHEET TITLE:

COVER SHEET

SCALE: AS SHOWN
PROJECT NUMBER: 01-119293

SHEET NUMBER: G-001

10/26/20 100% CONSTRUCTION DOCUMENTS



2 OVERALL INFORMATION RESOURCE CENTER FIRST FLOOR FLOOR PLAN

1/8" = 1'-0"

NORTH

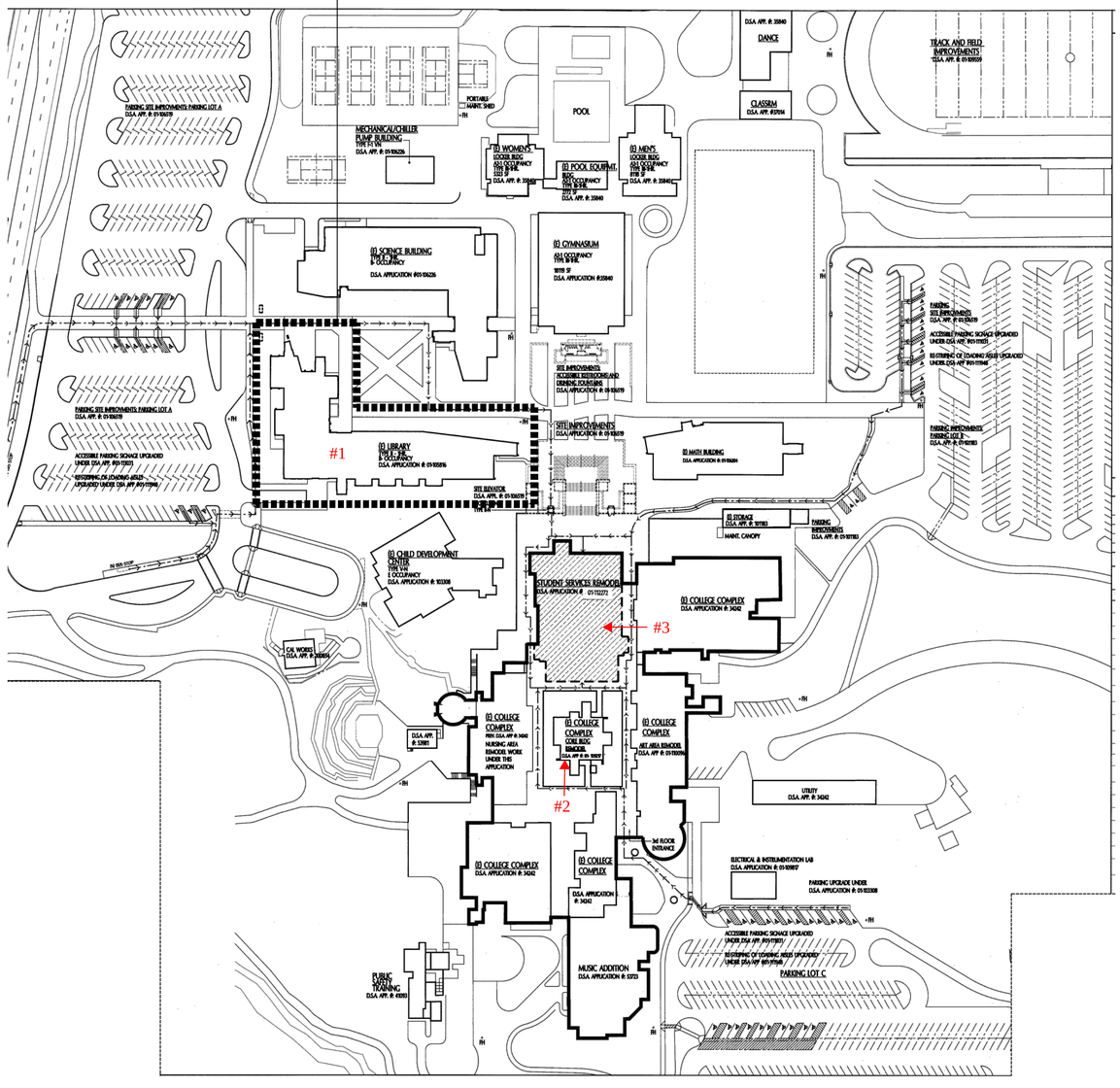
TRUE NORTH

DESIGN NORTH

CAMPUS DSA APPL NUMBERS

PLAN KEY & PROJECT NAME	DSA #	DSA Date
East Campus - College Complex	34242	M11
Physical Education Fields	36008	M13
Physical Education Complex	35840	M13
Portable Bldgs. Move & Remodel (To P.E. Area)	37104	M14
Tutorial, Other Offices & Classroom Alterations - College Complex	37100	M16
Allied Health & Counseling Alterations - College Complex	40068	M17
Public Safety Training Office of Instruction	41043	M18
Bookstore Expansion - College Complex	45710	M84
Administrations Return Fan Addition College Complex	5538	M84
Solarten Addition - College Complex	5873	M84
Relocatable Classroom	53481 or 53483	M90
Music Building Addition	58123	M92
Architectural Barrier Removal College Complex	54353	M93
Gateworks Modular	01-100834	9/22/1998
Child Development Center Addition	01-103306	6/1/2001
Site Preparation	01-105751	4/06/2004
Information Resource Center	01-105816	4/28/2004
Mathematics Building	01-106204	12/11/2004
Science Building	01-106226	1/14/2005
Planetarium Remodel-Alteration - College Complex Bldgs\Restrooms	01-105434	3/14/2005
Site Improvements - Accessible Restrooms and Drinking Fountains	01-106591	5/15/2005
Gone Building Remodel - College Complex	01-107217	3/19/2008
Electrical & Instrumentation Lab	01-109811	5/24/2008
Art Area Remodel - College Complex	01-110018	1/29/2009
Nursing EMT Remodel - College Complex	01-111031	1/04/2010
Business/Central Services Remodel	01-111835	6/03/2011
Office of Instruction / Second Floor Interim Remodels - College Complex	01-112012	6/1/2011
Admissions-Records Interim Remodel	01-111948	1/13/2011

2 AREA OF WORK



1 FULL CAMPUS SITE PLAN

1/8" = 1'-0"

NORTH

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP: 01-119293 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
DATE: 02/18/2021

CONTRA COSTA COLLEGE

TECTONICS
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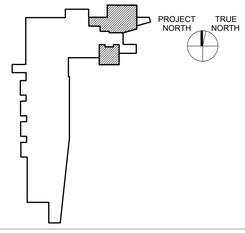
SEALS AND SIGNATURES

LICENSED ARCHITECT
Andrew d. [illegible]
No. C 30872
REN 6/2021
STATE OF CALIFORNIA

ISSUE SCHEDULE	NO.	DATE
PLAN REVIEW SUBMITTAL V1		12/30/2020
PLAN REVIEW SUBMITTAL V2		02/03/2021

KEY PLAN



LOS MEDANOS COLLEGE

COMMUNITY ROOM & CONFERENCE ROOM AV UPGRADES

SHEET TITLE:

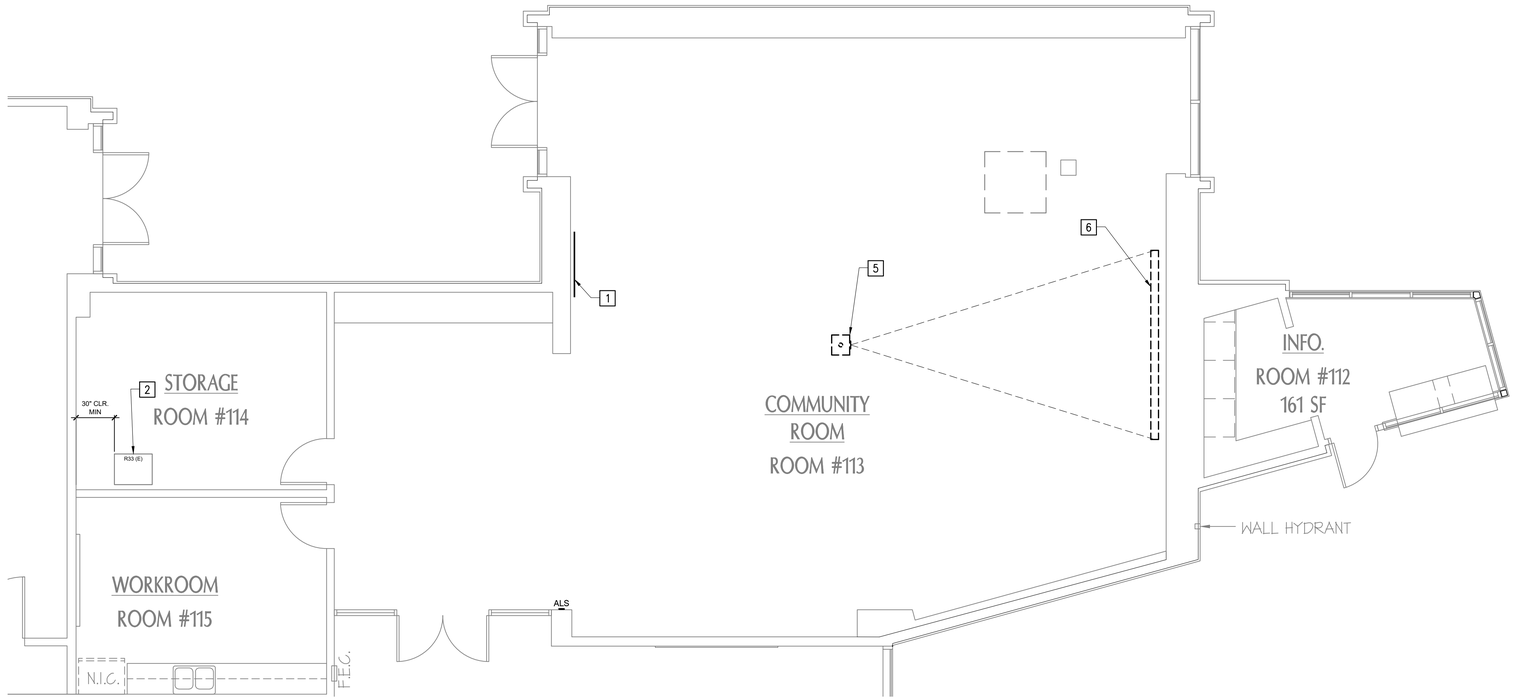
OVERALL INFO. RESOURCE CENTER FIRST FLOOR FLOOR PLAN

SCALE: AS SHOWN

PROJECT NUMBER: 01-119293

SHEET NUMBER: A111

10/26/20 100% CONSTRUCTION DOCUMENTS



1 COMMUNITY, STORAGE & WORKROOM FLOOR PLANS

1/4" = 1'-0"

NORTH

SHEET NOTES

A. REFER TO TA SHEETS FOR AUDIO VISUAL DESIGN REQUIREMENTS AND ADDITIONAL NEW WORK TO BE PERFORMED.

B. REMOVE (E) WALL FINISHES TO INSTALL BACKING PLATES. PATCH TME.

C. PROVIDE METAL BACKING PLATES BETWEEN STUDS AT ALL LOCATIONS REQUIRED FOR ATTACHMENT OF WALL–MOUNTED ITEMS, SEE DETAIL 1/A113.

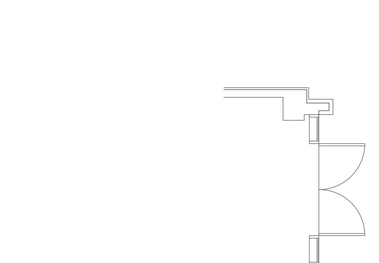
KEYNOTES

1. PROVIDE 70" WALL MOUNTED TELEVISION AND H CHIEF LTM SERIES OR EQUAL MOUNTING RACK. THE 70" TELEVISION TO BE MOUNTED AT 80" AFF TO THE UNDERSIDE OF SCREEN. REFER TO TA SHEETS FOR MOUNTING BRACKET INFORMATION. PROVIDE POWER AND DATA CONNECTIVITY AS REQUIRED.
2. EXISTING SERVER RACKS.
3. MODIFY THE EXISTING BASE CABINET TO PROVIDE AIR VENTILATION FOR THE EXISTING AV RACK. GC TO CUT OUT A ¼" SLOT AT THE UNDERSIDE OF THE TOE KICK AND TO ADD LOUVERS AT THE CABINET DOORS. REFER TO TA SHEETS FOR ADDITIONAL INFORMATION.
4. MODIFY EXISTING CONFERENCE TABLE TO INSTALL THE NEW FLIP–TOP CABLE CUBBY. REFER TO TA SHEETS FOR ADDITIONAL INFORMATION.
5. PROVIDE CEILING MOUNTED PROJECTOR. GC TO INSTALL THE NEW PROJECTOR PER DETAIL 2,3/A113 AND ADJUST THE EXTENSION POLE ACCORDINGLY FOR PROPER ALIGNMENT WITH THE SCREEN. REFER TO TA SHEETS FOR ADDITIONAL INFORMATION.
6. PROVIDE CEILING MOUNTED PROJECTION SCREEN. GC TO INSTALL THE NEW PROJECTION SCREEN PER DETAIL 4/A113. REFER TO TA SHEETS FOR ADDITIONAL INFORMATION.

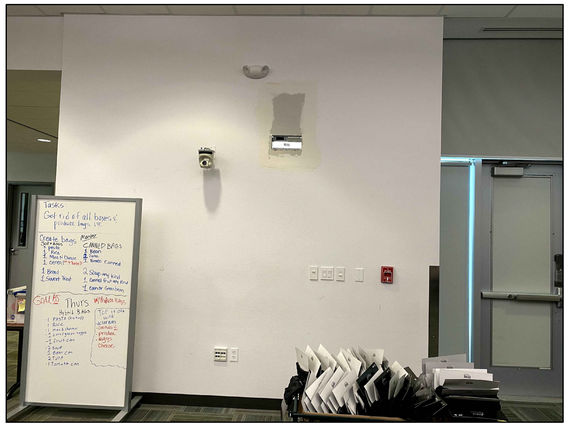
LEGEND

ALS — ASSISTIVE LISTENING SYSTEMS SIGN. SEE DETAIL 5/A112.

NOTES
1. MOUNT SIGN PROMINENTLY ON THE WALL AT 60" ABOVE FINISH FLOOR TO CENTER OF SIGN.
2. PLASTIC SIGN SHALL BE ⅛" THICK MINIMUM U.N.O.
3. VERIFY COLOR PLAQUE WITH OWNER.
4. VERIFY PROPOSED SIGNAGE MOUNT LOCATION WITH OWNER.
5. PROVIDE ALS SIGNAGE AT:
   COMMUNITY ROOM 113 OF THE INFORMATION RESOURCE CENTER
   CONFERENCE ROOM #1 OF THE INFORMATION RESOURCE CENTER
   CONFERENCE ROOM #2 OF THE INFORMATION RESOURCE CENTER
   CONFERENCE ROOM 409 OF THE STUDENT SERVICE CENTER
   CONFERENCE ROOM 420 OF THE CORE BUILDING



ALS SIGN
3"=1'-0"
5 / A112

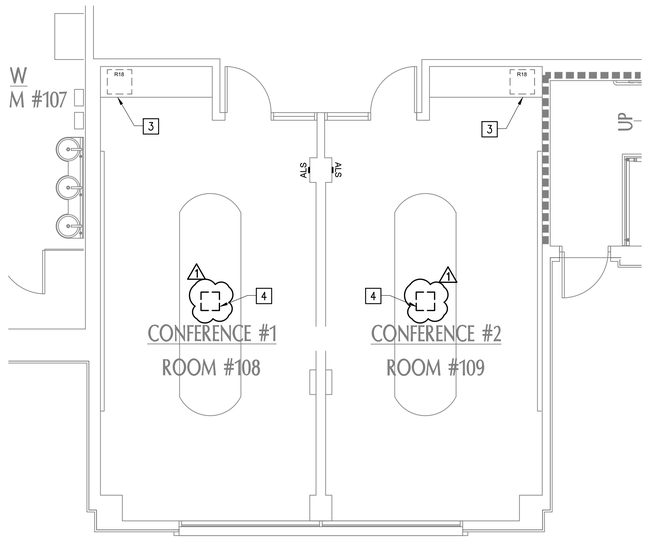


3 (E) WEST WALL AT ROOM 113

1/4" = 1'-0"

4 (E) EAST WALL AT ROOM 113

1/4" = 1'-0"



2 CONFERENCE ROOMS L108/ L109 FLOOR PLANS

1/4" = 1'-0"

NORTH

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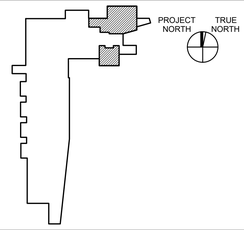
SEALS AND SIGNATURES

LICENSED ARCHITECT
ANDREW C. [illegible]
No. C 10672
REN 6/2021
STATE OF CALIFORNIA

ISSUE SCHEDULE	NO.	DATE
PLAN REVIEW SUBMITTAL V1		12/30/2020
PLAN REVIEW SUBMITTAL V2		02/03/2021
ADDENDUM #1	1	03/10/2021

KEY PLAN



LOS MEDANOS COLLEGE

COMMUNITY ROOM & CONFERENCE ROOM AV UPGRADES

SHEET TITLE:

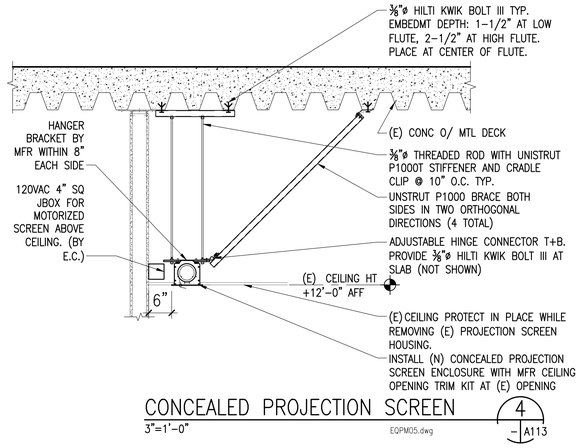
COMMUNITY AND CONFERENCE ROOMS L108/ L109 NEW FLOOR PLANS

SCALE: AS SHOWN

PROJECT NUMBER: 01-119293

SHEET NUMBER: A112

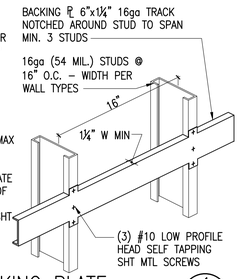
10/26/20 100% CONSTRUCTION DOCUMENTS



CONCEALED PROJECTION SCREEN — 4 / A113

3"=1'-0" EQPM05.dwg

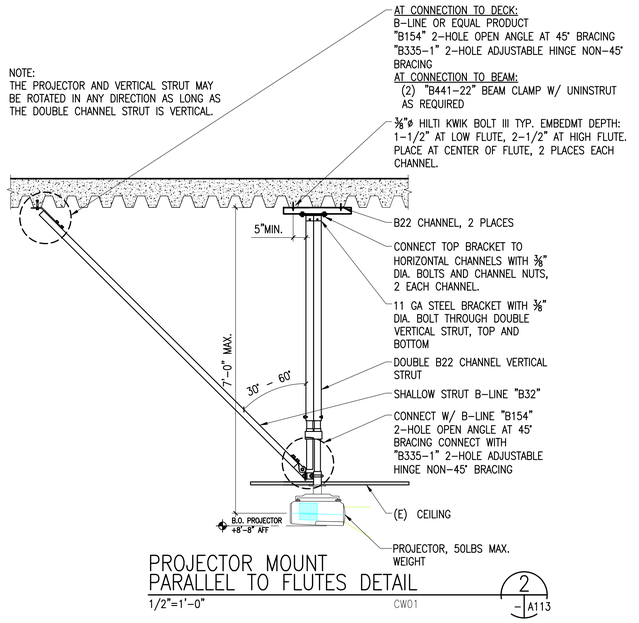
NOTES:
1. BACKING PLATE FOR UPPER WALL HUNG CABINETS (UP TO 2 SHELVES, BASE CABINETS, FULL HT CABINETS, FILM VIEWING COUNTERS, WALL HUNG BENCHES, HANDRAILS, GUARDRAILS, GRAB BARS, WALL HUNG EQUIP, ETC. MAX WT = 100 LBS/FT
2. VERIFY LENGTH, HT, LOCATION OF BACKING PLATE AND NO. REQ'D. W/MFR OF ITEMS TO BE SUPPORTED.
3. USE #12 SELF-TAPPING SHT MTL SCREWS TO ATTACH ITEMS TO BACKING PLATE.
4. WALL STUD FLANGES ARE CONT.



MTL STUD BACKING PLATE — 1 / A113

N.T.S. ST09

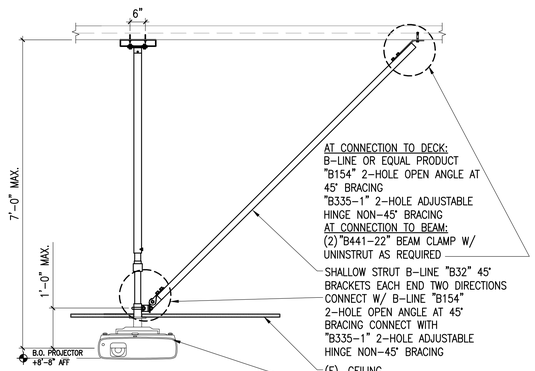
NOTE:
THE PROJECTOR AND VERTICAL STRUT MAY BE ROTATED IN ANY DIRECTION AS LONG AS THE DOUBLE CHANNEL STRUT IS VERTICAL.



PROJECTOR MOUNT PARALLEL TO FLUTES DETAIL — 2 / A113

1/2"=1'-0" CW01

NOTE:
THE PROJECTOR AND VERTICAL STRUT MAY BE ROTATED IN ANY DIRECTION AS LONG AS THE DOUBLE CHANNEL STRUT IS VERTICAL.



PROJECTOR MOUNT PERPENDICULAR TO FLUTES DETAIL — 3 / A113

1/2"=1'-0" CW01

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DATE: 02/18/2021

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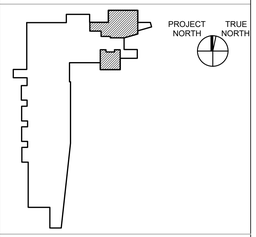
SEALS AND SIGNATURES

LICENSED ARCHITECT
ANDREW C. CAMPBELL
No. C 19872
REN 6/2021
STATE OF CALIFORNIA

ISSUE SCHEDULE	NO.	DATE

KEY PLAN



LOS MEDANOS COLLEGE

COMMUNITY & CONFERENCE ROOMS AV UPGRADES

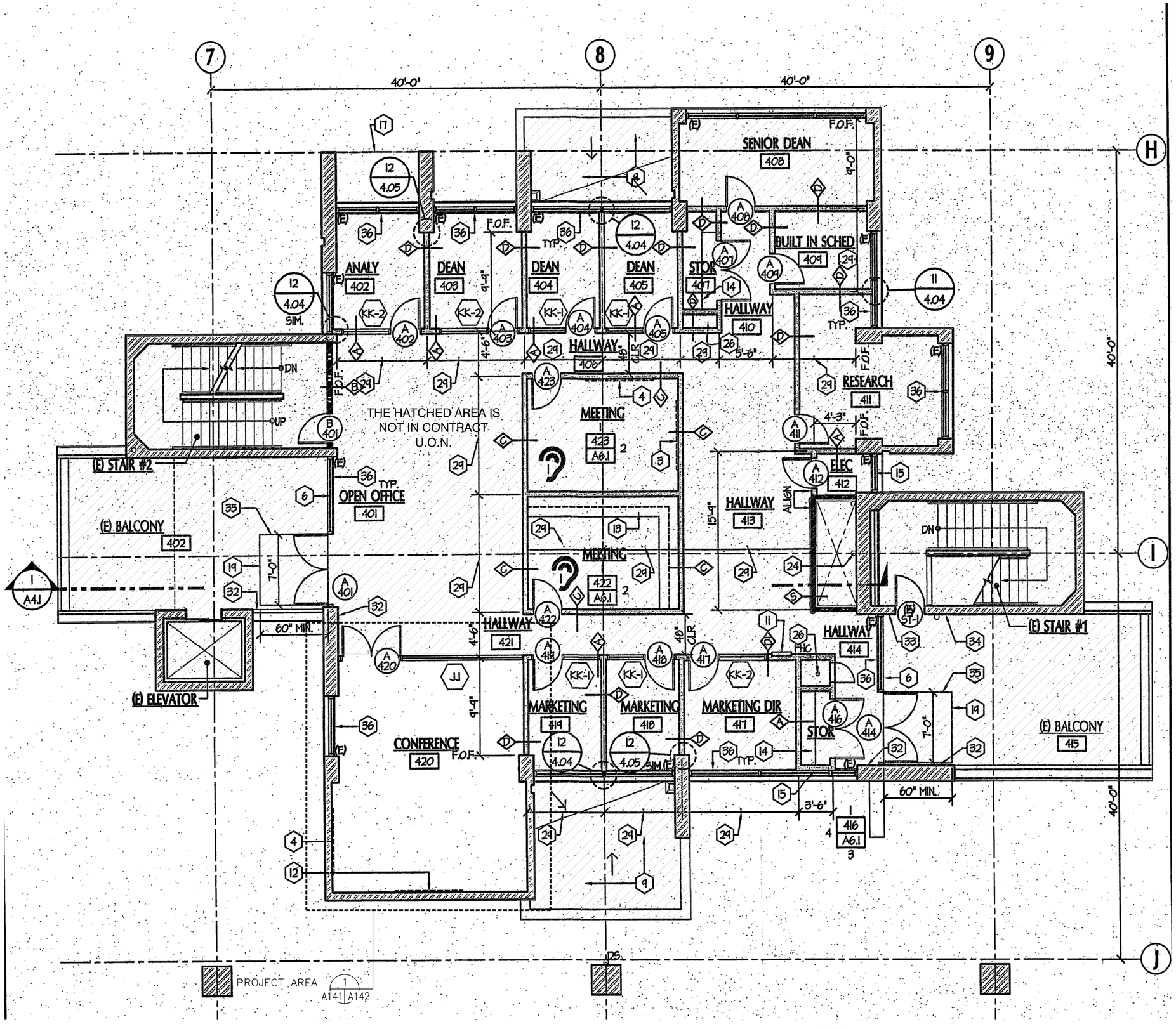
SHEET TITLE:

DETAILS

SCALE: AS SHOWN

PROJECT NUMBER: 2039

SHEET NUMBER: A113



1 **OVERALL CORE BUILDING FOURTH FLOOR FLOOR PLAN**

1/4" = 1'-0"

NORTH

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SEALS AND SIGNATURES

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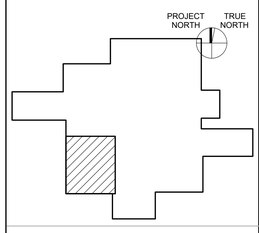
STATE OF CALIFORNIA

ISSUE SCHEDULE	NO.	DATE
PLAN REVIEW SUBMITTAL V1		12/30/2020
PLAN REVIEW SUBMITTAL V2		02/03/2021

KEY PLAN



LOS MEDANOS COLLEGE

COMMUNITY ROOM & CONFERENCE ROOM AV UPGRADES

SHEET TITLE:

OVERALL CORE BUILDING FOURTH FLOOR FLOOR PLAN

SCALE: AS SHOWN

PROJECT NUMBER: 01-119293

SHEET NUMBER: A141

10/26/20 100% CONSTRUCTION DOCUMENTS

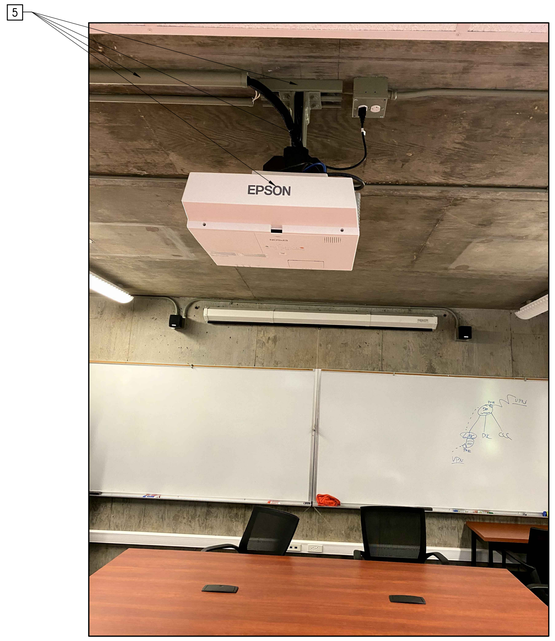
V:\DWG2020\2039 Los Medanos CC – SFMI\Drawings\Arch\2039_A141.dwg 2-01-21 09:12:55 AM wendy

SHEET NOTES

A. REFER TO TA SHEETS FOR AUDIO VISUAL DESIGN REQUIREMENTS AND ADDITIONAL NEW WORK TO BE PERFORMED.

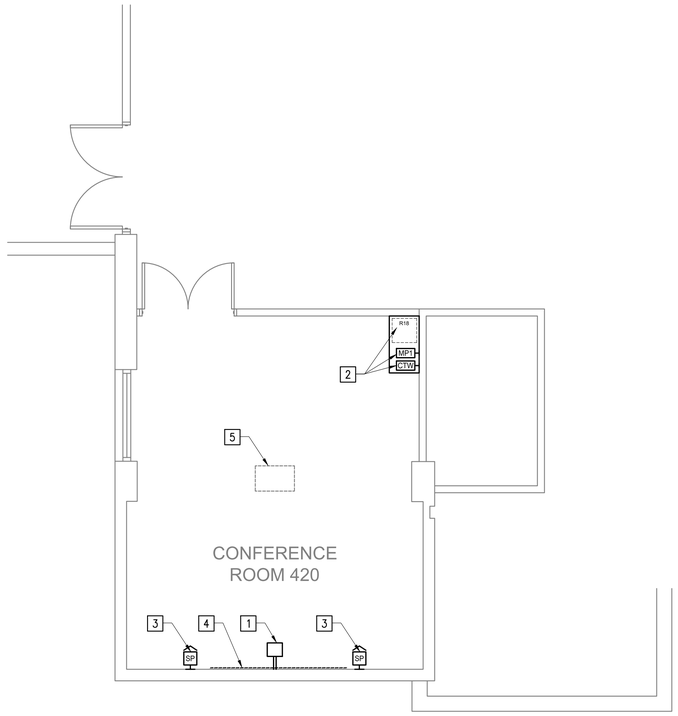
FLOOR PLAN KEYNOTES

1. PROVIDE EPSON BRIGHTLINK PRO 1430WI SHORT–THROW WALL MOUNTED PROJECTOR. PROVIDE SURFACE MOUNTED POWER AND DATA CONNECTIVITY AS REQUIRED. SEE DETAIL 4/A142 FOR MOUNTING DETAIL. REFER TO TA SHEETS FOR PRODUCT AND MOUNTING POSITION INFORMATION.
2. SERVER RACK AND AV EQUIPMENT. REFER TO TA SHEETS FOR ADDITIONAL INFORMATION.
3. PROTECT IN–PLACE EXISTING WALL MOUNTED SPEAKERS.
4. REMOVE (E) WHITE BOARD AND HARDWARE, PATCH WALL TO MATCH EXISTING AS REQUIRED. PROVIDE LEGRAND DA–LITE IDEA PANORAMIC SCREEN, SEE INTERIOR ELEVATION FOR ADDITIONAL INFORMATION.
5. REMOVE (E) CEILING MOUNTED PROJECTOR AND HARDWARE, PATCH SURFACES TO MATCH EXISTING AS REQUIRED. REFER TO TA SHEETS FOR ADDITIONAL INFORMATION.



2 (E) SOUTH WALL AT CONFERENCE ROOM 420

CORE BUILDING

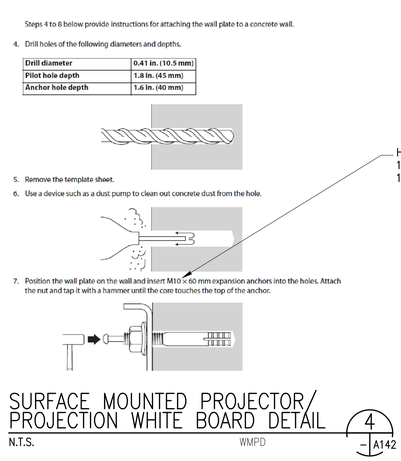


1 CONFERENCE ROOM 420 FLOOR PLAN

CORE BUILDING — 1/4" = 1'-0"

NORTH

NOTES:
1. REFER TO THE SHORT THROW PROJECTOR MANUFACTURER FOR WALL PLATE TEMPLATE TO DETERMINE THE POSITION OF THE WALL PLATE'S MOUNTING HOLES.

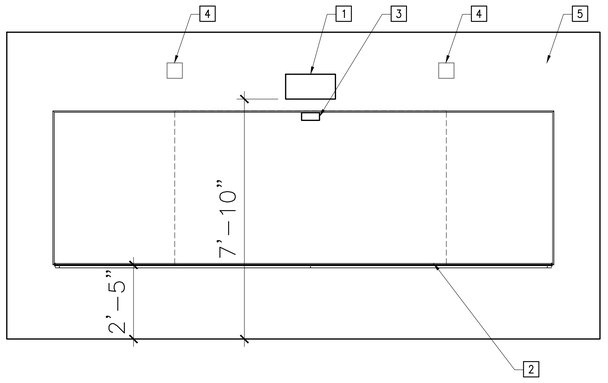


SURFACE MOUNTED PROJECTOR/ PROJECTION WHITE BOARD DETAIL

N.T.S. — WMPD — 4 / A142

INTERIOR ELEVATION KEYNOTES

1. PROVIDE EPSON BRIGHTLINK PRO 1430WI SHORT–THROW WALL MOUNTED PROJECTOR. PROVIDE SURFACE MOUNTED POWER AND DATA CONNECTIVITY AS REQUIRED. SEE DETAIL 4/A142 FOR MOUNTING DETAIL. REFER TO TA SHEETS FOR PRODUCT AND MOUNTING POSITION INFORMATION.
2. LEGRAND DA–LITE IDEA PANORAMIC SCREEN 27952T (CFCI), (HDTV 16:9, OVERALL SCREEN DIMENSION 60.25" H X 192" W AND VIEWING AREA OF THE SCREEN TO BE 59.5" H X 106" W,121" DIAGONAL WITH NO SEAMS ON THE SURFACE), SURFACE MOUNTED WITH FULL LENGTH MARKER TRAY. SEE DETAIL 4/A142
3. TOUCH UNIT FOR MAGNETIC SCREEN. REFER TO MANUFACTURER INSTALLATION GUIDELINE AND POSITION.
4. PROTECT IN–PLACE EXISTING WALL MOUNTED SPEAKERS.
5. EXISTING CONCRETE WALL



3 CONFERENCE ROOM 420 SOUTH INTERIOR ELEVATION

CORE BUILDING — 1/2" = 1'-0"

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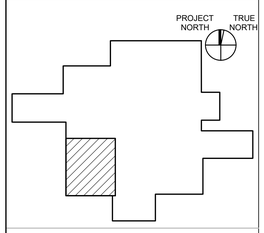
KEY PLAN



LOS MEDANOS COLLEGE

COMMUNITY & CONFERENCE ROOMS AV UPGRADES

SHEET TITLE:

PARTIAL CONFERENCE ROOM 420 NEW FLOOR PLAN

SCALE: AS SHOWN

PROJECT NUMBER: 2039

SHEET NUMBER: A142

POWER

	DISCONNECT SWITCH
	POWER PANEL– FLUSH MOUNT
	POWER PANEL– SURFACE MOUNT
	FUSED DISCONNECT SWITCH
M	SWITCH – MOTOR RATED
M	MOTOR
	DUPLEX – FLOOR
D	DUPLEX – WALL INDICATE DEDICATED CIRCUIT
	DUPLEX – CEILING
	DOUBLE DUPLEX – FLOOR
	DOUBLE DUPLEX – WALL
AC	DOUBLE DUPLEX – CEILING INDICATE ABOVE COUNTER CONTROLLED RECEPTACLE
C1	
GFI	GFI DUPLEX
	SPECIAL OUTLET – WALL (TYPE AS NOTED ON DWG.)
J	JUNCTION BOX – CEILING
J	JUNCTION BOX – FLOOR
J	JUNCTION BOX – WALL

WIRING

	3/4" CONDUIT WITH 2#12 WIRES, UON. GROUND WIRE NOT SHOWN. INCLUDE SEPARATE EGC IN EVERY CONDUIT.
#	3/4" CONDUIT WITH 3#12 WIRES, UON. GROUND WIRE NOT SHOWN. INCLUDE SEPARATE EGC IN EVERY CONDUIT.
#	3/4" CONDUIT WITH 4#12 WIRES, UON. GROUND WIRE NOT SHOWN. INCLUDE SEPARATE EGC IN EVERY CONDUIT.
#	3/4" CONDUIT WITH 6#12 WIRES, UON. GROUND WIRE NOT SHOWN. INCLUDE SEPARATE EGC IN EVERY CONDUIT.
S-1,3	HOMERUN WITH PANEL & CIRCUIT NUMBERS

WIRING

# #10	CONDUIT W/ 3#10 (OR SIZE SHOWN) GROUND WIRE NOT SHOWN. INCLUDE SEPARATE EGC IN EVERY CONDUIT. CONDUIT SIZE AND EGC SIZE TO CONFIRM TO FEEDER SCHEDULE.
	CAPPED CONDUIT
	CONDUIT RUN UNDERGROUND OR UNDER THE FLOOR SLAB
	CONDUIT TURNING DOWN
	CONDUIT TURNING UP
	CONDUIT BREAK
	FLEXIBLE CONNECTION
	LIGHTING/GROUNDING BARE COPPER CONDUCTOR

ABBREVIATIONS

(E)	EXISTING
EM	EMERGENCY LIGHT
(F)	FUTURE
(N)	NEW
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AL	ALUMINUM
C	CONDUIT
CEC	CALIFORNIA ENERGY CODE
cd	CANDELA
EGC	ELECTRIC GROUND CONDUCTOR
CO	CONDUIT ONLY
(D)	EXISTING WORK TO BE DEMOLISHED
EMT	EMPTY CONDUIT WITH NYLON PULL CORD
–	–
FBO	FURNISHED BY OTHERS
GFI	GROUND FAULT INTERRUPTER
GRD	GROUND
–	–
KAIC	KILO AMPS INTERRUPTING CAPACITY
KCM	THOUSAND CIRCULAR MILS
KVA	KILO VOLT AMPS
LV	LOW VOLTAGE SWITCH
M	METER
–	–
MLO	MAIN LUGS ONLY
NIC	NOT INCLUDED IN CONTRACT
PB	PULL BOX
(R)	REMOVE
(RL)	RELOCATED EQUIPMENT
(RR)	REMOVE AND RELOCATE
UON	UNLESS OTHERWISE NOTED
WP	WEATHERPROOF

MISCELLANEOUS

1	SHEET NOTE
	MECHANICAL EQUIPMENT TAG (SEE SCHEDULE)
1 / E1.1 (DETAIL NUMBER / SHEET NUMBER)	DETAIL TAG: DETAIL #1, SHEET E1.1
A	LIGHTING EQUIPMENT TAG (SEE SCHEDULE)

GENERAL DEMO NOTES

1. RECONNECT CIRCUITING AS REQUIRED TO MAINTAIN CONTINUITY TO REMAINING OUTLETS WHEN EXISTING FIXTURES AND DEVICES ARE REMOVED. CONSOLIDATE PARTIALLY LOADED CONVENIENCE RECEPTACLE CIRCUITS TO MAXIMIZE SPACE MADE AVAILABLE AT THE PANEL BOARD. TRACE CONSOLIDATED CIRCUITS TO VERIFY THAT THE TOTAL LOAD DOES NOT EXCEED 1920 VOLT AMPERES ON ANY 20A, 1 POLE CIRCUIT.
2. PROVIDE EXTENSION RINGS, COVER PLATES OR ACCESS DOORS AS NECESSARY TO MAINTAIN ACCESS TO EXISTING WIRING, WHERE REQUIRED BY NEW CONSTRUCTION. ALL ACCESS DOOR LOCATIONS SHALL BE REVIEWED BY ARCHITECT PRIOR TO INSTALLATION.
3. FIELD VERIFY LOCATIONS OF EXISTING OUTLETS. WHERE NEW CONSTRUCTION CONFLICTS WITH EXISTING OUTLETS, REMOVE WIRING DEVICES OR RELOCATE FIXTURES AS REQUIRED, WHETHER OR NOT SPECIFICALLY INDICATED.
4. PROVIDE BLANK COVER PLATES FOR JUNCTION BOXES WHICH ARE NOT REUSED.
5. PROVIDE TYPE AND SIZE OF CONDUCTORS TO MATCH EXISTING FOR EXISTING CIRCUITS WHICH ARE EXTENDED TO SERVE NEW OR RELOCATED DEVICES OR FIXTURES.
6. PROVIDE CUTTING AND PATCHING AS REQUIRED, WHETHER OR NOT SPECIFICALLY INDICATED. VERIFY EXTENT OF NEW AND EXISTING PARTITIONS WITH ARCHITECTURAL DRAWINGS.
7. FIELD VERIFY EXISTING CIRCUITING AND MAKE ADJUSTMENTS AS NECESSARY TO THE CIRCUITING SHOWN ON THE PLANS, AS REQUIRED BY FIELD CONDITIONS.
8. COORDINATE ALL DEMOLITION WORK WITH NEW REQUIREMENTS TO ASSURE THAT EXISTING EQUIPMENT, WIRING, ETC. THAT IS REQUIRED FOR A COMPLETE AND OPERABLE SYSTEM IS NOT REMOVED.
9. ALL EXISTING ELECTRICAL EQUIPMENT AND CONDUITS THAT INTERFERE WITH ANY NEW CONSTRUCTION SHALL BE RELOCATED OR RE–ROUTED AS REQUIRED TO CLEAR THE NEW CONSTRUCTION. RECONNECT ALL EXISTING EQUIPMENT THAT IS TO REMAIN AND NOT AFFECTED BY THE NEW CONSTRUCTION, TO THE NEWLY RELOCATED OR RE–ROUTED SYSTEM TO ENSURE A SAFE AND OPERATIONAL SYSTEM.
10. DISCONNECT AND RECONNECT THE EXISTING ELECTRICAL EQUIPMENT AS REQUIRED BY THE CONSTRUCTION MODIFICATIONS.
11. MODIFY AND RECONNECT THE EXISTING ELECTRICAL EQUIPMENT AS REQUIRED TO REMAIN, AND NOT AFFECTED BY THE NEW CONSTRUCTION, TO ENSURE THE FINAL SYSTEM WILL FUNCTION IN A SAFE MANNER ACCEPTABLE TO AUTHORITIES.
12. THE CONTRACTOR BY SITE INVESTIGATION, SHALL BE RESPONSIBLE FOR DETERMINING THE EXACT SCOPE OF DEMOLITION WORK AND THE EXACT QUANTITIES OF LIGHT FIXTURES, RECEPTACLES AND MISCELLANEOUS DEVICES TO BE DISCONNECTED AND REMOVED PRIOR TO THE DEMOLITION OF WALLS AND CEILINGS WITHIN THE AREA OF WORK AS DEFINED BY OUTLINED AREAS IN PLANS AND AS INDICATED IN ADJOINING SPACES.
13. THE CONTRACTOR SHALL INCLUDE IN HIS BID ALL MATERIALS AND LABOR REQUIRED FOR THE EXTENSIONS, RE–ROUTING AND RELOCATION OF EXISTING SYSTEM COMPONENTS, EQUIPMENT, WIRING, CONDUITS, AND CABLING SO AS MAINTAIN OPERATION OF ALL SYSTEM THROUGHOUT THE OCCUPIED AREAS OF THE BUILDING DURING THE DEMOLITION.
14. EXISTING RACEWAYS MAY BE REUSED, IF IN PLACE, WHERE POSSIBLE, AND WHERE IN COMPLIANCE WITH THE SPECIFICATIONS AND THE INTENT OF THE CONTRACT DOCUMENTS. UPGRADE AND/OR PROVIDE NEW CONDUIT SUPPORTS WHERE NECESSARY FOR ALL RACEWAYS BEING REUSED. INSURE INTEGRITY OF EXISTING RACEWAYS BEFORE REUSE.
15. WHERE CONDUIT AND WIRING STUBBED–UP THROUGH EXISTING FLOOR SLAB IS DEMOLISHED, PULL WIRES BACK TO POINT OF ORIGIN, GRIND EXISTING SURFACE, FILL CONDUIT WITH ELECTROMETRIC SEALING COMPOUND AND GROUT IN OPENING FLUSH WITH SURFACE.

GENERAL NOTES

1. PERFORM ALL WORK IN ACCORDANCE WITH THE LOCAL STANDARD DETAILS & SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, 2019 ELECTRICAL CODE, LATEST NFPA CODES AND REGULATIONS OF ALL LOCAL, CA STATE AND FEDERAL AUTHORITIES HAVING JURISDICTION, INCLUDING CALIFORNIA TITLE 24 WHERE APPLICABLE, PROVIDE OWNER WITH CERTIFICATE OF INSPECTION.
2. PERFORM ALL CUTTING AND PATCHING REQUIRED FOR THE WORK, INCLUDING TOUCH UP PAINTING OF PATCHED AREAS. FINISH PAINTING WILL BE BY OTHERS.
3. ELECTRICAL DRAWINGS ARE DIAGRAMMATIC AND INDICATE THE SIZE AND GENERAL LOCATION OF WORK. SCALED DIMENSIONS SHALL NOT BE USED. SEE ARCHITECTURAL DRAWINGS FOR EXACT SIZES, LOCATIONS AND DIMENSIONS OF ELECTRICAL DEVICES, FIXTURES AND EQUIPMENT.
4. PREPARE AND FURNISH TO THE ARCHITECT "AS–BUILT" PLANS FOR ALL WORK INSTALLED.
5. PROVIDE TEMPORARY LIGHT AND POWER AT CONSTRUCTION AREAS, IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE. CONTRACTOR IS RESPONSIBLE TO PAY FOR ALL TEMPORARY LIGHTS AND POWER EQUIPMENT COSTS, PERMITS, APPLICATION FEES AND MONTHLY UTILITY COST FOR THE DURATION OF THE PROJECT CONSTRUCTION UNTIL OWNER'S FINAL ACCEPTANCE.
6. ALL PARTS OF THE WORK AND ASSOCIATED EQUIPMENT SHALL BE TESTED AND ADJUSTED TO WORK PROPERLY AND BE LEFT IN PERFECT OPERATING CONDITION, THIS SHALL INCLUDE MEGGAR TEST BETWEEN PHASES AND BETWEEN EACH PHASE AND GROUND OF ALL FEEDERS, AND PANEL BOARDS, CORRECT DEFECTS DISCLOSED BY THESE TESTS.
7. UNLESS NOTED OTHERWISE THE CAPACITY OF CONDUCTORS 600 VOLTS OR LESS SHALL BE BASED ON THE TERMINALS NOT TO EXCEED 60°C (140°F) FOR CONDUCTOR SIZE #14 AWG THROUGH #1 AWG OR 75°C (167°F) FOR CONDUCTORS SIZED OVER #1 AWG.
8. GREEN INSULATED COPPER GROUNDING CONDUCTOR SHALL BE INSTALLED IN ALL BRANCH CIRCUITS AND FEEDERS. SIZE PER CEC. FOR UNDER GROUND OUTDOOR CIRCUITS PROVIDE #8 AWG.
9. SPLICES IN CONDUCTORS SHALL BE ELIMINATED WHEREVER POSSIBLE, AND WHERE NECESSARY (ONLY AS APPROVED BY OWNER'S REPRESENTATIVE) ARE ONLY TO BE MADE IN READILY ACCESSIBLE JUNCTION BOXES.
10. PROPERLY CLEAN–UP AND STORE ALL MATERIALS, TOOLS AND EQUIPMENT AFTER EACH WORK PERIOD.
11. PROVIDE APPROVED FIRE STOPPING AT ALL PENETRATIONS THROUGH FIRE RATED FLOORS, WALLS AND PARTITIONS TO MAINTAIN FIRE RATING OF FLOOR, WALLS OR PARTITIONS, DIRECTED BY AHJ.
12. MAINTAIN POWER AND LIGHTING THROUGHOUT. ALL REQUIRED INTERRUPTIONS SHALL BE AS DIRECTED BY OWNER'S REPRESENTATIVE.
13. PROVIDE EXPANSION FITTING IN ALL CONDUIT AND ELECTRICAL RACEWAY RUNS WHERE THEY CROSS BUILDING EXPANSION LINES.
14. PROJECT SPECIFICATIONS ARE AN INTEGRAL PART OF THESE DRAWINGS.
15. ALL EQUIPMENT SHALL BE LISTED BY A NATIONALLY RE–COGNIZED TESTING LABORATORY AND PROPERLY LABELED, CEC 110.3.
16. SWITCHES/CONTROLS, ETC., ARE INSTALLED AT A RANGE OF 15" TO 48" FOR FORWARD REACH OR 9" TO 54" FOR SIDE REACH, ABOVE THE FLOOR. PER CEC 210 AND 11B–308.3.2.
17. ALL RECEPTACLES OUTLETS SHALL BE INSTALLED AT LEAST 15" ABOVE THE FLOOR. CEC 21 AND 11B–308.3.2

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PROJECT NUMBER: 20–036

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Addendum 1	1	03/10/2021

SEALS AND SIGNATURES

REGISTERED PROFESSIONAL ENGINEER — PAUL ROBERT FAUSE — No. 7704 Exp. 9/22 — ELECTRICAL — STATE OF CALIFORNIA

ISSUE SCHEDULE	NO.	DATE
PLAN REVIEW SUBMITTAL V1		12/30/2020
PLAN REVIEW SUBMITTAL V2		02/03/2021
ADDENDUM #1	1	03/10/2021

KEY PLAN

PROJECT NORTH / TRUE NORTH

LOS MEDANOS COLLEGE

COMMUNITY ROOM & CONFERENCE ROOM AV UPGRADES

SHEET TITLE:
ELECT. SYMBOLS, LEGENDS, ABBREV., & GENERAL NOTES

SCALE: AS SHOWN
PROJECT NUMBER: 01-119293
SHEET NUMBER: E0.1

100% CONSTRUCTION DOCUMENTS 10/26/20

PART 1 – GENERAL

1.01 SCOPE OF WORK:
Furnish and install all materials and equipment and provide all labor, tools, transportation, superintendence and services required and necessary to complete the work shown on the drawings and/or specified herein. Also are included all other work and miscellaneous items, not specifically mentioned, but reasonably inferred for a complete installation including all accessories and appurtenances required for testing the system. It is the intent of the drawings and specifications that all systems be complete, and ready for operation.

1.02 REGULATORY REQUIREMENTS:
Code compliance is mandatory. Nothing in these Drawings and Specifications permits work not conforming to these codes. Where work is shown to exceed minimum code requirements, comply with drawings and specifications. All work and materials shall comply with the latest rules, codes and regulations, including, but not limited to the following:

1. Occupational Safety and Health Act Standards (OSHA).
2. NFPA #70: National Electric Code (NEC).
3. NFPA #101: Life Safety Code.
4. CEC: California Electrical Code 2019
5. CBC: California Building Code 2019
6. CFC: California Fire Code 2019
7. State Fire Marshal.
8. Local Utilities Companies.
9. Facility requirements.

1.03 LICENSE, FEES AND PERMITS:
Electrical contractor shall pay for all licenses, permits and inspection fees required by the authority having jurisdiction and shall arrange for all required inspections.

1.04 SAFETY AND INDEMNITY:
The Contractor shall be solely and completely responsible for conditions of the job site, including safety of all persons and property during performance of work. This requirement will apply continuously and not be limited to normal working hours. No act, service, drawing review or construction review by the Owner, the Engineers or their Consultants, is intended to include review of the adequacy of the Contractor's safety measures, in, on, or near the construction site.

1.05 DRAWINGS AND SPECIFICATIONS:
All drawings and all Divisions of these specifications shall be considered as a whole and work of this Division shown anywhere therein shall be furnished under this Division. Drawings are diagrammatic and indicate the general arrangement of equipment and wiring. Most direct routing of conduits and wiring is not assured. Exact requirements shall be governed by conditions of the job. Consult all other drawings in preparation of the bid. Extra lengths of wiring or addition of pull or junction boxes, etc., necessitate by such conditions shall be included in the bid.

1.06 CONDITIONS AT SITE:
The electrical contractor shall have examined the site and familiarized themselves with all discernible existing conditions. No extra payment will be allowed for work required because of these conditions, whether specifically mentioned or not.

1.07 WORKMANSHIP AND CONTRACTOR'S QUALIFICATIONS:
Only quality workmanship will be accepted. Haphazard or poor installation will be cause for rejection of work.

1.08 SHOP DRAWINGS AND MATERIALS LISTS:
Submit to Owner in a single package six (6) copies of complete shop drawings and materials list, as noted below, for review within fifteen (15) days after award of contract.
Submittals required as follows:

1. Wiring devices: switches, receptacles, device plates.
2. Enclosures for utility company metering.
3. Main fused disconnect switch.
4. Panelboards.
5. Disconnect switches.
6. Lighting fixtures, lamps and lighting control equipment.

1.09 SUBSTITUTIONS:
One or more makes of materials or methods may have been specified to establish the standard of quality, workmanship, finish and design required, but other materials or methods equal in quality, workmanship, finish, design, and guaranteed performance, will be accepted. However, all changes and substitutions shall be requested in letter form and shall be accompanied with a statement of the amount of money to be returned to the contract if the substitution is permitted.

No work involving materials submitted for substitution shall proceed until written acceptance is received from the Owner. The Owner is the sole judge of acceptability of preferred substitutions. If a substitution item is permitted, and any re-design effort is thereby necessitated, the required re- design shall be at the Contractor's expense.

1.10 COORDINATION:
Coordinate work with other trades to avoid conflict and to provide correct rough-in and connection for equipment furnished under other trades that require electrical connections. Inform Contractors of other trades of the required access to and clearances around electrical equipment to maintain service ability and code compliance.

Verify equipment dimensions and requirements with provisions specified under this Section. Check actual job conditions before fabricating work. Report necessary changes in time to prevent needless work. Changes or additions, subject to additional compensation, which are made without written authorization and an agreed price, shall be at the Contractor's risk and expense.

1.11 CUTTING AND PATCHING:
All cutting and patching required for work of this Division is included herein. Coordination with General Contractor and other trades is imperative. Contractor shall bear the responsibility for and the added expense of adjusting for improper holes, supports, etc.

1.12 ACCEPTANCE DEMONSTRATION:
Upon completion of the work, at a time to be designated by the Owner, the Contractor shall demonstrate for the Owner the operation of the electrical installation, including any and all special items installed by him or installed under his supervision. Properly set automatic time switches to perform switching operations in accordance with schedules provided by the Owner's representative, and demonstrate (using the manufacturer's operating instructions) how to override and/or test time switches programming.

1.13 RECORD DRAWINGS, EQUIPMENT DATA:
Maintain one set of clean working drawings at the job site and enter daily such "as-built" information as feeder and service routes, pull box locations and changes in layout or arrangement which occur during construction. Deliver completed drawings to the Owner.
Deliver to the Owner's representative three copies of data sheets or other current manufacturers' publications for each item of electrical equipment furnished for the project including at least these data:

1. Technical description and replaceable parts list.
2. Physical description and installation instructions.
3. User's manual and operating instructions.
4. Manufacturer's Warranty.

1.14 CLEAN-UP:
Rid the premises of scrap materials, trash and debris both during construction and at completion of the project. Leave the building and surrounding area in a clean and orderly condition.

1.15 GUARANTEE:
Guarantee the installation free from defects of workmanship and materials for a period of one year after Date of Certification of final payment and promptly remedy any defects developing during this period, without charge.

1.16 OWNER-FURNISHED ITEMS:
Contractor shall install, connect and complete the following items furnished by the Owner and shall provide wires, cables, connectors, pigtails, cords and cord-caps, boxes, conduits, plates, supports, and operating tests to make components and systems operate satisfactorily. Provide systems drawing from the manufacturer through the owner in order to install complete operable system.

1. Music sound system components.
2. Dimming panel for lighting controls.

PART 2 – PRODUCTS

2.01 MATERIAL APPROVAL
All materials must be new and bear Underwriter's Laboratories label. Materials that are not covered by UL testing standards shall be tested and approved by an independent testing laboratory or a governmental agency. Material not in accordance with these specifications may be rejected either before or after installation.

2.02 CONDUITS AND OTHER RACEWAYS:
A. Rigid Steel: Hot-dipped galvanized.
B. Intermediate Metal Conduit (IMC): Hot-dipped galvanized.
C. Electrical Metallic Tubing (EMT): Electro-galvanized.
D. Wireway: Code gauge steel, with knockouts and hinged cover, corrosion resistant gray baked enamel finish.
E. Provide fittings and accessories approved for the purpose equal in all respects to the conduit or raceway. EMT connectors and couplings shall be steel setscrew type indoors and steel compression type in wet locations and outdoors.

2.03 WIRES AND CABLES:
A. For power and lighting system 600V or less:
1. Conductor: minimum size #12 AWG.
a. #12 and #10 AWG solid copper.
b. #8 AWG and larger shall be stranded copper.
2. Insulation type:
a. #12 to #1 AWG: THWN for wet or underground and THHN for dry locations.
b. #1/0 through #4/0 AWG: XHHW (55 mils).
c. #250 MCM and larger: XHHW (65 mils).
d. Grounding wire: TW.
B. For signal and communications circuit:
1. Special cables shall be as specified on drawings.
2. Conductors for general use shall be stranded copper conductor, #16 AWG minimum, with THWN insulation for underground or wet locations and THHN insulation for dry locations.
C. Acceptable Products: General Electric, Anaconda, Okonite, Paranite or Triangle products conforming or exceeding applicable IPCEA standards.

2.04 OUTLET BOXES, JUNCTION AND PULL BOXES:
A. Outlet boxes: 4" square x 1-1/2" deep (or larger) galvanized sheet steel KO-type with plaster ring and cover for general interior use and cast metal type FS or FD with matching screw covers for exterior and exposed interior locations (gasketed in damp or wet locations).
B. Junction boxes shall be same as outlet boxes up to 42 cu. in. and code-gauge steel in larger sizes with surface or flush-type screw-mounted trim covers. Both boxes and covers inhibitor-primed and painted inside out.
C. Pull boxes shall be same as junction boxes unless indicated otherwise on the drawings, with covers.
D. Telephone outlet boxes shall be the type and size required by the serving telephone company but not smaller than 4-11/16" square x 2-1/8" deep with single-gang ring and Sierra #S-754N split plate bushing.

2.05 WIRING DEVICES AND PLATES:
Wiring devices and plates shall be by Pass and Seymour or approved equal.
1. Standard design:
a. Switch and receptacles devices shall be plastic bodies, color per architect.
b. Wall plates shall be metal type 430, stainless steel, color per architect.
c. Isolated ground receptacles shall be white with orange triangle as required per NEC, manufactured by "Leviton" # 5362-IGW or approved equal.
d. General Purpose Receptacle: Nema 5-15R or 5-20R
e. Half Controlled receptacles: Nema 5-20R, Pass & Seymour model # 26352.CHO or equal
f. Dual Controlled Receptacle: Nema 5-20R, Pass & Seymour model # 26352.CDIor equal
g. Dedicated Receptacle: Nema 5-20R

2.06 CONDUIT HANGERS:
For individual conduit runs not directly fastened to the structure, use rod hangers manufactured by Caddy, Unistrut or Powerstrut. For multiple conduit runs, use Unistrut or Powerstrut trapeze type conduit support designed for maximum deflection not greater than 1/8".

2.07 WIRE CONNECTORS:
For wire sizes #8 AWG and smaller: Insulated pressure type (with live spring) rated 105 degrees C, 600V, for building wiring and 1000V in signs or fixtures. Scotchlok or Ideal. For wire size #6 AWG and larger: T & B or equivalent compression type with 3M #33+ or Plymouth "Slipknot Grey" tape insulation.

2.08 INDIVIDUALLY MOUNTED MOTOR CONTROLLERS:
A. For Polyphase Motors: Combination motor circuit protector and magnetic starter, with 3-leg overload protection. Provide two interlock contacts of the interchangeable open-close type. Provide hand-off-automatic selector switch, motor running pilot light and reset button in cover. Circuits 300V and over shall be provided with 120V control transformers.
B. Starters for fractional horsepower 120V motors shall be manual type unless shown otherwise, equipped with built-in overload protection.
C. Acceptable manufacturers: General Electric, Siemens, Square D, Westinghouse, and Allen Bradley.

PART 3 – EXECUTION

3.01 GENERAL:
A. Electric system layouts indicated on the drawings are generally diagrammatic and shall be followed as closely as actual construction and work of other trades will permit. Drawings govern exact routing of cable and wiring and the locations of outlets by the structure and equipment served. Take all dimensions from architectural drawings.
B. Consult all other drawings, verify scales and report any dimensional discrepancies or other conflicts with Owner before submitting bid.
C. All home runs to panelboards are indicated as starting from the outlet nearest the panel and continuing in the general direction of that panel. Continue such circuits to the panel as though the routes were completely indicated. Terminate homeruns of signal, alarm, and communication systems in a similar manner.
D. Avoid cutting and boring holes through structure or structural members wherever possible. Obtain prior approval of Owner and conform to all structural requirements when cutting or boring the structure is necessary and permitted.
E. Furnish and install all necessary hardware, hangers, blocking, brackets, bracing, runners, etc. required for equipment specified under this Section.
F. Provide necessary backing required to insure rigid mounting of outlet boxes.

3.02 WIRING METHODS:
A. Install all wiring in raceway,
or use MC cable where approved by all applicable codes and regulations.
Conduit shall be rigid steel, IMC or EMT as follows:
1. Above ground: Use rigid steel, IMC or EMT.
a. Wet locations: Rigid steel or IMC only.
b. Locations subject to mechanical injury: Rigid steel or IMC only.
c. Dry locations and not subject to mechanical injury: EMT, IMC or rigid steel conduit.
2. Underground: Use rigid steel.
B. Use flexible conduits or MC cable in the following applications:
1. Final connections to motor.
2. Final connections into and out of the transformer.
3. Final connections to vibrating equipment.
4. Inter-connections between all light fixtures (not to include homerun from fixture or device to panelboard, which must be rigid).
5. Final connections where rigid conduit is not practical.
6. In walls (for light switches and 120V power receptacles and HVAC control equipment).
C. Flexible metalic conduit or MC cable must be the same size as the rigid conduit to which it is connected.
D. The connection to outdoor equipment must be weatherproof, i.e. liquidtight or sealtight.
E. Minimum size of conduit shall be 1/2" for individual lighting fixture connections or to individual light switches if approved by all applicable codes. Minimum size for all other locations shall be 3/4". If HVAC control wiring is required to be run in conduit, it shall be a 3/4" minimum, unless otherwise noted on drawings. All in/under floor conduits shall be 3/4" minimum size.

3.03 INSTALLATION OF CONDUITS:
A. General:
1. Run all conduit concealed unless otherwise noted or shown.
2. Run all conduit parallel to or at right angles to center lines of columns and beams.
3. Conduits above ceilings shall not obstruct removal of ceiling tiles, lighting fixtures, air diffusers, etc.
4. Conduits shall not cross any duct shaft or area designated as future duct shaft horizontally. Conduit risers when allowed in duct shaft must be coordinated with Mechanical work to avoid any conflict.
B. Conduit Supports:
1. Support conduits with Underwriter's Laboratories listed steel conduit supports at intervals required by the National Electric Code. Wires or sheet metal straps are not acceptable for conduit support. Use conduit hangers for all conduits not directly fastened to structure and for all multiple conduit runs. Do not attach any conduit to mechanical ducts or pipes.
2. Individual conduits 1/2" and 3/4" size for lighting may be supported from ceiling support wires with Caddy clips only if acceptable to local code. Only one conduit is permitted to be attached to any ceiling support wire. Hang such conduit so as not to affect level of ceiling.
3. Avoid attaching conduit to fan plenums. When it is necessary to support conduit from fan plenum, provide a length of flexible conduit between portion attached fan plenum and portion attached to the building to minimize transmission of vibration to the building structure.
C. Conduit Penetration:
1. Penetrating fire rated floor or wall: Install conduit in conduit sleeve or framed opening. Seal penetration with fire retardant sealant specified herein.
2. Penetrating roof or exterior wall: Avoid penetrating roof or exterior wall where possible. Where penetrations are necessary, building weatherproof integrity must be preserved.
3. Penetrating sound insulated or air plenum wall: Install conduit in conduit sleeve and seal penetration as detailed on the drawings.
4. Penetrating non-fire rated dry wall: Conduit sleeves are not required. Penetrations must be sealed with plaster prior to painting. Penetrations made after wall finish is applied must be as small as possible and provided with escutcheons, one on each side of wall.
5. Penetrating suspended ceiling: Cut hole as small as possible to permit conduit penetration. Provide escutcheon for each conduit below ceiling.

3.04 CONNECTIONS TO EQUIPMENT:
A. General:
1. Furnish and install required power supply conduit and wiring to all equipment. See below for other wiring required.
2. Furnish and install a disconnect switch immediately ahead of and adjacent to each magnetic motor starter or appliance unless the motor appliance is located adjacent and within sight of the serving panelboard, circuit breaker or switch. Verify all equipment nameplate current ratings prior to installation.
3. Install all rough-in work for equipment from approved shop drawings to suit the specific requirements of the equipment.
4. Furnish and install manual thermal protection for all motors not integrally equipped with thermal protection.
5. Furnish 120 Volt power to each control panel and time switch requiring a source of power to operate.

3.05 INSTALLATION OF WIRES:
A. Pull no wire into any portion of the conduit system until all construction work which might damage the wire has been completed.
B. Install all wire continuous from outlet to outlet or terminal to terminal. Splices in cables when required shall be made in handholes, pull boxes or junction boxes. Make branch circuit splices in outlet boxes with 8" of correctly color-coded tails left in the box.
C. Splices in wires and cables shall be made utilizing materials and methods described herein before.
D. Make all ground, neutral and line connections to receptacle and wiring device terminals as recommended by manufacture. Provide ground jumper from outlet box to ground terminal of devices when the device is not approved for grounding through the mounting screws.
E. Provide Brady wire markers where number of conductors in a box exceeds four.
F. Megger and record insulation resistance of all 600 Volt insulated conductors size #4/0 and larger using 500 Volt megger for one minute. Make tests with circuits isolated from source and load.

3.06 WIRE COLOR CODE:
Color coding shall be continuous for wire #12 through #10 AWG. Phase conductors #8 and larger and conductors of any size in cable assemblies may have colored phasing tape at terminations. Color code wires as follows:

Voltage	Phase A	Phase B	Phase C	Neutral	Ground
120/208V	Black	Red	Blue	White	Green

3.07 IDENTIFICATION:
A. Provide nameplates for switchgears, panelboards, and all similar devices. Nameplates shall be screwed (no adhesives) engraved bakelite or photo-etched metallic nameplate identification showing panel designation, voltage and phase in minimum 1/4" high letters.
B. Provide dymo labels on all lighting switches and convenience and special purpose receptacles to show panel and circuit number to which the device is connected.
C. Each panelboard shall contain a metal-framed circuit directory inside cover, with plastic protector.
D. Panelboard Schedule: After completion of work, provide typewritten updated panelboard schedules for all panelboards.

3.08 REMODELING WORK
A. Existing electrical wiring which will not be made obsolete and which will be disturbed due to construction changes required by this contract shall be restored to operating condition. Where construction changes require, outlets and conduit runs shall be relocated. Extend conduits and pull in new wiring or install junction boxes and splice in new wiring.
B. Outlets from which fixtures, switches, receptacles, and/or other electrical devices are moved and which are not replaced or reused shall be removed, where outlets boxes, etc., are completely removed, the contractor shall cut off conduits and remove wiring.
C. Where conduits extending through floors are to be abandoned, the contractor shall cut and cap or plug conduit, and the conduit shall not protrude above the floor.
D. Where existing conduit is to be abandoned, the conduit shall be removed if it is exposed, in a crawl space or in accessible ceiling . Where it is impossible to remove the conduit, it shall be cut off and capped or plugged.
E. Remove all existing wiring not reused or required to maintain continuity to circuits to remain.
F. The contractor shall be held fully responsible for the proper restoration of all existing surfaces requiring patching, plastering, painting and/or other repairs due to the installation of electrical work under the terms of this specification. Close all openings, repair all surfaces, etc., as required.
G. Maintain circuit continuity to areas outside of this work. provide new conduit and conductors as required to maintain continuity and maintain area as existing.

3.10 GROUNDING:
A. Electrical service and separately derived alternating current system shall be grounded in accordance with NEC Article 250-3 to 250-26, inclusive.
B. Ground non-current carrying metal parts of electrical equipment enclosures, frames, conductor raceways or cable trays to provide a low impendance path for line-to-ground fault current and to band all non-current carrying metal parts together. Provide ground conductor in each raceway system in addition to conductors shown. Equipment ground conductor shall be electrically and mechanically continuous from the electrical circuit source to the equipment to be grounded. Size ground conductors per NEC Article 250-95 unless larger conductors are shown on drawings.
C. Grounding conductors shall be identified with green insulation. Where green insulation is not available on larger sizes, black insulation shall be used and suitable identified with green tape at each junction box or device enclosure.

END OF SECTION

A & S ENGINEERS INC.
Mechanical, Electrical & Plumbing Consultants
175 LENNON LANE, SUITE 205
WALNUT CREEK, CA 94598
TEL: 925-937-6700 I WEB : http://www.asinca.com
PROJECT NUMBER: 20-036

CONTRA COSTA COLLEGE

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Addendum 1	1	03/10/2021

SEALS AND SIGNATURES

REGISTERED PROFESSIONAL ENGINEER
JOHN PAUL MORETTI
No. 7704
Exp. 9/22
ELECTRICAL
STATE OF CALIFORNIA

ISSUE SCHEDULE	NO.	DATE
PLAN REVIEW SUBMITTAL V1		12/30/2020
PLAN REVIEW SUBMITTAL V2		02/03/2021
ADDENDUM #1	1	03/10/2021

KEY PLAN

PROJECT NORTH / TRUE NORTH

LOS MEDANOS COLLEGE

COMMUNITY ROOM & CONFERENCE ROOM AV UPGRADES

SHEET TITLE:
ELECTRICAL SPECIFICATIONS

SCALE: AS SHOWN
PROJECT NUMBER: 01-119293
SHEET NUMBER: E0.2

100% CONSTRUCTION DOCUMENTS 10/26/20

A & S ENGINEERS INC.
Mechanical, Electrical & Plumbing Consultants
175 LENNON LANE, SUITE 205
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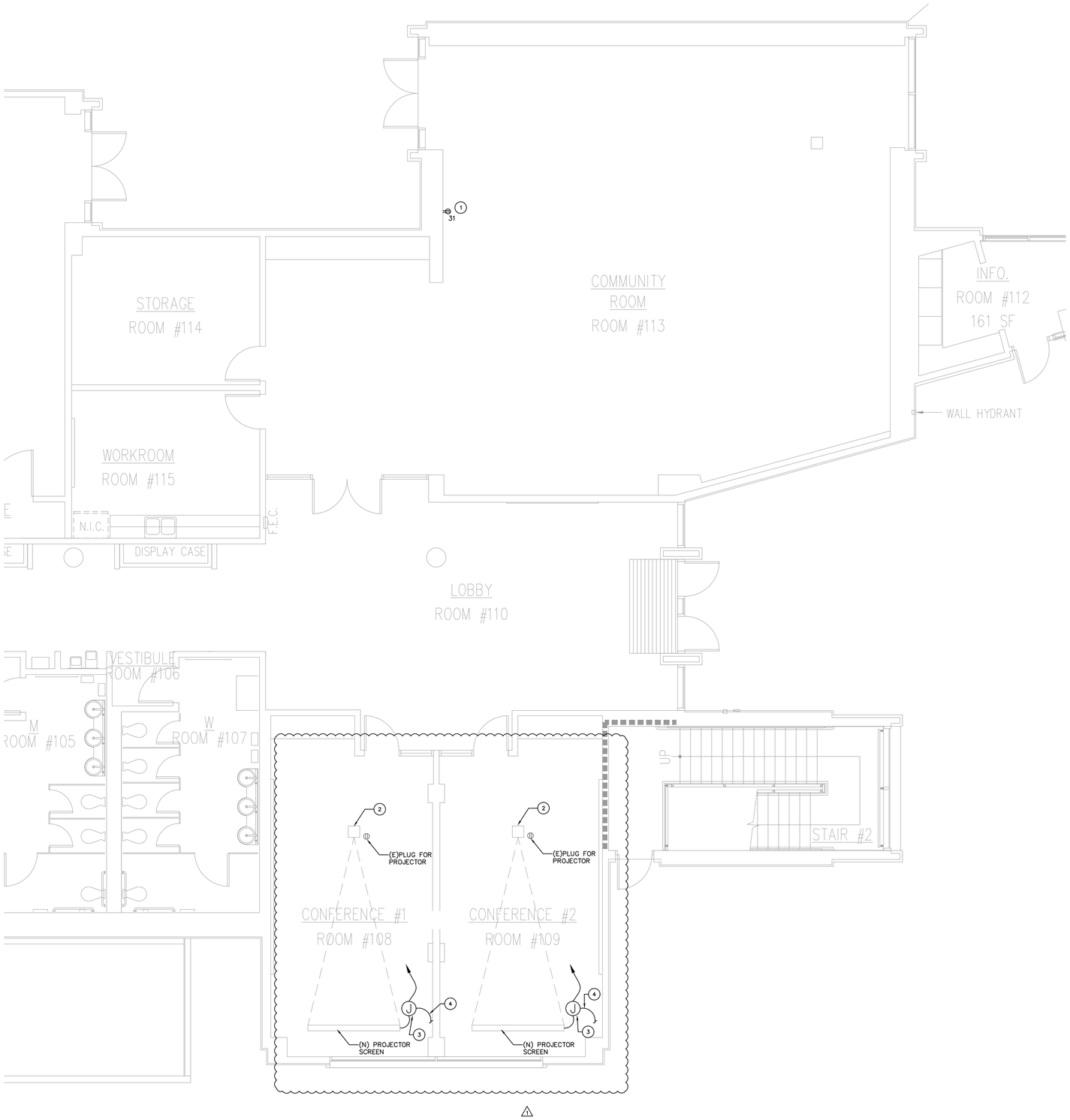
TEL: 925-937-6700 I WEB : http://www.asinca.com
PROJECT NUMBER: 20-036

GENERAL NOTES:

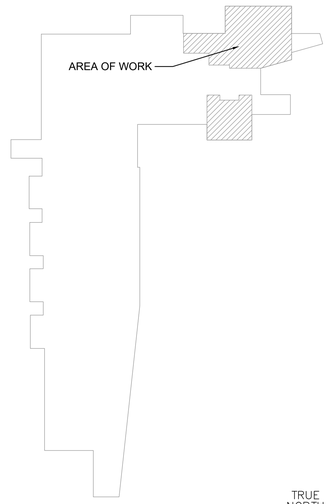
A. COORDINATE EXACT LOCATION AND MOUNTING HEIGHT OF RECEPTACLE AND DEVICES WITH ARCHITECT PRIOR TO ROUGH-IN WORKS.

SHEET NOTES:

1. PROVIDE NEW RECEPTACLE IN FWPB OF LCD MONITOR. CONNECT RECEPTACLE TO (E) RECEPTACLE CIRCUIT #31. REMOVE (E) RECEPTACLE AND EXTEND TO NEW RECEPTACLE IN FWPB PANEL.
2. NEW CEILING PROJECTOR IN (E) LOCATION. EXISTING POWER (PLUG-IN) TO REMAIN AND REUSE.
3. PROVIDE POWER 120V, FOR NEW PROJECTOR SCREEN. CONNECT CIRCUIT TO THE NEAREST EXISTING ROOM RECEPTACLE CIRCUIT.
4. TO PROJECTOR SCREEN CONTROL SWITCH LOCATION.



1 ELECTRICAL FLOOR PLAN
SCALE: 1/4"=1'-0"



3 ELECTRICAL KEY PLAN
SCALE: NONE

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Addendum 1	1	03/10/2021

SEALS AND SIGNATURES

REGISTERED PROFESSIONAL ENGINEER
ROBERT PAUL RODRIGUEZ
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ELECTRICAL
STATE OF CALIFORNIA

ISSUE SCHEDULE	NO.	DATE
PLAN REVIEW SUBMITTAL V1		12/30/2020
PLAN REVIEW SUBMITTAL V2		02/03/2021
ADDENDUM #1	1	03/10/2021

KEY PLAN

PROJECT NORTH / TRUE NORTH

LOS MEDANOS COLLEGE

COMMUNITY ROOM & CONFERENCE ROOM AV UPGRADES

SHEET TITLE:
COMMUNITY ROOM & CONFERENCE ROOMS L108/ L109 ELECTRICAL FLOOR PLAN

SCALE: AS SHOWN
PROJECT NUMBER: 01-119293
SHEET NUMBER: E113

10/26/20 100% CONSTRUCTION DOCUMENTS

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PROJECT NUMBER: 20-036

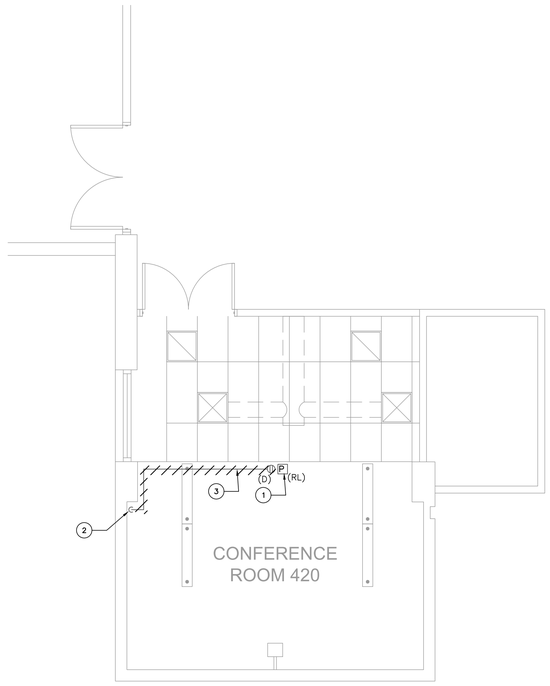
GENERAL NOTES:

A. COORDINATE EXACT LOCATION AND MOUNTING HEIGHT OF RECEPTACLE AND DEVICES WITH ARCHITECT PRIOR TO ROUGH-IN WORKS.

B. COORDINATE LOCATION OF HVAC EQUIPMENT WITH DIVISION 23 PRIOR TO ROUGH-IN WORKS.

C. ALL NEW WORK SHALL BE PER USPS LATEST DESIGN CRITERIA STANDARD AND SPECIFICATION DATED OCT 1, 2018.

D. ELECTRICAL DISCONNECTS SHALL BE HEAVY DUTY CAPABLE OF BEING LOCKED IN THE OFF POSITION AND NEMA 4X WEATHERPROOF WHEN LOCATED OUTSIDE.

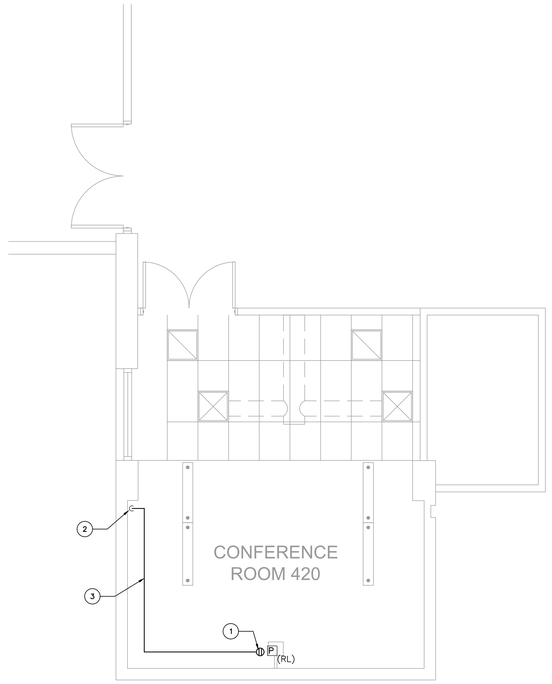


1 ELECTRICAL PARTIAL FLOOR PLAN - DEMO WORK
SCALE: 1/4"=1'-0"

NORTH

SHEET NOTES-DEMO WORK:

1. DISCONNECT POWER TO RELOCATED RECEPTACLE. REMOVE PORTION OF THE CONDUIT SERVING (RL) PROJECTOR AS SHOWN AS HATCH.
2. (E) CONDUIT THROUGH FLOOR.
3. (E) CONDUIT EXPOSED AT THE CEILING.

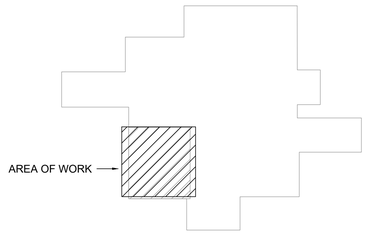


1 ELECTRICAL PARTIAL FLOOR PLAN - NEW WORK
SCALE: 1/4"=1'-0"

NORTH

SHEET NOTES-NEWWORK:

1. CONNECT (N) RECEPTACLE TO (E) CIRCUIT VIA 3/4" EXPOSED CONDUIT AT THE CEILING. INTERCEPT AND EXTEND EXISTING RECEPTACLE CIRCUIT (CONDUIT AND WIRING) TO NEW PROJECTOR LOCATION. COORDINATE LOCATION OF NEW CEILING RECEPTACLE WITH THE PROJECTOR NEW LOCATION PRIOR TO ROUGH-IN. PATCH CEILING TO MATCH (E).
2. (E) CONDUIT THROUGH FLOOR.
3. (N) CONDUIT EXPOSED AT THE CEILING.



3 ELECTRICAL KEY PLAN
SCALE: NONE

TRUE NORTH

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP: 01-119293 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
DATE: 02/18/2021

CONTRA COSTA COLLEGE

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SEALS AND SIGNATURES

REGISTERED PROFESSIONAL ENGINEER
ROBIN PAUL ROBERTS
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Exp. 9/22
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STATE OF CALIFORNIA

ISSUE SCHEDULE	NO.	DATE
PLAN REVIEW SUBMITTAL V1		12/30/2020
PLAN REVIEW SUBMITTAL V2		02/03/2021

KEY PLAN

PROJECT NORTH
TRUE NORTH

LOS MEDANOS COLLEGE

COMMUNITY ROOM & CONFERENCE ROOM AV UPGRADES

SHEET TITLE:

ELECTRICAL PARTIAL CONFERENCE ROOM 420 FLOOR PLAN- DEMO & NEW WORKS

SCALE: AS SHOWN

PROJECT NUMBER: 01-119293

SHEET NUMBER: E143

10/26/20 100% CONSTRUCTION DOCUMENTS

AUDIO VISUAL SYSTEMS GENERAL NOTES

1. REFER TO SPECIFICATIONS FOR COMPLETE REQUIREMENTS.
2. PROVIDE CONDUIT, BOXES AND FITTINGS SHOWN ON AUDIO VISUAL SYSTEMS (AV) DRAWINGS UNDER THE WORK OF SECTION 27 05 33 COMMUNICATIONS RACEWAYS, BOXES AND FITTINGS. UNLESS OTHERWISE INDICATED, PROVIDE 1 INCH TRADE SIZE MINIMUM. PROVIDE RACEWAY SIZE AS REQUIRED FOR A MAXIMUM OF 30 PERCENT WIRE FILL.
3. PROVIDE FIRESTOPPING UNDER THE WORK OF SECTION 27 05 33.
4. LOCATIONS SHOWN ON THE ARCHITECTURAL DRAWINGS TAKE PRECEDENCE OVER LOCATIONS SHOWN ON THE COMMUNICATIONS SYSTEMS DRAWINGS.
5. DEVICE QUANTITIES SHOWN ON FLOOR PLANS AND REFLECTED CEILING PLANS TAKE PRECEDENCE OVER DEVICE QUANTITIES SHOWN ON FUNCTIONAL DIAGRAMS.
6. QUANTITIES SHOWN ON FUNCTIONAL DIAGRAMS TAKE PRECEDENCE OVER QUANTITIES SHOWN ON RACK ELEVATIONS.
7. QUANTITIES SHOWN ON DEVICE SCHEDULES TAKE PRECEDENCE OVER QUANTITIES SHOWN ON FUNCTIONAL DIAGRAMS, FLOOR PLANS AND REFLECTED CEILING PLANS.
8. LOCATIONS SHOWN ON LARGE SCALE DRAWINGS TAKE PRECEDENCE OVER LOCATIONS SHOWN ON SMALL SCALE DRAWINGS.
9. NOT USED.
10. WIRING FOR THE WORK OF AUDIO VISUAL SYSTEMS IS NOT PERMITTED TO SHARE CONDUIT, SLEEVES OR J-HOOKS WITH WIRING FOR WORK OF COMMUNICATIONS WIRES, CABLES AND RELATED. MAINTAIN AT LEAST 2 INCHES SEPARATION IF RUNNING PARALLEL. MAINTAIN AT LEAST 1 INCH OF SEPARATION VERTICALLY IF CROSSING AT RIGHT ANGLES.

LEGEND

- SURFACE RACEWAY. FOR COMMUNICATIONS AND POWER SYSTEM PROVIDED UNDER DIV. 27.
- MARK INDICATES RACEWAY DROP FROM CEILING. COORDINATE EXACT LOCATION WITH DIV. 27 PLANS.
- NEW WIRE AND/OR CABLE IN EXPOSED CONDUIT OR RACEWAY. FILL PER SCHEDULE, PLANS AND SPECIFICATIONS.
- NEW WIRE AND/OR CABLE INSIDE NEW CONDUIT WALLS OR IN CEILING .
- CABLE/RACEWAY TURNS UP
- CABLE/RACEWAY TURNS DOWN
- HOME RUN
- 701 — WIRING NOTES
- TKA1 — KEYNOTES

GENERAL SYMBOLS

- XXXX / XXXX — ROOM KEY: ROOM NAME / ROOM NUMBER
- 1 / 1 — DETAIL SYMBOL: DRAWING NUMBER / SHEET NUMBER
- 1 / 1 — DRAWING NUMBER / SHEET NUMBER
- 1 / A1 — COLUMN GRID: GRID LINES; BUILDING LABEL
- 1 / 1 — BLDG. SECTION KEY: DRAWING NUMBER / SHEET NUMBER
- DRAWING MATCH LINE
- 1 / 1 — WALL SECTION KEY: DRAWING NUMBER / SHEET NUMBER
- 1 / 1 — ELEVATION KEY: DRAWING NUMBER / SHEET NUMBER
- 1 — REVISION SYMBOL: REVISION NUMBER

ABBREVIATIONS

A.D.A.	AMERICANS WITH DISABILITIES ACT
A.F.C.	ABOVE FINISHED CEILING
A.F.F.	ABOVE FINISHED FLOOR
ALT	ALTERNATE
A.M.F.F.	ABOVE MEZZANINE FINISHED FLOOR
BDF	BUILDING DISTRIBUTION FACILITY
B.F.C.	BELOW FINISHED CEILING
BLDG.	BUILDING
B.O.H.	BACK OF HOUSE
C.	CONDUIT
CAT.	CATEGORY
CBC	CALIFORNIA BUILDING CODE
CEC	CALIFORNIA ELECTRICAL CODE
COMM.	COMMUNICATIONS
C.L.	CENTERLINE
C.O.	CONDUIT ONLY
CONT.	CONTINUATION
CS	COMMUNICATIONS SYSTEM
(D)	DEMOLISH EXISTING
DED	DEDUCTIVE
DIA.	DIAMETER
DIV	DIVISION
(E)	EXISTING
EA.	EACH
EIA	ELECTRONIC INDUSTRIES ASSOCIATION
ELEV.	ELEVATION
E.O.L.	END OF LINE
EQPT.	EQUIPMENT
FIN	FINISHED
FUT	FUTURE
H.R.	HOME RUN
HT.	HEIGHT
IDF	INTERMEDIATE DISTRIBUTION FACILITY
J, JBOX	JUNCTION BOX
LAN	LOCAL AREA NETWORK
MAX.	MAXIMUM
MDF	MAIN DISTRIBUTION FACILITY
MIN.	MINIMUM
MMF	MULTI MODE OPTICAL FIBER
MOD.	MODULAR
MPOE	MINIMUM POINT OF ENTRY
(N)	NEW
NEC	NATIONAL ELECTRICAL CODE
N.I.C.	NOT IN CONTRACT
NTS	NOT TO SCALE
O.C.	ON CENTER
O.D.	OUTSIDE DIAMETER
O.F.E.	OWNER FURNISHED EQUIPMENT
OPP.	OPPOSITE
OSP	OUTSIDE PLANT
PNL.	PANEL
PROJ.	PROJECT
P.S.R.H	PROJECT STANDARD RECEPTACLE HEIGHT +18" ATT, U.O.N.
P.S.S.H.	PROJECT STANDARD SWITCH HEIGHT +48" AFF TO ℄ U.O.N.
RE:	REFER TO
REF.	REFERENCE
S.A.D.	SEE ARCHITECTURAL DRAWINGS
S.E.D.	SEE ELECTRICAL DRAWINGS
S.I.D.	SEE INTERIORS DRAWINGS
S.M.D.	SEE MECHANICAL DRAWINGS
SIM.	SIMILAR
SMF	SINGLE MODE OPTICAL FIBER
SN	SHEET NOTE
SP	SHIELDED PAIR - SEE SPECIFICATIONS
SPEC	SPECIFICATION
S.R.	SURFACE RACEWAY
STD	STANDARD
STP	SHIELDED TWISTED PAIR
T.C.	TELECOMMUNICATIONS CLOSET
TEL	TELEPHONE
TELCOM	TELECOMMUNICATIONS
TIA	TELECOMMUNICATIONS INDUSTRY ASSOCIATION
TP	TWISTED PAIR
TYP.	TYPICAL
U.O.N.	UNLESS OTHERWISE NOTED
W/	WITH
WP	WEATHERPROOF

ALS SCHEDULE

COMPLY WITH CBC 1104B.2 ASSISTIVE-LISTENING SYSTEMS IN ASSEMBLY AREAS.		
PROVIDE COMPLETE ASSISTIVE-LISTENING SYSTEMS UNDER THE WORK OF SECTION 27 41 16.		
	NUMBER OF PERMANENTLY INSTALLED ALS DEVICES REQUIRED:	
	ROOM NAME/TYPE	TOTAL OCCUPANCY
	Community Room	99
	Conference #1	24
	Conference #2	24
	Conference 409	28
	Conference 420	22
	TOTAL OCCUPANCY AT ALS-REQUIRED SPACES:	197
	PROVIDE QUANTITY OF RECEIVERS:	8
	PROVIDE QUANTITY OF HEARING-AID COMPATIBLE NECK LOOPS:	2
2	TYPE OF LISTENING SYSTEM: PERMANENT RF or IR	
3	LOCATION: FOR USE ANYWHERE WITHIN THE DESIGNATED AREAS.	
4	SIGNAGE: PROVIDE UNDER WORK OF SECTION 10 14 00.	

AV FUNCTIONALS LEGEND

Loudspeaker type (See Plans and Specifications) — SHB4 — x2 ← Loudspeaker quantity; 1 & 2 — 3.7W TAP ← 70V power tap; Loudspeaker reference number

- BM — TRANSFORMER BALANCED, LINE INPUT MODULE, PRIORITY MUTE GENERATING
- MBI — TRANSFORMER BALANCED, MIC INPUT MODULE, PRIORITY MUTE GENERATING
- VBI — TRANSFORMER BALANCED, LINE INPUT MODULE, PRIORITY MUTE RECEIVING, ADJUSTABLE MUTE LEVEL
- K — RELAY COIL
- VC-R — 70 WATT PRIORITY ATTENUATOR, RACK MOUNTED
- PUSH BUTTON SWITCH
- M — MOMENTARY PUSH BUTTON SWITCH
- SWITCH
- SWITCH
- NORMALLY OPEN CONTACT
- NORMALLY CLOSED CONTACT

- RR — REPEAT RELAY
- XF — XM — XLR CONNECTOR, 3 PIN, FEMALE; MALE
- 4F — 4M — XLR CONNECTOR, 4 PIN, FEMALE; MALE
- ASF — ASM — AUDIO SPEAKER CONNECTOR, FEMALE; MALE
- B — BNC CONNECTOR, 75 OHMS IMPEDANCE
- D — DIN CONNECTOR, MIDI STANDARD
- P — 1/4" PHONE CONNECTOR
- TRIPLE FIVE WAY BINDING POSTS
- TYPE "F" CONNECTOR
- RESISTIVE TERMINATION AT CIRCUIT CHARACTERISTIC IMPEDANCE
- WIRING CONTINUES AS INDICATED
- WIRING HOME RUN AS INDICATED
- FLY-ON OR FLY-OFF POINT
- TUBULAR CLAMP BARRIER BLOCK, SWITCH BLOCK SECTION QUANTITY AS REQUIRED BY CIRCUIT
- SVM — SVF — S-VIDEO CONNECTOR, MALE; FEMALE
- RF — RM — TYPE RCA AUDIO OR VIDEO CONNECTOR, FEMALE; MALE
- SCREW TERMINAL
- MF — MM — TRS MINI STEREO AUDIO CONNECTOR, FEMALE; MALE.

NOTES:

X DENOTES SEQUENCE NUMBER

JUNCTION BOX SCHEDULE

SYMBOL	H (INCHES)	W (INCHES)	D (INCHES)
J1	6	6	4
J2	8	8	4
J3	12	12	4
J4	12	12	6
J5	12	12	8
J6	16	12	8
J7	18	18	6
J8	20	16	6
J9	20	16	8
J10	20	20	6
J11	20	20	8
J12	24	20	6
J13	24	20	8
J14	24	24	8
J15	30	24	8
J16	30	30	8
J17	36	30	8
J18	36	36	8

SUFFIX:

NONE - NEMA 1
A - NEMA 12
B - NEMA 3R
C - NEMA 4
D - NEMA 4X

NOTE

ALL JUNCTION BOXES TO BE HINGED TYPE, PROVIDED WITHOUT PRE-PUNCHED KNOCKOUTS. PENETRATIONS IN JUNCTION BOXES SHALL BE CUT OR PUNCHED AS REQUIRED FOR INSTALLATION. PAINT ALL INTERIOR BOXES TO MATCH WALL FINISH. COORDINATE FINISH WITH ARCH. PLANS.

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP: 01-119293 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
DATE: 02/18/2021

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SEALS AND SIGNATURES

LICENSED ARCHITECT — Andrew G. Odell — No. C 10672 — Exp. 8/2021 — STATE OF CALIFORNIA

ISSUE SCHEDULE	NO.	DATE
PLAN REVIEW SUBMITTAL V1		12/30/2020
PLAN REVIEW SUBMITTAL V2		02/03/2021

KEY PLAN

PROJECT NORTH / TRUE NORTH

LOS MEDANOS COLLEGE

COMMUNITY ROOM & CONFERENCE ROOM AV UPGRADES

SHEET TITLE:

GENERAL NOTES, LEGEND, SYMBOL, ABBREV., JBOX & ALS SCHEDULES

SCALE: AS SHOWN

PROJECT NUMBER: 01-119293

SHEET NUMBER: TA-001

10/26/20 100% CONSTRUCTION DOCUMENTS

SYMBOL	DEVICE	FUNCTION OR SERVICE	LOCATION	WORK OF	ROUGH-IN	RACEWAY	ELEVATION	CABLE FILL & HOMERUN DESTINATION, U.O.N.	FINISH	WEIGHT, LB	DETAIL SHEET(S)
A	ASSISTIVE LISTENING TRANSMITTER	AUDIO VISUAL	CEILING	27 41 16	FLUSH 4S BOX, 1 G. RING.	R6	SURFACE MOUNT TO CEILING	SERVING IDF AV RACK	WHITE	1	N/A
BMIC	BOUNDARY MICROPHONE ARRAY	AUDIO VISUAL	CONFERENCE TABLE	27 41 16	N/A	N/A	TABLE SURFACE	UMBILICAL TO FLOORBOX BELOW	BLACK	N/A	N/A
HCBP	CONTROL BUTTON PANEL, WALL MOUNTED	AUDIO VISUAL	WALL	27 41 16	AT EXISTING CONTROL BUTTON PANEL LOCATION	R6	AT EXISTING CONTROL BUTTON PANEL LOCATION	PER FUNCTIONAL AND AS NOTED	WHITE	N/A	N/A
CCAM	USB CONFERENCING CAMERA	AUDIO VISUAL	WALL	27 41 16	FLUSH 4S BOX, 1 G. RING.	R6	+84" A.F.F., U.O.N.	PER FUNCTIONAL AND AS NOTED	WHITE	7	N/A
CM	CEILING MICROPHONE ARRAY	AUDIO VISUAL	CEILING	27 41 16	MFG. CEILING MOUNT KIT	R6	CEILING	PER FUNCTIONAL AND AS NOTED	WHITE	5	
CONFSBS	INTEGRATED CONFERENCING CAMERA/MICROPHONE/SOUNDBAR	AUDIO VISUAL	SET/WALL ATTACHED	27 41 16	N/A	N/A	BELOW FLAT PANEL DISPLAY	PER FUNCTIONAL AND AS NOTED	BLACK	12	N/A
CTP	AV CONTROL TOUCH PANEL, TOPSET	AUDIO VISUAL	CONFERENCE TABLE	27 41 16	FLUSH 2G BOX, W/ 2G. RING.	R6	+40" A.F.F. TO CL, U.O.N.	UMBILICAL TO FLOORBOX BELOW	WHITE	2	N/A
HCTW	AV CONTROL TOUCH PANEL, WALL MOUNTED	AUDIO VISUAL	WALL	27 41 16	FLUSH 2G BOX, W/ 2G. RING.	R6	+40" A.F.F. TO CL, U.O.N.	PER FUNCTIONAL AND AS NOTED	WHITE	2	N/A
FC6 (E)	FLOOR BOX, (EXISTING)	COMMUNICATIONS & AUDIO-VISUAL	FLOOR (E)	27 05 33	EXISTING	N/A	FLUSH IN FLOOR	AS SCHEDULED	ALUMINUM OR BRUSHED SS EXPOSED TRIM. COORDINATE CARPET CUT AND INSERT.	N/A	N/A
FPWB	FLAT PANEL ROUGH-IN BOX (E)	AUDIO VISUAL	FLUSH IN WALL – (E)	27 05 33	EXISTING	N/A	SEE DISPLAY ELEVATION, CENTERLINE OF FPWB TO MATCH CENTERLINE OF DISPLAY	AS SCHEDULED	WHITE	10	TA-901
1 FTC	FLUSH MOUNT CABLE CUBBY	AUDIO VISUAL	FLUSH IN (E) TABLE	27 41 16	PROVIDE CUT-IN. COORDINATE LOCATION OF CUBBY W/ FLOORBOX BELOW AND DISTRICT REPRESENTATIVE.	N/A	TABLE TOP	UMBILICAL TO FLOORBOX BELOW	ALUM OR BRUSHED STAINLESS	1	N/A
LCD23	FLAT PANEL DISPLAY, 23" DIAGONAL CLASS, TOPSET/PANEL MOUNT	AUDIO VISUAL	PRESENTATION LECTERN/RACK R33	27 41 16	N/A	N/A	PRESENTATION LECTERN/RACK PANEL	N/A	BLACK	20	N/A
LCD70	FLAT PANEL DISPLAY, 70" DIAGONAL CLASS	AUDIO VISUAL	WALL	27 41 16	FPWB	SEE FPWB	+80" A.F.F. TO UNDERSIDE	N/A	BLACK	145	TA-901
LCD80	FLAT PANEL DISPLAY, 80" DIAGONAL CLASS	AUDIO VISUAL	WALL	27 41 16	FPWB	SEE FPWB	+65" A.F.F. TO CENTERLINE	N/A	BLACK	175	TA-901
MP1	MEDIA INPUT PANEL,HDMI-4K	AUDIO VISUAL	WALL/FLOORBOX	27 41 16	AT WALL: 2-3/4" DEEP 1G BOX W/ RING, IN FLOORBOX: 1G PLATE	R6	+40" A.F.F. TO CL, U.O.N.	PER FUNCTIONAL AND AS NOTED	WHITE	N/A	N/A
MP2	MEDIA INPUT PANEL, RJ45	AUDIO VISUAL	FLOORBOX	27 41 16	1G PLATE IN FLOORBOX (MULTIPLE RJ45 JACKS SHOWN ON ROOM FUNCTIONAL DIAGRAMS MAYBE COMBINED ONTO A SINGLE PLATE	R6	+40" A.F.F. TO CL, U.O.N.	PER FUNCTIONAL AND AS NOTED	WHITE	N/A	N/A
R18	SLIDE-OUT/PIVOT UNDERCOUNTER AV EQUIPMENT RACK	AUDIO VISUAL	INDICATED	27 11 16	PROPRIETARY MANUFACTURER BACKBOX.	(4) 2" C. FROM REAR OF RACK TO ABOVE ACCESSIBLE CEILING	IN CASEWORK	PER FUNCTIONAL AND AS NOTED	BLACK	50	TA902
R33 (E)	4-POST AV EQUIPMENT RACK (EXISTING)	AUDIO VISUAL	INDICATED	27 11 16	N/A	(E) CONDUITS AND PATHWAY TO COMMUNITY ROOM EQUIPMENT TO BE RE-USED WHERE POSSIBLE.	FLOOR	PER FUNCTIONAL AND AS NOTED	BLACK	400	TA903
SA	LOUDSPEAKER, FLUSH-MOUNT, CEILING	AUDIO VISUAL	FLUSH IN FINISHED CEILING	27 41 16	PROPRIETARY MANUFACTURER BACKBOX.	R6	CEILING	PER FUNCTIONAL AND AS NOTED	WHITE	10.4	N/A
HSP	LOUDSPEAKER, SURFACE-MOUNT, WALL	AUDIO VISUAL	WALL	27 41 16	PROVIDE ONE (1) 5" SQUARE x 2.875" DEEP BOX WITH TWO (2) GANG RING EQUAL TO RANDL INDUSTRIES 5 SQUARE. www.randl-inc.com	R5	+80" A.F.F. TO UNDERSIDE	PER FUNCTIONAL AND AS NOTED	WHITE	12	N/A
VPROJ	VIDEO PROJECTOR, CEILING MOUNT. REFER TO ENLARGED PLANS.	AUDIO VISUAL	INDICATED	27 41 16	REUSE EXISTING CEILING/POLE MOUNT	R2	AS DETAILED - ALIGN TOP OF PROJECTOR LENS LEVEL WITH TOP OF VIEWABLE AREA OF PROJECTION SCREEN.	PER FUNCTIONAL AND AS NOTED	WHITE	50	TA902
VPROJ1	SHORT-THROW WALL MOUNT VIDEO PROJECTOR	AUDIO VISUAL	INDICATED	27 41 16	PROPRIETARY MANUFACTURER MOUNTING PLATE, S.A.D. FOR MOUNTING HARDWARE REQUIREMENTS	PROVIDE SURFACE-MOUNT RACEWAY FROM PROJECTOR MOUNT LOCATION TO R18.	MOUNT PROJECTOR TO ALIGN WITH VIEWABLE AREA OF PROJECTABLE WHITE-BOARD SURFACE BELOW, S.A.D. FOR WHITEBOARD DETAILS/ELEVATIONS.	PER FUNCTIONAL AND AS NOTED	WHITE	40	N/A
WMIC	WIRELESS MICROPHONE	AUDIO VISUAL	INDICATED	27 41 16	FLUSH 4S BOX, 1 G. RING.	R6	CEILING	PER FUNCTIONAL AND AS NOTED	WHITE	N/A	N/A

NOTE NO. WORK OF NOTES

LOCATION & ROUGH-IN NOTES

LRI1 INSTALLED ASSEMBLY, INCLUDING MONITOR SHALL NOT PROJECT MORE THAN 4" FROM FACE OF WALL.
LRI2 MATCH PROJECT SWITCH HEIGHT
LRI3 4S BOX W/ 1 GANG RING BLANK COVER PLATE
LRI4 NOT USED
LRI5 NOT USED
LRI6 NOT USED
LRI7 MANUFACTURER'S VENTED BACKBOX .
LRI8 NOT USED
LRI9 4S BOX, 2-1/8" DEEP MIN., W/ 1 GANG RING WITH LOCKING HINGED COVER PLATE (FSR WB-MR2G OR EQUAL).
LRI10 NOT USED
LRI11 PROVIDE BACKING AND SUPPORT FOR 5 POUND DEVICE.
LRI12 PROVIDE DEVICE COMPLETE WITH BACKBOX, TILE SUPPORT RAILS AND CEILING CUTOUT TEMPLATE. COMPLY WITH SECTION 09 50 11 ACOUSTICAL PANEL CEILINGS.
LRI13 PROVIDE BACKING IN WALL SUITABLE TO SUPPORT A 20 POUND DEVICE WITH A LOAD CENTROID 18 INCHES FROM THE FACE OF THE WALL.
LRI14 PROVIDE BACKING IN WALL SUITABLE TO SUPPORT A 200 POUND DEVICE WITH A LOAD CENTROID 8 INCHES FROM THE FACE OF THE WALL.
LRI15 AS DETAILED AND/OR SCHEDULED ON THE ARCHITECTURAL DRAWINGS.

RACEWAY NOTES

R1 2" C. EXTEND TO ACCESSIBLE CEILING
R2 2" C. H.R. TO AV EQUIPMENT RACK
R3 NOT USED
R4 AS DETAILED AND/OR SCHEDULED
R5 3/4" C. H.R. TO ACCESSIBLE CEILING OR FLOOR, OR TO SERVING BDF, IDF OR EQUIPMENT ROOM, U.O.N.
R6 1" C. H.R. TO ACCESSIBLE CEILING OR FLOOR, OR TO SERVING BDF, IDF OR EQUIPMENT ROOM, U.O.N.
R7 1-1/4" C. H.R. TO ACCESSIBLE CEILING OR FLOOR, OR TO SERVING BDF, IDF OR EQUIPMENT ROOM, U.O.N.
R8 NOT USED
R9 AT ACCESSIBLE CEILING, PROVIDE ABOVE CEILING PATHWAY USING CABLE HOOKS. WHERE MOUNTED IN GYP CEILING, EXTEND 3/4" C. TO ACCESSIBLE CEILING.
R10 2 1-1/4" C TO 4 GANG COMPARTMENT, 1 - 1" TO 1 GANG COMPARTMENT, STUBBED TO ACCESSIBLE CEILING OR FLOOR. SEE ELECTRICAL DRAWINGS FOR ELECTRICAL ROUGH-IN.
R11 UNLESS OTHERWISE SHOWN, PROVIDE 1.5" EMT SLEEVE, WITH INSULATED THROAT BUSHING AT EACH END, STUBBED OUT 4 INCHES FROM FACE OF WALL, AT ELEVATION APPROXIMATELY 6 INCHES ABOVE ACCESSIBLE CEILING. INSTALL SLEEVE IN AN ACCESSIBLE LOCATION AS DEFINED IN CALIFORNIA ELECTRICAL CODE, ARTICLE 100 DEFINITIONS. PROVIDE FIRESTOPPING UNDER WORK OF SECTION 27 05 33. BOND TO GROUND. COMPLY WITH DIVISION 26 AND SECTION 27 05 26 GROUNDING.
R12 4 1-1/4" C TO 6 GANG COMPARTMENT, 1 - 1.25" TO EA. 1 GANG COMPARTMENT, STUBBED TO ACCESSIBLE CEILING OR FLOOR, EXTEND TO SERVER ROOM IN BASKET TRAY. SEE ELECTRICAL DRAWINGS FOR ELECTRICAL ROUGH-IN TO 3 GANG COMPARTMENT.

ACCESSIBLE CEILING IS A T-BAR OR SIMILAR GRID BASED, PANELIZED REMOVEABLE CEILING MEETING THE DEFINITION FOR ACCESSIBLE WIRING METHODS IN ARTICLE 100 OF THE CALIFORNIA ELECTRICAL CODE.

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SEALS AND SIGNATURES

LICENSED ARCHITECT
ANDREW C. OWEN
No. C 30672
REN 6/2021
STATE OF CALIFORNIA

ISSUE SCHEDULE	NO.	DATE
PLAN REVIEW SUBMITTAL V1		12/30/2020
PLAN REVIEW SUBMITTAL V2		02/03/2021
BID ADDENDUM 1	1	03/10/2021

KEY PLAN

PROJECT NORTH / TRUE NORTH

LOS MEDANOS COLLEGE

COMMUNITY ROOM & CONFERENCE ROOM AV UPGRADES

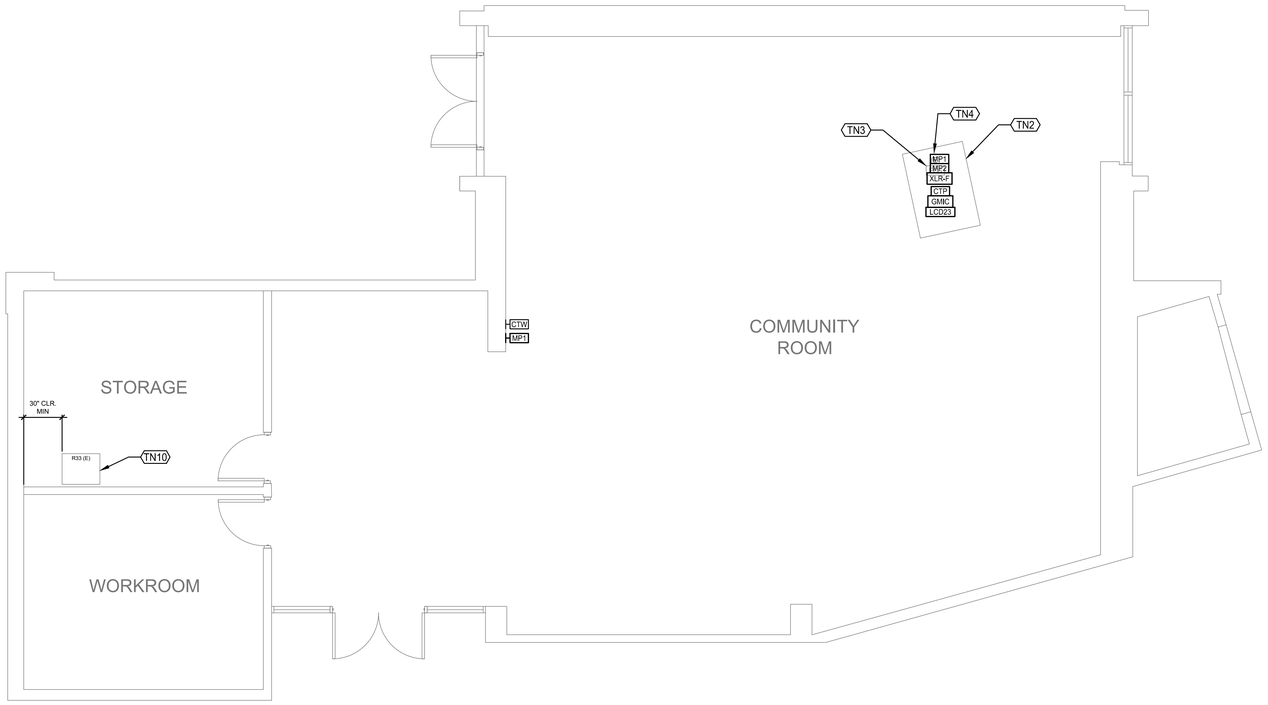
SHEET TITLE:

ABBREVIATIONS, LEGEND AND SYMBOL

SCALE: AS SHOWN
PROJECT NUMBER: 01-119293

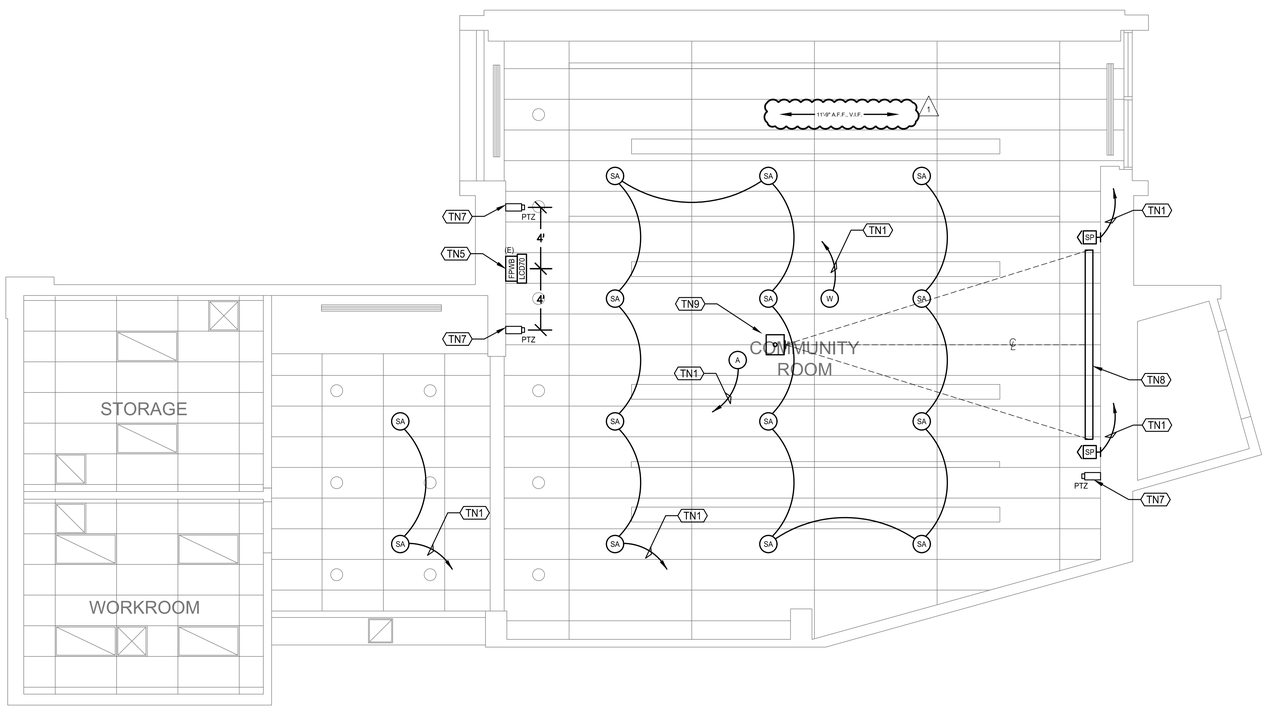
SHEET NUMBER: TA-002

10/26/20 100% CONSTRUCTION DOCUMENTS



1 COMMUNITY, STORAGE & WORKROOM FLOOR PLANS

1/4" = 1'-0"



2 COMMUNITY, STORAGE & WORKROOM RCP

1/4" = 1'-0"

KEYNOTES

TN1 H.R. TO R33 AV EQUIPMENT RACK IN ADJACENT STORAGE SPACE.

TN2 NEW ACCESSIBLE PRESENTATION LECTERN.

TN3 REMOVE (E) AUDIOVISUAL CONNECTORS AND RECEPTACLE PLATES FROM (E) FLOORBOX. REMOVE OBSOLETE CABLING FROM (E) PATHWAY FROM FLOORBOX TO RACK AND INSTALL (N) CABLING AND DEVICES AS SHOWN ON TA-701.

TN4 PROVIDE DETACHABLE UMBILICAL (INLUDING MICROPHONE AND AV CABLING) TO FLOORBOX BELOW TO ALLOW LECTERN TO BE DISCONNECTED AT FLOOR.

TN5 (N) CONFIDENCE MONITOR. BOTTOM OF DISPLAY SHALL BE +80" .F.F.

TN6 H.R. TO R18 AV EQUIPMENT RACK.

TN7 (N) WALL-MOUNTED PTZ CAMERA. BOTTOM OF CAMERA AND MOUNT SHALL BE AT +84" A..F.F.

TN8 (N) 16:10 ASPECT-RATIO TAB-TENSIONED MOTORIZED RETRACTABLE PROJECTION SCREEN w/ 72"H x 115.2"W VIEWABLE AREA.. PROVIDE BLACKDROP AREA ABOVE TO BRING BOTTOM OF VIEWABLE AREA TO + 48" A.F.F.

TN9 (N) CEILING-MOUNTED PROJECTOR. USE (E) MOUNTING SYSTEM AND MODIFY EXTENSION POLE LENGTH AS REQUIRED TO ALIGN TOP OF PROJECTOR LENS LEVEL WITH TOP OF VIEWABLE AREA AT +120" A.F.F. CONFIRM THAT PROJECTOR BEAM CLEARS UNDERSIDE OF (E) ADJACENT PENDANT LIGHT FIXTURES (BOTTOM OF FIXTURES +120" A.F.F., V.I.F.).

TN10 VERIFY (E) RACK REAR CLEARANCE AND ADJUST POSITION OF RACK IF REQUIRED TO ACHIEVE 30" REAR CLEARANCE.

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SEALS AND SIGNATURES

LICENSED ARCHITECT
ANDREW C. CHEN
No. C 19572
REN 6/2021
STATE OF CALIFORNIA

ISSUE SCHEDULE	NO.	DATE
PLAN REVIEW SUBMITTAL V1		12/30/2020
PLAN REVIEW SUBMITTAL V2		02/03/2021
BID ADDENDUM 1	1	03/10/2021

KEY PLAN

PROJECT NORTH / TRUE NORTH

LOS MEDANOS COLLEGE

COMMUNITY ROOM & CONFERENCE ROOM AV UPGRADES

SHEET TITLE:

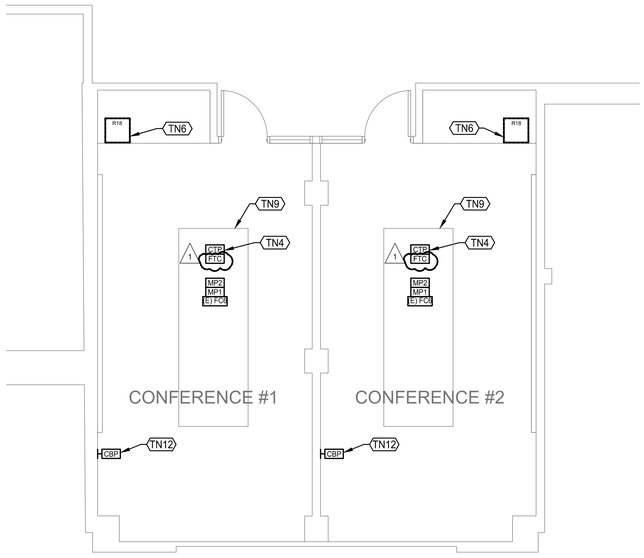
COMMUNITY, STORAGE & WORKROOM FLOOR PLAN & RCP

SCALE: AS SHOWN

PROJECT NUMBER: 01-119293

SHEET NUMBER: TA201

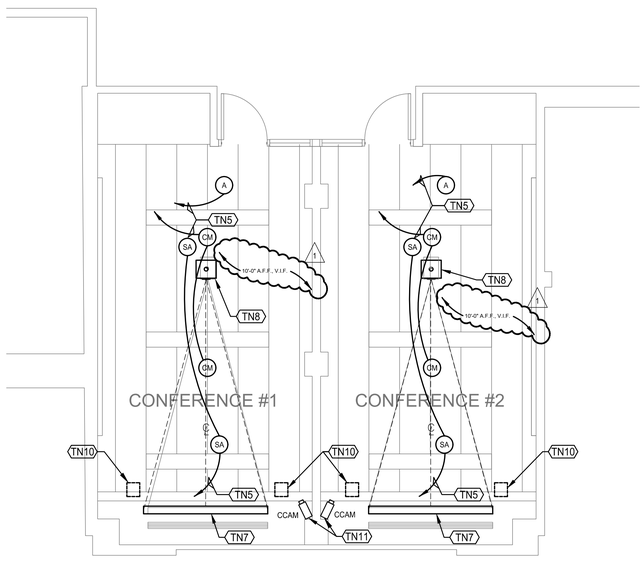
100% CONSTRUCTION DOCUMENTS 10/26/20



1 CONFERENCE # 1 & 2 FLOOR PLANS

1/4" = 1'-0"

NORTH



2 CONFERENCE # 1 & 2 RCP

1/4" = 1'-0"

NORTH

KEYNOTES

TN	AUDIOVISUAL SYSTEMS: WORK OF DIVISION 27.
TN1	NOT USED.
TN2	NOT USED.
TN3	REMOVE (E) AUDIOVISUAL CONNECTORS AND RECEPTACLE PLATES FROM (E) FLOORBOX. INSTALL (N) MP1 RECEIVER. REMOVE OBSOLETE CABLING FROM (E) PATHWAY FROM FLOORBOX TO RACK AND INSTALL (N) CABLING AS SHOWN ON FUNCTIONAL DIAGRAM, SEE TA-701.
TN4	(N) TOPSET AV CONTROL PANEL. PROVIDE DETACHABLE UMBILICAL TO CONNECTION IN FLOORBOX BELOW.
TN5	H.R. TO R18 AV EQUIPMENT RACK.
TN6	(E) CREDENZA-HEIGHT SWING-OUT AV EQUIPMENT RACK.
TN7	(N) 16:10 ASPECT-RATIO TAB-TENSIONED MOTORIZED RETRACTABLE PROJECTION SCREEN w/ 60"H x 96"W VIEWABLE AREA. PROVIDE BLACKDROP AREA ABOVE TO BRING BOTTOM OF VIEWABLE AREA TO + 48" A.F.F. △1
TN8	(N) CEILING-MOUNTED PROJECTOR. USE (E) MOUNTING SYSTEM AND MODIFY EXTENSION POLE LENGTH AS REQUIRED TO ALIGN TOP OF PROJECTOR LENS LEVEL WITH TOP OF VIEWABLE AREA AT +108" A.F.F. CONFIRM THAT PROJECTOR BEAM CLEARS UNDERSIDE OF (E) ADJACENT PENDANT LIGHT FIXTURES (BOTTOM OF FIXTURES +108" A.F.F., V.I.F.).
TN9	EXISTING CONFERENCE ROOM TABLE TO REMAIN.
TN10	REMOVE (E) SURFACE MOUNT LOUDSPEAKERS, PATCH AND PAINT AS REQ'D.
TN11	(N) CONFERENCING CAMERA.
TN12	REMOVE (E) AV CONTROL BUTTON PANEL. INSTALL (N) CONTROL BUTTON PANEL AT (E) LOCATION +40" A.F.F. TO CL.

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SEALS AND SIGNATURES

LICENSED ARCHITECT
ANDREW C. CHEN
No. C 30672
REN 6/2021
STATE OF CALIFORNIA

ISSUE SCHEDULE	NO.	DATE
PLAN REVIEW SUBMITTAL V1		12/30/2020
PLAN REVIEW SUBMITTAL V2		02/03/2021
BID ADDENDUM 1	△1	03/10/2021

KEY PLAN

PROJECT NORTH / TRUE NORTH

LOS MEDANOS COLLEGE

COMMUNITY ROOM & CONFERENCE ROOM AV UPGRADES

SHEET TITLE:

CONFERENCE # 1 & 2 FLOOR PLAN & RCP

SCALE: AS SHOWN

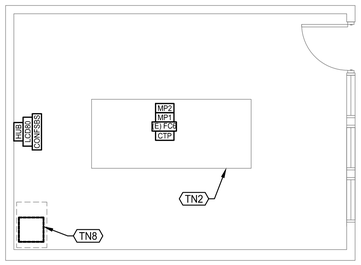
PROJECT NUMBER: 01-119293

SHEET NUMBER: TA202

100% CONSTRUCTION DOCUMENTS 10/26/20

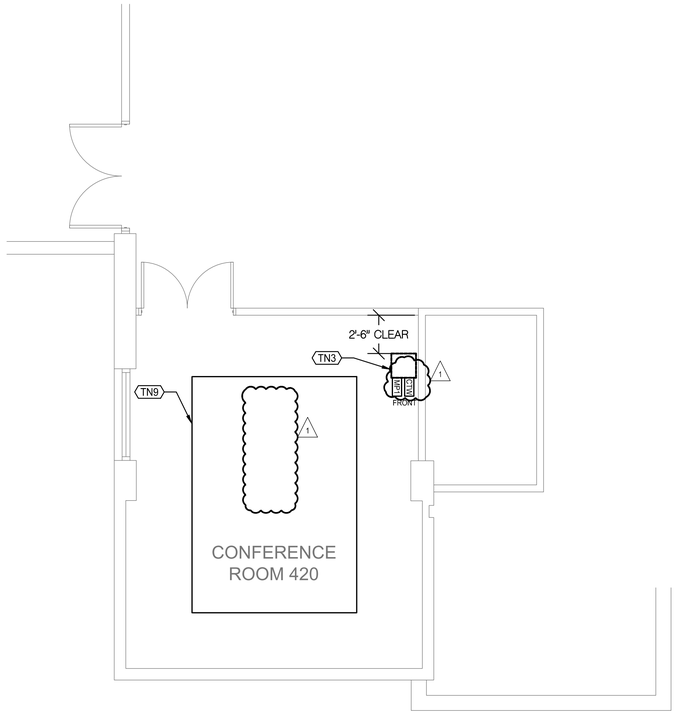
KEYNOTES

TN	AUDIOVISUAL SYSTEMS: WORK OF DIVISION 27.
TN1	H.R. TO R18 AV EQUIPMENT RACK.
TN2	(E) CONFERENCE TABLE TO REMAIN. PROVIDE GROMMET/PASSTHRU FOR CONTROL AND HDMI CABLE TO TABLE SURFACE FROM FLOORBOX BELOW. COORD. CUT-IN W/ OWNER REPRESENTATIVE.
TN3	RELOCATE (E) EQUIPMENT RACK TO PROVIDE 30" REAR CLEARANCE. PROVIDE ADEQUATE SIDE CLEARANCE FOR EXISTING CABLE PORTS IN WALL.
TN4	(N) SHORT-THROW WALL-MOUNTED PROJECTOR. UNDERSIDE OF PROJECTOR +80" A.F.F. COORDINATE MOUNTING POSITION TO CENTER ON PROJECTABLE WHITEBOARD SURFACE, S.A.D.
TN5	NOT USED.
TN6	(E) SURFACE MOUNTED LOUDSPEAKER TO REMAIN.
TN7	REMOVE (E) SCREEN HOUSING. PATCH AS REQ'D.
TN8	(E) RACKBAY IN CREDENZA TO REMAIN.
TN9	(E) PORTABLE CONFERENCE TABLES TO REMAIN, (CONFIGURATION VARIES).



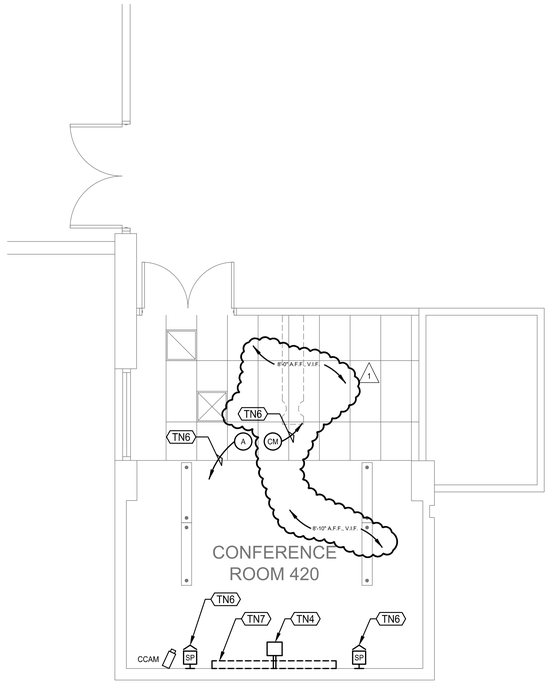
1 **CONFERENCE ROOM 409 FLOOR PLAN**
1/4" = 1'-0"

NORTH



2 **CONFERENCE ROOM 420 FLOOR PLAN**
1/4" = 1'-0"

NORTH



3 **CONFERENCE ROOM 420 RCP**
1/4" = 1'-0"

NORTH

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SEALS AND SIGNATURES

LICENSED ARCHITECT
ANDREW D. CHEN
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REN 6/2021
STATE OF CALIFORNIA

ISSUE SCHEDULE	NO.	DATE
PLAN REVIEW SUBMITTAL V1		12/30/2020
PLAN REVIEW SUBMITTAL V2		02/03/2021
BID ADDENDUM 1	1	03/10/2021

KEY PLAN

PROJECT NORTH / TRUE NORTH

LOS MEDANOS COLLEGE

COMMUNITY ROOM & CONFERENCE ROOM AV UPGRADES

SHEET TITLE:

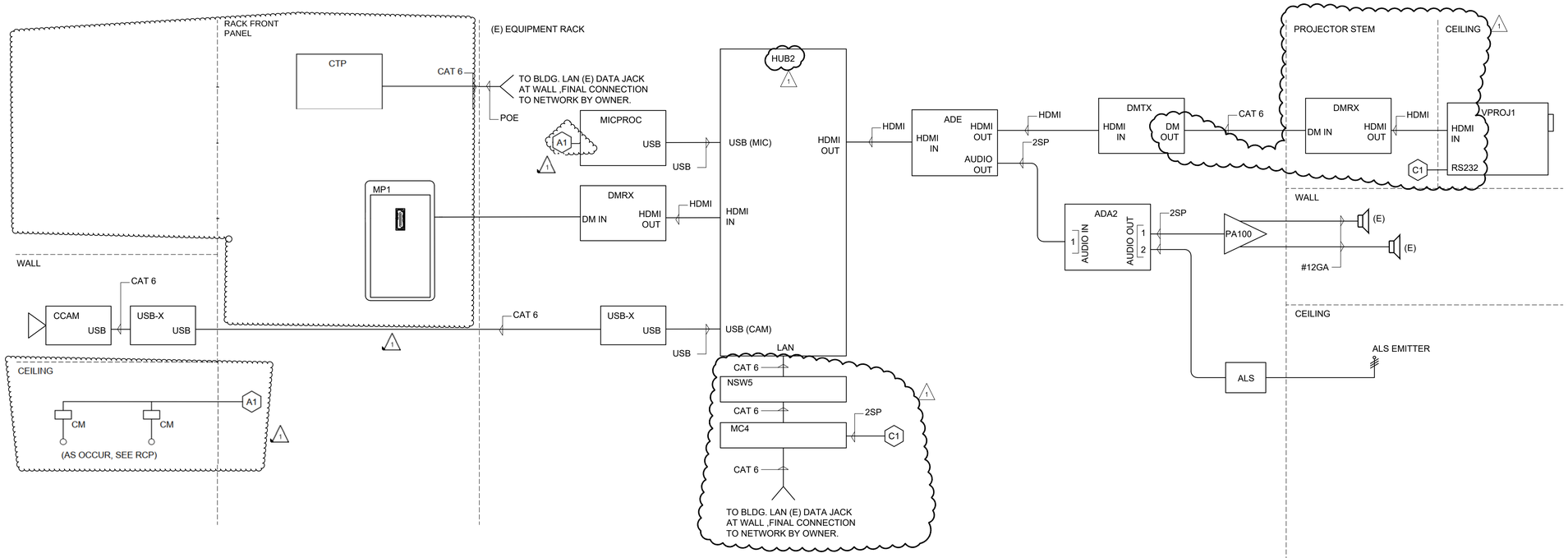
CONFERENCE ROOM 420 FLOOR PLAN & RCP

SCALE: AS SHOWN

PROJECT NUMBER: 01-119293

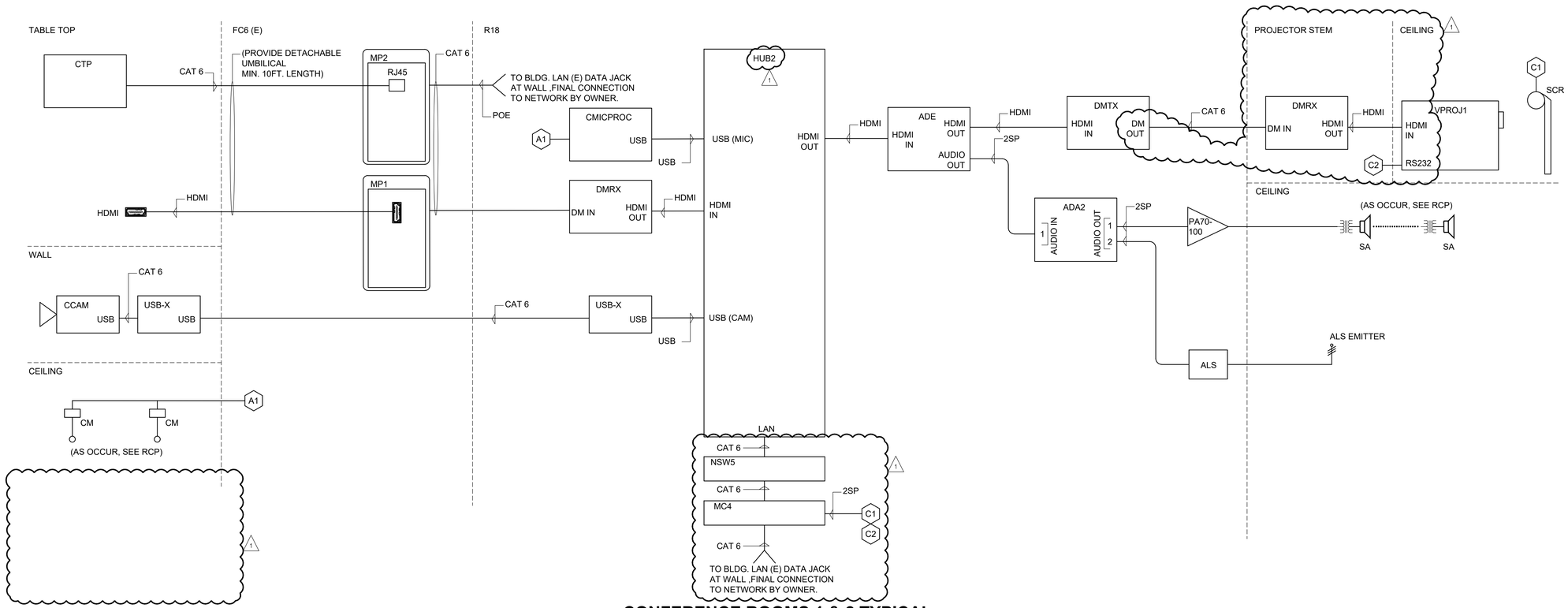
SHEET NUMBER: TA203

100% CONSTRUCTION DOCUMENTS 10/26/20



1 CONFERENCE ROOM 420 AUDIOVISUAL FUNCTIONAL DIAGRAM

NTS



2 CONFERENCE ROOMS 1 & 2 TYPICAL AUDIOVISUAL FUNCTIONAL DIAGRAM

NTS

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ISSUE SCHEDULE	NO.	DATE
PLAN REVIEW SUBMITTAL V1		12/30/2020
PLAN REVIEW SUBMITTAL V2		02/03/2021
BID ADDENDUM 1	1	03/10/2021

KEY PLAN

PROJECT NORTH / TRUE NORTH

LOS MEDANOS COLLEGE

COMMUNITY ROOM & CONFERENCE ROOM AV UPGRADES

SHEET TITLE:

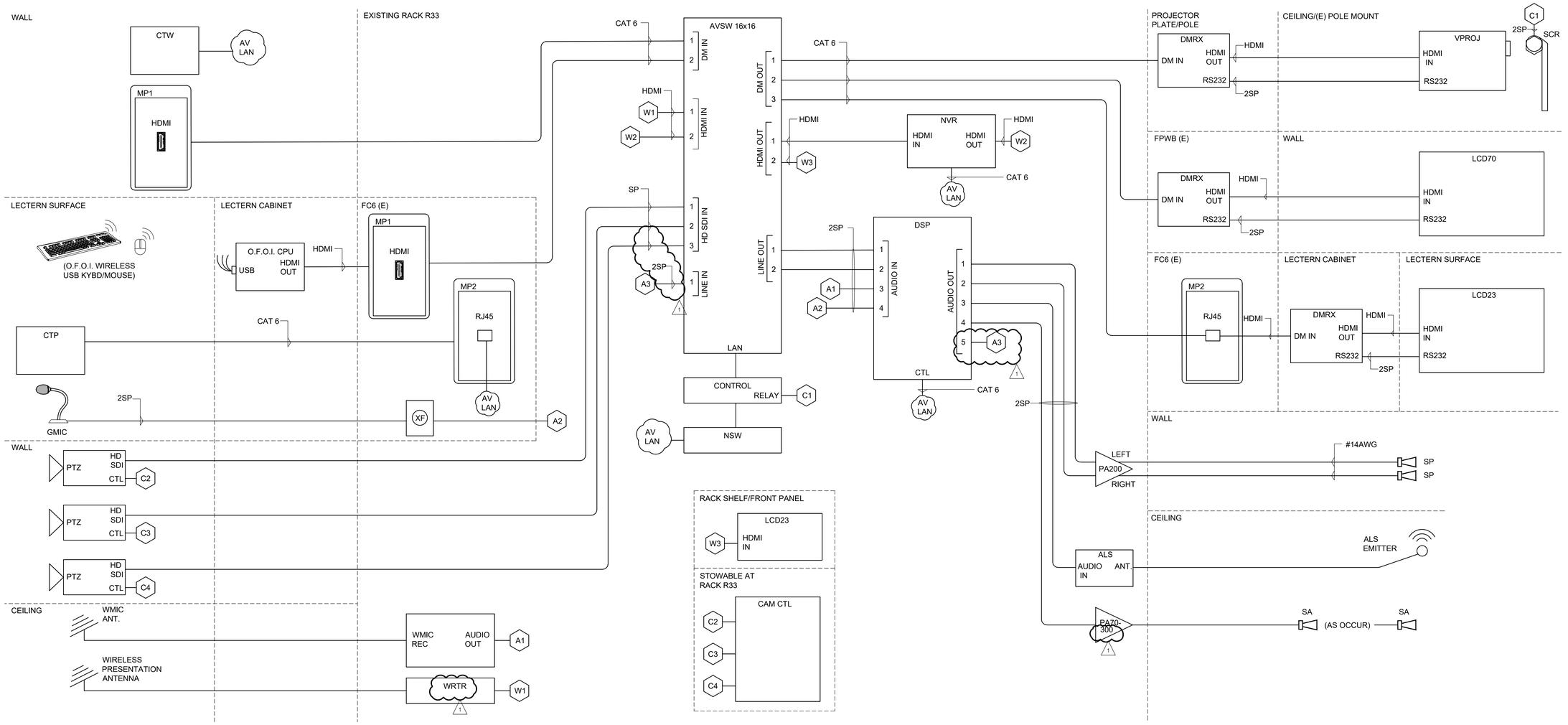
CONFERENCE ROOMS AUDIOVISUAL FUNCTIONAL DIAGRAMS

SCALE: AS SHOWN

PROJECT NUMBER: 01-119293

SHEET NUMBER: TA701

10/26/20 100% CONSTRUCTION DOCUMENTS



1 COMMUNITY ROOM AUDIOVISUAL FUNCTIONAL DIAGRAM

NTS

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LICENSED ARCHITECT — ANDREW D. CHEN — No. C 19872 — REN 6/2021 — STATE OF CALIFORNIA

ISSUE SCHEDULE	NO.	DATE
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PLAN REVIEW SUBMITTAL V2		02/03/2021
BID ADDENDUM 1	1	03/10/2021

KEY PLAN

PROJECT NORTH / TRUE NORTH

LOS MEDANOS COLLEGE

COMMUNITY ROOM & CONFERENCE ROOM AV UPGRADES

SHEET TITLE:

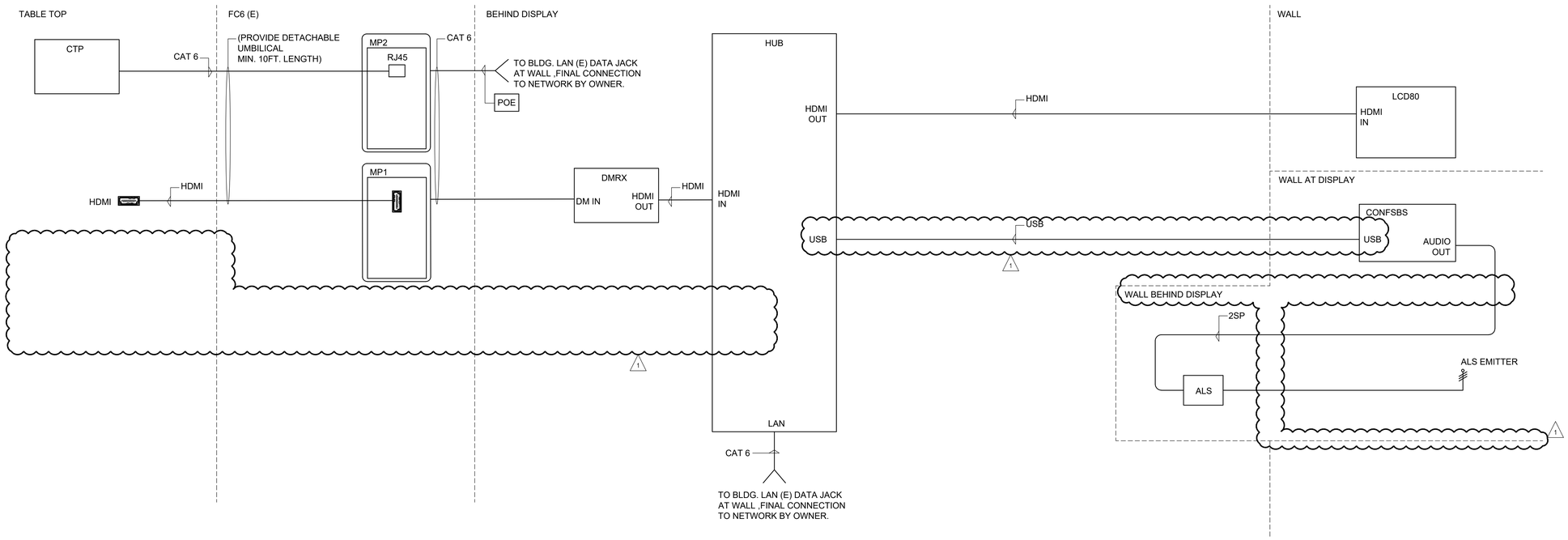
COMM. ROOM AUDIOVISUAL FUNCTIONAL DIAGRAM

SCALE: AS SHOWN

PROJECT NUMBER: 01-119293

SHEET NUMBER: TA702

10/26/20 100% CONSTRUCTION DOCUMENTS



1 CONFERENCE ROOM 409 AUDIOVISUAL FUNCTIONAL DIAGRAM

NTS

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SEALS AND SIGNATURES

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ANDREW C. CHEN
No. C 19572
REN 8/2021
STATE OF CALIFORNIA

ISSUE SCHEDULE	NO.	DATE
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PLAN REVIEW SUBMITTAL V2		02/03/2021
BID ADDENDUM 1	1	03/10/2021

KEY PLAN

PROJECT NORTH / TRUE NORTH

LOS MEDANOS COLLEGE

COMMUNITY ROOM & CONFERENCE ROOM AV UPGRADES

SHEET TITLE:

CONFERENCE ROOM 409 AUDIOVISUAL FUNCTIONAL DIAGRAM

SCALE: AS SHOWN

PROJECT NUMBER: 01-119293

SHEET NUMBER: TA703

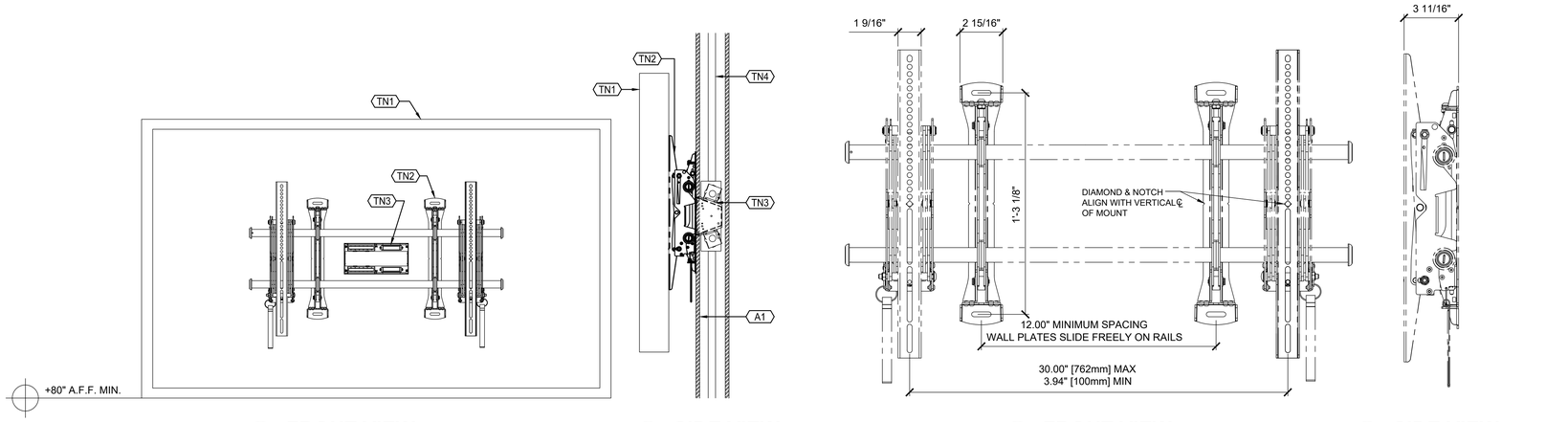
100% CONSTRUCTION DOCUMENTS 10/26/20

SHEET NOTES

1. CONTRACTOR TO CONTACT FLOOR BOX MANUFACTURER FOR INSTALLATION INSTRUCTIONS PRIOR TO ROUGH-IN.

KEYNOTES

A	ARCHITECTURAL: DIVISIONS 3 THROUGH 14.
A1	WALL CAVITY WITH MINIMUM 200 LB. BACKING.
TN	COMMUNICATIONS SYSTEMS: CONFORM WITH DIVISION 27 AND 28.
TN1	FLAT PANEL DISPLAY/LCD - NET WEIGHT NOT TO EXCEED 135 LBS.
TN2	FLAT PANEL MOUNT - NET WEIGHT NOT TO EXCEED 40 LBS. SECURE TO BACKING W/ MIN. (8) #12 SMS @ 6" O.C.
TN3	FLAT PANEL WALL BOX, RECESSED FLUSH IN WALL.
TN4	IN-WALL CONDUIT RACEWAY.



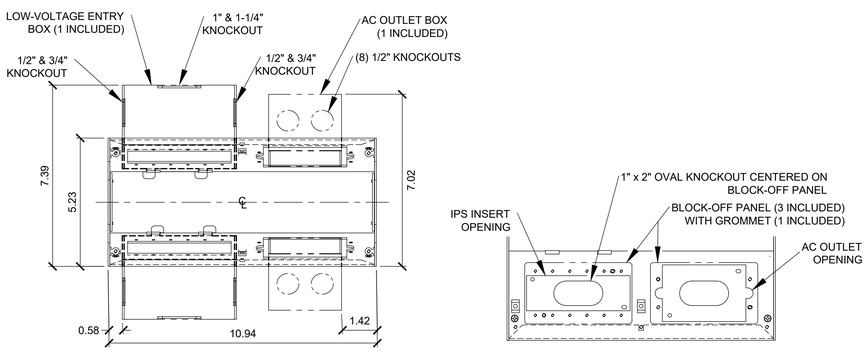
2A FRONT VIEW

2B SIDE VIEW

2C FRONT VIEW

2D SIDE VIEW

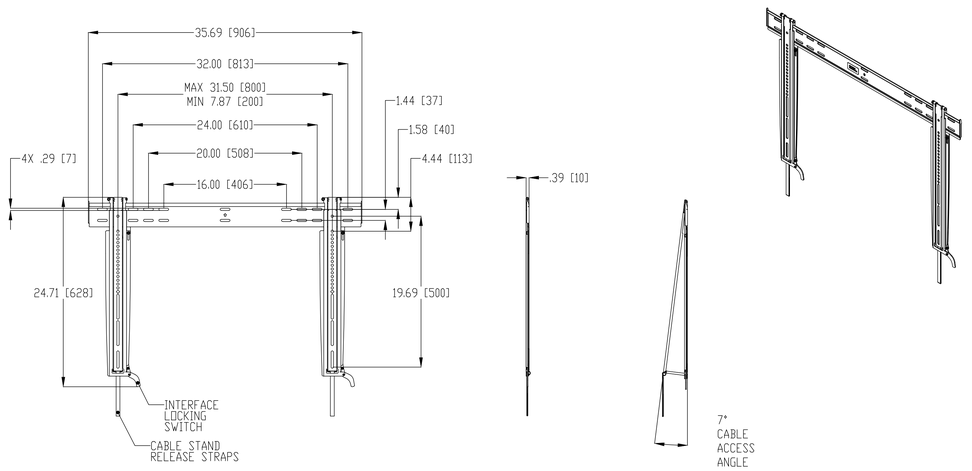
2 FLAT PANEL MOUNT ASSEMBLY
NTS



3A FRONT VIEW

3B TOP VIEW

3 FLAT PANEL WALL BOX - FPWB
NTS



4 CHIEF LST FLAT PANEL MOUNT
NTS

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SEALS AND SIGNATURES

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EXP. 6/2021
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KEY PLAN

PROJECT NORTH / TRUE NORTH

LOS MEDANOS COLLEGE

COMMUNITY ROOM & CONFERENCE ROOM AV UPGRADES

SHEET TITLE:

DETAILS - FLAT PANEL WALL BOX AND ASSEMBLY

SCALE: AS SHOWN

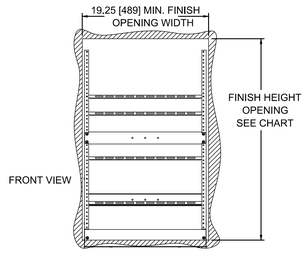
PROJECT NUMBER: 01-119293

SHEET NUMBER: TA901

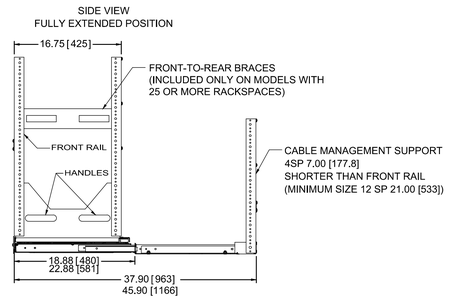
10/26/20 100% CONSTRUCTION DOCUMENTS

USEABLE RACKSPACES	FINISH HEIGHT OPENING
12	23.95 [608]
13	25.70 [653]
14	27.45 [697]
15	29.20 [742]
16	30.95 [786]
17	32.70 [831]
18	34.45 [875]
19	36.20 [920]
20	37.95 [964]
21	39.70 [1008]
22	41.45 [1053]
23	43.20 [1097]
24	44.95 [1142]
25 *	46.70 [1186]
26 *	48.45 [1231]
27 *	50.20 [1275]
28 *	51.95 [1320]
29 *	53.70 [1364]
30 *	55.45 [1408]

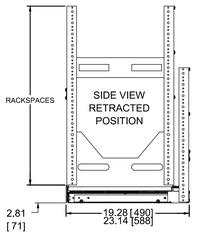
ATLANTIC PRODUCTS, INC.



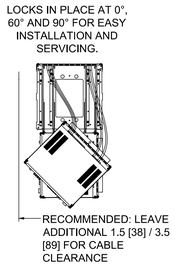
1D FRONT VIEW
NTS

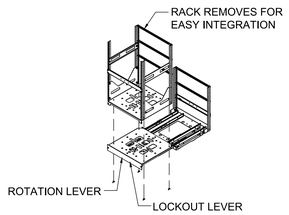


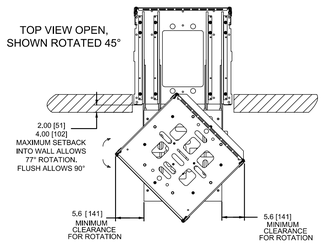
1E FULLY EXTENDED POSITION
NTS



1C CLOSED POSITION
NTS







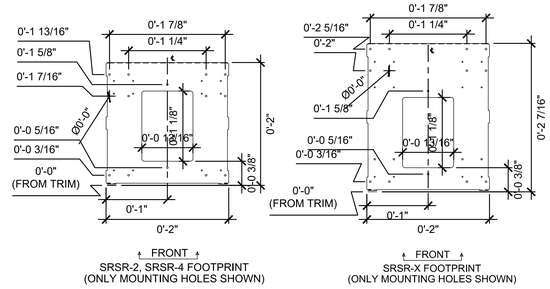
USEABLE EQUIPMENT DEPTH
17.25 [438] / 21.25 [540] = 2 [51] SETBACK
19.00 [483] / 23.00 [584] = 1/4 [6] SETBACK

NOTE:
SOME DIMENSIONS ARE GIVEN FOR
BOTH SRSR AND SRSR-X IN THE FORM:
[SRSR-2, SRSR-4] / [SRSR-X]

NOTE:
SIZES MARKED WITH A "*" ARE
AVAILABLE FOR SRSR-4 AND
SRSR-X ONLY

NOTE:
ALL DIMS ARE GIVEN IN THE
FORMAT INCHES [MM]

1B TOP VIEW
NTS



1A R18 FOOTPRINT
(ONLY MOUNTING HOLES SHOWN)
NTS

1 R18 SLIDING RAIL SYSTEM
NTS

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KEY PLAN

PROJECT NORTH / TRUE NORTH

LOS MEDANOS COLLEGE

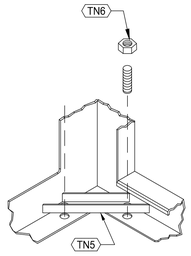
COMMUNITY ROOM & CONFERENCE ROOM AV UPGRADES

SHEET TITLE:
DETAILS - RACK R18

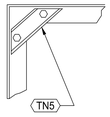
SCALE: AS SHOWN
PROJECT NUMBER: 01-119293

SHEET NUMBER: TA902

100% CONSTRUCTION DOCUMENTS 10/26/20

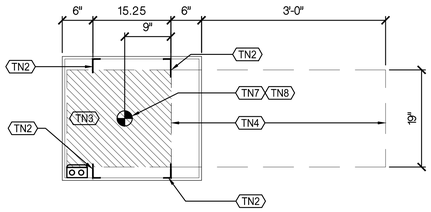


1B RACK INSIDE CORNER
(TYP 4 CORNERS) 3/4"=1'-0"

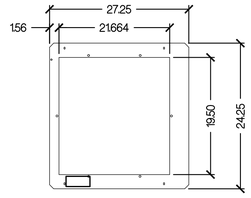


1A PLAN VIEW
(TYP 4 CORNERS) 3/4"=1'-0"

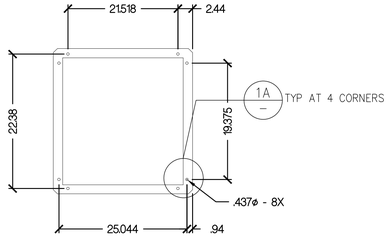
1 SEISMIC BRACKET INSTALLATION
3/4"=1'-0"



2A SECTION VIEW



2B TOP VIEW



2C BOTTOM VIEW

2 (E) RACK MOUNT DETAILS
1"=1'-0"

KEYNOTES

TN	COMMUNICATIONS SYSTEMS: COMPLY WITH DIV. 27 & 28 COMMUNICATIONS GENERAL PROVISIONS AND COMMUNICATIONS SECTIONS REFERENCED THEREIN.
TN1	(E) ENCLOSURE (RACK) FRAME. FASTEN TO FLOOR. SUBMIT FASTENING DETAILS.
TN2	NOT USED.
TN3	EQUIPMENT CLEAR MOUNTING AREA. HOLD VOLUME SHOWN CLEAR OF ANY OBSTRUCTIONS OR INTRUSIONS.
TN4	EQUIPMENT CLEAR FRONT PULL-OUT AREA. HOLD CLEAR OF OBSTRUCTIONS.
TN5	PROVIDE SEISMIC BRACKET MRK-Z4 SERIES INSTALLED TIGHT AT EACH CORNER OF THE STEEL HOST ENCLOSURE FRAME. THE LEVELING FOOT RIV-NUT IN THE CORNER OF THE FRAME SHALL NOT BE REMOVED. TIGHTEN THE FLOOR ANCHOR TO THE MANUFACTURER'S SPECIFIED TORQUE. DEFLECTION WILL OCCUR AROUND THE RIV-NUT, THIS IS REQUIRED; IT PRE-LOADS THE CORNER IN COMPRESSION.
TN6	AT EACH CORNER OF THE STEEL HOST ENCLOSURE FRAME, PROVIDE 2 EACH 3/8 INCH ITW RAMSET/RED HEAD TRUBOLT WEDGE ANCHOR WITH MINIMUM 2-INCH EMBEDMENT. PROVIDE TOTAL OF 8 ANCHORS AT EACH STEEL HOST ENCLOSURE FRAME.
TN7	ASSUMED LOAD CENTROID FOR AV/IT ELECTRONICS. ALLOW 300 POUNDS TOTAL LOAD FASTENED TO FRONT RAILS ONLY.
TN8	ASSUMED LOAD CENTROID FOR UNINTERRUPTIBLE POWER SYSTEM ALLOW 400 POUNDS TOTAL LOAD FASTENED TO BOTH FRONT AND REAR RAILS.

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KEY PLAN

PROJECT NORTH TRUE NORTH

LOS MEDANOS COLLEGE

COMMUNITY ROOM & CONFERENCE ROOM AV UPGRADES

SHEET TITLE:
DETAILS - RACK R33 FOUR POST

SCALE: AS SHOWN
PROJECT NUMBER: 01-119293

SHEET NUMBER: TA903

100% CONSTRUCTION DOCUMENTS 10/26/20

COMMUNITY AND CONFERENCE ROOMS UPGRADES FOR LOS MEDANOS COLLEGE

2700 E. LELAND ROAD

Pittsburg, California

Permit/ Bid Set Submittal

Specifications

29 October 2020

IDENTIFICATION STAMP
DIV. OF THE STATE ARCHITECT
APP: 01-119293 INC:
REVIEWED FOR
SS ☑ FLS ☑ ACS ☑
DATE: 02/18/2021

Prepared for Los Medanos College

LICENSED ARCHITECT
ANDREW C. CHEN
No. C 10672
RENI 6/2021
STATE OF CALIFORNIA

TECTONICS
Architects / Planners / Engineers

SPECIFICATIONS TABLE OF CONTENTS

DIVISION 01 - GENERAL REQUIREMENTS

All technical sections (Divisions 02 through 33) are from the current AIA Masterspec library.

DIVISION 02 - EXISTING CONDITIONS

NOT USED

DIVISION 03 – CONCRETE

NOT USED

DIVISION 04 – MASONRY

NOT USED

DIVISION 05 – METALS

NOT USED

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

NOT USED

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

NOT USED

DIVISION 08 – OPENINGS

NOT USED

DIVISION 09 – FINISHES

NOT USED

DIVISION 10 – SPECIALTIES

NOT USED

DIVISION 11 – EQUIPMENT

NOT USED

DIVISION 12 – FURNISHINGS

NOT USED

DIVISION 13 - SPECIAL CONSTRUCTION

NOT USED

DIVISION 14 - CONVEYING EQUIPMENT

NOT USED

DIVISION 21 - FIRE SUPPRESSION

NOT USED

DIVISION 22 – PLUMBING

NOT USED

DIVISION 23 - HEATING VENTILATING AND AIR CONDITIONING

NOT USED

DIVISION 26 – ELECTRICAL

NOT USED

DIVISION 27 – COMMUNICATIONS

SECTION 27 41 00 COMMON WORK RESULTS FOR AUDIOVISUAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes, but is not necessarily limited to:
   1. Common standards and procedures for the Audiovisual Work.
   2. Design, engineer and provide complete, all means of support, suspension, attachment, fastening, bracing, and restraint (hereinafter "support") of the Audiovisual Systems. Provide engineering of such support by parties licensed to perform work of this type in the Project jurisdiction.
   3. Provide audiovisual and conferencing systems in Community Room, Conference Rooms 1&2, Conference Room 409, and Conference Room 420.
      a. Remove (E) AV equipment as directed by plans. Coordinate disposal/disposition of removed equipment with District Representative.
      b. Provide commissioning, programming, and training for installed AV systems.
      c. For AV and conferencing equipment that connects to District networks, coordinate IP addressing with District IT Representative.

B. Provisions of this Section apply to Audiovisual Work, including the following Sections:
   1. Section 27 41 01 – Grounding and Bonding for Audiovisual Systems
   2. Section 27 41 02 – Hangers and Supports for Audiovisual Systems
   3. Section 27 41 03 – Conduits and Backboxes for Audiovisual Systems
   4. Section 27 41 06 – Noise and Vibration Controls for Audiovisual Systems
   5. Section 27 41 07 – Identification for Audiovisual Systems
   6. Section 27 41 08 – Audiovisual Cabinets, Racks, Frames and Enclosures
   7. Section 27 41 09 – Audiovisual Cable Management
   8. Section 27 41 16 – Integrated Audio-Video Systems and Equipment

1.2 REFERENCES

A. Usage: In accordance with Division 1 - Regulatory Requirements

B. American National Standards Institute (ANSI)
   1. ANSI/TIA/EIA-568-B.1-2001, Commercial Building Telecommunications Cabling Standard – Part 1: General Requirements
   2. ANSI/TIA/EIA-568-B.2-2001, Commercial Building Telecommunications Cabling Standard – Part 2: Balanced Twisted Pair Cabling Components
   3. ANSI/TIA/EIA-568-B.3-2000, Optical Fiber Cabling Components Standard
   4. ANSI/TIA/EIA-606-A-2002, Administration Standard for Commercial Telecommunications Infrastructure

1.3 DEFINITIONS

A. General Abbreviations used in these specifications. Refer additionally to the abbreviations list appearing on the Drawings.
   1. ADA Americans with Disabilities Act.
   2. AFC Above Finished Ceiling.
   3. AFF Above Finished Floor.

4. BLDG Building
5. CAT Category
6. CL Centerline
7. DIV Division
8. (E) Existing
9. FBU Furnished By Owner
10. HR Home Run
11. ID Inside Diameter
12. LAN Local Area Network
13. MAX Maximum
14. NIC Not In Contract.
15. OD Outside Diameter
16. PSRH Project Standard Receptacle Height.
17. PSSH Project Standard Switch Height.
18. TYP Typical
19. UFE Owner Furnished Equipment.
20. UON Unless Otherwise Noted.

B. Electrical and electronics terms used in the Audiovisual Sections shall be as defined in:
1. ANSI/TIA/EIA-568-B.1
2. ANSI/TIA/EIA-568-B.2
3. ANSI/TIA/EIA-568-B.3
4. ANSI/TIA/EIA-569-B
5. ANSI/TIA/EIA-606-A
6. IEEE Std 100
7. This Section.

C. Open Cable - Cabling that is not run in a raceway as defined by NFPA 70. This refers to cabling that is open to the space in which the cable has been installed and is therefore exposed to the environmental conditions associated with that space.

D. Open Office - A floor space division provided by furniture, moveable partitions, or other means instead of by building walls.

E. Pathway - A physical infrastructure utilized for the placement and routing of Audiovisual cable.

1.4 SUBMITTALS

A. Within bidding documentation, Contractor to provide a room by room equipment list.

B. Comply with Section 013300 and the following:
1. Submit all materials for review arranged in same order as Specifications, individually referenced to Specification Section, Paragraph and Contract Drawing number. Conform in every detail as applies to each referencing Section.
2. Submit 8 ½"x 11" items bound in volumes and drawings in edge bound sets. Submit all drawings on sheets of the same size.
3. Make each specified submittal as a coordinated package complete with all information specified herein. Incomplete or uncoordinated submittals will be returned with no review action.
4. Progress Schedule: Comply with Section 013300.

C. Contractor and Key Personnel Experience.
   1. A minimum of 30 days prior to installation, submit documentation of the experience of the low voltage systems, equipment and infrastructure contractor(s) and of their key personnel.
   2. Qualifications shall be provided for:
      a. the low voltage systems, equipment and infrastructure contractor(s),
      b. the low voltage systems, equipment and infrastructure installers,
      c. and the supervisor(s) (if different from the installers).
   3. Refer to Quality Assurance paragraph in this section for complete requirements.

D. Manufacturer's Product Data:
   1. Manufacturer's Product Data Sheets. Collate in sequence of List of Materials:
   2. Data sheet for each item in each Audiovisual Section, including all accessories, clearly marked for proposed product.
   3. Material Safety Data Sheet, where applies.
   4. List of Materials Schedule. For each item, include:
      a. Referencing Specification Section
      b. Referencing Paragraph
      c. Referencing Drawing, if specified only on plans
      d. Manufacturer.
      e. Model number.
      f. Listing, including name of Nationally Recognized Testing Laboratory.
      g. Precede each submittal book with a summary schedule, with columns for each item above and rows for each item submitted.
         i. Example:

Specification Section	Paragraph	Contract Drawing Reference	Manufacturer	Model No.	UL/ CLA Listed
27 41 00	2.3 C.		XYZ	123	Y
27 41 03	2.7 A. 1.		AAA	34-56	Y
		TA7.02	ZZY	456	Y

E. Field (Installation) Drawings:
   1. General
      a. Drawings shall present the proposed installation using the makes and models of devices proposed for use this project; replace vendor neutral-nomenclature used in bid set with specific makes and models of devices proposed.
      b. Where the existing systems and/or infrastructure are used and integrated into the work of the project, indicate them on drawings, including points of interface and demarcation of existing and new work.
      c. Collate, in sequence, at least the following minimum drawings, for each infrastructure and system to be installed under the work of this contract:
   2. Drawing index/symbol sheet.
   3. Site plans, floor plans and reflected ceiling plans.
      a. General
         i. The identifier for each termination and cable shall appear on the drawings, either directly on the floor plans, through an associated schedule or a unique identifier associated with a fully annotated single line diagram.
         ii. Include wiring diagrams and installation details of equipment indicating proposed

location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure a coordinated installation. Drawings shall indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices.

iii. At scale of Contract Documents, show:
(1) Device locations and type
(2) Rough-in.
(3) Mounting height.
(4) Conduit size.
(5) J-hook routes
(6) Wire type.
(7) Wire fill.

iv. On the floor plans, indicate floor and wall mounted devices and pathway below a height of 7 feet above finish floor. Indicate the locations of the Audiovisual Program and Control Rooms and provide reference to the enlarged Audiovisual Program and Control Rooms plans.

v. On the reflected ceiling plan, indicate ceiling and wall mounted devices and pathway above a height of 7 feet above finish floor. Indicate the locations of the Audiovisual Program and Control Rooms and provide reference to the enlarged Audiovisual Program and Control Rooms plans.

b. Audiovisual Systems, including KMVT Systems
i. Indicate:
(1) Device locations, orientation and depict integration of systems that need to be viewed from the complete building perspective.
(2) For distributed speaker systems, indicate limits of zones of coverage.
(3) Vertical and horizontal pathways
(4) Equipment rooms and racks
(5) Reference to enlarged plans and related details.

4. Enlarged Plans
a. General
i. Indicate at least as much information as is provided in the Contract Documents, supplemented by the dimensions and arrangement of the proposed equipment, trade coordination and field conditions.

b. Audiovisual Systems:
i. At equipment rooms
(1) Rack elevations, showing
(a) all equipment occupying the actual number of rack units required
(b) blank panels
(c) vent panels
(d) aux panels
(e) power strips
(f) UPS
(g) Reference mounting details.

5. System Conduit and Riser Diagrams,
a. General:
i. Wiring diagrams shall identify circuit terminals and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment.
ii. Single line diagram of structured wiring

iii. Grounding and bonding scheme
iv. Terminal cabinets.
v. Coordination with floor plans.
vi. Wire runs not shown on floor plans.
vii. Wire type.
viii. Wire fill.
ix. Interface to work provided by work of other Sections, Owner Furnished Equipment, existing equipment and/or future equipment.
x. For Audiovisual Systems, indicate digital or analog signal type and voltage levels (dBmV, microphone, line level, loudspeaker level) or optical signal levels.

6. Detail Drawings
   a. Mounting details:
      i. Specific details of restraints including anchor bolts submitted under the Section 27 41 02 – Hangers and Supports for Audiovisual Systems for mounting and maximum loading at each location, showing compliance and coordination with Code and the project Architectural, Structural and Mechanical Documents.
      ii. Stamped and signed by an Engineer licensed in the Project jurisdiction for work of this type.
         (1) Submit an accompanying Engineering analysis stamped and signed by an Engineer licensed in California for work of this type, indicating that the Equipment Enclosure System will comply with California Building Code for the Project Seismic Zone when loaded with the weight of the equipment submitted.
         (2) Show calculations on drawings or in bound volume for review by Authorities having jurisdiction.
      iii. Show loads, type and strength of connections, sizes, dimensions, materials, etc.
      iv. Provide details for:
         (1) Equipment Rack anchorage.
         (2) Wall and ceiling mounted projection screens.
         (3) Wall and ceiling mounted projectors.
         (4) Cameras and loudspeakers weighing 20 pounds or more.
         (5) Wall and ceiling mounted flat panel displays.
   b. Faceplate and Receptacles
      i. Receptacle and jack arrangement for each condition.
      ii. Labeling of receptacle/jacks and plate
      iii. Plate material.
      iv. Plate finish.
      v. Connector types.
      vi. Connector dimensioned layout.
   c. Pathway
      i. Firestopping
      ii. Details of flexible raceway connections to be made to vibrating equipment
      iii. Details of J-Box and sealant application for the typical conditions listed in Section 27 41 06 – Noise and Vibration Controls for Audiovisual System, and a schedule of rooms to receive application of mastic and sealant at J-Boxes
      iv. An itemized list of all items of equipment to be fitted with flexible electrical connections.
      v. Conduit racking details.
   d. California Access Compliance Manual and Americans with Disabilities Act (ADA)

compliance.

e. For systems with contractor or manufacturer programmed control and human interfaces submit at least:
   i. Narrative of the sequence of operation.
   ii. Color, full-size layouts of each touchpanel and/or computer screen (menu) image, cross-referenced to the sequence of operations.
   iii. Show chaining of sub-menus.
f. Terminal cabinets: Terminations.
g. Voice cable plant: Cut sheets for use by Owner's Telephone Systems Contractor

F. Samples: Samples for review by the Owner's Representative of all finishes/materials which will be visible to the public, including but not limited to:
   1. The Contractor shall submit a sample of each type of label to be used for labeling cables, patch panels, termination frames, and faceplates for the telephone and data systems.

G. Test Plan
   1. Submit complete documentation of the proposed test plan and equipment to be used to document that the performance of the cabling, equipment, sub-systems and complete systems installed under the work of this project conform to the performance standards outlined in each specification section.
   2. Submit not less than 45 days prior to the proposed test date. Include procedures for certification, validation, and testing.

H. Test Reports
   1. Manufacturer's Field Reports
      a. Factory reel tests
   2. Project Site Test Reports:
      a. Submit following system completion and prior to and as condition precedent to Acceptance Review and Testing of the Work of this Section.
      b. Schedule: Submit test reports in timely manner relative to Project schedule such that the Owner's Representative may conduct verification of submitted test data without delay of scheduled progress.
      c. Project Site test report:
      d. Content: Include at least:
         i. Time and date of test.
         ii. Personnel conducting test.
         iii. Test equipment, including serial and date of calibration.
         iv. Test object.
         v. Procedure used.
         vi. Results of test
         vii. Numerical or graphical presentation.
      e. Submit copy of final results on paper and in electronic form, organized by circuit number, consistent with circuit numbering scheme used in preparing submittal drawings and in labeling receptacles and terminations.
         i. Submit machine-generated documentation and raw data of all test results in electronic form on CD-R media
         ii. Where the electronic documentation requires use of a proprietary computer program to view the data, provide the Owner with 1 licensed copy of the software.

1.5 QUALITY ASSURANCE

A. Contractor Firm and Personnel Qualifications:

B. Designated Supervisor: Provide a designated supervisor present and in responsible charge in the fabrication shop and on the Project Site during all phases of installation and testing of the Work of this Section. This supervisor shall be the same individual through the execution of the Work unless illness, loss of personnel, or other circumstances reasonably beyond the control of the Contractor intervene.

C. Reference Documents: At all times when the work is in progress, maintain at the workplace, fabrication shop or Project Site as applies.
   1. A complete set of the latest stamped, actioned submittals of record.
   2. A complete set of manufacturer's original operation, instruction and service manuals for each equipment item.

D. Standard Products
   1. Audiovisual Systems Equipment. Provide Audiovisual Systems materials and equipment that are products of manufacturers regularly engaged in the production of such products which are of equal material, design and workmanship. Products shall have been in satisfactory commercial or industrial use for six months prior to bid opening. The six month period shall include applications of equipment and materials under similar circumstances and of similar size. The product shall have been on sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the six month period.
      a. Alternative Qualifications. Products having less than a 1-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 2500 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished.
   2. Material and Equipment Manufacturing Date
      a. Products manufactured more than 3 years prior to date of delivery to site shall not be used, unless specified otherwise.

E. Test Equipment
   1. Requirements:
      a. Maintain and operate test equipment at the fabrication shop and the job site for both routine and Acceptance Testing of the Work of this Section.
      b. Maintain test equipment at the job site while work is in progress from installation of equipment racks until Owner Acceptance of this Work; thereafter remove all of this test equipment from the job site.
      c. Unless otherwise indicated, test equipment shall remain property of the Contractor.
      d. Provide all required test cables, jigs and adapters.
      e. Provide equipment with traceable calibration, with calibration date not greater than one year prior to the date of the use of the equipment to perform the specified testing.

F. Qualifications
   1. Audiovisual Qualifications
      a. Audiovisual Systems work shall be performed by and the equipment shall be provided by the Audiovisual Systems contractor and key personnel. Qualifications shall be provided for:
         i. the Audiovisual Systems contractor,

ii. the Audiovisual Systems installer,
iii. and the supervisor (if different from the installer).

b. A minimum of 30 days prior to installation, submit documentation of the experience of the Audiovisual Systems and of the key personnel.

2. Audiovisual Systems Installer
   a. The installer of the Audiovisual systems shall be a firm regularly and professionally engaged in the business of installation, configuration and testing of the specified Audiovisual systems and equipment.
      i. Where the manufacturers of the specified and contractor proposed systems provide mandatory installer and programming training programs, the Contractor's programming and installation staff shall provide documentation to demonstrate their successful completion of the relevant training programs for the types and versions of equipment proposed for installation on this Project.
      ii. Where the manufacturer of the specified and contractor proposed systems and equipment lawfully restricts sales of their equipment to a network of dealers, the contractor shall provide documentation to their standing as such a dealer in good standing at the time of bid submittal.
      iii. The Audiovisual systems contractor shall demonstrate experience in providing successful Audiovisual systems of a similar scope and nature of those required by the work of this Project within the past 3 years.
      iv. Submit documentation for a minimum of three and a maximum of five successful Audiovisual system installations for the Audiovisual systems contractor.
   b. Key Personnel
      i. Provide key personnel who are regularly and professionally engaged in the business of the installing, programming, configuring and testing of the specified Audiovisual systems and related presentations and equipment.
         (1) There may be one key person or more key persons proposed for this project depending upon how many of the key roles each has successfully provided.
         (2) Each of the key personnel shall demonstrate experience in providing successful Audiovisual systems of a similar nature scope and extent to those required by the work of this Project within the past 3 years.

1.6 REGULATORY REQUIREMENTS

A. Regulations Applicable: Including but not limited to those defined in Section 014200 – Definitions, References, and Regulations:
   1. Nothing in the Contract Documents shall be construed to permit Work not conforming to applicable laws, ordinances, rules, or regulations.
   2. Safety Agency Listing: All devices provided under the Work of this Section which are connected to the Project electrical system shall be listed by a Nationally Recognized Testing Laboratory, and shall be so labeled.
   3. In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction," or words of similar meaning, to mean the Owner's Representative. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70 unless more stringent requirements are specified or indicated.

1.7 DELIVERY, STORAGE AND HANDLING

A. Procedures:
   1. As specified in the individual sections of Division 27 and the following.
      a. Provide protection from weather, moisture, extreme heat and cold, dirt, dust, and other contaminants for cabling and equipment placed in storage.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Connecting hardware shall be rated for operation under ambient conditions of 32 to 140 degrees F and in the range of 0 to 95 percent relative humidity, non-condensing.

1.9 SEQUENCING

A. Not Used

1.10 OPERATING AND MAINTENANCE DATA

A. Commercial off the shelf manuals shall be furnished for operation, installation, configuration, and maintenance of products provided as a part of the low voltage systems, equipment and infrastructure work of this Project. Precede the manuals with a systems narrative specific to this Project, outlining the major systems functionality, the major systems components, and identifying which manuals document the performance of which subsystems.
   1. Submit operations and maintenance data in accordance with Section 017800 – Project Record Documents and as specified herein not later than 2 months prior to the date of beneficial occupancy.

1.11 PROJECT RECORD DOCUMENTS

A. Comply with Section 017800 – Project Record Documents, and the following. Include at least as much information as required for the submittal drawings.
   1. Record Drawings
      a. CAD.
         i. Use a computer aided drafting (CAD) system in the preparation of record drawings for this Project. CAD system shall produce files in AutoCAD® .DWG format, version 2000 or later.
      b. Except where prohibited by Contract, Owner's Representative will furnish CAD backgrounds in AutoCAD® .DWG format, for use by the Contractor in preparing Record Drawings.
      c. Contractor shall be responsible for updating building and Audiovisual plans to reflect as-built conditions.
         i. Indicate actual work on Drawings; indicate actual products used, replace vendor neutral nomenclature used in bid set with makes and models of actual installed devices.
      d. Disk copy of Record Drawings: Provide 2 separate copies of each drawing file in the format noted above. Submit on CD-R disk.
      e. Reproduceables: Provide 1 set of Mylars.
   2. Software
      a. Controls and DSP Systems
         i. Provide licensing for project specific software programming at programmable devices.
         ii. Provide licensing and original software copies for each device provided that uses software for operation, configuration or control.

iii. Provide licensing for required workstation operating systems, and required third party software.
iv. For controls systems, provide a complete copy of the source code, including the device interface driver code modules.
v. Upgrade each software package to the release in effect at the end of the Warranty Period.

b. Provide at least a copy of software with at least 1 user license if required to view submitted test data.

3. Spare Parts
   a. In addition to the requirements of Division 01 – Record Documents, provide a complete list of parts and supplies, with current unit prices and source of supply, and a list of spare parts recommended for stocking.

1.12 WARRANTY SERVICE

A. In addition to provisions of Section 017800 – Guaranties, Warranties, Bonds and Maintenance Contracts, provide the following.
   1. Response Time: Provide a qualified technician familiar with the work at the Project Site within 24 hours after receipt of a notice of malfunction. Provide the Owner's Representative with telephone number attended 8 hours a day, 5 days a week, to be called in the event of a malfunction.

B. Provide all additional Warranties as defined in each Communication Systems Section.

1.13 ACCEPTANCE REVIEW AND TESTING PROCEDURES

A. Complete all Work of this Section. Submit Test Report. Submit review copies of Operating and Maintenance Manuals, less reduced set of Record Drawings. Notify the Owner's Representative in writing that the Work of these Sections is complete and fully complies with the Contract Documents. Request Acceptance Review and Testing. The Owner's Representative will conduct Verification of Submitted Test Data, and otherwise direct testing and adjustment of this Work. These procedures may be performed at any hour of the day or night as required by the Owner's Representative to comply with the Project Schedule and avoid conflict with Residents. Provide all specified personnel and equipment at any time without claim for additional cost or time.

B. Personnel: Provide services of the designated supervisor and additional technicians familiar with work of this Section. Provide quantity of technicians as required to comply with Project Schedule.

C. In Addition, Provide:
   1. All tools appropriate for performance of adjustment of and corrections to this Work. Include spare wire and connectors and specified tooling for application.
   2. Ladders, scaffolding and/or lifts as required to access high devices.
   3. All test equipment.
   4. Complete set of latest stamped, actioned submittals of record for reference.
   5. Complete set of Test Reports.
   6. Complete set of manufacturer's original operation, instruction and service manuals for each equipment item for reference.
   7. Demonstrate: Complete operation of all systems and equipment, including Portable Equipment.
   8. Adjust: As directed by the Owner's Representative.

9. Correct: In timely manner, failure to comply with the Contract Documents, as reasonably determined by the Owner's Representative.

D. Temporary Equipment: Provide and operate, without claim for additional cost or time, temporary equipment and/or systems to provide reasonably equivalent function, as determined by the Owner's Representative, in place of the Work of this Section which is incomplete or found not in conformance with the Contract Documents as of seven (7) days prior to the scheduled completion date. Provide such temporary equipment until Acceptance of the Work of this Section. Thereafter, remove such temporary equipment.

1.14 CLOSEOUT

A. Punch List: Perform any and all remedial work, at no claim for additional cost or time. Where required, retest and submit Test Report. Notify the Owner's Representative of completion of Punch List.

B. Portable Equipment: Furnish all portable equipment and spares to the Owner's Representative, along with complete documentation of the materials presented. Where applicable, furnish portable equipment in the original manufacturer's packing.

C. Operating and Maintenance Data: Install framed operating and maintenance instructions. Submit Manuals.

D. Project Record Documents: Submit print and digital copies. Digital files shall be in CAD system shall produce files in AutoCAD® .DWG format, latest version at time of bid. (Owner Standard, no substitution permitted) as defined above.

E. Keys: If applicable, replace construction locks with permanent locks. Provide 5 sets of keys to the Owner's Representative.

F. Instruction: Conduct specified instruction.

G. Warranty: Submit Warranty dated to run from date of Acceptance of the Work of this Section.

PART 2 - PRODUCTS

2.1 GENERAL

A. Where a particular material, device, piece of equipment or system is specified directly, the current manufacturer's specification for the same shall be considered to be a part of these specifications, as if completely contained herein in every detail.

B. Each material, device or piece of equipment shall comply with all of the manufacturer's current published specifications for that item.

C. Products shall be made by manufacturers regularly engaged in the production of such products.

D. Provide quantity as shown on Contract Drawings, or as otherwise indicated.

E. Provide all auxiliary and incidental materials and equipment necessary for the operation and protection of the Work of this Section as if specified in full herein.

F. Unless recycled content is specified, provide new materials.

G. Provide the manufacturer's latest design/model, permanently labeled with the manufacturer's name, model number and serial number.

H. Where products are of similar type or use, provide products of the same manufacturer, unless otherwise indicated.

I. Components
   1. UL or third party certified. Cabling and interconnecting hardware and components for Audiovisual systems shall be UL listed or third party independent testing laboratory certified, and shall comply with NFPA 70 and conform to the requirements specified herein.
   2. Where equipment or materials are specified to conform to industry and technical society reference standards of the organizations, submit proof of such compliance.
      a. The label or listing by the specified organization will be acceptable evidence of compliance.
      b. In lieu of the label or listing, submit a certificate from an independent testing organization, competent to perform testing, and approved by the Owner's Representative.
      c. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.

J. Enclosures:
   1. Provide steel frames and enclosures designed and wired to eliminate all induced currents.
   2. Make bolted connections with self-locking devices.

K. Finishes: Any item or component of the Work of this Section which is visible shall comply with the following.
   1. Finishes noted or scheduled on the Contract Drawings take precedence.
   2. Where design location requires that products, materials or equipment are visible to the public, no manufacturer's logos larger than 1/2 inch shall be visible. Unless otherwise noted or directed, neatly remove or permanently paint out such logos.
   3. Where finishes are not noted or otherwise defined in the Contract Documents, submit manufacturer's standard finish samples for selection by the Owner’s Representative.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine existing conditions before starting work. Submit conflicts in a timely manner for resolution

3.2 WIRING CLASSIFICATION AND RELATED

A. Audio Signal Wiring Classification:
   1. Type A-I: Microphone level wiring less than -30 dBu, 20 Hz to 20 kHz.
   2. Type A-2: Line level wiring -30 dBu to +24 dBu, 20 Hz to 20 kHz.
   3. Type A-3: Loudspeaker level or circuit wiring greater than +24 dBu, from 20 Hz to 20 kHz.

B. Video and Related Signal Wiring Classification:
   1. Type V-1: Baseband and composite video wiring 1 volt peak-to-peak into 75 ohms, 0 to 10.0 MHz.
   2. Type V-2: Synchronization and switching pulse wiring 4 volts peak-to-peak into 75 ohms, 15.62

to 15.75 kHz.
3. Type V-3: Color subcarrier wiring 0 to 4 volts peak-to-peak into 75 ohms, 3.57 to 4.43 MHz.
4. Type V-4: KMVT system wiring 0.1 to 1000 microVolts peak-to-peak into 50 or 75 ohms, 47 to 890 MHz.

C. Control Signal Wiring Classifications:
1. Type C-1: DC control wiring 0 to 50 volts.
2. Type C-2: Synchronous control or data wiring 0 to 40 volts, peak-to-peak.
3. Type C-3: AC control wiring 0 to 48 volts, 60 Hz.

D. Additional Wiring Classifications:
1. Type M-1: DC power wiring 0 to 48 volts.
2. Type M-2: AC power wiring greater than 50 volts, 60 Hz.
3. Wiring Combinations:

E. Except as indicated herein, conduit, wireways and cable bundles shall contain only wiring of a single classification. The following combinations are acceptable in conduit, or cable harnesses. Additional acceptable combinations may be indicated on the Drawings.
1. Types A-1, C-1, and M-1.
2. Types A-2, C-I, C-2, and M-I, runs less than 20 feet.
3. Types A-2, C-1, and M-1.
4. Types A-3, C-1, C-2, and M-1.
5. Types A-2, V-1, and V-3.
6. Types V-1, V-2, V-3, and C-1.
7. Types M-2 and C-3.

3.3 PREPARATION

A. Protection: Cover all computers, electronic equipment, desks, chairs, furniture and other articles when working at ceiling level and/or performing dust producing tasks.

3.4 REPAIR AND RESTORATION

A. Where working in spaces occupied by the Owner, return to their original positions any furniture or articles relocated to perform the work.

3.5 CLEANING

A. Where working in spaces occupied by the Owner:
1. Immediately after completing work within each space, clean up and remove all materials, scrap and dust.
2. All scrap material in work area shall be picked up and removed from the building at the end of each day. See also Section 017800 - Project Record Documents for additional requirements.
3. All dust resulting from work performed shall be vacuumed up daily.
4. All scrap material shall be removed and disposed of in an authorized disposal site. Refer to Section 017410 - LEED Waste Management.

END OF SECTION

SECTION 27 41 01 GROUNDING AND BONDING FOR AUDIOVISUAL SYSTEMS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Section includes grounding and bonding of Audiovisual Work, including but not limited to:
   1. Audiovisual Raceways
   2. Cable Runway
   3. Cable Shields
   4. Protector Fields
   5. Audiovisual Cabinets and enclosures.

B. Related Work Under Other Sections
   1. Section 27 41 00 – Common Work Results for Audiovisual Systems
   2. Section 27 41 02 – Hangers and Supports for Audiovisual Systems
   3. Section 27 41 03 – Conduits and Backboxes for Audiovisual Systems
   4. Section 27 41 08 – Audiovisual Cabinets, Racks, Frames and Enclosures
   5. Section 27 41 09 – Audiovisual Cable Management
   6. Section 27 41 16 – Integrated Audio-Video Systems and Equipment

1.2 SYSTEM DESCRIPTION

A. Provide Audiovisual system grounding conductor as described herein and indicate on drawings.

B. Except as otherwise indicated, the complete Audiovisual installation including the metallic conduits and raceways, cable trays, boxes, cabinets and equipment shall be completely and effectively grounded in accordance with all code requirements, whether or not such connections are specifically shown or specified.

C. Resistance:
   1. Resistance from the farthest ground bus through the ground electrode to earth shall not exceed 5 Ohms or the requirements of ANSI-J-STD-607-A-2002, whichever is more restrictive.

1.3 REFERENCES

A. American National Standards Institute (ANSI)
   1. ANSI/TIA/EIA-606-A-2002 Administration Standard for Commercial Telecommunications Infrastructure
   2. ANSI-J-STD-607-A-2002 Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
   3. Underwriters Laboratories (UL)
   4. UL 467 (1993); R 2004 Grounding and Bonding Equipment

1.4 SUBMITTALS

A. Conform with the requirements of Division 1 and Section 27 41 00 - Common Work Results for Audiovisual Systems.

PART 2 - PRODUCTS

2.1 Equipment Rack, Wall-Mount, 4RU

A. Drawing Reference: WR4

B. Features:
   1. Dimensions: 7.5"H, 19.75"W, 21.63"D.
   2. Weight capacity: 75 lbs.
   3. Rack Spaces: 4U Shipping Weight 21 lbs.

C. Manufacturer:
   1. Middle Atlantic SPM-4
   2. Great Lakes WR4
   3. Or equal.

D. Zone 4 Slide Out Rack, Steel Enclosure
   1. Drawing Reference: R35
   2. Features:
      a. Rack cabinet, 1 bay, steel frame mounted, with slide out inner frame for rear access of equipment from front of rack, floor supported.
      b. Zone 4 rated for up to 500 pounds of uniformly distributed load.
      c. 41 useable rack units.
      d. Fan System, 100 cfm minimum mounted into slide out inner frame.
      e. Locking, vented front doors.
      f. No rear doors.
      g. 26” deep inner frame, 32” deep outer frame.
      h. Open top outer frame.
   3. Manufacturer:
      a. Middle Atlantic Products AXS Slide Out System in MRK Steel Host Enclosure, configured with:
         i. MRK-4431AXS-26
         ii. MRK Z4 mounting brackets
         iii. AXS-WT50 Cable Management Tray
         iv. TRACK50 Service Track
         v. TRACKL Service Stand for Steel Cabinets
         vi. 1 each MW-4FT fan top (openings only) in outer frame
         vii. 2 each AXS-FAN with GUARD, 2 fans installed in the top of inner frame.
         viii. 1 each FC-4-1C Thermostatic Fan Control
         ix. At raised floor conditions, provide with SRB series base to match floor construction.
      b. Or equal (no known equal).

2.2 MANUFACTURERS

A. Equal products by the following manufacturers will be considered providing that all features of the specified product are provided:
   1. Ground Rod:
      a. High strength high carbon steel, with electrolytically bonded jacket of copper on surface
      b. UL spec. 467
      c. ANSI C-33.8-1072.
      d. Manufacturer:
         i. Allied Bolt
         ii. Inwesco 12A60

iii. Blackburn
iv. Cooper Power Systems
v. Weaver.
vi. Erico "Cadweld" Products, Inc.
vii. ITT Blackburn.
viii. Or equal.

2. Ground Wells:
   a. Christy Concrete Products, Inc.
   b. Forni Corp.
   c. Or equal.
3. Ground Bushings, Connectors, Jumpers and Bus:
   a. O-Z/Gedney.
   b. Thomas & Betts Corp.
   c. Or equal.
4. Compression Connector Lug
   a. Panduit
   b. B-Line SB-479 Series
   c. Thomas & Betts
   d. Or equal.
5. Audiovisual Ground Bus Bar
   a. CPI
   b. B-Line
   c. Panduit
   d. or equal.
6. Rack and Cabinet Grounding
   a. Panduit Structured Ground Kit
   b. Chatsworth Products Inc.
   c. or equal.
7. Bonding Ribbon:
   a. Annealed solid copper 3/8 inch wide x 1/16 inch thick, tin plated.
   b. Manufacturer:
      i. Inwesco 12A55
      ii. Corning Cable Systems
      iii. Preformed Line Products.
      iv. or equal.
8. Bonding Ribbon Clamp:
   a. Soft lead
   b. 1/16 inch thick
   c. Bolt hole for attachment
   d. Manufacturer:
      i. Inwesco 12A56
      ii. Corning Cable Systems
      iii. Preformed Line Products.
      iv. Or equal.
9. Fargo Clamp:
   a. Cast copper, silver plated, furnished with copper bolt.
   b. RUS Listed

c. Manufacturer:
   i. Allied Bolt
   ii. Inwesco 12A57
   iii. Corning Cable Systems
   iv. or equal.

10. Ground Inserts:
    a. Cast Bronze w 1/4 Copper Rod.
    b. Provide minimum one each maintenance hole or vault.
    c. Manufacturer:
       i. Inwesco 12H69
       ii. or equal by vault or manhole manufacturer.
       iii. or equal.

2.3 GROUND CONDUCTORS

A. General purpose insulated: UL listed and code sized copper conductor, with dual rated THHN/THWN insulation, color identified green. Where continuous color-coded conductors are not commercially available, provide a minimum 4" long color band with green, non-aging, plastic tape in accordance with NEC.

B. Bonding pigtails: Insulated copper conductor, identified green, sized per code, and provided with termination screw or lug. Provide solid conductors for #10 AWG or smaller and stranded conductors for #8 AWG or larger.

2.4 COMPRESSION CONNECTOR LUG

A. Description
   1. Connector lug with compression connection to conductor.
   2. Copper alloy body.
   3. Provide lug size to match conductor being terminated.
   4. Provide 2-hole pattern lugs.
   5. Provide each lug with silicon bronze hardware, including 2 bolts, 2 split lock washers and 2 nuts.

2.5 INSULATED GROUNDING BUSHINGS

A. Plated malleable iron or steel body with 150 degree Centigrade molded plastic insulating throat and lay-in grounding lug.

2.6 CONNECTIONS TO PIPE

A. For cable to pipe: UL listed bolted connection complying with CEC requirements.

2.7 CONNECTIONS TO STRUCTURAL STEEL, GROUND RODS, OR SPLICES

A. Where required by the Drawings or Specifications, grounding conductors shall be spliced together, connected to ground rods or connected to structural steel using exothermic welds or high pressure compression type connectors.
   1. Exothermic welds shall be used for cable-to-cable and cable-to-ground rod and for cable to structural steel surfaces. Exothermic weld kits shall be as manufactured by Cadweld, Thermoweld or equal. Each particular type of weld shall use a kit unique to that type of weld.

2. High-pressure compression type connectors shall be used for cable-to-cable and cable-to-ground rod connections. Connections shall be as manufactured by Thomas & Betts #53000 series, Burndy "Hy-Ground" or equal.

2.8 EXTRA FLEXIBLE, FLAT BONDING JUMPERS

A. Where required by the drawing or specified herein.

PART 3 - EXECUTION

3.1 GENERAL

A. Provide Grounding and Bonding according to the most restrictive requirements of:
   1. ANSI-J-STD-607-A.
   2. California Electrical Code Article 250 and references therein.
   3. California Electrical Code Article 800.

B. In the event of conflicting requirements, National Electrical Code requirements shall prevail.

C. Point of Connection
   1. Under Work of this Section, make connections to Audiovisual Ground Busbars. Coordinate with District Electrical Representative and conform to District requirements for electrical Grounding and Bonding
   2. Mechanical Connections

D. Make connections bare metal to bare metal.
   1. Where required, remove paint to bare metal, make grounding or bonding connection, and touch up paint.
   2. Torque threaded fasteners to manufacturer's recommended values.

E. Compression Connections
   1. Make compression connections with the lug or fitting manufacturer's recommended tooling, with the tooling set to the recommended force and stroke.

F. Audiovisual Raceways and Sleeves
   1. Bond metallic raceway and sleeves to the Audiovisual Ground Busbar at the Audiovisual Room that serves the related Audiovisual Receptacle.
   2. Where a metallic raceway connects two or more Audiovisual Rooms, bond to the Audiovisual Ground Busbar at each.

G. Cable Shields
   1. Comply with California Electrical Code Article 800.

H. Protector Fields
   1. Comply with California Electrical Code Article 800.

I. Audiovisual Cabinets and enclosures
   1. Bond to the Audiovisual Ground Busbar at the Audiovisual Room.

3.2 LABELING

A. Provide labeling according to the requirements of:

1. ANSI/TIA/EIA-606-A.
2. Section 27 41 07 - Identification for Audiovisual Systems.

END OF SECTION

SECTION 27 41 02 HANGERS AND SUPPORTS FOR AUDIOVISUAL SYSTEMS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. The work covered under this section consists of the furnishing of all necessary labor, supervision, materials, equipment, and services to completely execute the provision of Audiovisual supports and cable hook system as described in this specification, including but not limited to:
   1. Strut supports
   2. Cable Hooks (J-hooks)
   3. Beam clamps
   4. Concrete Fasteners
   5. Touch-Up Materials
   6. Conduit supports.
   7. Equipment supports.
   8. Fastening hardware.

B. Related work: Consult all other Sections, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete installation.
   1. Section 27 41 00 – Common Work Results for Audiovisual Systems
   2. Section 27 41 01 – Grounding and Bonding for Audiovisual Systems
   3. Section 27 41 03 – Conduits and Backboxes for Audiovisual Systems
   4. Section 27 41 06 – Noise and Vibration Controls for Audiovisual Systems
   5. Section 27 41 07 – Identification for Audiovisual Systems
   6. Section 27 41 08 – Audiovisual Cabinets, Racks, Frames and Enclosures
   7. Section 27 41 09 – Audiovisual Cable Management
   8. Section 27 41 16 – Integrated Audio-Video Systems and Equipment

1.2 SYSTEM DESCRIPTION

A. Provide devices specified in this Section and related Sections for support of Audiovisual equipment specified for this Project.

B. Provide support systems that are adequate for the weight of equipment, conduit and wiring to be supported.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM)
   1. ASTM A123/A123M-02 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
   2. ASTM A153/A153M-04 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
   3. ASTM B633-98e1 Specification for Electro-deposited Coatings of Zinc on Iron and Steel.
   4. ASTM A653/A653M-04a Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

B. American National Standards Institute (ANSI)

1. ANSI/TIA/EIA-568-B.1-2001, Commercial Building Telecommunications Cabling Standard – Part1: General Requirements
2. ANSI/TIA/EIA-568-B.2-2001, Commercial Building Telecommunications Cabling Standard – Part2: Balanced Twisted Pair Cabling Components
3. ANSI/TIA/EIA-568-B.3-2000, Optical Fiber Cabling Components Standard
4. ANSI/ TIA/ EIA 569-B Commercial Building Standard for Telecommunications Pathways and Spaces

C. National Fire Protection Association
   1. NFPA 70, National Electrical Code

1.4 SUBMITTALS

A. Conform with Division 1 and Section 27 41 00 - Common Work Results for Audiovisual Systems and the following:
   1. As part of the project submittals, the contractor to provide engineered shop drawings indicating the proposed design for mounting all work of this Division weighing more than 20 pounds, inclusive of mounting systems, and for equipment mounted at the exterior, inclusive of its effective wind load under conditions the range of conditions experience
      a. Shop drawings to be accompanied by anchorage calculations indicating that it shall remain attached to the mounting surface after experiencing forces in conformance with CCR, Title 24, Table 23P, Part II and with Section 2312 "Earthquake Regulations" of the "Uniform Building Code" for Seismic Zone 4 Area, Importance Factor of 1.25.
      b. Structural Calculations shall be prepared and signed by a California Registered Structural Engineer. Specify proof loads for drilled-in anchors, if used.

1.5 QUALITY ASSURANCE

A. All materials, equipment and parts comprising the units specified herein shall be new and unused, and of current manufacturer.

B. Cable hooks shall be listed and labeled by Underwriters Laboratories (UL) as required.

C. Cable hooks shall have the manufacturers name and part number stamped in the part itself for identification.

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

A. General
   1. Supports to be sized to suit load and selected to match mounting conditions

B. Manufacturers
   1. Equal products by the following manufacturers will be considered providing that all features of the specified product are provided:
      a. Concrete fasteners:
         i. Phillips "Red-Head".
         ii. Remington.

iii. Ramset.
iv. Hilti
v. Simpson Strong-Tie
vi. or equal.

b. Concrete inserts and construction channel:
i. Unistrut Corp.
ii. GS Metals "Globe Strut."
iii. Thomas & Betts "Kindorf" Corp.
iv. Or equal.

c. Conduit straps:
i. O-Z/Gedney.
ii. Erico "Caddy" Fastening Products.
iii. Thomas & Betts "Kindorf" Corp.
iv. Or equal.

d. Beam Clamps
i. Cooper B-Line
ii. SuperStrut
iii. Unistrut
iv. or equal

e. Aircraft Cable Sway Braces
i. Mason Industries
ii. M.W. Sausse/Vibrex
iii. Loos & Company, Inc.
iv. or equal.

C. Concrete Fasteners
1. Provide expansion-shield type concrete anchors.
2. Provide powder driven concrete fasteners with washers. Obtain approval by Owner's Representative prior to use.

D. Concrete Inserts
1. Provide pressed galvanized steel, concrete spot insert, with oval slot capable of accepting square or rectangular support nuts of ¼ inch to ½ inch diameter thread for rod support.

E. Aircraft cable sway braces
1. Steel rope sized to meet load.

F. Construction Channel:
1. Construction:
a. 1-5/8" square galvanized channel formed from U.S.S.G No. 12 or 0.109 inch cold formed steel with 17/32-inch diameter bolt holes, and 1-1/2 inch on center in the base of the channel.
b. 10 foot sections.
2. All supporting materials by same manufacturer.

G. Beam Clamps
1. Malleable iron electro-galvanized steel beam clamps selected to match building structural steel members.

H. Conduit Straps
1. One hole strap, steel or malleable iron, with malleable iron clamp-back spacer for surface mounted wall and ceiling applications.
   a. Use malleable strap with spacers for exterior and wet locations.
   b. Use steel strap without spacers for interior locations.
2. Steel channel conduit strap for support from construction channel.
3. Steel conduit hanger for pendant support with threaded rod
4. Steel wire conduit support strap for support from independent #12 gauge hanger wires.

I. Threaded rods, couplings, screws and nuts:
1. Electrolytically coated with zinc, 2 oz. zinc per square foot of surface, ASTM A123 or A153.

J. Miscellaneous Parts
1. Hot dipped galvanized after fabrication; after cutting, de-burring and hole drilling. Coated with zinc, 2 oz. zinc per square foot of surface, ASTM A123 or A153.

K. Paint/Tape for Touch-up:
1. Zinc: CRC "Zinc-It", Glyptal, Enterprise Galvanizing “Galambra”, or equal.

2.2 CABLE HANGERS

A. Ceiling Hung J-Hooks
1. Drawing Reference(s):
   a. WMJ
   b. ACJ
2. Features/Functions/Construction
   a. Specifically intended to carry the load of up to 50 Audiovisual cables without applying excess forces to cables at bottom of bundle.
   b. Integral broad bottom edge to spread cable load with flat bottom and provide a minimum of 1-5/8 inch cable bearing surface.
   c. Integral hanger rod attachment hardware at top.
   d. Load rated for application.
   e. Incorporates smooth 90-degree radiused edges to prevent snagging cable jackets on installation.
   f. Designed so the mounting hardware is recessed to prevent cable damage.
   g. Integral mechanical cable latch retainer to provide containment of cables within the hook. The retainer shall be removable and reusable.
   h. Suitable for direct attachment to walls, hanger rods, beam flanges, purlins, strut, floor posts, etc. to meet job conditions.
   i. Multi-tiered cable hooks to be used where required to provide separate cabling compartments, or where additional capacity is needed.
   j. Finishes:
      i. Cable hooks for non-corrosive areas shall be pre-galvanized steel, ASTM A653. Where additional strength is required, cable hooks shall be spring steel with a zinc-plated finish, ASTM B633, SC3.
      ii. Cable hooks for corrosive areas shall be stainless steel, AISI Type 304.
3. Manufacturer
   a. Cooper B-Line series BCH21, BCH32, BCH64
   b. Caddy/Erico CableCat

c. or equal.

PART 3 - EXECUTION

3.1 GENERAL

A. The Owner's Representative reserves the right to request additional supports where in their sole opinion said supports are required. Any additional supports shall be installed at no additional cost to the Owner.

3.2 EXAMINATION

A. Thoroughly examine site conditions for acceptance of supporting device installation to verify conformance with manufacturer and specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.3 PREPARATION

A. Coordinate size, shape and location of concrete pads required for equipment installation with Base Building General Contractor.

B. Layout support devices to maintain headroom, neat mechanical appearance and to support the equipment loads.

C. Where shown on the Drawings or Specifications, install freestanding Audiovisual equipment on concrete pads.

3.4 INSTALLATION

A. Furnish and install supporting devices as noted throughout the Audiovisual Systems work.

B. Audiovisual device and conduit supports shall be independent of all other system supports that are not structural elements of the building, unless otherwise noted.

C. Fasten hanger rods, conduit clamps, outlet and junction boxes to building structure using precast inserts, expansion anchors, preset inserts or beam clamps.

D. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster or gypsum board partitions and walls.

E. Use expansion anchors or preset inserts in solid masonry walls.

F. Use self-drilling anchors, expansion anchor, or preset inserts on concrete surfaces.

G. Use sheet metal screws in sheet metal studs and wood screws in wood construction.

H. Do not fasten supports to piping, ductwork, mechanical equipment, conduit, or acoustical ceiling suspension wires.

I. Do not drill structural steel members unless first approved in writing by the Owner's Representative.

J. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.

K. Install surface-mounted cabinets with minimum of four anchors. Provide additional support backing in stud walls prior to sheet rocking as required to adequately support cabinets and panels.

L. Bridge studs top and bottom with channels to support flush mounted cabinets and panelboards in stud walls.

3.5 ERECTION OF METAL SUPPORTS

A. Cut, fit, and place miscellaneous metal fabrications accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

B. Field Welding: Comply with AWS "Structural Welding Code."

3.6 WOOD SUPPORTS

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorage accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

3.7 DISTRIBUTION PATHWAY VIA CEILING HUNG CABLE HOOKS (J-HOOKS):

A. Void, Plenum or Suspended Ceiling Exposed Cable Installation. Where drawings specifically show or permit use of exposed cable installation in voids, conform to the most restrictive requirements of Code, TIA-569-B and this Section.

B. Provide support for all cabling. Do not place or attach directly to T-bar grid, concealed spline grid, flexible or rigid ductwork, HVAC registers, sprinkler piping or fixtures, light fixtures or building structure. Conform to the California Electric Code.

C. Placement:
1. All pathways created by ceiling hung cable hooks shall be reviewed by the Owner's Representative prior to installation.
2. Ceiling hung cable hooks and cabling supported by same shall not obscure access to access doors, hatches, air dampers, valves, filter sections, VAV boxes, cable trays, junction boxes, pull boxes or similar areas of access required by other trades.
3. All ceiling hung cable hooks shall be mounted close enough together such that upon completion of the station cable installation a minimum amount of cable droop occurs between adjacent rings. The distance between supporting rings shall not exceed 48 inches or as required by the current edition of TIA-569-B.

D. Follow manufacturer's recommendations for allowable fill capacity for each size of cable hook.
1. Cable hooks shall be capable of supporting a minimum of 30 pounds with a safety factor of 3.
2. Spring steel cable hooks shall be capable of supporting a minimum of 100 pounds with a safety factor of 3 where extra strength is required.

END OF SECTION

SECTION 27 41 03 CONDUITS AND BACKBOXES FOR AUDIOVISUAL SYSTEMS

PART 1 - GENERAL

1.1 SCOPE OF WORK:

A. Provide Audiovisual pathways in accordance with EIA TIA/EIA-569-B, as specified in this Section and as shown on the plans. Provide system furniture pathways in accordance with UL 1286. Provision of all low voltage Audiovisual Systems Pathway, including:
   1. Rigid steel conduit and fittings.
   2. PVC insulated rigid steel conduit and fittings.
   3. Intermediate metal conduit and fittings.
   4. Electrical metallic tubing and fittings.
   5. Flexible metallic conduit and fittings.
   6. Liquidtight flexible metallic conduit and fittings.
   7. Miscellaneous conduit fittings and products.
   8. Junction Boxes
   9. Floor Boxes
   10. Hinged cover enclosures.
   11. Pullboxes and Terminal Cabinets.

B. At Hazardous Occupancies, installation conforms to the requirements of California Electric Code for Class and Division rating of spaces.

1.2 RELATED WORK IN OTHER SECTIONS:

A. Patching and Painting – Patching, painting, and repair of existing finishes shall be coordinated by the Contractor with District Representatives.

B. Related work: Consult all other Sections, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete installation.
   1. Section 27 41 00 – Common Work Results for Audiovisual Systems.
   2. Section 27 41 01 – Grounding and Bonding for Audiovisual Systems
   3. Section 27 41 02 – Hangers and Supports for Audiovisual Systems
   4. Section 27 41 03 – Conduits and Backboxes for Audiovisual Systems
   5. Section 27 41 06 – Noise and Vibration Controls for Audiovisual Systems
   6. Section 27 41 16 – Integrated Audio-Video Systems and Equipment

1.3 REFERENCES

A. Usage: In accordance with Section 14200—Definitions, References, and Regulations.
   1. American National Standards Institute (ANSI)
      a. ANSI C80.1 1994 Rigid Steel Conduit - Zinc Coated
      b. ANSI C80.3 1991 Electrical Metallic Tubing - Zinc Coated
   2. National Electrical Manufacturers Association (NEMA)
      a. NEMA 250-2003 Enclosures for Electrical Equipment (1000 Volts Maximum)
      b. NEMA FB 1 (ANSI/NEMA FB 1-2003) Fittings, Cast Metal Boxes and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable
      c. FB 2.10 2000 Selection and Installation Guidelines For Fittings For Use With Non-

Flexible Metallic Conduit Or Tubing (Rigid Metal Conduit, Intermediate Metal Conduit, And Electrical Metallic Tubing).

d. FB 2.20 2000 Selection and Installation Guidelines for Fittings for use with Flexible Electrical Conduit and Cable
e. NEMA ICS 6 1988 (Rev. 1) Enclosures for Industrial Control and Systems
f. NEMA OS 3-2002 Selection and Installation Guidelines for Electrical Outlet Boxes.
g. NEMA RN 1-1998 Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
h. NEMA TC 7 2000 Smooth Wall Coilable Polyethylene Electrical Plastic Duct
i. NEMA TC 13 2000 Electrical Nonmetallic Tubing (ENT).
j. NEMA TC 14 1984(R 1986) Filament-Wound Reinforced Thermosetting Resin Conduit and Fittings

3. Underwriters Laboratories, Inc. (UL)
   a. UL 1 2000 Flexible Metal Conduit
   b. UL 6 2004 Electrical Rigid Metal Conduit - Steel
   c. UL 50 (1995; R 1999, Bul. 2001) Enclosures for Electrical Equipment
   d. UL 360 1986 (Bul. 1991) (R 1993) Liquid-Tight Flexible Steel Conduit
   e. UL 514A 1991 (R 2004) Metallic Outlet Boxes
   f. UL 514B 1989 (R 2004) Conduit, Tubing and Cable Fittings
   g. UL 514C 1996 (R 2000) Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers.
   h. UL 651 1989 (R 1989) (Bul. 1993) Schedule 40 and 80 Rigid PVC Conduit.
   i. UL 797 1993 (R 2004) Electrical Metallic Tubing - Steel
   j. UL 1242 1983 (R1993) (Bul. 1993) Intermediate Metal Conduit.
   k. UL 1286(1999; R 2001, Bul. 2002) Office Furnishings
   l. UL 1479 Fire Tests of Through Penetration Firestops
   m. UL Fire Resistance Directories

1.4 SUBMITTALS

A. Conform with the requirements of Division 1 and Section 27 41 00 - Common Work Results for Audiovisual Systems.

1.5 QUALITY ASSURANCE

A. All materials, equipment and parts comprising the units specified herein shall be new and unused, and of current manufacturer.

B. Only products and applications listed in this Section may be used on the project unless otherwise submitted and approved by the Owner's Representative.

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide the following types of conduit systems listed by their commonly used generic name.

2.2 RACEWAY

A. Manufacturers:
   1. Raceway:
      a. Allied Tube and Conduit Co.

b. Triangle PWC, Inc.
c. Western Tube and Conduit Corp.
d. Spring City Electrical Manufacturing Co.
e. Occidental Coating Co. (OCAL).
f. Alflex Corp.
g. American Flexible Metal Conduit Co.
h. Anaconda.
i. Or equal.

2. Fittings:
   a. Appleton Electric Co.
   b. OZ/Gedney.
   c. Thomas & Betts Corp.
   d. Spring City Electrical Manufacturing Co.
   e. Occidental Coating Co. (OCAL).
   f. Carlon.
   g. or equal.

B. Rigid Steel Conduit.
   1. Drawing and Spec Reference: RSC.
   2. Construction:
      a. Conduit: Full weight, threaded, hot-dip galvanized steel, conforming to ANSI C80.1 and UL 6.
      b. Standard threaded couplings, locknuts, bushings, and elbows: Only materials of steel or malleable iron are acceptable. Locknuts shall be bonding type with sharp edges for digging into the metal wall of an enclosure.
      c. Three piece couplings: Electroplated, cast malleable iron.
      d. Insulating bushings: Threaded polypropylene or thermosetting phenolic rated 150 degree C minimum.
      e. Insulated grounding bushings: Threaded cast malleable iron body with insulated throat and steel "lay-in" ground lug with compression screw.
      f. Insulated metallic bushings: Threaded cast malleable iron body with plastic insulated throat rated 150 degrees C.
      g. All fittings and connectors shall be threaded.

C. Coated Rigid Steel Conduit:
   1. Drawing and Spec Reference: CRSC.
   2. Conduit: Full weight, threaded, hot-dip galvanized steel, conforming to ANSI C80.1 and NEMA RN-1 with nominal 40 mil thermoplastic vinyl coating, heat fused and bonded to the exterior of the conduit.
   3. Fittings:
      a. Conduit couplings and connectors shall be as specified for galvanized rigid steel conduit and shall be factory PVC coated with an insulating jacket equivalent to that of the coated material.
      b. Fittings over-sleeve to extend 1 conduit diameter or 1-1/2" beyond fitting, whichever is less.
   4. Performance:
      a. Tensile Strength: 3500 psi.
   5. Approvals:

a. NEMA RN1 (Type 40 - 40 mils thick)
b. CalTrans Type 2

6. Manufacturers:
   a. Plastibond by RobRoy Industries.
   b. Occal-40 by Occidental Coating Company.
   c. KorKap by Plastic Applicators.
   d. Ocal-Blue
   e. or equal.

D. Intermediate Metal Conduit
1. Drawing Reference: IMC
2. Conduit: Hot dip galvanized steel meeting the requirements of CEC Article 345 and conforming to ANSI C80.6 and UL 1242.
3. Fittings: Conduit couplings, connector and bushing shall be as specified for galvanized rigid steel conduit. Integral retractable type IMC couplings are also acceptable.

E. Electrical Metallic Tubing.
1. Drawing and Spec Reference: EMT.
2. Conduit: Shall be formed of cold rolled strip steel, electrical resistance welded continuously along the longitudinal seam and hot dip galvanized after fabrication. Conduit shall conform to ANSI C80.3 specifications and shall meet UL classifications.
3. Set screw type couplings: Electroplated, steel or cast malleable iron, UL listed concrete tight. Use set screw type couplings with four setscrews each of conduit sizes over 2 inches. Setscrews shall be of case hardened steel with hex head and cup point to firmly seat in wall of conduit for positive grounding.
4. Set screw type connectors: Electroplated steel or cast malleable iron UL listed concrete tight with male hub and insulated plastic throat, 150 degree C temperature rated. Setscrew shall be same as for couplings.
5. Raintight couplings: Electroplate steel or cast malleable iron; UL listed raintight and concrete tight, using gland and ring compression type construction.
6. Raintight connectors: Electroplated steel or cast malleable iron, UL listed raintight and concrete tight, with insulated throat, using gland and ring compression type construction.

F. Flexible Conduit:
1. Drawing Reference: FLEX
2. Construction:
   a. Flexible steel, zinc coated on both inside and outside by hot-dipping process.
   b. Interlocking spirally wound continuous steel strip.
   c. 3/4" minimum size.
3. Fittings: Connectors shall be of the single screw clamp variety with steel or cast malleable iron bodies and threaded male hubs with insulated throats. Exception: Pressure cast screw-in connectors shall be acceptable for fixture connection in suspended ceilings and cut-in outlet boxes within existing furred walls.
4. Approvals:
   a. UL 1

G. Liquidtight Flexible Metallic Conduit
1. Drawing Reference: Liquidtight
2. Conduit: Shall be fabricated in continuous lengths from galvanized steel strips, interlocking

spirally wound, covered with extruded liquid-tight jacket of polyvinyl chloride (PVC) and conforming to UL 360. Provide conduit with a continuous copper-bonding conductor wound spirally between the convolutions.

3. Fittings: Connector body and gland nut shall be of cadmium plated steel or cast malleable iron, with tapered, male, threaded hub; insulated throat and neoprene "O" ring gasket recessed into the face of the stop nut. The clamping gland shall be of molded nylon with an integral brass push-in ferrule.

2.3 MISCELLANEOUS CONDUIT FITTINGS AND PRODUCTS

A. General
   1. UL 514B.
   2. Listed in UL Electrical Construction Materials List.

B. Conduit Fittings, Insulated Throat Grounding Bushings
   1. Description
      a. Threaded for Rigid Steel Conduit and Intermediate Metal Conduit.
      b. UL Listed for use with copper conductors.
      c. Thermoplastic insulated liner for 105 degrees Celsius.
      d. Body of malleable iron, zinc plated; or die cast zinc.
   2. Manufacturer
      a. Thomas & Betts (Steel City) BG-801 Series
      b. O-Z/Gedney
      c. or equal.

C. Watertight conduit entrance seals: Steel or cast malleable iron bodies and pressure clamps with PVC sleeve, neoprene sealing grommets and PVC coated steel pressure rings. Fittings shall be supplied with neoprene sealing rings between the body and PVC sleeve.

D. Watertight cable sealing bushings: One piece, compression molded sealing ring with PVC coated steel pressure disks, stainless steel sealing screws and zinc plated cast malleable iron locking collar.

E. Expansion fittings: Multi-piece unit comprised of a hot dip galvanized malleable iron or steel body and outside pressure bussing designed to allow a maximum of 4" conduit movement (2" in either direction). Furnish with external braid tinned copper bonding jumper. Unit shall be UL listed for wet or dry locations.

F. Expansion/deflection couplings: Multi-piece unit comprised of a neoprene sleeve with internal flexible tinned copper braid attached to bronze end couplings with stainless steel bands. Coupling shall accommodate .75-inch deflection, expansion, or contraction in any direction, and allow 30-degree angular deflections. Flexible, corrosion-resistant, watertight, moisture and heat resistant molded rubber jacket and stainless steel jacket clamps. Unit shall comply with UL467 and UL514.
   1. Manufacturer:
      a. OZ/Gedney Type DX
      b. Steel City Type EDF
      c. or equal.

G. Fire rated penetration seals:
   1. UL classified.
   2. Conduit penetrations in fire rated separation shall be sealed with a UL classified assembly

consisting of fill, void or cavity materials.

3. The fire rated sealant material shall be the product best suited for each type of penetration, and may be a caulk, putty, composite sheet or wrap/strip.
4. Penetrations of rated floors shall be sealed with an assembly having both F and T ratings at least equal to rating of the floor.
5. Penetrations of rated walls shall be sealed with an assembly having an F rating at least equal to the rating of the wall.

H. Standard products not herein specified:
1. Submit for review a listing of standard electrical conduit hardware and fittings not herein specified prior to use or installation, i.e. locknuts, bushings, etc.
2. Listing shall include manufacturers name, part numbers, and a written description of the item indicating type of material and construction.
3. Miscellaneous components shall be equal in quality, material, and construction to similar items herein specified.

I. Hazardous area fittings: UL listed for the application.

2.4 FLOORBOXES AND POKE-THROUGHS

A. Floor Box High Capacity, 4 Compartment

1. Drawing Reference: FC6
2. Features
   a. UL Listed
   b. Box
      i. Size at least 13.5 inches by 12 inches by 6 inches deep.
      ii. Four compartments, with voltage barriers, with standard electrical plate mounting brackets for at least:
         (1) One 6 gang
         (2) One 3 gang
         (3) Two single gang
   c. Knockouts concentric, combination 1 inch and 1.25 inch.
   d. Flat cover - metallic finish. Confirm finish w/ District Representative.
   e. Cover size approximately 14 inches by 12.5 inches.
   f. At least 11 gage steel.
   g. Within cover, provide a lift-off, full-access door, open area approximately 6.5 inches by 8 inches.
   h. Within the lift-off, full-access door, provide a hinged, fold-back cable exit port.
   i. Open area approximately 2 inches by 2 inches.
   j. Flush in closed position.
3. Applications:
   a. FC6: Concrete floor systems. Provide "pour pan" protection at slab on grade conditions
4. Approvals:
   a. UL 514A scrub water
5. Manufacturers
   a. FSR Inc.
      i. FC6: FL-600P with cover. Submit cover finish for approval by the Architect.

Provide manufacturer's “Pour Pan” FL-GRD2 or FL-GRD4 to protect from moisture at installations at grade level.

b. or equal (No known equal).

2.5 JUNCTION AND DEVICE BOXES

A. Junction and Device Boxes
1. Drawing References: As shown on Symbol Schedule
2. Construction:
a. Concealed/Flush Mounted:
b. One or two piece welded knockout boxes.
c. UL 514A, cadmium or zinc-coated 1.25 oz/sq. ft., if ferrous metal.
d. Pressed sheet steel, for indoor locations.
e. UL 514C approved if non-metallic.
f. At hollow masonry, tile walls and plaster walls, provide with device rings as required.
g. Surface mounted:
i. Exterior - Conform to the Junction and/or PullBox construction scheduled on the Plans. Where construction not otherwise scheduled or noted on the plans, conform to the following:
(1) Cast iron or aluminum with threaded hubs and mounting lugs.
(2) Gasketed cover with spring lid.
ii. Concrete floor embedded:
(1) Cast iron concrete pour boxes with screwed brass cover, unless otherwise noted.
(2) Cadmium plated screw cover attachment at least 6" on center.
h. If size not otherwise noted, at least 4S (4" square) by 2-1/8" deep, or Code minimum size, whichever is larger.
i. Wherever 4S is indicated, contractor may at their option substitute 4-11/16" square boxes while maintaining the minimum depth required by these specifications and the drawings.
ii. At recessed masonry wall installations, provide gangable masonry boxes.
i. Provide complete with approved type of connectors and required accessories, including attachment lugs or hangers. Provide raised device covers as required to accept scheduled device.
3. Approvals.
a. UL 514A
4. Manufacturers:
a. Interior:
i. Steel City.
ii. Bowers
iii. or equal.
b. Exterior, exposed with cover of same construction.
i. Appleton
ii. Pyle-National
iii. or equal.
c. Other conditions:
i. Any meeting approvals and requirements.

B. Flat-panel Wall Box
   1. Drawing reference: FPWB
   2. Features, functions and construction:
      a. Box provides means to install Audiovisual, network and power receptacles flush in wall behind flat-panel display. With box cover installed, connectors are concealed and cables, both power and communications pass through slot at base of cover plate into connection points on back of flat-panel.
      b. Cover plate protrudes less than 1/2" from face of wall.
      c. 16 gauge box construction with 1/16" inch thick minimum cover plate, white finish baked enamel or powder coat, field paintable
      d. Box incorporates provisions to mount up to two electrical device boxes for provision of duplex power receptacles either from above or below.
      e. Additionally box mounts manufacturers low-voltage conduit entry box which accommodates manufacturer's line of Audiovisual connector inserts. Design of FP WB permits installation of up to two low-voltage conduit entry boxes, which may be mounted either above or below the FPWB.
      f. Manufacturers Audiovisual insert line shall support at least the following receptacles:
         i. BNC, in combinations of 1 to 5 BNC's, color-coded for composite, component analog and RGBHV video formats, as required.
         ii. RCA, in combinations of 1 to 3 RCA's color-coded for Composite and component analog video formats, as required.
         iii. S-Video.
         iv. XLR, 3 and 4 pin.
         v. DB-15
         vi. DB-9
         vii. Neutrik Speakon.
         viii. DVI
         ix. HDMI
         x. 1/4" and mini TRS.
      g. Provide with manufacturer's connector inserts as required to terminate cabling types and applications indicated on the single-line diagrams. Punch blank panel inserts and provide other receptacle types as required or indicated to fulfill the requirements of the contract documents. Fill remaining openings with blank inserts.
   3. Manufacturers:
      a. FSR Inc. PWB-100 with:
         i. (2) low voltage backboxes
         ii. (2) electrical gem boxes
         iii. Connectors and inserts from manufacturer's IPS series.
      b. Or equal (no known equal).

2.6 CABINETS AND ENCLOSURES

A. Terminal Cabinets:
   1. Drawing Reference: As Scheduled.
   2. Construction:
      a. Zinc Coated Sheet Steel, code gauge with standard concentric knockouts for conduit terminations.
      b. Interior dimensions not less than those scheduled.

c. Finish: Manufacturer's standard gray baked enamel finish.
d. Covers: Trim fitted, continuous hinged steel door, flush catch – lockable and keyed to match. Screw fastened doors not acceptable.
   i. Door face to be not less than 95% of panel interior dimensions.
e. Provide with 3/4" fire retardant treated ply backboard.

3. Mounting:
   a. Flush cabinets shall be furnished with concealed trim clamps and shall be not less than 4 inches deep.
   b. Surface cabinets shall be furnished with screw cover trim, flush hinged door and shall not be less than 6 inches deep.
   c. Interior Applications:
      i. NEMA 250 Type 1, unless otherwise noted. Refer to plans and schedules.
   d. Exterior Applications:
      i. NEMA 250 Type - As Scheduled, not less than NEMA 3R.
4. Manufacturers:
   a. B-Line Electrical Enclosures
   b. Circle AW Products.
   c. Hammond
   d. Henessey.
   e. Hoffman.
   f. Myers Electric Products
   g. Rittal.
   h. or equal.

PART 3 - EXECUTION

3.1 CONDUIT APPLICATION

A. General: Install the following types of conduits and fittings in the locations listed, unless otherwise noted in the drawings:
   1. Exterior, Exposed:
      a. Type RSC for applications up to 8 feet AFF or to first pull box, whichever is first, applications subject to physical abuse or for applications greater than 4" diameter.
      b. EMT acceptable in all other applications not noted above up to 4", where used in conjunction with specified Raintight (compression) couplers.
   2. Interior, Exposed, Wet and Damp Locations:
      a. Type RSC.
      b. At interior locations over 8 feet above finished floor, EMT acceptable.
   3. Interior, Hazardous Locations
      a. Type RSC
      b. Type IMC, where permitted by the CEC.
   4. Interior, exposed or concealed, dry locations:
      a. RSC, if subject to physical abuse.
      b. EMT, if not subject to physical abuse.
   5. Interior, concealed, damp locations, including in masonry walls.
      a. RSC
   6. Embedded in Concrete
      a. RSC or rigid non-metallic conduit.

b. PVC Type DB-120.

7. Transition from walls to open plan furniture systems:
   a. Liquidtight

3.2 GENERAL REQUIREMENTS

A. Refer to the manufacturer's instructions and conform thereto.

B. Distribution Pathway via EMT Raceway:
   1. The EMT conduit is to be installed meeting the NEC handbook Article 348 Installation Specifications.
   2. Provide escutcheon plates for all through wall conduit stubs.
   3. All ends of conduits shall be cut square, reamed and fitted with insulated bushing.
   4. All conduit which passes through fire walls shall be sealed with fire stop putty after all station wire has been installed.

3.3 MOUNTING AND INSTALLATION – DEVICE BOXES

A. Conform to the more restrictive of NEMA OS 3-2002 and the following.

B. Provide backboxes at all Audiovisual systems devices. Installation of device plates directly to wall surface without use of a backbox, unless specifically directed on plans, is unacceptable.

C. The distance between pull boxes shall not exceed 150 feet or more than two 90 degree bends.

D. Align boxes plumb with floor and surrounding construction. At door frames, locate 4" from frame. Verify placement with Owner's Representative details to ensure that box clears all trim, etc.

E. Support and fasten boxes securely. At stud walls use rigid bar hangers, attached to hanger with stud and nut.

F. At existing locations, provide cutting, patching and finishing as required to maintain or restore finishes so that resulting installation is integrated into the Architectural decor of the particular location.

G. Mounting Height: the mounting height of a wall-mounted outlet box is defined as the height from the finished floor to the horizontal center line of the cover plate.

H. Mount outlet boxes with the long axis vertical. Three or more gang boxes shall be mounted with the long axis horizontal.

I. Install wiring jacks and outlet devices only in boxes which are clean; free from excess building materials, dirt, and debris.

J. Install wiring jacks and outlet devices after wiring work is complete.

3.4 TERMINAL CABINETS, JUNCTION BOXES AND PULL BOXES

A. General
   1. Thoroughly examine site conditions for acceptance of cabinets and enclosures installation to verify conformance with manufacturer and specification tolerances. Do not commence with installation until all conditions are made satisfactory.

B. Set cabinets and enclosures plumb and symmetrical with building lines. Furnish and install all construction channel bolts, angles, etc. required to mount all equipment furnished under this Section of the Specifications.

C. Cabinets and enclosures shall be anchored and braced to withstand seismic forces calculated in accordance with standards referenced in Section 27 41 02 – Hangers and Supports for Audiovisual Systems.

D. "Train" interior wiring, bundle and clamp using specified plastic wire wraps. Separate power and signal wiring.

E. Replace doors or trim exhibiting dents, bends, warps or poor fit that may impede ready access, security or integrity.

F. Terminate conduit in cabinet with lock nut and grounding bushing.

G. Cleaning
   1. Touch-up paint any marks, blemishes or other finish damage suffered during installation.
   2. Vacuum clean cabinet on completion of installation.

3.5 SUPPORT

A. Provide supports for raceways as specified in Section 27 41 02 – Hangers and Supports for Audiovisual Systems.

B. All raceways installed in exposed dry locations shall be grouped in a like arrangement and supported by means of conduit straps, wall brackets or trapeze hangers in accordance with Code and the requirements of the this Section and Section 27 41 02 – Hangers and Supports for Audiovisual Systems. Fasten all hangers from the building structural system.

C. Provide supports and mounting attachments per the most restrictive of Code and the following.

Raceway Size (inches)	No of cables in run	Location	Support Spacing (feet)	
			RSC	EMT
Horizontal Runs				
½, 3/4	1-2	Flat Ceiling Wall Runs	5	5
½, 3/4	1-2	Where access limited to building structure	7	7
½, 3/4	3≥	Any location	7	7
1≥	1-2	Flat ceiling or wall	6	6
1≥	1-2	Where access limited to building structure	10	10
1≥	3≥	Any locations	10	10
Any	Any	Concealed	10	10
Vertical Runs				
½, 3/4	Any	Exposed	7	7
1, 1-1/4	Any	Exposed	8	8
1-1/2≥	Any	Exposed	10	10

D. Install no more than one coupling or device between supports.

E. Conduit support
   1. As specified in Section 27 41 02 – Hangers and Supports for Audiovisual Systems

F. The Owner's Representative reserves the right to request additional supports where in their sole opinion said supports are required. Any additional supports shall be installed at no additional cost to the Owner.

3.6 PENETRATIONS

A. Gypsum Wall Board Penetrations: Provide circular penetrations maximum 1/8" inch larger than outer diameter of conduit being used. On both sides of the wall fill space between conduit and wall with joint compound, depth to match gypsum board thickness.

B. Install UL listed fire-stop system whenever a raceway penetrates a firewall in conformance with the manufacturer's directions, the published systems assembly requirements, CBC Section 709 and 710 and CEC 300-21, whichever is the most restrictive. At cable tray penetrations, provide pillow type removable fire stop per CBC Section 709 and 710, the published systems assembly requirements and the manufacturer's directions, whichever is the most restrictive.

C. All Audiovisual systems conduit openings in walls and floors are the responsibility of the Contractor. Install sleeves shown on the drawings when the concrete is poured. Any openings required after the concrete has set maybe core drilled.

3.7 RACEWAY INSTALLATION, GENERAL

A. Raceway runs are shown schematically. Install concealed unless specifically shown otherwise. Supports, pull boxes, junction boxes and similar generally not indicated. Provide where designated.
   1. Install exposed conduit and raceway parallel and perpendicular to nearby surfaces or exposed structural members, and follow the surface contours. Level and square conduit and raceway runs.
   2. Raceway runs shall be mechanically and electrically continuous between all each equipment rack and utility demarcation point, receptacle and/or surface raceway strip, as applies.
   3. Each conduit shall enter and be securely connected to a cabinet, junction box, pull box, or outlet by means of a locknut on the outside and a bushing on the inside or by means of a liquid-tight, threaded, self-locking, cold-weld type wedge adapter.
   4. Bends
      a. All bends or elbows shall have a minimum radius as follows:

Conduit Size	Min. Radius (Inches)
3/4"	8
1"	12
1-1/4"	18
2"	24
2-1/2"	24
3"	30
3-1/2"	30
4"	30
5"	36

6"	42

b. Use factory elbows or machine bends for conduit bends 1-1/4" and larger.

5. Make bends and offsets so the inside diameter is not effectively reduced. Make bends in parallel or banked runs from the same center line so that the bends are parallel.
6. Install at least one (1) 3/8", 200 pound strength nylon pull cord in all empty raceways.
7. Raceways crossing building expansion joints or in straight runs exceeding 100 feet shall be provided with UL listed expansion fittings.
8. Install conduit seals and drains to prevent accumulated moisture in conduits from entering Audiovisual System enclosures.

B. Do not install conduit in concrete slabs unless specifically directed by Owner's Representative. Embedded conduits in concrete slab walls, and columns shall be installed in center third between upper and lower layers of reinforcing steel as directed by the Owner's Representative. Space conduits 8" on center except at cabinet locations where slab thickness shall be increased as directed by the Owner's Representative.

C. All conduits to be kept 12" away from steam or hot water lines. Install horizontal conduit and raceway runs below water and steam piping.

D. Conduit dropping down to equipment shall be as straight as possible without any offsets, parallel or perpendicular to walls, ceilings and other building features.

E. Conduit installed on any equipment shall be run symmetrical with the equipment and in such a manner as to:
1. not to be exposed to damage;
2. not interfere with access to components of the equipment that will interfere with maintenance operation or;
3. not to be in a manner that the Owner deems detrimental to its operation.

F. Whenever an installation such as that listed occurs, the Contractor shall make all necessary changes at no additional cost to the Owner.

G. All cut ends of conduit, scratches, tool marks, etc. on any metallic raceway installed in the ground or on the exterior of the building shall be treated with two coats of specified Touch Up Paint/Tape.

H. Exposed conduit and metallic surface raceway installed in finished spaces shall be painted to match surrounding surfaces using paint and methods directed by the Owner's Representative.

I. All raceways stubbing up into equipment or racks shall be sealed. Raceways with conductors shall be plugged with duct-seal. Spare raceways shall be capped. Prevent foreign matter from entering conduit and raceway; use temporary closure protection. Replace conduits containing concrete, varnish or other foreign material.

J. Complete installation of conduit and raceway runs before starting installation of cables/wires within conduit and raceway.

K. Use specified conduit and raceway fittings that are of types compatible with the associated conduit and raceway and suitable for the use and location. Join and terminate conduit and raceway with fittings designed and approved for the purpose of the conduit and raceway system and make up tight.

L. Where chase nipples are used, align the raceway and coupling square to the box and tighten the chase nipple so no threads are exposed.

M. Horizontal conduit or EMT runs, where required and permitted, shall be installed as close to ceiling or ceiling beams as practical.

N. Conduit and EMT connected to wall outlets shall be run in such a manner that they will not cross water, steam or waste pipes or radiator branches.

O. Conduit and EMT shall not be run through beams, purlins or columns except where permission is granted by Owner's Representative in writing.

P. Bond installed metallic raceway in accordance with the requirements of the CEC.

3.8 HAZARDOUS LOCATIONS

A. Use rigid steel conduit only.

B. Install UL listed sealing fittings that prevent passage of explosive vapors in accordance with the manufacturers written instructions. Locate fittings at suitable, accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank coverplate having a finish similar to that of adjacent plates or surfaces.

C. Install raceway sealing fittings at the following points and elsewhere as indicated:
1. Where conduits enter or leave hazardous locations.

END OF SECTION

SECTION 27 41 06 NOISE AND VIBRATION CONTROLS FOR AUDIOVISUAL SYSTEMS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provisions of:
   1. Flexible Audiovisual raceway connections to vibrating machinery
   2. Sealing of Audiovisual device boxes related installed in sound rated walls.
   3. Coordination of airtight installation requirements at Mechanical and Electrical Rooms and/or duct enclosures.

1.2 RELATED WORK IN OTHER SECTIONS

A. Consult all other Sections, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete installation.
   1. Division 15
      a. Energy Management Panels mounted on vibrating equipment connected to the Audiovisual Work.
   2. Division 27
      a. UPS equipment connected to the Audiovisual Work.
      b. Section 27 41 03 - Conduits and Backboxes for Audiovisual Systems

1.3 REFERENCES

A. American National Standards Institute (ANSI)
   1. ANSI/UL 1479-2003 Fire Tests of Through Penetration Firestops

B. American Society for Testing and Materials (ASTM)
   1. ASTM E814-02 Standard Test Method for Fire Tests of Through Penetration Fire Stops.

C. Underwriters Laboratories, Inc. (UL)
   1. UL Fire Resistance Directories

1.4 SUBMITTALS

A. Comply with the requirements of Section 01 33 23 - Shop Drawings, Product Data and Samples and Section 27 41 00 – Common Work Results for Audiovisual Systems.

PART 2 - PRODUCTS

2.1 FLEXIBLE AUDIOVISUAL CONNECTIONS:

A. Make Audiovisual connections to vibrating equipment flexible as follows:
   1. For conduit over 1" O.D. make Audiovisual connections to vibrating equipment via a flexible expansion/deflection conduit coupling sized as required. Coupling shall have flexible and watertight outer jacket, internal grounding strap, plastic inner sleeve to maintain smooth wireway, and end hubs with threads to fit standard threaded metal conduit.
   2. Manufacturers:

a. XD Xpansion Deflection Coupling by Crouse-Hinds of Syracuse, N.Y.
b. Type DF Expansion and Deflection fitting by Spring City Electrical Mfg. Co.
c. or equal.

3. For conduit under 1" O.D. utilize FLEX or LIQUIDTIGHT conduit as specified in Section 27 41 03 – Conduits and Backboxes for Audiovisual Systems with slack at least 3' or 15 diameters long, whichever is the longer or provide a flexible coupling as defined above.

2.2 J-BOX MASTIC:

A. At all electrical boxes penetrating sound isolating partitions, utilize sheet form adhesive mastic as directed elsewhere herein

B. Manufacturers:
1. Insul-Pad by Dottie Corp.
2. Duct-Seal by Gardner Bender, Inc.
3. Duxseal by Manville
4. Outlet Pad by Lowry
5. or equal.

2.3 RESILIENT PENETRATIONS:

A. For conduit:
1. Sleeves: Sleeves of appropriate gage galvanized sheet metal shall be formed to at least the thickness of the penetrated construction and 3/4" to 1" larger in each cross-sectional dimension than the penetrating element.
a. Manufacturers:
i. Century-Line Sleeves by Thunderline Corporation
ii. Custom by Contractor
iii. or equal.
2. Batt: Glass fiber of batt or mineral wool, 1 to 3 lb./cu. ft. density.
a. Manufacturers
i. Certain-Teed
ii. Johns-Manville
iii. Owens-Corning
iv. or equal.
3. Acoustical Sealant:
a. Manufacturers
i. DAP
ii. Pecora
iii. Tremco
iv. U.S. Gypsum
v. or equal.
4. Firestop Sealant:
a. Where required, resilient firestop caulking may be used in lieu of Acoustical Sealant when installed in strict conformance with the manufacturer's directions. Fully hardened firestop caulk shall develop a Shore A hardness of no greater than 35. Refer to the requirements of Section 27 41 03 – Conduits and Backboxes for Audiovisual Systems.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS, CONNECTION TO VIBRATING EQUIPMENT

A. The Contractor shall not install any vibrating equipment or conduit attached thereto which makes rigid contact with the "building" unless it is approved in this specification or by the Owner's Representative. "Building" includes, but is not limited to slabs, beams, columns, walls, partitions, ceilings, studs, ceiling framing and suspension systems.

B. Prior to installation, the Contractor shall bring to the Owner' Representative's attention any conflicts between trades which will result in unavoidable rigid contact at equipment, conduit, piping, ducts, etc., as described herein, due to inadequate space or other unforeseen conditions. Corrective work necessitated by conflicts after installation shall be at the responsible contractor's expense.

C. The Contractor shall obtain inspection and approval from the Owner's Representative of any installation to be covered or enclosed, prior to such closure.

3.2 INSPECTION OF CONDITIONS:

A. Examine related Work and surfaces before starting Work of this Section. Report to the Owner's Representative, in writing, conditions which will prevent proper provision of this work. Beginning the Work of this Section without reporting unsuitable conditions to the Owner's Representative constitutes acceptance of such conditions by Contractor. Perform any required removal, repair, or replacement of this Work caused by unsuitable conditions at no additional cost to the Owner.

B. Coordination
   1. Coordinate with the work of the Base Building Construction Contract. Coordinate Work of this Section with all other impacted trades.

3.3 INSTALLATION REQUIREMENTS, FLEXIBLE ELECTRICAL CONNECTIONS

A. The installation of flexible electrical connections to vibration isolated equipment shall in no way impair or restrain the function of the vibration isolation installed by the work by Others.
   1. Using gross slack. Install flexible conduit in a grossly slack loop form or shallow "U" form. Install stranded conductors with sufficient slack to accommodate maximum possible movement.
   2. Using flexible coupling. The flexible coupling shall be free and not in contact with any nearby building construction and shall be installed slack, and free of strain in any direction. Install stranded conductors as above

3.4 INSTALLATION REQUIREMENTS, J-BOX MASTIC

A. Application: All Audiovisual Systems work in sound isolating assemblies, including but not limited to residential rooms, offices, mechanical rooms, electrical rooms and related to utilize backboxes for all services, including but not limited to low voltage communication. Installation of backboxes to conform with following:
   1. Space outlet boxes on opposite faces of the wall by more than 24" o.c. Where daisy chainned conduits indicated on the plans, connect such boxes by slack flexible conduit (2 times longer than distance between outlets).
   2. Cutouts for electrical boxes and penetrating piping/conduit shall be no more than 1/4" oversize.
   3. Caulk gap between drywall and electrical boxes and/or piping/conduit airtight with Acoustical

Sealant. Apply J-Box mastic to back of all penetrating electrical boxes and press firmly at joint to wallboard to provide an airtight seal.

3.5 INSTALLATION REQUIREMENTS, RESILIENT PENETRATIONS

A. Penetrations included in this Section of the Specifications include all Audiovisual conduit connected to vibrating equipment within 30 feet of such equipment

B. Method for round or rectangular penetrations.
   1. Cut a clean opening in the penetrated construction very nearly the size of the sleeve for each penetrating element. Provide lintels above, relief structure below and vertical framing between and to the sides, as required. Provide the above, escutcheon plates and such related construction as is necessary to make the penetrated structure as solid and massive near the penetrations as the surrounding construction.
   2. Set the metal sleeve into the penetrated construction in an airtight manner around its outer periphery, using grout, dry packing, plaster or drywall compound full depth and all around - but only to a maximum width of ½" - or the requirements of the above paragraph shall not have been satisfied.
   3. Pack annular opening with glass fiber between metal sleeve and penetrating element full depth, all around to a firm degree of compaction. Leave a ½" deep annular opening free at each end of the metal sleeve; fill this fully with sealant.

3.6 MECHANICAL AND ELECTRICAL ROOMS REQUIREMENTS

A. All mechanical and electrical rooms, plenums, duct shafts and drywall duct enclosures and other enclosures of high noise sources shall be constructed airtight. This means that every precaution shall be taken to maintain construction completely airtight around a room so designated. Construction joints, duct penetrations, electrical boxes, frames, supports, cabinets, doors, access panels, fixtures, etc., all shall be built or installed in such a manner as to prevent sound transmission through any construction enclosing a room horizontally or vertically. Appropriate lintels, frames, blocking, escutcheons, grouting, gaskets, packing, caulking, taping, filling, etc., all shall be employed to prevent sound transmission. Refer to requirements of this Section for Resilient Penetrations.

B. All work under this section is to comply with the above. Contractor to report to Owner's Representative any construction conditions which arise which might compromise compliance with this requirement.

END OF SECTION

SECTION 27 41 07 IDENTIFICATION FOR AUDIOVISUAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY:

A. Provide all labor, materials, tools, and equipment required for permanent intelligible labeling on, or adjacent to, all cabling, connectors, innerduct, faceplates, jacks, receptacles, controls, fuses, circuit breakers, patching jacks, and racks.

B. This section includes minimum requirements for the following:
   1. Labeling Audiovisual Cabling
   2. Labeling Closet Hardware
   3. Labeling Work Stations
   4. Labeling Pathways, Spaces, Grounding and Bonding.

C. Refer to detailed plans for additional requirements.

D. Clearly and distinctly indicate the function of the item.

E. Coordinate with Record Drawings

1.2 REFERENCES:

A. Usage: In accordance with Section 014200 – Definitions, References, and Regulations

B. American Society for Testing and Materials (ASTM)
   1. ASTM D 709(2001) Laminated Thermosetting Materials

C. Electronic Industries Alliance (EIA)
   1. EIA TIA/EIA-606-A(2002) Administration Standard for Commercial Telecommunications Infrastructure (ANSI/TIA/EIA-606)

D. Underwriters Laboratories (UL)
   1. UL 969 (1995; R 2001) Marking and Labeling Systems

1.3 QUALITY ASSURANCE

A. Identification and administration work specified herein shall comply with the applicable requirements of:
   1. ANSI/TIA/EIA – 606-A Administration Standards.
   2. ANSI/TIA/EIA – 569B Pathway and Spaces
   3. ANSI/TIA/EIA – 568B Telecommunications Cabling Standard.
   4. BICSI Telecommunications Distribution Methods Manual.
   5. UL 969 (1995; R 2001) Marking and Labeling Systems.

1.4 SUBMITTALS

A. Conform with the requirements of Section 013300 – Submittal Procedures and Section 27 41 00 - Common Work Results for Audiovisual Systems.

1.5 DELIVERY, STORAGE AND HANDLING

A. Procedures: In accordance with Section 011100 – Summary of Work.

1.6 SEQUENCING

A. Not Used.

PART 2 - PRODUCTS

2.1 COMMUNICATION CABLING LABELS, INTERIOR

A. Shall meet the legibility, defacement, exposure and adhesion requirements of UL 969.

B. Shall be preprinted or computer printed type. Hand written labels are not acceptable.

C. Provide vinyl substrate with a white printing area and black print. If cable jacket is white, provide cable label with printing area that is any other color than white, preferably orange or yellow – so that the labels are easily distinguishable.

D. Shall be flexible vinyl or other substrates to apply easy and flex as cables are bent.

E. Shall use aggressive adhesives that stay attached even to the most difficult to adhere to jacketing.

F. Manufacturers:
   1. Cable Type – Audiovisual Cabling, General Purpose
      a. Brady TLS2200 labels – PTL-31-427,PTL-32-427
      b. Brady Laser tab labels – LAT-18-361, LAT-53-361
      c. Hubbell
      d. Leviton
      e. Panduit.
      f. or equal.
   2. Cable Type – RG-6 Coax
      a. Brady TLS2200 labels – PTL-31-427, PTL-32-427
      b. Brady Laser tab labels –LAT-18-361, LAT-53-361
      c. Panduit.
      d. or equal.
   3. Cable Type – RG-59 Coax
      a. Brady TLS2200 labels – PTL-31-427, PTL-32-427
      b. Brady Laser tab labels – LAT-18-361, LAT-53-361
      c. Panduit.
      d. or equal.
   4. Cable Bundles
      a. Brady TLS2200 labels – PTL-12-109
      b. Panduit.
      c. or equal.

2.2 GROUNDING AND BONDING, PATHWAY, AND SPACE LABELS

A. Shall meet the legibility, defacement, exposure and adhesion requirements of UL 969.

B. Shall be preprinted or computer printed type. Hand written labels are not acceptable.

C. Manufacturers:

1. Brady Corporation
    a. TLS2200 labels
        i. PTL-20-422, Size 2.0” x 1.0”
        ii. PTL-22-422, Size 3.0” x 1.0”
        iii. PTL-37-422, Size 3.0” x 1.9”
        iv. PTL-23-422, Size 4.0” x 1.0”
        v. PTL-38-422, Size 4.0” x 1.0”
    b. Laser tab labels
        i. LAT-13-747, Size 1.875” x 0.833”
        ii. LAT-24-747, Size 1.75” x 1.0”
        iii. LAT-32-747, Size 3.0” x 0.9 “
        iv. LAT-33-747, Size 2.0” x 1.437”
        v. LAT-34-747, Size 3.0” x 1.437”
    c. Continuous tape for TLS2200
        i. PTL-8-422, Size 0.5” white polyester
        ii. PTL-8-430, Size 0.5” clear polyester
        iii. PTL-8-439, Size 0.5” white vinyl
        iv. PTL-42-439, Size 1.0” white vinyl
        v. PTL-43-439, Size 1.9” white vinyl
2. Panduit.
3. or equal.

2.3 NAMEPLATES

A. Field Fabricated Nameplates
    1. Features/Function/Construction
        a. Provide laminated plastic nameplates for each equipment enclosure, relay, switch, and device; as specified or as indicated on the drawings.
        b. Comply with ASTM D 709.
        c. Each nameplate inscription shall identify the function and, when applicable, the position.
        d. Nameplates shall be melamine plastic, 0.125 inch thick, white with black center core.
        e. Surface shall be matte finish.
        f. Corners shall be square.
        g. Accurately align lettering and engrave into the core.
        h. Minimum size of nameplates shall be one by 2.5 inches.
        i. Lettering shall be a minimum of 0.25 inch high normal block style

PART 3 - EXECUTION

3.1 GENERAL

A. Apply labeling to clean surfaces free of oil, dust, solvents or loose material.

B. Apply after Project painting in area of application is complete.

C. Apply to locations where labeling will not be damaged, covered over or in the way of the ordinary maintenance and operation of the installed Audiovisual infrastructure or system.

D. Apply labeling right side up, parallel to major edges of surfaces to which it is applied. When no line is evident, apply parallel to floor line. Correct conditions of labeling applied out of true.

E. Protect installed labeling from damage.

F. Replace labeling that is defaced, illegible or peeling off of the surface to which it is applied.

3.2 IDENTIFICATION & LABELING

A. Pathways
   1. Pathways shall be marked at each endpoint and at all intermediate pull or junction boxes. In the case of partitioned pathways (i.e. innerduct) each partition shall have a unique identifier.
   2. Label pathways using the appropriate abbreviation and a number.
   3. Use adhesive type labels.

B. Labels shall be affixed at the entry to all Audiovisual Control Rooms and spaces (Includes entrance facilities, communication equipment rooms, communication equipment spaces and work areas)
   1. Use adhesive type labels for all Audiovisual space labeling,
   2. Affix labels to entrance doors – coordinate location with Owner's Representative.

C. Cables
   1. Horizontal shall be marked within 12” of each endpoint or to innerduct in which the cable is installed.
   2. Except where installed in innerduct or conduit, all backbone fiber optic cable shall have affixed to the outer jacket, labels of a bright color that contain at least the legend "FIBER OPTIC CABLE." These labels must be affixed at separations no greater than 10 ft.
   3. Any cable installed in conduit shall be labeled at all intermediate pull or junction boxes.
   4. Label cables using the appropriate circuit ID.
   5. Use adhesive type labels for all AV cable labels.
   6. Affix labels to cables – marking cable is not permitted.
   7. Where cable is fully encased in innerduct label the outside of the innerduct with the cable label and, where the contents are fiber optic cabling, the "FIBER OPTIC CABLE" label.

D. Grounding and Bonding
   1. The AVGB(s) (Audiovisual main ground bar) shall be labeled as such with an adhesive type label(s) affix label(s) to TMGB.
   2. The conductor connecting the AVGB (Audiovisual main ground bar) to the building ground shall be labeled at each end with an affixed label in a visible location as close as practicable to the bonding point at each end of the conductor.

E. Firestopping
   1. Each firestopping location shall be labeled at each location where firestopping is installed, on each side of the penetrated fire barrier, within 12 in. of the firestopping material.

END OF SECTION

SECTION 27 41 08 AUDIOVISUAL RACKS, CABINETS, & ACCESSORIES

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Audiovisual racks and cabinets.

B. Production Desks and Mobile Production Racks.

1.2 RELATED WORK IN OTHER SECTIONS

A. Section 27 41 01 – Grounding and Bonding for Audiovisual Systems
   1. Bonds racks and cabinets.

B. Section 27 41 03 – Conduits and Backboxes for Audiovisual Systems
   1. Signal systems raceways at Audiovisual Control Rooms

1.3 REFERENCES

A. American National Standards Institute (ANSI)
   1. EIA-310-D (1992) Cabinets, Racks, Panels, and Associated Equipment (ANSI/EIA/310-D)
   2. ANSI-J-STD-607-A Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications (ANSI/J-STD-607-A-2002)

B. International Conference of Building Officials (ICBO)
   1. AC156 ICBO ES Acceptance Criteria for Seismic Qualification Testing of Nonstructural Components (Jul. 2004)

C. Telecordia Technologies
   1. Network Equipment Building System (NEBS) GR-63-CORE (Seismic Zone 4)

1.4 SUBMITTALS

A. Conform with the requirements of Section 013300 – Submittal Procedures and Section 27 41 00 - Common Work Results for Audiovisual Systems.

1.5 DELIVERY, STORAGE AND HANDLING

A. Procedures: In accordance with Section 011100 – Summary of Work.

PART 2 - PRODUCTS

2.1 GENERAL

A. KEYS
   1. Key all boxes, cabinets, enclosures, panels, controls, doors and related provided for similar usage within a system identically.

2.2 EQUIPMENT ENCLOSURE SYSTEMS

A. General:
   1. Provide enclosure systems including, but not limited to enclosures, cabinets, cases and related

panels and accessories as specified herein. Provide size and quantity as shown on drawings or scheduled.

2. Provide color as shown on drawings. If no color is shown on drawings, submit manufacturer's standard color chips for selection.
3. Provide enclosure systems conforming to the UBC/CBC, latest edition, for seismic design.
4. Equipment Enclosures: Each rack provided with frame angles tapped 10-32, ANSI/EIA 310-D Universal Spaced.

B. Zone 4 Undercounter Slide-Out Rack, Steel Enclosure

1. Drawing Reference: R18

2. Features
   a. Rack cabinet, 1 bay, steel frame mounted, with slide out inner frame for rear access of equipment from front of rack, floor supported.
   b. Zone 4 rated for up to 500 pounds of uniformly distributed load.
   c. 41 useable rack units.
   d. Fan System, 100 cfm minimum mounted into slide out inner frame.
   e. No front except where called for on the plans - at such conditions, provide fully perforated steel door.
   f. No rear doors
   g. Locking side panels.
   h. Open top outer frame
   i. Raised floor base - provide engineered means of support where installation at raised floor conditions are indicated sufficient to maintain racks Zone 4 rating.
   j. Provide vertical power strips in accordance with Section 27 11 26.
   k. Provide sliding shelf.

3. Manufacturer:
   a. Middle Atlantic SRSR-4-12
   b. or equal (No known equal).

2.3 RACK PANELS AND ACCESSORIES

A. Rack Mounting Screws:
1. Screws 10-32; length as required for at least 1/4" excess when fully seated; oval head with black plastic non marring cup washer or equivalent ornamental head; nickel, cadmium or black plated; Phillips, Allen Hex, Square-Tip or Torx drive. Slotted screws are not acceptable.

B. Sliding Shelf:
1. Plan Reference: SLIDING SHELF
2. Construction/Features:
   a. 16 gauge minimum cold rolled steel
   b. Powder coat finish to match rack color, unless otherwise noted
   c. 19" Wide Pull out with handhole or knob.
   d. Solid or perforated surface
   e. Depth: At least 20", u.o.n.
   f. 50 pound minimum load capacity

3. Manufacturers:
    a. Atlas Sound
    b. BGW Systems, Inc. Sliding Shelves
    c. Chatsworth Products 32" Deep Megaframe Sliding Shelf.
    d. Elkay SLSH series
    e. Homaco Adjustable Pull-Out Equipment Shelves
    f. Hubbell MCCTELSHLF
    g. Middle Atlantic Heavy-Duty Sliding Shelf
    h. APW SSDC30.
    i. AFCO AS-SO-19-24.
    j. Or equal.

C. Fixed Shelf - 4 post rack applications
1. Plan Reference(s):
    a. FIXED SHELF
    b. SHELF
2. Construction:
    a. 16 gauge minimum cold rolled steel
    b. Powder coat finish to match rack color, unless otherwise noted
    c. Holds 100 lbs load
    d. Mounts to front and rear rails, U.O.N.
    e. Solid or Perforated bottom panel to suit equipment being mounted.
    f. Depth to equal not less than 75% of depth of equipment rack.
    g. Not more than 1 RU in height.
3. Manufacturers:
    a. Atlas Sound Heavy Duty Shelves, SH series.
    b. BGW Systems, Inc. Rack Mount Trays
    c. Elkay SSH Series
    d. Homaco Adjustable Equipment Shelves and Fixed Dual Shelves
    e. Lowell Rack Mounted Utility Shelves
    f. Middle Atlantic Universal Rackshelves
    g. Rack Innovations, Inc.
    h. ZERO/Stantron Stationary Shelves
    i. AFCO AS-SF-19-24
    j. APW ESDC30.
    k. Hubbell MCCPSHLF
    l. Chatsworth Products 29" Deep Megaframe Fixed Shelves.
    m. or equal

D. Keyboard/Mouse Shelf
1. Drawing Reference: Keyboard/Mouse Shelf
2. Stores fullsize keyboard and mouse inside rack.
3. Upon retraction to rack front, pivots 90 degrees for operator access.
4. Manufacturers
    a. APC 19" Rotating Keyboard Drawer.
    b. Middle Atlantic
    c. or equal.

E. Grommet Panel
   1. Features/Functions/Construction
      a. 1 RU steel or aluminum panel with 18" wide x 1" tall smooth edged opening in face
      b. Cable management panel protrudes below opening perpendicular to rear face.
   2. Manufacturers:
      a. Middle Atlantic BR1
      b. Custom by Contractor using Blank Panel
      c. or equal.

F. Blank Panels:
   1. Construction
      a. 16 gauge minimum cold rolled steel
      b. Powder coat finish to match rack color, unless otherwise noted
   2. Manufacturers
      a. Middle Atlantic Products SB Series.
      b. Atlas Sound S19 Series.
      c. BGW Systems Inc. Flanged Steel Blank Panels
      d. Dukane
      e. Elkay
      f. Lowell Series L3
      g. Zero ZP112000 Series.
      h. Hubbell
      i. or equal.

G. Vent Panels:
   1. Construction
      a. 20 gauge minimum cold rolled steel
      b. 1/8" minimum holes, at least 70% open total panel cross-section.
      c. Powder coat finish to match rack color, unless otherwise noted
   2. Manufacturers
      a. Atlas Sound SVP Series.
      b. BGW Systems Inc. Perforated Vent Panels
      c. House of Metal Enclosures (HOME) Series PRP.
      d. Lowell Series L5
      e. Middle Atlantic Products VT Series.
      f. Zero.
      g. or equal.

H. Drawers
   1. Construction
      a. 16 gauge minimum cold rolled steel
      b. Powder coat finish to match rack color, unless otherwise noted
      c. Suitable for mounting from face of 4 post rack
      d. At least 14-1/2" deep.
      e. Full extension ball bearing slides with trigger release disconnect.
      f. Rated for at least 100 pound load.
      g. Flush handle does not protrude from drawer face.

h. Provide key lock where indicated.

2. Manufacturers
   a. BGW Systems Inc. Rack Mount Drawer Systems.
   b. Middle Atlantic Heavy Duty D or TD series.
   c. Atlas Sound SD*-165FP Series.
   d. Elkay SSD Series.
   e. or equal.

I. Vertical Lacer Strips
   1. 44RU high vertical steel strips with points for attachment of velco cable ties at at least 6" o.c.
   2. Manufacturers:
      a. Middle Atlantic LACE-44LP
      b. APW
      c. or equal.

J. Horizontal Lacer Bars
   1. EIA 19" Width steel strips or bars suitable to provide support to large cable dressed horizontally through racks
   2. Size to suit load and mounting width.
   3. Manufacturers:
      a. Middle Atlantic LBP-1R4, LBP-1.5 and LBP-1S.
      b. APW
      c. or equal.

K. Seismic Hold-down Equipment Straps
   1. Drawing Reference: None - Provide as required to secure equipment that cannot be screw fastened to mounting shelves.
   2. Manufacturers:
      a. BGW Systems
      b. Everest Electronic Equipment Lock Down Kit
      c. Ergotron
      d. Chatsworth Products
      e. Middle Atlantic Products
      f. Q-Safety, Inc.
      g. or equal.

PART 3 - EXECUTION

3.1 MOUNTING

A. Unless otherwise noted, all floor supported equipment racks shall be bolted to the structure in accordance with the requirements of the CBC, the UBC and the contractors approved structural engineering submittal demonstrating the method to be used to conform to these requirements.

B. Rows of identical racks shall be bolted together in addition to being bolted to the floor and bonded to form a single electrical ground plane.

C. Wall mounted equipment racks and cabinets shall similarly be bolted to structural members in accordance with the requirements of the CBC, the UBC and the contractors approved structural engineering submittal demonstrating the method to be used to conform to these requirements.

3.2 EQUIPMENT ENCLOSURE (RACK) AND EQUIPMENT BACKBOARD FABRICATION

A. Combustible material, other than incidental trim of indicated equipment, is prohibited within equipment racks.

B. Provide permanent labels for all equipment and devices.

C. Floor racks to be bolted floor unless otherwise indicated.

D. Access shall not require demounting or de-energizing of equipment. Install access covers, hinged panels, or pull-out drawers to insure complete access to terminals and interior components.

E. Provide a permanent label on the front of each equipment rack including the rack designation, and the circuit breaker number and associated electrical distribution panel designation servicing same.

F. Where wiring of mixed types are called for on the plans, maintain separation of wiring classifications as specified in the individual sections of the Audiovisual Work. Separately dress, route and land microphone, audio line level and data cables and related on the right side of the equipment enclosure, as viewed from the rear; dress, route, and land loudspeaker level, data and control cables on the left side of the equipment enclosure, as viewed from the rear.

G. Provide vertical wire management of cabling within the rack independent of the adjustable EIA mounting rails. Vertical wiring management provided by the contractor within the rack shall not prevent such rails from being moved as required by the Owner.

H. Dress and support cabling at a minimum of 24 inch on center.

I. Access shall not require demounting or de-energizing of equipment or cabling. Install access covers, hinged panels, or pull-out drawers to insure complete access to terminals and interior components.

J. Fasten removable covers containing any wired component with a continuous hinge along one side, with associated wiring secured and dressed to provide an adequate service loop. Provide an appropriate stop locks to hold all hinged panels and drawers in a serviceable position.

K. Provide permanent labels for all equipment and devices. Where possible, fasten such labels to the rack frame or to blank or vent panels which will remain in place when active equipment is removed for possible service.

L. At audio and video jackfields, provide service loop to permit removal of jackfields from rack sufficient to conveniently access all jack contacts for routine cleaning and maintenance. Organize the service loop and harness such that reasonable reconnection of jacks and jack normals is possible without cutting apart the harness.

M. Coordinate the design and execution of wire harnessing of multi-bay audio and video rack ensembles with conditions of delivery to installation locations at Project Site, and with the requirement herein for test of the completely wired system in the shop prior to delivery to the Project Site. Organize the wiring harnesses such that they will fold within one shippable unit without risk of damage, or provide polarized multipin connectors and related interconnect systems as specified elsewhere herein.

3.3 SIGNAL GROUNDING & BONDING PROCEDURES

A. Comply with National Electrical Code and the California Electric Code. Bond equipment racks to ground in accordance with the California Electric Code and ANSI/ EIA/ TIA 607 and Section 27 41 01 – Grounding and Bonding for Audiovisual Systems.

B. Unless otherwise noted maintain a unipoint ground scheme.

C. Equipment enclosures shall not be permitted to touch each other unless bolted together and electrically bonded.

END OF SECTION

SECTION 27 41 09 AUDIOVISUAL CABLE MANAGEMENT

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Section includes provision of cable management for cabling installed under the work of this Project as well as for Owner furnished patch cords at equipment racks

B. Scope includes:
   1. Innerduct
   2. Cable End Spillway

C. Backboard Cable Management

D. Patch Panel Cable Management at racks and cabinets

1.2 RELATED WORK IN OTHER SECTIONS

1. Section 27 41 03 – Conduits and Backboxes for Audiovisual Systems
2. Section 27 41 07 – Identification for Audiovisual Systems
3. Section 27 41 08 – Audiovisual Cabinets, Racks, Frames and Enclosures

1.3 REFERENCES

A. American Society For Testing and Materials (ASTM)
   1. ASTM D2239-03 Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter

B. Underwriters Laboratories (UL)
   1. UL 910 Test for Flame-Propagation and Smoke-Density Values for Electrical and Optical-Fiber Cables used in Spaces Transporting Environmental Air (Nov. 1998)

1.4 SUBMITTALS

A. Conform with the requirements of Section 013300 – Submittal Procedures and Section 27 41 00 - Common Work Results for Audiovisual Systems.

1.5 DELIVERY, STORAGE AND HANDLING

A. Procedures: In accordance with Section 011100 – Summary of Work.

PART 2 - PRODUCTS

2.1 INNERDUCT

A. Innerduct, Single Chamber
   1. Drawing and spec reference(s):
      a. ID*, Innerduct ("*" denotes cross sectional area of innerduct referenced to standard conduit trade size).
      b. IDP*, Innerduct, Plenum ("*" denotes cross sectional area of innerduct referenced to standard conduit trade size).
   2. Construction:

a. Selected product suitable for:
    i. underground installation in ductbank,
    ii. plenum (IDP)
    iii. exposed, in interior utility rooms where indicated.
b. High density polyethylene.
c. Ribbed or similar exterior construction to resist crushing surface to promote fiber cable installation.
d. Provides an interior chamber with a capacity equal to a trade size conduit referenced above.

3. Approvals:
    a. ASTM D2239(1985) Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.
    b. IDP - UL Standard Test Method 2024 of UL 910.
4. Manufacturers, ID in underground ductbanks:
    a. Carlon Optic-Gard/PE.
    b. Arnco.
    c. Vikimatic.
    d. or equal.
5. Manufacturers, ID in interior, non-plenum applications:
    a. Carlon Optic-Gard/PVC.
    b. Arnco.
    c. Vikimatic.
    d. or equal.
6. Manufacturers, IDP:
    a. Carlon Plenum-Gard.
    b. Arnco.
    c. Vikimatic.
    d. or equal.

B. Innerduct, Multi-Chamber:
1. Drawing and spec reference: #ID*, Innerduct ("#" denotes number of chambers, "*" denotes cross sectional area of each chamber referenced to standard conduit trade size).
2. Construction:
    a. Multi-Chamber Innerduct shall be installed within an outer diameter CRSC or PVC Conduit per manufacturer's recommendation, and as described elsewhere herein.
    b. Shall provide independent interior chambers each with a capacity equal to a trade size conduit referenced above.
3. Approvals:
    a. ASTM D2239(1985) Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.
4. Manufacturers, MultiChamber Innerduct:
    a. AMP OptiDuct (Design Basis) Provide in combinations to meet scheduled requirement.
        i. 3ID1 - Provide one (1) Three Cell innerduct in one-half of a 4" diameter PVC conduit. Each cell to have 1” cross-sectional area.
        ii. 1ID3 - Provide one (1) Single Cell innerduct in one-half of a 4" diameter PVC conduit, with 3" cross-sectional area.
        iii. 2ID1.25 - Provide one (1) Two cell innerduct in one-half of a 4" diameter PVC conduit. Each cell to have 1.25" cross-sectional area.

b. Carlon Multi-Gard
c. North Supply Multi-Guard Multi-Cell Conduit.
d. Tamaqua.
e. or equal

5. Manufacturers - Independent InnerDuct runs in overall PVC conduit - Multiple runs of single chamber inner duct may be provided in lieu of single, multiple chamber innerduct provided above. Contractor bears burden of selected innerduct quantity to provide an exact match of cross-sectional area of each chamber of multi-chamber assembly and to re-size overall PVC conduit to accommodate this use.
   a. Carlon.
   b. American Plastics
   c. Vikimatic
   d. Or equal
6. Manufacturers, for direct burial or boring:
   a. Tamaqua
   b. Carlon
   c. Or equal

C. Innerduct, UV Rated
   1. Drawing Reference: ID, UV Rated*, where"*" denotes cross sectional area of each chamber referenced to standard conduit trade size).
   2. Approvals:
      a. ASTM D2239(1985) Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.
   3. Construction.
      a. Listed for UV exposure.
   4. Manufacturers:
      a. Tamaqua Plus II Series Telecom Duct.
      b. Allwire Black AllDuct.
      c. or equal.

D. Woven Mesh Innerduct
   1. Drawing Reference: MID, WMID
   2. Features/Functions
      a. Three inch wide woven mesh assembly contains at least three continuous pullable sleeves, each can accommodate a cable of at least 1” diameter.
      b. Systems providing fewer than 3 integrally woven sleeves per WMID assembly not acceptable.
      c. Includes color coded pull tape in each sleeve.
      d. Pre-Lubricated for cable pulling
      e. Non-Hydroscopic
      f. 2500 Pound Tensile Strength
      g. 480 degree F melting point.
      h. At least 5 years prior field use including at least 25 million feet of product in use.
      i. Provide plenum rated assembly at plenum locations as defined by the California Electric Code.
   3. Manufacturers:
      a. Maxcell/TVC 3” 3-cell in three unique colors per duct.

b. or equal (No known equal with identical 3 sleeves woven into a single assembly nor equal industry usage).

2.2 CONDUIT CABLE MANAGEMENT

A. Conduit End Waterfall Spillway
   1. Drawing Reference: CEW
   2. Features/Functions
      a. Spillway fastens to end of EMT conduit, provides radius sweep, open on top, solid from below
      b. Maintains proper bend radii for fiber/cable
      c. Provides tie points for fire pillow retention
      d. Supports up to 100 lbs. of hanging fiber/cable
      e. Clamp for securing to EMT
      f. Self-fastening tie down system for supporting cabling
   3. Construction:
      a. Fire Retardant ABS
   4. Manufacturers:
      a. Bejed BJ-2049 Spillway.
      b. or equal (no known equal).

PART 3 - EXECUTION

3.1 INNERDUCT INSTALLATION

A. Schedule of Application
   1. At plenum tray conditions, provide IDP.
   2. At 4” and larger interior conduits, provide WMID. Provide plenum rated WMID at plenum ceiling conditions.

3.2 CONDUIT END WATERFALL

A. Fasten securely to conduit end wherever cabling will exit conduit 18" or more above the cable tray to prevent damage due to cabling due to weight of cable bearing on a conduit end.

B. Secure cabling with integral cable restraint system.

END OF SECTION

SECTION 27 41 16 INTEGRATED AUDIOVISUAL SYSTEMS AND EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Provide all labor, materials, transportation and equipment to complete the furnishing, installation, assembly, set up, and testing of the Sound and Audiovisual System work indicated on the drawings and specified herein. Notwithstanding any detailed information in this Section, provide complete, working systems.

B. Design, engineer and provide complete, all means of support, suspension, attachment, fastening, bracing, and restraint (hereinafter "support") of the Work of this Section. Provide engineering of such support by parties licensed to perform work of this type in the Project jurisdiction.

1.2 AUDIOVISUAL SYSTEMS AND EQUIPMENT

A. Provide the following, in addition to work shown on the drawings, along with any additional equipment and accessories required for a complete, working system:
   1. Provide and install (N) Audiovisual, DSP, conferencing, and control systems and equipment and Presentation Lectern in Community Room and (4) Conference Rooms at Los Medanos College. Remove and/or relocate existing equipment as indicated.
   2. Confirm code-required clearances at (E) full-height AV equipment rack serving Community Room, adjusting position and re-securing to slab as required to obtain clearance.
   3. Provide and install new loudspeakers, loudspeaker enclosures and mounts, assistive listening equipment, cabling, and conduit to new locations. Commission, aim, test, and verify maximum sound pressure levels of installed devices.
   4. Remove projectors from existing mounts. Install new projectors re-using existing mounts where indicated. Provide new mounting hardware where required.
   5. Remove existing projection screens. Install new tab-tensioned screens with 16:10 aspect ratio viewing area and blackout perimeter.
   6. Install (N) AV equipment and cabling in (E) AV floorboxes and pathway. Remove obsolete cabling and AV connectors/baluns.
   7. Remove abandoned AV connectors throughout spaces cover abandoned AV backboxes with blank faceplates, color to be coordinated with District Representative.
   8. Develop user interface for control systems with District Representative familiar with the operation of Community Room and Conference Room spaces. Provide system programming, training, and support to Owner during first-substantial-use.

B. Loudspeaker/Audio Processing, general:
   1. Program audio and speech content to output through overhead loudspeakers.

C. Racking compartment, general:
   1. Provide blank plates at all unused openings.
   2. Provide fans as required to keep the interior of each equipment rack at a temperature at least 5-10 degrees cooler than equipment manufacturer’s recommended operating temperature.
      a. Fans to emit not more than 30 dB of noise.

D. Control Systems, general:

1. Review all push button and touch panel button nomenclature with Owner Representative prior to system programming.
2. Provide graphic indication of program volume level on control touch panel when volume control l s selected.
3. Provide Main Menu selection button on all touch panel screens to route user back to main touch panel menu.

E. Control Functions:
   a. Control: Confirm all control functions and layouts with Owner Representative prior to system programming.
   b. Functions to operate by scene/mode, not by device.
   c. Provide user-interface (manual) selection to operate system in unified or subdivided modes, depending on how the ballroom's moveable partitions are configured.
   d. End user selection of a single A/V input source (push buttons) automates:
      i. Presets recalled.
      ii. Sets audio chain to loudspeakers.
   e. End user selection on an Audio Only input automates:
      i. Sets audio chain.
   f. Touch Panel Menus:
      i. Startup Page: "Press here to Begin"
      ii. Home Page:
         (1) "Select Source": provides sub-menus of source selections.
         (2) "Power Off": Provides sub-menu selection of "Do you want to power off the system?" with "Yes" and "No" selections. Upon selection of "Yes", menu reads "Please wait, shutting down system."
      iii. All menus, except Home Page, to include "Home" button to revert back to Home Page.

1.3 REFERENCE STANDARDS

A. Conform to the applicable portions of the current standards published by these organizations:
   1. SMPTE Society of Motion Picture and Television Engineers.
   2. NAB National Association of Broadcasters.
   3. EIA Electrical Industries Association of America.
   4. UL Underwriters Laboratories.
   5. AES Audio Engineering Society.
   6. NEC National Electrical Code.
   7. UBC Uniform Building Code.
   8. NFPA National Fire Protection Association.
   9. EIAJ Electrical Industries Association of Japan.
   10. IEC International Electrotechnical Commission.
   11. FCC Federal Communications Commission.
   12. NTC Network Transmission Committee of the Video Transmission Engineering Advisory Committee.
   13. NCTA National Cable Television Association.
   14. BTSC Broadcast Television Stereo Committee.
   15. TASO Television Allocation Study Organization.

B. Conform additionally to the following specific standards:
   1. American National Standards Institute (ANSI)
      a. ANSI S1.4-1983 (R2001) American National Standard Specification for Sound Level Meters
      b. ANSI S1.11-1986 (R2001) American National Standard Specification for Octave-Band and Fractional Octave-Band Analog and Digital Filters
      c. ANSI S1.42-1986 (R2001) American National Standard Design Response of Weighting Networks for Acoustical Measurements
      d. ANSI IT 7.214-89 Audio-visual Systems - Front Projection Screens (Tripod/Free-Standing) - Methods for Testing and Reporting Performance Characteristics.
   2. Audio Engineering Society Incorporated (AES)
      a. AES2-1984 (r1997) AES Recommended Practice Specification of Loudspeaker Components Used in Professional Audio and Sound Reinforcement
      b. AES5-1998 (Revision of AES5-1984) AER recommended practice for professional digital audio – Preferred sampling frequencies for applications employing pulse-code modulation
      c. AES14-1992 (r1998) AES standard for professional audio equipment – Application of connectors, part 1, XLR-type polarity and gender
      d. AES20-1996 AES recommended practice for professional audio – Subjective evaluation of loudspeakers
      e. AES26-2001 Revision of AES26-1995 AES recommended practice for professional audio interconnections – Conservation of the polarity of audio signals
      f. AES-R2-1998 AES project report for articles on professional audio and for equipment specifications – Notations for expressing levels
   3. Electronic Industries Association of America (EIA)
      a. EIA-160 Sound Systems
      b. EIA-310-E Racks, Panels and Associated Equipment
      c. EIA-101-A Amplifiers for Sound Equipment
      d. SE-103 Speakers for Sound Equipment
      e. SE-104 Engineering Specifications for Amplifiers for Sound Equipment
   4. International Electrotechnical Commission (IEC)
      a. IEC 268-3 (1988) Sound system equipment – Part 3: Amplifiers
      b. IEC 268-5 (1989) Sound system equipment – Part 5: Loudspeakers
      c. IEC 268-12 (1987) Sound system equipment – Part 12: Application of Connectors for Broadcast and Similar Use
      d. IEC 651 (1979) Sound level meters
   5. International Organization for Standardization (ISO)
      a. ISO 1996-1 Acoustics – Description and measurement of environmental noise – Part 1: Basic quantities and – Composite Analog Video Signal – NTSC for Studio Applications
   6. Federal Specifications (FS)
      a. GG-S-00172D Screen, Projection. Federal Supply Classification (FSC) 670.
   7. Federal Standards (Fed-Std)
      a. 191A Textile Test Methods.
         i. 5760 Mildew Resistance of Textile Materials; Mixed Culture Method.
         ii. 5903.1 Flame Resistance of Cloth; Vertical.
   8. NFPA
      a. 255 Method of Testing Surface Burning Characteristics of Building Materials.
      b. 701 Methods of Fire Tests for Flame-Resistant Textiles and Films.
   9. Society of Motion Picture Engineers (SMPTE).

a. SMPT 196M-86 Motion Picture - Screen Luminance and Viewing Conditions - Indoor Theater Projection Guide.
b. SMPTE 202M-1998 Motion Pictures – B Chain Electroacoustic Response – Dubbing Theaters, Review Rooms and Indoor Theaters
c. SMPTE RP167-1995 Alignment of NTSC Color Picture Monitors
d. SMPTE EG1-1990 Alignment Color Bar Test Signal for Television Picture Monitors
e. SMPTE EG27-1994 Supplemental Information for ANSI/SMPTE 170M and Background on the Development of NTSC Color Standards (R1999)
f. RP 94 Recommended Practice for Gain Determination of Front Projection Screens.
g. SMPTE RP 95 Recommended Practice for Installation of Gain Screens.
h. SMPTE RP 98 Recommended Practice for Measurement of Screen Luminance in Theatres.

10. Underwriters Laboratories Incorporated (UL)
a. UL 813 Commercial Audio Equipment 1996
b. UL 1419 Professional Video and Audio Equipment 1997
c. UL 1492 Audio-Video products and Accessories 1996
d. UL 6500 Audio/Video and Musical Instrument Apparatus for Household, Commercial and Similar General Use 1999

1.4 RELATED WORK IN OTHER SECTIONS

A. Section 27 41 01 – Grounding and Bonding for Audiovisual Systems

B. Section 27 41 02 – Hangers and Supports for Audiovisual Systems

C. Section 27 41 03 – Conduits and Backboxes for Audiovisual Systems
1. Raceway system for work of this Project, including floorboxes.

D. Section 27 41 06 – Noise and Vibration Controls for Audiovisual Systems
1. Outlet box pads for the work of this Project.

E. Section 27 41 07 – Identification for Audiovisual Systems

F. Section 27 41 08 – Audiovisual Cabinets, Racks, Frames
1. Floor Mounted and Casework Equipment Racks for the work of this Section.

G. Section 27 41 09 – Audiovisual Cable Management

1.5 QUALITY ASSURANCE

A. Test Equipment - Refer to 27 41 00:
1. Sound Systems:
a. Wide band oscilloscope, 50 MHz, analog. (Example: Tektronix TAS-250 or 2212).
b. True RMS audio digital volt-ohm-millimeter (Example: Fluke 8060A).
c. Integrated audio test set (Example: Audio Precision or Neutrik A1 or A2 System).
d. Acoustic polarity tester (Example: BSS Audio Ltd. Phasecheck System AR 130).
e. Pink Noise generator (Example: Ivie IE-20B).
f. Calibrated microphone and pre-amplifier assembly (Example: Ivie IE-2P preamplifier/power supply with Ivie/ACCO, Bruel & Kjaer, or Larson-Davis microphone capsule).
g. Real time audio spectrum analyzer, one-third octave (Example: Ivie IE-30A or JBL Smaart system).

h. Frequency/time audio analyzer (Example: Crown TEF system or JBL Smaart system).

B. Baseband Video Systems:
1. Wide band oscilloscope, 50 MHz, analog. (Example: Tektronix TAS-250 or 2212).
2. Analog composite test generator (Example: Tektronix TSG 170A or TSG 100 Opt. 01).
3. Analog composite waveform/vector monitor (Example: Tektronix 1740A or WFM 90.)

C. RGBHV Wideband Component Analog Video Systems:
1. Wide band oscilloscope, 200 MHz, analog. (Example: Tektronix TAS-485).
2. RGBHV test generator (Example: Extron VTG 100).

D. Projection Systems:
1. Luminance meter. (Example: Tektronix J17/J18 with J1803 8 degree luminance head.).
2. Grey scale chart.
3. Precision optical comparator. (Example: Phillips or Tektronix J17/J18 with J1810/J1820 chromaticity head.).

E. High-bandwidth Digital Content Protection (HDCP) check
1. Quantum Data 882E HDMI-HDCP Compliance Test Tool

F. Any other items of equipment or materials required to demonstrate conformance with the Contract Documents.

1.6 SUBMITTALS

A. Conform with Section 27 41 00 - Common Work Results for Audiovisual Systems

1.7 CONFLICTS

A. Present any conflicts between codes, regulations, specifications and/or requirements at least thirty (30) days prior to the commencement of the scheduled work.

1.8 SYSTEM PERFORMANCE REQUIREMENTS, AUDIO-VISUAL SYSTEM

A. Using the listed test equipment, document that the installed systems meet or exceed the performance standards below.

B. Audio Playback and Sound Reinforcement Systems:
1. Electrical Performance; Source Input to Power Amplifier Output:
a. Frequency Response (Equalizer flat): +0.5 dB 30 Hz to 15 kHz.
b. Total Harmonic Distortion (THD): Less than 0.5%, 30 Hz to 15 kHz, +4 dBm line level.
c. Signal to Noise: At least 70 dB, 30 Hz to 15 kHz, referenced to input of +4 dBm.
d. Crosstalk: At least -60 dB, 30 Hz to 15 kHz.
2. Electro/Acoustic Performance:
a. Uniformity of Coverage: ±4 dBA, 5 feet above the floor.
b. Minimum Sound Pressure Level at Center of Target - at indicated aiming point, down centerline of device. 83 dBA, 5 feet above the floor.
3. Equipment: Specified individually.
4. Audio Signal Path: Shall not degrade performance of connected equipment.

C. Video Systems:
   1. Video Signal System: NTSC to EIA RS-170A, except as noted.
   2. Video Signal Path: To EIA RS-250B short haul where equalized, otherwise to the performance limit of the specified video cable.

D. RGBS Video Systems:
   1. Video Signal: Pass 300 Hz to 120 MHz sine wave from any input to any output with losses of less than 1 dB over cable loss at cable manufacturer specified performance points without amplification.

E. Projection and Display Systems:
   1. Consistent with performance of specified displays, projectors and screens.
   2. Brightness, convergence per ANSI standard procedures for device.

F. High-bandwidth Digital Content Protection (HDCP) check
   1. At spaces with HDMI transmission:
      a. Run HDCP check to ensure all devices are HDCP compliant.
      b. Test with sample source device with quantity of HDCP keys as required to operate by the system.

1.9 TRAINING

A. Conduct training on completed system at reasonable convenience of the District during normal business hours.

B. Operator Training: Sixteen (16) hours.

C. Initial Use Support: Provide standby trainer/system engineer during two (2) system uses, each not to exceed four (4) hours of training.

1.10 DEFINITIONS

A. Definitions of Terms: The following definitions and conditions apply to each of the respective parameters and the measurements of those parameters, unless specifically stated otherwise:
   1. Frequency Response: The minimum acceptable frequency band over which the amplitude response is within 3 dB (or any specified range), or the specified limits of the response relative to the reference frequency (1 kHz for audio, 1.0 MHz for video) under design load conditions, at any operating level up to and including the specified maximum output while fully in compliance with all other performance specifications.
   2. Maximum Output Level: The minimum acceptable maximum signal output level (voltage, current or power) attained under design load conditions attained while fully in compliance with all other performance specifications.
   3. Harmonic Distortion: The maximum acceptable harmonic distortion measured at any operating level, up to and including the specified maximum output, with an applied sine wave signal of any frequency in the range of the specified frequency response.
   4. Audio Intermodulation Distortion: The maximum acceptable intermodulation distortion resulting from the introduction of 60 Hz and 7 kHz signals in a ratio of 4:1 under design load conditions at any operating level up to and including the specified maximum output level.

5. Signal to Noise Ratio: The minimum acceptable ratio of signal to noise levels derived from broadband measurements under design load at maximum output over the entire range of the specified frequency response.
6. Clipping Level: The minimum acceptable maximum level of signal applied to the device under design load conditions while fully in compliance with all other performance specifications.
7. Sensitivity: The maximum acceptable level of input signal applied to the device that is necessary to provide the maximum output under design load conditions.
8. Design Load: The load (in ohms) specified by usage of the particular device input or output.
9. Composite Triple Beat Ratio: The ratio of visual carrier level to composite third order distortion products.
10. Cross Modulation Ratio: The ratio of visual carrier level to coherent spurious signal level (i.e. intermodulation products).
11. Carrier to Noise Ratio: The ratio of visual carrier to noise levels derived from broadband measurements under design load at maximum output over the entire range of the specified frequency response.

B. Signal Levels: The following voltage levels shall be considered the standard operating levels for the particular circuitry, unless specifically noted otherwise (0.775 Volt = 0 dBu = 0 dbm for a 600 ohms terminated circuit):
   1. Microphone Circuits: -30 dBu or less.
   2. Audio Line Level Circuits: -30 dBu to +24 dBu; equivalent to -30 dBm to +24 dBm for a 600 ohms terminated circuit.
   3. Loudspeaker Level Circuits: More than +24 dBu.
   4. Video Line Level Circuits: 1.0 Volt, peak to peak composite signal.
   5. Radio Frequency (RF), Television (TV) Circuits: +6 to +72 dBmV (0 dBmV = 1,000 microvolts).

C. Characteristic Impedances: The following operating impedances shall be considered to be the standard operating impedances for the particular circuitry, unless specifically noted otherwise:
   1. Microphone Circuits: 50-250 ohms source, 150-1500 ohms terminating, electrostatically and electromagnetically balanced to ground.
   2. Audio Line Level Circuits: 600 ohms maximum source, 600 ohms minimum terminating, line to line, electrostatically and electromagnetically balanced to ground.
   3. Video Line Level Circuits: 75 ohms maximum source, 75 ohms minimum terminating to shield and signal ground, with Vertical Standing Wave Ratio (VSWR) not to exceed 1.2.
   4. Radio Frequency (RF) Television Circuits: 75 ohms nominal to shield and signal ground, with Vertical Standing Wave Ratio (VSWR) not to exceed 1.2.

1.11 SOFTWARE LICENSING

A. Provide licensing for project specific software programming at programmable devices.

B. Provide licensing and original software copies for each device provided under Work of this Section that uses software for operation, configuration or control.
   1. Provide licensing for required workstation operating systems, and required third party software.
   2. For the Control System, provide a complete copy of the source code, including the device interface driver code modules.

C. Upgrade each software package to the release in effect at the end of the Warranty Period.

PART 2 - PRODUCTS

2.1 POWER AMPLIFIERS AND RELATED

A. Power Amplifiers, General
1. Drawing Symbol: PA [number].
2. Provide the following functions and/or features
a. Employ solid state devices (integrated circuits and/or transistors) throughout and employ positive protection of circuit components.
b. With amplifier input driven 10 dB beyond input level required to produce full rated output, amplifier shall withstand for at least 15 seconds any of the following load conditions without instability or operation of main over current protection (i.e. no blown fuses or circuit breakers).
i. "Short" circuit of 0.1 ohm.
ii. Open circuit (no load).
iii. Standard Reactive Load: 5.4 ohms in series with the parallel combination of 12.5 microhenrys; 800 microfarads and 18.3 ohms resistive.
c. Peak voltage of turn-on and/or turn-off transients not greater than 20 dB below maximum rated amplifier output.
i. Time duration of transients not to exceed 3 seconds.
d. Input level controls for each output channel to be calibrated, stepped attenuators with at least 50 dB range.
i. For 0 to 34 dB of attenuation, steps not to be greater than 2.0 dB.
ii. Attenuators to track calibration within 0.5 dB.
iii. Stepped attenuators are not required at Power Amplifiers where the connected driving source device includes a precision attenuator under digital control with precision not less than that specified herein.
e. Input Connectors: XLR connector or tip sleeve (standard) phone jack or barrier strip.
f. Output Connectors: Standard 0.75 inch spacing "5-way" binding posts, or barrier strip.
g. Where integral cooling fans are provided, such fans shall have a minimum life rating of 50,000 hours at 25 degree Centigrade ambient temperature.
h. Where indicated, provide balanced input, differential or transformer. Provide matching accessory to implement if not a standard feature of the product provided.
i. Listed by a Nationally Recognized Testing Laboratory.
3. Minimum performance requirements with all channels driven
a. Power Output Per Channel: As scheduled on Drawings as Minimum Amplifier (Min Amp) and specified below; continuous average sine wave power into 70 Volt line over a bandwidth of 40 Hz to 20 kHz.
i. Frequency Response: plus 0 dB, minus 0.5 dB, 40 Hz to 20 kHz at rated output.
ii. Total Harmonic Distortion: Less than 0.25 percent at rated output, 40 Hz to 20 kHz.
iii. Intermodulation Distortion: Less than 0.04 percent at rated output using frequencies of 60 Hz and 7 kHz, mixed in a ratio of 4:1.
iv. Input Impedance: 15,000 ohms minimum; unbalanced, or balanced as shown on drawings.
v. Hum & Noise: At least 94 dB signal-to-noise ratio.
vi. Channel Separation: At least 75 dB at 1 kHz.

vii. Phase Shift: Less than plus20 degrees from 20 Hz to 20 kHz.
viii. D.C. Offset: Less than 10 millivolts.

B. Power Amplifiers, 2 Channel, Low Impedance
1. Drawing Symbols
a. PA 25
b. PA100
c. PA200
d. PA300
2. Comply with Power Amplifiers, General, in this Section.
3. Power Output Per Channel, continuous average sine wave power into 8 ohm voice coil impedance, not less than:
a. PA25, 25 Watts
b. PA100, 100 Watts
c. PA200, 200 Watts
d. PA300, 275 Watts
4. Dimensions
a. PA 25, not to exceed 1 rack unit for 2 channels.
b. PA100, PA200 and PA300, not to exceed 3 rack units for 2 channels.
5. Manufacturer, PA25
a. Crown D-45
b. Stewart Electronics
c. Or equal
6. Manufacturer, PA100
a. Crown CL1
b. Crown Cdi in low impedance mode.
c. QSC
d. Stewart Electronics
e. Electro-Voice
f. Peavey
g. Or equal
7. Manufacturer, PA200
a. Crown CL1
b. Crown Cdi in low impedance mode.
c. QSC
d. Stewart Electronics
e. Electro-Voice
f. Peavey
g. Or equal
8. Manufacturer, PA300
a. Crown CL1
b. Crown Cdi in low impedance mode.
c. QSC
d. Stewart Electronics
e. Electro-Voice
f. Peavey
g. Or equal

C. Power Amplifiers, 2 Channel, 70 Volt
   1. Drawing Symbol
      a. PA50-70
      b. PA100-70
      c. PA200-70
      d. PA300-70
      e. PA600-70
   2. Comply with Power Amplifiers, General, in this Section.
   3. Power Output Per Channel, continuous average sine wave power into 70 Volt line impedance, not less than.
      a. PA50-70, 50 Watts
      b. PA100-70, 100 Watts
      c. PA200-70, 200 Watts
      d. PA300-70, 300 Watts
      e. PA600-70, 600 Watts
   4. Dimensions: Not to exceed 3 rack units for 2 channels.
      a. Manufacturer, PA50-70
         i. Stewart CVA-50-1
         ii. Crown
         iii. QSC
         iv. Peavey
         v. Or equal
      b. Manufacturer, PA100-70
         i. Crown CH-1
         ii. QSC
         iii. Peavey
         iv. Or equal
      c. Manufacturer, PA200-70
         i. Crown CH-1
         ii. QSC
         iii. Peavey
         iv. Or equal
      d. Manufacturer, PA300-70
         i. Crown CH-1
         ii. QSC
         iii. Peavey
         iv. Or equal
      e. Manufacturer, PA600-70
         i. Crown CH-2
         ii. QSC
         iii. Peavey
         iv. Or equal

2.2 DISTRIBUTED LOUDSPEAKER ASSEMBLIES AND RELATED

A. Distributed Loudspeakers – Ceiling, Flush-mount
   1. Drawing Reference: SA

2. Complete Assembly to consist of:
   a. 6.5”woofer+tweeter 2-way loudspeaker
   b. 8-ohm, 70v functionality with transformer taps
   c. Nominal Diameter: 6.5”.
   d. Minimum Performance:
      i. Frequency Response 95Hz to 15kHz
      ii. Blind mount back-can
      iii. White
      iv. Pressure Sensitivity: Not less than 91 dB 1 W @ 1M.
3. Manufacturers:
   a. Crestron Saros ICI6T-W-T-EACH
   b. JBL Control 16C/T
   c. Or equal.

B. Compact Package 2-way Program Audio Speakers
   1. Drawing Reference: SP
   2. General:
      a. Two-way speaker system, including
         i. Point source time-coherent driver system, or
         ii. 6-1/2" Woofer and 1" Softdome HF driver
      b. Minimum Features, Functions, Performance:
         i. Frequency Response, on axis: 80Hz to 16kHz + 2.5dB
         ii. Power Handling Capacity: 100 watts rms, as per EIA RS-426-A.
         iii. Pressure Sensitivity: Not less than 90 dB at 1M with 1 watt from 100Hz to 10kHz.
         iv. Nominal Impedance: 4-8 ohms
         v. Dispersion: 120 degrees horizontal, 120 degrees vertical nominal 6dB down at 2 kHz.
      c. Construction:
         i. Maximum Dimensions: 9" (H) x 6" (W) x 5" (D)
         ii. Maximum Weight: 6 lbs.
         iii. Integral anchorage for mounting hardware.
         iv. All direction adjustable anchorage.
         v. Black or White Plastic enclosure, black or white painted grill. Color selected by City's Representative.
   3. Manufacturers:
      a. JBL Control 25 with Omnimount 60 WB mount.
      b. Tannoy T8 or i7 Contour with Omnimount 60 WB mount.
      c. Cambridge Sound Newton Series M60 or M80 with Omnimount 60 WB mount.
      d. QSC Audio
      e. Or equal.

2.3 ASSISTIVE LISTENING SYSTEM (ALS):

A. General
   1. Provide Radio Frequency Type, Frequency Modulated
   2. 72 MHz Assistive Listening band.
   3. Quantity of Devices:

B. ALS Transmitter
   1. Drawing Symbol: ALS TX
   2. Features
      a. Balanced bridging line input.
      b. Rack mounted.
      c. Connector for remote-mounted antenna.
      d. Selectable transmitting frequency.
   3. Manufacturer
      a. Listen Technologies LT-800-072 Stationary Transmitter with LA-326 Rack Mounting Kit
      b. Phonic Ear
      c. Williams Sound Corp
      d. Or equal.

C. ALS Remote Transmitting Antenna
   1. Drawing Symbol: A
   2. Features
      a. Antenna system with mounting hardware, matching specified ALS TX.
   3. Manufacturer
      a. Listen Technologies LA-123
      b. Phonic Ear
      c. Williams Sound Corp
      d. Or equal.

D. Receivers and Accessories
   1. Receiver
      a. Battery powered, rechargeable.
      b. Volume control.
      c. Receptacle for earphone/accessory.
      d. Rechargeable battery.
      e. Tuneable to channel in use by the user.
      f. Quantity: As Scheduled on the plans
   2. Earphone
      a. Ear hung, not inserted in the ear canal.
      b. Hearing-Aid Compatible - For hearing-aid compatible receivers:
      c. Wireless neck loop compatible with “T” coil hearing aids.
      d. Built-in antenna
      e. Operates with provided receivers
   3. Manufacturer
      a. Listen Technologies LR-500-072-0-M-C, LA-164 earphones, and LA-166 neck loops
      b. Phonic Ear
      c. Williams Sound Corp
      d. Or equal.

E. Battery Charger/Storage/Carry Case
   1. Features
      a. Store and charge up to 16 Receivers and related accessories.
      b. Cover, latches and carrying handles.

c. Removable lid.

2. Quantity: To simultaneously recharge each received as scheduled on the plans
   a. Manufacturer
   b. Listen Technologies LA-325
   c. Phonic Ear
   d. Williams Sound Corp
   e. Or equal.

2.4 AUDIO SIGNAL SOURCE AND STORAGE:

A. Ceiling Microphone System
   1. Drawing Reference: CM, CMIC, CMICPROC
   2. Manufacturer:
      a. Sennheiser TeamConnect Ceiling 2
      b. Shure
      c. Or equal.

B. Microphone, Gooseneck, Top-set with Switch
   3. Drawing Reference: GMIC
   4. Features/Functions:
      a. Gooseneck integrated microphone with desktop base with integrated programmable switch and indicator.
      b. Element: Cardioid condenser.
      c. Frequency response: +/- 3 dB, 80 Hz to 15,000 Hz
      d. Output impedance 200 Ohms or less.
      e. Total harmonic distortion: Less than 3% at 110 dB SPL.
      f. Output level (Open circuit Voltage at 1,000 Hz): at least -78.0 dB (0dB= 1 V/microbar).
      g. Maximum SPL: 120 dB.
      h. Signal to noise ratio: 65 dB at 1 kHz at 94 dB SPL.
      i. Power: Phantom (Simplex) 12 to 48 VDC operating range.
      j. Windscreen: Foam or metal and foam.
      k. Gooseneck: Flexible, miniature. Stiff center section, flexible both ends.
      l. LED indicator: On when microphone is on.
      m. Connector: 5 pin circular audio connector, male, on 10 foot cable.
      n. Finish: Flat black.
      o. Length: Approximately 18 inches overall
      p. Base: Weighted desktop base.
      q. Switch: Membrane switch, programmable function. Configure for push on/push off function.
   5. Manufacturer
      a. Shure MX418D/C and accessory mic cable (black).
      b. AudioTechnica ES915C18 Gooseneck Microphone with AT8666RSC Base and accessory mic
      c. Or equal.

B. Digital Signal Processing (DSP) System

1. Drawing Symbol(s): DSP
2. Function/Features:
    a. Implement functions shown on Drawings using Digital Signal Processing (DSP) hardware and software.
    b. System implements in software at least the following functions as indicated on the plans:
        i. AMIX - automatic microphone mixer - MIC and LINE INPUTS as indicated
        ii. REMOTE - Remote power on/off, gain control, auxiliary mixer select, System Mode - controlled through interface to Control System specified elsewhere in this Section.
        iii. DELAY - multi-channel delay, output quantity as indicated with 0-100 ms delay assignable to each output on selection of delay mode operation.
        iv. LEVEL - Gain control under control of REMOTE
        v. X02WAY 24dB - Crossover network, 2 port, 24 dB/octave
        vi. HP - High Pass Filter
        vii. LIM - Limiter
        viii. SHELF - Shelving Filter
        ix. FBX - Automatic Feedback Suppressor
        x. PEQ* - Parametric Equalizer, where * indicates bands provided
        xi. MIX* - Mixer, where * indicates channel count
        xii. LP - Low pass filter
    c. Field reconfigurable functions and parameters.
    d. Performance:
        i. Sample at 48 kHz or greater.
        ii. At least 20 bit input/output quantization.
        iii. Noise performance within 3 dB of theoretical limit.
        iv. Minimum of 24 bit internal processing.
        v. Provide control with true status feedback.
    e. Priority volume attenuator implemented as indicated on the drawings/specification narrative.
3. Manufacturer - DSP System
    a. QSYS 113f
    b. Symetrix Prism
    c. BSS
    d. Or equal.

C. Boundary Microphone, Table-top, Conferencing

1. Drawing Reference: BMIC (note “BMIC PROC” microphone processor may be omitted for products that do not require it)
2. Manufacturer:
    a. MXL AC-404-Z
    b. Shure
    c. Or equal.

D. Radio Frequency Receiver/Wireless Microphone System:

1. Drawing Reference(s):
    a. WMRX

b. WMIC LAV - Wireless Mic, Lavalier
c. Wireless microphone symbol.

2. Provide quantity of complete systems to match quantity of WMIC LAV microphone symbols shown.
   a. Coordinate operating frequency with other UHF local sources, including but not limited to current television operating frequencies and DTV frequency allocations and/or local public safety operating frequencies to eliminate any interference from outside RF sources.
   b. Provide Receiver unit configured for diversity reception.
   c. Allows the expansion of wireless microphone systems by splitting one pair of antennas to multiple receivers. It also amplifies RF signals to compensate for insertion loss that results from splitting signal power to multiple outputs. A single system can support up to four wireless receivers.
3. Function/Features/Performance:
   a. WMRX/WMIC LAV
      i. Operating Range Under Typical Conditions: 100m (300 ft.) Note: actual range depends on RF signal absorption, reflection, and interference.
      ii. Audio Frequency Response (+/– 2 dB): Minimum: 45 Hz; Maximum: 15 kHz
      iii. Total Harmonic Distortion (ref. +/– 38 kHz deviation, 1 kHz tone): 0.5%, typical
      iv. Dynamic Range: >100 dB A-weighted
      v. Operating Temperature Range: –18°C (0°F) to +57°C (+135°F)
      Note: battery characteristics may limit this range
      vi. Transmitter Audio Polarity: Positive pressure on microphone diaphragm (or positive voltage applied to tip of WA302 phone plug) produces positive voltage on pin 2 (with respect to pin 3 of low impedance output) and the tip of the high impedance 1/4-inch output.
4. Manufacturer, WMIC LAV System:
   a. Shure QLXD24/SM58 Digital Wireless Handheld System w/ SM58 Cartridge, Shure QLXD14 Bodypack System, and Shure WCE6T Omnidirectional Condenser Rigid Earset Microphone, tan.
   b. Or equal.

E. Audio-deembedder
1. Drawing Reference: ADE
2. Manufacturer:
   a. C2G CG40695
   b. Extron
   c. Or equal

F. 1x2 Audio Distribution Amplifier
1. Drawing Reference: ADA2
2. Manufacturer:
   a. RDL ST-DA3
   b. Or equal

2.5 CONTROL SYSTEM, SWITCHING AND RELATED

A. General

1. Products provide under this Section shall be made by manufacturers regularly engaged in the production of programmable commercial audio-visual control systems. Such manufacturers shall have at least 5 years prior production experience in the manufacture of such goods.
2. Provide control system to perform functions scheduled on drawings and herein.
   a. System to be field programmable.
   b. Provide programming allowance to implement system as required to provide the functionality indicated herein and as defined by the City during design and construction phase meetings, including closely matching the user interface of the existing control panels used elsewhere at the City in style, color and organization to the extent directed by the City's Representative.
3. In addition to providing programming to meet the requirements outlined in part one of this specification section and as outlined by the City during the reconstruction programming meetings, Contractor to provide an allowance of up to $6000 to implement new functions in the audiovisual systems programming identified by the City after the substantial completion of this project. Allowance may not be expended by the Contractor in completing the base bid scope of work including Warranty defect items.

B. Control Processor Mini

1. Drawing References: MCU4
2. Manufacturer:
   a. Crestron MCU4
   b. Extron
   c. Or equal

C. Control Processor

1. Drawing References: CONTROL
2. Features/Functions/Performance:
   a. Control System shall utilize a processor at no less that of sufficient capacity to provide the indicated control functions without degradation due to system overload.
   b. I/O Ports:
      i. At least 3 RS-232/422/485 Ports.
      ii. At least 8 IR/Serial Ports.
      iii. At least 8 Isolated Relay Ports
      iv. At least 8 I/O Ports.
      v. At least 1 Port for the control system manufacturer's proprietary A/V network.
      vi. At least 1 TCP/IP Ethernet Network connection via an RJ-45 connector.

c. Control System shall be fully compatible with the control system manufacturer's projector and A/V equipment status monitoring and
d. management software.
e. Control System shall include a 10/100 BaseT Ethernet Port that supports
f. all of the following features:
    i. TCP/IP Communications
    ii. DHCP and DNS Support
    iii. IEEE 802.11b and Bluetooth Compatibility
    iv. Native Email Client
    v. Remote Diagnostics
    vi. Remote Program Loading and Administration
    vii. Built-In Web Server
    viii. FAT32 File System for easy data management
    ix. SSL security plug-in
    x. PDA Integration and Control, XPanel PDA - Pocket PC 2002
    xi. WebTablet Integration and Control – Microsoft Tablet PC
    xii. Self Generating Executable GUI, XPanel EXE – Microsoft Family of Operating Systems
    xiii. Self Generating ActiveX powered Microsoft Internet Explorer Integration and Control, XPanel Microsoft Internet Explorer.
    xiv. Self Generating Java powered Web Integration and Control
g. Control System Processor shall utilize a real time, event driven, multitasking, multi-threaded operating system with a dual bus architecture.
h. High speed processor shall communicate directly with Ethernet, control
i. ports and proprietary control network utilizing high-speed, parallel bus
j. infrastructure. Control processors that communicate via a serial bus shall
k. not be accepted.
l. Control processor shall contain sufficient memory for the applications indicated.
m. Control System processor shall utilize a FAT32 file structure.
n. Control System shall support internal communications speed via two, independent communications busses. First control bus speed shall be at least 40 mb/s, second control bus speed shall be at least 300 mb/s.
o. Full API (Applications Interface) directly to control system via TCP/IP for integration with Visual Basic, C++, Java, etc. applications. API support through included control system manufacturer's ActiveX modules and/or their Dynamic Link Library (.DLL) file.
p. Control system manufacturer's to continuously monitor the integrity of the A/V control network for wiring faults, marginal communication
q. performance, network errors – all information is viewable.
r. System Support RS-485 token passing network with data communication for a minimum distance of 5000 feet.
s. Allow proprietary A/V Network network expansion via Ethernet or RS-232 ports, which can allow for high-speed network acceleration.

t. Support a minimum of 253 proprietary network devices simultaneously.
u. Control system shall support object-oriented logic based programming
v. language and a C-like language programming language. Both programming types are supported to run simultaneously and integral to
w. each other.
x. System shall supply Windows-based graphical
y. programming software for drag and drop object oriented programming for the control system operation.
z. System shall provide Windows-based graphical programming software, which is self-documenting in that it generates a symbolic flow diagram printout from the system program.
aa. The control system shall support a variety of wireless communication modes, including one-way and two-way radio frequency and infrared transmission.

3. Provide supplemental AV Network power supplies and network segmentation (C Block) as necessary to conform with the manufacturer's recommendations for the total number of connected devices.
4. Manufacturers:
   a. Crestron Series 4 with I/O expanders as required to match indicated functionality, CNTBLOCK and CNPWS-75 power supplies as required. Provide options and software kit as necessary to enable manufacturers XPanel IE functionality at clinicians desktops, and at desktop of of designated clinical lab administrative support personnel.
   b. Extron
   c. Or equal.

D. A/V Net distribution block

1. Drawing Reference: CBLOCK
2. Function/Features/Performance:
   a. Parallel distribution block for termination of multiple 4-wire A/V net cables
   b. NET 1 – 8: (8) 4-pin 3.5mm detachable terminal blocks
   c. Enclosure: Steel, black matte powder coat finish, surface mount box with (2) integral mounting flanges
3. Manufacturers
   a. Crestron CNTBLOCK
   b. Extron
   c. Or equal.

E. Control Panels, Touch, 7" Diagonal, Topset (CTP), Wallmount (CTW)

1. Drawing Reference: CTP/CTW (for Conf. 1, 2, 409 and 420 these are part of Zoom Rooms Kit, refer to HUB and HUB2 specifications in 274116).
2. Features/Functions

a. Touchscreen Display
   i. Display Type TFT Active matrix color LCD
   ii. Size 7 inch (178 mm) diagonal
   iii. Aspect Ratio 15:9 WVGA
   iv. Resolution 1024 x 600 pixels
   v. Brightness 350 nits (cd/m²)
   vi. Contrast 1100:1
   vii. Color Depth 24-bit, 16.7M color
   viii. Illumination Edgelit LED
   ix. Viewing Angle ±80° horizontal, ±80° vertical
   x. Touchscreen: Protected Capacitive, 5-point multi-touch capable
b. Graphics Engine: Crestron Smart Graphics, multi-language web browser, multi-language on-screen keyboard, screensaver, single scalable streaming video window.
c. Communications
   i. 10/100 Mbps, auto-switching, auto-negotiating, auto-discovery, full/half duplex, TCP/IP, UDP/IP, CIP, DHCP, SSL, TLS, SSH, SFTP (SSH File Transfer Protocol), IEEE 802.1X, SNMP, IPv4 or IPv6, IEEE 802.3af and 802.3at Type 1 compliant.
   ii. USB 2.0 Type A (for future use)
   iii. 8-pin RJ45 with 2 LED indicators; 10Base-T/100Base-TX Ethernet port, Power over Ethernet compliant; Green and yellow LEDs indicate Ethernet port status
   iv. IEEE 802.3at Type 1 (802.3af compatible) Class 3 (12.95 W) PoE Powered Device
d. Enclosure
   i. Plastic, smooth black or white finish, edge-to-edge glass with black or white surround 8”H x 11”W x 7”D
   ii. Submit color choice for selection by City representative.

3. Manufacturers
   a. Crestron TSW-770 w/ table-top kit (CTP) or wall-mount kit (CTW)
   b. Extron
   c. Or equal.

F. Flip-top Flush Mount Cable Cubby

1. Drawing References: FTC
2. Manufacturer:
   a. Crestron FT-600-B w/ Power Outlet Module, cable retractor (HDMI) and blank insert plates.
   b. Extron
   c. Or equal.

G. 5-port PoE Switch

1. Drawing References: NSW5
2. Port Count: 5

3. Manufacturer:
    a. Crestron
    b. Extron
    c. Or equal.

H. 100 Base-T Control LAN Ethernet Switch

1. Drawing References: NSW/NSW24
2. Port Count:
    a. As Required plus at least 3 spare
3. Features/Functions/Performance:
    a. RJ-45 10/100Base-TX ports (IEEE 802.3 Type 10Base-T; 802.3u Type 100Base-TX) ports.
    b. Each port can automatically provide 10 or 100 MBps Ethernet Layer 2 switching.
    c. Each port can automatically sense maximum connection speed of attached device (10 or 100 MBps) and its ability to support full or half duplex connectivity and respond (auto-sensing). .
    d. Performance - at least:
        i. throughput: 1 million pps (64-byte packets)
        ii. address table size: 2,000 entries
    e. Communications - provides full support for the following standards:
        i. IEEE 802.1p Priority;
        ii. IEEE 802.1D Spanning Tree;
        iii. IEEE 802.1Q VLANs;
        iv. IEEE 802.3x Flow Control
    f. Management - Provide at least:
        i. SNMPv1/v2c
    g. Environmental - can operate normally within at the following range of conditions:
        i. operating temperature: 0 degrees C to 55 degrees C (32 degrees F to 131 degrees F)
        ii. relative humidity: 15 to 95% @ 40 degrees C (104 degrees F), non-condensing
    h. Provides port filtering by MAC address.
    i. Automatic shutdown of ports detecting jabber
    j. Status lights indicating at least port activity on each port.
4. Construction.
    a. 1 Rack Unit maximum per 12 ports provided.
    b. Provide accessories as required to rack mount.
5. Manufacturers:
    a. Netgear
    b. DLink
    c. Hewlett Packard
    d. Cisco Systems
    e. Or equal.

2.6 VIDEO SYSTEMS AND RELATED

A. General
1. Products provide under this Section shall be made by manufacturers regularly engaged in the production of programmable commercial audio-visual control systems. Such manufacturers shall have at least 5 years prior production experience in the manufacture of such goods.
2. Provide control system to perform functions scheduled on drawings and herein.
   a. System to be field programmable.
   b. Provide programming allowance to implement system as defined in Part 1 and as modified by Owner prior to first use. Provide an additional $2,000 to implement system operation enhancements determined by Owner following first use.

B. Crestron Zoom Conferencing Hub
1. Drawing Reference: HUB2
2. Manufacturer:
   a. Crestron UC-C100-Z-WM
   b. No known equal.

C. Integrated Conferencing Soundbar Speaker/Microphone/Camera
1. Drawing Reference: HUB, CONFSBS, CTP (Room 409)
2. Manufacturer:
   a. Crestron Flex UC-BX30-Z Room Kit
   b. No known equal.

D. Camera Controller
1. Drawing Reference: CAMCTL
2. Function/Features:
   a. Capacity to provide PTZ control for up to (2) cameras.
3. Manufacturer:
   a. Datavideo RC-190
   b. Or equal.

E. USB Web-Conferencing Camera, wallmount
1. Drawing Reference: CCAM
2. Manufacturer
   a. Huddly IQ
   b. Or equal

F. HDMI Routing Switcher, with Signal Transport and Up-Conversion
1. Drawing References: AVSW8x8, AVSW16x16, AVSW32x32
   a. At AVSW Switchers the designation IxO, where I is 8, 16 or 32 and O is 8, 16, 32, the values of I and O indicate the minimum number of input and output ports to be provided respectively.
2. General
   a. Provide and install as indicated on the drawing an HD Content Point-to-Point Transport System.
   b. The HD Digital Transport and Distribution System shall include providing and integrating the following principal systems:
      i. Audio/Video switching.

ii. Audio/Video distribution at native resolution without compression.
iii. Video interface equipment.
iv. Audio interface equipment.
v. HDMI signal transport.
vi. HDMI 1.3 support.
vii. Deep Color support.
viii. Resolution management.
ix. HDCP key handling/management.
x. EDID management.
xi. Fast HDMI switching with keep alive HDCP link.
xii. Multi-Channel Surround Sound Audio.
xiii. Digital diagnostic tools

c. Audio & Video Switching
i. The AV switching system shall support at least 6.75Gbps of data transfer on each input and output to support 1080p 36-bit (Deep) Color video resolutions without compression.
ii. The AV switching system shall support 8 channel audio.
iii. The AV switching system shall support audio breakaway from video.
iv. The AV switching system shall have less than 5us of latency from AV input to AV output.
v. The AV switching system shall support the HDMI specification of less than 1 in 1x10-9 bit errors at 1080p 36-bit (Deep) Color.
vi. The AV switching system shall downmix multi-channel audio into 2-channel audio so that the same audio content may be routed to both multi-channel and 2-channel sinks.
vii. The AV switching system shall be able to dither between standard and deep color video signals on each input and output.
viii. The AV switching system shall support the following AV signal inputs:
(1) HDMI 1.3a (High Definition MultiMedia Interface)
(2) DVI 1.1 (Digital Visual Interface)
(3) DisplayPort Multimode 1.1
(4) Analog RGB
(5) YPbPr
(6) S-Video
(7) CVBS
(8) SPDIF
(9) Analog Stereo Audio
ix. The AV switching system shall transcode the AV signals to a single signal type for distribution.

d. Audio Video Distribution

i. The AV distribution system shall use multimode fiber or shielded twisted pair for AV signal distribution.
ii. The AV distribution system shall route AV signals from any input to any output with less than 1ms of latency.
iii. The twisted pair structured cabling used to carry the AV signals shall be shielded.
iv. The twisted pair structured cabling used to carry the AV signals shall be specified to 1.2GHz of bandwidth or greater.
v. The AV distribution system shall not require extra cabling to transmit the following control signals for AV sources and sinks:
(1) RS-232
(2) Infrared
(3) Ethernet
(4) USB Human Interface Device-class devices
(5) Contact closure

e. EDID Management
i. The AV switching system shall allow configuration of the EDID presented to sources on each AV input.
ii. Each input on the AV switching system shall be configured independently.
iii. The AV switching system shall by default present an EDID to each input that includes only the video timings and audio formats common all sinks connected to the outputs.
iv. The AV switching system shall allow the user to enter each input's EDID video timings individually.
v. The AV switching system shall allow the user to enable and disable support for the following items in each input's EDID.
(1) Deep color
(2) 3D support

f. HDCP Management
i. The AV switching system shall support HDCP 1.1 or greater.
ii. The AV switching system shall detect the number of KSVs supported by each source. A KSV is commonly called an HDCP 'key'. A unique ID for each HDMI sink that must be sent to HDCP-enabled sources in order for the sinks to receive content.
iii. The AV switching system shall not send a source more KSVs than it supports.
iv. The AV switching system shall cache the KSVs from each connected sink.
v. The AV switching system shall authenticate all cached KSVs with each source up to the source's KSV limit, so that authentication does not need to be re-started each time content is routed to a new output.

g. Signal Detection
i. The AV switching system shall report the following incoming signal information to an AV control system:
(1) Signal detect

(2) Horizontal and vertical resolution
(3) Signal refresh rate
(4) Presence of HDCP

ii. The AV switching system shall report the following information to an AV control system:
(1) HDCP authentication status for each source and sink
(2) EDID Preferred video timing for each sink
(3) Maximum number of KSVs supported by each source

h. Troubleshooting
i. The AV switching system shall report the following information for troubleshooting:
(1) Maximum number of KSVs supported by each source
(2) The number of KSVs sent to each source
(3) EDID indicated Video timings and audio formats supported for each sink
(4) EDID presented to each source
ii. The AV switching system shall support off-site remote troubleshooting via Ethernet

i. HD Digital Transport and Distribution System
i. The HD Digital Transport and Distribution System operate as part of a larger matrix switching system.
ii. HD Source/Sink Controller
(1) The HD Source/Sink Controller shall provide control of connected devices (i.e. Blu-Ray Players, LCD Monitors, Projectors, etc.) when used in conjunction with an AV Network Control System. It shall support IR and RS-232/422/485 protocols, closed-contact input, low-voltage relay, and HDMI CEC (Consumer Electronics Control). No additional cabling (above the required cabling for the HD Digital Transport and Distribution System) shall be required.
iii. The HD Content Transport System shall be an advanced signal extender system incorporating the following features:
(1) HD Content Transmitter.
(2) HD Content Receiver.
(3) UTP/STP or Fiber Optic cabling.
(4) HDCP 1.1 support.
(5) Fast HDMI switching.
(6) CEC support.
(7) Uncompressed video and audio transport.
(8) HDMI 1.3 with Deep Color.
(9) 7.1 channel HD lossless audio.
(10) Video resolutions up to 1920x1200 or 1080p/60.
(11) Advanced video detection on every video type, including resolution, frame rate and color depth.
(12) IR and RS-232 control over local device(s) (when used with a control system by same manufacturer).

(13) Ethernet support.
(14) Signal transmission up to 450 feet via UTP/STP cable.
(15) Signal transmission up to 3000 feet via fiber.

j. Transmitters
i. The HDMI Transmitters shall be able to extend HDMI (including audio) . Where two or more signal inputs are available, the transmitter shall include integrated switcher with signal sensing. The switcher shall switch to the last detected input (when not used with a control system by the same manufacturer). The HDMI transmitter types shall be as follows:
ii. Transmitter Type WPI
(1) The WPI signal transmitters shall extend HDMI video, audio, and data over a single UTP/STP cable to compatible transmission receiver modules or ports. The following source formats shall be supported:
(a) HDMI
(b) DVI-I
(c) RGBHV
(d) VGA
(e) YPbPr
(f) Y/C
(g) Composite
(h) Analog 2-channel audio
(i) USB HID (Human Interface Device)
(2) Performance. The transmitter shall meet the following minimum requirements:
(a) One (1) HDMI video, audio, and control input:
(b) Supports HDMI.
(c) Supports HDCP.
(d) Supports Dolby Digital, Dolby Digital EX, DTS, DTS-ES, DTS 96/24, up to 8 channel PCM.
(e) Supports DVI-D with adaptor.
(f) Supports DisplayPort Multimode.
(g) CEC device control.
(h) One (1) DB15 input:
(i) Component (YPbPr)
(j) RGB
(k) S-Video (Y/C)
(l) Composite Video
(m) One (1) analog stereo audio input:
(n) (1) 3.5mm TRS (L/R unbalanced)
(o) One (1) USB HID port.
(p) Supports USB HID class devices
(3) Single UTP/STP cable transmission connection

(a) Supports HDBaseT signal specifications.
(b) Supports remote power injection through matrix switcher.
(c) Supports CAT5e.
(4) Signal transmission up to 330 feet.
(5) Power supply modes:
(a) Remote power supplied by matrix switcher through UTP/STP transmission cable.
(b) Local or remote DC power source.
(6) Mounting:
(a) 2-gang wall box mount.
(b) 2-gang floor box mount.

iii. Transmitter/Receiver Type WPIS
(1) HDMI transmission, as for WPI
(2) RS-232 transmission through use of matched transmitter receiver pairs.
(3) Signal transmission up to 330 feet.
(4) Mounting:
(a) 1-gang box mount.

iv. Transmitter Type WPIH
(1) HDMI transmission, as for WPI
(2) Signal transmission up to 330 feet.
(3) Mounting:
(a) 1-gang box mount.

k. Receivers, Fiber
i. The receiver shall accept the HD signal via multimode fiber and convert it to one (1) HDMI output. When used with a supported control system, the receiver shall provide local control to device(s). In addition, when used with the Matrix switcher, the receiver shall provide Ethernet connectivity to any compatible devices.
ii. The receiver shall meet the following minimum requirements:
(1) HDMI 1.3 digital video/audio output.
(2) One (1) 19-pin Type A HDMI female connector.
(3) One (1) USB 1.1 port for USB HID data.
(4) Mouse, keyboard, game controller, or other USB HID device support.
(5) USB Type A female connector.
(6) Two (2) relays.
(a) 4-pin 3.5mm detachable terminal block comprising (2) normally open, isolated relays.
(b) Rated 1 Amp, 30 Volts AC/DC.
(c) MOV arc suppression across contacts.
(7) One (1) bidirectional RS-232 port.
(a) One (1) 5-pin 3.5mm detachable terminal block.

(b) GND, TX, RX, CTS, RTS support.
(c) Up to 115.2k baud, hardware and software handshaking support.

(8) Two (2) IR/Serial ports.
(a) One (1) 4-pin 3.5mm detachable terminal block.
(b) IR output up to 1.1 MHz.

(9) 1-way serial TTL/RS-232 (0-5 Volts) up to 19200 baud.

(10) One (1) Digital/contact closure sensing input.
(a) One (1) 2-pin 3.5mm detachable terminal block
(b) Rated for 0-24 Volts DC, referenced to GND;
(c) Input Impedance: 2.2k ohms pulled up to 5 Volts DC;
(d) Logic Threshold: 2.5 Volts DC nominal with 1 Volt hysteresis band.

(11) One (1) 10/100 LAN port.

(12) One (1) Fiber input.

(13) Two (2) multi-mode fiber inputs.

(14) Two (2) SC multimode fiber connectors.

(15) One (1) power input.

(16) (1) 2-pin 3.5mm detachable terminal block.

(17) Shall support transmission distances of up to 1000ft.

(18) Flush mountable to a 2-gang, 4" square, or Euro electrical box.

iii. Receivers, Copper with Scaler

(1) The signal receiver shall receive long distance transmission from compatible transmitter modules or ports. Receiver shall include the following outputs types and connections:
(a) HDMI
(b) USB HID (Human Interface Device)

(2) Receiver shall include the following control port types for remote device control.
(a) Serial RS-232 communication.
(b) Infrared (IR) control.

(3) Performance
(a) The receiver shall meet the following minimum requirements:
(b) HDMI digital video, audio, and control output:
(c) One (1) 19-pin Type A HDMI female connector
(d) Supports HDMI with Deep Color and 3D.
(e) Supports DVI-D with adaptor.
(f) Supports HDCP.
(g) HDMI audio Support:
(h) Dolby Digital, Dolby Digital EX, Dolby TrueHD, DTS, DTS-ES, DTS 96/24, DTS-HD Master Audio, and up to 8 channel PCM.
(i) CEC device control.

(4) Integrated HD video scaling:

(a) Deinterlacing and interlacing.
(b) Frame rate conversion.
(c) Deep Color support.
(d) 3D to 2D conversion.
(e) Content adaptive noise reduction.
(f) Wide screen format selection:
(g) Zoom.
(h) Stretch.
(i) Maintain source aspect ratio.
(j) 1:1.

(5) One (1) bidirectional RS-232 port:
(a) One (1) 5-pin 3.5mm detachable terminal block.
(b) GND, TX, RX, CTS, RTS support.
(c) Up to 115.2k baud, hardware and software handshaking support.

(6) Two (2) IR/Serial ports:
(a) One (1) 4-pin 3.5mm detachable terminal block.
(b) IR output up to 1.1 MHz.
(c) 1-way serial TTL/RS-232 (0-5 Volts) up to 19200 baud.

(7) One (1) USB HID port.
(a) USB type A female.

(8) One (1) 10/100 LAN port.
(a) Single UTP/STP cable transmission connection
(b) Supports HDBaseT signal specifications.
(c) Supports CAT5e
(d) Signal transmission up to 330 feet

(9) Power supply:
(a) Local or remote DC power source.
(b) Mounts on a US 2-gang electrical box

l. HD Content Matrix Switcher

i. The HDMI Matrix shall consist of a card-cage type unit, capable of accepting different input and output cards.
Any input shall be routable to any output. Matrix shall provide almost instantaneous HDMI switching for sources with HDCP. Breakaway audio, video, and USB switching shall also be available.

ii. The HDMI Matrix shall be compatible with the HD Content Point-to-Point Transport System.

iii. The matrix shall meet the following minimum requirements:

(1) Ethernet support.
(a) Gigabit uplink.
(b) Integrated 10/100 managed Ethernet switch.

(2) Eight, Sixteen or 32 field configurable input card slots corresponding to indicated input configuration
(3) Two, Four or Eight output card slots, where output card accommodates 4 signal outputs to provide eight, 16 or 32 outputs where indicated by inidcated output configuration.
(4) Software based setup tool.
(5) Front panel LCD diagnostic screen.
(6) HDCP key register detection.
(7) HDMI Cable test tool.
(8) Automatic resolution management via EDID.
(9) HDCP digital rights key management.
(10) Fast HDMI switching with keep-alive HDCP link.
(11) CEC signal management.
(12) Intercept CEC data being sent from HDMI devices.
(13) Forwards AV control network information.

iv. Input Cards
(1) Input cards shall accept various signal types. Input signals shall be converted to HDMI format.
(2) HDMI Input Cards
(a) The HDMI input cards shall be compatible with the HDMI Matrix. Input cards shall provide HDMI (connector) buffered output of input signal. Input cards shall be field upgradeable/installable.
(b) The HDMI input card shall accept an HDMI signal. This signal shall be available as an output on the matrix.
(c) The HDMI input card shall meet the following minimum requirements:
(d) One (1) HDMI input.
(e) 19-pin type A female HDMI connector.
(f) Supports HDCP 1.1.
(g) Supports HDMI 1.3 with Deep Color.
(h) One (1) HDMI output.
(i) Buffered output from input.
(j) 19-pin type A female HDMI connector.
(k) Supports HDCP 1.1.
(l) Supports HDMI 1.3 with Deep Color.
(m) One (1) USB 1.1 port for USB HID data.
(n) Mouse, keyboard, game controller, or other USB HID device support.
(o) USB Type A female connector.
(p) Digital to analog converter.
(q) 24-bit, 48 KHz
(r) One (1) stereo analog audio output.
(s) Two (2) RCA female connectors.

(t) Unbalanced line-level output.
(u) Provides pass-through signal converted from HDMI input.
(v) Maximum Output Level: 2 Vrms.
(w) Output Impedance: 100 ohms nominal.
(x) Analog shall meet or exceed:
(y) Frequency response: 20Hz to 20kHZ ±0.5dB.
(z) S/N Ratio: >95dB, 20Hz to 20kHz A-weighted;
(aa) THD+N: <0.005% @ 1kHz;
(bb) Stereo Separation: >90dB

(3) DVI Input Card
(a) The Video Input Card shall accept a DVI video signal, injected audio and convert to HDMI signal. This signal shall be available as an output on the matrix.
(b) The HDMI input card shall meet the following minimum requirements:
(c) One (1) DVI input.
(d) One (1) DVI-I female connector.
(e) Auto-sensing multi-format analog video input.
(f) Support for the following video types:
(g) DVI
(h) YPbPr (component).
(i) Y/C (S-Video).
(j) RGB
(k) Support for the following video formats:
(l) NTSC
(m) PAL
(n) Support for the following video resolutions:
(o) 480i
(p) 480p
(q) 576i
(r) 576p
(s) 720p
(t) 1080i
(u) 1080p
(v) Video analog to digital converter.
(w) 10-bit, 170MHz.
(x) One (1) HDMI output.
(y) Buffered output from input.
(z) 19-pin type A female HDMI connector.
(aa) Pass through of video input signal (matched format/resolution).
(bb) Pass through of audio input signal.

(cc) One (1) analog audio input.
(dd) One (1) 5 pin 3.5mm terminal block- detachable.
(ee) Pass through to HDMI output.

(4) UTP/STP Input Card
(a) The UTP/STP Input Card shall accept UTP/STP signal and convert to HDMI signal and separate audio output. This signal shall be available as an output on the matrix.
(b) The UTP/STP input card shall meet the following minimum requirements:
(c) One (1) UTP/STP input.
(d) Two (2) 8 pin RJ45 UTP/STP connectors, female.
(e) Support for the following video resolutions:
(f) 480i
(g) 480p
(h) 576i
(i) 576p
(j) 720p
(k) 1080i
(l) 1080p
(m) Video analog to digital converter.
(n) 10-bit, 170MHz.
(o) One (1) HDMI output.
(p) Buffered output from input.
(q) 19-pin type A female HDMI connector.
(r) Pass through of video input signal (matched format/resolution).
(s) Support for various audio/surround formats:
(t) Bypass.
(u) Stereo.
(v) PCM 96/24.
(w) MLP Lossless.
(x) Dolby Pro Logic IIx.
(y) Dolby Digital 5.1.
(z) Dolby Digital EX.
(aa) Dolby TrueHD.
(bb) DTS Neo:6.
(cc) DTS Virtual.
(dd) DTS Digital 5.1 Discrete.
(ee) DTS ES 6.1 Discrete.
(ff) DTS ES 6.1 Matix.
(gg) DTS 96/24.
(hh) DTS-HD Master Audio.

(ii) Pass through of audio input signal.

(jj) One (1) analog audio ouput.

(kk) Two (2) RCA female connectors.

(ll) Pass through to HDMI output.

(mm) Digital to analog conversion: 24 bit 48 kHz

v. Output Cards

(1) The HDMI output cards shall be compatible with the HDMI Matrix. Output cards shall transmit any input signal. Output cards shall have various arrangements of connector types. Output cards shall have up to four (4) outputs per card. Output card types shall be as follows:

(2) UTP/STP Output Card

(a) The UTP/STP Output Card shall provide transmission of any HDMI signal inputted to the matrix.

(b) The Output Card shall provide four (4) discrete outputs.

(c) The Output Card shall interface with unshielded twisted-pair or shielded twisted pair cable.

(3) HDMI Output Card

(a) The HDMI Output Card shall provide transmission of any HDMI signal inputted to the matrix.

(b) The Output Card shall provide four (4) discrete outputs.

(c) The Output Card shall interface with 19-pin Type A HDMI female connectors.

m. Minimum Environmental Operating Conditions

i. Temperature: 32° to 104°F (0° to 40°C)

ii. Humidity: 10% to 90% RH (non-condensing)

iii. Heat Dissipation: 1500 BTU/Hr

n. Enclosure

i. Chassis: Metal with black finish, vented sides, fan-cooled

ii. Faceplate: Extruded aluminum, black finish with polycarbonate label overlay

iii. Mounting: 7U 19-inch rack-mountable rack ears included)

o. Dimensions

i. Height: 12.22 in (311 mm) without feet

ii. Width: 17.28 in (439 mm), 19.00 in (483 mm) with ears

iii. Depth: 18.13 in (461 mm) without cards

3. Manufacturers:

a. Crestron

i. AVSW16x16: DM-MD16X16 DigitalMedia Switcher with input cards as required, including DMC-F-DSP, DMC-HD-DSP, DMC-DVI, DMC-CAT, and 8G output cards in quantities as required to provide the indicated functionality.

ii. HCMPO: DM-RMC-SCALER-C.

iii. HCMPOA: DM-RMC-200-C

iv. HCMPOF: DMC-150-S
v. HCAT RPTR: DM DR
vi. WPI: DM-TX-200-C-2G Wall Plate DigitalMedia CAT Transmitter in quantities as required to provide the indicated functionality.
vii. WPIS: HD-TX3-C and HD-RX3-C. Provide in pairs.
viii. WPIH: DM-TX-1G
ix. Provide MP-WP185 Media Presentation Wall Plate at floor box and similar locations where cable needs to be connectorized.
x. Adapter Cabling as required.

b. Extron
c. Or equal

G. Wireless Presentation Transmitter
1. Drawing Reference: WRTR, WIRELESS PRESENTATION ROUTER
2. Functions/Features:
a. Provide wireless connectivity via Client Application on End-user device.
b. Secure isolated wireless network
c. Moderator function to allow queuing of up to 40 presenters and authorization of active presenter.
3. Manufacturer:
a. Extron Sharelink 500
b. Crestron Air-media
c. Or Equal.

H. High Definition A/V Transmitter
1. Drawing Reference: DMTX, MP1
2. Functions/Features:
a. Provides 4k HDMI video input
b. Transmits audio, video and control signaling to specified receiver over a single UTP6-4P cable.
c. HDCP compatible.
d. Can be remotely powered by specified control system.
3. Manufacturer
a. Crestron DM-TX-4KZ-100-C-1G-W
b. Or equal.

I. RJ45 Keystone Jack Plate
1. Drawing Reference: MP2
2. Features:
a. RJ45 jack (passthrough) in quantity shown on drawings. Multiple jacks may be combined on single plate at floorbox locations.
3. Manufacturer:
a. Panduit
b. Commscope
c. Or equal

J. Multimedia Receiver w/ Scaler
1. Drawing Reference: DMRX
2. Features/Functions

a. Receives audio, video and control over a single UTP Cat 6 cable.
b. Outputs
    i. HDMI 4k
    ii. RS-232
    iii. IR
c. Communications: HDCP management, EDID format management, CEC
d. Compatible with specified switcher.
e. Enclosure
    i. Metal, black finish, vented sides and front
f. Built-in video scaler: HD video scaler, motion-adaptive deinterlacer, interlacer, intelligent frame rate conversion, Deep Color support, 3D to 2D conversion, content-adaptive noise reduction

3. Manufacturers
    a. Crestron DM-RMC-4KZ-100-C
    b. Or equal.

K. Pan-Tilt-Zoom Camera, Wall-mounted
1. Drawing Reference: PTZ
2. Features/Functions:
    a. PTZ Camera, Signal Extender and CCU assembly.
    b. 1/3-Type Exmor High-speed, Progressive Scan CMOS Sensor with 1.3 Megapixels
    c. Video Output Resolutions: HD: 1080p/60/59.94/50/30/25, 1080i/59.94/50, 720p/59.94/50, SD: 480i/NTSC & 576i/PAL (Crop, Squeeze or Letterbox mode)
    d. Lens/ Focal Length 19X Optical Zoom, F=4.5mm wide to 85mm tele (F1.6-F2.9), Min. Focus Distance 1.0m
    e. Horizontal Viewing Angle 58.1° Wide End to 3.2° Tele End - 16:9 Format
    f. Video S/N Ratio >52 dB
    g. Minimum Illumination 0.7 LUX (F1.6, 50IRE)
    h. Serial Control Protocol RS-232 (Modified VISCA)
    i. Pan Range Pan: +170 degrees to -170 degrees, Tilt: +90 degrees to -30 degrees, Invertible for Ceiling Mount.
    j. Preset Positions 16 (internal), 6 recalled via IR Remote
    k. Tally Light Available through RS-232 Control Connectors • 12 VDC Power Input: EIAJ-04 Coaxial Power Connector
    l. HD Video Outputs: YPbPr on DE-15 (D-Sub 15-pin HD)
    m. SD Video Output: BNC Connector
    n. RS-232/IR Out: RJ-45 Jack (RS-232 Communication and IR Out (with Quick-Connect -SR Interfaces)
    o. EZ Power HD Video: RJ-45 Jack, for use with Quick-Connect SR Interface or Quick-Connect DVI/HDMI
    p. SR Interface. Supplies power to the camera and returns HD video from the camera to the Quick-Connect - SR Systems.
    q. HD Video Select 16-Position Rotary Switch: Used to set HD Video Resolution Output
    r. Camera Settings 10-Position Dip Switch: Settings for IR Select, Baud Rate 9600, Image Flip, SD LB and SQ, Test Bars
    s. OSD (On Screen Display) for fine tuning
3. Manufacturer:

a. ClearVIEW HD-19 North America 999-6940-000 (Black), 999-6940-000AW (Arctic White), confirm color with Owner's Representative prior to product submittal. Accessories:
   i. Thin Profile Wall Mount 535-2000-230 (Black), 535-2000-230W (White)
   ii. EZIM HD-SDI Slot Card PN# 998-6900-007
b. Sony
c. Panasonic
d. Or equal

2.7 FLAT PANEL DISPLAYS, PROJECTORS, AND PROJECTION SCREENS

A. LCD, 70" Diagonal

1. Drawing Reference: LCD70
2. Features/Functions:
   a. Panel Type: LCD, LED Backlighting
   b. Professional/commercial grade display warrantied by the manufacturer for continuous operation for not less than two years.
   c. Minimum Viewable Panel Size: 80" diagonal, 16:9 aspect ratio
   d. Maximum Pixel Pitch: 0.923 x 0.923 mm
   e. Native Resolution: 1920 x 1080
   f. Viewing Angle (H/V): 176°/176°
   g. Brightness: 450 cd/m^2
   h. Maximum Response Time: 6 ms
   i. Contrast Ratio: 5000:1
   j. Inputs
      i. VGA (D-sub 15 pin)
      ii. HDMI
      iii. Stereo Mini Jack
   k. Control:
      i. RS-232C
      ii. RJ45
      iii. IR, included IR Remote
   l. Power Consumption: In accordance with California Code of Regulations, Title 20: Division 2, Chapter 4, Article 4, Sections 1601-1608: Appliance Efficiency Regulations
   m. Weight: 145 lbs. Maximum
   n. Operating Temperature: 5-40 degrees C
   o. Operating Humidity: 20-80%
   p. Dimensions: Less than 2" deep.
3. Manufacturer
   a. Sharp PNR-703
   b. Samsung
   c. NEC
   d. Or equal

B. LCD, 80" Diagonal w/ Integral Audio or Soundbar Loudspeaker

1. Drawing Reference: LCD80
2. Features/Functions:
   a. Panel Type: LCD, LED Backlighting
   b. Professional/commercial grade display warrantied by the manufacturer for continuous operation for not less than two years.
   c. Minimum Viewable Panel Size: 80" diagonal, 16:9 aspect ratio
   d. Maximum Pixel Pitch: 0.923 x 0.923 mm
   e. Native Resolution: 1920 x 1080
   f. Viewing Angle (H/V): 176°/176°
   g. Brightness: 450 cd/m^2
   h. Maximum Response Time: 6 ms
   i. Contrast Ratio: 5000:1
   j. Inputs
      i. VGA (D-sub 15 pin)
      ii. HDMI
      iii. Stereo Mini Jack
   k. Control:
      i. RS-232C
      ii. RJ45
      iii. IR, included IR Remote
   l. Power Consumption: In accordance with California Code of Regulations, Title 20: Division 2, Chapter 4, Article 4, Sections 1601-1608: Appliance Efficiency Regulations
   m. Weight: 175 lbs. Maximum
   n. Operating Temperature: 5-40 degrees C
   o. Operating Humidity: 20-80%
   p. Dimensions: Less than 2" deep.
3. Manufacturer
   a. Sharp PNR-803
   b. Samsung
   c. NEC
   d. Or equal

C. Ceiling-mounted Projector
1. Drawing Reference : VPROJ
2. Manufacturer :
   a. District Standard Epson PRO G7200W or PRO G7200 WNL
   b. No Known Equal

D. Short-Throw Wall-mounted Projector
1. Drawing Reference : VPROJ1

2. Manufacturer :
    a. District Standard Brightlink PRO697UI
    b. No Known Equal

E. Projection Screen, Recessed Ceiling-Mount Motorized, Tab Tensioned, Wide Format

1. Drawing Reference(s): Projection screen, indicated
2. Features/Functions:
    a. Size: Custom, as indicated on drawings
    b. 16:10 aspect ratio.
    c. Seamless viewing and black drop area.
    d. Electrical: 120 volts, single phase, 60 hertz.
    e. Fabric: Flame and mildew resistant surface with black masking borders and flat black edge finish.
    f. Black drop above the viewing surface to lower screen to indicated height above finished floor. Do not provide more black drop than required.
    g. Motorized operation with automatic travel stops.
    h. Motor and roller:
        i. Reversible motor with permanent seal ball bearings, automatic thermal overload cut-out. Stressed truss roller minimum 5 inches (127 mm) diameter, mounted on steel brackets with heavy duty bearings.
        ii. Access to motor from below.
    i. Cable tensioning system at edges to ensure flatness - Provide as close to exact black drop as required to avoid varying tensioning which could cause potential screen wrinkling.
    j. UL listed.
    k. Finished housing mounts to wall. Housing can be delivered to site and rough-in prior to placement of screen to protect screen from damage.
    l. Provision screen with all necessary screen manufacturer options to use indicated low voltage, closure operation. Receipt of serial control or contact closure from Audio-visual control system shall be sufficient to unroll screen for viewing, re-roll screen or to stop screen at intermediate point. Field adjustable down limit switch shall automatically stop screen in full down position.
3. Performance:
    a. Minimum 1.0 gain on-axis gain ±0.1.
    b. Minimum half gain angle of 50 degrees.
    c. High contrast grey finish suitable for use with moderate to high output LCD or DLP projection. Absorbs moderate amount of stray ambient light.
4. Manufacturers
    a. Da-Lite Tensioned Contour Electrol w/ High Contrast Cinema Vision screen material
    b. Draper
    c. Vutech
    d. Stewart Filmscreen
    e. Or equal.

F. Dual Chamber Projection Support Mount

1. Construction
    a. Pipe column or multiple joined runs of electrical support strut with vanity cover.

b. Channel and plate to mount to ceiling or wall as required.
c. Seismic restraint diagonal bracing as required.
d. Provide mount manufacturer's bottom plate to match projectors provided under work of this Section.
e. Mount rated load capacity not less than 50 pounds.
f. Allows safe adjustment of pitch, roll and yaw at least plus minus 5 degrees after installation of the mount and projector.
g. Allows for locking of pitch, roll and yaw settings after adjustment.
h. Allows removal and replacement of the projector without loss of the specific adjustment of pitch, roll and yaw.
i. Accepts City supplied padlock to prevent removal of projector from mount.
j. Where mounting fasteners are exposed during normal operations, secure mount with tamper-resistant fasteners.
k. Provide manufacturer's escutcheon plate to cover transition of support through the ceiling plane.

2. Approvals
   a. Provide OSHPD OPA assembly. Install in accordance with OPA.
3. Manufacturer, Video Projector Mount to CMU Wall
   a. Chief Manufacturing RPA Series Inverted LCD/DLP Projector Ceiling Mount with
      i. WMA-300 Wall Mount Accessory Arm
      ii. CMA-nnn Series Extension Column as required.
      iii. CMA-640 Finishing Ring.
   b. Westbrook Engineering, Inc. Promount Series.
   c. Monger Mount.
   d. Or equal.
4. Manufacturer, Video Projector Mount to Structure Above
   a. Chief Manufacturing RPA Series Inverted LCD/DLP Projector Ceiling Mount with
      i. CMA-110 Ceiling Plate 8" x 8" with 1 ½" NPT fitting.
      ii. CMA-nnn Series Extension Column as required.
      iii. CMA-640 Finishing Ring - Finish per City's Representative.
      iv. Lateral bracing per Contractor's engineered detail.
   b. Westbrook Engineering, Inc. Promount Series.
   c. Monger Mount MM series, including LB, LF, CMKP2, and SC-2.
   d. Or equal.

G. Flat-Panel Display Wall Mount

1. Drawing Reference: None - provide at locations where wall mount of LCD* and FPNL* devices are indicated except as otherwise provided herein.
2. Functions:
   a. Can support the required LCD and Plasma Panels supplied by the work of this Project.
   b. Holds rear of panel away from wall ~2" to permit A/V interface mounting behind display.

c. Permits display to be tilted in the vertical plane for optimum viewing as directed by the City's Representative.
d. Allows the complete mount and display assembly to not protrude more than 4" out from wall surface.
e. Designed to mount to 16", 20", 24" center stud systems
f. Panel can be securely fastened to mount using to prevent theft by adding a City furnished padlock.
g. Where mounting fasteners are exposed during normal operations, secure mount with tamper-resistant fasteners.
h. Designed to accommodate panels from at least Pioneer, Panasonic, Sharp, Samsung, & LG Electronics
i. Heavy duty construction with steel components
j. UL or ETL listed
k. California OSHPD OPA (seismic restraint pre-approval). Installation to be accordance with OPA.

3. Manufacturers:
   a. Chief Manufacturing, Inc. LTM Series, selected for display and mounting conditions.
   b. Or equal

2.8 SOUND CABLES AND RELATED

A. General
1. Provide cable with electrical conductors of soft drawn annealed copper, bare or tinned, solid or concentric stranded as applies, conductivity not less than 98 percent of pure copper.
2. Comply with applicable Code for insulation, jacket, marking and listing for applicable use.
   a. Refer to California Electrical Code, Table 725-61. Cable Uses and Permitted Substitutions.
3. Manufacturer part number specified is for a Listed Type CM construction to indicate intended cable construction and quality.
   a. Code requirements take precedence.
   b. Provide type required by Code at no additional cost to the Owner.

B. Cable, Microphone and Line Level, General Purpose
1. Drawing Symbol(s): SP, 2A.
2. Description: Shielded, single twisted pair, with #20 AWG color coded stranded conductors and foil shield with drain wire.
3. Performance/Construction
   a. Conductors AWG #20.
   b. Conductors Stranding: 7 by 28.
   c. D.C. Resistance Per 1000 feet: 15 ohms maximum.
   d. Shield: Aluminum polyester foil with #20 AWG stranded tinned copper drain wire.
   e. Diameter 0.24 inch maximum.
4. Where 2A indicated, provide 2 each SP
5. Manufacturer
   a. Belden 8762
   b. West Penn.
   c. Or equal.

C. Cable, Microphone and Line Level, Miniature
   1. Drawing Symbol: SP, 2A
   2. Restriction: For use within fixed equipment racks only.
   3. Description: Shielded, single twisted pair, with #22 AWG color coded stranded conductors and foil shield with drain wire.
   4. Performance/Construction:
      a. Conductors AWG #22.
      b. Conductors Stranding: 7 by 30.
      c. D.C. Resistance Per 1000 feet: 20 ohms maximum.
      d. Shield: Aluminum polyester foil with #24 stranded tinned copper drain wire.
      e. Diameter 0.15 inch maximum.
   5. Where 2A indicated, provide 2 each SP
   6. Manufacturer
      a. Belden 8451, 9451, 1266A.
      b. Alpha.
      c. West Penn.
      d. Or equal.

D. Cable, Antenna, Assistive Listening System and Wireless Microphone System
   1. Description
      a. Nominal 50 ohms (actual 51 or 52 ohms) coaxial cable.
   2. Minimum 97 percent shield coverage.
   3. Joint Army Navy (JAN) or Military (MIL) Construction
      a. RG-8/U to JAN-C-17A
      b. RG-8 A/U to MIL-C-17D
      c. RG-9/U to JAN-C-17A.
   4. Manufacturer
      a. Belden 8237, 9251 or 8242.
      b. CommScope.
      c. Or equal.

E. Cable, Loudspeaker and D.C. Power
   1. Drawing Symbol(s)
      a. #18TP
      b. #16TP
      c. #14TP
      d. #12TP
   2. Description
      a. Twisted pair, jacketed, unshielded cables, #12, #14, #16, or #18, as shown on Drawings.
   3. Plenum rated where installed in open plenum return voids.
   4. Performance/Construction
      a. Conductor, AWG: #12, #14, #16, and #18, as noted.
      b. Maximum diameter
         i. 0.384 inch (#12)
         ii. 0.332 inch (#14)
         iii. 0.256 inch (#16)
         iv. 0.224 inch (#18).
   5. Manufacturer

a. Belden.
    i. #12TP, Belden 8477
    ii. #14TP, Belden 8473
    iii. #16TP, Belden 8471
    iv. #18TP, Belden 9740
    v. West Penn.
    vi. Or equal.

2.9 VIDEO CABLES, COPPER COAX AND RELATED

A. General
1. Provide cable with electrical conductors of soft drawn annealed copper, bare or tinned, solid or concentric stranded as applies, conductivity not less than 98 percent of pure copper.
2. Comply with applicable Code for insulation, jacket, marking and listing for applicable use.
    a. Refer to California Electrical Code, Table 725-61. Cable Uses and Permitted Substitutions.
    b. Manufacturer part number specified is for a Listed Type CM construction to indicate intended cable construction and quality.
3. Code requirements take precedence.
    a. Provide type required by Code at no additional cost to the Owner.

B. Cable, Data Monitor Precision Video
1. Plan Reference(s):
    a. D5
    b. 5DVideo
2. Construction
    a. 5 miniature high resolution coax cables in an overall shielded overall jacket to transmit analog component video based on the Red-Green-Blue-Horizontal Sync-Vertical Sync (RGBHV) transmission method.
    b. Sub cables are color coded Red, Green, Blue, Black, Grey; or approved alternate color coding scheme.
    c. Jacket: Code approved equal for application.
    d. Overall five sub cable assembly diameter: 0.56" maximum in raceway applications.
    e. Center Conductor AWG: Twenty two (22) ga Silver Plated Copper.
    f. Insulation: Foamed Teflon.
    g. Shield:
        i. Each sub-cable is double shielded
        ii. Overall cable has 100% tape shield.
3. Approval/Rating:
    a. UL: Recognized Type CL2P (Article 725 of NEC) for plenum application, riser rated elsewhere.
4. Performance - each sub-cable:
    a. Resistance: 0.0162 ohms/ft nominal @ 20C
    b. Impedance: 75 ohm nominal
    c. Capacitance: 17.5 pf/ft nominal
    d. Velocity of Propagation: 80% nominal
    e. Time Delay: 1.19ns/ft nominal
    f. Maximum Attenuation Per 100':
        i. 10 MHz: 0.8 dB/100 ft.

ii. 50 MHz: 2.5 dB/100 ft.
iii. 100 MHz: 3.5 dB/100 ft.
iv. 200 MHz: 4.6 dB/100 ft.
v. 300 MHz: 5.0 dB/100 ft.
vi. 400 MHz: 7.2 dB/100 ft.
vii. 1000 MHz: 14.6 dB/100 ft.

5. Manufacturers:
   a. Altinex CB5100PL in plenum spaces, riser rated elsewhere.
   b. Extron
   c. Belden
   d. Gepco.
   e. or equal.

C. HDMI/DVI Cabling
   1. Drawing Reference: DVI/HDMI
   2. Features/Functions
      a. The plans indicate the required distances for HDMI format transmission. Contractor to provide a transmission system appropriate to the indicated lengths. Contractor engineered solutions may consist of:
         i. Passive HDMI cabling, where the indicated length is within the service distance of such systems.
         ii. Copper HDMI cabling and active HMDI repeaters
         iii. Fiber Optic Cabling and HDMI transceivers.
      b. Contractor to select and provide the method of transmission appropriate to the length and operating parameters of the selected transmission system as defined by the manufacturers of the cabling systems, the repeaters and/or transceivers and the HDMI transmission standard as defined at www.hdmi.com.
   3. Manufacturers, copper cabling and extenders:
      a. Extron
      b. Broadata
      c. Altinex
      d. Liberty Cable
      e. or equal.

2.10 CONTROL CABLING

A. General
   1. Provide cable with electrical conductors of soft drawn annealed copper, bare or tinned, solid or concentric stranded as applies, conductivity not less than 98 percent of pure copper.
   2. Comply with applicable Code for insulation, jacket, marking and listing for applicable use.
      a. Refer to California Electrical Code, Table 725-61. Cable Uses and Permitted Substitutions.
      b. Manufacturer part number specified is for a Listed Type CM construction to indicate intended cable construction and quality.
   3. Code requirements take precedence.
      a. Provide type required by Code at no additional cost to the Owner.

B. USB Cabling
   1. Drawing Reference: USB
   2. Features/Functions:

a. Conforms with minimum USB 2.0 standard
b. Provides USB input in a single gang wall plate
c. Extends USB signal up to at least 200' or distance as required by project requirements.

3. Manufacturers:
   a. Extron
   b. Trulink
   c. or equal.

C. High Speed, TIA/TIA Category Cabling
   1. Drawing Reference:** UTP6-4, where ** denotes cable count
   2. Construction:
      a. Provide horizontal copper cable in accordance with:
         i. EIA ANSI/TIA/EIA-568-B.2
         ii. UL 444,
         iii. NEMA WC 66 (Performance Standard for Category 6 and Category 7 100 Ohm Shielded and Unshielded Twisted Pair)
         iv. ICEA S-90-661
      b. UTP (unshielded twisted pair),
      c. 100 ohm impedance
      d. Four each individually twisted pair, 22 or 24 AWG conductors,
         i. Color code
            (1) Pair 1 White/Blue Blue
            (2) Pair 2 White/Orange Orange
            (3) Pair 3 White/Green Green
            (4) Pair 4 White/Brown Brown
      e. No shield in the sheath.
      f. Jacket
         i. Thermoplastic jacket
         ii. Color: Blue unless otherwise indicated.
         iii. Cable imprinted with manufacturers name or identifier, flammability rating, gauge of conductor, transmission performance rating (category designation) at regular intervals not to exceed 2 feet.
         iv. The word "FEET" or the abbreviation "FT" shall appear after each length marking.
         v. Provide communications general purpose (CM or CMG), communications plenum (CMP) or communications riser (CMR) rated cabling in accordance with NFPA 70.
         vi. Type CMP and CMR may be substituted for type CM or CMG and type CMP may be substituted for type CMR in accordance with NFPA 70.
   3. Certification
      a. Warrantied by the manufacturer to provide Category 6 performance when installed in accordance with applicable EIA/TIA standards and when terminated with the jacks supplied by the Contractor for this Project.
   4. Performance
      a. Assembly electrically meets or exceeds EIA ANSI/TIA/EIA-568-B.2 Category 6 performance standards
   5. Manufacturers:
      a. Berk-Tek LANmark-1000
      b. Belden/CDT
      c. Berk-Tek

d. Commscope/Systimax
e. Commscope/Uniprise
f. General Cable
g. Mohawk/CDT
h. Superior/Essex
i. or equal

D. High Speed, Category 6 Cabling, Plenum Rated
1. Drawing Reference:** UTP6-4P, where ** denotes cable count
2. Construction:
a. As for non-plenum, with fire retardant overall jacket construction.
b. UL listed, NEC compliant for plenum installation.
c. CSA Certified type PCC FT4 FT6.
3. Manufacturers
a. As for non-plenum Cat-6, plenum construction.

2.11 MISCELLANEOUS PRODUCTS

A. Adjustable Height Accessible Presentation Lectern
1. Drawing Reference: to replace (E) lectern in Community Room
2. Manufacturer:
a. Spectrum Furniture Freedom One eLift Lectern w/ 55380 Customized Logo Panel, 99058 Power Module, and 55379 Keyboard Tray.
b. No known equal.

B. Audio and Control Connectors and Related:
1. Circular Audio Connector, Cord, 3 through 5 contacts, gold plated contacts, captive cable clamp strain relief, matte black chrome finish over nickel metal shell
a. Neutrik C-Series, X-Series.
b. Switchcraft.
c. Or equal.
2. Circular Audio Connector, Panel mount, male and female devices to fit same panel cutout including fasteners, 3 through 5 contacts, gold plated contacts, matte black chrome finish over nickel metal shell, female receptacles locking type:
a. Neutrik D Series Version L.
b. Switchcraft
c. Or equal.
3. Loudspeaker Connector, Panel mount, female devices to fit same panel cutout including fasteners as other panel mount receptacles, 4 contacts, matte black finish Polyamid/graphite shell, female receptacles locking type. UL Component Recognized:
a. Neutrik NL4MP.
b. Switchcraft
c. Or equal.

C. Video Connectors and Related
1. Video Connector, BNC type, 75 ohms, Panel, recessed, flush with panel face, insulated from panel, double female
a. Manufacturer
i. Canare BCJ-JRU.
ii. Tec Nec

iii. Liberty Wire & Cable/Panelcraft
iv. or equal.

2. Video Connector, BNC type, 75 ohms, Panel, recessed, flush with panel face, insulated from panel, single female to solder pin
   a. Manufacturer
      i. Canare BCJ-RU.
      ii. Tec Nec
      iii. Liberty Wire & Cable/Panelcraft
      iv. or equal.
3. Video connector, BNC type, 75 ohms, cord, crimp applied. Coordinate with cable.
   a. Manufacturer
      i. Amp.
      ii. Amphenol.
      iii. Augat/LRC Products
      iv. Canare.
      v. Kings.
      vi. Liberty Wire & Cable/Panelcraft
      vii. RFI/Celltronics.
      viii. Trompeter.
      ix. or equal.
4. Video Precision 75 ohms Terminator, BNC:
   a. Manufacturer
      i. Canare BCP-TA
      ii. Trompeter TNAI-1-75.
      iii. or equal.
5. DB15 Connectors
   a. Drawing Reference HD15
   b. Manufacturer
      i. Amp.
      ii. Amphenol.
      iii. Canare.
      iv. Kings.
      v. Liberty Wire & Cable/Panelcraft
      vi. RFI/Celltronics.
      vii. or equal.

D. Custom Facility Panels, Rackmount Auxiliary Panels, Rack Lighting
   1. Drawing Reference(s):
      a. MP* - Media Panels, where * is a number indicating the panel type.
      b. FP* - Facility Panels, where * is a number indicating the panel type.
      c. Aux Panel
   2. Provide connector types and plate finish as shown. If none shown, provide:
      a. Rack mount panels:
         i. 16 gauge minimum, cold rolled steel or 1/8" minimum aluminum, finish to match rack finish.
         ii. At contractor's option, fabricate using rack mount panels with Decora/Decorator openings and steel plates with specified connectors. Match insert color to panel color provided. Refer to Rack Panel with Decora Openings below.

b. Wall Panels: 16 gauge minimum cold rolled steel, finish to match surrounding electrical and other low voltage panels.

3. Manufacturers, Rack Mount Panels
   a. BGW Systems Inc.
   b. Conquest
   c. Middle Atlantic Products Universal Connector Panel
   d. Middle Atlantic Products Universal Connector Panel, Modular Custom Connector Panel Systems
   e. ProCo Sound, Inc.
   f. Ultimate Plates and Panels
   g. or equal.
4. Manufacturers, Wall Panels
   a. PanelCrafters Division of Liberty Wire & Cable, Classic Series
   b. FSR
   c. RCI Systems
   d. Middle Atlantic
   e. Ultimate Plates and Panels
   f. Whirlwind
   g. Or equal.
5. Manufacturers, Decora/Decorator connector inserts:
   a. Connector Plates by Radio Design Labs. Provide specified connectors rear mounted in D-Blank insert for connector combinations not available from RDL.
   b. Grey by Pathway Connectivity Solutions. Provide specified connectors rear mounted in 5100 insert for connector combinations not available from Pathway Connectivity Solutions.
   c. or equal.
6. Manufacturers, Rack Mount Decora Panel Openings
   a. Lowell Manufacturing LD8-RMP with Lowell DBB-4 blank Decora plates at openings not fitted with equipment.
   b. Middle Atlantic DECP Series
   c. or equal.
7. Manufacturers, Rack Lighting
   a. Middle Atlantic PDLT-815RV-RN.
   b. or equal.

2.12 POWER DISTRIBUTION EQUIPMENT

A. Comply with applicable Codes. Provide UL Listed devices suitable for commercial use. Provide all junction boxes, raceway, fittings, wire, supports and fastenings as required for complete installation. Contractor to coordinate plug end of selected strip with rack power receptacles installed under the work of Division 16. Unless otherwise noted, provide receptacles of NEMA 5-15R configuration.

B. Power Sequencer System
   1. Drawing References: PSEQ
      a. Power Sequencer
      b. Fire Alarm Interface – provide where required to shunt system operation on receipt of closure from Fire Alarm system.
      c. Sold State Relay (SSR) SSR1 through SSR7
   2. Features

a. Power sequencing system.
b. Solid state switching, zero crossing.
c. Sequencing on power up and power down.
d. Front panel button and external closure activation.
e. Alarm terminal to sequence the system down when tripped.
f. UL Listed.

3. Manufacturer
a. FSR Inc. Power Products Group SPC-20 Power Sequencer and SPC-20X Solid State Relay
b. Furman
c. Or equal.

C. Power Supplies and Related:
1. Drawing Reference: PS24.
2. Relay and Lamp Power Supply:
3. 24 VDC, regulated within 5%. Ripple not greater than 1.5%. Output current rating at least 150% of maximum possible load. Circuit breaker or intrinsic over current protection. UL Recognized or UL Listed.

D. Full Height Receptacle Strip, One (1) Circuit, 15A
1. Features/Construction:
a. Not less than 60" Long
b. Not less than eleven (11) 15A receptacles
c. Integral circuit breaker
d. NEMA 5-15P plug on 6' cord.
e. UL Listed Assembly
f. Provide mounting hardware as necessary to attach to rack interior.
2. Manufacturers.
a. Wiremold Series 7011ULBC.
b. Lowell ACS 1524
c. Geist NSVB200-101S15
d. Hubbell PR206
e. Leviton
f. Middle Atlantic
g. Chatsworth 12848-701
h. or equal.

E. Full Height Receptacle Strip, One (1) Circuit, 20A
1. Features/Construction:
a. Not less than 70" Long
b. Not less than eleven (11) 15A receptacles
c. Integral circuit breaker
d. NEMA 5-20P plug on 6' cord.
e. UL Listed Assembly
f. Provide mounting hardware as necessary to attach to rack interior.
2. Manufacturers. Contractor to coordinate selected strip with rack power receptacles installed under the work of Division 26.
a. Geist NSVB200-102S20
b. Hubbell PR20820DRTL
c. Leviton P104x series
d. Lowell ACS-2024

e. Midde Atlantic PD-1020C-NS
f. Wiremold Series 7011ULBC20.
g. Chatsworth 12848-705
h. or equal.

F. Rackmount Power Panel, Horizontal Mount, User Aux device use:
1. Drawing Reference: POWER.
2. Functions/Features:
a. Front face of panel shall provide two electrical power outlets and a switch. An indicator lamp shall show the presence of AC power when on. The front face of panel shall have a black finish. The rear face shall provide a minimum of at least four receptacles. The panel shall be racked mounted in a maximum of two rack units. The panel shall be Code approved and UL rated for this application.
3. Manufacturers:
a. Hubbell MCCPSS19TS
b. Leviton 4515
c. Geist SP124-1020

2.13 POWER PANEL:

1. Drawing Reference: POWER.
2. Functions/Features:
a. Front face of panel shall provide two electrical power outlets and a switch. An indicator lamp shall show the presence of AC power when on. The front face of panel shall have a black finish. The rear face shall provide a minimum of at least four receptacles. The panel shall be racked mounted in a maximum of two rack units. The panel shall be Code approved and UL rated for this application.
3. Manufacturers:
a. Hubbell MCCPSS19TS
b. Geist SP124-1020
c. Or equal.

PART 3 - EXECUTION

3.1 GENERAL

A. Perform the Work of this Section in accordance with acknowledged industry and professional standards and practices, and the procedures specified herein.

B. Furnish and install (herein, "provide") all materials, devices, components, and equipment required for complete, operational systems.

C. Refer to Section 27 15 00 for additional execution requirements that apply to the work of this Section.

3.2 PRECONSTRUCTION PROGRAMMING MEETING

A. Not less than 60 days prior to the scheduled completion of the project, Contractor to initiate a request of the Owner's Representative to schedule an Audiovisual Systems programming meeting.
1. The Owner's Representative will schedule the meeting at the reasonable mutual convenience of the Contractor and the Owner's technical systems representatives.

2. The purpose of the meeting is for the Owner's Representative to indicate to the contractor how the programmable interfaces of the Audiovisual systems are to be implemented, including:
    a. Integration of VoIP conference dialing into AV controls.
    b. Button assignments and labels for physical button panels
    c. Touchscreen menu hierarchy, scene arrangement, button and background colors, text size, logos
    d. When multiple panels control the same systems, which screens appear on which touchpanels.
    e. Whether authorization codes or passwords will be required to access special functions/menus.
3. Contractor to document the information received from the Owner's Representatives at this meeting.
4. Contractor to submit the documentation of the requirements meeting, along with their proposed response to the Owner's programming requirements in the form of screen shots and system menu flow diagrams as required under Section 27 41 00 – Common Work Results for Audiovisual Systems, 1.4 D Submittals.

3.3 WIRING CLASSIFICATION AND RELATED

A. Audio Signal Wiring Classification:
    1. Type A-I: Microphone level wiring less than -30 dBμ, 20 Hz to 20 kHz.
    2. Type A-2: Line level wiring -30 dBμ to +24 dBμ, 20 Hz to 20 kHz.
    3. Type A-3: Loudspeaker level or circuit wiring greater than +24 dBμ, from 20 Hz to 20 kHz.

B. Video and Related Signal Wiring Classification:
    1. Type V-1: Baseband and composite video wiring 1 volt peak-to-peak into 75 ohms, 0 to 10.0 MHz.
    2. Type V-2: Synchronization and switching pulse wiring 4 volts peak-to-peak into 75 ohms, 15.62 to 15.75 kHz.
    3. Type V-3: Color subcarrier wiring 0 to 4 volts peak-to-peak into 75 ohms, 3.57 to 4.43 MHz.
    4. Type V-4: TV system wiring 0.1 to 1000 uV peak-to-peak into 50 or 75 ohms, 47 to 890 MHz.

C. Control Signal Wiring Classifications:
    1. Type C-1: DC control wiring 0 to 50 volts.
    2. Type C-2: Synchronous control or data wiring 0 to 40 volts, peak-to-peak.
    3. Type C-3: AC control wiring 0 to 48 volts, 60 Hz.

D. Additional Wiring Classifications:
    1. Type M-1: DC power wiring 0 to 48 volts.
    2. Type M-2: AC power wiring greater than 50 volts, 60 Hz.

E. Wiring Combinations:
    1. Except as indicated herein, conduit, wireways and cable bundles shall contain only wiring of a single classification. The following combinations are acceptable in conduit, or cable harnesses. Additional acceptable combinations may be indicated on the Contract Drawings.
        a. Types A-1, C-1, and M-1.
        b. Types A-2, C-I, C-2, and M-I, runs less than twenty (20) feet.
        c. Types A-2, C-1, and M-1.

d. Types A-3, C-1, C-2, and M-1.
e. Types A-2, V-1, and V-3.
f. Types V-1, V-2, V-3, and C-1.
g. Types M-2 and C-3.

3.4 WIRE AND CABLE INSTALLATION

A. Provide permanent identification of run destination at all raceway terminations.

B. All wire and cable shall be continuous and splice-free for the entire length of run between designated connections or terminations.

C. All shielded cables shall be insulated. Do not permit shields to contact conduit, raceway, boxes, panels or equipment enclosures.

D. Within buildings, make splices only in designated terminal cabinets and/or on designated equipment backboards. Outside buildings, make splices only in designated manholes and/or handholes. Protect splices outside of buildings with splicing kits equivalent to Scotchcast Re-enterable. Make splices only with connectors or terminal devices specified herein. Document all splices on Record Drawings.

E. Verify that all raceway has been de-burred and properly joined, coupled, and terminated prior to installation of cables. Verify that all raceway is clear of foreign matter and substances prior to installation of wire or cable.

F. Inspect all conduit bends to verify proper radius. Comply with Code for minimum permissible radius and maximum permissible deformation.

G. Apply a chemically inert lubricant to all wire and cable prior to pulling in conduit. Do not subject wire and cable to tension greater than that recommended by the manufacturer. Use multi-spool rollers where cable is pulled in place around bends. Do not pull reverse bends.

H. Provide a box loop for all wire and cable routed through junction boxes or distribution panels. Provide tool formed thermal expansion loops at cable at manholes, handholes and at both sides of all fixed mounted equipment. Cable loops and bends shall not be bent at a radius greater than that recommended by the manufacturer.

I. Secure all wire and cable run vertically for continuous distances greater than thirty (30) feet. Secure robust non-coaxial cables with screw-flange nylon cable ties or similar devices appropriate to weight of cable. For all other cables, provide symmetrical conforming nonmetallic bushings or woven cable grips appropriate to weight of cable.

3.5 SIGNAL POLARITY CONVENTION

A. Maintain consistent absolute signal polarity at all connectors, patch points and connection points accessible in the system. Comply with AES26-2001.Where applicable, a positive polarity electrical signal shall yield positive acoustic pressure from the loudspeakers.

B. Audio signal connector convention: Comply with AES 14-1992 (r1998)

Signal	Connector	Wire
Signal Phase	Pin 2	Red or White
Signal Anti-Phase	Pin 3	Black

Signal Ground	Pin 1	Drain Wire

C. Video and RF/TV Connector Convention:

Signal	Connector	Wire
Signal Phase	Center Pin	Center conductor
Signal Anti-Phase	Shell	Shield
Signal Ground	Shell	Shield

3.6 WIRING PRACTICE

A. Land all non-coaxial field wiring entering each equipment rack at specified terminal devices prior to connection to any equipment or devices within racks. At Contractor's option, such terminals may be located in the equipment racks or in the terminal cabinets provided. Coordinate such selection with Project construction sequence and test procedures specified herein.

B. Identify all wire and cable clearly with permanent labels wrapped about the full circumference within one (1) inch of each connection. Indicate the number designated on the associated field or shop drawing or run sheet, as applies. Assign wire or cable designations consistently throughout a given system. Each wire or cable shall carry the same labeled designation over its entire run, regardless of intermediate terminations. Conform with the requirements of Section 27 41 00.

C. Apply all crimp connectors only with manufacturer's recommended ratchet type tooling and correct crimp dies for connector and wire size. Plier type crimp tooling shall not be acceptable.

D. Coordinate insulation displacement (quick connect) terminal devices with wire size and type. Comply with manufacturer's recommendations. Make connections with automatic impact type tooling set to recommended force.

E. Make all connections to screw-type barrier blocks with insulated crimp-type spade lugs. Lugs are not required at captive compression terminal type blocks. Provide permanent designation strips designed for use with the terminal blocks provided. Make neat, intelligible markings with indelible markers equivalent to "Sharpie".

F. Tin terminated shield drain wires and insulate with heat shrinkable tubing.

G. Use only rosin core 60/40 tin/lead solder for all solder connections.

H. Dress, lace or harness all wire and cable to prevent mechanical stress on electrical connections. No wire or cable shall be supported by a connection point. Provide service loops where harnesses of different classes cross, or where hinged panels are to be interconnected.

I. Termination and build-out resistors and related circuit correction components shall be visible. Do not install in connector shells or internally modify equipment. Show locations on Record Drawings.

J. Correct any and all of the following unacceptable wiring conditions:
   1. Deformed, brittle or cracked insulation.
   2. Insulation shrunken or stripped further than 1/8" away from the actual point of connection within a connector, or on a punch block.
   3. Cold solder joints.
   4. Flux joints.
   5. Solder splatter.

6. Un-grommeted, un-bushed, or uninsulated wire or cable entries.
7. Deformation or improper radius of wire or cable.

3.7 SIGNAL GROUNDING PROCEDURES

A. Comply with National Electrical Code.

B. Unless otherwise noted maintain a unipoint ground scheme.

C. Signal and electrical system grounds shall be isolated except at the Project ground field connection.

D. Equipment enclosures shall not be permitted to touch each other unless bolted together and electrically bonded.

E. Ground and bond equipment racks and similar equipment enclosures containing powered equipment exclusively via the ground conductors provided under Division 27.

F. At each rack, provide a ground bus within the rack. At each rack, provide a lug bonded to the rack frame with a #12 TW stranded wire to the rack Ground bus.

G. At each ensemble of racks, provide a single labeled Ground tubular-clamp bus bar terminal strip to land the individual rack Isolated Ground bus ground conductors. Connect the main Isolated Ground conductor from the Technical Power panelboard at this point.

H. Equipment signal ground shall be to the Ground System via the green wire of the equipment power cord. Where equipment uses two (2) wire power cord, provide #12 green bond wire to rack ground bus bar. At equipment, provide crimp lug and suitable hardware for bonding.

I. Shielded cables of this section shall be grounded exclusively to Isolated Ground by a single path. Shield shall be tied to Ground at one end only, i.e., at the low potential (receiving) end of run, unless otherwise noted.

J. Unless otherwise noted, at audio jackfields, tie source shield at jackbay frame. Float shields at connections to output jacks. Bus each row of jack frames and run individual #12 green ground wire for each row to rack IG bus bar.

K. Signal Ground provisions shall realize less than 0.15 ohms to the primary ground connection.

3.8 FINISHES

A. Finishes and materials for contractor fabricated assemblies such as racks, custom control panels, brackets, blank panels, equipment mounting in furniture or casework, speaker baffles, speaker grille material and in general any item or component herein which is visible shall adhere to the following:
   1. Finish shall be as directed by the Owner's Representative.
   2. In the event that the Owner's Representative provides no direction as to finish, finish shall match exactly the surrounding and adjacent surfaces.
   3. Wooden speaker back boxes and baffles shall be painted flat black if not otherwise finished or stained.

3.9 EQUIPMENT ENCLOSURE (RACK) AND EQUIPMENT FABRICATION

A. Combustible material, other than incidental trim of indicated equipment, is prohibited within equipment racks.

B. Within each equipment enclosure, provide a full-height multi-circuit ground outlet strip with branch circuit count as shown on drawings; locate on the left side of the equipment enclosure, as viewed from the rear. In each enclosure provide number of receptacles required by present and future equipment indicated on drawings, plus at least two spare receptacles. Provide flexible steel raceway and junction box for connection of power service. Bond internal raceway to rack frame.

C. Provide a permanent label on the front of each equipment rack including the rack designation, and the circuit breaker number and associated electrical distribution panel designation servicing same.

D. Maintain separation of wiring classifications as specified herein. Separately dress, route and land microphone and line level cables and related on the right side of the equipment enclosure, as viewed from the rear; dress, route, and land loudspeaker level and control cables on the left side of the equipment enclosure, as viewed from the rear.

E. Access shall not require demounting or de-energizing of equipment. Install access covers, hinged panels, or pull-out drawers to insure complete access to terminals and interior components.

F. Fasten removable covers containing any wired component with a continuous hinge along one side, with associated wiring secured and dressed to provide an adequate service loop. Provide an appropriate stop locks to hold all hinged panels and drawers in a serviceable position.

G. Provide permanent labels for all equipment and devices. Where possible, fasten such labels to the rack frame or to blank or vent panels which will remain in place when active equipment is removed for possible service.

H. At jackfields, provide service loop to permit removal of jackfields from rack sufficient to conveniently access all jack contacts for routine cleaning and maintenance. Organize the service loop and harness such that reasonable reconnection of jacks and jack normals is possible without cutting apart the harness.

I. Coordinate the design and execution of wire harnessing of multi-bay rack ensembles with conditions of delivery to installation locations at Project Site, and with the requirement herein for test of the completely wired system in the shop prior to delivery to the Project Site. Organize the wiring harnesses such that they will fold within one shippable unit without risk of damage, or provide polarized multipin connectors and related interconnect systems as specified elsewhere herein.

J. At each equipment backboard, provide UL Listed surge suppressing multioutlet assembly with at least six (6) receptacles.

3.10 EQUIPMENT RACK AND EQUIPMENT TESTING AND ADJUSTING PROCEDURES

A. Conduct procedures in fabrication shop. Verify safe and proper operation of all components, devices, or equipment, establish nominal signal levels within the systems and verify the absence of extraneous or degrading signals. Make all preliminary adjustments and document the setting of all controls, parameters of all corrective networks, voltages at key system interconnection points, gains and losses, as applicable. Submit test report. Request and coordinate verification of submitted test data by the Owner's Representative. Correct all non-conforming conditions prior to shipment to Project Site. Perform at least the following procedures:

B. Preliminary: Verify:
   1. Grounding of devices and equipment. Integrity of signal and electrical system ground connections.
   2. Proper provision of power to devices and equipment.
   3. Integrity of all insulation, shield terminations and connections.
   4. Integrity of soldered connections. Absence of solder splatter, solder bridges.
   5. Absence of debris of any kind, tools, etc.
   6. Routing and dressing of wire and cable.
   7. All wiring, including polarity and continuity, including conformance with wire designations on running sheets, field and shop drawings.
   8. Mechanical integrity of all support provisions.

C. Rig temporary power and grounding. Comply with all applicable Codes, regulations and ordinances.

D. Determine the proper sequence of energizing systems to minimize the risk of damage. Energize. Burn in for at least 168 hours.

E. Sound Systems:
   1. Gain control settings: Establish tentative normal settings for all gain controls. Set all equalizers flat. Set all automatic gain control devices to bypass. Terminate power amplifier outputs with power load resistors with resistance value within 10% the nominal output impedance of the respective amplifier. Adjust all gain controls on equipment for optimum signal-to-noise ratio and signal balance and, unless they are sub-panel mounted, cap them to prevent tampering. Unless specified or directed otherwise, adjust gains such that in a given system the "front end" operates at unity gain and maintains 10 dB of clip margin referenced to the first onset of clipping of the associated power amplifier(s). Measure and document system gains at 1 kHz. Settings may require further adjustment by the Contractor, a result of testing by the Owner's Representative.
   2. Freedom from parasitic oscillation and radio frequency pickup: Maintain previous setup. Set up for each mode of operation specified in the functional requirements; verify that all systems are free from spurious oscillation and radio-frequency pickup using broadband oscilloscope. Correct any such defects.
   3. Hum and noise level/signal to noise level/signal to crosstalk level: Maintain previous setup. Terminate microphone and line-level inputs with shielded resistors of 150 and 600 ohms, respectively. Set available variable gain controls such that full power amplifier output would be achieved with -40 dBm input level at a microphone input and +12 dBm at a line-level input. Measure and document the specified parameters of the system overall for each microphone input channel and line-level input channel. Compare with nominal signal level.
   4. Total Harmonic Distortion: Maintain previous setup. Measure at reference operating level at least at 63 Hz, 125 Hz, 1 kHz, 10 kHz.

F. Baseband Video Systems:
   1. Picture Monitors:
      a. Apply crosshatch. Verify linearity.
      b. Apply red field. Adjust purity.
      c. Apply SMPTE bars and PLUGE. Adjust to standards.
   2. Video Path Test: Use manufacturer's procedures. Use full field or line signals.

G. Data/Graphics Systems:
   1. Projector:
      a. Apply crosshatch. Converge at design distance. Verify linearity.
      b. Apply red, green and blue field. Adjust purity.
   2. Wideband Component Analog Video Path Test: Use manufacturer's procedures.

H. Control System:
   1. Demonstrate complete operation.

3.11 PROJECTION SCREEN INSTALLATION

A. Inspection
   1. General: Examine surfaces and rough framing to determine suitability to install screen and mount. Do not start work until unsatisfactory conditions are corrected.

B. Installation
   1. Install screen and projector mount horizontal and plumb for proper operation per manufacturer's recommendations. Securely anchor to supporting structure to withstand all loading conditions and strain of service.

C. Adjustment
   1. Adjust units as required for smooth operation and alignment as required.
   2. Just prior to final acceptance of project, clean the screen surface according to the manufacturer's instructions.
   3. Protect completed work from damage until acceptance by the Owner's Representative.

3.12 LOUDSPEAKER ASSEMBLY INSTALLATION

A. Loudspeakers:
   1. Verify proper installation of loudspeaker enclosures and related support.
   2. Verify that no loudspeaker assembly is subjected to stresses or loading effects in any way contributing to possible extraordinary failure.

3.13 VIDEO PROJECTOR ASSEMBLY INSTALLATION

A. Design, engineer and provide complete, all means of support, suspension, attachment, fastening, bracing, and restraint (hereinafter "support") of such equipment. Provide engineering of such support by parties licensed to perform work of this type in the Project jurisdiction. Submit in timely manner.

B. Comply with applicable Code and the requirements of the Authorities having jurisdiction.

C. Provide safety factor greater than six (6) or as required by Code, whichever is greater.

D. Do not apply any load to building structure without first obtaining written approval of the Owner's Representative. Obtain per Project procedures.

E. During Acceptance Testing, adjust orientation of Video Projector as directed to achieve optimum picture. Provide workers and ladders as required. Perform such adjustment with no claim for additional cost or time.

3.14 SYSTEMS PERFORMANCE TESTING AND ADJUSTING PROCEDURES

A. Upon completion of the installation of all equipment in an area, perform the following tests and record results. Verify safe and proper operation of all components, devices, or equipment, establish nominal signal levels within the systems and verify the absence of extraneous or degrading signals. Make all preliminary adjustments and document the setting of all controls, parameters of all corrective networks, voltages at key system interconnection points, gains and losses, as applicable. Submit test report. Correct all non-conforming conditions prior to requesting Acceptance Review and Testing. Perform at least the following procedures:
   1. Mechanical: Verify:
      a. Integrity of all support provisions.
      b. Absence of debris of any kind, tools, etc.
   2. Power and Isolated Ground: Verify:
      a. Isolation of Isolated Ground system from raceway and related ground.
      b. Grounding of devices and equipment. Integrity of signal and technical power system ground connections.
      c. Proper provision of power to devices and equipment.
   3. Signal Wiring: Verify:
      a. Integrity of all insulation, shield terminations and connections.
      b. Integrity of soldered connections. Absence of solder splatter, solder bridges.
      c. Routing and dressing of wire and cable.
      d. Continuity, including conformance with wire designations on running sheets, field and shop drawings.
      e. Absence of ground faults.
      f. Polarity.
   4. Use the proper sequence of energizing systems to minimize the risk of damage. Energize.
   5. Sound Systems, Electronic Tests; confirm:
      a. Gain at 1 kHz.
      b. Maximum output.
      c. Input clipping level.
      d. Frequency response.
      e. Total harmonic distortion.
      f. Signal to noise ration.
      g. Signal to crosstalk ratio.
   6. Electro/Acoustic Tests:
      a. Uniformity of coverage.
      b. Electronic and acoustic frequency response/one-third octave equalization. Measure at ear level. Comply with applicable portions of ANSI (SMPTE) PH22.202M-1984, "B chain electro-acoustic response - control rooms and indoor theaters." Adjust to "curve X of B chain characteristic". Owner's Representative will direct final adjustment.

c. Maximum continuous sound pressure level (in the reverberant field). Drive systems with broadband pink noise. Sustain for at least five (5) minutes with no system damage. Measure for "A" and "C" weightings at ear level on loudspeaker axis. Turn off noise.
d. Acoustic signal-to-noise ratio referenced to the specified maximum continuous sound pressure level in the reverberant field. Measure for "A" and "C" weightings at ear level on loudspeaker axis with mechanical systems operating. Present comparison with previous measurement.

7. Video Systems:
   a. Picture Monitors:
      i. Apply crosshatch. Verify linearity.
      ii. Apply red field. Adjust purity.
      iii. Apply SMPTE bars and PLUGE. Adjust to standards.
   b. Video Path Test: Use NTC Report No. 7 procedures. Use full field or line signals.
      i. Insertion Gain.
      ii. Gain/Frequency Distortion.
8. Control System: Demonstrate complete operation.

3.15 LABELING

A. Conform with the requirements of Section 27 41 07 – Identification for Audiovisual Systems.

B. Provide permanent "wedge" type labels on all controls, as applies, to indicate correct settings after systems performance testing and adjustment procedures have been successfully completed.

END OF SECTION