Purchase College
STATE UNIVERSITY OF NEW YORK

Capital Facilities Planning

Addendum

To: Prospective Bidders

From: Sayim Malik
Project Manager, Capital Facilities Planning

Re: Addendum No. 1 to specifications SU-022317,

DATE: AUGUST 22ND 2017.

The Following items needs to be incorporated into the Bid.

The New Bid Due Date is September 12th 2017 at 1:00 PM local time at Purchasing Accounts Payable Office Administration Buildings, 735 Anderson Hill Road, Purchase New York 10577-1402. where such Proposals will be publicly opened and read aloud. Proposals may be hand delivered or mailed to the above location and must be received by such time.

1. Painting:
   At all locations where the flooring mastic was abated on both the 2nd and 3rd floors, provide the following repair at the lower 12" of sheetrock at all walls where the base was removed:
   1. Seal the damaged areas with an oil based or shellac based primer. Latex will NOT work as it gets absorbed and doesn't give it proper strength. Provide two coats.
   2. Sand all areas once primer is completely dry.
   3. Skim coat after sanding to prepare for wall finish.

2. Flooring:
   At all locations where the flooring mastic was abated on both the 2nd and 3rd floors, provide the following flash patching process:
   1. Provide a self-leveling bonding agent for the entire raw surface in preparation for new floor finish: Ardex or equal.
3. The Proposed work duration has been extended from 60 days to 90 Calendar days.
4. Please see attached revised electrical drawings Dated 08/21/17. Please price accordingly
5. Please see attached revised CTS specification. Please price accordingly
6. Please see attached Proposal form with alternates and allowance.
7. Please see attached Siemens quote that is to be incorporated as allowance in the Bid.

SYMBOLS LIST

$_a	SINGLE POLE SWITCH RATED AT 20AMP, 120 VOLT a=CONTROLLING OUTLET OR FIXTURE "a"
GFI	DUPLEX RECEPTACLE RATED AT 20-AMPS 120 VOLTS. GFI= GROUND FAULT INTERRUPTOR AC= ABOVE COUNTER
	WALL DOUBLE DUPLEX EACH RECEPTACLE RATED AT 20-AMPS 120 VOLTS. N ONE 4"X4" BOX
A	SPECIAL PURPOSE WALL MOUNTED RECEPTACLE (208V, 30A) TO BE REMOVED 2 POLE 3 WIRE (NEMA 6-30R)
(1)	EXISTING LEGACY TELEPHONE OUTLETS. NUMBER INDICATES TOTAL QUANTITY OF PORTS ON OUTLET BOX. REMOVE ALL LEGACY TELEPHONE OUTLETS, AND REMOVE ALL ASSOCIATED VISIBLE RACEWAY AND SURFACE MOUNTED BOXES. CUT BACK CABLING TO POINT WITHIN WALL. ALL EXISTING FLUSH MOUNTED BOXES SHALL BE PROVIDED WITH NEW BLANK FACEPLATES.
(1) RM	EXISTING DATA/TEL OUTLET. NUMBER INDICATES TOTAL QUANTITY OF PORTS ON OUTLET BOX. PROTECT AND PRESERVE UNLESS OTHERWISE NOTED. RM = REMOVE FACEPLATE & LOW VOLTAGE RING. CABLE SHALL BE COILED NEATLY, WITH COIL SUPPORTED BY J-HOOK ABOVE NEAREST ACCESSIBLE CEILING. PROTECT AND PRESERVE UNLESS OTHERWISE NOTED.
TV	EXISTING LEGACY COAXIAL NETWORK LOCATION WITH RECESSED BOX AND GROMMET PLATE. CUT BACK CABLE IN EXISTING BOX AND PROVIDE BLANK FACEPLATE.
(3) EXR	EXISTING DATA/TEL OUTLET TO BE RELOCATED. REMOVE FACEPLATE AND LOW VOLTAGE RING, AND INSTALL IN NEW LOCATION AS INDICATED ON DRAWINGS E-200 AND E-201. PULL BACK CAT6 CABLES AND REINSTALL IN NEW LOCATION. CABLES SHALL BE PROPERLY HANDLED BY QUALIFIED PROFESSIONALS WHILE BEING REMOVED. CONTRACTOR MUST PROTECT CABLES AT ALL TIMES DURING CONSTRUCTION. SHEETROCK MUST BE REPAIRED WHERE LOW-VOLTAGE RING HAS BEEN REMOVED. EXISTING PATHWAY SHALL BE UTILIZED. PATHWAY EXISTS FROM CS0008 TO EVERY ROOM ON 2ND AND 3RD FLOOR. SEE ADD ALTERNATE #1 ON THIS SHEET FOR MORE INFORMATION.
(3) RL	EXISTING DATA/TEL OUTLET RELOCATED TO NEW POSITION.
(3) RL	EXISTING DATA/TEL OUTLET RELOCATED TO NEW POSITION (PROVIDED IN NEW WALLS ONLY). NUMBER INDICATES TOTAL QUANTITY OF PORTS ON OUTLET. EXISTING RISER AND PATHWAY SHALL BE UTILIZED (EXISTING PATHWAY EXISTS FROM CS0008 TO EVERY ROOM ON 2ND AND 3RD FLOOR). PROVIDE (1) 1" EMT CONDUIT FROM OUTLET BOX TO ACCESSIBLE CEILING DIRECTLY ABOVE. SEE ADD ALTERNATE #1 ON THIS SHEET FOR MORE INFORMATION.
(4)	DATA/TEL OUTLET WITH LOW VOLTAGE RING LOCATED ABOVE ACCESSIBLE CEILING. PROVIDE CAT6 CABLE FROM OUTLET BOX TO COMMUNICATIONS ROOM CS0008 IN BASEMENT. NUMBER INDICATES TOTAL QUANTITY OF PORTS ON OUTLET. (EXISTING PATHWAY EXISTS FROM CS0008 TO EVERY ROOM ON 2ND AND 3RD FLOOR). SEE ADD ALTERNATE #1 ON THIS SHEET FOR MORE INFORMATION.
(3)	EXTRA DATA/TEL DROP. NUMBER INDICATES TOTAL NUMBER OF SPARE CABLES RUN FROM COMMUNICATIONS ROOM CS0008 IN BASEMENT TO THIS LOCATION. INDIVIDUALLY COIL 50' SLACK ON EACH CABLE NEATLY WITH VELCRO AND HANG COIL ON J-HOOK AT THIS LOCATION ABOVE FINISHED CEILING. (EXISTING PATHWAY EXISTS FROM CS0008 TO EVERY ROOM ON 2ND AND 3RD FLOOR).
J H	WALL MOUNTED JUNCTION BOX (J-BOX) WITH HOMERUN CIRCUIT AND FLEXIBLE CONNECTION TO EQUIPMENT. USE SEALTITE FOR OUTDOOR CONNECTIONS.
	FUSED DISCONNECT SWITCH. FUSE TO BE EQUAL TO OR LESS THAN THE WIRING AMPACITY.
	UNFUSED DISCONNECT SWITCH; SWITCH SIZE TO BE GREATER THAN OR EQUAL TO OVER CURRENT PROTECTION. U.O.N.
M	ELECTRIC METER
M	MOTOR
WAP EX	LOCATION OF EXISTING WIRELESS ACCESS POINT, PREVIOUSLY REMOVED BY OTHERS. PROTECT AND PRESERVE CAT6 CABLING, AND REINSTALL ACCESS POINT USING EXISTING CABLING. COLLEGE TO PROVIDE ACCESS POINT AND MOUNTING BRACKET.
WAP N	INSTALL NEW WIRELESS ACCESS POINT (ACCESS POINT AND MOUNTING BRACKET PROVIDED BY COLLEGE). PROVIDE (2) CAT6 CABLES FROM COMMUNICATIONS ROOM CS0008 TO NEW WIRELESS ACCESS POINT LOCATION USING EXISTING PATHWAYS.
HOMERUN NOTATION	PP-KIT/21,23,25 PANEL DESIGNATION CKT NUMBER
HD	HAND DRYER
OS	COMBINATION OCCUPANCY SENSOR/SWITCH: MANUFACTURER: LUTRON MODEL: MS-OPS6M2-DV-WH
VS	COMBINATION VACANCY SENSOR/SWITCH: MANUFACTURER: LUTRON MODEL: MS-VPS6M2-DV-WH
VS2	COMBINATION VACANCY SENSOR/SWITCH W/ 0-10V DIMMING CAPABILITY: MANUFACTURER: LUTRON MODEL: MS-Z101-V
VS3	COMBINATION VACANCY SENSOR/SWITCH W/ LINE VOLTAGE DIMMING CAPABILITY: MANUFACTURER: LUTRON MODEL: MSCL-VP153M
CS	COMPANION SWITCH FOR 3-WAY APPLICATIONS W/ COMBINATION VACANCY SENSOR/SWITCH: MANUFACTURER: LUTRON MODEL: MA-AS
OS a OS a	CEILING/CORNER MOUNTED WIRELESS OCCUPANCY SENSOR MANUFACTURER: LUTRON MODEL: LRF2-OCR2B-P LOWERCASE LETTER INDICATES LIGHTS CONTROLLED
CR	CARD READER. PROVIDE (1) 1" CONDUIT FROM READER TO NEAREST ACCESSIBLE CEILING, AND PROVIDE CAT6 CABLE TERMINATING IN NEAREST CEILING MOUNTED DATA OUTLET.
EX	EXISTING TO REMAIN
EXR	EXISTING TO BE RELOCATED
RM	EXISTING TO BE REMOVED
N	NEW DEVICE

ELECTRICAL ABBREVIATIONS

@	"AT" OR "EACH AT"
A	AMPERE
AC	ABOVE COUNTER
AF	AMPERE FRAME
AFF	ABOVE FINISHED FLOOR
AL	ALUMINUM
ALM	ALARM
ASYM	ASYMMETRICAL
AT	AMPERE TRIP
ATS	AUTOMATIC TRANSFER SWITCH
AUTO	AUTOMATIC
AWG	AMERICAN WIRE GAUGE
BKR	BREAKER
BLDG	BUILDING
C	CONDUIT
°C	DEGREE CELSIUS
CB	CIRCUIT BREAKER
CKT	CIRCUIT
CLG	CEILING
CLOS	CLOSET
COMM	COMMUNICATION
CONT	CONTINUATION
CT	CURRENT TRANSFORMER
CU	COPPER
CUH	CABINET UNIT HEATER
DB	DECIBEL
DEG	DEGREE
DISC	DISCONNECT
DN	DOWN
DP	DISTRIBUTION PANELBOARD
DWG	DRAWING
E	EMERGENCY
EA	EACH
EC	ELECTRICAL CONTRACTOR
EL	ELEVATION
ELEC	ELECTRICAL
ELEV	ELEVATOR
EM	EMERGENCY
EQPT	EQUIPMENT
EXIST	EXISTING
EXT	EXTERIOR
°F	DEGREE FAHRENHEIT
FA	FIRE ALARM
FAP	FIRE ALARM PANEL
FBO	FURNISHED BY OTHERS
FDS	FUSED DISCONNECT SWITCH
FIXT	FIXTURE
FL	FLOOR
FLEX	FLEXIBLE
FT	FEET OR FOOT
G	GROUND
GEN	GENERATOR
GFI	GROUND FAULT INTERUPTER
HC	HUNG CEILING
HP	HORSEPOWER
HV	HIGH VOLTAGE
HZ	HERTZ
IC	INTERRUPTING CAPACITY
INST	INSTANTANEOUS
JB	JUNCTION BOX
KV	KILOVOLT
KVA	KILOVOLT AMPERE
KW	KILOWATT
KWH	KILOWATT HOUR
LTG	LIGHTING
LV	LOW VOLTAGE
MAX	MAXIMUM
MCB	MAIN CIRCUIT BREAKER
MCM	THOUSAND CIRCULAR MILS
MECH	MECHANICAL
MFS	MAIN FUSED SWITCH
MIN	MINIMUM
MLO	MAIN LUGS ONLY
N	NEUTRAL
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE
PB	PULLBOX
ø	PHASE
RECEPT	RECEPTACLE
REQ	REQUIRED
RM	ROOM
SCHED	SCHEDULE
SECT	SECTION
SIG	SIGNAL
SP	SINGLE POLE
SPEC	SPECIFICATION
SW	SWITCH
SYM	SYMMETRICAL
SYS	SYSTEMS
TBD	TO BE DETERMINED
TD	TIME DELAY
TEL	TELEPHONE
TEMP	TEMPERATURE
TS	TAMPER SWITCH
TV	TELEVISION
TYP	TYPICAL
UNF	UNFUSED
UON	UNLESS OTHERWISE NOTED
V	VOLT OR VOLTAGE
VA	VOLT AMPERE
W	WATT
WP	WEATHERPROOF

ADD ALTERNATE #1

1. CONTRACTOR SHALL PROVIDE ADD ALTERNATE PRICING FOR ALL DATA/TEL OUTLET RELOCATIONS, CABLING INSTALLATION, AND SYSTEM TESTING. THIS SHALL NOT BE PROVIDED IN THE BASE BID.

ELECTRICAL DRAWING LIST

LIGHT FIXTURE SCHEDULE

SYMBOL	FIXTURE DESIGNATION	MANUFACTURER/MODEL #	DESCRIPTION	LAMP TYPE	VOLTAGE	WATTAGE
A / EM	A	CREE NORMAL: CR22-32L-35K-10V EMERGENCY: CR22-32L-35K-10V-EB14	RECESSED, 2X2 ARCHITECTURAL LED TROFFER. 'EM' INDICATES FIXTURE TO BE USED AS EMERGENCY LIGHT IN SPECIFIED AREAS.	LED	120-277	35
B / EM	B	CREE NORMAL: S-DL-6-34L-30K-EB EMERGENCY: S-DL-6-34L-30K	RECESSED 6" ROUND DOWNLIGHT. 'EM' INDICATES FIXTURE TO BE USED AS EMERGENCY LIGHT IN SPECIFIED AREAS.	LED	120-277	34
C	C	CREE FP14-40L-35K-10V	1X4 FLAT PANEL TROFFER.	LED	120/277	40
D	D	TECH LIGHTING 700UCF-19-9-3-W-LED	UNILIME SLIMLINE UNDERCABINET LIGHT. PROVIDE W/ SPLICE BOX FOR HARDWIRED APPLICATIONS.	LED	120	10.5
	--	LITHONIA LQC-1-R-EL N	CEILING MOUNTED EXIT LIGHTING FIXT. SHADED AREA INDICATES SIGN FACE. ARROW INDICATES DIRECTIONAL ARROW ON SIGN FACE.	LED	120/277	0.6

ELECTRICAL GENERAL NOTES

1. DRAWINGS ARE DIAGRAMMATIC AND INDICATE GENERAL ARRANGEMENT OF SYSTEMS AND WORK. FOLLOW DRAWING IN LAYING OUT WORK AND CHECK DRAWINGS OF OTHER TRADES TO VERIFY SPACE CONDITIONS. MAINTAIN HEADROOM AND SPACE CONDITIONS.
2. SECURE ALL SUPPORTS TO BUILDING STRUCTURE UTILIZING TOGGLE BOLTS (HOLLOW MASONRY), EXPANSION SHIELDS OR INSERTS (CONCRETE AND BRICK), MACHINE SCREWS (METAL), BEAM CLAMPS (FRAMEWORK), WOOD SCREWS (WOOD) OR PAN THRU STRAPS (METAL DECK). NAILS, RAWL PLUGS AND WOOD PLUGS ARE NOT PERMITTED. WHERE REQUIRED BY STRUCTURE, PROVIDE THRU BOLTS AND FISH PLATES. SUPPORT HORIZONTAL RUNS OF METALLIC RACEWAYS NOT MORE THAN 10 FT APART. SUPPORT RACEWAY RISERS AT EACH FLOOR LEVEL.
3. RACEWAYS SHALL BE ALLOWED TO PASS OVER WATER, STEAM OR OTHER PIPING WHEN PULL BOXES ARE NOT REQUIRED. NO RACEWAY SHALL BE ROUTED WITHIN 3 INCHES OF STEAM OR HOT WATER PIPES, OR APPLIANCES, EXCEPT PERPENDICULAR CROSSINGS WHERE RACEWAY SHALL BE A MINIMUM OF 1 INCH FROM PIPE COVER.
4. CUT CONDUIT ENDS SQUARE, REAM SMOOTH. PAINT MALE THREADS OF FIELD THREADED RACEWAYS WITH GRAPHITE BASE PIPE COMPOUND. DRAW UP TIGHT WITH RACEWAY COUPLING.
5. HORIZONTAL OR CROSS RUNS IN PARTITIONS AND WALLS ARE NOT PERMITTED. DO NOT RUN CONDUIT IN PRECAST ROOF SLABS, IN 2 INCH SLAB OR IN TERRAZZO FLOOR FINISH.
6. LEAVE WIRES WITH SUFFICIENT SLACK TO PERMIT MAKING FINAL CONNECTIONS. PROVIDE FISH WIRE FOR ALL EMPTY CONDUITS.
7. SET BOXES SQUARE AND TRUE WITH BUILDING FINISH. ERECT WALL AND SWITCH OUTLETS IN ADVANCE OF FURRING AND FIREPROOFING. SECURE TO BUILDING STRUCTURE BY ADJUSTABLE STRAP IRONS.
8. VERIFY LOCATIONS OF OUTLETS AND SWITCHES IN FINISHED ROOMS WITH ARCHITECTURAL DRAWINGS OF INTERIOR DETAILS AND FINISH. IN CENTERING OUTLETS AND LOCATING BOXES AND OUTLETS, ALLOW FOR OVERHEAD PIPES, DUCTS AND MECHANICAL EQUIPMENT, VARIATIONS IN FIREPROOFING AND PLASTERING, WINDOW AND DOOR TRIM, PANELING, HUNG CEILINGS AND THE LIKE. CORRECT ANY INACCURACY RESULTING FROM FAILURE TO DO SO WITHOUT EXPENSE TO OWNER.
9. LOCATIONS INDICATED FOR LOCAL WALL SWITCHES ARE SUBJECT TO MODIFICATIONS AT OR NEAR DOORS. COORDINATE WITH ARCHITECT AND INSTALL SWITCH ON SIDE OPPOSITE HINGE. VERIFY FINAL HINGE LOCATIONS IN FIELD PRIOR TO SWITCH OUTLET INSTALLATION.
10. COVERS OF JUNCTION AND PULLBOXES SHALL BE READILY ACCESSIBLE.
11. PROVIDE PULLBOXES AS INDICATED, REQUIRED BY CODE AND WHEREVER NECESSARY TO FACILITATE PULLING OF WIRE. COORDINATE PULLBOX LOCATIONS WITH OTHER TRADES.
12. FOR EMPTY RACEWAY RUNS, PROVIDE PULL BOXES EVERY 100 FT AND AS INDICATED. COORDINATE LOCATIONS WITH OTHER TRADES.
13. JUNCTION AND PULL BOXES SHOULD NOT BE LOCATED EXPOSED IN FINISHED SPACES. WHERE NECESSARY, REROUTE RACEWAYS OR MAKE OTHER ARRANGEMENTS FOR CONCEALMENT.
14. SUPPORT PANEL, JUNCTION AND PULL BOXES INDEPENDENTLY TO BUILDING STRUCTURE WITH NO WEIGHT BEARING ON RACEWAYS.
15. ALL ACCESS DOOR LOCATIONS SHALL BE REVIEWED BY ARCHITECT PRIOR TO INSTALLATION.
16. CONNECT CONDUIT TO MOTOR CONDUIT TERMINAL BOXES WITH FLEXIBLE CONDUIT; MINIMUM 18 IN. IN LENGTH AND 50% SLACK. DO NOT TERMINATE IN OR FASTEN RACEWAYS TO MOTOR FOUNDATION.
17. DO NOT PULL THERMOPLASTIC WIRES AT TEMPERATURES LOWER THAN 32°F (0°C) PROVIDE CABLE SUPPORTS FOR WIRE IN RISER CONDUITS AS REQUIRED BY CODE.
18. SEPARATE RACEWAYS FOR CONDUCTORS OF NORMAL AND EMERGENCY CIRCUITS. BOXES: PROVIDE BARRIERS BETWEEN EMERGENCY AND NORMAL WIRING.
19. HEIGHTS OF OUTLETS FROM FINISHED FLOOR TO CENTERLINE OF OUTLET:

RECEPTACLES:	
GENERALLY	1'-0"
OVER WORK BENCHES	3'-6"
WALL SWITCHES	4'-0"
WALL FIXTURES	7'-0"
HORN/STROBES	8'-0"

EXCEPTIONS: AT JUNCTION OF DIFFERENT WALL FINISH MATERIALS; ON MOLDING OR BREAK IN WALL SURFACE; IN VIOLATION OF CODE REQUIREMENTS; AS NOTED OR DIRECTED.

20. WIRE COLOR CODING: AS PER CODE. WHERE COLOR-CODED CABLE IS NOT AVAILABLE, CERTIFY IN WRITING AND REQUEST PERMISSION FOR OVERLAP COLOR TAPING OF CONDUCTORS (MINIMUM LENGTH 6") IN ACCESSIBLE LOCATIONS. COLOR CODING, ONCE SELECTED, MUST BE USED CONSISTENTLY FOR THE ENTIRE PROJECT.
21. INSTALL NEW WORK AND CONNECT TO EXISTING WORK WITH MINIMUM INTERFERENCE TO EXISTING FACILITIES. TEMPORARY SHUTDOWNS: ONLY WITH WRITTEN CONSENT OF OWNER. MAINTAIN CONTINUOUS OPERATION OF EXISTING FACILITIES. ALARM AND EMERGENCY SYSTEMS ARE NOT TO BE INTERRUPTED.
22. ALL LIGHT FIXTURES AND INSTRUMENTS THAT ARE REMOVED SHOULD BE CAREFULLY STORED FOR FUTURE USE. COORDINATE REMOVAL AND STORAGE OF ALL EQUIPMENT WITH BUILDING MANAGEMENT.
23. RUN EXPOSED RACEWAYS PARALLEL WITH OR AT RIGHT ANGLES TO WALLS.
24. FIRESTOPPING SHALL BE INSTALLED WHENEVER WIRING OR RACEWAYS CROSS FIRE RATED CONSTRUCTION.
25. POWER INTERRUPTIONS AND CORE DRILLING ONLY PERMITTED BETWEEN THE HOURS OF 6 PM AND 8 AM. AS APPROVED BY BUILDING MANAGER.
26. SUPPORT RACEWAY RISERS AT EACH FLOOR LEVEL.
27. DO NOT SWITCH POWER TO BATTERY BALLAST FOR EMERGENCY FIXTURES SHOWN SWITCH CONTROLLED.
28. FOR LIGHT FIXTURES SPECIFICATIONS SEE ARCHITECTURAL SPECIFICATIONS & DRAWINGS.
29. COORDINATE ALL EXPOSED CONDUIT RUNS WITH ARCHITECT PRIOR TO EXPOSED CONDUIT INSTALLATION.
30. ALL OUTDOOR ELECTRICAL EQUIPMENT SHALL BE RATED NEMA-3R.
31. FOR EACH MODIFIED ELECTRICAL PANEL, THE CONTRACTOR SHALL PROVIDE A TYPE WRITTEN DIRECTORY CARD TO REFLECT NEW CIRCUITING.
32. UPON COMPLETION OF THE WORK, A MARKED UP SET OF "AS-BUILT" DRAWINGS SHALL BE SUBMITTED TO THE BUILDING MANAGER AND TENANT.

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ARCHITECT
dimovski architecture PLLC
59 Kensico Road, Thornwood, NY 10594
(914) 747-3500 | (914) 747-3588 fax
www.dimovskiarchitecture.com

MEP ENGINEER
Collado ENGINEERING
2 HOLLAND AVENUE
WHITE PLAINS NY 10603
(914) 332-7658

NO.	REVISION/ISSUE	DATE
3.	ELECTRICAL ADDENDUM	08/21/2017
2.	ISSUE FOR BID	05/10/2017
1.	ISSUE FOR 90% REVIEW	05/01/2017

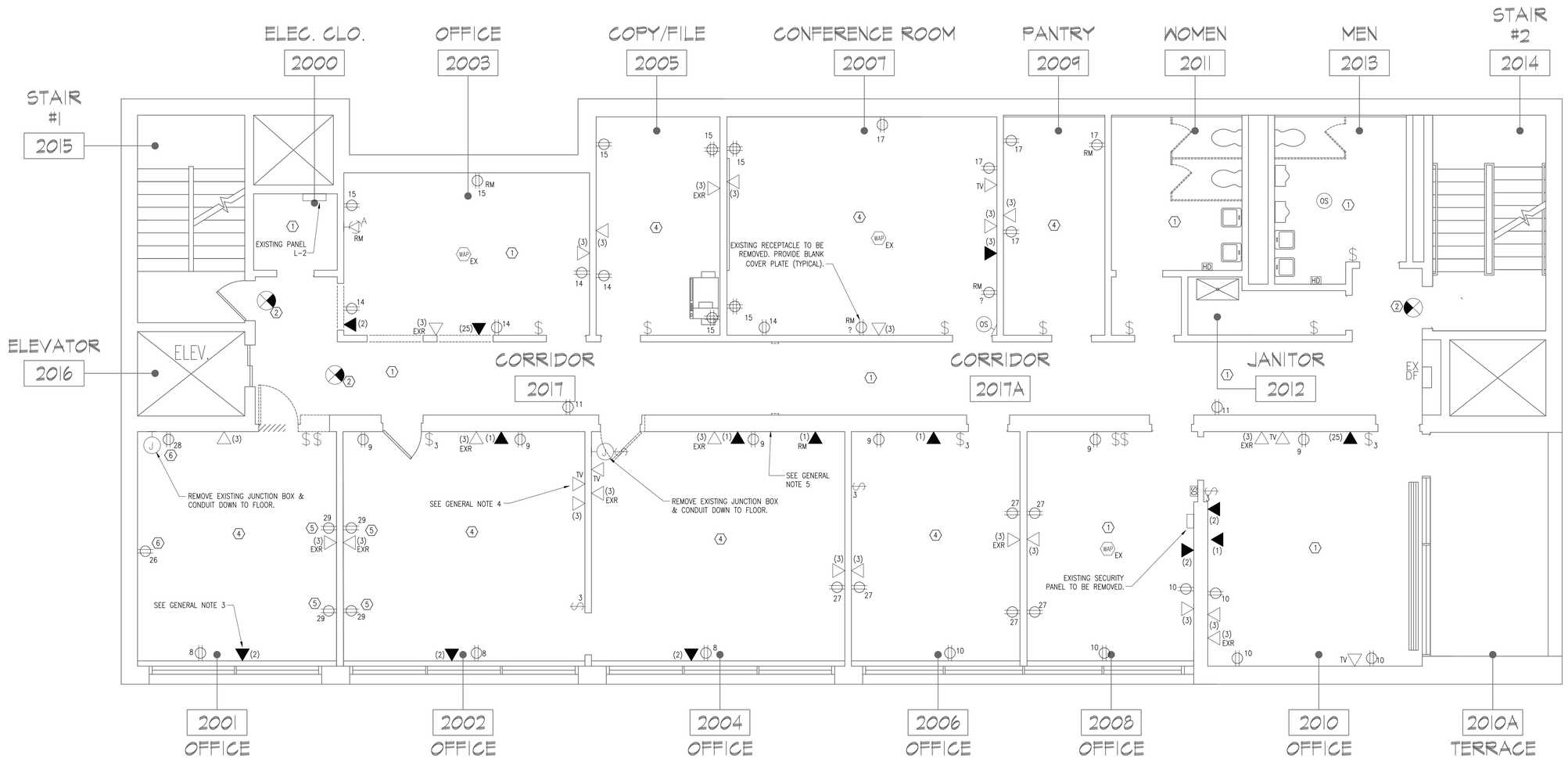
SEAL

PROJECT
INTERIOR RENOVATION
CAMPUS CENTER SOUTH

DATE:	05/01/2017
PROJECT NO:	DA 16169 / SU 022317
DRAWN BY:	YK
CHECKED BY:	PD/SGD
SCALE:	AS NOTED

DRAWING TITLE
ELECTRICAL SYMBOLS LIST, ABBREVIATIONS, GENERAL NOTES, LIGHTING SCHEDULE, & DRAWING LIST

SHEET NO.
E-001



1 2ND FLOOR ELECTRICAL DEMOLITION PLAN

SCALE: 1/4" = 1'-0"

ELECTRICAL KEYED NOTES:

1. REMOVE EXISTING LIGHTING AND ASSOCIATED CONTROLS WITHIN ROOM INDICATED. TERMINATE WIRING & CONDUIT FEEDING THESE FIXTURES BACK TO NEAREST JUNCTION BOX FOR FUTURE RE-USE.
2. REMOVE EXISTING EXIT SIGN. CONDUIT AND WIRING TO REMAIN FOR CONNECTION TO FUTURE EXIT SIGN.
3. NOT USED.
4. REMOVE EXISTING LIGHTING CONTROLS WITHIN ROOM INDICATED. EXISTING LIGHTING FIXTURES TO REMAIN. WIRING & CONDUIT TO REMAIN FOR FUTURE RE-USE.
5. PANEL SCHEDULE INDICATES RECEPTACLES ARE LOCATED ON CIRCUIT 29. CIRCUIT 29 IS NOT AN ACTIVE CIRCUIT.
6. COMBINE (2) RECEPTACLES TO ONE CIRCUIT (L-2/26). REFER TO PANEL SCHEDULE FOR DETAILS.

ELECTRICAL GENERAL NOTES:

1. FOR ALL TEL/DATA OUTLETS, ACCESS POINTS, AND OTHER IT EQUIPMENT TO BE REMOVED, CAT6 CABLE SHALL BE CAREFULLY PRESERVED AND NEATLY COILED IN CEILING FOR FUTURE USE. ALL DATA CABLES SHALL BE RE-USED FOR NEW DEVICES WHEREVER POSSIBLE.
2. ALL CIRCUITS INDICATED ARE CONNECTED TO PANEL PANEL L-2.
3. EXISTING LEGACY TELEPHONE OUTLET (TYPICAL). REFER TO SYMBOL LIST FOR SCOPE OF DEMOLITION.
4. CUT BACK EXISTING CATV CABLE AND TUCK INTO EXISTING GANG BOX OR WALL FOR FUTURE USE. INSTALL NEW BLANK FACEPLATE ON EXISTING CATV GANG BOX. IF EXISTING CATV BOX WAS SURFACE MOUNTED, THEN REMOVE BOX AND TRIM CABLE, TUCKING CABLE INTO WALL.
5. REMOVE EXISTING ALARM PANEL AND ASSOCIATED WIRING. CUT WIRING FLUSH WITH WALL AND PRESERVE CABLES IN WALL FOR FUTURE USE.

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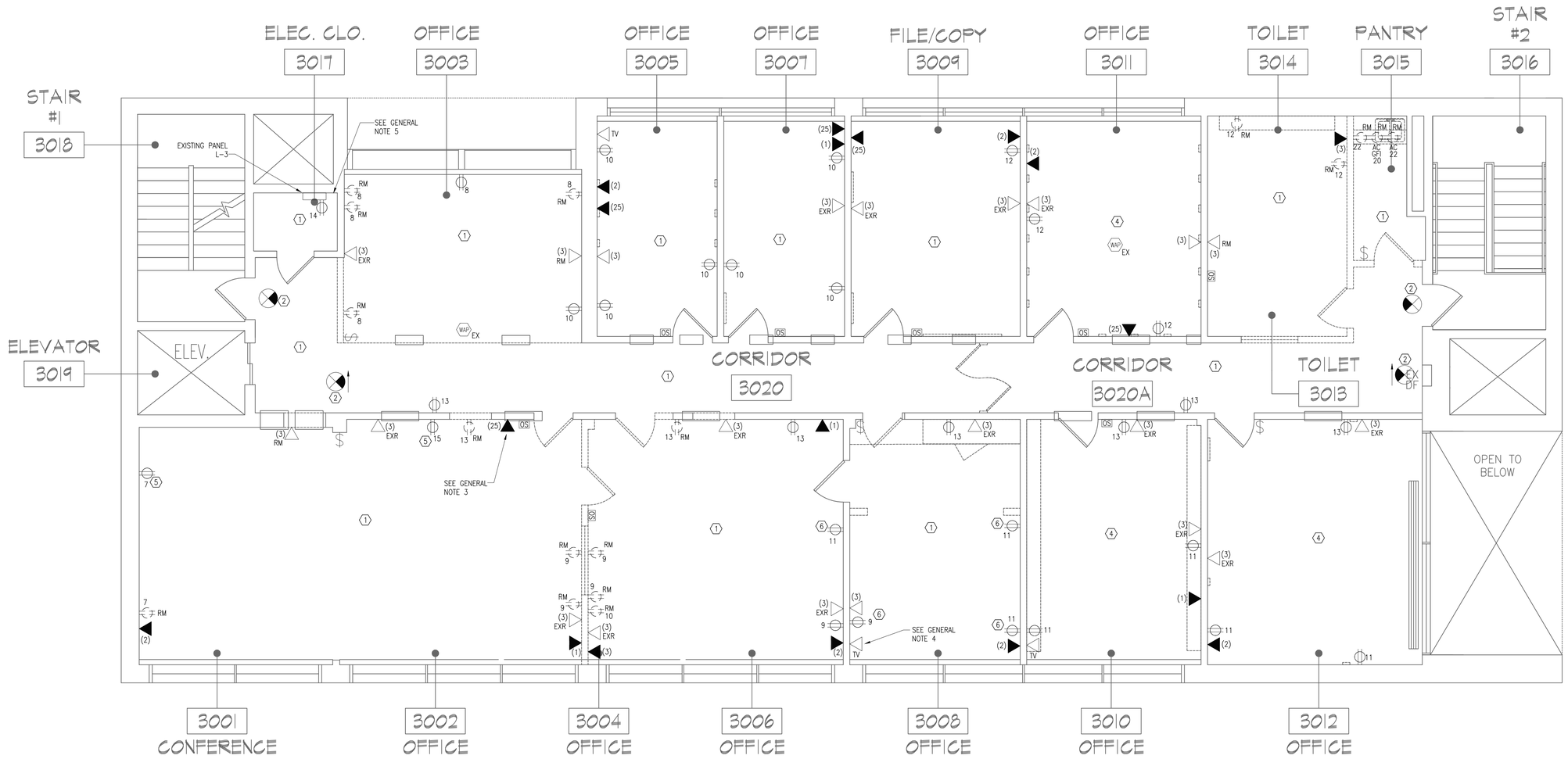
CHECKED BY:	PD/SGD
SCALE:	AS NOTED

DRAWING TITLE

2ND FLOOR ELECTRICAL DEMOLITION PLAN

SHEET NO.

E-101



1 3RD FLOOR ELECTRICAL DEMOLITION PLAN

SCALE: 1/4" = 1'-0"

ELECTRICAL KEYED NOTES:

1. REMOVE EXISTING LIGHTING AND ASSOCIATED CONTROLS WITHIN ROOM INDICATED. TERMINATE WIRING & CONDUIT FEEDING THESE FIXTURES BACK TO NEAREST JUNCTION BOX FOR FUTURE RE-USE.
2. REMOVE EXISTING EXIT SIGN. CONDUIT AND WIRING TO REMAIN FOR CONNECTION TO FUTURE EXIT SIGN.
3. NOT USED.
4. REMOVE EXISTING LIGHTING CONTROL WITHIN ROOM INDICATED. EXISTING LIGHT FIXTURES TO REMAIN. CONDUIT & WIRING TO REMAIN FOR FUTURE RE-USE.
5. RE-CONNECT RECEPTACLE (L-3/15) TO RECEPTACLE CIRCUIT (L-3/7).
6. (3) EXISTING RECEPTACLES SHOWN (L-3/11) SHALL BE RECONNECTED TO RECEPTACLE CIRCUIT (L-3/9).

ELECTRICAL GENERAL NOTES:

1. FOR ALL TEL/DATA OUTLETS, ACCESS POINTS, AND OTHER IT EQUIPMENT TO BE REMOVED, CAT6 CABLE SHALL BE CAREFULLY PRESERVED AND NEATLY COILED IN CEILING FOR FUTURE USE. ALL DATA CABLES SHALL BE RE-USED FOR NEW DEVICES WHEREVER POSSIBLE.
2. ALL CIRCUITS INDICATED ARE CONNECTED TO PANEL L-3.
3. EXISTING LEGACY TELEPHONE OUTLET (TYPICAL). REFER TO SYMBOL LIST FOR SCOPE OF DEMOLITION.
4. CUT BACK EXISTING CATV CABLE AND TUCK INTO EXISTING GANG BOX OR WALL FOR FUTURE USE. INSTALL NEW BLANK FACEPLATE ON EXISTING CATV BOX. IF EXISTING CATV BOX WAS SURFACE MOUNTED, THEN REMOVE BOX AND TRIM CABLE, TUCKING CABLE INTO WALL.
5. NEATLY COIL EXISTING RUBBER (WEATHERPROOF) 12/2 AND COAXIAL ANTENNA CABLE THAT DESCENDS FROM CORNER OF ELECTRICAL CLOSET ABOVE PATCH PANEL AND PRESERVE FOR FUTURE USE.

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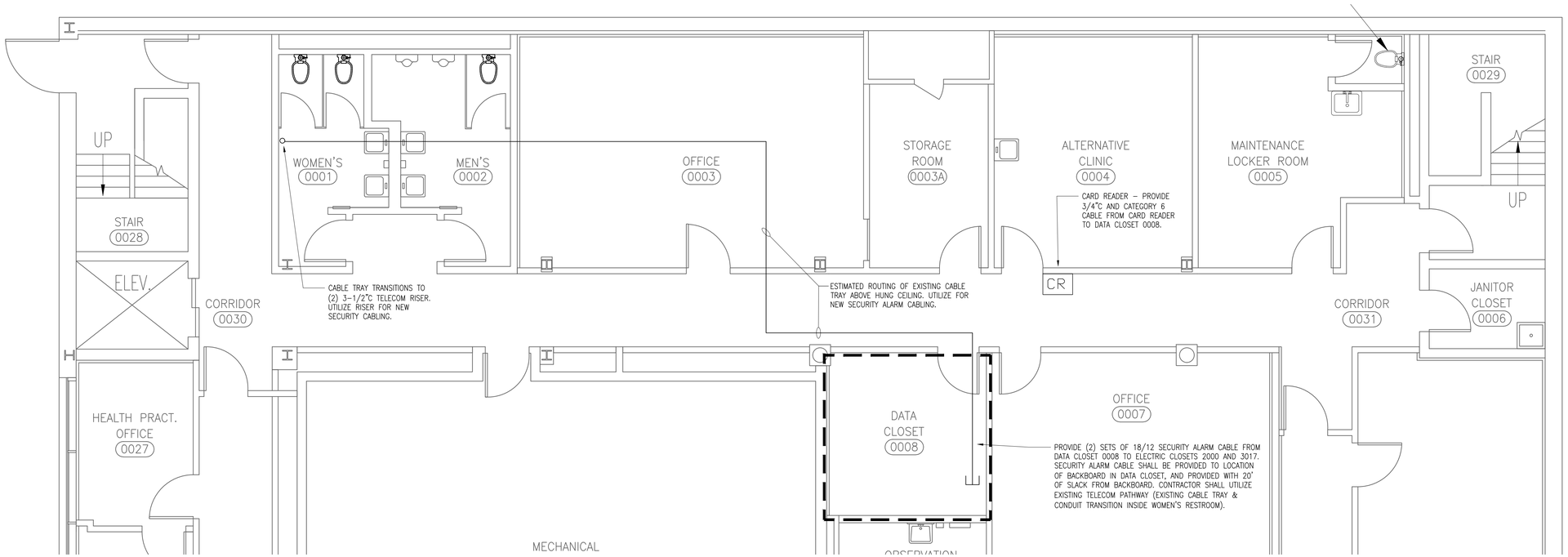
DRAWING TITLE
3RD FLOOR ELECTRICAL DEMOLITION PLAN

SHEET NO.
E-102



1 CELLAR IT ROUTING PLAN
SCALE: 1/4" = 1'-0"

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PURCHASE, NY 10577-1400

ARCHITECT
dimovski architecture PLLC
59 Kensico Road, Thornwood, NY 10594
(914) 747-3500 | (914) 747-3588 fax
www.dimovskiarchitecture.com

MEP ENGINEER
Collado ENGINEERING
2 HOLLAND AVENUE
WHITE PLAINS NY 10603
(914) 332-7658

NO.	REVISION/ISSUE	DATE
3.	ELECTRICAL ADDENDUM	08/21/2017
2.	ISSUE FOR BID	05/10/2017
1.	ISSUE FOR 90% REVIEW	05/01/2017

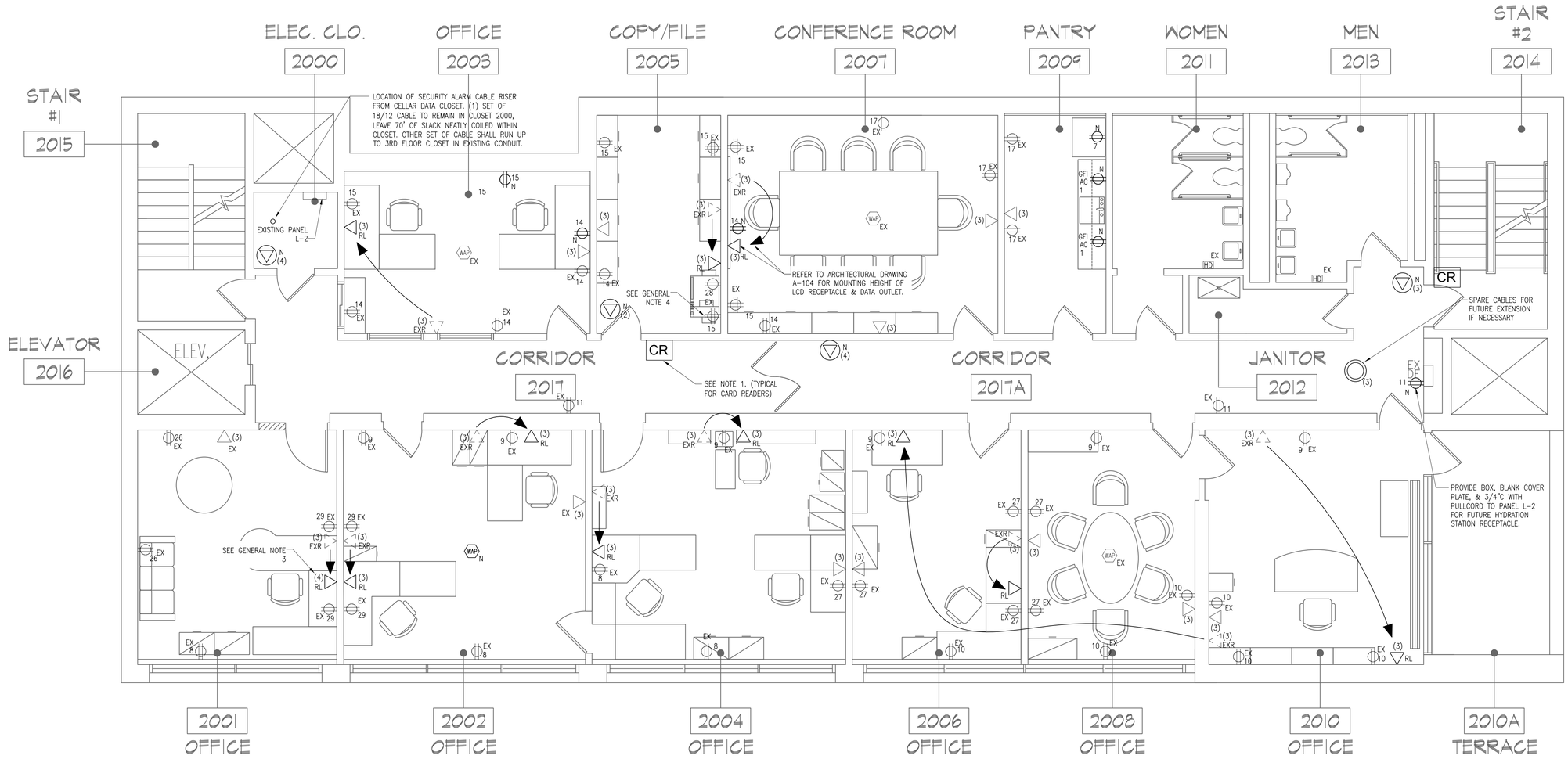
SEAL

PROJECT
INTERIOR RENOVATION
CAMPUS CENTER SOUTH

DATE:	05/01/2017
PROJECT NO:	DA 16169 / SU 022317
DRAWN BY:	YK
CHECKED BY:	PD/SGD
SCALE:	AS NOTED

DRAWING TITLE
CELLAR AND 1ST FLOOR IT ROUTING PLAN

SHEET NO.
E-200



1 2ND FLOOR ELECTRICAL POWER PLAN

SCALE: 1/4" = 1'-0"

ELECTRICAL GENERAL NOTES:

1. PROVIDE (1) 1" CONDUIT FROM CARD READER TO NEAREST ACCESSIBLE CEILING. PROVIDE CAT6 PATCH CABLE FROM CARD READER TO NEAREST CEILING MOUNTED DATA RECEPTACLE
2. ALL NEW/EXISTING POWER & DATA OUTLETS: PROTECT WITH BLANK COVER FACEPLATES DURING CONSTRUCTION WORK TO PROTECT AGAINST DAMAGE. PRIOR TO PAINTING, TAPE OVER FACEPLATES TO AVOID PAINTING OVER.
3. PROVIDE ADDITIONAL NEW DATA OUTLET/CABLE IN ADDITION TO THE THREE DATA OUTLETS/CABLES THAT SHALL BE MOVED TO SPECIFIED LOCATION IN OFFICE 2001. CABLE SHALL BE PROVIDED FROM COMMUNICATIONS ROOM CS0008.
4. PROVIDE BLANK COVER PLATE FOR EXISTING QUAD RECEPTACLE.
5. ALL CIRCUITS INDICATED SHALL BE CONNECTED TO PANEL L-2.

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dimovski architecture PLLC
59 Kensico Road, Thornwood, NY 10594
(914) 747-3500 | (914) 747-3588 fax
www.dimovskiarchitecture.com

MEP ENGINEER
Collado ENGINEERING
2 HOLLAND AVENUE
WHITE PLAINS NY 10603
(914) 332-7658

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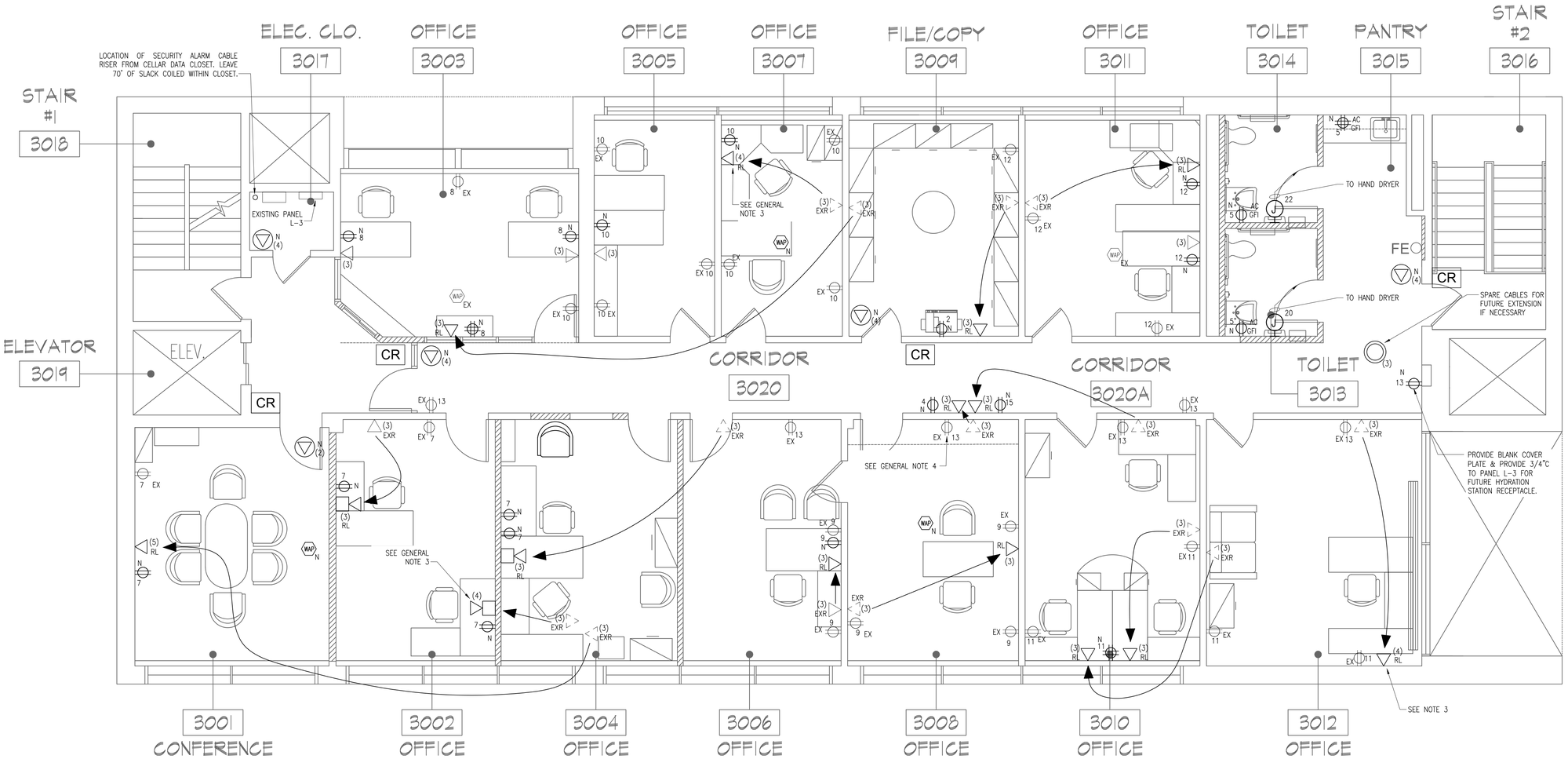
DRAWING TITLE
2ND FLOOR ELECTRICAL POWER PLAN

SHEET NO.
E-201



1 3RD FLOOR ELECTRICAL POWER PLAN

SCALE: 1/4" = 1'-0"

ELECTRICAL GENERAL NOTES:

1. PROVIDE (1) 1" CONDUIT FROM CARD READER TO NEAREST ACCESSIBLE CEILING. PROVIDE CAT6 CABLE FROM CARD READER TO NEAREST CEILING MOUNTED DATA RECEPTACLE.
2. ALL NEW/EXISTING POWER & DATA OUTLETS: PROVIDE WITH FACEPLATES DURING CONSTRUCTION WORK TO PROTECT AGAINST DAMAGE. PRIOR TO PAINTING, TAPE OVER FACEPLATES TO AVOID PAINTING OVER.
3. PROVIDE ADDITIONAL NEW DATA OUTLETS/CABLES IN ADDITION TO THE THREE DATA OUTLETS/CABLES THAT SHALL BE MOVED TO SPECIFIED LOCATION. CABLE SHALL BE PROVIDED FROM COMMUNICATIONS ROOM CS0008.
4. PROVIDE BLANK COVER PLATE FOR EXISTING DUPLEX RECEPTACLE.
5. ALL CIRCUITS INDICATED SHALL BE CONNECTED TO PANEL L-3.

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ARCHITECT

dimovski architecture PLLC
59 Kensico Road, Thornwood, NY 10594
(914) 747-3500 | (914) 747-3588 fax
www.dimovskiarchitecture.com

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2 HOLLAND AVENUE
WHITE PLAINS NY 10603
(914) 332-7658

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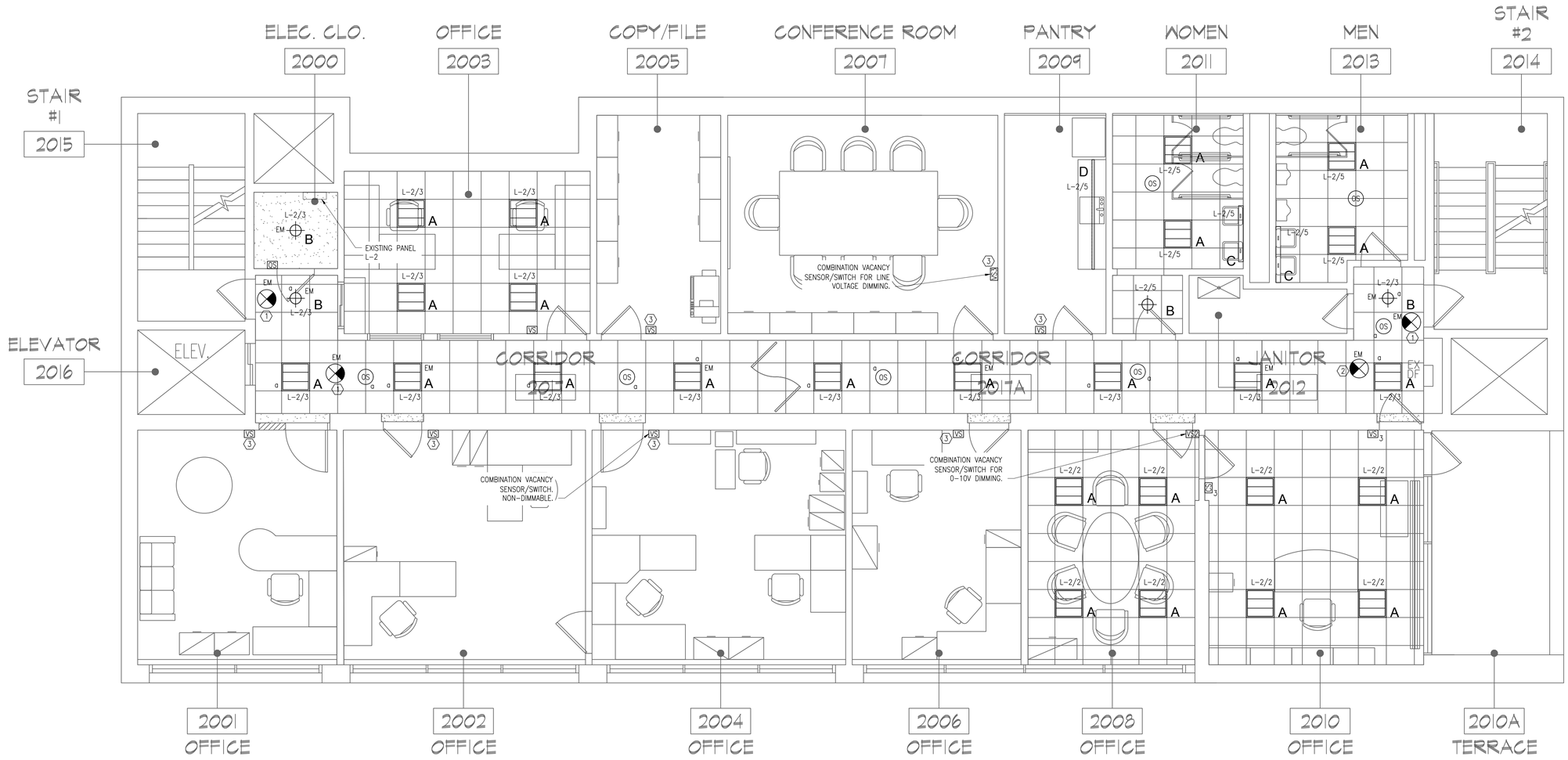
3RD FLOOR ELECTRICAL POWER PLAN

SHEET NO.

E-202



1 2ND FLOOR ELECTRICAL LIGHTING PLAN

SCALE: 1/4" = 1'-0"

ELECTRICAL KEYED NOTES:

1. PROVIDE NEW EXIT SIGN IN SAME LOCATION AS ORIGINAL FIXTURE AND EXTEND WIRING & CONDUIT TO NEW FIXTURE.
2. CONNECT NEW EXIT SIGN TO NEAREST ADJACENT EXIT SIGN CIRCUIT.
3. PROVIDE COMBINATION SENSOR/SWITCH AS INDICATED AND CONNECT TO EXISTING LIGHTING CIRCUIT.

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dimovski architecture PLLC
59 Kensico Road, Thornwood, NY 10594
(914) 747-3500 | (914) 747-3588 fax
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2 HOLLAND AVENUE
WHITE PLAINS NY 10603
(914) 332-7658

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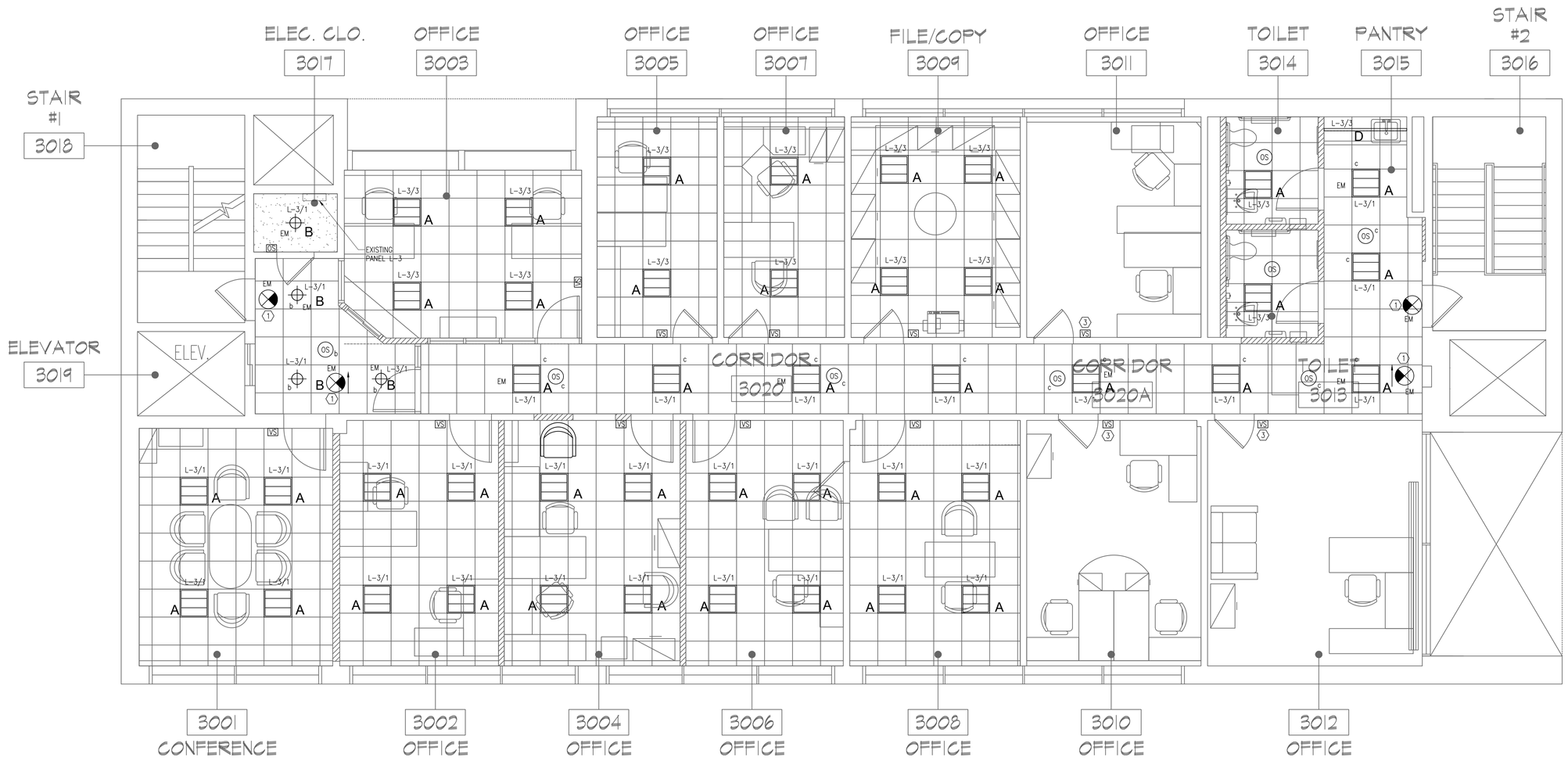
DRAWING TITLE

2ND FLOOR ELECTRICAL LIGHTING PLAN

SHEET NO.

E-203



1 3RD FLOOR ELECTRICAL LIGHTING PLAN

SCALE: 1/4" = 1'-0"

ELECTRICAL KEYED NOTES:

1. CONNECT NEW LIGHTING TO CIRCUIT FEEDING EXISTING LIGHTING IN THIS ROOM.
2. PROVIDE NEW EXIT SIGN IN SAME LOCATION AS ORIGINAL FIXTURE AND EXTEND WIRING & CONDUIT TO NEW FIXTURE.
3. PROVIDE COMBINATION SENSOR/SWITCH AS INDICATED AND CONNECT TO EXISTING LIGHTING CIRCUIT.

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2 HOLLAND AVENUE
WHITE PLAINS NY 10603
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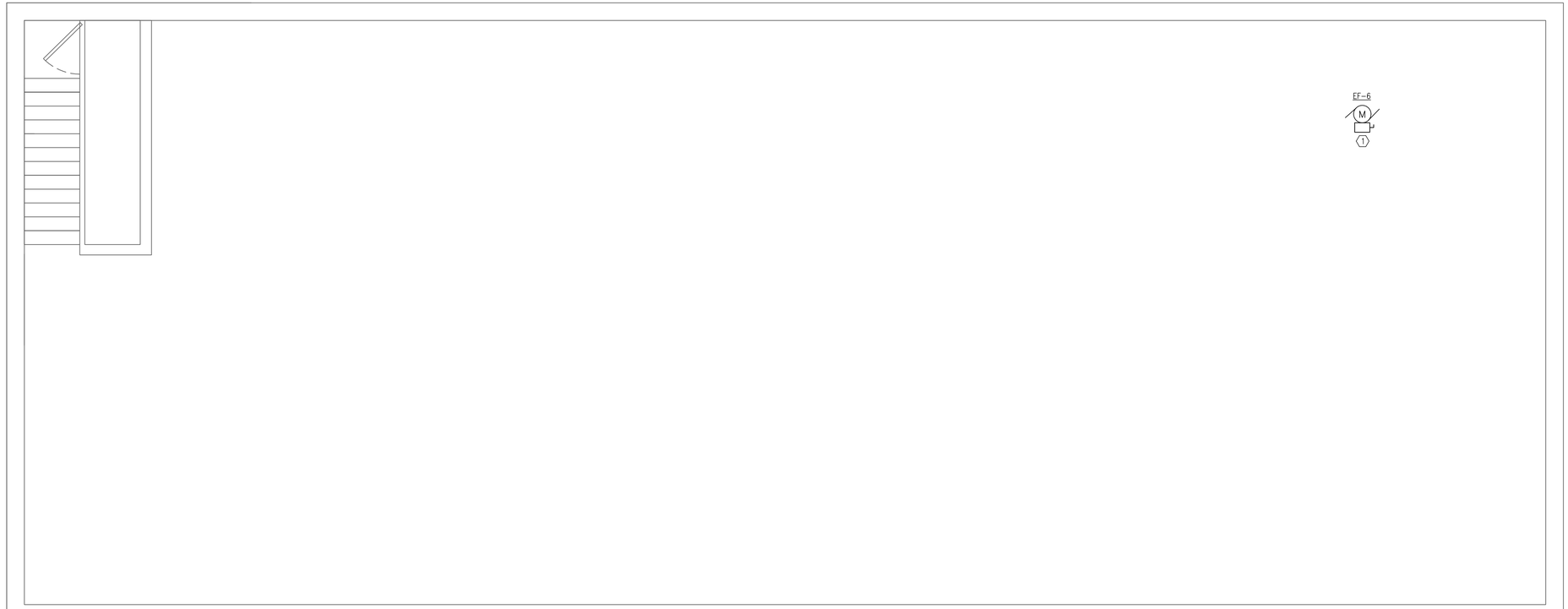
SCALE:	AS NOTED

DRAWING TITLE

3RD FLOOR ELECTRICAL LIGHTING PLAN

SHEET NO.

E-204



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

ELECTRICAL KEYED NOTES:

1 DISCONNECT EXISTING EXHAUST FAN AND RECONNECT EXISTING WIRING & CONDUIT TO NEW EXHAUST FAN.

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PURCHASE, NY 10577-1400

ARCHITECT
dimovski architecture PLLC
59 Kensico Road, Thornwood, NY 10594
(914) 747-3500 | (914) 747-3588 fax
www.dimovskiarchitecture.com

MEP ENGINEER
Collado ENGINEERING
2 HOLLAND AVENUE
WHITE PLAINS NY 10603
(914) 332-7658

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SCALE:	AS NOTED

DRAWING TITLE
ROOF ELECTRICAL POWER PLAN

SHEET NO.
E-205

PANEL NO. L-2 SECTION _____ EXISTING PANEL ☐RECESSED ☒SURFACE MOUNTED ☐MAIN LUG ONLY ☒MAIN CB ☐FEED THRU LUG REV. DATE _____ REV. DATE _____ REV. DATE _____

VOLTS 120/208 PH 3 W 4 G 1

MAIN CB 100A BUS 100A MIN. INTERRUPTING RATING _____ SYMM.

CKT NO.	TRIP (AMPS)	DESCRIPTION OF LOAD	LOAD (AMPS)	PER PHASE AMPS A	B	C	LOAD (AMPS)	DESCRIPTION OF LOAD	TRIP (AMPS)	CKT NO.
1	20	EXISTING LIGHTS ROOMS 2003, 2005	0	0			0	EXISTING LIGHTS ROOMS 2004, 2006, 2008	20	2
3	20	EXISTING LIGHTS ROOM 2000, CORRIDOR 2017, 2017A	0		0		0	EXISTING LIGHTS ROOM 2002	20	4
5	20	EXISTING LIGHTS ROOMS 2007, 2009, 2011, 2012, 2013	0			0	0	EXISTING LIGHTS ROOM 2001	20	6
7	20	EXISTING LIGHTS ROOM 2010	0	4.5			4.5	EXISTING RECP. ROOMS 2001, 2002, 2004	20	8
9	20	EXISTING RECP. ROOMS 2002, 2004, 2006, 2008, 2010	9		18		9	EXISTING RECP. ROOMS 2006, 2008, 2010	20	10
11	20	EXISTING RECP. CORRIDOR 2017, 2017A	4.5			4.5	0	EXISTING CIRCUIT	20	12
13	20	EXISTING CIRCUIT	0	7.5			7.5	EXISTING RECP. ROOMS 2003, 2005, 2007	20	14
15	20	EXISTING RECP. ROOMS 2003, 2005, 2007	10.5		10.5		0	EXISTING CIRCUIT	20	16
17	20	EXISTING RECP. ROOMS 2007, 2009	7.5			7.5	0	EXISTING CIRCUIT	20	18
19	20	EXISTING CIRCUIT	0	0			0	EXISTING CIRCUIT	20	20
21	20	EXISTING CIRCUIT	0		0		0	EXISTING CIRCUIT	20	22
23	20	EXISTING CIRCUIT	0			0	0	EXISTING CIRCUIT	20	24
25	20	EXISTING CIRCUIT	0	1.5			1.5	EXISTING RECP. ROOM 2001 (1)	20	26
27	20	EXISTING RECP. ROOMS 2004, 2006, 2008	9		10.5		1.5	EXISTING RECP. ROOM 2001 (1)	20	28
29	20	EXISTING RECP. ROOMS 2001, 2002	6			6	0	EXISTING CIRCUIT	20	30
31			0	0			0	EXISTING CIRCUIT	20	32
33	100	MAIN	0		0		0	EXISTING CIRCUIT	50	34
35			0			0	0			36
				13.5	39	18				

ELECTRICAL KEYED NOTES:

(1) CONTRACTOR SHALL COMBINE (2) CIRCUITS INTO ONE (L-2/26) BY PROVIDING JUNCTION BOX ADJACENT TO PANEL AND SPLICING CIRCUITS.

1 PANEL SCHEDULES – EXISTING CONDITIONS
SCALE: N/A

PANEL NO. L-3 SECTION _____ EXISTING PANEL ☐RECESSED ☒SURFACE MOUNTED ☐MAIN LUG ONLY ☒MAIN CB ☐FEED THRU LUG REV. DATE _____ REV. DATE _____ REV. DATE _____

VOLTS 120/208 PH 3 W 4 G 1

MAIN CB 100A BUS 100A MIN. INTERRUPTING RATING _____ SYMM.

CKT NO.	TRIP (AMPS)	DESCRIPTION OF LOAD	LOAD (AMPS)	PER PHASE AMPS A	B	C	LOAD (AMPS)	DESCRIPTION OF LOAD	TRIP (AMPS)	CKT NO.
1	20	EXISTING LIGHTS ROOM 3017, CORRIDOR 3020, 3020A	0	0			0	EXISTING LIGHTS ROOMS 3001, 3002	20	2
3	20	EXISTING LIGHTS ROOMS 3003, 3005, 3007	0		0		0	EXISTING LIGHTS ROOMS 3004, 3006, 3008	20	4
5	20	EXISTING LIGHTS ROOMS 3009, 3011, 3013, 3014, 3015	0			0	0	EXISTING LIGHTS ROOMS 3010, 3012	20	6
7	20	EXISTING RECP. ROOM 3001	3	10.5			7.5	EXISTING RECP. ROOM 3003	20	8
9	20	EXISTING RECP. ROOMS 3002, 3004, 3006, 3008	9		21		12	EXISTING RECP. ROOMS 3003, 3004, 3005, 3007	20	10
11	20	EXISTING RECP. ROOMS 3006, 3008, 3010, 3012	10.5			18	7.5	EXISTING RECP. ROOMS 3009, 3011, 3013, 3014	20	12
13	20	EXISTING RECP. ROOMS 3002, 3004, 3006, 3008, 3010, 3012, CORRIDOR 3020, 3020A	12	13.5			1.5	EXISTING RECEP. ROOM 3017	20	14
15	20	EXISTING RECP. ROOM 3002	1.5		1.5		0	EXISTING CIRCUIT	20	16
17	20	EXISTING CIRCUIT	0			0	0	EXISTING CIRCUIT	20	18
19			0	1.5			1.5	EXISTING GFI RECP. ROOM 3015	20	20
21	100	MAIN	0		3		3	EXISTING RECP. ROOM 3015	20	22
23			0			0	0	EXISTING SPACE		24
				25.5	25.5	18				

PANEL NO. L-2 SECTION _____ EXISTING PANEL ☐RECESSED ☒SURFACE MOUNTED ☐MAIN LUG ONLY ☒MAIN CB ☐FEED THRU LUG REV. DATE _____ REV. DATE _____ REV. DATE _____

VOLTS 120/208 PH 3 W 4 G 1

MAIN CB 100A BUS 100A MIN. INTERRUPTING RATING _____ SYMM.

CKT NO.	TRIP (AMPS)	DESCRIPTION OF LOAD	LOAD (AMPS)	PER PHASE AMPS A	B	C	LOAD (AMPS)	DESCRIPTION OF LOAD	TRIP (AMPS)	CKT NO.
1	20	EXISTING LIGHTS ROOM 2005 & NEW GFI RECEPTACLES IN 2009	4.67	11.17			6.5	EXISTING LIGHTS ROOMS 2004, 2006 & NEW LIGHTS ROOM 2008, 2010	20	2
3	20	NEW LIGHTS ROOM 2000, 2003, CORRIDOR 2017, 2017A	4.67		7.17		2.5	EXISTING LIGHTS ROOM 2002	20	4
5	20	EXISTING LIGHTS ROOMS 2007, 2012 & NEW LIGHTS ROOMS 2009, 2011, 2013	5.5			8	2.5	EXISTING LIGHTS ROOM 2001	20	6
7	20	FRIDGE RECP. ROOM 2009	1.5	7.5			6	EXISTING RECP. ROOMS 2001, 2002, 2004	20	8
9	20	EXISTING RECP. ROOMS 2002, 2004, 2006, 2008, 2010	9		18		9	EXISTING RECP. ROOMS 2006, 2008, 2010	20	10
11	20	EXISTING RECP. CORRIDOR 2017, 2017A, & HYDRATION STATION	4.5			4.5	0	EXISTING CIRCUIT	20	12
13	20	EXISTING CIRCUIT	0	10.5			10.5	EXISTING RECP. ROOMS 2003, 2005, 2007 & NEW RECP. ROOMS 2003, 2007	20	14
15	20	EXISTING RECP. ROOMS 2003, 2005, 2007 & NEW RECP. ROOM 2003	16.5		16.5		0	EXISTING CIRCUIT	20	16
17	20	EXISTING RECP. ROOMS 2007, 2009	6			6	0	EXISTING CIRCUIT	20	18
19	20	EXISTING CIRCUIT	0	0			0	EXISTING CIRCUIT	20	20
21	20	EXISTING CIRCUIT	0		0		0	EXISTING CIRCUIT	20	22
23	20	EXISTING CIRCUIT	0			0	0	EXISTING CIRCUIT	20	24
25	20	EXISTING CIRCUIT	0	3			3	EXISTING RECP. ROOM 2001	20	26
27	20	EXISTING RECP. ROOMS 2004, 2006, 2008	9		9		0	COPIER	20	28
29	20	EXISTING RECP. ROOMS 2001, 2002	6			6	0	EXISTING CIRCUIT	20	30
31			0	0			0	EXISTING CIRCUIT	20	32
33	100	MAIN	0		0		0	EXISTING CIRCUIT	50	34
35			0			0	0			36
				32.17	50.67	24.5				

2 PANEL SCHEDULES – FINAL CONDITIONS
SCALE: N/A

PANEL NO. L-3 SECTION _____ EXISTING PANEL ☐RECESSED ☒SURFACE MOUNTED ☐MAIN LUG ONLY ☒MAIN CB ☐FEED THRU LUG REV. DATE _____ REV. DATE _____ REV. DATE _____

VOLTS 120/208 PH 3 W 4 G 1

MAIN CB 100A BUS 100A MIN. INTERRUPTING RATING _____ SYMM.

CKT NO.	TRIP (AMPS)	DESCRIPTION OF LOAD	LOAD (AMPS)	PER PHASE AMPS A	B	C	LOAD (AMPS)	DESCRIPTION OF LOAD	TRIP (AMPS)	CKT NO.
1	20	NEW LIGHTS ROOM 3001, 3002, 3004, 3006, 3008, 3017, CORRIDOR 3020, 3020A	9.63	9.63			0	COPIER	20	2
3	20	NEW LIGHTS ROOMS 3003, 3005, 3007, 3009, 3013, 3014, 3015 & EXISTING LIGHTS ROOM 3011	6.67		6.67		0	PRINTER	20	4
5	20	NEW GFI RECP. ROOMS 3013, 3014, 3015	6			10.16	4.16	EXISTING LIGHTS ROOMS 3010, 3012	20	6
7	20	EXISTING RECP. ROOM 3001 & 3002 & NEW RECP. ROOMS 3001, 3002 & 3004	10.5	18			7.5	EXISTING & NEW RECP. ROOM 3003	20	8
9	20	EXISTING RECP. ROOMS 3006, 3008 & NEW RECP. ROOMS 3006	9		22.5		13.5	EXISTING RECP. ROOMS 3003, 3005, 3007 & NEW RECP. ROOM 3007	20	10
11	20	EXISTING RECP. ROOMS 3010, 3012 & NEW RECP. 3010	9			16.5	7.5	EXISTING RECP. ROOMS 3009, 3011, UNKNOWN, & NEW RECP. ROOMS 3011	20	12
13	20	EXISTING RECP. ROOMS 3006, 3008, 3010, 3012, CORRIDOR 3020, 3020A, & HYRDRATION STATION	10.5	10.5			0	EXISTING CIRCUIT	20	14
15	20	COPIER	0		0		0	EXISTING CIRCUIT	20	16
17	20	EXISTING CIRCUIT	0			0	0	EXISTING CIRCUIT	20	18
19			0	0			0	HAND DRYER ROOM 3013	20	20
21	100	MAIN	0		0		0	HAND DRYER ROOM 3014	20	22
23			0			0	0	EXISTING SPACE		24
				38.13	29.17	26.66				

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2 HOLLAND AVENUE
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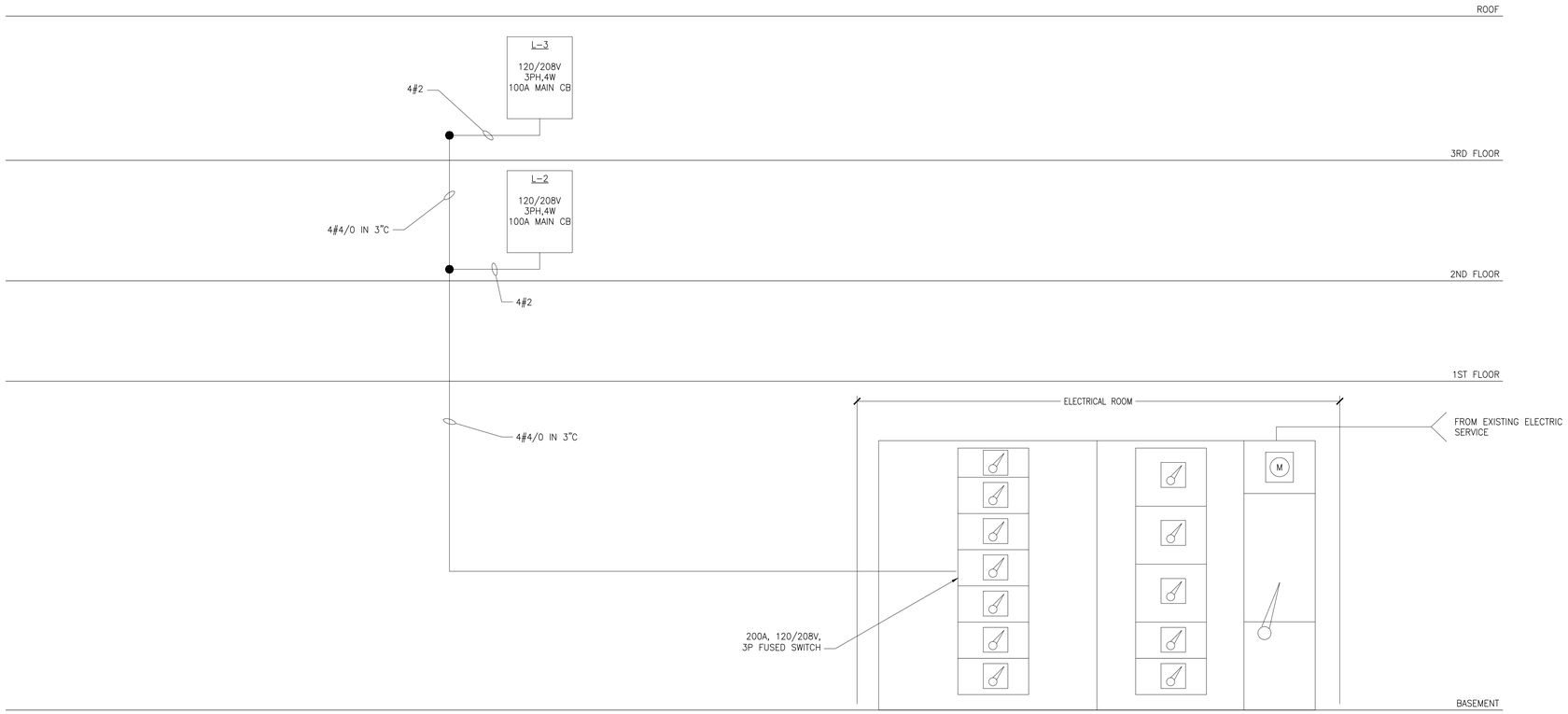
DRAWING TITLE
ELECTRICAL PANEL SCHEDULES

SHEET NO.
E-300



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ARCHITECT

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DRAWING TITLE

ELECTRICAL RISER DIAGRAM

SHEET NO.

E-400

ELECTRICAL WORK

1. GENERAL:

A. THE "GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION," AIA DOCUMENT A201, LATEST EDITION, AND THESE SPECIFICATIONS AS APPLICABLE ARE PART OF THIS CONTRACT.

B. ALL APPLICABLE CODES, LAWS AND REGULATIONS GOVERNING OR RELATING TO ANY PORTION OF THIS WORK ARE HEREBY INCORPORATED INTO AND MADE A PART OF THESE SPECIFICATIONS, AND THEIR PROVISIONS SHALL BE CARRIED OUT BY THE CONTRACTOR.

C. INVESTIGATE EACH SPACE THROUGH WHICH EQUIPMENT MUST BE MOVED. WHERE NECESSARY, EQUIPMENT SHALL BE SHIPPED FROM MANUFACTURER IN SECTIONS OF SIZE SUITABLE FOR MOVING THROUGH AVAILABLE RESTRICTIVE SPACES. ASCERTAIN FROM BUILDING OWNER AND TENANT AT WHAT TIMES OF DAY EQUIPMENT MAY BE MOVED THROUGH ALL AREAS.

D. DRAWINGS ARE DIAGRAMMATIC AND INDICATE GENERAL ARRANGEMENT OF SYSTEMS AND WORK. CONDUIT ROUTING IS SHOWN DIAGRAMMATICALLY AND DOES NOT SHOW ALL OFFSETS, DROPS AND RISES OF RUNS. THE CONTRACTOR SHALL ALLOW IN HIS PRICE FOR ROUTING OF CONDUIT TO AVOID OBSTRUCTIONS. COORDINATION WITH EXISTING SERVICES, INCLUDING THOSE OF OTHER TRADES, IS REQUIRED. MAINTAIN HEADROOM AND SPACE CONDITIONS.

E. INSTALL WORK SO AS TO BE READILY ACCESSIBLE FOR OPERATION, MAINTENANCE AND REPAIR. MINOR DEVIATIONS FROM DRAWINGS MAY BE MADE TO ACCOMPLISH THIS, BUT CHANGES WHICH INVOLVE EXTRA COST SHALL NOT BE MADE WITHOUT APPROVAL.

F. REMOVAL AND RELOCATION OF CERTAIN EXISTING WORK MAY BE NECESSARY FOR THE PERFORMANCE OF THE GENERAL WORK. ALL EXISTING CONDITIONS CANNOT BE COMPLETELY DETAILED ON THE DRAWINGS. THE CONTRACTOR SHALL SURVEY THE SITE AND INCLUDE ALL CHANGES AND CHARGES IN MAKING UP THE WORK PROPOSAL.

G. CONNECTIONS TO EXISTING WORK: INSTALL NEW WORK AND CONNECT TO EXISTING WORK WITH MINIMUM INTERFERENCE TO EXISTING FACILITIES. TEMPORARY SHUTDOWNS OF EXISTING SERVICES SHALL BE PERFORMED AT NO ADDITIONAL CHARGES, AT TIMES NOT TO INTERFERE WITH NORMAL OPERATION OF EXISTING FACILITIES AND ONLY WITH WRITTEN CONSENT OF OWNER. ALARM AND EMERGENCY SYSTEMS SHALL NOT BE INTERRUPTED. MAINTAIN CONTINUOUS OPERATION OF EXISTING FACILITIES AS REQUIRED WITH NECESSARY TEMPORARY CONNECTIONS BETWEEN NEW AND EXISTING WORK. CONNECT NEW WORK TO EXISTING WORK IN NEAT AND ACCEPTABLE MANNER. RESTORE EXISTING DISTURBED WORK TO ORIGINAL CONDITION, INCLUDING MAINTENANCE OF WIRING CONTINUITY AS REQUIRED.

H. DISCONNECT, REMOVE AND/OR RELOCATE EXISTING MATERIAL, EQUIPMENT AND OTHER WORK AS NOTED OR REQUIRED FOR PROPER INSTALLATION OF NEW WORK.

I. THE CONTRACTOR SHALL KEEP ALL EQUIPMENT AND MATERIALS, AND ALL PARTS OF THE BUILDING, EXTERIOR SPACES AND ADJACENT STREETS, SIDEWALKS AND PAVEMENTS, FREE FROM MATERIAL AND DEBRIS RESULTING FROM THE EXECUTION OF THIS WORK. EXCESS MATERIALS WILL NOT BE PERMITTED TO ACCUMULATE EITHER ON THE INTERIOR OR THE EXTERIOR.

J. SEAL OPENINGS THROUGH PARTITIONS, WALLS AND FLOORS WITH MINERAL WOOL OR OTHER NONCOMBUSTIBLE MATERIAL.

K. PROVIDE ALL NECESSARY FLASHING AND COUNTERFLASHING TO MAINTAIN THE WATERPROOFING INTEGRITY OF THE BUILDING AS REQUIRED BY THE INSTALLATION OR REMOVAL OF CONDUIT AND EQUIPMENT. PROVIDE EQUIPMENT CURBS AS REQUIRED.

L. ALL EXISTING MATERIAL, EQUIPMENT AND CONSTRUCTION DEBRIS TO BE REMOVED UNDER THIS CONTRACT SHALL BECOME THE PROPERTY OF THE CONTRACTOR WITH THE EXCEPTION OF SPECIFIC EQUIPMENT AND APPARATUS REQUESTED BY THE BUILDING REPRESENTATIVE, ARCHITECT OR AS NOTED TO BE RELOCATED ON THE DRAWINGS. REMOVED EQUIPMENT SHALL BE PROPERLY DISPOSED OF BY THIS CONTRACTOR.

M. THE CONTRACTOR'S PROPOSAL FOR ALL WORK SHALL BE PREDICATED ON THE PERFORMANCE OF THE WORK DURING REGULAR WORKING HOURS. WHEN SO DIRECTED, HOWEVER, THE CONTRACTOR SHALL INSTALL WORK DURING OVERTIME HOURS AND THE ADDITIONAL COST TO BE CHARGED THEREFORE SHALL BE ONLY THE "PREMIUM" PORTION OF THE WAGES PAID.

N. UNLESS OTHERWISE SPECIFICALLY NOTED OR SPECIFIED, INCLUDE ALL CUTTING AND PATCHING OF EXISTING FLOORS, WALLS, PARTITIONS AND OTHER MATERIALS IN THE EXISTING BUILDING. THE CONTRACTOR SHALL RESTORE THESE AREAS TO ORIGINAL CONDITION.

O. ALL MATERIAL AND EQUIPMENT SHALL BE NEW UNLESS OTHERWISE NOTED AND SHALL BE IN ACCORDANCE WITH BUILDING STANDARDS.

P. SUBMISSION OF A PROPOSAL SHALL BE CONSTRUED AS EVIDENCE THAT A CAREFUL EXAMINATION OF THE PORTIONS OF THE EXISTING BUILDING, EQUIPMENT, ETC., WHICH AFFECT THIS WORK, AND THE ACCESS TO SUCH SPACES, HAS BEEN MADE AND THAT THE CONTRACTOR IS FAMILIAR WITH EXISTING CONDITIONS AND DIFFICULTIES THAT WILL AFFECT THE EXECUTION OF THE WORK. THE CONTRACTOR IS RESPONSIBLE TO INDICATE ANY DISCREPANCIES BETWEEN THE CONTRACT DRAWINGS AND ACTUAL FIELD CONDITIONS PRIOR TO SUBMITTAL OF BID. SUBMISSION OF A PROPOSAL WILL BE CONSTRUED AS EVIDENCE THAT SUCH AN EXAMINATION HAS BEEN MADE. LATER CLAIMS SHALL NOT BE MADE FOR LABOR, EQUIPMENT OR MATERIALS REQUIRED BECAUSE OF DIFFICULTIES ENCOUNTERED WHICH COULD HAVE BEEN FORESEEN DURING SUCH AN EXAMINATION. THE ON-SITE INSPECTION SHALL VERIFY EXISTING CONDUIT (SIZES, CLEARANCES, ETC) AND CONDITIONS.

Q. INSURANCE: IN ACCORDANCE WITH BUILDING REQUIREMENTS AND SHALL INCLUDE A HOLD HARMLESS CLAUSE FOR OWNER AND ENGINEER.

R. THE FINAL ACCEPTANCE SHALL BE MADE AFTER THE CONTRACTOR HAS ADJUSTED HIS EQUIPMENT, TESTED THE VARIOUS SYSTEMS, DEMONSTRATED THAT IT FULFILLS THE REQUIREMENTS OF THE DRAWINGS AND SPECIFICATIONS AND HAS FURNISHED ALL THE REQUIRED CERTIFICATES OF INSPECTION AND APPROVAL.

2. SCOPE OF WORK:

A. SCOPE OF WORK SHALL CONSIST OF PROVIDING LABOR, MATERIALS, EQUIPMENT, SERVICES AND FEES NECESSARY FOR COMPLETE AND SAFE INSTALLATION IN CONFORMITY WITH THE NATIONAL ELECTRICAL CODE (NEC) AND ALL OTHER APPLICABLE INDUSTRY, NATIONAL AND LOCAL CODES AND AUTHORITIES HAVING JURISDICTION, AS INDICATED ON DRAWINGS AND HEREIN SPECIFIED.

B. ALL DRAWINGS, PLANS, DETAILS, SPECIFICATIONS AND SPECIFICATION ADDENDA ARE MADE PART OF THIS CONTRACT AND SHALL APPLY TO ALL WORK UNDER THE CONTRACT UNLESS OTHERWISE AMENDED, MODIFIED, SUPPLEMENTED OR SPECIFIED HEREIN.

C. THE CONTRACTOR SHALL FURNISH A WRITTEN GUARANTEE TO REPLACE OR REPAIR PROMPTLY AND ASSUME RESPONSIBILITY FOR ALL EXPENSES INCURRED FOR ANY WORKMANSHIP AND EQUIPMENT IN WHICH DEFECTS DEVELOP WITHIN ONE YEAR FROM THE DATE OF FINAL CERTIFICATE FOR PAYMENT AND/OR FROM DATE OR ACTUAL USE OF EQUIPMENT OR OCCUPANCY OF SPACES BY OWNER INCLUDED UNDER THE VARIOUS PARTS OF THE WORK, WHICHEVER DATE IS EARLIER. THIS WORK SHALL BE DONE AS DIRECTED BY THE OWNER. THIS GUARANTEE SHALL ALSO PROVIDE THAT WHERE DEFECTS OCCUR, THE CONTRACTOR WILL ASSUME RESPONSIBILITY FOR ALL EXPENSES INCURRED IN REPAIRING AND REPLACING WORK OF OTHER TRADES AFFECTED BY DEFECTS, REPAIRS OR REPLACEMENTS IN EQUIPMENT SUPPLIED BY THE CONTRACTOR.

D. THE CONTRACTOR SHALL GIVE NECESSARY NOTICE, FILE DRAWINGS AND SPECIFICATIONS WITH ALL DEPARTMENTS HAVING JURISDICTION, OBTAIN PERMITS OR LICENSES NECESSARY TO CARRY OUT THIS WORK AND PAY ALL FEES THEREFORE. THE CONTRACTOR SHALL ARRANGE FOR INSPECTION AND TESTS OF ANY OR ALL PARTS OF THE WORK IF SO REQUIRED BY AUTHORITIES AND PAY ALL CHARGES FOR SAME. THE CONTRACTOR SHALL PAY ALL COSTS FOR, AND FURNISH TO THE OWNER BEFORE FINAL BILLING, ALL CERTIFICATES NECESSARY AS EVIDENCE THAT THE WORK INSTALLED CONFORMS WITH ALL REGULATIONS WHERE THEY APPLY TO THIS WORK.

3. SHOP DRAWINGS

A. PRIOR TO THE INSTALLATION OF ANY WORK AND PROCUREMENT OF EQUIPMENT, CONTRACTOR SHALL PROVIDE COMPLETE SETS OF COORDINATED SHOP DRAWINGS OF ALL NEW AND EXISTING EQUIPMENT, INDICATING CAPACITY, DIMENSIONS AND SEQUENCE OF OPERATION FOR WRITTEN APPROVAL BY THE ARCHITECT AND ENGINEER.

B. INDICATE ON EACH SHOP DRAWINGS SUBMITTED:

1) PROJECT NAME AND LOCATION
2) NAME OF ARCHITECT AND ENGINEER
3) ITEM IDENTIFICATION
4) APPROVAL STAMP OF PRIME CONTRACTOR

C. SUBMISSIONS:

1) SUBMISSIONS 11 IN. X 17 IN. OR SMALLER: IF THE SUBMISSION IS A CATALOG CUT, THEN THE CONTRACTOR SHALL SUBMIT ONE ORIGINAL AND TWO COPIES. OTHERWISE, HE SHALL SUBMIT THREE COPIES. THE ARCHITECT WILL FORWARD THE ORIGINAL AND ONE COPY (TWO COPIES WHEN NO ORIGINAL IS RECEIVED) TO THE ENGINEER. ALL CATALOG CUTS SHALL BE COMPLETE.
2) SUBMISSIONS LARGER THAN 11 IN. X 17 IN.: SUBMIT THREE PRINTS TO THE ARCHITECT. THE ARCHITECT WILL FORWARD TWO PRINTS TO THE ENGINEER.

D. SUBMIT SHOP DRAWINGS FOR THE FOLLOWING:

1) SWITCHES
2) CIRCUIT BREAKERS
3) RACEWAYS
4) WIRE AND CABLE
5) WALL SWITCHES
6) INSERTION RECEPTACLES
7) MOMENTARY CONTACT SWITCHES
8) SURFACE METAL RACEWAY
9) LIGHTING FIXTURES.

4. AS-BUILT DRAWINGS AND EQUIPMENT OPERATIONAL INSTRUCTIONS

A. UPON COMPLETION AND ACCEPTANCE OF WORK, CONTRACTOR SHALL FURNISH WRITTEN INSTRUCTIONS AND EQUIPMENT MANUALS AND DEMONSTRATE TO THE OWNER THE PROPER OPERATION AND MAINTENANCE OF ALL EQUIPMENT AND APPARATUS FURNISHED UNDER THIS CONTRACT.

B. THESE INSTRUCTIONS SHALL BE TYPED ON 8-1/2 IN. X 11 IN. PAPER AND BOUND IN THREE RING BINDERS WITH CLEAR ACETATE COVERS. CONTRACTOR SHALL GIVE THREE COPIES OF THE INSTRUCTIONS TO THE OWNER AND ONE COPY TO THE ENGINEER.

C. THE INSTRUCTION BOOKLET SHALL BEAR THE NAME, ADDRESS AND TELEPHONE NUMBER OF THE PROJECT, ARCHITECT AND ENGINEER.

D. REPRODUCIBLE "AS-BUILT" DRAWINGS SHALL BE PROVIDED INDICATING THE AS INSTALLED CONDITIONS OF THE WORK. "AS-BUILT" DRAWINGS SHALL BE PROVIDED TO THE ARCHITECT AFTER COMPLETION OF THE INSTALLATION.

5. GENERAL PROVISIONS FOR ELECTRICAL WORK:

A. SPECIFICATIONS ARE OF SIMPLIFIED FORM AND INCLUDE INCOMPLETE SENTENCES. WORDS OR PHRASES SUCH AS "THE CONTRACTOR SHALL," "SHALL BE," "FURNISH," "PROVIDE," "A," "THE," AND "ALL" HAVE BEEN OMITTED FOR BREVITY.

B. DEFINITIONS:

1) "PROVIDE": TO SUPPLY, INSTALL AND CONNECT UP COMPLETE AND READY FOR SAFE AND REGULAR OPERATION THE PARTICULAR WORK REFERRED TO UNLESS SPECIFICALLY OTHERWISE NOTED.
2) "INSTALL": TO ERECT, MOUNT AND CONNECT COMPLETE WITH RELATED ACCESSORIES.
3) "FURNISH" OR "SUPPLY: TO PURCHASE, PROCURE, ACQUIRE AND DELIVER COMPLETE WITH RELATED ACCESSORIES.
4) "WORK": LABOR, MATERIALS, EQUIPMENT, APPARATUS, CONTROLS, ACCESSORIES AND OTHER ITEMS REQUIRED FOR PROPER AND COMPLETE INSTALLATION.
5) "WIRING": RACEWAY, FITTINGS, WIRE, BOXES AND RELATED ITEMS.
6) "CONCEALED": EMBEDDED IN MASONRY OR OTHER CONSTRUCTION, INSTALLED IN FURRED SPACES, WITHIN DOUBLE PARTITIONS OR HUNG CEILINGS, IN TRENCHES, IN CRAWL SPACES, OR IN ENCLOSURES.
7) "EXPOSED": NOT INSTALLED UNDERGROUND OR "CONCEALED" AS DEFINED ABOVE.
8) "SIMILAR" OR "EQUAL": EQUAL IN MATERIALS, WEIGHT, SIZE, DESIGN AND EFFICIENCY OF SPECIFIED PRODUCT.

C. TEMPORARY LIGHT AND POWER: PROVIDE TEMPORARY LIGHT AND POWER SYSTEMS AT EARLIEST POSSIBLE DATE WITHIN THE CONSTRUCTION AREAS FOR THE REQUIREMENTS OF ALL TRADES AS HEREIN DESCRIBED. EXTEND SYSTEMS TO NEW CONSTRUCTION AS SOON AS PHYSICALLY POSSIBLE. MAINTAIN SYSTEM DURING WORKING HOURS OF ALL TRADES. COST OF ENERGY WILL BE PAID FOR BY OWNER. PROVIDE ALL REQUIRED MAINTENANCE, INCLUDING LAMPS AND SOCKETS.

D. QUALITY ASSURANCE

1) QUALITY AND GAUGE OF MATERIALS: NEW, BEST OF THEIR RESPECTIVE KINDS, FREE FROM DEFECTS AND LISTED BY UNDERWRITERS LABORATORIES, INC., OR OTHER NATIONALLY APPROVED TESTING AGENCY AND BEARING THEIR LABEL. MATERIALS AND EQUIPMENT OF SIMILAR APPLICATION SHALL BE OF SAME MANUFACTURER, EXCEPT AS NOTED.
2) GUARANTEE: ALL MATERIALS AND WORKMANSHIP SHALL BE GUARANTEED AS DEFINED IN PARAGRAPH 2.C.
3) CURRENT CHARACTERISTICS:
   a. DISTRIBUTION: 120/208 VOLT, 3 PHASE, 4 WIRE, 60 HERTZ WITH GROUNDED NEUTRAL.
4) HEIGHTS OF OUTLETS: FROM FINISHED FLOOR TO CENTERLINE OF OUTLETS FOR:
   a. RECEPTACLES AND TELEPHONES:1 FT-6 IN.
   b. WALL SWITCHES: 4 FT-0 IN.

EXCEPTIONS: AT JUNCTION OF DIFFERENT WALL FINISH MATERIALS, ON MOLDING OR BREAK IN WALL SURFACE, IN VIOLATION OF CODE, OR AS NOTED OR DIRECTED.

E. PRODUCT DELIVERY, STORAGE AND HANDLING

1) MOVING OF EQUIPMENT: WHERE NECESSARY, SHIP IN CARTED SECTIONS OF SIZE TO PERMIT PASSING THROUGH AVAILABLE SPACES.
2) ACCESSIBILITY: FOR OPERATION, MAINTENANCE AND REPAIR. MINOR DEVIATIONS SHALL BE PERMITTED. CHANGES OF MAGNITUDE OR INVOLVING EXTRA COST ARE NOT PERMISSIBLE WITHOUT REVIEW. GROUP CONCEALED ELECTRICAL EQUIPMENT REQUIRING ACCESS WITH EQUIPMENT FREELY ACCESSIBLE THROUGH ACCESS DOORS.

F. MATERIALS

1) NAMEPLATES: PROVIDE BLACK LAMICOID SHEET WITH 3/4 IN. WHITE LETTERING, FASTENED WITH EPOXY CEMENT FOR EACH DISCONNECT SWITCH, CIRCUIT BREAKER, PANEL, CABINET, TRANSFORMER, ENCLOSURE, MOTOR CONTROLLER AND THE LIKE. NAMEPLATES SHALL DESCRIBE THE NAME AND NUMBER OF EACH COMPONENT.
2) CABLE TAGS: TAG EACH CONDUCTOR PASSING THROUGH SPLICE OR PULLBOX WITH A WHITE LINEN TAG, INDICATING POINT OF ORIGIN AND TERMINATION OF THE CIRCUIT.
3) INSERTS AND SUPPORTS:
   a. INSERTS: STEEL, SLOTTED TYPE, FACTORY PAINTED.
   – SINGLE ROD: SIMILAR TO GRINNELL FIG. 281.
   – MULTI-ROD: SIMILAR TO FEE AND MASON SERIES 9000 WITH END CAPS AND CLOSURE STRIPS.
   – CLIP FORM NAILS FLUSH WITH INSERTS.
   – MAXIMUM LOADING 75 PERCENT OF RATING.
   b. SUPPORTS FROM BUILDING CONSTRUCTION: INSERTS, BEAM CLAMPS, STEEL FISHPLATES (IN CONCRETE FILL ONLY), CANTILEVER BRACKETS OR OTHER MEANS. SUBMIT FOR REVIEW.
   c. GROUPED LINES AND SERVICES: TRAPEZE HANGERS OF BOLTED ANGLES OR CHANNELS.
   d. WHERE BUILDING CONSTRUCTION IS INADEQUATE: PROVIDE ADDITIONAL FRAMING. SUBMIT FOR REVIEW.

G. PAINT SHALL BE THE BEST GRADE FOR ITS PURPOSE. DELIVER IN ORIGINAL SEALED CONTAINERS AND APPLY IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. COLORS SHALL BE AS SELECTED BY ARCHITECT OR ENGINEER. UTILIZE GALVANIZED IRON PRIMER ON PANEL AND PULL BOXES, AFTER FABRICATION. UTILIZE HOT DIPPED GALVANIZED OR DIPPED IN ZINC BASED PRIMER FOR: OUTLET BOXES, JUNCTION BOXES, CONDUIT HANGERS, RODS, INSERTS AND SUPPORTS. ZINC BASED PRIMER WITH FINISH TO MATCH SURROUNDINGS SHALL BE USED FOR MARRED SURFACES OF STEEL EQUIPMENT AND RACEWAYS. A FIELD-APPLIED ZINC BASED PRIME COAT SHALL BE UTILIZED FOR STEEL OR IRONWORK.

H. BRUSH AND CLEAN WORK PRIOR TO CONCEALING, PAINTING AND ACCEPTANCE. PAINTED EXPOSED WORK SOILED OR DAMAGED; CLEAN AND REPAIR TO MATCH ADJOINING WORK BEFORE FINAL ACCEPTANCE. REMOVE DEBRIS FROM INSIDE AND OUTSIDE OF MATERIAL AND EQUIPMENT.

I. FINAL LOCATIONS AND MOUNTING ORIENTATIONS OF ALL SWITCHES, RECEPTACLES AND LIGHT FIXTURES SHALL BE VERIFIED WITH ARCHITECT.

J. ALL ACCESS DOOR LOCATIONS SHALL BE REVIEWED BY ARCHITECT PRIOR TO INSTALLATION.

6. LOW-VOLTAGE DISTRIBUTION EQUIPMENT:

A. PROVIDE COMPLETE EQUIPMENT INCLUDING: SWITCHES AND CIRCUIT BREAKERS.

B. ALL EQUIPMENT SHALL CONFORM TO NEMA, ANSI AND IEEE STANDARDS.

C. DISCONNECT SWITCHES SHALL BE NONFUSED AS NOTED. VOLTAGE SHALL BE AS REQUIRED. SWITCHES SHALL BE HEAVY DUTY, EXCEPT AS NOTED, AND HORSEPOWER RATED FOR MOTOR LOADS. TOGGLE TYPE SWITCHES SHALL BE NONFUSED, LOAD BREAK, HAVING MAXIMUM RATINGS OF 30 AMP AT 240 VOLTS. TWO-POLE SWITCHES SHALL BE SIMILAR TO HART AND HEGEMAN NO. 6808F. THREE-POLE SWITCHES SHALL BE SIMILAR TO HART AND HEGEMAN NO. 7810F.

KNIFE-BLADE TYPE SWITCHES SHALL BE LOAD BREAK, QUICK-MAKE-QUICK-BREAK, UL CLASS R UP TO 600 AMP. SWITCHES SHALL BE SIMILAR TO GENERAL ELECTRIC QMR. ALL SWITCH ENCLOSURES SHALL BE DEAD FRONT, NEMA TYPE 1, EXCEPT AS NOTED.

D. CIRCUIT BREAKERS: MOLDED CASE BREAKERS SHALL BE THERMAL-MAGNETIC, QUICK-MAKE-QUICK-BREAK, BOLT-ON TYPE, MANUALLY OPERATED WITH INSULATED TRIP-FREE HANDLE. MULTI-POLE TYPE BREAKERS SHALL CONTAIN INTERNAL TRIP BAR. TERMINALS SHALL BE SUITABLE FOR COPPER OR ALUMINUM CABLE. FURNISH AUXILIARY DEVICES WHERE REQUIRED FOR SHUNT-TRIPPING, OPEN AND CLOSE MOTOR OPERATOR AND ALARM INDICATION. ENCLOSURES SHALL BE DEAD FRONT, NEMA TYPE 1, EXCEPT AS NOTED. FRAMES, IC AND INTERCHANGEABLE TRIPS SHALL BE AS FOLLOWS, UNLESS OTHERWISE NOTED:

1) 120 VOLTS, 100-AMP FRAME: 10,000 AMPS, 1 POLE.
2) 240 VOLTS, 100-AMP FRAME: 18,000 AMPS, 2 AND 3 POLES.

E. BALANCE THE LOAD OVER PHASES WHEN NEW CIRCUITS ARE ADDED TO EXISTING PANELS. UPDATE DIRECTORIES ON EXISTING PANELBOARDS WHERE CIRCUITING IS CHANGED.

F. TESTS: OPEN AND CLOSE LOAD BREAK SWITCHING DEVICES UNDER LOAD.

7. RACEWAYS:

A. PROVIDE RACEWAYS COMPLETE WITH BOXES, FITTINGS AND ACCESSORIES. CONDUIT OR TUBING SIZES REFERRED TO IN SPECIFICATIONS AND ON DRAWINGS ARE NOMINAL DIAMETERS. MINIMUM DIAMETER SHALL BE 3/4 IN.

B. MATERIALS

1) RACEWAYS:
   a. RIGID STEEL CONDUIT: FULL-WEIGHT PIPE, GALVANIZED, THREADED.
   b. ELECTROMETALLIC TUBING (EMT): THIN WALL PIPE, GALVANIZED, THREADLESS.
   c. FLEXIBLE STEEL CONDUIT: CONTINUOUS SINGLE STRIP, GALVANIZED.
   d. WIREWAYS: WIRE SHALL BE AS NOTED, MINIMUM NO. 16 GAUGE STEEL WITH GROUND CONTINUITY. FINISH SHALL BE BAKED ENAMEL. COVERS SHALL BE SCREW-ON.
   e. SURFACE METAL RACEWAY: SIZE AS NOTED. BASE 0.04 IN., COVER 0.25 IN. MATERIAL SHALL BE STEEL. FINISH SHALL BE BAKED ENAMEL. COVERS SHALL BE SCREW-ON.
2) FITTINGS AND ACCESSORIES:
   a. RIGID STEEL: NONSPLIT, THREADED, STEEL OR MALLEABLE IRON. ZINC DIE CAST NOT PERMITTED.
   b. ELECTROMETALLIC TUBING: COMPRESSION TYPE. GALVANIZED RIGID STEEL ELBOWS, 2 IN. OR LARGER.
   c. FLEXIBLE METALLIC CONDUIT: ANGLE WEDGE TYPE WITH INSULATED THROAT.
   d. BUSHINGS: METALLIC INSULATED TYPE.
3) BOXES:
   a. OUTLET BOXES: EXCEPT AS OTHERWISE REQUIRED BY CONSTRUCTION, DEVICES OR WIRING, BOXES SHALL BE STAMPED STEEL, 4 IN. SQUARE OR OCTAGON FOR FIXTURES. BOXES ABOVE CEILING SHALL BE 1-1/2 IN. DEEP. BOXES IN CEILING OR SLAB SHALL BE 3 IN. DEEP. BOXES IN WALL FOR FIXTURES SHALL BE 2-3/4 IN. DEEP. BOXES IN WALL FOR RECEPTACLES AND SWITCHES SHALL BE 1-1/2 IN. DEEP. FURNISH WITH RAISED COVERS AND FIXTURE STUDS WHERE REQUIRED. WITHOUT FIXTURE OR DEVICE: FURNISH BLANK COVER. OFFSET BACK-TO-BACK OUTLETS WITH MINIMUM 6 IN. SEPARATION.
   b. JUNCTION AND PULL BOXES: GALVANIZED SHEET STEEL WITH SCREW-ON COVERS, EXCEPT AS NOTED. FURNISH WITH INSULATED SUPPORTS FOR CABLES. LOCATIONS SHALL BE AS NOTED OR REQUIRED AND ACCESSIBLE. PROVIDE BARRIERS IN NEW AND RENOVATED BOXES BETWEEN EMERGENCY AND NORMAL WIRING. POWER: DUPLEX RECEPTACLE OR OTHER AS NOTED. INCREASE SIZE TO SUIT AS NECESSARY.

C. PROVIDE RACEWAYS ONLY AS HEREIN SPECIFIED, EXCEPT AS NOTED. RACEWAYS SHALL BE RUN CONCEALED, EXCEPT AS NOTED.

PROVIDE RACEWAY SUPPORT UTILIZING CEILING TRAPEZE, STRAP HANGERS, OR WALL BRACKETS. PROVIDE U-BOLTS AT EACH FLOOR LEVEL OF RISER RACEWAYS AND CONNECTED TO ACCEPTABLE SUPPORTS. PROVIDE RISER CLAMPS AT EACH FLOOR LEVEL OF RISER RACEWAYS AND RESTING ON SLAB.

SECURE ALL RACEWAYS TO SUPPORTS WITH PIPE STRAPS OR U-BOLTS. SPACING OF SUPPORTS SHALL BE A MINIMUM OF 10 FT ON CENTER FOR METALLIC RACEWAY AND AS REQUIRED FOR NONMETALLIC RACEWAY. SPACING SHALL BE 5 FT ON CENTER FOR WIREWAYS AND PER CODE AND AS NOTED FOR OTHERS. MOUNT SUPPORTS TO STRUCTURE MASONRY WITH TOGGLE BOLTS ON HOLLOW MASONRY, EXPANSION SHIELDS OR INSERTS IN CONCRETE AND BRICK, MACHINE SCREWS ON METAL, BEAM CLAMPS ON FRAMEWORK, WOOD SCREWS ON WOOD, AND PAN THROUGH STRAPS IN METAL DECK. NAILS, RAWL PLUGS OR WOOD PLUGS SHALL NOT BE PERMITTED. WHERE REQUIRED BY STRUCTURE, FURNISH THROUGH BOLTS AND FISHPLATES.

EXPOSED RACEWAYS SHALL BE RUN PARALLEL WITH OR AT RIGHT ANGLES TO WALLS. PROVIDE CLEARANCE WITH WATER, STEAM OR OTHER PIPING (MINIMUM 3 IN. SEPARATION FROM STEAM AND HOT WATER PIPES, EXCEPT 1 IN. FROM PIPE COVER AT CROSSINGS AND 18 IN. FOR PARALLEL RUNS). FOR HUNG CEILING OUTLETS, RUN IN HUNG CEILING AND CONNECT TO CEILING SUPPORT CHANNELS. IN MASONRY AND POURED CONCRETE, RUN VERTICALLY ONLY.

MAINTAIN GROUNDING CONTINUITY OF INTERRUPTED METALLIC RACEWAYS WITH GROUND CONDUCTOR, AND IN FLEXIBLE CONDUIT FOR FEEDERS AND MOTOR TERMINAL CONNECTIONS.

EMPTY RACEWAYS OVER 10 FT LONG: PROVIDE FISH OR PULL WIRE, GALVANIZED OR NYLON ROPE.

RIGID STEEL CONDUIT SHALL BE PERMITTED FOR FEEDERS AND BRANCH CIRCUITS. PAINT MALE THREADS OF FIELD-THREADED CONDUIT WITH GRAPHITE-BASE PIPE COMPOUND AND BUTT CONDUIT ENDS. TOUCH UP MARRED SURFACES AND FIELD-CUT THREADS, CRC-COLD GALVANIZED.

EMT SHALL BE PERMITTED FOR BRANCH CIRCUITS ONLY, IN DRY LOCATIONS, DRY WALLS, HUNG CEILINGS, HOLLOW BLOCK WALLS AND FURRED SPACES.

FLEXIBLE STEEL CONDUIT SHALL BE UTILIZED FOR SHORT CONNECTIONS WHERE RIGID CONDUIT IS IMPRACTICAL. FROM OUTLET BOX TO RECESSED LIGHTING FIXTURE: PROVIDE MINIMUM 4 FT AND MAXIMUM 6 FT LENGTHS. FOR FINAL CONNECTION TO MOTOR TERMINAL BOX AND OTHER VIBRATING EQUIPMENT: PROVIDE WITH POLYVINYL SHEATHING AND GROUND CONDUCTOR. MINIMUM LENGTH: 18 IN. WITH SLACK. CONNECT GROUND CONDUCTOR TO ENCLOSURE OR RACEWAY AT EACH END.

CUT CONDUIT ENDS SQUARE. REAM SMOOTH. PAINT MALE THREADS OF FIELD THREADED RACEWAYS WITH GRAPHITE BASE PIPE COMPOUND. DRAW UP TIGHT WITH RACEWAY COUPLING.

ALL COUPLINGS SHALL BE COMPRESSION TYPE. NO SET SCREW FITTINGS.

EXPANSION FITTINGS SHALL BE INSTALLED AT RIGHT ANGLES WITH CLIP JOINT CENTERED IN EXPANSION JOINT. PROVIDE A LENGTH OF RUN IN ACCORDANCE MANUFACTURER'S RECOMMENDATIONS. PRESET FITTINGS SHALL ALLOW FOR TEMPERATURE VARIATION.

RACEWAYS PASSING THROUGH FIRE-RATED CONSTRUCTION: SEAL OPENING WITH FIRE SEALANT.

D. ERECT WALL AND SWITCH OUTLETS IN ADVANCE OF FURRING AND FIREPROOFING. OUTLET BOXES SHALL BE SET SQUARE AND TRUE WITH BUILDING FINISH. SECURE TO BUILDING STRUCTURE BY ADJUSTABLE STRAP IRON OR GROUT IN WITH MASONRY. VERIFY OUTLET LOCATIONS IN FINISHED SPACES WITH ARCHITECTURAL DRAWINGS OF INTERIOR DETAILS AND FINISHES.

E. PANEL, JUNCTION AND PULL BOXES SHALL BE LOCATED CLEAR OF OTHER TRADES. CONCEAL JUNCTION AND PULL BOXES IN FINISHED SPACES. WHERE NECESSARY, REROUTE RACEWAYS OR MAKE OTHER ARRANGEMENTS FOR CONCEALMENT. BOXES SHALL BE ACCESSIBLE. SUPPORT BOXES FROM BUILDING STRUCTURE, INDEPENDENT OF CONDUIT. PROVIDE FLOOR-TO-CEILING CHANNELS FOR MOUNTING ON DRYWALL AND LIGHTWEIGHT CONSTRUCTION. OUTLET BOXES FOR FIXTURES RECESSED IN HUNG CEILINGS SHALL BE ACCESSIBLE THROUGH OPENING CREATED BY REMOVAL OF FIXTURE. SECURE TO BLACK IRON SUPPORT. MOTOR TERMINAL BOXES: COORDINATE WITH MOTOR BRANCH CIRCUIT CONDUIT AND WIRING; ADD BOX VOLUME WHERE REQUIRED.

F. FIRE SEALANTS: PROVIDE FOR RACEWAYS AND WIRE PASSING THROUGH FLOOR SLOTS, SLEEVES OR OPENINGS IN FIRE-PARTITIONS ROOMS.

G. PERFORM CONTINUITY TESTS OF RESISTANCE OF FEEDER CONDUITS FROM SERVICE TO POINT OF FINAL DISTRIBUTION USING 1 CONDUCTOR RETURN. MAXIMUM RESISTANCE SHALL BE 25 OHMS.

8. WIRE AND CABLE:

A. PROVIDE WIRE AND CABLE COMPLETE WITH ACCESSORIES. SIZE REFERENCE SHALL BE AWG EXCEPT AS NOTED.

B. CONDUCTORS SHALL BE COPPER, ASTM STANDARD SOLID (NO. 10 AND SMALLER) OR STRANDED (NO. 8 AND LARGER). GENERAL USE CABLING SHALL BE NO. 12 MINIMUM. AT 120 VOLTS AND OVER 100 FT CIRCUIT LENGTH PROVIDE NO. 10 MINIMUM.

CONTROL AND ALARM CABLING, EXCEPT AS NOTED, SHALL BE NO. 14 MINIMUM. AT 120 VOLTS AND OVER 200 FT CIRCUIT LENGTH PROVIDE NO. 12 MINIMUM.

OTHER VOLTAGES AND PHASES: ADJUST CABLE SIZING AS REQUIRED TO MAINTAIN VOLTAGE DROP. INCREASE RACEWAY SIZES FOR LARGER WIRE AS REQUIRED.

C. INSULATION SHALL BE RUBBER AND THERMOPLASTIC MEETING ASTM AND IPCEA STANDARDS. TYPE THW OR THWN SHALL BE UTILIZED FOR FEEDERS AND BRANCH CIRCUITS EXCEPT AS NOTED.

D. ARMORED CABLE (BX) SHALL BE UTILIZED FOR BRANCH CIRCUITS IN DRY HOLLOW LOCATIONS, HUNG CEILINGS, AND BLOCK WALLS. WHEN USED IN LIEU OF WIRING IN CONDUIT, STATE IN PROPOSAL THAT PRICE IS BASED UPON THE USE OF BX.

E. COLOR CODING SHALL BE AS FOLLOWS:

1) 120/208 VOLT SYSTEM:
   BLACK FOR A PHASE
   RED FOR B PHASE
   BLUE FOR C PHASE
2) NEUTRAL WIRE SHALL UTILIZE WHITE OUTER COVERING THROUGHOUT. EQUIPMENT GROUND WIRE SHALL UTILIZE GREEN OUTER COVERING THROUGHOUT.

WHERE COLOR-CODED CABLE IS NOT AVAILABLE, CERTIFY IN WRITING AND REQUEST PERMISSION TO OVERLAP CONDUCTORS WITH 6 IN. OF COLOR TAPING IN ACCESSIBLE LOCATIONS.

F. PROVIDE FLAMEPROOF LINEN OR FIBER TAGS IN ACCESSIBLE LOCATIONS. FOR FEEDERS INDICATE FEEDER NUMBER, SIZE, PHASE AND POINTS OF ORIGIN AND TERMINATIONS. FOR CONTROL AND ALARM WIRING INDICATE TYPE (CONTROL OR ALARM), SIZE OF WIRE, AND POINTS OF ORIGIN AND TERMINATIONS.

G. TERMINATIONS, SPLICES AND TAPS UNDER 600 VOLTS: COPPER CONDUCTORS NO. 10 AND SMALLER SHALL UTILIZE COMPRESSION-TYPE OF TWIST-ON SPRING-LOADED CONNECTORS AND CLEAR NYLON-INSULATED COVERING. COPPER CONDUCTORS NO. 8 AND LARGER SHALL UTILIZE MECHANICAL BOLTED PRESSURE OR HYDRAULIC COMPRESSION TYPE USING MANUFACTURER'S RECOMMENDED TOOLING. CABLE LUGS AND CONNECTORS SHALL UTILIZE COMPRESSION TYPE OF SAME METAL AS CONDUCTOR. PROVIDE TO MATCH CABLE, WITH MARKING INDICATING SIZE AND TYPE. COPPER LUG CONNECTIONS TO BUS BARS: USE ANTISEIZE COMPOUND ON TANG.

H. NOT MORE THAN 3 LIGHTING OR CONVENIENCE OUTLET CIRCUITS SHALL BE INSTALLED IN ONE CONDUIT UNLESS OTHERWISE INDICATED. PULL NO THERMOPLASTIC WIRES AT TEMPERATURES LOWER THAN 32 DEG F. THERMOPLASTIC WIRES SHALL NOT BE INSTALLED IN COMPUTER AREA RAISED FLOORS.

I. LEAVE WIRES WITH SUFFICIENT SLACK TO PERMIT MAKING FINAL CONNECTIONS.

J. PERFORM CONTINUITY AND INSULATION TESTS. MEGGER TEST 10 PERCENT OF BRANCH CIRCUITS.

PERFORM TESTS PRIOR TO CONNECTING EQUIPMENT AND IN PRESENCE OF AUTHORIZED REPRESENTATIVES. SUBMIT WRITTEN REPORT OF RESULTS. CORRECT OR REPLACE CABLE TESTING BELOW MANUFACTURER'S STANDARDS.

9. DEVICES:

A. PROVIDE COMPLETE MATERIAL AND ACCESSORIES AS NOTED.

B. LOCAL WALL SWITCHES SHALL BE SPECIFICATION GRADE, TOGGLE, QUIET TYPE, RATED 20 AMP, 120/277 VOLT, AC. SIMILAR TO HUBBELL NOS. 1221 (SINGLE POLE), 1222 (DOUBLE POLE), 1223 (3-WAY) AND 1224 (4-WAY).

C. INSERTION RECEPTACLES SHALL BE SPECIFICATION GRADE DUPLEX CONVENIENCE 125 VOLTS, 2 POLE, 3 WIRE, U GROUND SLOT. GROUNDED, EXCEPT AS NOTED. MEETING NEMA STANDARDS, PUBLICATION WD-1-1971. SIMILAR TO HUBBELL NOS. 5362 (20 AMP) AND 5262 (15 AMP).

1) SINGLE, EXCEPT AS NOTED:
   a. 20 AMP STRAIGHT BLADE, SIMILAR TO HUBBELL NO. 5361.
   b. 125 VOLT, 2 POLE, 3 WIRE, GROUNDED.
2) GROUND FAULT INTERRUPTER RECEPTACLES:
   a. FEED-THRU TYPE. SIMILAR TO HUBBELL NOS. GF5362 (20 AMP) AND GF5262 (15 AMP).

D. DEVICE PLATES: SEE ARCHITECT FOR TYPE. FOR RECEPTACLES WITH OTHER THAN 120 VOLT, INSCRIBED VOLTAGE AVAILABLE.

E. COLORS: COORDINATE COLORS WITH ARCHITECT.

F. MOUNTING ORIENTATION OF RECEPTACLES (HORIZONTAL OR VERTICAL): COORDINATE WITH ARCHITECT.

10. LIGHTING FIXTURES:

A. PROVIDE FIXTURES ("LUMINARIES"), COMPONENTS AND LAMPS. FIXTURES SHALL BE COMPLETELY FACTORY ASSEMBLED, WIRED AND EQUIPPED WITH ALL NECESSARY SOCKETS, BALLASTS, SUPPORTING HARDWARE AND ACCESSORIES. REFER TO DRAWINGS FOR INDIVIDUAL FIXTURE DESCRIPTIONS.

B. FIXTURE CATALOG NUMBERS USED TO ILLUSTRATE EQUIPMENT TYPE DO NOT NECESSARILY DENOTE REQUIRED MOUNTING EQUIPMENT OR ACCESSORIES. PROVIDE ACCESSORIES TO SUIT.

11. TELEPHONE CONDUIT SYSTEM:

A. PROVIDE COMPLETE SYSTEM OF: EMPTY CONDUIT, PULL BOXES, OUTLETS, SLEEVES AND FISHWIRES.

B. EQUIPMENT SHALL CONFORM TO REQUIREMENTS OF TELEPHONE COMPANY.

C. OUTLETS SHALL BE:

1) ALL: 4 IN. SQUARE WITH BUSHED COVER PLATE.
2) FLOOR: CAST IRON WITH LOW TENSION FITTING.

D. PROVIDE FISHWIRES, IN RACEWAYS OVER 10 FT LONG.

E. CONDUIT SHALL BE 3/4 IN. MINIMUM. FURNISH EMPTY CONDUIT FROM OUTLET TO NEAREST ACCESSIBLE HUNG CEILING.

13. GROUNDING

A. GROUND CONNECTORS SHALL BE TIN-PLATED ALUMINUM ALLOY, UL APPROVED AND STAMPED FOR USE WITH EITHER ALUMINUM OR COPPER CONDUCTORS.

B. GROUND CABLES SHALL BE BARE OR GREEN COLOR CODED, INSULATED, ANNEALED STRANDED TINNED COPPER WIRE AS INDICATED ON DRAWINGS.

C. PROVIDE CONTINUOUS GROUND PATH FOR ALL ELECTRICAL CIRCUITS, FROM POINT OF UTILIZATION BACK TO SOURCE THROUGH GROUND WIRES, CONDUIT RUNS, AND RELATED ITEMS.

D. ALL GROUND WIRES AND BONDING JUMPERS SHALL BE STRANDED COPPER INSTALLED IN CONDUIT. ALL GROUND WIRES SHALL BE WITHOUT JOINTS AND SPLICES OVER ITS ENTIRE LENGTH.

E. MECHANICAL EQUIPMENT SHALL BE BONDED TO THE BUILDING EQUIPMENT GROUNDING SYSTEM, INCLUDING FANS, PUMPS, ETC.

F. PVC CONDUITS AND PORTIONS OF THE METALLIC PIPING AND DUCT SYSTEMS WHICH ARE ISOLATED BY FLEXIBLE CONNECTIONS, INSULATED COUPLINGS, METERS, ETC. SHALL BE BONDED TO EQUIPMENT GROUND WITH A FLEXIBLE BONDING JUMPER, OR SEPARATE GROUNDING CONDUCTOR.

G. PROVIDE GROUNDING TYPE BUSHINGS FOR CONDUIT TERMINATED THROUGH MULTIPLE CONCENTRIC KNOCKOUTS NOT FULLY KNOCKED OUT, ON INSIDE OF PANELBOARDS AND LOAD CENTERS, GROUND BUSHING WITH #12 BARE COPPER TO PANELBOARD GROUND BUS.

PURCHASE COLLEGE
STATE UNIVERSITY OF NEW YORK

735 ANDERSON HILL RD
PURCHASE, NY 10577-1400

ARCHITECT
dimovski architecture PLLC
59 Kensico Road, Thornwood, NY 10594
(914) 747-3500 | (914) 747-3588 fax
www.dimovskiarchitecture.com

MEP ENGINEER
Collado ENGINEERING
2 HOLLAND AVENUE
WHITE PLAINS NY 10603
(914) 332-7658

NO.	REVISION/ISSUE	DATE
3.	ELECTRICAL ADDENDUM	08/21/2017
2.	ISSUE FOR BID	05/10/2017
1.	ISSUE FOR 90% REVIEW	05/01/2017

SEAL

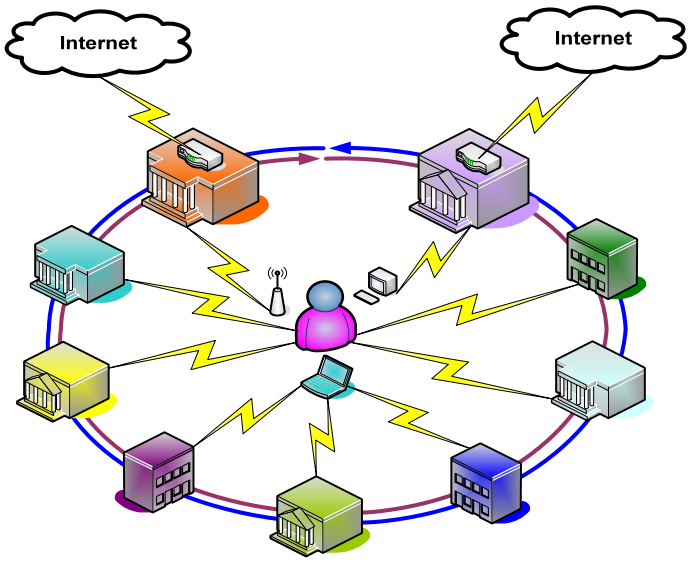
PROJECT
INTERIOR RENOVATION
CAMPUS CENTER SOUTH

DATE:	05/01/2017
PROJECT NO:	DA 16169 / SU 022317
DRAWN BY:	YK
CHECKED BY:	PD/SGD
SCALE:	AS NOTED

DRAWING TITLE
ELECTRICAL SPECIFICATIONS

SHEET NO.
E-500

Purchase College
State University of New York



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Network Cable Installation Specification and Scope of Work

For Campus Center South Renovation 2017

Version 2.54

August 22, 2017~~August 17, 2017~~

Table of Contents

Part 1: Introduction

1.1) Introduction

Purchase College (SUNY) located in Purchase, NY, maintains the following specification (hereafter referred to as "Specification", "the Specification", or "this Specification") as a set of requirements for any installation of cables that shall support data, telephone, and/or video surveillance services on the Purchase College campus.

1.2) The Terms "Owner" and "the Owner"

The Terms "Owner" and "the Owner" shall represent Purchase College, State University of New York (SUNY) of 735 Anderson Hill Rd., Purchase, NY 10577.

1.3) Applicability of this Specification and the Term "Contractor"

This Specification may be presented in a number of ways, including but not limited to the following:

1.3.1) This Specification may be attached to a request for quotation or request for proposal, in which case this document shall specify requirements for proposed work upon which a vendor shall base its quotation. In this case the terms "Contractor" and "the Contractor" shall represent the vendor who is providing cost quotation/proposal upon which an agreement to perform the work may be reached. By use of the terms "Contractor" and "the Contractor", Owner conveys no promise or intention that such an agreement will be reached.

1.3.2) This Specification may accompany an order for installation services and materials, in which case it shall serve as requirements by which vendor is to provide requested service and materials should the vendor accept the order. In this case the terms "Contractor" and "the Contractor" shall represent the selected vendor in its obligation to perform the actual work.

1.4) Format

This Specification consists of the following five parts:

Part 1: Introduction
Part 2: General,
Part 3: Materials,
Part 4: Execution, and
Part 5: Scope of Work.

Part 2: General

2) General

2.1) Schedule

Contractor shall submit a proposed schedule in writing to Project Manager, including all of the Project Milestones specified below and the Schedule Requirements specified in the Scope of Work.

Contractor shall complete all work according to any Schedule Requirements specified in the Scope of Work.

If awarded, proposed schedule of successful Contractor shall become the Schedule. Contractor shall adhere strictly to the Schedule and convey any proposed adjustments to the Schedule as a Transmittal to Owner Project Manager, and shall include adjustment to all of the Project Milestones specified below.

Written approval from Owner Project Manager must be obtained by Contractor prior to change of Schedule. If written approval from Owner Project Manager is not obtained by Contractor, then the Schedule remains unchanged and Contractor is obligated to perform according to Schedule.

Project Milestones and Schedule Requirements are as follows:

2.1.1) Materials Delivery Date (if different from the start date)
2.1.2) Start Date
2.1.3) Start of Path Installation (incl. core drilling, conduit, cable tray installation) Date
2.1.4) Completion of Risers Date
2.1.5) Completion of Path Installation Date
2.1.6) Completion of Cable Pulling and Rough-in Date
2.1.7) Testing and Labeling Date
2.1.8) Remainder Completion of Fiber-Optic Cable Installation Date
2.1.9) Completion of Telecommunications Feeder Installation Date
2.1.10) Documentation Delivery Date
2.1.11) Project Total Completion Date

2.2) Contractor References

Contractor shall supply along with their bid a list of references of comparable installations, including contact name and telephone number. Owner may elect to perform a site visit to one or more references. Contractor shall note at least one reference that is able to accommodate a site visit by Owner.

2.3) Designated Contacts

2.3.1) Owner Designated Contacts

Owner shall specify the name, mailing address, email address, fax, and telephone numbers for the following persons, hereafter referred to as “Owner Designated Contacts”.

Changes to any Owner Designated Contacts before or during the relevant period of this work shall be communicated to all Designated Contacts by the Owner Project Manager.

Contractor shall communicate exclusively with the Owner Designated Contacts defined below in regard to any matter pertaining to the work described herein.

2.3.1.1) Owner Project Manager

Sean Connolly
Capital Facilities Planning
Purchase College
735 Anderson Hill Rd., Purchase NY 10577
(914)251-6916
sean.connolly@purchase.edu

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2.3.1.2) Owner Technical Contact

Christopher Marsigliano
Campus Technology Services
Purchase College
735 Anderson Hill Rd., Purchase NY 10577
(914)251-6916
chris.marsigliano@purchase.edu

2.3.1.3) Owner Billing Contact

~~Nikolaus Lentner~~Edward Herran
Purchasing and Accounts Payable Office
Purchase College
735 Anderson Hill Rd., Purchase NY 10577
Phone: (914)251-6070
Fax: (914)251-6075
edward.herran@purchase.edu

2.3.1.4) Owner Parking and Transportation Contact

~~Stephanie Ferrer~~Christine Onderdonk
Parking and Transportation Office
CCN Building, Rm. 1014
Purchase College
735 Anderson Hill Rd., Purchase NY 10577
(914)251-6177
~~stephanie.ferrer~~christin.onderdonk@purchase.edu

2.3.1.5) Owner Certified Payroll Records Contact

Anne Marie Russillo
Capital Facilities Planning Office
Purchase College
735 Anderson Hill Rd., Purchase NY 10577
(914)251-4480
anne-marie.russillo@purchase.edu

2.3.1.6) Owner Capital Projects Contact

~~Anne Marie Russillo~~Sayim Malik
Capital Facilities Planning
Purchase College
735 Anderson Hill Rd., Purchase NY 10577
(914)251-44~~80~~79
sayim.malik@purchase.edu

2.3.2) Contractor Designated Contacts

Contractor shall specify the name, mailing address, email address, fax, and telephone numbers for the following persons, hereafter referred to as “Contractor Designated Contacts”.

Changes to any Contractor Designated Contacts before or during the relevant period of this work shall be communicated to all Designated Contact by the Contractor Project Manager.

2.3.2.1) Contractor Project Manager
2.3.2.2) Contractor Field Contact
2.3.2.3) Contractor Sales Contact
2.3.2.4) Contractor Billing Contact
2.3.2.5) Contractor President / CEO

2.3.3) Coordination by Contractor with Owner Designated Contacts

Contractor shall simultaneously forward copies of any correspondence between Contractor (or any of its employees or designees) and Owner (or any of its employees or designees) to the Owner Project Manager.

Contractor shall forward copies of meeting minutes within one business day following any meeting with Owner Designated Contact(s) to the Owner Project Manager, and copy any attending Owner Designated Contact(s).

Contractor shall submit all required documentation, all test results, all quotations, all matters of dispute, and all questions pertaining to this document in writing via the mailing address of the Owner Project Manager. Contractor shall send electronic copy of same to both the Owner Project Manager and the Owner Technical Contact via email.

Contractor shall submit all technical questions to the Owner Technical Contact via email, with copy to Owner Project Manager.

Contractor shall submit all matters of billing to the mailing address of the Owner Billing Contact, with copy to Owner Project Manager.

Contractor shall submit all certified payroll records to the Owner Certified Payroll Records Contact, and notify Owner Project Manager when these are sent.

Contractor shall submit all questions regarding parking and transportation on Owner premises, all requests for permission to park vehicles on owner premises, and all disputes related to parking/ticketing/towing on Owner premises to the Owner Parking and Transportation Contact

2.4) Quality Assurance and Contractor Qualifications:

Contractor must have and maintain the following qualifications:

2.4.1) Contractor's personnel are trained and experienced in the installation and testing of cabling systems according to all parts of TIA, BICSI, and related standards.

2.4.2) Contractor's personnel are trained and experienced in cable support techniques.

2.4.3) Contractor's personnel are trained and experienced in fire stopping methods.

2.4.4) Contractor's on-site personnel must be fully conversant with and capable of the installation of large scale Category-6 cabling systems for high-speed data and voice, and telecommunications cabling systems to support both analog and digital voice communications.

2.4.5) Contractor's on-site personnel must be trained and certified in installing Category-6 and equivalent cabling system at the level required to provide the cabling system manufacturer extended performance warranty with a minimum of a 20 year term.

2.4.6) Contractor's on-site personnel must have completed at least three comparable installations of telecommunications cabling systems supporting analog and digital voice communications within the last year.

2.4.7) Contractor's on-site personnel must be fully conversant with and capable of the installation of large scale SMF cabling systems supporting high-speed data and voice, if scope requires SMF installation.

2.4.8) Contractor's on-site personnel must have completed at least three comparable installations of SMF cabling systems supporting 1000Base-LX Ethernet within the last year.

2.4.9) Contractor's on-site personnel must be trained and certified in installing Corning Single-mode Fiber and equivalent cabling system at the level required to provide the cabling system manufacturer extended performance warranty with a minimum of a 20 year term.

2.4.10) Contractor's on-site personnel must be fully conversant with and capable of the installation of large scale security and surveillance cabling systems supporting analog and digital signals.

2.4.11) Contractor's on-site personnel must have completed at least three comparable installations of cabling systems supporting installation of security/surveillance cable within the last year.

2.4.12) Contractor's on-site personnel must be trained and certified in installing security/surveillance cabling systems supporting analog and digital signals.

2.5) Technical References

The provision and installation of the cable plant is to adhere to the strictest codes, standards, and practices. All products, processes, and standards of work must conform to the current versions of all applicable standards as defined by the following organizations and codes:

American National Standards Institute (ANSI)
American Society for Testing and Materials (ASTM)
Edison Testing Laboratories (ETL)
Building Industry Consulting Service International (BICSI)
Association of Cabling Professionals (ACP)
Electronic Industries Association (EIA)
Federal Communications Commission (FCC)
International Electrotechnical Commission (IEC)
Institute of Electrical and Electronics Engineers (IEEE)
National Electrical Code (NEC // NFPA 70)
National Electrical Contractors Association (NECA)
National Electrical Manufacturers Association (NEMA)
National Electrical Safety Code (NESC)
National Fire Protection Association (NFPA)
New York State Uniform Fire Prevention and Building Code
Telecommunication Industries Association (TIA)
Underwriters Laboratories (UL)

In the event of a conflict between standards or codes, Contractor shall adhere to the most stringent.

In the event of a conflict between this Specification and any standard, code, or practice whereby this Specification is the most stringent, Contractor shall adhere to this Specification.

In the event of a conflict between this Specification and any standard, code, or practice whereby this Specification is not the most stringent, Contractor will immediately inform Owner Technical Contact and identify the conflict.

2.6) Approvals

Certain materials and practices are specified herein. If Contractor wishes to propose an equivalent alternate component or practice, a formal request including manufacturer performance data, cut sheets, shop drawings, and all supporting documentation must be submitted to the Owner Technical Contact and Owner Project Manager for approval.

Proposed alternate component or practice must not invalidate manufacturer warranty on installed cabling system.

Any variance from this Specification must be explicitly approved in writing by both the Owner Technical Contact and the Owner Project Manager. An approval from one of either the Owner Technical Contact or Owner Project Manager shall not suffice as approval. Both the Owner Technical Contact and Owner Project Manager must approve of the variance.

Owner reserves the right to deny any request for approval. If an approval request is denied or an approval is not received, then Contractor shall comply with this Specification.

2.7) Notification of Errors, Inquires and Interpretation

It shall be the responsibility of the Contractor to bring to the attention of Owner any errors in this Specification and to make recommendations to Owner Project Manager and Owner Technical Contact in writing for any additional requirements deemed necessary. If Owner finds the errors significant or a change in the requirements necessary, then Owner will notify Contractor in writing of the change in this Specification. No deviations from this Specification shall be made without approval from Owner.

2.8) Parking and Operation of Vehicles on Campus

Contractor will operate vehicles responsibly under campus rules and regulations and will not park vehicles in unauthorized areas. Illegally parked vehicles will be towed at vehicle owner's expense.

It will be the responsibility of the Contractor to contact the Parking and Transportation Office at (914)251-6177 to make arrangements for temporary visitor parking permits. The Owner Parking and Transportation Office is located in the Campus Center North (CCN) Building, in room 1014. Illegally parked vehicles are subject to ticketing and/or towing.

Unless otherwise noted, or otherwise instructed by the Owner Parking and Transportation Office, Contractor shall park all vehicles in parking lot W-1. Metered parking is available at vehicle operator's expense in parking lot W-1 for short-term parking of vehicles that have not been issued a temporary visitor parking permit.

Contractor shall not park or operate motor vehicles on grass or other non-paved surfaces, unless explicit written permission is granted by the Parking and Transportation Office.

2.9) Proper Contractor Identification

Employees of the Contractor while on site shall carry identification badge or cards and shall be instructed to submit same to scrutiny upon request by Police or Owner supervisory personnel.

2.10) Subcontracts

All of the requirements herein that apply to Contractor shall also apply to any subcontractor that Contractor uses to execute the requirements of this Specification. It is Contractor's sole responsibility to insure that all work is executed according to this Specification, whether performed directly by Contractor, or by Contractor's subcontractor. Upon request, Contractor must provide a list of all proposed subcontractors along with detailed information regarding their financial and technical abilities.

2.11) Certified payroll records must be submitted by the Contractor to Owner Certified Payroll Records Contact.

Part 3: Materials

3) Materials

The following materials requirements shall pertain to any materials provided, installed, and/or used by Contractor.

3.1) General

Contractor shall supply all materials, unless otherwise noted.

All materials, equipment, tools and methods used shall be of standard manufacture, shall have undergone thorough tests, shall have been proven in actual use, and shall not be custom-designed for this project.

3.2) Category-6

All Category-6 network cable, jacks, plugs, patch panels, and patch cables must be rated Category 6, must exceed performance specifications for Category 6 cable as defined in TIA-568-C.2, and must be certified by manufacturer at a frequency range of 1Mhz through 350Mhz.

Installed Category-6 network shall support 100BASE-TX Ethernet as per IEEE 802.3u, 1000BASE-T Ethernet as per IEEE 802.3ab, 1000BASE-TX Ethernet as per TIA-854, and Power over Ethernet as per the IEEE 802.3af and IEEE802.3at standards.

Installed materials must form an integrated system and must integrate with existing network. Components and interconnections must match for optimum future performance. All components must be produced by the same manufacturer, or be warranted by an exclusive partnership.

3.2.1) Warranty on Installed Cabling system

Manufacturer warranty on installed Data/Telecommunications Cabling System shall be extended to Owner **for a period of not less than 20 years** and shall provide immediate remediation or replacement of installed cabling system by manufacturer, if cabling system does not meet the requirements of this Specification, including but not limited to testing parameters, at any point during the warrantee period.

Contractor shall submit manufacturer warranty information on proposed Data/Telecommunications Cabling System, along with copies of manufacturer certification credentials for Contractor, with Contractor's bid.

3.2.2) Category-6 Cable

Category-6 cabling shall be 24 AWG, 4-pair UTP, UL/NEC CMP rated, with a blue PVC jacket. Plenum-rated Category-6 cabling shall be used where wiring runs through an air-handling space or plenum. Individual conductors of Category-6 cable shall be 100% FEP insulated. Category-6 cable jacketing shall be lead-free, and outer cable jacket diameter shall not exceed 0.22 inches.

Category-6 cable must exceed ANSI/TIA-568-C Category 6 and ISO/IEC 11801 ClassE performance requirements by significant margins on all parameters – minimally compliant Category-6 cable is not acceptable.

Category-6 cable shall be ETL verified to Category 6. Independent verification for flammability compliance shall be to NEC article 800 and NFPA 70; CMR ANSI/UL 1666.

Cable shall be dispensed from a plastic reel in a cardboard box packaged by manufacturer.

Category-6 Cable shall be TE CONNECTIVITY “NETCONNECT” part number TE-620R-BLRB / TE-620P-BLRB, or approved equal.

3.2.3) Shielded Category-6 Outside Service Plant Cable (“Category-6 OSP Cable”)

Category-6 OSP Cable shall be 23 AWG, 4-pair STP, with a sunlight and abrasion resistant black polyethylene outer jacket. Category-6 OSP Cable shall consist of a core of four balanced twisted pairs held in place by a cross-web separator and surrounded by a filling compound to prevent water ingress. Category-6 OSP Cable shall provide dry water block between the shield and the core jacket to prevent water ingress. Category-6 OSP Cable shall be suitable for buried applications.

Category-6 OSP Cable shall be produced by Superior Essex Corp., and shall be Superior Essex OSP Broadband Category 6 Shielded Cable, Product Code BBDN6, Part Number 04-001-64.

3.2.4) Category-6 Modular Plugs for Outside Service Plant (OSP) Cable

Category-6 Modular Plugs for Outside Service Plant Cable shall 8P8C shielded modular plugs that are designed to accept 23-gauge solid conductor shielded cable, and operate as part of an installed Category 6 cable system.

Category-6 Modular Plugs for Outside Service Plant Cable shall be SENTINEL Connector Systems Inc., Part number 111S08080090C34, or approved equal.

3.2.5) Category-6 Patch Cables

Patch cable and station cable assemblies shall be gray in color. Patch cable and station cable assemblies shall be constructed using 50-micron gold-plated 8-position modular plugs, wired to the T568A wiring pattern. The cable assemblies shall utilize colored cable and "snagless" cable boots that match the color of the cable. Cable shall be stranded, and cable assemblies shall comply with TIA Category 6 performance requirements and shall be backed by a 20-year component warranty provided by the manufacturer to Owner. Patch cables shall be AMP NETCONNECT part number 219885 or approved equivalent.

3.2.6) Category-6 Data/Telecommunication Outlets

For wall-mounted data/telecommunications outlets, outlet faceplates shall be 45-degree downward-facing angled faceplates.

Floor-mounted data/telecommunications outlets shall have self-sealing flip-open covers, and faceplates shall be flush with the floor when covered are closed. Floor-mounted data/telecommunications outlets must be water and dust proof.

Faceplates and fittings shall be colored almond unless otherwise specified.

Modular jacks shall be un-keyed, RJ-45 (8-position – 4-pair) and shall meet EIA/TIA-568 requirements for Category 6 component performance.

Modular jacks shall fit in a .790" X .582" opening. Modular jacks shall be terminated using PDS 110-style insulation displacement pc board connectors, color-coded for both T568A and T568B wiring. The 110-style connectors shall be capable of terminating 22-24 AWG solid wire. The 110 Contacts shall be paired (with additional space between pairs) to improve crosstalk performance. Each jack shall be provided with a bend-limiting strain relief. The strain relief shall provide a “silo” to limit the bend radius at the point of termination. Each jack shall be wired to T568B. Each jack shall have an integral dust cover.

Category-6 data/telecommunications outlet modular jacks shall be colored orange.

Data/telecommunications faceplates shall be colored almond unless otherwise specified.

Data/telecommunications modular jacks shall be AMP NETCONNECT part number 1375187-5 or approved equivalent.

Data/telecommunications faceplates shall be AMP NETCONNECT part numbers 1375155-1, 406185-1, 211008-1, or approved equivalent.

3.2.7) Category-6 Patch Panels

Category-6 patch panels shall be 1.75” high, occupy one 19” rack unit (1RU), and provide 24 RJ-45 (8-position – 4-pair) modular jack ports wired to T568B. Patch panels shall be configured as 6-port modules with individually replaceable jacks. The front of each module shall be capable of accepting 9mm to 12mm labels. Each port shall be capable of accepting an icon to indicate its function. Patch panels shall terminate the building cabling on PDS 110-style insulation displacement connectors.

Individually replaceable modular jacks inserted in patch panel will be pre-installed and will be colored black, unless otherwise noted.

Patch panels must be UL-Listed AMP NETCONNECT part number 1375014-2 or approved equivalents.

Patch panels shall be labeled using compatible labels and label covers, or approved alternate.

3.2.8) Category-6 Lightning Protectors

Category-6 Lightning Protectors shall be designed and laboratory-tested for use with 10/100/1000 Base-T Ethernet networks in indoor and outdoor environments between -40 degrees Fahrenheit and +176 degrees Fahrenheit. Category-6 Lightning Protectors shall meet or exceed the GR-1089 Intra-Building surge protection requirements for 10/100/1000 Base-T Ethernet lines.

Category-6 Lightning Protectors shall present two Category 6 8P8C shielded modular jacks, with shield isolated from the safety ground. Category-6 Lightning Protectors modular jacks shall accept 8P8C shielded modular plugs for inline installation in a single permanent link. Category-6 Lightning Protectors shall be compatible with 802.3af Power-over-Ethernet (PoE) devices, and shall support PoE modes A and B as per 802.3af.

Category-6 Lightning Protectors clamping voltage shall be 15 Volts for wire-to-wire, 90 Volts for wire-to-ground, and 90 Volts for shield-to-ground.

Category-6 Lightning Protectors shall have a weatherproof ABS enclosure with gasketed cover and concealed mounting holes. Ground clamp provided outside the Category-6 Lightning Protector enclosure shall accept a 10-gauge ground cable.

Category-6 Lightning Protectors shall be HyperLink AL-CAT6HPW manufactured by L-Com, or approved equal.

3.3) Category 3 Telecommunications Feeder/Backbone

All telecommunications feeder cables, patch panels, and punch-down blocks shall be rated Category-3, must comply with or exceed specifications as defined in TIA-568-B, and must be certified by manufacturer at a frequency range of 1Mhz through 16Mhz.

Installed Category-3 telecommunications feeder shall support analog telephony as per TIA 470-C and digital telephony as per TIA-810-B.

Installed materials must form an integrated system and must integrate with existing telecommunications network. Components and interconnections must match for optimum future performance. All components must be produced by the same manufacturer, or be warranted by an exclusive partnership.

3.3.1) Telecommunications Feeder Cable

Telecommunications feeder cable shall be type ARMM, and shall consist of 100-pair of #24 AWG solid conductor cables wrapped individually in expanded polyethylene insulation. Telecommunications feeder cable shall be wrapped in ALVYN sheath-corrugated polymer-coated aluminum shield adhering to a flame-retardant grey PVC jacket. Cable shall be UL/NEC rated. Cable jacketing shall be lead-free.

Color-coding of insulation on individual pairs of conductors shall conform to TIA-568-B and PIC standard color codes for telecommunications backbone cable.

Telecommunications feeder cable shall be ETL verified to Category-3 transmissions requirements as defined in the TIA-568-A standard.

Typical electrical characteristics shall be as follows at 20-degree Celsius:

3.3.1.1) Max DC Resistance of 27.3 Ohms/kft
3.3.1.2) Insulation Resistance of 5000 Megohms-kft
3.3.1.3) Mutual Capacitance of 83 nF/mile at 1 kHz(nom)
3.3.1.4) Nominal Attenuation of 6.9 dB/kft at 772 kHz
3.3.1.5) Characteristics Impedance of 100 Ohms at 1 MHz(nom)

3.3.2) Telecommunications Feeder Patch Panels

Category-3 patch panels shall be 7” high, occupy four 19” rack units (4RU), and provide 96 RJ14C (4-position – 2-pair) modular jack ports on front of panel, with PDS 110-style insulation displacement connectors on rear of panel.

Telecommunications feeder patch panel will be colored black.

Patch panels must be UL-Listed AMP part number 557-415-1 or approved equivalents.

3.3.3) Telecommunications Distribution Frame Punch-Down Block

Cross-connect punch-down blocks for telecommunications distribution frames shall be type 66M split 50-pair blocks. Cross-connect blocks shall provide 6 pins per row, and shall be designed for termination of 22-26 AWG solid or 20-26 AWG stranded conductors. Block shall be molded of flame-retardant thermoplastic with quick-connect clips.

All pairs of the telecommunications feeder cable in the telecommunications distribution frame end shall be terminated on 66M insulation displacement connectors on cross-connect punch-down blocks for telecommunications distribution frames. A sufficient number of cross-connect punch-down blocks for telecommunications distribution frames shall be provided and installed by Contractor such that all pairs of the telecommunications feeder cable provided by Contractor may be terminated.

Cross-connect punch-down blocks for telecommunications distribution frames shall be Hubbell part number HPW66M150C5 or approved equal.

3.3.4) Telecommunications Gas Protector Panel

Gas Protector Panels shall be CIRCA Telecom (serial #205226, CIRCA 1900A1-100) gas protector panel or approved equal.

3.3.5) Telecommunications Patch Cables

Telecommunications patch cable jacket shall be silver in color. Telecommunications patch cable assemblies shall be “silver satin” with four 28-gauge stranded copper conductors, four-position RJ14C modular plugs, with 15-micron gold-plated contacts.

3.4) Fiber-Optics

All fiber-optic network cable, jacks, patch panels, and patch cables shall be designed for single-mode optical transmission.

Installed fiber-optic network shall support 1000bLX Ethernet, as per the IEEE 802.3z standard.

Installed materials must form an integrated system and must integrate with existing fiber-optic network. Components and interconnections must match for optimum future performance. All components must be produced by the same manufacturer, or be warranted by an exclusive partnership.

All components shall be produced by Corning Cable Systems, or approved equal.

3.4.1) Fiber-Optic Cable

All fiber-optic cable shall contain 24-strands strands of single-mode fibers surrounded by a lead-free flame-retardant outer jacket. Fiber-optic cable shall provide an 8-9 micron core transmission medium with 125 micron cladding, and introduce no more than .4 dB/km of attenuation (nominal).

Color of fiber-optic strand cladding and buffer tubes shall conform to TIA-598-C.

Outer jacket of all fiber-optic cable, including armored and non-armored fiber-optic cable, shall be colored yellow.

Fiber-optic cable shall be manufactured by Corning Cable Systems.

3.4.1.1) Intra-building Single-mode Fiber Optic Cable

All intra-building single-mode fiber optic cable shall contain 24-strands strands of 900 µm tight-buffered fibers surrounded by dielectric strength members and a lead-free flame-retardant outer jacket. Outer jacket of all intra-building Single-mode fiber optic cable shall be colored Yellow.

Indoor single-mode fiber optic cable shall be:

3.4.1.1.1) Plenum-rated Armored Single-mode fiber optic cable -- Corning MIC Interlocking Armored Plenum Cable, Corning part number 024E88-33131-A3

3.4.1.1.2) Riser-rated Armored Single-mode fiber optic cable -- Corning MIC Interlocking Armored Riser Cable, Corning part number 024E81-33131-A1

3.4.1.1.3) Plenum-rated (non-armored) Single-mode fiber optic cable – Corning MIC Plenum Cable, Corning part number 024E88-33131-29

3.4.1.1.4) Riser-rated (non-armored) Single-mode fiber optic cable – Corning MIC Riser Cable, Corning part number 024E81-33131-24

3.4.1.2) Inter-building Single-mode Fiber Optic Cable

All inter-building single-mode fiber optic cable shall contain 24-strands strands of fiber in two 3.0 mm buffer tubes, surrounded by dielectric strength members and a lead-free UV-resistant flame-retardant outer jacket.

Indoor single-mode fiber optic cable shall be:

3.4.1.2.1) Plenum-rated Armored inter-building Single-mode fiber optic cable – Corning FREEDM Plenum Loose Tube Cable with Interlocking Armor, part number 024E8P-31131-A3

3.4.1.2.2) Riser-rated Armored inter-building Single-mode fiber optic cable – Corning FREEDM Loose Tube Cable with Interlocking Armor, part number 024EWF-14101-AA1

3.4.1.2.3) Riser-rated (non-armored) inter-building Single-mode fiber optic cable – Corning FREEDM Loose Tube Indoor/Outdoor Cable, part number 024EWF-T4103A20

3.4.1.2.4) Plenum-rated (non-armored) inter-building Single-mode fiber optic cable – Corning FREEDM Loose Tube Indoor/Outdoor Cable, part number

3.4.2) Fiber Optic Grounding

Armored cable shall be grounded.

Armored cable grounding assembly shall be Corning part number FDC-CABLE-GRND (Armored Cable Grounding Kit)

3.4.3) Fiber-Optic Connectors

Fiber optic connectors on patch panels shall be compliant with TIA/EIA 604-2 ("SC") connectors. Fiber-optic connectors shall be crimp-on type, and shall have Ultra Physical Contact (UPC) polish/finish. Fiber-optic connector ferrules shall be constructed of ceramic.

Fiber-optic connectors shall present no more than 0.2 dB of typical insertion loss and 0.5 dB of maximum insertion loss, as measured by manufacturer at wavelengths of 1310 nm and 1550 nm, FOTP-171.

Fiber-optic connectors shall be Corning Unicam SC Single-Mode Connector with Ultra PC Polish, Corning Cable Systems part number 95-200-42, or approved equal.

3.4.4) Fiber-Optic Patch Panel

Fiber optic patch panels shall meet requirements of TIA-568-C and TIA606, suitable for loose tube, tight-buffered, and optical fiber ribbon cables. Fiber optic patch panels shall be rack-mountable in standard EIA 19" (48 cm) equipment racks (1.75-in EIA hole spacing). Fiber optic patch panels shall be capable of being rack-mounted with either a 4.5" (11.4 cm) frontal projection to allow entry of fiber-optic patch cable sot front compartment, or flush to rack rails (0" projection). Fiber optic patch panels shall offer multiple locations for jumper egress, and a slide-out drawer for easy connector access.

Fiber-optic patch panel shall provide integrated bend radius limiting, cable anchor, and strand fan-out in rear connector housing. Protection for patch cable connectors, D-rings for patch cable routing, and side egress for patch cables shall be provided on front of housing.

Fiber optic patch panels located in building data/telecommunications closets shall consume two rack spaces (3.5-in high), shall have up to 64 fiber total capacity (SC or ST connectors). Fiber optic patch panels located in building data/telecommunications closets shall be Corning part number CCH-02U (Corning Cable Systems' Closet Connector Housing) and shall include four 12-fiber panels (48 fiber capacity), Fan-out kits (Corning part number FAN-BT25-06 kit), fan-out consumables (Corning part number TKT-FANBT-C), Buffer Tube Fan-Out Assembly Tool Kit (Corning part number TKT-FANBT-A), and any other materials required for proper termination and installation of fiber optic cable at patch panel.

3.4.5) Fiber Optic Cable Management

Fiber optic cable management shall be one rack unit (1.75-in) high.

Fiber optic cable management shall be Corning part number CJP-01U.

3.4.6) Fiber-Optic Patch Cables (Jumpers)

Fiber-optic patch cable assemblies shall be single-mode, 2-fiber jumper cable, and shall provide one duplex SC connector to one duplex un-keyed LC connector.

Fiber-optic patch cable assembly cable shall be engineered to present lowest attenuation at bends up to and including a minimal bend radius of 30mm (1.2 inches).

Fiber-optic patch cable assembly cable outer jacket shall be yellow in color, and shall allow separation of individual fibers and duplex connectors in field to allow conversion to two separate 1-fiber jumpers. Each separable 1-fiber cable shall be minimum of 2mm in diameter.

SC and LC connectors shall allow coupling and decoupling in duplex or single connector configuration.

LC connector duplex clip shall allow pairs to be swapped in the field such that cable may be field-configurable as either a straight-through or crossover cable.

Connector ferrules shall be constructed of ceramic. Connectors shall be factory-installed, shall have Ultra Physical Contact (UPC) polish/finish, and shall present no more than 0.15 dB of typical insertion loss and 0.4 dB of maximum insertion loss, as measured by manufacturer at wavelengths of 1310 nm and 1550 nm.

Fiber-optic patch cable assemblies shall be factory-built and factory-tested to produce no more than 1 dB attenuation at wavelengths of 1310 nm and 1550 nm.

Fiber-optic patch cable assemblies shall be Corning Cable Systems part number 0472-02-R5120-002-M or approved equal.

3.4.7) Fiber-Optic Splice Enclosures

Fiber-Optic Splice Enclosures shall be Corning Cable Systems part number SCF-6C28-01-144 or approved equal.

Fiber splice trays shall by type 2S trays, and shall permit for 24 RTF fusion splices. Fiber-optic splice trays shall be Corning Cable Systems part number M67-092 or approved equal.

3.5) Security/Surveillance

All Category-6 network cable, jacks, patch panels, and patch cables used to interconnect surveillance system components shall meet all requirements for Category-6 cable and components, described elsewhere in this document.

Installed materials must form an integrated system and must integrate with existing security/surveillance network. Components and interconnections must match for optimum future performance. All components must be produced by the same manufacturer, or be warranted by an exclusive partnership.

3.5.1) Warranty on Installed Cabling system

Contractor shall submit manufacturer warranty information on proposed security/surveillance cabling system, along with copies of manufacturer certification credentials for Contractor, with Contractor's bid.

3.5.2) Security/Surveillance Cable

3.5.2.1) Power Cable

Power cable used for surveillance network shall be two conductor 18 AWG twisted pair, with stranded bare copper conductors, encased in a black jacket.

3.6) Pathway

3.6.1) Ladder Cable Tray

All cable trays installed in data/telecommunications closets will be ladder-style aluminum cable tray. Ladder cable tray shall be a minimum of eighteen inches (18") wide, have a side rail height of four inches (4"), a load depth of at least three inches (3"), and a rung spacing of six inches (6"). Ladder cable tray shall be installed according to manufacturer specification, using proper radius fittings and fasteners prescribed by manufacturer. Ladder cable tray shall be grounded per NEC and manufacturer standards and to the same ground as equipment rack. Ladder cable tray will be Wiremold SpecMate Aluminum L Series Ladder Tray System or approved equal.

3.6.2) Basket Cable Tray ("Basket Tray")

Unless otherwise noted, all intra-building cable trays will be 8"-wide welded wire mesh basket cable tray with a 2" usable load depth. Finish of basket tray shall be pre-galvanized zinc finish, applied to steel wire prior to fabrication, and meeting the minimum properties of ASTM A 641. Basket tray shall have T-weld on top rail in order to avoid sharp surfaces or protrusions on tray surface. Wire Diameter on all mesh sections of basket tray must be a minimum of 0.197 inch. Basket tray manufacturer must have a demonstrated history of production and distribution of product offering for a minimum period of 3 years in the US. Basket cable tray shall be installed as per manufacturer's specification. All fittings shall be field-formed, from straight sections, in accordance with manufacturer's instructions. Basket tray shall be classified by UL as an Equipment Ground Conductor (ECG) when spliced as recommended. All splicing assemblies shall likewise be UL approved as ECG. Basket cable trays will be 8" FLEXTRAY Cable Management System part number FT2x8x10GS, or approved equal.

3.6.3) Poke-Throughs

Poke-throughs shall fit into 4" cored hole, and shall be fire-rated for four hours when installed in compatible unprotected reinforced concrete floors or fire-rated for three hours when installed in compatible floors employing steel floor units with concrete top floors. An adjustable fire barrier shall be integral to the poke-through that may accommodate floors between 2 ¼ inches to 7 inches in thickness. Poke-throughs shall be suitable for new or retrofit installations, and shall be appropriate for installation on carpeted or tiled floors.

Poke-throughs shall provide four Category-6 Data/Communications ports, and four NEMA 5-20R receptacles fed by four separate 20 Amp 125V power circuits.

Poke-throughs shall provide flip-up gasketed covers over each data/communications and power receptacle, to exclude scrub-water and dirt/debris when closed. Poke-through receptacles shall be positioned face-up atop a flange that shall raise the receptacles a minimum of 0.5 inches in height, further discouraging scrub-water infiltration even when covers are opened.

Poke-throughs shall exceed UL514A and UL514C testing standards, and UL scrub water exclusion requirements.

Poke-throughs shall be Hubbell part numbers PT4X4BLHPW, PT4X4BRS3HPW, PT4X4GYHPW, PT4X4IHPW, or approved equal. Miscellaneous additional Hubbell parts shall be required to accommodate the proper number of data/communications and power receptacles.

3.6.4) Conduit

All conduits to be installed by Contractor, unless otherwise specified, shall be Electrical Metallic Tubing.

3.6.4.1) Electrical Metallic Tubing

Electrical Metallic Tubing (EMT) must be ANSI C80.3 galvanized conduit.

EMT fittings and conduit bodies installed in interior spaces must be NEMA FB 1 steel setscrew type.

EMT fittings, conduit bodies, and junction boxes installed in exterior spaces must be weatherproof compression type.

Conduit system bushing and connectors must have nylon insulated throats.

3.6.5) Raceway

Raceway and fittings shall be constructed entirely of PVC, and shall be colored Ivory. minimum 8' lengths. Raceway shall be designed to be secured to walls mechanically using screws or bolts. Raceway product series must include the following finishing fittings:

3.6.5.1) cover clip / union
3.6.5.2) internal 90-degree bend
3.6.5.3) external 90-degree bend
3.6.5.4) flat 90-degree bend

3.6.5.5) end-cap

Fittings shall have a minimum of 1.3 inches interior bend radius, and shall be suitable to maintain rating of selected Category-6 cable.

Raceway shall be Wiremold NM2000 series or approved equal.

3.6.6) Surface-mount device boxes

Surface-mount device boxes shall be constructed entirely of PVC, and shall be ivory in color. Surface-mount device boxes shall be 2 7/8" inches deep, and shall be single-gang, 3 inches wide by, 4 7/8" high. Surface mount boxes shall be of same manufacturer and compatible with selected raceway, and shall have knockouts/twist-outs for selected raceway model. Surface-mount device boxes shall be designed to be secured to wall mechanically using screws or bolts.

Surface-mount device boxes shall be Wiremold NM2044 or approved equal.

3.7) Box Eliminator Bracket

Box eliminator brackets must allow faceplate to be mounted flush, with no greater than a 1/16" gap between faceplate and wall.

3.8) Innerduct

All innerduct shall be constructed of corrugated High Density Polyethylene (HDPE) and shall be colored orange.

3.9) Pull Tape

Pull tape shall be composed of longitudinal aramid strands tied together with a 90-degre cross-weave of polyester strands. Pull cord shall have a minimum tensile strength of 1250 pounds, and shall maintain less than 4% tensile elongation at yield.

Pull tape shall have lubrication coating applied at factory, and shall have a coefficient of less than 0.12 (twelve hundreths).

Pull tape shall have footage marked clearly on tape by manufacturer.

Pull tape shall meet or exceed pull line requirement as defined in Bellcore GR-356-CORE "Generic Requirements for Optical Cable Innerduct and Accessories".

Pull tape shall be ARNCO Bull-Line WOVEN ARAMID Fiber with Polyweft part number WP12, or approved equal.

3.10) Pull Cord

Pull cord shall be composed of continuous polyethylene fibers and shall have a tensile strength of at least 200 pounds.

3.11) Cable Fasteners

Velcro brand hook-and-loop fasteners, or equivalent shall be used to secure cables. Contractor shall not use nylon or plastic zip strip, tie wrap, cable tie, (etc.) or similar fasteners on cables during construction and installation of the Data/Telecommunications Cabling System.

3.12) Equipment Cabinets ("Cabinets")

Equipment cabinets shall be four-post free-standing EIA 19" cabinets, specifically designed for high-density cabling system applications. Cabinets shall include steel side panels each end of a series of bayed cabinets. Each cabinet shall include steel locking doors on front and rear. Installed cabinets shall provide NEMA 12 rating of protection against dust, falling dirt, and dripping non-corrosive liquids.

Cabinets shall be rated IP 51, and classified UL 50 Type 1, UL 50 Type 2, and UL 50 Type 12. Cabinets shall be certified by Underwriters Laboratories to be in compliance with UL 50 (Standard for Safety for Enclosures for Electrical Equipment), and to maintain integrity of a UL Type 12 enclosure.

Cabinets shall include integrated plinths to raise bottom of cabinet a minimum of 4" from floor when installed. Plinths shall have side, front, and rear covers.

Cabinets shall be constructed of steel and shall provide a minimum of 1500 pound static load capacity. Cabinet mounting rails/panels shall be constructed of 11 gauge zinc-plated steel. Cabinet frame, roof, base, and sidewalls shall be constructed of 16 gauge steel. Cabinet doors shall be constructed of 14 gauge steel.

Cabinet exterior shall be dipcoat primed, and powder-painted ANSI 70 Grey or Tiger RAL 7035 at factory.

Cabinet door handles shall be tamper-proof with integrated locks, keyed alike.

Unless otherwise specified, cabinets shall be 78.74" high (not including plinth), 31.5" wide, and 31.5" deep, and provide 42 rack units (RU) of equipment mounting space.

If integrated cabinet system air conditioner is specified, then air conditioner shall be manufactured by the same manufacturer as the cabinet, and shall be compatible with cabinet. Cabinet shall maintain its NEMA 12 rating when the air conditioner is installed. Air conditioner shall accept 230V input, and provide a minimum of 9390 BTU of continuous cooling in sustained ambient temperatures of 55 degrees Celsius. Cabinet system shall offer the capabilities of expanding cooling capacity to a total of 40,000 BTU via replacement, upgrade, and/or supplementation of additional similar air conditioning units. Temperature levels shall be maintained by microprocessor control. Current cabinet inside temperature, and temperature settings shall be displayed on external numeric display of air conditioner.

Cabinets shall be Rittal base model number 9971160 or approved equivalent.
Integrated cabinet system air conditioner shall be Rittal part number 3328110, or approved equivalent.

One Rittal cabinet baying kit shall be supplied with each cabinet.

Additional components by Rittal may need to be included in order to meet this Specification.

Contractor shall coordinate with Rittal product specialist and Owner Technical Contact to ensure proper cabinet configuration and order. Contractor shall submit Bill of Materials to Owner Technical Contact and Owner Project Manager for approval prior to order placement.

3.12.1) Mounting Hardware for Cabinets

Contractor shall furnish a quantity of one hundred (100) compatible 10/32" cage nuts and one hundred (100) matching bolts for each cabinet supplied.

3.12.2) Power Distribution Units for Cabinets

Contractor shall supply two (2) Power Distribution Units (PDUs) per each cabinet supplied by Contractor.

PDUs for cabinets shall each have a single 30 amp 125 volt input via a NEMA L5-30M (male) plug, and shall distribute power to a total of twenty-four (24) NEMA 5-15/20 ("T-slot") female receptacle outputs.

PDUs shall each be between 42" and 49" in height, between 2" and 3" in width, and less than 2.5" inches in depth. Input power cable shall be 7' long.

Two 20 Amp circuit breakers shall be integrated into PDU chassis, and shall each be wired to twelve (12) NEMA 5-15/20 outputs.

PDUs for Cabinets shall be BayTech PDU22-30 TL UC437 Power Strip, or approved equal.

3.12.3) Vertical Cable Management Panels for Cabinets

One vertical slotted duct cable management panel shall be provided and installed by Contractor on each post of each cabinet provided by Contractor (four per cabinet).

Vertical slotted duct cable management provided with cabinet shall be molded out of plastic and shall incorporate bend radius control throughout the fingers, pass-through holes, and transitions between horizontal and vertical pathways. Integral cable retainers shall be molded on the end of each finger. Four snap-on adjustable cable retainers, manufactured specifically to fit the selected model of cable management, shall be attached to duct fingers to provide additional retention of cables within channel.

Vertical slotted duct cable management provided with cabinet shall be double-sided. Front and rear dual-hinged cover shall open minimum of 110-degrees in the left or right position. Front duct shall be 83" high X 6" deep X 4.9" wide. Rear duct shall be 83" high X 6" deep X 4.9" wide.

Vertical slotted duct cable management provided with cabinets shall be colored black.

Vertical slotted duct cable management provided with cabinets shall be PANDUIT part number WMPV45E, or approved equivalent.

3.13) Wall-Mounted Cabinets ("Wall-Mounted Cabinets")

Wall-Mounted Cabinets shall be constructed of 16 gauge steel with black powder-coated finish. Wall-Mounted Cabinets shall have front and rear (two pairs of) equipment mounting rails fastened to cabinet sides. Wall-Mounted Cabinet equipment mounting rails shall be constructed of 11 gauge steel with black powder-coated finish, shall be 19 inches apart with fully adjustable depth position, and shall provide 26 rack units of usable rack space with 12/32-inch factory-tapped holes in an EIA-310-D Universal pattern. Wall-Mounted Cabinets shall have solid front door. Wall-Mounted Cabinet shall have a rear hinged section with pre-drilled/cut keyholes slots that permits mounting to wall, and allows full access to rear of cabinet when mounted. Rear section of cabinet shall have three 3-inch diameter and eight ¾-inch diameter conduit entry knockouts. Wall-Mounted Cabinet side panels shall be vented via ventilation slots/louvers. Wall-Mounted Cabinet top shall have 250 CFM exhaust fan. Wall-Mounted Cabinet dimensions shall be 48 inches high, by 21 inches wide, by 26 inches deep.

Wall-Mounted Cabinet shall be Hubbell base part number MCC48WMCSD19D.

Wall-Mounted Cabinet shall include an installed 250 CFM top-mounted fan, Hubbell part number MCCWMRFAN, or approved equal.

Wall-Mounted Cabinet rear rails shall be Hubbell part number WMC48RAILS or approved equal, installed.

3.13.1) Mounting Hardware for Wall-Mounted Cabinets

Contractor shall furnish a quantity of one hundred (100) compatible 10/32" cage nuts and one hundred (100) matching bolts for each cabinet supplied.

3.14) Open Equipment Racks (“Racks”, “Open Racks”)

Equipment racks shall be two-post free-standing EIA 19” wide racks, specifically designed for high-density cabling system applications. Racks shall be constructed of steel and shall provide a minimum of 1500 pound static load capacity. Rack shall be colored black with powder-painted at factory.

Rack posts shall be factory machine-tapped on front and rear with 10/32” holes in EIA pattern.

Rack posts shall contain built-in cable routing channels with hand-hole access openings on sides. The depth of the built-in cable routing channels shall be 16.5”. Rack shall provide open access to cable routing channels from top, bottom, and inside of rack. The cable routing channel outside walls shall provide built-in cable tie points for affixing ¾”-wide velcro fasteners directly to sidewalls while dressing cable.

Racks shall have integrated rungs on top of rack behind rack face to permit support and routing of cables to patch panel rear. Integrated rungs shall be of sufficient radius to maintain proper bend radius of cable.

Racks shall have integrated top trough with built-in waterfall in front of posts to provide bend radius control and efficient routing for patch cables.

Unless otherwise specified, racks shall be seven feet high (7’ H), and provide 45 rack units (45 RU) of equipment mounting space.

Seven-foot-high racks shall be Legrand part number OR-MM6716, or approved equivalent.

Eight-foot-high racks shall be Legrand part number OR-MM6816, or approved equivalent.

3.14.1) Mounting Hardware for Open Racks

Contractor shall furnish a quantity of one hundred (100) compatible 10/32” bolts for each rack supplied.

3.14.2) Power Distribution Units for Open Racks

Contractor shall supply two (2) Power Distribution Units (PDUs) per each open rack supplied by Contractor.

PDUs for open racks shall each have a single 30 amp 125 volt input via a NEMA L5-30M (male) plug, and shall distribute power to a total of twenty-four (24) NEMA 5-15/20 (“T-slot”) female receptacle outputs.

PDUs shall each be between 42” and 49” in height, between 2” and 3” in width, and less than 2.5” inches in depth. Input power cable shall be 7’ long.

Two 20 Amp circuit breakers shall be integrated into PDU chassis, and shall each be wired to twelve (12) NEMA 5-15/20 outputs.

PDUs for Open Racks shall be BayTech PDU22-30 TL UC437 Power Strip, or approved equal.

3.14.3) Vertical Cable Management Panels for Open Racks

One vertical cable management panels shall be provided and installed by Contractor on each post of each rack provided by Contractor.

Vertical cable management provided with racks shall be colored black, with a solid black front cover with hinge on both sides to permit opening of panel from right or left without removal of panel. Vertical cable management provided with racks shall be manufactured by same manufacturer of rack to fit selected rack. Vertical cable management provided with racks shall include snap-on bend-radius-limiting cable management spools and bend-limiting clips. Vertical cable management provided with racks shall provide a 6-inch-wide channel between racks for front and back routing of equipment cables and patch cords.

Seven-foot-high vertical cable management panels for seven-foot-high open racks shall be Ortronics part number OR-MM6VMD710 or approved equivalent.

Eight -foot-high vertical cable management panels for eight-root-high open racks shall be Ortronics part number OR-MM6VMD810 or approved equivalent.

3.15) Horizontal Cable Management Panels

One horizontal slotted duct cable management panel shall be supplied and installed per each 24-port Category-6 patch panel supplied.

Horizontal slotted duct cable management panel shall be molded out of plastic and shall incorporate bend radius control throughout the fingers, pass-through holes, and transitions between horizontal and vertical pathways. Integral cable retainers shall be molded on the end of each finger. Four snap-on adjustable cable retainers shall be attached to duct fingers to provide additional retention of cables within channel. Snap-on adjustable cable retainers must be manufactured specifically to fit the selected model of slotted duct cable management panel.

Horizontal slotted duct cable management panel shall be colored black.

Horizontal slotted duct cable management panel shall be double-sided. Front dual-hinged cover shall open 180-degrees in the up or down position. Rear cover shall snap on. Front duct shall be 3.5" high X 3" deep. Rear duct shall be 2" high X 5" deep. Horizontal slotted duct cable management panels shall mount to any standard EIA 19" wide rack.

Horizontal slotted duct cable management panel shall be PANDUIT part number NCMH2, or approved equivalent.

3.16) Labels

All labels shall meet the legibility requirements of UL 969, and shall be preprinted using a mechanical means of printing (e.g., laser printer).

Where insert type labels are used provide transparent plastic cover over label.

All label text shall conform to the Cable Installation Labeling Convention, described elsewhere in this document.

3.16.1) Data/telecommunications Outlet Labels

Data/telecommunications faceplates shall be labeled using compatible non-adhesive labels. A transparent snap-in plastic label cover shall be provided.

Data/telecommunications outlets and data/telecommunications outlet ports shall be labeled according to the Cable Installation Labeling Convention, described elsewhere in this document.

3.16.2) Labels for Patch Panels (all types)

Patch Panels shall be labeled using compatible non-adhesive labels. A transparent slide-in plastic label cover shall be provided.

Patch panels and patch panel ports shall be labeled according to the Cable Installation Labeling Convention, described elsewhere in this document.

3.16.3) Cable Marking Labels

Cable marking labels shall be composed of vinyl substrate with a white printing area and a clear “tail” that self laminates the printed area when wrapped around the cable.

Cable marking labels shall meet the legibility, defacement, exposure, and adhesion requirements of UL 969, and shall be preprinted using a mechanical means of printing (e.g., laser printer).

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.

Cables shall be labeled on both ends according to the Cable Installation Labeling Convention, described elsewhere in this document.

3.16.4) Fiber-Optic Cable Warning Labels

Fiber-optic cable warning labels shall alert to the presence of fiber-optic cable within innerduct and conduit.

Fiber-optic cable warning labels shall be colored yellow, and shall clearly state in black print applied by manufacturer: “WARNING” and “FIBER OPTIC CABLE”.

Fiber-optic cable warning labels shall also advise reader in clearly legible print to “CONTACT: CTS NETOPS AT (914)251-6465” for information.

Fiber-optic cable warning labels shall be manufactured to attach directly to innerduct, conduit, and fiber-optic cable via mechanical means, rather than adhesive.

3.17) Plywood Backboard

Plywood used for backboard in data/telecommunications closets shall be 3/4” thick, type A/C, and must be stamped clearly on the “good” finished side (the “A” side) by manufacturer showing that it has been treated with fire-retardant chemical, and meets Class A requirements for NFPA Life Safety Code (NFPA 101). Plywood shall be entirely unpainted. At least one fire-retardant treatment stamp must be clearly visible on plywood at all times, regardless of what is mounted on the backboard.

Whole 4’ x 8’ sections of plywood shall be cut to fit the specified area of backboard. Scrap or remnant wood is not acceptable. Plywood must be free of dirt and dust.

Plywood shall be cut and mounted such that specified size and area of backboard is covered continuously, with as few joints and as few cuts as possible.

3”x4”x3” 11-gauge steel U-brackets shall be supplied with each piece of plywood for use in mounting.

3.18) Electrical Grounding Busbar for Data/Telecommunications Closets

Contractor shall supply and install one UL-listed electrical grounding busbar for each plywood backboard assembly installed by Contractor in data/telecommunications closets, to be used as the Telecommunications Main Grounding Busbar (TMGB) in data/telecommunications located closest to entrance facility, and as Telecommunications Grounding Busbar (TBB) in all other closets as per TIA/EIA J-STD-607-A.

Grounding busbars for data/telecommunications closets shall be 0.25” deep x 4" high x 12" wide copper grounding busbar with a minimum of eighteen (18) 0.437” holes at a minimum of 1” separation.

Grounding busbars for data/telecommunications closets shall be insulated from each of its supports by a minimum of two inches (2”) of UL standoff insulators.

Grounding busbars for data/telecommunications closets shall be mounted at bottom of plywood backboard via two stainless steel mounting brackets, and four stainless steel assembly bolts and lock washer.

Grounding busbars for data/telecommunications closets shall be suitable for indoor or outdoor installations.

Electrical Grounding Busbar shall be Storm Copper SCGB-5KT Ground Bar Kit, or approved equal.

3.19) Firestopping

Use only Firestopping products that have been tested for specific fire resistance rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire rating involved for each separate instance.

3.19.1) Firestopping Putty, Firestopping Caulk, or Firestopping Foam

Firestopping Putty, Firestopping Caulk, and Firestopping Foam (Firestopping Putty/Caulk/Foam) shall remain soft and pliable to allow removal, repair, and the addition of cables ("reenterability") without power tools, and without any danger of damaging existing cable traversing the penetration.

Firestopping Putty/Caulk/Foam shall not re-emulsify, dissolve, leach, breakdown or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during or after construction.

Firestopping Putty/Caulk/ Foam shall be colored red.

3.19.2) Fire Rated Cable Pathway Devices (Firestop Assemblies)

Fire Rated Cable Pathway Devices shall be comprised of steel raceway with intumescent foam pads allowing 0 to 100 percent cable fill.

Fire rated pathway devices shall:

3.23.2.1.1) Meet the hourly rating of the floor or wall penetrated.
3.23.2.1.2) Permit the allowable cable load to range from 0% to 100% visual fill thereby eliminating the need to calculate allowable fill ratios.
3.23.2.1.3) Permit multiple devices to be ganged together to increase overall cable capacity.
3.23.2.1.4) Allow for retrofit to install around existing cables.
3.23.2.1.5) Include an optional means to lengthen the device to facilitate installation in thicker barriers without degrading fire or smoke sealing properties or inhibiting ability of device to permit cable moves, add-ons, or changes.
3.23.2.1.6) Not require any additional action on the part of the installer to open or close the pathway device or activate the internal smoke and fire seal, such as, but not limited to:
3.23.2.1.6.1) Opening, closing, or adjustment of doors.
3.23.2.1.6.2) Twisting an inner liner.
3.23.2.1.6.3) Removal or replacement of any material such as, but not limited to, sealant, caulk, putty, pillows, bags, foam plugs, foam blocks, or any other material.

Fire Rated Cable Pathways shall be Specified Technologies Inc. (STI) EZ-PATH™ Fire Rated Pathway or approved equal.

3.19.3) Firestopping for Data/Telecommunications Cabinet Penetrations

Firestopping used on data/telecommunications cabinet penetrations shall provide a fire, smoke, and watertight seal to cabinet. This seal shall remain soft and pliable to allow removal, repair, and the addition of cables ("reenterability") without power tools, and without any danger of damaging existing cable traversing the penetration.

Firestopping used inside data/telecommunications closet and cabinet penetrations shall be RTV silicone foam PR-855 chase foam manufactured by PRC-DeSoto, or approved equivalent.

3.20) Wireless Access Point Mounting Brackets

3.20.1) Suspended-Ceiling-Mount Wireless Access Point Mounting Bracket

Suspended-Ceiling-Mount WAP Bracket shall be Cisco AIR-AP-T-RAIL-R, Part Number 700-19209-04. Suspended-Ceiling-Mount Wireless Access Point Bracket shall be provided by Purchase College.

3.20.2) Indoor Wall-Mount Wireless Access Point Mounting Bracket

Indoor Wall-Mount Wireless Access Point Mounting Bracket shall be constructed of 18 gauge steel, and be constructed sturdily with a hostile environment in mind. Door concealing faceplate must lock, and all Wall-Mount WAP Mounting Brackets must be keyed alike. Two keys shall be furnished for each Wall-Mount WAP Mounting Bracket provided. Surface of WAP Mounting Bracket shall be finished with textured white powder coat.

Indoor Wall-Mount Wireless Access Point Enclosures shall be Oberon Wireless model 1012-00 or approved equal.

Part 4: Execution

4) Execution

4.1) Workmanship

Workmanship will be to the highest standards in industry; all equipment and materials to be installed in a neat and secure manner in accordance with applicable industry technical standards, local code standards and product manufacturer's standards for their installation.

4.2) Pre-Bid and Pre-Installation Surveys

Prior to placing any cabinet, rack, wireless access point enclosure, conduit, cable tray, raceway, feeder, or cable, the Contractor shall survey the site to see that job conditions do not impose any obstructions that would interfere with the safe and satisfactory placement of the cables or equipment. Necessary changes to the plans may be determined by Contractor's site survey and such changes may not be made without the prior approval of Owner.

Building plans and documentation are not guaranteed to be entirely accurate or to scale, and are provided for informational purposes only. Contractor must verify all measurements in the field.

Unless otherwise noted, Contractor may freely access public areas of campus during normal hours of operation in order to verify measurements and existing conditions.

Contractor is urged to perform a site visit and verify measurements and existing conditions prior to placing a bid in respond to any request for quote or request for proposal.

4.3) Access and Physical Security

Contractor may require access to locked doors or alarmed areas. Contractor shall coordinate access with Owner Project Manager.

If a security alarm is tripped, then Contractor must immediately notify the University Police Department at (914)251-6900.

Contractor shall comply with all of Owner's policies regarding access to non-public areas.

Contractor may be provided with a chaperone by Owner while working in residence facilities, museum, art galleries, and other restricted areas of the campus.

4.4) Coordination with Other Trades

In order to conform to the overall project event schedule, Contractor shall survey the work areas regularly, and coordinate work with other applicable trades and with the Owner Project Manager.

4.5) Damage or Loss

During installation, and prior to final acceptance, the Contractor shall protect finished and unfinished work against damage and loss. In the event of such damage or loss, the Contractor shall replace or repair such work at no additional cost to Owner. As cable is installed, care must be taken to avoid nicks, kinks or other damage to the cable.

4.6) Existing Cables and Equipment

Contractor shall perform work without disturbing existing cables and equipment. If Contractor must disturb existing cables in order to perform work, then Contractor must obtain prior written permission to do so from Owner.

4.7) Clean-up

Contractor is required to clean up work areas of debris and dust generated by Contractor, as specified.

4.7.1) End of day

Contractor will broom-clean all work areas of job site prior to leaving job site the end of each workday.

Contractor must restore suspended-ceilings in occupied areas to their former condition by the end of each workday. If suspended-ceiling tiles are damaged or broken, then Contractor must replace tiles.

4.7.2) End of project

Following the completion of construction in an area, Contractor shall vacuum-clean and wipe-down all dust and debris generated by the work.

4.7.3) Data/Telecommunications closets and cabinets shall be delivered to college in clean condition with all surfaces dust-free and debris-free.-

4.8) Regular Meeting with Owner Project Manager

Owner Project Manager and Contractor Project Manager shall meet weekly, or more frequently as determined by Owner Project Manager. Owner Technical Contact and/or Contractor Field Contact, or any other party that Owner or Contractor deem necessary may be present.

4.9) Splices

All cables shall be “home run” between patch panel and termination point.

No intermediate splice points are permitted for cables of any type.

Splicing of any cables of any type is prohibited, except where fiber-optic fusion splices are specified.

4.10) Technical Requirements

4.10.1) Data/Telecommunications Cabling System

Installed Category-6 network shall support 100BASE-TX Ethernet as per IEEE 802.3u, 1000BASE-T Ethernet as per IEEE 802.3ab, 1000BASE-TX Ethernet as per TIA-854,

The installed Data/Telecommunications Cabling System shall support 100base-TX Fast Ethernet as per IEEE 802.3u, 1000base-T Gigabit Ethernet as per IEEE 802.3ab, Voice-Over-IP telephony (VOIP) as per TIA-TR41, digital telephony as per TIA-810-B, analog telephony as per TIA 470-C, and Power over Ethernet as per the IEEE 802.3af and IEEE802.3at standards. Installation of Data/Telecommunications Cabling System must satisfy requirements set forth in all parts and addenda of ANSI/TIA/EIA-568-C, and TIA-569-A, ISO/IEC 11801:2002 2nd Edition, and IEC 61156-5/-6.

Contractor shall furnish and install cables, terminals, connectors, patch panels, and miscellaneous hardware required for delivery of a complete and working cable plant.

4.11) Cabinets and Racks

4.11.1) Securing Cabinets and Racks to Floor and to Each Other

Cabinets and racks installed by Contractor must be securely anchored and bolted to the floor. Wherever one cabinet or rack is installed directly adjacent to another cabinet or rack, the cabinets or racks must be securely connected using manufacture-approved baying kit.

4.11.2) Knockouts

Where knockouts in cabinet sheet metal are specified or are necessary, knockout will be fitted with a bushed steel chase nipple to prevent cable from contacting sharp surfaces of cut sheet metal and to allow proper packing of fire-stop/water-stop material at cabinet penetration. All unused knockouts in cabinet are to be covered with knockout seals, regardless of whether or not knockout was open prior to Contractor performing work.

4.11.3) Fire-stop and Water-stop for Cabinet Penetrations

Contractor shall insure that combination fire-stop/water-stop material is installed at all knockouts or other entrances to any cabinet in which Contractor performs work, regardless of whether or not Contractor disturbed fire-stop/water-stop, and whether or not fire-stop/water-stop was present prior to Contractor performing work.

Contractor shall install fire-stop/water-stop in any new cabinet penetration that contractor creates. Contractor shall insure that prior to the completion of the job, absolutely every cabinet penetration has combination fire-stop/water-stop installed.

4.11.4) Cabinet or Rack Layout

The top eight rack units in each rack and cabinet are reserved for fiber, telecommunication feeder patch panel, and future use. Contractor will install first 24-port Category-6 patch panel below the eighth rack unit (8RU) from the top of the cabinet.

Patch panels and cable management will be installed in "blocks" of six rack units (6RU), with each 6RU "block" consisting of two 1RU 24-port patch panels, one 2RU slotted duct cable management, and 2RU of reserved space for equipment.

Directly below the 2U of reserved space at bottom of a "block", subsequent "blocks" shall be installed in a similar fashion as long as space in rack permits entire block to be installed.

Example: Basic rack elevation of building data/telecommunications closet, with shaded "block":

TOP OF CABINET/RACK

	2RU (RESERVED) UNUSED SPACE
BOTTOM SHELF	2RU (RESERVED) 24-Port Fiber-optic Patch Panel
	1RU (RESERVED) Fiber-optic Cable Management
	3RU (RESERVED) Telecommunications Feeder Patch Panel
CABINET/RACK	1RU 24-Port Cat 6 Patch Panel
	1RU 24-Port Cat 6 Patch Panel
	2RU Slotted Duct Cable Management
	2RU RESERVED SPACE
	1RU 24-Port Cat 6 Patch Panel
	1RU 24-Port Cat 6 Patch Panel
	2RU Slotted Duct Cable Management
	2RU RESERVED SPACE
	etc …

4.12) Drip Loops

For all cables Contractor installs, Contractor will create minimum 3" radius drip loops before cabinets, racks, and connection blocks. Drip loops shall not be located anywhere above or within three feet (3') of cabinets, equipment, patch panels, and connection blocks, and shall direct any water traveling on cables away from such equipment.

4.13) Plywood Backboard

Plywood backboard shall be provided in whole 4'x8' sections cut to maximum size and fit in the designated location.

Plywood backboard shall be furred to wall using 3"x4"x3" U-brackets constructed of 11ga steel in corners of each installation section of plywood, such that a 3" void exists behind the backboard. Access via top, bottom, and sides of backboard shall be available to void behind plywood backboard after installation. Adequate mounting methods and fasteners shall be utilized to insure proper support of the weight of the backboard assembly plus 300 pounds of static load on backboard.

Plywood backboard shall be bolted to steel furring such that bottom edge of plywood is 36" AFF and top edge of plywood is 84" AFF. Bolts and brackets must be filed and sanded as to be of sufficient smoothness not to nick or cut cables that are routed behind backboard in the future.

Wood screws used in mounting equipment, cable, and supports to backboard shall not exceed 3/4" in length. Screws and other sharp objects must not protrude out rear of backboard where they may nick or cut cables that are routed behind backboard in the future.

Existing light fixtures, electrical outlets, switches, and other items fixed to designated wall must be avoided, or plywood must be cut around such items such that access to items is not hindered in any way.

The "good" finished side (the "A" side) of the A/C plywood shall face away from mounting wall, and shall display manufacturer's stamps confirming that it has been treated with fire-retardant chemical.

Plywood backboard shall be entirely unpainted so that stamps show clearly for fire inspector. At least one stamp in its entirety must be clearly visible on plywood at all times, regardless of what is mounted on the backboard.

4.14) Grounding

All components of the Data/Telecommunications Cabling System shall be properly grounded and bonded as per ANSI/TIA/EIA 607, and all applicable electrical codes. Electrical ground busbars shall be available on plywood backboards in all data/telecommunications closets

A complete connection to ground shall be formed from each structural metallic part of the cable plant to and through all others which parallel the route that a signal is designed to travel. Appropriate gauge copper ground cable as per code and standards shall be used to connect all components. Paint-piercing screws, grounding lugs, and split-bolt connectors shall be utilized as appropriate to insure proper connections.

All connections to the Grounding busbars for data/telecommunications closets shall all be made via UL-rated two-hole compress lugs – one-hole compression lugs are not acceptable. Each compression lug shall be crimped a minimum of twice to insure good connection to lug. Grounding busbars for data/telecommunications closets and associated lugs shall be cleaned prior to fastening of conductors, and an anti-oxidant shall be applied to contact area to control corrosion and reduce contact resistance.

Grounding busbars for data/telecommunications closets shall be installed no more than ten feet from electrical panel located in same data/telecommunications closet that serves the data/telecommunications system. A minimum gauge of #6 AWG cable designed for use in grounding/bonding applications shall be used to interconnect grounding/bonding components, and shall have a green insulating jacket that meets the fire ratings of its pathway. Any cable used to ground/bond newly-installed components shall be installed without splices.

A Telecommunications Bonding Backbone cable of at minimum #3/0 AWG cable designed for use in grounding/bonding applications shall be supplied and installed by Contractor to interconnect the Main Telecommunications Grounding Busbar and all Telecommunications Ground Busbar(s)as per ANSI/TIA/EIA J-STD-607-A, if one does not exist.

4.15) Keys to Cabinets and WAP Mounting Brackets

Keys to cabinets and WAP Mounting Brackets may be retained by Contractor until Final Completion, at which time all keys must be returned to Owner. Contractor shall not make copies of ANY key.

4.16) Service Slack

4.16.1) Data/telecommunications Outlet Service Slack

Each installed data/telecommunications cable shall provide a minimum of eight inches (8") of service slack in the station outlet gang box at modular jack termination point, or as much as is allowed considering available space in gang box. Service slack shall be arranged in a loop and tucked in gang box, with consideration for the specified maximum bend radius of installed cable.

4.16.2) Additional Service Slack for Wireless Access Point Data Outlets

Each installed data cable designated for Wireless Access Point (WAP) connection shall have thirty feet (30') of service slack coiled above the ceiling within 5' of WAP outlet, and hung on nearest j-hook or other approved support using Velcro.

4.16.3) Additional Service Slack for Spare Cables

Each installed data/telecommunications cable designated as a "Spare Cable" shall have fifty feet (50') of service slack coiled above the ceiling, and hung on nearest j-hook or other approved support using Velcro.

4.16.4) Data/Telecommunications closet and MDF Service Slack

4.16.4.1) Category-6 Cable

At each data/telecommunications closet, Category-6 cables shall be combed, secured to plywood backboard using Velcro, and arranged in an S-curve such that ten feet (10') of service slack is provided in the data/telecommunications closet.

With written approval or where preexisting conditions exist, contractor may alternatively lay service slack in data/telecommunications closet in an S-curve on adjoined cable trays that are dedicated for the purpose of dressing service slack. Service slack on cable tray shall be combed and secured to cable tray using Velcro fasteners.

An additional three feet (3') of service slack shall be provided in the cabinet or rack via a small "C-curve" secured to side rail of cabinet or rack with Velcro fasteners, directly before cable enters rear of slotted duct cable management.

4.16.4.2) Telecommunications Feeder Cable Service Slack

At each data/telecommunications closet and telecommunications distribution frame, telecommunications feeder cable shall be neatly secured to plywood backboard using Velcro, and arranged in a C-curve such that six feet (6') of service slack is provided.

With written approval, contractor may alternatively lay telecommunications feeder cable service slack in a coil in data/telecommunications closet on adjoined cable trays that are dedicated for the purpose of dressing service slack. Service slack on cable tray shall be secured to cable tray using Velcro fasteners.

An additional four feet (4') of service slack on telecommunications feeder cable shall be provided in the cabinet or rack in data/telecommunications closet via an "S-curve" secured to side rail of cabinet or rack with Velcro fasteners, directly before cable enters fiber-optic patch panel.

4.16.4.3) Fiber-optic Cable Service Slack

At each data/telecommunications closet, fiber-optic cable shall be neatly secured to plywood backboard using Velcro, and arranged in a coil such that fifty feet (50') of service slack is provided in each data/telecommunications closet.

With written approval, contractor may alternatively lay fiber-optic cable service slack in a coil in data/telecommunications closet on adjoined cable trays that are dedicated for the purpose of dressing service slack. Service slack on cable tray shall be secured to cable tray using Velcro fasteners.

An additional ten feet (10') of service slack on fiber-optic cable shall be provided in the cabinet or rack via an "S-curve" secured to side rail of cabinet or rack with Velcro fasteners, directly before cable enters fiber-optic patch panel.

4.17) Strain Relief and Cable Dressing

The Contractor shall provide and install Velcro ties, riser cable support grips and strain relief based upon field conditions to maintain orderly cable organization

Contractor shall neatly dress cable in data/telecommunications closets and securely bundle them at every two-foot interval using prescribed cable fastener. Separate cable fasteners shall be used to attach cable bundle to cable tray, cabinet, cable management, or other cable support in the room.

Contractor shall utilize strain relief system for all installed patch panels. Strain relief shall system include use of rear compartment of double-sided slotted duct cable management. Plastic strain relief bars that mount directly to patch panel are not acceptable. Strain relief will be installed in such a way that patch panel may be serviced with strain relief in place. Strain relief boots and termination caps shall be installed on the station outlet modular jack and patch panel, if provided as part of the assembly.

4.18) Data/telecommunications Cabling System

4.18.1) Data/telecommunications Outlets

4.18.1.1) Outlet Placement

Standard wall data/telecommunications outlets shall be installed on the wall entirely above baseboard or cove base, and approximately 15" AFF or matching existing electrical outlets at a minimum of 8” height on center.

4.18.1.1.1) Wall outlets from which EMT stub-up shall be provided shall be installed in a recessed extra-deep single gang electrical box (4”H x 2”W x 3.5”D)

4.18.1.1.2) Wall outlets retrofitted into sheetrock walls shall utilize “box eliminator” brackets. Box eliminator bracket must allow selected faceplate to be mounted flush, with no greater than 1/16” clearance to wall.

4.18.2) Termination

All Category-6 termination assemblies shall employ the TIA-568-B wiring configuration for color-coding of pinout/position.

In order to maintain the electrical and data transmission characteristics of Category-6 cables, the following practices must be observed during the termination of all Category-6 cabling:

4.18.2.1) Only remove the minimum amount of cable sheath necessary to properly terminate the wires.

4.18.2.2) Cable conductors are arranged in pairs. Each pair has a specific twist associated with that pair. Maintain the pair twist at all times. Do not untwist and then attempt to re-twist cable pairs while terminating. Separate the conductors in a pair only as much as absolutely necessary to terminate the cable onto the connector. For all twisted pair cables the maximum untwisted length is not to exceed 0.5 inches.

4.18.2.3) Never remove insulation from the conductors. All of the terminations in this project shall be of the insulation displacement (IDC) type.

4.18.2.4) Leave the minimum amount of conductor after termination in an IDC connector. If necessary, use a cable scissor to trim extra length. Under no circumstances shall the excess length exceed 0.125 inches above the terminator block face edge.

4.19) Telecommunications Feeder Cable

Telecommunications feeder cable shall be terminated on PDS 110-style insulation displacement connectors on rear of in 19" rack-mount telecommunications feeder patch panel at data/telecommunications closet end, and on 66M cross-connect punch-down block at the telecommunications distribution frame end.

An intermediary gas protector panel may be specified for data/telecommunications closet, in which case it shall be placed on plywood backboard in data/telecommunications closet.

One pair of conductors shall be terminated on each port of 19" rack-mount telecommunications feeder patch panel, in color order according to TIA/PIC standards. Pairs shall be terminated in corresponding order on left side of telecommunications punch-down block at building Distribution Frame.

4.20) Fiber-Optic Cable

Fiber-optic cable shall be run within innerduct or dedicated ¾" EMT for the entirety of the cable length between data/telecommunications closets.

A conduit less than or equal to 1.5" in diameter that a fiber-optic cable is run through shall be deemed non-reenterable. Additional cables shall not be pulled through this conduit following testing/certification of fiber-optic cable, in order to insure performance of the fiber-optic cable.

When run through conduit greater than 1.5" in diameter or on cable tray, fiber-optic cable shall be run within innerduct.

When otherwise run above suspended-ceilings, in mechanical rooms, and in mechanical spaces, fiber-optic cable shall be run in dedicated ¾" EMT.

When otherwise run below suspended-ceilings and in occupied areas that require aesthetics to be maintained, fiber-optic cable shall be run in raceway that is specifically designed to maintain bend radius of the fiber-optic cable.

4.20.1) Non-Armored Fiber-Optic Cable

No exceptions shall be made in any circumstance regarding the above use of innderduct/EMT/raceway with non-armored fiber-optic cable.

4.20.2) Armored Fiber-Optic Cable

Exceptions may be made under certain circumstances regarding the above use of innerduct/EMT/raceway with armored fiber-optic cable, but only if explicit written permission is granted from both Owner Project Manager and Owner Technical Contact.

4.20.3) Patch Panels and Termination

Termination of fiber-optic cable at fiber-optic patch panels shall confirm to TIA-568-C. SC duplex connectors shall be used for all single-mode fiber termination.

The highest level of workmanship and attention to detail shall be exercised during installation and termination of fiber-optic cable.

Only cable manufacturer compatible tools and materials such as crimpers, fanouts, and connectors shall be used in terminating fiber-optic cable termination.

4.20.4) Splicing and Fusion Splicing

Where fusions splices of fiber-optic cable are specified, contractor shall use fusion splicing tool from same manufacturer as cable being fused, to insure optimal results. Each fusion splice shall be tested at point of fuse, and less than 0.1 dB

Mechanical splices of fiber optic cable are not permitted.

4.21) Cable Pathway

4.21.1) General

Cable pathways will be constructed of appropriate cable supports such as J-hooks, cable tray, raceways, or conduits. Cable supports will not be attached to existing suspended-ceiling grid supports and must be installed as per manufacturer specifications.

J-hooks or cable tray may be used to support cable above suspended-ceiling, where there is no requirement for a specific type of cable support at that location in the scope of work.

If employed as a cable support, J-hooks must never be installed more than six feet apart. When transitioning from J-hook to another approved cable support, J-hook shall be at most four feet from alternate cable support.

Path shall be constructed with Owner's hostile environment in mind. With the exception of designated Mechanical Room spaces, cables must not be exposed when run below ceilings -- all cables shall be run within conduit, within raceway, in walls, or above suspended-ceilings. Cables must be run within conduit or metallic raceway on exposed walls or ceilings. Raceway may be used as an alternate path when it is desirable to avoid ceiling space, though any use of conduit or raceway not explicitly prescribed in the scope of work must be approved in writing by Owner prior to bid submission.

Cable supports installed above suspended-ceilings shall be supported from the building structure and not from the existing ceiling support cables, grid, rods, or acoustical tees. Cable supports installed above suspended-ceiling shall be installed below plenum partition, if enough space exists between ceiling and plenum partition. If insufficient space exists between ceiling and plenum partition to install cable supports, then alternate pathway or method must be proposed by Contractor and approved in writing by Owner.

Threaded support rods shall extend a minimum of one inch (1") below cable tray wherever space allows to accommodate extension hardware that may be need to be added in the future.

Conduit, cable tray, innerduct, and raceway installation shall be continuous and connected appropriately to all boxes, cabinets, and other pathway components. Manufacturer's fitting must be used for all transitions. Caps and gaskets shall be used to prevent dirt and moisture from entering installed conduit, innerduct, and raceway where appropriate. Nylon bushings shall be used on all stubs and points of connection to prevent sharp edges from damaging cable and pull tape.

Headroom shall be maintained when installing conduit, cable tray, raceway, J-hooks, and cable.

4.21.2) Basket Cable Tray and Ladder Cable Tray

Contractor shall install anchors, threaded rod, clamps and bars as needed to properly install and secure cable tray. Contractor shall use support methods, splice methods, fittings, and materials that are recommended by the cable tray manufacturer to continuously connect sections of cable tray and fittings. Cable tray shall be grounded per NEC and manufacturer standards and to the same ground as equipment rack. Contractor shall provide sufficient space encompassing cable tray to permit access for installing and maintaining cables. Contractor shall install cable tray in accordance with recognized industry practices, and in accordance with all of the following:

4.21.2.1) NEMA VE-2 2000
4.21.2.2) NEC and applicable portions of NFPA70B
4.21.2.3) NECA's "Standards of Installation" pertaining to general electrical installation practices

4.21.3) Avoidance of Electromagnetic Interference Sources

All conduit, cable tray, and cables containing metallic elements -- including, but not limited to dielectric/non-metallic cable housed in metallic armor -- shall be routed in such a way as to maintain the following distances from sources of electromagnetic interference:

6 inches from power lines 2KVA or less.
12 inches from fluorescent lighting such as fluorescent/HID lamps
60 inches from transformers, motors, or power lines of 5KVA and up

4.21.4) Innerduct

All cables running within conduit of 3" (three inch) or greater outer diameter that is at 0% fill (unused) initially, and is expected to be filled to less than 25% upon completion of job must be run within innerduct supplied and installed by Contractor.

When installing innerduct in an unused conduit, Contractor shall simultaneously pull the maximum number of 1" and/or 1.25" diameter innerduct capable of fitting in the conduit, such that the maximum number of innerducts is provided for future use.

Pull tape shall be installed in each innerduct.

4.21.5) Conduit

Conduit shall be run in parallel, wherever practical, and secured to existing steel channel and steel beams using conduit straps or clamps. Existing steel channel or trapeze may be used if additional load can be supported at appropriate safety factor.

Unless specified, conduit fill ratio must never exceed 40% or the fill ratio specified by the firestopping assembly, whichever is lesser. For conduit of over 50 feet of length with no intermediate pull point, the fill ratio must never exceed 30%.

There shall not be more than 100 feet in length of conduit between pull boxes or conduit ends. Each 30-degrees of bend shall be considered as 10 feet of conduit when determining pull box placement.

There shall not be between two pull boxes or conduit ends more than a 180 degree cumulative total of bends.

Pull boxes shall not be used in place of bends. Conduit ends must be aligned in parallel on opposite sides within each pull box, such that they permit a straight pull through a pull box. Angled pulls and U-pulls through pull boxes are not permitted.

Example:

A length of conduit originating from a pull box, containing one 90-degree bend (counted as 30 feet of a 100 foot total budget), must not contain more than 70 feet of straight conduit (30 + 70 = 100 feet) before terminating in a pull box.

4.21.6) Raceway

Surface-mount raceway (raceway) shall be provided and installed in such a manner to optimize aesthetics. Appropriate raceway fittings such as unions, bends, and end-caps must be provided and installed by Contractor. In-field mitering of raceway in lieu of using fittings is not permitted.

Raceway and fittings used for data/telecommunications cable must be appropriate for a Category-6 installation, maintaining minimum bend radius and other properties of the Category-6 cable contained within.

Raceway fill shall not exceed 80% of the raceway manufacturer's recommendations, such that 20% spare capacity remains available in the raceway for future use without exceeding manufacturer's recommendations.

Raceway shall be mechanically mounted as per manufacturer's instructions using screws, anchors, and/or bolts. Raceway shall not be mounted with adhesive.

Raceway shall run vertically near the corners of room and horizontally at same height of data/telecommunications outlets. Raceway shall not run near the middle of walls. Installed raceway shall not cover or prevent access to any existing service, outlet, control, or access panel. Raceway covers must be installed and secured properly.

4.21.7) Pulling Tension

No cable shall be installed with a pulling tension exceeding the maximum recommended by the manufacturer. Pulling tension shall be monitored with a tension gauge (tensiometer) to ensure the maximum tension rating of cable is not exceeded.

A suitable breakaway link (swivel) should be used as a failsafe to insure maximum pulling tension of cable is not exceeded. Breakaway link/swivel shall be used as a failsafe in this respect, and not as a primary means of controlling cable tension.

If multiple cables are to be pulled at one time, the Contractor shall make the necessary allowances to back off the pulling tension of the bundle.

As necessary, for cable pulls in conduit, the Contractor shall use only an approved lubricant compatible with the cable outer jacket insulation, innerduct, and pull tape.

4.21.8) Pull tape

Contractor shall install new pull tape in all conduits 2" or greater in trade size installed by contractor, and in all pre-existing conduits 2" or greater in trade size utilized by Contractor.

Pull tape installed in conduits and innerducts shall be lubricated with a lubricant appropriate for the selected pull tape, innerduct, and installed cable, as necessary to prevent burn-through of pull tape.

All installed pull tape shall be tied securely on both ends of the conduit to a fixed object that is attached to or part of the conduit system. Pull tape installed in a conduit or cable tray shall include 4' of slack on both ends. Slack shall be rolled and tied neatly.

4.21.9) Pull Cord

Contractor shall install pull cord in all conduits less than 2" in trade size installed or utilized by Contractor, all raceways installed or utilized by Contractor, all cable tray installed or utilized by contractor, and all walls fished by Contractor.

4.21.10) Bend Radii

4.21.10.1) Conduits

The minimum inside radius for conduits 2-inch in diameter or less shall be six times the internal diameter of the conduit. Conduits having diameter greater than two inches shall have a minimum inside radius of ten times the internal diameter of the conduit.

4.21.10.2) Cable tray (Basket Cable Tray and Ladder Cable Tray)

Radius shields shall be installed at all cable tray lateral bends, and must maintain a minimum 6 inch radius in interior of tray.

Waterfall/radius-drop fittings shall be installed at all cable tray vertical transitions, where cables transition more than six inches (6") vertically without support. Waterfall/radius-drop fittings shall have minimum of 3 inch radius.

4.21.10.3) Cables

All cables shall be installed with a bend radius greater than or equal to the bend radius recommended by the cable manufacturer to maintain cable rating and transmission properties.

As necessary, cable guides shall be used to maintain recommended bend radii during pulling.

Cables shall be secured using prescribed cable fasteners so as to prevent migration and maintain proper bend radius after initial installation.

Contractor shall secure the cable bundle at each J-hook with a prescribed cable fastener.

4.22) Labeling

All outlets, patch panel ports, cable ends, and firestopping locations shall be clearly labeled according the Cable Installation Labeling Convention.

4.22.1) Cable Installation Labeling Convention

The Cable Installation Labeling Convention shall be used to identify all components of installed systems, including but not limited to equipment, cable, termination points (such as modular jacks, patch panel ports, or other connectors), and firestop installation, in all documentation, test results, and labeling.

Cable Installation Labeling Convention is a TIA-606-A -compatible identification standard.

There are a total of six fields in each name: five identifying fixed-length fields used to identify *where* an item is located and *what* the item is, followed by one *variable length* field used to identify a port on the item.

The first three fields describe the general location of an item. This will describe the building, room, suite, and possibly a general location within a room (e.g. a Rack or Cabinet within the room). These three fields are a total of exactly eight characters in length (2+4+2).

General Location Fields:

1) Building Code field (two letters)
(e.g. "NS" for Natural Sciences – see table)
2) Room or Suite Number field (four digits, typically)
(e.g. "1023")
3) Location in Suite/Room field: letter+digit, or "-" as placeholder
(e.g. data center coordinates "K6",
"-2" for rack #2 in a room with three racks in it,
"L-" for living room in suite,
"A-" for bedroom A in suite,
or a placeholder of two hyphens ("--") if this information is not pertinent)

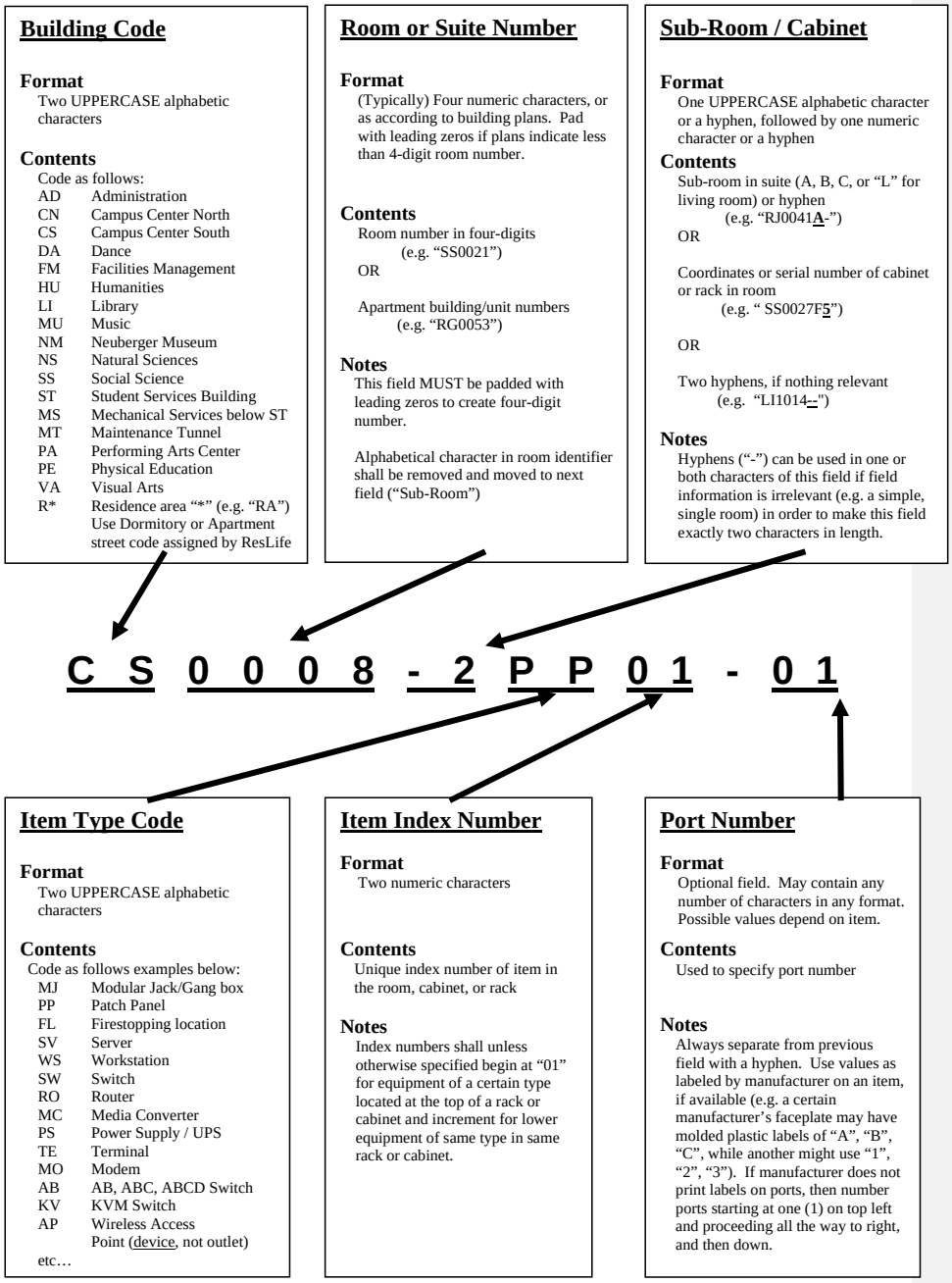
The last three fields identify a particular type of item in the location; specify the unique identification number of that particular type of item in the location; and specify a particular port on that particular item. This part contains three fields and totals four or more characters in length:

Item Identification

4) Item Type Code field: two letters
(e.g. "MJ" for Modular Jack box, "PP" for Patch Panel)
5) Index number of Item within room or rack field: two digits
(e.g. "03" for the third item of its type in the location)
6) [Optional] Port Number field**: *variable length*
(e.g. patch panel port "9", or modular jack "4")

** The Index Number field is separated from the Port Number field by a hyphen (e.g. "03-9" or "03-D")

[See illustration next page]


Building Code
Format
Two UPPERCASE alphabetic characters
Contents
Code as follows:
AD Administration
CN Campus Center North
CS Campus Center South
DA Dance
FM Facilities Management
HU Humanities
LI Library
MU Music
NM Neuberger Museum
NS Natural Sciences
SS Social Science
ST Student Services Building
MS Mechanical Services below ST
MT Maintenance Tunnel
PA Performing Arts Center
PE Physical Education
VA Visual Arts
R* Residence area "*" (e.g. "RA") Use Dormitory or Apartment street code assigned by ResLife
Room or Suite Number
Format
(Typically) Four numeric characters, or as according to building plans. Pad with leading zeros if plans indicate less than 4-digit room number.
Contents
Room number in four-digits (e.g. "SS0021")
OR
Apartment building/unit numbers (e.g. "RG0053")
Notes
This field MUST be padded with leading zeros to create four-digit number.
Alphabetical character in room identifier shall be removed and moved to next field ("Sub-Room")
Sub-Room / Cabinet
Format
One UPPERCASE alphabetic character or a hyphen, followed by one numeric character or a hyphen
Contents
Sub-room in suite (A, B, C, or "L" for living room) or hyphen (e.g. "RJ0041A-")
OR
Coordinates or serial number of cabinet or rack in room (e.g. " SS0027F5")
OR
Two hyphens, if nothing relevant (e.g. "LI1014--")
Notes
Hyphens ("-") can be used in one or both characters of this field if field information is irrelevant (e.g. a simple, single room) in order to make this field exactly two characters in length.
C S 0 0 0 8 - 2 P P 0 1 - 0 1
Item Type Code
Format
Two UPPERCASE alphabetic characters
Contents
Code as follows examples below:
MJ Modular Jack/Gang box
PP Patch Panel
FL Firestopping location
SV Server
WS Workstation
SW Switch
RO Router
MC Media Converter
PS Power Supply / UPS
TE Terminal
MO Modem
AB AB, ABC, ABCD Switch
KV KVM Switch
AP Wireless Access Point (device, not outlet)
etc…
Item Index Number
Format
Two numeric characters
Contents
Unique index number of item in the room, cabinet, or rack
Notes
Index numbers shall unless otherwise specified begin at "01" for equipment of a certain type located at the top of a rack or cabinet and increment for lower equipment of same type in same rack or cabinet.
Port Number
Format
Optional field. May contain any number of characters in any format. Possible values depend on item.
Contents
Used to specify port number
Notes
Always separate from previous field with a hyphen. Use values as labeled by manufacturer on an item, if available (e.g. a certain manufacturer's faceplate may have molded plastic labels of "A", "B", "C", while another might use "1", "2", "3"). If manufacturer does not print labels on ports, then number ports starting at one (1) on top left and proceeding all the way to right, and then down.

4.22.2) Data/telecommunications Outlet Labels

Contractor shall label data/telecommunications outlet faceplates with appropriate far-end termination address for each port, as in the following example:

Example:

NS2055A-PP01-24
(Room NS2055, Cabinet “A”, Patch Panel #01, port 24)

Where a label insert slot or space is available on faceplate, insert a compatible non-adhesive label, and provide and install manufacturer-supplied clear plastic cover over label slot.

4.22.3) Patch Panel Labels

Contractor shall label patch panel ports using compatible labels and label covers.

Contractor shall label patch panel ports with appropriate far-end termination address as in the following example:

Example:

NS1010B-MJ06-4
(Room “NS1010B”, Modular Jack faceplate “06”, Jack “4”)

Where a label insert slot or space is available on patch panel, insert a compatible non-adhesive label, and provide and install manufacturer-supplied clear plastic cover over label slot.

4.22.4) Cable Marking Labels

All cables shall have wrap labels affixed to cable at both ends between three inches (3”) and five inches (5”) of each termination point. Contractor shall label each cable end with the appropriate near and far-end termination address, as in the following example:

Example:

A data/telecommunications cable runs between NS1010B-MJ06-4 and NS255A-PP01-24.

In room “NS101B”, the cable termination at faceplate “MJ06”, jack “4”, will be labeled “NS1010B-MJ06-4 / NS2055A-PP01-24”.

In room “NS2055A”, the same cable terminated at patch panel “PP01”, port “24”, will be labeled “NS2055A-PP01-24 / NS1010B-MJ06-4”.

4.22.5) Labeling of Firestopping Locations

Contractor shall legibly and neatly mark firestopping locations with firestopping location name using permanent marker on the firestopping material, in a conspicuous location.

If Contractor cannot mark firestopping location name on firestopping materials, then Contractor shall mark firestopping location name on the firestopped barrier or assembly, directly adjacent to firestopping material.

Contractor shall consider aesthetics of surrounding area when labeling/marking firestopping locations.

4.22.6) Fiber Optic Cable Warning Labels

Fiber optic cable warning labels shall be placed on all innerduct containing fiber optic cable, within two feet of location where innerduct enters or exits conduit.

4.23) Safety and Code Requirements

Contractor will adhere to all applicable local, state, and federal laws and codes.

4.24) Firestopping

Contractor shall provide and install Firestopping materials at all penetrations of fire-rated barriers, both existing and created by Contractor, through which any cable, conduit, or sleeve installed by the Contractor passes.

Contractor shall provide and install Firestopping materials in the interior of all conduits, sleeves, and raceways that are installed or utilized by Contractor and that traverse a fire-rated barrier. Threaded metal caps may be utilized, as per applicable codes, to close-off unused conduits and/or sleeves.

Firestopping materials shall be installed according to code, according to certification listing, and according to firestopping manufacturer instructions. Firestopping materials used must meet the hourly rating of the floor or wall penetrated.

4.24.1) Firestopping product type

The type of firestopping utilized in each particular case shall be determined based on this Specification, on firestopping manufacturer instructions, on code, on certification listing, and on particular application including but not limited to:

4.24.1.1) Barrier or assembly in which the firestopping is being installed
4.24.1.2) Size of penetration
4.24.1.3) Materials (e.g. cables, conduit, basket tray, etc.) that shall traverse or adjoin the penetration

4.24.2) Fire Rated Pathway Devices

4.24.2.1) Fire Rated Pathway Devices shall be the preferred method of firestopping and shall be installed in all locations where frequent cable moves, add-ons and changes will occur.

4.24.2.2) Cable trays shall terminate at each barrier and resume on the opposite side such that cables pass independently through fire-rated pathway devices. Cable tray shall be rigidly supported independent from fire-rated pathway devices on each side of barrier.

4.24.2.3) Install through-penetration firestop systems in accordance with Performance Criteria and in accordance with the conditions of testing and classification as specified in the published design.

4.24.3) Firestop Putty, Firestop Caulk, and Firestop Foam

Where it is not practical to use a Fire Rated Pathway Device, Firestop Putty/Caulk/Foam may be used.

4.24.3.1) Before beginning installation, verify that substrate conditions previously installed under other sections are acceptable for installation of firestopping in accordance with manufacturer's installation instructions and technical information.

4.24.3.2) Surfaces shall be free of dirt, grease, oil, scale, laitance, rust, release agents, water repellants, and any other substances that may inhibit optimum adhesion.

4.24.3.3) Provide masking and temporary covering to protect adjacent surfaces.

4.24.4) Firestopping Pillows

Pillow-type firestopping may be used in conduits if and where code permits. If firestopping pillows are utilized, then all firestopping pillow manufacturer instructions and certification listing must be adhered to, including but not limited to those pertaining to compression ratio, cable bundling, and hose-stream dislodgement prevention. Proper compression ratio must be maintained as per certification listing and manufacturer instructions. Cable bundles must be shaped properly as per certification listing and manufacturer instructions in order to prevent smoke penetration between cables. Wire mesh or other material must be installed on larger openings to prevent dislodgement of pillow as per certification listing and manufacturer instructions.

Contractor shall submit compression ratio calculations to the Owner Project Manager for each penetration in which a firestopping pillow is used by Contractor, including:

4.24.4.1) any penetration in which a new firestopping pillow is installed by Contractor

4.24.4.2) any existing penetration used by contractor in which an existing firestopping pillow has been disturbed by Contractor

4.24.4.3) any penetration where a cable has been added or removed by Contractor

4.24.5) Firestopping of Data/Telecommunications Cabinet Penetrations

Contractor shall create and maintain fire, smoke, and watertight seal of firestopping for data/telecommunications cabinet penetrations.

4.25) Testing and Certification Requirements

4.25.1) Independent Testing and Certification Requirement

Contractor shall arrange to have a qualified 3rd-Party independent inspecting and testing agency perform field testing and submit certification and observation reports for each and every cable installed by Contractor, including 100% of installed fiber optic cable strands, 100% of installed category-6 Cable permanent links, 100% of installed telephone feeder/trunk cable pairs, and 100% of installed security/surveillance cables.

Field test certification and observation reports shall indicate and interpret test results relative to compliance with performance requirements of the installed systems, and as defined herein.

This Independent Testing and Certification Requirement may at the option of Owner be waived in the Scope of Work or in a Transmittal signed by both the Owner Project Manager and Purchase College Technical Contact. If the Independent Testing and Certification Requirement is waived in such a way, then all certification and testing requirements shall be maintained save that for the requirement of having an independent 3rd-Party perform the testing and certification: Contractor shall submit field test certification reports, as defined herein, from a qualified employee for 100% of cables installed by Contractor.

4.25.2) All Testing to be Witnessed and/or Reviewed by Owner

The Owner Project Manager and the Owner Technical Contact shall be invited to witness and/or review field-testing.

The Owner Project Manager and the Owner Technical Contact shall be notified of the start date of the testing phase five (5) business days before testing commences.

The Owner Project Manager will select a random sample of 5% of the installed cables. Owner may test these randomly selected cables. The results obtained may be compared to the data provided by the installation contractor. If more than 2% of the sample results differ in terms of the pass/fail determination, then Contractor under supervision of Owner Technical Contact's representative shall repeat 100% testing at no cost to the Owner.

4.25.3) Category-6 Cable Testing

100% of the Category-6 cables in the installation shall be tested in accordance with the Telecommunications Industry Association (TIA) standard ANSI/TIA/EIA-568-C.2 and with this Specification.

The installed twisted-pair links shall be tested from the patch panel or termination block, to the data/telecommunications outlet against the "Permanent Link" performance limits specification as defined in ANSI/TIA/EIA-568-C.2.

4.25.3.1) Technician Qualifications

All tests shall be executed by trained technicians who have successfully attended an appropriate training program and have obtained a certificate as proof thereof. Appropriate training programs include but are not limited to installation certification programs provided by BICSI or the ACP.

4.25.3.2) Test Equipment Accuracy

The test equipment (tester) shall comply with or exceed the accuracy requirements for enhanced level II (Level II-E) field testers as defined in TIA-568; Annex I: Section I.4. The tester including the appropriate interface adapter must meet the specified accuracy requirements. The accuracy requirements for the permanent link test configuration (baseline accuracy plus adapter contribution) are specified in Table I.4 of Annex I of TIA/EIA-568-B.2. (Table I.5 in this TIA document specifies the accuracy requirements for the Channel configuration.)

The tester shall be within the calibration period recommended by the vendor in order to achieve the vendor-specified measurement accuracy. The contractor shall provide proof that the interface has been calibrated within the period recommended by the vendor.

The tester interface adapters must be of high quality and the cable shall not show any twisting or kinking resulting from coiling and storing of the tester interface adapters. In order to deliver optimum accuracy preference is given to a permanent link interface adapter for the tester that can be calibrated to extend the reference plane of the Return Loss measurement to the permanent link interface. To ensure that normal handling on the job does not cause measurable Return Loss change, the adapter cord cable shall not be of twisted-pair construction.

4.25.3.3) The Pass or Fail condition for the link-under-test is determined by the results of the required individual tests (detailed in “Performance Test Parameters”, below). Any Fail, Fail*, or marginal pass (“Pass*”) result yields a Fail for the link-under-test. In order to achieve an overall Pass condition, the results for each individual test parameter must pass - the accuracy margin of the testing device.

A Pass or Fail result for each parameter is determined by comparing the measured values with the specified test limits for that parameter. The test result of a parameter shall be marked with an asterisk (*) when the result is closer to the test limit than the accuracy of the field tester. The field tester manufacturer must provide documentation as an aid to interpret results marked with asterisks. (Reference TIA-568; Annex I: Section I.2.2)

4.25.3.4) Performance Test Parameters

The test parameters for Category-6 are defined in ANSI/TIA/EIA standard TIA-568-B.1; The test of each Category-6 link shall contain all of the following parameters as detailed below. In order to pass the link test all measurements must meet or exceed the limit value determined in the TIA-568.1 standard at each frequency in the range from 1 MHz through 100 MHz.

In addition to any tests performed in the 1MHz through 100MHz frequency range, each parameter shall also be measured from 1 through 250 MHz and all of these measurement points are to be recorded in the test results information as detailed in Section 4.26.1.3)~~4.25.1.3)~~ (“Database Detailed Information”)

4.25.3.4.1) Wire Map [as defined in TIA/EIA-568-B.1]

Wire Map shall report Pass if the wiring of each wire-pair from end to end is determined to be correct. The Wire Map results shall include the continuity of the shield connection if present.

4.25.3.4.2) Length [as defined in TIA/EIA-568-B.1]

The field tester shall be capable of measuring length of all pairs of a permanent link or channel based on the propagation delay measurement and the average value for the Nominal Velocity of Propagation (NVP). The physical length of the link shall be calculated using the pair with the shortest electrical delay. This length figure shall be reported and shall be used for making the Pass/Fail decision. The Pass/Fail criteria are based on the maximum length allowed for the permanent link configuration (90 meters, or 295 ft) plus 10% to allow for the variation and uncertainty of NVP.

4.25.3.4.3) Insertion Loss (Attenuation) [as defined in TIA/EIA-568-B.1]

Insertion Loss shall be tested from 1 MHz through 100MHz in maximum step size of 1 MHz. It is preferred to measure attenuation at the same frequency intervals as NEXT Loss in order to provide a more accurate calculation of the Attenuation-to-Crosstalk Ratio (ACR) parameter.

Test results shall identify the worst wire pair (1 of 4 possible). The test results for the worst wire pair must show the highest attenuation value measured (worst-case), the frequency at which this worst-case value occurs, and the test limit value at this frequency.

4.25.3.4.4) NEXT Loss, pair-to-pair [as defined in TIA/EIA-568-B.1]

Pair-to-pair near-end crosstalk loss (abbreviated as NEXT Loss) shall be tested for each wire pair combination from each end of the link (a total of 12 pair combinations). This parameter is to be measured from 1 through100 MHz. The maximum step size for NEXT Loss measurements shall not exceed the maximum step size defined in the standards as shown in Table 1, column 2.

Test results shall identify the wire pair combination that exhibits the worst case NEXT margin (2) and the wire pair combination that exhibits the worst value of NEXT (worst case). NEXT is to be measured from each end of the link-under-test. These wire pair combinations must be identified for the tests performed from each end. Each reported case shall include the frequency at which it occurs as well as the test limit value at this frequency.

Table 1:

Frequency Range (MHz)	Maximum Step Size (MHz)
1 – 31.25	0.15
31.26 – 100	0.25

4.25.3.4.5) PSNEXT Loss [as defined in TIA/EIA-568-B.1]

Power Sum NEXT Loss shall be evaluated and reported for each wire pair from both ends of the link-under-test (a total of 8 results). PSNEXT Loss statistically captures the combined near-end crosstalk effect on a wire pair when all other pairs actively transmit signals. Like NEXT this test parameter must be evaluated from 1 through 100 MHz and the step size may not exceed the maximum step size defined in the standards as shown in Table 1, column 2.

Test results shall identify the wire pair that exhibits the worst-case margin and the wire pair that exhibits the worst value for PSNEXT. These wire pairs must be identified for the tests performed from each end. Each reported case shall include the frequency at which it occurs as well as the test limit value at this frequency.

4.25.3.4.6) ELFEXT Loss, pair-to-pair [as defined in TIA/EIA-568-B.1]

Pair-to-pair FEXT Loss shall be measured for each wire-pair combination from both ends of the link-under-test. FEXT is measured to compute ELFEXT Loss that must be evaluated and reported in the test results. This test yields 24 wire-pair combinations. ELFEXT is to be measured from 1 through 100 MHz and the maximum step size for FEXT Loss measurements shall not exceed the maximum step size defined in the standards as shown in Table 1, column 2.

Test results shall identify the wire pair combination that exhibits the worst-case margin and the wire pair combination that exhibits the worst value for ELFEXT. These wire pairs must be identified for the tests performed from each end. Each reported case shall include the frequency at which it occurs as well as the test limit value at this frequency.

4.25.3.4.7) PSELFEXT Loss [as defined in TIA/EIA-568-B.1]

Power Sum ELFEXT shall be calculated, yielding 8 wire-pair combination values. Each wire-pair is evaluated from 1 through 100 MHz in frequency increments that do not exceed the maximum step size defined in the standards as shown in Table 1, column 2.

Test results shall identify the wire pair that exhibits the worst-case margin and the wire pair that exhibits the worst value for PSELFEXT. These wire pairs must be identified for the tests performed from each end. Each reported case shall include the frequency at which it occurs as well as the test limit value at this frequency.

4.25.3.4.8) Return Loss [as defined in TIA/EIA-568-B.1]

Return Loss (RL) measures the total energy reflected on each wire pair. Return Loss is to be measured from both ends of the link-under-test for each wire pair. This parameter is also to be measured form 1 through 100 MHz in frequency increments that do not exceed the maximum step size defined in the standards as shown in Table 1, column 2.

Test results shall identify the wire pair that exhibits the worst-case margin and the wire pair that exhibits the worst value for Return Loss. These wire pairs must be identified for the tests performed from each end. Each reported case shall include the frequency at which it occurs as well as the test limit value at this frequency.

4.25.3.4.9) ACR (Attenuation to crosstalk ratio) [This parameter is not demanded by the standards but may be required in order to obtain the premise wiring vendor's warranty. Premise wiring vendor's parameters shall prevail.]

This calculation yields 12 combinations – six from each end of the link.

Test results shall identify the wire pair combination that exhibits the worst-case margin and the wire pair combination that exhibits the worst value for ACR.

These wire pair combinations must be identified for the tests performed from each end. Each reported case shall include the frequency at which it occurs as well as the test limit value at this frequency.

4.25.3.4.10)PSACR [This parameter is not required by the standards but may be required in order to obtain the premise wiring vendor's warranty. Premise wiring vendor's parameters shall prevail.]

This calculation yields 8 combinations – one for each wire pair from both ends of the link.

Test results shall identify the wire pair that exhibits the worst-case margin and the wire pair that exhibits the worst value for PSACR. These wire pairs must be identified for the tests performed from each end. Each reported case shall include the frequency at which it occurs as well as the test limit value at this frequency.

4.25.3.4.11)Propagation Delay [as defined in TIA/EIA-568-B.1; Section 11.2.4.10]

This measurement is to be performed for each of the four wire pairs. Minimum test results documentation (summary results): Identify the wire pair with the worst-case propagation delay.

Test results shall identify the propagation delay value measured as well as the test limit value.

4.25.3.4.12)Delay Skew [as defined in TIA/EIA-568-B.1]

Test results shall identify the wire pair with the worst-case propagation delay (the longest propagation delay). The report shall include the delay skew value measured as well as the test limit value.

4.25.4) Telecommunications Feeder Cable Testing

100% of the Category-3 cables in the installation shall be tested in accordance with the Telecommunications Industry Association (TIA) standard ANSI/TIA/EIA-568-B and with this Specification.

All pairs of the installed telecommunications feeder cable shall be tested and shall be confirmed meet or exceed Category 3 specification as per TIA-568-B.

The installed telecommunications feeder cable shall be tested from the telecommunications feeder patch panel, to the MDF connection block against performance limits specification as defined in ANSI/TIA/EIA-568-B.Technician Qualifications

All tests shall be executed by trained technicians who have successfully attended an appropriate training program and have obtained a certificate as proof thereof. Appropriate training programs include but are not limited to installation certification programs provided by BICSI or the ACP (Association of Cabling Professionals).

4.25.4.1) Test Equipment Accuracy

The test equipment (tester) shall comply with or exceed the accuracy requirements for enhanced level II (Level II-E) field testers as defined in TIA-568; Annex I: Section I.4. The tester including the appropriate interface adapter must meet the specified accuracy requirements

The tester shall be within the calibration period recommended by the vendor in order to achieve the vendor-specified measurement accuracy. The contractor shall provide proof that the interface has been calibrated within the period recommended by the vendor.

The tester interface adapters must be of high quality and the cable shall not show any twisting or kinking resulting from coiling and storing of the tester interface adapters. I

4.25.4.2) The Pass or Fail condition for the link-under-test is determined by the results of the required individual tests. Any Fail or Fail* result yields a Fail for the link-under-test. In order to achieve an overall Pass condition, the results for each individual test parameter must Pass or Pass*.

A Pass or Fail result for each parameter is determined by comparing the measured values with the specified test limits for that parameter. The test result of a parameter shall be marked with an asterisk (*) when the result is closer to the test limit than the accuracy of the field tester. The field tester manufacturer must provide documentation as an aid to interpret results marked with asterisks.

4.25.4.3) Performance Test Parameters

The test parameters for Category-3 are defined in ANSI/TIA/EIA standard TIA-568-B; The test of each Category-3 link shall contain all of the following parameters as detailed below. In order to pass the link test all measurements must meet or exceed the limit value determined in the TIA-568.B standard at each frequency in the range from 1 MHz through 16 MHz.

4.25.5) Fiber-Optic Cable Testing

This Section includes the minimum requirements for the test certification and administration of backbone and horizontal optical fiber cabling.

Contractor shall notify the Owner Project Manager and the Owner Technical Contact of any additional tests that are deemed necessary to guarantee a fully functional system as described under this Specification. The contractor shall carry out and record any additional measurement results at no additional charge.

4.25.5.1) Testing Scope

4.25.5.1.1) Testing shall be carried out in accordance with this Specification. This includes testing the attenuation and polarity of the installed cable plant with an optical loss test set (OLTS) and the installed condition of the cabling system and its components with an optical time domain reflectometer (OTDR). The condition of the fiber endfaces shall also be verified.

4.25.5.1.2) Testing shall be performed on each cabling link (connector to connector).

4.25.5.1.2.1) Testing shall not include any active devices or passive devices within the link or channel other than cable, connectors, and splices, i.e. link attenuation does not include such devices as optical bypass switches, couplers, repeaters, or optical amplifiers.

4.25.5.1.3) All tests shall be documented including OLTS dual wavelength attenuation measurements for multimode and singlemode links and channels and OTDR traces and event tables for multimode and singlemode links and channels.

4.25.5.1.3.1) Documentation shall also include optical length measurements and pictures of the connector endface.

4.25.5.2) Quality Assurance

4.25.5.2.1) All testing procedures and field-test instruments shall comply with applicable requirements of:

4.25.5.2.1.1) ANSI Z136.2, ANS For Safe Use Of Optical Fiber Communication Systems Utilizing Laser Diode And LED Sources

4.25.5.2.1.2) ANSI/EIA/TIA 455 50B, Light Launch Conditions For Long-Length Graded-Index Optical Fiber Spectral Attenuation Measurements

4.25.5.2.1.3) ANSI/TIA/EIA-455-59A, Measurement of Fiber Point Discontinuities Using an OTDR

4.25.5.2.1.4) ANSI/TIA/EIA 455 60A, Measurement of Fiber or Cable Length Using an OTDR

4.25.5.2.1.5) ANSI/TIA/EIA 455 61A, Measurement of Fiber or Cable Attenuation Using an OTDR

4.25.5.2.1.6) ANSI/TIA/EIA 526 7, Optical Power Loss Measurements of Installed Singlemode Fiber Cable Plant

4.25.5.2.1.7) ANSI/TIA/EIA 526 14 A, Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant

4.25.5.2.1.8) ANSI/TIA/EIA-568-B.1, Commercial Building Telecommunications Cabling Standard, Part 1, General Requirements

4.25.5.2.1.9) ANSI/TIA/EIA 568 B.3, Optical Fiber Cabling Components Standard

4.25.5.2.1.10) TIA/EIA TSB-140, Additional Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber Cabling Systems

4.25.5.2.1.11) ANSI/TIA/EIA-606-A, Administration Standard for Commercial Telecommunications Infrastructure, in addition to the requirements specified by Owner.

4.25.5.2.2) Trained technicians who have successfully attended an appropriate training program, which includes testing with an OLTS and an OTDR and have obtained a certificate as proof thereof shall execute the tests. These certificates may have been issued by any of the following organizations or an equivalent organization:

4.25.5.2.2.1) Manufacturer of the fiber optic cable and/or the fiber optic connectors

4.25.5.2.2.2) Manufacturer of the test equipment used for the field certification

4.25.5.2.2.3) Training organizations (e.g., BICSI, A Telecommunications Association headquarters in Tampa, Florida; ACP [Association of Cabling Professionals™] Cabling Business Institute located in Dallas, Texas).

4.25.5.3) Submittals

Contractor shall supply the following to Owner Project Manager upon request:

4.25.5.3.1) Manufacturers catalog sheets and specifications for fiber optic field-test instruments including optical loss test sets (OLTS; power meter and source), optical time domain reflectometer (OTDR) and inspection scope.

4.25.5.3.2) A schedule (list) of all optical fibers to be tested.

4.25.5.3.3) Sample test reports.

4.25.5.4) Acceptance of Test Results

4.25.5.4.1) Unless otherwise specified by the Owner or the Owner's representative, each cabling link shall be in compliance with the following test limits:

4.25.5.4.1.1) Optical loss testing

4.25.5.4.1.1.1) Backbone (multimode and singlemode) link

The link attenuation shall be calculated by the following formulas as specified in ANSI/TIA/EIA-568-B.1.

4.25.5.4.1.1.1.1) Link Attenuation (dB) = Cable_Attn (dB) + Connector_Attn (dB) + Splice_Attn (dB)
4.25.5.4.1.1.1.2) Cable_Attn (dB) = Attenuation_Coefficient (dB/km) * Length (Km)
4.25.5.4.1.1.1.3) Connector_Attn (dB) = number_of_connector_pairs * connector_loss (dB)
4.25.5.4.1.1.1.4) Maximum allowable connector_loss = 0.75 dB
4.25.5.4.1.1.1.5) Splice_Attn (dB) = number_of_splices * splice_loss (dB)
4.25.5.4.1.1.1.6) Maximum allowable splice_loss = 0.3 dB

4.25.5.4.1.1.1.7) The values for the Attenuation_Coefficient (dB/km) are listed in the table below:

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

4.25.5.4.1.1.2) Horizontal (multimode) link

4.25.5.4.1.1.2.1) The acceptable link attenuation for a multimode horizontal optical fiber cabling system is based on the maximum 90 m (295 ft) distance.

4.25.5.4.1.1.2.2) The horizontal link may be tested using a fixed upper limit for attenuation of 2.0 dB. This value is based on the loss of two (2) connector pairs, one pair at the telecommunications outlet/connector and one pair at the horizontal cross-connect, plus 90 m (295 ft) of optical fiber cable.

4.25.5.4.1.1.2.3) A horizontal link in an Open Office Cabling network with a consolidation point may be tested using a fixed upper limit for attenuation of 2.75 dB.

4.25.5.4.1.1.3) Centralized (multimode) link

4.25.5.4.1.1.3.1) The acceptable link attenuation for a multimode centralized optical fiber cabling system is based on the maximum 300 m (984 ft) distance.

4.25.5.4.1.1.3.2) The centralized link may be tested using a fixed upper limit for attenuation of 3.3 dB. This value is based on the loss of three (3) connector pairs, one pair at the telecommunications outlet/connector, one pair at the consolidation point and one pair at the horizontal cross-connect, plus 300 m (984 ft) of optical fiber cable.

4.25.5.4.1.1.3.3) A horizontal link in an Open Office Cabling network with a consolidation point may be tested using a fixed upper limit for attenuation of 4.1 dB.

4.25.5.4.1.2) OTDR testing

4.25.5.4.1.2.1) Reflective events (connections) shall not exceed 0.75 dB.

4.25.5.4.1.2.2) Non-reflective events (splices) shall not exceed 0.3 dB.

4.25.5.4.1.3) Magnified endface inspection

4.25.5.4.1.3.1) Fiber connections shall be visually inspected for endface quality.

4.25.5.4.1.3.2) Scratched, pitted or dirty connectors shall be diagnosed and corrected.

4.25.5.4.2) All installed cabling links and channels shall be field-tested and pass the test requirements and analysis as described in this Specification. Any link or channel that fails these requirements shall be diagnosed and corrected. Any corrective action that must take place shall be documented and followed with a new test to prove that the corrected link or channel meets performance requirements. The final and passing result of the tests for all links and channels shall be provided in the test results documentation in accordance with this Specification.

4.25.5.4.3) Acceptance of the test results shall be given in writing after the project is fully completed and tested in accordance with Contract Documents and to the satisfaction of the Owner.

Note: High Bandwidth applications such as 1000BASE-SX, 10GBASE-S, and FC1200 impose stringent channel loss limits. Where practical, certification shall consider loss length limits that meet maximum channel (transmitter to receiver) loss.

Performance specification for MM fiber at 850 nm

Fiber Type		Bandwidth	1000BASE-SX		10GBASE-SR		FibreChannel 1200-MX-SN-I	
	µm	(MHz• Km)	Length (m)	Loss (dB)	Length (m)	Loss (dB)	Length (m)	Loss (dB)
OM1	62.5	220	275	2.38	26	2.6	33	2.4
OM2	50	500	550	3.56	82	2.3	82	2.2
OM3	50	2000	1000	3.56	300	2.6	300	2.6

4.25.5.5) Optical Fiber Cable Tester Device Requirements

4.25.5.5.1) The field-test instrument shall be within the calibration period recommended by the manufacturer.

4.25.5.5.2) Optical loss test set (OLTS)

4.25.5.5.2.1) Multimode optical fiber light source
4.25.5.5.2.2) Provide dual LED light sources with central wavelengths of 850 nm (±30 nm) and 1300 nm (±20 nm)
4.25.5.5.2.3) Output power of –20 dBm minimum.
4.25.5.5.2.4) The light source shall meet the launch requirements of ANSI/EIA/TIA 455 50B, Method A. This launch condition can be achieved either within the field test equipment or by use of an external mandrel wrap (as described in clause 11 of ANSI/TIA/EIA-568-B.1) with a Category 1 light source.

4.25.5.5.3) Singlemode optical fiber light source

4.25.5.5.3.1) Provide dual laser light sources with central wavelengths of 1310 nm (±20 nm) and 1550 nm (±20 nm).
4.25.5.5.3.2) Output power of –10 dBm minimum.

4.25.5.5.4) Power Meter

4.25.5.5.4.1) Provide 850 nm, 1300/1310 nm, and 1550 nm wavelength test capability.
4.25.5.5.4.2) Power measurement uncertainty of ± 0.25 dB.

4.25.5.5.4.3) Store reference power measurement.
4.25.5.5.4.4) Save at least 100 results in internal memory.
4.25.5.5.4.5) PC interface (serial or USB).

4.25.5.5.5) Optional length measurement

4.25.5.5.5.1) It is preferable to use an OLTS that is capable of measuring the optical length of the fiber using time-of-flight techniques.

4.25.5.5.6) Optical Time Domain Reflectometer (OTDR)

4.25.5.5.6.1) Multimode OTDR
4.25.5.5.6.1.1) Wavelengths of 850 nm (± 20 nm) and 1300 nm (± 20 nm).
4.25.5.5.6.1.2) Event deadzones of 3.7 m maximum at 850 nm and 1300 nm.
4.25.5.5.6.1.3) Attenuation deadzones of 10 m maximum at 850 nm and 13 m maximum at 1300 nm.
4.25.5.5.6.1.4) Distance range not less than 2000 m.
4.25.5.5.6.1.5) Dynamic range at least 10 dB at 850 nm and 1300 nm

4.25.5.5.6.2) Singlemode OTDR
4.25.5.5.6.2.1) Wavelengths of 1310 nm (± 20 nm) and 1550 nm (± 20 nm).
4.25.5.5.6.2.2) Event deadzones of 3.5 m maximum at 1310 nm and 1550 nm.

4.25.5.5.6.2.3) Attenuation deadzones of 10 m maximum at 1310 nm and 12 m maximum at 1550 nm.
4.25.5.5.6.2.4) Distance range not less than 10000 m.
4.25.5.5.6.2.5) Dynamic range at least 10 dB at 1310 nm and 1550 nm

4.25.5.5.7) Fiber Microscope

4.25.5.5.7.1) Magnification of 200X or 400X for endface inspection.
4.25.5.5.7.2) Test equipment shall be capable of saving and reporting the endface image.

4.25.5.5.8) Integrated OLTS, OTDR and fiber microscope
4.25.5.5.8.1) Test equipment that combines into one instrument an OLTS, an OTDR and a fiber microscope may be used.

4.25.5.6) Administration

4.25.5.6.1) Administration of the documentation shall include test results of each fiber link and channel.

4.25.5.6.2) The test result information for each link shall be recorded in the memory of the field-test instrument upon completion of the test.

4.25.5.6.3) The test result records saved within the field-test instrument shall be transferred into a Microsoft Windows™-based database utility that allows for the maintenance, inspection and archiving of these test records.

4.25.5.7) Execution of Optical Fiber Cable Testing

4.25.5.7.1) All outlets, cables, patch panels and associated components shall be fully assembled and labeled prior to field-testing. Any testing performed on incomplete systems shall be redone on completion of the work.
4.25.5.7.2) All tests performed on optical fiber cabling that use a laser or LED in a test set shall be carried out with safety precautions in accordance with ANSI Z136.2.
4.25.5.7.3) Field-test instruments shall have the latest software and firmware installed.
4.25.5.7.4) Link and channel test results from the OLTS and OTDR shall be recorded in the test instrument upon completion of each test for subsequent uploading to a PC in which the administrative documentation (reports) may be generated.
4.25.5.7.5) Fiber endfaces shall be inspected at 200X or 400X magnification. 200X magnification is suitable for inspecting multimode and singlemode fibers. 400X magnification may be used for detailed examination of singlemode fibers. Scratched, pitted or dirty connectors shall be diagnosed and corrected.
4.25.5.7.5.1) Endface images shall be recorded in the memory of the test instrument for subsequent reporting.
4.25.5.7.6) Testing shall be performed on each cabling segment (connector to connector).
4.25.5.7.7) Testing shall be performed on each cabling channel (equipment to equipment) that is planned for use per the Owner's instructions.

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

4.25.5.7.9) Optical loss testing

4.25.5.7.9.1) Backbone link

4.25.5.7.9.1.1) Multimode backbone links shall be tested at 850 nm and 1300 nm in accordance with ANSI/EIA/TIA-526-14A, Method B, One Reference Jumper or the equivalent method.

4.25.5.7.9.1.2) Singlemode backbone links shall be tested at 1310 nm and 1550 nm in accordance with ANSI/TIA/EIA-526-7, Method A.1, One Reference Jumper or the equivalent method.

4.25.5.7.9.1.3) Link attenuation does not include any active devices or passive devices other than cable, connectors, and splices, i.e. link attenuation does not include such devices as optical bypass switches, couplers, repeaters, or optical amplifiers.

4.25.5.7.9.1.4) Use the One Reference Jumper Method specified by ANSI/TIA/EIA-526-14A, Method B and ANSI/TIA/EIA-526-7, Method A.1 or the equivalent method. The user shall follow the procedures established by these standards or application notes to accurately conduct performance testing.

4.25.5.7.9.2) Horizontal (multimode) link

4.25.5.7.9.2.1) The horizontal optical fiber cabling link segments need to be tested at only one wavelength. Because of the short length of cabling, attenuation deltas due to wavelength are insignificant. The horizontal link shall be tested at 850 nm or 1300 nm in one direction in accordance with ANSI/EIA/TIA-526-14A, Method B, One Reference Jumper method or the equivalent method.

4.25.5.7.9.3) Centralized (multimode) link

4.25.5.7.9.3.1) The centralized optical fiber cabling link segments need to be tested at only one wavelength. Because of the short length of cabling, attenuation deltas due to wavelength are insignificant. The horizontal link shall be tested at 850 nm or 1300 nm in one direction in accordance with ANSI/EIA/TIA-526-14A, Method B, One Reference Jumper method or the equivalent method. Testing at 850 nm is recommended unless otherwise specified by the Owner.

4.25.5.7.10) OTDR Testing

4.25.5.7.10.1) Backbone, horizontal and centralized links shall be tested at the appropriate operating wavelengths for anomalies and to ensure uniformity of cable attenuation and connector insertion loss.

4.25.5.7.10.1.1) Backbone multimode: 850 nm and 1300 nm

4.25.5.7.10.1.2) Backbone singlemode: 1310 nm and 1550 nm

4.25.5.7.10.1.3) Horizontal multimode: 850 nm or 1300 nm

4.25.5.7.10.1.4) Centralized multimode: 850 nm or 1300 nm (850 nm recommended unless otherwise specified by the end user)

4.25.5.7.10.2) Each fiber link and channel shall be tested in one direction.

4.25.5.7.10.3) A launch cable shall be installed between the OTDR and the first link connection.

4.25.5.7.10.4) A receive cable shall be installed after the last link connection.

4.25.5.7.11) Magnified Endface Inspection

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

4.25.5.7.12) Length Measurement

4.25.5.7.12.1) The length of each fiber shall be recorded.

4.25.5.7.12.2) It is preferable that the optical length be measured using an OLTS or OTDR.

4.25.5.7.13) Polarity Testing

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

4.25.6) Security/Surveillance Power Cable Testing

100% of the Security/Surveillance cables in the installation shall be tested.

All conductors of the installed Security/Surveillance cable shall be tested and shall be confirmed continuous.

The installed Security/Surveillance cable shall be tested from the point of termination, to the Security/Surveillance patch panel.

4.25.7) Additional Requirements

4.25.7.1) The test results documentation shall be available for inspection by the Owner Project Manager and the Owner Technical Contact during the installation period and shall be passed to the Owner Project Manager and the Owner Technical Contact representative within 5 working days of completion of tests on cabling served by a telecommunications room or of backbone cabling. The installer shall retain a copy to aid preparation of as built information.

4.25.7.2) Circuit IDs reported by the test instrument shall match the Cable Marking Label on the patch panel end of the tested cable, in accordance with the Cable Installation Labeling Convention, described in this Specification.

4.26) Documentation

4.26.1) Category-6 Test Results

Contractor will supply test results from test equipment for all cables that Contractor installs.

The test results information for each link shall be recorded in the electronic memory of the field tester equipment upon completion of the test.

The test results records saved by the field tester shall be transferred into a Microsoft Windows™-based database utility that allows for the maintenance, inspection, archiving, and plain-text exporting of these test records. A guarantee must be made that the measurement results are transferred to the PC unaltered (i.e., "as saved in the field-test instrument") and that these results cannot be modified at a later time. Testers that transfer the numeric measurement data from the tester to the PC in a non-printable format in this regard offer superior protection. The file format, CSV (comma separated value), does not provide adequate protection of these records and shall not be used.

The database for the completed job and all source tester data files shall be stored and delivered on CD-ROM prior to Owner acceptance of the tested cable. This CD-ROM shall include the software tools required to view, inspect, and print any selection of the test reports.

A paper hard copy shall be submitted, containing a test results summary of each installed link.

4.26.1.1) Hard Copy

A paper copy of the test results shall be provided that lists all the links that have been tested with the following summary information:

4.26.1.1.1) The identification of the link in accordance with the Cable Installation Labeling Convention, described in this Specification
4.26.1.1.2) The overall Pass/Fail evaluation of the link-under-test including the NEXT Headroom (overall worst case) number
4.26.1.1.3) The date and time the test results were saved in the memory of the tester

4.26.1.2) Database General Information

General Information to be provided in the electronic database with the test results information for each link:

4.26.1.2.1) The identification of the customer site as specified by Owner
4.26.1.2.2) The identification of the link in accordance with the Cable Installation Labeling Convention, described in this Specification
4.26.1.2.3) The overall Pass/Fail evaluation of the link-under-test
4.26.1.2.4) The name of the standard selected to execute the stored test results
4.26.1.2.5) The cable type and the value of NVP used for length calculations
4.26.1.2.6) The date and time the test results were saved in the memory of the tester
4.26.1.2.7) The brand name, model and serial number of the tester
4.26.1.2.8) The identification of the tester interface

4.26.1.2.9) The revision of the tester software and the revision of the test standards database in the tester

4.26.1.2.10) The test results information must contain information on each of the required test parameters that are listed in Section 0 ("Performance Test Parameters") and as further detailed below under paragraph 4.26.1.3)~~4.25.1.3)~~ ("Database Detailed Information")

4.26.1.3) Database Detailed Information

The detailed test results data to be provided in the electronic database for each tested Category-6 link must contain the following information:

For each of the frequency-dependent test parameters, the minimum test results documentation shall be stored for each wire-pair or wire-pair combination as observed from each end of the link. The minimum test results documentation for each test parameter shall be in compliance with the information in Section 0 ("Performance Test Parameters")

4.26.1.3.1) The name of the test limit selected to execute the stored test results

4.26.1.3.2) The name of the personnel performing the test

4.26.1.3.3) The date and time the test results were saved in the memory of the tester

4.26.1.3.4) The manufacturer, model and serial number of the field-test instrument

4.26.1.3.5) The version of the test software and the version of the test limit database held within the test instrument

4.26.1.3.6) Length: Identify the wire-pair with the shortest electrical length, the value of the length rounded to the nearest foot and the test limit value

4.26.1.3.7) Propagation delay: Identify the pair with the shortest propagation delay, the value measured in nanoseconds (ns) and the test limit value

4.26.1.3.8) Delay Skew**:** Identify the pair with the largest value for delay skew, the value calculated in nanoseconds (ns) and the test limit value

4.26.1.3.9) Insertion Loss (Attenuation): Minimum test results documentation as explained in Section 0 ("Performance Test Parameters") for the wire pair with the worst insertion loss

4.26.1.3.10) Return Loss: Minimum test results documentation as explained in Section 0 ("Performance Test Parameters"). Identify as detected from each end of the link, the wire pair that exhibits the worst-case margin and the wire pair with the worst RL. Each reported case shall include the frequency at which it occurs as well as the test limit value at this frequency.

4.26.1.3.11) NEXT, ELFEXT, ACR: Minimum test results documentation as explained in Section 0 ("Performance Test Parameters"). Identify as measured from each end of the link, the wire pair combination that exhibits the worst case margin and the wire pair combination that delivers the worst case value. Each reported case shall include the frequency at which it occurs as well as the test limit value at this frequency.

4.26.1.3.12) PSNEXT, PSELFEXT, and PSACR: Minimum test results documentation as explained in Section 0 ("Performance Test Parameters"). Identify as detected from each end of the link, the wire pair that exhibits the worst-case margin and the wire pair with the worst value. Each reported case shall include the frequency at which it occurs as well as the test limit value at this frequency.

4.26.1.3.13) Link length, propagation delay, and delay skew shall also be reported for each wire pair as well as the test limit for each of these parameters.

4.26.2) Telecommunications Feeder Cable Test Results

Contractor will supply test results from test equipment for all telecommunications feeder cables that Contractor installs.

The test results information for each pair of the installed telecommunications feeder cable shall be recorded in the electronic memory of the field tester equipment upon completion of the test.

The test results records saved by the field tester shall be transferred into a Microsoft Windows™-based database utility that allows for the maintenance, inspection, archiving, and plain-text exporting of these test records. A guarantee must be made that the measurement results are transferred to the PC unaltered (i.e., "as saved in the field-test instrument") and that these results cannot be modified at a later time. Testers that transfer the numeric measurement data from the tester to the PC in a non-printable format in this regard offer superior protection. The file format, CSV (comma separated value), does not provide adequate protection of these records and shall not be used.

The database for the completed job and all source tester data files shall be stored and delivered on CD-ROM prior to Owner acceptance of the tested cable. This CD-ROM shall include the software tools required to view, inspect, and print any selection of the test reports.

A paper hard copy shall be submitted, containing a test results summary of each installed pair.

4.26.2.1) Hard Copy

A paper copy of the test results shall be provided that lists all the pairs that have been tested with the following summary information:

4.26.2.1.1) The identification of the pair in accordance with the Cable Installation Labeling Convention, described in this Specification
4.26.2.1.2) The overall Pass/Fail evaluation of the pair-under-test
4.26.2.1.3) The date and time the test results were saved in the memory of the tester

4.26.2.2) Database General Information

General Information to be provided in the electronic database with the test results information for each pair:

4.26.2.2.1) The identification of the customer site as specified by Owner
4.26.2.2.2) The identification of the pair in accordance with the Cable Installation Labeling Convention, described in this Specification
4.26.2.2.3) The overall Pass/Fail evaluation of the link-under-test
4.26.2.2.4) The name of the standard selected to execute the stored test results
4.26.2.2.5) The cable type
4.26.2.2.6) The date and time the test results were saved in the memory of the tester
4.26.2.2.7) The brand name, model and serial number of the tester
4.26.2.2.8) The identification of the tester interface
4.26.2.2.9) The revision of the tester software and the revision of the test standards database in the tester

4.26.2.2.10) The test results information must contain information on each of the required test parameters as detailed below under “Database Detailed Information”

4.26.2.3) Database Detailed Information

The detailed test results data to be provided in the electronic database for each tested Category-3 pair must contain the following information:

For each of the frequency-dependent test parameters, the minimum test results documentation shall be stored for each wire-pair or wire-pair combination as observed from each end of the pair. The minimum test results documentation for each test parameter shall be in compliance with TIA568-B specification for Category-3 cable.

4.26.2.3.1) The name of the test limit selected to execute the stored test results
4.26.2.3.2) The name of the personnel performing the test
4.26.2.3.3) The date and time the test results were saved in the memory of the tester
4.26.2.3.4) The manufacturer, model and serial number of the field-test instrument
4.26.2.3.5) The version of the test software and the version of the test limit database held within the test instrument
4.26.2.3.6) Insertion Loss (Attenuation)
4.26.2.3.7) Return Loss: Identify as detected from each end of the pair, the wire pair that exhibits the worst-case margin and the wire pair with the worst RL. Each reported case shall include the frequency at which it occurs as well as the test limit value at this frequency.

4.26.3) Fiber-optic Cable Test Results

Contractor will supply test results from test equipment for all fiber-optic cables that Contractor installs.

The test results information for each terminated or fused strand shall be recorded in the electronic memory of the field tester equipment upon completion of the test.

The test results records saved by the field tester shall be transferred into a Microsoft Windows™-based database utility that allows for the maintenance, inspection, archiving, and plain-text exporting of these test records. A guarantee must be made that the measurement results are transferred to the PC unaltered (i.e., "as saved in the field-test instrument") and that these results cannot be modified at a later time. Testers that transfer the numeric measurement data from the tester to the PC in a non-printable format in this regard offer superior protection. The file format, CSV (comma separated value), does not provide adequate protection of these records and shall not be used.

The database for the completed job and all source tester data files shall be stored and delivered on CD-ROM prior to Owner acceptance of the tested cable. This CD-ROM shall include the software tools required to view, inspect, and print any selection of the test reports.

A paper hard copy shall be submitted, containing a test results summary of each strand.

4.26.3.1) Hard Copy

A paper copy of the test results shall be provided that lists all the links that have been tested with the following summary information:

4.26.3.1.1) The identification of the strand in accordance with the Cable Installation Labeling Convention, described in this Specification
4.26.3.1.2) The overall Pass/Fail evaluation of the strand-under-test
4.26.3.1.3) The date and time the test results were saved in the memory of the tester

4.26.3.2) Database General Information

General Information to be provided in the electronic database with the test results information for each link:

4.26.3.2.1) The identification of the customer site as specified by Owner
4.26.3.2.2) The identification of the pair in accordance with the Cable Installation Labeling Convention, described in this Specification
4.26.3.2.3) The overall Pass/Fail evaluation of the strand-under-test
4.26.3.2.4) The name of the standard selected to execute the stored test results
4.26.3.2.5) The cable type
4.26.3.2.6) The date and time the test results were saved in the memory of the tester
4.26.3.2.7) The brand name, model and serial number of the tester
4.26.3.2.8) The identification of the tester interface
4.26.3.2.9) The revision of the tester software and the revision of the test standards database in the tester

4.26.3.2.10) The test results information must contain information on each of the required test parameters as detailed below under “Database Detailed Information”

4.26.3.3) Database Detailed Information

Detailed test results documentation data is to be provided in an electronic database for each tested optical fiber and shall contain the following information:

4.26.3.3.1) The identification of the customer site as specified by Owner
4.26.3.3.2) The name of the test limit selected to execute the stored test results
4.26.3.3.3) The name of the personnel performing the test
4.26.3.3.4) The date and time the test results were saved in the memory of the tester
4.26.3.3.5) The manufacturer, model and serial number of the field-test instrument
4.26.3.3.6) The version of the test software and the version of the test limit database held within the test instrument
4.26.3.3.7) Circuit ID - as reported by the test instrument and matching the label on test tested cable, in accordance with the Cable Installation Labeling Convention, described in this Specification
4.26.3.3.8) The fiber strand identification number
4.26.3.3.9) The length for each optical fiber
4.26.3.3.10) Optionally the index of refraction used for length calculation when using a length capable OLTS
4.26.3.3.11) Test results to include OLTS attenuation link and channel measurements at the appropriate wavelength(s) and the margin (difference between the measured attenuation and the test limit value).
4.26.3.3.12) Test results to include OTDR link and channel traces and event tables at the appropriate wavelength(s).
4.26.3.3.13) The length for each optical fiber as calculated by the OTDR.
4.26.3.3.14) The overall Pass/Fail evaluation of the link-under-test for OLTS and OTDR measurements
4.26.3.3.14.1) A picture or image of each fiber end-face
4.26.3.3.15) A pass/fail status of the end-face based upon visual inspection.

4.26.4) As-Built Documentation

Contractor shall provide as-built documentation in electronic format, describing all work performed. As-built documentation shall follow apparent documentation standards and formats of existing data wiring documentation and building plans, submitted to Contractor by Owner.

4.26.4.1) Circuit Endpoint Table

Contractor shall submit a completed “Circuit Endpoint Table.xls” document, entering as-built labeling information for 100% of installed cables into this Microsoft Excel document. A blank “Circuit Endpoint Table.xls” form shall be provided to Contractor by Owner upon request.

Contractor shall submit completed spreadsheet to Owner as both electronic document (Microsoft Excel spreadsheet), and as hard-copy.

4.26.4.2) As-Built Drawings

Contractor shall provide a full set of as-built drawings in electronic format as a Microsoft Visio Version 11 (Visio 2003) document.

As-built drawings shall convey an accurate depiction of the entire installation superimposed on a drawing of the building. As-built drawings must be to scale.

All edits and additions by Contractor shall be placed in a new layer, which shall have a name clearly identifying Contractor name, and date of job completion.

The as-built drawings shall include, but shall not be limited to, the following information for all materials installed by Contractor and for all existing materials used by Contractor:

4.26.4.2.1) Inside Service Plant (ISP) drawings, depicting all installed materials, as well as any existing materials utilized, along with building envelope, walls, and features. These shall include, but not be limited to:

- 4.26.4.2.1.1) station outlet location and label
- 4.26.4.2.1.2) details of cable path
- 4.26.4.2.1.3) locations of cable termination points
- 4.26.4.2.1.4) locations of pull boxes
- 4.26.4.2.1.5) locations and diameter of conduits/sleeves
- 4.26.4.2.1.6) locations and manufacturer/model number of raceway
- 4.26.4.2.1.7) locations of penetrations and installed firestopping
- 4.26.4.2.1.8) block diagrams
- 4.26.4.2.1.9) frame and cable labeling
- 4.26.4.2.1.10) location of cabinets/racks
- 4.26.4.2.1.11) equipment room layouts and frame installation details

4.26.4.2.2) Outside Service Plant (OSP) drawings, depicting all installed materials, as well as any existing materials utilized, along with campus building envelopes and landmarks. This shall include, but not be limited to:

- 4.26.4.2.2.1) label or name of each utilized manhole, handhole, and pole as per existing documentation (if available), and as per any label evident on the utilized manhole, handhole, or pole
- 4.26.4.2.2.2) precise locations of each utilized manhole, handhole, as determined by the Global Positioning System (GPS), expressed as longitude and latitude in DMS (degrees◦minutes' seconds"), and accurate to one-hundredth of a minute.
- 4.26.4.2.2.3) measured pull distances between manholes, as evident from markings on installed pull tape and/or cable jacket
- 4.26.4.2.2.4) the type of cable that was installed between manholes, handholes and poles. e.g. 24-strand-SM-fiber, OSP-CAT6, etc., etc.
- 4.26.4.2.2.5) labels on installed cables in manhole/handhole/pole

4.26.4.2.3) The as built drawings shall also include accurate depiction of all field-directed changes made up to construction completion. These shall include, but not limited to:

- 4.26.4.2.3.1) field-directed changes to pull schedule
- 4.26.4.2.3.2) field-directed changes to cross connect and patching schedule
- 4.26.4.2.3.3) horizontal cable routing changes
- 4.26.4.2.3.4) backbone cable routing or location changes
- 4.26.4.2.3.5) associated detail drawings

4.26.4.3) Firestopping Locations

Contractor shall provide a table of as-built firestopping locations in Microsoft Excel format as in the following example:

Example:

	A	B	C	D
1	**Location**	**Description**	**Manufacturer**	**Material**
2	LI1005C-FL01	Above Cable tray	Hilte	Intumescent putty
3	LI1005C-FL02	Around 4" Conduit	Hilte	Mortar
4	LI1005C-FL03	Inside 4" conduit	Hilte	Vermiculite Pillow
…				
…				
…				
37	LI0003F-PP01-22	3" Cabinet penetration	PRC-DeSoto	PR-855 Chase Foam

4.27) Submission of Manufacturer Warranty Information

Contractor shall submit Manufacturer Warranty documents on installed cable plant upon completion of installation.

4.28) Punch Lists

Owner Project Manager and Owner Technical Contact shall inspect all work with Contractor at a punch list inspection tours, to take place as determined by Owner Project Manager.

Additional punch list inspection tours shall be performed as deemed necessary by Owner Project Manager, whereby prior punch list items shall be inspected, and additional punch list items may be generated.

The punch lists shall be conveyed in writing by Owner Project Manager to Owner Technical Contact, and to Contractor.

Contractor shall provide all materials and labor to repair, replace, or complete each punch list item that is within the Scope of Work.

Contractor shall respond to all punch list items in writing, either by stating that the item has been addressed/completed or by claiming that the item is outside of the Scope of Work.

Final payment shall not be released by Owner until after such a time that all punch list items have been completed to the satisfaction of Owner Project Manager and Owner Technical Contact.

4.29) Unused materials

At completion of work, Contractor shall deliver to Owner Technical Contact any materials of significant value that were included in Contractor's cost quotation/proposal for the work, but neither delivered, installed, nor credited by Contractor to Owner.

This shall include, but not be limited to:

4.29.1) Spooled/reeled/boxed copper cable greater than 150' in length
4.29.2) Unused or trimmed fiber-optic cable greater than 1000' in length
4.29.3) Unused jacks and faceplates
4.29.4) Unused patch panels
4.29.5) Unused patch cables
4.29.6) Unused racks/cabinets
4.29.7) Unused cable management
4.29.8) Unused conduit, raceway and cable tray, greater than 5' in length
4.29.9) Unused conduit, raceway, and cable tray fittings
4.29.10) Unused firestopping
4.29.11) Unused wireless access point brackets/enclosures

Part 5: Scope of Work

5) Scope of Work

Contractor shall supply all necessary parts and labor for installation of cabling and accessories to support data/telephone, Audio-visual, and security systems as described herein.

All work described in this Scope of Work shall be specified as a DEDUCT ALTERNATE to main bid entitled "DEDUCT ALTERNATE #1".

5.1) General

5.1.1) Contractor shall furnish and install cables, terminals, connectors, patch panels, and miscellaneous hardware required for delivery of a complete and working cable plant as described herein.

5.1.2) Contractor shall furnish and install raceway, duct, conduit, J-hooks, straps, and cable tray to supplement existing pathways where necessary in order to perform the scope of work described herein.

5.1.3) Contractor shall provide for testing of the installed cabling systems in the scope of work described herein, and submit results to Owner.

5.1.4) Contractor shall provide as-built documentation of the installed cabling systems in the scope of work described herein, and submit documentation to Owner.

5.1.5) Data/Telecommunications Cabling System

The Category-6 portion of the Data/Telecommunications Cabling System shall support 1000BASE-T Gigabit Ethernet as per IEEE 802.3ab, 100BASE-T Fast Ethernet as per IEEE 802.3u, Voice-Over-IP telephony (VOIP) as per TIA-TR41, digital telephony as per TIA-810-B, and analog telephony as per TIA 470-C.

5.2) Patch Cables

5.2.1) Category-6 Booted Patch Cables

Contractor shall supply (furnish only) a number of Category-6 booted patch cables equal to twice the total number of Category-6 outlets installed.

Patch cables shall be shipped to Owner Project Manager in boxes, and shall be sized as follows:

5.2.1.1) All (100%) of the total number of Category-6 booted patch cables supplied shall be five (5) feet in length

5.3) Data/telecommunications Closet

Supply and install ~~the following~~ components in all specified data/telecommunications closets as described in the attached plans and in this specification..

Prepare data/telecommunications closets for installation of cables and equipment.

Placement of installed materials in data/telecommunication closets shall be directed by Owner Technical Contact.

~~5.4)~~ Main Pathway

~~Stud grommets shall be used as cable support as appropriate on hallway ceiling of Natural Sciences (NS) building, when main pathway is not available.~~

J-hooks shall be used as cable support ~~as appropriate in all other places~~ when acceptable ~~main~~ pathway ~~is not~~ does not already exist~~available~~.

~~Main pathway is to be installed as follows:~~

~~5.5)~~5.4) Category-3 Telecommunications Feeder Cable

~~5.5.1) Telecommunications Feeder Cable~~

~~Supply and install a one (1) 100-pair category-3 telecommunications feeder cable~~Not applicable to this scope of work.~~.~~

5.5) Existing Category-6 Cables

Functionality of existing certified Category-6 cables~~installation~~ must be preserved by C~~c~~ontractor.~~:~~

Contractor must protect cables from damage at all times during construction.

Contractor shall re-certify (re-test) all existing cables as per specification following construction, demonstrating that all permanent links PASS test requirements set forth in specification, and submitting test results per specification requirements.

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5.6) Relocation of Existing Category-6 Outlets

Relocate a total of 75 existing Category-6 Outlets in 25 existing faceplates, as per attached drawings.

Cables shall be properly handled by qualified professionals while being moved. Contractor must protect cables from damage at all times during construction.

Functionality of existing certified installation must be preserved by Contractor.

Contractor shall re-certify (re-test) all moved cables as per specification following construction, demonstrating that all permanent links PASS test requirements set forth in specification, and submitting test results per- specification requirements.

New

5.7) Category-6 Cable Installation

Supply and install a grand total of (5745~~51~~) new Category-6 ~~new~~ cables/outlets ~~as follows~~in eighteen faceplates as per attached drawings.

Outlets that are ~~noted~~specified to be relocated on attached drawings shall use existing cables, and are not counted toward this grand total of new cables, nor are they counted in the detailed break-down of new cables, below.

~~5.6)~~

~~5.6.1)~~5.7.1) Workstation Outlets

Supply and install a total of (6) new Category-6 data/telecommunications cables to supplement existing ~~telecom~~ datatel outlets, as indicated on attached drawings.

~~5.6.2)~~5.7.2) Wireless access point outlets

Supply and install a total of (8) new Category-6 cables for wireless access point outlets on the 2nd and 3rd floor as indicated on attached drawings. Each wireless access point outlet location shall have two cables run to it, with 30' of slack on each cable coiled near destination. Place outlets in ~~surface-mount metallic surface-mounted~~ metallic boxes surface-mounted above ceiling in locations ~~as per~~ indicated on attached ~~diagram~~drawings.

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5.6.3)5.7.3) ~~Ceiling Mounted~~ Security System Outlets

Supply and install a total of (31) new Category-6 cables for ~~ceiling- mounted~~ outlets mounted above-ceiling for the installation of ~~speakers~~ security cameras and card-readers. Place outlets in faceplate on low-voltage ring~~surface-mounted~~ mounted on wall nearest~~metallic boxes surface-mounted~~ above ceiling in location ~~as per~~ specified on attached drawings.

5.6.4)5.7.4) Spare Cables

Supply and install a total of (12~~6~~) new spare data/telecommunications cables in ceilings, coiled w/ 50' slack on each cable. Spare cables shall be left un-terminated in ceiling of specified location. Spare cables shall be terminated in data/telecommunications closet patch panel, ~~labeled as outlet port "-SPAREx" (where "x" is a unique numeral)~~ and shall not be tested.

Spare cable~~s jacks~~ shall be referred to as "-SPAREn" on patch panel and cable labels, where "n" is a numeric index, e.g. "LI0009B-SPARE1", "LI0009B-SPARE2", etc.

5.6.4.1)5.7.4.1) Install six (6)~~3~~ "spare" cables to end of each of the 2nd and 3rd floor hallway~~s~~ (~~one~~ six to~~on~~ end of 2nd floor, ~~one~~ and six to end of ~~on~~ 3rd floor).

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5.7)5.8) Wireless Access Point ~~Enclosures~~Bracket and Wireless Access Pointsand Mounting Brackets

~~Provide and install~~Install Wireless Access Point~~s. Brackets of the following types in the specified location~~in the locations specified on attached drawings. Precise location for mounting shall be field-directed, with approval by Owner Technical Contact.

Wireless Access Points and Mounting ~~Suspended-Ceiling-Mount Wireless Access Point~~ Brackets shall be provided by Owner. Contractor shall mount access points and connect wireless access points to designated wireless access point data outlets after brackets are installed, documenting the manufacturer label ("MAC" label) of each WAP installed at each location:~~:~~

5.7.1) ~~Install nine (9) S~~suspended-ceiling-mount Wireless Access Point~~s and Mounting / Enclosures~~ Brackets. ~~(98 total).~~

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5.8.1)

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5.8)5.9) Removal of Abandoned Category-5, Category-5e Cable, Category-6 data cable.~~e.~~

~~Abandoned Category-5 cable shall be removed as per NFPA/NEC code.~~

~~5.8.1) Coordinate cutover to newly-installed cable with Owner Technical Contact, following completion of installation.~~

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~~5.8.2) Following successful cutover to newly-installed cable, remove all abandoned Category-5 and Category-5e cabling that was replaced by the newly-installed Category-6 cable.~~

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~~Not applicable to this Scope of Work.~~Cut back and remove cable as ~~indicated~~directed on attached drawings.

~~5.9)~~5.10) Attachments

See attached diagrams and documentation for further description of Scope of Work.

*** **END OF DOCUMENT** ***

_____
NAME OF BIDDER

_____
ADDRESS OF BIDDER

PROPOSAL
FOR

Project Number: **SU-022317** Date: **07/31/2017**
Project Name: **Interior Renovation Campus Center South**

TO THE STATE UNIVERSITY OF NEW YORK:

1. **The Work Proposed Herein Will Be Completed Within 90 Calendar Days, Starting 10 Calendar Days After The Contract Approval Date.** In the event the bidder fails to complete such work by said date or dates, or within the time to which such completion may have been extended in accordance with the Contract Documents, the bidder agrees to pay the University liquidated damages in an amount equal to the values indicate in the Liquidated Damages Schedule below for each calendar day of delay in completing the work.

==========

LIQUIDATED DAMAGES SCHEDULE

Contract Amount	***Liquidated Damages***
Under $100,000	**$100/day**
$100,000-$499,999	**$200/day**
$500,000-$999,999	**$300/day**
$1MM-$1,999,999	**$400/day**
$2MM-$3,499,999	**$500/day**
$3.5MM-$5MM	**$700/day**
Over $5MM (to be determined by the University in each instance)	**$_____/day**

==========

2. The bidder hereby declares that it has carefully examined all Bidding and Contract Documents and that it has personally inspected the actual location of the work, together with the local sources of supply, has satisfied itself as to all the quantities and conditions, and understands that in signing this Proposal, it waives all right to plead any misunderstanding regarding the same.

3. The bidder further understands and agrees that it is to do, perform and complete all work in accordance with the Contract Documents and to accept in full compensation therefore the amount of the Total Bid, modified by such additive or deductive alternates, if any, as are accepted by the University.

4. The bidder further agrees to accept the unit prices, if any, set forth in paragraph (5) of this proposal, except as the same may be modified pursuant to the provisions of Section (5) of the Information to Bidders, as full payment for the amount of the credit to the University for any deletions, additions, modifications or changes to the portion or portions of work covered by said unit prices.

5. **BID CALCULATION**

a. **BASE BID** *(does not include allowances)*

$_____
(in numbers)

_____
(in words)

b. **ALLOWANCES:** In accordance with the Schedule I and Section 4.05 of Agreement, the bidder further agrees to the following additions to the Base Bid:

Work or Materials Description	Amount in Words	Amount in Figures
Siemens Controls/ wiring and Engineering	Twenty Two Thousand Five hundred only.	22,500.00

c. **TOTAL BID** *(base bid + allowances = total bid)*

$_____
(in numbers)

_____
(in words)

d. **ALTERNATES**: In accordance with Section B of the General Requirements the bidder proposes the following additions to or deductions from the Total Bid for the alternates listed below:

Alternate Number	Add/Deduct	Amount in Words	Amount in Figures
Provide pricing for all Data/ Tel Outlet Relocations cabling installation and system testing.			
PROVIDE PRICING FOR: POLLY FP-500, FLOOR MOUNTED HEAD RAIL BRACED. SOLID MOLDED PLASTIC PANELS, COLOR: WHITE GRANITE HARDWARE FINISH: POLISHED S/S.			

PROVIDE PRICING FOR: ELECTROSTATICALLY PAINT EXISTING PARTITIONS SCRAPE, STRIP ALL EXISTING PAINT PRIOR TO PAINTING			

e. **UNIT PRICES**: In accordance with Section (5) paragraph (2) of the Information to Bidders and Section 4.04 of the Agreement the bidder or the University may insert unit prices for the work or materials listed below for clarification.

Work or Materials Description	Amount in Words	Amount in Figures
Repair and Patch wall per square foot		
Prep, Prime and Paint Provide square foot cost		

6. By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid, each party thereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief: (a) the prices in this bid have been arrived at independently without collusion, consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor; (b) unless otherwise required by law, the prices have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor; and (c) no attempt has been made or will be made by the bidder to induce any person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.

   A bid shall not be considered for award nor shall any award be made where (a), (b) and (c) above have not been complied with; provided, however, that if in any case the bidder cannot make the foregoing certification the bidder shall so state and shall furnish with the bid a signed statement which sets forth in detail the reasons therefor. Where (a), (b), and (c) above shall have not been complied with, the bid shall not be considered for award nor shall any award be made unless the Campus President, or designee, or Vice Chancellor for Capital Facilities, or designee, determines that such disclosure was not made for purposes of restricting competition.

   The fact that a bidder (a) has published price lists, rates, or tariffs covering items being procured, (b) has informed prospective customers of proposed or pending publication of new or revised price lists for such items, or (c) has sold the same items to other customers at the same prices being bid, does not constitute, without more, a disclosure within the meaning of this Section.

7. The bidder agrees that if awarded the Contract, it will commence work within (10) calendar days after date of receipt of a fully executed Agreement and that it will fully complete the work by the date stated herein.

8. The bidder acknowledges the receipt of the following addenda, but agrees that it is bound by all addenda whether or not listed herein.

Addendum Number	Date	Addendum Number	Date
_____	___/___/___	_____	___/___/___
_____	___/___/___	_____	___/___/___
_____	___/___/___	_____	___/___/___

9. The bidder submits herewith bid security in an amount not less than five (5) percent of the Total Bid. In the event that (a) the bidder's Total Bid is the lowest one submitted and the bidder does not timely provide the Post-Bid Information required by the Information for Bidders or (b) this Proposal is accepted by the University and the bidder shall refuse or neglect, within ten (10) calendar days after date of receipt of Agreement, to execute and deliver said Agreement in the form provided herein, or to execute and deliver a Performance Bond and a Labor and Material Bond in the amounts required and in the form prescribed, the bidder shall be liable to the University, as liquidated damages, for the amount of the bid security or the difference between the Total Bid of the bidder and the Total Bid of the bidder submitting the next lowest bid, whichever sum shall be higher, otherwise the total amount of the bid security will be returned to the bidder in accordance with the provisions set forth in the Information for Bidders. The University may apply the bid security in full or partial payments, as the case may be, of said liquidated damages and in the event the bid security is less than the amount of liquidated damages to which the University is entitled, the bidder shall pay the difference, upon demand, to the University.

10. The bidder certifies that all wood products that are to be used in the performance of this Contract shall be in accordance with the Specifications and provisions of Section 167 b. of the State Finance Law which Section prohibits the purchase and use of tropical hardwoods.

11. The bidder affirms that it understands and agrees to comply with the procedures of the Fund relative to permissible contacts as required by Sections 139-j(3) and 139-j-(6)(b) of the State Finance Law.

12. The bidder certifies that all information provided or to be provided to the University in connection with this procurement is, as required by Section 139-k of the State Finance Law, complete, true and accurate.

Dated _____/_____/_____

Firm's Federal ID Number or
Social Security Number as applicable _____

Legal name of person, partnership, joint venture or corporation:

_____

By_____
(signature)

Title_____

Email address_____

ACKNOWLEDGMENT FOR THE PROPOSAL

THE LEGAL ADDRESS OF THE BIDDER

_____

_____

_____

_____

Telephone No._____ Facsimile No._____

If a Corporation

Name Address

_____PRESIDENT _____

_____SECRETARY _____

_____TREASURER _____

If a Partnership

Name of Partners Address

_____ _____

_____ _____

_____ _____

If a Joint Venture

Name of Members Address

_____ _____

_____ _____

_____ _____

If an Individual

Name of Individual Address

_____ _____

Attachment A – List of Completed Similar Construction Projects

Bidder Name: **Project No.:**

Bidders must provide three (3) example projects completed in the past five (5) years in which the Bidder served as the prime contractor. Example projects must be of similar size, scope and complexity to the project currently being bid, as further described in the Description of Work. Each project must include the Owner/Agency, Award Date, Contract Amount, Date Completed, Contact Person, Telephone number of the contact, Architect and/or Engineer's Name, Contract Number, Contact Email, and the Project Title and a brief scope description. Reference contacts may be used to verify project size, scope, dollar value, percentages and quality of performance.

1.	Agency/Owner			Award Date	Contract Amount / Date Completed
	Agency/Owner Contact Person		Telephone No.	Designer Architect and /or Design Engineer	
	Contract No.	Contact Email	Project Title & Scope		
2.	Agency/Owner			Award Date	Contract Amount / Date Completed
	Agency/Owner Contact Person		Telephone No.	Designer Architect and /or Design Engineer	
	Contract No.	Contact Email	Project Title & Scope		
3.	Agency/Owner			Award Date	Contract Amount / Date Completed
	Agency/Owner Contact Person		Telephone No.	Designer Architect and /or Design Engineer	
	Contract No.	Contact Email	Project Title & Scope		
Completed By:				Phone Number: Email: Date:	

SIEMENS

Siemens Industry, Inc.

Proposal

Attn: Mechanical contractors

Date	8-21-17
Proposal #:	510-08212017
Limiting Date:	30 Days

Project:

Location: CAMPUS CENTER SOUTH ADDITIONAL WORK FOR VAV RETROFIT

Proposal: Siemens Industry, Inc. is pleased to provide the following—

The detail scope of work with clarifications and/or exclusions for this project is attached for your review and approval. Our terms and conditions are also attached for your review.

Net Price: $ 22,500.00

Remarks: This is work to be done that is additional to the base job already being designed by Siemens See notes

TAX

☒ This is a taxable project – Tax will be added to the invoice if required
☐ This is a capital improvement project – Certificate to be provided by the purchaser or tax will be added to the invoices
☐ This is a tax exempt project – Certificate to be provided by the purchaser or tax will be added to the invoices

Proposal Accepted:
Siemens Industry, Inc. is authorized to proceed with the work as proposed.

Proposal Submitted:
Siemens Industry, Inc.,

Purchaser		**Seller**	Siemens Industry, Inc.
By		**By**	Bruce A. Sumner
Title		**Title**	Account Executive
Date		**Date**	8-21-2017
Signature		**Signature**	

Siemens Industry, Inc.
8 Fernwood Road
Florham Park NJ 07932

Tel: (973) 396-4267 Fax: (973) 575-7968
Email: bruce.sumner@siemens.com
Mobile: (973) 703-8009

I. Scope of Work :

Siemens will provide this additional work that is not covered in the base installation already being worked on by Siemens.

The additional scope is the differential from Siemens contract dated 7-7-16 and the drawings dated 5-10-2017. M-001,100,101,102,200,300.

Siemens will provide additional wiring from the 20 already provided TEC controllers to the newly installed electronic valves provided by Siemens under this agreement and installed by the mechanical contractor.

The following equipment will be provided.

- (26) Control valves for (18) existing reheats (5) new reheats (3) radiation
- Control wiring for all electronic valves to be installed
- (5) new TEC controllers for new reheats
- (5) new stats and cables for new reheats
- Wire for Reheat controller #5 to basement to 2nd floor stat
- Interlock wiring for exhaust fan
- Engineering submittals for entire job

II. Specifically Included by Siemens:

A. Extension and connection to the existing Siemens Building Management System.
B. Project management and supervision
C. One-year warranty
D. Programming and startup of new Siemens equipment
E. Install graphics on front end

III. Specifically Excluded by Siemens:

A. All valves installed by others
B. No line voltage or power wiring (24 v only)
C. General contractor work including but not limited to cutting, patching and painting.
D. All work done on straight time
E. Opening and closing of sheetrock ceilings.
F. Repair and replacement of ceiling tiles damaged during installation of work.
G. Air and water balancing.
H. Work in areas with asbestos.
I. Installation and setting of valves, dampers, flow measuring stations and actuators.
J. Demolition work, removal of old panels, devices, controls and control lines.
K. Per Project Aggregate Insurance.
L. Redesign of any mechanical systems including resizing of same or any addition piping or valves.
M. Permits and Fees.
N. Fire alarm tie in and smoke purge is not covered in this agreement

IV. Clarifications:

All work on straight time no overtime included

V. Payment Terms:

A. 15% upfront payment is required for mobilization.
B. Net 30 days after receipt of invoice as progress payment.
C. No retention to be held on this project.

INSTALLATION TERMS AND CONDITIONS (REV. 10/09)

These Terms and Conditions are incorporated by reference and form an integral part of each proposal or agreement between Siemens Industry, Inc., Building Technologies Division. ("SIEMENS") and the party for whom the Work is to be performed ("Customer"). The portions of each proposal or agreement relating to "Scope of Work" or "Proposed Solution" (in either case "Scope"), together with these Terms and Conditions, are collectively referred to as the "Agreement".

Article 1: General

1.1 (a) The Agreement, when accepted in writing by Customer and approved by an authorized representative of SIEMENS, constitutes the entire, complete and exclusive agreement between the parties relating to the services ("Services") and the equipment ("Equipment") to be provided by SIEMENS as described in the Scope (such Services and Equipment collectively referred to as "Work") and shall supersede and cancel all prior agreements and understandings, written or oral, relating to the subject matter of the Agreement. The Agreement and any rights or obligations thereunder may not be assigned by either party without the prior written consent of the other, except that either party may assign this Agreement to its affiliates and SIEMENS may use subcontractors in the performance of the Work.

(b) The terms and conditions of this Agreement shall not be modified or rescinded except in writing, signed by an authorized representative of SIEMENS. SIEMENS' performance under this Agreement is expressly conditioned on Customer's assenting to all of the terms of this Agreement, notwithstanding any different or additional terms contained in any writing at any time submitted or to be submitted to SIEMENS by Customer relating to the Work.

c) The terms and conditions set forth herein shall supersede, govern and control any conflicting terms of the Proposed Solution or the Proposal.

d) Nothing contained in this Agreement shall be construed to give any rights or benefits to anyone other than the Customer and SIEMENS without the express written consent of both parties. All obligations arising prior to this Agreement and all provisions of this Agreement allocating responsibility or liability between the parties shall survive the completion of the Work and the termination of this Agreement.

1.2 This Agreement shall be governed by and enforced in accordance with the laws of the State of Illinois. All claims or disputes arising under this Agreement shall be litigated in the State, Commonwealth, or Province in which the Work is being provided to Customer hereunder.

Article 2: Work by SIEMENS

2.1 SIEMENS will perform the Work expressly described in this Agreement and in any work release documents or change orders that are issued under this Agreement and signed by the parties. The Work performed by SIEMENS shall be conducted in a manner consistent with the degree of care and skill ordinarily exercised by reputable firms performing the same or similar work in the same locale acting under similar circumstances and conditions.

2.2 SIEMENS shall perform the Work during its normal working hours, Monday through Friday, excluding holidays, unless otherwise agreed herein.

2.3 SIEMENS is not required to conduct safety or other tests, install new devices or equipment or make modifications to any Equipment beyond the Scope set forth in this Agreement. Any Customer request to change the Scope or the nature of the Work must be in the form of a mutually agreed change order, effective only when executed by all parties hereto.

2.4 All reports and drawings specifically prepared for and deliverable to Customer pursuant to this Agreement ("Deliverables") shall become Customer's property upon full payment to SIEMENS. SIEMENS may retain file copies of such deliverables. All other reports, notes, calculations, data, drawings, estimates, specifications, manuals, other documents and all computer programs, codes and computerized materials prepared by or for SIEMENS are instruments of SIEMENS' work ("Instruments") and shall remain SIEMENS' property. To the extent specified in the Scope, Customer, its employees and agents ("Permitted Users") shall have a right to make and retain copies of Instruments except uncompiled code, and to use all Instruments, provided however, the Instruments shall not be used or relied upon by any parties other than Permitted Users, and such use shall be limited to the particular Work and location for which the Instruments were provided. All Deliverables and Instruments provided to Customer are for Permitted Users' use only for the purposes disclosed to SIEMENS, and Customer shall not transfer them to others or use them or permit them to be used for any extension of the Work or any other project or purpose, without SIEMENS' express written consent. Any reuse of Deliverables or Instruments for other work or locations without the written consent of SIEMENS, or use by any party other than Permitted Users will be at Permitted Users' risk and without liability to SIEMENS; and Customer shall indemnify, defend and hold SIEMENS harmless from any claims, losses or damages arising therefrom.

2.5 Customer acknowledges that SIEMENS, in the normal conduct of its business, may use concepts and improved skills and know-how developed while performing other contracts. Customer acknowledges the benefit which may accrue to it though this practice, and accordingly agrees that anything in this Agreement notwithstanding, Siemens may continue, without payment of a royalty, this practice of using concepts and improved skills and know-how developed while performing this Agreement.

2.6 SIEMENS shall be responsible for any portion of the Work performed by any subcontractor of SIEMENS. SIEMENS shall not have any responsibility, duty or authority to direct, supervise or oversee any contractors of Customer or their work or to provide the means, methods or sequence of their work or to stop their work. SIEMENS' work and/or presence at a site shall not relieve others of their responsibility to Customer or to others. SIEMENS shall not be liable for the failure of Customer's contractors or others to fulfill their responsibilities, and Customer agrees to indemnify, hold harmless and defend SIEMENS against any claims arising out of such failures

Article 3: Responsibilities of Customer

3.1 Customer, without cost to SIEMENS, shall:

(a) Designate a contact person with authority to make decisions for Customer regarding the Work and provide SIEMENS with information sufficient to contact such person in an emergency. If such representative cannot be reached, any request for work received from a person located at Customer's premises will be deemed authorized by Customer, and SIEMENS will, in its discretion, act accordingly.;

(b) Provide or arrange for reasonable access and make all provisions for SIEMENS to enter any site where Work is to be performed;

(c) Permit SIEMENS to control and/or operate all facility controls, systems, apparatus, equipment and machinery necessary to perform the Work;

(d) Furnish SIEMENS with all available information pertinent to the Work;

(e) Furnish SIEMENS with all approvals, permits and consents from government authorities and others as may be required for performance of the Work except for those SIEMENS has expressly agreed in writing to obtain;

(f) Notify SIEMENS promptly of any site conditions requiring special care, and provide SIEMENS with any available documents describing the quantity, nature, location and extent of such conditions;

(g) Comply with all laws and provide any notices required to be given to any government authorities in connection with the Work, except such notices SIEMENS has expressly agreed in writing to give;

(h) Provide SIEMENS with Material Safety Data Sheets that conform to OSHA requirements related to all Hazardous Materials located at the site;

(i) Furnish to SIEMENS any contingency plans related to the site; and

(j) Furnish the specified operating environment, including without limitation, suitable, clean, stable, properly conditioned electrical power to all Equipment; telephone lines, capacity and connectivity as required by such Equipment; and heat, light, air conditioning and other utilities in accordance with the specifications for the Equipment.

3.2 Customer acknowledges that the technical and pricing information contained in this Agreement is confidential and proprietary to SIEMENS and agrees not to disclose it or otherwise make it available to others without SIEMENS' express written consent.

3.3 Customer acknowledges that it is now and shall at all times remain in control of the project site. Except as expressly provided herein, SIEMENS shall not be responsible for the adequacy of the health or safety programs or precautions related to Customer's activities or operations, Customer's other contractors, the work of any other person or entity, or Customer's site conditions. SIEMENS is not responsible for inspecting, observing, reporting or correcting health or safety conditions or deficiencies of Customer or others at Customer's site. So as not to discourage SIEMENS from voluntarily addressing health or safety issues at Customer's site, in the event SIEMENS does address such issues by making observations, reports, suggestions or otherwise, SIEMENS shall not be liable or responsible on account thereof.

3.4 Customer is solely responsible for any removal, replacement or refinishing of the building structure or finishes that may be required to gain access to the Work.

3.5 Customer shall properly dispose of all ballasts, mercury bulb thermostats, used oil, contaminated filters, contaminated absorbents, refrigerant and any other Hazardous Materials that at any time are present at Customer's premises, in accordance with all applicable federal, state, and local laws, regulations, and ordinances.

Article 4. Changes; Delays; Excused Performance

4.1 As the Work is performed, conditions may change or circumstances outside SIEMENS' reasonable control (including changes of law) may develop which would require SIEMENS to expend additional costs, effort or time to complete the Work, in which case SIEMENS will

notify Customer and an equitable adjustment will be made to SIEMENS' compensation and time for performance. In the event conditions or circumstances require the Work to be suspended or terminated, SIEMENS shall be compensated for Work performed and for costs reasonable incurred in connection with the suspension or termination.

4.2 SIEMENS shall not be responsible for loss, delay, injury, damage or failure of performance that may be caused by circumstances beyond its control, including but not restricted to acts or omissions by Customer or its employees, agents or contractors, Acts of God, war, civil commotion, acts or omissions of government authorities, fire, theft, corrosion, flood, water damage, lightning, freeze-ups, strikes, lockouts, differences with workmen, riots, explosions, quarantine restrictions, delays in transportation, or shortage of vehicles, fuel, labor or materials. In the event of such delay or failure, the time for performance shall be extended by a period equal to the time lost plus a reasonable recovery period and the compensation shall be equitably adjusted for additional costs SIEMENS incurs due to such delay.

Article 5: Compensation

5.1 SIEMENS shall be compensated for the Work at its prevailing rates and reimbursed for costs and expenses (plus reasonable profit and overhead)incurred in its performance of the Work. All other services, including but not limited to the following, shall be separately billed or surcharged on a time and materials basis: (a) emergency work performed at Customer's request, if inspection does not reveal any deficiency covered by the Agreement; (b) work performed other than during SIEMENS' normal working hours; and, (c) work performed on equipment not covered by the Agreement.

5.2 SIEMENS may invoice Customer on a monthly or other progress billing basis. Invoices are due and payable upon receipt or as otherwise set forth in the Agreement. If any payment is not received when due, SIEMENS may deem Customer to be in breach hereof and may enforce any remedies available to it hereunder or at law, including without limitation, acceleration of payments and suspension or termination of the Work at any time and without notice and shall be entitled to compensation for the Work previously performed and for costs reasonably incurred in connection with the suspension or termination. In the event any payment due hereunder is not made when due, the Customer agrees to pay, on demand, as a late charge, one and one-half percent (1.5%) of the amount of the payment per month, limited by the maximum rate permitted by law, of each overdue amount (including accelerated balances) under the Agreement, Customer shall reimburse SIEMENS for SIEMENS' costs and expenses (including reasonable attorneys' and witnesses' fees) incurred for collection under this Agreement. In the event of a dispute by Customer regarding any portion or all of an invoiced amount, it shall notify SIEMENS in writing of the amount in dispute and the reason for its disagreement within 21 days of receipt of the invoice, the undisputed portion shall be paid when due, and interest on the disputed, unpaid portion shall accrue as aforesaid, from the date due until the date of payment, to the extent that such amounts are finally determined to be payable to SIEMENS.

5.3 Except to the extent expressly agreed in writing, SIEMENS' fees do not include any taxes, excises, fees, duties or other government charges related to the Work, and Customer shall pay such amounts or reimburse SIEMENS for any amounts it pays. If Customer claims a tax exemption or direct payment permit, it shall provide SIEMENS with a valid exemption certificate or permit and indemnify, defend and hold SIEMENS harmless from any taxes, costs and penalties arising out of same.

Article 6: Warranty, Insurance and Allocation of Risk

6.1 (a) Until one year from either the date the Equipment is installed or the date of first beneficial use, whichever first occurs, all Equipment manufactured by SIEMENS or bearing its nameplate will be free from defects in material and workmanship arising from normal use and service.

(b) Labor for all Work under this Agreement is warranted to be free from defects for ninety (90) days after the earlier of the date the Work is substantially completed or the date of first beneficial use.

6.2 (a) The limited warranties set forth in Section 6.1 will be void as to, and shall not apply to, any Work (i) repaired, altered or improperly installed by any person other than SIEMENS or its authorized representative; (ii) subjected to unreasonable or improper use or storage, used beyond rated conditions, operated other than per SIEMENS' or the manufacturer's instructions, or otherwise subjected to improper maintenance, negligence or accident; (iii) damaged because of any use of the Work after Customer has, or should have, knowledge of any defect in the Work; or (iv) Equipment not manufactured, fabricated and assembled by SIEMENS or not bearing SIEMENS' nameplate. However, SIEMENS assigns to Customer, without recourse, any and all assignable warranties available from any manufacturer, supplier, or subcontractor of such Equipment and will assist Customer in enforcement of such assigned warranties.

(b) Any claim under the limited warranty granted above must be made in writing to SIEMENS within thirty (30) days after discovery of the claimed defect unless discovered directly by SIEMENS. Such limited warranty only extends to Customer and not to any subsequent owner of the Equipment. Customer's sole and exclusive remedy for any Work not conforming with this limited warranty is limited to, at SIEMENS' option, (i) repair or replacement of defective components of covered Equipment, or (ii) reperformance of the defective portion of the Work

(c) SIEMENS shall not be required to repair or replace more than the component(s) of the Equipment actually found to be defective. SIEMENS' warranty liability shall not exceed the purchase price of such component(s) Repaired or replaced Equipment will be warranted hereunder only for the remaining portion of the original warranty period.

6.3 THE EXPRESS LIMITED WARRANTIES PROVIDED ABOVE ARE IN LIEU OF AND EXCLUDE ALL OTHER WARRANTIES, STATUTORY, EXPRESS, OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, WHICH ARE HEREBY EXPRESSLY DISCLAIMED. SIEMENS MAKES NO WARRANTY, EXPRESS OR IMPLIED, THAT ANY EQUIPMENT PROVIDED HEREUNDER WILL PREVENT ANY LOSS, OR WILL IN ALL CASES PROVIDE THE PROTECTION FOR WHICH IT IS INSTALLED OR INTENDED. THE LIMITED EXPRESS WARRANTIES AND REPRESENTATIONS SET FORTH IN THIS AGREEMENT MAY ONLY BE MODIFIED OR SUPPLEMENTED IN A WRITING SIGNED BY A DULY AUTHORIZED CORPORATE OFFICER OF SIEMENS.

6.4 SIEMENS shall maintain the following insurance while performing the Work: Workers' Compensation Statutory
Employers' Liability $1,000,000 each accident
Commercial General Liability $1,000,000 per occurrence and
$5,000,000 in the aggregate
Automobile Liability $1,000,000 per occurrence/aggregate

6.5 Risk of loss of materials and Equipment furnished by SIEMENS shall pass to Customer upon delivery to Customer's premises, and Customer shall be responsible for protecting and insuring them against theft and damage.

6.6 ANYTHING HEREIN NOTWITHSTANDING, IN NO EVENT SHALL SIEMENS BE RESPONSIBLE UNDER THIS AGREEMENT FOR INCIDENTAL, CONSEQUENTIAL, PUNITIVE, EXEMPLARY OR SPECIAL DAMAGES, INCLUDING WITHOUT LIMITATION LOST PROFITS, LOSS OF USE AND/OR LOST BUSINESS OPPORTUNITIES, WHETHER ARISING IN WARRANTY, LATE OR NON-DELIVERY OF ANY WORK, TORT, CONTRACT OR STRICT LIABILITY, AND REGARDLESS OF WHETHER CUSTOMERHAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES AND, IN ANY EVENT, SIEMENS' AGGREGATE LIABILITY FOR ANY AND ALL CLAIMS, LOSSES OR EXPENSES (INCLUDING ATTORNEYS FEES) ARISING OUT OF THIS AGREEMENT, OR OUT OF ANY WORK FURNISHED UNDER THIS AGREEMENT, WHETHER BASED IN CONTRACT, NEGLIGENCE, STRICT LIABILITY, AGENCY, WARRANTY, TRESPASS, INDEMNITY OR ANY OTHER THEORY OF LIABILITY, SHALL BE LIMITED TO THE LESSER OF $1,000,000 OR THE TOTAL COMPENSATION RECEIVED BY SIEMENS FROM CUSTOMERUNDER THIS AGREEMENT. SIEMENS reserves the right to control the defense and settlement of any claim for which SIEMENS has an obligation to indemnify hereunder. The parties acknowledge that the price which SIEMENS has agreed to perform its Work and obligations under this Agreement is calculated based upon the foregoing limitations of liability, and that SIEMENS has expressly relied on, and would not have entered into this Agreement but for such limitations of liability.

6.7 It is understood and agreed by and between the parties that SIEMENS is not an insurer and this Agreement is not intended to be an insurance policy or a substitute for an insurance policy. Insurance, if any, shall be obtained by Customer. Fees are based solely upon the value of the Work, and are unrelated to the value of Customer's property or the property of others on Customer's premises.

Article 7: Hazardous Materials Provisions

7.1 The Work does not include directly or indirectly performing or arranging for the detection, monitoring, handling, storage, removal, transportation, disposal or treatment of Oil or Hazardous Materials. Except as disclosed pursuant to Section 7.3, Customer represents that there is no asbestos or any other hazardous or toxic materials, as defined in the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended, the regulations promulgated thereunder, and other applicable federal, state or local law ("Hazardous Materials"), present at Customer's locations where Work is performed. SIEMENS will notify Customer immediately if it discovers or suspects the presence of any Hazardous Material. All Work has been priced and agreed to by SIEMENS in reliance on Customer's representations as set forth in this Section 7.1 The presence of Hazardous Materials constitutes a change in the Proposed Solution equivalent to a change

order whose terms must be agreed to by SIEMENS before its obligations hereunder will continue.

7.2 Customer shall be solely responsible for testing, abating, encapsulating, removing, remedying or neutralizing such Hazardous Materials, and for the costs thereof. Even if an appropriate change order has been entered into pursuant to Section 7.1 above, SIEMENS will continue to have the right to stop the Work until the job site is free from Hazardous Materials. In such event, SIEMENS will receive an equitable extension of time to complete its Work, and compensation for delays caused by Hazardous Materials remediation. In no event shall SIEMENS be required or construed to take title, ownership or responsibility for such Oil or Hazardous Materials. Customer shall sign any required waste manifests in conformance with all government regulations, listing Customer as the generator of the waste.

7.3 Customer warrants that, prior to the execution of the Agreement, it has notified SIEMENS in writing of any and all Hazardous Materials present, potentially present or likely to become present at Customer's locations and has provided a copy of any jobsite safety policies, including but not limited to lock-out and tag procedures, laboratory procedures, chemical hygiene plan, material safety data sheets or other items covered or required to be disclosed or maintained by federal, state, or local laws, regulations or ordinances.

7.4 For separate consideration of $10 and other good and valuable consideration, the receipt and adequacy of which are hereby acknowledge, Customer shall indemnify, defend and hold SIEMENS harmless from and against any damages, losses, costs, liabilities or expenses (including attorneys' fees) arising out of any Oil or Hazardous Materials or from Customer's breach of, or failure to perform its obligations under, Sections 7.1, 7.2 or 7.3.

Article 8: Import / Export Indemnity

8.1 Customer acknowledges that SIEMENS is required to comply with applicable export laws and regulations relating to the sale, exportation, transfer, assignment, disposal and usage of the Work or Equipment or Services provided under the Contract, including any export license requirements. Customer agrees that such Work or Equipment or Services shall not at any time directly or indirectly be used, exported, sold, transferred, assigned or otherwise disposed of in a manner which will result in non-compliance with such applicable export laws and regulations. It shall be a condition of the continuing performance by SIEMENS of its obligations hereunder that compliance with such export laws and regulations be maintained at all times. CUSTOMERAGREES TO INDEMNIFY AND HOLD SIEMENS HARMLESS FROM ANY AND ALL COSTS, LIABILITIES, PENALTIES, SANCTIONS AND FINES RELATED TO NON-COMPLIANCE WITH APPLICABLE EXPORT LAWS AND REGULATIONS