UVU PERFORMING ARTS COMPLEX

PROGRAMMING DOCUMENT
December 20, 2015

METHODstudio INC. + ARUP

06 appendices

EXIST BUILDINGS TO BE REMOVED

APPROXIMATE LIMITS OF DEMOLITION. REMOVE ALL PAVING, CONCRETE WALKS, CURBS, STAIRS, RAMPS, ETC. WITHIN LIMITS

REMOVE EXIST 8" SANITARY SEWER LINE

ELECTRICAL SERVICES TO BE MODIFIED/RELOCATED

REMOVE EXIST FIRE HYDRANT

COMMUNICATION LINES TO BE REMOVED

REROUTE ±415 L.F. EXIST 8" WATER LINE

REMOVE ±345 L.F. EXIST IRRIGATION LINE

REMOVE EXIST 8" SANITARY SEWER LINE

REMOVE STORM DRAIN PIPING AND BOXES WITHIN LIMITS OF DEMOLITION

ELECTRICAL SERVICES TO BE MODIFIED/RELOCATED

EXISTING UTILITIES TO REMAIN

EXISTING BUILDING

NORTH

HORIZONTAL GRAPHIC SCALE

50 0 25 50 100

(IN FEET)
HORZ: 1 inch = 50 ft.

LEGEND

- EXISTING FIRE HYDRANT
- EXISTING SANITARY SEWER MANHOLE
- EXISTING LIGHT
- ss — EXISTING SANITARY SEWER
- w — EXISTING CULINARY WATER LINE
- e — EXISTING ELECTRICAL LINE
- c — EXISTING COMMUNICATIONS LINE
- irr — EXISTING IRRIGATION LINE

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ART CENTER
UTAH VALLEY UNIVERSITY
OREM, UTAH

DEMOLITION PLAN
PROGRAMMING

PROJECT # 6756
DATE 11/12/15
DRAWN BY B. PAGE
PROJECT MANAGER K. MORGAN

C-1

EXIST BUILDINGS TO BE REMOVED

PROPOSED FIRE HYDRANT

CONNECT TO EXIST IRRIGATION LINE

RE-ROUTE COMMUNICATION LINES

PROPOSED FIRE HYDRANT

PROPOSED ±720 L.F., 8" WATER LINE

PROPOSED ±815 L.F., IRRIGATION LINE

CONNECT TO EXIST 8" WATER LINE

CONNECT TO EXIST IRRIGATION LINE

PROPOSED BUILDING AREA

CONNECT NEW SEWER SERVICE TO EXISTING LINE AND MANHOLE

CONNECT TO EXIST IRRIGATION LINE

WATER AND FIRE PROTECTION LINES TO BUILDING

CONNECT TO EXIST 8" WATER LINE

EXIST FIRE HYDRANT

EXISTING BUILDING

HORIZONTAL GRAPHIC SCALE

50 0 25 50 100

(IN FEET)
HORZ: 1 inch = 50 ft.

LEGEND

	EXISTING FIRE HYDRANT
	PROPOSED FIRE HYDRANT
	EXISTING SANITARY SEWER MANHOLE
	PROPOSED SANITARY SEWER MANHOLE
	EXISTING LIGHT
SS	EXISTING SANITARY SEWER
SS	PROPOSED SANITARY SEWER LINE
W	EXISTING CULINARY WATER LINE
W	PROPOSED CULINARY WATER LINE
e	EXISTING ELECTRICAL LINE
C	PROPOSED COMMUNICATIONS LINE
IRR	PROPOSED IRRIGATION LINE

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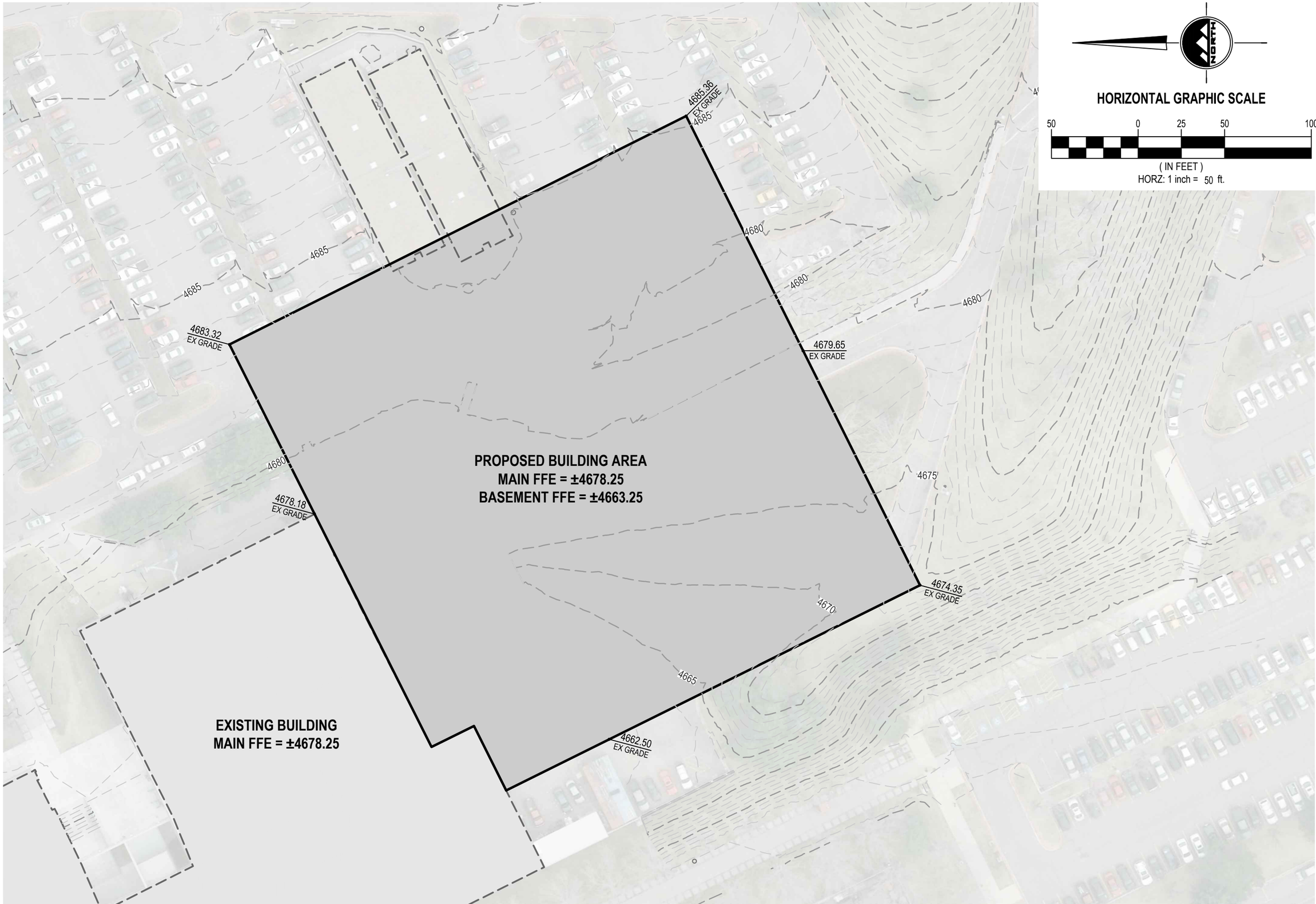
UTILITY PLAN
PROGRAMMING

PROJECT # 6756
DATE 11/12/15
DRAWN BY B. PAGE
PROJECT MANAGER K. MORGAN

C-2



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UTAH VALLEY UNIVERSITY
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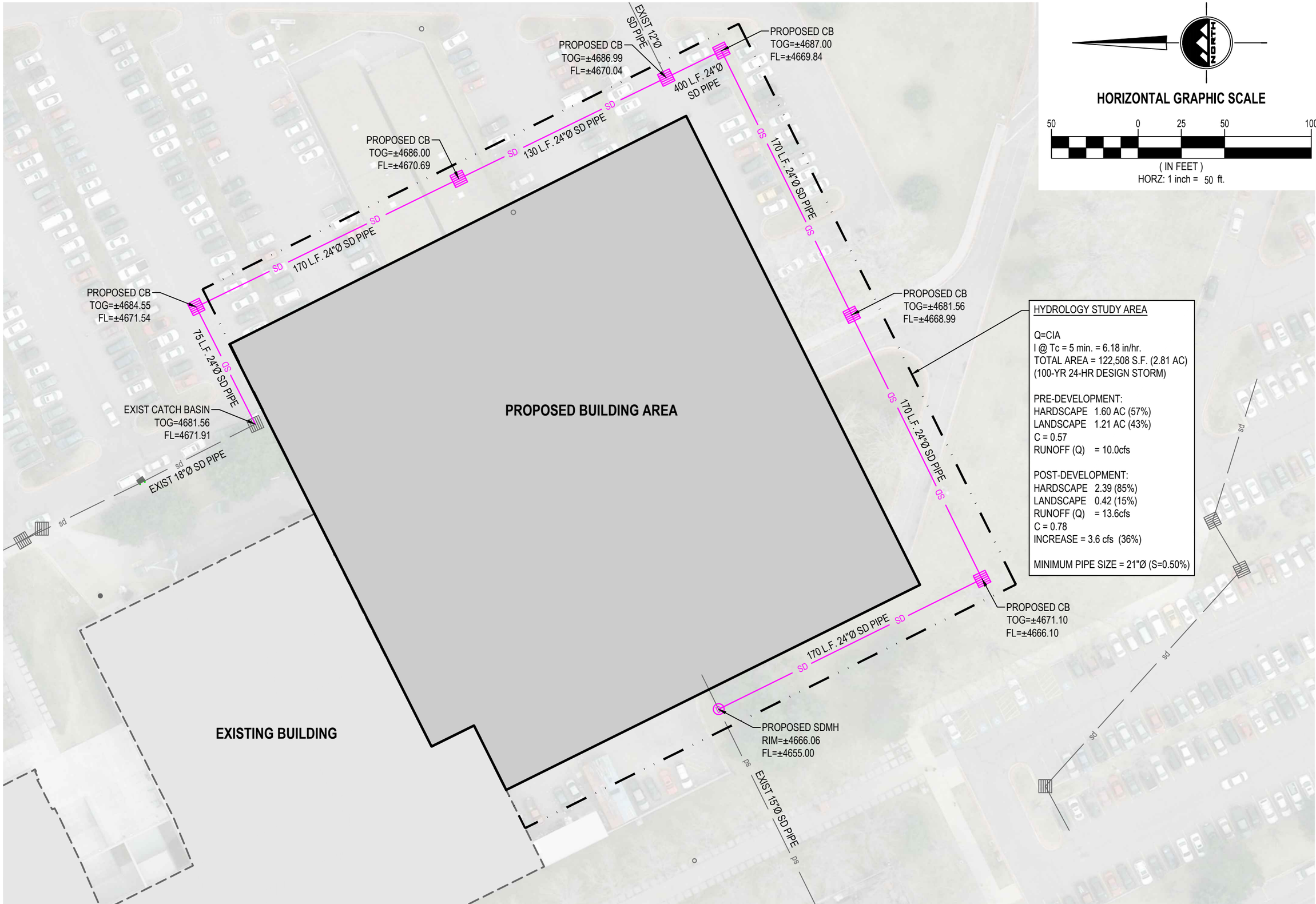
GRADING PLAN
PROGRAMMING

PROJECT #
6756
DATE
11/4/15
DRAWN BY
B. PAGE
PROJECT MANAGER
K. MORGAN

C-3



HYDROLOGY STUDY AREA

Q=CIA
I @ Tc = 5 min. = 6.18 in/hr.
TOTAL AREA = 122,508 S.F. (2.81 AC)
(100-YR 24-HR DESIGN STORM)

PRE-DEVELOPMENT:
HARDSCAPE 1.60 AC (57%)
LANDSCAPE 1.21 AC (43%)
C = 0.57
RUNOFF (Q) = 10.0cfs

POST-DEVELOPMENT:
HARDSCAPE 2.39 (85%)
LANDSCAPE 0.42 (15%)
RUNOFF (Q) = 13.6cfs
C = 0.78
INCREASE = 3.6 cfs (36%)

MINIMUM PIPE SIZE = 21"Ø (S=0.50%)

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UTAH VALLEY UNIVERSITY
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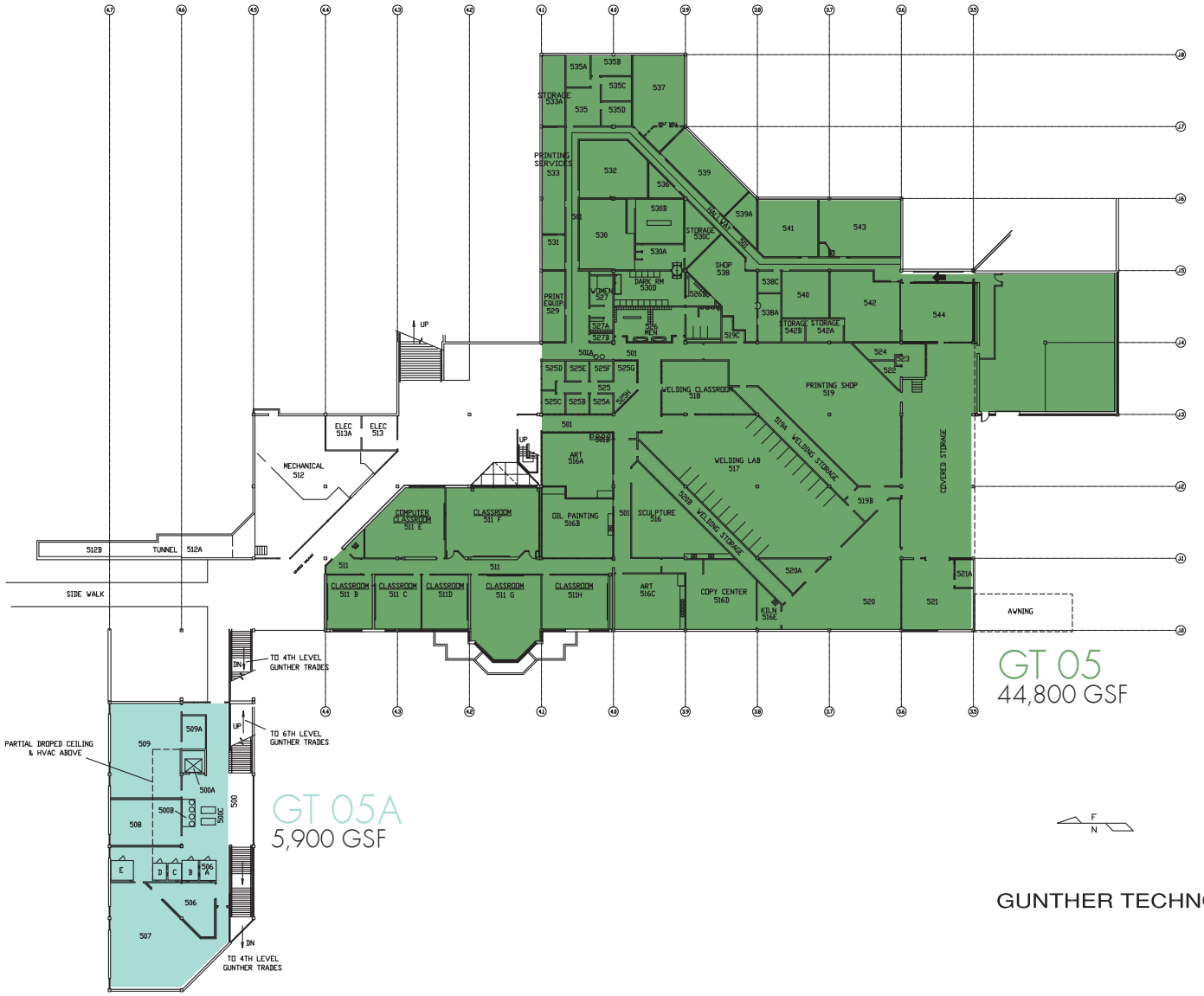
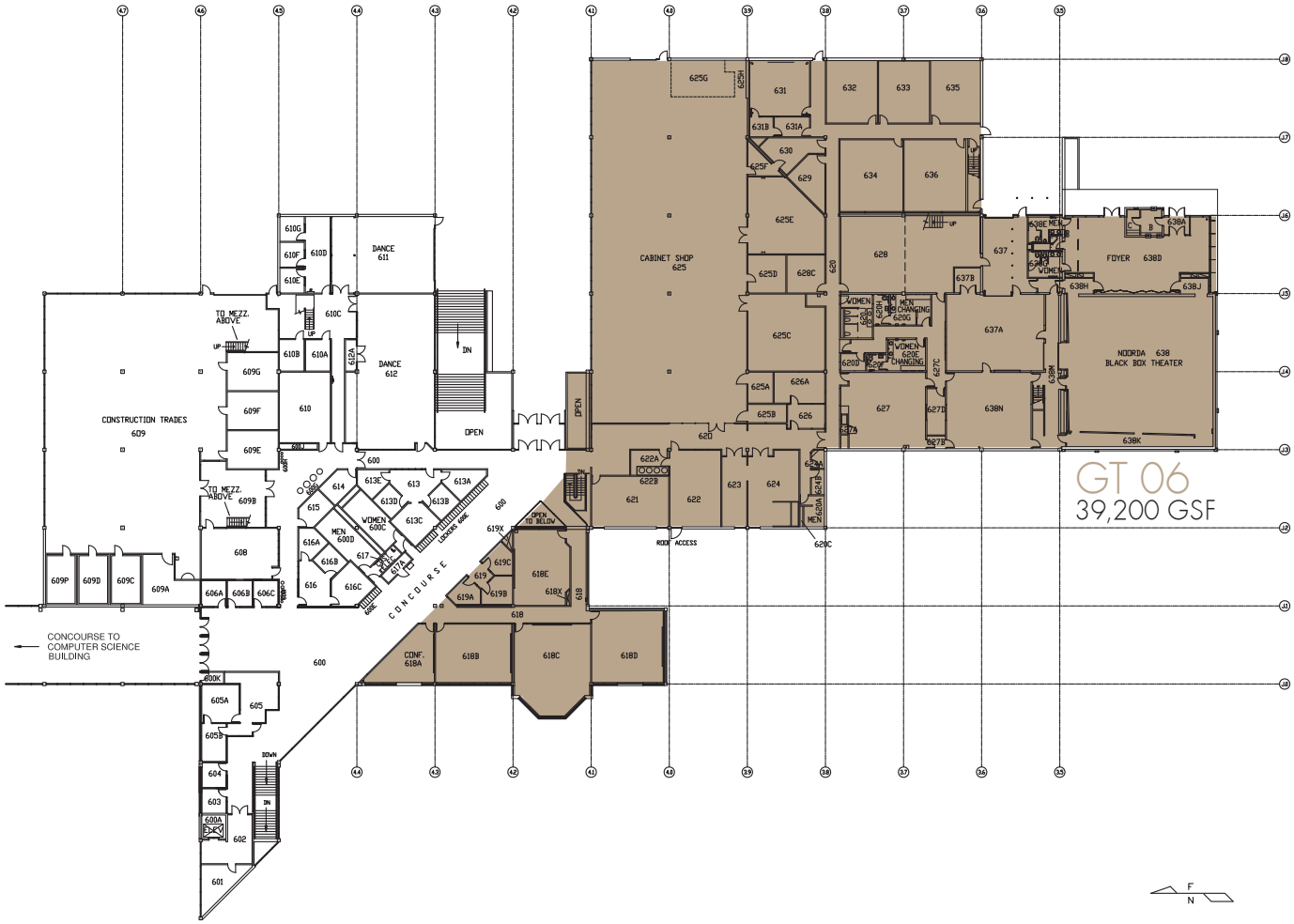
DRAINAGE PLAN
PROGRAMMING

PROJECT # 6756
DATE 11/4/15
DRAWN BY B. PAGE
PROJECT MANAGER K. MORGAN

C-3

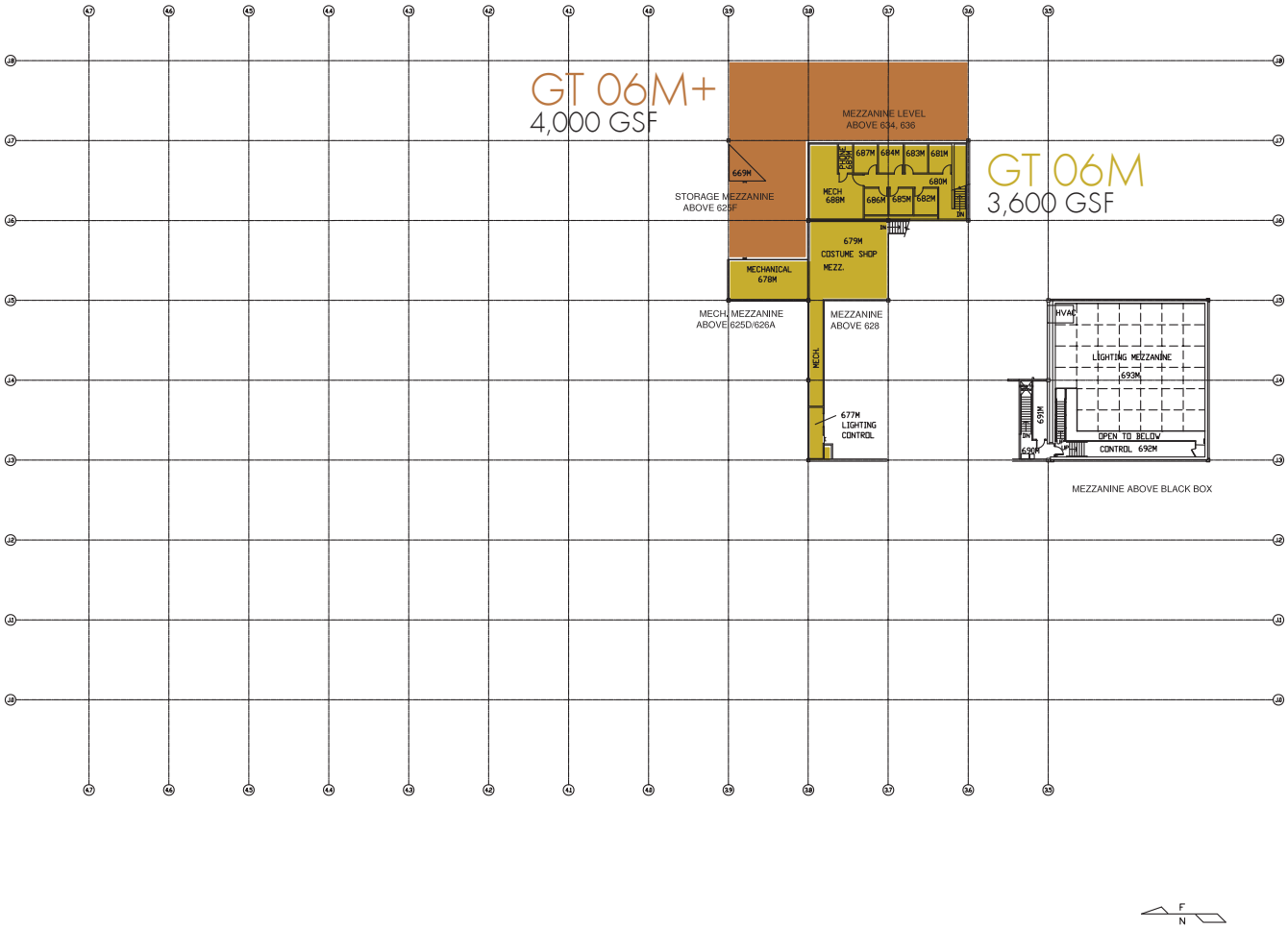


METHODstudio INC. + ARUP



LEVEL 06

GUNTHER TECHNOLOGY



LEVEL 06 MEZZ.

GUNTHER TECHNOLOGY

METHODstudio INC. + ARUP

GT 05
44,800 GSF

GT 05A
5,900 GSF

GT 06
39,200 GSF

GT 06M
3,600 GSF

GT 06M+
4,000 GSF

GUNTHER TECHNOLOGY TOTAL =

97,500 GSF

C| costume shops - separate remodel project

COSTUME SHOP - 7001

1000 SQ FT

SPACE REQUIREMENTS

- **SPACE SUMMARY**
  TYPE OF SPACE: INSTRUCTION

  TOTAL NUMBER: 1

  OCCUPANTS: 10-15

  PRIMARY FUNCTION:
  PATTERNING, DRAPING, CUTTING, ASSEMBLY, MACHINE SEWING, IRONING OF COSTUMES IN THEIR VARIOUS WORK FLOW PHASES

- **RELATIONSHIPS**
  LOCATION:
  COSTUME SHOP REMODEL

  ADJACENCIES:
  FITTING ROOMS, SMALL STORAGE, LAUNDRY/DYEING ROOM, OFFICE, COSTUME SEWING CLASSROOM/LAB

  SEPARATION:
  N/A

- **DESIGN/AESTHETIC:**
  COMFORTABLE, CLEAN, DURABLE

- **PRIVACY/SECURITY:**
  KEY LOCK ENTRY

ARCHITECTURAL REQUIREMENTS

- **CEILING HEIGHT ABOVE FF:** 10'-0" - 15'-0"

- **FINISHES**
  FLOOR:
  SEALED CONCRETE OR VINYL (EASY TO CLEAN)

  WALLS:
  PAINTED GYPSUM BOARD

  CEILING:
  EXPOSED PAINTED

  SPECIALTY FINISHES:
  NONE

  ACOUSTICAL / SOUND:
  NC 40

- **DOORS**
  TYPE:
  3'-6" DOOR, SOLID CORE WOOD WITH VISION PANEL + CLEAR FINISH

  FRAME:
  PAINTED HOLLOW METAL

  SPECIAL:
  NONE

- **WINDOWS**
  TYPE:
  EXTERIOR , LOW E

  GLAZING:
  RATED, TO PUBLIC SPACES TO SHOW SHOP ACTIVITY

  NATURAL LIGHT:
  DESIRED

  FRAME:
  ALUMINUM

  SPECIAL:
  NONE

TECHNICAL REQUIREMENTS

- **MECHANICAL**
  OCCUPIED TEMP: COOLING TO 72 F/HEATING TO 74F

  UNOCCUPIED TEMP: COOLING TO 85 F/ HEATING TO 55 F

  VENTILATION:
  OVERHEAD VAV BOX W/ DUCT-MOUNTED REHEAT COIL, SUPPLY DIFFUSERS IN OH EXPOSED DUCTWORK, RETURN GRILLE IN OH TRANSFER DUCT THROUGH WALL

  CONTROLS:
  DEDICATED TEMPERATURE CONTROL ZONE W/ TEMP. SENSOR

  SPECIAL SYSTEMS:
  NONE

  PLUMBING:
  COUNTER SINK W/ FAUCET

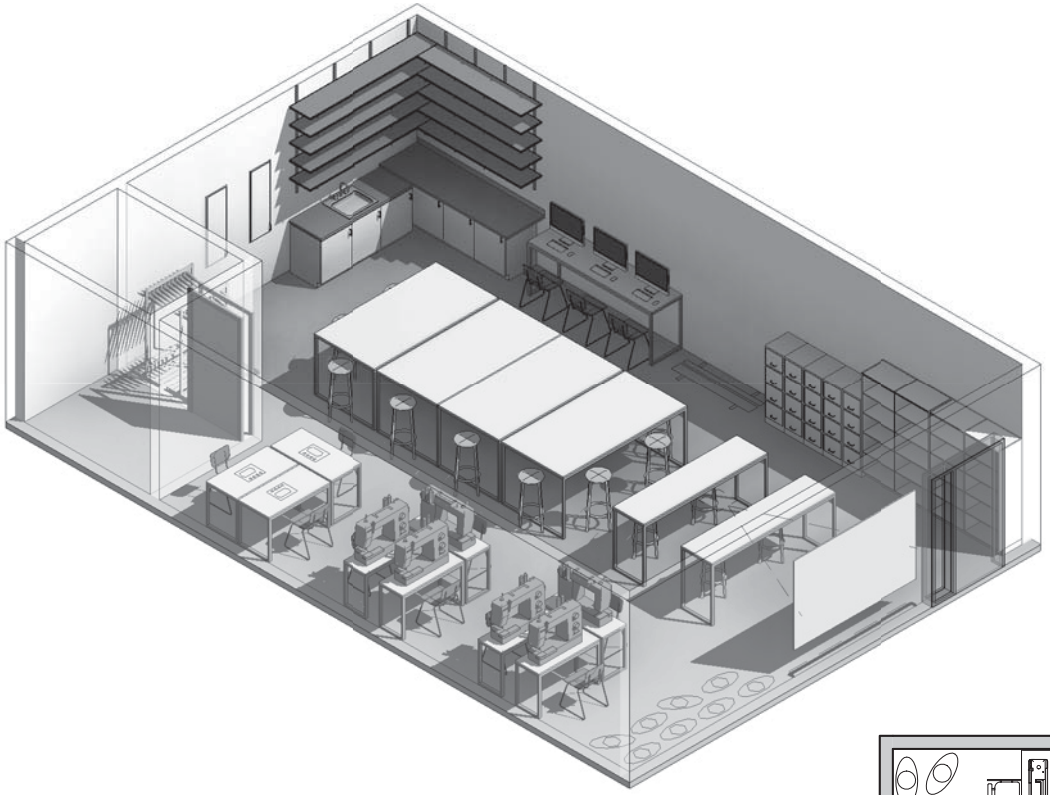
- **ELECTRICAL**
  POWER:
  MULTIPLE 20A AC OUTLETS

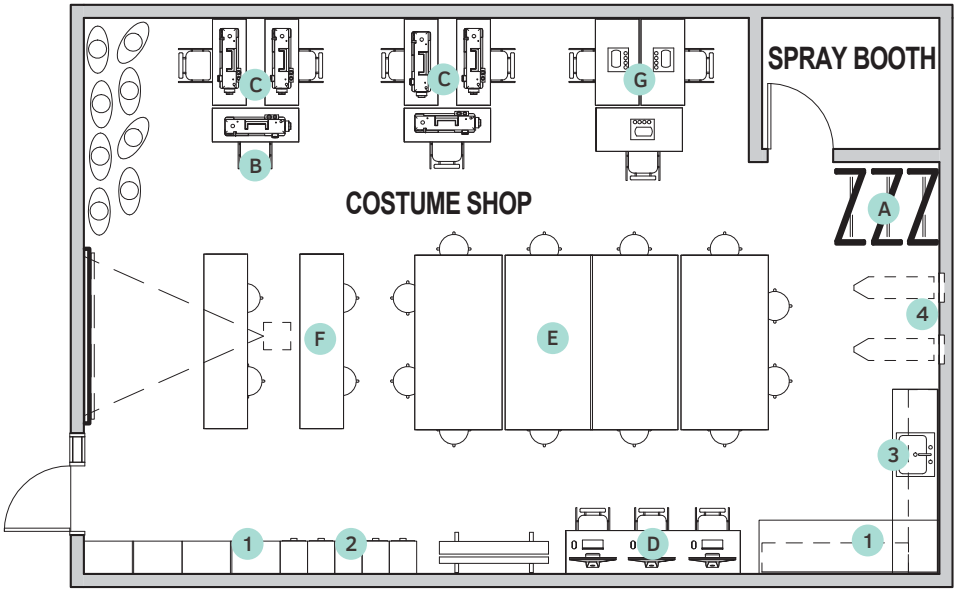
  PHONE/DATA:
  STANDARD CLASSROOM ENVIRONMENT, SEE CAMPUS IT SPEC.

  AUDIO/VIDEO:
  STANDARD CLASSROOM ENVIRONMENT, SEE CAMPUS A/V SPEC.

- **LIGHTING**
  FOOT CANDLES:
  40
  FIXTURE TYPE:
  T-5 FLOURESCENT CHAIN HUNG

  TASK LIGHTING:
  TASK LIGHTING AT WORK SURFACES
  CONTROLS:
  VACANCY SENSOR W/ MANUAL CONTROL





CASEWORK/FIXED EQUIPMENT:

1. SHELVING/STORAGE
2. STORAGE UNIT
3. SINK AND COUNTER WITH CUPBOARDS
4. MIRROR WALL

MOVEABLE FURNISHINGS + EQUIPMENT:

- A ROLLING COSTUME RACK
- B TASK CHAIR
- C COMMERCIAL SEWING MACHINE (6-8)
- D COMPUTER
- E 4X8 COUNTER HIGH WORK TABLES (4)
- F 2 X 8 WORK TABLES (2)
- G SERGERS, IRONS, GROMMET MACHINE

COSTUME SEWING CLASSROOM - 7001-A

740 SQ FT

SPACE REQUIREMENTS

- **SPACE SUMMARY** I
  TYPE OF SPACE: INSTRUCTION

  TOTAL NUMBER: 1

  OCCUPANTS: 15

  PRIMARY FUNCTION:
  TEACHNG SEWING CLASSES + COSTUME SHOP PRODUCTION

- **RELATIONSHIPS**
  LOCATION:
  COSTUME SHOP REMODEL

  ADJACENCIES:
  FITTING ROOMS, SM. STORAGE, LAUNDRY/DYEING ROOM, OFFICE, COSTUME SEWING CLASSROOM/LAB

  SEPARATION:
  N/A

- **DESIGN/AESTHETIC:**
  COMFORTABLE, CLEAN, DURABLE

- **PRIVACY/SECURITY:**
  KEY LOCK ENTRY

ARCHITECTURAL REQUIREMENTS

- **CEILING HEIGHT ABOVE FF:** 10'-0" - 15'-0"

- **FINISHES**
  FLOOR:
  CEMENT OR VINYL (EASY TO CLEAN)

  WALLS:
  PAINTED GYPSUM BOARD

  CEILING:
  PAINTED GYPSUM BOARD

  SPECIALTY FINISHES:
  NONE

  ACOUSTICAL / SOUND:
  NC 30

- **DOORS**
  TYPE:
  3'-6" DOOR, SOLID CORE WOOD WITH VISION PANEL + CLEAR FINISH

  FRAME:
  PAINTED HOLLOW METAL

  SPECIAL:
  NONE

- **WINDOWS**
  TYPE:
  EXTERIOR WITH

  GLAZING:
  LOW E GLAZING

  NATURAL LIGHT:
  DESIRED

  FRAME:
  ALUMINUM

  SPECIAL:
  YES

TECHNICAL REQUIREMENTS

- **MECHANICAL**
  OCCUPIED TEMP: COOLING TO 72 F/HEATING TO 74F

  UNOCCUPIED TEMP: COOLING TO 85 F/ HEATING TO 55 F

  VENTILATION:
  OVERHEAD VAV BOX W/ DUCT-MOUNTED REHEAT COIL, SUPPLY DIFFUSERS IN OH EXPOSED DUCTWORK, RETURN GRILLE IN OH TRANSFER DUCT THRU WALL

  CONTROLS:
  DEDICATED TEMPERATURE CONTROL ZONE W/ TEMP. SENSOR

  SPECIAL SYSTEMS:
  NONE

  PLUMBING:
  COUNTER SINK W/ FAUCET

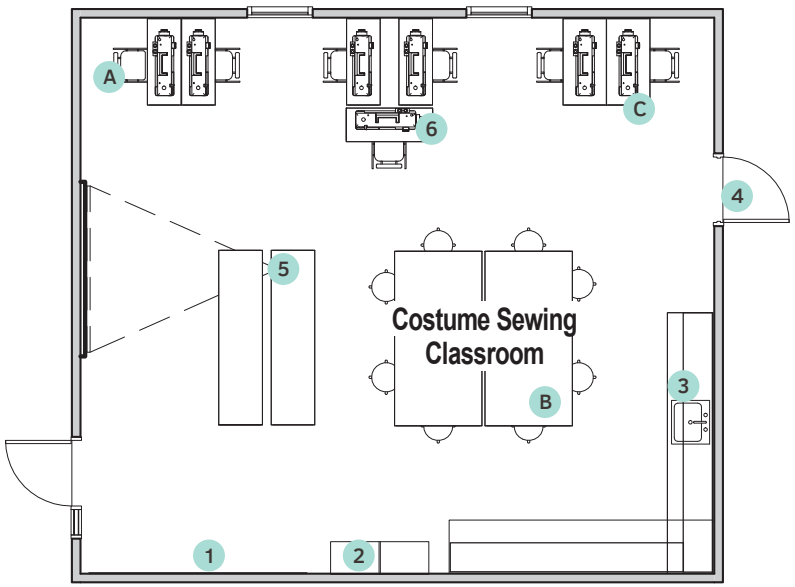
- **ELECTRICAL**
  POWER:
  DROP DOWN ELECTRIC OR FLOOR CONNECTION FOR MACHINES. ELECTRICAL OUTLETS AT COUNTERS.

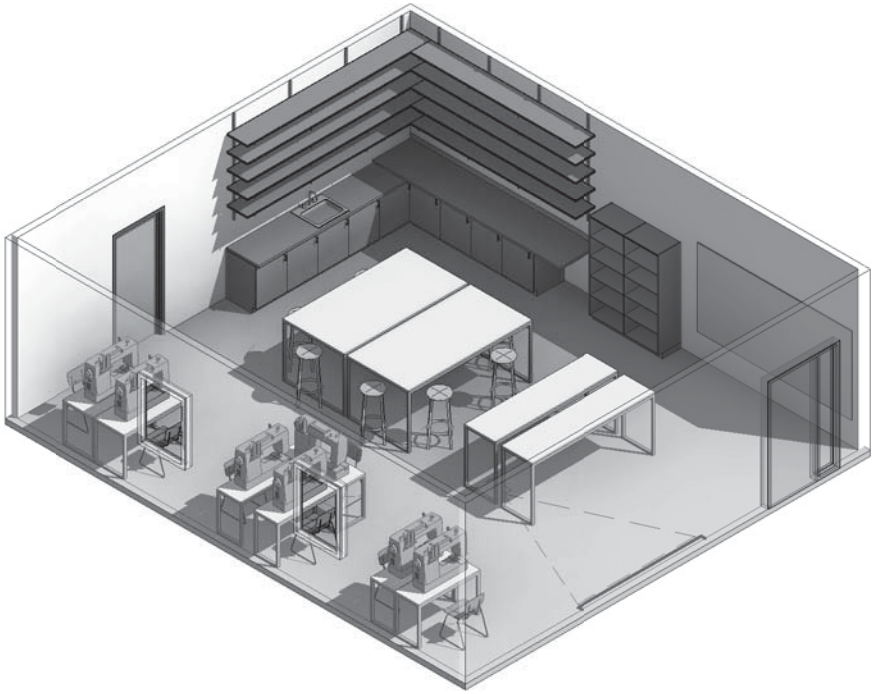
  PHONE/DATA:
  UVU CLASSROOM, SEE CAMPUS IT SPEC.

  AUDIO/VIDEO:
  UVU CLASSROOM, SEE CAMPUS A/V SPEC., W/ DOCUMENT CAMERA ON SEWING MACHINE

- **LIGHTING**
  FOOT CANDLES:
  40
  FIXTURE TYPE:
  T-5 FLUORESCENT CHAINHUNG

  TASK LIGHTING:
  TASK LIGHTING AT WORK SURFACES
  CONTROLS:
  VACANCY SENSOR W/ MANUAL CONTROL





CASEWORK/FIXED EQUIPMENT:

1. PAINT + TACK BOARDS
2. STORAGE UNIT
3. SINK, COUNTER + CUPBOARDS
4. DOOR INTO ADJACENT SMART CLASSROOM
5. PROJECTOR + SCREEN
6. CAMERA ON INSTRUCTOR'S MACHINE

MOVEABLE FURNISHINGS + EQUIPMENT:

- A TASK CHAIR
- B 4X8 WORK TABLES (2)
- C SEWING MACHINE CONSOLES W/CHAIRS (7)

DESIGN WING SMART CLASSROOM - 7001-B

400 SQ FT

SPACE REQUIREMENTS

- **SPACE SUMMARY**
  TYPE OF SPACE: INSTRUCTION

  TOTAL NUMBER: 1

  OCCUPANTS: 15

  PRIMARY FUNCTION:
  COURSE INSTRUCTION IN THEATER DESIGN CLASSES

- **RELATIONSHIPS**
  LOCATION:
  THEATRE REMODEL

  ADJACENCIES:
  COSTUME SEWING CLASSROOM 7001-A + LIGHTING CLASSROOM 7001-C

  SEPARATION:
  NONE

- **DESIGN/AESTHETIC:**
  FLEXIBLE TEACHING AREA WITH SMART CLASSROOM TECHNOLOGIES AND CREATIVE ENVIRONMENT

- **PRIVACY/SECURITY:**
  STANDARD CLASSROOM LOCKSET

ARCHITECTURAL REQUIREMENTS

- **CEILING HEIGHT ABOVE FF:** 10'-0"

- **FINISHES**
  FLOOR:
  SEALED CONCRETE OR VINYL (EASY TO CLEAN)

  WALLS:
  PAINTED GYPSUM BOARD

  CEILING:
  LAY-IN ACOUSTICAL

  SPECIALTY FINISHES:
  NONE

  ACOUSTICAL / SOUND:
  NC 30

- **DOORS**
  TYPE:
  3'-6" DOOR, SOLID CORE WOOD WITH VISION PANEL + CLEAR FINISH

  FRAME:
  PAINTED HOLLOW METAL

  SPECIAL:
  NONE

- **WINDOWS**
  TYPE:
  N/A

  GLAZING:
  N/A

  NATURAL LIGHT:
  NONE

  FRAME:
  NONE

  SPECIAL:
  NONE

TECHNICAL REQUIREMENTS

- **MECHANICAL**
  OCCUPIED TEMP: COOLING TO 72 F/HEATING TO 74F

  UNOCCUPIED TEMP: COOLING TO 85 F/ HEATING TO 55 F

  VENTILATION:
  OVERHEAD VAV BOX W/ DUCT-MOUNTED REHEAT COIL, SUPPLY DIFFUSERS IN CEILING, RETURN GRILLE IN CEILING, PLENUM RETURN

  CONTROLS:
  DEDICATED TEMPERATURE CONTROL ZONE W/ TEMP. SENSOR

  SPECIAL SYSTEMS:
  NONE

  PLUMBING:
  NONE

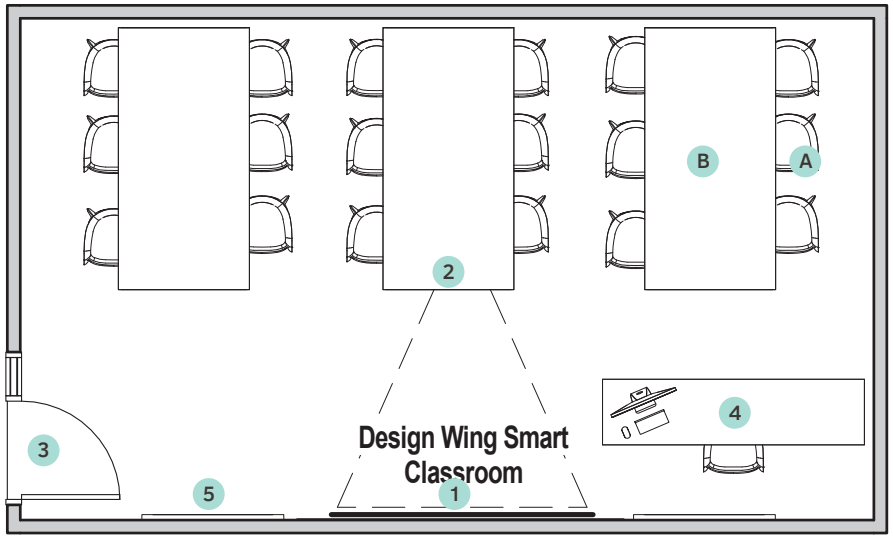
- **ELECTRICAL**
  POWER:
  MULTIPLE 20A AC OUTLETS

  PHONE/DATA:
  UVU CLASSROOM, SEE CAMPUS IT SPEC.

  AUDIO/VIDEO:
  UVU CLASSROOM, SEE CAMPUS A/V SPEC.

- **LIGHTING**
  FOOT CANDLES:
  40
  FIXTURE TYPE:
  T-5 FLUORESCENT CHAINHUNG

  TASK LIGHTING:
  TASK LIGHTING AT WORK SURFACES
  CONTROLS:
  VACANCY SENSOR W/ MANUAL CONTROL



CASEWORK/FIXED EQUIPMENT:

1. SCREEN
2. PROJECTOR
3. DOOR INTO ADJACENT COSTUME SEWING CLASSROOM
4. INSTRUCTOR COUNTER WITH COMPUTER + DOCUMENT CAMERA
5. PAINT + TASK BOARDS

MOVEABLE FURNISHINGS + EQUIPMENT:

A. TASK CHAIR/STOOLS
B. COUNTER HIGH WORK TABLE

LIGHTING DESIGN CLASSROOM - 7001 - C

430 SQ FT

SPACE REQUIREMENTS

- **SPACE SUMMARY**
  TYPE OF SPACE: INSTRUCTION

  TOTAL NUMBER: 1

  OCCUPANTS: 10

  PRIMARY FUNCTION:
  TO TEACH, DEMONSTRATE AND PRACTICE STAGE LIGHTING SKILLS

- **RELATIONSHIPS**
  LOCATION:
  GT REMODEL

  ADJACENCIES:
  DESIGN CLASSROOM 7001-B

  SEPARATION:
  N/A

- **DESIGN/AESTHETIC:**
  EMULATE THEATRE ENVIRONMENT SIMILAR TO BLACK BOX

- **PRIVACY/SECURITY:**
  KEYED LOCKS ON DOORS

ARCHITECTURAL REQUIREMENTS

- **CEILING HEIGHT ABOVE FF:** MIN 12'-0", IDEAL 17'-0"

- **FINISHES**
  FLOOR:
  CEMENT OR VINYL

  WALLS:
  PAINTED FLAT BLACK, GYPSUM BOARD

  CEILING:
  PAINTED FLAT BLACK, GYPSUM BOARD

  SPECIALTY FINISHES:
  N/A

  ACOUSTICAL / SOUND:
  N/A

- **DOORS**
  TYPE:
  3'-6" DOOR, SOLID CORE WOOD + CLEAR FINISH

  FRAME:
  PAINTED HOLLOW METAL

  SPECIAL:
  N/A

- **WINDOWS**
  TYPE:
  NONE

  GLAZING:
  N/A

  NATURAL LIGHT:
  N/A

  FRAME:
  N/A

  SPECIAL:
  N/A

TECHNICAL REQUIREMENTS

- **MECHANICAL**
  OCCUPIED TEMP: COOLING TO 72 F/HEATING TO 74F

  UNOCCUPIED TEMP: COOLING TO 85 F/ HEATING TO 55 F

  VENTILATION:
  OVERHEAD VAV BOX W/ DUCT-MOUNTED REHEAT COIL, SUPPLY DIFFUSERS IN CEILING, RETURN GRILLE IN CEILING, PLENUM RETURN

  CONTROLS:
  DEDICATED TEMPERATURE CONTROL ZONE W/ TEMP. SENSOR

  SPECIAL SYSTEMS:
  NONE

  PLUMBING:
  NONE

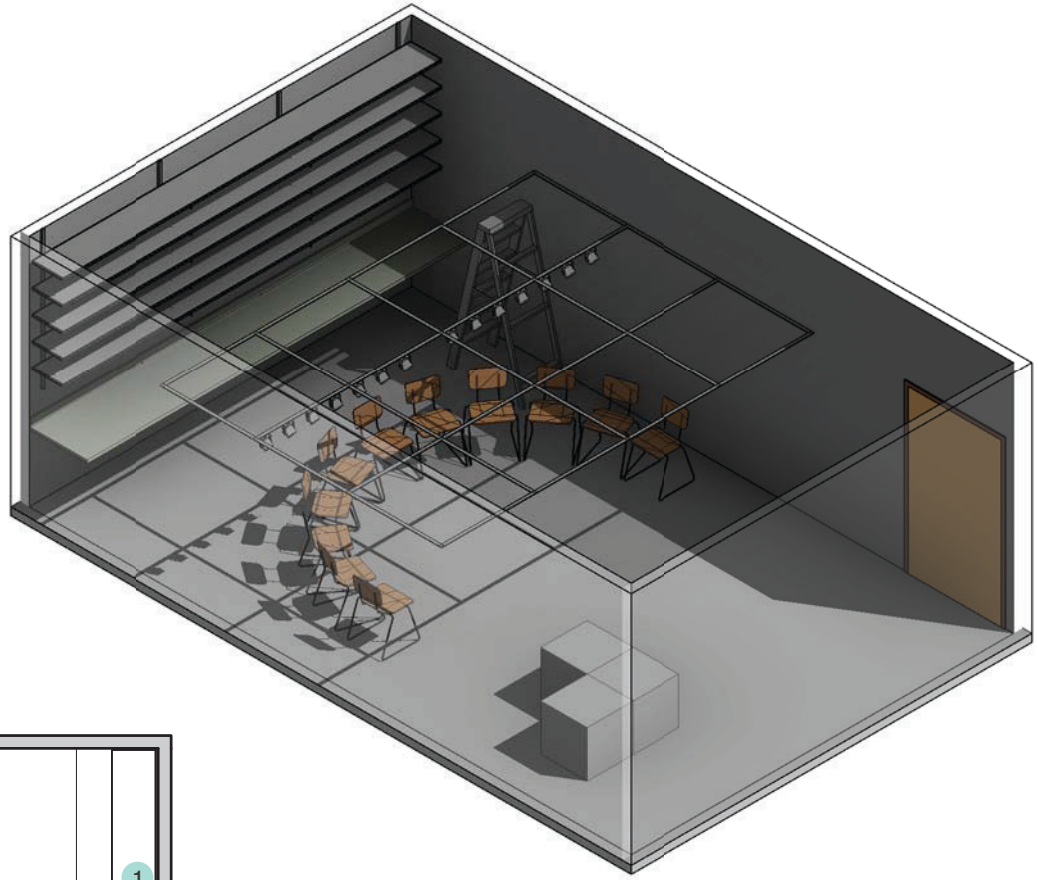
- **ELECTRICAL**
  POWER:
  WALL OUTLETS

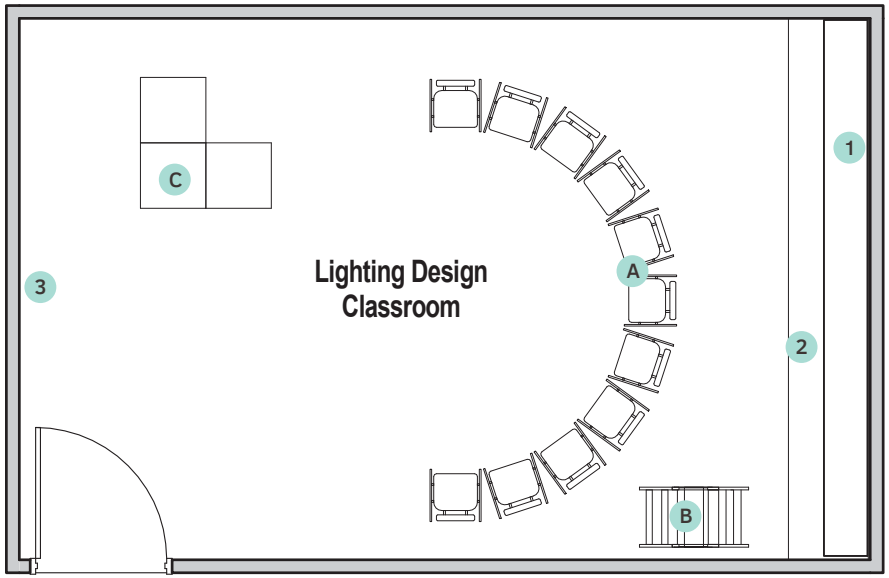
  PHONE/DATA:
  UVU CLASSROOM, SEE CAMPUS IT SPEC.

  AUDIO/VIDEO:
  UVU CLASSROOM, SEE CAMPUS A/V SPEC.

- **LIGHTING**
  FOOT CANDLES:
  40
  FIXTURE TYPE:
  T-5 FLUORESCENT CHAINHUNG

  TASK LIGHTING:
  TASK LIGHTING AT WORK SURFACES
  CONTROLS:
  VACANCY SENSOR W/ MANUAL CONTROL





CASEWORK/FIXED EQUIPMENT:

1. SHELVING
2. WORKING COUNTER
3. 4 X 4 GRID

MOVEABLE FURNISHINGS + EQUIPMENT:

- A TASK CHAIR
- B LADDER
- C ACTING BLOCKS

DESIGN WING SMART CLASSROOM - 7001 - D

400 SQ FT

SPACE REQUIREMENTS

- **SPACE SUMMARY**
  TYPE OF SPACE: INSTRUCTION

  TOTAL NUMBER: 1

  OCCUPANTS: 15

  PRIMARY FUNCTION:
  COURSE INSTRUCTION IN THEATER DESIGN CLASSES

- **RELATIONSHIPS**
  LOCATION:
  DESIGN CLASSROOM 7001-E

  ADJACENCIES:
  STANDARD CLASSROOM LOCKSET

  SEPARATION:
  N/A

- **DESIGN/AESTHETIC:**
  N/A

- **PRIVACY/SECURITY:**
  N/A

ARCHITECTURAL REQUIREMENTS

- **CEILING HEIGHT ABOVE FF:** 10'-0" - 15'-0"

- **FINISHES**
  FLOOR:
  CEMENT OR VINYL (EASY TO CLEAN)

  WALLS:
  LAY-IN

  CEILING:
  N/A

  SPECIALTY FINISHES:
  N/A

  ACOUSTICAL / SOUND:
  NC 40

- **DOORS**
  TYPE:
  3'-6" DOOR, SOLID CORE WOOD WITH VISION PANEL + CLEAR FINISH

  FRAME:
  PAINTED HOLLOW METAL

  SPECIAL:
  N/A

- **WINDOWS**
  TYPE:
  NONE

  GLAZING:
  NONE

  NATURAL LIGHT:
  NONE

  FRAME:
  NONE

  SPECIAL:
  NONE

TECHNICAL REQUIREMENTS

- **MECHANICAL**
  OCCUPIED TEMP: COOLING TO 72 F/HEATING TO 74F

  UNOCCUPIED TEMP: COOLING TO 85 F/ HEATING TO 55 F

  VENTILATION:
  OVERHEAD VAV BOX W/ DUCT-MOUNTED REHEAT COIL, SUPPLY DIFFUSERS IN CEILING, RETURN GRILLE IN CEILING, PLENUM RETURN

  CONTROLS:
  DEDICATED TEMPERATURE CONTROL ZONE W/ TEMP. SENSOR

  SPECIAL SYSTEMS:
  NONE

  PLUMBING:
  NONE

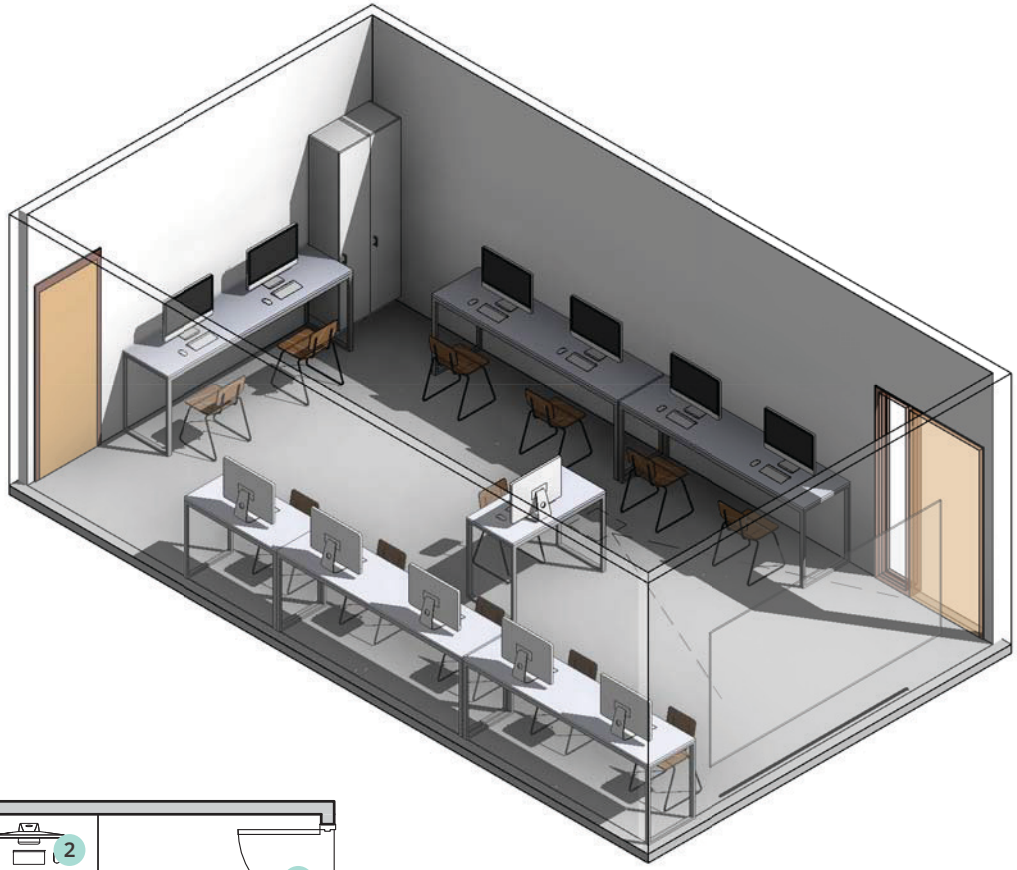
- **ELECTRICAL**
  POWER:
  MULTIPLE 20A AC OUTLETS

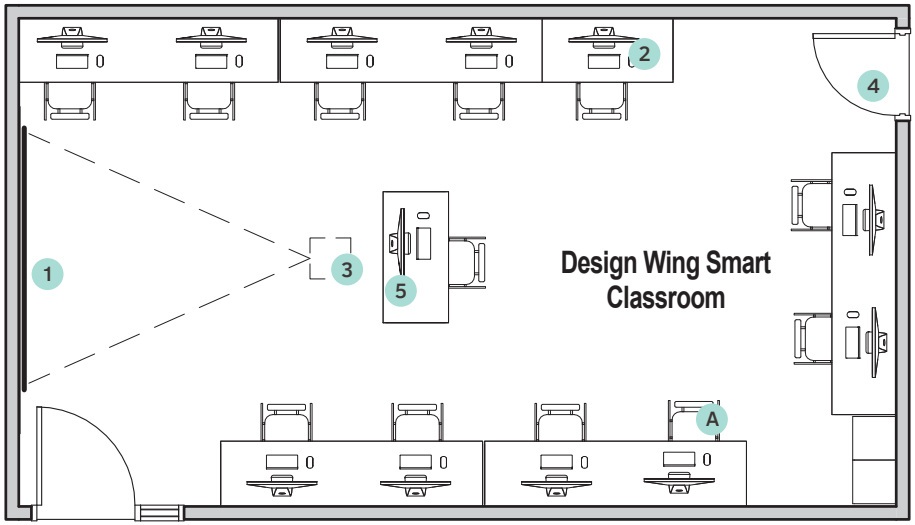
  PHONE/DATA:
  UVU CLASSROOM, SEE CAMPUS IT SPEC.

  AUDIO/VIDEO:
  UVU CLASSROOM, SEE CAMPUS A/V SPEC.

- **LIGHTING**
  FOOT CANDLES:
  40
  FIXTURE TYPE:
  T-5 FLUORESCENT LAY-IN

  TASK LIGHTING:
  N/A
  CONTROLS:
  VACANCY SENSOR W/ MANUAL CONTROL





CASEWORK/FIXED EQUIPMENT:

1. TACK BOARD
2. COMPUTER MONITORS
3. PROJECTOR
4. DOOR ADJACENT CLASSROOM
5. INSTRUCTOR COUNTER W/ COMPUTER + DOCUMENT CAMERA

MOVEABLE FURNISHINGS + EQUIPMENT:

A TASK CHAIR

DESIGN CLASSROOM - 7001 - E

740 SQ FT

SPACE REQUIREMENTS

- **SPACE SUMMARY**
  TYPE OF SPACE: INSTRUCTION

  TOTAL NUMBER: 1

  OCCUPANTS: 15

  PRIMARY FUNCTION:
  COURSE INSTRUCTION IN THEATER DESIGN CLASSES

- **RELATIONSHIPS**
  LOCATION:
  7001-A, 7001-C, AND 7001-D

  ADJACENCIES:
  NONE

  SEPARATION:
  N/A

- **DESIGN/AESTHETIC:**
  N/A

- **PRIVACY/SECURITY:**
  STANDARD CLASSROOM LOCKSET

ARCHITECTURAL REQUIREMENTS

- **CEILING HEIGHT ABOVE FF:** 10'-0" - 15'-0"

- **FINISHES**
  FLOOR:
  10'-0" - 15'-0"

  WALLS:
  CEMENT OR VINYL (EASY TO CLEAN)

  CEILING:
  PAINTED GYPSUM BOARD

  SPECIALTY FINISHES:
  LAY-IN

  ACOUSTICAL / SOUND:
  N/A

- **DOORS**
  TYPE:
  BI-FOLD ACCORDION DOOR INTO SMART CLASSROOM (NOTE: WE RECOMMEND USING A NORMAL DOOR INSTEAD OF AN ACCORDION DOOR)
  FRAME:
  PAINTED HOLLOW METAL

  SPECIAL:
  N/A

- **WINDOWS**
  TYPE:
  N/A

  GLAZING:
  N/A

  NATURAL LIGHT:
  N/A

  FRAME:
  N/A

  SPECIAL:
  N/A

TECHNICAL REQUIREMENTS

- **MECHANICAL**
  OCCUPIED TEMP: COOLING TO 72 F/HEATING TO 74F

  UNOCCUPIED TEMP: COOLING TO 85 F/ HEATING TO 55 F

  VENTILATION:
  OVERHEAD VAV BOX W/ DUCT-MOUNTED REHEAT COIL, SUPPLY DIFFUSERS IN CEILING, RETURN GRILLE IN CEILING, PLENUM RETURN

  CONTROLS:
  DEDICATED TEMPERATURE CONTROL ZONE W/ TEMP. SENSOR

  SPECIAL SYSTEMS:
  NONE

  PLUMBING:
  COUNTER SINK W/ FAUCET

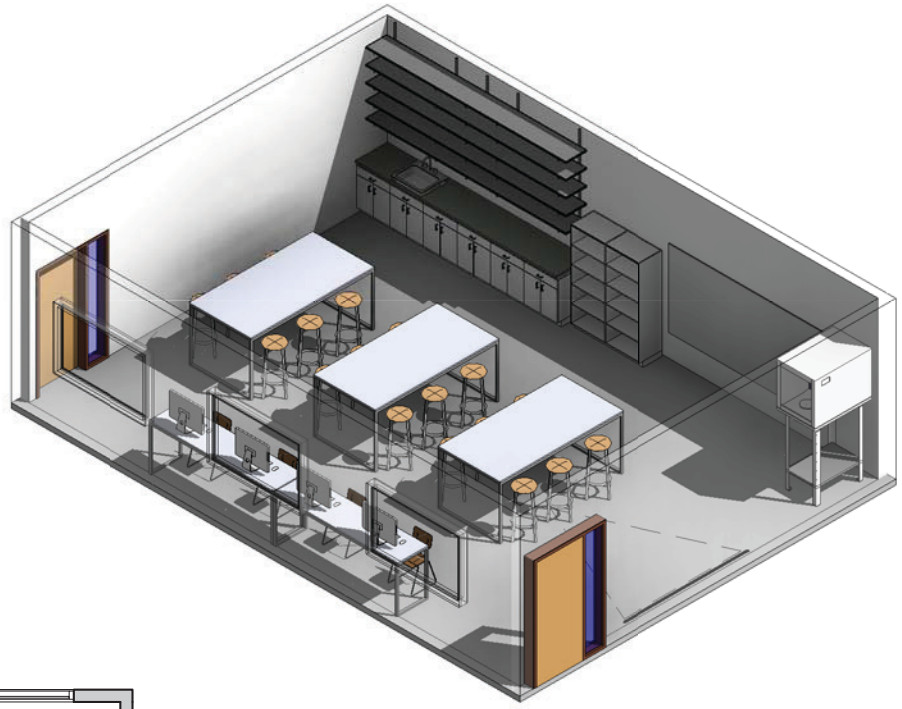
- **ELECTRICAL**
  POWER:
  WALL OUTLETS

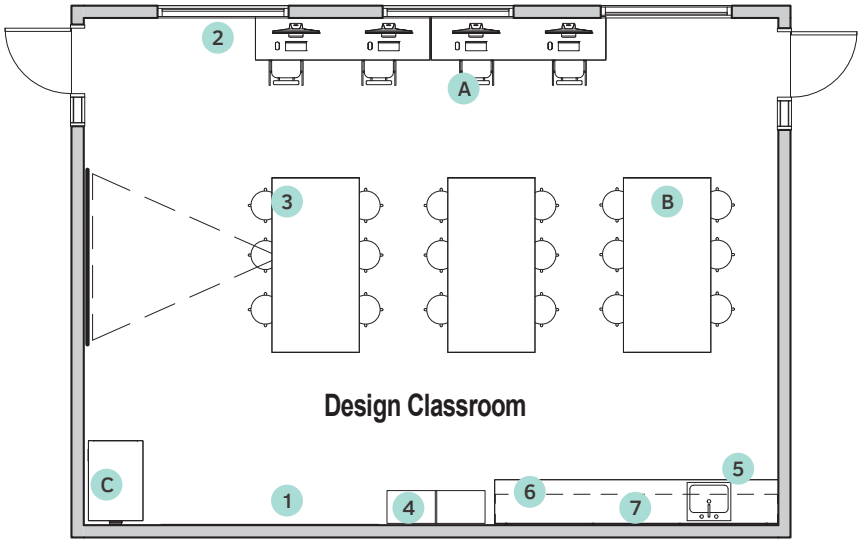
  PHONE/DATA:
  N/A

  AUDIO/VIDEO:
  INSTRUCTIONAL PROJECTOR + SCREEN. COMPUTER WITH DOCUMENT CAMERA

- **LIGHTING**
  FOOT CANDLES:
  0-50 VARIABLE
  FIXTURE TYPE:
  T-5 FLUORESCENT LAY-IN

  TASK LIGHTING:
  N/A
  CONTROLS:
  VACANCY SENSOR W/ MANUAL CONTROL





CASEWORK/FIXED EQUIPMENT:

1. TACK BOARD
2. COMPUTER MONITORS
3. PROJECTOR
4. STACKED STORAGE
5. SINK
6. COUNTERTOP
7. SHELVING
8. WINDOWS VIEWING TO OUTDOORS/PUBLIC SPACE

MOVEABLE FURNISHINGS + EQUIPMENT:

- A TASK CHAIR
- B COUNTER HIGH WORK TABLE
- C SMALL PROJECT VENTILATED SPRAYING AREA

DESIGN SUPPLY CLOSET - 7001 - F

288 SQ FT

SPACE REQUIREMENTS

- **SPACE SUMMARY**
  TYPE OF SPACE: STORAGE 7001-F

  TOTAL NUMBER: 1

  OCCUPANTS: 15

  PRIMARY FUNCTION:
  UTILITY AREA, CLASS AND DEPARTMENTAL STORAGE

- **RELATIONSHIPS**
  LOCATION:
  7001-E

  ADJACENCIES:
  N/A

  SEPARATION:
  N/A

- **DESIGN/AESTHETIC:**
  UTILITARIAN

- **PRIVACY/SECURITY:**
  KEYED LOCKS ON DOORS

ARCHITECTURAL REQUIREMENTS

- **CEILING HEIGHT ABOVE FF:** 10'-0" - 15'-0"

- **FINISHES**
  FLOOR:
  CEMENT OR VINYL (EASY TO CLEAN)

  WALLS:
  PAINTED GYPSUM BOARD

  CEILING:
  OPEN TO STRUCTURE

  SPECIALTY FINISHES:
  N/A

  ACOUSTICAL / SOUND:
  N/A

- **DOORS**
  TYPE:
  3'-6" DOOR, SOLID CORE WOOD WITH VISION PANEL + CLEAR FINISH

  FRAME:
  PAINTED HOLLOW METAL

  SPECIAL:
  N/A

- **WINDOWS**
  TYPE:
  N/A

  GLAZING:
  N/A

  NATURAL LIGHT:
  N/A

  FRAME:
  N/A

  SPECIAL:
  N/A

TECHNICAL REQUIREMENTS

- **MECHANICAL**
  OCCUPIED TEMP: COOLING TO 72 F/HEATING TO 74F

  UNOCCUPIED TEMP: COOLING TO 85 F/ HEATING TO 55 F

  VENTILATION:
  SUPPLY DIFFUSERS IN OH EXPOSED STRUCTURE, RETURN GRILLE IN OH TRANSFER DUCT THROUGH WALL

  CONTROLS:
  DEDICATED TEMPERATURE CONTROL ZONE W/ TEMP. SENSOR

  SPECIAL SYSTEMS:
  NONE

  PLUMBING:
  N/A

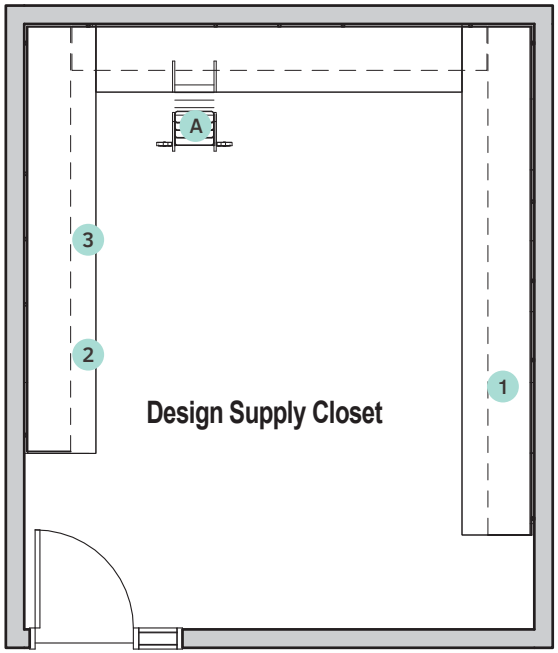
- **ELECTRICAL**
  POWER:
  20A AC OUTLETS AT COUNTER HEIGHT, CONVENIENCE OUTLETS

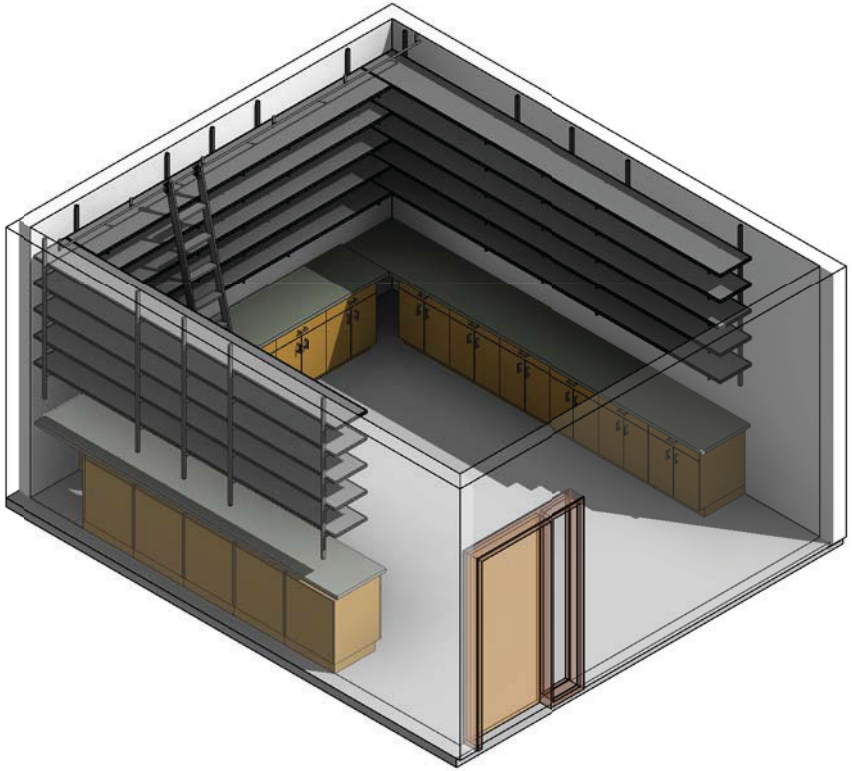
  PHONE/DATA:
  N/A

  AUDIO/VIDEO:
  N/A

- **LIGHTING**
  FOOT CANDLES:
  40
  FIXTURE TYPE:
  T-5 FLUORESCENT CHAIN HUNG

  TASK LIGHTING:
  N/A
  CONTROLS:
  VACANCY SENSOR W/ MANUAL CONTROL





CASEWORK/FIXED EQUIPMENT:

1 STORAGE SHELVES

2 CUPBOARDS

3 COUNTER

MOVEABLE FURNISHINGS + EQUIPMENT:

A ROLLING SHELF LADDER

COSTUME STORAGE AND SMALL ADJACENT: 7002

150 SQ FT

SPACE REQUIREMENTS

- **SPACE SUMMARY**
  TYPE OF SPACE: STORAGE 7002

  TOTAL NUMBER: 1

  OCCUPANTS: 1-2

  PRIMARY FUNCTION:
  STORAGE OF COSTUMES BEING BUILT AND PULLED FOR CURRENT SHOWS

- **RELATIONSHIPS**
  LOCATION:
  GT REMODEL

  ADJACENCIES:
  7001

  SEPARATION:
  N/A

- **DESIGN/AESTHETIC:**
  N/A

- **PRIVACY/SECURITY:**
  N/A

ARCHITECTURAL REQUIREMENTS

- **CEILING HEIGHT ABOVE FF:** 10'-0" - 15'-0"

- **FINISHES**
  FLOOR:
  CEMENT OR VINYL (EASY TO CLEAN)

  WALLS:
  PAINTED GYPSUM BOARD

  CEILING:
  EXPOSED TO STRUCTURE OR LAY-IN

  SPECIALTY FINISHES:
  N/A

  ACOUSTICAL / SOUND:
  N/A

- **DOORS**
  TYPE:
  3'-6" DOOR, SOLID CORE WOOD WITH VISION PANEL + CLEAR FINISH

  FRAME:
  PAINTED HOLLOW METAL

  SPECIAL:
  N/A

- **WINDOWS**
  TYPE:
  N/A

  GLAZING:
  N/A

  NATURAL LIGHT:
  N/A

  FRAME:
  N/A

  SPECIAL:
  N/A

TECHNICAL REQUIREMENTS

- **MECHANICAL**
  OCCUPIED TEMP: COOLING TO 72 F/HEATING TO 74F

  UNOCCUPIED TEMP: COOLING TO 85 F/ HEATING TO 55 F

  VENTILATION:
  SUPPLY DIFFUSERS IN OH EXPOSED STRUCTURE, RETURN GRILLE IN OH

  CONTROLS:
  DEDICATED TEMPERATURE CONTROL ZONE W/ TEMP. SENSOR

  SPECIAL SYSTEMS:
  NONE

  PLUMBING:
  N/A

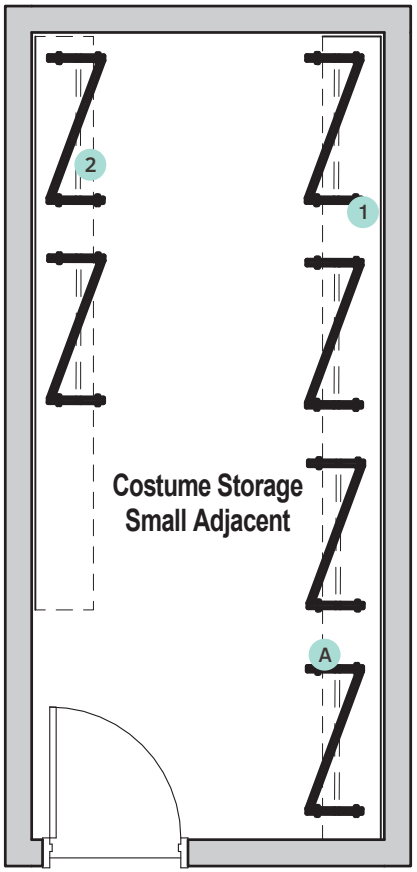
- **ELECTRICAL**
  POWER:
  CONVENIENCE OUTLETS AT BASE ONLY

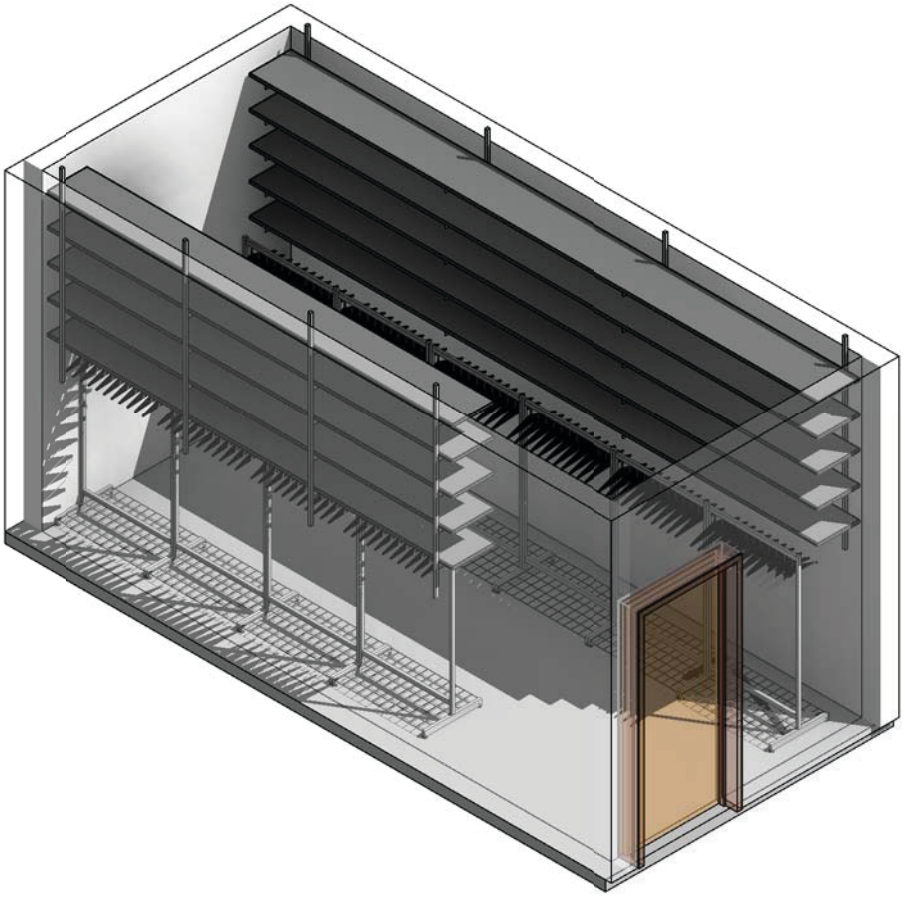
  PHONE/DATA:
  N/A

  AUDIO/VIDEO:
  N/A

- **LIGHTING**
  FOOT CANDLES:
  40
  FIXTURE TYPE:
  T-5 FLUORESCENT CHAIN HUNG

  TASK LIGHTING:
  N/A
  CONTROLS:
  VACANCY SENSOR W/ MANUAL CONTROL





CASEWORK/FIXED EQUIPMENT:

1 SHELVING/STORAGE

2 HANGING COSTUME RACK

MOVEABLE FURNISHINGS + EQUIPMENT:

A ROLLING COSTUME RACK

COSTUME STORAGE LARGE: 7003

1000 SQ FT

SPACE REQUIREMENTS

- **SPACE SUMMARY**
  TYPE OF SPACE: STORAGE 7003

  TOTAL NUMBER: 1

  OCCUPANTS: 1-2

  PRIMARY FUNCTION:
  STORAGE FOR FREQUENTLY PULLED AND RENTAL COSTUMES

- **RELATIONSHIPS**
  LOCATION:
  GT REMODEL

  ADJACENCIES:
  N/A

  SEPARATION:
  N/A

- **DESIGN/AESTHETIC:**
  N/A

- **PRIVACY/SECURITY:**
  KEY CARD ACCESS

ARCHITECTURAL REQUIREMENTS

- **CEILING HEIGHT ABOVE FF:** 10'-0" - 15'-0"

- **FINISHES**
  FLOOR:
  CEMENT OR VINYL (EASY TO CLEAN)

  WALLS:
  PAINTED GYPSUM BOARD

  CEILING:
  EXPOSED TO STRUCTURE, PAINTED OR LAY-IN

  SPECIALTY FINISHES:
  N/A

  ACOUSTICAL / SOUND:
  N/A

- **DOORS**
  TYPE:
  3'-6" DOOR, SOLID CORE WOOD WITH VISION PANEL + CLEAR FINISH

  FRAME:
  PAINTED HOLLOW METAL

  SPECIAL:
  N/A

- **WINDOWS**
  TYPE:
  N/A

  GLAZING:
  N/A

  NATURAL LIGHT:
  N/A

  FRAME:
  N/A

  SPECIAL:
  N/A

TECHNICAL REQUIREMENTS

- **MECHANICAL**
  OCCUPIED TEMP: COOLING TO 72 F/HEATING TO 74F

  UNOCCUPIED TEMP: COOLING TO 85 F/ HEATING TO 55 F

  VENTILATION:
  SUPPLY DIFFUSERS IN OH EXPOSED STRUCTURE, RETURN GRILLE IN OH TRANSFER DUCT THROUGH WALL

  CONTROLS:
  DEDICATED TEMPERATURE CONTROL ZONE W/ TEMP. SENSOR

  SPECIAL SYSTEMS:
  NONE

  PLUMBING:
  N/A

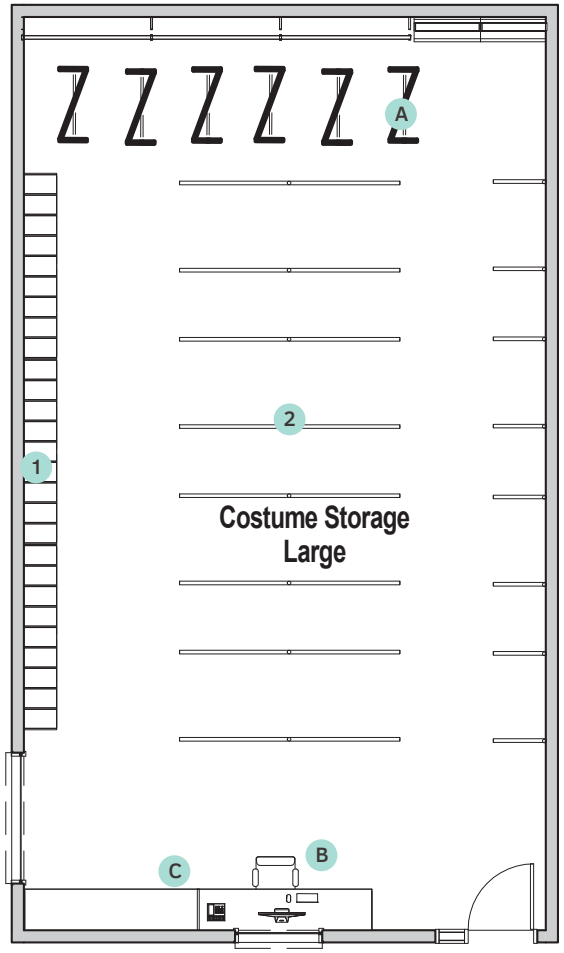
- **ELECTRICAL**
  POWER:
  20A AC OUTLETS AT COUNTER HEIGHT, CONVENIENCE OUTLETS

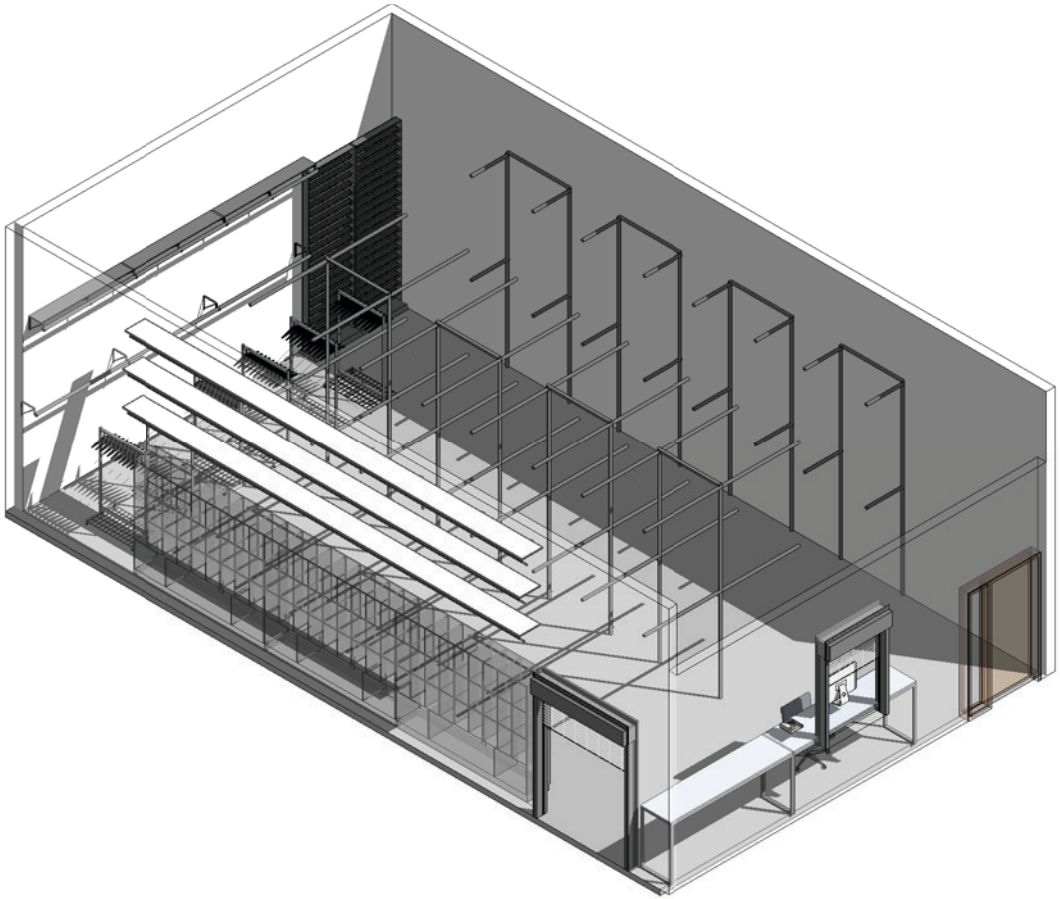
  PHONE/DATA:
  N/A

  AUDIO/VIDEO:
  N/A

- **LIGHTING**
  FOOT CANDLES:
  40
  FIXTURE TYPE:
  T-5 FLUORESCENT CHAIN HUNG

  TASK LIGHTING:
  N/A
  CONTROLS:
  VACANCY SENSOR W/ MANUAL CONTROL





CASEWORK/FIXED EQUIPMENT:

1 SHELVING/STORAGE

2 HANGING COSTUME RACK

MOVEABLE FURNISHINGS + EQUIPMENT:

A ROLLING COSTUME RACK

B TASK CHAIR

C PRINTER/PHONE

FITTING ROOMS: 7004 - 7005

80 SQ FT

SPACE REQUIREMENTS

- **SPACE SUMMARY**
  TYPE OF SPACE: COSTUME FITTING ROOM

  TOTAL NUMBER: 2

  OCCUPANTS: 2

  PRIMARY FUNCTION:
  FITTING COSTUMES, SEWING ALTERATION

- **RELATIONSHIPS**
  LOCATION:
  GT REMODEL

  ADJACENCIES:
  DESIGN CLASSROOM 7001-B

  SEPARATION:
  N/A

- **DESIGN/AESTHETIC:**
  CLEAN, BRIGHT, COMFORTABLE

- **PRIVACY/SECURITY:**
  CURTAIN PARTITION

ARCHITECTURAL REQUIREMENTS

- **CEILING HEIGHT ABOVE FF:** 10'-0" - 15'-0"

- **FINISHES**
  FLOOR:
  CEMENT OR VINYL (EASY TO CLEAN)

  WALLS:
  PAINTED GYPSUM BOARD

  CEILING:
  OPEN TO STRUCTURE, PAINTED OR LAY-IN

  SPECIALTY FINISHES:
  NONE

  ACOUSTICAL / SOUND:
  NC 30

- **DOORS**
  TYPE:
  3'-6" DOOR, SOLID CORE WOOD WITH VISION PANEL + CLEAR FINISH

  FRAME:
  PAINTED HOLLOW METAL

  SPECIAL:
  NONE

- **WINDOWS**
  TYPE:
  N/A

  GLAZING:
  N/A

  NATURAL LIGHT:

  FRAME:
  N/A

  SPECIAL:
  NONE

TECHNICAL REQUIREMENTS

- **MECHANICAL**
  OCCUPIED TEMP: COOLING TO 72 F/HEATING TO 74F

  UNOCCUPIED TEMP: COOLING TO 85 F/ HEATING TO 55 F

  VENTILATION:
  SUPPLY DIFFUSERS IN OH EXPOSED STRUCTURE, RETURN GRILLE IN OH TRANSFER DUCT THROUGH WALL

  CONTROLS:
  DEDICATED TEMPERATURE CONTROL ZONE W/ TEMP. SENSOR

  SPECIAL SYSTEMS:
  NONE

  PLUMBING:
  NONE

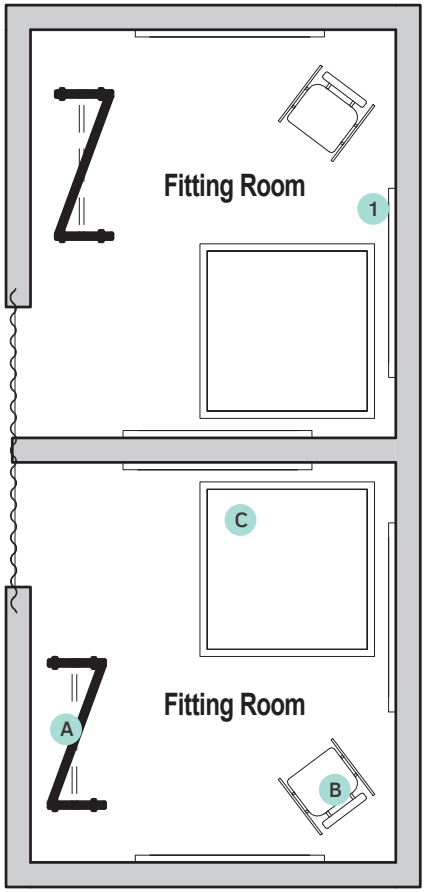
- **ELECTRICAL**
  POWER:
  20A AC OUTLETS AT COUNTER HEIGHT, CONVENIENCE OUTLETS

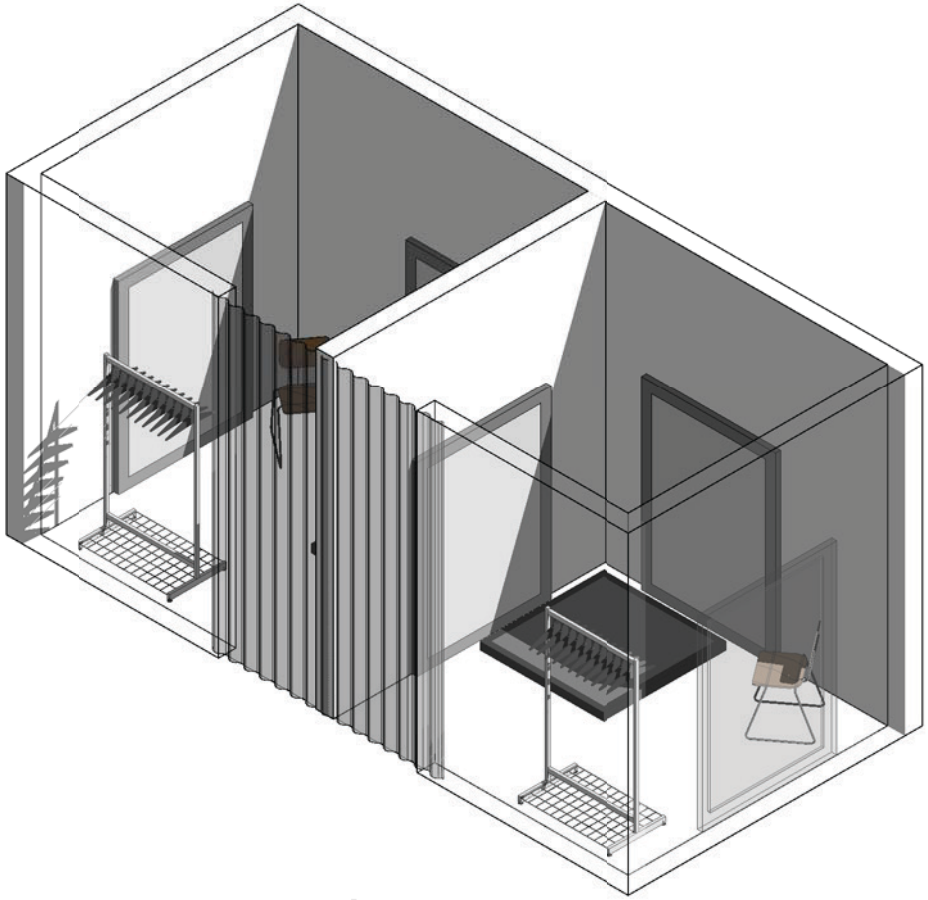
  PHONE/DATA:
  N/A

  AUDIO/VIDEO:
  N/A

- **LIGHTING**
  FOOT CANDLES:
  40
  FIXTURE TYPE:
  N/A

  TASK LIGHTING:
  T-5 FLUORESCENT CHAIN HUNG
  CONTROLS:
  VACANCY SENSOR W/ MANUAL CONTROL





CASEWORK/FIXED EQUIPMENT:

1 MIRROR

MOVEABLE FURNISHINGS + EQUIPMENT:

A ROLLING COSTUME RACK

B TASK CHAIR

C SMALL PLATFORM

HAT + SHOE STORAGE: 7006

200 SQ FT

SPACE REQUIREMENTS

- **SPACE SUMMARY**
  TYPE OF SPACE: HAT AND SHOE STORAGE

  TOTAL NUMBER: 1

  OCCUPANTS: 10

  PRIMARY FUNCTION:
  TO TEACH, DEMONSTRATE AND PRACTICE STAGE LIGHTING SKILLS

- **RELATIONSHIPS**
  LOCATION:
  GT REMODEL

  ADJACENCIES:
  DESIGN CLASSROOM 7001-B

  SEPARATION:
  N/A

- **DESIGN/AESTHETIC:**
  UTILITARIAN STORAGE, BRIGHT, ORDERLY

- **PRIVACY/SECURITY:**
  KEYED LOCKS ON DOORS

ARCHITECTURAL REQUIREMENTS

- **CEILING HEIGHT ABOVE FF:** 10'-0" - 15'-0"

- **FINISHES**
  FLOOR:
  CEMENT OR VINYL (EASY TO CLEAN)

  WALLS:
  PAINTED GYPSUM BOARD

  CEILING:
  OPEN TO STRUCTURE, PAINTED OR LAY-IN

  SPECIALTY FINISHES:
  NONE

  ACOUSTICAL / SOUND:
  NC 30

- **DOORS**
  TYPE:
  3'-6" DOOR, SOLID CORE WOOD WITH VISION PANEL + CLEAR FINISH

  FRAME:
  PAINTED HOLLOW METAL

  SPECIAL:
  NONE

- **WINDOWS**
  TYPE:
  N/A

  GLAZING:
  N/A

  NATURAL LIGHT:
  N/A

  FRAME:
  N/A

  SPECIAL:
  NONE

TECHNICAL REQUIREMENTS

- **MECHANICAL**
  OCCUPIED TEMP: COOLING TO 72 F/HEATING TO 74F

  UNOCCUPIED TEMP: COOLING TO 85 F/ HEATING TO 55 F

  VENTILATION:
  SUPPLY DIFFUSERS IN OH EXPOSED STRUCTURE, RETURN GRILLE IN OH TRANSFER DUCT THROUGH WALL

  CONTROLS:
  DEDICATED TEMPERATURE CONTROL ZONE W/ TEMP. SENSOR

  SPECIAL SYSTEMS:
  NONE

  PLUMBING:
  NONE

- **ELECTRICAL**
  POWER:
  20A AC OUTLETS AT COUNTER HEIGHT, CONVENIENCE OUTLETS

  PHONE/DATA:

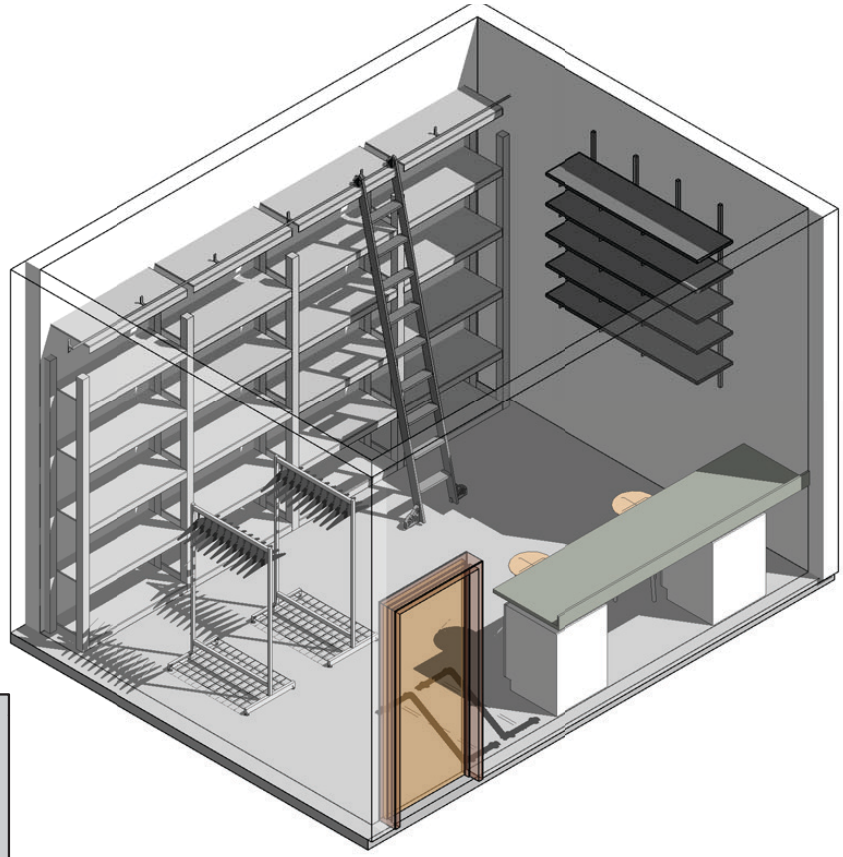
  N/A

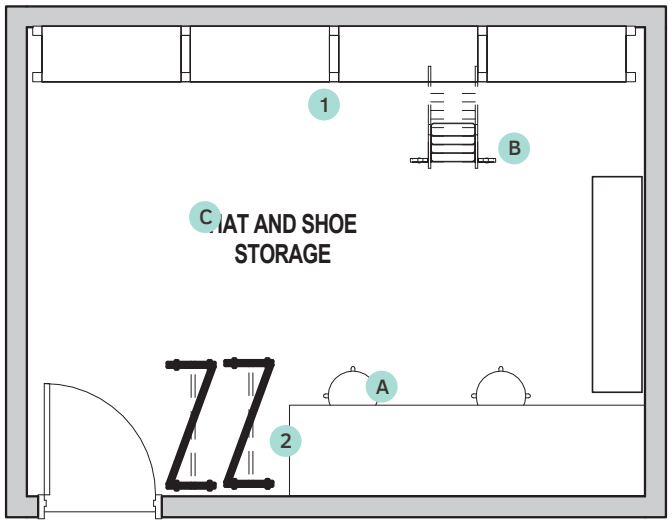
  AUDIO/VIDEO:

  N/A

- **LIGHTING**
  FOOT CANDLES:
  40
  FIXTURE TYPE:
  T-5 FLUORESCENT CHAIN HUNG

  TASK LIGHTING:
  N/A
  CONTROLS:
  VACANCY SENSOR W/ MANUAL CONTROL





CASEWORK/FIXED EQUIPMENT:

1 OPEN SHELVING

2 WORKING COUNTER

MOVEABLE FURNISHINGS + EQUIPMENT:

A CHAIR

B ROLLING SHELF LADDER

C ROLLING COSTUME RACK

FABRIC/ NOTION / SUPPLY STORAGE: 7007

800 SQ FT

SPACE REQUIREMENTS

- **SPACE SUMMARY**
  TYPE OF SPACE: STORAGE

  TOTAL NUMBER: 1

  OCCUPANTS: 2

  PRIMARY FUNCTION:
  STORAGE FOR COSTUME SHOP

- **RELATIONSHIPS**
  LOCATION:
  GT REMODEL

  ADJACENCIES:
  DESIGN CLASSROOM 7001-B

  SEPARATION:
  N/A

- **DESIGN/AESTHETIC:**
  UTILITARIAN STORAGE, CLEAN, BRIGHT

- **PRIVACY/SECURITY:**
  KEYED LOCKS ON DOORS

ARCHITECTURAL REQUIREMENTS

- **CEILING HEIGHT ABOVE FF:** 10'-0" - 15'-0"

- **FINISHES**
  FLOOR:
  CEMENT OR VINYL (EASY TO CLEAN)

  WALLS:
  PAINTED GYPSUM BOARD

  CEILING:
  OPEN TO STRUCTURE, PAINTED OR LAY-IN

  SPECIALTY FINISHES:
  NONE

  ACOUSTICAL / SOUND:
  NC 30

- **DOORS**
  TYPE:
  3'-6" DOOR, SOLID CORE WOOD WITH VISION PANEL + CLEAR FINISH

  FRAME:
  PAINTED HOLLOW METAL

  SPECIAL:
  NONE

- **WINDOWS**
  TYPE:
  N/A

  GLAZING:
  N/A

  NATURAL LIGHT:
  N/A

  FRAME:
  NONE

  SPECIAL:
  N/A

TECHNICAL REQUIREMENTS

- **MECHANICAL**
  OCCUPIED TEMP: COOLING TO 72 F/HEATING TO 74F

  UNOCCUPIED TEMP: COOLING TO 85 F/ HEATING TO 55

  VENTILATION:
  SUPPLY DIFFUSERS IN OH EXPOSED STRUCTURE, RETURN GRILLE IN OH TRANSFER DUCT THROUGH WALL

  CONTROLS:
  DEDICATED TEMPERATURE CONTROL ZONE W/ TEMP. SENSOR

  SPECIAL SYSTEMS:
  NONE

  PLUMBING:
  NONE

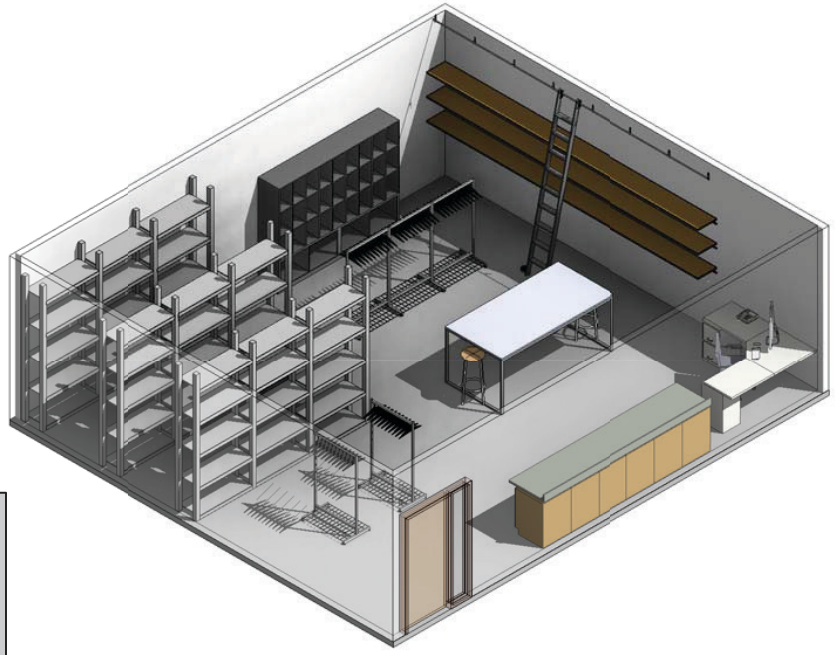
- **ELECTRICAL**
  POWER:
  20A AC OUTLETS AT COUNTER HEIGHT, CONVENIENCE OUTLETS

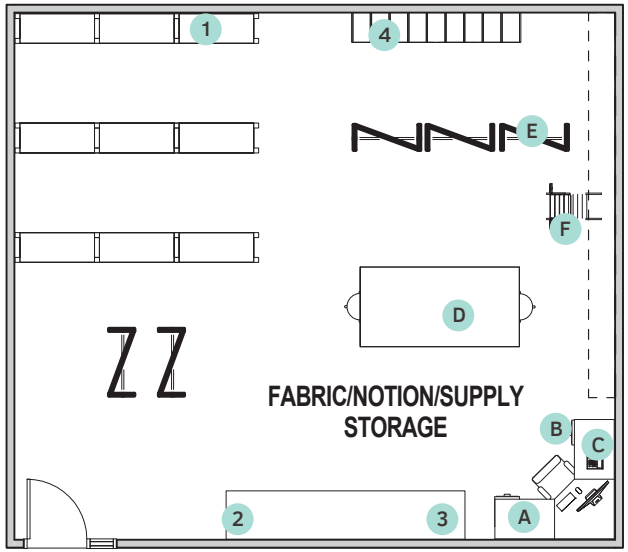
  PHONE/DATA:
  N/A

  AUDIO/VIDEO:
  N/A

- **LIGHTING**
  FOOT CANDLES:
  40
  FIXTURE TYPE:
  T-5 FLUORESCENT CHAIN HUNG

  TASK LIGHTING:
  N/A
  CONTROLS:
  VACANCY SENSOR W/ MANUAL CONTROL





CASEWORK/FIXED EQUIPMENT:

1. SHELVING
2. FILING CABINET/LOCKING STORAGE
3. WORK COUNTER
4. STACK STORAGE

MOVEABLE FURNISHINGS + EQUIPMENT:

- A COMPUTER STATION
- B TASK CHAIR
- C PRINTER/PHONE/SCANNER
- D FOLDING TABLE
- E ROLLING COSTUME RACK
- F ROLLING SHELF LADDER

LAUNDRY / DYE ROOM: 7008

288 SQ FT

SPACE REQUIREMENTS

- **SPACE SUMMARY**
  TYPE OF SPACE: LAUNDRY

  TOTAL NUMBER: 1

  OCCUPANTS: 2

  PRIMARY FUNCTION:
  COSTUME CARE

- **RELATIONSHIPS**
  LOCATION:
  GT REMODEL

  ADJACENCIES:
  DESIGN CLASSROOM 7001-B

  SEPARATION:
  N/A

- **DESIGN/AESTHETIC:**
  UTILITARIAN, BRIGHT, COMFORTABLE

- **PRIVACY/SECURITY:**
  KEYED LOCKS ON DOORS

ARCHITECTURAL REQUIREMENTS

- **CEILING HEIGHT ABOVE FF:** 10'-0" - 15'-0"

- **FINISHES**
  FLOOR:
  CEMENT OR VINYL (EASY TO CLEAN)

  WALLS:
  PAINTED GYPSUM BOARD

  CEILING:
  OPEN TO STRUCTURE, PAINTED OR LAY-IN

  SPECIALTY FINISHES:
  NONE

  ACOUSTICAL / SOUND:
  NC 30

- **DOORS**
  TYPE:
  3'-6" DOOR, SOLID CORE WOOD WITH VISION PANEL + CLEAR FINISH

  FRAME:
  PAINTED HOLLOW METAL

  SPECIAL:
  NONE

- **WINDOWS**
  TYPE:
  N/A

  GLAZING:
  N/A

  NATURAL LIGHT:
  N/A

  FRAME:
  N/A

  SPECIAL:
  NONE

TECHNICAL REQUIREMENTS

- **MECHANICAL**
  OCCUPIED TEMP: COOLING TO 72 F/HEATING TO 74F

  UNOCCUPIED TEMP: COOLING TO 85 F/ HEATING TO 55 F

  VENTILATION:
  SUPPLY DIFFUSERS IN OH EXPOSED STRUCTURE, RETURN GRILLE IN OH TRANSFER DUCT THROUGH WALL

  CONTROLS:
  DEDICATED TEMPERATURE CONTROL ZONE W/ TEMP. SENSOR

  SPECIAL SYSTEMS:
  NONE

  PLUMBING:
  NONE

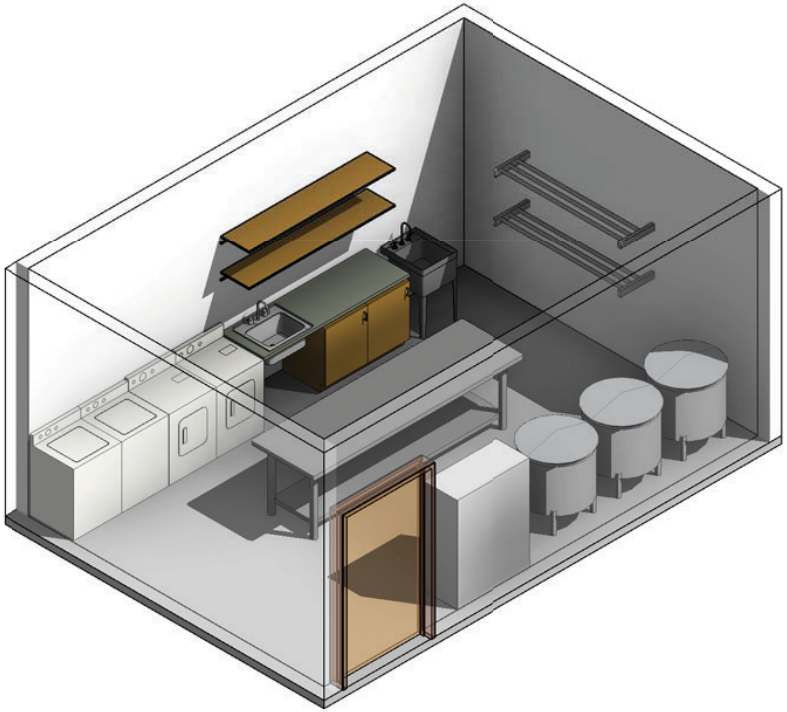
- **ELECTRICAL**
  POWER:
  20A AC OUTLETS AT COUNTER HEIGHT, CONVENIENCE OUTLETS

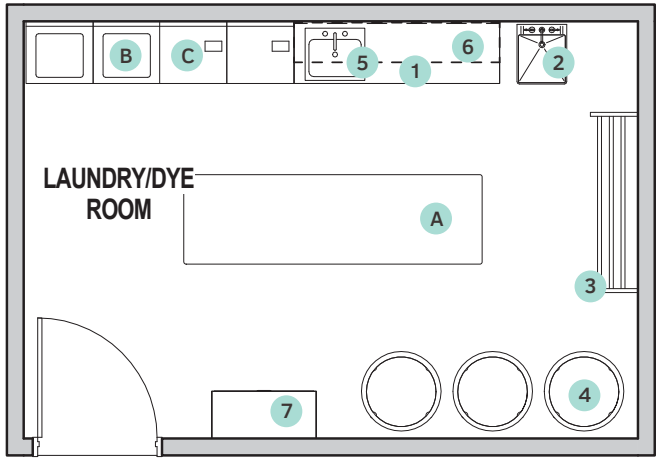
  PHONE/DATA:
  N/A

  AUDIO/VIDEO:
  N/A

- **LIGHTING**
  FOOT CANDLES:
  40
  FIXTURE TYPE:
  N/A

  TASK LIGHTING:
  T-5 FLUORESCENT CHAIN HUNG
  CONTROLS:
  VACANCY SENSOR W/ MANUAL CONTROL





CASEWORK/FIXED EQUIPMENT:

1. COUNTER WORKSPACE
2. LAUNDRY SINK
3. DRYING/HANGING RACK
4. LARGE DYEING VAT
5. SINK
6. SHELVES
7. DYE STORAGE

MOVEABLE FURNISHINGS + EQUIPMENT:

- A TABLE
- B COMMERCIAL WASHING MACHINE
- C DRYER

COSTUME SHOP / OFFICE : 7009

120 SQ FT

SPACE REQUIREMENTS

- **SPACE SUMMARY**
  TYPE OF SPACE: INSTRUCTION

  TOTAL NUMBER: 1

  OCCUPANTS: 10

  PRIMARY FUNCTION:
  TO TEACH, DEMONSTRATE AND PRACTICE STAGE LIGHTING SKILLS

- **RELATIONSHIPS**
  LOCATION:
  GT REMODEL

  ADJACENCIES:
  DESIGN CLASSROOM 7001-B

  SEPARATION:
  N/A

- **DESIGN/AESTHETIC:**
  EMULATE THEATRE ENVIRONMENT SIMILAR TO BLACK BOX

- **PRIVACY/SECURITY:**
  KEYED LOCKS ON DOORS

ARCHITECTURAL REQUIREMENTS

- **CEILING HEIGHT ABOVE FF:** 10'-0" - 15'-0"

- **FINISHES**
  FLOOR:
  CEMENT OR VINYL (EASY TO CLEAN)

  WALLS:
  PAINTED GYPSUM BOARD

  CEILING:
  OPEN TO STRUCTURE, PAINTED OR LAY-IN

  SPECIALTY FINISHES:
  NONE

  ACOUSTICAL / SOUND:
  NC 30

- **DOORS**
  TYPE:
  3'-6" DOOR, SOLID CORE WOOD WITH VISION PANEL + CLEAR FINISH

  FRAME:
  PAINTED HOLLOW METAL

  SPECIAL:
  NONE

- **WINDOWS**
  TYPE:
  N/A

  GLAZING:
  N/A

  NATURAL LIGHT:
  N/A

  FRAME:
  NONE

  SPECIAL:
  N/A

TECHNICAL REQUIREMENTS

- **MECHANICAL**
  OCCUPIED TEMP: COOLING TO 72 F/HEATING TO 74F

  UNOCCUPIED TEMP: COOLING TO 85 F/ HEATING TO 55 F

  VENTILATION:
  SUPPLY DIFFUSERS IN OH EXPOSED STRUCTURE, RETURN GRILLE IN OH TRANSFER DUCT THROUGH WALL

  CONTROLS:
  DEDICATED TEMPERATURE CONTROL ZONE W/ TEMP. SENSOR

  SPECIAL SYSTEMS:
  NONE

  PLUMBING:
  NONE

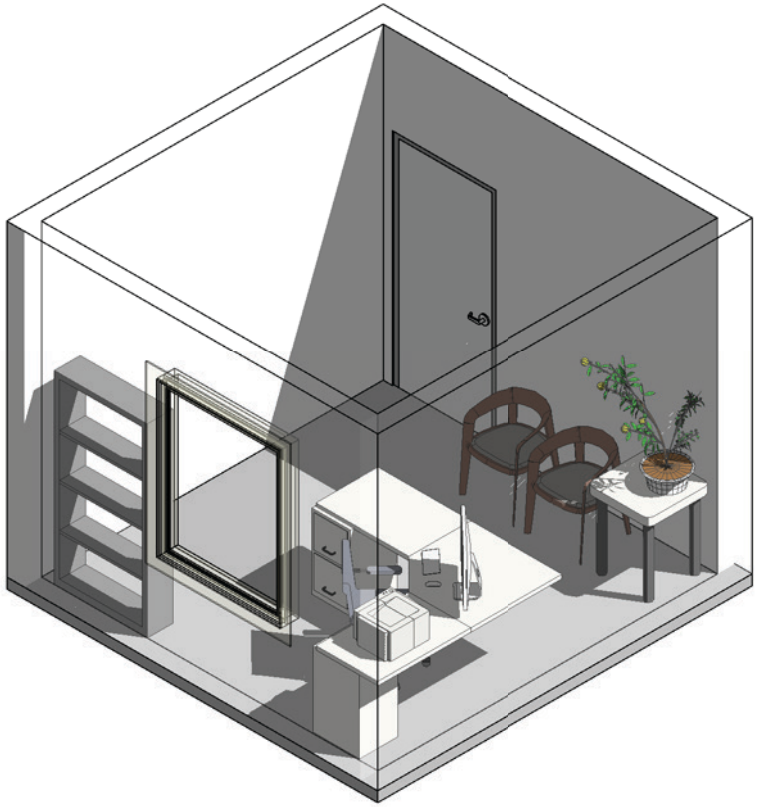
- **ELECTRICAL**
  POWER:
  20A AC OUTLETS AT COUNTER HEIGHT, CONVENIENCE OUTLETS

  PHONE/DATA:
  N/A

  AUDIO/VIDEO:
  N/A

- **LIGHTING**
  FOOT CANDLES:
  40
  FIXTURE TYPE:
  N/A

  TASK LIGHTING:
  T-5 FLUORESCENT CHAIN HUNG
  CONTROLS:
  VACANCY SENSOR W/ MANUAL CONTROL

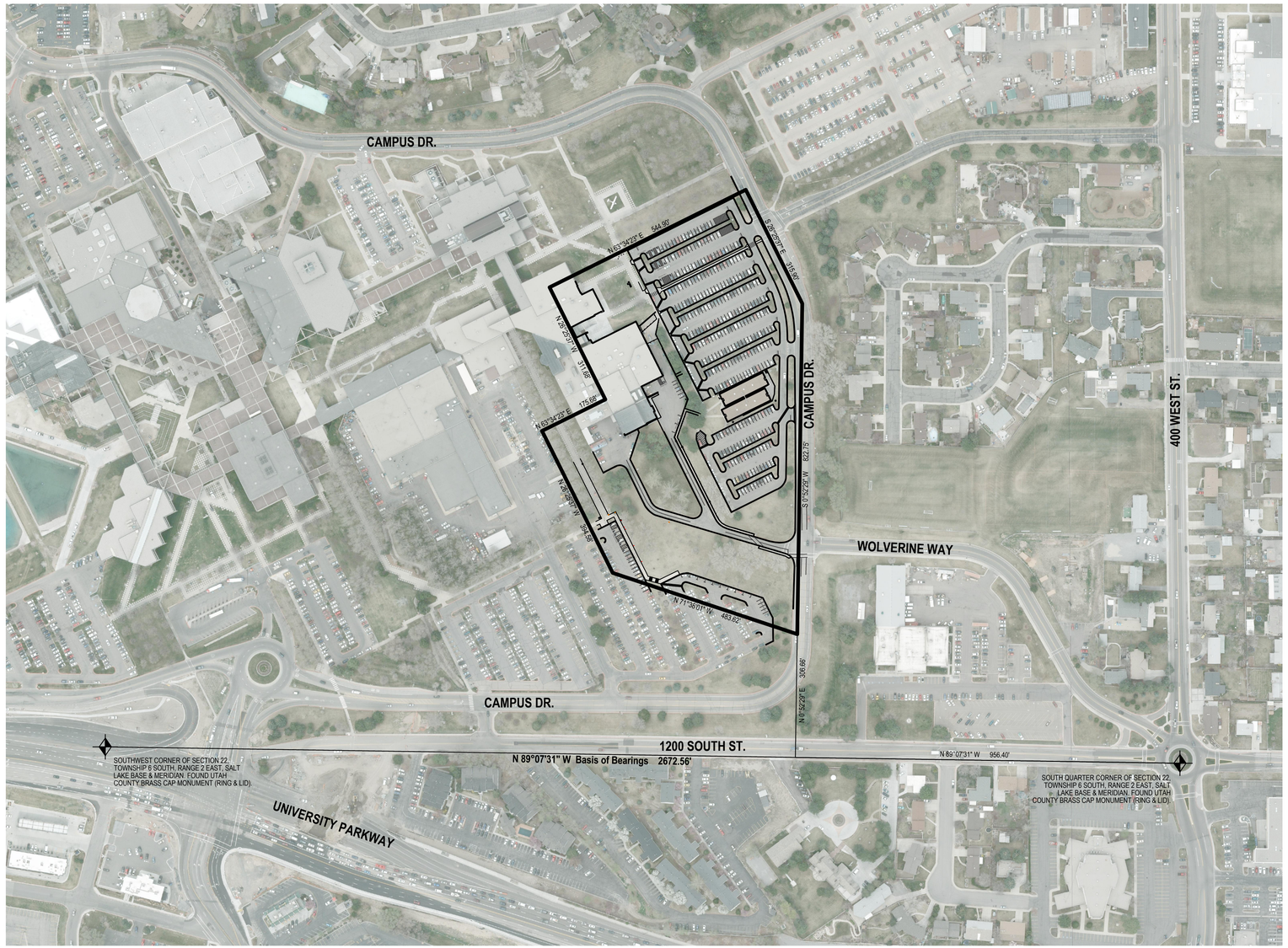


CASEWORK/FIXED EQUIPMENT:

1 SHELVING
2 OFFICE DESK
3 FILING CABINET
4 PRINTER
5 COMPUTER

MOVEABLE FURNISHINGS + EQUIPMENT:

A TASK CHAIR



NORTH

HORIZONTAL GRAPHIC SCALE

150 0 75 150 300

(IN FEET)
HORZ: 1 inch = 150 ft.

SURVEYOR'S NARRATIVE

I, Michael B Herbst do hereby state that I am a Registered Professional Land Surveyor and that I hold certificate no. 5046930 as prescribed by the laws of the State of Utah and represent that I have made a survey of the following described property. The Purpose of this survey is to provide an ALTA/ACSM Land Title and Topography Survey for use by the client. The Basis of Bearing is the line between the Southwest Corner and the South Quarter of Section 22, Township 6 South, Range 2 East, Salt Lake Base and Meridian measuring South 89°07'31" East 2672.56 feet.

PROJECT LOCATION

UVU - Art Center ALTA (survey limits for reference only, not the boundary)

Beginning at a point along East Campus Drive, said point being 956.40 feet North 89°07'31" West along the section line, and 306.66 feet North 00°52'29" East from the South Quarter Corner of Section 22, Township 6 South, Range 2 East, Salt Lake Base and Meridian and running thence; North 71°38'01" West 483.62 feet; thence North 26°25'37" West 394.58 feet; thence North 63°34'23" East 175.68 feet; thence North 26°25'37" West 311.68 feet; thence North 63°34'23" East 544.90 feet; thence South 26°25'37" East 315.90 feet; thence South 00°52'29" West 822.75 feet to the point of Beginning.

SCHEDULE B-2 EXCEPTIONS

No exceptions effect this survey.

To: Metro National and Fidelity Title Insurance Company

This is to certify that this map or plat and the survey on which it is based were made in accordance with 2011 Minimum Standard Detail Requirements for ALTA/ACSM Land Title Surveys, jointly established and adopted by ALTA and NSPS, and includes items 8, 9, 11(a), 16, 18, 20(a) and 21 of Table A hereof.

The field work was completed on: 10/22/2015

Date of Plat or Map: 11/13/2015

11-13-2015
Date

Michael B Herbst

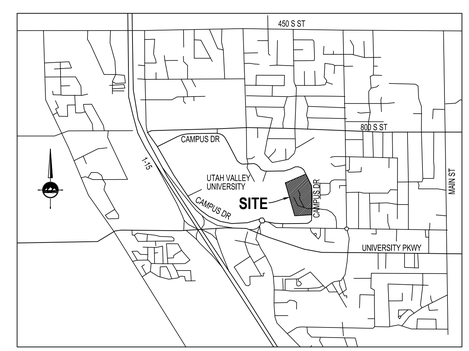
Michael B Herbst

License No. 5046930

Note: For conditions of record not shown hereon as well as specific references to items in the title report, please refer to a title report supplied by Metro National Title, of Salt Lake City, Utah under Commitment No. 48569, dated effective October 2, 2015.

LEGEND

SECTION CORNER	MINOR CONTOURS 1' INCREMENT
MONUMENT	MAJOR CONTOURS 5' INCREMENT
WATER METER	CONCRETE
WATER MANHOLE	BUILDING PRIMARY
WATER VALVE	X FENCE
FIRE HYDRANT	SS SANITARY SEWER
IRRIGATION VALVE	SD STORM DRAIN LINE
SANITARY SEWER MANHOLE	W WATER LINE
STORM DRAIN CLEAN OUT	E ELECTRIC POWER LINE
STORM DRAIN CATCH BASIN	FO FIBER OPTICS LINE
SIGN	
UTILITY MANHOLE	
UTILITY POLE	
GAS VALVE	
TREE	



VICINITY MAP
NOT TO SCALE

ENSIGN
THE STANDARD IN ENGINEERING

SALT LAKE CITY
45 W. 10000 S., Suite 500
Sandy, UT 84070
Phone: 801.255.0529

LAYTON
Phone: 801.547.1100

TOOELE
Phone: 435.843.3590

CEDAR CITY
Phone: 435.865.1453

RICHFIELD
Phone: 435.896.2983

WWW.ENSIGNENG.COM

FOR:
METHOD STUDIO
925 SOUTH WEST TEMPLE
SALT LAKE CITY, UTAH 84101

CONTACT:
TODD KELSEY
PHONE: (801) 532-4422

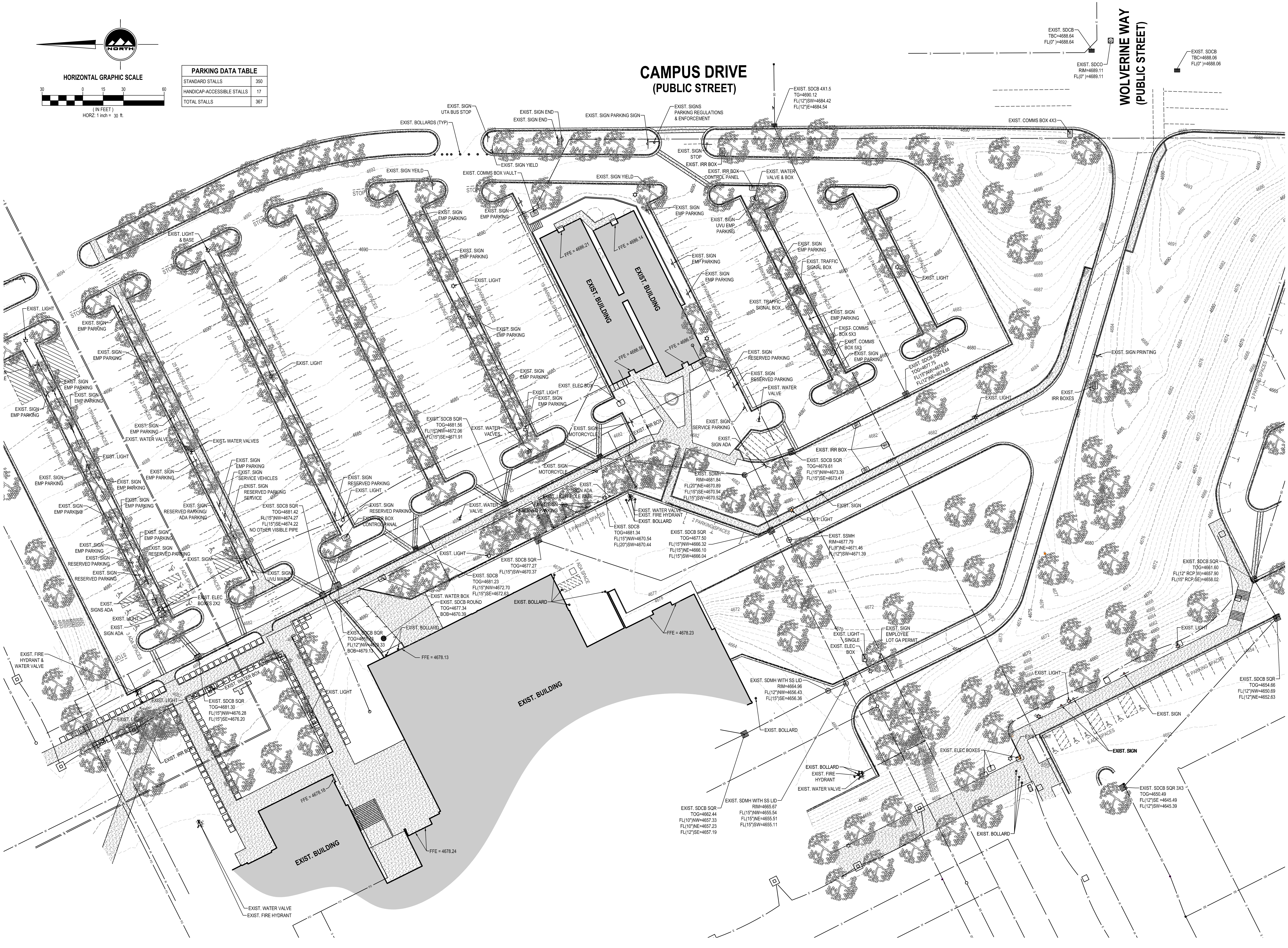
ART CENTER
UTAH VALLEY UNIVERSITY
ALTA/ACSM LAND TITLE AND TOPOGRAPHIC SURVEY
OREM, UTAH

PROFESSIONAL LAND SURVEYOR
Electronic Seal
No.5046930
MICHAEL B. HERBST
11/13/2015
STATE OF UTAH

LOCATED IN THE SOUTHWEST QUARTER OF SECTION 22, TOWNSHIP 6 SOUTH, RANGE 2 EAST, SALT LAKE BASE AND MERIDIAN

ALTA/ACSM LAND TITLE & & TOPOGRAPHIC SURVEY

PROJECT NUMBER 6717	PRINT DATE 11/13/2015
DRAWN BY M. HERBST	CHECKED BY
PROJECT MANAGER P. HARRIS	



PARKING DATA TABLE

STANDARD STALLS	350
HANDICAP-ACCESSIBLE STALLS	17
TOTAL STALLS	367

ART CENTER
UTAH VALLEY UNIVERSITY
ALTA/ACSM LAND TITLE AND TOPOGRAPHIC SURVEY
OREM, UTAH

ENSIGN
THE STANDARD IN ENGINEERING

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PROFESSIONAL LAND SURVEYOR
Electronic Seal
No.5046930
MICHAEL B. HERBST
11/13/2015
STATE OF UTAH

LOCATED IN THE SOUTHWEST QUARTER OF SECTION 22, TOWNSHIP 6 SOUTH, RANGE 2 EAST, SALT LAKE BASE AND MERIDIAN

ALTA/ACSM LAND TITLE & & TOPOGRAPHIC SURVEY

PROJECT NUMBER 6717
PRINT DATE 11/13/2015
DRAWN BY M. HERBST
CHECKED BY
PROJECT MANAGER P. HARRIS

2-2

AGEC
Applied GeoTech

GEOTECHNICAL INVESTIGATION
PROPOSED PERFORMING ARTS CENTER
UTAH VALLEY UNIVERSITY MAIN CAMPUS
OREM, UTAH

PREPARED FOR:

DFCM
4130 STATE OFFICE BUILDING
SALT LAKE CITY, UTAH 84114

ATTENTION: CLINT BUNNELL

PROJECT NO. 1150793 **NOVEMBER 12, 2015**

600 West Sandy Parkway • Sandy, Utah 84070 • (801) 566-6399 • FAX (801) 566-6493

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APPENDIX

CPT SOUNDINGS

EXECUTIVE SUMMARY

1. Approximately 8, 8 and 12 inches of topsoil overlying sand was encountered in Borings B-1, B-9 and B-12, respectively. Approximately 3 to 6 inches of asphaltic concrete overlying approximately 4 to 9 inches of base course was encountered in the other borings and is underlain by sand with the exception of Borings B-5 and B-6, where gravel was encountered below the base course. Gravel was encountered between depths of approximately 4 and 9 feet in Boring B-1 and to a depth of approximately 14 feet in Boring B-5. Gravel extended the full depth of Boring B-6, approximately 4½ feet. Sand was encountered below the gravel in Borings B-1 and B-5 and extends the full depth of these two borings and other borings with the exception of Boring B-6. The maximum depth investigated by borings was approximately 35½ feet. Deeper subsurface investigation was performed by cone penetration test (CPT) soundings which extended to a depth up to approximately 50 feet. These soundings encountered predominantly sand but appear to have encountered some clay and silt layers below a depth of approximately 40 feet.

2. No subsurface water was encountered to the maximum depth of the borings. There is no indication that water was encountered in the CPT soundings.

3. The proposed building may be supported on spread footings bearing on the undisturbed natural soil or on compacted structural fill extending down to the undisturbed natural soil and may be design for a net allowable bearing pressure determined by the relationship given in the report. For example, a footing with a width of 5 feet and an embedment depth of 1 foot may be designed for a net allowable bearing pressure of 3,700 pounds per square foot.

4. Temporary, unretained cut slopes may be constructed at 1½ horizontal to 1 vertical or flatter. Slope reinforcement or retainage will generally be needed for steeper slopes.

   Permanent, unretained cut and fill slopes may be constructed at 2 horizontal to 1 vertical or flatter. Slopes should be protected from erosion by revegetation or other methods. Surface drainage should be directed away from cut and fill slopes.

5. Geotechnical information related to foundations, subgrade preparation, pavement design and materials is included in the report.

SCOPE

This report presents the results of a geotechnical investigation for the proposed Performing Arts Center to be constructed at the south end of the Gunther Trades building and the Noorda Theater at the Utah Valley University Main Campus in Orem, Utah. The report presents the subsurface conditions encountered, laboratory test results and recommendations for foundations and pavement. The study was conducted in general accordance with our proposal dated September 21, 2015.

Field exploration was conducted to obtain information on the subsurface conditions. Samples obtained from the field investigation were tested in the laboratory to determine physical and engineering characteristics of the on-site soil and to define conditions at the site for our engineering analysis. Results of the field exploration and laboratory testing were analyzed to develop recommendations for the proposed buildings and pavement.

This report has been prepared to summarize the data obtained during the study and to present our conclusions and recommendations based on the proposed construction and the subsurface conditions encountered. Design parameters and a discussion of geotechnical engineering considerations related to construction are included in the report.

SITE CONDITIONS

At the time of our field study, the property consisted of parking, drives and landscaped areas. There are two buildings for the Faculty Annex in the east/central portion of the site.

The ground surface at the site is irregular and has low and high areas. The general slope of the ground is down toward the west.

Vegetation at the site consists of grass and trees in between parking areas and along roads.

The building will connect to the Gunther Trades and Noorda Theater buildings, which are multi-level structures. Areas to the north and south of the site consist of asphalt-paved paring areas. There is an access drive to the east of the site.

FIELD STUDY

The field study was conducted on October 29 and 30, 2015. Twelve borings were drilled at the approximate locations indicated on Figure 1 using 8-inch diameter, hollow-stem auger and direct push methods. Five cone penetration test (CPT) soundings were obtained at five locations at the proposed building area. The soundings extended to depths up to approximately 50 feet.

The borings were logged and soil samples obtained by an engineer from AGEC. Logs of the subsurface conditions encountered in the borings are graphically shown on Figures 2 through 5 with legend and notes on Figure 6. Results of the CPT soundings are included in the appendix.

SUBSURFACE CONDITIONS

Approximately 8, 8 and 12 inches of topsoil overlying sand was encountered in Borings B-1, B-9 and B-12, respectively. Approximately 3 to 6 inches of asphaltic concrete overlying approximately 4 to 9 inches of base course was encountered in the other borings and is underlain by sand with the exception of Borings B-5 and B-6, where gravel was encountered below the base course. Gravel was encountered between depths of approximately 4 and 9 feet in Boring B-1 and to a depth of approximately 14 feet in Boring B-5. Gravel extended the full depth of Boring B-6, approximately 4½ feet. Sand was encountered below the gravel in Borings B-1 and B-5 and extends the full depth of these two borings and other borings with the exception of Boring B-6. The maximum depth investigated by borings was

approximately 35½ feet. Deeper subsurface investigation was performed by cone penetration test (CPT) soundings which extended to a depth up to approximately 50 feet. These soundings encountered predominantly sand but appear to have encountered some clay and silt layers below a depth of approximately 40 feet.

A description of the various soils encountered in the borings follows:

Base Course - The base course consists of silty sand and gravel. It is moist and brown.

Laboratory tests performed on the base course indicate that it has moisture contents ranging from 4 to 5 percent. Results of gradation tests performed on samples of the base course are presented on Figures 7 and 8. The gradation tests indicate the base course does not meet UDOT or APWA gradation specifications for base course.

Poorly-graded Sand with Silt - The sand contains a small to moderate amount of silt and some gravel and gravel lenses. It is medium to very dense, slightly moist to moist and brown to gray.

Laboratory tests conducted on samples of sand indicate that it has natural moisture contents ranging from 3 to 20 percent and dry densities ranging from 95 to 112 pounds per cubic foot (pcf).

Poorly-graded Gravel with Silt and Sand - The gravel contains occasional sand lenses. It is medium to very dense, slightly moist to moist and brown to gray.

Laboratory tests conducted on a sample of gravel indicate that it has a natural moisture content of 3 percent and a natural dry density of 119 pcf. Results of a gradation test performed on a sample of the gravel are presented on Figures 7.

Results of the laboratory tests are summarized on Table I and are included on the logs of the borings.

SUBSURFACE WATER

No subsurface water was encountered in the borings to the maximum depth investigated, approximately 35½ feet. There is no indication that water was encountered within the CPT soundings, which extended up to a depth of approximately 50 feet.

PROPOSED CONSTRUCTION

We understand that most buildings will be up two stories in height with some up to three stories. We have assumed maximum column loads of 400 kips and maximum wall loads of 10 kips per lineal foot.

Modifications to parking areas are planned for areas around the proposed building. We have assumed two traffic conditions; one consisting predominantly of car traffic and the second consisting of up to 20 delivery trucks and one semi per day.

If the proposed construction, building loads or anticipated traffic is significantly different from what is described above, we should be notified so that we can reevaluate our recommendations.

RECOMMENDATIONS

Based on the subsoil conditions encountered, laboratory test results, and the proposed construction as described above, the following recommendations are given:

A. Site Grading

Final site grading plans were not provided for our review. We anticipate that there will be significant cut in some areas to reconfigure the area for the proposed construction.

1. Existing Fill

We expect that there may be some areas of the site with significant fill, particularly near buildings and mounded areas of landscaping. Unsuitable fill should be removed from below proposed building and pavement areas and below areas with proposed construction sensitive to settlement. The existing fill meeting the criteria presented in the Materials section of the report could be considered for re-use as compacted fill below structures, pavement areas, or used as site grading or utility trench backfill if the topsoil, debris, organics and other deleterious materials are removed, or it may be used in landscaping areas.

2. Pavement Subgrade Preparation

Prior to placing grading fill or base course, organics, topsoil, unsuitable fill, debris and other deleterious material should be removed.

The subgrade should be scarified to a depth of approximately 8 inches, the moisture adjusted to within 2 percent of the optimum moisture content and the subgrade compacted to at least 90 percent of the maximum dry density as determined by ASTM D 1557. The subgrade should be proof-rolled to identify soft areas. Soft areas should be removed and replaced with compacted granular fill consisting predominantly of gravel with less than 15 percent passing the No. 200 sieve.

3. Excavation

We anticipate that excavation at the site can be accomplished with typical excavation equipment.

4. Cut and Fill Slopes

Temporary, unretained cut slopes may be constructed at 1½ horizontal to 1 vertical or flatter. Slope reinforcement or retainage will generally be needed for steeper slopes.

Permanent, unretained cut and fill slopes may be constructed at 2 horizontal to 1 vertical or flatter. Slopes should be protected from erosion by revegetation or other methods. Surface drainage should be directed away from cut and fill slopes.

5. Compaction

Compaction of materials placed at the site should equal or exceed the minimum densities as indicated below when compared to the maximum dry density as determined by ASTM D 1557.

Fill To Support	Compaction
Foundations	≥ 95%
Concrete Flatwork and Pavement	≥ 90%
Landscaping	≥ 85%
Retaining Wall Backfill	85 - 90%

To facilitate the compaction process, fill should be compacted at a moisture content within 2 percent of the optimum moisture content. Fill should be placed in thin enough lifts to allow for adequate compaction.

Base course should be compacted to at least 95 percent of the maximum dry density as determined by ASTM D 1557.

Fill and pavement materials placed for the project should be frequently tested for compaction.

6. Materials

Material placed as fill to support foundations should be non-expansive granular soil.

Listed below are materials recommended for imported structural fill.

Fill to Support	Recommendations
Footings	Non-expansive granular soil Passing No. 200 Sieve < 35% Liquid Limit < 30% Maximum size 4 inches
Floor Slab (Upper 4 inches)	Sand and/or Gravel Passing No. 200 Sieve < 5% Maximum size 2 inches
Slab Support	Non-expansive granular soil Passing No. 200 Sieve < 50% Liquid Limit < 30% Maximum size 6 inches

The on-site fill and natural soil meeting the criteria presented above, exclusive of topsoil, organics, over-sized particles, debris and other deleterious materials may be used as structural fill, site grading fill, fill below proposed pavement areas and as utility trench backfill, or they may be used in landscaping areas.

The use of the fill and natural soil as fill may require moisture-conditioning (wetting or drying) prior to use as fill. Drying of the soil may not be practical during cold or wet times of the year.

7. Drainage

The ground surface surrounding the proposed buildings should be sloped away from the buildings in all directions. Roof downspouts and drains should discharge beyond the limits of backfill.

The collection and diversion of drainage away from the pavement surface is important to the satisfactory performance of the pavement section. Proper drainage should be provided.

B. Foundations

1. Bearing Material

With the proposed construction and the subsurface conditions encountered, the proposed buildings may be supported on spread footings bearing on the undisturbed, natural soil or on compacted structural fill extending down to the undisturbed, natural soil. Structural fill should extend out away from the edge of footings at least a distance equal to the depth of fill beneath footings.

The topsoil, unsuitable fill, debris and other deleterious materials should be removed from below proposed foundation areas.

2. Bearing Pressure

Spread footings bearing on the undisturbed natural soil or on compacted structural fill extending down to the undisturbed natural soil may be designed using an allowable net bearing pressure determined from the following relationship:

$$q_a = 570B + 850D$$

where: q_a = net allowable bearing pressure in psf
B = footing width in feet
D = footing embedment depth in feet

The allowable bearing pressure determined from the above relationship should be limited to not exceed 4,000 psf.

3. Settlement

Based on the subsurface conditions encountered and the building loads as described in the proposed construction section of the report, we estimate that total and differential settlement for foundations designed as indicated above will be less than ¾ and ½ inch, respectively.

Care will be required to not disturb the natural soil in the base of foundation excavations in order to maintain settlement within tolerable limits.

4. Temporary Loading Conditions

The allowable bearing pressure may be increased by one-half for temporary loading conditions such as wind or seismic loads.

5. Frost Depth

Exterior footings and footings beneath unheated areas should be placed at least 30 inches below grade for frost protection.

6. Foundation Base

The base of footing excavations should be cleared of loose or deleterious material prior to structural fill or concrete placement.

7. Construction Observation

A representative of the geotechnical engineer should observe footing excavations prior to structural fill or concrete placement.

C. Concrete Slab-on-Grade

1. Slab Support

Concrete slabs may be supported on the undisturbed natural soil or on compacted structural fill extending down to the undisturbed natural soil.

Topsoil, organics, unsuitable fill and other deleterious materials should be removed from below proposed floor slab areas.

2. Underslab Sand and/or Gravel

A 4-inch layer of free-draining sand and/or gravel (less than 5 percent passing the No. 200 sieve) should be placed below the concrete slabs for ease of construction and to promote even curing of the slab concrete.

3. Vapor Barrier

A vapor barrier should be placed under the concrete floor if the floor will receive an impermeable floor covering. The barrier will reduce the amount of water vapor passing from below the slab to the floor covering.

D. Lateral Earth Pressures

1. Lateral Resistance for Footings

Lateral resistance for spread footings placed on the natural soil or on compacted structural fill is controlled by sliding resistance between the footing and the foundation soil. A friction value of 0.45 may be used in design for ultimate lateral resistance for footings bearing on the undisturbed, natural soil.

2. Subgrade Walls and Retaining Structures

The following equivalent fluid weights are given for design of subgrade walls and retaining structures. The active condition is where the wall moves away from the soil. The passive condition is where the wall moves into the soil and the at-rest condition is where the wall does not move. The values listed below assume a horizontal surface adjacent the top and bottom of the wall.

Soil Type	Active	At-Rest	Passive
Sand & Gravel	40 pcf	55 pcf	300 pcf

3. Seismic Conditions

Under seismic conditions, the equivalent fluid weight should be increased by 33 pcf for the active condition and 18 pcf for the at-rest condition and decreased by 33 pcf for the passive condition. This assumes a peak ground acceleration of 0.55g, which represents a 2 percent probability of exceedance in a 50-year period (IBC, 2012).

4. Safety Factors

The values recommended above assume mobilization of the soil to achieve the assumed soil strength. Conventional safety factors used for structural

analysis for such items as overturning and sliding resistance should be used in design.

E. Seismicity, Faulting and Liquefaction

1. Seismicity

Listed below is a summary of the site parameters for the 2012 International Building Code.

a.	Site Class	D
b.	Short Period Spectral Response Acceleration, S_S	1.23g
c.	One Second Period Spectral Response Acceleration, S_1	0.42g

2. Faulting

There are no mapped active faults extending through the project site. The closest mapped fault considered to be active is the Wasatch fault located approximately 3.7 miles east of the site (Black and others, 2003).

3. Liquefaction

The site is located in an area mapped as having a "very low" potential for liquefaction (Anderson and others, 1994). Research indicates that the soil type most susceptible to liquefaction during a large magnitude earthquake is loose, clean sand. In order for liquefaction to occur the soil must be saturated. The liquefaction potential for soil tends to decrease with an increase in fines content and density.

Based on the subsurface conditions encountered to the depth investigated and our understanding of the geologic conditions in the area, it is our professional opinion that liquefaction is not a hazard at the site.

F. Water Soluble Sulfates

One sample of the natural soil was tested in the laboratory for water soluble sulfate content. Results of the test indicate that there is less than 0.1 percent water soluble sulfate in the soil. Based on results of the test and published literature, the natural soil possesses negligible sulfate attack potential on concrete. Sulfate resistant cement is not needed for concrete placed in contact with the natural soil. Other conditions may dictate the type of cement to be used in concrete for the project.

G. Pavement

Based on the subsoil conditions encountered, laboratory test results and the assumed traffic as indicated in the Proposed Construction section of the report, the following pavement support recommendations are given.

1. Subgrade Support

   The near surface subgrade soil consists predominantly of sand. We have assumed a CBR value of 5 percent which assumes a silty sand subgrade.

2. Pavement Thickness

   Based on the subsoil conditions, assumed traffic as described in the Proposed Construction section of this report, a design life of 20 years for flexible pavement and 30 years for rigid pavement, and methods presented by the Utah Department of Transportation, a flexible pavement section consisting of 3 inches of asphaltic concrete overlying 6 inches of base course may be used for areas of no significant truck traffic. The asphaltic concrete thickness should be increased to 3½ inches and the base course increased to 8 inches for areas of truck traffic as described in the Proposed Construction section of the report. Alternatively, rigid pavement sections consisting of 5 and 5½ inches of Portland Cement concrete may be used above a prepared subgrade for non-truck traffic and truck traffic areas, respectively.

A pavement section consisting of 6½ inches of Portland cement concrete over 4 inches of base course is recommended for dumpster approach slabs.

3. Pavement Materials and Construction

a. Flexible Pavement (asphaltic concrete)

The pavement materials should meet the material gradation and quality specifications for the applicable jurisdiction. The use of other materials may result in the need for different pavement material thicknesses.

b. Rigid Pavement (Portland Cement concrete)

The pavement thickness indicated assumes that the pavement will have aggregate interlock joints and that a concrete shoulder or curb will be provided.

The pavement materials should meet the specifications for the applicable jurisdiction. The pavement thickness indicated above assumes that the concrete will have a 28-day compressive strength of at least 4,000 pounds per square inch. Concrete should be air entrained with approximately 6 percent air. The maximum allowable slump will depend on the method of placement, but should not exceed 4 inches.

4. Jointing

Joints for concrete pavement should be laid out in a square or rectangular pattern. Joint spacings should not exceed 30 times the thickness of the slab. The joint spacings indicated should accommodate the contraction of the concrete and under these conditions steel reinforcing will not be required. The depth of joints should be approximately one-fourth of the slab thickness.

H. Preconstruction Meeting

A preconstruction meeting should be held with representatives of the owner, project architect, geotechnical engineer, general contractor, earthwork contractor and other members of the design team to review construction plans, specifications, methods and schedule.

LIMITATIONS

This report has been prepared in accordance with generally accepted geotechnical engineering practices in the area for the use of the client for design purposes. The conclusions and recommendations included within the report are based on the information obtained from the borings drilled and CPT soundings at the approximate locations indicated on the site plan. Variations in the subsurface conditions may not become evident until additional exploration or excavation is conducted. If the subsurface conditions or groundwater level is found to be significantly different from what is described above, we should be notified to reevaluate our recommendations.

APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, INC.

LICENSED PROFESSIONAL ENGINEER
11/12/15
No. 260053
DOUGLAS R. HAWKES
STATE OF UTAH

Douglas R. Hawkes, P.E., P.G.

Reviewed by Jay R. McQuivey, P.E.

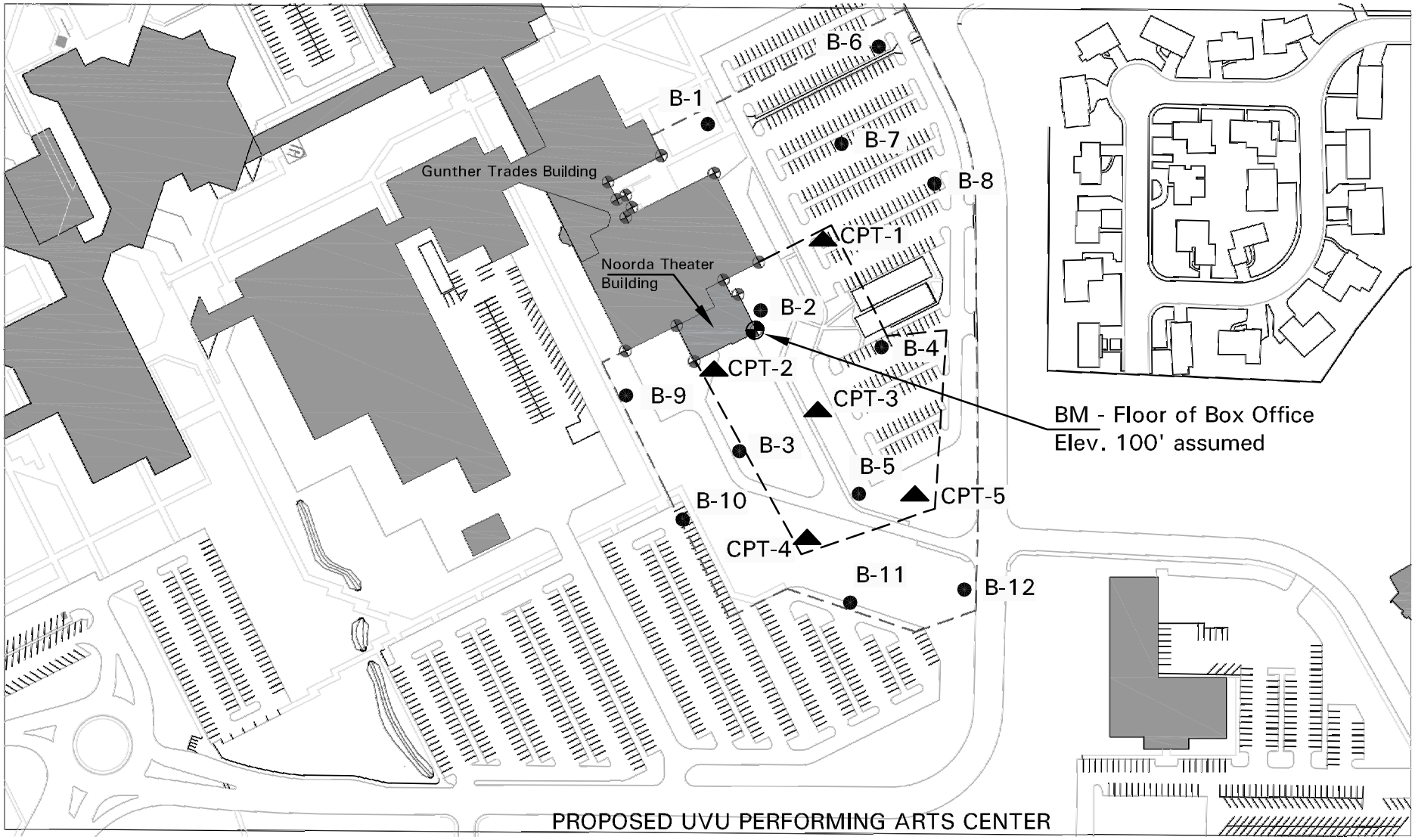
DRH/rs

REFERENCES

Anderson, L. R., Keaton, J. R. and Bischoff, J. E., 1994; Liquefaction Potential Map for Utah County, Utah Geological Survey Contract Report 94-8.

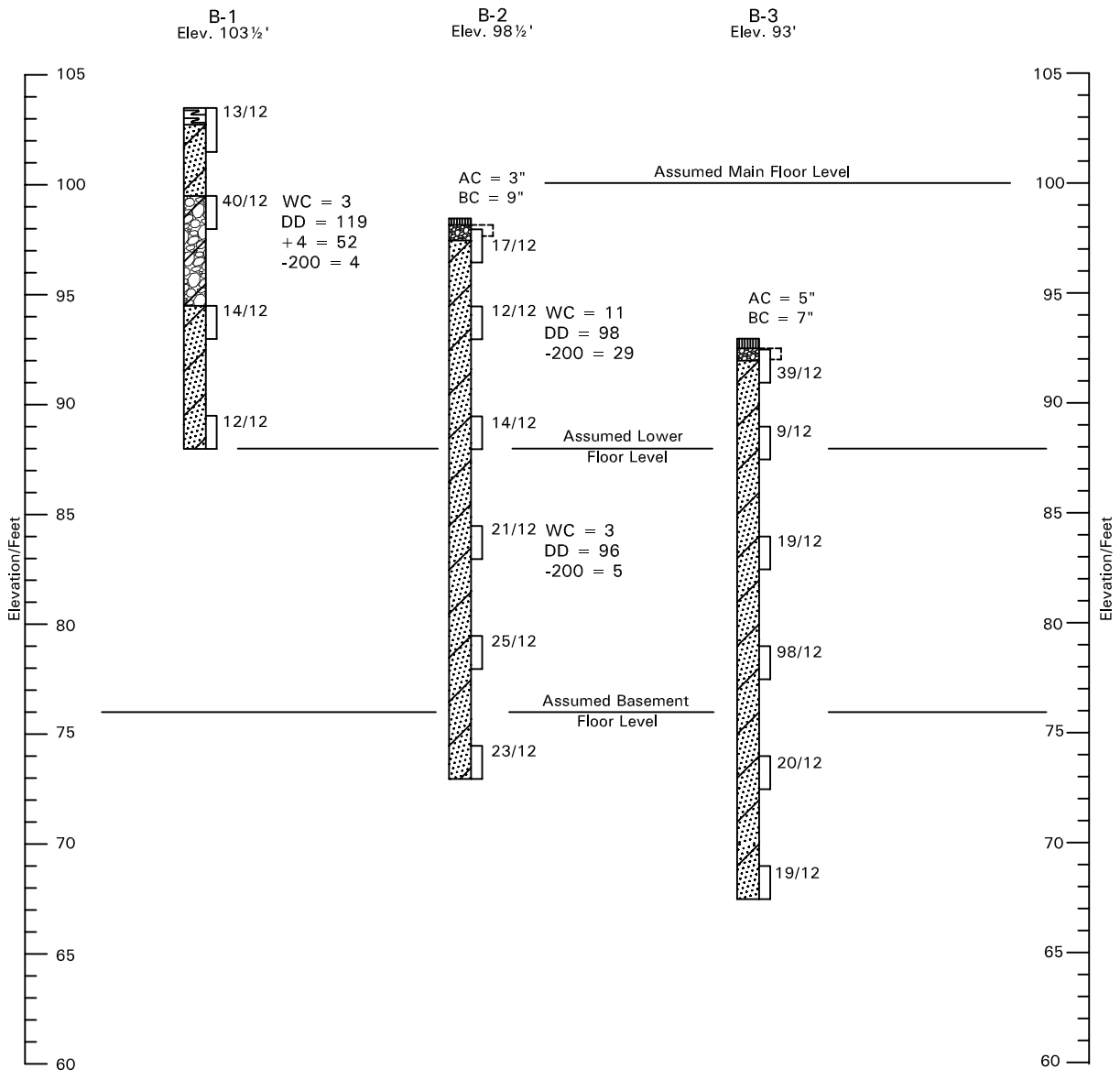
Black, B.D., Hecker, S., Hylland, M.D., Christenson, G.E., and McDonald, G.N., 2003; Quaternary fault and fold database and map of Utah; Utah Geological Survey Map 193DM.

International Building Code, 2012; International Code Council, Inc., Falls Church, Virginia.



PROPOSED UVU PERFORMING ARTS CENTER
UTAH VALLEY UNIVERSITY MAIN CAMPUS
OREM, UTAH

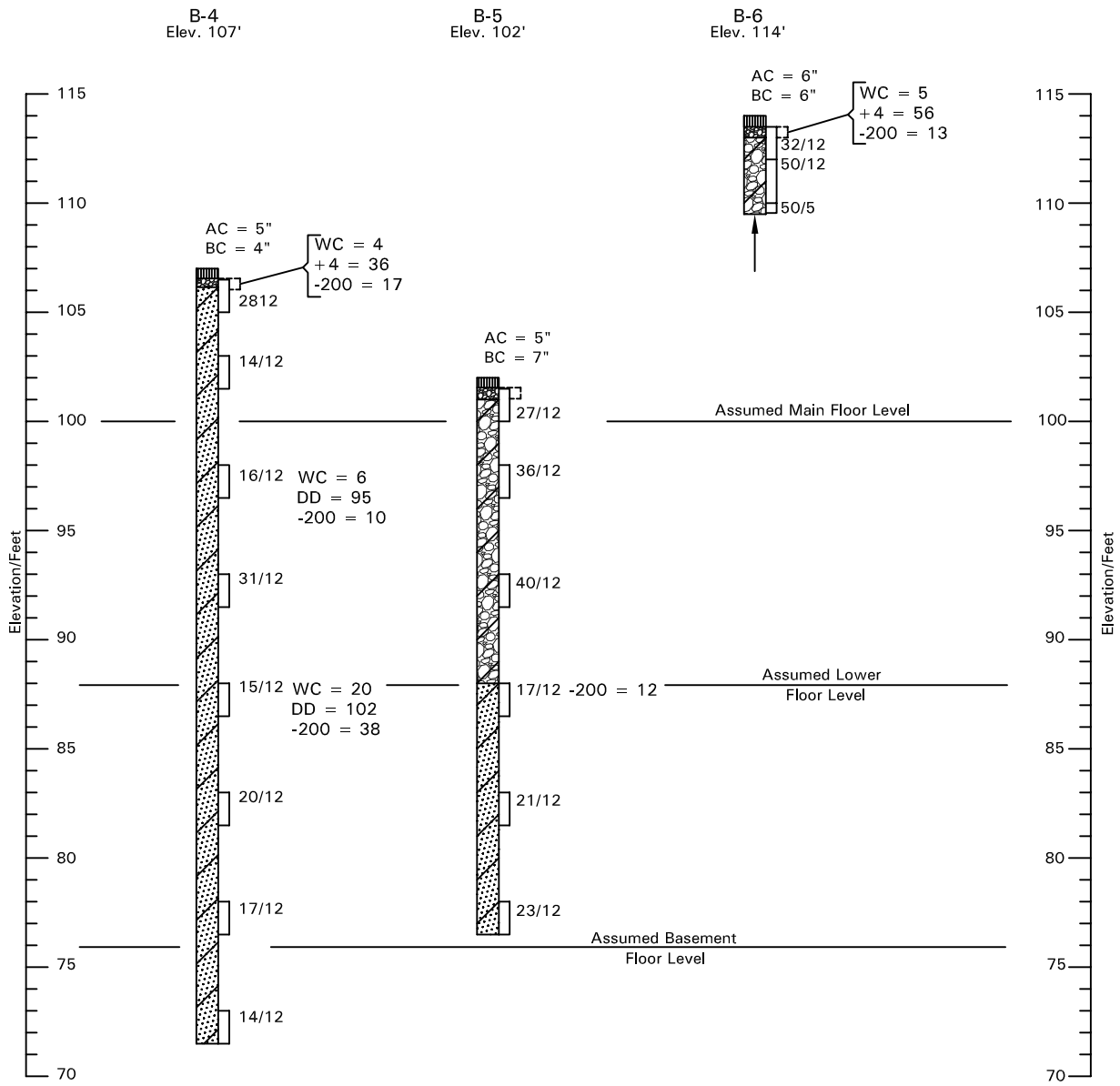
1150793	AGEC	Locations of Borings	Figure 1



Approximate Vertical Scale 1" = 8'

See Figure 6 for legend and notes.

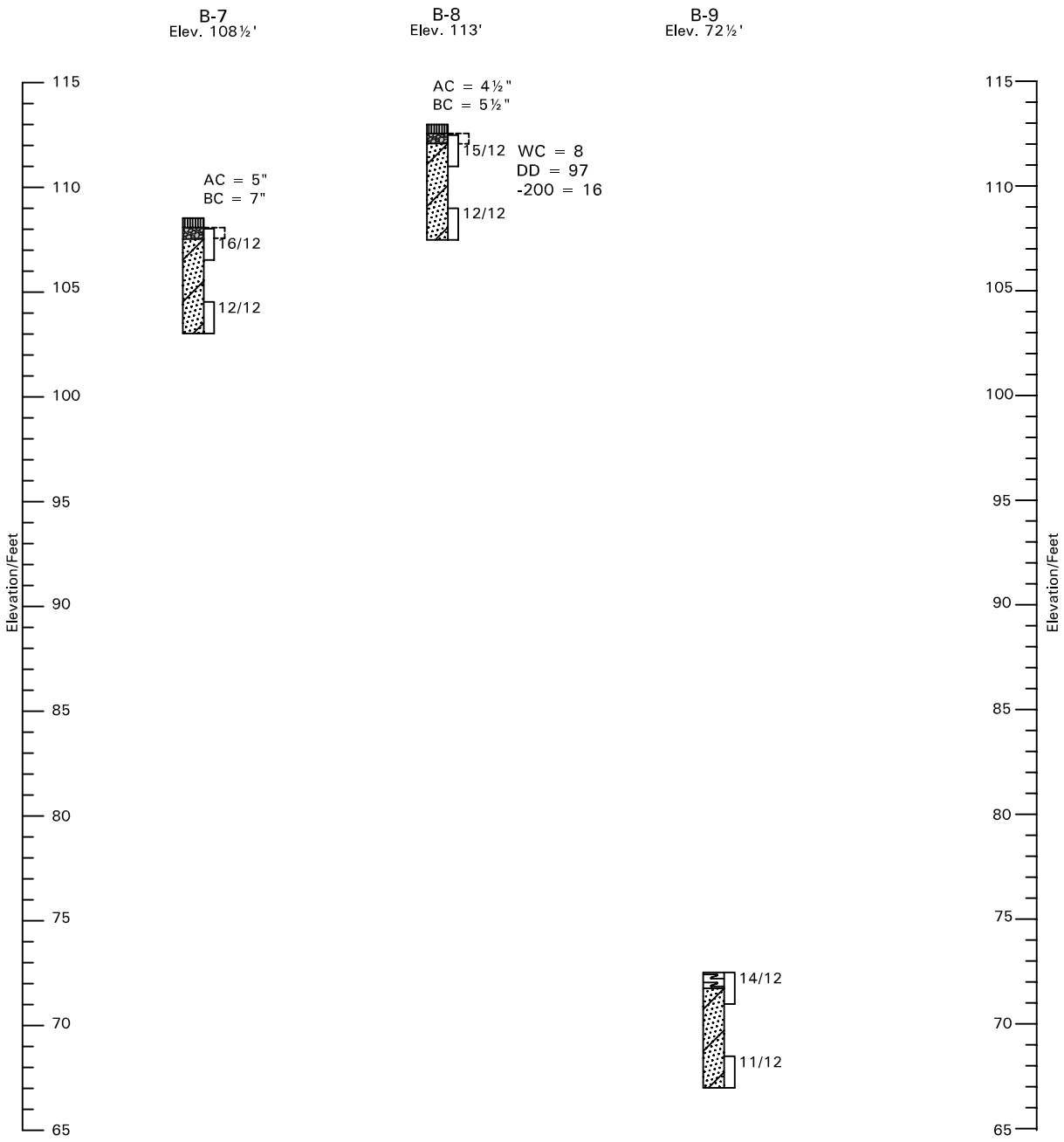
1150793	AGEC	Logs of Exploratory Borings	Figure 2



Approximate Vertical Scale 1" = 8'

See Figure 6 for legend and notes.

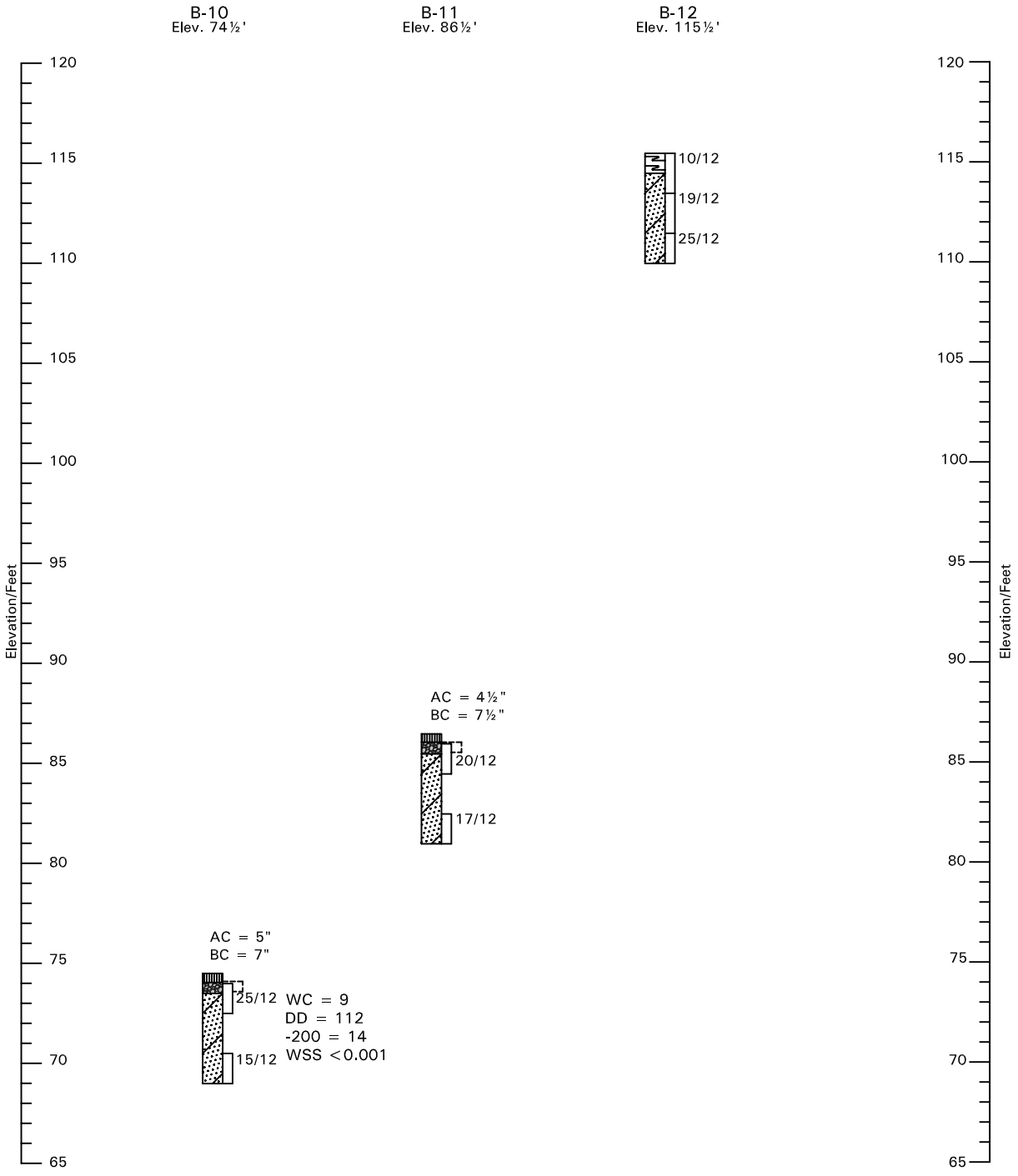
1150793	AGEC	Logs of Exploratory Borings	Figure 3



Approximate Vertical Scale 1" = 8'

See Figure 6 for legend and notes.

1150793	AGEC	Logs of Exploratory Borings	Figure 4



Approximate Vertical Scale 1" = 8'

See Figure 6 for legend and notes.

1150793	AGEC	Logs of Exploratory Borings	Figure 5

LEGEND:

Asphaltic Concrete.

Base Course; silty sand and gravel, moist, brown.

Topsoil; lean clay with sand, moist to very moist, dark brown, roots, organics.

Poorly-graded Sand with Silt (SP-SM); small to moderate amount of silt, some gravels and gravel lenses, medium to very dense, slightly moist to moist, brown to gray.

Poorly-graded Gravel with Silt and Sand (GP-GM); occasional sand lenses, medium to very dense, slightly moist to moist, brown to gray.

10/12 California Drive sample taken. The symbol 10/12 indicates that 10 blows from a 140 pound automatic hammer falling 30 inches were required to drive the sampler 12 inches.

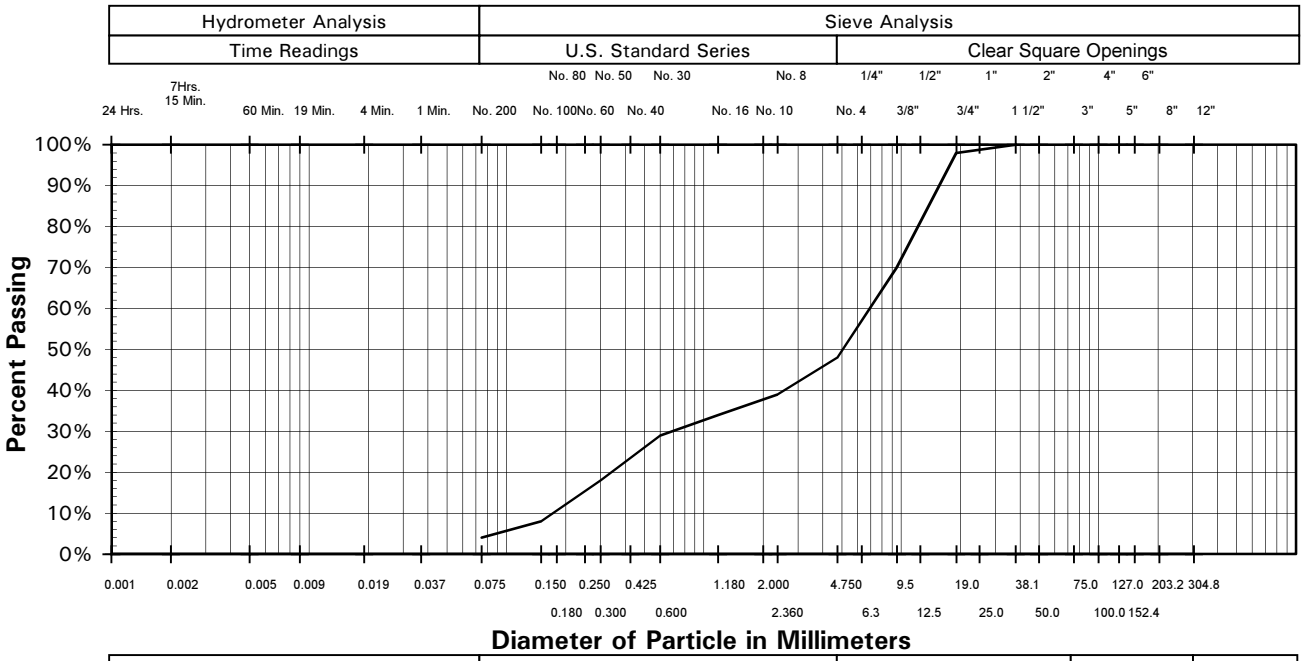
Indicates disturbed sample taken.

Indicates practical auger refusal.

NOTES:

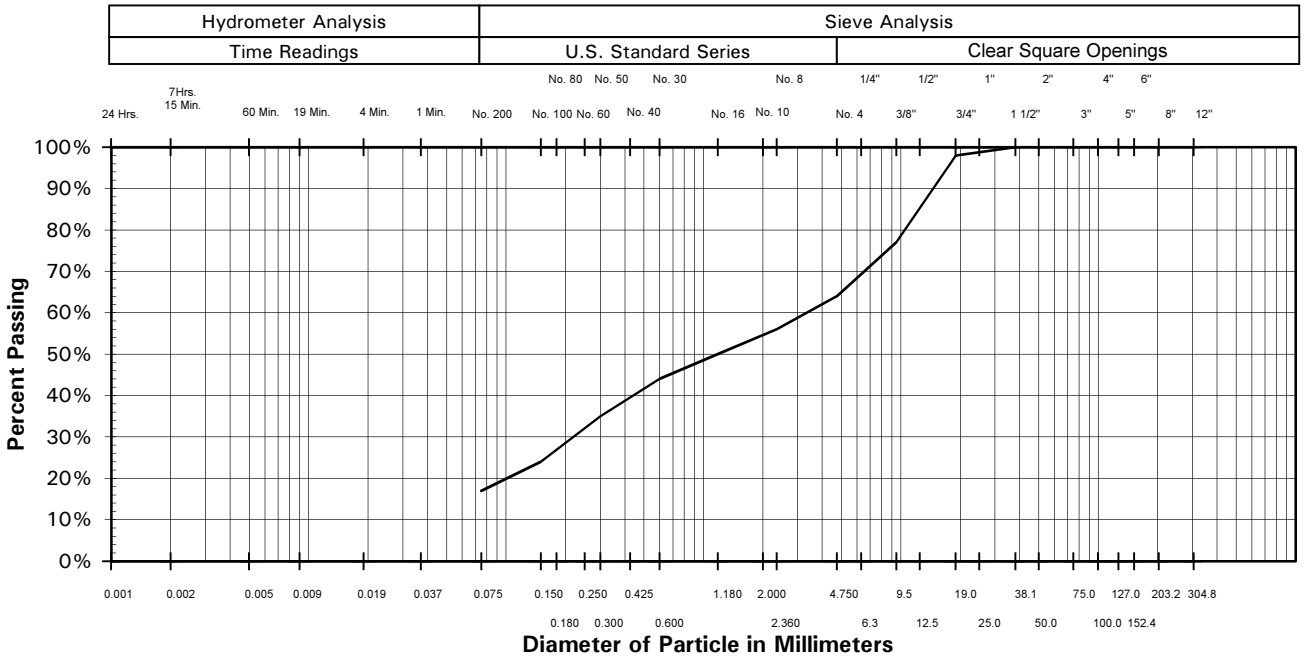
1. Borings were drilled on October 29 and 30, 2015 with 8-inch diameter hollowstem auger or direct push methods.
2. Locations of borings were measured approximately by pacing from features shown on the site plan provided.
3. Elevations of borings were measured by automatic level and refer to the benchmark shown on Figure 1.
4. The boring locations and elevations should be considered accurate only to the degree implied by the method used.
5. The lines between the materials shown on the boring logs represent the approximate boundaries between material types and the transitions may be gradual.
6. No subsurface water was encountered in the borings at the time of drilling.
7. WC = Water Content (%);
   DD = Dry Density (pcf);
   +4 = Percent Retained on No. 4 Sieve;
   -200 = Percent Passing No. 200 Sieve;
   WSS = Water Soluble Sulfates (%);
   AC = Asphaltic Concrete Thickness;
   BC = Base Course Thickness.

APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, INC.



Clay to Silt	Sand			Gravel		Cobbles	Boulders
	Fine	Medium	Coarse	Fine	Coarse		

Gravel	52%	Liquid Limit	-
Sand	44%	Plasticity Index	-
Silt and Clay	4%	Sample Location	B-1 at 4 feet
Sample Description	Poorly-graded Gravel with Sand		

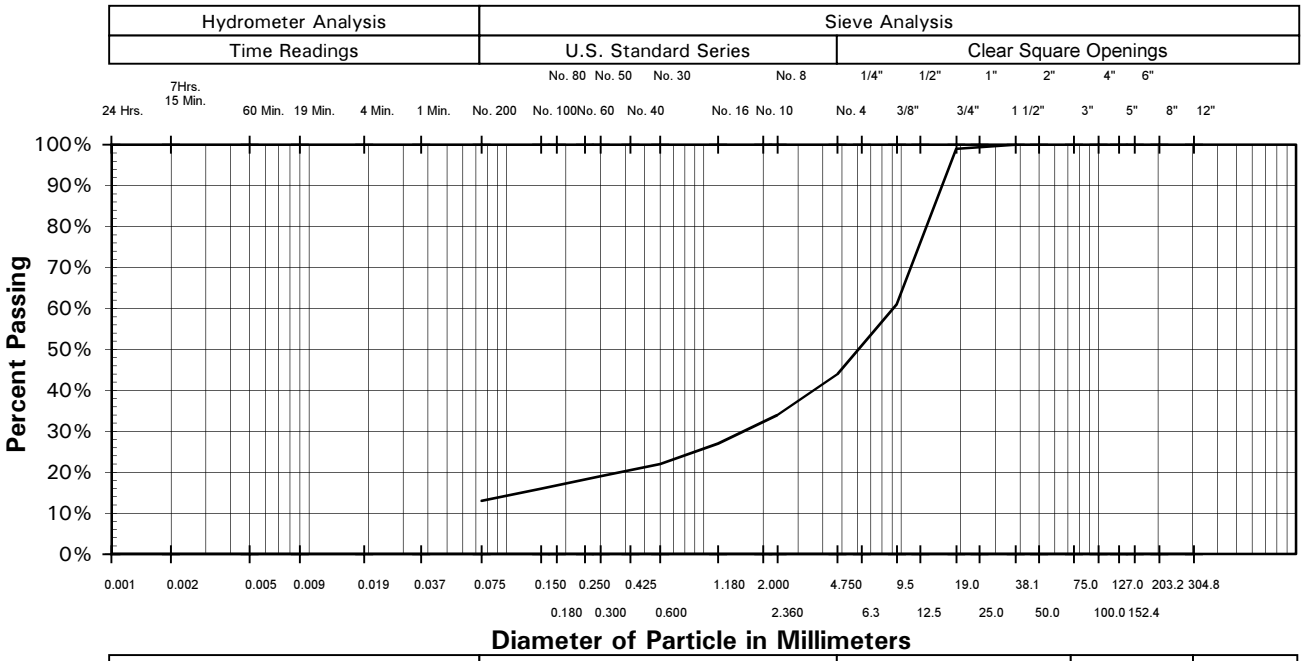


Clay to Silt	Sand			Gravel		Cobbles	Boulders
	Fine	Medium	Coarse	Fine	Coarse		

Gravel	36%	Liquid Limit	-
Sand	47%	Plasticity Index	-
Silt and Clay	17%	Sample Location	B-4 at 5 inches
Sample Description	Base Course: Silty Sand with Gravel		

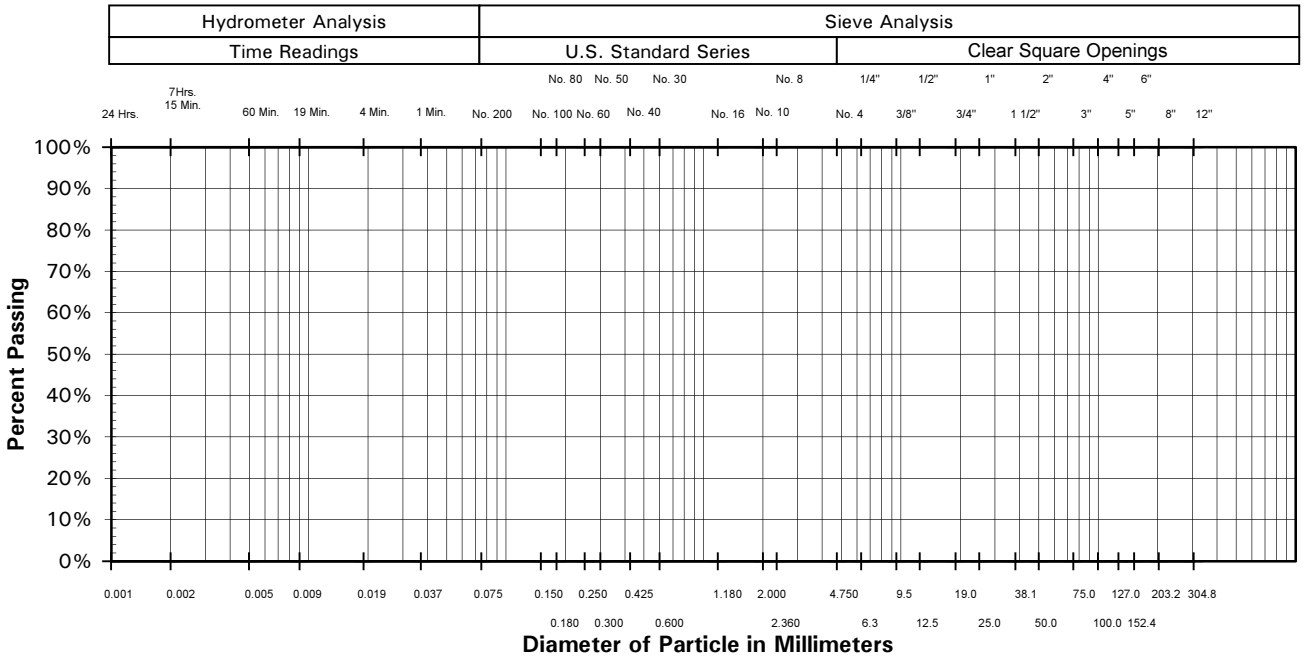
GRADATION TEST RESULTS

APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, INC.



Clay to Silt	Sand			Gravel		Cobbles	Boulders
	Fine	Medium	Coarse	Fine	Coarse		

Gravel	56%	Liquid Limit	-
Sand	31%	Plasticity Index	-
Silt and Clay	13%	Sample Location	B-6 at 6 inches
Sample Description	Base Course; Silty Gravel with Sand		



Clay to Silt	Sand			Gravel		Cobbles	Boulders
	Fine	Medium	Coarse	Fine	Coarse		

Gravel		Liquid Limit	-
Sand		Plasticity Index	-
Silt and Clay		Sample Location	
Sample Description			

Project No. 1150793

GRADATION TEST RESULTS

Figure 8

APPLIED GEOTECHNICAL ENGINEERING CONSULTANTS, INC.

TABLE I

SUMMARY OF LABORATORY TEST RESULTS

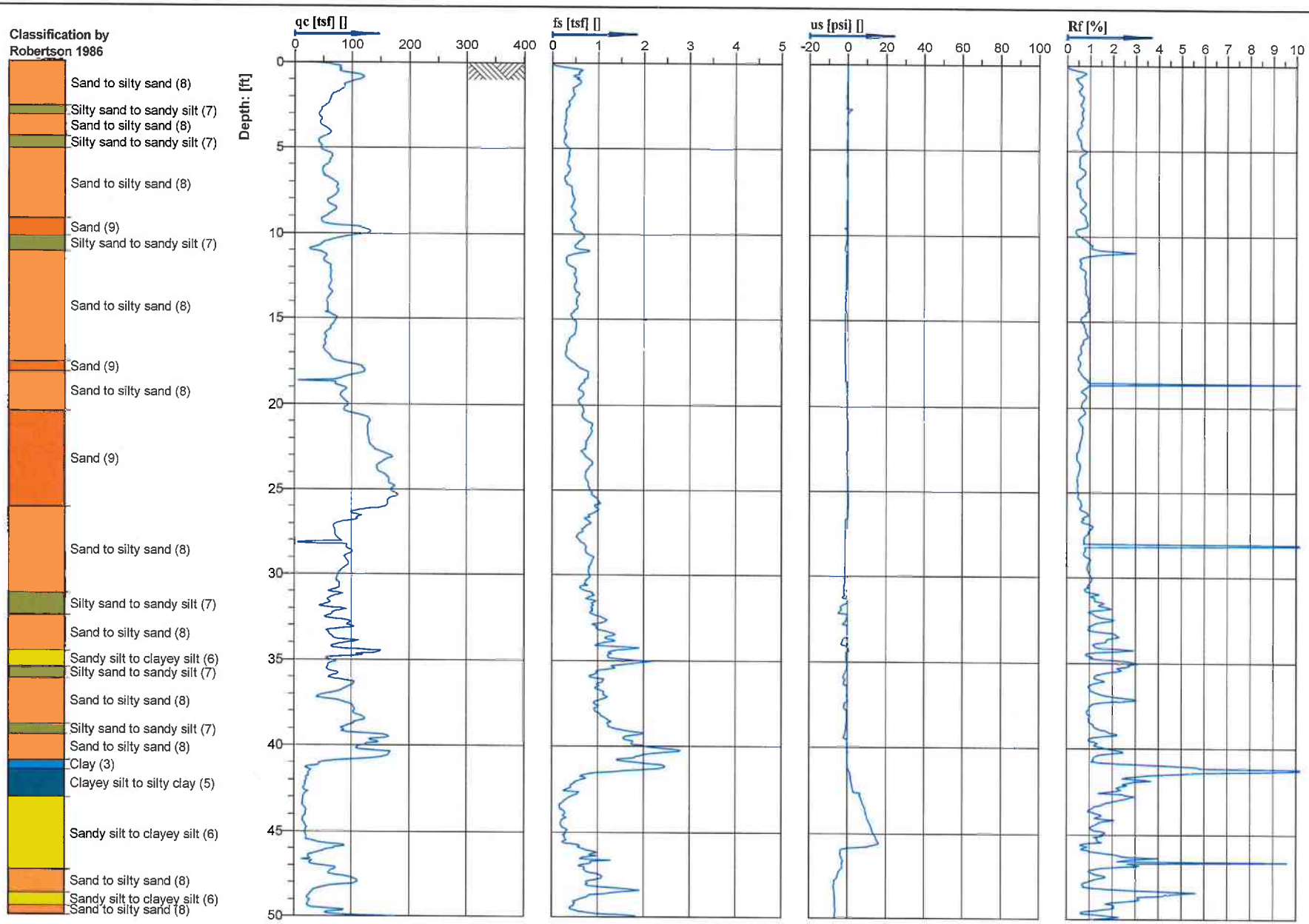
PROJECT NUMBER 1150793

SAMPLE LOCATION		NATURAL MOISTURE CONTENT (%)	NATURAL DRY DENSITY (PCF)	GRADATION			ATTERBERG LIMITS		UNCONFINED COMPRESSIVE STRENGTH (PSF)	WATER SOLUBLE SULFATE (%)	SAMPLE CLASSIFICATION
BORING	DEPTH (FEET)			GRAVEL (%)	SAND (%)	SILT/ CLAY (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)			
B-1	4	3	119	52	44	4					Poorly-graded Gravel with Sand
B-2	4	11	98			29					Silty Sand
	14	3	96			5					Poorly-graded Gravel with Sand
B-4	5"	4		36	47	17					Base Course; Silty Sand with Gravel
	9	6	95			10					Poorly-graded Sand with Silt
	19	20	102			38					Silty Sand
B-5	14					12					Poorly-graded Sand with Silt
B-6	½	5		56	31	13					Base Course; Silty Gravel with Sand
B-8	½	8	97			16					Silty Sand
B-10	½	9	112			14				<0.001	Silty Sand

APPENDIX

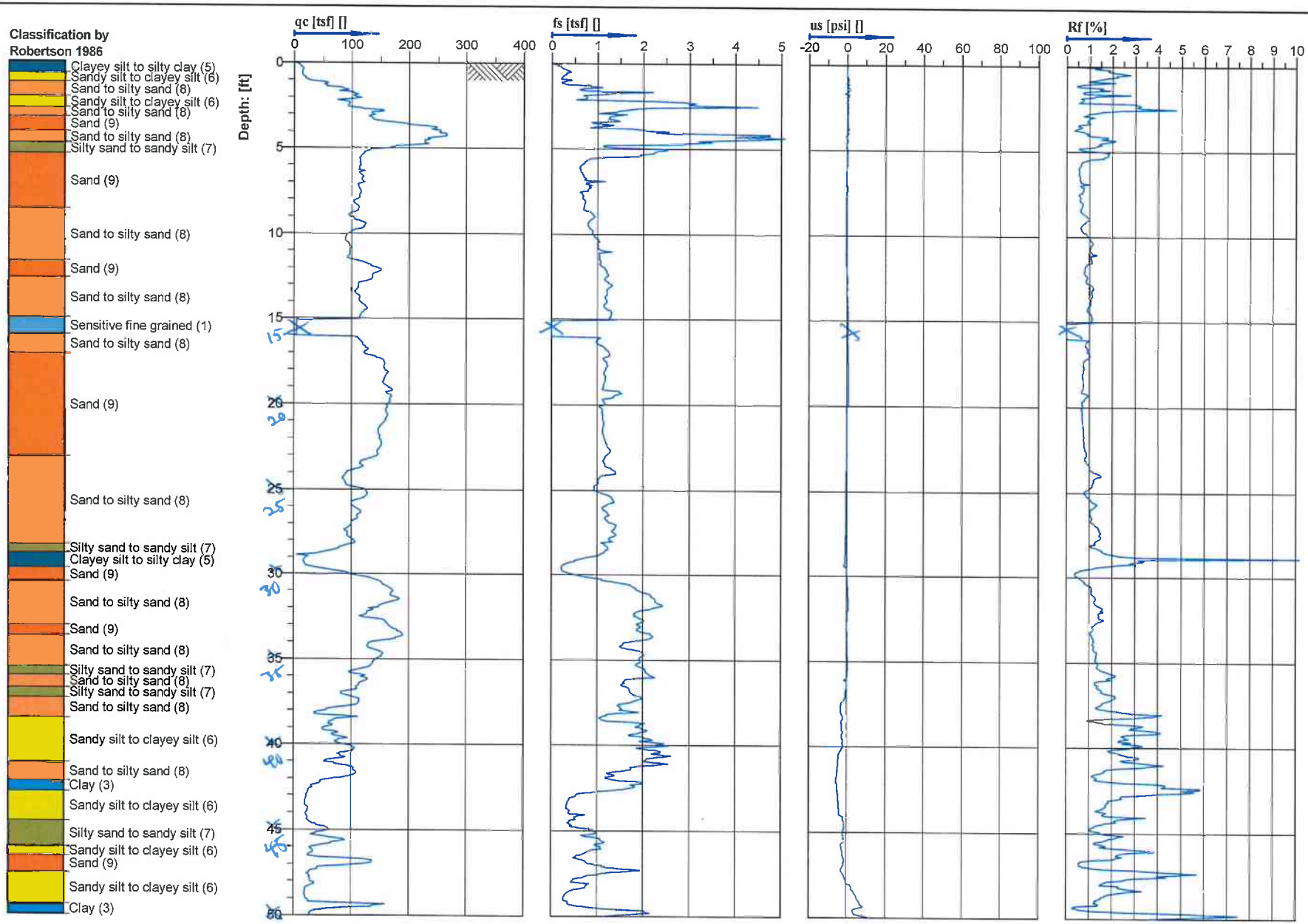
CPT SOUNDINGS

Project No. 1150624



AGEC
Applied GeoTech

Location: 40° 16' 40.91" N 111° 42' 32.53" W	Position:	Ground level: 0.00	Test No.: C-1
Project ID: 1150793	Client:	Date: 10/29/2015	Scale: 1 : 100
Project: UVU Performing Arts Center		Page: 1/1	Fig.:
		File: C-1.cpd	

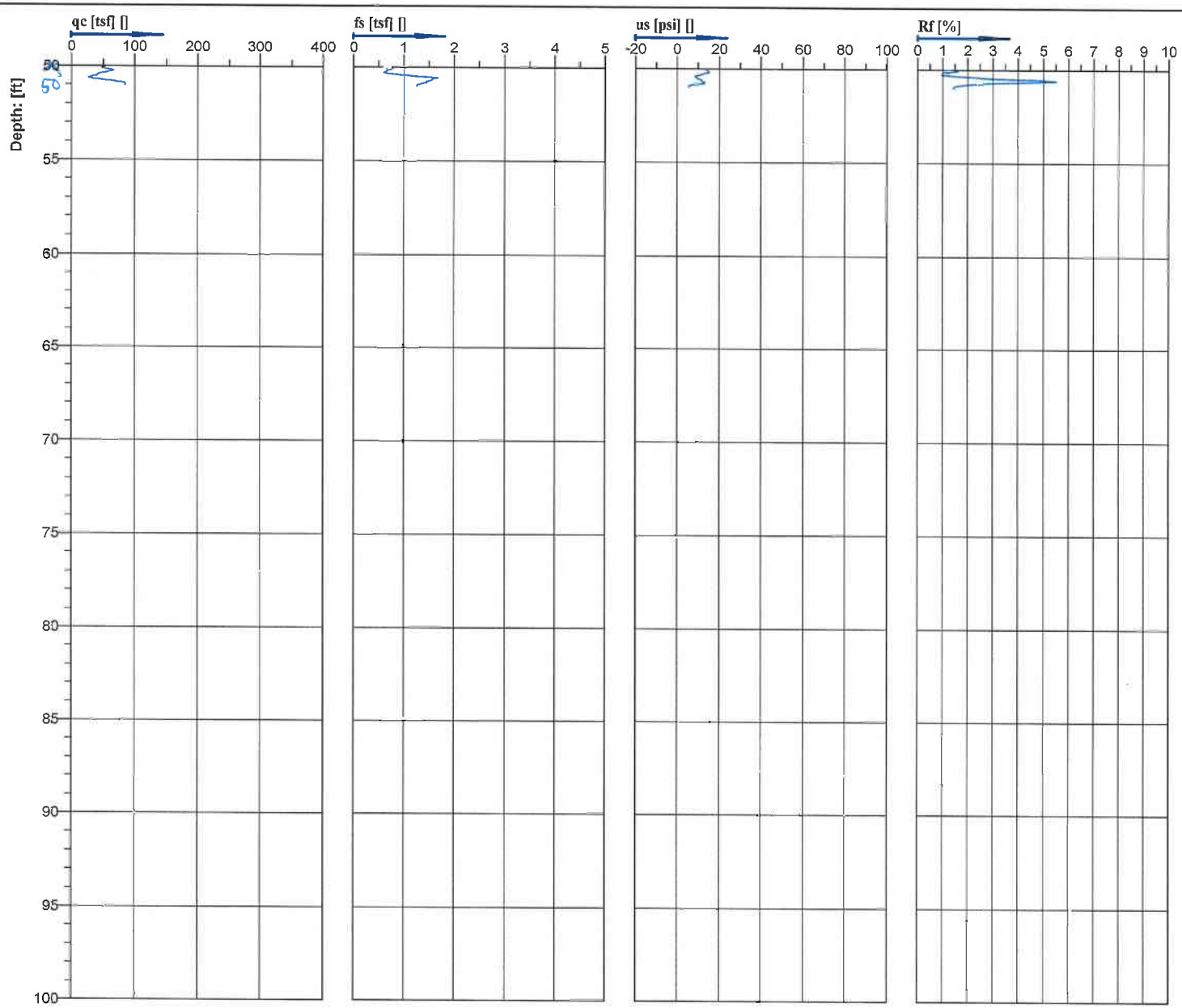


AGEC
Applied GeoTech

Location: 40° 16' 39.00" N 111° 42' 34.59" W	Position:	Ground level: 0.00	Test No.: C-2
Project ID: 1150793	Client:	Date: 10/29/2015	Scale: 1 : 100
Project: UVU Performing Arts Center		Page: 1/2	Fig.:
		File: C-2.cpd	

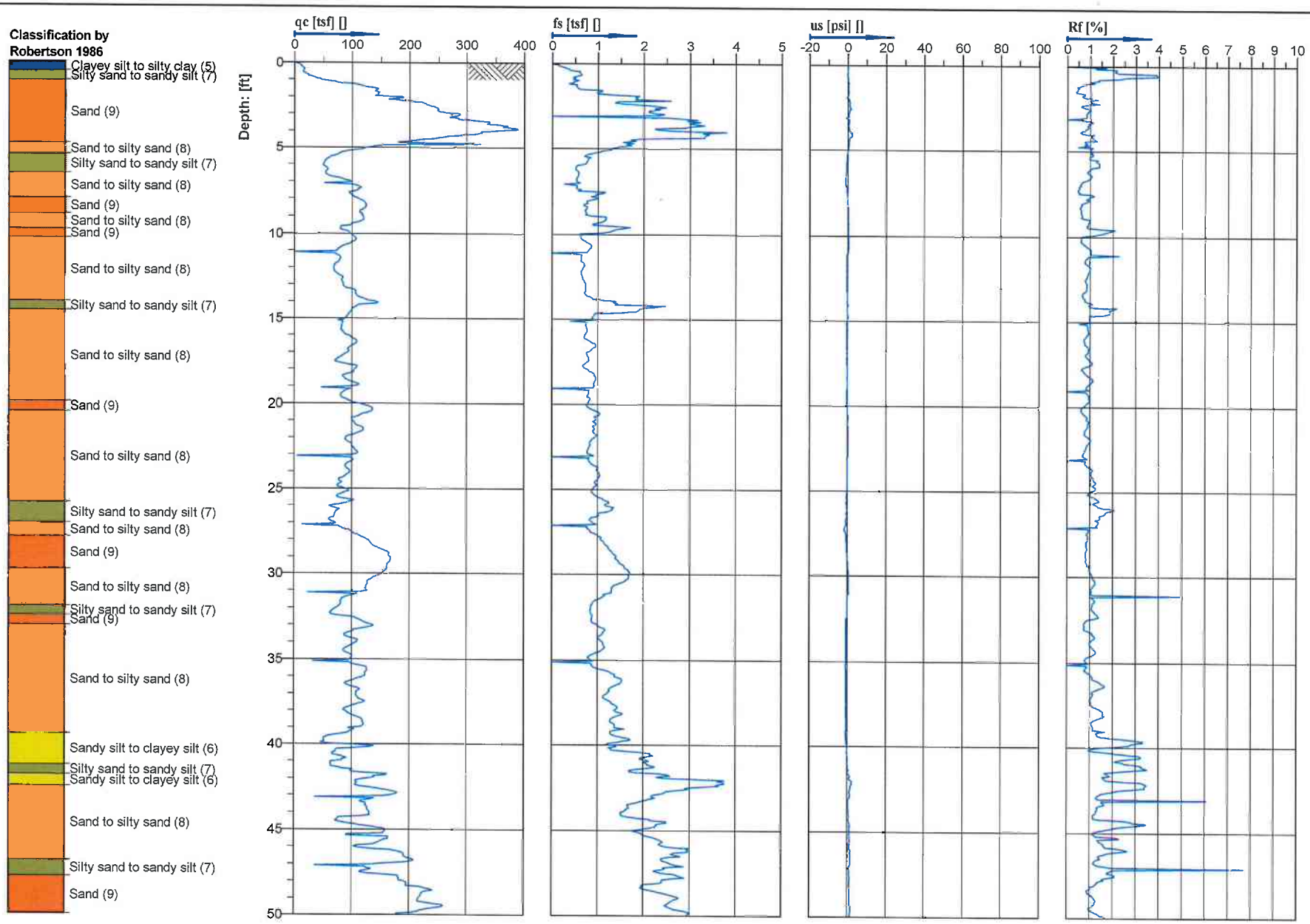
Classification by Robertson 1986

Clay (3)



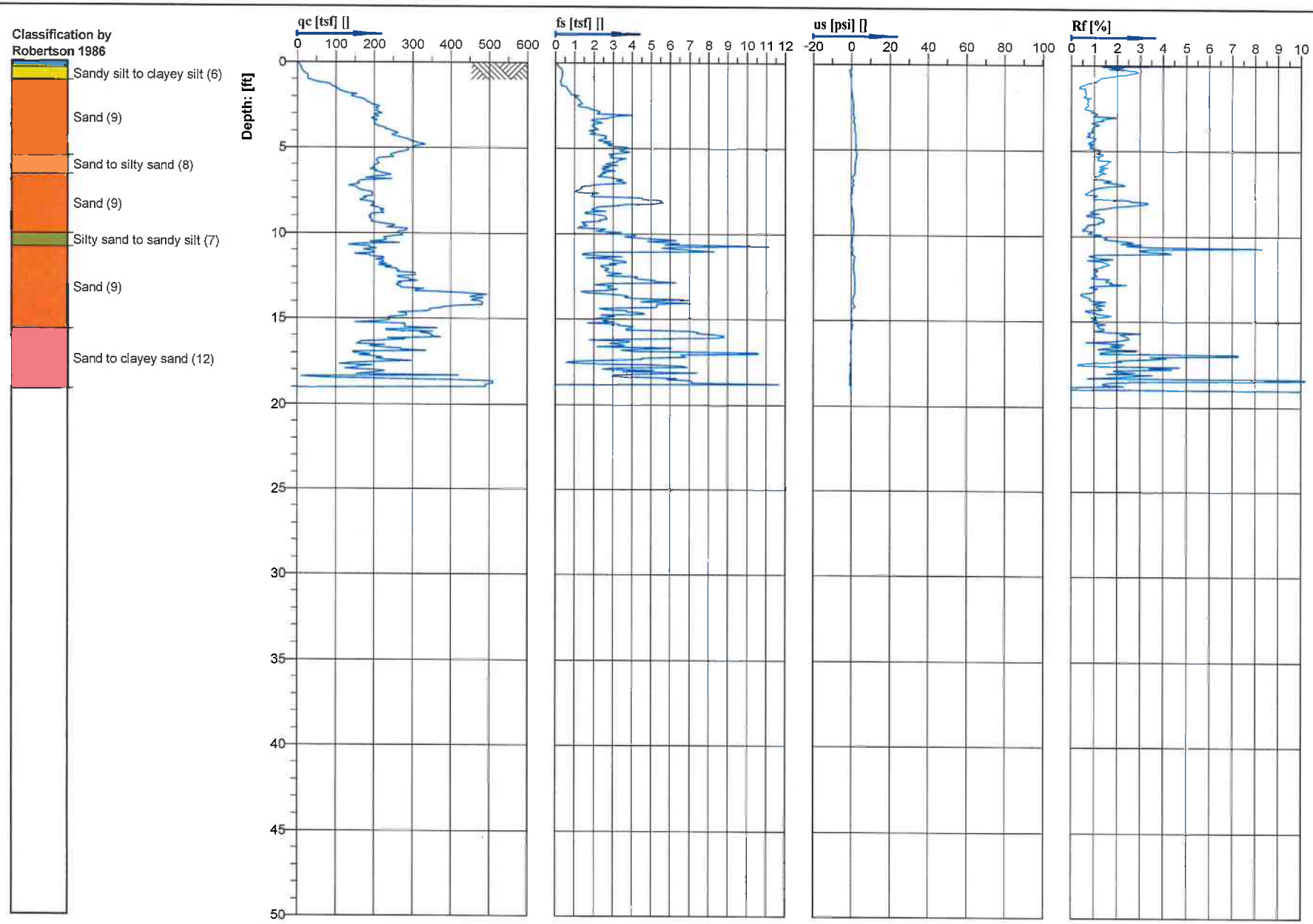
AGEC Applied GeoTech

Location: 40° 16' 39.00" N 111° 42' 34.59" W	Position:	Ground level: 0.00	Test No.: C-2
Project ID: 1150793	Client:	Date: 10/29/2015	Scale: 1 : 100
Project: UVU Performing Arts Center		Page: 2/2	Fig.:
		File: C-2.cpd	



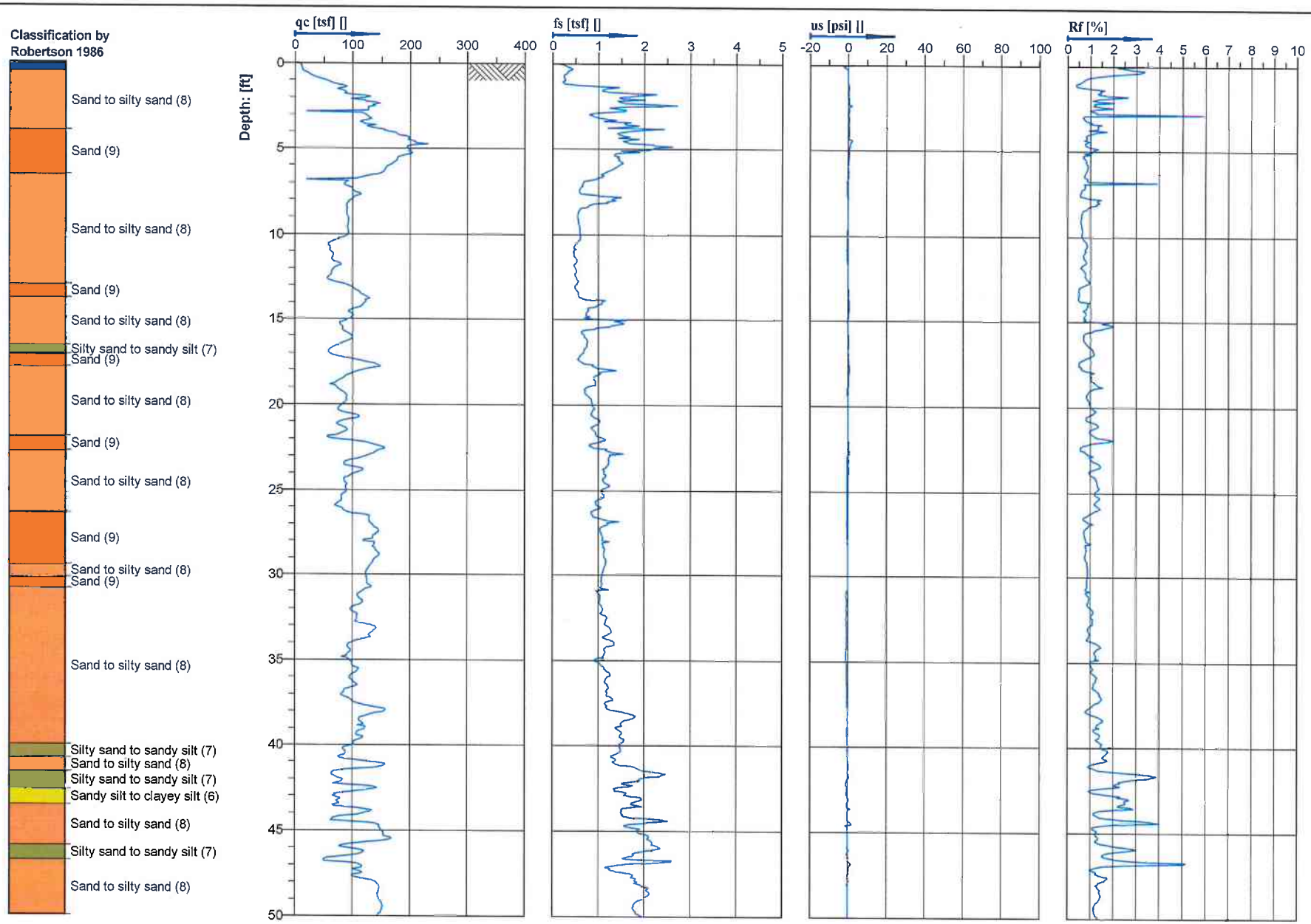
Location: 40° 16' 38.47" N 111° 42' 32.82" W	Position:	Ground level: 0.00	Test No.: C-3
Project ID: 1150793	Client:	Date: 10/29/2015	Scale: 1 : 100
Project: UVU Performing Arts Center		Page: 1/1	Fig.:
		File: C-3.cpt	

AGEC
Applied GeoTech



AGEC
Applied GeoTech

Location: 40° 16' 38.64" N 111° 42' 33.55" W	Position:	Ground level: 0.00	Test No.: C-4
Project ID: 1150793	Client:	Date: 10/29/2015	Scale: 1 : 100
Project: UVU Performing Arts Center		Page: 1/1	Fig.:
		File: C-4.cpt	



AGEC
Applied GeoTech

Location: 40° 16' 37.16" N 111° 42' 30.44" W	Position:	Ground level: 0.00	Test No.: C-5
Project ID: 1150793	Client:	Date: 10/29/2015	Scale: 1 : 100
Project: UVU Performing Arts Center		Page: 1/1	Fig.:
		File: C-5.cpd	

AUDIO/VISUAL DESIGN GUIDE

90% DRAFT

December 15, 2015

Approved by: _____

UVU Media Services & Engineering (MS&E) Date
Travis Tasker, Director (AVPM)

Approved by: _____

Facilities / Engineering Date
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Prepared by:

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and

SUMMIT
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1 Preface

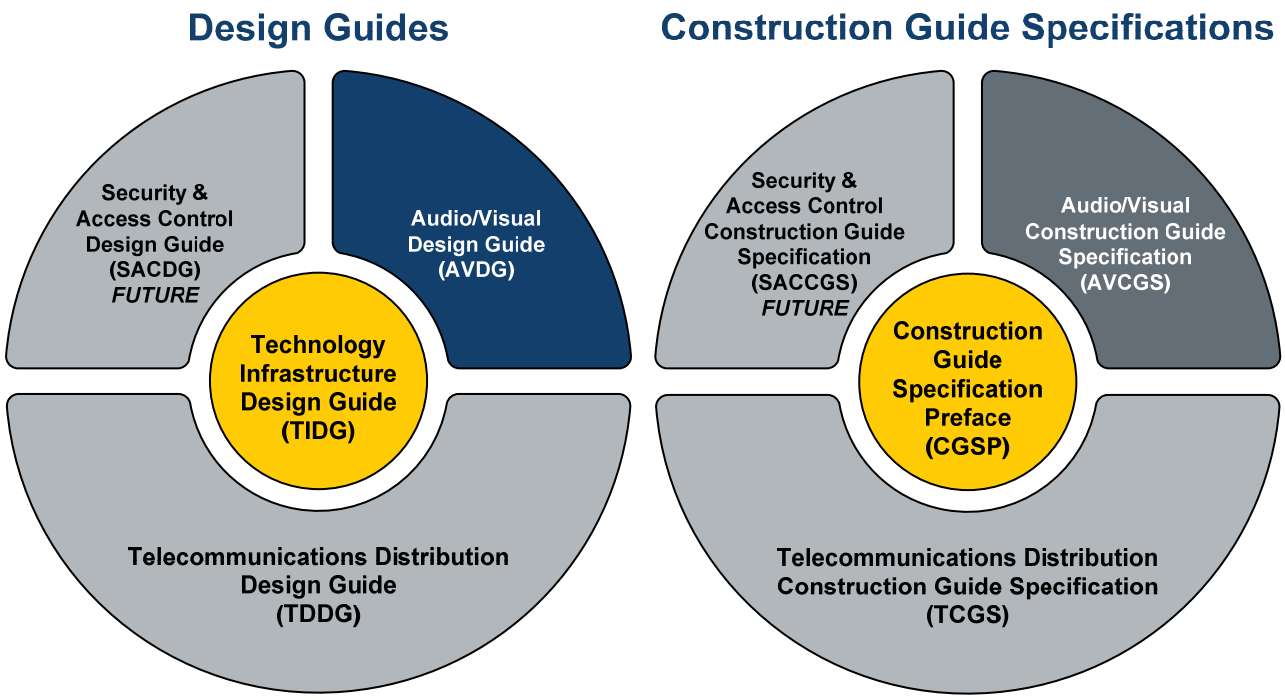
1.1 Introduction

A. The Audio/Visual Design Guide (AVDG) is written to communicate the requirements of Utah Valley University (UVU) for the design and installation of audio/visual systems and infrastructure at UVU facilities.

- The AVDG is written for an audience of Architects, Engineers, and Designers who are responsible for the design of new or remodeled facilities for UVU where audio/visual systems currently exist or will be installed.
- It is also intended for Audio Visual, Electrical and other Contractors installing audio/visual systems at UVU facilities.
- This document also applies to infrastructure designed and installed by UVU Media Services & Engineering (MS&E) staff, and will be used to develop formal designs on projects.

B. The AVDG belongs to a set of documents (depicted below) that encompass the standard design and installation practices for all facets of technology infrastructure and systems at UVU facilities.

Technology Infrastructure Standards Document Set



C. The Technology Infrastructure Design Guide (TIDG), contains information common to all of UVU's Design Guides and is applicable to all involved parties; Engineers, Architects, Contractors and Integrators.

D. The Audio/Visual Construction Guide Specification (AVCGS) is a key companion to the AVDG.
- Designers shall adapt the AVCGS "as written" for creating specifications for a particular project according to the instructions in the AVDG. In other words, Designers shall use the electronic specification section documents (provided by UVU in MS Word format) and then shall make any project-specific adjustments to the specifications in those documents. Any changes to the specifications shall be done using the "Revision Tracking" features in MS Word.
- Rewriting the AVCGS or modifying the format structure or requirements will not be accepted. All changes are subject to review by UVU MS&E, and approval of any changes is at MS&E's discretion.

E. It is the responsibility of the audio/visual systems Designer to coordinate with the other designers on a project (architectural, electrical, mechanical, etc.) to determine that other systems are both compatible with and complementary to the audio/visual systems. It is critical to coordinate between disciplines during the design phase of a project, rather than making adjustments in the field during construction.

F. This document was prepared by the Information Technology Services department at Utah Valley University and by Summit Engineering & Consulting, P.S. As technology and needs progress, the document will be periodically updated.

- Date – Originally published

1.2 Standards and Guidelines

A. Generally speaking, UVU follows guidelines and standards endorsed or published by the International Communications Industries Association, Inc. (www.infocomm.org).

B. Audio/visual system designers and installers shall adhere to the following guidelines (or newer editions) for audio/visual system design:

- *Basics of Audio and Visual Systems Design,* published by the International Communications Industries Association, Inc. (www.infocomm.org).
- *Audio Visual Best Practices*, published by the International Communications Industries Association, Inc.
- *AV Design Reference Manual*, jointly published by Infocomm and BICSI (www.bicsi.org).

- *Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools*, ANSI S12.60-2002 from American National Standard.
- *Standard Guide for Audiovisual Systems Design and Coordination Processes*, ANSI/INFOCOMM 2M-2010.
- *AV Systems Performance Verification*, InfoComm 10-201x.
- *2010 ADA Standards for Accessible Design*, (www.ada.gov).

C. While lighting and lighting control are to be managed under the current UVU Facilities standard for buildings, lighting control for conference rooms and classrooms shall comply with ANSI InfoComm Standard 3M-2011: Projected Image System Contrast Ratio. The projected image contrast ratio shall not be less than the "Basic Decision Making Level" as set forth in that standard. Areas that have audio visual resources also require additional coordination for projection and preset control.

D. Audio/visual infrastructure shall fully comply with the current UVU AVDG (this document), the UVU Telecommunications Distribution Design Guide (TDDG), and the National Electrical Code (NEC).

E. Any request to deviate from the requirements of the National Electrical Code will not be accepted.

F. Audio/visual systems shall be designed for construction following UVU standards and using materials from current product lines of the manufacturers upon which UVU has standardized.

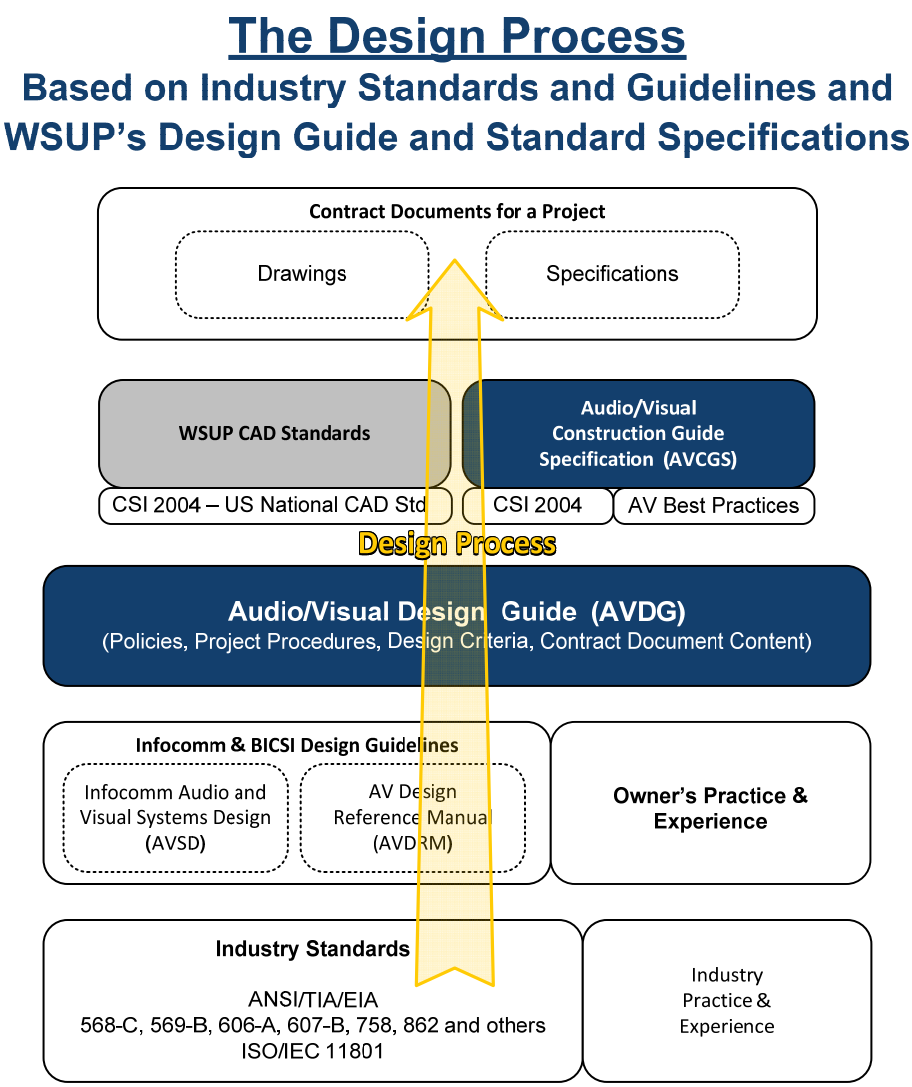
G. The Designer shall seek approval for designs and equipment models that are not consistent with UVU AVDG requirements. Standards Variance Requests (SVR) to deviate from industry standards or UVU design solutions will be considered on a case-by-case basis by the UVU Audio/Visual Project Manager (AVPM). Designers shall contact the AVPM to discuss proposed alternatives before spending significant time pursuing the option. See the TIDG for more information about the roles of UVU technology project managers.

H. The Designer and Integrators are to only use the manufacturers and models listed in this document and the AVCGS in the design and implementation of systems (unless otherwise directed by UVU) and to design systems that will be suitable for the use of products from these manufacturers. The construction documents shall require that the A/V Contractor's installation workmanship fully comply with the current installation requirements from the manufacturers of these products and remain consistent with UVU's best practices as outlined in this document.

I. The requirements contained in the AVDG are considered to be in addition to those required under contract with the State of Utah. Where the requirements differ, the issue shall be brought to the attention of the UVU Facilities Project Manager and the UVU Audio/Visual Project Manager (AVPM). Generally, the more stringent requirement shall apply.

1.3 Document Intent

A. The Design Process diagram below depicts the relationships between the ANSI/TIA/EIA Standards, the BICSI Design Guidelines, the UVU documents (AVDG, AVCGS), and the project-specific Construction Documents. Audio/visual infrastructure at UVU facilities shall be designed based on industry guidelines (primarily from InfoComm and BICSI) and compliant with the ANSI/TIA/EIA Standards as applied by and illustrated in the UVU AVDG.



B. The AVDG is intended to be used in conjunction with the industry standards and guidelines listed above in order to reinforce selected content as well as highlight any restrictions and/or limitations that are specific to UVU's requirements.

C. This document provides directions for making standards-compliant design decisions that will, in due course, be reflected in Construction Documents.

The Construction Documents for a project shall be comprised of drawings and specifications that properly incorporate audio/visual infrastructure within a project. The AVDG shall be used in conjunction with the AVCGS. Drawings shall conform to the guidelines contained in this document for content and completeness, and the specifications shall be based upon the AVCGS.

D. The AVDG is not intended to serve as a master specification, nor for stand-alone use on design build projects but in conjunction with the AVCGS and the other listed resources.

1.4 Document Structure

The AVDG is organized in the following sections:

1. The **Preface** (this section) describes this document, its intent, and its relationship to industry standards, practices and the various audiences affected by the document. It also describes how to use this document.

2. The **UVU Audio/Visual Procedures** section defines and discusses considerations for internal UVU stakeholders (UVU Facilities, Engineering, MS&E, etc.) as they plan the instructional functionality of a new or remodeled building.

3. The **Project Procedures** section discusses the activities that should occur during each phase of a project.

4. The **Physical Infrastructure for A/V** section describes the physical infrastructure components that are required to support audio/visual systems for UVU.

5. The **A/V Features, Functions and Service** section defines and describes the features, systems, materials, equipment, furnishings and services that shall be used as components in audio/visual systems for UVU.

6. The **Application Spaces** section describes how the components introduced in the A/V Systems section shall be deployed in specific room types.

7. The **Construction Document Content** section describes the content that a complete set of drawings and specifications shall contain.

8. The **Appendices** contains documentation and references for use with all other sections. It also contains the change order form and other form letters for distribution.

1.5 UVU Personnel

A. There are several specific UVU personnel roles defined in the TIDG and referenced in this document. The Designer shall interact with these individuals as direct points of contact.

B. The UVU Audio/Visual Policies section of this document applies specifically to UVU personnel. In addition to the UVU Audio/Visual Policies section, UVU personnel should be aware of the instructions, requirements, and guidelines for Designers contained in the other sections of this document. Also, the AVCGS contains additional requirements related to audio/visual system materials and installation methods applicable at UVU facilities.

C. UVU personnel should be familiar with these requirements with respect to their application on both large-scale audio/visual distribution projects and smaller-scale projects. These requirements also apply to remodels, in-house operations and maintenance of existing audio/visual systems.

1.6 Audio/Visual System Designers

Audio/visual system Designers shall be responsible to apply the guidelines, instructions and requirements in this document, and adapt the AVCGS specifications in the course of designing audio/visual systems for UVU facilities.

1.7 Contractors and System Integrators

Contractors and System Integrators involved in projects without a formal engineering and design process shall be fluent with and adhere to the requirements of this document and also the requirements for audio/visual systems materials and installation methods contained in the AVCGS.

1.8 Copyright

Summit Engineering & Consulting retains the copyright for this document. Utah Valley University is authorized to edit, adapt and use this document.

Summit Engineering & Consulting has authored similar documents for many other organizations. This document is intended (in part) to describe best practices that are found in some segments of the industry. As a result, portions of this document are similar to comparable content in documents previously prepared by Summit Engineering & Consulting for other organizations. This document does not contain any information that is proprietary or confidential to other organizations.

2 UVU Audio/Visual Policies

The following policies apply to anyone that may be involved in the design, installation, maintenance or use of audio/visual systems at a UVU facility.

2.1 Getting Help from the Media Servicedesk

All requests for A/V assistance should be submitted to:

- Call 801.863.1111
- Email media@uvu.edu
- See http://www.uvu.edu/media
- AVPM Travis.Tasker@uvu.edu

When requests are received, they will be addressed in one of the following ways:

- Assistance will be provided by telephone
- On-site assistance will be provided
- A trouble ticket will be logged
- A project will be requested

Support for issues affecting existing systems will be given priority over new implementation requests.

MS&E is most efficient in meeting your needs when you work through our normal channels. We are committed to applying our best efforts to address each request in a timely and professional manner.

2.1.1 DO NOT ALTER CABLING OR EQUIPMENT

Audio/visual equipment and its associated cabling shall not be altered by anyone outside of MS&E. Doing so will cause interoperability problems with equipment and may void manufacturer warranties.

Please do not:

- Remove installed connectors
- Attempt to access locked panels
- Remove patch cables

Anyone needing help with cabling should contact MS&E for assistance.

2.2 Facilities

The following information is intended to assist representatives in the Facilities department as projects are planned and during the construction and commissioning of buildings.

2.2.1 AUDIO/VISUAL FEATURES IN BUILDING SPACES

In the life of a building, technology advances occur, systems become obsolete, and the cabling and equipment components of the technology infrastructure will be changed several times (typically following a 7 year replacement cycle). In order to keep the life-cycle costs low, it is essential that spaces and pathways supporting technology infrastructure are properly sized, properly located, and remain accessible.

Please use the following guidelines when considering the audio/visual features of spaces in new projects:

2.2.1.1 CLASSROOMS AND INSTRUCTIONAL SPACES

Classrooms and instructional spaces are designed in a variety of sizes and functions:

Space Type	Student Capacity	Room Configuration
Classroom / Teaching Lab	up to 150	Movable tables and Chairs with a set Teacher Station off to one side
Collaboration Labs	up to 60	Configurable tables for pods for up to 10 groups of 6 people. Room equipment will be rack mounted in a custom credenza
Horseshoe Classroom	up to 150	Fixed tables with movable chairs with a set Teacher Station off to one side
Lecture Hall	151 – 250	Fixed tables with movable chairs with a set Teacher Station off to one side
Auditorium	250 or more	Fixed tables with movable chairs with floor boxes for adjusting the location of the Teacher Station or lectern on the stage
Large Auditorium	1000 or more	Fixed tables with movable chairs with floor boxes for adjusting the location of the Teacher Station or lectern on the stage

Standard Feature Set:

- Audio/visual equipment rack housed in custom furniture (See Appendix)
- Projection screen & projector
- Document camera
- Blu-ray player
- Touch panel control interface
- External VGA, HDMI, Data, 1/8" audio connections for user devices
- Stereo and PA audio with amp & Speakers (may be integrated with the video panel for small spaces)
- Assistive listening system
- Whiteboards
- Acoustic wall treatment as required
- Instructor computer, with network
- Standard Office & Presentation software

Classrooms may include: lecture capture capabilities, soft Video Conferencing equipment, etc.

2.2.1.1.1 LARGER SPACES

As Classroom and Instructional spaces increase in size to support larger groups, the following additional features will also be required:

- Digital Signal Processor (audio)
- Different audio amplifier(s) with sufficient power to support the higher power stereo speakers
- Public Address 70 Volt Amplifier
- Speakers sufficient for the space
- Multiple projection displays & surfaces including additional projectors
- Additional Equipment Racks
- Audio Visual Equipment Room (approximately 10' x 9')

2.2.1.1.2 VIDEO CONFERENCING SPACES

Video conferencing spaces are designed to support two-way video conferencing with other classrooms and distance sites. In addition to the presentation audio/visual features of Classrooms and Instructional Spaces, Distance Education spaces will also have the audio/visual features listed below:

- Cameras
- Video Codec
- Microphone(s) (desktop, lapel, and/or ceiling-hung)
- Additional video panels
- Additional cameras
- Instructor computer
- Lecture Capture application
- Standard Office & Presentation software
- Ceiling-hung microphones
- Acoustic wall treatment
- Technical Operation center

2.2.1.2 COLLABORATION LABS

Collaboration Labs are designed to support groups of 2-6 people in numerous pods. Pods will work independently and have the ability to be linked together. The amount of pods in a lab will be determined by the size of the space.

Standard Feature Set:

- Audio/visual equipment rack housed in custom credenza (See Appendix)
- Multiple displays for groups of 2-6
- Button panel control per pod & Touch panel for the entire room
- External VGA,HDMI, Data, 1/8" audio connections for user devices and teach pod and at the credenza
- Audio per pod via flat panel or external speakers and PA audio with amp for larger space
- Whiteboards next to each pod display
- Facilitator computer, with network
- Collaboration software
- White boarding software
- Office & Presentation software

Collaboration labs may include: lecture capture capabilities, Interactive flat panel displays for each pod, computers per pod, Soft Video Conferencing equipment, etc.

2.2.1.3 THEATERS

Theater spaces are defined as Small, Medium and Large Theaters.
The following features are typically needed:

- Audio/visual equipment racks
- Video projector(s) and projection surface(s) per theatre
- Building wide digital video distribution system/matrix
- Flat Panel displays at specific locations depending on size and scope of the venue, to include lobbies, light booth, sound booth, backstage, dressing rooms, green rooms, ticketing office, etc.
- Presentation Podium with built in microphone jack, video monitors, and AV inputs
- Wired and wireless discrete networks (campus, Dante primary, Dante Secondary, AV)
- 400 amp power 3 phase power with posilok/camlok type connectors per theatre
- Theatre wide DMX system
- Video surveillance cameras
- Backstage multipurpose area (storage, scenery, etc)
- Dressing rooms, green rooms, rehearsal spaces, dance studio spaces (all sound-treated to prevent overflow)
- Stage wings ½ width of stage on left and right sides
- Catwalk system
- Emergency lighting separate from other lighting systems in theater (fixtures off by default unless power outage)
- Generator power in light booth, sound booth, and AV rack areas
- Wireless/wired collaborative screen-sharing system
- Audio system, digital audio mixer, stage monitors, house speakers, and digital audio distribution system (Dante) per theatre
- Neutrik XLR and Speakon master patch panel with I/O boxes throughout venue per theatre
- Building wide PA
- Assistive listening system per theatre
- Room control panel with presets for lighting, sound, AV
- Acoustic wall and ceiling treatment appropriate for venue
- Sound proofing treatment for theater to prevent sound bleed to neighboring rooms
- Above stage fly system, single pitch, 1.5x height of proscenium, access from stage and loading dock above stage
- Above stage and house work lights
- Theatrical lighting fly bars above stage and in house, other “boom” lighting locations in house
- House lighting, dimmable and powered from dimmers or DMX controllable
- Dimmers for theatrical lighting
- Lighting console
- Orchestra pit (depending on size of venue)
- Stage trap door (depending on venue)
- Manual spotlight positions
- Wired and wireless production intercom system

2.2.1.4 MULTIPURPOSE ROOMS

These rooms are intended for hosting a variety of events and are typically dividable. The following features are typically needed per joined & divided space:

- Audio/visual equipment rack housed in custom credenza (See Appendix)
- Projection screen & projector
- Document camera
- Blu-ray player
- Partition sensor
- External VGA,HDMI, Data, 1/8" audio connections for user devices
- Stereo and PA audio with amp & Speakers
- Assistive listening system
- Touch panel control interface for joined and independent control

2.2.1.5 CONFERENCE SPACES

Conference spaces are designed in a variety of sizes and functions:

	# of People	Feature Set
Small Conference/Group Study Room	up to 10	Limited Presentation Features, possibly supporting Soft Video Conferencing
Conference Room	up to 20	Presentation, Soft Video Conferencing and/or Distance Education Video Conferencing

Presentation spaces typically need the following features:

- Audio/visual equipment rack (housed inside credenza furniture)
- Projection surface & projector
- Document camera
- Blu-ray/DVD player
- Touch panel control interface
- Auxiliary A/V Analog and Digital connection for user devices
- VOIP Conference telephone
- Speakers (may be integrated with the video panel for small spaces)
- Assistive listening system
- Whiteboards
- Acoustic wall treatment as required
- Instructor computer, with
- Standard Office & Presentation software

Conference spaces may include: lecture capture capabilities, Interactive flat panel displays, integrated computers, Soft Video Conferencing equipment, etc.

2.2.1.6 BOARDROOMS

Physically, Boardrooms are shaped similar to Conference Rooms, however the Audio/Visual features in Boardrooms are similar to full-featured Classrooms.

Standard Feature Set:

- Audio/visual equipment rack housed in custom furniture (See Appendix)
- Interactive monitors
- Multiple video panels (option)
- Public Address amplifier and speakers sufficient for the space
- Assistive listening system
- Whiteboards

- Multiple projection displays & surfaces including additional projectors (options)
- Document camera
- Blu-ray player
- Wired microphones
- Touch panel control interface
- External VGA, HDMI, Data, 1/8" audio connections for user devices
- Wireless support for BYOD personal devices
- Cameras
- Video Codec
- Microphone(s) (desktop, lapel, and/or ceiling-hung)
- Additional video panels
- Additional cameras
- Acoustic wall treatment as required
- Instructor computer, with network
- Standard Office & Presentation software
- Teleconferencing
- Controllable, dimmable lighting
- Controllable window shades
- Audio Recording
- Digital Signal Processor (audio)
- Additional Equipment Racks
- Audio Visual Equipment Room (approximately 10' x 9')
- Instructor computer
- Lecture Capture application
- Standard Office & Presentation software
- Table-top microphones
- Ceiling-hung microphones (option)
- Acoustic wall treatment
- Technical Operation center

2.2.1.7 HUDDLE SPACES PODS

These spaces are intended for collaboration and are usually placed in hallways or other open areas were small groups can congregate.

The following features are typically needed in a Huddle Space:

- Video Panel
- Button panel control interface
- Auxiliary A/V Analog and Digital plate for connection for user devices

2.2.1.8 ENTERTAINMENT SPACES

Spaces for relaxation, social interaction and entertainment can be created with a variety of applications:

- Sports zones, with multiple video displays and wall button control
- Video game centers, comprised of seating furniture surrounding video displays with gaming equipment
- Informational digital signage
- Entertainment displays (not just in sports zones)

These applications will require some or all of the following:

- Special conduit and pathways
- Video panels
- Furniture
- Power and data outlets
- Audio speakers
- Simple control interface
- Signage players and licensing

- Video game equipment
- Digital Graphic Engine for content overlay/control

2.2.1.9 DANCE STUDIOS

Dance studios are used for academic instruction and artistic practice.

The following features are typically needed:

- Audio/visual equipment rack (housed inside a credenza)
- Media player
- Speakers
- Acoustic wall treatment
- Audio inputs for personal music players

2.2.1.10 ATHLETIC/PERFORMANCE STADIUMS

Large facilities are constructed for athletic and performance events. These venues are each unique and require custom-designed solutions.

The following features are typically needed:

- Audio/visual control rooms
- Large video displays
- Video Distribution/Digital Signage
- Audio/visual equipment racks
- Pathways and power for event setup
- Large audio amplifier systems
- Large speaker systems
- Acoustic treatments
- Fixed HD PTZ cameras (not security)
- Extra video surveillance

2.2.1.11 EXERCISE SPACES

Exercise spaces often have stationary exercise equipment such as treadmills, bicycles, stair climbers, etc. The following features are typically needed

- Multiple video displays showing multiple simultaneous television programs
- Low-power FM Radio audio broadcasts for each video panel, allowing patrons to tune into the audio for the video program they would like to watch.
- Informational digital signage
- Data and power outlets for equipment

2.2.1.12 INSTRUCTIONAL MEDIA STUDIOS

Instructional Media Studios are used to prepare audio/visual media for instructional and or training purposes. Lectures or demonstrations can be recorded (both audio and video) and streaming media files can be produced in this space.

The space is sized similar to an office and will require a movable table.

The following audio/visual features are required:

- Audio/visual equipment rack (floor-standing)
- Computer with two video panels for
- Document camera
- Blu-ray/DVD player
- VOIP telephone

lecture capture and presentation software
- Interactive video panel
- Cameras
- Speakers
- Microphone (lapel, desktop or ceiling-hung)
- Acoustic wall treatment
- Specialty lighting as needed

2.2.1.13 VIDEO PANEL APPLICATIONS

Video panels are wall-mounted or ceiling-mounted in a variety of forms and serve the following applications:

- Digital Signage
- Video Walls
- Entertainment Displays
- Way Finding and Informational
- Multiple Display
- Study Pod
- Conference Rooms
- Classrooms

Where applicable, the video panels may also be provided with touch-interaction capability.

UVU uses a variety of content sources to display information on digital signage. Consult with the AVPM regarding the appropriate solution for each application.

2.2.1.14 OUTDOOR PLAZA / GATHERING SPACES

Outdoor public gathering spaces can be used for group events requiring public address systems to communicate with larger groups. The following physically constructed features are needed:

- Various High amp (50 Amp or greater) distribution multi-phase power for distribution power via spider boxes.
- 150 Amp or greater with cam-lock (3-phase, neutral, ground) for lighting and high powered audio systems.
- Wireless network access points

In addition to the infrastructure above, the following audio visual equipment is also required and supplied as a portable kit with enclosures, to be deployed whenever an event occurs:

- Large projector with 20k Lumens, mounted on mobile cart
    - Two lenses: one standard throw 1.3-1.7 and one short throw 0.3-1.0
- Large, portable, free-standing projection screen with protective enclosure, 16x9 aspect ratio
- Two large-venue powered line array speakers (800W)
    - Hand-crank speaker stands and road cases with wheels for speakers
- Power cables and signal cables to connect system with projector and speakers located at least 50 feet away from power source and each other.

2.2.2 AV FURNITURE PROVISION

The UVU Furniture Purchasing Agent shall pay close attention to the audio visual furniture needs, including:

- teacher stations
- credenzas
- collaboration pods
- conference tables
- movable podiums
- movable demonstration tables

All A/V furniture shall meet the program requirements of the space, shall match the interior design of the space, and shall be coordinated through the AVPM.

2.2.3 SYSTEM INTEGRATION

Significant technical advances have been made in recent years resulting in numerous systems that now communicate with audio/visual systems and with networks. The following are examples of systems or processes that should be integrated with audio/visual systems:

- Window coverings/sunshades (in conference rooms and multipurpose rooms)
- Folding walls (to divide rooms)
- Lighting control systems

These systems shall use both wired-network connectivity and RS232 serial. Do not expect wireless networking to provide the capacity, reliability or security required to handle these systems.

It is therefore crucial to the success of these systems that Facilities Services coordinate with OIT during the planning and design phases to ensure that adequate network and infrastructure are included in the design.

2.2.4 DOCUMENTATION

2.2.4.1 SYSTEM DIAGRAMS

System Diagrams are an important tool for long-term maintenance and operation of the system. Any project involving audio visual systems must include the provision of system diagrams. The FSPM and A/V commissioning agent should verify that the required documentation has been prepared during design for use during construction, and also that as-built drawings and record drawings have been accurately prepared and submitted before releasing retainage funds.

See the example system diagram in Appendix 8.1.

2.2.4.2 AS-BUILT / RECORD DRAWINGS

When a construction project is completed, a copy of the as-built drawings and record drawings need to be given to AVS&E for the following:

- Full-size hard copy of printed Electrical Drawings. The full set is not required, just the sheets that pertain to electrical features of the project.
- Full-size hardcopy printed drawings – the portion of the drawing set that is applicable to A/V technology. The full set is not required, just the sheets that depict the technology features of the project.
- The A/V Contractor's as-built drawings are extremely important for maintenance of the A/V systems. Please obtain both hardcopy and CAD files of these drawings on a flash drive.
- The A/V Contractor's software configuration files and software settings (used in the A/V equipment) are also required for UVU to maintain the A/V systems.
- Provide uncompiled, editable configuration files and software settings for each A/V component including controls system program and layouts.
- A hard copy printed system diagram shall be posted on the door inside each equipment cabinet

2.3 Applicability to Non-UVU Tenants

The content in this document has limited applicability to provisions for non-UVU tenants who occupy space in UVU-owned facilities. Any physical mounting of signage or other equipment requires prior UVU approval and shall comply with UVU's standards (this document) and accepted industry best practices. Heavy equipment (such as projectors and video panels) shall be securely attached as described herein using specified mounting hardware to robust surfaces and structure. It is also the University's intent that such mounting not harm the permanent building structure.

The University's ADA-related requirements must also be met by non-UVU tenants.

Non-UVU tenants are not obligated to comply with UVU's standards for equipment, cabling or integration.

3 Project Procedures

The Project Procedures section contains guidelines for architects, engineers, and audio/visual systems designers regarding the procedures that UVU requires for projects that include audio/visual systems. This applies both to projects that entail primarily audio/visual work (such as classroom or conference room upgrade projects) as well as to architectural projects and other work (such as a new building or campus) that involve audio/visual design.

B. This section is not intended to supersede State of Utah contract requirements, but rather to complement them, providing additional requirements that apply specifically to audio/visual design projects at UVU facilities.

It is intended that the requirements in this section be considered contractually binding for professional design firms providing audio/visual design services.

3.1 Designer Qualifications

A. For the purposes of this document, the term “Designer” shall mean an InfoComm Certified Technology Specialist (CTS) who is currently in good standing with InfoComm (http://www.infocomm.org). This means that the audio/visual design shall be produced by the Designer. UVU’s communications with the audio/visual design consultant shall be mainly through the Designer. On projects where the CTS-certified Designer is not the prime consultant, the Designer shall keep the prime consultant (Architect/Engineer (A/E)) informed of all direct communications with UVU.

B. In addition, the CTS-certified Designer shall have the following qualifications:

- The Designer shall demonstrate a minimum of 5 years of experience in the design of audio/visual systems.
- Experience not directly related to the design of audio/visual systems, such as sales and/or marketing, project management, or installation experience, is not an acceptable substitute.
- The Designer shall demonstrate that he/she has designed or has had personal design oversight of a minimum of five projects similar in size and construction cost to the current UVU project.
- The Designer shall be independent from and unaffiliated with any manufacturer associated with the audio/visual equipment industry.
- The Designer shall be completely familiar and conversant with applicable industry standards.

C. In addition to the CTS certification, it is preferred that the Designer have one or more of the following qualifications:

- Professional Engineer (P.E.) in the electrical engineering field
- Certified Technology Specialist – Designer (CTS-D) from InfoComm
- Crestron Certification:
  - Crestron CAPE Certified Programmer

- Crestron Digital Media Certified Designer (DMC-D) (required for systems with digital media features)

3.2 Cross-Discipline Coordination

During the design phases, the Designer shall coordinate the audio/visual design with the following features designed by other members of the A&E Team:

- Make sure that fire sprinklers do not occupy the same space as video projectors or obstruct the projection path.
- Make sure that lighting does not obstruct the projection path and that fixtures are not mounted near screens and displays. Light fixtures wired to be “always on” shall be placed in the rear of the room, away from screens and video panels.
- Work with the designer of the lighting control system to group the front row of light fixtures adjacent to the projection surface(s) onto a single switch/dimmer.
- Work with the electrical designer to verify placement and density of power outlets for A/V applications
- Work with the designer of the HVAC systems, to provide adequate cooling and ventilation for A/V equipment.

4 Physical Infrastructure for A/V

This section defines and describes the physical infrastructure components that are required to support audio/visual systems for UVU. The Designer shall design these into the various application spaces (classrooms, conference rooms, etc.) in UVU facilities as described in Section 5. The Designer shall incorporate this content into the construction drawings and specifications.

4.1 Acoustics & Color

Some A/V applications have more stringent acoustic or color treatment requirements than others. It is dramatically more expensive to retrofit a space with acoustic treatments if they are not provided at the time of original construction.

The Designer shall investigate with UVU the possibility that any of the A/V application spaces in a building might possibly need higher levels of acoustic treatment in the future. If so, such spaces shall be designed for the higher levels of acoustic treatment during original construction.

According to the recommendations of ANSI S12.60-2002, a noise coefficient of NC 35 and a reverberation time of 0.6 seconds are the maximum allowable (worst-case) acoustics parameters for some spaces, whereas a noise coefficient of NC 25 is desirable and NC 30 is the maximum permitted for other spaces.

Wherever video broadcasting will occur, the background colors shall be neutral, such as beige, light gray or light blue.

4.2 Furniture

4.2.1 TEACHER STATIONS

4.2.1.1 CODE/REGULATORY CONSIDERATIONS

Section 802.1 in the ADA Standards for Accessible Design addresses the requirements for wheelchair-accessible spaces. In order to meet this requirement, adjustable-height Teacher Stations are required, and they must be open beneath the work surface to permit a wheelchair to roll underneath.

However, since the A/V Equipment Rack and other equipment are mounted inside the Teacher Station beneath the work surface, there is not space for a wheelchair to roll underneath.

Exception Advisory 226.1 of the ADA Standards for Accessible Design explains that ADA requirements do not apply to work surfaces for employees. Accommodations for employee work surfaces are allowable on an “as needed” basis.

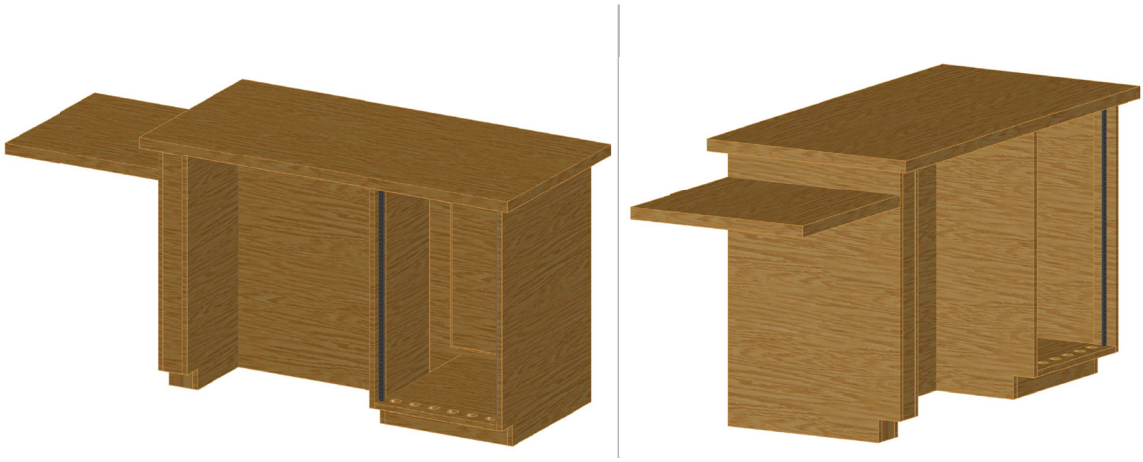
UVU’s Accessibility Services Department administers campus policies related to ADA topics.

4.2.1.2 DESIGN GUIDELINES

Teacher Stations shall be custom-designed on a project-by-project basis. The Designer and architect shall work closely with the AVPM to create a solution that will meet the needs of the application. The architect shall verify that the design is ADA-compliant and meets the needs of the project, and shall then include the built in millwork as part of the project.

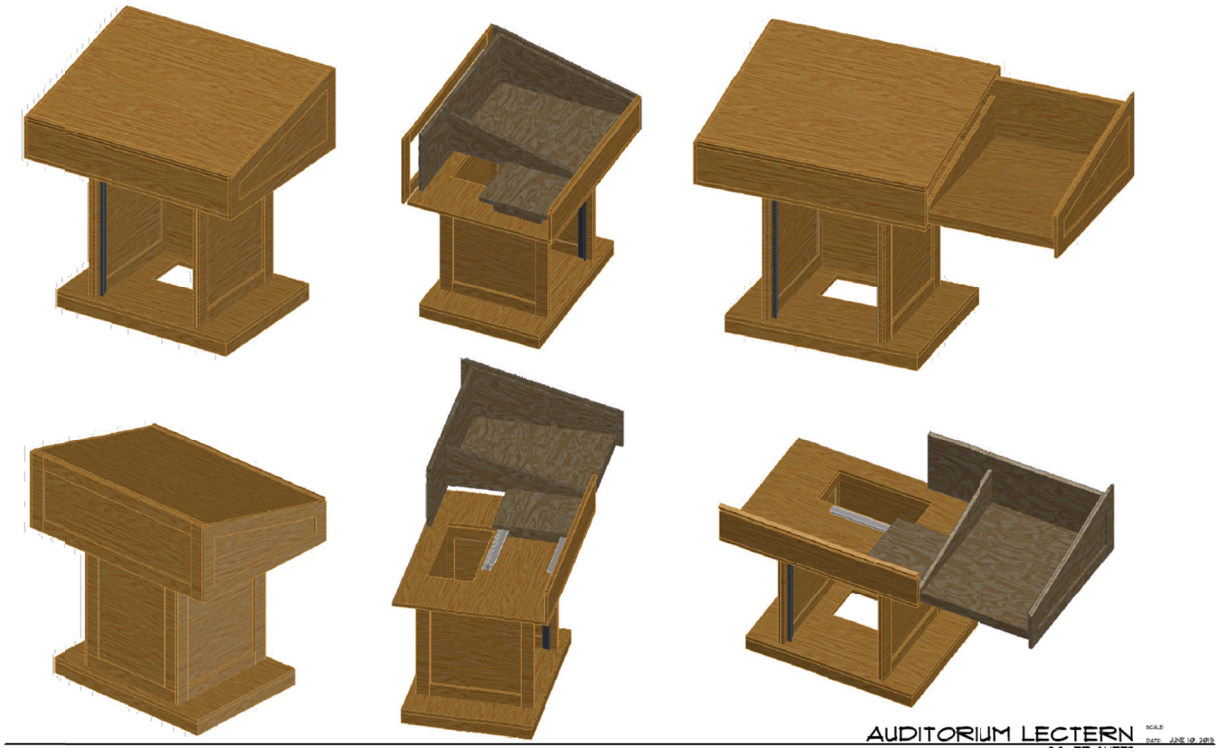
On the back side of the Teacher Station (facing the classroom) the furniture shall have a hinged door to allow access to the A/V equipment mounted inside the cabinet portion of the Teacher Station. See Appendix 9.1 for drawings depicting each Teacher Station style. There are three main styles of Teacher Station:

- Desk style form-factor (both a left and right version)



- Standup work surface style form factor (not movable) with dual racks
    - The rack on one side contains the amplifier and control systems, and is locked to prevent user adjustment.
    - The other rack contains equipment that is accessible to the user.

- Lectern with interior equipment rack



The space surrounding the Teacher Station shall comply with the ADA Standards for Accessible Design.

UVU will accommodate wheelchair-bound instructors and students by specifying a work surface on the side of each Teacher Station, sized 30” wide (minimum) at a height of 34”. Preferably this work surface would fold out from a hinged attachment on the Teacher Station, but it could also be a table beside the Teacher Station. The control system used to operate the audio/visual equipment and other instructional technology shall be reachable by a person working from the fold-out work surface.

The arrangement of the equipment that sits on the table top shall be cooperatively designed by the Designer and the AVPM. The Designer shall coordinate with the AVPM, the Telecommunications Designer, and the Electrical Engineer to cooperatively specify appropriate quantities of modular device inserts for power outlets, data cables, auxiliary plates, and audio/visual inputs to be installed in table-top boxes.

The cabinetry shop that the contractor hires must meet UVU standards and provide a durable long lasting product. The University has had good success with a cabinet shop called Woodworks. Their contact information is:

Shawn Madsen
(801) 318-4539
shawnswoordworks@msn.com

Woodworks
311 East 400 North
Lindon, Utah 84042

4.2.2 INSTRUCTIONAL MEDIA WORKSTATION

Workstation furniture will be required for some spaces where instructional media is produced or edited. This furniture shall be a hybrid office desk / credenza. A user will sit at the desk while using A/V equipment located on the desktop and rack-mounted inside the credenza portion of the furniture.

The desk/credenza floor shall have an opening for cabling to enter from a floor box or a poke-through. There shall be no cabinet face structure behind the door, allowing an A/V equipment rack to slide out of the desk/credenza for service.

The furniture shall provide adequate ventilation to prevent overheating of the equipment inside. The following two features shall be provided in each door for air circulation:

- Near the top of all doors: Four ¼" slots (10" long), spaced ¾" apart. Mesh screen material shall be applied to cover the backside of the slots to prevent foreign matter from being inserted into the slots.
- Below all doors: Approximately five 1" ventilation holes in the top portion of the toe-kick plate.

4.2.3 CONFERENCE ROOM CREDENZAS

UVU prefers to use single-bay and double-bay credenzas in conference spaces depending on the application and need of the space. Credenzas will host rack mounted A/V equipment.

- If the back of the credenza is accessible then a rear access door shall be provided, and equipment will be mounted on secured rack rails.
- If the credenza is placed against a wall then the furniture shall have Middle Atlantic pull-out racks.

All credenzas will meet the need and match the interior design and other furniture of the space and be coordinated through the AVPM.

4.2.4 CONFERENCE TABLES

Conference tables shall meet the needs of the room. The table shall be designed to support cable routing from a floor box to a table-top power/data/AV access portal via a table leg. The floor box location(s) shall be correlated with the cable routing leg, which ideally shall fully conceal the floor box.

UVU requires that a table-top box with power, data and AV cables be installed in the top of each conference table. The Designer shall coordinate with the Telecommunications Designer and the Electrical Engineer to cooperatively specify appropriate quantities of modular device inserts for power outlets, data cables, and audio/visual inputs for each application.

- Tables 15' long or shorter require one tabletop power/data/AV access portal in the center of the table.
- Tables longer than 15' require two or more tabletop power/data/AV access portals, one each at the one-third points along the length of the table.

When selecting the conference table, consider how cables for wired network, desktop microphones, A/V inputs, and wiring for power shall be routed from the floor box up through a table leg. It is recommended that tables be manufactured with integrated cable raceways and pop-up devices that provide table-top access to electrical power, A/V features, and the network.

Some applications (such as Boardrooms) benefit from table systems that are open in the center. In all such cases, modesty panels are required.

4.2.5 COLLABORATION PODS CLASSROOMS AND LABS

Collaboration pods are an integrated table and A/V enclosure. They can be either custom-manufactured or prefabricated depending on the application and design needs of the space. The finishes of all collaboration furniture shall match the interior design and other furniture. The Designer shall coordinate the finish selection with the AVPM.

4.2.6 HALLWAY HUDDLE SPACES

In most cases these spaces will not have furniture. However, if furniture is desired in Hallway Huddle spaces, it shall be coordinated through the AVPM.

4.2.7 MOVABLE PRESENTATION LECTERNS

Movable presentation podiums shall be sized for the application, with casters so that the podium can be easily moved when not required for a presentation.

For lectern drawings see Appendix 9.1.3.

4.2.8 MOVABLE DEMONSTRATION TABLES

Movable demonstration tables shall be sized for the application, with locking casters so that the table can be easily moved when not required for events.

4.2.9 KIOSKS

For projects that require informational kiosks, the Designer shall consult with the AVPM for guidance on a case-by-case basis.

4.3 Equipment Racks and Cabinets

UVU prefers racks and cabinets from Middle-Atlantic.

4.3.1 GROUNDING / BONDING

All racks and cabinets shall be bonded to building ground (not isolated).

4.3.2 FIXED RACKS IN TEACHER STATIONS

One or two fixed racks (approximately 14 rack units) shall be mounted inside teacher stations.

UVU prefers to use the Middle Atlantic racks that pull-out on rails in cabinets where the back of the equipment is not accessible.

4.3.3 RACKS IN CREDENZAS

A mid-height rack (approximately 14 rack units) shall be used to host equipment stored inside credenzas for applications such as conference rooms.

UVU prefers to use the Middle Atlantic racks that pull-out on rails in cabinets where the back is not accessible.

4.3.4 EQUIPMENT CABINETS

A 6-foot tall cabinet shall be used to host larger quantities of equipment in dedicated A/V spaces and applications such as A/V Equipment Rooms. The cabinets shall be bolted to the floor.

Full-height cabinets shall have full-height, vertically-mounted PDU strips on rear of the rack and shall have a rack-mounted UPS, both Owner-provided.

Cabinets shall have lockable, vented front and rear doors.

Products from Middle Atlantic are desirable.

4.4 Pathways

It is essential to the long-term cost-effective operation of each building that the infrastructure be in place to support the technology of the future. It is much less expensive to install physical infrastructure during construction than to retrofit spaces while the building is in use.

Pathways and boxes shall be designed to serve the life of the building, not just day-one applications.

A/V pathways that are concealed from public view shall be routed to be as direct as possible, including angled runs to a device. It is important to reduce the length of A/V cables wherever possible.

4.4.1 WIRE BASKET CABLE TRAY

A wire basket cable tray shall be designed above the ceiling to distribute audio/visual cabling within the room. This tray shall connect to the main low-voltage distribution cable tray in the building.

- A 6” wide, 2” high tray is typically sufficient for most in-room A/V applications.

4.4.2 BOXES AND CONDUITS

Device boxes/outlet boxes serving A/V applications shall comply with UVU's telecommunications standards. Box sizing shall be as follows:

- Typically 4" square, 2 1/8" deep (minimum depth). With the mud-ring/extension ring, the overall internal minimum depth shall be 2 ½" minimum.
- Where thick/stiff cabling is terminated (having large bend radius requirements), device boxes shall be 5" square boxes. See RANDL Industries, Inc. www.randl-inc.com
- Device boxes that receive 2" conduit will typically be 4" square, 3 ¼" deep (minimum depth) with the mud-ring/extension, such as the Hubble-Raco RAC260.
- For wall-mounted devices (such as speakers and assistive listening transmitters), provide a single gang faceplate with a feed through plate for cable pass-through.

Conduits serving A/V applications shall comply with UVU's telecommunications standards (see TDDG). In addition, the following requirements apply:

- All conduits shall be 1 1/4" trade size minimum.
- Conduits intended to pass large connectors shall be sized accordingly – minimum 2" trade size, but larger if required to accommodate the sizes of factory-terminated connectors (VGA, DVI and other A/V cabling).
- Provide a separate conduit for speaker wiring.

4.4.3 A/V JUNCTION PANEL

The A/V Junction Panel is a junction box that shall be recess-mounted into the wall in the back of the credenzas serving A/V cabinets. The A/V Junction Panel shall be sized 18"W x 14"H x 4"D and be finished to match the interior décor of the space. The FSR Wall Box (painted the color of the wall) is one possible acceptable solution. Common electrical junction boxes with screw covers are typically not acceptable.

Conduits from the A/V Junction Panel shall route to the following locations:

- A/V equipment locations
- A/V floor box
- Above ceiling A/V junction box
- Above ceiling wire basket cable tray (if applicable).

4.4.4 A/V FLOOR BOXES

A/V floor boxes are required to accommodate the quantity of A/V cables, data cables, and power outlets that comprise A/V systems. Many A/V cables have limited bend radius due to the size and stiffness of the cables. UVU's preferred A/V floor box solution is from FSR, Inc. www.fsrinc.com (or a Hubbell equal when pre-approved):

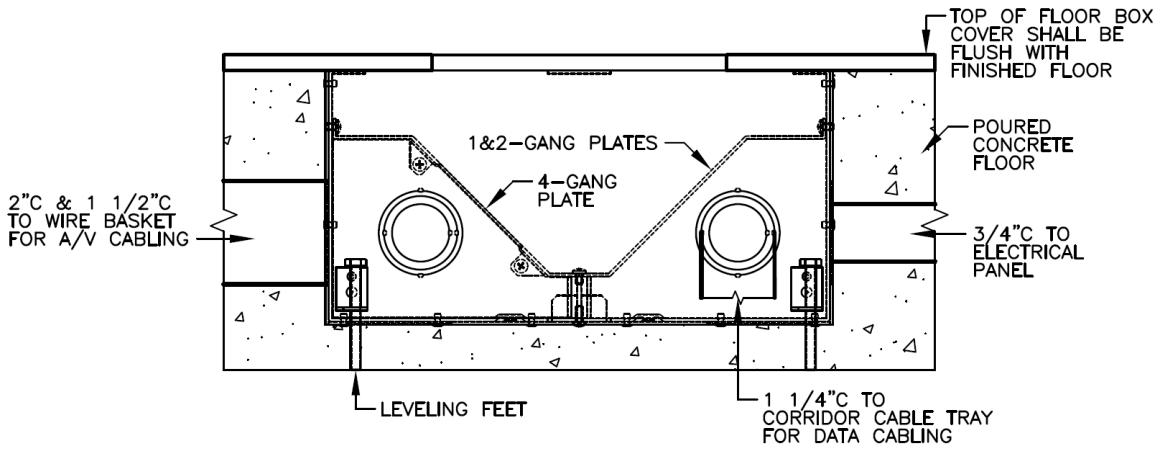
- For all applications:
  - FL-500P-8 or FL-600P-8-B with 8” depth.
  - Single Gang for Power, with a ¾” Conduit
  - Double Gang for Data, with a 1 ¼ Conduit
  - Four Gang for A/V, with a 2” Conduit
- For slab-on-grade applications:
  - Use the FL-GRD2/4 pour pan with one of the above boxes.
- For fire-rated floor applications:
  - Use the FL-FRK-500P or FL-FRK-605P firestop box assembly with one of the above boxes.

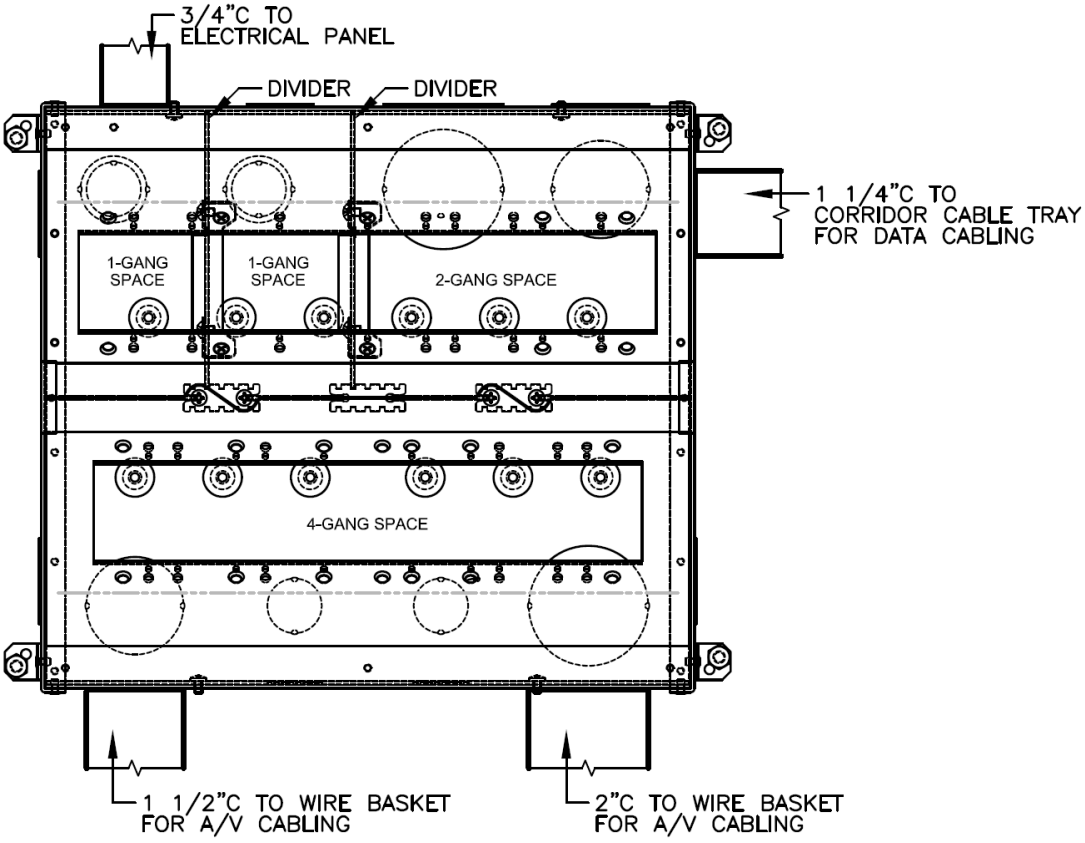
A. Large floor boxes serving an instructor podium shall have a cover that will incorporate a finish (carpet, tile, etc.) that matches the finish of the floor. Floor boxes shall have three separate partitions serving power, data and audio/visual terminations.

- A/V terminations require a 4-gang partition with two 2” conduits.
- Telecommunications cabling requires a double gang partition with a 1¼” conduit.
- Electrical power requires a single gang partition with a ¾” conduit.

B. The basis of design is the FSR FL-500P-x Series floor box. It is desirable because it is available in 4”, 6”, 8” and 10” depths.

C. The diagrams below depict the plan view and side view of a floor box with the required conduits:





D. Some applications may require a high-capacity floor box, for example FSR FL-600P-x. The Designer shall inquire with the ITPM on a project-by-project basis.

5 A/V Features, Functions & Services

This section defines and describes the features, systems, materials, equipment, furnishings, and services that shall be used in audio/visual systems for UVU. The Designer shall design these into the various application spaces (classrooms, conference rooms, etc.) in UVU facilities as described in Section 5. The Designer shall incorporate this content into the construction drawings and specifications.

UVU prefers to consistently use the same equipment from project to project wherever possible to optimize spare parts management. When a component fails, it is very desirable to replace it with an identical make and model so that the control logic programmed into the system will work with the replacement device. The manufacturers and equipment models for equipment currently used at UVU are referenced below in each category. The Designer shall:

- Verify that this equipment will be available at the time the building is constructed.
- If this equipment will not be available, work cooperatively with the UVU AVPM to select a replacement, preferably from the same manufacturer and product family as the listed equipment.
- Design the systems using UVU approved standards and equipment.

5.1 General

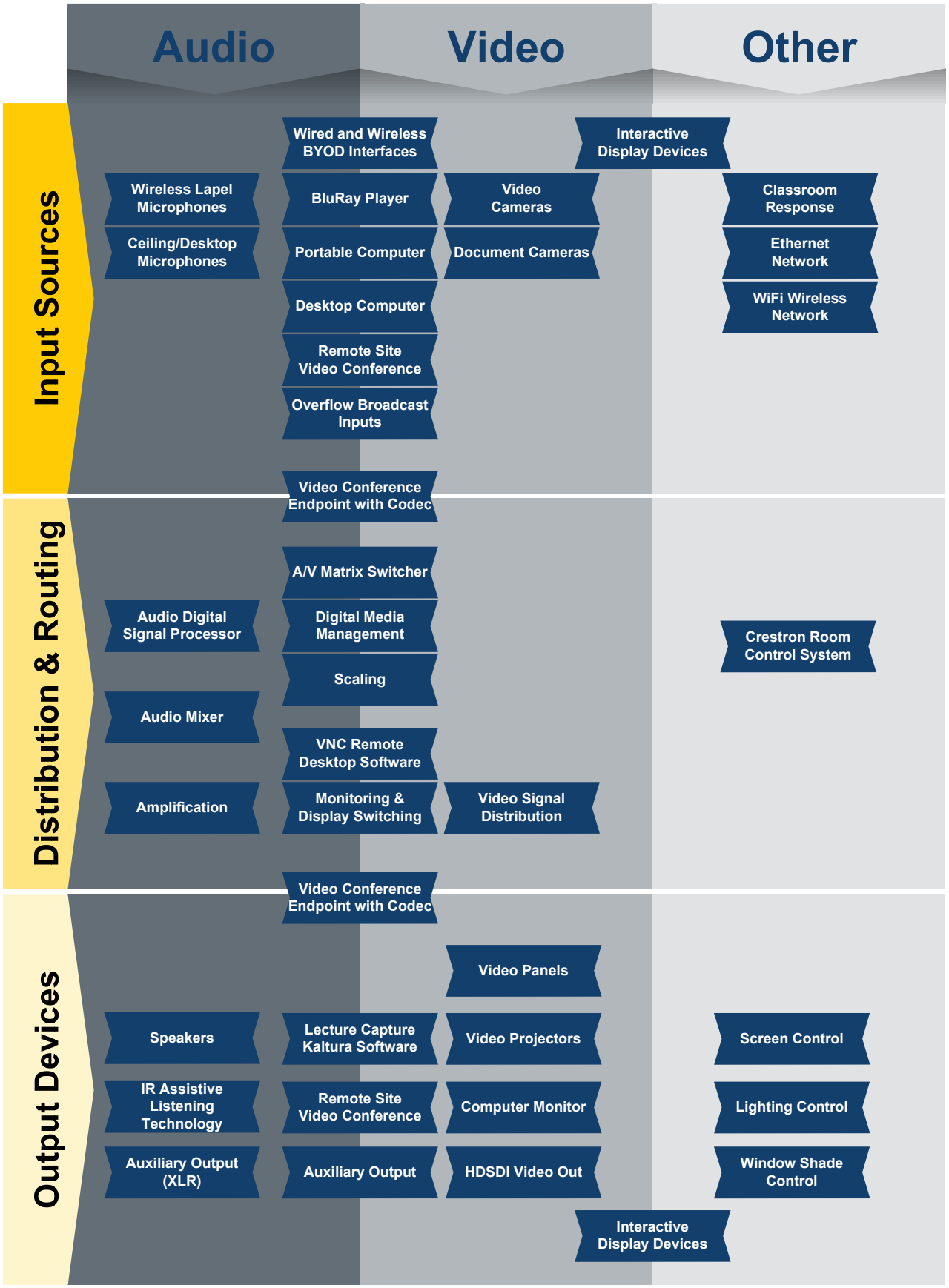
Generally speaking, audio/visual systems are comprised of devices and functions in three categories:

- Sourcing and Input
- Distribution and Routing
- Output

Also, audio/visual and event lighting equipment can serve audio, video, production and “other” functions.

See the AVCGS for the full specifications of each device and its associated cabling.

The following diagram depicts the various types of devices that generally comprise UVU’s audio/visual systems:


Audio
Video
Other
Input Sources
Wireless Lapel Microphones
Ceiling/Desktop Microphones
Wired and Wireless BYOD Interfaces
BluRay Player
Portable Computer
Desktop Computer
Remote Site Video Conference
Overflow Broadcast Inputs
Video Cameras
Document Cameras
Interactive Display Devices
Classroom Response
Ethernet Network
WiFi Wireless Network
Distribution & Routing
Video Conference Endpoint with Codec
A/V Matrix Switcher
Audio Digital Signal Processor
Digital Media Management
Scaling
Audio Mixer
VNC Remote Desktop Software
Amplification
Monitoring & Display Switching
Video Signal Distribution
Crestron Room Control System
Video Conference Endpoint with Codec
Output Devices
Video Panels
Speakers
Lecture Capture Kaltura Software
Video Projectors
Screen Control
IR Assistive Listening Technology
Remote Site Video Conference
Computer Monitor
Lighting Control
Auxiliary Output (XLR)
Auxiliary Output
HDSDI Video Out
Window Shade Control
Interactive Display Devices

5.2 Sourcing and Input Devices

The audio/visual system shall support audio and video content from the following sources and input devices:

5.2.1 MICROPHONES

5.2.1.1 CEILING-HUNG

Ceiling-hung microphones shall be digital, three-element devices from Shure and Audix. They shall be installed according to the manufacturer's specifications in sufficient quantity and necessary spacing to adequately cover the entire classroom seating and teaching area.

Ceiling-hung microphones shall be supported using wire to building structure. Coordinate with the installer of the ceiling grid to shoot-in extra ceiling wires to support microphones, speakers, and electronics boxes for microphones.

UVU also uses a ceiling-box mounted Crown PZM-11 pressure zone microphone for some applications.

5.2.1.2 DESK-MOUNTED

Wired microphones shall be provided for any classroom lab or conference space that has a capacity of over 45 people. The Designer shall inquire whether wired microphones are required for just the presenter or on a two-to-one ratio for the entire space. The Designer shall also inquire which of the following three options should be used for a given area:

- Option 1:

  Ceiling-hung microphones may be required in some applications. In these cases, the system shall be programmed to activate or mute the corresponding ceiling microphones with a desktop control interface.

- Option 2:

  Desktop puck microphones can be either single or double-sided. The system shall be programmed to activate or mute the microphone as the button is pressed. Three distinct indicator conditions are required to display the status of the microphone: on (green), muted (red) and powered off (dark, no light).

- Option 3:

  Gooseneck microphones shall be shock mounted. The system shall be programmed to activate or mute the microphone as the button is pressed. Three distinct indicator conditions are required to display the status of the microphone: on (green), muted (red) and powered off (dark, no light).

5.2.1.3 WIRELESS MICROPHONES

Wireless microphones require the use of a receiver/transmitter in each application space. The receiver shall be located in a position near the control equipment of the other audio/visual systems. All wireless microphones shall be UHF, tunable, with the ability to self-determine available radio frequencies. All microphone installations shall be done in accordance with good engineering practices and with coordination of frequencies with nearby users.

The microphone shall be wired into the sound system to allow for voice reinforcement to the room without feedback as well as to room record outputs. Antennas should be adequately placed throughput the space for proper coverage. Volume adjustment for the microphone shall be immediately available to the instructor.

Wireless microphones shall be provided for any classroom lab or conference space that has a capacity of over 40 people. The Designer shall inquire how many microphones are required for each space and which of the following four options shall be used for a given area:

Wireless Microphone options

- Option 1: Lapel – used in instructional and lecture spaces
- Option 2: Handheld – used as a secondary preference option in lecture and instructional spaces
- Option 3: Countryman – used in theater applications
- Option 4: Headset – used in dance studios and exercise facilities

5.2.2 CAMERAS

All cameras shall be high definition 1080p 60Hz (16:9 aspect ratio). Standard definition (4:3 aspect ratio) devices are prohibited.

Camera tracking systems may be required for certain applications.

5.2.2.1 DOCUMENT CAMERAS

Document cameras shall be 1080P 60Hz, have a 16x9 aspect ratio and be mounted on the top of the teacher station. It shall be connected to the video switcher/scaler to enable quick and easy change of sources.

Some cases warrant the use of ceiling-mounted document cameras. All document cameras shall be controlled via a touch panel. Serial control shall be used if the equipment supports it.

5.2.2.2 CONFERENCE ROOM SOFT CONFERENCING CAMERAS

USB cameras are the most frequently used solution for soft video conferencing applications.

Soft conferencing cameras shall have a USB output and a minimum resolution of 1080P at 60Hz. Some situations may warrant a more professional fixed or Pan Tilt Zoom (PTZ) camera with higher resolutions and other output types (HDSDI, HDMI etc.).

5.2.2.3 CLASSROOM CAMERAS

UVU currently uses professional PTZ or fixed cameras for distance education and collaborative classroom applications.

The Designer shall discuss with the AVPM the cameras to be used.

5.2.3 BLU-RAY PLAYER

The Designer shall discuss with the AVPM whether Blu-ray player equipment is required on a per space basis.

Blu-ray players require serial control or plug-in IR control. Adhesive IR “bugs” are not allowed.

5.2.4 MEDIA PLAYER FOR DIGITAL SIGNAGE APPLICATIONS

The Designer shall discuss with the AVPM whether stand-alone player boxes will be used or NEC video panels shall be fitted with Open Pluggable Specification (OPS) Media Player Cards.

5.2.5 COMPUTERS

Computers shall be furnished by the UVU Computer Shop in accordance with established campus standards and pursuant to the design requirements of the application.

- The AV Contractor shall be required to install (mount) the computer into the AV equipment rack inside the Teacher Station (either rack-mounted, or provide a 2U shelf).

By contrast, the monitors, keyboards, mouses, USB cameras, and other appurtenances shall be provided (both furnished and installed) by the AV Contractor, and therefore require the attention of the Designer to properly specify these devices.

The monitor shall be attached to the top of the Teacher Station, typically on the side of the station that is away from the classroom door. The monitor shall be secured to the furniture with a suitable rigid mount, cable and lock assembly to impede theft.

5.2.6 PORTABLE DEVICES (BYOD MODEL)

Audio/visual systems shall be compatible with BYOD devices being able to receive audio and video inputs, including but not limited to laptop computers (PC and Mac), tablets, smartphones, and other multimedia devices.

UVU currently requires the following auxiliary inputs:

- HDMI audio/video
- VGA video, for legacy devices
- 3.5mm audio inputs
- a set of RCA audio and video inputs
- an XLR input for a microphone
- USB 3.0 type-A connection
- Ethernet jack for teacher network connection

- A set of commonly used Mac adapters attached to digital and analog cables, including:
  - Digital
    - Mini Display to HDMI
    - USB C to HDMI
  - Analog
    - Mini Display to VGA
    - USB C to VGA

Auxiliary inputs shall be implemented using cable retractor devices or Auxiliary input plates depending on the need and use of the space for both Teacher Stations and Conference Room tables.

When interface plates are used, the plates shall be custom manufactured from anodized aluminum and have beveled edges. The Designer shall work with the AVPM on a project-by-project basis to design a suitable custom interface panel for each application.

5.2.7 CLASSROOM RESPONSE APPLICATIONS

UVU does not currently provide an enterprise-class classroom response system for new projects. Teachers are welcome to bring their own systems.

5.3 Distribution and Routing Equipment

5.3.1 AUDIO/VIDEO DIGITAL MATRIX SWITCHING EQUIPMENT

Audio and video digital matrix switching and processing is done using pro-grade solutions. Device control shall be present and interfaced with control systems. The Designer shall discuss specific model selection for a given project with the AVPM.

5.3.2 AMPLIFIERS

The Designer shall discuss the audio requirements and options with the AVPM prior to starting the design.

Audio systems shall be designed in such a manner as to provide (at every location within the classroom) a clearly intelligible instructor speech monaural (Public Address PA) and independent stereo audio signals. Audio levels front-to-back and side-to-side shall not vary by more than 2dB at any point within the seating area. Audio enhancement shall provide a level of not less than 55 dB SPL at 48 inches above finished floor in the classroom seating area.

Amplifiers shall typically be Class D type, providing a minimum of 75W RMS per channel and supporting speakers of 4 and 8 ohms for the stereo system. Amplifiers will be 70V line outputs for public address audio.

5.3.3 VIDEO CONFERENCING ENDPOINTS

UVU currently uses Cisco High Definition Group Series Video Conferencing Endpoint (VCE). The VCE contains an integrated codec.

VCEs connect to IT networks via a standard 10GB Ethernet jack.

Two video sources connect directly to the VCE inputs:

- Cameras
- Content video
- Classroom Technology: Aux Plate, Doc Camera, Blu-ray, Computer etc.

Two audio sources connect directly to the VCE inputs via an Audio DSP/router/mixer:

- Microphones
- Content audio

Input and output switching as well as volume are controlled via the room control system.

5.4 Output Devices

The audio/visual system shall output audio and video content to the following devices:

5.4.1 SPEAKERS

UVU typically uses 70V and 8-ohm speaker configurations.

Speaker quantity, arrangement, and spacing shall be designed sufficient to provide for an even coverage of the entire seating area with a volume level of not less than 15 dBA above the average ambient room sound.

5.4.1.1 CEILING-MOUNTED

Ceiling-mounted speakers shall be spaced appropriately for the broadcast pattern of the speaker specified.

Ceiling-hung speakers shall be supported using wires attached to the building structure or using suspension systems designed for use with T-bar ceiling materials.

UVU typically uses JBL Control Series speakers.

5.4.1.2 WALL-MOUNTED

Wall-mounted speakers are also used at UVU where a room application requires stereo and/or surround sound. The device box serving the speakers shall have a feedthrough faceplate for wire exit. The Designer shall discuss this situation in advance with the AVPM.

UVU typically uses JBL Control Series speakers.

5.4.2 ASSISTIVE LISTENING DEVICES

UVU typically uses radio frequency (RF) assistive listening equipment from ListenTech.

In accordance with the ADA Standards for Accessible Design, UVU provides assistive listing devices for all spaces that feature audio amplification. UVU's Accessibility Services department delivers this service in a two-part strategy:

- By loaning RF receivers to people who request them.
- By deploying RF transmitters (mounted in the Teacher Stations) in the rooms used by people who request RF receivers.

The Designer shall include in the design a program-out audio feed located on an interface plate on the Teacher Station. This output also serves as an auxiliary audio record output.

UVU is currently transitioning to loop-based systems in larger spaces for compatibility with hearing aid wearers. Theaters shall have full phased array loop/double loop coverage in the floor. Other spaces shall have a single loop installed in a portion of the room, covering an area that is designated for the hearing impaired.

Table 219.3 in the ADA Standards for Accessible Design provides information about the number of receivers required depending on the number of seats in a given room.

The Designer shall include in the specification, a requirement that the AV Contractor provide RF transmitters, loop wiring, loop transmitters, and loop receivers according to the following table:

Seating Capacity of Assembly Area	Number of RF Transmitters	Number of Wired Loops in Room	Number of Transmitters for Loop Based systems	Minimum Number of Loop Receivers
65 or less	1 per 10 rooms 65 seats or less*	1	1 per 10 rooms 65 seats or less* (furnish uninstalled)	2
66 to 250	None	1	1 per 5 rooms over 65 seats* (furnish uninstalled)	2, plus 1 per 25 seats over 65 seats*
251 to 500	None	1	1 per 5 rooms over 250 seats* (furnish uninstalled)	2, plus 1 per 25 seats over 250 seats*
501 to 1000	None	1	1 per room over 500 seats (installed)	20, plus 1 per 33 seats over 500 seats*
1001 to 2000	None	phased array loop/double loop coverage	2 per room over 1000 seats or as required to serve the loops in a room (installed)	35, plus 1 per 50 seats over 1000 seats*
2001 and over	None			55, plus 1 per 100 seats over 2000 seats*

* or fraction thereof

5.4.3 VIDEO OUTPUT DEVICES

5.4.3.1 PROJECTORS

Video projectors shall have the following performance characteristics:

- Standard-throw projectors are preferred.
    - Short-throw projectors are not normally desirable, and require pre-approval by the UVU AVPM, as well as coordination with pendant lighting).
- The minimum acceptable resolution for projectors is WUXGA 1920x1200 native resolution with 16:10 aspect ratio.
- Three-Chip DLP or LED/Laser projectors are required in large venues (over 150 seats).
- LCD, LED/Laser, and 1 Chip DLP Projectors are acceptable in standard rooms. (150 seats or less)
- The Designer shall discuss with the AVPM the minimum ANSI lumens output rating to meet the space requirements in compliance with industry standards, taking into account windows and other sources of ambient light.
    - Standard Rooms (less than 150 seats) typically require 5,000-7,000 lumens. Large rooms (more than 150 seats) may require up to 20,000 lumens.

- No keystone adjustment shall be required with a properly installed system.

Acceptable manufacturers of projectors include:

- Ultra Short-throw: Panasonic, NEC and Epson WUXGA or better
- Standard-throw: Panasonic, NEC and Epson, WUXGA or better

Wiring for projectors shall consist of the following telecommunications cables terminated in an outlet and faceplate mounted near each projector. The cables shall be designed per the requirements of the TDDG. The cables shall be installed and tested per the requirements of the TCGS by a certified telecommunications cabling installer:

- One Category 6A cable for Ethernet data, routed to the telecommunications room.
- One Category 6A cable for Control, routed to the A/V rack.
- One shielded serial control cable for RS232, routed to the A/V rack.
- One HDMI cable, routed to the A/V rack, where the distance between the rack and projector is within 40 feet.
- One VGA cable, routed directly to an interface plate on the Teacher Station (bypassing the A/V rack), where the distance between the rack and projector is within 50 feet.
- One Category 6A cable (10GB rated) for video signal (such as HDBaseT/DXLink), field connectorized and passed through a faceplate space (not terminated on jacks), and routed to the A/V rack.

See Sections 6.1.1.3.3 and 8.1 below for more information about projector wiring.

Projectors shall be ceiling-mounted, and may be attached to the building structure. Mounts require manufacturer-approved and Code-approved seismic bracing or security attachments to the structure. Ceiling-mounted projectors shall be no lower than eight feet above the finished floor with a clear and unobstructed path to the screen to produce a clear image without keystoning. Light fixtures shall be installed so as not to obstruct the projection image.

Acceptable manufacturers of ceiling mounts for projectors include:

- Chief Manufacturing (use the model-specific mount, a custom plate specific for each projector). If a model-specific mount is not available for the projector, then the Designer shall request direction from the AVPM.

5.4.3.1.1 IN-CEILING PLENUM-RATED BOXES

UVU uses plenum-rated, in-ceiling boxes (Chief CMA473) to enclose the power outlet, data outlet and A/V cable feed-through box supporting each projector application.

This box allows power outlets to be installed in the ceiling space in a Code-compliant manner. The Designer shall be prepared to defend this installation method during construction.

5.4.3.2 WRITEABLE PROJECTION SURFACES

Whiteboards mounted on the projection wall shall be 16:10 aspect ratio to allow the projection image to align with the whiteboard surface.

UVU is considering the use of Idea Paint (www.ideapaint.com) and Da-Lite IDEAScreen materials (www.da-lite.com) in lieu of projection screens. These products can be used to cover the wall and serve both as a projectable surface and also as a dry-erase whiteboard. The Designer shall discuss these options with the AVPM on a case-by-case basis.

Wherever these products are used, the treated area shall be surrounded with thin metal framing to prevent overwriting or wiping ink residue onto the surrounding surfaces. The Designer shall discuss the framing options with the AVPM on a case-by-case basis.

5.4.3.3 PROJECTION SCREENS

Projection screen shall be sized appropriately to the room size. Screens shall be a tensioned, electrically operated screen with a 16:10 aspect ratio and have a matte white surface.

Screens shall be low voltage controlled (by the A/V system) and shall also have a low-voltage control switch located near the Teacher Station, but not behind the screen. A service shut-off switch above the ceiling is also required, allowing a technician to cut power to the screen for servicing.

Screens shall be sized according to the following formula:

- The height of the projected image shall not be less than one sixth of the distance to the farthest viewing position in the room, as defined by ANSI/INFOCOMM 3M-2011.

5.4.3.4 VIDEO PANELS

5.4.3.4.1 PRODUCT GRADE

Video panels can be professional grade, prosumer-grade or consumer-grade equipment, depending on the amount of usage time per day expected for the application.

Grade	Usage (hours per day)	Typical Warranty
Professional	18-24	3-years
Prosumer	8-18	3-years
Consumer	Less than 8	1 year

For new construction, the Designer shall not use consumer grade products.

Consumer grade video panels are only permitted for remodel or retrofit projects, and then only with the approval of the AVPM. When considering whether to select a consumer-grade video panel, the cost of the consumer grade product should be half or less than the cost of the prosumer grade product.

5.4.3.4.2 CHARACTERISTICS

The minimum acceptable resolution for video panels is 1080P native resolution. 4k Ultra High Definition with 4096x2160 native resolution is preferred.

The minimum acceptable refresh rate for video panels 240Hz.

5.4.3.4.3 VIDEO PANEL MOUNTING

Displays are to be hung on wall mounts which have panel security locking provisions or with structure-attached ceiling mounts. Depending on the application, mounts shall be articulation, tilt, or flat fixed style. The Designer shall work with the AVPM to select the appropriate mount for each application.

For all video panels, the wall shall be reinforced for mounting purposes.

- For articulating mounts, a backbox shall be installed with the mount attached inside the box. This application requires that wood studs be provided to support the backbox per the manufacturer's requirements. See the diagram in Section 6.6.2.1.4.1.
- For flat fixed mounts, the mount attaches directly to the wall. This application requires that wood backing be added to the studs to support the mount per the manufacturer's requirements. See the diagram in Section 6.6.2.1.4.1.

The Architect shall specifically consider the weight of heavier video panels when designing the wall and backing materials.

5.4.3.4.4 VIDEO PANEL WIRING FOR CLASSROOMS AND CONFERENCE ROOMS

Wiring for video panels shall consist of the following telecommunications cables terminated in an outlet and faceplate mounted behind the video panel. The cables shall be designed per the requirements of the TDDG. The cables shall be installed and tested per the requirements of the TCGS by a certified telecommunications cabling installer:

- One Category 6A cable for Ethernet data, routed to the telecommunications room.
- One Category 6A cable for Control, routed to the A/V rack.
- One shielded serial control cable for RS232, routed to the A/V rack.
- One HDMI cable, routed to the A/V rack, where the distance between the rack and projector is within 40 feet.
- One VGA cable, routed directly to an interface plate on the Teacher Station (bypassing the A/V rack), where the distance between the rack and projector is within 50 feet.
- One Category 6A cable (10GB rated) for video signal (such as HDBaseT), field connectorized and passed through a faceplate space (not terminated on jacks), and routed to the A/V rack.

5.4.3.4.4.1 Wiring for Video Walls

- The wiring required for video walls is defined in Section 6.10.3 below.

5.4.3.5 VIDEO PANELS FOR DIGITAL SIGNAGE

Video panels for digital signage applications shall be professional-grade and rated for a minimum of 16 hours per day operation.

5.4.3.5.1 WIRING FOR DIGITAL SIGNAGE

- One Category 6A cable for Ethernet data to the media player, routed to the telecommunications room.
- Where a non-OPS local media player is provided, one HDMI cable, between the media player and the video panel.
- Where a local media player is not provided, one Category 6A cable (10GB rated) for video signal (such as HDBaseT), field-connectorized and passed through a faceplate space (not terminated on jacks), and routed to the A/V rack.
- See Sections 6.10.1 and 8.1 below for more information about video panel wiring.

5.4.3.6 LECTURE CAPTURE SYSTEMS

Currently UVU is formulating standards for lecture capture. Kaltura is UVU's existing content management platform. Any lecture capture solutions used at UVU shall interface directly with Kaltura's content management platform. Kaltura also provides cloud-based lecture capture service and this may in the future become UVU's standard.

5.5 Room Control Systems

5.5.1 CONTROL SYSTEMS

A room control system shall be provided for device control and audio level control in each space.

The control system shall automate projector, screen functions, audio functions and video switching. It shall also provide for an orderly startup and shutdown of the classroom electronic devices, and room environment features, such as lighting and window shades.

The University has standardized on the Crestron brand control system. The system includes a central processor, touch panels, current sensors, occupancy sensors, partition sensors, and relay or RS-232 controls for electric projection screens, lights, window shades, projectors, video panels, switchers, scalers, audio mixer, amplifier, cameras, source devices, codecs, and other hardware devices. All programming for the control processor and all touch panels shall be coordinated with the UVU AVPM. Every touch panel in use throughout the campus has the same page layout and button nomenclature, and all new touch panels shall follow suit.

All Crestron programming developed within a UVU project shall become the property of UVU and shall become part of the project deliverables in the current standard Crestron source code (uncompiled) format for both graphic interface and automation.

Power on/off and input selections on the projector are selected by the Crestron system. The Crestron system shall also control the lighting and automatically lower and raise the projection screen with the projector on/off control. The Crestron system shall provide control for the following devices depicted on the diagram discussed in Section 5.1 – A/V Features, Functions & Services.

5.5.2 TOUCH PANEL

A Touch Panel shall be used as the control interface. In smaller applications, the AVPM may choose to use a button panel.

5.6 Signal Transport Methods

All A/V cables routed through the ceiling or wall space shall be plenum-rated.

5.6.1 HDBASET

The Designer shall always deploy shielded Category 6A cabling for HDBaseT to all video panel and projector locations.

Where the cable distance exceeds the 40-foot distance limitation of HDMI, the Designer shall also deploy HDBaseT equipment to deliver video, audio and control signals to the video output devices using the shielded Category 6A cable described above.

Shielded Category 6A cabling shall be connectorized with an RJ45 connector (not a jack).

In larger venues, the AVPM may require the use of a patch panel in the AV Equipment Rack for HDBaseT applications.

Where distances exceed 295 feet, a fiber optic extender shall be used in lieu of HDBaseT cabling.

5.6.2 HDMI

Generally speaking, UVU prefers that connections to input devices and output devices be accomplished using HDMI cabling. All HDMI cabling should be 40 feet or less.

Regardless, a shielded Category 6A cable for HDBaseT shall always be provided for future applications, even when the distance is within HDMI limitations.

5.6.3 DANTE

The use of Dante audio signal transport solutions within a single application space is acceptable at UVU facilities. This solution is required in all large event/performing spaces for distribution of digital audio.

Provide two dedicated network switches for Dante-based systems.

All Dante plate connections shall be Ethercon.

Primary and Secondary Dante ports shall be provided at every Dante location.

At least 1 Dante Breakout Box (minimum 16 in and 8 out) shall be provided for each space where Dante is installed.

5.7 Specialty Lighting

5.7.1 HOUSE LIGHTING

In large presentation and performing spaces, house lighting shall be dimmable linearly from 0% to 100%, and be controllable separately from any other zone Lighting shall be controlled by dimmers located near the presenter, in the back of the room and from the room A/V control system.

5.7.2 PODIUM LIGHTING

Multiple light fixtures shall be used to provide proper light coverage with full overlap and redundancy. ETC brand fixtures shall be used, and LED lights are preferred.

Spot locations shall be designed for the podium and other key positions, such as where panel discussions would take place.

5.8 Administration / Labeling

5.8.1 NUMBERING SCHEME

UVU's standard numbering scheme is required for all audio/visual infrastructure:

All sequential numbering consists of a 2-digit number with a leading zero for numbers less than 10. All sequence numbers are preceded by a hyphen (dash).

5.8.1.1 EQUIPMENT

Each piece of equipment receives a unique identifier:

Equipment Type	Abbreviation	Sequence	Example
Controller	IC	.##	IC.##
Touch Panel	TP	.##	TP.##
Camera	CAM	.##	CAM.##
Codec Video Conference	VC	.##	VC.##
Video Switcher	SW	.##	SW.##
Computer	PC	.##	PC.##
Computer Monitor	MON	.##	MON.##
Doc Cam	DOC	.##	DOC.##
Laptop	LPTP	.##	LPTP.##
Video Wall Processor	VWP	.##	VWP.##
Audio Mixer	MIX	.##	MIX.##
Digital Signal Processor	DSP	.##	DSP.##
Projector	PRJ	.##	PRJ.##
Video Panel	VP	.##	VP.##
Distribution Amplifier	DA	.##	DA.##
Assistive Listening	ADA	.##	ADA.##
Speaker	SP	.##	SP.##
Projection Screen	SCR	.##	SCR.##
Blu-ray Player	BDP	.##	BDP.##
Wireless Mic	WMIC	.##	WMIC.##
Wired Microphone Input	MIC	.##	MIC.##
Line Input	AUX	.##	AUX.##

(## = 2-digit number with leading zero for numbers less than 10)

5.8.1.2 CABLES

Each cable receives a unique identifier.

Cable Type	Abbreviation	Sequence	Example
DVI-D	DVI	.##	DVI.##
VGA	VGA	.##	VGA.##
HDMI	HDMI	.##	HDMI.##
DisplayPort	DP	.##	DP.##
HDBaseT	HDBT	.##	HDBT.##
DC Power	PWR	.##	PWR.##
Mic Cable	MIC	.##	MIC.##
Speaker Audio	SP	.##	SP.##
Ethernet	DATA	.##	DATA.##
RS232 Serial Control	RS232	.##	RS232.##
RS485 Serial Control	RS485	.##	RS485.##
Infrared Control	IR	.##	IR.##
Relay / Dry Contact Control	RLY	.##	RLY.##
Crestron Cresnet	CRES	.##	CRES.##
GPIO Control	I/O	.##	I/O.##

(## = 2-digit number with leading zero for numbers less than 10)

5.8.1.3 CABLE LABELS

Cable labels are comprised of three parts:

- Cable Number
- Source (where the near end of the cable terminates)
- Destination (where the far end of the cable terminates)

Each cable shall be labeled with its own cable identifier plus the piece of equipment and connection point (source) on which the cable terminates (destination), as follows:

[CABLE#] SOURCE –> DESTINATION

For example, the first RS232 control cable, connected to RS232 port #1 on Crestron Controller #1, to Video Switch #1 would be given the following label:

RS232.01	IC.01	–>	SW.01

5.9 Services

Video content service providers (cable television, satellite television, etc.) shall deliver their services to the campus and terminate at the main campus service demark. The services shall then be carried via campus backbone cabling to their desired destination. This applies to both UVU and non-UVU tenants.

New television service provisions shall be established in coordination with UVU IT. Occupants of UVU facilities shall not contract directly with content providers to establish new service.

A dedicated fiber optic cable connection shall be provided for high-bandwidth services such as IP television streaming.

6 Application Spaces

See Sections 4 and 5 for the definitions and specifications of the features and equipment described in each application space below.

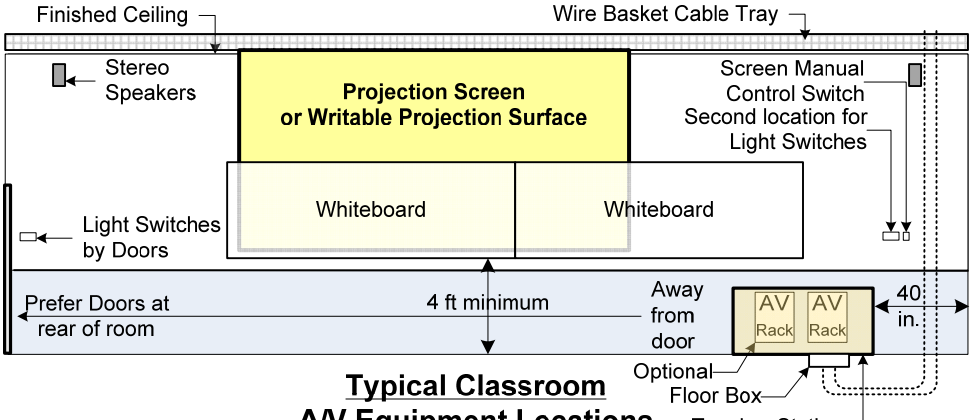
6.1 Classrooms and Instructional Spaces

6.1.1 CLASSROOMS AND LABS

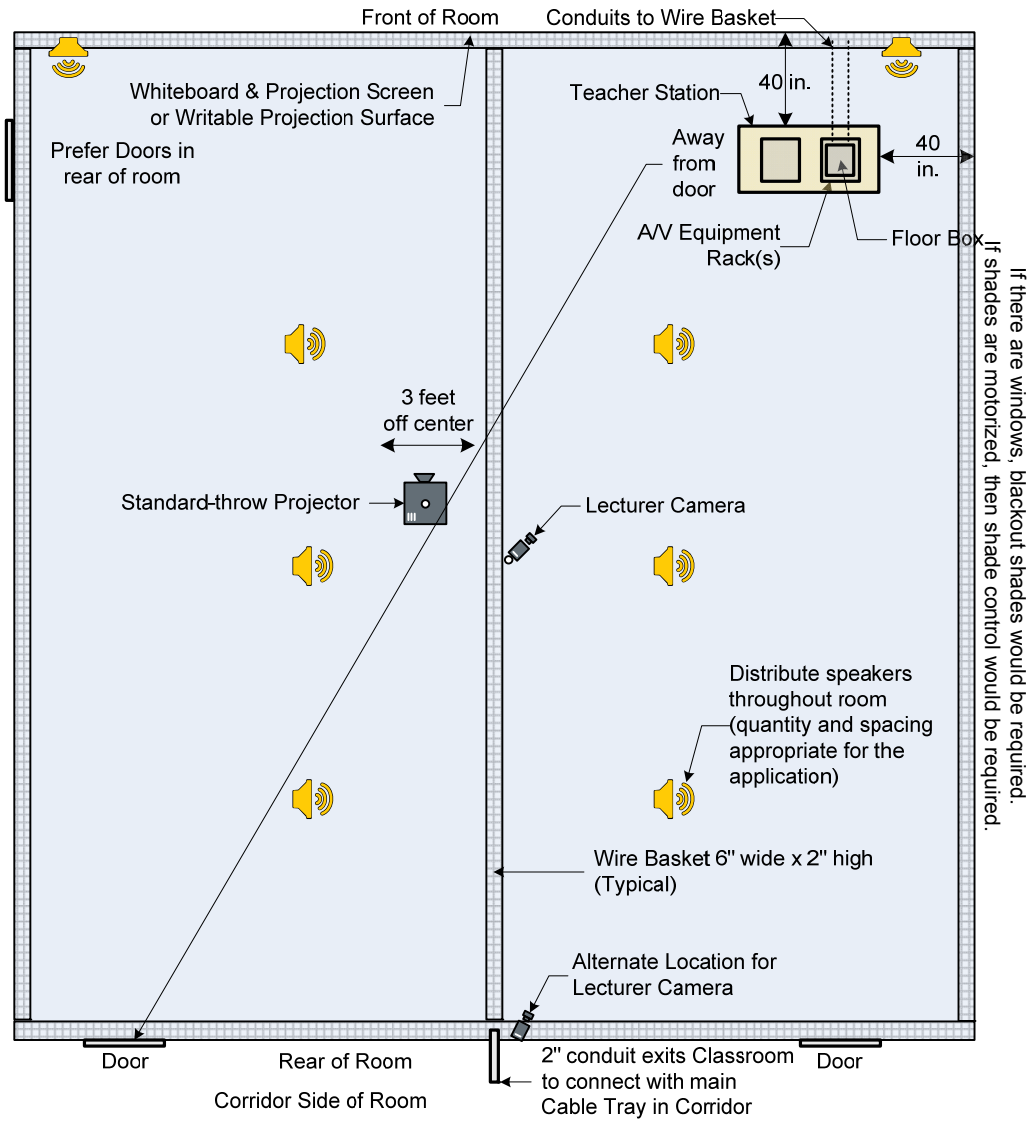
A Classroom has presentation audio/visual, audio amplification features, lecture capture features, and web conferencing.

6.1.1.1 TYPICAL PLAN AND ELEVATION DIAGRAMS

The diagrams below depict the plan view and an elevation of the front wall of a typical Classroom.



Typical Classroom A/V Equipment Locations Front Wall Elevation



Typical Classroom
A/V Equipment Locations
Plan View

6.1.1.2 ARCHITECTURAL REQUIREMENTS

6.1.1.2.1 CLASSROOM LOCATION

Noise-producing equipment (such as elevators and HVAC equipment), shall be separated from teaching spaces. While soundproofing can treat some problems, it has its limits and can be expensive.

6.1.1.2.2 ROOM SHAPE

Classrooms should preferably be deeper (front to back) than they are wide. Window walls should be perpendicular to the presentation wall.

6.1.1.2.3 ACOUSTICS

A. A noise coefficient of NC 35 and a reverberation time of 0.6 seconds are the highest allowable per the recommendations of ANSI S12.60-2002.

B. The Designer and the Architect shall discuss with the Owner whether there is any possibility that a classroom might be upgraded in the future to serve as Distance Education Classroom. If this possibility exists, the acoustics for the classroom shall be designed to meet the Distance Education Classroom requirements from day one.

C. Ideally, walls shall be at least 6” thick. They shall employ sound-dampening material and construction methods to suppress sound transfer between application spaces.

D. Acoustic treatment shall be employed on walls, floors, and ceilings to reduce reverberant conditions. This treatment shall have an NRC of 80-85, which is typical of fabric over 1" fiberglass. Extraneous sounds must be prevented from entering the classroom. In some cases this might require dense materials in ceilings and walls. Carpeting is highly desirable to improve acoustics and visual imagery.

6.1.1.2.4 COLORS

The Designer and the Architect shall discuss with the Owner whether there is any possibility that a Classroom might be upgraded in the future to serve as a Distance Education Classroom.

- If this possibility exists, the color treatments in the classroom shall be designed to meet the Distance Education Classroom requirements from day one.

6.1.1.2.5 WINDOWS

If there are windows in the room, automatic blackout shades to control light spill shall be considered.

6.1.1.2.6 FURNITURE

When selecting student tables, consider whether power outlets, data outlets or microphones will be required. If so, it is recommended that tables be manufactured with integrated cable raceways. Table top surface, style and color shall match room décor and custom A/V cabinetry.

The Designer shall work with the UVU Furniture Purchasing Agent to specify the table colors and table top surface materials.

6.1.1.3 ELECTRICAL REQUIREMENTS

6.1.1.3.1 POWER REQUIREMENTS

The electrical power circuits supplying the Projector, Video Panels, Teacher Station, Floor Box, and Equipment Rack shall be dedicated for technology applications, be from the same breaker panel and use the same phase in the panel.

The Equipment Racks in the Teacher Station can share a single dedicated 20A circuit.

Throughout the room, the A/V equipment that will require power includes:

- Video Projector – typically located in a plenum-rated device box mounted in the tile bridge directly above the projector (concealed in the accessible ceiling). This outlet shall be a dedicated circuit serving the projector only.
- A/V Rack – quad outlet per rack, mounted in a floor box or in base of the Teacher Station (inside) oriented facing to the side (not face-up). This outlet shall be a dedicated circuit serving the Teacher Station only.
- Projection Screen – When the screen's motor operates, it can cause interference to other electronic equipment. Therefore, power for projection screens shall be circuited separately from the projector, the Teacher Station and other A/V equipment.

6.1.1.3.2 LOW-VOLTAGE PATHWAYS AND BOXES

A. A/V conduits shall be sized 1 ¼" minimum, and shall be larger as required for each application.

B. Provide an A/V Floor Box below the Teacher Station as shown in the plan diagram above.

   Provide one 2" conduit for A/V purposes only from the A/V Floor Box up to the wire basket in the ceiling.

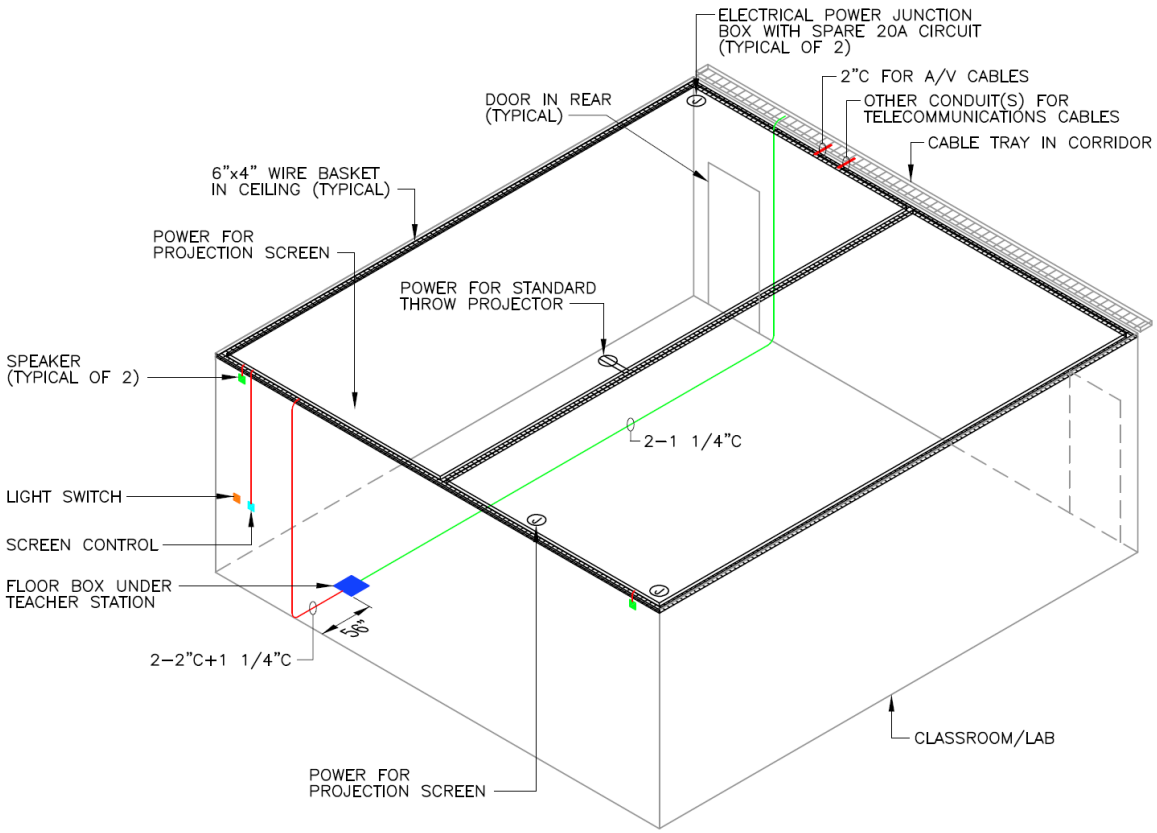
   Provide a separate 1 ¼" conduit routed from the A/V Floor Box under the Teacher Station to the main distribution cable tray (typically in the corridor) for telecommunications cabling.

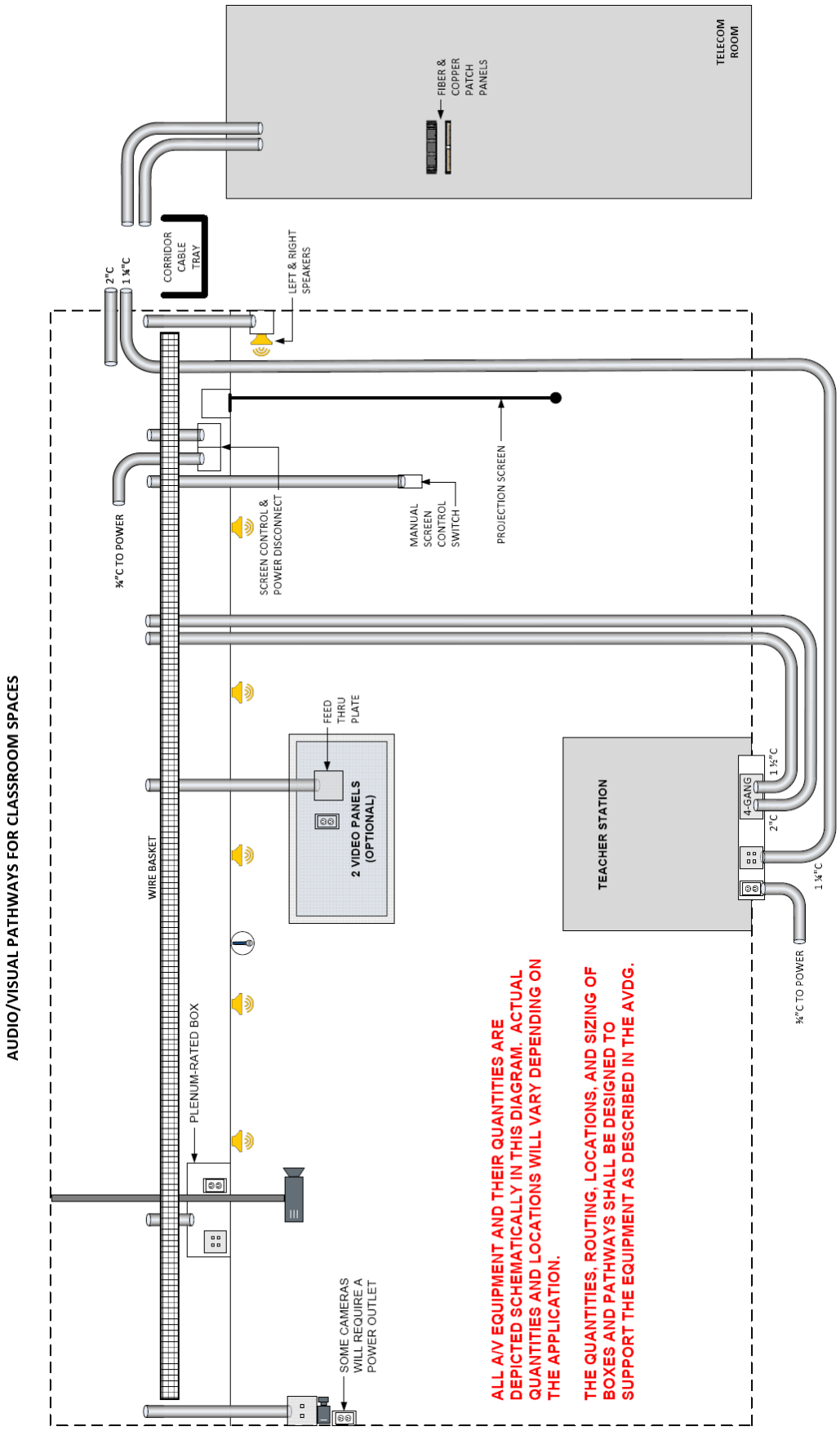
C. For wall-mounted A/V devices (such as speakers and cameras) provide conduits (1" trade size) from the wire basket in the ceiling down to in-wall, 2 1/8" deep device boxes, with a single gang mud ring serving each wall-mounted audio/visual device. Provide feedthrough faceplates sized to accommodate cables with connectors to pass through. Provide blank faceplates for future devices. Conduits, device boxes, and faceplates shall comply with UVU telecommunications guidelines. Faceplates shall match (color, material, style) the other faceplates used in the project.

   - Be aware that some PTZ cameras mount directly to a 2-gang mud ring.

D. Provide wire basket cable trays in accessible ceiling to accomplish the functions depicted in the plan diagram above. Cable tray practices shall comply with UVU telecommunications guidelines.

E. The two diagrams below depict the pathways and boxes required for a Classroom A/V application:


ELECTRICAL POWER JUNCTION BOX WITH SPARE 20A CIRCUIT (TYPICAL OF 2)
2"C FOR A/V CABLES
OTHER CONDUIT(S) FOR TELECOMMUNICATIONS CABLES
CABLE TRAY IN CORRIDOR
DOOR IN REAR (TYPICAL)
6"x4" WIRE BASKET IN CEILING (TYPICAL)
POWER FOR PROJECTION SCREEN
POWER FOR STANDARD THROW PROJECTOR
SPEAKER (TYPICAL OF 2)
2-1 1/4"C
LIGHT SWITCH
SCREEN CONTROL
FLOOR BOX UNDER TEACHER STATION
5"
2-2"C+1 1/4"C
CLASSROOM/LAB
POWER FOR PROJECTION SCREEN


AUDIO/VISUAL PATHWAYS FOR CLASSROOM SPACES
TELECOM ROOM
FIBER & COPPER PATCH PANELS
CORRIDOR CABLE TRAY
2"C
1 ¼"C
LEFT & RIGHT SPEAKERS
¾"C TO POWER
SCREEN CONTROL & POWER DISCONNECT
MANUAL SCREEN CONTROL SWITCH
PROJECTION SCREEN
WIRE BASKET
FEED THRU PLATE
2 VIDEO PANELS (OPTIONAL)
TEACHER STATION
4-GANG
1 ½"C
2"C
1 ¼"C
¾"C TO POWER
PLENUM-RATED BOX
SOME CAMERAS WILL REQUIRE A POWER OUTLET
ALL A/V EQUIPMENT AND THEIR QUANTITIES ARE DEPICTED SCHEMATICALLY IN THIS DIAGRAM. ACTUAL QUANTITIES AND LOCATIONS WILL VARY DEPENDING ON THE APPLICATION.
THE QUANTITIES, ROUTING, LOCATIONS, AND SIZING OF BOXES AND PATHWAYS SHALL BE DESIGNED TO SUPPORT THE EQUIPMENT AS DESCRIBED IN THE AVDG.

6.1.1.3.3 TELECOMMUNICATIONS CABLING REQUIREMENTS

A. The Designer shall work with the telecommunications designer and the AVPM to verify that the appropriate numbers of cables and colored jacks are included in the telecommunications drawings to support A/V applications, in addition to other needs. See the TDDG for further information.

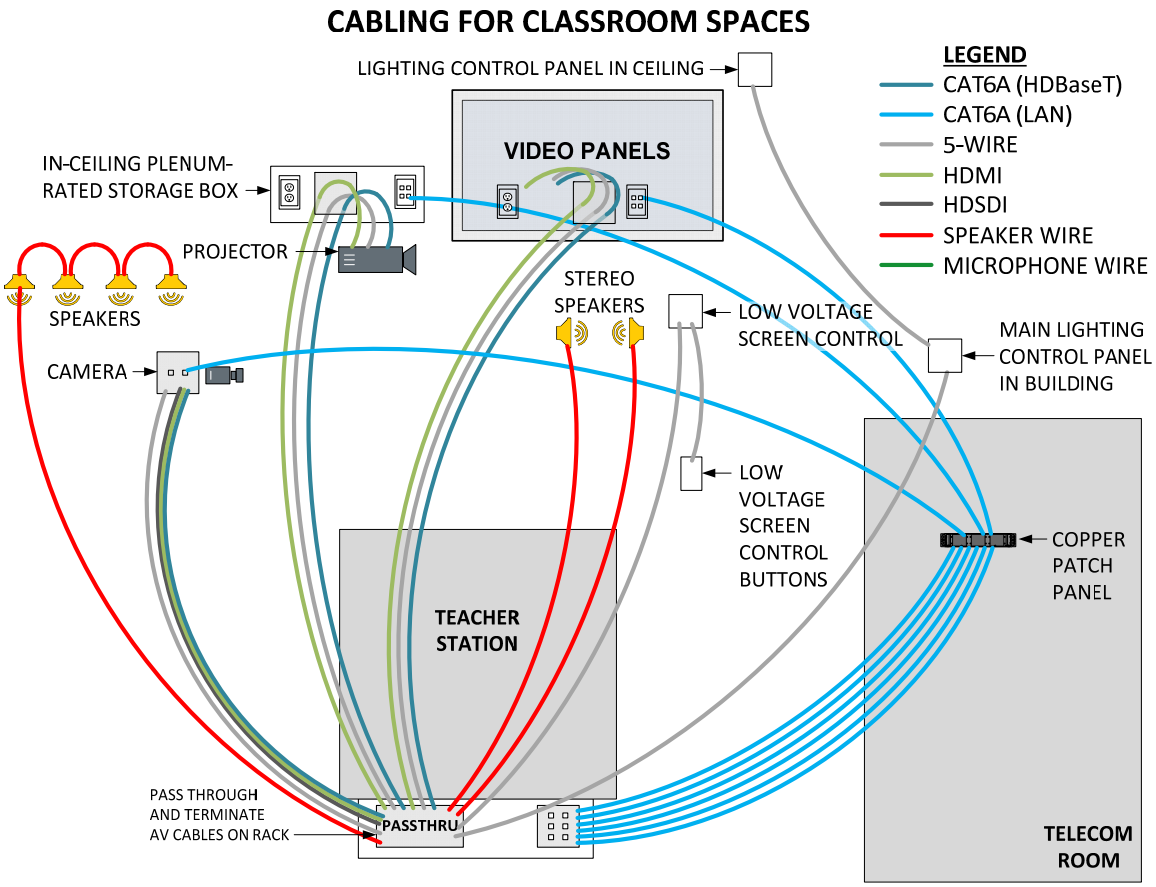
B. Provide the following telecommunications cabling:

Application	Endpoint/Termination	Cable	Endpoint	Termination
Crestron control system	Telecom Room	Category 6A	Outlet in floor box under Teacher Stn	RJ45 Jack
Owner-provided computer located in the A/V Rack	Telecom Room	Category 6A	Outlet in floor box under Teacher Stn	RJ45 Jack
Video Switcher located in the A/V Rack	Telecom Room	Category 6A	Outlet in floor box under Teacher Stn	RJ45 Jack
Blu-Ray Player	Telecom Room	Category 6A	Outlet in floor box under Teacher Stn	RJ45 Jack
Data network connection for laptop	Telecom Room	Category 6A	Outlet in floor box under Teacher Stn	RJ45 Jack
Spare	Telecom Room	Category 6A	Outlet in floor box under Teacher Stn	RJ45 Jack
Each Projector (LAN)	Telecom Room	Category 6A	Outlet above projector in plenum box	RJ45 Jack
Each Video Panel (LAN)	Telecom Room	Category 6A	Outlet behind video panel	RJ45 Jack
Each Camera – (LAN)	Telecom Room	Category 6A	Outlet behind camera	RJ45 Jack
Each Camera – (HDBaseT)	Pass through floor box under Teacher Station	Category 6A	Pass through outlet behind camera	Connectors on both ends (no jacks
HDBaseT to each video projector and video panel	Pass through floor box under Teacher Station	Category 6A	Pass through outlet above projector or behind video panel	Connectors on both ends (no jacks)

The cable quantities will vary, depending on the number of audio/visual devices in the A/V Equipment Rack and located throughout the room.

Multiple outlets may be required inside the Teacher Station to terminate all cables.

The following diagram depicts the telecommunications cabling required for a Classroom audio/visual application:



ALL A/V EQUIPMENT AND THEIR QUANTITIES ARE DEPICTED SCHEMATICALLY IN THIS DIAGRAM. ACTUAL QUANTITIES AND LOCATIONS WILL VARY DEPENDING ON THE APPLICATION.

THE QUANTITIES, ROUTING, AND TERMINATION OF CABLING SHALL BE DESIGNED TO SUPPORT THE EQUIPMENT AS DESCRIBED IN THE AVDG.

OTHER A/V WIRING AND CABLING MAY ALSO REQUIRED FOR SPECIAL APPLICATIONS NOT DEPICTED HERE.

6.1.1.3.4 LIGHTING REQUIREMENTS

Pendant light fixtures shall be coordinated so that they do not obstruct the projector light path to the display wall. Standard-throw projectors are typically hung between 8 and 14 inches below the finished ceiling to center of lens, and set back from the front of the room a distance of twice the screen width minus 2 feet. Refer to the projection throw chart that is specific to the projector model and lens being used. Projectors shall be located in the middle of the acceptable throw range defined by the manufacturer.

Front-of-room lighting must be controllable separately from the rest of the room to eliminate spill on the screen that would degrade image quality.

Light fixtures that are wired to be “always on” shall not be placed near projection screens or video panels.

6.1.1.4 HVAC REQUIREMENTS

In order to meet the above Noise Coefficient, the HVAC, must be low velocity with sound absorption material in the ducts.

HVAC designers shall anticipate that A/V equipment will produce a heat gain of approximately 1500 watts in the classroom.

Since students will occupy these rooms for up to three hours at a time at intense levels of concentration, there must be temperature control, humidity control and complete changes of air on a cycle consistent with that type of activity.

6.1.1.5 A/V EQUIPMENT AND FURNISHINGS

6.1.1.5.1 TEACHER STATION

Teacher Station furniture shall be located in the front of the classroom, to the side of the display area of the front wall, away from the door. The Teacher Station shall be visible from every seat in the space, but shall not obstruct the line of sight to the projection screen from any seat in the space. Teacher Stations shall be anchored to the floor, preferably in an angled orientation.

The Designer shall inquire with the AVPM to select which of the three standard styles of Teacher Station Furniture shall be used in each application space:

- Desk style form-factor (both a left and right version)
- Standup work surface style form factor (not movable) with dual racks
- Lectern with interior equipment rack

See Teacher Station drawings in Appendix 9.1.

6.1.1.5.2 A/V EQUIPMENT RACK

An A/V Equipment Rack assembly (or two racks) shall be located inside the teacher station. The cabling shall enter the rack at the bottom rear, and be properly routed and Velcroed to the cable lacing system. All cables should be groomed such that cables can be easily traced and removed. The A/V Equipment Rack shall contain the following equipment:

- Crestron controller system, which shall be connected to the University data network.
- Blu-ray/DVD player, if required.
- Owner-provided computer. The Designer shall inquire with the UVU AVPM whether the computer will be rack-mountable or whether the Designer shall include a 3U shelf to support the computer.
- Wireless microphone receiver

- Video Switcher/Scaler
- Audio Switcher/DSP
- Amplifier
- Ventilation Fans
- In Teacher Stations, power conditioning devices shall be provided to protect the equipment in the A/V Racks. For racks with 8x8 matrices and larger, provide an uninterruptible power supply (UPS).

An example A/V Equipment Rack elevation detail is shown in Appendix 8.2 Rack Elevation Diagrams.

6.1.1.5.3 FLOOR BOX

Typically, a floor box beneath the Teacher Station is desirable. When a floor box is not feasible UVU prefers that low-voltage conduits serving the technology applications in the Teacher Station simply stub up approximately 1" above the floor, and enter the Teacher Station through cutouts in the floor of the Teacher Station. If a permanent teacher station or podium are secured above then no A/V cabling shall terminate in it, but rather the floor box shall serve as a pass-through point. All Data and connections shall be terminated in the floor box.

6.1.1.5.4 VIDEO PROJECTOR

Discuss with the UVU AVPM which type of project should be used for a given project. Standard throw projectors are typically preferred. However, where a standard throw projector cannot be used, consider using a ceiling-mounted long-throw projector.

AC power will be required for the projector.

6.1.1.5.5 PROJECTION SCREEN

Where a projectable surface is used, do not use a projection screen.

Otherwise, projection screens shall be mounted in a central location in the front of the room. Screen shall be mounted a maximum of 4 inches away from the wall and shall clear the chalk tray of any black or white board-mounted behind it when extended. The bottom of the fully-extended screen shall be a minimum of 36 inches above the finished floor.

A low voltage manual screen control switch is required. A power cutoff switch above the ceiling is also desired so that technicians can disconnect the screen from power for servicing activities.

The Designer shall consult with the UVU AVPM regarding the desired screen sizes in each application.

6.1.1.5.6 SPEAKERS

The classroom audio system shall be designed with separate speaker systems to provide a clearly intelligible stereo (for content) and monaural (for speech) audio signal at every location within the classroom. Audio enhancement shall provide a level of not less than 55 dB SPL at 48 inches above finished floor in the classroom seating area.

Audio levels front to back/side to side shall not vary by more than 2dB at any point within the seating area.

6.1.1.5.7 ASSISTIVE LISTENING

Every classroom requires assistive listening features.

6.1.1.5.8 ROOM CONTROL

The Crestron room control system shall provide control of the video display devices, projection screen, content source selection (audio and video), window dressing, and lighting.

The Designer shall discuss with the AVPM which room-specific features shall be programmed into the control system.

6.1.1.5.8.1 Room Control Programming

All programming for the Crestron Processor and all touch panels shall be coordinated with the UVU AVPM. Every touch panel and PC software interface in use has the same page layout and button nomenclature throughout the campus and all additions must follow suit.

6.1.1.5.8.2 Projector Control

Power on/off and input selections on the projector are selected by the Crestron system. The Crestron system shall also provide for the automated lowering and raising of the projection screen with the projector on/off control.

6.1.1.5.8.3 Lighting

The Crestron control system shall be programmed to provide lighting control, automated with the use of the video projector. The lighting system shall also be given a separate control page for overriding the automated control as needed.

6.1.1.5.8.4 Codec

The Designer shall discuss with the AVPM if a codec will be required.

6.1.1.5.8.5 Audio and Video Routing and Switching

Audio and video routing shall be done with the Crestron control system.

The room control system performs source selections via peripheral equipment to provide sources to the video projector.

6.1.1.5.8.6 Content Switcher

When UVU uses the Crestron DMP 300 series Digital Media switcher, the switcher is used for all video source selections including computer, laptop, Blu-ray/DVD and document camera. The Polycom codec is used for camera source selection.

6.1.1.5.8.7 Touch Panel

A Crestron touch panel shall be used for the control interface.

6.1.2 HORSESHOE CLASSROOMS

Horseshoe Classrooms incorporate the features described above for all classrooms, with the following additional features:

The seating in a Horseshoe Classroom shall be tiered and arranged in a U shape.

The horseshoe shape of the seating requires a choice between two sets of three video output devices:

• A video projector aimed at the **left wall** behind student seating	• A video projector aimed at the front wall behind the instructor	• A video projector aimed at the **right wall** behind student seating

OR

• A ceiling-mounted video panel, centered in the room, angled downward facing the **left wall**	• A video projector aimed at the front wall behind the instructor	• A ceiling-mounted video panel, centered in the room, angled downward facing the **right wall**

6.1.3 DISTANCE EDUCATION CLASSROOMS

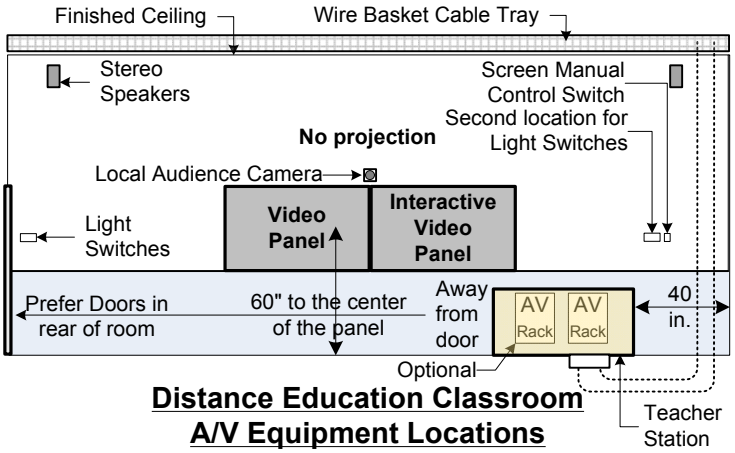
A Distance Education Classroom has the same audio/visual features as a Classroom plus the following additional features:

- Multiple video cameras
- Multiple video panels
- Microphones (desktop, wireless or ceiling-hung)
- Video conference endpoint

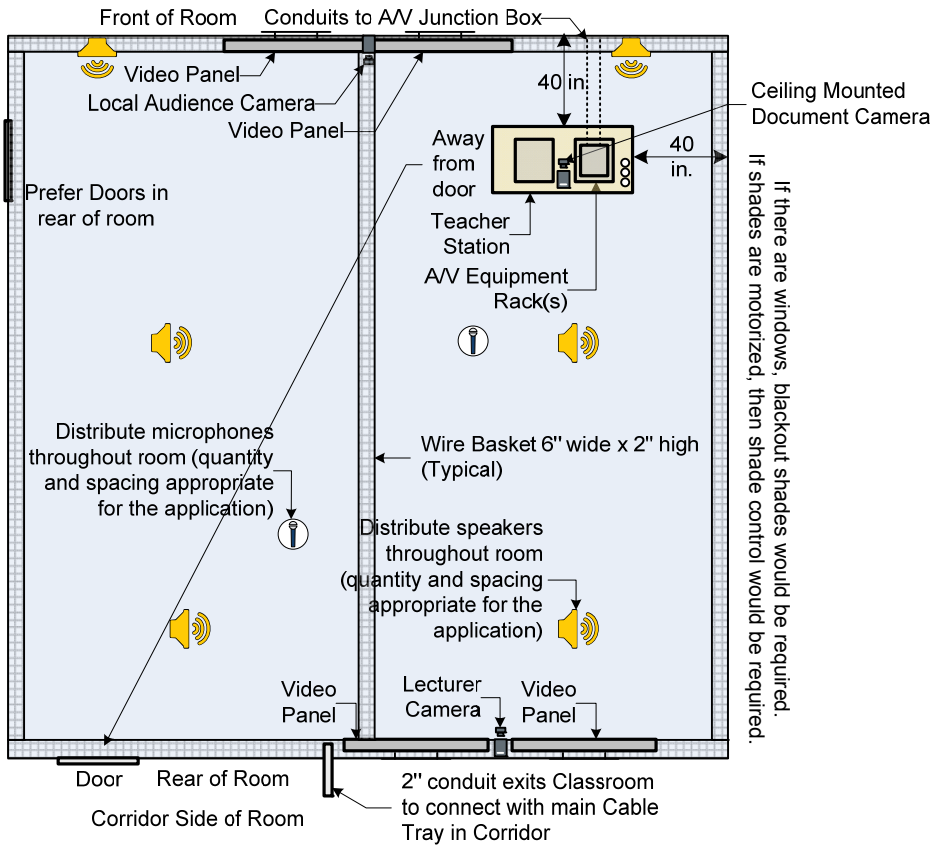
Distance Education Classrooms tend to be smaller than standard classrooms.

6.1.3.1 TYPICAL PLAN AND ELEVATION DIAGRAMS

The diagrams below depict the plan view and an elevation of the front wall of Distance Education Classroom:



Distance Education Classroom
A/V Equipment Locations
Front Wall Elevation



Distance Education Classroom
A/V Equipment Locations
Plan View

6.1.4 COLLABORATION CLASSROOMS

Collaboration Classrooms are sometimes referred to as “Flipped” classrooms. In addition to the audio/visual features of all classrooms, they contain additional video panels and/or projectors to display student computer images.

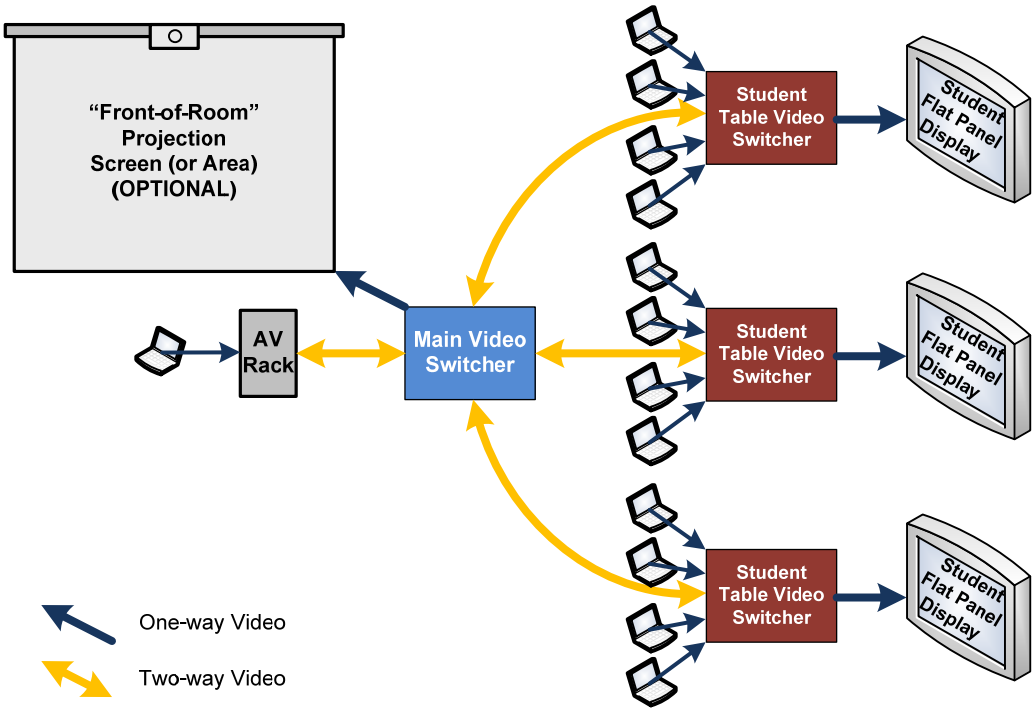
In Collaboration Classrooms, the instructor spends most of his or her time in the class period moving from table to table to support student groups as they collaboratively apply what they studied outside of class to solve the challenges given them in class. Collaboration Classrooms are not well-suited to video conferencing applications.

In Collaboration Classrooms, students sit in groups of up to 9 around each table. The tables are equipped with technology to support computers that are used by students during the class period. The wall near each table may have a video panel or a projection surface where the students can view it and can interact collectively.

Collaboration Classrooms also have a “front-of-room” projection wall where the instructor might present a limited amount of material; however, Collaboration Classrooms are not intended as lecture spaces. The front-of-room designation is a loosely used term, because the room is not intended to operate primarily in this mode, but will instead

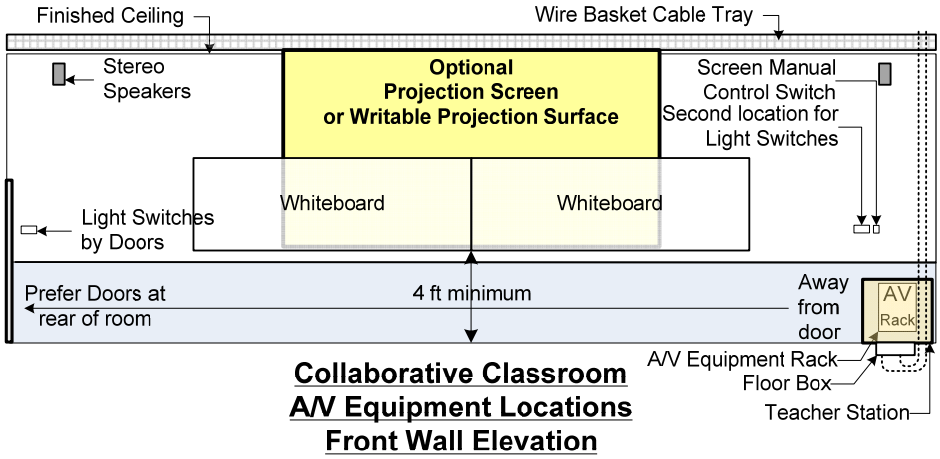
function most of each class period in a student-table-centric mode. The front-of-room projection shall also be able to display the monitor of any of the student tables should the instructor wish to feature a particular group for the entire class.

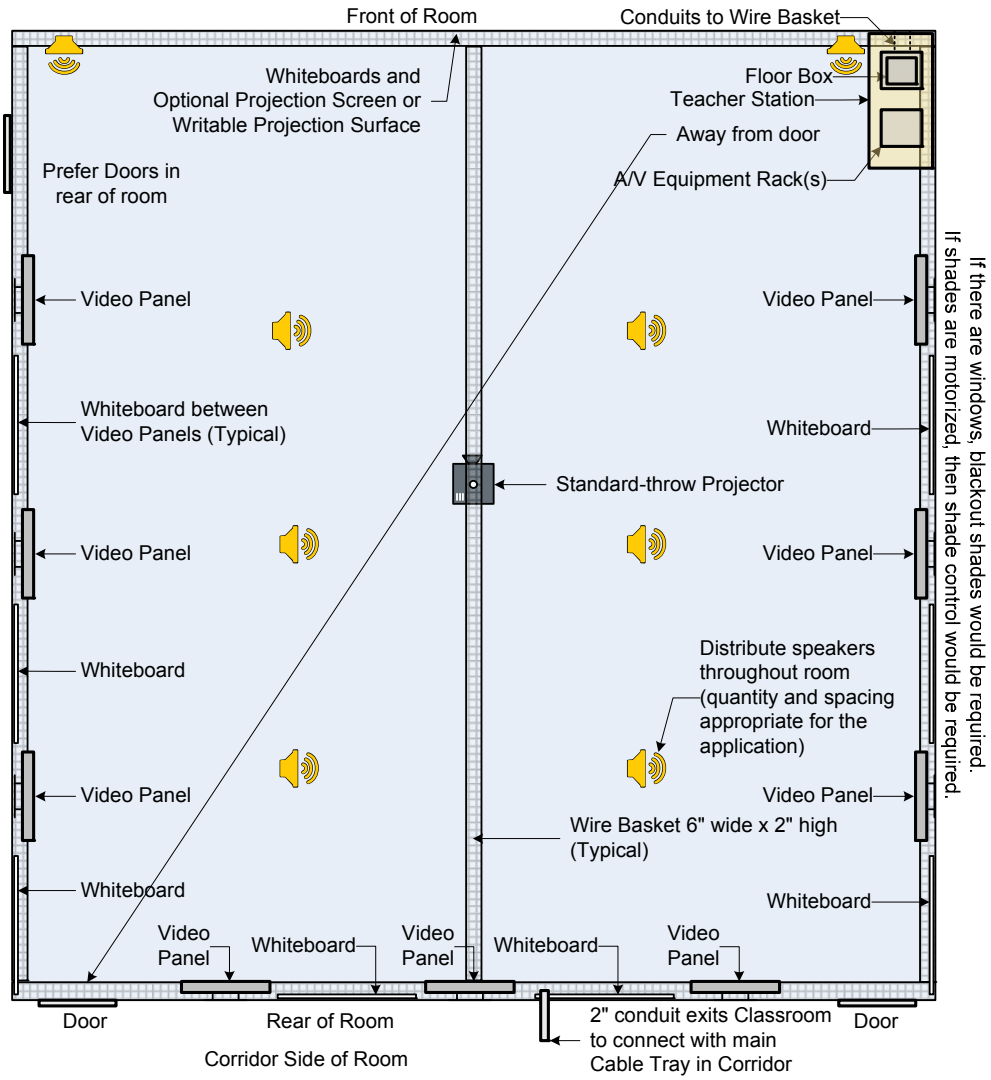
Depending on the intended use of a Collaboration Classroom space, it may not have a Teacher Station. In such cases, the A/V Equipment Rack will need to be mounted inside the Teacher Station.



6.1.4.1 TYPICAL PLAN AND ELEVATION DIAGRAMS

The diagrams below depict the plan view and an elevation of the front wall of a typical Collaboration Classroom.





Collaborative Classroom
A/V Equipment Locations
Plan View

6.1.4.1.1 A/V EQUIPMENT AND FURNISHINGS

In addition to all of the features of a Classroom, Collaboration Classrooms will also require video switching (equipment or software) and video panels as shown in the diagrams above and discussed below.

The Designer shall discuss the furniture layout and style with the AVPM. The Designer shall discuss the finish and desktop laminates with the Facilities Services Interior Designer.

6.1.4.1.1.1 Video Panels

Near each student group table, video panels shall be wall-mounted using a secure, articulating wall mount. Security devices shall be installed to protect against theft. Video

panels shall be mounted no higher than is required to see the bottom of the image from any seat in the room.

Some Collaboration Classrooms may be better served with projectors and projection screens. Typically, this decision shall be made during the Schematic Design or Design Development Phase, in conjunction with the UVU user group/building committee. The Designer shall also discuss this option with the UVU AVPM.

6.1.4.1.1.2 Video Switching

Video switching equipment and/or software will be required on two levels:

- At each table, the students will need to be able to choose which of their computers to show on the wall-mounted video panel or projection screen. Also, students should be able to choose to show the front-of-room projection on their wall-mounted video panel.
- At the front of the room, the instructor will need to be able to choose to project audio/visual content, the screen image from the instructor's computer, or the screen image from a student computer anywhere in the room.

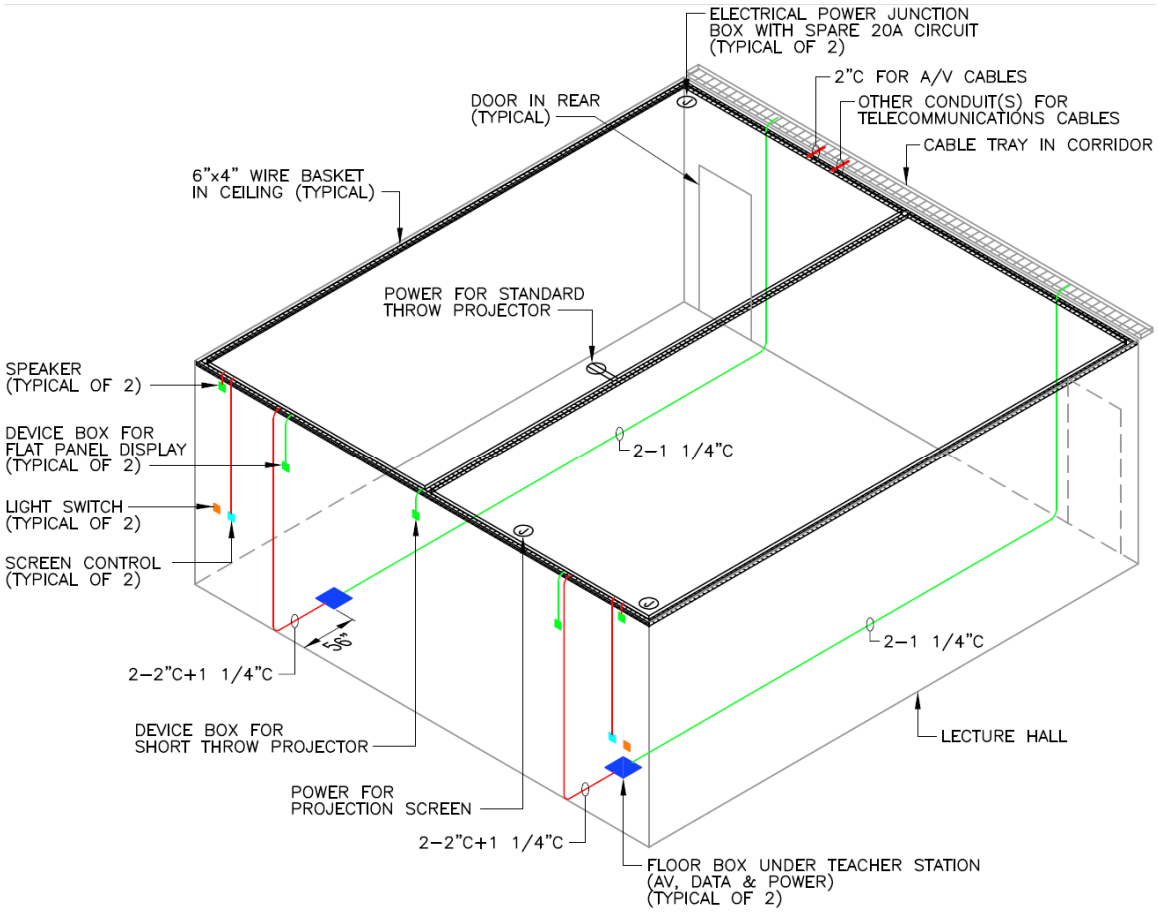
Video switching can be done with physical equipment and cabling or using software to control video streamed over the network. Currently, UVU is investigating software and hardware products to perform video switching for Collaboration Classrooms.

6.1.5 LECTURE HALLS

Lecture Halls are similar to classrooms with the following significant differences:

- There are two stations at the front of the room for the teacher station furniture.
- There are two video panels on the front wall, one on each side of the projection screen.
- There is typically tiered seating.

A. The Designer shall work with the A/V designer and refer to the AVDG to provide the correct pathways and features for Lecture Halls, as depicted below:



6.2 Dance Studios

Dance studios are used for academic instruction and artistic practice and shall include a typical classroom setup with the following additional features:

The following features are typically needed:

- Audio/visual equipment rack (housed inside a credenza)
- CD player
- Bluetooth Audio Receiver
- Large Venue Speakers and Subwoofers
- Acoustic wall treatment
- Audio inputs for personal music players

6.3 Exercise Spaces

Exercise spaces often have stationary exercise equipment such as treadmills, bicycles, stair climbers, etc. The following features are typically needed:

- Multiple video displays showing multiple simultaneous television programs.
- Students' can use an application on their personal smartphones to stream the audio broadcasts for each video panel, allowing patrons to tune into the audio for the video program they would like to watch.
- Informational digital signage.

6.4 Auditoriums

6.4.1 A/V EQUIPMENT AND FURNISHINGS

An Auditorium has the same audio/visual features as a Lecture Hall. However, since an Auditorium is much larger than a Lecture Hall and seats more people, it is usually necessary to adjust the following features:

- Add a raised platform at the front of the room.
- Add a third teacher station position in the center of the raised platform.
- Add a digital signal processor.
- Increase the number of speakers throughout the room.
- Provide audio amplifiers with sufficient power to support the larger number of speakers required.
- Provide a rear projection space behind the projection surface and incorporate the A/V Equipment Room into that space.
- Provide acoustic wall treatment as required.

6.4.2 ELECTRICAL POWER IN AUDITORIUMS

It is critical that all audio/visual equipment located in and serving an Auditorium be powered on the same phase of the electrical power distribution system, preferably through technology-dedicated electrical circuits, all on the same phase of the electrical power distribution system.

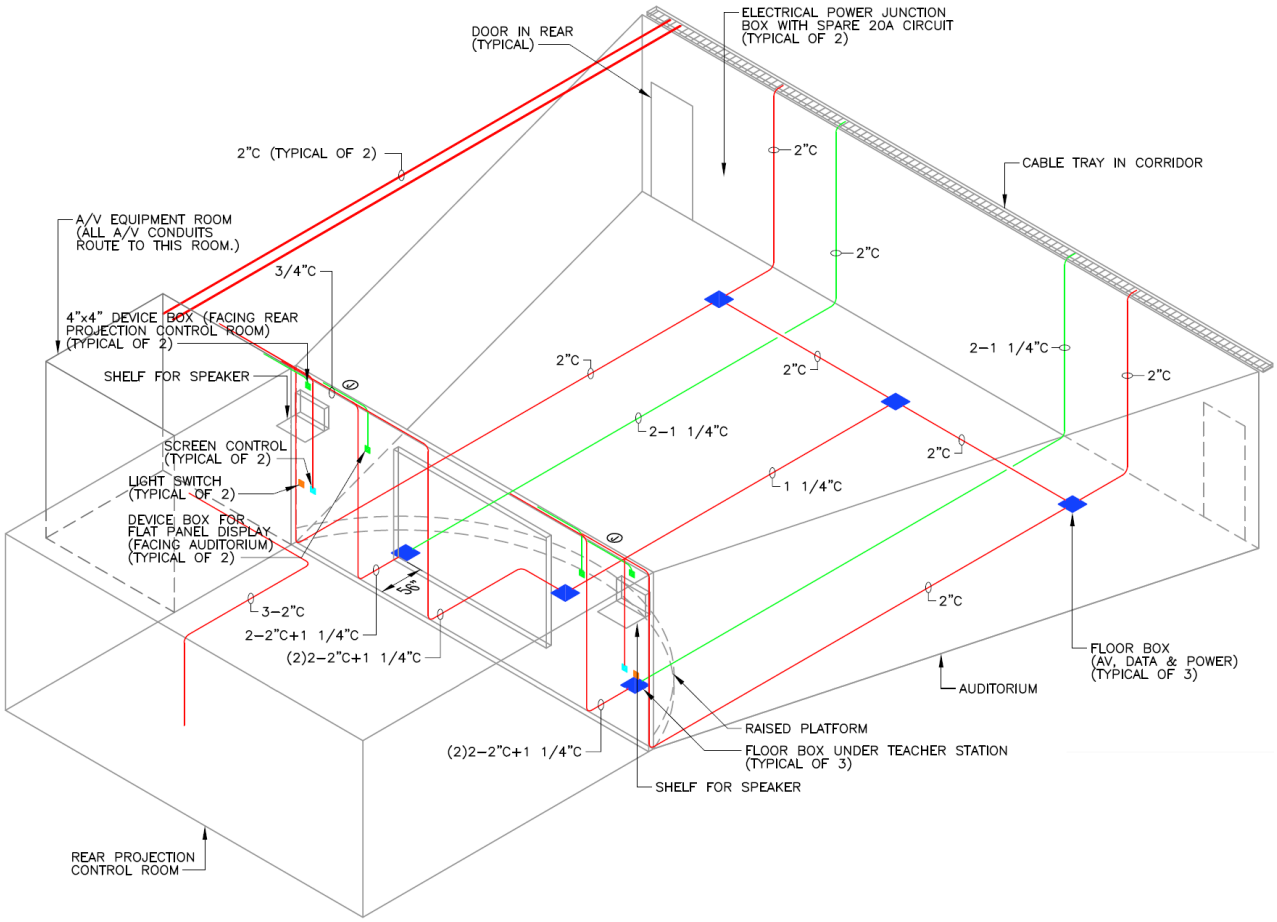
- This includes the equipment in the A/V Equipment Room, the equipment in the Teacher Station rack and the video projectors.

It is permissible for both an A/V Equipment Room and a Telecommunications Room to share the same technical power panel.

6.4.3 LOW VOLTAGE PATHWAYS AND BOXES IN AUDITORIUMS

A. Auditoriums require a rear projection room that also serves as an A/V Equipment Room.

B. The Designer shall work with the A/V designer and refer to the AVDG to provide the correct pathways and features for Auditoriums, as depicted below:



6.4.4 A/V EQUIPMENT ROOM

An A/V Equipment Room may be required to host the audio/visual equipment used for Auditoriums and other large spaces. Some labs and larger classrooms may also require an A/V Equipment Room.

The Designer shall inquire whether there are opportunities to combine an A/V Equipment Room with a Telecommunications Room.

6.4.4.1 SIZING

A/V Equipment Rooms in new construction and full remodel projects shall be sized such that ADA-required space is available after equipment racks have been installed.

- Rooms shall be 9 feet by 10 feet (minimum dimensions), with the door on the 9-foot side.

6.4.4.2 ARCHITECTURAL PROVISIONING

A. The Designer shall be responsible to inform the Architect about the architectural provisioning requirements for A/V Equipment Rooms, and to do this early in the Design Development phase of the project.

B. The Designer shall be responsible to review project documents and determine that the architectural requirements for the A/V Equipment Rooms are met as described in this document. For projects where an architect is involved, the Designer shall coordinate directly with the architect, and verify that the architect's design documentation meets these requirements. For projects without an architect, the Designer shall alert UVU where additional architectural adjustments are needed to meet the requirements.

C. Doors shall open out (180-degree swing) from A/V Equipment Room spaces wherever possible, and shall be a minimum of 36" wide and 80" high, fitted with a lock. Coordinate lock and key requirements with UVU. Doors shall be located in hallways or other common areas.

- The Designer shall inquire whether access control electronics are required for a given A/V Equipment Room.

A/V Equipment Room doors shall never be located in another building occupant's designated space.

- If Code or circumstances do not allow an outward swing, the room size shall be increased to accommodate an inward door swing.

D. Minimum clearance height within an A/V Equipment Room shall be 8 feet. False ceilings (t-bar ceilings, ceiling grids, etc.) shall not be installed in t A/V Equipment Rooms. The floor, walls, and ceiling shall be sealed to reduce dust.

E. Finishes shall be light in color to enhance room lighting. Flooring materials shall be light-colored and slip-resistant – carpet is not required for A/V Equipment Rooms. Interior floor finish and floor covering materials shall also meet the requirements in the International Building Code.

F. The walls in A/V Equipment Rooms shall be covered either with plywood that has been treated with fire-retardant chemicals by a pressure impregnation process, or plywood that has been painted with a UL-listed, non-toxic fire-retardant intumescent coating having a Class A surface flame spread rating. The plywood shall be painted with primer and two coats of white paint.

- If an approved fire retardant intumescent coating is used, a small plaque shall be attached to the backboard near the door, listing the fire spread rating of the backboard, the manufacturer, and the product number of the fire-retardant intumescent coating. This information may be helpful for future maintenance activities.

Plywood backboards shall extend from 6" above the floor up to a height of 8'6" above the finished floor.

6.4.4.3 ENVIRONMENTAL PROVISIONING

A. The Designer shall be responsible to inform the Mechanical Engineer of the

environmental provisioning requirements for A/V Equipment Rooms, and to do this early in the Design Development phase of the project.

B. The Designer shall be responsible to determine that the mechanical HVAC requirements for the A/V Equipment Rooms are met as described in this document. For projects where a Mechanical Engineer is involved, the Designer shall coordinate directly with the engineer, and verify that the engineer's design documentation meets these requirements. For projects without the involvement of a Mechanical Engineer, the Designer shall alert UVU where adjustments to the mechanical infrastructure are needed to meet the requirements.

C. The Designer shall coordinate with the Mechanical Engineer to ensure that the HVAC requirements for the A/V Equipment Rooms are met and also that HVAC ductwork and motors do not conflict with cable tray or conduit routing.

D. A/V Equipment Rooms shall be environmentally provisioned as follows:

1. A fundamental design assumption is that all A/V Equipment Rooms will contain active electronic equipment (Owner-provided) even if the current design does not call for such devices. A/V equipment requires an air conditioning system capable of operating on a 24/7/365 basis. If the building system cannot assure continuous cooling operation, a stand-alone unit shall be provided for the A/V Equipment Room.

   In addition, a positive pressure differential with respect to surrounding areas is required to help keep dust and other particles out of the room.

- Where practical, the use of outside air for cooling is encouraged. Dehumidification and filtration may be required for systems using outdoor air.
- Where practical, UVU encourages the use of heat reclamation features.
- Environmental management and monitoring systems shall be designed for A/V Equipment Rooms.
- Typically, the building's central air conditioning system should cool the A/V Equipment Rooms during summer months. During the months when the central air conditioning system is not running, a stand-alone air conditioning system shall be used to cool the A/V Equipment Rooms.
  - This unit and any roof penetrations shall be located away from (not directly above) electronics of any kind, to avoid damage from condensate drip and roof leaks.
- Split systems are preferred, with the equipment located outside the A/V Equipment Rooms wherever possible. The temperature controls shall be located inside the A/V Equipment Rooms.
- It is never acceptable to rely solely upon exhaust fans to cool an A/V Equipment Room.
- UVU currently has no preference for any particular manufacturer of air conditioning equipment, so long as it is quality equipment that is suitable for the application.

2. The Designer shall request power consumption data for the audio/visual equipment in the project, and shall work with the mechanical systems designer to

ensure that the designed cooling capacity is sufficient to handle the A/V heat load.

3. Minimum clearance height in A/V Equipment Rooms shall be eight feet without obstructions (light fixtures, ducting, etc.).

4. The Designer shall carefully coordinate the location of fire suppression sprinklers and piping in A/V Equipment Room spaces.

- If fire suppression sprinklers are required in A/V Equipment Rooms, they shall be dual-action dry-pipe sprinkler systems.
- Sprinkler guards must be provided where sprinklers are installed less than 8 feet above the floor.
- Sprinkler heads and piping shall be mounted and routed above walking space – not above equipment racks or the equipment they will contain.

6.4.4.4 PROHIBITED SYSTEMS

Similar to the requirements for telecommunications rooms, the following shall not be located in or adjacent to A/V Equipment Rooms:

- Areas subject to water or steam infiltration, particularly basements. Floor drains (with trap primers) are required if there is any risk of water entry.
- Areas exposed to excessive heat or direct sunlight.
- Areas exposed to corrosive atmospheric or environmental conditions.
- Near or adjacent to potential sources of electromagnetic interference (EMI) or radio frequency interference (RFI) such as large electric motors, power transformers, arc welding equipment, or high-power radio transmitting antennas.
- In a shared space with electrical equipment other than panels serving the A/V equipment.

Water piping shall not be routed across the ceiling or through the walls of A/V Equipment Rooms.

6.5 Multipurpose Rooms

Multipurpose Rooms are mini-event spaces used to stage a variety of events, including:

- Conferences
- Lectures
- Meetings
- Seminars
- Luncheons
- Panel discussions

Multipurpose Rooms feature dividable spaces without fixed seating for flexible sizing and arrangement of the space. A movable podium is typically located at the front of the room.

A credenza shall be provided on one wall to host the A/V equipment required to support all of the subdividable spaces within the Multipurpose Room.

Ceiling mounted standard-throw projectors are provided on mounts that can pivot to point at different walls

Auxiliary inputs and outputs shall be provided on walls and at the credenza to support event-specific A/V requirements.

Multiple floor boxes are required, typically one per subdividable space. All A/V cabling in floor boxes shall route to patch panels in a credenza cabinet.

Sensors shall be provided to detect the status of the divider walls. Speakers shall be zoned so that the A/V switcher can sub feed each room separately if divided or all rooms if combined.

6.6 Conference Spaces

6.6.1 GROUP STUDY ROOMS

Group Study Rooms are small conference rooms with space for approximately 4 to 8 people, and have a wall-mounted video panel with integrated speakers for presentation purposes only. Video conferencing features are not provided in Group Study Rooms.

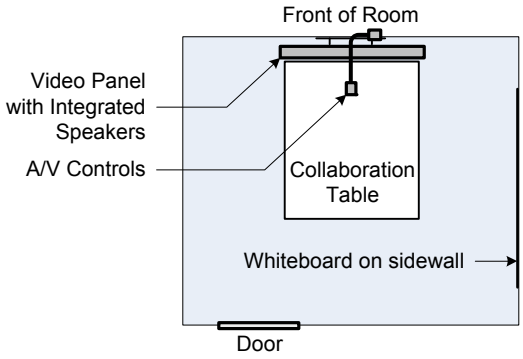
Provide a conduit and box to support an A/V control pad, and a second box and faceplate to host an auxiliary input plate. The Designer shall select a location that coordinates with furniture locations in this space. These features will enable users to connect their own mobile devices without requiring access to the HDMI ports on the rear of the video panel, and also to control the video panel without using the buttons on the panel.

UVU currently uses the Crestron MPC Series Button Panels for this purpose. The control pad shall provide the following functions:

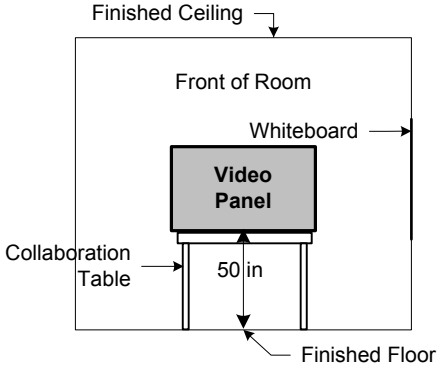
- Video Panel On/Off
- Volume Up/Down
- Input Select

6.6.1.1 TYPICAL PLAN AND ELEVATION DIAGRAMS

The diagrams below depict the plan view and wall elevations of Group Study Rooms:



Group Study Room
AV Equipment Locations
Plan View



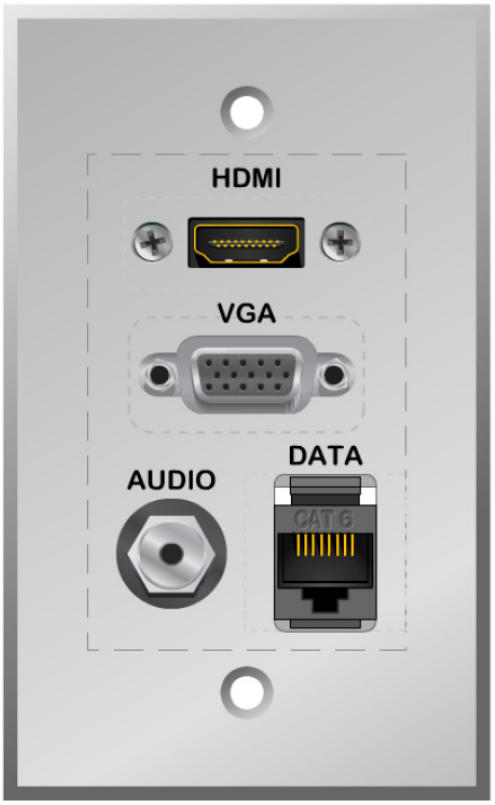
Group Study Room
A/V Equipment Locations
Wall Elevation

6.6.1.2 A/V INTERFACE

A connection point for A/V cabling shall be provided on the wall adjacent to the video panel or in the table top near the video panel.

The diagram at right is an example of the connections that should be included in this connection point:

- HDMI jack
- VGA Video input for a document camera or notebook computer
- 3.5mm stereo audio jack
- A network jack



6.6.2 CONFERENCE ROOMS

Conference Rooms usually have only presentation features; however some may have video conferencing features also. A/V cabinets are located inside credenzas.

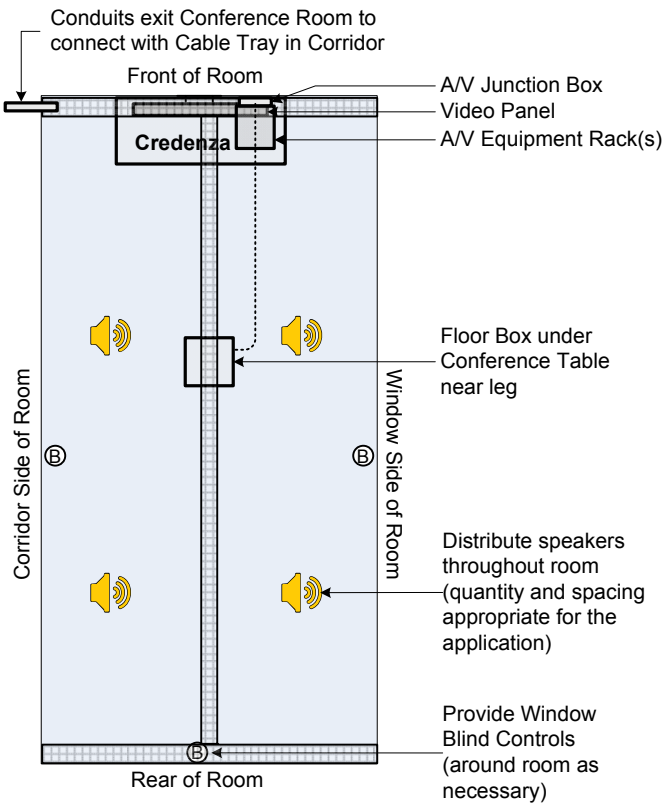
Conference Rooms shall use the same audio/visual systems as a Classroom except that there will not be a Teacher Station. This is the UVU standard conference facility, especially for non-instructional use. It can also serve as a small classroom for some very specialized purposes, such as graduate seminars.

Conference Rooms shall use video panels (typically not video projection).

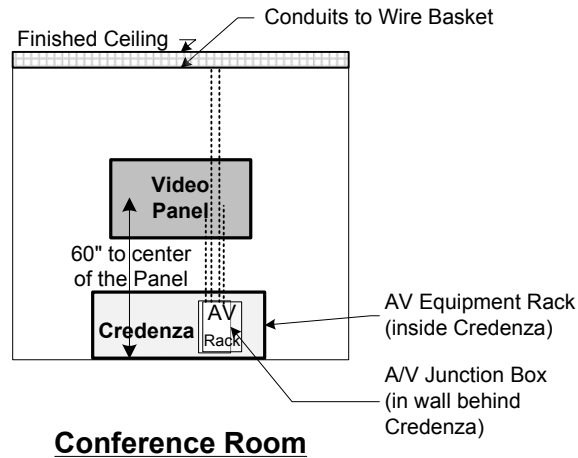
All Conference Rooms shall be designed to include conduits and boxes sufficient to support a future upgrade into a Large Conference Room.

6.6.2.1 TYPICAL PLAN AND ELEVATION DIAGRAMS

The diagrams below depict the plan view and an elevation of the front wall of Conference Rooms.



Conference Room
AV Equipment Locations
Plan View



Conference Room
A/V Equipment Locations
End Wall Elevation

6.6.2.1.1 ARCHITECTURAL REQUIREMENTS

6.6.2.1.1.1 Acoustics

A noise coefficient of NC 35 is the highest allowable. Figures between NC 25 and 30 are desirable with a reverberation time of less than 0.6 sec.

Acoustic treatment should be employed on walls, floors and ceilings to reduce reverberant conditions. This treatment should have an NRC of 80-85 which is typical of fabric over 1" fiberglass. Extraneous sounds shall be prevented from entering the classroom. In some cases this might require dense materials in ceilings and walls. Carpeting is highly desirable to improve acoustics and help improve visual imagery.

6.6.2.1.1.2 Windows

If there are windows in the room, they shall have automatic blackout shades to control light spill as well as curtains to help with sound control.

6.6.2.1.1.3 Walls

Walls shall be at least 6” deep. They shall employ sound-dampening material and construction methods to suppress sound transfer between application spaces.

Whiteboards are required.

6.6.2.1.1.4 Colors

Neutral colors without patterns are better for wall areas that will be visible in the background of video conferencing images. The Architect shall carefully select wall treatments that will be compatible with video conferencing.

6.6.2.1.1.5 Furniture

Each Conference Room requires a credenza (located along the presentation wall, biased to one side) to host the A/V Equipment Rack. The credenza is defined in Section 4.2.3 above.

A conference table with table-top boxes shall be provided to fit the room.

In each cable box, provide the following:

- Two electrical power receptacles
- Two data jacks

In one recessed A/V table-top box at the presentation end of the room, provide the following cables:

- One HDMI jack
- One VGA Video input for a document camera or notebook computer
- 3.5mm stereo audio jack

6.6.2.1.2 ELECTRICAL REQUIREMENTS

6.6.2.1.2.1 Power Requirements

Wherever possible, the electrical power circuits supplying the Projector, Video Panels, A/V Floor Box, and Equipment Rack (inside Casework) must be from the same breaker panel, and use the same phase in the panel.

Conduits for electrical power shall be ¾” trade size minimum.

Throughout the room, the A/V equipment that will require power includes:

- Conference Table (table-top boxes) – quad outlet, mounted inside the table leg (preferred), or in a floor box.
- Video Panel(s) – wall-mounted power outlets typically concealed behind each video panel.
- Video Projector – wall-mounted power outlet typically located above the ceiling to support a short-throw projector.
- Projection Screen – If a projectable surface is not used, a motorized projection screen will be needed, requiring a hard-wired power circuit.

6.6.2.1.2.2 Lighting Requirements

Pendant light fixtures shall be coordinated so that they do not obstruct the projector light path to the display wall. The projector shall typically be hung between 6 and 12 inches below the finished ceiling and approximately twice the screen width back from the front of the room, minus 2 feet.

Front-of-room lighting must be controllable separately from the rest of the room to eliminate spill on the screen causing a reduction of image contrast.

Fixtures located overhead shall produce 75-80 foot-candles. This light may be fluorescent. Specialized video conferencing lighting shall be considered.

6.6.2.1.3 HVAC

In order to meet the above Noise Coefficient, the HVAC, must be low velocity with sound absorption material in the ducts.

In Conference Rooms, HVAC designers shall anticipate a heat gain from A/V equipment of approximately 700 watts.

6.6.2.1.4 LOW-VOLTAGE PATHWAYS AND BOXES

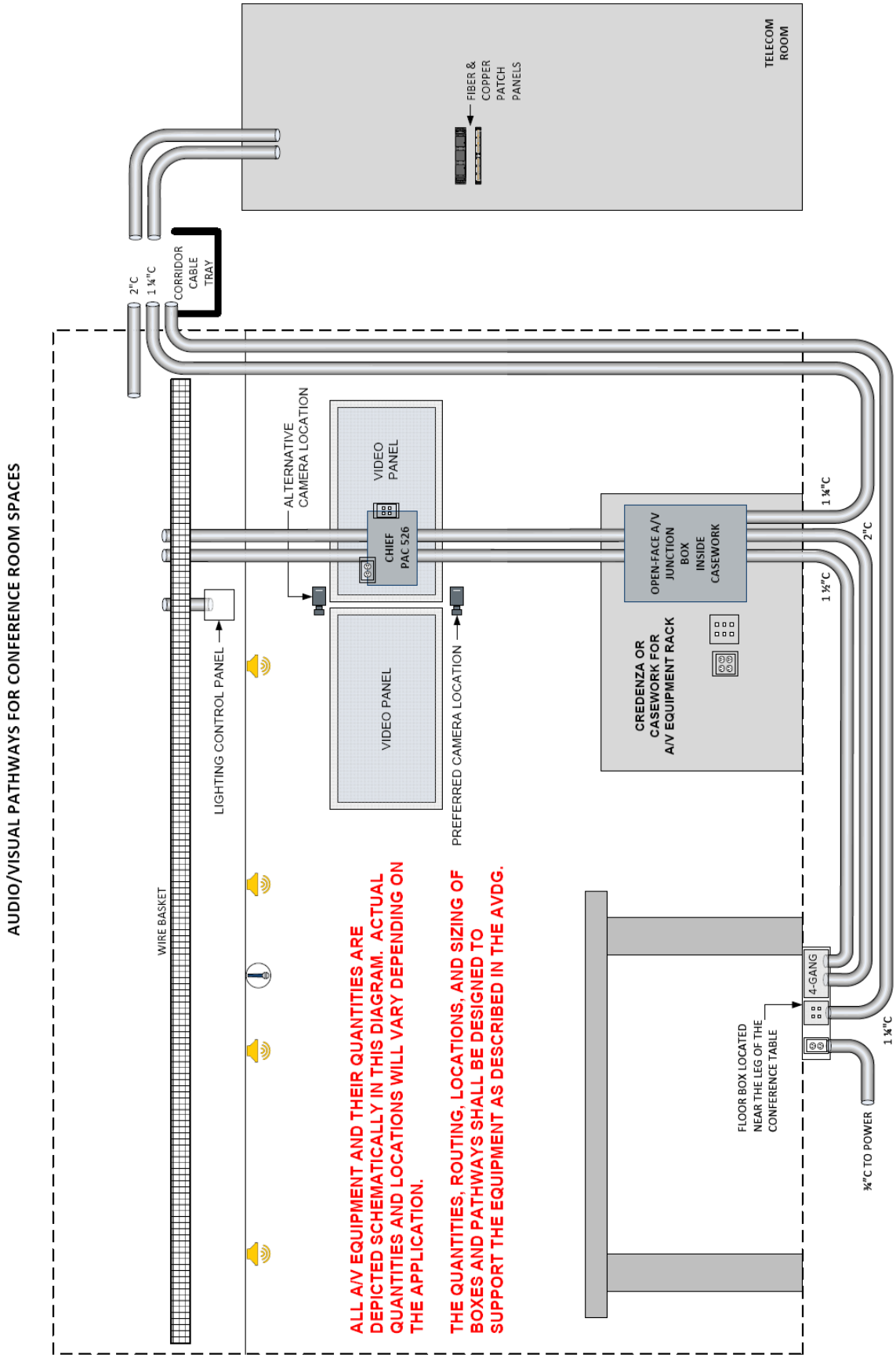
The wall elevation and plan diagrams above depict the arrangement of audio/visual features in conference room spaces. The schematic below also depicts conduits and boxes required for all conference rooms, regardless of whether the room will initially include video conferencing features. Conduits and boxes shall be designed to support video conferencing for future use, if not from original occupancy.

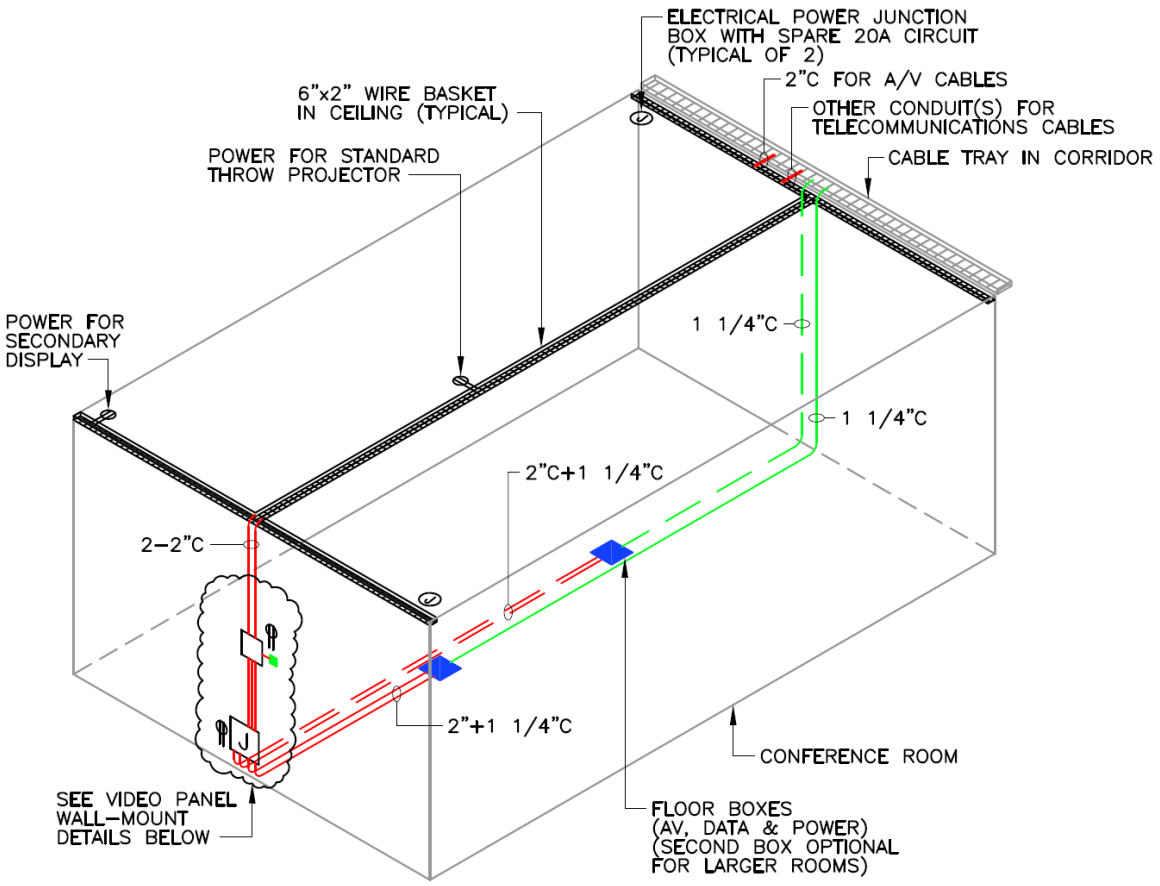
A. All Conference Rooms shall have pathways for video conferencing, even if video conferencing features are not initially installed.

B. Typically, it is desirable to locate a wireless access point in or near each Conference Room.

C. Do not place doors on the flat panel display/presentation wall.

D. Conference Rooms vary in size depending on the intended usage. The Designer shall work with the A/V designer and refer to the AVDG to provide the correct pathways and features for Conference Rooms. Examples of “large” (seats for more than 10 persons) and “small” (seats for 10 persons and less) Conference Rooms are depicted below:


AUDIO/VISUAL PATHWAYS FOR CONFERENCE ROOM SPACES
TELECOM ROOM
FIBER & COPPER PATCH PANELS
CORRIDOR CABLE TRAY
2"C
1 ¼"C
WIRE BASKET
LIGHTING CONTROL PANEL
ALTERNATIVE CAMERA LOCATION
VIDEO PANEL
CHIEF PAC 526
VIDEO PANEL
PREFERRED CAMERA LOCATION
OPEN-FACE A/V JUNCTION BOX INSIDE CASEWORK
CREDENZA OR CASEWORK FOR A/V EQUIPMENT RACK
1 ¼"C
2"C
1 ½"C
4-GANG
1 ¼"C
FLOOR BOX LOCATED NEAR THE LEG OF THE CONFERENCE TABLE
¾"C TO POWER
ALL A/V EQUIPMENT AND THEIR QUANTITIES ARE DEPICTED SCHEMATICALLY IN THIS DIAGRAM. ACTUAL QUANTITIES AND LOCATIONS WILL VARY DEPENDING ON THE APPLICATION.
THE QUANTITIES, ROUTING, LOCATIONS, AND SIZING OF BOXES AND PATHWAYS SHALL BE DESIGNED TO SUPPORT THE EQUIPMENT AS DESCRIBED IN THE AVDG.

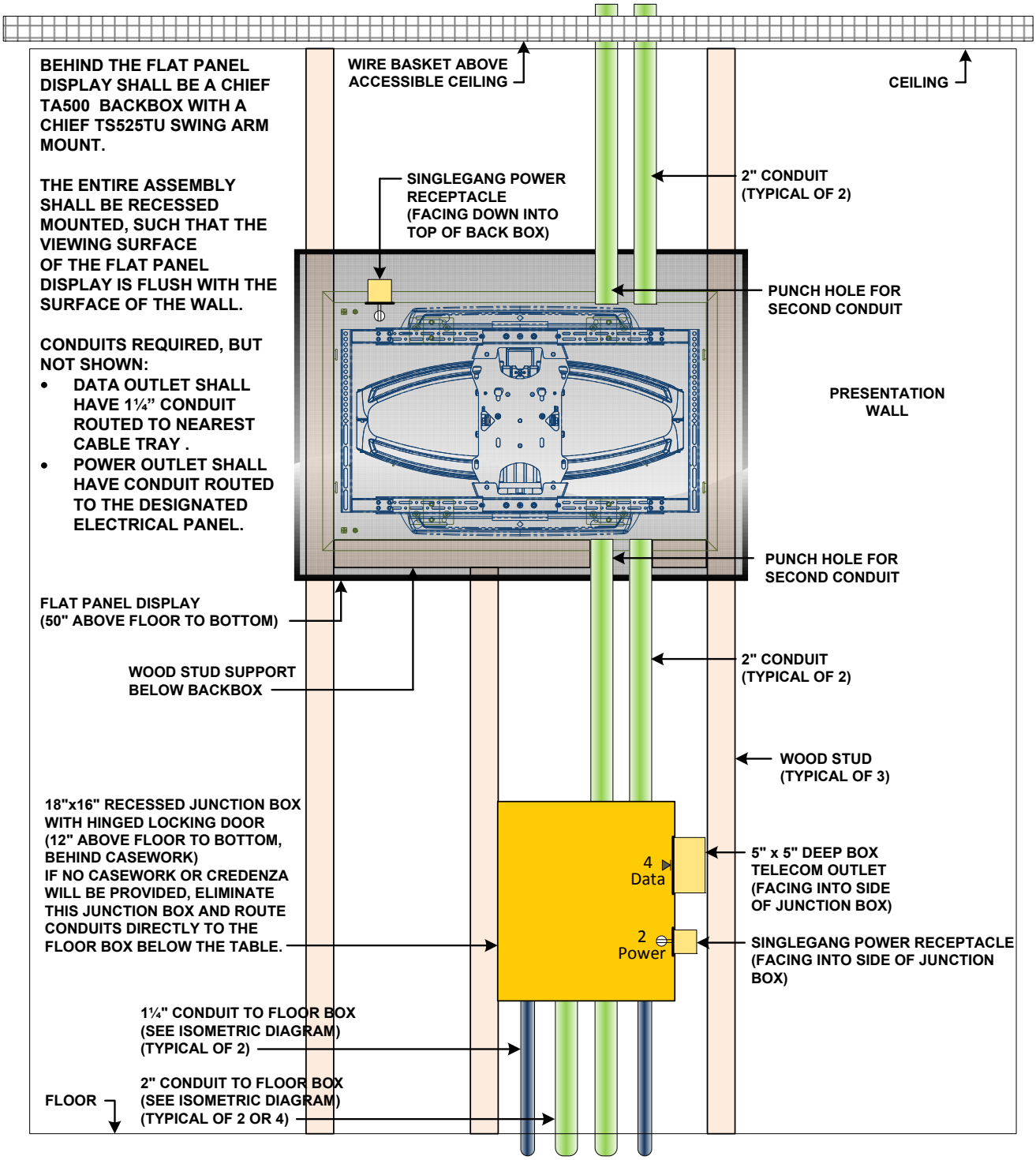


6.6.2.1.4.1 Presentation Wall Box and Conduit Details

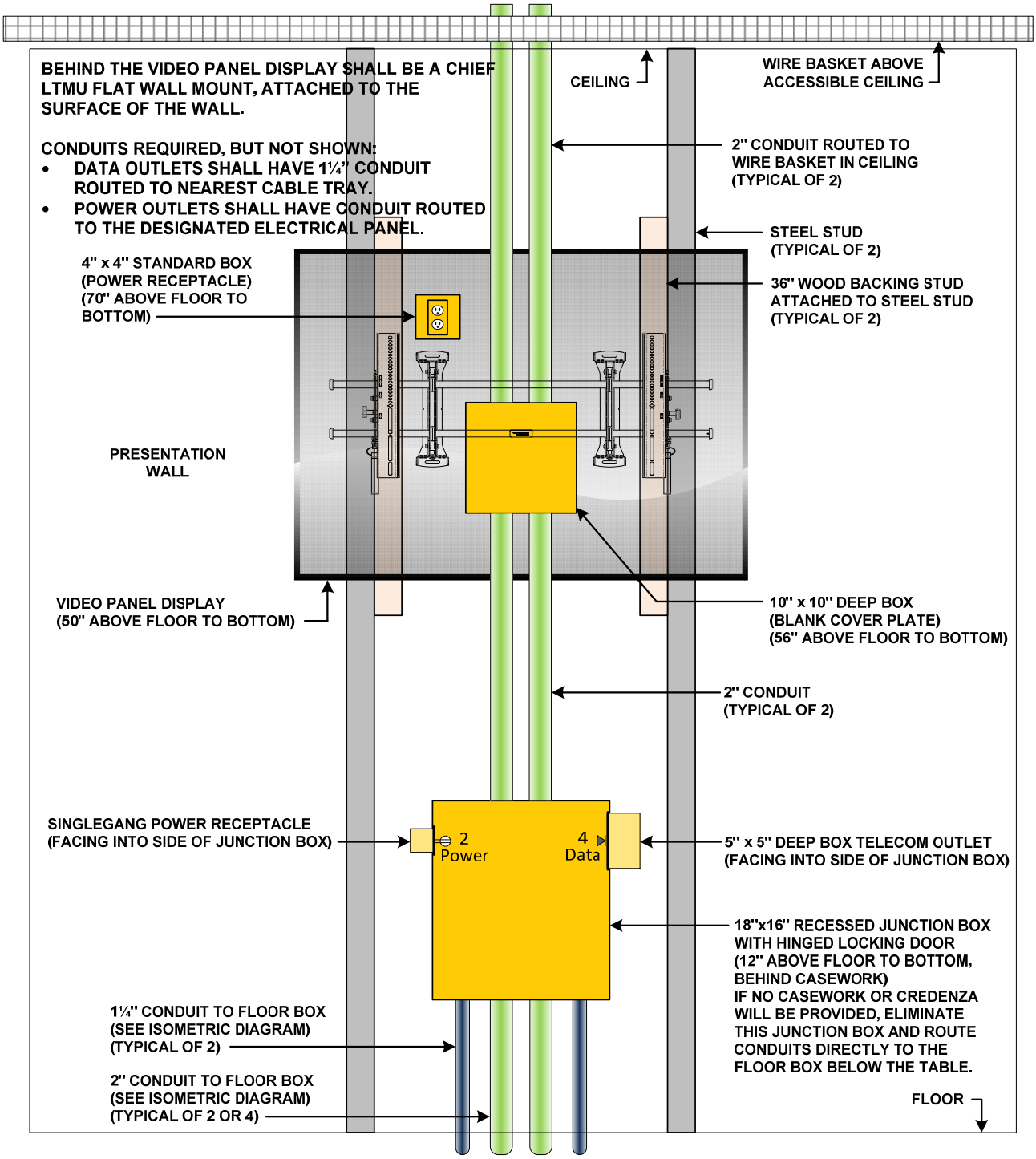
There are two options (depicted below) for flat panel display mounting, with its associated pathways and boxes.

- The Designer shall work with the A/V designer and refer to the AVDG to provide the UVU-desired solution for each Conference Room application.

Swing Arm-mount Option – Conference Room Flat Panel Display Mounting (This is the standard solution.)



Flat Wall-mount Option – Conference Room Video Panel Display Mounting
(This solution requires AVPM approval for rooms that might have double panels.)



E. Conference tables shall have floor boxes installed beneath them and a table-top box, with patch cords routed up from the floor box to a table-top connection point providing access to power outlets, data outlets and audio/visual inputs.

- The Designer shall work with the A/V designer and refer to the AVDG to provide the correct quantities, types and colors of cables for each application.
- See the AVDG for guidelines about the sizing and quantity of floor boxes and table-top boxes required for each conference table application.
- Conference rooms (those with tables seating 10 or less) may only need one floor box.

6.6.2.1.4.2 Wire Basket Cable Trays

Optional: provide wire basket cable trays in accessible ceiling to accomplish the functions depicted in the diagram above. Cable tray practices shall comply with UVU telecommunications guidelines (see TDDG).

6.6.2.1.4.3 Conduits, Device Boxes and Faceplates

Provide conduits (minimum 1" trade size) from the A/V Junction Box to in-wall, 2 1/8" deep device boxes, with a single gang mud ring serving each wall-mounted audio/visual device. Provide faceplates with circular holes in the plates that are large enough for connectorized cables to pass through. Provide blank faceplates for future devices. Conduits, device boxes, and faceplates shall comply with UVU telecommunications guidelines. Faceplates shall match (color, material, style) the other faceplates used in the project.

- Be aware that some PTZ cameras mount directly to a 2-gang mud ring.

6.6.2.1.4.4 A/V Junction Box

Provide an A/V Junction Box recessed in the wall above the ceiling as shown in the diagram above.

Provide three 1 ½" conduits to the equipment rack credenza.

Provide separate conduits routed to the main distribution cable tray for telecommunications cabling. Do not route this cabling exposed through the A/V wire basket because this may require the data cabling to be plenum-rated.

6.6.2.1.4.5 A/V Floor Box

Some applications may require an A/V Floor Box beneath conference tables or other furniture. UVU requires that all floor boxes be used for cable pass-through only.

6.6.2.1.5 TELECOMMUNICATIONS CABLING REQUIREMENTS

A. The Designer shall work with the telecommunications designer and the AVPM to verify that the appropriate numbers of cables and colored jacks are included in the telecommunications drawings to support A/V applications, in addition to other needs. See the TDDG for further information.

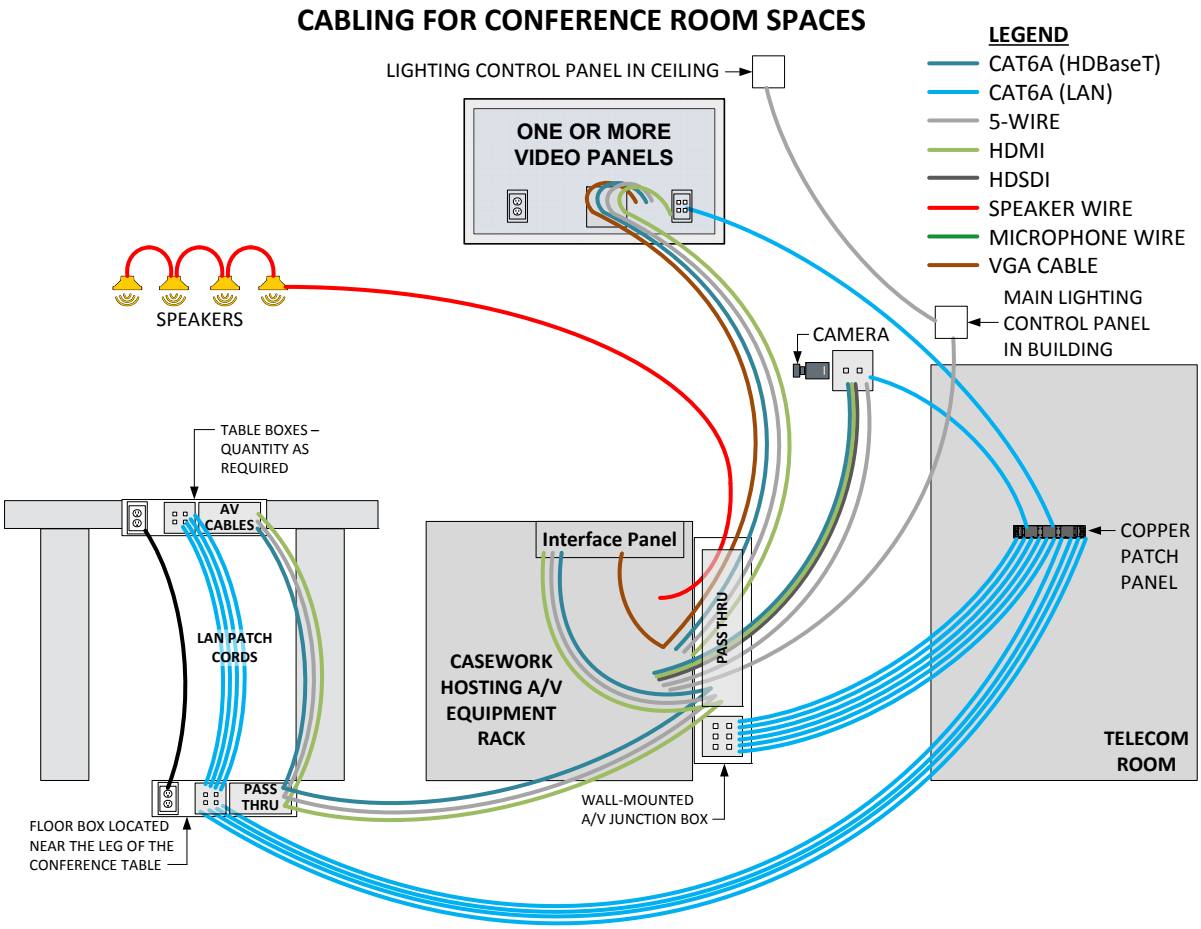
B. Provide the following telecommunications cabling:

Application	Endpoint/Termination	Cable	Endpoint	Termination
Crestron control system	Telecom Room	Category 6A	Outlet in J-Box behind Casework	RJ45 Jack
Owner-provided computer located in the A/V Rack	Telecom Room	Category 6A	Outlet in J-Box behind Casework	RJ45 Jack
Video Switcher located in the A/V Rack	Telecom Room	Category 6A	Outlet in J-Box behind Casework	RJ45 Jack
Blu-Ray Player	Telecom Room	Category 6A	Outlet in J-Box behind Casework	RJ45 Jack
Teleconferencing DSP	Telecom Room	Category 6A	Outlet in J-Box behind Casework	RJ45 Jack
Spare	Telecom Room	Category 6A	Outlet in J-Box behind Casework	RJ45 Jack
Each Video Panel (LAN)	Telecom Room	Category 6A	Outlet behind video panel	RJ45 Jack
Each Camera – (LAN)	Telecom Room	Category 6A	Outlet behind camera	RJ45 Jack
Each Camera – (HDBaseT)	Pass through J-Box behind Casework	Category 6A	Pass through outlet behind camera	Connectors on both ends (no jacks
HDBaseT to each video panel	Pass through J-Box behind Casework	Category 6A	Pass through outlet behind video panel	Connectors on both ends (no jacks)

The cable quantities will vary, depending on the number of audio/visual devices in the A/V Equipment Rack and located throughout the room.

Multiple outlets may be required inside the Casework to terminate all cables.

The following diagram depicts the telecommunications cabling required for a Conference Room audio/visual application:



ALL A/V EQUIPMENT AND THEIR QUANTITIES ARE DEPICTED SCHEMATICALLY IN THIS DIAGRAM. ACTUAL QUANTITIES AND LOCATIONS WILL VARY DEPENDING ON THE APPLICATION.

THE QUANTITIES, ROUTING, AND TERMINATION OF CABLING SHALL BE DESIGNED TO SUPPORT THE EQUIPMENT AS DESCRIBED IN THE AVDG.

OTHER A/V WIRING AND CABLING MAY ALSO REQUIRED FOR SPECIAL APPLICATIONS NOT DEPICTED HERE.

6.6.2.1.6 A/V EQUIPMENT AND FURNISHINGS

6.6.2.1.6.1 Equipment Racks

Inside the casework, a rack will host the codec, room audio system, and possibly a Blu-ray/DVD player.

6.6.2.1.6.2 Video Panels

Video panels shall be wall-mounted using a secure, articulating wall mount. Security devices shall be installed to protect against theft. The main panel shall be sized appropriate for the room.

Video panels shall be mounted with the bottom edge at approximately 50 inches above finished floor or higher as needed, in order to see the bottom of the image from any seat in the room.

6.6.2.1.6.3 Projection Screen and Projector

Conference Rooms typically use video panels. However, if an application requires video projection, the following requirements apply:

- The projection screen shall be appropriately sized for the room,
- The bottom of the fully extended screen shall not be less than 36 inches above the finished floor.
- Use a standard throw or ultra-short throw projector. The Designer shall discuss this option with the AVPM.

6.6.2.1.6.4 Speakers

Ceiling-mounted speakers of the same style as the classroom speakers shall be used.

6.6.2.1.6.5 Wireless support for BYOD personal devices

The Designer shall inquire with the AVPM whether wireless support for BYOD personal devices is required in a conference room. This equipment shall be mounted in the equipment rack.

6.6.2.1.6.6 Microphones

Desktop microphones are preferred for Conference Rooms. Ceiling-mounted digital microphones might be used in some applications, and if so, they shall be hung centered above the conference table. Provide the appropriate quantity of microphones for the room size. Microphones shall be appropriately spaced in the room.

6.6.2.1.6.7 Audio Recording

UVU requires a rack-mounted digital hardware solution for recording audio in Conference Rooms.

It is required to use room microphones for recording audio.

6.6.2.1.6.8 Teleconferencing

There are two options for teleconferencing:

- A digital signal processor (DSP) with VOIP telephone capabilities (this is the preferred option)
- A VOIP conference telephone (approval of the AVPM is required for this option)

For all but small conference room applications, DSP-based teleconferencing would be required, and room speakers and room microphones shall be integrated into the teleconferencing system.

A flip-top table box with a touch screen is required for DSP-based teleconferencing.

6.6.2.1.6.9 Video Conferencing

Where conference rooms require video conferencing, software-based solutions shall be provided. A UVU computer will be mounted into the A/V equipment rack.

6.6.2.1.6.9.1 Cameras

The Designer shall include a USB camera in the design.

A shelf-mounted or wall-mounted camera is required at the presentation wall end of the table. If video panels are used, the camera shall be mounted immediately between the video panels at approximately 60 inches above finished floor. If a projection screen is used, the camera shall be mounted adjacent to the projection screen at an approximate height of 60 inches above the finished floor.

6.6.3 BOARDROOMS

Physically, Boardrooms are shaped similar to oversized Conference Rooms, and the features of Conference Rooms apply to Boardrooms.

6.6.3.1.1 ARCHITECTURAL REQUIREMENTS

6.6.3.1.1.1 Audio Visual Equipment Room

A small room adjacent to the Boardroom is required to house one or more equipment racks for the large volume of A/V equipment required to support a Boardroom. See Section 6.4.4 above for information about A/V Equipment Rooms.

6.6.3.1.1.2 Windows

If there are windows in the room, they shall have automatic, controlled blackout shades to control light. Blinds are also required for interior windows for privacy.

6.6.3.1.1.3 Credenza

A credenza is required (located along the presentation wall, biased to one side) to host the A/V Equipment Rack. The credenza is defined in Section 4.2.3 above.

6.6.3.1.1.4 Conference Table

A large custom conference table is required, as defined in Section 4.2.4 above.

Multiple flip-top cable boxes in the table top shall be provided to fit the room. Also, system control touch panels or button panels shall be installed in one or more of the flip-top cable boxes.

6.6.3.1.2 ELECTRICAL REQUIREMENTS

In addition to the power requirements for standard conference rooms, the following Boardroom-specific power requirements shall also be addressed.

6.6.3.1.2.1 Power Requirements

More power outlets are required in a Boardroom table than would typically be provided for a normal conference room table. In addition to power receptacles in the flip-top cable boxes, a duplex receptacle shall be provided for each pair of seats.

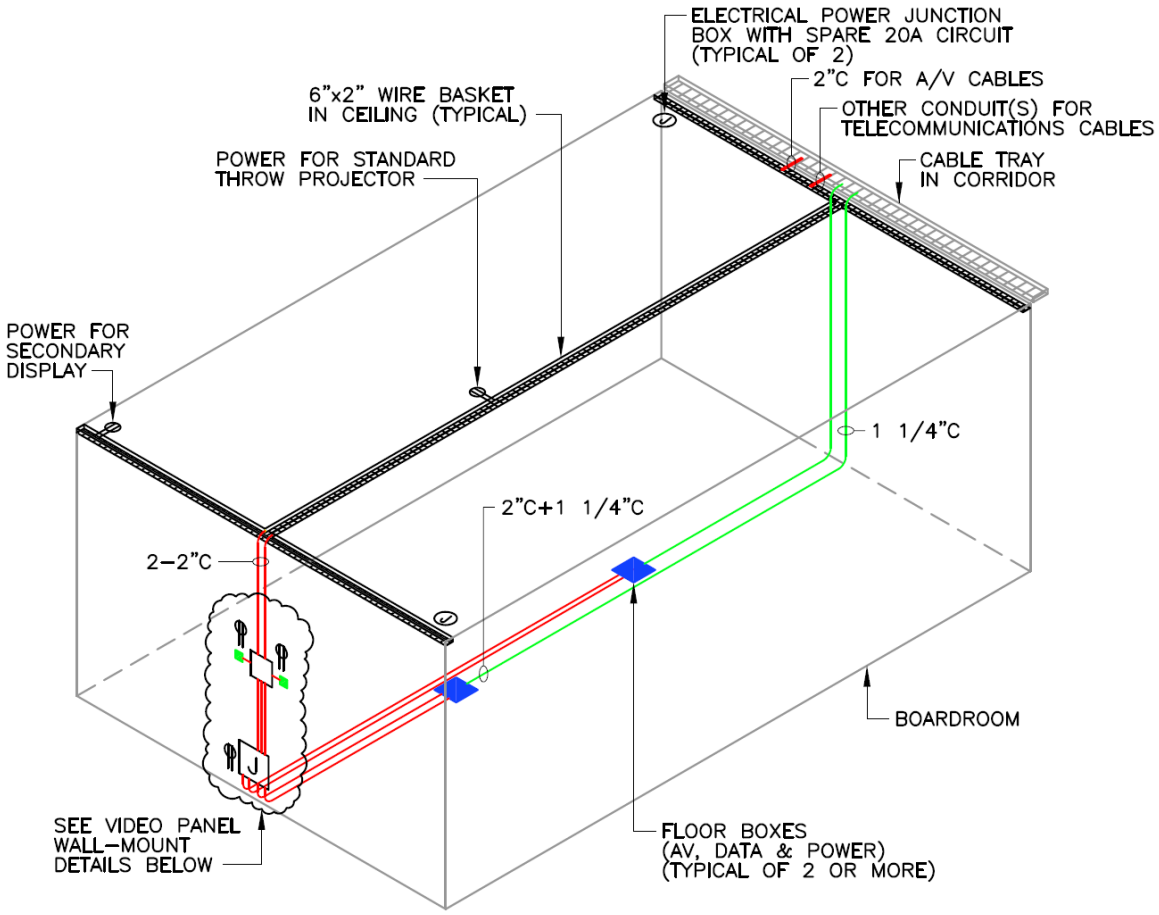
6.6.3.1.2.2 Lighting Requirements

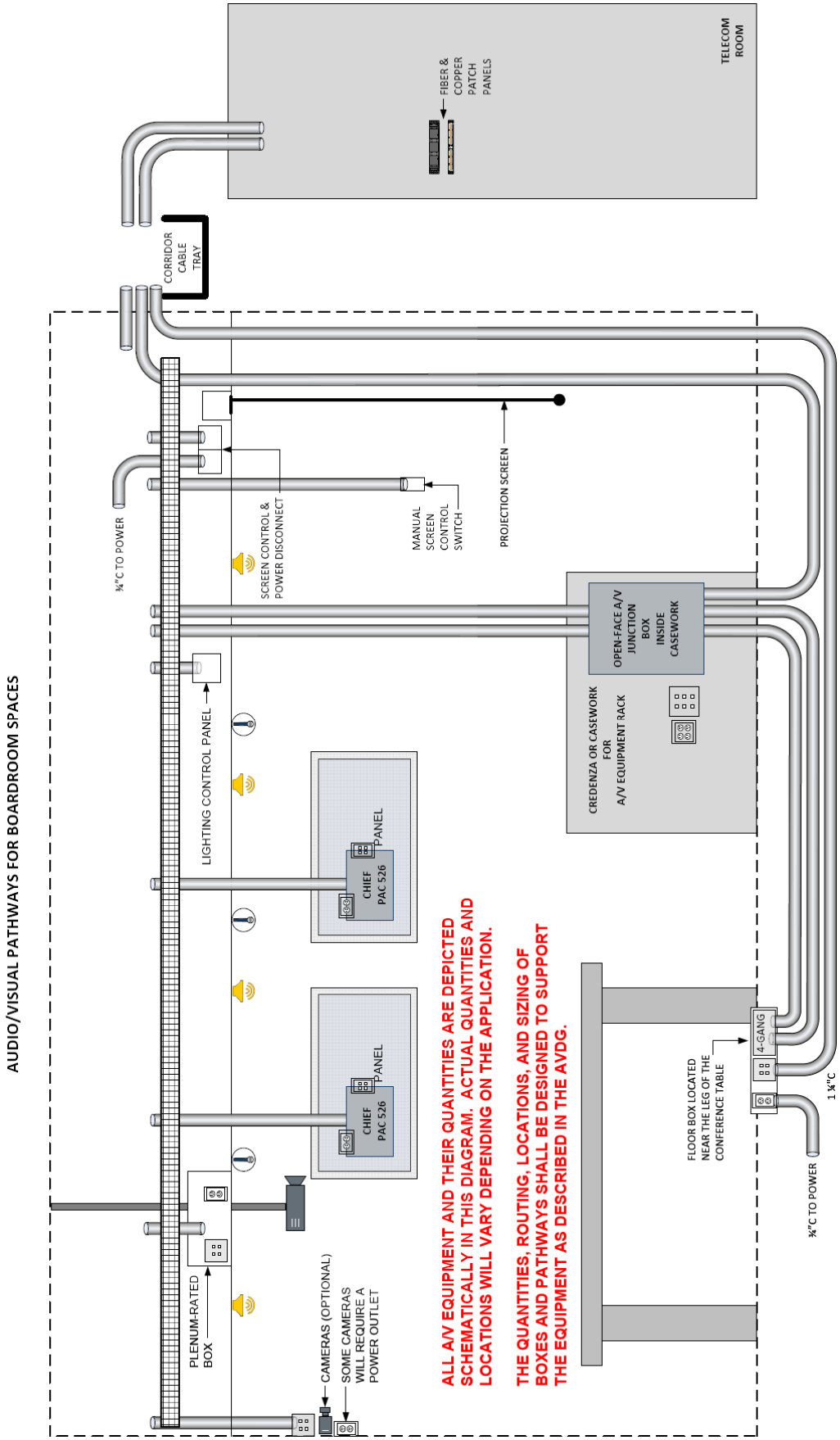
Boardrooms might require more flexible lighting, such as more zones and controllable, dimmable fixtures.

6.6.3.1.3 LOW-VOLTAGE PATHWAYS AND BOXES

The wall elevation and plan diagrams for conference rooms (above) also depict the arrangement of audio/visual features in Boardroom spaces. The diagrams below depict

conduits and boxes required for all Boardrooms. Conduits and boxes shall be designed to support video conferencing for future use, if not from original occupancy.




AUDIO/VISUAL PATHWAYS FOR BOARDROOM SPACES
TELECOM ROOM
FIBER & COPPER PATCH PANELS
CORRIDOR CABLE TRAY
¾"C TO POWER
SCREEN CONTROL & POWER DISCONNECT
MANUAL SCREEN CONTROL SWITCH
PROJECTION SCREEN
OPEN-FACE A/V JUNCTION BOX INSIDE CASEWORK
CREDENZA OR CASEWORK FOR A/V EQUIPMENT RACK
LIGHTING CONTROL PANEL
CHIEF PAC 526
PANEL
CHIEF PAC 526
PANEL
PLENUM-RATED BOX
CAMERAS (OPTIONAL)
SOME CAMERAS WILL REQUIRE A POWER OUTLET
ALL A/V EQUIPMENT AND THEIR QUANTITIES ARE DEPICTED SCHEMATICALLY IN THIS DIAGRAM. ACTUAL QUANTITIES AND LOCATIONS WILL VARY DEPENDING ON THE APPLICATION.
THE QUANTITIES, ROUTING, LOCATIONS, AND SIZING OF BOXES AND PATHWAYS SHALL BE DESIGNED TO SUPPORT THE EQUIPMENT AS DESCRIBED IN THE AVDG.
FLOOR BOX LOCATED NEAR THE LEG OF THE CONFERENCE TABLE
4-GANG
1¼"C
¾"C TO POWER

6.6.3.1.3.1 Presentation Wall Box and Conduit Details

The Designer shall work with the A/V designer and refer to the AVDG to provide the UVU-desired solution for each Boardroom application.

6.6.3.1.3.2 Wire Basket Cable Trays

Wire basket cable trays are required to accomplish the functions depicted in the diagram above. Cable tray practices shall comply with UVU telecommunications guidelines (see TDDG).

6.6.3.1.4 A/V EQUIPMENT AND FURNISHINGS

A/V equipment and furnishings shall be similar to standard conference rooms with the following differences:

6.6.3.1.4.1 Projection Screen and Projector

Boardrooms almost always require the use of a projector and projection screen.

- The projection screen shall be appropriately sized for the room,
- The bottom of the fully extended screen shall not be less than 36 inches above the finished floor.
- Use a standard throw or ultra-short throw projector. The Designer shall discuss this option with the AVPM.

6.6.3.1.4.2 Video Panels

Video panels are also frequently used in addition to video projection. One or more video panels shall be wall-mounted using a secure, articulating wall mount. Security devices shall be installed to protect against theft. Video panels shall be sized appropriate for the room.

Video panels shall be mounted with the bottom edge at approximately 50 inches above finished floor or higher as needed, in order to see the bottom of the image from any seat in the room.

6.6.3.1.4.3 Wireless support for BYOD personal devices

Wireless support for BYOD personal devices is required in a Boardroom.

6.6.3.1.4.4 Assistive Listening

Assistive Listening equipment is always required for Boardrooms.

6.6.3.1.4.5 Audio Recording

Audio Recording is always required for Boardrooms, requiring ceiling-hung microphones and a digital signal processor.

6.6.3.1.4.6 Teleconferencing

Teleconferencing is always required for Boardrooms.

6.6.3.1.4.7 Public Address System

An amplifier is required for public address audio.

6.6.3.1.4.8 Video Conferencing

Video conferencing is rarely used in Boardrooms. If it were needed, one or more higher-quality cameras, possibly with custom lensing, would be required.

6.7 Theaters

Theaters are more complex that most other audio visual applications and require experienced professional audio engineering, coordinated through the AVPM.

For projects that include theater spaces, the Designer shall work directly with the AVPM to design theater features.

6.7.1 ARCHITECTURAL FEATURES

Theaters require architectural attention to include a large number of key features:

- Orchestra pit with a trench system for microphone cables
- Cable management around the inside curve of the orchestra pit
- Cable management around the outside curve of the stage
- Cable management resting on the floor along the back wall of the stage, typically 8” wide x 4” high, black painted, wire basket cable tray
- Overhead catwalks (above the audience and stage) are typically required to access electrically-operated battens for supporting lighting, props, speakers and other theatrical devices.
- Fly systems (electric and passive) above the stage, and sometimes over the stage apron and audience
- Rear crossover space for performers to travel between the sides of the stage while hidden from audience view
- Green Rooms
- Ensemble Dressing Rooms
- Star Dressing Rooms
- Wardrobe and prop staging spaces
- Quick Change Rooms (located in both wings)
- Scene shop (wood shop, paint shop, etc.)
- Costume Sewing
- Set Storage
- Loading dock
- Lift Storage
- Stage Manager’s Office
- Visiting Director’s Office

- Trap Room under the stage, with a door to the orchestra pit
- Overhead rigging, designed for a specific weight rating
- Lighting Dimmer Room
- A/V Equipment Room to host amplifier amp racks, Dante network headend, some patching of wired microphones, and HDBaseT patch panels
- Paint all stage, ceiling and performance spaces visible to the audience flat black – gloss or satin paint is prohibited.

6.7.2 SOUND BOOTH

A Sound Booth is required to provide a front-of-house mixing position, along with an adjacent Lighting Booth.

A small A/V Equipment Rack is required in the booth to host an equipment patch panel.

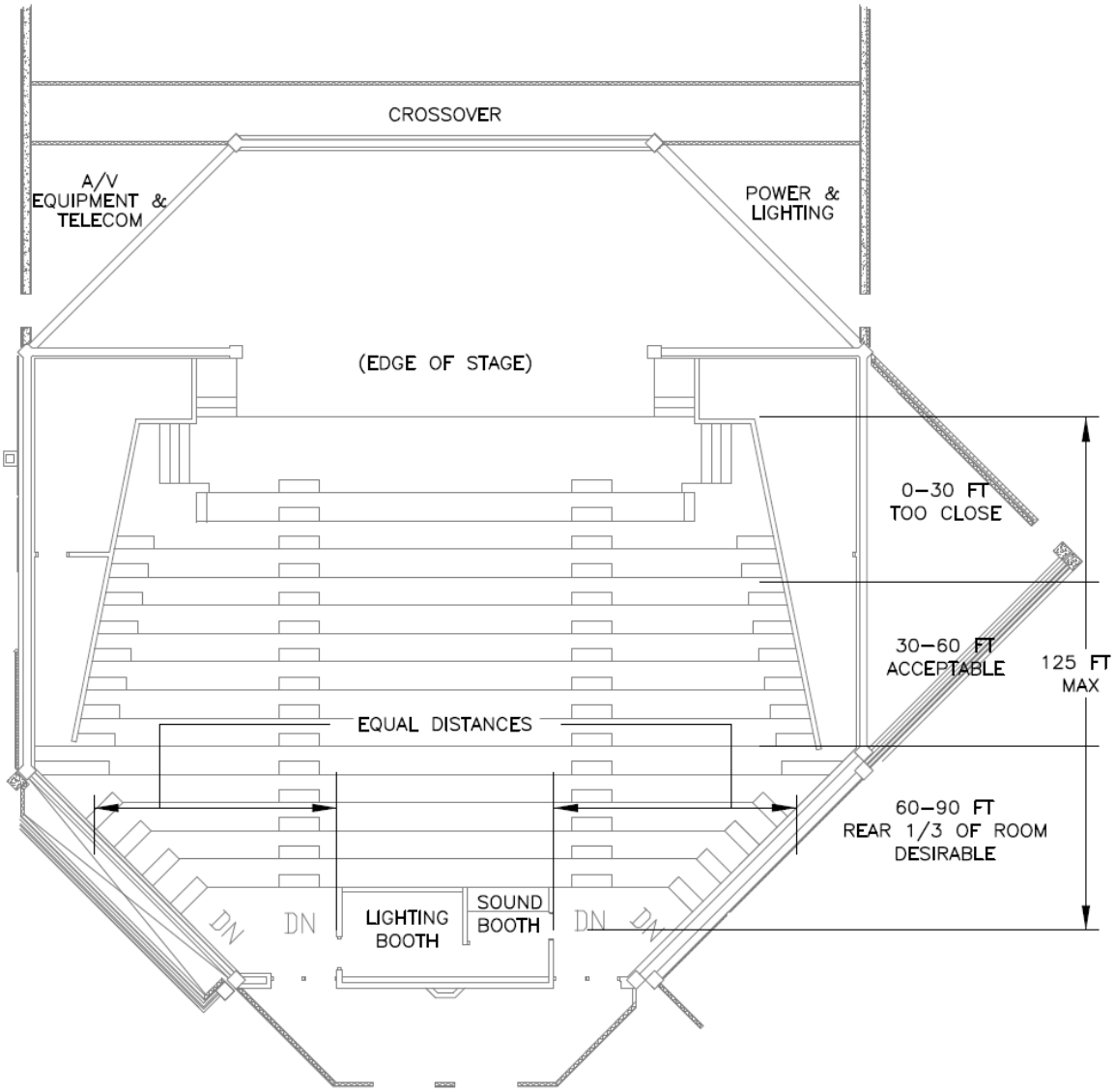
Sound booths shall be sized to host control board equipment and multiple people (audio engineer and a few students). While theaters are used for performances, they also serve pedagogical functions where students observe or perform theater operational functions.

A Sound Booth shall be provided that is open-air (not an enclosed space) and is located as follows:

- At eye level with the performers on the stage.
- Located no further than 125 feet from edge of the stage. Approximately half to two-thirds the length of the room. The pair of booths (Sound and Lighting) shall be centered (left/right) in the space.
- Not beneath a balcony overhang. If the theater has a balcony, with the sound booth near the overhang, provide a rear wall and ceiling over the top of the sound and lighting booths to provide protection from dropped (or otherwise) objects and to reduce the visible distractions to audience members above.

For larger theaters, it will probably be required to place the Sound Booth within the audience.

- If a sunken sound booth is desired, the height of the parapet wall of the Sound Booth must be higher than the head/hat height of people seated in front of the Sound Booth.
- A rear wall shall be provided.



Sound Booths shall be painted flat black. All hardware in the booth shall also be flat black.

Some acoustic wall treatment may be necessary or desirable in the Sound Booth.

Undesirable sources of noise shall be located away from the Sound Booth. For example the following shall not be located near, within, or below the Sound Booth:

- HVAC ducts
- Mechanical Rooms
- Any noise-producing equipment

It is required that the Sound Booth and its specialized equipment be secured while the theater is not in operation. Given that the Sound Booth operates in the open air, Booth security requires careful architectural attention.

6.7.3 LIGHTING BOOTH

A Lighting Booth is required to provide a front-of-house lighting control position, adjacent to the Sound Booth described above.

The Lighting Booth can be enclosed with a single pane sliding window, however this is not required. If a window is provided, there shall not be a visible discontinuity in the field of view (such as a window mullion, window frame or overlapping glass panels).

Sized to host control board equipment and multiple people (lighting director and a few students)

6.7.4 THEATER PATHWAYS

- Provide a minimum of one 4” conduit (PVC or EMT) terminated with open bell-end fittings:
  - between the Sound Booth and stage left
  - between the Sound Booth and stage right
  - between the Sound Booth and orchestra pit

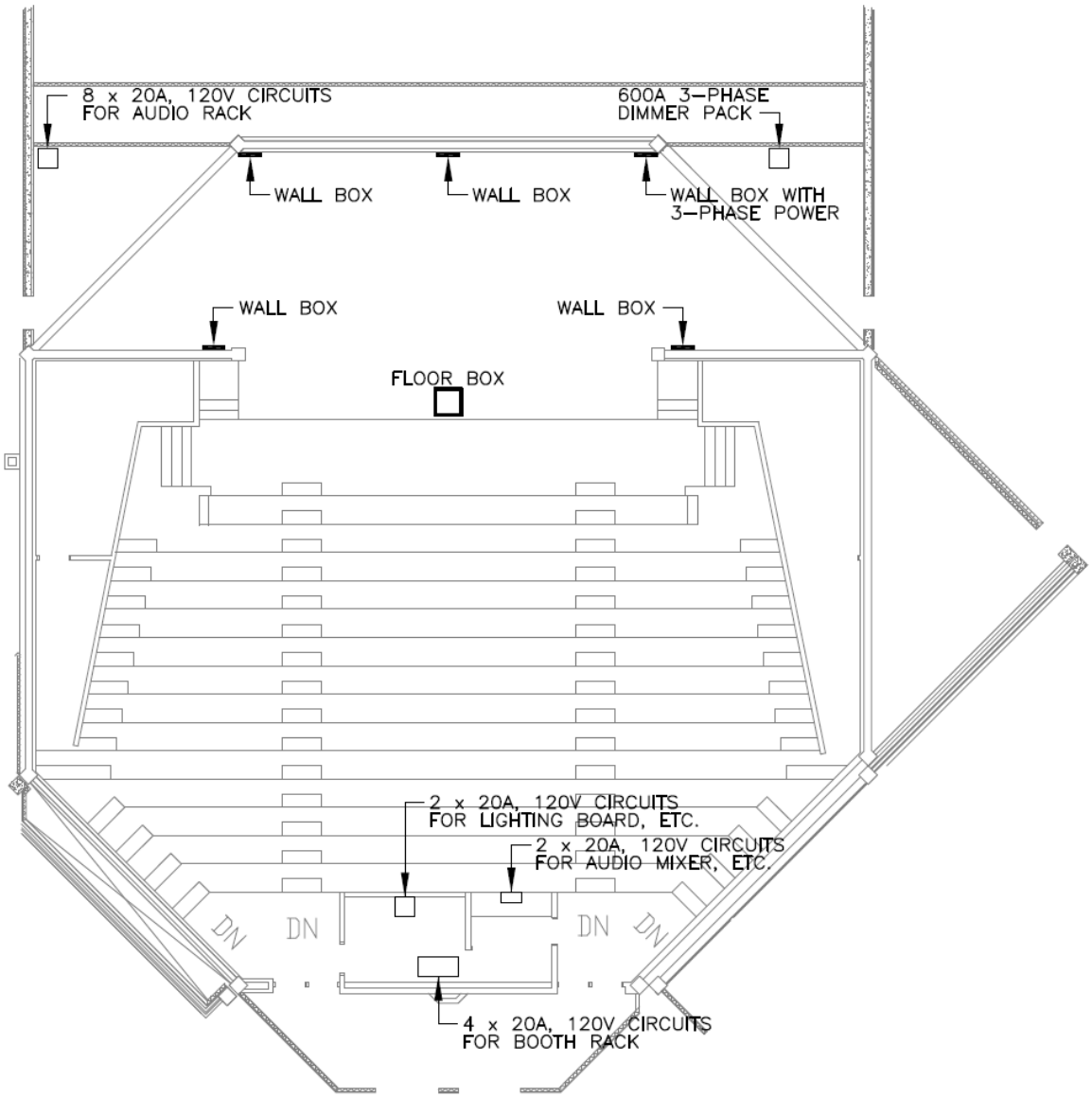
- Provide a minimum of four 2” conduits (PVC or EMT) terminated with open bell-end fittings:
  - between the Sound Booth and A/V Equipment Room

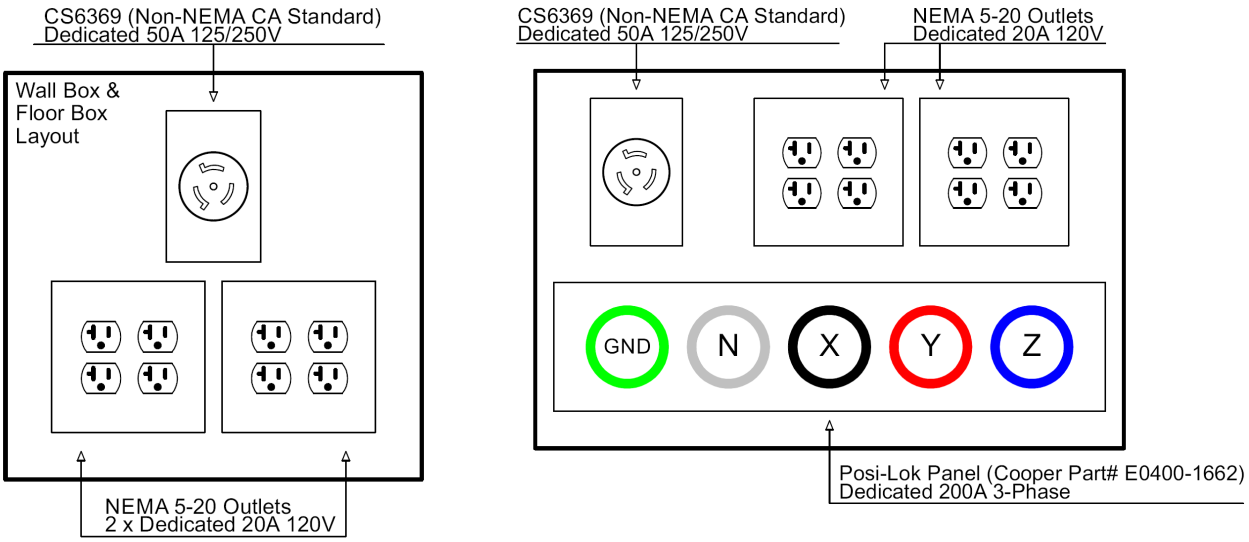
- Audio monitor conduits (sized as appropriate, typically 1”) route as follows:
  - between the A/V Equipment Room and Green Room
  - between the A/V Equipment Room and Lobby

- Wire basket cable tray, 6”x2”, painted black, following the route of the catwalk
  - 2” conduits between the cable tray and the A/V Equipment Room and the Sound Booth

6.7.5 AUDIO VISUAL POWER

The Designer shall work with the electrical engineer to provide wall boxes for audio visual power in the locations shown in the diagram below:


8 x 20A, 120V CIRCUITS
FOR AUDIO RACK
600A 3-PHASE
DIMMER PACK
WALL BOX
WALL BOX
WALL BOX WITH
3-PHASE POWER
WALL BOX
WALL BOX
FLOOR BOX
2 x 20A, 120V CIRCUITS
FOR LIGHTING BOARD, ETC.
2 x 20A, 120V CIRCUITS
FOR AUDIO MIXER, ETC.
DN
DN
DN
DN
4 x 20A, 120V CIRCUITS
FOR BOOTH RACK


CS6369 (Non-NEMA CA Standard)
Dedicated 50A 125/250V
Wall Box &
Floor Box
Layout
NEMA 5-20 Outlets
2 x Dedicated 20A 120V
CS6369 (Non-NEMA CA Standard)
Dedicated 50A 125/250V
NEMA 5-20 Outlets
Dedicated 20A 120V
GND
N
X
Y
Z
Posi-Lok Panel (Cooper Part# E0400-1662)
Dedicated 200A 3-Phase

Additional auxiliary power outlets shall be provided just outside the stage area for use with mobile production equipment. The outlets shall have cam lock style fittings suitable for 3-phase 400A service.

In addition to the audio visual power, the electrical engineer shall design convenience power outlets throughout the Theater as required for other purposes.

6.7.6 LIGHTING FIXTURES

The architect and electrical engineer shall design the theater lighting including:

- House lights
  - Shall be on separate dimmable ETC controllable zones
- Worklights
  - Can be whatever matches other building spaces
- Egress step lights, aisle lights, walkway lights – LED only
- Exit signs – lower brightness, tritium gas
- Stage Lighting
  - ETC Source Four 750W Ellipsoidal Spotlight
  - ETC ColorSource Par D-series
    - DMX connectivity
  - LED preferred
  - Follow-spots:
    - Moving / Robotic head spots

6.7.7 AUDIO SYSTEMS

Dante audio communications technology is desirable:

- Provide redundant switches (Primary and Backup) with 1GB switch ports for each Dante device.
- Provide 2 Cat6A cables for each Dante device (one cable for each switch).

Specify CL Series Yamaha Audio Boards

Yamaha Remote I/O (RIO) racks are required in the following locations:

- One rack in the top-center catwalk – 24U
- One rack in the orchestra pit – 24U
- Interface boxes on each of the four corners of the stage.

Provide a minimum of two Speakon NL4FX connectors at every location where there is a microphone input or a Dante Remote IO (RIO)

DMX or other 3-pin cable connections shall be provided around the stage at the RIO locations listed above.

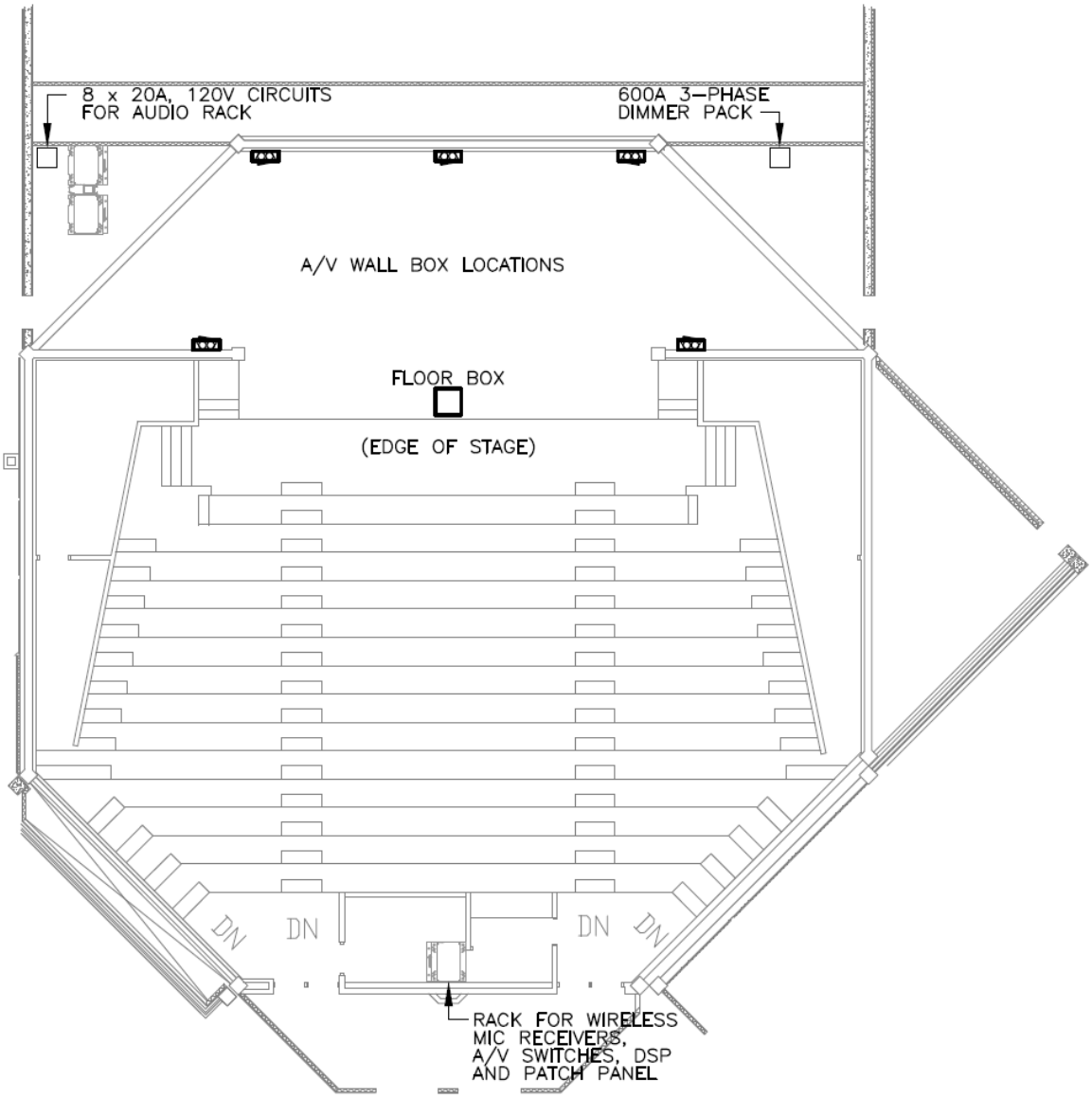
Orchestra pit – floor trench with grommets in floor for mic cables to each musician

Provide an interface panel and provide pre-configured setups for common theater uses so that non-technical people can deploy the audio visual features in the room without requiring technical support.

Provide wireless microphone receivers and antennas in the sound booth.

A separate A/V Equipment Room incorporating a small telecommunications room is required.

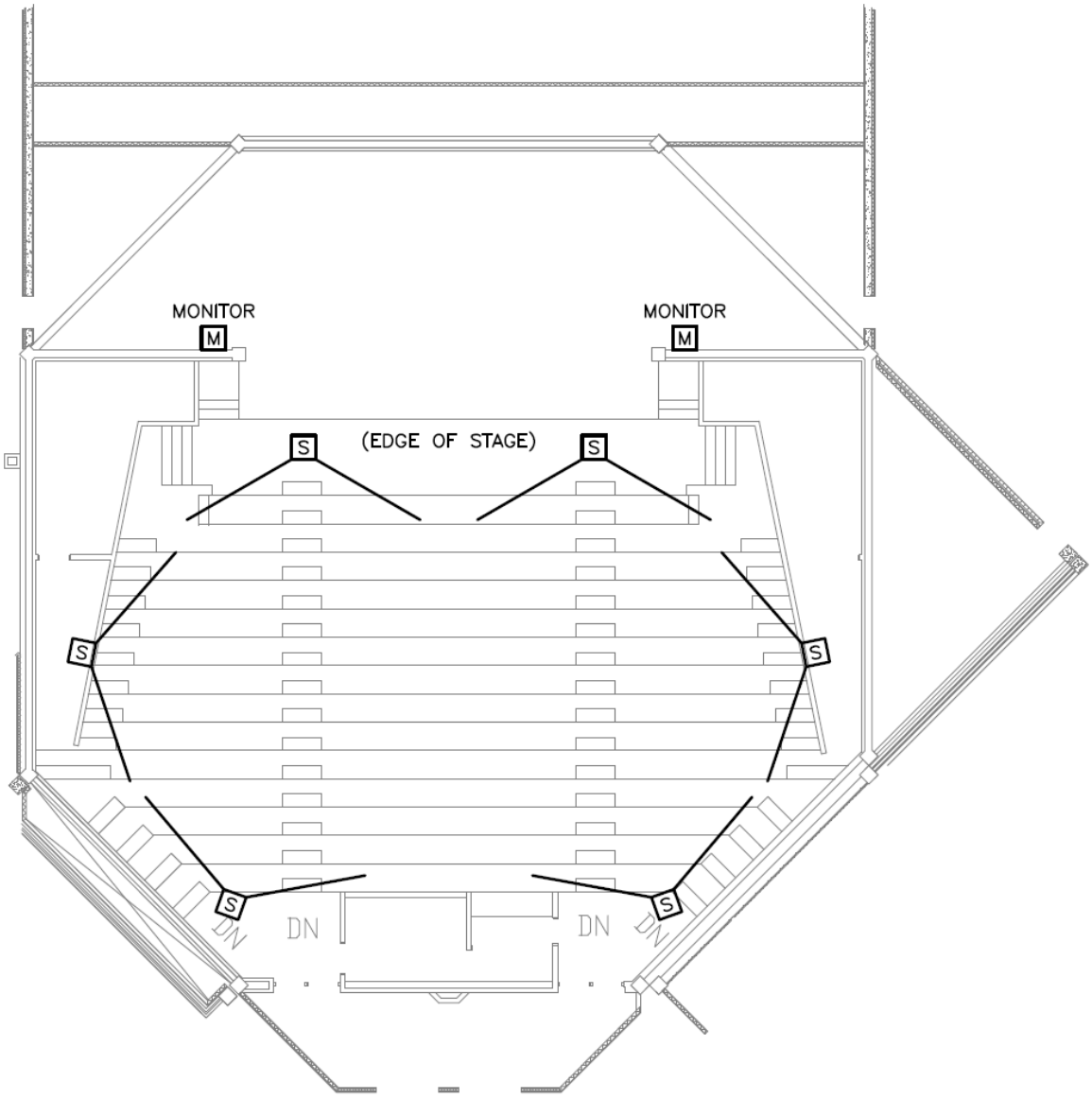
- Physically accessible, close proximity to the stage, with a side door.
- Should be near the Green Room if possible.
- Sized similar to a 3-rack IDF (2 racks for AV, 1 rack for telecom). See the TDDG for further information.
- Provide a 24-port patch panel in the sound booth that is cabled to the nearest telecommunications room (typically the AV Equipment Room).



6.7.8 SPEAKERS

House speakers shall be provided approximately in the locations shown in the diagram below.

- Horizontal speaker throw shall be 100-120 degrees
- Vertical speaker throw shall be 10-30 degrees



For balcony seating, provide fill speakers as required.

Speakers shall be passive (not powered) speakers.

Each speaker shall be power-rated at least 2W per audience seat, typically between 600W and 3000W RMS.

Speakers shall typically be ceiling-hung using aircraft cables. A unistrut mounting structure shall be attached to the overhead structure or to the underside of the catwalk. This solution provides for convenient, finely tunable placement and orientation of each speaker.

Provide a ¾" conduit to each speaker location, with a 4"x4" square device box and a feedthrough faceplate.

Speaker Wiring:

- Speaker wiring shall be 12AWG or larger, and shall be routed to the amplifier rack.

Monitor Speakers shall be provided in the following locations:

- Lighting Booth
- Green Room
- Dressing Rooms
- Ticket Office and Lobby (including each entrance). In the Ticket Office, independent volume control and three source switching shall be provided for the Lobby speakers:
    - Program Audio
    - Public Address Announcements
    - Music

6.7.9 INTERCOM

Each theater shall be equipped with a 4-channel intercom system.

- Wall-mount speaker stations with push-to-talk shall be provided in locations designated by the AVPM.
- Wired headset stations shall be provided in locations designated by the AVPM.
- Wireless headset intercom shall also be provided with coverage throughout the theater, house and associated spaces.

UVU uses intercom equipment from the following two manufacturers:

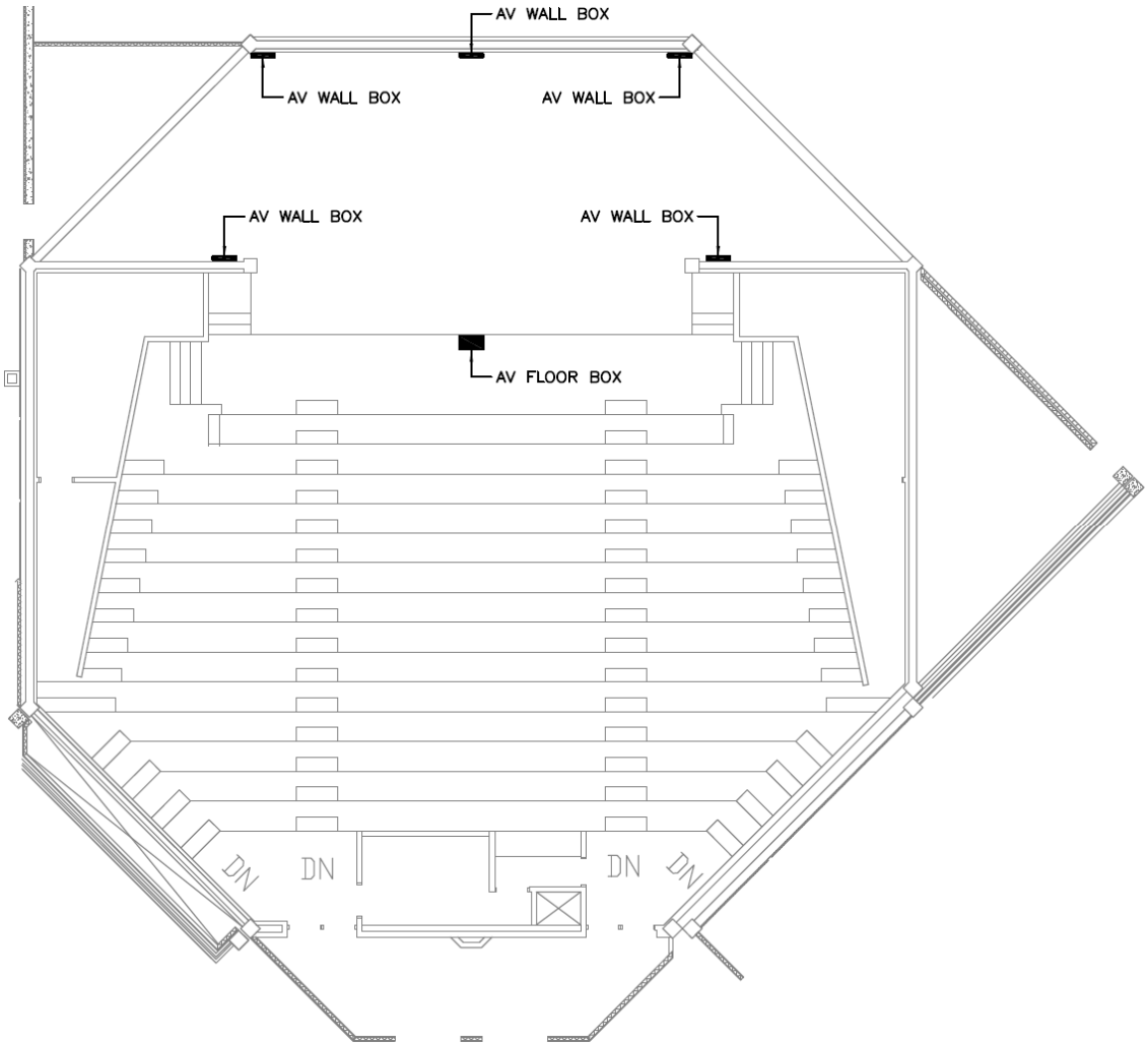
- Clear-Com
- Telex

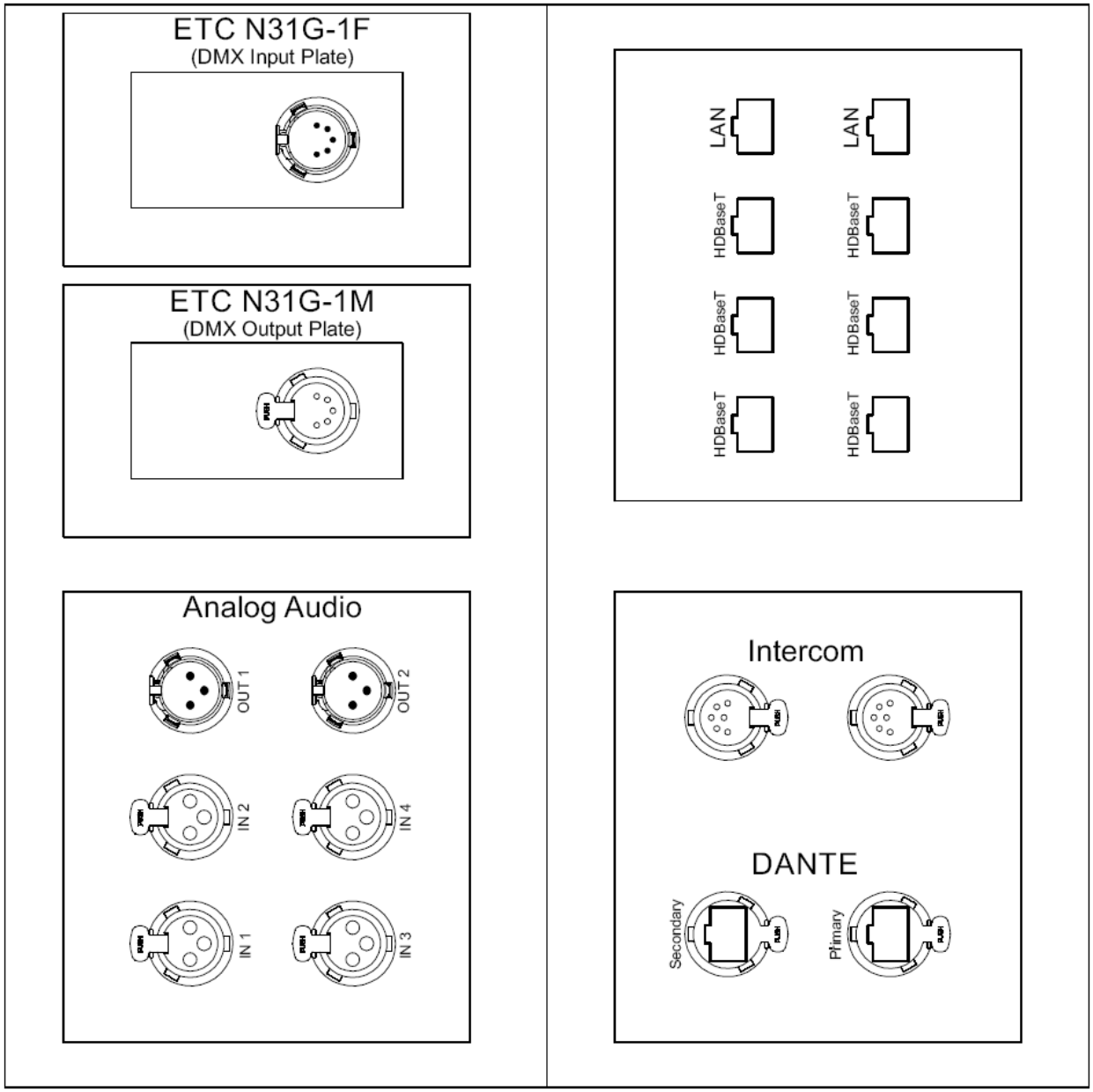
6.7.10 AUDIO VISUAL INTERFACE BOXES

Wall boxes shall be provided in the locations shown in the diagram below to provide audio visual inputs and outlets as shown in the wall box detail below the diagram:

Provide Neutrik etherCON Cat6A, XLR form-factor connectors for all Dante and DM connections.

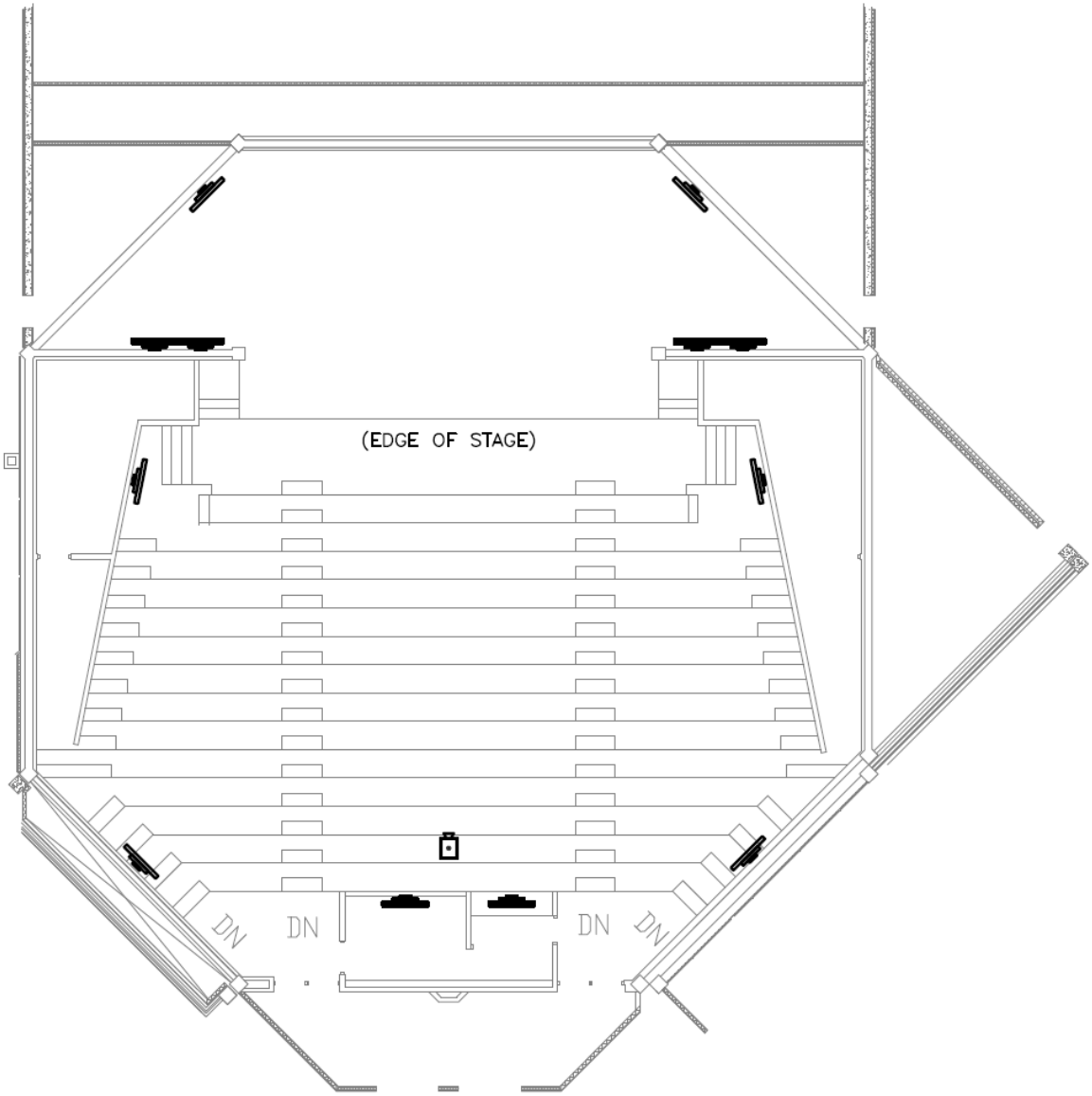
Provide Neutrik custom colored lettering plates.


AV WALL BOX
AV WALL BOX
AV WALL BOX
AV WALL BOX
AV WALL BOX
AV FLOOR BOX
DN
DN
DN
DN



6.7.11 VIDEO PANELS

Video panels shall be located in approximately twenty locations throughout the theater and its associated spaces. The diagram below depicts most of these locations, with references to the list:



In addition to the locations shown on the diagram above, the following additional locations require video panels:

1. Left side of the Lobby (by the left entrance)
2. Right side of the Lobby (by the right entrance)
3. Backstage Corridor Waiting Area
4. Back side of the proscenium
5. Green Room
6. Men's Dressing Room
7. Women's Dressing Room
8. Ticket Office

Each video panel shall be provided one shielded Category 6A cable and HDBaseT distribution, cabled directly to a patch panel in the Sound Booth.

In addition, another shielded Category 6A cable shall be provided between the Sound Booth and the nearest telecommunications room for auxiliary distribution elsewhere in the building.

6.7.12 VIDEO PROJECTORS

A video projector shall be provided, typically located in the rear of the theater, near the Lighting and Sound Booths, as depicted in the diagram above. However, for large theaters, the projector may need to be suspended from the overhead catwalk at a distance within the projection throw range of the projector.

The projector shall be selected based on performance characteristics that meet the requirements of the theater space. The following parameters shall be considered to be a starting point for projector selection.

- 12K Lumens minimum
- 1080p minimum
- 120 nits minimum

Two DM cables are required for each projector, terminated in an outlet adjacent to the projector.

6.7.13 STAGE LIGHTING CONTROLS

Stage lighting controls shall be comprised of products from Electronic Theatre Controls (ETC) www.etcconnect.com

- Dimmers
- Consoles – the Ion family of control consoles is typically suitable for most UVU theater spaces
- Consoles – the EOS family of control consoles might be needed for a larger theater

6.8 Athletic/Performance Stadiums

Large facilities are constructed for athletic and performance events. These venues are each unique and require custom-designed solutions.

The following features are typically needed:

- Audio/visual control rooms
- Large video panels
- Audio/visual equipment racks
- Digital signage
- LED banner signage
- Broadcasting infrastructure
- Large audio amplifier systems
- Large speaker systems
- Acoustic treatments
- Video panel cluster/scoreboard
- Concert lighting infrastructure
- Concert power infrastructure

6.9 Instructional Media Studios

Instructional Media Studios are used by teachers to prepare audio/visual media for instructional purposes or by students for multimedia assignments. Lectures or demonstrations can be recorded, both audio and video, and streaming media files can be produced in this space.

The Designer shall request case-by-case direction from the AVPM to guide the design process for each Instructional Media Studio.

The space is sized similar to an office, with a credenza/desk serving as an operator workstation and containing an A/V Equipment Rack.

A noise coefficient of NC 35 and a reverberation time of 0.6 seconds are the highest allowable per the recommendations of ANSI S12.60-2002. Provide neutral-colored, fabric-covered acoustic panels.

The video background wall behind a person being recorded shall be painted with a matte blue/gray color. A ceiling-mounted pull-down background screen shall be provided with the following two screen options:

- UVU Logo
- Green screen (for video editing)

The lighting shall be dimmable, warm-colored light (not solely fluorescent).

The following audio/visual features are required:

Audio/visual equipment rack (housed inside a credenza)
Computer with two video panels
Cameras
Document camera
Blu-ray/DVD player
Speakers
Microphones (desktop, wireless or ceiling-hung)
Acoustic wall treatment
Specialty lighting

In addition to the Code-required convenience power outlets, additional power outlets shall be provided to serve A/V functions, including special lighting – provide two outlets per wall above the T-bar ceiling.

6.10 Video Panel Applications

6.10.1 DIGITAL SIGNAGE

Video panels shall be sized for the application. Each panel shall be 46 to 55 inches (diagonally measured), or larger for special applications.

Video panels used for digital signage shall be wall-mounted using a secure wall or ceiling mount. Security devices shall be installed to protect against theft.

Each digital signage application requires a double-gang electrical power outlet, concealed behind the video panel. This power outlet will support at least 2 devices that require 120VAC power.

Each application shall have the following low voltage jacks terminated in an outlet concealed behind the video panel:

- Two Category 6A cables are required for each Digital Signage video panel, terminated in the nearest telecommunications room.
- See the TDDG for more information.

The design shall require the A/V Contractor to provide a media player, software and license for each application and connect the media player to the existing campus system (SCALA). The Designer shall work with the AVPM to select the appropriate solution on a case-by-case basis, probably deploying one or more of the following options:

- Provide an Open Pluggable Specification (OPS) media player. UVU's preferred video panel from NEC has integrated OPS card slots.

- A second option is to use thin-client computers. Products from Lenovo and Intel are currently being used.

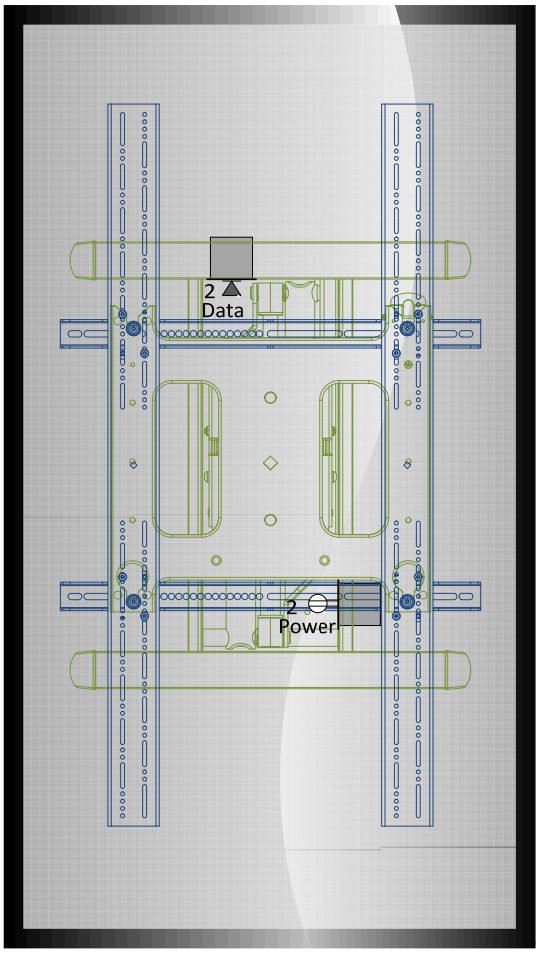
The Designer shall inquire with the UVU AVPM on a case-by-case basis about the requirements for a project.

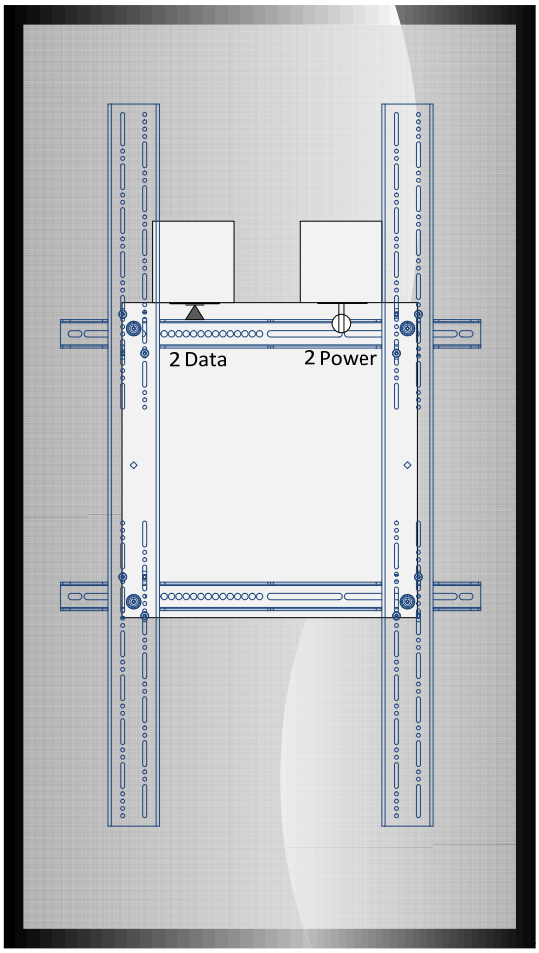
6.10.2 DIGITAL SIGNAGE SOFTWARE LICENSING

Each digital signage application will require digital signage software (DSS) to operate. The Designer shall include in the design documents a requirement that the contractor provide fully licensed software as a part of their deliverables.

6.10.2.1 DIGITAL SIGNAGE – PORTRAIT ORIENTATION

Portrait-oriented digital signage panels shall be mounted 40" above finished floor to the bottom of the display. This will vary depending upon the size of the display. The Designer shall coordinate with the AVPM to determine the exact locations and sizes.





RECESSED APPLICATIONS

THE ENTIRE ASSEMBLY SHALL BE RECESSED MOUNTED, SUCH THAT THE VIEWING SURFACE OF THE FLAT PANEL DISPLAY IS FLUSH WITH THE SURFACE OF THE WALL.

BEHIND THE FLAT PANEL DISPLAY SHALL BE A CHIEF PIWRFUB MOUNT WITH A CHIEF PSBU INTERFACE BRACKET.

CONDUITS REQUIRED, BUT NOT SHOWN:

- **DATA OUTLET SHALL HAVE 1¼" CONDUIT ROUTED TO NEAREST CABLE TRAY.**
- **POWER OUTLET SHALL HAVE CONDUIT ROUTED TO THE DESIGNATED ELECTRICAL PANEL.**

SURFACE-MOUNTED APPLICATIONS

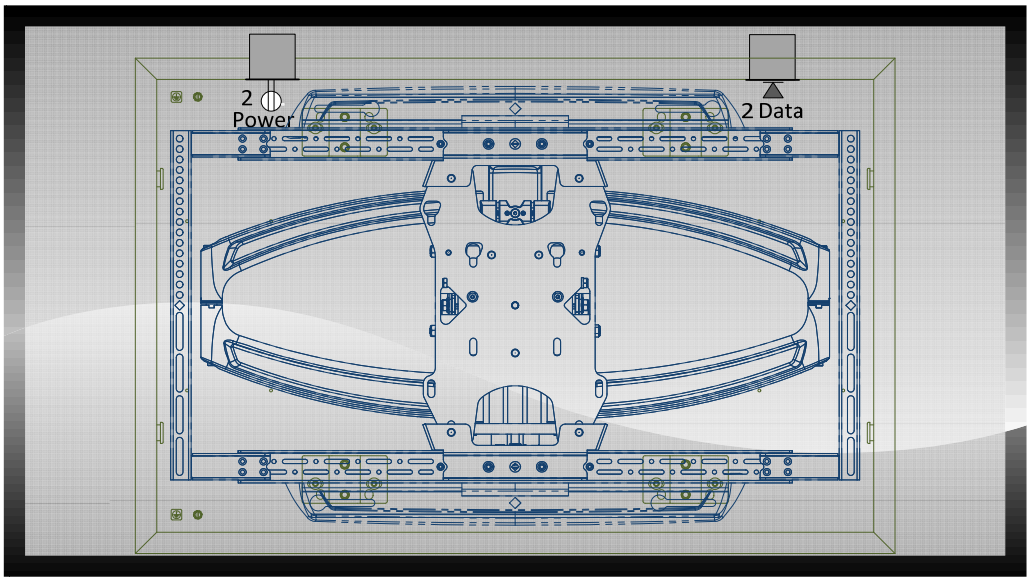
BEHIND THE FLAT PANEL DISPLAY SHALL BE A CHIEF PAC 516 IN-WALL BOX WITH A CHIEF PIWRFUB MOUNT OVER THE TOP.

CONDUITS REQUIRED, BUT NOT SHOWN:

- **DATA OUTLET SHALL HAVE 1¼" CONDUIT ROUTED TO NEAREST CABLE TRAY.**
- **POWER OUTLET SHALL HAVE CONDUIT ROUTED TO THE DESIGNATED ELECTRICAL PANEL.**

6.10.2.2 DIGITAL SIGNAGE – LANDSCAPE ORIENTATION

Landscape-oriented digital signage panels shall be mounted 50" above finished floor to the bottom of the panel. This will vary depending upon the size of the display. The Designer shall coordinate with the AVPM to determine the exact locations and sizes.



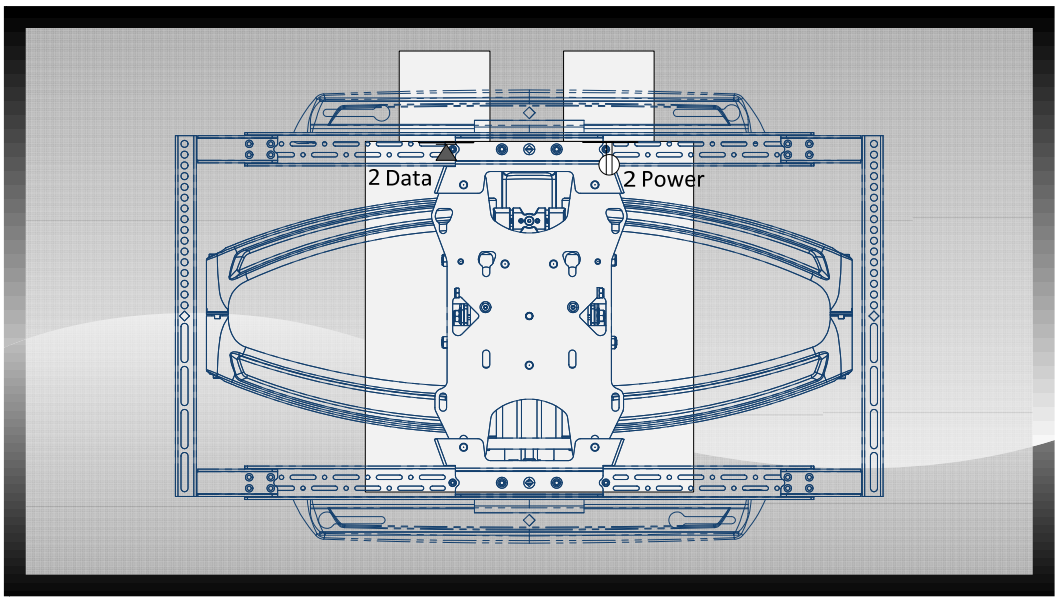
RECESSED APPLICATIONS

THE ENTIRE ASSEMBLY SHALL BE RECESSED MOUNTED, SUCH THAT THE VIEWING SURFACE OF THE FLAT PANEL DISPLAY IS FLUSH WITH THE SURFACE OF THE WALL.

BEHIND THE FLAT PANEL DISPLAY SHALL BE A CHIEF TA500 BACKBOX WITH A CHIEF TS525TU SWING ARM MOUNT.

CONDUITS REQUIRED, BUT NOT SHOWN:

- **DATA OUTLET SHALL HAVE 1¼" CONDUIT ROUTED TO NEAREST CABLE TRAY .**
- **POWER OUTLET SHALL HAVE CONDUIT ROUTED TO THE DESIGNATED ELECTRICAL PANEL.**



SURFACE-MOUNTED APPLICATIONS

BEHIND THE FLAT PANEL DISPLAY SHALL BE A CHIEF PAC 526 IN-WALL BOX WITH A CHIEF PIWRFUB MOUNT OVER THE TOP.

CONDUITS REQUIRED, BUT NOT SHOWN:

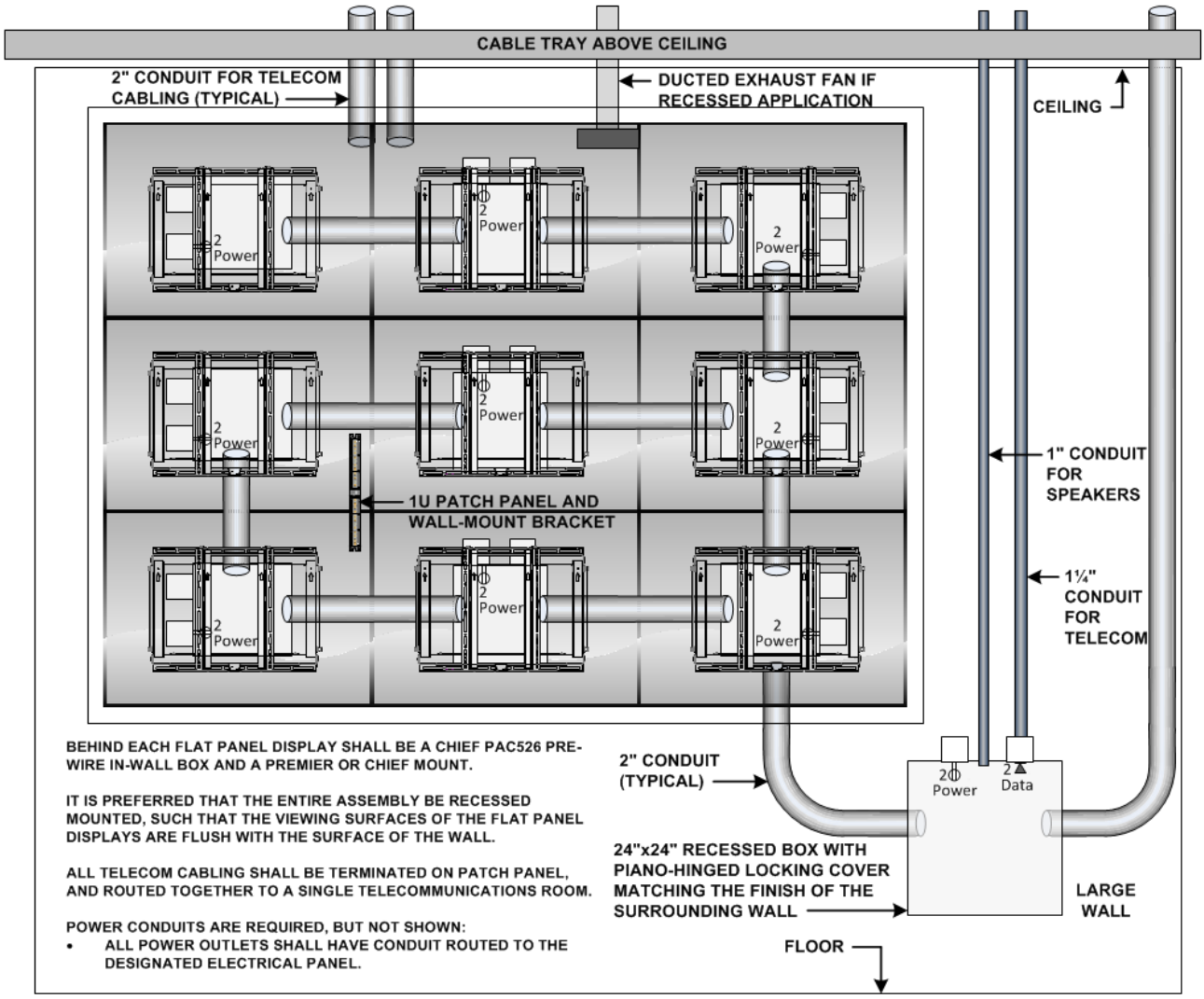
- **DATA OUTLET SHALL HAVE 1¼" CONDUIT ROUTED TO NEAREST CABLE TRAY .**
- **POWER OUTLET SHALL HAVE CONDUIT ROUTED TO THE DESIGNATED ELECTRICAL PANEL.**

6.10.3 VIDEO WALLS

A. Video walls require careful attention to the details that are unique to each application space. Therefore, the Designer shall collaborate with the AVPM to define the design parameters for each project.

B. The Designer shall work with the Architect to design the appropriate wall structure, wall thickness, and finish materials. It is very desirable that space be available on the back side of this wall for an equipment rack. Otherwise, a rack must be located within 100 feet of the video wall.

C. The following diagram depicts a solution that serves as a starting point for the design of a video wall:



6.11 Entertainment Spaces

Spaces for relaxation, social interaction and entertainment can be created with a variety of applications:

- Sports zones, with multiple video displays
- Video game centers, comprised of seating furniture surrounding video displays with gaming equipment
- Informational digital signage

These applications will require some or all of the following:

- Video panels
- Furniture
- Power and data outlets
- Audio speakers
- Video game equipment

A pathway and junction box system shall be designed for these spaces using a hierarchical star topology. Each subspace or pod within the Entertainment Space shall have pathway to an aggregation junction box, and from there, pathway (including cable tray in the corridor) shall be provided to the nearest telecommunications room

The Designer shall work with the AVPM to address the unique requirements for each Entertainment Space.

6.12 Outdoor Plaza / Gathering Spaces

Outdoor public gathering spaces at UVU are used for group events such as presentations, concerts and fairs. These events sometimes require public address systems to communicate with larger groups and specialty lighting.

Power outlets are required for A/V equipment and computer equipment, and power for lighting shall be circuited separately. Provide power distribution spider boxes.

- Various high amp (50Amp or greater) distribution multi-phase power for distribution power via spider boxes terminated with a CS6369 non-NEMA CA standard connector.
- One 150 Amp or greater outlet with cam-lock (3-phase, neutral, ground) for lighting and high powered audio systems

A weatherproof connection panel shall be mounted near the power outlets. The panel shall typically host 2 Category 6A cables and 6 strands of singlemode fiber optic cabling.

The Designer shall inquire with the AVPM on a case-by-case basis which of the above features or other unique features will be required for a given application.

7 Construction Document Content

This section of the AVDG describes the content requirements that the Designer shall include when creating the Construction Documents. This content is in addition to the content found in some generally accepted document sets.

The services provided by the Designer and the resulting documents shall comply with the State of Utah's contract requirements. In addition to these requirements, the Designer shall also meet the requirements in this document, including the Construction Document content requirements in this section.

Construction Documents shall communicate a fully detailed and coordinated design (rather than making adjustments in the field during construction), and are expected to result in reduced construction costs and fewer change orders. The level of detail required to meet this objective may be substantially greater than some audio/visual designers may be accustomed to providing.

The Designer shall include the following content in the Construction Documents:

7.1 Plans and Drawings

7.1.1 GENERAL

The audio/visual portion of the Construction Drawing set shall include the following:

- Cover Sheet
- Sheet List
- Site Map
- Symbol Schedule
- List of Abbreviations
- Plan Sheets
- Elevation Diagrams
- Schematic Diagrams
- Construction Details
- Demolition

All plan sheets shall be scaled, shall indicate the scale, and shall show a north arrow. All plan sheets shall show a key plan when the building or site is too big to fit on a single sheet.

Equipment and cable identifiers shall be shown on the drawings and diagrams.

7.1.2 OUTSIDE PLANT SITE PLAN DRAWINGS

Typically, there will not be a large amount of audio/visual content on site plan drawings. However, video distribution cabling (fiber optic) between buildings will sometimes be

designed on a project. In these cases, the telecommunications engineer will design the outside plant ductbanks and cabling, and the Audio/Visual Designer shall work with the telecommunications engineer to make sure that any audio/visual cabling needs are addressed.

Other outside plant audio/visual applications may include:

- Outdoor speakers in Plaza/Gathering areas
- Access to indoor equipment for outdoor events

For projects where there is no telecommunications engineer but where outside plant cabling is required, the following requirements apply:

A. Provide drawings showing a scaled telecommunications distribution site plan. These drawings shall show the following:

- Maintenance hole or handhole locations (labeled with their identifiers)
- Complete ductbank routing, details, and elevations
- Conduit sizes, quantities, and arrangements
- Section cuts
- Existing and new surface conditions
- Outside plant fiber optic telecommunications cabling, including fiber types and strand counts
- Locations of buildings, roads, poles, existing underground utilities, and other obstructions

B. These sheets shall also identify coordination arrangements where conflicts with site work for other disciplines could possibly arise, in particular indicating the separation distances between low voltage and power or steam. The sequencing of site work shall also be shown, if applicable.

7.1.3 INSIDE PLANT PLAN DRAWINGS

A. Scaled plan drawings shall be provided for each building showing the audio/visual applications and cabling inside the building. These drawings shall show the following:

- Routing of new pathway to be constructed during the project.
  - The content of the drawings shall be coordinated with other disciplines and shall be representative of the complete pathway route that the Contractor shall use, rather than a schematic depiction.
  - The Designer shall expend considerable coordination effort during the design process. Non-coordinated pathway/raceway is not acceptable to UVU.
- Approximate locations of junction boxes and conduit bends.
- Backbone distribution cabling.

B. Where new cabling will be pulled into existing conduits, the Construction Documents shall show the routes of each *existing* conduit. Where it is not

possible to determine the routing of existing conduits, the Designer shall inform the UVU AVPM and seek direction on whether to use the existing conduits or design new conduits for use on the project. Typically, the Designer is required to identify such conditions during field investigation activities.

7.1.4 DEMOLITION

A. Any existing equipment and cabling intended to be no longer in use following the new installation shall be removed (salvaged and returned to the Owner undamaged and in working condition) as a part of the project. UVU uses salvaged equipment as spare parts to support the existing equipment in other buildings. The Designer shall inquire with the AVPM for approval of the disposition of salvageable equipment and cabling.

B. Existing cabling to be demolished shall be shown on the plans and schematic diagrams. Separate demolition plan sheets and schematic diagrams shall be provided for projects with extensive cable demolition.

7.1.5 A/V EQUIPMENT ROOM PLAN DETAILS

A. Construction documents for UVU projects shall show scaled plan drawing details for the A/V Equipment Room spaces. The details shall show the footprint and location of each of the major components in the room including at least the following:

- Cable Tray Entrances
- Backbone Cable Routing
- Grounding Busbar
- Equipment Cabinets
- Desks or workstations
- Space for other low voltage systems
- Ladder Racking

7.1.6 ELEVATION DIAGRAMS

A. The Designer shall provide scaled wall elevation details for each Conference Room, Classroom, and A/V Equipment Room affected by the project.

B. For remodel projects, the Designer shall produce digital photographs of each wall depicting the existing conditions where future audio/visual equipment will be located. These photos shall be provided with the wall elevation details in the Construction Documents.

C. The wall elevation details shall show the components that are mounted on the walls in the room including at least the following:

- Ladder Racking
- Cable Slack Loops
- Grounding Busbar
- Existing Devices
- Work Area
- Backbone Cable Routing
- Cable Management
- Termination Blocks
- Power Receptacles
- Wall-Mounted Electronic Equipment
- Entrance Conduits
- Equipment Cabinets
- Other low voltage systems
- Space for Future Equipment

D. Elevation details shall be provided for each of the A/V equipment cabinets in each Conference Room, Classroom, and A/V Equipment Room. Rack elevation details shall show the cabinets and any components that are mounted on or near the racks including at least the following:

- Patch Panels
- UPS Equipment
- Existing Devices
- Shelves / Drawers
- A/V Equipment
- Power strips
- Space for Future Equipment
- Cable Management

E. The details shall depict the audio/visual materials that are listed in the specification.

F. Where a project involves additions to existing equipment racks/cabinets, the elevation details shall identify the existing equipment and indicate the equipment to be removed, in addition to indicating which items are "new, to be provided under the Contract." Provide the following elevation details:

- Existing Rack/Cabinet Elevation
- Revised Rack/Cabinet Elevation

7.1.7 SCHEMATIC DIAGRAMS

A. The Designer shall provide schematic diagrams for the design of each A/V application. The diagrams shall show the equipment identifiers for each device. Where diagrams span multiple pages, reference tags shall be shown for each cable that connects to another page.

B. An example A/V schematic diagram is shown in Appendix 8.1.

7.2 Project Manual

A. The State of Utah DFCM publishes requirements for the Project Manual.

B. The Project Manual shall contain a summary of the audio/visual work on the project, a description of the demolition requirements (if applicable), and a discussion of the utility coordination requirements.

C. In addition to these requirements, the Project Manual shall contain the A/V Systems Cutover Plan.

7.2.1 SPECIFICATIONS

7.2.1.1 UVU AUDIO/VISUAL CONSTRUCTION GUIDE SPECIFICATION

A. The UVU Audio/Visual Construction Guide Specification (AVCGS) is a *guide* specification as opposed to a *master* specification. It does not include an exhaustive listing of all possible products or installation methods that could be employed in an audio/visual project.

B. The AVCGS is an example of a specification that shall be used for an A/V upgrade project or for a new facility project. It has verbiage that identifies issues that the Designer shall consider throughout the adaptation process. The Designer shall adapt the sections in the AVCGS to the particular requirements of the given project.

C. The Designer shall directly edit the AVCGS for use on each project. The Designer shall notify the UVU AVPM where changes or additions to the specifications are desired. Edits to the documents shall be performed with the "Revision Tracking" features activated. At the various project milestones when the documents are submitted to UVU for review, the specifications shall be printed showing the revision markings.

D. The Designer shall be responsible for adding any necessary content to the specification that is applicable to the project and not already contained in the AVCGS.

E. Please refer to the more detailed instructions contained in the AVCGS, both in the Preface of that document as well as in the "hidden text" comments contained in the electronic files.

7.2.1.2 COMMON SPECIFICATION SECTIONS

There are several specification sections that are commonly used for audio/visual systems or contain content that supports audio/visual functionality.

The following section is a UVU standard and addresses Teacher Stations. The Architect and Audio/Visual Designer will have involvement in the preparation of this section:

- 06 41 23 – Interior Custom Casework

Sections typically provided by the architect, but requiring Audio/Visual Designer input:

- 09 23 13 – Acoustical Gypsum Plastering
- 09 81 00 – Acoustic Insulation
- 09 83 00 – Acoustic Finishes
- 09 84 00 – Acoustic Room Components

Sections typically provided by the Telecommunications Engineer, possibly requiring Audio/Visual Designer input:

- 27 05 00 – Common Work Results for Communications
- 27 05 26 – Grounding and Bonding for Communications Systems
- 27 05 28.29 – Hangers and Supports for Communications Systems
- 27 05 28.33 – Conduits and Backboxes for Communications Systems
- 27 05 28.36 – Cable Trays for Communications Systems
- 27 11 00 – Communications Equipment Room Fittings
- 27 13 00 – Communications Backbone Cabling
- 27 15 00 – Communications Horizontal Cabling

- 27 16 00 – Communications Connecting Cords, Devices, and Adapters
- 33 81 26 – Communications Underground Ducts, Manholes, and Handholes
- 33 82 00 – Communications Distribution
- 33 82 43 – Grounding and Bonding for Communications Distribution

Sections typically provided by the Audio/Visual Designer:

- 27 41 00 – Audio/Video Systems

7.2.2 CUTOVER PLAN

The Designer shall provide a detailed cutover plan that is coordinated with other disciplines on the project as well as with UVU data and telephone equipment cutover requirements. Verbiage describing the sequence of work tasks to accomplish the cutover shall be provided in this section. Limitations on the permissible downtime allowed and temporary service arrangements shall be discussed in the cutover plans.

Not all projects will require a cutover plan.

7.2.3 FIBER LINK-LOSS BUDGET ANALYSIS

For projects that include fiber optic cabling as part of the audio/visual system:

A. The Designer shall provide (in the Construction Documents) a link-loss budget analysis for each fiber optic cable.

B. The link-loss budget analysis shall be formatted as shown in the Appendix of UVU's Telecommunications Distribution Design Guide. Upon request, UVU will provide an electronic spreadsheet file to be used as a template.

7.3 Record Drawings and Documentation

The State of Utah DFCM publishes requirements for Record Drawings and submittals. The following requirements related to Record Drawings and submittals are **in addition** to those published by the State:

7.3.1 RECORD DRAWING CONTENT

- The Record Drawings shall show the identifiers for the audio/visual equipment and cabling as constructed.

7.3.2 RECORD DRAWING DELIVERABLES

The following shall be delivered to the UVU FSPM, the second copy of which shall be given to the AVPM:

- Two copies of a CDROM containing editable 2D AutoCAD drawings (with all xrefs bound to the drawing) of the audio/visual plans, elevations, and details, in addition to the Revit or BIM model files.

- Two copies of the A/V subcontractor's redline drawings and updated CAD drawings (reflecting construction adjustments), in both printed and electronic form (on CDROM).
- Two copies of a CDROM containing the digital photographs taken by the Designer during the project shall be delivered to UVU Facilities Planning and Construction.

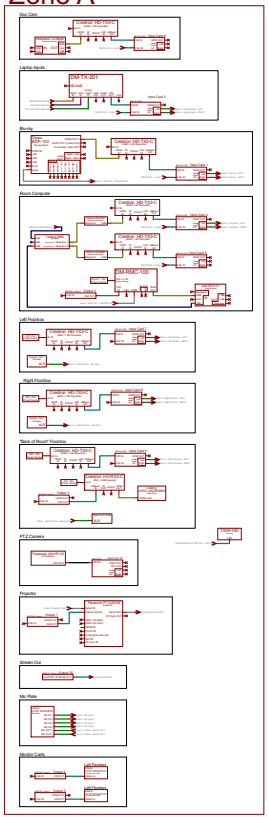
8 Appendices

8.1 Cabling Schematic

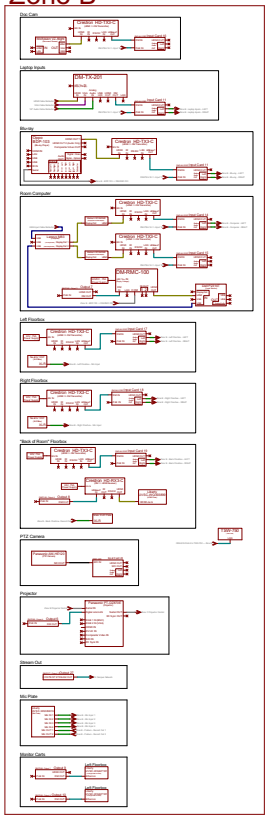
The schematic diagram on the following page depicts UVU's standard practices for cabling in typical audio/visual applications. The Designer shall apply these practices for each application, and adjust the cabling as required to achieve the objectives of the application space.

CB101 Auditorium

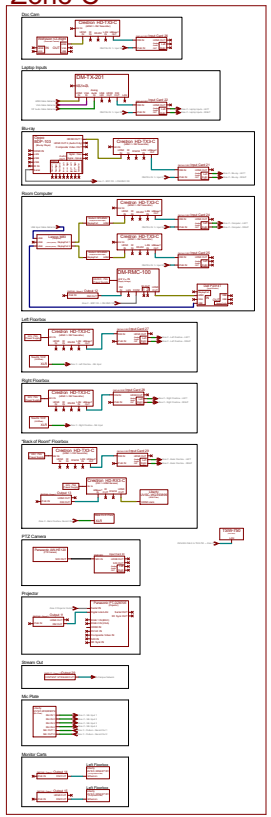
Zone A



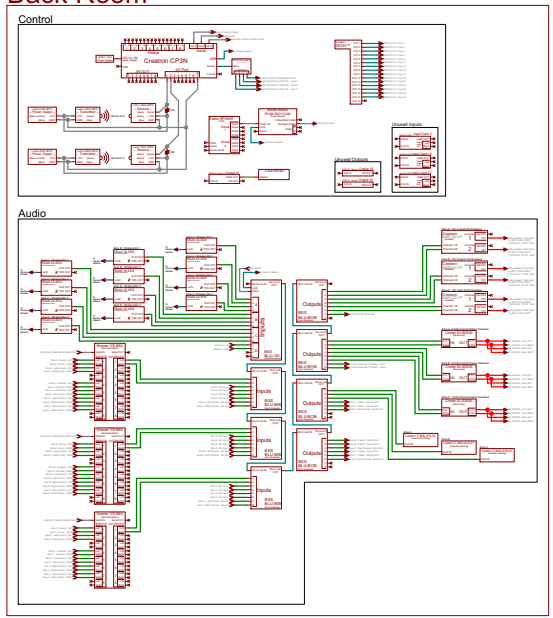
Zone B



Zone C



Back Room



DM-MD32x32

Inputs			Outputs		
1	Zone A - Blu-ray	HDMI/DVI/DP	1	Zone A - Projector	HDMI/DVI/DP
2	Zone A - Laptop Inputs	HDMI/DVI/DP	2	Zone A - Computer Monitor	HDMI/DVI/DP
3	- UNUSED -	HDMI/DVI/DP	3	Zone A - Record Out	HDMI/DVI/DP
4	Zone A - Computer Primary	HDMI/DVI/DP	4	Zone A - Monitor Cart 1	HDMI/DVI/DP
5	Zone A - Computer Secondary	HDMI/DVI/DP	5	Zone B - Projector	HDMI/DVI/DP
6	Zone A - Document Camera	HDMI/DVI/DP	6	Zone B - Computer Monitor	HDMI/DVI/DP
7	Zone A - Left Floorbox	HDMI/DVI/DP	7	Zone B - Record Out	HDMI/DVI/DP
8	Zone A - Right Floorbox	HDMI/DVI/DP	8	Zone B - Monitor Cart 1	HDMI/DVI/DP
9	Zone A - Back Floorbox	HDMI/DVI/DP	9	Zone C - Projector	HDMI/DVI/DP
10	Zone A - PTZ Camera	HDMI/DVI/DP	10	Zone C - Computer Monitor	HDMI/DVI/DP
11	Zone B - Blu-ray	HDMI/DVI/DP	11	Zone C - Record Out	HDMI/DVI/DP
12	Zone B - Laptop Inputs	HDMI/DVI/DP	12	Zone C - Monitor Cart 1	HDMI/DVI/DP
13	- UNUSED -	HDMI/DVI/DP	13	Zone A - Monitor Cart 2	HDMI/DVI/DP
14	Zone B - Computer Primary	HDMI/DVI/DP	14	Zone B - Monitor Cart 2	HDMI/DVI/DP
15	Zone B - Computer Secondary	HDMI/DVI/DP	15	Zone C - Monitor Cart 2	HDMI/DVI/DP
16	Zone B - Document Camera	HDMI/DVI/DP	16	- UNUSED -	HDMI/DVI/DP
17	Zone B - Left Floorbox	HDMI/DVI/DP	17	Zone A - Stream Out 1	HDMI/DVI/DP
18	Zone B - Right Floorbox	HDMI/DVI/DP	18	- N/A -	—
19	Zone B - Back Floorbox	HDMI/DVI/DP	19	Zone B - Stream Out 1	—
20	Zone B - PTZ Camera	HDMI/DVI/DP	20	- N/A -	—
21	Zone C - Blu-ray	HDMI/DVI/DP	21	Zone C - Stream Out 1	HDMI/DVI/DP
22	Zone C - Laptop Inputs	HDMI/DVI/DP	22	- N/A -	—
23	- UNUSED -	HDMI/DVI/DP	23	- NOT USED -	HDMI/DVI/DP
24	Zone C - Computer Primary	HDMI/DVI/DP	24	- NOT USED -	HDMI/DVI/DP
25	Zone C - Computer Secondary	HDMI/DVI/DP	25	Zone A - Stream Out 2	HDMI/DVI/DP
26	Zone C - Document Camera	HDMI/DVI/DP	26	- N/A -	—
27	Zone C - Left Floorbox	HDMI/DVI/DP	27	Zone B - Stream Out 2	HDMI/DVI/DP
28	Zone C - Right Floorbox	HDMI/DVI/DP	28	- N/A -	—
29	Zone C - Back Floorbox	HDMI/DVI/DP	29	Zone C - Stream Out 2	HDMI/DVI/DP
30	Zone C - PTZ Camera	HDMI/DVI/DP	30	- N/A -	—
31	Studios IN	HDMI/DVI/DP	31	Local Monitor (Backstage)	HDMI/DVI/DP
32	- EMPTY -	HDMI/DVI/DP	32	- NOT USED -	HDMI/DVI/DP

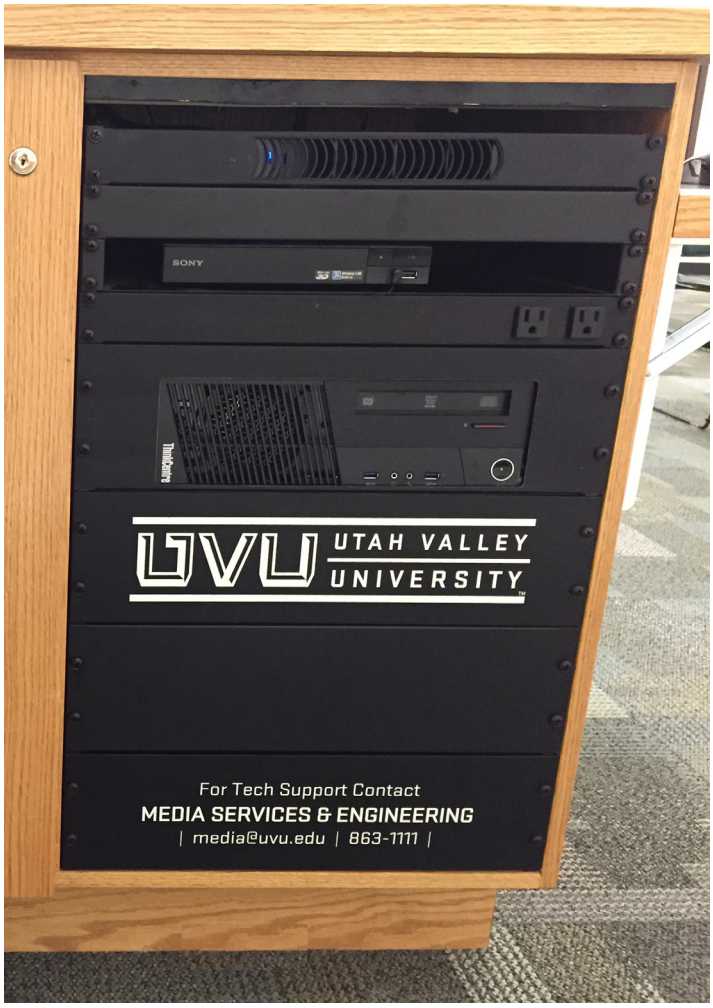
(DMCO-88)
(DMCO-88)
(DMCO-88)
(DMCO-88)
(DMCO-77)
(DMCO-75)
(DMCO-77)
(DMCO-75)

Legend

Control Cable	
Speaker Cable	
Mic Cable	
CAT6	
HDMI, DisplayPort	
VGA	
USB, Other	
RS232	

8.2 Rack Elevation Diagrams

UVU has developed best practice strategies for arranging the equipment in A/V equipment racks. While each application space and project may require unique solutions, the Designer shall apply the best practice guidelines depicted below and shall prepare rack elevations for each A/V equipment rack in the project.



A. Power strip with built-in exhaust fan shall be located at the top of the rack – no power switch on the front.

B. Blank filler panels between all accessible equipment that is visible to the public. If a rack is behind a lockable door (not visible), blank panels are not required.

C. Whenever there is space available, spread equipment to provide a 1RU space between each piece of active rack-mounted equipment to reduce overheating.

D. Where an equipment rack has space available in the locked side of a Teacher Station, mount the amplifier in the top of the rack on the locked side so that rising heat doesn't affect other equipment. Otherwise, place the amplifier low in the visible rack behind a security door.

E. UVU logo and A/V Servicedesk contact info shall be silkscreened on one or more blank filler panels.

F. On the visible rack, the most frequently used equipment shall be mounted higher in the rack. For example, the Blu-ray player and computer should be near the top. The drawer should be near the bottom.

G. Provide a drawer (where possible 4U high) near the bottom of the visible rack to hold the charging equipment for the wireless microphone and other appurtenances.

H. All shelf-mounted equipment shall be installed with a custom bezel to conceal unfilled space around the devices on the shelf. In addition to aesthetics, the purposes of the bezel are to prevent theft, to prevent the shelf from being used to store non-A/V items, and to stabilize equipment on the shelf.

I. Accessible to public: source devices, drawer, auxiliary interface panel, exhaust fan, auxiliary power outlet, lecture capture device,

J. Secured away from public: control system, amplifier, digital signal processor, A/V switchers, transmitter/receivers, wireless microphone receivers, codecs, network switch, distribution amplifiers, mixers, ventilation

9 UVU Appendix

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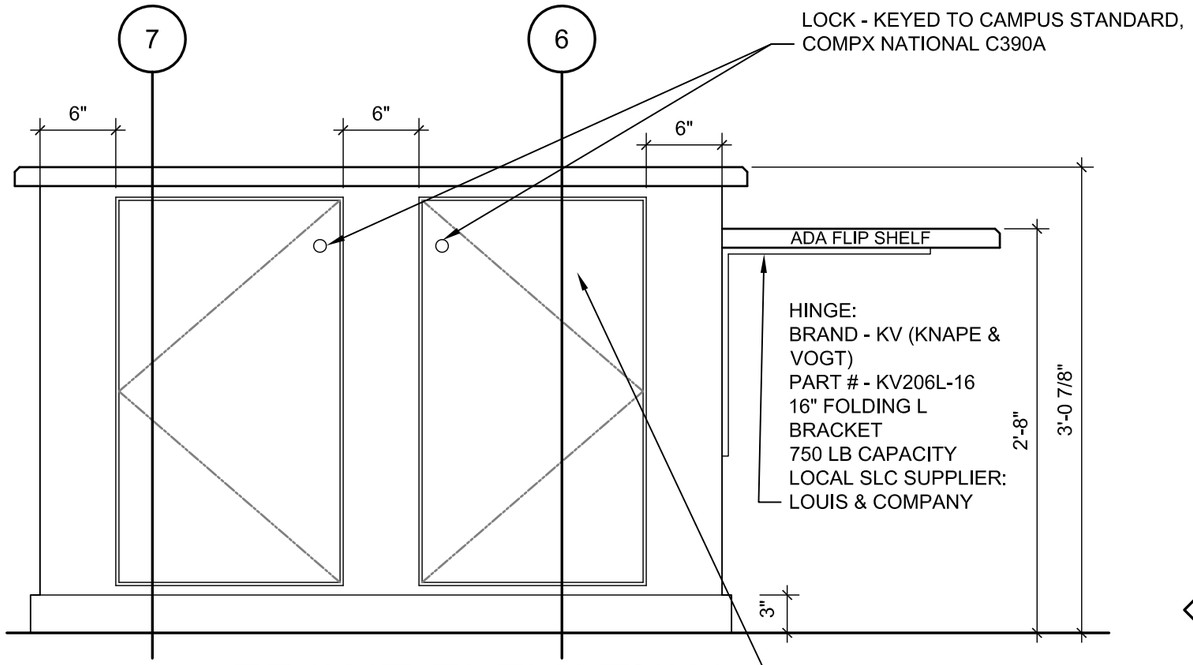
9.1 Teacher Station Drawings

The following pages show three different styles of Teacher Stations that are used at UVU. The Designer shall inquire with the UVU AVPM regarding which style(s) shall be used in each space for each given project:

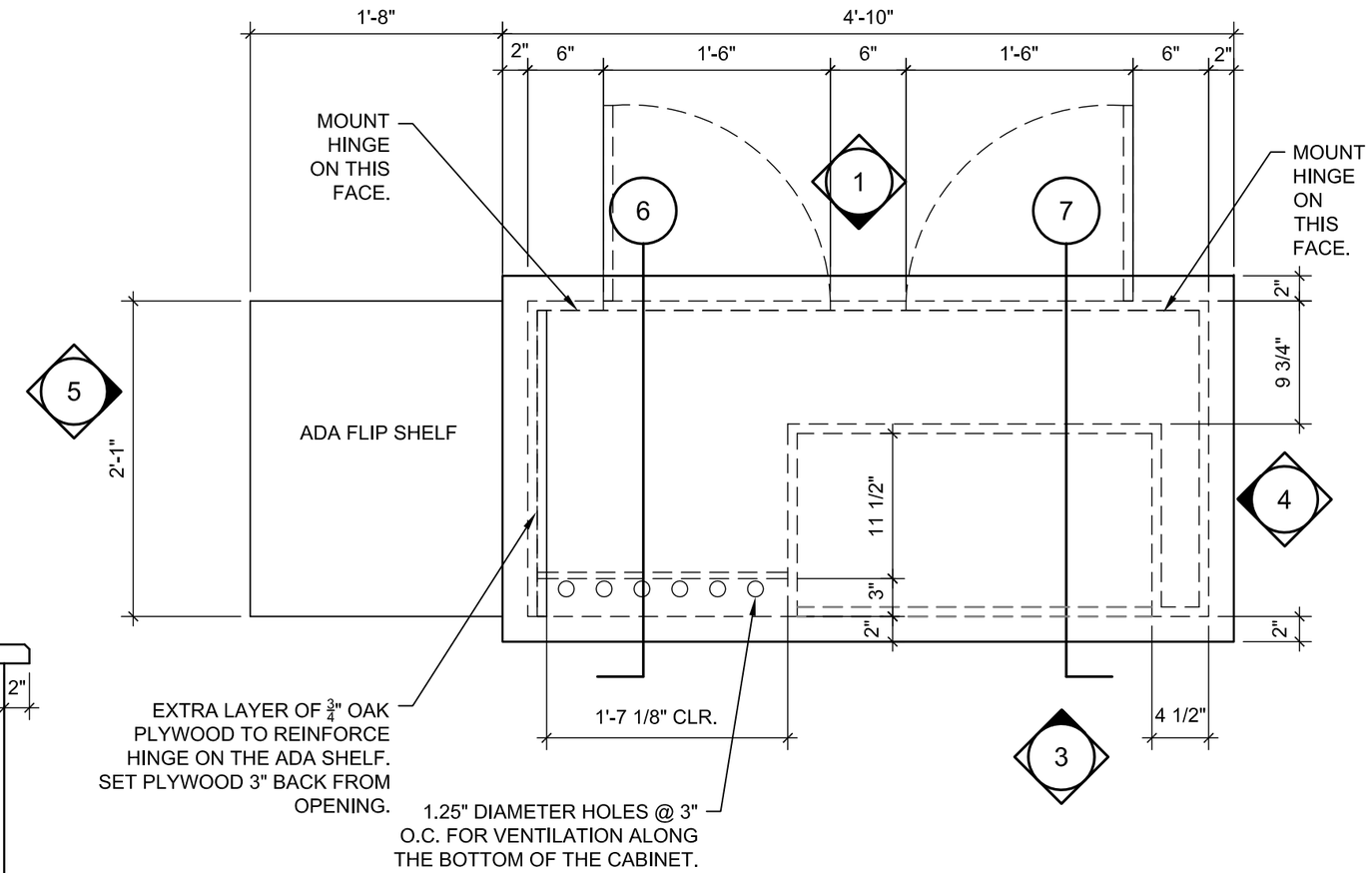
9.1.1 DESK STYLE FORM-FACTOR (BOTH A LEFT AND RIGHT VERSION)



FRONT ELEVATION

1

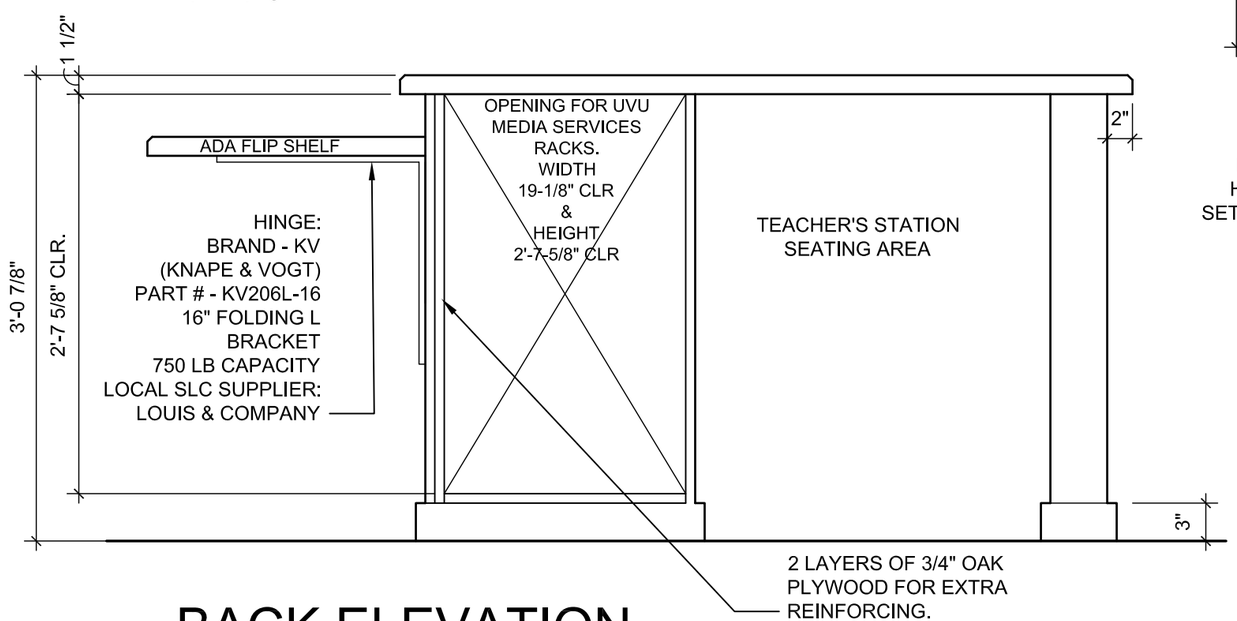
1" = 1'-0"



FLOOR PLAN

2

1" = 1'-0"



BACK ELEVATION

3

1" = 1'-0"

CLASSROOM TEACHER STATION

FLOOR PLAN & ELEVATIONS

SCALE: 1" = 1'-0"

DATE: JUNE 10, 2015

FINISHES

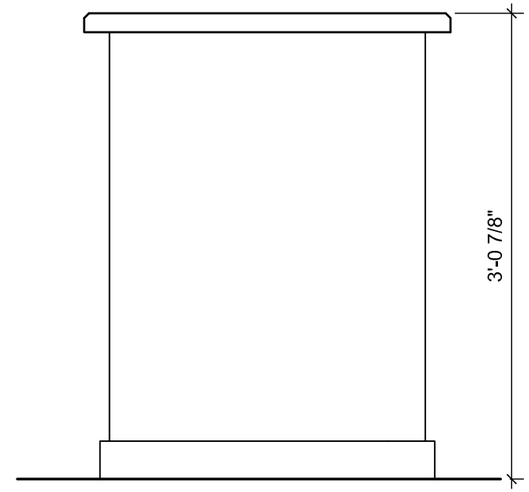
COUNTER: $\frac{3}{4}$" WHITE OAK PLYWOOD WITH HDWD OAK BEVELED EDGES, NATURAL FINISH.

TEACHER STATION VERTICAL PANELS: $\frac{3}{4}$" WHITE OAK PLYWOOD, NATURAL FINISH.

3" BASE: $\frac{3}{4}$" HDWD WHITE OAK, NATURAL FINISH.

NOTES

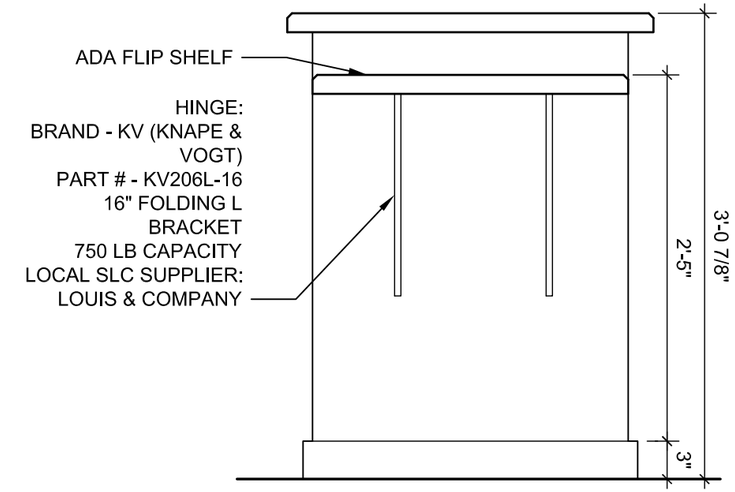
THE DIRECTION OF THE GRAIN TO BE THE SAME ON FRONT, BACK, SIDES & BASE. PROVIDE CUTOUTS IN THE TOP SURFACE AND THE LOCATION & SIZES WILL BE COORDINATED WITH UVU MEDIA SERVICES.



SIDE ELEVATION

4

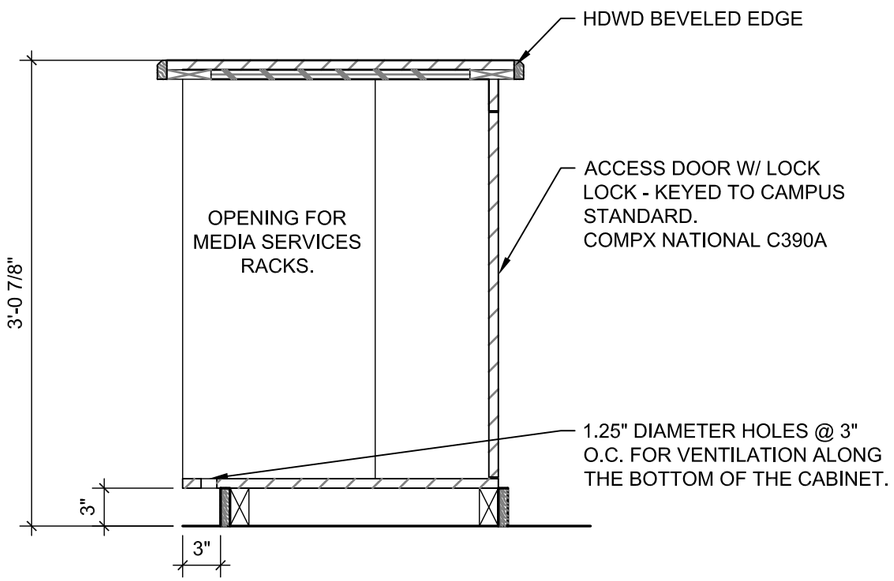
1"=1'-0"



SIDE ELEVATION

5

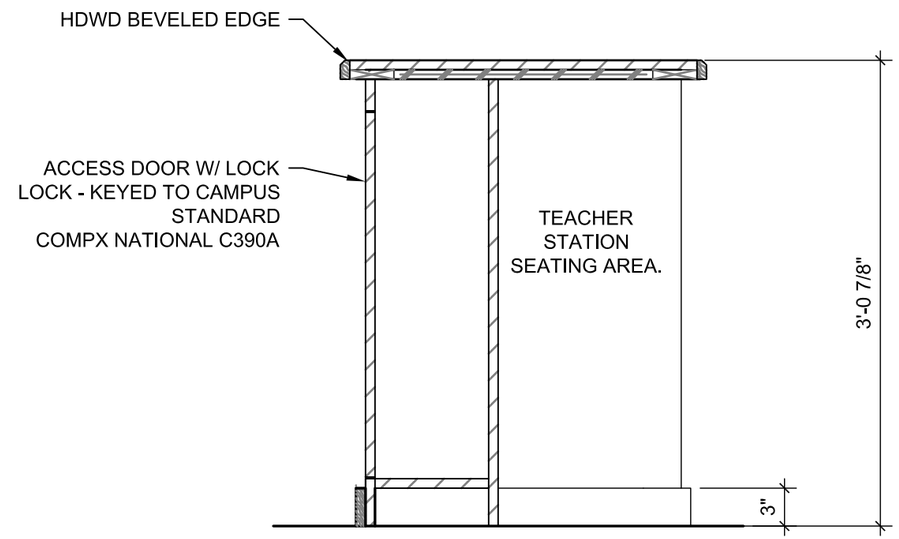
1"=1'-0"



SECTION

6

1"=1'-0"



SECTION

7

1"=1'-0"

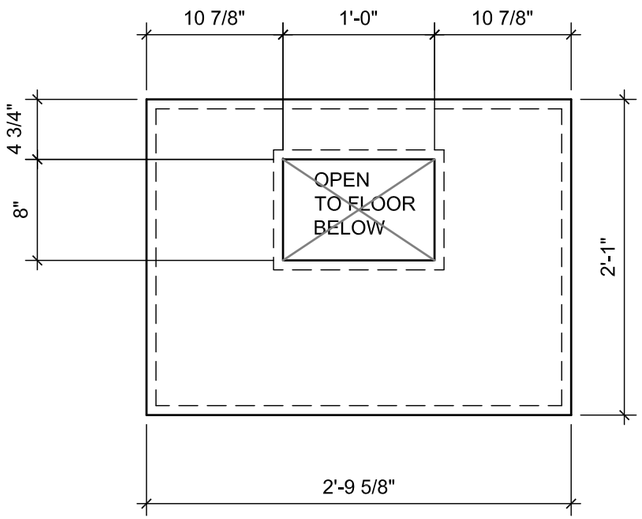
CLASSROOM TEACHER STATION

ELEVATION AND SECTIONS

SCALE: 1"=1'-0"

DATE: JUNE 10, 2015

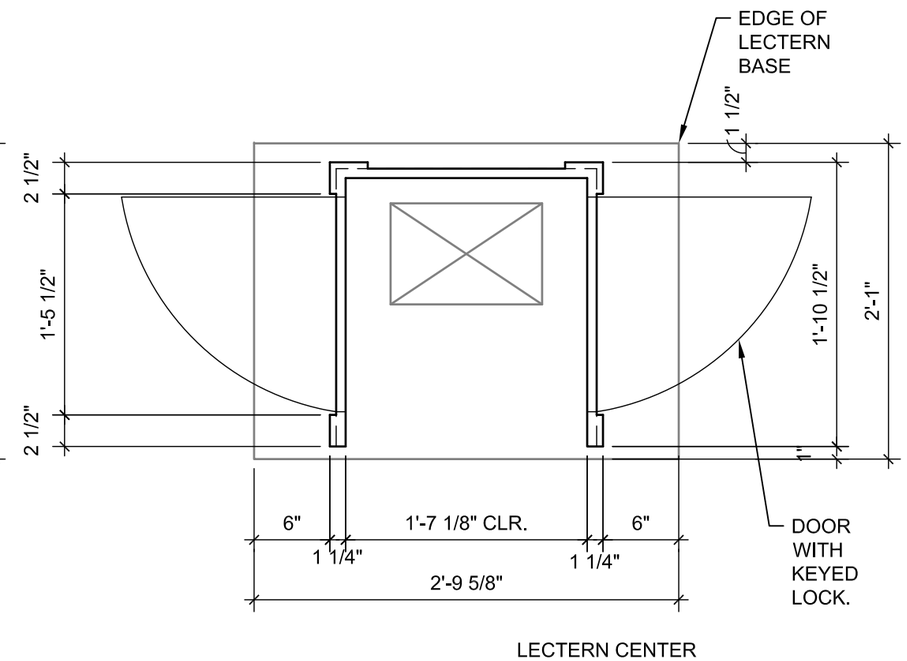
9.1.2 STAND-UP STYLE (NOT MOVABLE) PODIUM FORM-FACTOR



LECTERN BASE

1

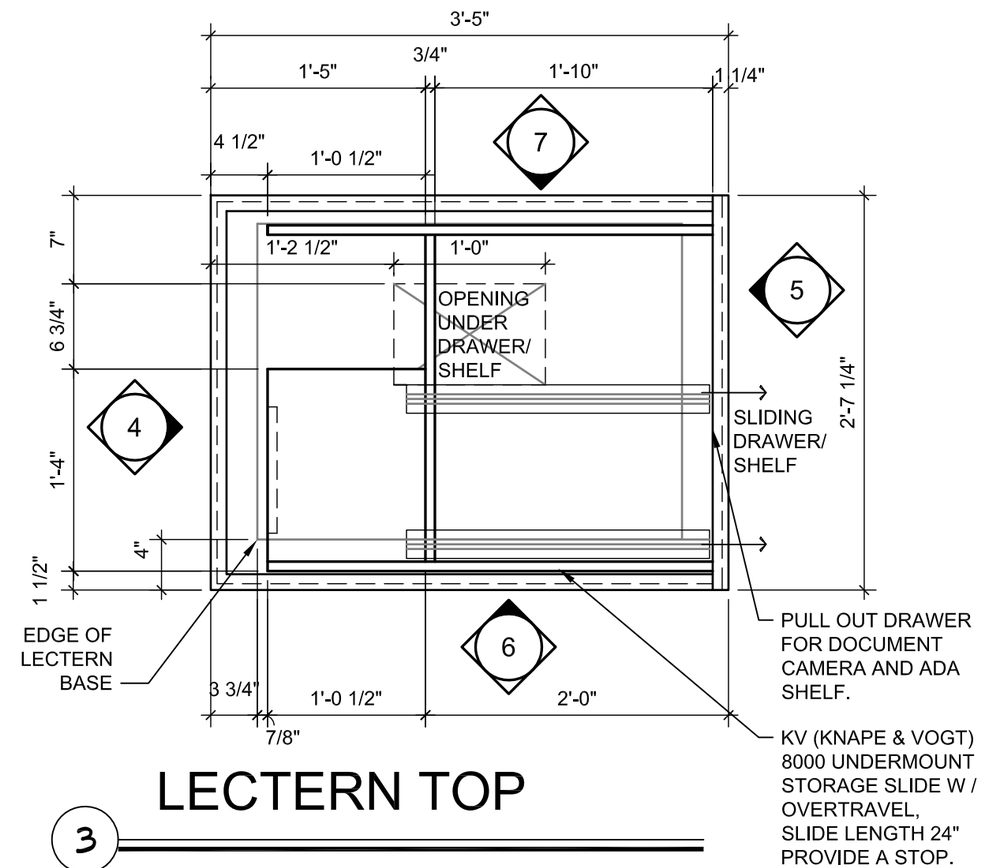
1" = 1'-0"



LECTERN CENTER

2

1" = 1'-0"



LECTERN TOP

3

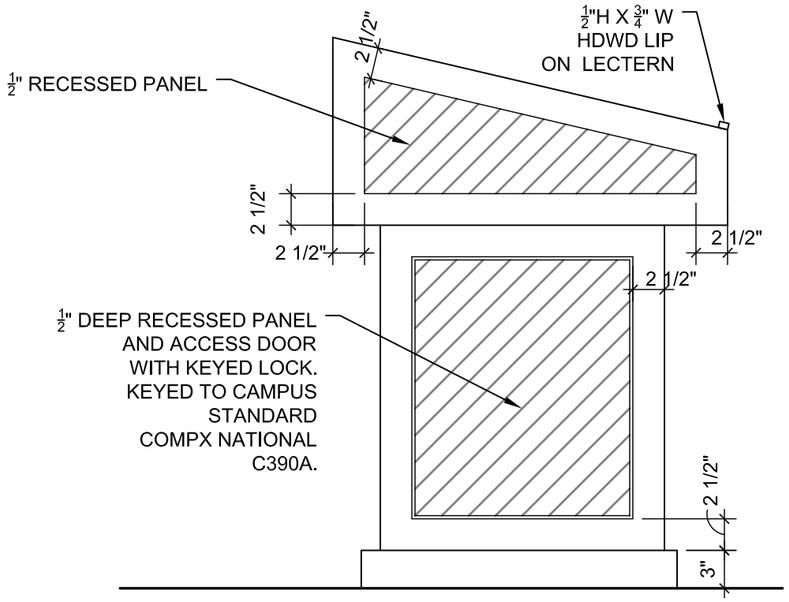
1" = 1'-0"

AUDITORIUM LECTERN

LECTERN PLANS

SCALE: 1"=1'-0"

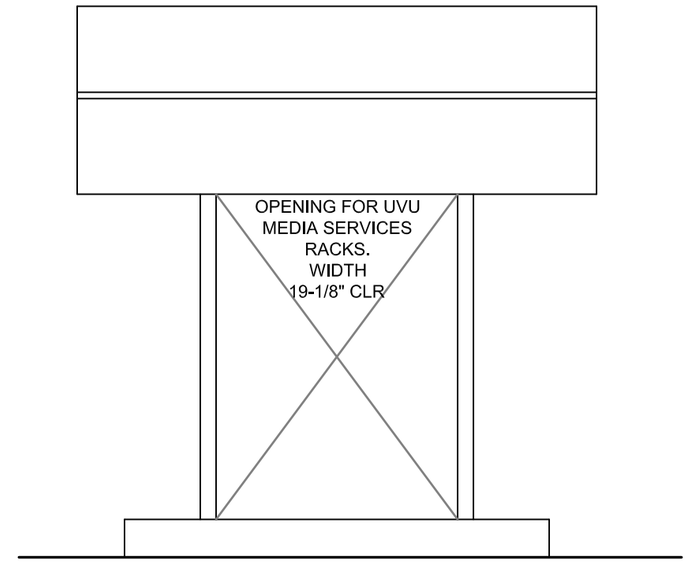
DATE: JUNE 10, 2015



SIDE VIEW

4

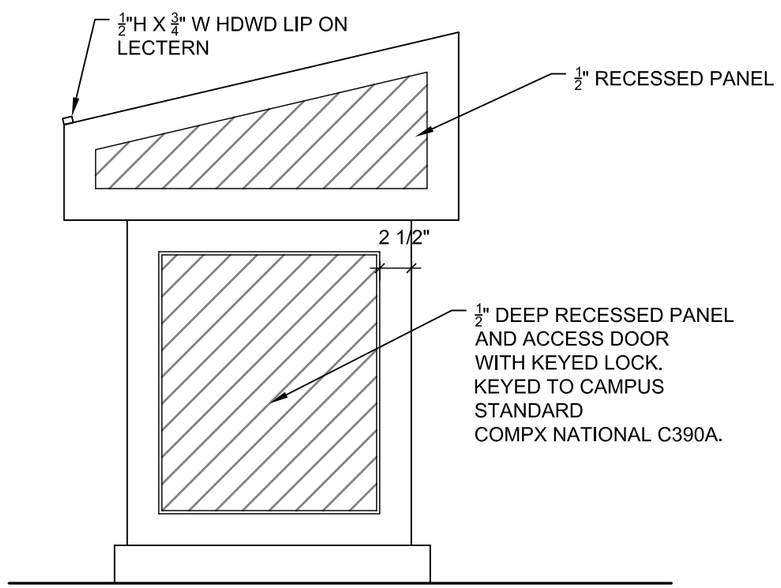
1" = 1'-0"



FRONT VIEW (PRESENTER'S SIDE)

6

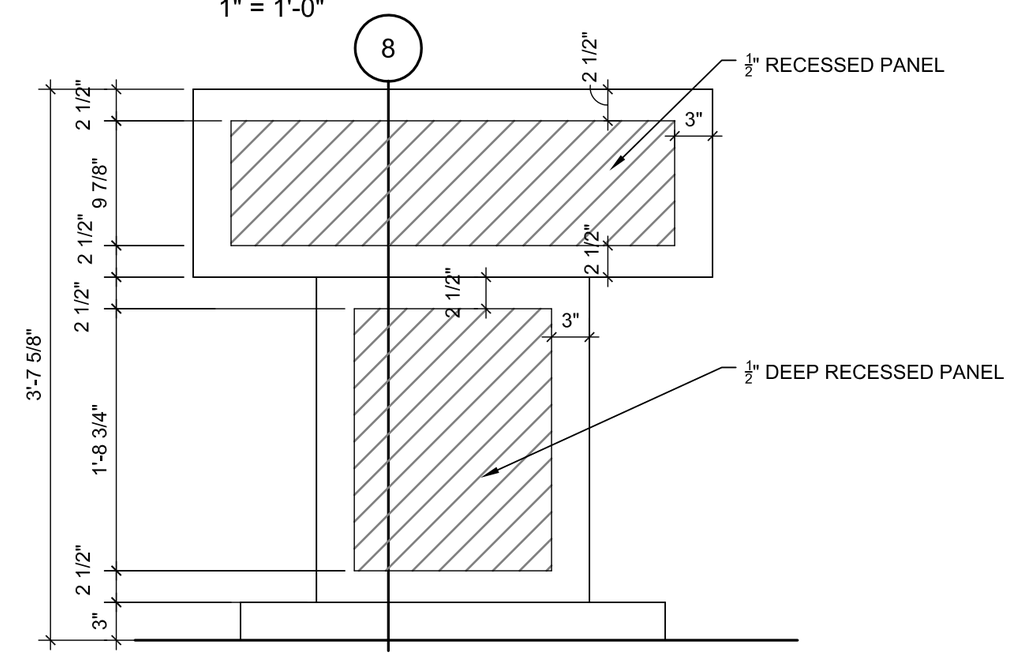
1" = 1'-0"



SIDE VIEW - SLIDING DRAWER SIDE

5

1" = 1'-0"



BACK VIEW (AUDIENCE SIDE)

7

1" = 1'-0"

AUDITORIUM LECTERN

LECTERN ELEVATIONS

SCALE: 1"=1'-0"

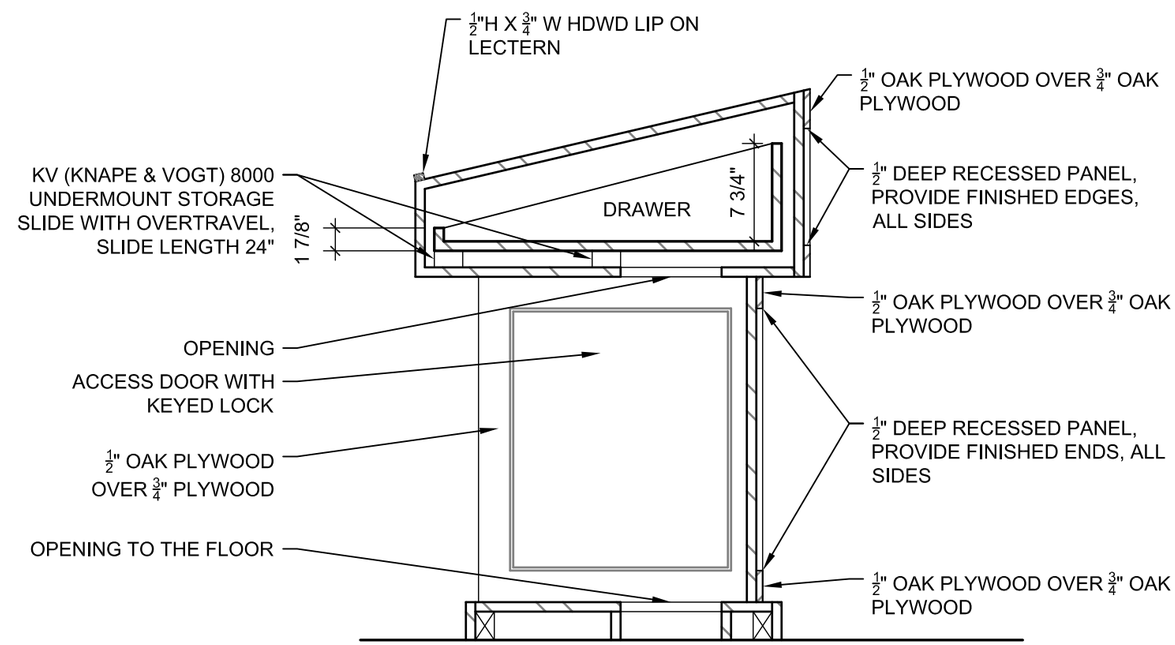
DATE: JUNE 10, 2015

FINISHES

LECTERN: $\frac{3}{4}$" WHITE OAK PLYWOOD, NATURAL FINISH.

3" BASE: $\frac{3}{4}$" HDWD WHITE OAK, NATURAL FINISH.

NOTES
THE DIRECTION OF THE GRAIN TO BE THE SAME ON FRONT, BACK, SIDES & BASE. PROVIDE CUTOUTS IN THE TOP SURFACE AND THE LOCATION & SIZES WILL BE COORDINATED WITH UVU MEDIA SERVICES.



SECTION

8

1" = 1'-0"

AUDITORIUM LECTERN
SECTION

SCALE: 1"=1'-0"
DATE: JUNE 10, 2015

TELECOMMUNICATIONS DISTRIBUTION DESIGN GUIDE

DRAFT

October 21, 2015

Approved by: _____

IT Infrastructure Services — Date
Eddie Sorensen, Sr. Director

Approved by: _____

Facilities / Engineering — Date
Frank Young, AVP

Prepared by:

Utah Valley University
Information Technology Services

and

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Engineering & Consulting P.S.
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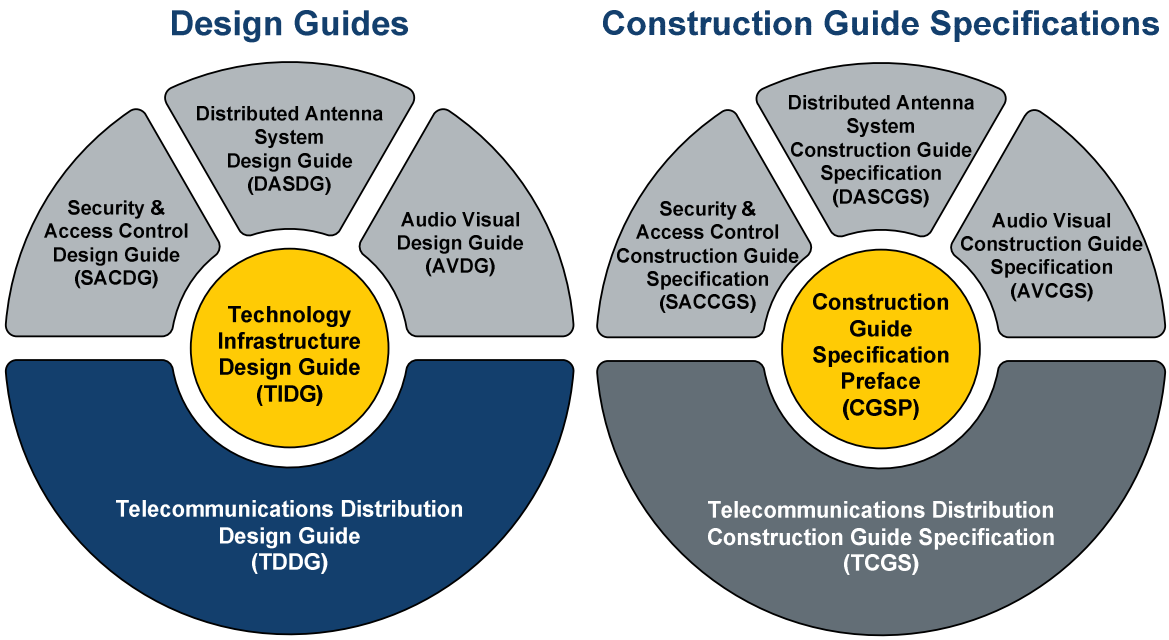
1 Preface

1.1 Introduction

A. The Telecommunications Distribution Design Guide (TDDG) is written to communicate the requirements of Utah Valley University (UVU) for the design and installation of telecommunications distribution infrastructure at UVU facilities.
- The TDDG is written for an audience of Architects, Engineers and Designers who are responsible for the design of new or remodeled facilities for UVU where telecommunications distribution systems currently exist or will be installed.
- It is also intended for other low-voltage telecommunications Contractors installing telecommunications distribution systems at UVU facilities.
- This document also applies to infrastructure designed and installed by UVU staff, when a formal design is not developed.

B. The TDDG belongs to a set of documents (depicted below) that comprise the standard design and installation practices for all facets of technology infrastructure and systems at UVU facilities.

Technology Infrastructure Standards Document Set



C. The Technology Infrastructure Design Guide (TIDG) contains information common to all of UVU's Design Guides.

D. The Telecommunications Construction Guide Specification (TCGS) is a key companion to the TDDG.
   - Designers shall adapt the TCGS "as written" for creating specifications for a particular project according to the instructions in the TDDG. In other words, Designers shall use the electronic specification section documents (provided by UVU in MSWord format) and then shall make any project-specific edits to the specifications in those documents. Any changes to the specifications shall be done using the "Revision Tracking" features in MSWord.
   - Rewriting the TCGS or modifying the format structure or requirements will not be accepted.

E. Telecommunications distribution systems designed for UVU are expected to support and integrate voice, data, video and other low-voltage systems with common media (fiber optic and unshielded twisted pair (UTP) copper cable).

F. The telecommunications distribution systems Designer shall coordinate with the other designers on a project (architectural, electrical, mechanical, etc.) to determine that other systems are both compatible with and complementary to the telecommunications distribution system. It is critical to coordinate between disciplines during the design phase of a project, rather than making adjustments in the field during construction.

G. The telecommunications Designer shall design new systems to comply with the requirements of this document set and that are consistent with the existing infrastructure at UVU.

H. This document was prepared by the Information Technology Services department at Utah Valley University and by Summit Engineering & Consulting, P.S. As technology and needs evolve, the document will be periodically updated.

   - May 1, 2013 – Originally published
   - November xx, 2015 – First Revision

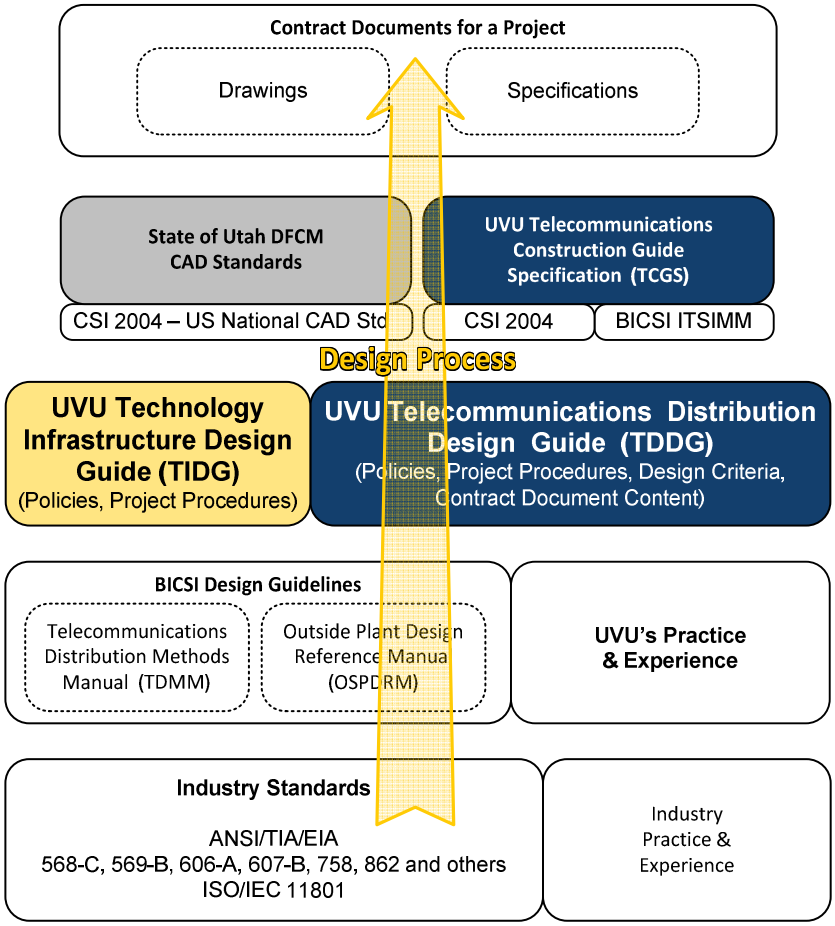
1.2 Document Intent

A. The Design Process diagram below depicts the relationships between the ANSI/TIA/EIA Standards, the BICSI Design Guidelines, the UVU documents (TDDG, TCGS) and the project-specific Construction Documents. Telecommunications distribution infrastructure at UVU facilities shall be designed based on the BICSI design guidelines (the TDMM, the OSPDRM and the ITSIMM) and compliant with the ANSI/TIA/EIA Standards as applied by and illustrated in the UVU TDDG.

B. The TDDG is intended to be used in conjunction with the TDMM and OSPDRM in order to reinforce selected TDMM content as well as highlight any restrictions and/or limitations on TDMM and OSPDRM content in order to meet the specific requirements of UVU facilities. The TDDG is not intended to replace or detract from the TDMM or OSPDRM.

The Design Process

Based on Industry Standards and Guidelines and UVU's Design Guide and Standard Specifications



C. This document provides directions for making standards-compliant design decisions that will, in due course, be reflected in Construction Documents. The Construction Documents for a project will be comprised of drawings and a system specification that properly incorporates telecommunications infrastructure within a project. The TDDG shall be used in conjunction with the TCGS. Drawings shall conform to the guidelines contained in this document for content and completeness, and the specifications shall be based upon the TCGS.

D. The TDDG is not intended to serve as a master specification nor for stand-alone use on design-build projects. This document should serve as a guide for making standards-compliant design decisions that, in due course, will be reflected in a project specification based upon the TCGS.

E. The TDDG uses many terms and abbreviations that are common in the telecommunications industry. Please refer to the Glossary in the BICSI TDMM and also the Glossary section at the end of the BICSI OSPDRM for definitions.

1.3 Document Structure

The TDDG is organized in the following sections:

1. The **Preface** (this section) describes this document, its intent and its relationship to industry standards, practices and the various audiences affected by the document. It also describes how to use this document.

2. The **UVU Telecommunications Procedures** section applies specifically to UVU personnel. It describes internal UVU telecommunications procedures, requirements, standard practices and processes for designing, installing and operating telecommunications infrastructure. UVU personnel should also be aware of the instructions, requirements and guidelines for Designers contained in the other sections of this document, with respect to their application on both large-scale telecommunications distribution projects and small-scale "moves/adds/changes" (MAC) projects. In addition, these requirements apply to in-house operations and maintenance of existing telecommunications distribution systems.

3. The **Project Procedures** section describes the required qualifications for telecommunications Designers as well as the procedures that Designers must follow when working on telecommunications infrastructure projects at UVU facilities. It includes activities that are required throughout the project as well as phase-specific requirements.

4. The **Design Criteria** section serves two purposes. The first is to describe the general requirements for UVU telecommunications infrastructure along with the typical features required for different categories of building spaces and construction types. The second purpose is to place limitations on the materials and methods described in the BICSI TDMM and OSPDRM. While the TDMM and OSPDRM describe many materials and methods that are generally accepted in the industry for providing telecommunications infrastructure, UVU facilities have some unique characteristics that restrict some of the materials and methods that otherwise might be acceptable. Some of the practices discussed in the TDMM and OSPDRM are expressly prohibited in UVU facilities. Other practices are permitted in certain areas (residential halls, for example) but prohibited in other areas such as academic buildings.

   Generally speaking, if the BICSI TDMM and OSPDRM do not describe a particular material or method for use with telecommunications distribution infrastructure, it will not be allowed for UVU facilities. In addition, the UVU TDDG places further restrictions on the use of some materials and methods that the BICSI design guidelines support.

5. The **Construction Document Content** section defines the minimum level of detail that UVU requires to be present in the telecommunications portion of the Construction Documents for a project. In this section, the required types of details along with the content in the details are both described. This section also briefly describes the specifications that are required for a project.

6. The **Appendices** section provides examples and standard forms and diagrams that are required for UVU telecommunications infrastructure.

1.4 Standards and Guidelines

A. UVU has standardized on the ANSI/TIA/EIA Commercial Building Telecommunications Standards series and has adopted the following BICSI[1] design guide documents as the basis for telecommunications distribution design in UVU facilities:
- BICSI Telecommunications Distribution Methods Manual (TDMM) (13th Edition)
- BICSI Outside Plant Design Reference Manual (OSPDRM) (5th Edition)
- BICSI Information Technology Systems Installation Methods Manual (ITSIMM) (6th Edition)

The UVU TDDG is the guide to the application of the ANSI/TIA/EIA Standards, the BICSI TDMM, the BICSI OSPDRM and the BICSI ITSIMM to the unique circumstances present in UVU facilities and projects.

All references to these manuals shall specifically address only the editions specified above. Newer editions shall be used “for reference only” until authorized by UVU in writing or through a revised edition of the TDDG.

B. Adherence to and compliance with the codes, standards and industry practices listed below, along with the UVU requirements contained in this document, is mandatory:
- State of Utah Division of Facilities Construction and Management (DFCM)
- UVU Facilities Design and Construction Standards
- 2009 International Building Code
- National Electrical Safety Code, American National Standards Institute C2
- National Electrical Code (NEC), National Fire Protection Association (NFPA 70)
- Firestop Contractors International Association (FCIA), Manual of Practice
- ANSI/TIA/EIA 568-C series – Commercial Building Telecommunications Standards
- ANSI/TIA/EIA 569-C series – Commercial Building Telecommunications Standards for Pathways and Spaces
- ANSI/TIA/EIA 606-B series – Administration Standard for Commercial Telecommunications Infrastructure

[1] BICSI is widely considered to be the industry source for standards-compliant design guidelines for telecommunications distribution systems. See www.bicsi.org for further information.

- ANSI/TIA/EIA 607-B series – Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
- ANSI/TIA/EIA 758-B series – Customer-Owned Outside Plant Telecommunications Cabling Standard
- ANSI/TIA/EIA 862-A – Building Automation Systems Cabling Standard for Commercial Buildings
- ANSI/TIA/EIA 942-A – Telecommunications Infrastructure Standard For Data Centers
- ANSI/BICSI 005-2013 - Electronic Safety and Security (ESS) System Design and Implementation Best Practices
- Fiber Optic Test Standards, TIA/EIA 455 (Series)
- Optical Fiber Systems Test Procedures, TIA/EIA 526 (Series)
- Local Area Network Ethernet Standard, IEEE 802.3 (Series)
- Wireless LANs, IEEE 802.11 (Series)

C. The requirements in these documents apply to all technology infrastructure installed in UVU facilities, including infrastructure serving non-UVU tenants.

D. Any request to deviate from the requirements of the National Electrical Code will not be accepted.

E. The Designer shall seek approval for designs that are not consistent with UVU TDDG requirements. Requests to deviate from industry standards or UVU design solutions will be considered on a case-by-case basis by the UVU Information Technology Services Project Manager. Designers shall contact the UVU Information Technology Services Project Manager to discuss proposed alternatives before spending significant time pursuing the option.

F. The requirements contained in the TDDG are considered to be in addition to those required under contract with the State of Utah. Where the requirements differ, the issue shall be brought to the attention of the UVU Facilities Project Manager – otherwise the more stringent requirement shall apply.

1.5 Required Manufacturers (Basis of Design)

A. Telecommunications distribution systems shall be designed for construction using materials from the current product lines of the manufacturers required by UVU.

B. Currently the basis of design is defined as solutions comprised of Siemon-plus-Mohawk or Siemon-plus-General Cable (unless otherwise directed by UVU). Designs shall comply with the requirements of these manufacturers such that Mohawk and General Cable will certify the installation with their warranty. The construction documents shall require that the Contractor's installation workmanship fully comply with the current installation requirements from the manufacturers of these products, even if those requirements exceed industry standard practices.

- For copper termination materials, UVU requires the Siemon Company product line.
- For copper cabling materials, UVU requires products by Belden, and General Cable. Belden provides warranties ranging from 20-year to lifetime on telecommunications cabling systems when terminated with Siemon products. General Cable provide similar warranties.

- For fiber optic termination materials, UVU requires Corning termination hardware.
- For fiber optic cabling materials UVU requires Corning glass as a component, but not necessarily Corning as the manufacturer of the assembled fiber cabling products.
- For equipment racking-related materials, UVU requires the Siemon Company's products.
- All telecommunications room racks shall be of steel construction. Aluminum rack mounts are unacceptable to UVU.

C. The Designer shall incorporate a manufacturer consistently throughout the entire project (unless otherwise directed by UVU) and design a telecommunications distribution system that will be suitable for the use of products from this manufacturer.

Required manufacturers and their products are identified in the TCGS.

- For example, ladder racking in all telecommunications rooms shall be manufactured by a single manufacturer and cabling system materials shall be manufactured by a single manufacturer. However, it is not required that cabling and ladder racking be from the same manufacturer.

The construction documents shall require that the installation workmanship fully comply with the current installation requirements from the manufacturers of these products.

1.6 UVU Personnel

A. There are several specific UVU personnel roles defined in the TIDG and referenced in this document. The Designer shall interact with these individuals as direct points of contact.

B. The UVU Telecommunications Policy section of this document applies specifically to UVU personnel. In addition to the UVU Telecommunications Policy section, UVU personnel should be aware of the instructions, requirements and guidelines for Designers contained in the other sections of this document. Also, the TCGS contains additional requirements related to telecommunications distribution system materials and installation methods applicable at UVU facilities.

C. UVU personnel should be familiar with these requirements with respect to their application on both large-scale telecommunications distribution projects and small-scale “moves/adds/changes” projects. These requirements also apply to in-house operations and maintenance of existing telecommunications distribution systems.

1.7 Copyright

Summit Engineering & Consulting retains the copyright for this document. Utah Valley University is authorized to edit and adapt the document.

Summit Engineering & Consulting has authored similar documents for many other organizations. The document is intended (in part) to describe best practices that are found in some segments of the industry. As a result, portions of this document are similar to comparable content in documents previously prepared by Summit Engineering & Consulting for other organizations. This document does not contain any information that is proprietary or confidential to other organizations.

2 UVU Telecommunications Procedures

This section describes internal UVU telecommunications procedures, requirements, standard practices and processes associated with designing, installing, maintaining and operating telecommunications infrastructure. It is intended for an internal audience of UVU personnel, including:

- Office of Information Technology (OIT)
- Facilities
- Anyone that may be involved in the design, installation, maintenance or use of telecommunications infrastructure, network equipment or telephone equipment at a UVU facility.

Please see Section 2 in the TIDG for internal procedures covering all technologies at UVU.

2.1 Everyone

The following procedures apply to anyone that may be involved in the design, installation, maintenance or use of telecommunications infrastructure at a UVU facility.

2.1.1 GETTING HELP FROM THE IT SERVICEDESK

All requests for IT assistance should be submitted to:

- Call 801.863.8888
- Email servicedesk@uvu.edu
- See http://www.uvu.edu/servicedesk/

2.1.2 DO NOT ALTER TELECOMMUNICATIONS CABLING AND EQUIPMENT

Telecommunications cabling and technical equipment shall not be altered by anyone outside IT Infrastructure Services. Doing so will cause interoperability problems with network equipment and may void manufacturer warranties.

Please do not:

- Remove installed connectors
- Attempt to access locked panels
- Remove patch cables

Anyone needing assistance with cabling and technical equipment should contact the IT Servicedesk for assistance.

2.2 Facilities

All telecommunications infrastructure shall be installed in compliance with the requirements of this document.

2.2.1 SPACE ALLOCATION

In the life of a building, the cabling and equipment components of the technology infrastructure will be changed several times as advances occur and systems become obsolete. In order to keep the life-cycle costs low, it is therefore essential that spaces and pathways supporting the technology infrastructure are properly sized, properly located and remain accessible.

Please use the following guidelines when allocating space for technology infrastructure in new projects:

2.2.1.1 TELECOMMUNICATIONS ROOMS

When considering the budgeting requirements for a new project, the following items should be included for each telecommunications room (TR):

- TRs should be located centrically within the areas they serve. TRs should be vertically stacked from floor to floor.
- TRs require 24x7x365 air conditioning, with a preference for AC equipment that is located outside the TR with the controls in the TR. Split systems are acceptable for remodel projects.
- TR doors shall swing out of the room.

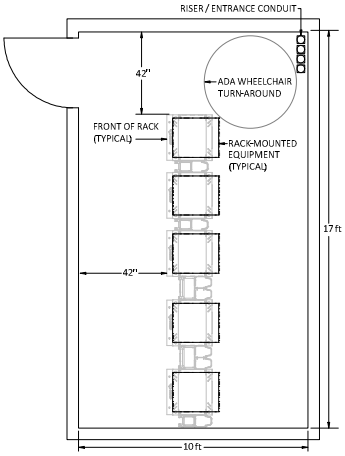
OIT recognizes that floor plan space set aside for technology infrastructure reduces the amount of space that can be allocated to other valuable programs and purposes. In an effort to be frugal with University resources, the telecommunications room sizes below have been developed to be **"optimally minimum."** This means that the rooms cannot serve their intended purposes and meet Code requirements if they are made smaller in either dimension. The rooms could be increased in size; however, this additional space would not necessarily be put to good use.

- Frequently (during the course of design), value engineering considerations target telecommunications rooms as a source of additional space that might be used for other purposes. OIT considers the spaces described below as being "already value engineered" in advance. OIT will not agree to size reductions to these spaces.
- All room sizes listed in this document are the interior dimensions of the rooms.

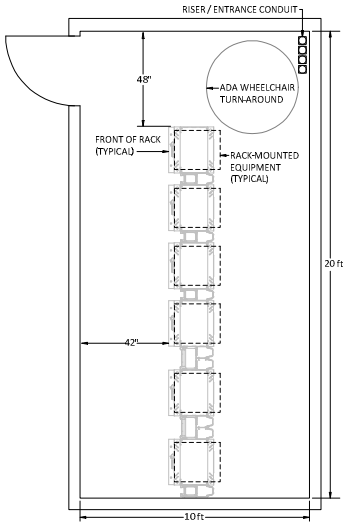
2.2.1.1.1 MAIN (MDF)

The main telecommunications room (also known as the "MDF") in the building is typically located on the lowest floor of the building. It is almost always larger than the other telecommunications rooms in the building, and will typically contain 5 or 6 racks.

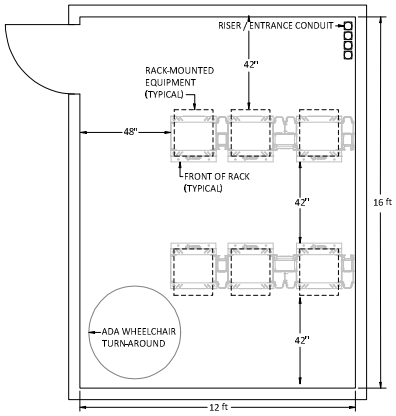
Below are some options for main telecommunications room floor plan (interior) sizing:



5-rack MDF
10' x 17'
(interior)



6-rack MDF
10' x 20'
(interior)



6-rack MDF
12' x 16'
(interior)

The UVU ITPM will work with Facilities to identify whether a 5-rack MDF or a 6-rack MDF will be required for a given project.

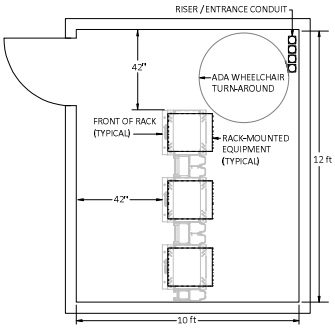
For more detailed examples of telecommunications room arrangements, please see Appendix 6.3.

2.2.1.1.2 SECONDARY (IDF)

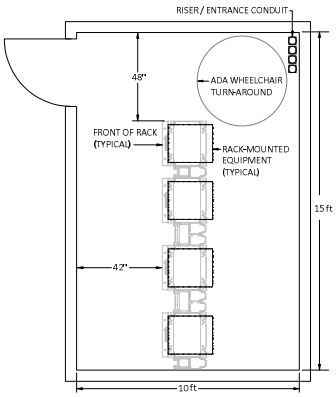
In addition to the main telecommunications room (MDF), additional secondary telecommunications rooms (also known as "IDF") will be required. At least one per floor will be needed.

The number of racks required is dependent on the quantity of cabling that the room will serve. Typically, an IDF will need 3 racks in a 10' by 12' room (interior dimensions).

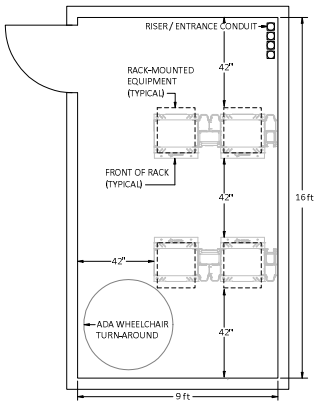
Below are some options for secondary telecommunications room (IDF) floor plan sizing:



3-rack IDF
10' x 12'
(interior)



4-rack IDF
10' x 15'
(interior)



4-rack IDF
9' x 16'
(interior)

The UVU ITPM will work with Facilities to identify whether 3-rack IDFs or 4-rack IDFs will be required for a given project.

For more detailed examples of telecommunications room arrangements, please see Appendix 6.3.

2.2.1.2 CABLE TRAYS

UVU uses cable trays to distribute cabling throughout its buildings. Cable trays should be installed in corridors or other accessible spaces. Ceilings below cable trays must be accessible. Hard-lid / gypboard ceilings prevent access to cable trays.

Cable trays should not be installed above offices or classrooms for the following reasons:

- It is very difficult to work with ladders in office spaces. Removing ceiling tiles and working above desks disrupts the users and spreads ceiling dust on their desks.
- Coordinating around class and office schedules causes inefficiency and longer response times.
- If cable trays are installed in classrooms, all cabling work must be scheduled around class times.

The minimum space required for cable tray along the entire length of main corridor ceilings is:

- A minimum clear space of 12 inches adjacent to the side of the cable tray to allow technicians to stand next to the tray (on a ladder) and add or remove cabling.
- A minimum clear space of 10 inches (head height) above the cable tray to allow for cables to be added to or removed from the tray.

Therefore, the minimum overall cross-sectional area for a 12”x4” cable tray and the associated working space is 24” wide x 14” high. Wider trays will require more space.

2.2.1.3 AUDIO / VISUAL EQUIPMENT ROOMS

In most classrooms and small auditoriums (seating less than 150 people) the audio / visual equipment will fit inside the podium. An A/V Equipment Room will be required for larger auditoriums as follows:

- For auditoriums designed to seat 150-249 people, a 10’ x 9’ A/V Equipment Room is required. The room will host one A/V equipment rack and one telecommunications rack.
- For auditoriums designed to seat more than 250 people, a rear projection room is required, located behind the presentation wall. The rear projection room shall be as wide as the presentation wall, twice as deep as the height of the presentation wall, and have clear ceiling space as high as the presentation wall.
    - The rear projection room will host any needed A/V Equipment racks.

- A separate 10' x 9' telecommunications room (secondary IDF) is also required. If the Auditorium is less than 100 ft from a major telecommunications room on that floor, this requirement might be waived.

2.2.2 SYSTEM INTEGRATION

Significant technical advances have been made in recent years resulting in numerous systems that now communicate via the campus network. The following are examples of systems or processes that now require secure networking:

- HVAC / environmental control systems
- Mechanical / DDC control systems
- Security and intrusion detection systems
- Access control systems
- Surveillance video systems
- Infrared scanner systems
- Handling of personally identifiable information (PII)
- Financial transactions

Do not expect wireless networking to provide the capacity, reliability or security required to handle these systems.

It is therefore crucial to the success of these systems that Facilities coordinate with OIT during the planning and design phases to ensure that adequate network equipment and infrastructure are included in the design.

2.2.3 DOCUMENTATION

2.2.3.1 AS-BUILT / RECORD DRAWINGS

When a construction project is completed, the as-built drawings or (preferably) record drawings need to be made available to OIT as follows:

- Full-size hard copy printed drawings – the portion of the drawing set that is applicable to technology. The full set is not required, just the sheets that depict the technology features of the project.

- Facilities shall maintain a network-accessible archive of both CAD files and PDFs of the record drawings, organized by building. OIT shall have unrestricted access to review the information via the network.

2.2.3.2 CABLE TEST REPORTS

At the conclusion of each project, the telecommunications cabling subcontractor is required (in the project specifications) to provide their cable test reports. The subcontractor is also required to register the manufacturer's warranty for the cabling infrastructure.

- Other technology subcontractors may also have similar test report and warranty requirements for their specialties.

The Facilities Project Manager should require the test results and warranty registrations at the time that record drawings are submitted, and prior to final payment.

3 Project Procedures

A. The Project Procedures section contains guidelines for architects, engineers and telecommunications distribution designers regarding the procedures that UVU requires for projects that include telecommunications distribution systems. This applies both to projects that entail primarily telecommunications distribution work (such as telecommunications infrastructure replacement projects) as well as to architectural projects and other work (such as a new building) that involve telecommunications design.

B. This section is not intended to supersede State of Utah contract requirements, but rather to complement them, providing additional requirements that apply specifically to telecommunications design projects at UVU facilities.

C. It is intended that the requirements in this section be considered contractually binding for professional design firms providing telecommunications design services.

3.1 Designer Qualifications

A. See the TIDG for other qualifications requirements and for instructions about where the services of a professional engineer and fire protection engineer are required.

B. For the purposes of this document, the term “Designer” shall mean a person who is a Registered Communications Distribution Designer (RCDD) who is currently in good standing with BICSI. Telecommunications designs on UVU projects shall be produced by the RCDD. This means that the telecommunications design shall be produced by the Designer. UVU’s communications with the telecommunications consultant shall be mainly through the RCDD. On projects where the RCDD is not the prime consultant, the RCDD shall keep the prime consultant (Architect/Engineer (A/E)) informed of all direct communications with UVU.

- The Registered Information Technology Professional (RITP) certification from BICSI is not an acceptable substitute for the RCDD.

C. In addition to the RCDD certification, it is preferred that the RCDD have one or more of the following qualifications.

- Professional Engineer (P.E.) in the electrical engineering field
- RCDD/ESS certification from BICSI
- RCDD/OSP certification from BICSI

D. In addition, the RCDD shall have the following qualifications.

- The RCDD shall demonstrate a minimum of 5 years of experience in the design of inside plant telecommunications distribution systems. Experience designing telecommunications infrastructure on UVU projects is desirable, but is not required.

- Experience not directly related to the design of telecommunications distribution systems, such as sales and/or marketing, project management, or installation experience, is not sufficient.
- The RCDD shall demonstrate that he/she has designed or has had personal design oversight of a minimum of five projects similar in size and construction cost to the current UVU project.
- The RCDD shall be independent from and unaffiliated with any manufacturer associated with the telecommunications distribution system industry.
- The RCDD shall be completely familiar and conversant with industry and UVU telecommunications standards.

3.2 Procedures Related to Project Phases

In addition to the procedures described in the TIDG Section 3.5 for each project phase, the following requirements are specific to telecommunications infrastructure:

3.2.1 CONSTRUCTION OBSERVATION

3.2.1.1 CABLE TRAYS

Verify that the installed cable trays meet the following requirements:

- Wherever cable tray passes through a wall, the wall penetration shall be finished (no sheetrock visible) and firestopped if the wall is a fire-rated wall.
- To protect technicians and cabling, all cuts to cable tray materials shall be finished smooth. Cable trays shall not have rough or sharp edges or points.
- Each segment of the cable tray requires a ground conductor bonding lug.
- When cable trays, walls and ceilings are painted, care shall be taken to not paint the cabling. Cable manufacturers will not warrant any painted cabling.

3.2.1.2 CABLE LABELING

Verify that cable labeling matches actual room numbering. Sometimes room numbering can change late in the project, and the labeling should adjust to match final room numbering.

3.3 General Procedures

3.3.1 PROCUREMENT AND INSTALLATION

A. The Designer shall inquire which procurement method will be used for a particular project. The construction documents prepared by the Designer shall be suited for the procurement method designated for the project.

B. Typically, the construction contract scope of work includes the complete telecommunications infrastructure (pathways, spaces, cabling and terminations).

- The network electronics are usually handled as a separate contract managed by UVU IT Infrastructure Services.

4 Design Criteria

A. The UVU TDDG is not intended to be a comprehensive design guide resource for telecommunications design at UVU facilities. The Designer shall refer primarily to the BICSI TDMM for design guidance. The Construction Documents produced for each project shall be consistent with the installation practices described in the BICSI Information Transport Systems Installation Methods Manual (ITSIMM).

B. Where ANSI/TIA/EIA standards or BICSI manuals offer multiple choices with a preferred method identified, and where the UVU TDDG does not select one method over another or define specific requirements precluding use of the preferred method, the ANSI/TIA/EIA or BICSI-preferred method shall be selected.

C. Where ANSI/TIA/EIA Standards or BICSI manuals identify warnings regarding potential adverse effects from certain design or installation methods, the design or installation method used shall typically be the method with the least potential for adverse effects. The Designer shall notify the UVU TPM of any such decisions.

D. Any request to deviate from the requirements of the National Electrical Code or the manufacturer's warranties will not be accepted. The Designer shall seek approval for designs that are not consistent with UVU TDDG requirements through the UVU Standards Variance Request (SVR) process. Requests to deviate from industry standards or UVU design solutions will be considered on a case-by-case basis by the UVU TPM. Designers may contact the UVU TPM to discuss proposed alternatives before spending significant time researching or preparing an SVR.

E. Telecommunications distribution infrastructure shall fully comply with the current UVU TDDG, the current ANSI/TIA/EIA Commercial Building Telecommunications Standards and the National Electrical Code (NEC).

F. Please refer to the Bibliography and Resources section and Glossary section of the BICSI TDMM for definitions, abbreviations, acronyms and symbols used for describing and documenting telecommunications infrastructure at UVU facilities.

G. The following subsections are arranged to mirror the chapter sequence of the BICSI TDMM 13th Edition (the subsection numbers below are in the form of 4.x where x corresponds with the chapter number in the BICSI TDMM).

- Each TDDG subsection contains commentary and requirements regarding the application of the BICSI TDMM to UVU projects. In particular, each section contains limitations and prohibitions on specific materials and methods discussed in the BICSI TDMM.

4.1 Principles of Transmission

Please refer to Chapter 1, *Principles of Transmission* in the BICSI TDMM for general information regarding the design of telecommunications distribution infrastructure.

4.2 Electromagnetic Compatibility

Please refer to Chapter 2, *Electromagnetic Compatibility* in the BICSI TDMM for general information regarding the electromagnetic interference (EMI) with and clearance requirements for telecommunications infrastructure. The following requirements take precedence over the BICSI TDMM guidelines for telecommunications infrastructure at UVU facilities:

A. The BICSI TDMM includes tables listing minimum separation distances from sources of EMI. Telecommunications infrastructure shall not be installed closer than the minimum separation distances listed in the BICSI TDMM. Where the NEC or local codes require greater separation distances than those listed in the BICSI TDMM, the greater separation distance shall be maintained.

B. Separation distances apply equally to both copper cabling and fiber optic cabling. Even though fiber optic cabling is impervious to EMI, once a pathway is established for fiber, it could later be used for copper cabling.

C. OSP telecommunications infrastructure designs shall adhere to the governing clearance requirements of the NEC and NESC.

4.3 Telecommunications Spaces

Please refer to Chapter 3, *Telecommunications Spaces* in the BICSI TDMM for general information regarding the design of telecommunications rooms. The following requirements take precedence over the BICSI TDMM guidelines for telecommunications infrastructure at UVU facilities:

A. In UVU facilities, the TRs in a building may also serve as low-voltage systems equipment rooms, typically containing electronic equipment intended to serve the building or a portion of the building. The TR shall not be shared with electrical installations other than those necessary for telecommunications.

4.3.1 TELECOMMUNICATIONS ROOM LOCATION

A. The Designer shall be responsible to inform the Architect of the sizing and location requirements for Telecommunications Rooms during the Schematic Design phase of the project.

B. The most desirable location for telecommunications rooms shall be located as centrally and closely as possible to the area being served. In addition, for multi-story buildings, telecommunications spaces shall be vertically aligned. This allows for clean, vertical pathway to be easily provided to each space. It also

reduces the number of bends and offsets that the intra-building backbone pathway must undergo as it connects each of the telecommunications rooms. Please see the discussion in TDDG Section 4.4.1 Intra-building Backbone Pathways for further information.

C. There shall be a minimum of one TR per building. Additional TRs shall be added when the area to be served exceeds 10,000 square feet or where the cable lengths will exceed 295 feet between a TR and the work area telecommunications outlet, including allowance for cable slack loops. Generally, each floor of a building shall be served by a TR located on that floor.

1. When specifically approved by the UVU ITPM, a TR may be designed to serve multiple floors of a building.

D. Telecommunications Rooms shall not be co-located with any type of electrical room or mechanical room. The TR location shall maintain the separation distances identified in the Electromagnetic Compatibility subsection of this document.

E. The telecommunications room shall not be located in any of the locations listed below:
1. Areas subject to water or steam infiltration, particularly basements. Floor drains (with deep traps and/or other method to prevent backflow and entry of gasses) are required if there is any risk of water entry. Do not use trap primers.
2. Areas exposed to excessive heat or direct sunlight.
3. Areas exposed to corrosive atmospheric or environmental conditions.
4. Near or adjacent to potential sources of electromagnetic interference (EMI) or radio frequency interference (RFI) such as large electric motors, power transformers, arc welding equipment, or high-power radio transmitting antennas.
5. In a shared space with electrical equipment other than equipment serving the telecommunications system.

4.3.2 TELECOMMUNICATIONS ROOM SIZING

A. Telecommunications rooms shall typically be one of the following sizes in Table 4.4 below (or larger where required):

Table 4.1 Telecommunications Room Sizes (Interior Dimensions)

MDF Dimensions	# of Racks	Day 1 Design Limitations	MDF Comments
20’ x 10’	**6**	**336 CAT6A / 13 Fiber Cables**	**Standard MDF**
16’ x 12’	6	336 CAT6A / 13 Fiber Cables	Only when specifically approved by the ITPM
17’ x 10’	5	336 CAT6A / 8 Fiber Cables	Only when specifically approved by the ITPM
15’ x 10’	4	336 CAT6A / 6 Fiber Cables	Only when specifically approved by the ITPM
16’ x 9’	4	336 CAT6A / 6 Fiber Cables	Only when specifically approved by the ITPM

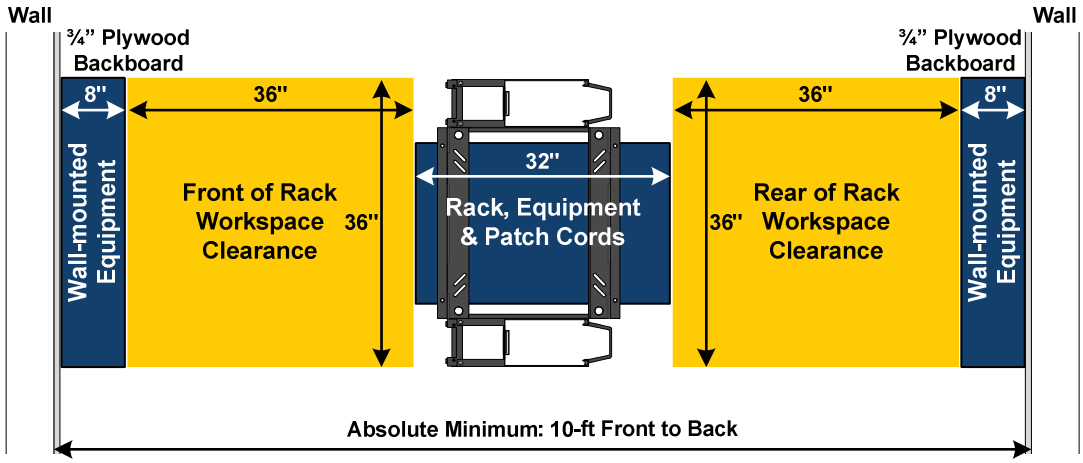
IDF Dimensions	# of Racks	Day 1 Design Limitations	IDF Comments
15' x 10'	4	336 CAT6A / 6 Fiber Cables	Commonly used
16' x 9'	4	336 CAT6A / 6 Fiber Cables	Commonly used
12' x 10'	**3**	**288 CAT6A Cables**	**Standard IDF**
9' x 10'	2	**192 CAT6A Cables**	Only when specifically approved by the ITPM
6' x 10'	1	**96 CAT6A Cables**	Only when specifically approved by the ITPM
4' x 10'	1	**96 CAT6A Cables**	Only when specifically approved by the ITPM

Please note that the above room sizes are minimum interior dimensions, and are not representative of acceptable square footage allocations.

- For example, a 12' x 10' space totals 120 square feet. A 5' x 24' room would be an unacceptable space, even though it also totals 120 square feet.
- Telecommunications rooms shall be rectangular. Unconventional shapes are not acceptable.
- All room dimensions listed in this document are interior dimensions, independent of the thickness of the walls.

See the sample telecommunications room plan drawings in Appendix 6.3 of the TDDG for further information.

B. The 10' dimension is derived from the following space allocation requirement:



C. If project circumstances prevent the establishment of adequately-sized telecommunications spaces, the following options may be considered on a case-by-case basis, subject to the approval of the UVU ITPM:

1. Reach-in closets and small room designs for minor remodel construction projects may be considered through the SVR process.
2. Wall-mounted swing cabinets may be appropriate for some remodel applications serving small numbers of people and where floor space for a full telecommunications room would be unavailable or impractical.

D. Telecommunications room sizing shall be increased if other low-voltage systems

equipment is intended to be hosted in the TR; for example, fire alarm panels, security system equipment, etc. The Designer shall seek input from the UVU ITPM regarding room sizing.

E. Telecommunications rooms in new construction and modernization projects shall be sized such that ADA-required space is available after racks and equipment have been installed.

4.3.3 ARCHITECTURAL PROVISIONING

A. The Designer shall be responsible to inform the Architect early in the Design Development phase of the project of the architectural provisioning requirements for Telecommunications Rooms.

B. The Designer shall be responsible to review project documents and determine that the architectural requirements for the telecommunications spaces are met as described in this document. For projects where an Architect is involved, the Designer shall coordinate directly with the Architect, and verify that the Architect's design documentation meets these requirements. For projects without an Architect, the Designer shall alert UVU where additional architectural adjustments are needed to meet the requirements.

C. Doors shall open out (180-degree swing) from telecommunications spaces wherever possible and shall be a minimum of 36" wide and 80" high, fitted with a strike cover, lock and electronic access control. Coordinate lock and key requirements with UVU. Doors shall be located in hallways or other common areas. Telecommunications room doors shall never be located in another building occupant's designated space.

D. Minimum clearance height within a telecommunications space shall be 8 feet. False ceilings (t-bar ceilings, ceiling grids, etc.) shall not be installed in telecommunications spaces. The floor, walls, and ceiling shall be sealed to reduce dust.

E. Finishes shall be light in color to enhance room lighting. Flooring materials shall be light colored and slip resistant – carpet is not acceptable for telecommunications rooms. Interior floor finish and floor covering materials shall also meet the requirements in the International Building Code.

F. The walls in telecommunications rooms shall be covered with plywood and shall be fire retardant. There are two approved methods to accomplish this:

- Plywood that has been treated with fire retardant chemicals by a pressure impregnation process, then painted with primer and two coats of white paint.

- Untreated plywood that has been painted with a UL-listed, non-toxic fire retardant intumescent coating having a Class A surface flame spread rating. A small plaque shall be attached to the backboard near the door, listing the fire spread rating of the backboard, the manufacturer and the product number

of the fire-retardant intumescent coating. This information may be helpful for future maintenance activities and to satisfy the authority having jurisdiction.

Plywood backboards shall extend from 6” above the floor up to a height of 8’6” above the finished floor.

All painting shall be completed prior to the installation of telecommunications equipment.

4.3.4 ENVIRONMENTAL PROVISIONING

A. Environmentally friendly solutions shall be considered in the design of cooling systems for technology spaces, incorporating heat reclamation and non-mechanical cooling features where reasonable and practical. Utah DFCM requires LEED Silver for new buildings.

B. The Designer shall be responsible to inform the Mechanical Engineer early in the Design Development phase of the project of the environmental provisioning requirements for Telecommunications Rooms.

C. The Designer shall be responsible to determine that the mechanical HVAC requirements for the telecommunications spaces are met as described in this document. For projects where a Mechanical Engineer is involved, the Designer shall coordinate directly with the engineer, and verify that the engineer’s design documentation meets these requirements. For projects without the involvement of a Mechanical Engineer, the Designer shall alert UVU where adjustments to the mechanical infrastructure are needed to meet the requirements.

D. The Designer shall coordinate with the Mechanical Engineer to ensure that the HVAC requirements for the telecommunications spaces are met and also that HVAC ductwork and motors do not conflict with cable tray or conduit routing.

   a. Minimum clearance height in the TR shall be eight feet without obstructions (light fixtures, ducting, etc.).

E. In addition to the requirements in the BICSI TDMM, telecommunications rooms shall be environmentally provisioned as follows:

   1. A fundamental design assumption is that all TRs will at some time contain active electronic equipment (hubs, routers, switches, etc.) even if the current design does not call for such devices. Network electronics require an HVAC system capable of operating on a 24 / 7 / 365 basis. If the building system cannot assure continuous cooling operation, a stand-alone cooling unit shall be provided for the TR.

      - This unit and any roof penetrations shall be located away from and not directly above electronics of any kind, to avoid damage from condensate drip and roof leaks.

In addition, a positive pressure differential with respect to surrounding areas is required to help keep dust and other particles out of the room.

- Where practical, UVU encourages the use of heat reclamation features.
- Environmental management and monitoring systems shall be designed for TRs.
- Typically, the building's central air conditioning system should cool the telecommunications rooms during summer months. During the months when the central air conditioning system is not running, a stand-alone air conditioning system shall be used to cool the telecommunications rooms.
- The temperature controls (including a thermostat) shall be located inside the telecommunications rooms and connected to the building environmental control system. Alarm conditions shall be configured to alert both IT and Facilities personnel.
- The heat load in some small telecommunications rooms can be low enough that simply exhausting the air may be sufficient to maintain the temperature in the room. In these cases, positive pressure must still be maintained in the space to prevent the collection of dust.

2. UVU typically provides network electronics that provide Power-over-Ethernet. The Designer shall request power consumption data for the equipment that UVU will use, and work with the mechanical systems designer to ensure that the cooling capacity is sufficient to support the POE heat load.

4.3.5 FIRE SUPPRESSION SYSTEMS

A. UVU prefers dry-type preaction fire suppression systems in telecommunications rooms.

- Sprinkler guards shall be provided where sprinklers are installed less than 8 feet above the floor.
- Sprinkler heads and sprinkler piping shall not be located our routed directly above equipment racks or the equipment they will contain.

4.3.6 CABLE TRAY ENTRANCE

A. Horizontal cabling shall be routed into telecommunications rooms via cable tray entrance slots permitting the tray to pass through the walls, protruding 2" into the room. Cable trays shall terminate above the ladder racking in the telecommunications rooms and have a radius fitting ("waterfall") to protect the cabling as it drops to the ladder rack.

B. See Section 4.7 *Firestop Systems* for requirements for treating fire-rated walls through which cable trays pass.

C. The Designer shall design cable trays and entrance slots sufficient to support the maximum number of cables that the room can accommodate (twice the Day-1 design limit).

D. See Appendix 6.3 for examples of cable tray entrance slots.

E. See Appendix 6.2 for rack elevation samples indicating the total number of cables allowable for Day 1, and also showing the additional future 48-port patch panels that the racks could support if necessary.

4.3.7 FLOOR-STANDING EQUIPMENT RACKS AND CABINETS

A. Each telecommunications room shall be provisioned with a full set of floor-standing 7' high x 19" wide ANSI/TIA/EIA standard open-frame equipment racks to fill the room, regardless of whether or not equipment is required at the time of construction.

- For minor remodel construction, this requirement may be waived given budget, project size, or other limiting factors.
- The use of a wall-mounted swing rack or a wall-mounted hinged bracket may be acceptable, subject to UVU approval via the SVR process.

B. The rack arrangement shall be selected from the options shown in Appendix 6.2, and shall be sized to accommodate, at a minimum, all existing and new equipment that is to be installed in the rack plus an additional 50% of space for additional equipment that may be added in the future.

4.3.7.1 FLOOR-STANDING EQUIPMENT RACKS

A. See the sample floor plan details in Appendix 6.3 of the TDDG for rack arrangement guidance.

B. Floor-standing racks shall be securely bolted to the floor, and shall be braced to the wall with cable ladder racking. Multiple racks in the same TR shall be interconnected with cable ladder racks.

C. Racks shall be equipped with horizontal and vertical cable management modules both front and rear, with strain relief brackets to support proper cable bend radius and to maintain strain relief for the cabling. Vertical cable management modules shall include spools/posts to manage cable slack.

1. Vertical cable management between racks shall be 12" wide.
2. Vertical cable management on the sides of racks shall typically be 6" wide. Some applications, however, may require 8" or 10" wide vertical cable management.

D. Sometimes an equipment cabinet is required for larger IT equipment (servers, large UPSs, etc.) with both front and rear mounting rails. The Designer shall discuss with UVU the network electronics that will be hosted in each TR and shall design appropriate racks and cabinets to support the equipment. Racks and cabinets shall be shown on the rack elevation details in the plan drawings.

E. Ladder racking shall be provided at 7 feet above finished floor, circling the room and crossing the room over the tops of the equipment racks, as shown in Appendix 6.3 and Appendix 6.4.

4.3.7.2 TELECOMMUNICATIONS CABINETS

A. When planning the size and location of TRs in existing buildings, the Designer shall make every reasonable effort to meet the requirements for telecommunications rooms. In certain instances, the only viable alternative may be the use of one or several telecommunications cabinets in lieu of TRs.

B. UVU uses wall-mounted cabinets in Lab spaces.

C. In minor remodel projects, some buildings may not justify a separate room as the telecommunications room. In some circumstances, sufficient space may not be available for a telecommunications room. In these instances, a wall-mounted or floor-standing telecommunications cabinet may be used.

D. Wall-mounted cabinets shall be double-hinged to permit access to both the front and rear of the equipment. Care shall be taken to specify cabinets with strong hinges that do not begin to sag over time due to the weight of the cabinet's contents. Telecommunications cabinets shall be constructed of heavy gauge steel with lockable doors:

- If the cabinet will be located in an occupied space, use a Plexiglas® door to reduce noise.
- If the cabinet is not located in an occupied space, use a mesh-screened door to improve ventilation.

D. Cabinets shall be sized to allocate space for cabling termination infrastructure, network electronics, and UPS equipment, and shall also include space allocated for future growth. Wall space shall be allocated to permit cabinets to fully swing open.

E. Cabinets shall be equipped with horizontal wire management modules with strain relief brackets to support proper cable bend radius and to maintain strain relief for the cabling.

F. Power and telecommunications cables for equipment housed within the cabinet are to be contained within the cabinet. Exposed wiring or cables are not permitted. Power and telecommunications cables routed to or from the cabinet shall be contained in conduit, surface-mounted raceway, or concealed within the adjacent wall.

- Technical power outlets serving cabinets shall be mounted inside the cabinet.

G. Each cabinet that hosts equipment that produces a significant heat load shall have front and rear screen doors, allowing air flow through the equipment. Cooling fans are typically not required.

H. Each cabinet shall have a telecommunications grounding busbar (TGB) installed inside, in accordance with the grounding requirements discussed in the BICSI TDMM Chapter 8 *Bonding and Grounding (Earthing)*.

I. The cabinet shall not be located in or adjacent to areas containing sources of electromagnetic interference (EMI). See TDDG Section 4.2 *Electromagnetic Compatibility* (above) for further information.

4.3.8 POWER REQUIREMENTS

A. The Designer shall be responsible to determine that the power requirements for the telecommunications spaces are met as described in this document. For projects where an Electrical Engineer is involved, the Designer shall coordinate directly with the engineer, and verify that the engineer's design documentation meets these requirements. For projects without the involvement of an Electrical Engineer, the Designer shall alert UVU where additional power infrastructure is needed to meet the requirements.

B. UVU typically provides network electronics that provide Power-over-Ethernet. The Designer shall request power consumption data for the equipment that UVU will use, and work with the electrical power distribution designer to ensure that the cooling capacity is sufficient to support the POE heat load.

4.3.8.1 BACKUP POWER (GENERATOR & UPS)

A. All telecommunications rooms require backup power from both a standby generator and an uninterruptible power supply (UPS). Devices that depend on Power-over-Ethernet to operate require that network switches remain operational. The UPS equipment is intended to provide power long enough to allow the generator to strike up and deliver stable power.

B. The Designer shall work with the Electrical Engineer to design an appropriately sized standby generator to provide power to:

- All telecommunications rooms
- All mechanical cooling serving telecommunications rooms

C. UVU typically provides rack-mounted UPS equipment.

- Centralized UPS equipment is primarily reserved for data center-class spaces. The Designer shall inquire with UVU on a project-by-project basis whether a centralized UPS is desired for the project.

D. The Designer shall work with the Electrical Engineer to design appropriate power receptacles that will be suitable to serve the Owner-provided UPS equipment that will be used on the project.

E. The Designer shall reserve sufficient space at the base of an equipment rack in

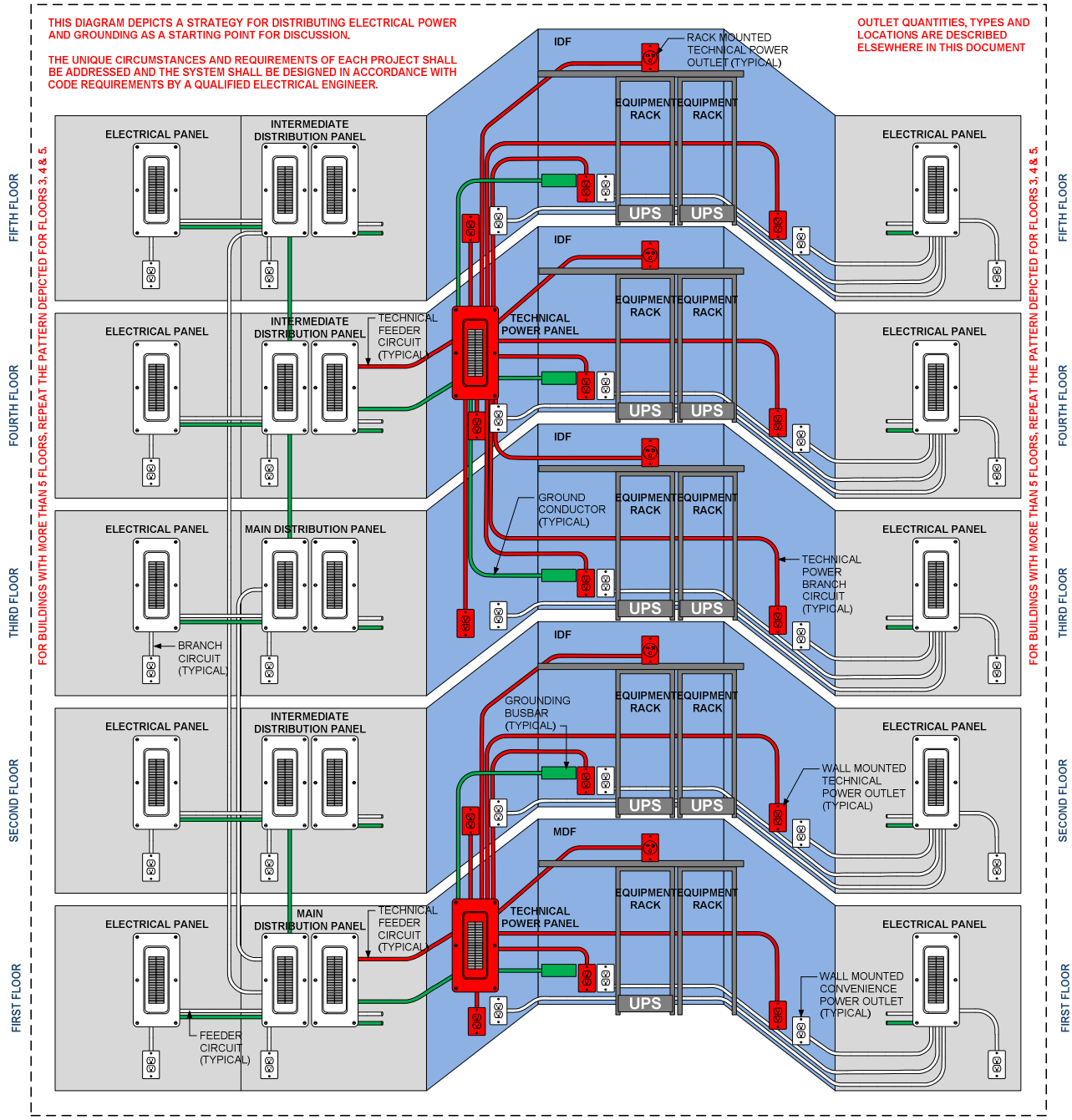
each telecommunications room to hold the Owner-provided UPS equipment.

4.3.8.2 ELECTRICAL POWER PANELS

A. The technical power circuits in each telecommunications room shall originate from an electrical power panel (non-dedicated) located **outside** of the telecommunications room. In the absence of other influencing circumstances, the panel shall be sized for 100 Amp service (minimum). The power panel shall not be used to supply power to sources of EMI such as large electric motors, arc welding, or industrial equipment.

B. The following diagram depicts UVU's strategy for distributing technical power to telecommunications rooms, with UPS equipment distributed to each telecommunications room:

POWER AND GROUNDING FOR TELECOMMUNICATIONS ROOMS WITH DISTRIBUTED UPS EQUIPMENT



4.3.8.3 TECHNICAL POWER OUTLETS

A. The Designer shall obtain electrical power connection/load requirements from UVU for each piece of equipment, and tabulate the information for review and

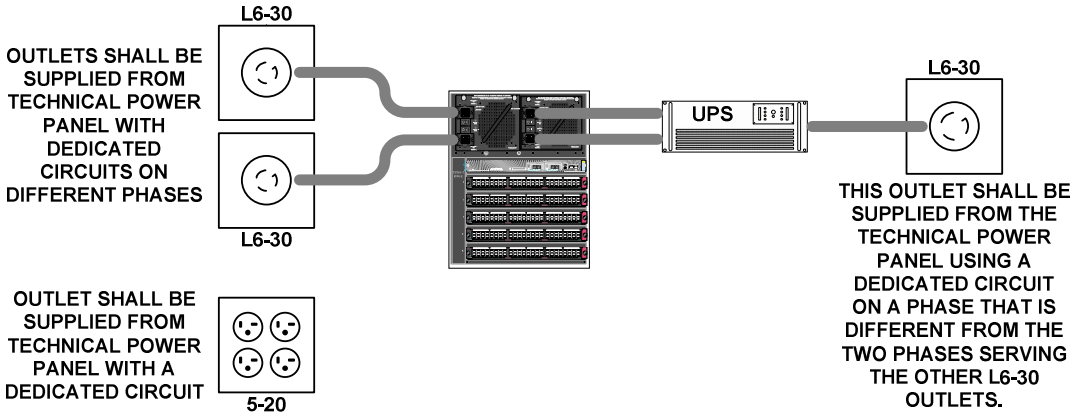
confirmation by UVU. This equipment may include network electronics, UPS equipment, computers/servers, phone system equipment, voice mail systems, video equipment and service provider equipment.

B. UVU intends to provide UPS equipment for each telecommunications room that requires two 240V 30 Amp power sources:

- One with unconditioned utility power
- One with generator-backed power

The Owner-provided UPS equipment will have 110VAC or 240VAC outlets to meet the needs of the Owner-provided network equipment, and will connect to power distribution units supporting rack-mounted equipment. The Designer shall show a power strip in the middle of racks (on back side) containing active electronics.

The diagram below depicts the required power architecture:



C. At least two power outlets shall be provided (each with dedicated circuits) for exclusive use by telecommunications-related electronic equipment.

- Outlets shall be colored orange, and shall show the panel and circuit numbers.
- Where 110VAC Technical power outlets are required, outlets shall be equipped for “straight-blade plugs” (NEMA 5-20R), rather than twist-lock style receptacles.
- Where 240VAC Technical power outlets are required, the Designer shall inquire with the UVU ITPM to determine the plug requirements for the equipment to be served.
- Each outlet shall be equipped with a dedicated insulated solid copper equipment-grounding conductor. Ground conductors serving technical power outlets shall ***not*** be *isolated* ground conductors.
- See the telecommunications room plan details in Appendix 6.3 of the TDDG for technical power outlet locations.

D. The Designer shall specifically investigate the potential need for voltage or current requirements other than the typical 110VAC/20 Ampere power outlet. Some UPS and network switch equipment requires specialized plugs or electrical service. The Designer shall inquire with the UVU ITPM to determine whether any dedicated or specialized circuit requirements exist.

E. Care shall be taken during the design process and during construction observation to make sure that power outlets are located such that they are conveniently aligned with the equipment racks to avoid inadvertent disconnection of the power cords.

4.3.8.3.1 FOR NEW CONSTRUCTION AND MODERNIZATION PROJECTS

A. Faceplates for power receptacles and light switches in the TR shall be mounted at the surface of the plywood backboard (as opposed to being recessed into a cutout in the plywood backboard). The device boxes shall be recessed into the wall, and the conduits shall be concealed in the wall (not surface-mounted).

B. Conduits serving convenience power outlets shall be concealed in walls behind backboards.

C. In addition to the outlets intended to serve the racks, a minimum of one duplex technical power outlet shall be provided per wall (centered on the wall) except for the wall adjacent to the racks. For walls more than 10' in length, a minimum of 2 outlets shall be provided, and at intervals of no more than 6 feet between outlets.

4.3.8.3.2 FOR MINOR REMODEL PROJECTS

Where telecommunications backboards are applied to existing walls with existing power outlets and light switches, the design shall require backboards to be provided with cutouts permitting access to the existing electrical devices.

4.3.8.4 CONVENIENCE POWER OUTLETS

Convenience power outlets shall be provided on telecommunications room walls for use with power tools and other non-technical devices. Conduits serving convenience power outlets shall be concealed in walls behind backboards.

4.3.9 GROUNDING, BONDING, AND ELECTRICAL PROTECTION

All equipment racks, metallic conduits and exposed non-current-carrying metal parts of telecommunications and information technology equipment in the TR shall be bonded to the TMGB or TGB. Refer to Chapter 8 *Bonding and Grounding* in the BICSI TDMM and TDDG Section 4.8 *Bonding and Grounding (Earthing)* for more information regarding the design of grounding, bonding and electrical protection systems.

- Grounding and bonding conductors shall be sized according to the requirements in ANSI/TIA/EIA J-STD-607A.

4.3.10 CABLES ENTERING TELECOMMUNICATIONS ROOMS

All cables shall be fully supported and properly transitioned throughout their lengths, including proper bend radius fittings at pathway transitions.

Where cabling is routed vertically, it shall be appropriately secured such that the weight of the cabling does not subject the cabling to stresses that could potentially reduce the performance of the cabling.

- Provide vertically oriented ladder racking, attached to walls, to carry riser/backbone cabling vertically between telecommunications rooms.

4.3.11 PROHIBITED ITEMS

The following items shall not be located in telecommunications rooms:

- Electrical power transformers
- Electrical power panels
- Lighting control panels
- EMI-producing equipment such as HVAC VAV boxes.
- Water piping (except for fire suppression systems)

4.3.12 ENTRANCE FACILITIES

4.3.12.1 OUTSIDE PLANT CONDUIT ENTRANCE

All UVU utility services are delivered to the main demarc on campus. Therefore, the concept of an Entrance Facility at UVU's buildings is limited to entrance conduits from the outside plant into the main telecommunications room in the building. Typically, UVU prefers to co-locate the entrance facility with the main telecommunications room.

4.3.12.2 ROOFTOP CONDUIT ENTRANCE

The top most telecommunications room in each building shall have a minimum of two 2" conduits routed to the roof. The conduits shall be terminated above the roof with a weatherhead.

Rooftop conduits can be used to serve antennae for service inputs (satellite, emergency responder radio, cellular service) or provide pathway for cabling serving cameras or other devices mounted on the roof.

4.3.13 SERVER ROOMS

For projects that include server rooms or equipment rooms, the requirements of Section 4.3 *Telecommunications Spaces* apply. The following additional features are required for server rooms. (For full-scale Data Centers, see Section 4.18 *Data Centers* below.)

4.3.13.1 RAISED / ACCESS FLOOR

Server Rooms shall have raised/access flooring (minimum depth of 12") to support cable tray and cabling without restricting airflow.

Floor tiles shall have an anti-static finished surface, without carpet. Tiles shall be 2'x2' in size and non-concrete filled. Tiles shall be held in place by friction and not screwed in place.

Flooring materials and cable tray shall be properly grounded.

4.3.13.2 ELECTRICAL POWER

Conditioned power that is protected with UPS and connected to a generator backup system shall be provided, typically distributed below the raised flooring to adequately support computer equipment that is installed in the server room.

Power distribution equipment shall not be housed in the server room, including transformers, UPS equipment, electrical panels and large PDU equipment.

The Designer shall coordinate the efforts of the Electrical Engineer to be sure that these features are included in the design. The Designer shall involve the UVU ITPM to accurately assess the power load requirements of the Owner-provided equipment.

4.3.13.3 LOCATION

The server room shall be located adjacent to the MDF.

4.3.13.4 PATHWAYS

Cable tray pathways shall route directly between the MDF and the server room.

Like telecommunications rooms, server rooms shall have a horizontal ladder rack circling the room and crossing the room a few inches above all equipment racks/enclosures.

4.3.13.5 ENVIRONMENTAL PROVISIONING

In addition to temperature, humidity control shall also be connected to the building environmental control system. Alarm conditions shall be configured to alert both IT and Facilities personnel.

Server rooms shall have a secondary/backup heat displacement system that is manually controlled, reversible from outside-supply to outside-exhaust.

The Designer shall coordinate the efforts of the Mechanical Engineer to be sure that these features are included in the design. The Designer shall involve the UVU ITPM to accurately assess the heat loads associated with the Owner-provided equipment.

4.3.13.6 SECURITY

In addition to access control, surveillance video monitoring shall be provided.

4.4 Backbone Distribution Systems

Please refer to Chapter 4, *Backbone Distribution Systems* in the BICSI TDMM, Chapter 5, *Cabling Infrastructure* and Chapter 6, *Pathways and Spaces* in the BICSI OSPDRM, and Chapter 2, *Pathways and Spaces* in the BICSI ITSIMM for general information regarding the design of backbone distribution pathway and cabling. The following requirements take precedence over the guidelines in those documents for telecommunications infrastructure at UVU facilities:

4.4.1 INTRA-BUILDING BACKBONE PATHWAYS

A. Intra-building backbone pathway shall utilize a physical star topology. The Designer, however, shall inquire whether another pathway topology would be appropriate for a given application. Backbone raceway shall consist of conduit, chases or shafts, sleeves, and/or vertically-mounted ladder racking.

B. All cables shall be fully supported and properly transitioned throughout their lengths, including proper bend radius fittings at pathway transitions. Where cabling is routed vertically, it shall be appropriately secured such that the weight of the cabling does not subject the cabling to stresses that could potentially reduce the performance of the cabling.

C. In new construction and remodel projects:

1. The main telecommunications room in the building shall have a direct pathway connection to the entrance facility.

2. All intermediate telecommunications rooms shall have direct pathway connections to the main telecommunications room in the building.

   - This is usually accomplished with vertical riser pathway (Specified Technologies Inc. (STI) Ez-Path).

3. For buildings requiring multiple intermediate telecommunications rooms on a given floor, the secondary telecommunications rooms do not require a direct backbone pathway to the main telecommunications room. Instead, the first intermediate telecommunications room on a floor shall have a direct pathway. The other telecommunications rooms shall connect to the first via the main cable tray on that floor.
   - This solution is typically adequate when backbone cables are relatively small compared to the horizontal cable load in the cable tray.
   - Even though ***pathway*** from one telecommunications room may connect to another telecommunications room before connecting to the

main telecommunications room, backbone ***cabling*** shall not cross-connect in the interposing telecommunications room. Intra-building backbone cabling shall be continuous (non-spliced) between the main telecommunications room and each intermediate telecommunications room.

4.4.1.1 BACKBONE RACEWAY SIZE AND QUANTITY REQUIREMENTS

A. Future growth requirements shall be considered when sizing intra-building backbone pathways. The cost to install additional spare pathways during initial construction is significantly less than the cost of retrofitting additional pathway in the future.

B. In general, for new construction and modernization projects, UVU requires a minimum of four 4" Ez-Path sleeves leaving the main telecommunications room/entrance facility enroute to the intermediate telecommunications rooms on floors above. However, for buildings higher than five floors, additional Ez-Path sleeves shall be provided.

4.4.1.1.1 SINGLE-STORY BUILDINGS

A. For single-story buildings with multiple telecommunications rooms, 4" conduit pathways shall be routed through the ceiling, not in or under the floor slab. The Designer shall determine the number of 4" conduits required to serve initial and future backbone cabling requirements.

1. In cases where it is not possible to route 4" conduits to each of the telecommunications rooms, three 2" conduits may be substituted for each required 4" conduit.

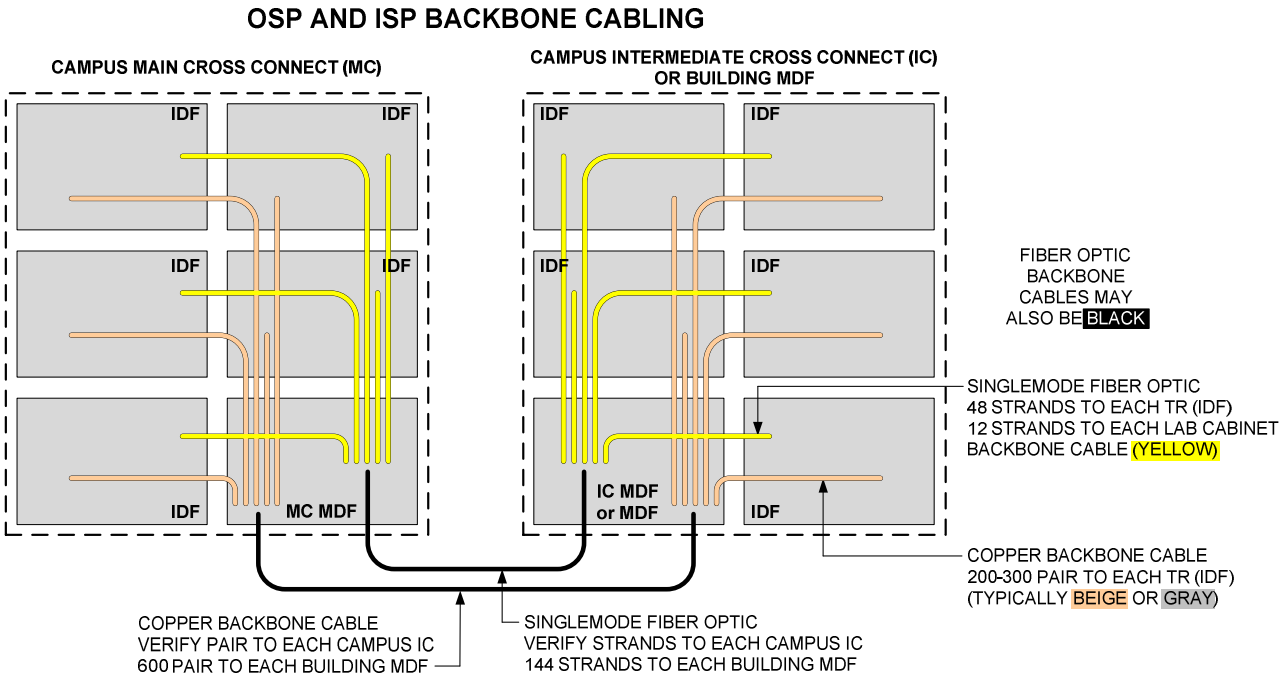
4.4.1.1.2 MULTI-STORY BUILDINGS

A. In new construction and modernization projects, telecommunications rooms shall be vertically aligned (stacked) floor-to-floor wherever possible. Sleeved vertical pathways shall be extended to the roof (or to an attic space with access to the roof) to facilitate access for future antennas or other telecommunications equipment. Conduits terminating on a roof shall be capped with a weatherhead.

B. Ladder racking shall be vertically-mounted in the stacked telecommunications rooms to route and support backbone cable passing from the room below to upper rooms.

4.4.2 INTRA-BUILDING BACKBONE CABLING

The diagram below depicts intra-building and inter-building backbone cabling requirements (including strand and pair counts) for UVU buildings:



4.4.2.1 INTRA-BUILDING BACKBONE CABLE TYPES

A. UVU uses two types of telecommunications cabling for intra-building backbone systems:

- Multipair copper voice backbone cable
- 8/125µm OS2 singlemode fiber optic cabling (yellow color)

B. Splices are prohibited for backbone cabling.

C. Indoor-rated backbone cabling is acceptable for intra-building backbone applications between phyically contiguous buildings. This cabling must be plenum-rated.

D. Outdoor-rated cabling shall be used where buildings are not physically contiguous. This cabling must terminate within 50 ft. of entry.

4.4.2.2 STRAND AND PAIR COUNTS

A. The diagram above indicates all standard strand and pair counts.

B. Backbone cable sizing (# of strands, # of pairs) shall be considered with respect to possible future requirements. The cost to add additional backbone pairs and strands during the initial installation is significantly less than the cost of adding another cable in the future.

The Designer shall inquire with the UVU ITPM and TPM on a case-by-case basis about strand and pair counts for backbone connections between the Campus MC and a Campus IC.

4.4.2.3 PATCH CORDS

A. Patch cords with a connector boot shall be factory-manufactured by the SCS manufacturer. Patch cords shall be certified by the manufacturer to match the cable type used in the backbone cabling.

- Field-connectorized patch cords are not acceptable. Any existing field-connectorized patch cords used in areas affected by a project shall be replaced under the project with factory-manufactured patch cords.

B. See Appendix 6.1 for a diagram that depicts UVU's standard patch cord colors.

C. The Designer shall quantify and specify the required patch cords in the Contract Documents to be furnished by the Contractor for each particular project, as shown in Table 4.3, below:

Table 4.2 Patch Cord Requirements

Type & Color	Patch Cord Requirements, Quantities	Lengths
Singlemode Duplex Yellow	Require fiber optic patch cords to be furnished by the Contractor for 30% of the fiber strands terminated in the building. Half SC-LC and half SC-SC.	• 30% - 1 meter • 40% - 2 meters • 30% - 3 meters

4.4.2.4 CABLE SEGREGATION

In no case shall copper or fiber optic backbone cabling be run in the same raceways as those used by electrical power conductors. However, copper, fiber optic and other low-voltage cables are permitted to run together in shared raceways.

4.4.2.5 INNERDUCT

Plenum-rated innerduct (white colored) is required for all intra-building fiber optic installations at UVU facilities. Intra-building innerduct shall be sized 1 ¼" and shall be distributed via cable trays (not in conduit).

4.4.3 INTER-BUILDING (CAMPUS) BACKBONE PATHWAYS

The Designer shall follow the guidelines in the BICSI TDMM and the BICSI OSPDRM when designing underground outside plant pathways.

4.4.3.1 DUCTBANK

4.4.3.1.1 CONDUIT TYPES

A. UVU requires 4" Schedule 40 PVC for all outside plant pathway.

B. A 10AWG trace wire shall be installed along the route of the ductbank. The trace wire shall terminate on a ground rod in each handhole or maintenance hole. The termination shall be detachable so that the wire can be used with tracing equipment.

C. OSP conduit shall transition from PVC to PVC-coated rigid steel conduit when it enters within 10 feet of the building foundation and shall route from that point to the building entrance facility. PVC-coated, rigid steel conduit is intended to defend against the shearing effects of differential ground settling around the building foundation. It also increases the protection against future landscaping activities near the building.

- Transition back to PVC conduit after passing five feet inside the building foundation is acceptable as long as the conduit remains in or under the slab, otherwise it shall transition to rigid galvanized steel conduit.

- A maximum of fifty feet of outdoor-rated cable is permitted in a building space. Therefore, rigid galvanized steel conduit shall be used to route the cable until it is close enough to its termination point that fifty feet or less of outdoor-rated cable (including slack loops) will be exposed.

D. UVU also permits directional boring in certain applications. Conduits installed via directional boring shall be 1¼" trade size and shall be continuous from endpoint to endpoint.

E. The use of flexible metallic conduit is prohibited.

4.4.3.1.2 BURIAL DEPTH AND SLOPE

A. The preferred ductbank depth is 36" to the top of the conduit. Where this is unattainable, a 30" depth is permitted.
- Under no circumstances will ductbanks be permitted shallower than the extent of the frost zone. In Orem, the frost zone reaches 30" below the surface, according to Utah County[2].

B. Directional boring applications shall route a minimum of 48" deep, except where the conduits are surfacing.

C. Conduit to be used for routing entrance cables from third party service providers to an entrance facility shall be installed per the service providers' requirements, generally 36 to 48 inches deep. The Designer shall consult with the service providers prior to designing conduits serving an entrance facility.

[2] Click the Design Criterion tab: http://www.utahcounty.gov/Dept/ComDev/BuildingInsp/index.asp

D. A continuous drain slope should exist at all points along the ductbank to allow drainage and prevent the accumulation of water.
   - A drain slope of ¼" per foot is desirable where possible.
   - Where ¼" per foot is not possible due to inadequate natural slope or long duct runs, a drain slope of no less than 1/8" per foot is acceptable.
   - If no other option exists, the Designer shall require the Contractor to provide a "center crown" drain slope by sloping the first half of the ductbank up towards the midpoint, and then down from the midpoint to the end. Of course, the center crown technique cannot be used for conduits between a maintenance hole and a building, because water would then drain into the building.

4.4.3.1.3 CONDUIT SWEEPS (BENDS)

A. UVU has standardized on the use of factory-manufactured fiberglass sweeps with a minimum bend radius of 48" for all OSP ductbanks with the following exceptions and alternatives:

   - Shallow curves comprised of continuous lengths of individual straight RNC conduit are permissible with a minimum sweep radius of 40 feet.

   - Where cabling larger than 400-PR UTP copper is intended to be installed, conduit bends shall have a radius larger than 48". The Designer shall consult with the UVU ITPM on a case-by-case basis to select appropriately-sized conduit sweeps.

B. The Designer shall minimize the effects of sidewall pressure between the cable and conduit at bend points where possible by designing bends with the tightest bend radii to be near the cable feed end of the duct section rather than the middle or end of the duct bank.

4.4.3.1.4 DUCTBANK ENCASEMENT

UVU requires controlled-density fill (CDF) encasement with full-length reinforcement and formed sides for all ductbanks.

A. Prior to concrete being poured, the UVU ITPM or a designated representative shall observe the OSP conduit installation to identify unacceptable installations that need to be corrected prior to concrete encasement.

B. Should the use of direct-buried conduit ductbank be warranted, the Designer shall ensure that all bends in the ductbanks are encased.

C. Wherever cold-joints are required in concrete encasement, the design shall require rebar spanning the joint between ductbank encasement segments to avoid differential settling.

4.4.3.1.5 NUMBER OF DUCTS

A. The OSP pathway system shall accommodate the requirements for signal and low-voltage cabling systems at UVU facilities. The Designer shall inquire with the UVU ITPM and FPM about the potential for future buildings or building expansions that may adversely affect an existing or proposed distribution pathway, and accommodate those plans within the design.

B. The number of 4" conduits in a ductbank should meet the needs of the specific application and should offer future expansion capability. The following list is a guideline for consideration when designing a new ductbank.

- Small utility buildings up to 5,000 sq. ft.: 2 ducts (approvable on a case-by-case basis)
- Buildings up to 100,000 sq. ft.: 4 ducts
- Buildings 100,000 sq. ft. to 300,000 sq. ft.: 6 ducts
- Buildings larger than 300,000 sq. ft.: multiple redundant entrances with 6 ducts each
- Buildings serving as data centers or communications centers: 6 ducts

4.4.3.1.6 DUCTBANK LENGTH

A. In general, ductbank systems shall be designed with section lengths averaging 400 feet, and as straight as possible.

B. The maximum permissible ductbank length (between maintenance holes and/or buildings) is 600 ft. Ductbank runs that exceed this distance require intermediate maintenance holes or handholes. This requirement may be waived through the SVR process in rare cases having the following conditions:
- The ductbank run has no bends.
- The Designer can demonstrate that the pulling tension of UVU's standard OSP telecommunications cable types will not be exceeded during installation.

4.4.3.1.7 SEPARATION FROM OTHER UTILITIES

A. In general, ductbank used as pathway for telecommunications and other low-voltage cabling should not be routed with other utilities. Budgetary constraints, space limitations, and various obstructions can make this difficult to achieve at times. Should shared routing be a necessity (perhaps for overbuild construction projects), the Designer shall ensure that adequate separation exists between ducts used for telecommunications and ducts used for other utilities.

B. The pathway system shall be designed such that telecommunications and other low-voltage systems do not share conduits, maintenance holes, handholes or tunnels with the electrical power distribution system. The telecommunications distribution pathway shall also maintain minimum separation distances from electrical power distribution infrastructure as required by UVU.

The vertical and horizontal separation requirements for OSP telecommunications pathways from other underground utility infrastructure are as follows:

4.4.3.1.7.1 Proximity to Power or Other Foreign Conduits

NESC requirements state that outside plant telecommunications conduits shall not be installed closer to power conduits or other unidentified underground conduits than:

- 3” where the surrounding material is concrete
- 4” where the surrounding material is masonry
- 12” where the surrounding material is well-tamped earth

The NESC requirements above are focused on safety issues, and the performance of telecommunications systems can be negatively affected by the presence of nearby sources of EMI, even though the NESC safety-related separation requirements are met. Where the Designer is concerned about EMI due to the proximity of power distribution infrastructure, the Designer shall discuss the issue with the UVU ITPM.

4.4.3.1.7.2 Proximity to Water, Gas or Oil Conduits

Outside plant telecommunications conduits shall not be installed closer to conduits that can be identified as not containing electrical power distribution conductors than:

- 6” where the conduits cross
- 12” where the conduits run parallel to each other

Telecommunications conduits running parallel to water, gas or oil conduits shall not be installed vertically above the other conduits, but rather to the side of the conduits. This arrangement should contribute to decreased disruption to the telecommunications conduits in the event of excavation maintenance activities associated with the other nearby conduits.

4.4.3.1.8 INNERDUCT

Innerduct is required for all interbuilding fiber optic installations at UVU facilities. Both 1” and 1¼” innerduct can be used as appropriate for the application. When designing cabling runs through outside plant conduit:

1. Design copper cabling without innerduct.
2. Design fiber optic cabling runs using innerduct
3. Fill the remaining space in a used conduit with empty innerduct, with pull strings in each empty innerduct.
4. Do not fill vacant conduits with innerduct.

4.4.3.1.9 COORDINATION WITH UTILITY SERVICE PROVIDERS

The Designer shall inquire with the UVU ITPM to determine whether services from utility service providers will be necessary. If so, the Designer shall contact the utilities to obtain their entrance pathway, entrance facility and demarcation point requirements.

4.4.3.2 MAINTENANCE HOLES AND HANDHOLES

A. Most of the buildings at the UVU Orem campus are physically contiguous or connected with corridors. As a result, outside plant ductbank is primarily used for small building applications such as Converted Residential Offices. Handholes

are typically sufficient for these applications.

B. UVU has successfully used products from Oldcastle Precast, specifically polymer concrete handhole models 2436 and 3048 with a 24" body.

- The Designer shall be responsible to select an appropriate handhole for each application, especially taking into consideration the potential traffic load that may contact the handhole.

C. Typically, maintenance holes are installed for main ductbanks (i.e. ductbanks used for routing large portions of the telecommunications system backbone), and handholes/pullholes are installed for subsidiary ductbanks (i.e. ductbanks serving a single small building).

D. Maintenance holes and their covers shall be appropriately sized for the application.

- Diamond plate hinged covers are not permitted for maintenance holes at UVU.

E. Telecommunications maintenance holes and handholes shall not be shared with electrical power distribution infrastructure. In general, powered devices should not be located in telecommunications maintenance holes and handholes.

F. The number of duct entrances in a maintenance hole or handhole should be sized for both immediate and future requirements. Also, splayed duct entrance arrangements are preferred over center entrances.

- It is desirable to have ducts enter and exit from opposite ends of a maintenance hole or handhole. Sidewall duct entrances should be avoided because such entrances may obstruct racking space, cause cable bends to exceed limits, interfere with cable maintenance activities, and increase construction costs during cable installation.

- UVU recognizes that sidewall duct entry may be necessary or desirable in some circumstances. In these cases, sidewall ducts shall enter and exit at diagonally opposite corners – ducts shall not enter and exit at the midpoints of the endwalls or sidewalls. The Designer shall ensure that endwall and sidewall duct entry in a maintenance hole or handhole will not hinder access to the maintenance hole or the proper installation and maintenance of cabling.

G. Ducts shall be designed to enter the maintenance holes and handholes starting at the lowest conduit knockouts and moving upward, preserving remaining knockouts accessible for future conduit additions. The Designer shall design the duct entrances such that the relative position of each duct does not change as it enters and exits the maintenance hole or handhole. Also, the Designer shall endeavor to design ductbank arrangements so that the conduits enter and exit a sequence of maintenance holes or handholes in the same relative positions.

H. Splices in backbone fiber optic cable are not allowed, and while splices in backbone copper cable may be permitted in some rare cases (through an approved ADR), they are discouraged. However, when sizing OSP telecommunications maintenance holes, the design shall require the Contractor to provide space for possible future splice closures when required (for example, to repair cable breaks).

I. Some situations may require placement of maintenance holes at below-typical depths. In such cases, the top of the maintenance hole shall be placed at normal depth and the height of maintenance hole shall be increased through the use of intermediate riser extensions between the base and the top. UVU wishes to avoid deep-collar entrance portals wherever possible, to improve lighting and ventilation.

4.4.3.3 AERIAL DISTRIBUTION

Aerial distribution of telecommunications cabling at UVU facilities is not authorized. If an application requires aerial distribution, permission to use this method shall be requested through the SVR process.

4.4.3.4 BRIDGE AND WATERWAY CROSSINGS

A Civil Engineer shall review the construction of bridge and waterway crossing distribution systems. The design and installation shall also be reviewed by the UVU ITPM.

4.4.3.5 WIRELESS AND RADIO SYSTEM DISTRIBUTION

A. UVU facilities use wireless or radio systems for telecommunications with mobile units and personnel, both on and off campus. These systems typically use one or more radio antennas connected by cabling to radio transceiver equipment. In some cases, the radio equipment may be interfaced into the telephone system. The outside plant telecommunications substructure shall be designed with adequate cable routing pathways between antenna locations, radio transceiver locations, and the telephone backbone cabling system.

B. Radio antenna transmission cables that connect the antenna to the radio transceiver emit radio frequency (RF) radiation. These cables may be routed through the common telecommunications ductbank and maintenance hole system if necessary, but shall be routed in a separate conduit from non-fiber optic telecommunications cables. Cables containing RF radiation shall be shielded cables.

C. Radio interconnection cables (for analog or digital signaling to remote radio operating positions or to the telephone system) typically emit low levels of radio frequency radiation. These interconnection cables shall be routed through the common telecommunications ductbank and maintenance hole system. Individual conduits may be shared for these interconnection cables and other telecommunications services, and available cable pairs in telephone backbone

cables may be used for these interconnections, provided that the signaling is analog or digital signaling, and is not direct radio frequency signal.

4.4.3.6 WIRELESS AND RADIO SYSTEM DISTRIBUTION

UVU facilities frequently use rooftop satellite, wireless or radio systems. These systems typically use one or more radio antennas connected by cabling to radio transceiver equipment. Pathways shall be designed from rooftop locations down to the main telecommunications room to serve these applications.

4.4.4 CAMPUS CABLING

When OSP cabling is required, the Designer shall follow the guidelines in the BICSI TDMM and the BICSI OSPDRM.

A. The design shall require that a slack loop be installed inside the nearest maintenance hole or handhole (not stored in the TR). The Designer shall require that sufficient racking hardware be provided in the maintenance hole or handhole to support the slack loop.

B. The length of the loop shall be a minimum of 25 feet. The Designer shall consider the arrangement of the telecommunications room and the possibility of a rearrangement that might consume the cable slack. If necessary, additional slack shall be required in the design, up to the NEC limit of 50 feet of exposed OSP-rated cabling.

4.4.4.1 UTILITY SERVICES

At UVU, telephone services, cable television services and Internet services are typically provided via campus infrastructure. The Designer shall request from the UVU ITPM information about any needed telecommunications infrastructure to support the required services.

4.4.4.1.1 NON-UVU TENANT DEMARC

The Designer shall also request similar information from the UVU FPM for requirements to support non-UVU tenants of the building. Generally speaking:

- UVU does not generally provide utility services to non-UVU tenants unless specified otherwise in the client's contract with UVU.
- Any utility services needed by a non-UVU tenant shall demarc at the campus headend and then be delivered to a building via the campus backbone cabling.

4.4.4.2 WIRELESS AND RADIO SYSTEM DISTRIBUTION

A. Outdoor-rated backbone cabling shall be designed to serve rooftop satellite, wireless or other radio system applications. Lightning protection equipment shall also be designed as appropriate.

B. Radio antenna transmission cables that connect the antenna to the radio transceiver emit radio frequency (RF) radiation. These cables may be routed in a

separate conduit from other telecommunications cables. Cables carrying signals that produce RF radiation shall be shielded cables.

4.5 Horizontal Distribution Systems

Please refer to Chapter 5, *Horizontal Distribution Systems* in the BICSI TDMM for general information regarding the design of horizontal distribution pathway and cabling. The following requirements take precedence over the BICSI TDMM guidelines for telecommunications infrastructure at UVU facilities:

4.5.1 DEVICE BOX CONSIDERATIONS

A. Device boxes for telecommunications outlets shall be mounted at standard outlet mounting height, matching electrical power outlets. Typically this is 18" above finished floor.

B. Device boxes shall include double gang mud rings that support a double gang faceplate. Single gang faceplates are not acceptable. See the photo in Section 4.5.2.1, above.

C. For projects using Category 6A (Augmented) cabling, the commonly-used 4"x4" device boxes are too small to provide sufficient cable bend radius – for example, when there are 4 or more cables terminating in the box. Therefore, where device boxes are used with CAT6A cabling, 5"x5" device boxes are required, with reducing extension rings and faceplates with angled jacks. The Designer shall verify cable dimensions and bend radius limitations with the cable manufacturer to determine whether larger boxes are required.

- As of this writing, there are two known sources of 5"x5" device boxes:
  - RANDL Industries, Inc. (www.randl-inc.com)
  - Siemon (www.siemon.com)

D. Within the limitations of the project budget, the provision of spare outlets and spare ports in a work area is encouraged, to provide flexibility for future needs.

E. Both telecommunications cabling and CATV coaxial cabling are permitted to be terminated in a shared device box.

F. Device boxes intended for use with low-voltage cabling (telecommunications, CATV, etc.) shall not host electrical power receptacles or power wiring. "Combo boxes" (divided, multi-gang device boxes for power and data behind a single faceplate) are not permitted.

4.5.1.1 FLOOR BOXES

A. Device boxes shall not be mounted in the floor (i.e. "floor boxes") except where no suitable alternative exists. If device boxes must be mounted in the floor, each device box shall be served with its own individual conduit – floor boxes shall not

be “daisy-chained” together.

B. Power outlets may be combined with telecommunications cabling in floor boxes if the power wiring is routed to the floor boxes separately from the telecommunications cabling, and if the floor box provides for metallic barrier segregation of the power and telecommunications cabling within the box.

C. Floor boxes shall be….

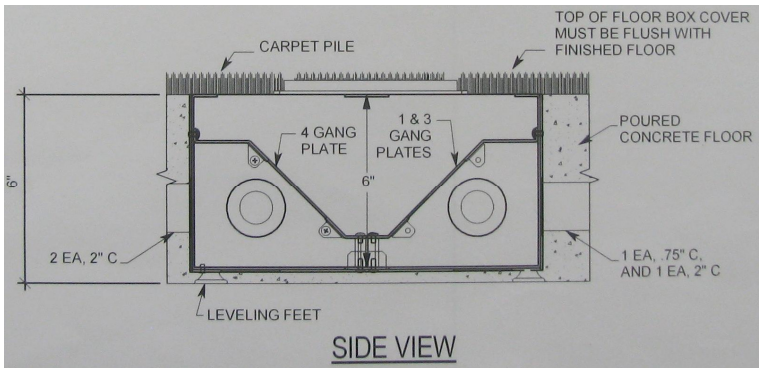
- Hubbell – Curtis will send
- Poke-thru

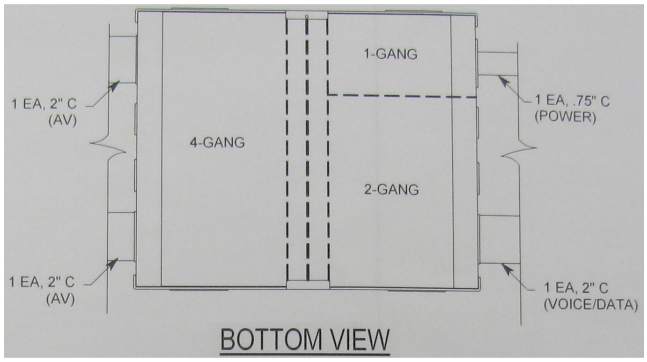
D. See the AVDG for floor boxes serving audio visual requirements.

E. Large floor boxes serving an instructor podium shall have a cover that will incorporate a finish (carpet, tile, etc.) that matches the finish of the floor. Floor boxes shall have three separate partitions serving power, data and audio/visual terminations.

- A/V terminations require a 4-gang partition with two 2” conduits.
- Telecommunications cabling requires a double gang partition with a 1¼” conduit.
- Electrical power requires a single gang partition with a ¾” conduit.

F. The basis of design is the FSR FL-500P-x Series floor box. It is desirable because it is available in 4”, 6”, 8” and 10” depths.





G. Hubbell also provides floor boxes with these features.

H. Some applications may require a high-capacity floor box, for example FSR FL-600P-x. The Designer shall inquire with the ITPM on a project-by-project basis.

4.5.1.2 FOR NEW CONSTRUCTION AND FULL REMODEL

A. A device box shall be provided for each telecommunications outlet. Device boxes shall be 4”x4”x3-½” (where 2-¼” is the depth of the box and 1-¼” is the depth of the extension ring, with an overall depth of 3-½”). Device boxes shall be recess-mounted.

- If Category 6A cabling will be used, the Designer shall require 5”x5” device boxes regardless of the cable count.

B. Surface-mounted device boxes are not acceptable. However, for concrete masonry unit (CMU) walls or other wall types that may obstruct cable or conduit installation, the Designer shall request direction from the UVU TPM on a case-by-case basis.

4.5.1.3 FOR OTHER PROJECTS

A. Existing device boxes and conduits shall be reused where they are standards-compliant, or where it can be verified that the existing conduits and boxes will permit telecommunications cabling to be installed without negatively affecting the performance of the cabling. The bend radius of the cabling inside each box shall be considered carefully in evaluating existing boxes. For concealed conduits that cannot be verified, the Designer shall assist the UVU TPM to consider conduit length, number of bends and cable fill percentage, then decide on a case-by-case basis whether they are suitable for reuse.

B. A device box shall be provided for each telecommunications outlet. Device boxes shall be recess-mounted wherever possible and shall be 4”x4” and at least 2 ½” deep (a 3 ½” depth is preferable). Surface-mounted device boxes (if required) may be standard single gang (2” x 4”) and at least 2 ½” deep.

C. Where cabling can be fished through interstitial wall spaces, it is typically

permissible to use faceplate mounting brackets in lieu of device boxes.

4.5.2 WORK AREAS

4.5.2.1 STANDARD TELECOMMUNICATIONS OUTLETS

A. All cabling shall be plenum-rated.

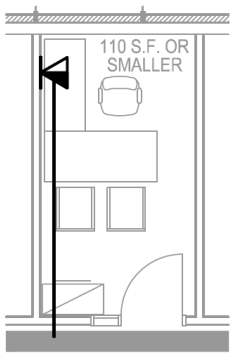
B. Each outlet shall have 4 jacks (ports) total, as shown in the photo at right:

- 2 voice jacks, served with a single Category 5e cable. Split the pairs to provide two pairs per voice jack.
- 2 data jacks, each served with a separate Category 6A cable. Do not under any circumstances split pairs on data jacks.

4.5.2.2 PERMANENT OFFICE SPACES

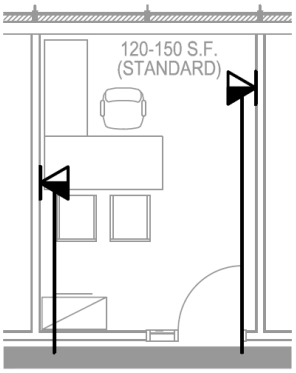
There are three sizes of permanent office spaces depicted below, with outlet locations identified for each case:

4.5.2.2.1 SMALL OFFICES (110 SQUARE FEET OR SMALLER)



A. Provide one outlet in the corner opposite the door.

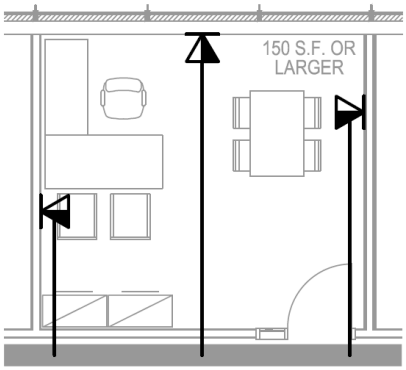
4.5.2.2.2 STANDARD OFFICES (120 TO 150 SQUARE FEET)



A. Provide two outlets on opposite sides of the room. The outlets shall be arranged as shown in the floor plan below, intended to complement the possible furniture orientations and maximize patch cord coverage in the room.

B. If an exterior wall will not support outlets due to windows, it is acceptable to place two outlets on a single wall if they are spread apart and one of the outlets is near the exterior wall.

4.5.2.2.3 LARGE OFFICES (150 SQUARE FEET OR LARGER)



A. For larger offices, a third outlet shall be provided on the exterior wall, as shown in the floor plan below.

B. If an exterior wall will not support outlets due to windows, it is acceptable to place two outlets on a single wall if they are spread apart and one of the outlets is near the exterior wall.

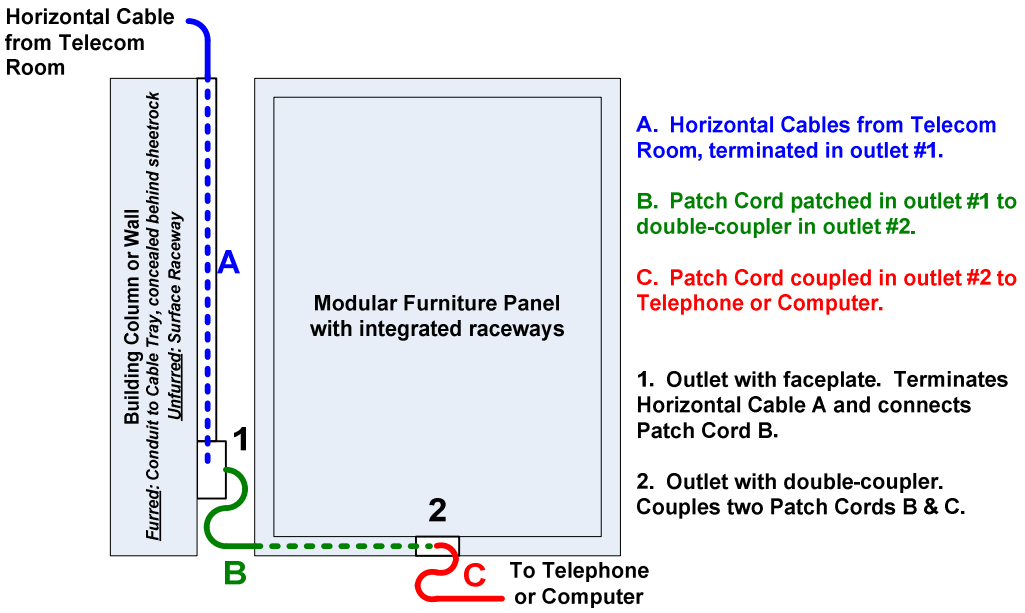
4.5.2.3 OPEN OFFICE / MODULAR FURNITURE

A. UVU prefers to serve open office areas using permanently mounted outlets in the wall nearest the modular furniture. Where modular furniture is not located adjacent to a wall, floor boxes are required.

- It is usually preferable to route cabling inside concealed conduits or through interstitial wall spaces. Therefore, columns that are wrapped or furred are preferable because conduits and device boxes can be concealed inside.
- The TPM may authorize the use of surface-mounted raceway in certain projects for columns that are not able to conceal raceway.
- Where columns and floor boxes do not exist and cannot be added, utility poles shall be designed as a last resort.
- Where columns are available, raceways shall route cabling down from the ceiling space to two outlets on opposite sides of each column, allowing furniture to sit against the columns on the sides without outlets.
- Outlets on columns shall have up to 6 ports per outlet.

B. Raceways integrated into modular furniture shall have separate channels for power and data. The channels shall be designed with abrasion protection features.

C. The standard treatment for each modular furniture office space (cubicle) is two data jacks with two Category 6A cables and two voice jacks with one Category 5E cable split between the two ports. The following diagram depicts UVU's preferred method of routing cabling to modular furniture:



D. Furniture shall not obstruct access to power or telecommunications outlets. Where necessary, access panels shall be provided and/or holes shall be cut through obstructions to allow access to the outlets.

4.5.2.4 TELECOMMUNICATIONS OUTLETS FOR WIRELESS ACCESS POINTS / IP CAMERAS

A. UVU currently uses Cisco wireless access point equipment in its buildings. This equipment operates with Power-over-Ethernet (POE) and requires two Category 6A cables per device (plenum-rated). The Designer shall accommodate POE equipment in the design, including the power and cooling requirements.

B. The Designer shall work cooperatively with the UVU ITPM to design telecommunications infrastructure to appropriately support wireless technologies. The Designer shall show the locations where wireless access points (WAP) are desired on the drawings. On occasion, UVU may request services to identify appropriate WAP locations and prepare associated coverage and signal strength maps.

4.5.2.4.1 STANDARD PROVISIONS

A. Generally speaking, outlets serving wireless access points shall be provided in a grid-like pattern for each 900 square foot portion throughout the occupiable building space. Additional outlets shall be provided to support higher density occupation as needed.

B. Outlets serving wireless access points shall be mounted above a T-bar ceiling or higher than 120” above finished floor where the ceiling is exposed. Outlets shall be attached to structure, walls, or cable tray. Do not mount outlets for WAPs above inaccessible ceilings.

C. Outlets serving wireless access points shall be distributed around the room near

locations where WAPs will be deployed.

D. Each standard outlet (5-square box) shall have two Category 6A cables.

E. These outlets may also serve IP video surveillance cameras, requiring additional cables for that purpose. See Section 4.5.2.5 for information about video surveillance applications.

F. The Owner will install all WAP equipment and patch cords after the Contractor installs the cabling.

4.5.2.4.2 GENERAL BUILDING COVERAGE

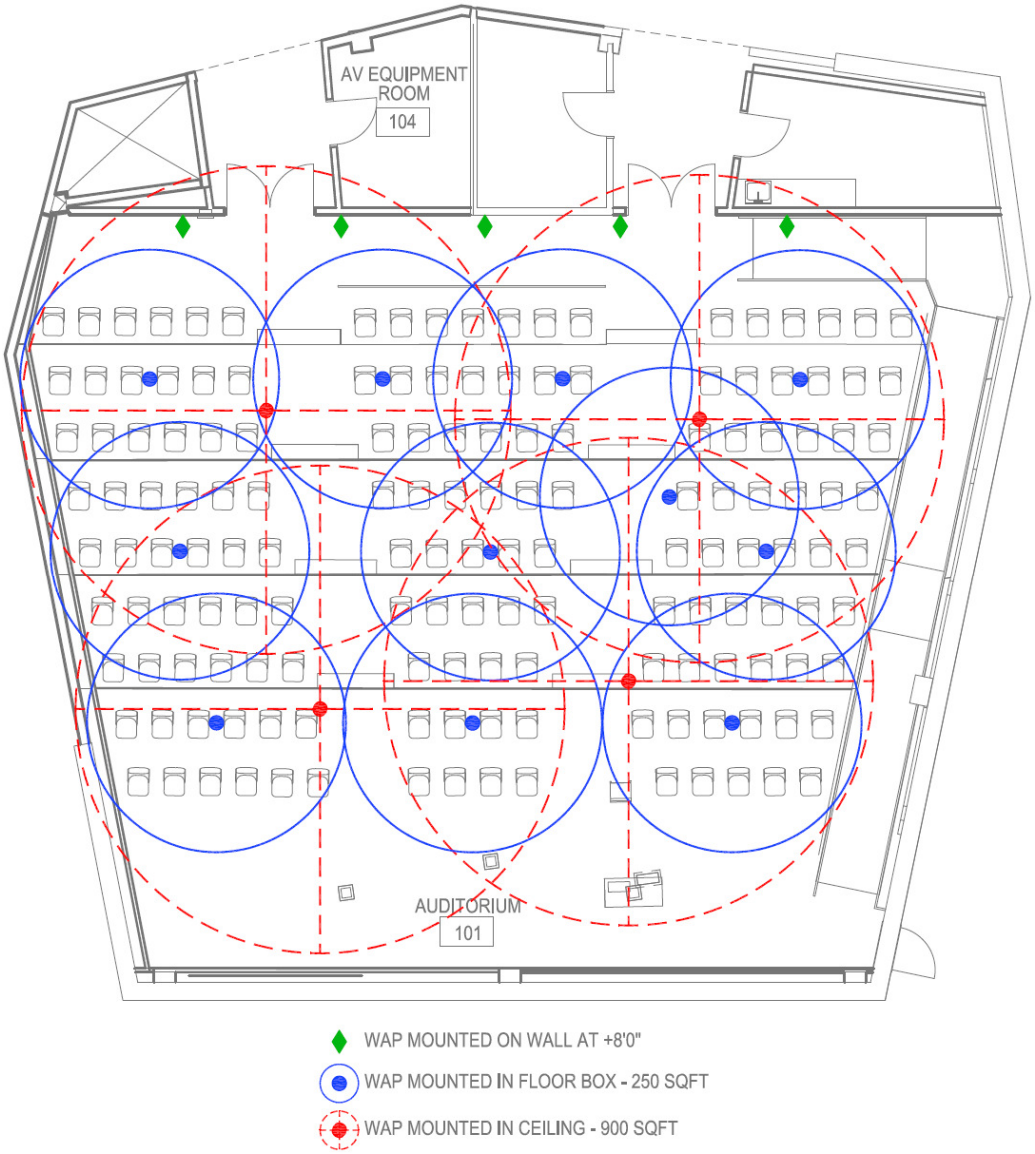
Outlets for WAPs shall be provided for every 900 square feet of building space, distributed uniformly throughout the building.

4.5.2.4.3 AREAS OF HIGHER WAP CONCENTRATION

The following WAP outlets shall be provided in addition to the General Building Coverage WAPs described above.

Classrooms and Lecture Halls	Outlets and Cables
50 seats or less	• One outlet with **two** data cables in the center of the ceiling
51 to 100 seats	• Two outlets with **two** data cables each, spread evenly in the ceiling
101 to 150 seats	• For every 250 square foot space, one floor box 14”x14”x8” with **two** data cables • One outlet with **six** data cables in the center of the ceiling
151 seats or more (See diagram below)	• Five outlets spread evenly along the widest wall of the room (typically the rear wall) with **two** data cables each, mounted below the ceiling • For every 250 square foot space, one floor box 14”x14”x8” with **two** data cables • For every 900 square foot space, one outlet with **two** data cables in the ceiling • **Two** data cables installed in every fourth seat in every third row (for student use with patch cords – not WAPs)

WAP Locations for Auditoriums with more than 150 Seats



4.5.2.5 TELECOMMUNICATIONS OUTLETS FOR SPECIAL INDOOR APPLICATIONS

A. IP video surveillance camera applications shall be provided one data cable each, terminated near the desired camera location.

- Mount the data outlet between 12” and 24” above accessible ceiling tiles or above the lighting plane of an exposed ceiling.
  - For hard-lid (gypboard) unaccessible ceilings, provide a wall-mounted data outlet below the ceiling or a downward-facing ceiling-recessed data outlet.
- Provide a single gang mud ring and faceplate.
- Use a patch cord to connect the camera to the jack in the data outlet.

B. An ADA-compliant courtesy telephone (Owner provided, model number 2554,

wall phone) may be required in a main floor gathering space. The Designer shall inquire with the Architect and UVU FPM whether courtesy telephones are included in the project and shall design a wall-phone outlet for each location.

C. Recent Code revisions (IBC 2012 1007.8) require that an elevator emergency two-way communication device be located on each floor near elevator doors. UVU currently uses the device below for this application:

- E-1600-30A from Viking Electronics, Inc. http://www.vikingelectronics.com/

Each device requires a single CAT5e voice cable, terminated directly onto terminals of the phone device which is installed into a 4”x4” device box.

D. The following table lists several special applications and the corresponding provisions for voice, data and power:

Application	Conduits	Voice	Data	Power
Vending Machines	one 1¼”		1 cable per machine	1 single gang receptacle per machine
Touch Screen Kiosks	one 1¼”		1 cable per machine	1 single gang receptacle per 2 machines
Instructor’s Podium	See Sect. 4.5.4.9	1 cable, 2 jacks	6 cables	1 single gang receptacle
Courtesy Telephones	one 1¼”	1 cable, 1 jack		
Pay Telephones	one 1”	1 cable, 1 jack		
Digital Signage (Flat Panel Display + Digital Media Player)	one 1¼”		2 cables	1 single gang receptacle
Televisions	one 2”		1 cable	1 single gang receptacle
Ceiling-mounted Projectors	one 2”		1 cable	1 single gang receptacle
Active Door Signage	one 1”		1 cable	1 single gang receptacle
Conference Room A/V Junction Wall Box	See Sect. 4.5.4.9		4 cables	1 single gang receptacle
Lighting Control System Main Panel	one 1¼”		2 cables	

E. Outlets mounted in raised floor applications shall be fed from Siemon MUTOA termination boxes. Provide 2 cables to each outlet from the MUTOA, with a maximum of 12 cables per MUTOA.

- Otherwise, UVU rarely accepts consolidation point solutions.

F. Outlets shall be provided to connect power monitoring equipment to the network.

G. Outlets will be required in mechanical and electrical spaces to provide network services to mechanical control equipment, electrical power monitoring equipment and lighting control panels. The Designer shall address these needs on a project-by-project basis.

H. The following applications require case-by-case direction. The Designer shall work with the the UVU FPM, ITPM, TPM and non-UVU tenants to determine the appropriate solutions for these applications:

- Fire alarm panels
- Elevators
- Security systems
- Access control systems
- Security systems
- Security scanning stations
- Point-of-sale equipment
- ATM Machines
- Irrigation controllers

I. UVU considers undercarpet telecommunications cabling (UTC) solutions to be undesirable in most cases. The Designer shall discuss any apparent justifications for undercarpet cabling with the UVU TPM prior to its inclusion in a design and shall also discuss the next best alternative to using undercarpet cabling.

J. Structural backing shall be designed into walls to support wall-mounted equipment. See the manufacturer's guidelines for each piece of wall-mounted equipment. The Designer shall discuss this topic with the UVU ITPM.

K. The Designer shall inquire about the requirements for any special design considerations, including compliance with the Architectural Barriers Act Accessibility Standard (ABAAS).

4.5.2.6 OUTDOOR WIRELESS ACCESS POINTS AND SURVEILLANCE VIDEO CAMERAS

Outdoor-rated outlets may be required to serve outdoor wireless access points and outdoor surveillance video cameras.

4.5.2.6.1 BUILDING ROOF TOP-MOUNTED

If a roof top mounting is useful, the Designer shall incorporate the following features:

- Lightning protection (surge suppression)
- Camera housing heat

An example of a roof top application at UVU is shown at right.

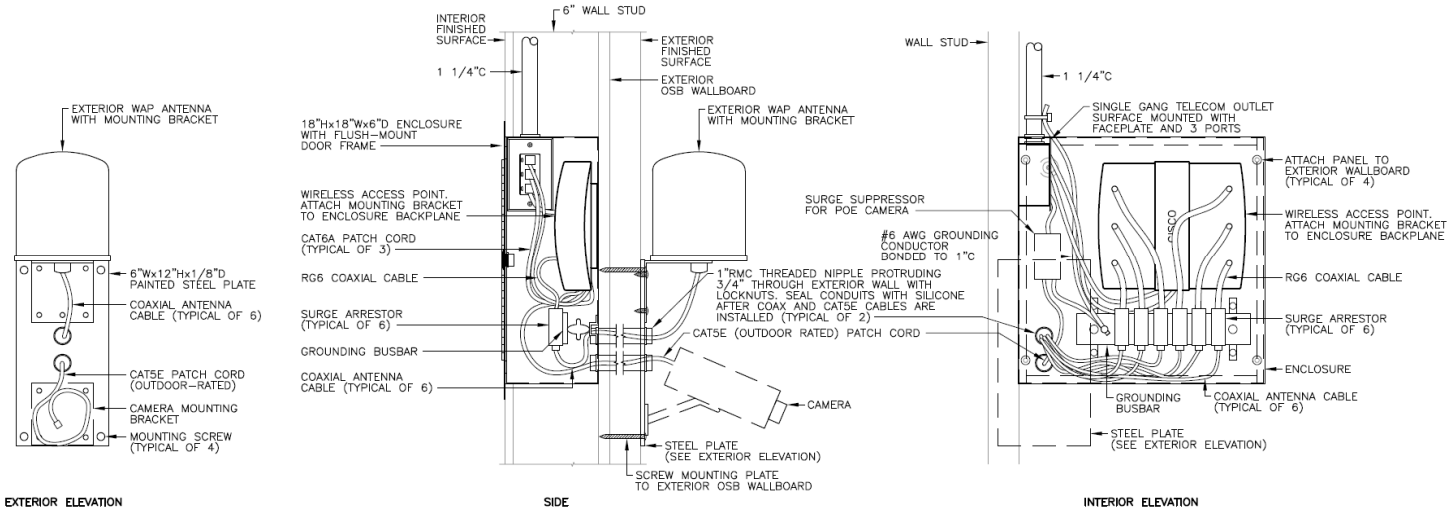
4.5.2.6.2 POLE-MOUNTED

If a roof-top mounting is useful, an enclosure will be required at the pole to house the WAP equipment. The Designer shall incorporate the following features:

- Lightning protection (surge suppression)
- Camera housing heat
- Vandalism protection
- Aesthetic integration

4.5.2.6.3 BUILDING WALL-MOUNTED

A. Where useful and practical, UVU prefers to combine outdoor WAP locations with outdoor security camera applications. One possible solution to accomplish this is depicted below.



4.5.2.7 WORKSTATION POWER OUTLETS

A. There shall be at least one general-purpose convenience power outlet (120VAC, 20 Ampere minimum) located within three feet of every telecommunications outlet. The Designer shall discuss any application-specific needs with UVU IT staff and adjust the power outlet locations and amperage accordingly.

- In the case of new construction and modernization projects, the power outlet associated with each telecommunications outlet shall be a 4”x4” device box (dual gang) with four power receptacles. It is the Designer’s responsibility to coordinate with the electrical engineer to ensure that power outlets are located near telecommunications device boxes.

- In the case of minor remodel, historical building remodel and telecommunications-only projects, it may be difficult to meet this requirement. Therefore, where existing power outlets are not located within six feet of each telecommunications outlet, the Designer shall alert the UVU TPM and request consideration of the situation on a case-by-

case basis.

4.5.3 HORIZONTAL CABLING SYSTEMS

4.5.3.1 GENERAL

A. The Designer shall work with the UVU FPM and the UVU TPM to identify and understand the needs and requirements for the facility on a project-by-project basis. This includes understanding the expected future uses of the facility. The Designer shall design the horizontal cabling accordingly.

B. Telecommunications infrastructure designs and specifications shall be based upon products from approved manufacturers, as defined in TDDG Section 1.5 *Required Manufacturers (Basis of Design)*, above.

C. All horizontal cabling shall be plenum-rated.

D. In addition to the manufacturers listed above, UVU has selected several manufacturers of products for telecommunications cabling systems (cable, connectors, termination blocks, patch panels, etc.) and telecommunications distribution hardware (racks, cable tray, enclosures, etc.). The Designer shall incorporate only these manufacturers into the design, and shall design a telecommunications distribution system that will be suitable for the use of products from these manufacturers.

E. Whenever moves, adds or changes (MAC) are made to existing systems, the new cabling shall follow the routes of existing established telecommunications cabling pathways.

4.5.3.2 TOPOLOGY

UVU has standardized on the star topology for all horizontal cabling, with some exceptions for certain building automation systems that require or benefit greatly from ring or other topologies.

4.5.3.3 HORIZONTAL DATA APPLICATIONS

A. At UVU facilities, horizontal distribution copper cable and components for data applications shall be rated for and installed in compliance with the IEEE 802.3ab 10GBase-T standard. UVU requires 4-pair, 100-ohm, 24 AWG, unshielded twisted-pair (UTP) copper Category 6A-rated cabling for all horizontal data cabling applications.

B. Horizontal cables shall be terminated at the work area end and patch panel end with modular jacks.

1. UVU has standardized on the color white for horizontal data cabling.
2. The color of the modular jack shall match the color of the cable.

3. Category 6A data jacks shall be angled.

C. In existing buildings, where additions are made to an existing Category 5 or 5e installation, the Designer shall seek direction from UVU regarding whether to install Category 6 or Category 6A cabling. If the number of additional cables to be installed is small compared to the installed base, UVU will likely wish to add new Category 6 cabling. If the number of new cables to be installed is relatively large, UVU may choose to use Category 6A cable and matching components.
   1. Category 5 cable and components shall not be installed under any scenario.
   2. Category 6 cables shall be terminated at the work area end with a modular jack matching the category of the cabling.

4.5.3.4 HORIZONTAL VOICE APPLICATIONS

A. UVU uses its TDM telephone system for all new voice applications. Horizontal distribution cable intended to support voice services shall be Category 5E cable.

B. Horizontal voice cables shall be terminated at the work area end with modular jacks and on 110 blocks in the telecommunications rooms.

   1. UVU has standardized on the color blue for horizontal voice cabling.

C. In existing buildings, where additions are made to an existing Category 3, 5 or 5e installation, Category 5e cabling shall be used for new voice applications.

   1. Category 3 and 5 cable and components shall not be installed under any scenario.
   2. Category 5e cables shall be terminated at the work area end with modular USOC RJ-14c jacks.

4.5.3.5 LOW-VOLTAGE AND BUILDING AUTOMATION SYSTEMS

A. During planning for intra-building telecommunications cabling installations, the Designer shall identify options for supporting power-limited (low-voltage) and building automation systems with the common structured cabling system, and present the options to UVU for consideration. These options shall comply with ANSI/TIA/EIA 862 – Building Automation Systems Cabling Standard for Commercial Buildings.

B. By providing a common cabling distribution system for the various building automation systems, it may be possible to reduce construction costs and operational costs while creating an intelligent building that can contribute many other benefits (see TDMM Chapter 14 *Building Automation Systems* for further information). Low-voltage systems that are capable of using a common structured cabling system (either backbone or horizontal cabling) shall be designed to use telecommunications cable and termination hardware wherever possible.

C. The Designer shall request from UVU a list of systems that will require

telecommunications outlets for operations. The Designer shall then include horizontal cabling in the design as necessary to meet the listed requirements.

D. Some low-voltage and building automation equipment benefits from installing a connector directly onto the horizontal cable without first terminating it in a jack.

- One significant uniqueness for horizontal telecommunications cabling intended for use with permanently mounted equipment is detailed in the new standard ANSI/BICSI D005 - *Electronic Safety and Security (ESS) Information Technology System (ITS) Design and Implementation Best Practices*. This standard is currently under industry review and is expected to be adopted soon.
    - This standard permits horizontal cabling to be terminated on the device end of the cable using a connector (as opposed to a jack) allowing the horizontal cable to plug straight into the device.
    - The horizontal cable does not need to terminate in a faceplate-mounted jack.

E. Other low-voltage and building automation equipment uses terminals that require the cable to be terminated directly onto the equipment without using a modular jack. There is no method of testing a cable in this configuration.
- This application is not standards-compliant, and is unlikely to be approved by the TPM.
- In most cases, it is possible to terminate the horizontal cable in a standard outlet inside a panel, field-manufacture a half-patch cord to plug into the outlet, and then terminate the raw end of the half-patch cord directly onto the terminals of the equipment.

4.5.3.6 HORIZONTAL CROSS-CONNECT (HC)

All Category 6A horizontal cabling serving a data application shall be terminated on a rack-mounted patch panel.

All Category 5E horizontal cabling serving a voice application shall be terminated on 110 blocks.

4.5.3.7 GPON HORIZONTAL CABLING SOLUTION

UVU does not currently use GPON, and does not anticipate doing so in the near future. However, the Designer shall discuss with the ITPM whether GPON might be beneficial for a given application.

GPON tends to be useful for Residential applications that require CATV service. However, since UVU does not operate student residential buildings, and since UVU's television distribution is an IPTV solution, it is unlikely that GPON will be worthwhile at UVU.

4.5.3.8 PHYSICAL SEPARATION REQUIREMENTS

There are currently no UVU-driven applications or procedures that require certain cables to be physically segregated from other cables. The only expected source of such a requirement would come from a regulatory authority. The Designer shall consider whether any such regulations exist when designing cabling applications for UVU.

4.5.3.9 PATCH CORDS

B. Patch cords with a connector boot shall be factory-manufactured by the SCS manufacturer. Patch cords shall be certified by the manufacturer to match the cable type used in the horizontal distribution.

- Field-connectorized patch cords are not acceptable. Any existing field-connectorized patch cords used in areas affected by a project shall be replaced under the project with factory-manufactured patch cords.

C. See Appendix 6.1 for a diagram that depicts UVU's standard patch cord colors.

D. The Designer shall quantify and specify the required patch cords in the Contract Documents to be furnished by the Contractor for each particular project, as shown in Tables 4.1 and 4.2, below:

Table 4.3 Patch Cord Requirements for Telecommuncations Rooms

Type & Color	Patch Cord Requirements, Quantities	Lengths Telecom Room (Patch Panel)
CAT6A	Require patch cords to be furnished by the Contractor for **each Category 6A cable terminated on a patch panel port**.	• 25% - 3 ft • 50% - 5 ft • 25% - 7 ft
CAT6A **Blue**	Require patch cords to be furnished by the Contractor for each Category 6A cable terminated on a patch panel port **that will serve an Audio Visual device**. For each **Blue** patch cord, delete a white patch cord from the above count.	• 25% - 3 ft • 50% - 5 ft • 25% - 7 ft

Table 4.4 Patch Cord Requirements for Work Areas (Outlets)

Type & Color	Patch Cord Requirements, Quantities	Lengths Work Area (Outlet)
CAT6A	Require patch cords to be furnished by the Contractor for **40% of total Category 6A cables terminated on patch panel ports**.	• 50% - 12 ft • 40% - 15 ft • 10% - 25 ft
CAT6A **Blue**	Require patch cords to be furnished by the Contractor for 80% of the Category 6A cables terminated on patch panel ports **that will serve an Audio Visual device**. For each **Blue** patch cord, delete a white patch cord from the above count.	• 30% - 3 ft • 50% - 5 ft • 20% - 7 ft

E. The Owner will install all patch cords. This includes routing patch cords through modular furniture, connecting to telephones, and also the patch panel-to-switch connections in the telecommunications rooms.

4.5.4 HORIZONTAL PATHWAY SYSTEMS

The process of selecting the type of pathway that would be appropriate for a particular project shall be a cooperative effort involving the Designer and the UVU TPM.

4.5.4.1 GENERAL PATHWAY DESIGN CONSIDERATIONS

A. All cables shall be fully supported and properly transitioned throughout their lengths, including proper bend radius fittings at pathway transitions. Where cabling is routed vertically, it shall be appropriately secured such that the weight of the cabling does not subject the cabling to stresses that could potentially reduce the performance of the cabling.

B. UVU prefers generally to use a combination of cable tray, conduits and junction boxes for all telecommunication and other low-voltage pathways.

C. The Designer shall discuss pathway type and size options with the UVU TPM.

1. The Designer shall discuss the relative merits of the pathway options available and shall assist the UVU TPM and the project design team to select the most appropriate pathway solution for the project.
2. The future growth anticipated for the facilities affected by the project shall be discussed. Horizontal feeder pathways (cable trays, conduits from TRs to distribution junction boxes) shall be sized to support the initial cabling installation plus a minimum of 25% growth.
3. For new construction and full remodel projects, J-hook pathways are not permitted. J-hook pathways are only acceptable for minor remodel projects, and only when approved by the UVU TPM. When used, J-hook pathways shall be sized to support 100% additional cables after the original cabling installation. In other words, the pathway shall be no more than 50% full after installation is completed.

D. Spare pathway shall be designed to terminate at building perimeters where future expansion of the building is anticipated.

E. When considering the design of a ceiling-located cable tray or J-hook pathway, the Designer shall verify that the pathway locations will comply with accessibility and clearance requirements. Cable tray and J-hook pathways routed through ceiling spaces shall be designed such that all installed cable is conveniently accessible after construction, both for cable maintenance and to install subsequent cable additions. J-hooks shall be installed at approximate intervals of 4 to 5 feet. Conduit shall be used to span inaccessible areas where the pathway will cross “hard-lid” ceilings, where ceiling tiles are not readily removable, or where accessibility is impeded.

F. Pathway routing shall remain on the same floor as the telecommunications room and telecommunications outlets served by the pathways. Where project-specific conditions exist that justify other routing, the Designer shall request UVU approval through the SVR process.

G. “Poke-thru” penetrations to the ceiling space of the floor below are normally not permitted. For minor remodel construction, poke-thru penetrations may be allowed given budgetary, project size, or other limiting factors. Permission to use poke-thru pathways in any circumstance requires an SVR on a project-by-project basis, and always requires the services of a structural engineer to avoid irreparable structural damage.

H. All wall and floor penetrations for cabling shall be fully sleeved with bushings, and protected in accordance with the requirements in the International Building Code.

I. For on-grade slab construction, telecommunications conduits shall not be routed in or under the slab (a designated wet environment) unless no other options exist.

- Floor boxes under conference tables in Meeting Rooms and under instructor podiums in Classrooms are exceptions to this requirement.
- In any application (including Meeting Rooms and Classrooms) where telecommunications conduit passes in or under an on-grade slab, outdoor-rated cabling shall be provided.

4.5.4.2 PATHWAYS FOR NEW CONSTRUCTION AND MODERNIZATION PROJECTS

A. Where ceiling spaces will be inaccessible after construction, the only permitted pathway option is conduit. Cable tray and wire basket are not permitted if ceiling spaces will be difficult to access after construction.

B. Surface raceways and surface-mounted device boxes are not permitted.

C. J-hook pathways are not permitted.

4.5.4.3 PATHWAYS FOR MINOR REMODEL AND TELECOMMUNICATIONS-ONLY PROJECTS

A. For minor remodel construction, there may not be an existing (or suitable space for a new) telecommunications room available on the same floor as an outlet. While pathways shall generally be designed from the device box serving the telecommunications outlet to the nearest telecommunications room on the same floor as the outlet, this requirement may be waived by the TPM.

B. Existing pathways shall be reused where existing raceway is standards-compliant or where it can be verified that the existing pathway will permit telecommunications cabling to be installed without negatively affecting the performance of the cabling. Where a pathway is concealed or cannot otherwise be verified, the Designer shall request direction from the UVU TPM on a case-by-case basis.

C. Where existing pathways cannot be reused, or where additional pathways are required:

1. J-hook pathway may be used. D-ring and bridal-ring pathways are not permitted. J-hook pathways shall be established through concealed spaces. J-hook pathways shall be sized for a minimum of 100% expansion. In other words, the pathway shall be no more than 50% full after installation is completed.

2. When 30 or more cables are designed to be routed through an area, the use of cable tray or conduit shall be considered in lieu of J-hooks.

D. It may be permissible to use faceplate mounting brackets in lieu of device boxes. In these cases, cabling is routed to the outlet location through interstitial wall spaces. UVU permission for this method is required on a project-by-project basis.

4.5.4.4 CABLE TRAY PATHWAY SYSTEMS

A. On the UVU campus, most buildings are constructed contiguously, allowing people to walk from building to building without going outdoors. UVU's standard practice is to link buildings together via cable tray installed in the corridors.

B. In general, cable tray systems shall be located in corridor or office throughway spaces, and shall not be installed above office or classroom space. Distances from EMI/RFI sources shall be maintained according to Section 4.2, *Electromagnetic Compatibility* (above), regardless of whether the raceway is routing copper- or fiber optic-based media.

C. UVU prefers that all cable tray be the ladder-rung style, with an open-rung bottom and sidewall channels.

- Ladder racking shall be used only in telecommunications rooms. It shall not be used anywhere else.
- Spine-style tray is not acceptable.

D. For main distributions (corridors) 12” x 4” tray is the minimum allowable size. The Designer shall design cable tray that is filled to no more than 50% of its allowable rating on Day 1.

- For example, if a Category 6A cable has a 0.35 in O.D., a 12” x 4” tray could hold 200 such cables given a 40% allowable fill. The Designer could select a 12” x 4” cable tray if fewer than 100 Category 6A cables would be carried by this tray on Day 1. In other words, the Owner should be able to double the amount of cable in that tray in the future.

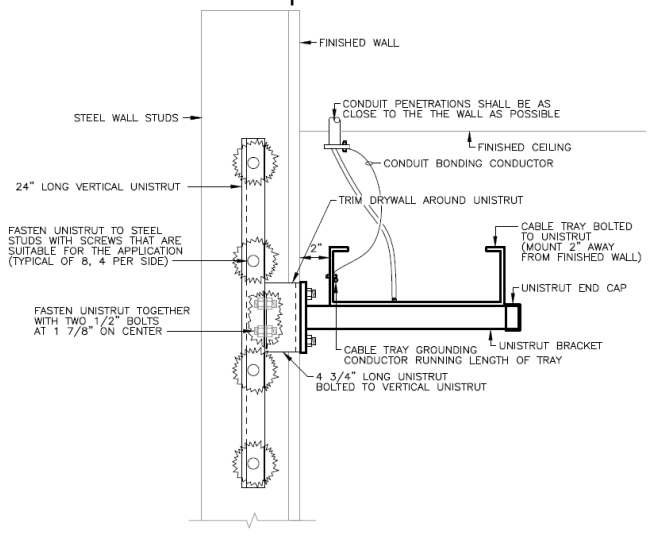
E. Steel cable tray is preferred over aluminum because aluminum is much easier to dent and deform through careless handling.

- UVU prefers a galvanized finish, un-painted to match its surroundings, to minimize the presence of the tray.
- The Designer shall coordinate the selection of the cable tray materials with the design intent of the Architect or interior designer.

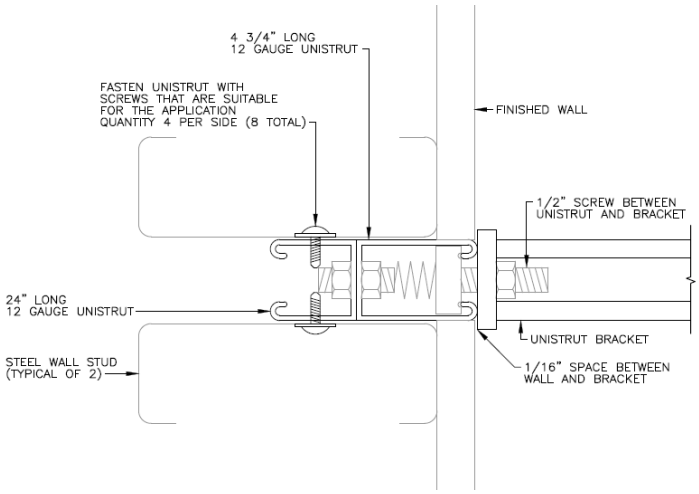
F. A continuous ground conductor shall be run the length of the cable trays, and shall terminate on the telecommunications grounding busbar in the telecommunications room. Each segment of cable tray shall be bonded to this conductor with a bonding lug. Even though most cable tray manufacturers offer solutions to use the tray as a grounding conductor, those solutions shall not be used at UVU.

G. Telecommunications cable trays shall not be shared with power cables.

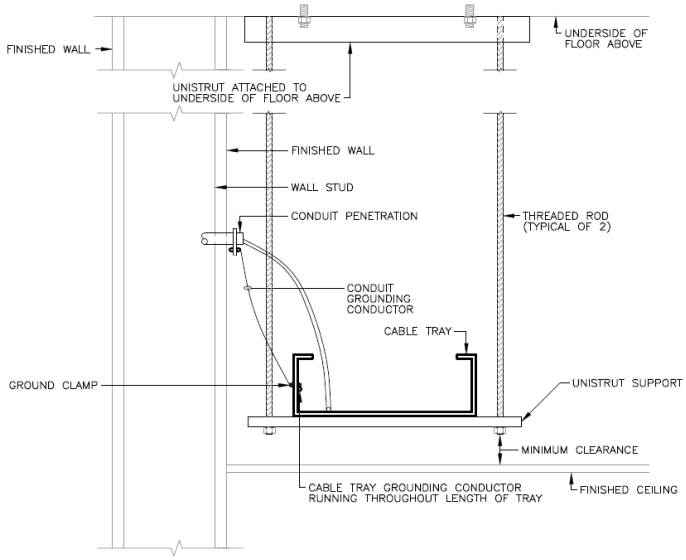
H. When cable tray is wall-mounted, the contact points for each mount shall be reinforced. The diagram at right depicts a possible solution for reinforced wall mounts:



The diagram at right depicts a detailed view of the point of wall-mount attachment:



When cable tray is ceiling-hung, use trapeze-style supports. The diagram at right depicts a possible solution:



4.5.4.4.1 CABLE TRAY CLEARANCES

UVU uses cable trays to distribute cabling throughout its buildings. Cable trays shall be installed in corridors or other accessible spaces. Ceilings below cable trays must be accessible. Hard-lid / gypboard ceilings prevent access to cable trays.

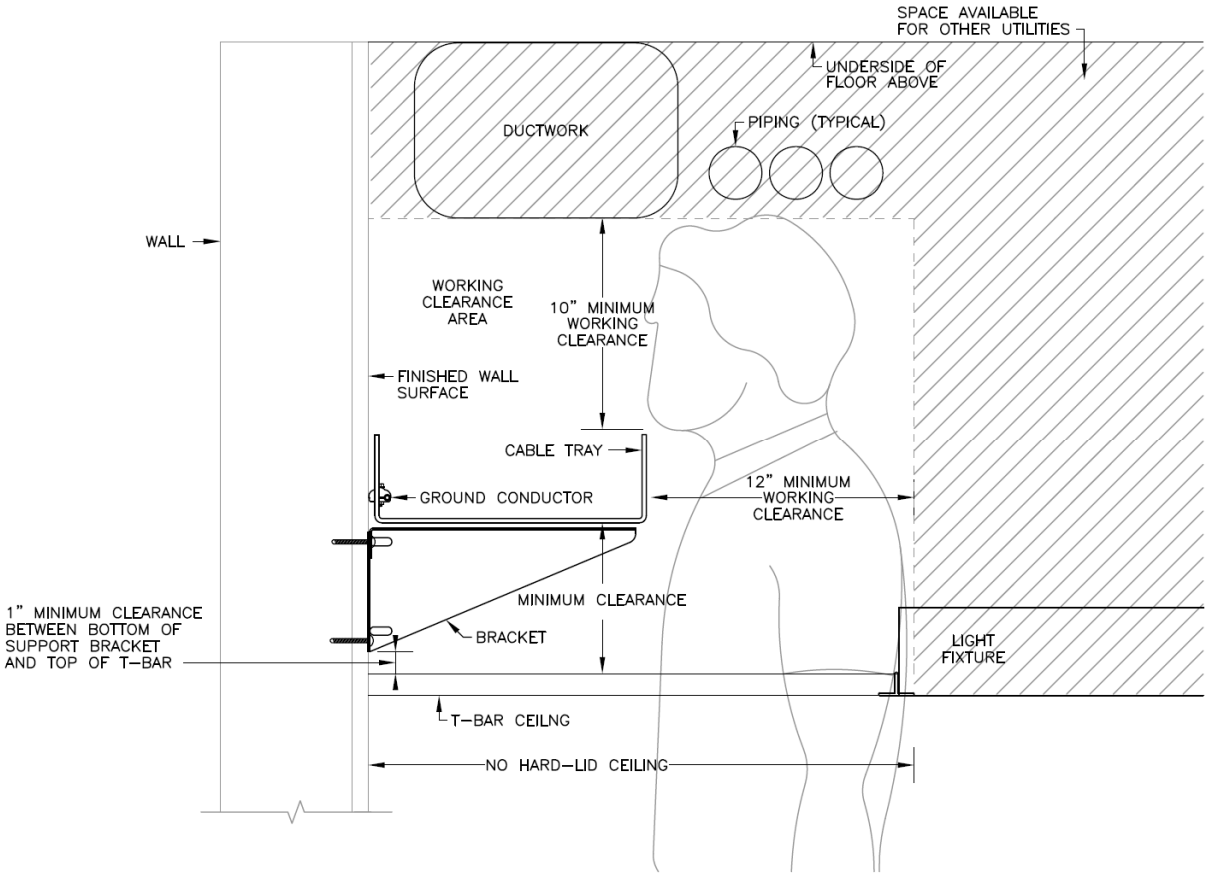
Do not design cable tray routing above offices or classrooms.

To preserve access to the cable trays post-construction, the Designer shall coordinate the routing of cable trays through ceiling spaces with the designers of mechanical systems and other electrical systems, incorporating the tray into the project's BIM model. The design shall also be coordinated with the architects desiging ceiling spaces. The minimum space required for cable tray along the entire length of main corridor ceilings is:

- A minimum clear space of 12 inches adjacent to the side of the cable tray, to allow technicians to stand next to the tray (on a ladder) and add or remove cabling.

- A minimum clear space of 10 inches (head height) above the cable tray, to allow for cables to be added or removed from the tray.

As shown in the diagram below, if a 12”x4” cable tray were used, the minimum overall cross-sectional area for and the associated working space is 24” wide x 14” high.



Occasional obstructions to the cable tray are permissible as long as access to the tray (as depicted above) is restored within 36” (arm’s reach).

4.5.4.5 CONDUIT AND JUNCTION BOX PATHWAY SYSTEMS

A. Conduits both in and under the ground floor slab are considered “wet locations” where indoor-rated cabling is not permitted. Therefore, conduit serving the main floors of such buildings shall be routed in walls and ceilings – not in or under the slab. Intra-building and horizontal pathways shall only be installed in “dry” locations where indoor cabling can be protected from humidity levels and condensation that are beyond the intended range of indoor-only rated cable.

- Floor boxes in an on-grade slab are the only permissible exception. This application also requires outdoor-rated Category 6 cabling.

B. Where conduit runs terminate at cable trays, the conduits shall be arranged in an organized, uniform manner to facilitate an orderly cable transition from conduit to cable tray. Conduits shall terminate within a range of 3” to 18” of the cable tray.

C. Where conduit runs terminate in telecommunications rooms, the conduits shall be arranged in an organized, uniform manner to facilitate an orderly cable transition from conduit to ladder rack.

D. Non-metallic conduit and flex conduit shall not be used for horizontal pathways.

E. Conduits shall not be filled beyond 40%. The Designer shall verify the outer diameter of the cabling for a project at the time of the design to determine the maximum number of cables that can be placed inside a conduit without exceeding the 40% fill limitation.

F. In new construction, all work area outlets shall have a minimum 1¼" conduit routing from the device box to an accessible cable pulling location. The conduit size shall be increased as necessary for the quantity of cables to be installed. Where new conduit is installed in existing buildings, the Designer shall notify UVU when existing conditions prevent the use of one-inch trade size conduit as a minimum conduit size.

- Conduit used to route cabling from the cable tray to a work area outlet shall be sized a minimum of 1¼".

G. Device boxes shall not be "daisy-chained." Each device box shall be complete with its own dedicated conduit to the nearest distribution point/pathway.

H. Junction boxes and pull boxes shall be oriented for access doors to open from the area where the cable installer will normally work. For ceiling-mounted boxes, this is typically from the bottom (floor) side of the box.

I. Ceiling access to junction boxes and pull boxes shall be designed to allow full access to the door, adequate working room for the installation personnel, and proper looping of the cable during installation.

J. Junction boxes and pull boxes shall be located in spaces that are easily accessible during normal working hours, such as hallways and common areas. Junction boxes and pull boxes shall not be located in conference rooms or offices unless there is an overriding design reason for doing so, dependent upon approval from UVU.

4.5.4.6 SURFACE RACEWAY

A. Surface raceway may be permissible in areas where no suitable alternatives exist. Surface raceway shall conform to bend radius requirements for the cable type being installed.

B. Surface raceway may be either plastic or metal.

C. Where Category 6A (Augmented) cabling is routed through surface raceway, the Designer shall verify cable dimensions and bend radius limitations with the cable

manufacturer to determine whether the surface raceway will be deep enough. Typically only two jacks will fit in a faceplate, and the jacks must be side-entry style in order to meet cable bend radius requirements.

4.5.4.7 UNDERFLOOR DUCT SYSTEMS

A. The design of new underfloor duct systems is prohibited.

4.5.4.8 ACCESS FLOORS

A. Data Centers typically require access flooring.

B. While some open office circumstances may require access flooring, it may be more expensive than other pathway options. When considering solutions to provide cabling in open office situations, the Designer shall consider other solutions (such as floor boxes) ahead of an access flooring solution.

4.5.4.9 PATHWAYS AND BOXES FOR AUDIO / VISUAL APPLICATIONS

Successful audio/visual applications require properly planned pathways and boxes. Several applications are depicted below. The Designer shall design the designated pathways, boxes and other features indicated in each application that appears in a project.

The sections below describe the requirements for the following applications:

- Conference Rooms
- Classrooms / Labs
- Lecture Halls
- Auditoriums
- Video Wall
- Digital Signage
- Video Surveillance

4.5.4.9.1 CONFERENCE ROOMS

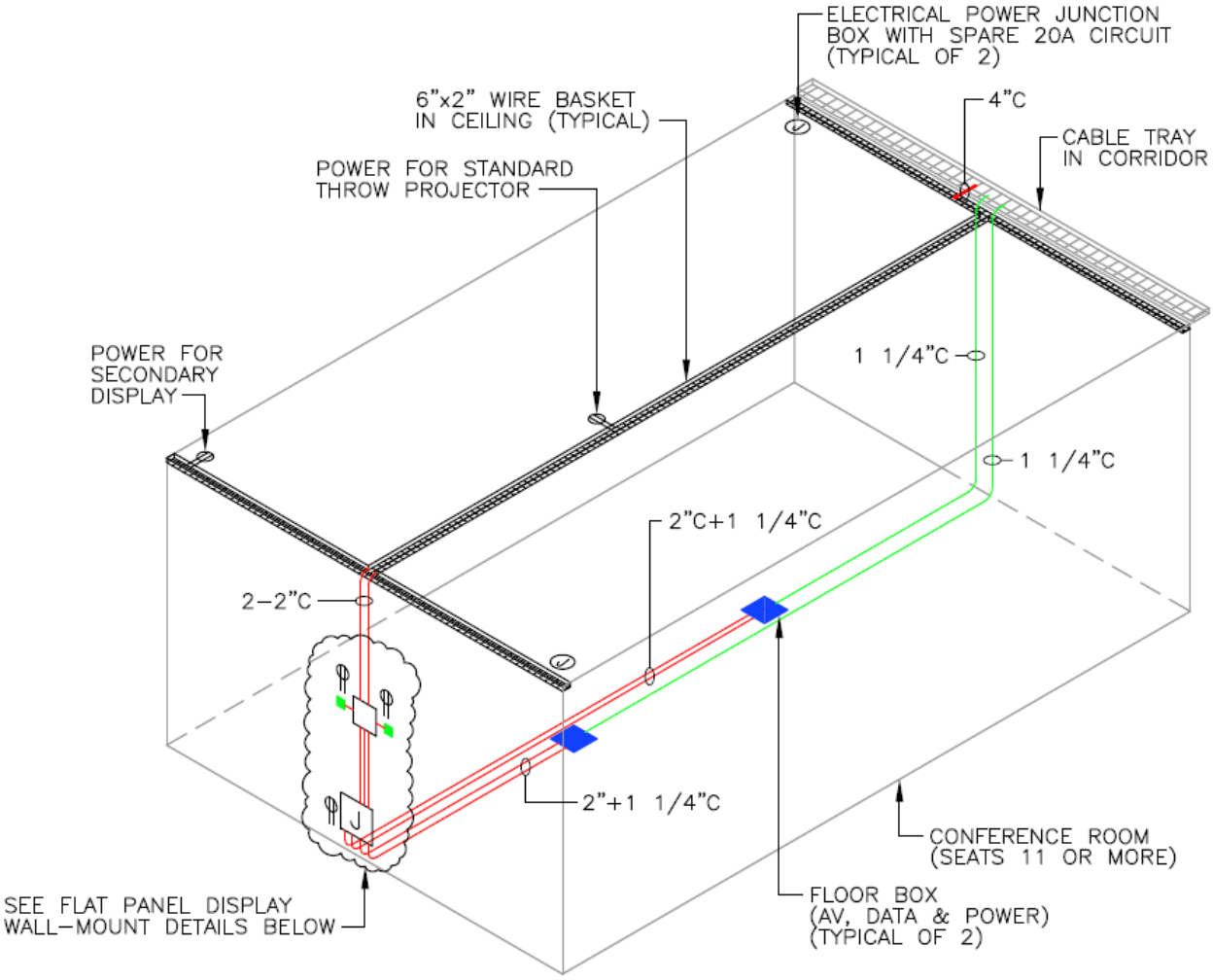
A. All Conference Rooms shall have pathways for video conferencing, even if video conferencing features are not initially installed.

B. Typically, it is desirable to locate a wireless access point in or near each Conference Room.

C. Do not place doors on the flat panel display/presentation wall.

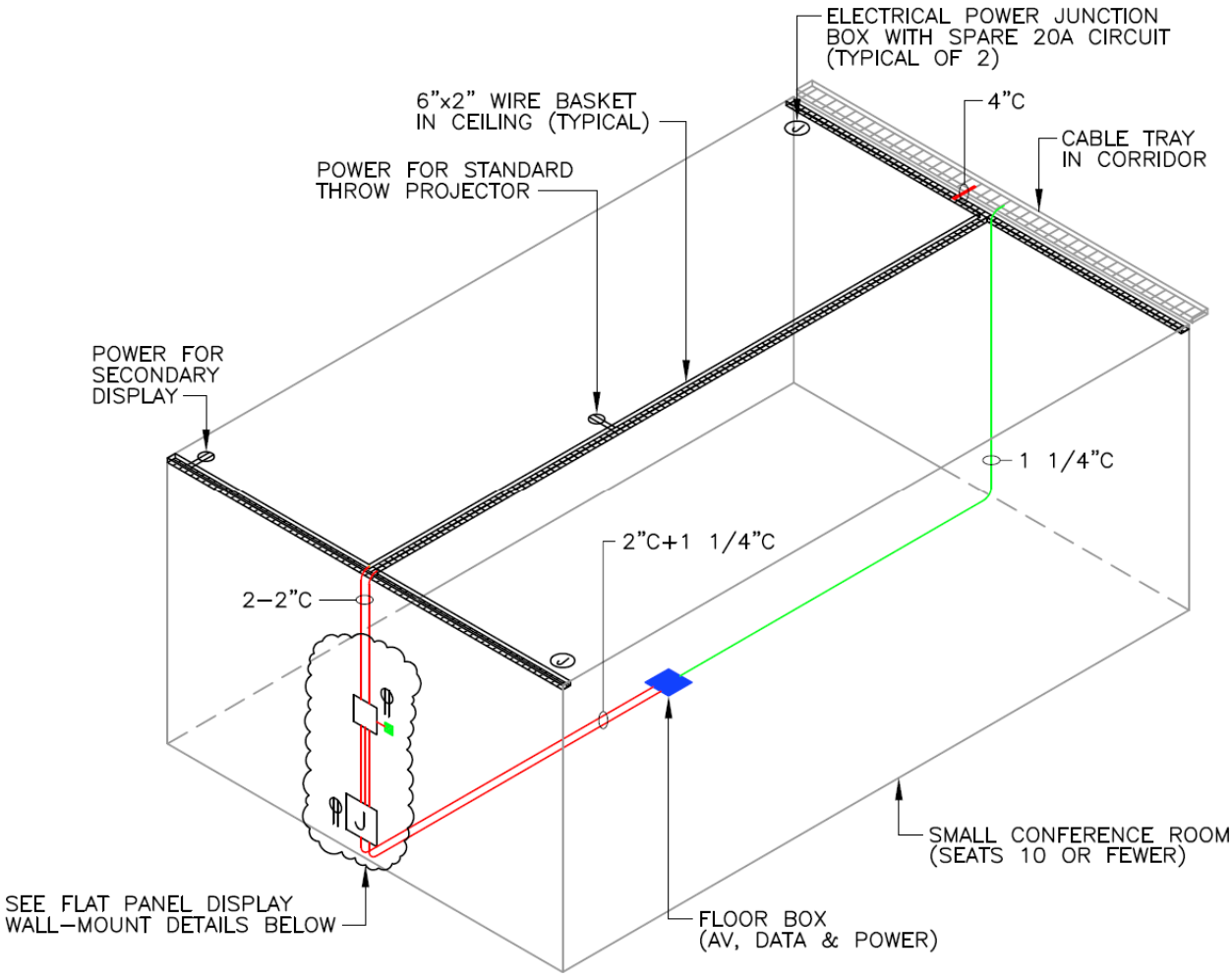
D. Conference Rooms vary in size depending on the intended usage. The Designer shall work with the A/V designer and refer to the AVDG to provide the correct pathways and features for Conference Rooms. Examples of "large" (seats for more than 10 persons) and "small" (seats for 10 persons and less) Conference Rooms are depicted below:

4.5.4.9.1.1 Large Conference Rooms



Verify whether dual video panels are required or whether they might in the future be desired, and provide dual power outlets as necessary.

4.5.4.9.1.2 Small Conference Rooms

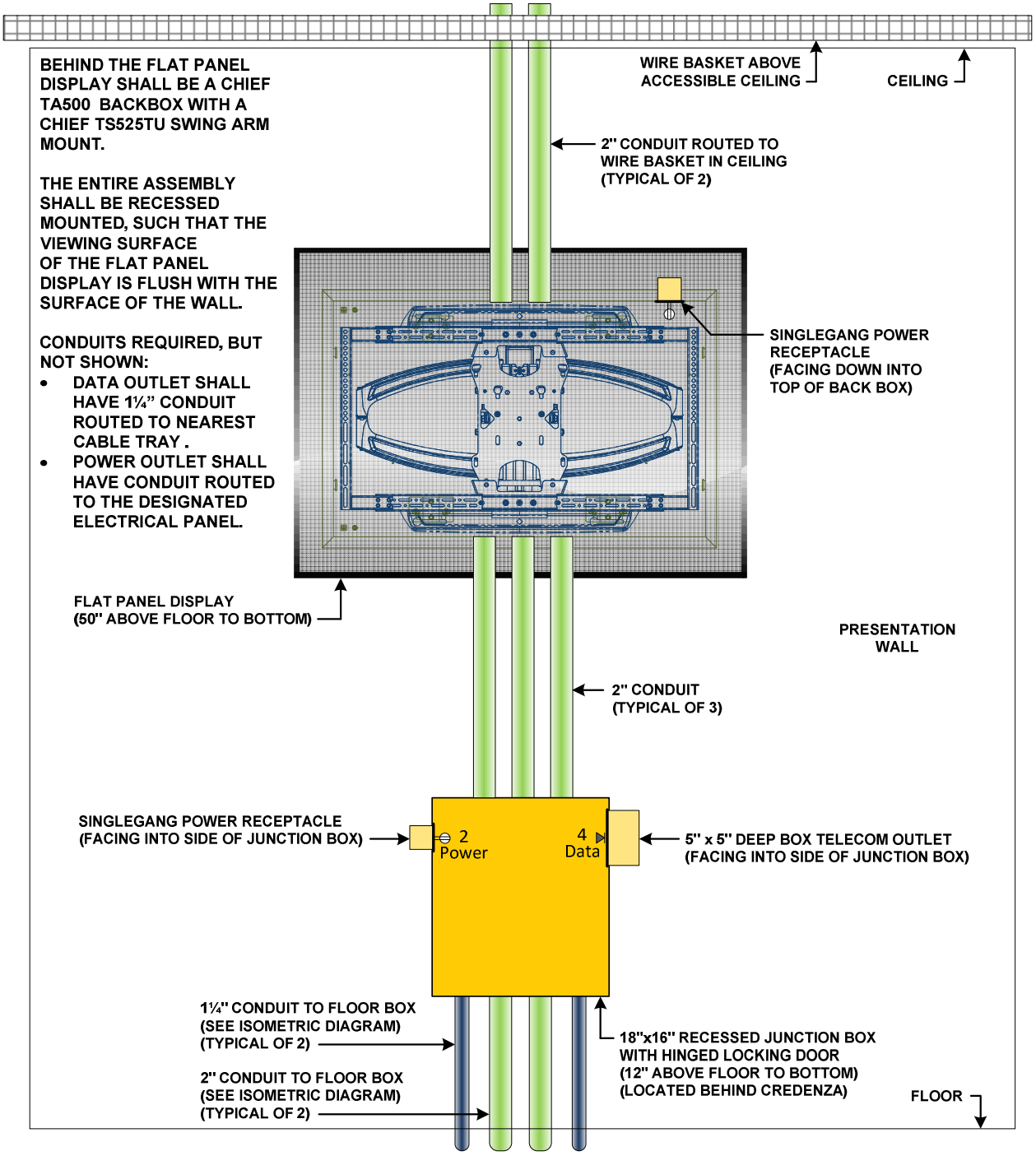


4.5.4.9.1.3 Presentation Wall Box and Conduit Details

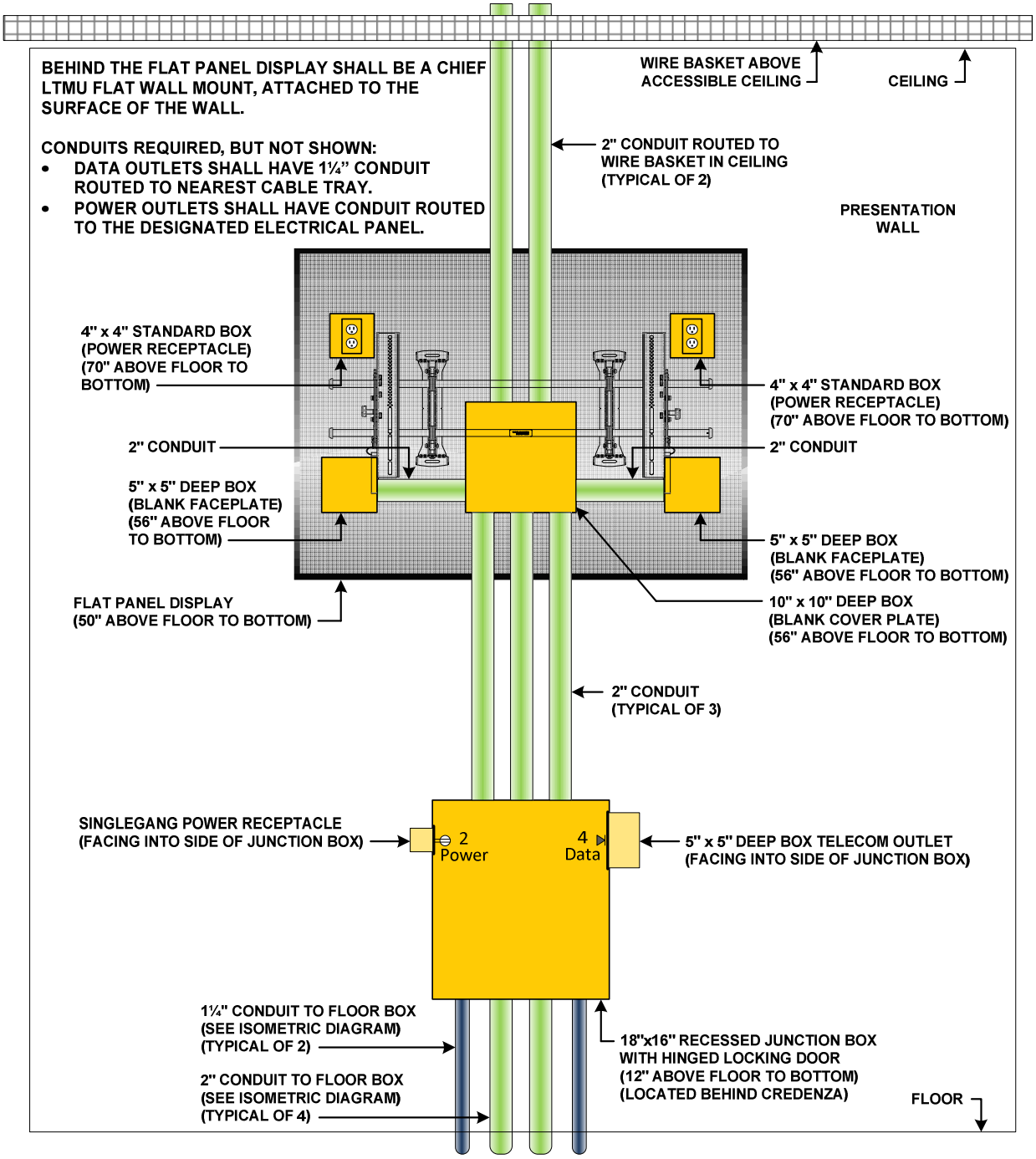
There are two options (depicted below) for flat panel display mounting, with its associated pathways and boxes.

- The Designer shall work with the A/V designer and refer to the AVDG to provide the UVU-desired solution for each Conference Room application.

Swing Arm-mount Option – Conference Room Flat Panel Display Mounting (This is the standard solution.)

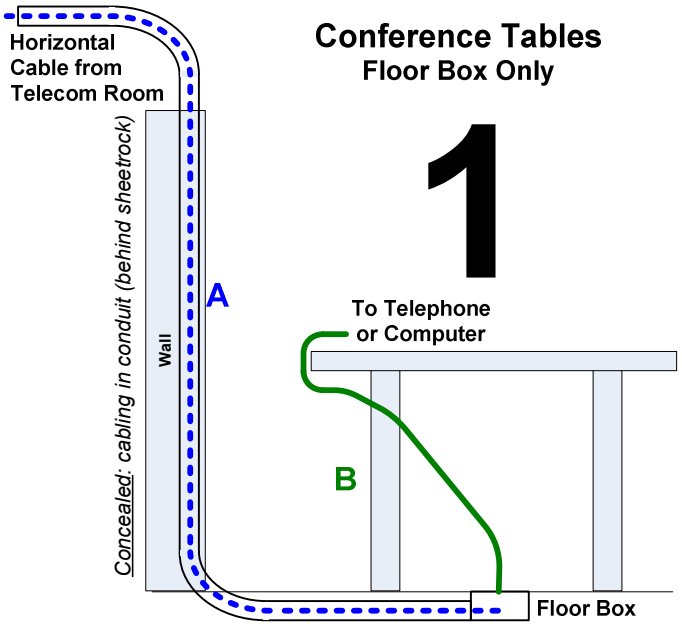


Flat Wall-mount Option – Conference Room Flat Panel Display Mounting
(This solution requires AVPM approval for rooms that might have double panels.)



E. Conference tables shall have floor boxes installed beneath them (see Option 1, below). Some tables may also have a table-top cable cubby (see Option 2, below), with patch cords routed up from the floor box to a table-top connection point providing access to power outlets, data outlets and audio/visual inputs.

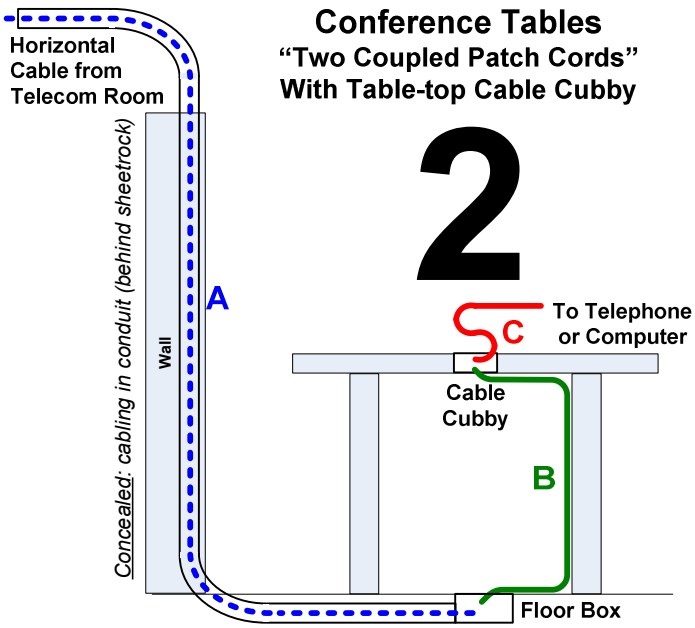
- The Designer shall work with the A/V designer and refer to the AVDG to provide the correct quantities, types and colors of cables for each application.
- See the AVDG for guidelines about the sizing and quantity of floor boxes and cable cubbies required for each conference table application.
- Small conference rooms (those with tables seating 10 or less) may only need one floor box.



A. Horizontal Cable from Telecom Room, terminates on a jack in floor box.

B. Patch Cord connects to jack in floor box and to Telephone or Computer. Patch cord routes around table while in use.

Floor box with angled-port faceplates terminates Horizontal Cable A and connects Patch Cord B.



A. Horizontal Cable from Telecom Room, terminates on a jack in floor box.

B. Patch Cord connects to jack in floor box and connects to double-coupler in cable cubby.

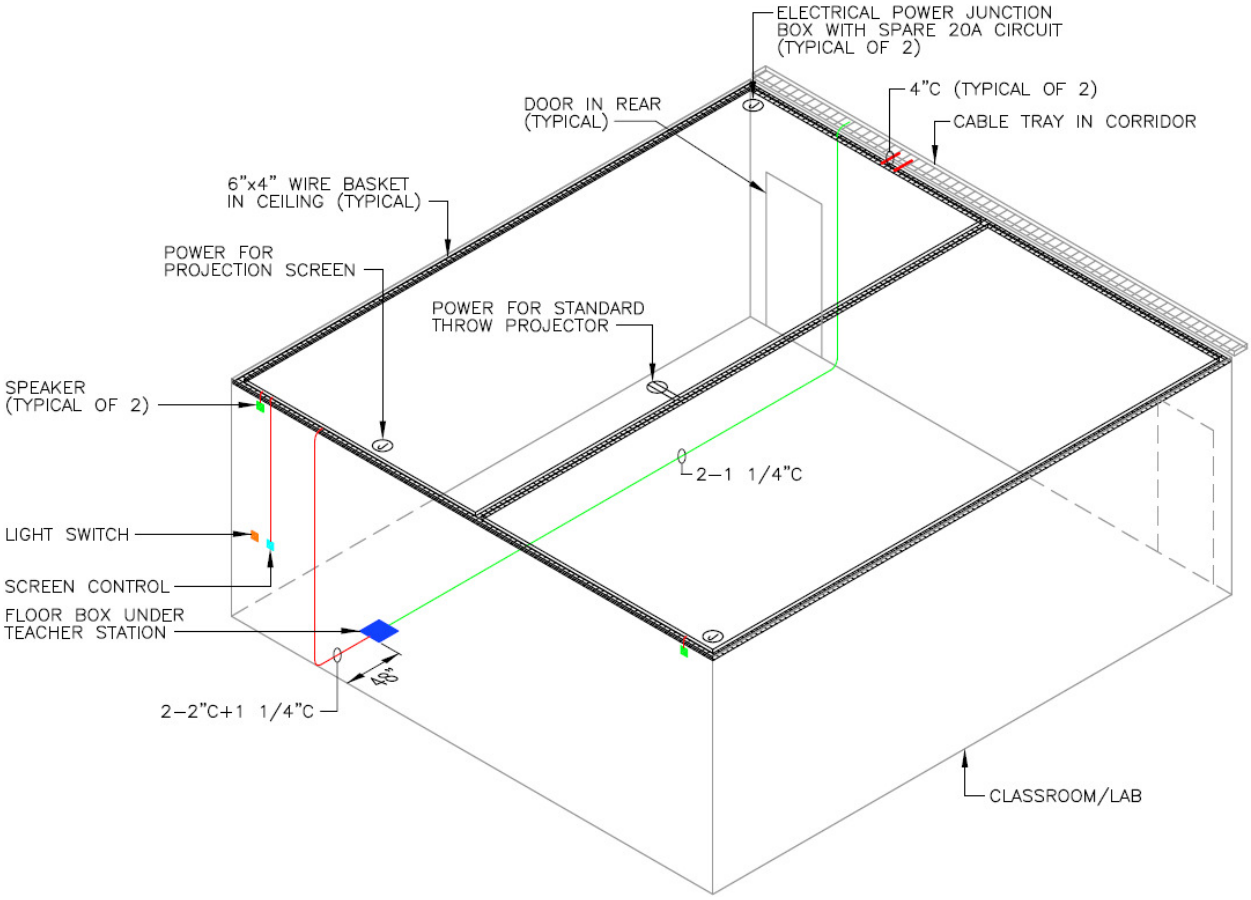
C. Patch Cord connects to jack in cable cubby and to Telephone or Computer.

Floor box with angled-port faceplates terminates Horizontal Cable A and connects Patch Cord B.

Cable cubby in table-top couples Patch Cord B and Patch Cord C.

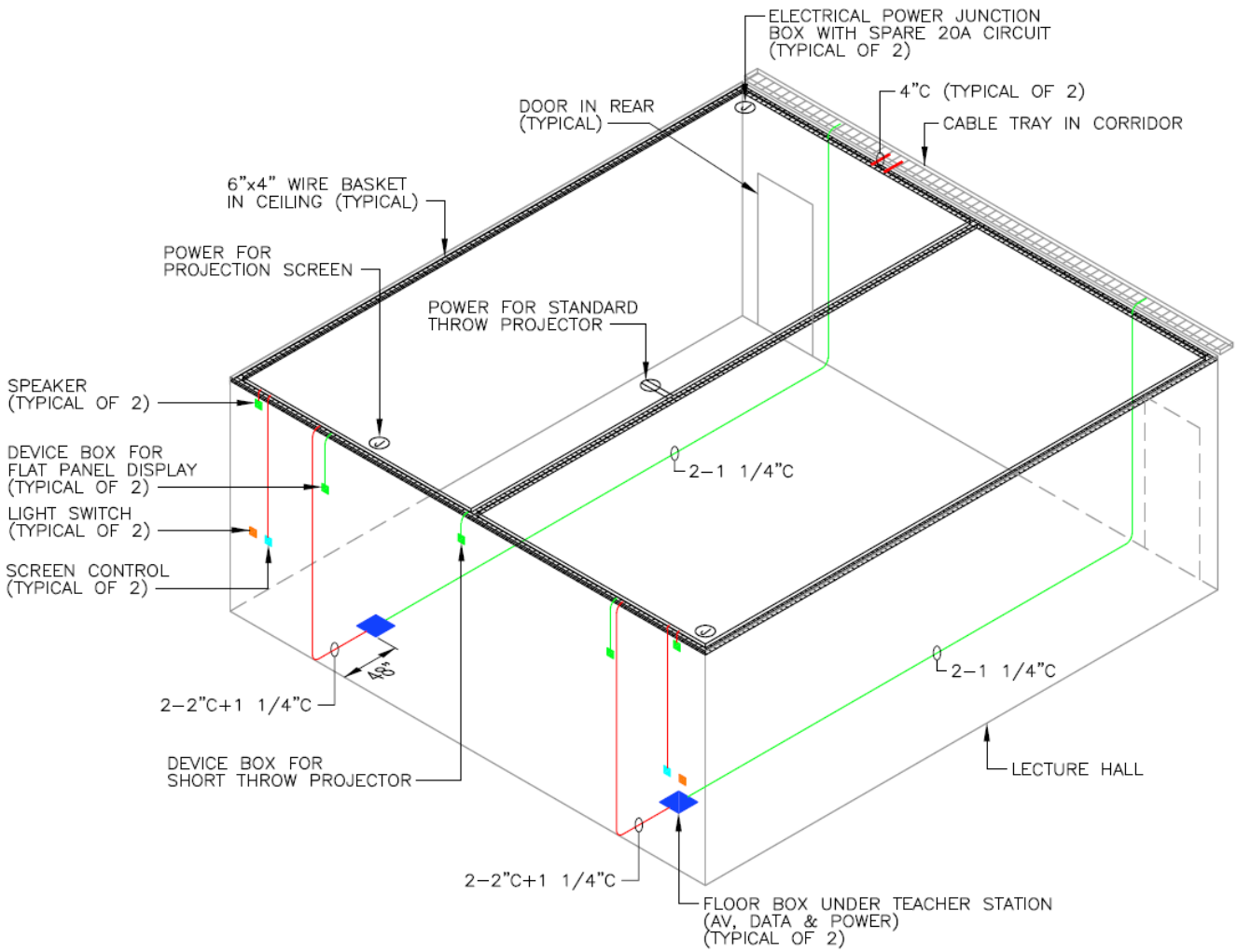
4.5.4.9.2 CLASSROOM / LAB (UP TO 150 SEATS)

A. The Designer shall work with the A/V designer and refer to the AVDG to provide the correct pathways and features for Classrooms and Labs, as depicted below:



4.5.4.9.3 LECTURE HALL (151 – 250 SEATS)

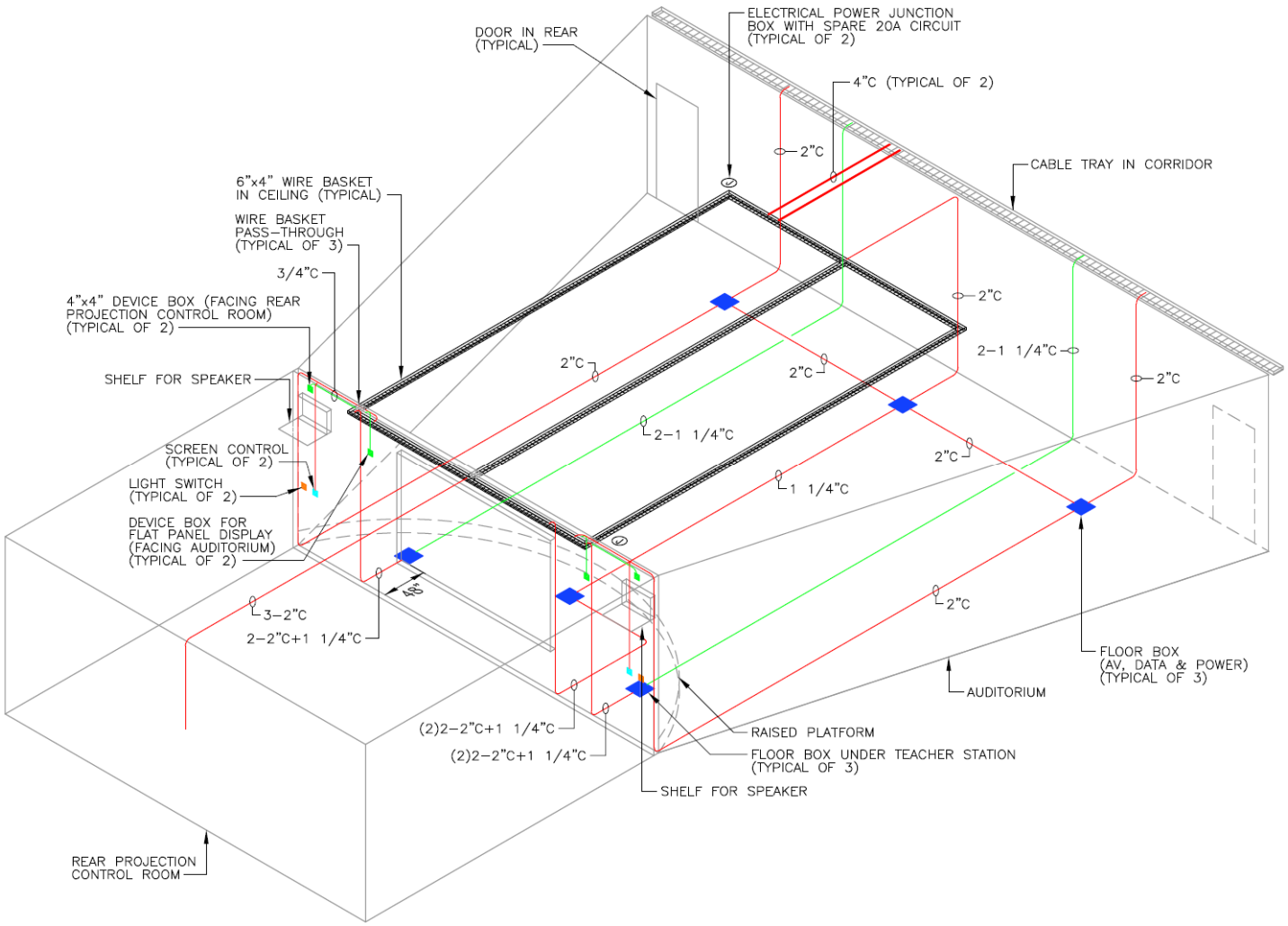
A. The Designer shall work with the A/V designer and refer to the AVDG to provide the correct pathways and features for Lecture Halls, as depicted below:



4.5.4.9.4 AUDITORIUM (MORE THAN 250 SEATS)

A. Auditoriums require a rear projection room that also serves as an A/V Equipment Room.

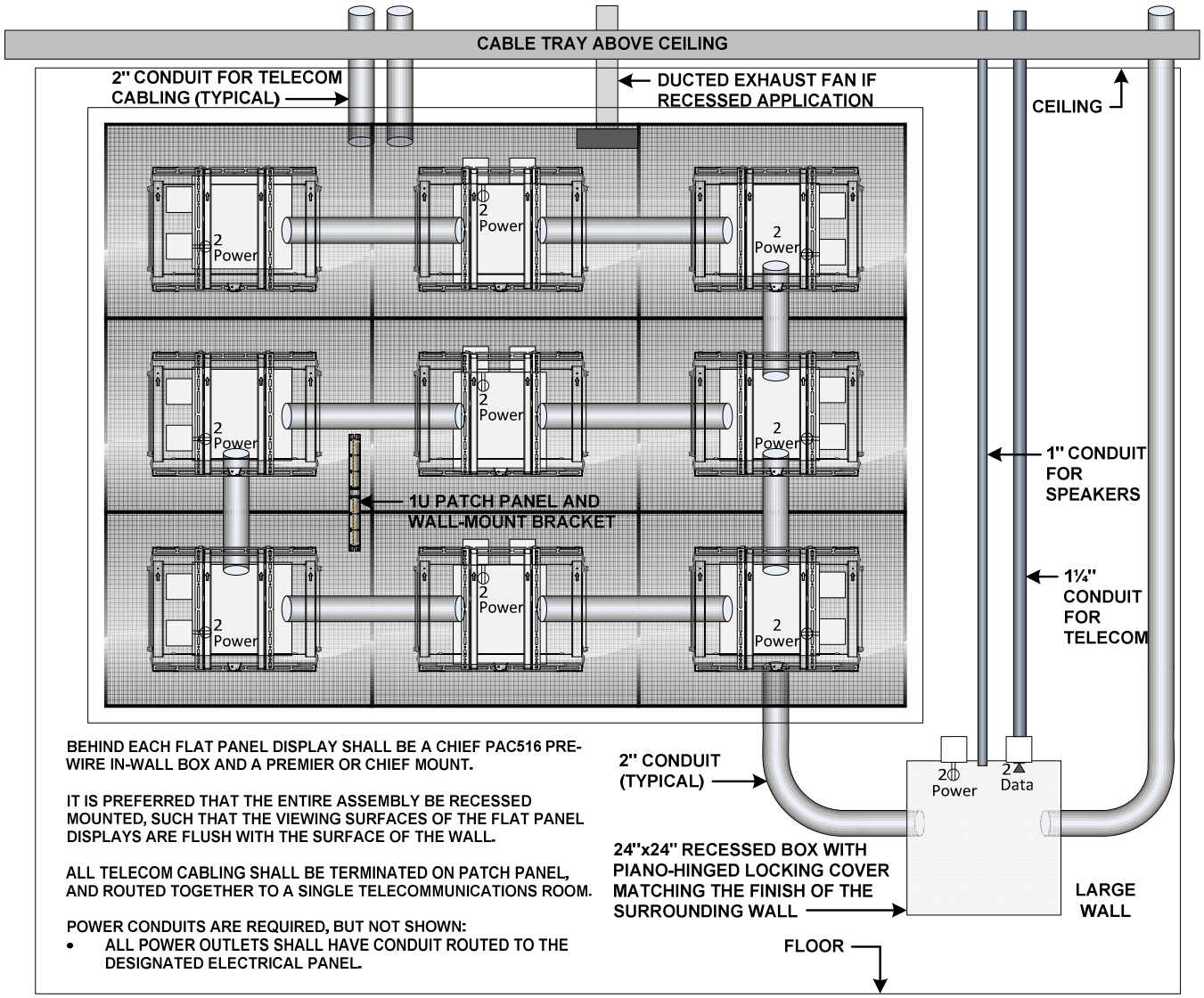
B. The Designer shall work with the A/V designer and refer to the AVDG to provide the correct pathways and features for Auditoriums, as depicted below:



4.5.4.9.5 VIDEO WALL

A. The Designer shall work with the Architect to design the appropriate wall structure, wall thickness, and finish materials. It is very desirable that space be available on the back side of this wall for an equipment rack. Otherwise, a rack must be located within 100 feet of the video wall.

B. The Designer shall work with the A/V designer and refer to the AVDG to provide the correct pathways and features for Video Walls, as depicted below:

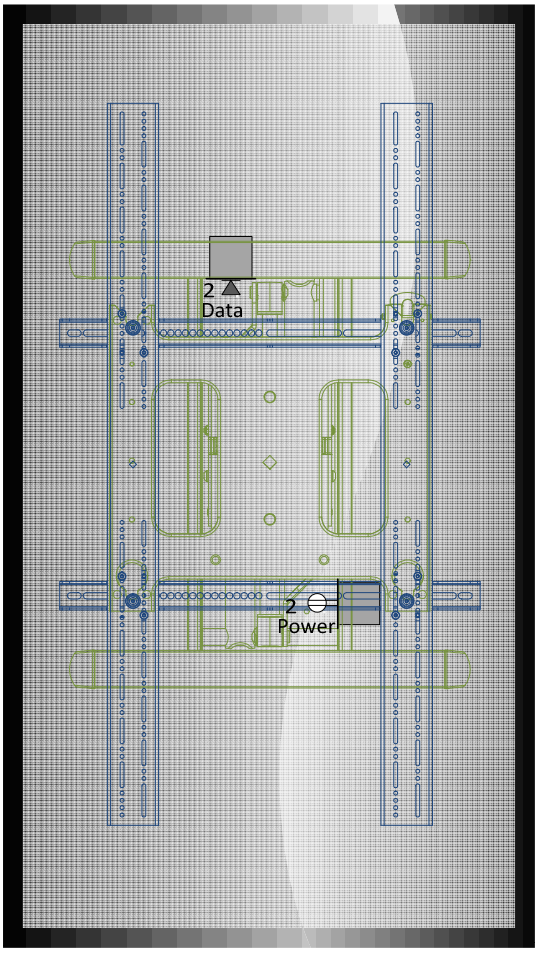


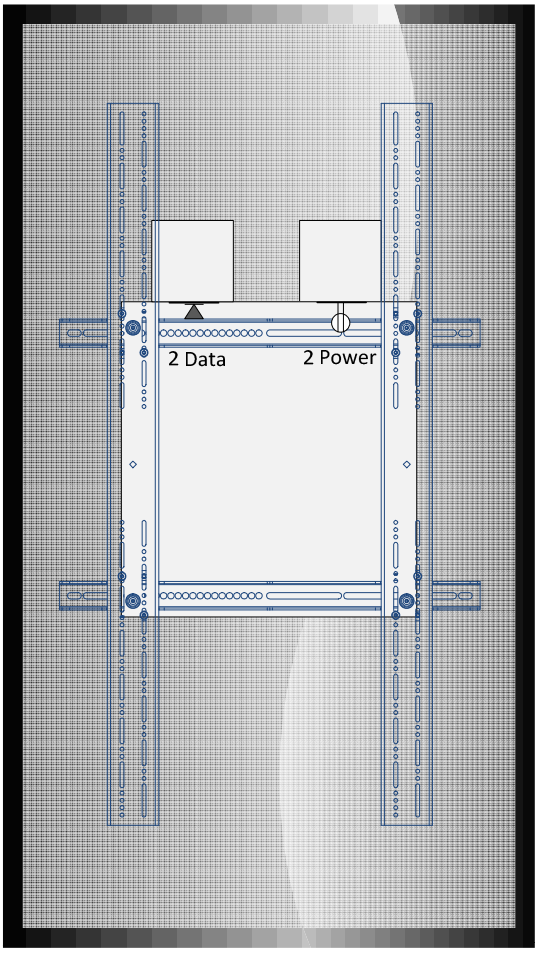
4.5.4.9.6 DIGITAL SIGNAGE

The Designer shall work with the A/V designer and refer to the AVDG to provide the correct pathways and features for Digital Signage, as depicted below:

4.5.4.9.6.1 Digital Signage – Portrait Orientation

Portrait-oriented digital signage panels shall be mounted 40" above finished floor to the bottom of the display. This will vary depending upon the size of the display. The Designer shall coordinate with the AVPM to determine the exact locations and sizes.





RECESSED APPLICATIONS

THE ENTIRE ASSEMBLY SHALL BE RECESSED MOUNTED, SUCH THAT THE VIEWING SURFACE OF THE FLAT PANEL DISPLAY IS FLUSH WITH THE SURFACE OF THE WALL.

BEHIND THE FLAT PANEL DISPLAY SHALL BE A CHIEF PIWRFUB MOUNT WITH A CHIEF PSBU INTERFACE BRACKET.

CONDUITS REQUIRED, BUT NOT SHOWN:

- DATA OUTLET SHALL HAVE 1¼" CONDUIT ROUTED TO NEAREST CABLE TRAY.
- POWER OUTLET SHALL HAVE CONDUIT ROUTED TO THE DESIGNATED ELECTRICAL PANEL.

SURFACE-MOUNTED APPLICATIONS

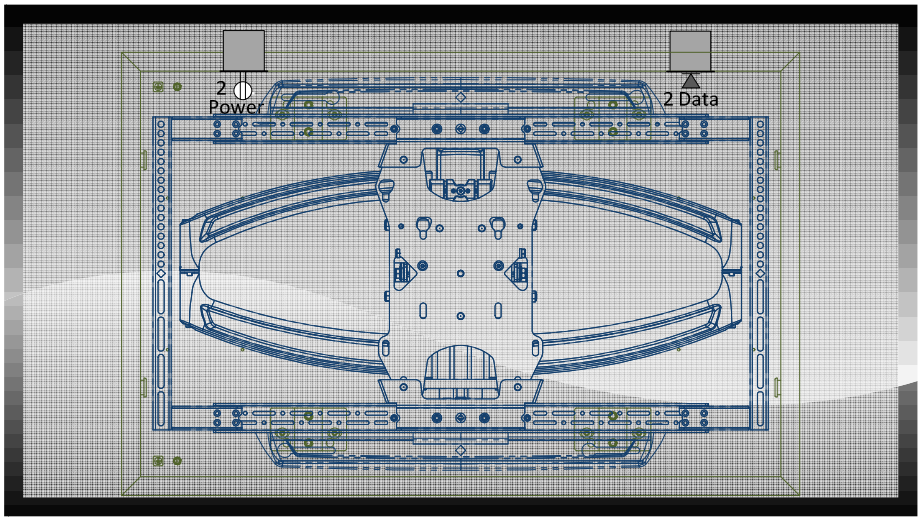
BEHIND THE FLAT PANEL DISPLAY SHALL BE A CHIEF PAC 516 IN-WALL BOX WITH A CHIEF PIWRFUB MOUNT OVER THE TOP.

CONDUITS REQUIRED, BUT NOT SHOWN:

- DATA OUTLET SHALL HAVE 1¼" CONDUIT ROUTED TO NEAREST CABLE TRAY.
- POWER OUTLET SHALL HAVE CONDUIT ROUTED TO THE DESIGNATED ELECTRICAL PANEL.

4.5.4.9.6.2 Digital Signage – Landscape Orientation

Landscape-oriented digital signage panels shall be mounted 50” above finished floor to the bottom of the panel. This will vary depending upon the size of the display. The Designer shall coordinate with the AVPM to determine the exact locations and sizes.



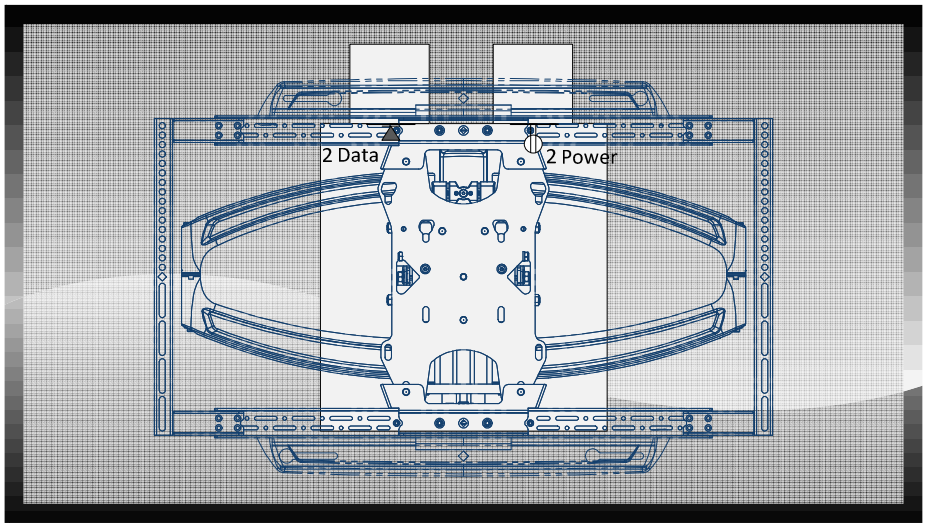
RECESSED APPLICATIONS

THE ENTIRE ASSEMBLY SHALL BE RECESSED MOUNTED, SUCH THAT THE VIEWING SURFACE OF THE FLAT PANEL DISPLAY IS FLUSH WITH THE SURFACE OF THE WALL.

BEHIND THE FLAT PANEL DISPLAY SHALL BE A CHIEF TA500 BACKBOX WITH A CHIEF TS525TU SWING ARM MOUNT.

CONDUITS REQUIRED, BUT NOT SHOWN:

- **DATA OUTLET SHALL HAVE 1¼” CONDUIT ROUTED TO NEAREST CABLE TRAY .**
- **POWER OUTLET SHALL HAVE CONDUIT ROUTED TO THE DESIGNATED ELECTRICAL PANEL.**



SURFACE-MOUNTED APPLICATIONS

BEHIND THE FLAT PANEL DISPLAY SHALL BE A CHIEF PAC 516 IN-WALL BOX WITH A CHIEF PIWRFUB MOUNT OVER THE TOP.

CONDUITS REQUIRED, BUT NOT SHOWN:

- **DATA OUTLET SHALL HAVE 1¼” CONDUIT ROUTED TO NEAREST CABLE TRAY .**
- **POWER OUTLET SHALL HAVE CONDUIT ROUTED TO THE DESIGNATED ELECTRICAL PANEL.**

4.6 ITS Cables and Connecting Hardware

Please refer to Chapter 6, *ITS Cables and Connecting Hardware* in the BICSI TDMM for information regarding the design of telecommunications cables and connecting hardware. The following requirements take precedence over the BICSI TDMM guidelines for telecommunications infrastructure at UVU facilities:

4.6.1 COPPER CABLING

A. 110-style termination blocks and connectors are required in the design of new telecommunications infrastructure for voice applications at UVU facilities.

B. The design of new telecommunications infrastructure at UVU facilities shall not include the following termination blocks or connectors:

- 66-style blocks or connectors
- BIX-style blocks or connectors
- LSA-style blocks or connectors
- 50-position miniature ribbon connectors

4.6.2 FIBER OPTIC CABLING

A. UVU uses singlemode fiber optic cabling for all fiber applications. While there is some existing multimode fiber optic cabling on campus, no new multimode fiber shall be installed.

B. Fiber optic cabling shall be terminated at both patch panels and outlets using SC-style connectors. All other connector styles (including LC, ST, and MTRJ) are prohibited for new fiber optic cabling at UVU facilities.

C. Where an application requires connectors with more than two strands of fiber (high bandwidth applications, pre-terminated cables, etc.) MPO connectors shall be used in accordance with manufacturer recommendations. Other connector types may be approved by the UVU ITPM on a case-by-case basis.

D. Where equipment does not support SC-style connectors, the Designer shall specify hybrid patch cords with SC connectors on one end and the other end matching the requirements of the equipment.

4.6.3 SPLICING

Splicing or coupling copper or fiber optic cable is prohibited for inside plant infrastructure.

4.7 Firestop Systems

Please refer to Chapter 7, *Firestop Systems* in the BICSI TDMM for general information regarding the design of firestopping for telecommunications infrastructure. The following requirements take precedence over the BICSI TDMM guidelines for telecommunications infrastructure at UVU facilities:

A. The Designer shall pay careful attention to the fire ratings of existing and new walls. Wherever penetrations are made through fire-rated walls, the Drawings shall identify the firestopping requirements.

B. Penetrations through fire-rated walls and floors shall be firestopped in accordance with the requirements of the manufacturer of the firestopping materials, and to satisfy local code officials.

C. The Designer shall avoid design solutions calling for penetration of fire walls, fire barriers, fire partitions, smoke barriers, and smoke partitions when other reasonable cable-routing options exist.

D. The predominant color of fire-rated pathway devices shall be red.

E. UVU prefers to use STI Ez-Path for penetrations through fire-rated walls and floors. This preference is based on the experience that it is difficult to keep putty-based materials intact inside conduit sleeves, especially vertically oriented sleeves, particularly through multiple moves-adds-changes.

4.8 Bonding and Grounding (Earthing)

Please refer to Chapter 8, *Bonding and Grounding (Earthing)* in the BICSI TDMM for general information regarding the design of grounding, bonding and electrical protection systems. The following requirements take precedence over the BICSI TDMM guidelines for telecommunications infrastructure at UVU facilities:

- Grounding and bonding conductors shall be sized according to the requirements in ANSI/TIA/EIA J-STD-607A.

4.9 Power Distribution

Please refer to Chapter 9, *Power Distribution* in the BICSI TDMM for general information regarding the design of power distribution for telecommunications infrastructure. The following requirements take precedence over the BICSI TDMM guidelines for telecommunications infrastructure at UVU facilities:

A. The Designer shall be responsible to determine that the electrical power distribution requirements supporting the telecommunications infrastructure are met as described in this document.

B. For projects where an Electrical Engineer is involved, the Designer shall coordinate directly with the engineer, and verify that the engineer's design documentation meets these requirements. For projects without the involvement of an Electrical Engineer, the Designer shall alert UVU where additional power infrastructure is needed to meet the requirements.

1. Please refer to Chapter 5, *Horizontal Distribution Systems* in the BICSI TDMM and also in TDDG Section 4.5.2 *Work Areas* for power outlet requirements for work areas.

2. Please refer to Chapter 3, *Telecommunications Spaces* in the BICSI TDMM and also in TDDG Section 4.3 *Telecommunications Spaces* for information on the power outlet requirements for TRs.

    - UVU typically provides network electronics that provide Power-over-Ethernet.
    - The Designer shall request power consumption data for the equipment that UVU will use, and shall size the power distribution infrastructure sufficiently to support this equipment.

3. Please refer to Chapter 18, *Data Centers* in the BICSI TDMM and also in TDDG Section 4.18 *Data Centers* for information on the power outlet requirements for data centers.

    - UVU data centers will typically be either Tier II or Tier III systems.
    - The Designer shall inquire which tier is to be designed for each project, and design appropriate power distribution systems to support the Tier designation.

C. The Designer shall inquire which type of power conditioning / power protection equipment should be designed for each project.

4.10 Telecommunications Administration

Please refer to Chapter 10, *Telecommunications Administration* in the BICSI TDMM for general information regarding the documentation and labeling of telecommunications infrastructure. The following requirements take precedence over the BICSI TDMM guidelines for telecommunications infrastructure at UVU facilities:

4.10.1 IDENTIFICATION STRATEGY

A. The "identifier" is the unique name or description assigned to a given telecommunications infrastructure component. The Designer shall assign identifiers to the telecommunications infrastructure components listed below and clearly show the identifier assignments on the Construction Documents.

B. While it is the Contractor's responsibility to provide marked-up drawings to the Designer indicating any construction-related changes to the identifiers, the

Designer shall verify that the identifiers are clearly and accurately shown on the record drawings.

C. Telecommunications components shall ***not*** be labeled with an application-specific identifier. Ports shall ***not*** be labeled with the name or function of the device that is served by the port (server names, computer types. Also, the use of "V-#" and "D-#" are inconsistent with the industry standard-based philosophy of designing cabling systems that are independent of the application, and are therefore not permitted.

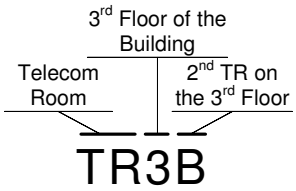
D. The Designer shall prepare construction specifications that shall contain a comprehensive listing of the identification strategy requirements.

4.10.1.1 NEW TELECOMMUNICATIONS DISTRIBUTION SYSTEMS

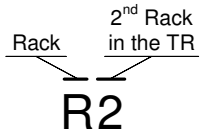
The items listed below shall be shown on the Construction Documents. The Designer shall assign the identifiers to the telecommunications components based on the following required identification strategy.

A. Telecommunications Rooms, Equipment Rooms and Data Centers shall be identified by room number. The Designer shall work with the FPM to assign room numbers to all telecommunications rooms.
   - For example: a telecommunications room located in Room #1242 in a building would be identified as "1242".
   - The Designer shall pay attention to this issue throughout construction. If the room numbering changes during construction, instructions shall be given to the Contractor to ensure that the labeling matches the final room numbering signage.

   However, if a telecommunications room does not have an assigned room number, then the Designer shall work with the ITPM to assign room numbering in the form of "TR#@", where "#" is the floor number on which the telecommunications room resides, and "@" represents a sequentially assigned letter to distinguish between multiple rooms on the floor.
   - For example: a building with two un-numbered telecommunications rooms on the third floor would have rooms labeled "TR3A" and "TR3B". This is permitted only on the approval of the ITPM.



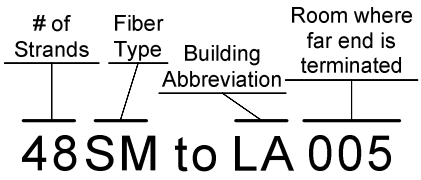
B. Racks in telecommunications rooms shall have identifiers of the form "R#" where "R" stands for "Rack" and "#" is the sequential rack number within a given TR, numbered left to right while facing the front of the racks.
   - For example: the first rack in a given telecommunications room would have the label "R1", the second "R2" and so on.



C. Fiber Optic Patch Panels shall have identifiers in the form of "##SM to BB rm#" where "##" is the number of strands, "SM" is the fiber type, "BB" is the building

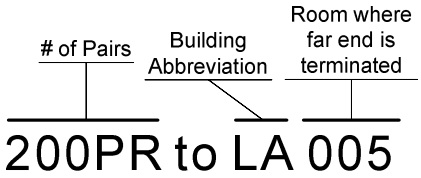
abbreviation and “rm#” is the telecommunications room or lab where the far end of the cable is terminated. Since each patch panel is used to terminate a single cable, no further labeling is required.

- For example: a 48-strand singlemode cable whose far end terminates in telecommunications room 005 in building “LA” would be labeled on the near end “48SM to LA 005”.
- See paragraph A above for room number information.



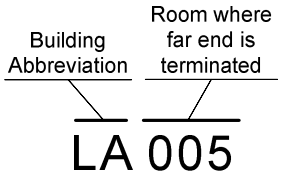
D. Backbone Cables (both fiber optic and copper) shall be labeled on both ends within 6 feet feet of entrance into a telecom room where they terminate, and also within 12” of the termination equipment (fiber patch panel or 110-block).

- Fiber optic cable labeling shall be identical to the fiber optic patch panel labeling. See paragraph C above.
- Copper backbone cable labeling shall have identifiers in the form of “###PR to BB rm#” where “###PR” is the number of copper pairs, “BB” is the building abbreviation and “rm#” is the telecommunications room where the far end of the cable is terminated.
- For example: a 200PR copper backbone cable whose far end terminates in telecommunications room 005 in building “LA” would be labeled on the near end “200PR to LA 005”.



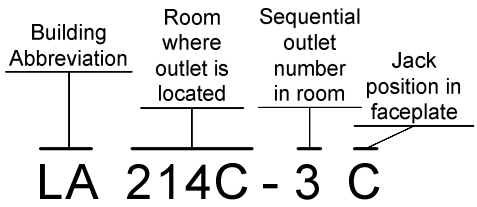
E. Innerduct shall be labeled within 6 feet of the telecommunications room entrance and again within 12” of each end. The labels shall identify the far end of the innerduct, in the form of “BB r m#”, where “BB” is the building abbreviation and “rm#” is the telecommunications room.

a. For example: an innerduct whose far end terminates in telecommunications room 005 in building “LA” would be labeled on the near end “LA 005”.



F. Faceplates on Workstation Outlets shall have identifiers for each jack, labeled in the form “BB ###-X@” where “BB” is the building abbreviation, “###” is the room number where the outlet is located, “X” is the sequential number of the outlet within the room, and “@” is either A, B, C or D corresponding to the jack location within the faceplate.

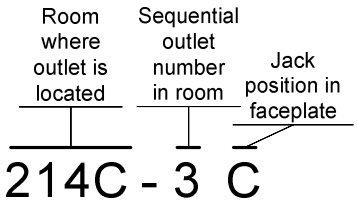
- For example: if room number 214C in building LA has 3 outlets, and the third outlet is used to terminate one voice cable serving two jacks and two data cables, the labels on the faceplate would indicate: “LA 214C-3A”, “LA 214C-3B”, “LA 214C-3C” and “LA 214C-3D”. Where labeling space is limited, it is permitted to combine labels, for



example “LA 214C-3A B” and “LA 214C-3C D”.

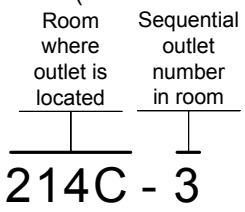
G. Ports on Workstation Patch Panels are typically pre-labeled by the manufacturer with sequential numbers (i.e. 1 to 48). In addition to these labels, label each port with the same number used on the faceplate for that cable, minus the building abbreviation.

- For example: in the case of a port on a patch panel terminating a horizontal copper data cable that terminates in room number 214C in the 3rd outlet in the lower left position in the faceplate, the label on the patch panel port would indicate: “214C-3C”.



H. Terminations on 110-Blocks for horizontal voice cables shall be labeled with the room number and outlet number that appears on the faceplate label (no need for the building abbreviation or jack position).

- For example: in the case of a voice termination on a 110-block terminating a horizontal copper voice cable that terminates in room number 214C in the 3rd outlet, the label on the 110-block termination would indicate: “214C-3”.



4.10.1.2 MOVES, ADDS AND CHANGES (MAC)

The only exception to the above identification scheme is for small projects relating to moves or changes to existing cabling, or the addition of new outlets terminated among other existing cables in existing TRs. In such cases (where the amount of new work is small compared to the overall system), the identification scheme for the new cables shall be consistent with the existing identification scheme.

For projects where there are larger amounts of change, the Designer shall inquire with UVU whether it is desirable to re-label the existing cables when new cabling is being installed.

4.11 Field Testing of Structured Cabling

Please refer to Chapter 11, *Field Testing of Structured Cabling* in the BICSI TDMM for general information regarding the field testing of telecommunications cabling. The following requirements take precedence over the BICSI TDMM guidelines for field testing at UVU facilities:

A. The Designer shall require the Contractor to test 100% of field-terminated cabling and at least 10% of all pre-terminated cables.

- UVU reserves the right to require the Contractor to test more than 10% of all pre-terminated cables if the 10% test results are unsatisfactory.
- Copper cables shall be Link tested (not Channel tested).

B. Cable tester equipment shall be manufactured by Fluke.

C. The Designer shall require the Contractor to submit the actual native machine test result files downloaded from the test equipment, and also the same test results in a PDF document. Printed (hard copy) test reports are not necessary or desirable.

D. The Designer shall review the cable test results submitted by the Contractor. In particular, the Designer shall check for the following items on the cable test reports:

- The cable test report shall be automatically produced by the test equipment.
- The report shall indicate that the cable passed the test. It shall also indicate the date of calibration, the software version and the name of the technician or conducted the test. The reports shall also include graphical results of the performance curves obtained during the testing.
- Indications that the cabling meets distance limitation requirements.
- Indications that the wire-map of the cable is correct.
- Indications that the cable test equipment was properly configured. For copper cabling, the test equipment's configuration parameter for Nominal Velocity of Propagation (NVP) shall match the value stated by the cabling manufacturer for the type of cable installed.
- Marginal test results (typically indicated with an asterisk "*") are only acceptable when the condition is "over length" and when the over-length situation was intentional during design. For example, a low bandwidth device might be served by a cable that would otherwise be too long to support a high bandwidth device. Over-length issues due to choice of routing or extra service loops are not acceptable.
- For Fiber Optic Cabling: the cable test report shall indicate a headroom dB value that is equal to or better than the value calculated in the link-loss budget.

E. The cabling performance characteristics shall meet or exceed the performance guaranteed by the manufacturer, which may exceed standard industry requirements. In other words, even though a particular cable might pass its tests, the cable might still be rejected (requiring re-termination or replacement) if it does not meet the higher standard of performance that the manufacturer may list for its products.

F. UVU may choose to spot-test cabling to back-check the Contractor's test results.

G. UVU may choose to hire a third-party cable test company to conduct an independent cabling test.

H. The final test results shall have been verified by the Designer to be acceptable before submission to UVU. Test results shall be submitted to UVU in electronic form, both in PDF form and also the original test result data files.

I. Contractors shall be required to retain a copy of the test reports for a period of at least 5 years after installation.

4.12 Outside Plant

Please refer to Chapter 12, *Outside Plant* in the BICSI TDMM and the BICSI OSPDRM for information regarding the design of outside plant telecommunications infrastructure.

See Section 4.4 *Backbone Distribution Systems* above.

4.13 Audio/Visual Systems

Please refer to Chapter 13, *Audiovisual Systems* in the BICSI TDMM for information regarding the design of telecommunications infrastructure to support audio/visual systems, private CATV distribution systems, and distributed paging systems at UVU facilities.

4.13.1 AUDIO/VISUAL SYSTEMS

The Designer shall coordinate with the AVPM and reference the Audio/Visual Design Guide (AVDG) for information about the telecommunications infrastructure required to support audio/visual applications at UVU.

4.13.2 DISTRIBUTED PAGING SYSTEMS

A new campus-wide fire alarm system is currently being designed. One of the intended features of this system is a public safety annunciation system. The system will likely use telecommunications backbone cabling. The Designer shall inquire with UVU to determine whether a given project should include infrastructure to support this system.

4.13.3 PRIVATE CATV DISTRIBUTION SYSTEMS

UVU no longer provides conventional television (via coaxial cabling) to television locations on campus. Instead, IPTV is now used, requiring a single jack Category 6A outlet for each television location.

However, the Designer shall inquire with UVU to determine whether conventional coaxial cable-based television distribution is required for any application. If so, then content in Chapter 13 of the BICSI TDMM would apply.

4.14 Building Automation Systems

Please refer to Chapter 14, *Building Automation Systems* in the BICSI TDMM for information regarding the design of telecommunications infrastructure to support building automation systems at UVU facilities.

A. ANSI/TIA/EIA-862 applies to telecommunications infrastructure serving building automation systems (BAS). The Designer shall pay particular attention to the following BAS issues:
   - Verify that the voltage and current requirements of each BAS application are

satisfied by the cabling materials to be installed.
- Verify that a suitable horizontal connection point (HCP) is installed for each BAS application.

B. BAS devices are increasingly converging onto structured cabling systems. While the design of these systems is typically outside the scope of work of the telecommunications infrastructure designer, the Designer shall design the telecommunications cabling required to support these systems.

C. Typically, BAS systems require telecommunications cabling routed from the devices to a patch panel termination point in a designated mechanical room or other location managed by building maintenance personnel. In addition to the device-specific cables, other cables shall be designed from the telecommunications rooms to the BAS patch panels, to permit these systems to gain access to the data networks.

D. Horizontal connection points are only required for BAS applications. Do not use an HCP for typical voice/data/video applications.

4.14.1 FIRE ALARM SYSTEM

A. The fire alarm system at UVU's campus communicates via one of three singlemode fiber optic rings and also uses two analog phone circuits for each Fire Alarm Control Panel (FACP).

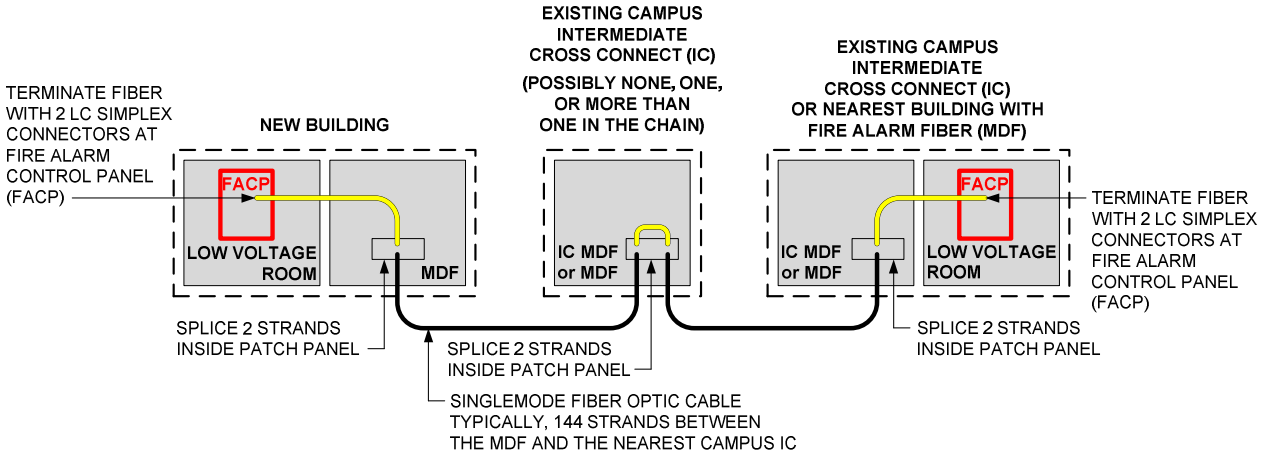
B. The Designer shall include in the design an outlet with two telephone cables for backup alarm dialing, terminating at the FACP in a new building.

C. In addition, the Designer shall include in the design two strands of singlemode fiber, continuously spliced (patch cords are not acceptable) from the FACP in a new building through the MDF (splice) to an ITPM designated point where it can intercept an established ring.

D. The construction scope of work will include splicing activities in other buildings outside of the new or remodeled building in order to connect the fire alarm system to an existing campus ring. The Designer shall include these requirements on the Contract Documents.

E. The diagram below depicts the cabling and splicing requirements for the fire alarm system. The Designer shall work with the ITPM to determine the best location on campus to insert a new link into an existing fiber loop.

SINGLEMODE BACKBONE FIBER FOR THE FIRE ALARM SYSTEM



4.15 Data Networks Design

Please refer to Chapter 15, *Data Networks Design* in the BICSI TDMM for general information regarding the design of telecommunications infrastructure for serving local area networks. The following requirements take precedence over the BICSI TDMM guidelines for telecommunications infrastructure at UVU facilities:

A. All UVU facilities use the Ethernet LAN protocol. Telecommunications infrastructure for all UVU facilities shall be designed, installed, and tested to support the Institute of Electrical and Electronic Engineers (IEEE) Ethernet 802.3 standards. UVU networks use the 1000Base-X Gigabit Ethernet protocol based on the IEEE 802.3z standard to the workstation and 10GBase-X in the backbone. All newly installed cabling shall support this protocol.

B. The design of the network electronics is done by UVU and is outside the scope of work of the telecommunications Designer.

C. The Designer shall coordinate with the UVU ITPM to determine the requirements for supporting the network electronics in each space. The design shall provide rack space to host UVU's network equipment.

4.16 Wireless Networks

Please refer to Chapter 16, *Wireless Networks* in the BICSI TDMM and the BICSI Wireless Design Reference Manual (WDRM) for information regarding the design of telecommunications infrastructure to support wireless and microwave telecommunications systems at UVU facilities.

4.16.1 WIFI NETWORKS

See Section 4.5.2.4 *Telecommunications Outlets for Wireless Access Points / IP Cameras* for information about wireless access points.

4.16.2 DISTRIBUTED ANTENNA SYSTEMS

UVU requires the services of an RF Distribution Engineer to properly design distributed antenna systems (DAS) for campus buildings.

4.16.2.1 EMERGENCY RESPONDER RADIO

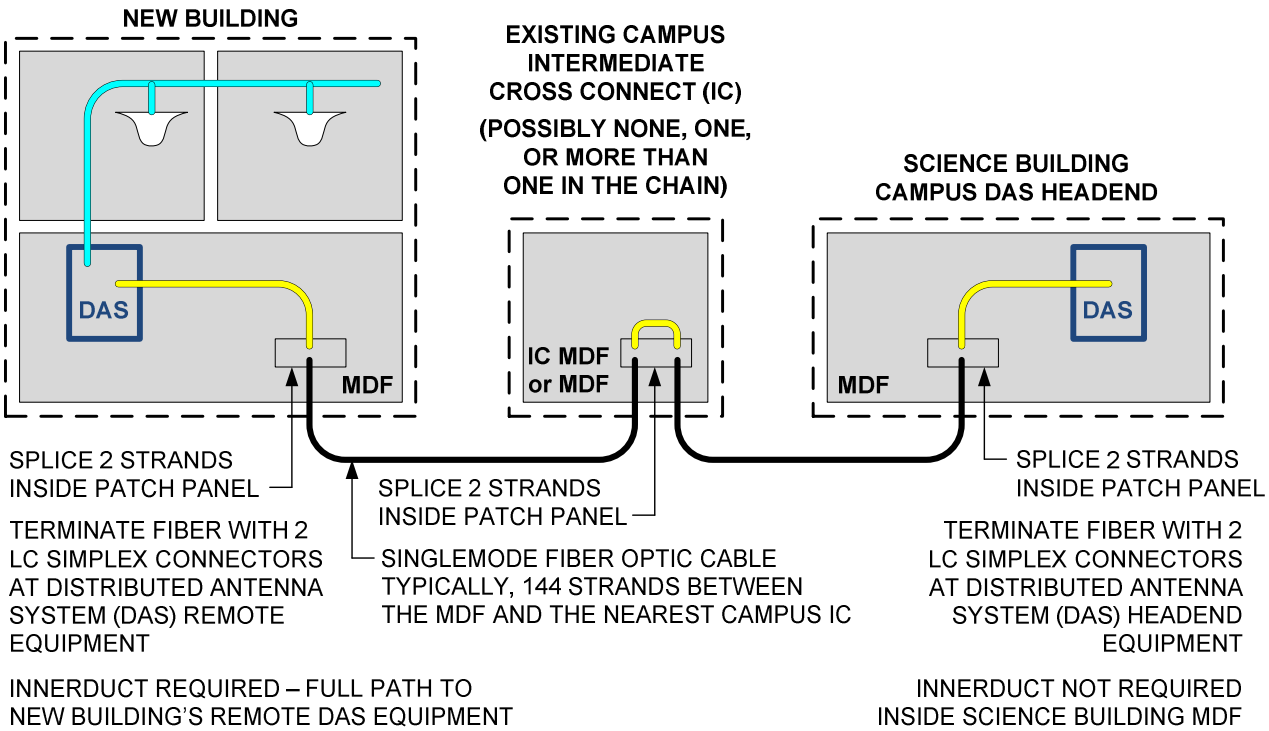
A. For compatibility with the radio systems of the various nearby emergency responder organizations, UVU deploys an 800 MHz distributed antenna system in each building. UVU has standardized on the use of DAS equipment from Solid (www.solid.com).

B. Campus facilities will typically require more than one antenna.

C. The fiber optic cabling path requires continuous fiber strands (spliced) across campus. Patch cords are not acceptable.

D. The diagram below depicts UVU's standard fiber optic cabling infrastructure for DAS applications. The Designer shall include requirements in the Construction Document for the Contractor to provide splicing in multiple buildings (as required) including locations that are not otherwise part of the project.

SINGLEMODE BACKBONE FIBER FOR DISTRIBUTED ANTENNA SYSTEMS



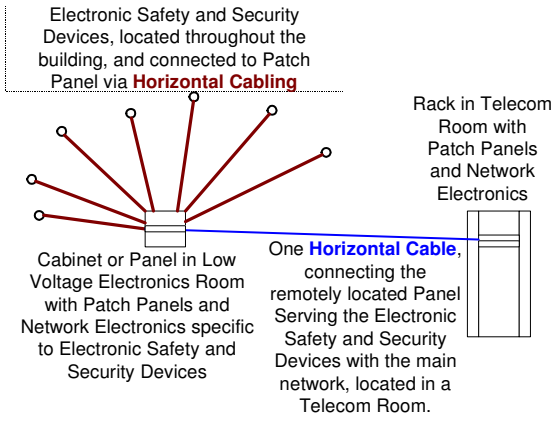
4.16.2.2 CELLULAR TELEPHONE SERVICE AUGMENTATION

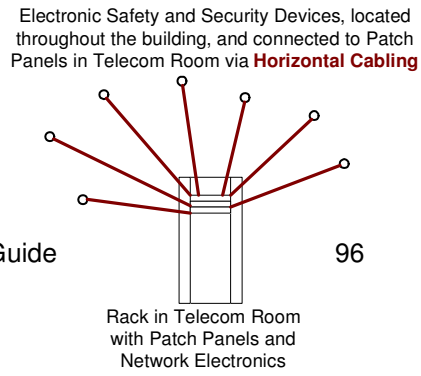
Currently, UVU does not provide augmented cellular service coverage within its buildings. The Designer shall inquire with the ITPM to determine whether this feature should be designed for a specific project.

4.17 Electronic Safety and Security

Please refer to Chapter 17, *Electronic Safety and Security* in the BICSI TDMM for general information regarding the design of telecommunications infrastructure for serving electronic safety and security systems.

Electronic safety and security (ESS) devices are increasingly converging onto structured cabling systems. While the design of these systems may fall outside the scope of work of the telecommunications infrastructure designer, the Designer shall design the telecommunications cabling required to support these systems, and the telecommuncations cabling subcontractor shall install the telecommunications cabling.





Sometimes ESS systems require telecommunications cabling routed from the devices to a patch panel termination point in a designated low-voltage electronics room or other location managed by building security personnel. In addition to the device-specific cables, additional cables shall be designed from the telecommunications rooms to the ESS patch panels, to permit these systems to gain access to the data networks.

Other times, ESS systems can be cabled directly to patch panels in the telecommunications rooms just like any other computer or telephone device.

The diagrams above depict the differences between these two solutions. The Designer shall inquire on a project-by-project basis which solution to apply to a given project. Non-technical issues will commonly affect which solution is used.

4.18 Data Centers

Please refer to Chapter 18, *Data Centers* in the BICSI TDMM for general information regarding the design of telecommunications infrastructure for serving data centers. Generally speaking, UVU follows the TIA-942 Data Center Standard in the design of data centers and larger equipment rooms. The requirements below take precedence over the BICSI TDMM guidelines.

The requirements for small-scale equipment rooms are the same as for telecommunications rooms.

The Designer shall inquire with UVU whether an equipment room in a given project is intended to be designed with telecommunications room features or data center features.

4.18.1 SIZING CONSIDERATIONS

A. The Designer shall consult with the UVU ITPM to determine any sizing requirements for the Data Center on a project-by-project basis. The design shall include a minimum of 50% vacant space for future growth.

B. The power consumption profile of equipment to be hosted in the data center and its associated heat-load profile are the two key parameters for sizing a data center. The Designer shall work with UVU ITPM to identify the power consumption per cabinet footprint, which will have a direct correlation to the cooling requirements of the space. The quantity of equipment cabinets that can be powered and cooled in the space drives the sizing plan.

- During the life of the data center, advances in technology may shrink the space requirements for each server, making more physical space available for additional servers. However, if there is not sufficient power to support another server, or sufficient cooling capacity to remove the heat produced by another server, then the additional space is unusable.

C. The UVU ITPM shall approve the final space requirements and design layout for the equipment and racks.

4.18.2 TIER CLASSIFICATION

UVU data centers are typically designed for Tier II+ classification (redundant components, single distribution path, and N+1 redundancy). However, the Designer shall inquire with the ITPM on a project-by-project basis for the desired Tier classification of each data center or equipment room.

4.18.3 ARCHITECTURAL CONSIDERATIONS

The Data Center shall be separated from other occupancies within the building by fire-resistant-rated construction of not less than 1 hour.

Raised flooring with antistatic tiles is required.

4.18.4 ENVIRONMENTAL PROVISIONING

Environmentally friendly solutions shall be considered in the design of data center cooling systems, incorporating heat reclamation and non-mechanical cooling features where reasonable and practical. Utah DFCM requires LEED Silver for new buildings.

Environmental management and monitoring systems shall be designed for data centers.

Consideration shall be given to both cooled cabinets and whole-room cooled air solutions.

Air conditioning systems for technology/server and UPS rooms shall be supported by emergency power systems. Typically, a generator will perform this function.

4.18.5 FIRE DETECTION AND SUPPRESSION

All Data Centers shall be protected by a non-water-based suppression system.

Very Early Smoke Detection Aparatus (VESDA) systems shall be considered for this application.

4.18.6 FLOOR-STANDING EQUIPMENT RACKS

Some IT equipment requires an equipment rack with both front and rear mounting rails. The Designer shall discuss with UVU the network electronics that will be hosted in each rack in each Data Center, and shall show this equipment on the rack elevation details in the plan drawings. The Designer shall also discuss with UVU the potential for future additional racks, and identify spaces for the future racks on the plan drawings.

4.18.7 TELECOMMUNICATIONS CABINETS

A. Other styles of equipment racks and cabinets might be used in the Data Center, some of which may be proprietary to a particular system or service provider. The Designer shall plan the Data Center layout to make allowances for proprietary

cabinets and racks, and allow expansion room for future equipment.

B. Floor-standing cabinets shall have hinged doors (front and rear) to permit access to both the front and rear of the equipment. Telecommunications cabinets shall be constructed of heavy-gauge steel. The side panels of the cabinet shall be removable for maintenance accessibility.

C. Each cabinet shall be vented and, where appropriate, equipped with cooling fans.

4.18.8 POWER REQUIREMENTS

4.18.8.1 TECHNICAL POWER PANELS

A. A standby generator is required for each Data Center.

B. A separate supply circuit serving the room shall be provided and terminated in its own electrical panel located in the Data Center. This power panel shall be designated as "Data Center Technical Power." The Data Center technical power panel shall be used exclusively for supplying power to electronics equipment in the equipment room. Sizing of electrical power supply is dependent upon the equipment types and equipment load, and shall be calculated on a case-by-case basis, including sufficient spare capacity for future growth.

C. The technical power circuits in each Data Center shall originate from a technical power panel, dedicated to serving the Data Center. The technical power panel shall not be used to supply power to sources of EMI such as large electric motors, arc welding, or industrial equipment.

D. Power for critical network components such as servers, routers, switches, and telephone systems shall always be provided through at least one uninterruptible power supply (UPS).

E. UVU will consider the use of centralized UPS equipment as applications warrant, such as for Data Centers. However, if UVU wishes to use a centralized UPS, the following requirements shall be met:

- The UPS battery bank shall be sized to provide a minimum of two hours of run time for the supported low-voltage systems hardware. The Designer shall request direction from the UVU ITPM regarding project specific needs for increased run time.

- Upon installation, a qualified electrician shall test new centralized UPS units for correct output voltage prior to connecting electronic equipment.

- Centralized UPS equipment shall be provided with a network interface card so that the UPS can communicate via the network with servers and other equipment to orchestrate a coordinated safe-shutdown of the equipment in the event of an extended power outage. The telecommunications cabling

design shall require a telecommunications outlet located in the centralized UPS room near each UPS to support the UPS's network connection.

- UVU recognizes that flywheel-based UPS equipment is available. However, the initial cost of flywheel equipment is typically very high. As a result, the return on investment is low, with a lengthy time to payback. For most applications, flywheel-based UPS systems are probably cost-prohibitive.

F. UVU typically uses network electronics that provide Power-over-Ethernet (POE).

G. The Designer shall request power consumption data for the equipment that UVU will use, and will size the power distribution infrastructure sufficient to support this equipment.

4.18.8.2 TECHNICAL POWER OUTLETS

A. Generally, the power outlet requirements applicable to telecommunications rooms are also applicable to equipment rooms. See TDDG Section 4.3.8 *Power Requirements* (above).

B. The Designer shall obtain connection/load requirements from UVU for each piece of equipment, and tabulate the information for review and confirmation by UVU. This equipment may include network electronics, UPS equipment, computers/servers, phone system equipment, voice mail systems, video equipment and service provider equipment.

C. Some telephone PBX equipment, UPS equipment and network switch equipment requires specialized plugs or electrical service. The Designer shall specifically investigate the potential need for voltage or current requirements other than the typical 120VAC/20 Ampere power outlet, and shall coordinate with the design team to design the electrical power infrastructure to serve the needs of the equipment.

4.18.8.2.1 FOR REMODEL PROJECTS

If an equipment room is truly required in a remodel project, budget limitations and other constraints shall be resolved through actions that do not deviate from the requirements of this document. In particular, the electrical power requirements of equipment in an equipment room shall not be discounted or taken lightly.

4.18.8.3 CONVENIENCE POWER OUTLETS

Convenience power outlets shall be provided as described (above) in TDDG Section 4.3.8.4 *Convenience Power Outlets* (above).

4.18.9 GROUNDING, BONDING, AND ELECTRICAL PROTECTION

All equipment racks, metallic conduits and exposed non-current-carrying metal parts of telecommunications and information technology equipment in the Data Center shall be bonded to the TGB. Please refer to Chapter 8, *Bonding and Grounding (Earthing)* in the BICSI TDMM and TDDG Section 4.8 for more information regarding the design of grounding, bonding and electrical protection systems.

- The Data Center requires a dedicated/isolated ground wire routed inside a metallic conduit directly from the main electrical service-grounding electrode for PBX equipment. This ground wire is in addition to and separate from the telecommunications grounding system.

- Grounding and bonding conductors shall be sized according to the requirements in ANSI/TIA/EIA J-STD-607A.

4.19 Health Care

Please refer to Chapter 19, *Health Care* in the BICSI TDMM for general information regarding the design of telecommunications infrastructure for serving health care facilities.

UVU owns very few health care-related facilities. The likelihood of encountering a project of this type is low.

4.20 Residential Cabling

Please refer to Chapter 20, *Residential Cabling* in the BICSI TDMM for information regarding the design of telecommunications infrastructure to support residential facilities within UVU facilities.

UVU currently does not include any residential-type facilities. The likelihood of encountering a project of this type is low.

Generally speaking, UVU-owned residential facilities shall be provided with the same telecommunications infrastructure materials and methods as are used for all other UVU facilities, except where specifically noted in this document.

4.21 Business Development and Project Management

Please refer to Section 3 in both the TIDG and TDDG for Project Management requirements that are specific to UVU.

Please refer to *Appendix A: Codes, Standards and Regulations* in the BICSI TDMM for general information regarding the codes, standards and regulations that apply to telecommunications infrastructure.

5 Construction Document Content

This section of the TDDG describes the content requirements that the Designer shall include when creating the Construction Documents. This content is in addition to the content found in some generally accepted document sets.

The services provided by the Designer and the resulting documents shall comply with the State of Utah's contract requirements. In addition to these requirements, the Designer shall also meet the requirements in this document, including the Construction Document content requirements in this section.

Construction Documents shall communicate a fully detailed and coordinated design (rather than making adjustments in the field during construction) and are expected to result in reduced construction costs and fewer change orders. The level of detail required to meet this objective may be substantially greater than some telecommunications designers may be accustomed to providing.

The Designer shall include the following content in the Construction Documents:

5.1 Plans and Drawings

5.1.1 GENERAL

The telecommunications portion of the Construction Drawing set shall include the following:

- Cover Sheet
- Sheet List
- Site Map
- Symbol Schedule
- List of Abbreviations
- Plan Sheets
- Elevation Diagrams
- Schematic Diagrams
- Construction Details
- Demolition

All plan sheets shall be scaled, shall indicate the scale and shall show a north arrow. All plan sheets shall show a key plan when the building or site is too big to fit on a single sheet.

Equipment and cable identifiers shall be shown on the drawings and diagrams.

5.1.2 OUTSIDE PLANT SITE PLAN DRAWINGS

A. Provide drawings showing a scaled telecommunications distribution site plan. These drawings shall show the following:

- Maintenance hole or handhole locations (labeled with their identifiers)
- Complete ductbank routing, details and elevations
- Conduit sizes, quantities and arrangements
- Section cuts
- Existing and new surface conditions
- Outside plant copper telecommunications cabling, including pair counts
- Outside plant fiber optic telecommunications cabling, including fiber types and strand counts
- Locations of buildings, roads, poles, existing underground utilities and other obstructions

B. These sheets should also identify coordination arrangements where conflicts with site work for other disciplines could possibly arise, in particular indicating the separation distances between telecommunications and power or steam. The sequencing of site work also should be shown, if applicable.

C. The site plan shall show the cabling from the service providers (cable television, telephone, etc.) and shall indicate the requirements for owner-provided maintenance holes or handholes and pathway to the point of demarcation.

D. These sheets should also identify coordination arrangements where conflicts with site work for other disciplines could possibly arise, in particular indicating the separation distances between low-voltage and power or steam. The sequencing of site work also should be shown, if applicable.

5.1.3 MAINTENANCE HOLE/HANDHOLE BUTTERFLY DIAGRAMS

A. Butterfly diagrams are a combination of tabular information and a schematic diagram used to organize and communicate information related to the conduits and cabling in each maintenance hole and handhole. These diagrams are CAD files to be included in the project's drawing set.

B. The Designer shall provide a set of butterfly diagrams depicting each maintenance hole or handhole affected by the project and showing new cabling as well as existing cabling to remain in the maintenance hole or handhole.

- Ducts to be used for new cabling shall be assigned during the course of design, not during construction. Duct assignments must be approved by UVU prior to the release of the Construction Documents.

C. A second set of butterfly diagrams shall be provided for each maintenance hole or handhole that contains existing cabling intended to be demolished under the project.

D. The diagrams shall be formatted as shown in the sample butterfly diagram in the Appendix 6.5. Upon request, UVU will provide an electronic AutoCAD file of this

diagram to be used as a template, as well as electronic CAD files for each butterfly diagram affected by a project.

5.1.4 INSIDE PLANT PLAN DRAWINGS

A. Scaled plan drawings shall be provided for each building showing the telecommunications applications and cabling inside the building. These drawings shall show the following:

- Routing of new pathway to be constructed during the project.
  - The content of the drawings shall be coordinated with other disciplines and shall be representative of the complete pathway route that the Contractor shall use, rather than a schematic depiction.
  - It is expected that the Designer will expend considerable coordination effort during the design process. Non-coordinated pathway/raceway is not acceptable to UVU.
- Approximate locations of junction boxes and conduit bends.
- The cable quantities and the raceway at any given point in the system.
- Backbone distribution cabling.

B. Where new cabling will be pulled into existing conduits, the Construction Documents shall show the routes of each *existing* conduit. Where it is not possible to determine the routing of existing conduits, the Designer shall inform the UVU TPM and seek direction on whether to use the existing conduits or design new conduits for use on the project. Typically, the Designer is required to identify such conditions during field investigation activities.

C. Telecommunications outlet symbols shall be shown on drawings as follows:

OUTLET WITH # OF DATA CABLES (# JACKS)

OUTLET WITH 2 DATA CABLES (2 JACKS)

OUTLET WITH 1 VOICE CABLE (2 JACKS)
AND 2 DATA CABLES (2 JACKS)

OUTLET WITH 1 VOICE CABLE (2 JACKS)

D. The subscript on outlet symbols shall be shown on drawings as follows:

C = CEILING-MOUNTED OUTLET

AP = CEILING-MOUNTED OUTLET
SERVING WIRELESS ACCESS POINT

F = FLOOR BOX

W = WALL-MOUNTED PHONE (1 JACK)

5.1.5 DEMOLITION

A. Any existing equipment and cabling intended to be no longer in use following the new installation shall be removed (salvaged and returned to the Owner undamaged and in working condition) as a part of the project. UVU uses salvaged equipment as spare parts to support the existing equipment in other buildings.

B. Existing cabling to be demolished shall be shown on the plans and schematic diagrams. Separate demolition plan sheets and schematic diagrams shall be provided for projects with extensive cable demolition.

5.1.6 TELECOMMUNICATIONS ROOM PLAN DETAILS

A. Construction Documents for UVU projects shall show scaled plan drawing details for the telecommunications spaces. The details shall show the footprint and location of each of the major components in the room including at least the following:

- Backboards
- Ladder Racking
- Work Area
- Backbone Cable Routing
- Entrance Conduits
- UPS Equipment
- Termination Blocks
- Grounding Busbar
- Space Reserved for Utility Demarc
- Racks and Vertical Cable Mgmt
- Space for other low-voltage systems
- Entrance Protection Equipment
- PBX and Voice Mail Equipment

B. For modifications to existing telecommunications rooms, it may be necessary to provide a demolition plan.

C. Sample telecommunications room plan diagrams are included in Appendix 6.3.

5.1.7 ELEVATION DIAGRAMS

A. The Designer shall provide scaled wall elevation details for each TR and ER affected by the project.

B. For remodel projects, the Designer shall produce digital photographs of each wall depicting the existing conditions where future TRs and ERs will be located. These photos shall be provided with the wall elevation details in the Construction Documents.

C. The wall elevation details shall show the components that are mounted on the walls in the room, including at least the following:

- Backboards
- Ladder Racking
- Backbone Cable Routing
- Cable Management
- Wall-mounted Electronic Equipment
- Wall-mounted Swing Racks & Contents

- Cable Slack Loops
- Grounding Busbar
- Existing Devices
- Work Area
- UPS
- Entrance Pit
- Termination Blocks
- Power Receptacles
- Entrance Conduits
- Space for Future Racks
- PBX and Voice Mail
- Racks and Vertical Cable Mgmt
- Entrance Protection Equipment
- Other low-voltage systems
- Space for Future Equipment
- Space Reserved for Utility Demarc

D. Elevation details for each of the telecommunications racks in each TR and ER shall also be provided. Rack elevation details shall show the racks and any components that are mounted on or near the racks including at least the following:

- Patch Panels
- UPS Equipment
- Existing Devices
- Shelves / Drawers
- Termination Blocks
- Power Receptacles
- Space for Future Equipment
- Electronic Equipment
- Cable Management

E. The details shall depict the telecommunications materials that are listed in the specification.

F. Where a project involves additions to existing racks, the elevation details shall show the existing equipment in the racks and indicate which items are existing, in addition to indicating which items are “new, to be provided under the Contract.”

G. Examples of rack elevation details are included in Appendix 6.2. An example wall elevation detail is included in Appendix 6.4.

5.1.8 INTRA-BUILDING BACKBONE SCHEMATIC DIAGRAMS

A. A schematic diagram shall be provided showing the sizing and routing of fiber optic and copper backbone cables.

B. On projects where existing intra-building distribution cabling is to be removed, it may be useful to provide a separate schematic diagram depicting cabling to be demolished.

5.2 Project Manual

A. The State of Utah DFCM publishes requirements for the Project Manual.

B. In addition to these requirements, the Project Manual shall contain the following items as described below:

- Horizontal Cabling Labeling Spreadsheet
- Fiber Link-Loss Budget Analyses
- Cutover Plans

5.2.1 SPECIFICATIONS

5.2.1.1 UVU TELECOMMUNICATIONS CONSTRUCTION GUIDE SPECIFICATION

A. The UVU Telecommunications Construction Guide Specification (TCGS) is a *guide* specification as opposed to a *master* specification. It does not include an exhaustive listing of all possible products or installation methods that could be employed in a telecommunications infrastructure project.

B. The TCGS is an example of a specification that shall be used for an infrastructure replacement project or for a new facility project. It has verbiage that identifies issues that the Designer shall consider throughout the adaptation process. The Designer shall adapt the sections in the TCGS to the particular requirements of the given project.

C. The Designer shall directly edit the TCGS for use on each project. The Designer shall notify the UVU ITPM and TPM where changes or additions to the specifications are desired. Edits to the documents shall be performed with the "Revision Tracking" feature activated. At the various project milestones when the documents are submitted to UVU for review, the specifications shall be printed showing the revision markings.

D. The Designer shall be responsible for adding any necessary content to the specification that is applicable to the project and not already contained in the TCGS.

E. Please refer to the more detailed instructions contained in the TCGS, both in the Preface of that document as well as in the "hidden text" comments contained in the electronic files.

5.2.1.2 COMMON SPECIFICATION SECTIONS

There are several specification sections that are commonly used for telecommunications systems or contain content that supports telecommunications functionality.

Sections typically provided by the Architect, but requiring Designer input:

- 09 91 00 – Painting
- 07 84 00 – Firestopping

Sections typically provided by the Telecommunications Engineer:

- 27 05 00 – Common Work Results for Communications
- 27 05 26 – Grounding and Bonding for Communications Systems
- 27 05 29 – Hangers and Supports for Communications Systems
- 27 05 33 – Conduits and Backboxes for Communications Systems
- 27 05 36 – Cable Trays for Communications Systems

- 27 11 00 – Communications Equipment Room Fittings
- 27 13 00 – Communications Backbone Cabling
- 27 15 00 – Communications Horizontal Cabling
- 27 16 00 – Communications Connecting Cords, Devices, and Adapters
- 27 32 00 – Voice Communication Telephone Sets
- 33 81 26 – Communications Underground Ducts, Manholes, and Handholes
- 33 82 00 – Communications Distribution
- 33 82 43 – Grounding and Bonding for Communications Distribution

5.2.2 CUTOVER PLAN

The Designer shall provide a detailed Cutover Plan that is coordinated with other disciplines on the project as well as with UVU data and telephone equipment cutover requirements. Verbiage describing the sequence of work tasks to accomplish the cutover shall be provided in this section. Limitations on the permissible downtime allowed and temporary service arrangements shall be discussed in the Cutover Plan.

The Cutover Plan shall also include a rollback strategy to enable reversion to the existing system if a problem develops that is serious enough to render cutover unfeasible.

Not all projects will require a Cutover Plan.

5.2.3 FIBER LINK-LOSS BUDGET ANALYSIS

A. The Designer shall provide (in the Construction Documents) a link-loss budget analysis for each fiber optic cable.

B. The link-loss budget analysis shall be formatted as shown in Appendix 6.6 of the TDDG. Upon request, UVU will provide an electronic spreadsheet file to be used as a template.

5.3 Record Drawings and Documentation

The State of Utah DFCM publishes requirements for Record Drawings and submittals. The following requirements related to Record Drawings and submittals are **in addition** to those published by the State:

5.3.1 RECORD DRAWING CONTENT

- The Record Drawings shall show the identifiers for the telecommunications equipment and cabling as constructed.
- The Record Drawings shall show actual measured signal levels and lengths of television distribution cabling as constructed.

5.3.2 RECORD DRAWING DELIVERABLES

The original copy of hard-copy as-built and record drawings shall be provided to UVU Facilities.

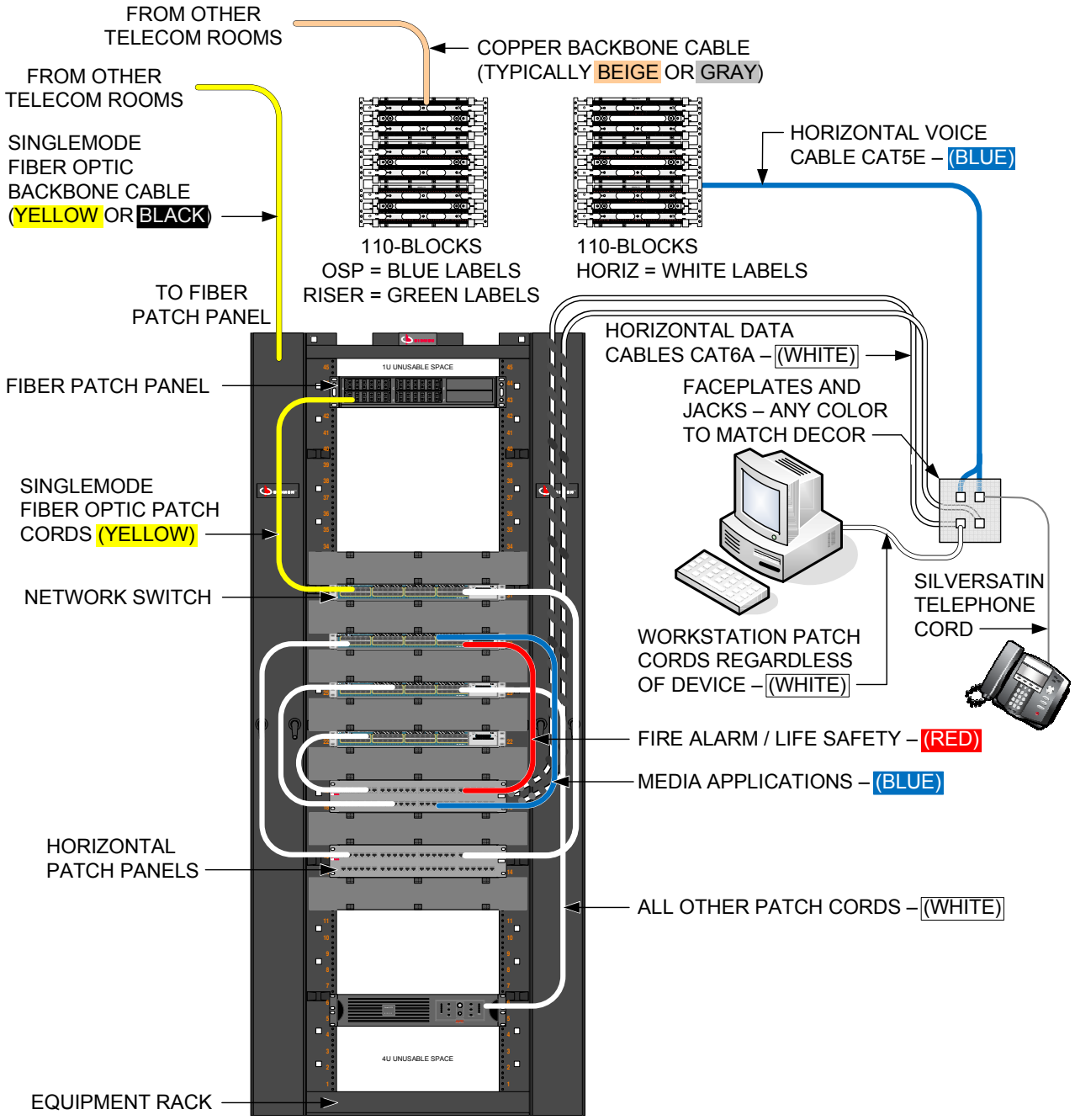
In addition to paper copies, at least two copies of the following electronic file sets shall be delivered to UVU (for Facilities and OIT):

- One CDROM containing editable 2D AutoCAD drawings (with all xrefs bound to the drawing) of the telecommunications plans, elevations and details, in addition to the Revit or BIM model files.
- One CDROM containing the digital photographs taken by the Designer during the project shall be delivered to UVU Facilities Planning and Construction.

6 Appendix

6.1 Cable Color Scheme

The following graphic depicts the approved cable color scheme for UVU projects:



6.2 Sample Rack Elevation Details

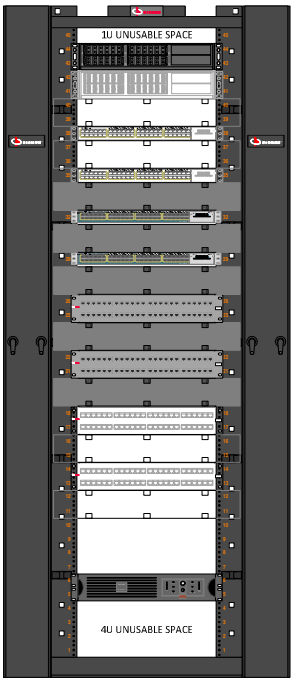
The Designer shall provide scaled rack elevation details in the project drawings (similar to the details below), and shall identify the racks, vertical and horizontal cable management, patch panels, shelves and drawers in each detail. The drawings below depict maximum Day-1 design capacity, with accommodations for future growth shown in outline form.

Note that the designated contents in each rack are intentionally arranged for optimal operational considerations. If the adjacent wall is on the left side of a row of multiple racks, the designer shall invert the arrangement.

6.2.1 IDF: 1 RACK

This example is suitable for a Day-1 design with a maximum of 96 horizontal cables (leaving room for future growth).

A one-rack room is rarely adequate, because it has very limited space for future equipment or cabling to be added. Therefore, it shall only be used as a last resort, and then only with the approval of the ITPM.

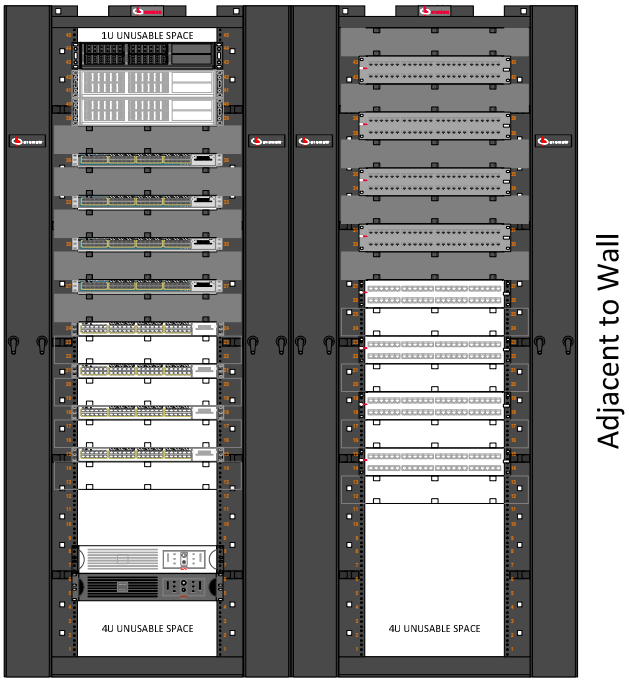


Rack 1
Fiber Optic, Horizontal &
Network Electronics

6.2.2 IDF: 2 RACKS

This example is suitable for a Day-1 design with a maximum of 192 horizontal cables (leaving room for future growth).

A two-rack room is rarely adequate, because it has very limited space for future equipment or cabling to be added. Therefore, it shall only be used as a last resort, and then only with the approval of the ITPM.

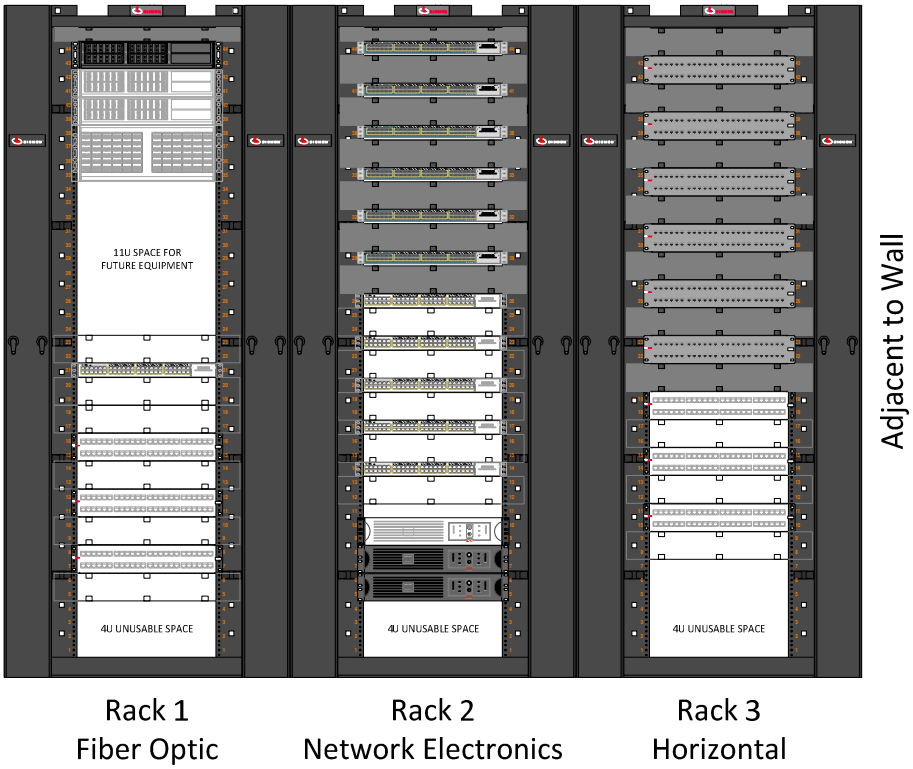


Rack 1
Fiber Optic &
Network Electronics

Rack 2
Horizontal

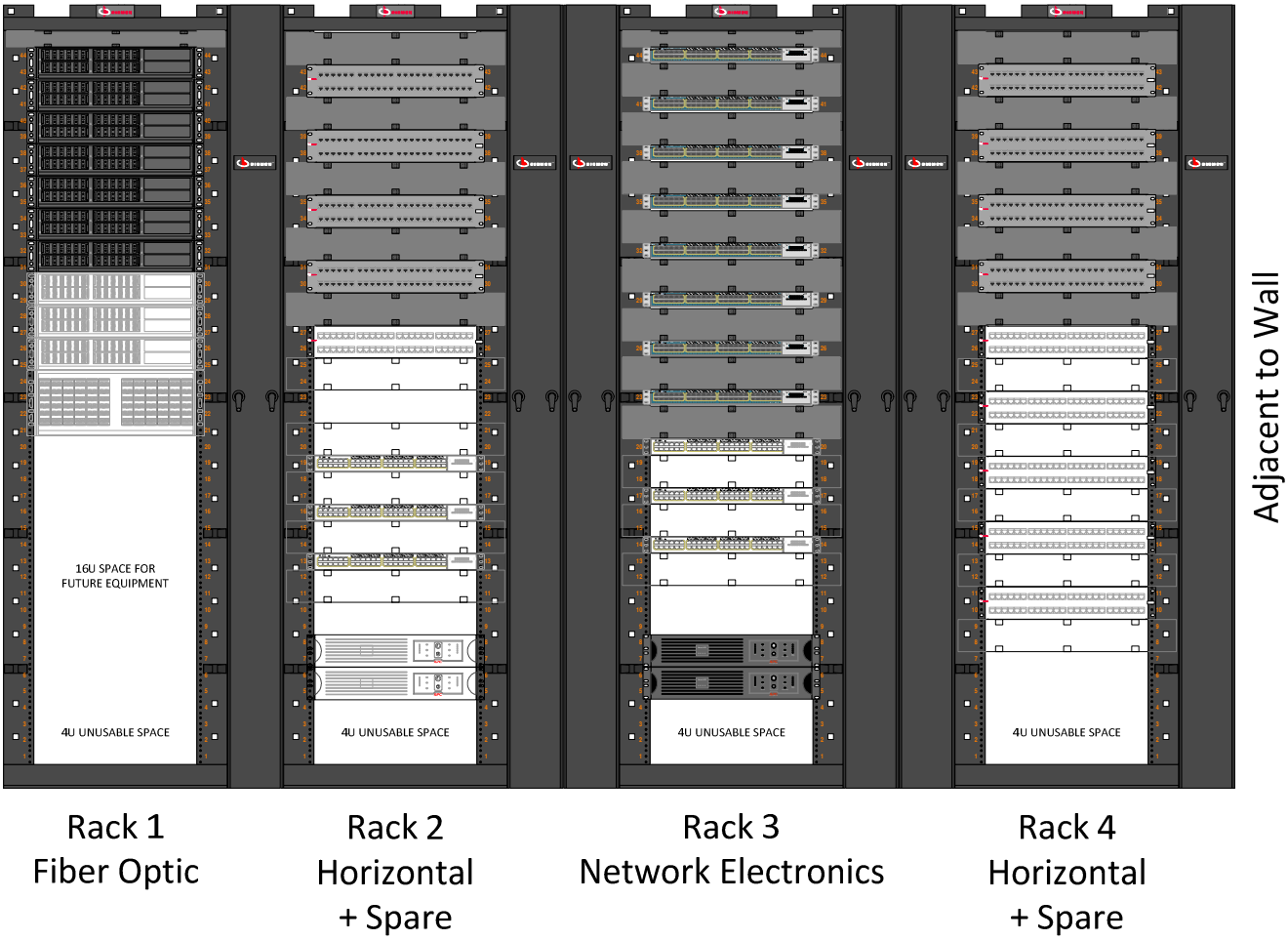
6.2.3 IDF: 3 RACKS

This example is suitable for a Day-1 design with a maximum of 288 horizontal cables (leaving room for future growth).



6.2.4 MDF: 4 RACKS

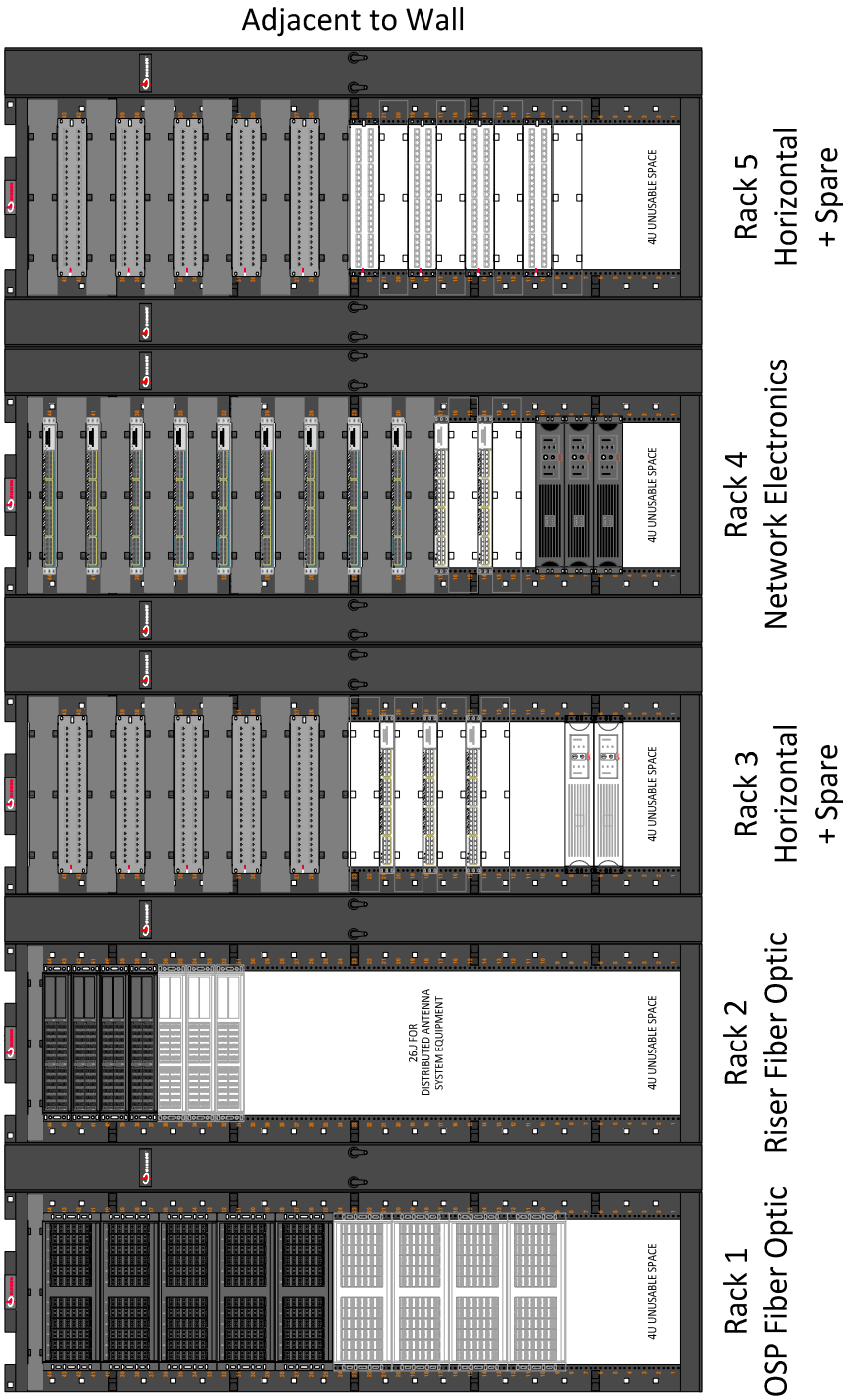
This example is suitable for a Day-1 design with a maximum of 336 horizontal cables and 6 fiber optic cables (leaving room for future growth).



When four racks are designed in a two-row arrangement (see Section 6.3.6, below), split the rows between racks 2 and 3.

6.2.5 MDF: 5 RACKS

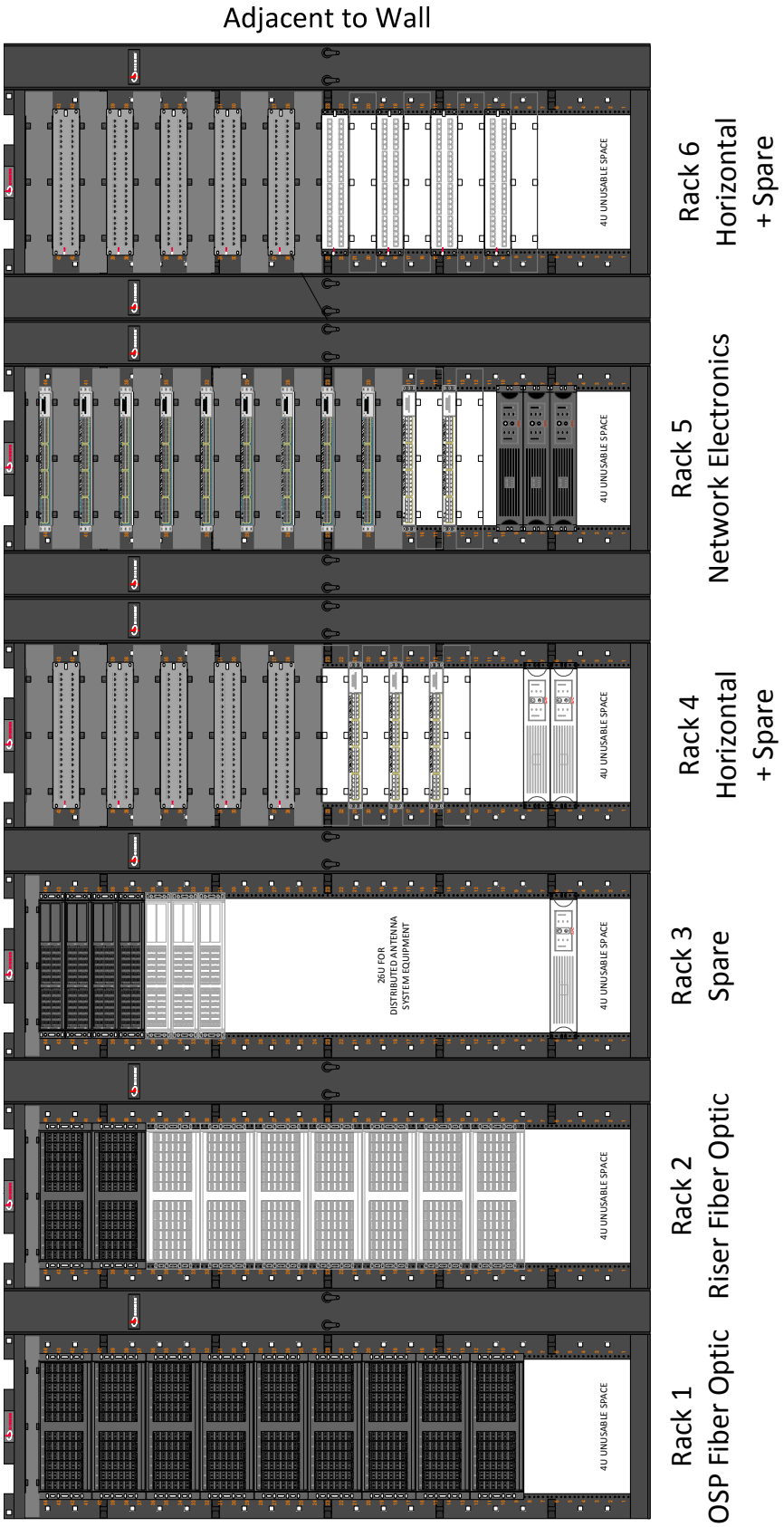
This example is suitable for a Day-1 design with a maximum of 336 horizontal cables and 8 fiber optic cables (leaving room for future growth).



6.2.6 MDF: 6 RACKS

This example is suitable for a Day-1 design with a maximum of 336 horizontal cables and 13 fiber optic cables (leaving room for future growth).

When six racks are designed in a two-row arrangement (see Section 6.3.9), split the rows between racks 3 and 4.



6.3 Sample Telecommunications Room Plan Details

Below are sample plan details for several sizes of telecommunications rooms. The Designer shall provide similar details and information for each telecommunications room and equipment room affected by the project. This information shall be provided in the Construction Documents.

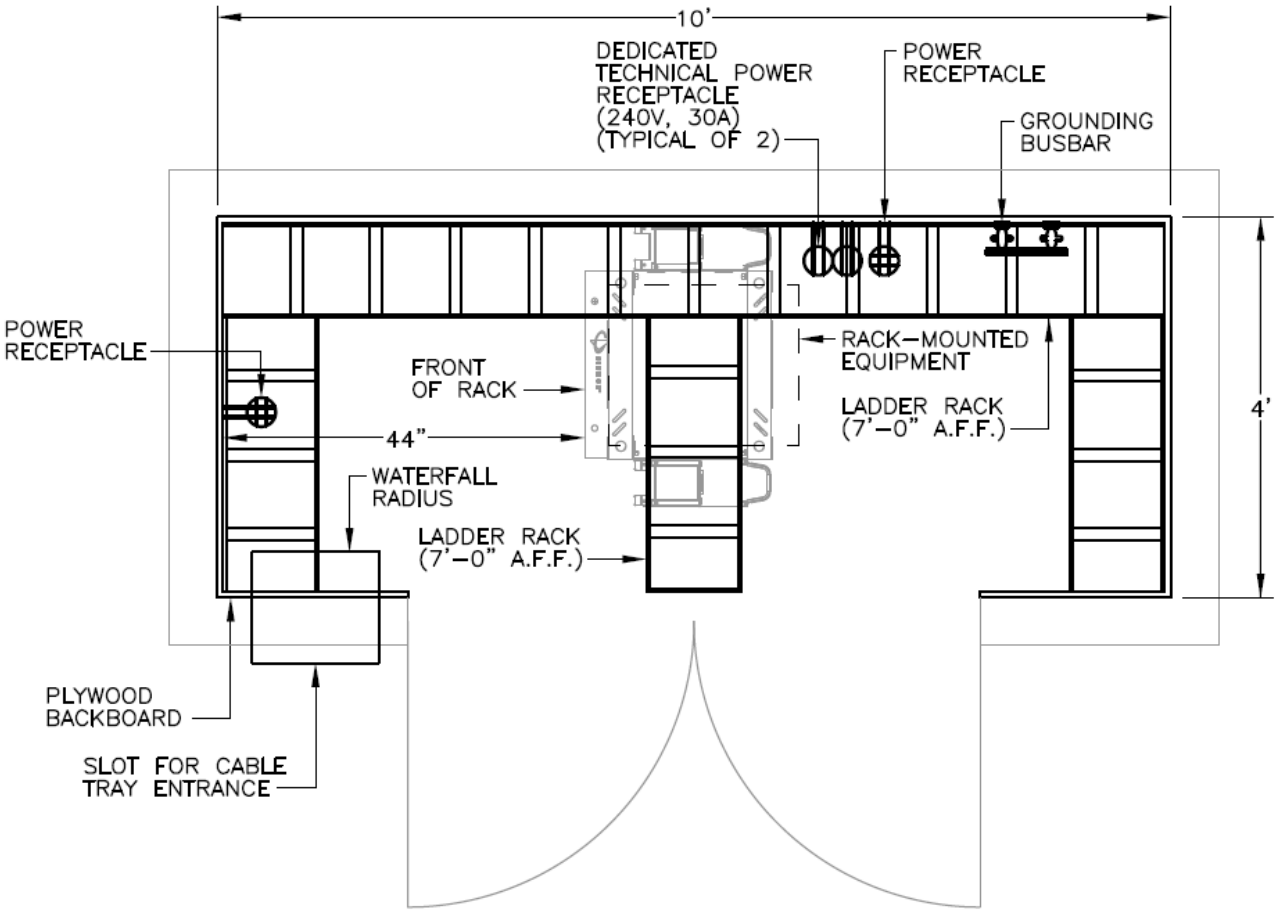
These sample plan details have been pre-approved for use at UVU. The Designer shall use this layout wherever appropriate and shall discuss project-specific alternatives with the ITPM.

The room dimensions shown are considered to be acceptable minimums.

6.3.1 IDF: 1 RACK REACH IN – 10' X 4' (INTERIOR DIMENSIONS)

This example is suitable for a Day-1 design with a maximum of 96 horizontal cables (leaving room for future growth).

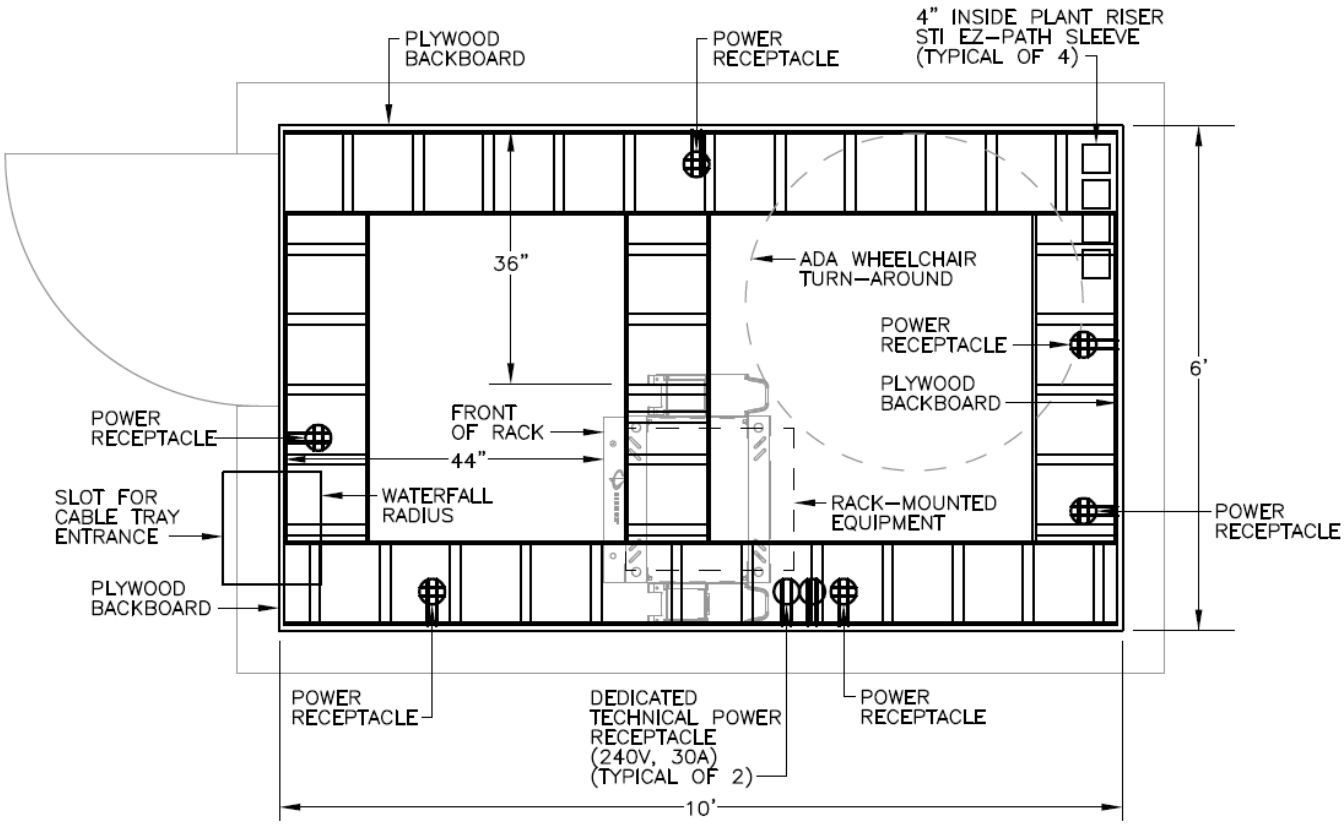
A one-rack room is rarely adequate, because it has very limited space for future equipment or cabling to be added. Therefore, it shall only be used as a last resort, and then only with the approval of the ITPM.



6.3.2 IDF: 1 RACK – 10' X 6' (INTERIOR DIMENSIONS)

This example is suitable for a Day-1 design with a maximum of 96 horizontal cables (leaving room for future growth).

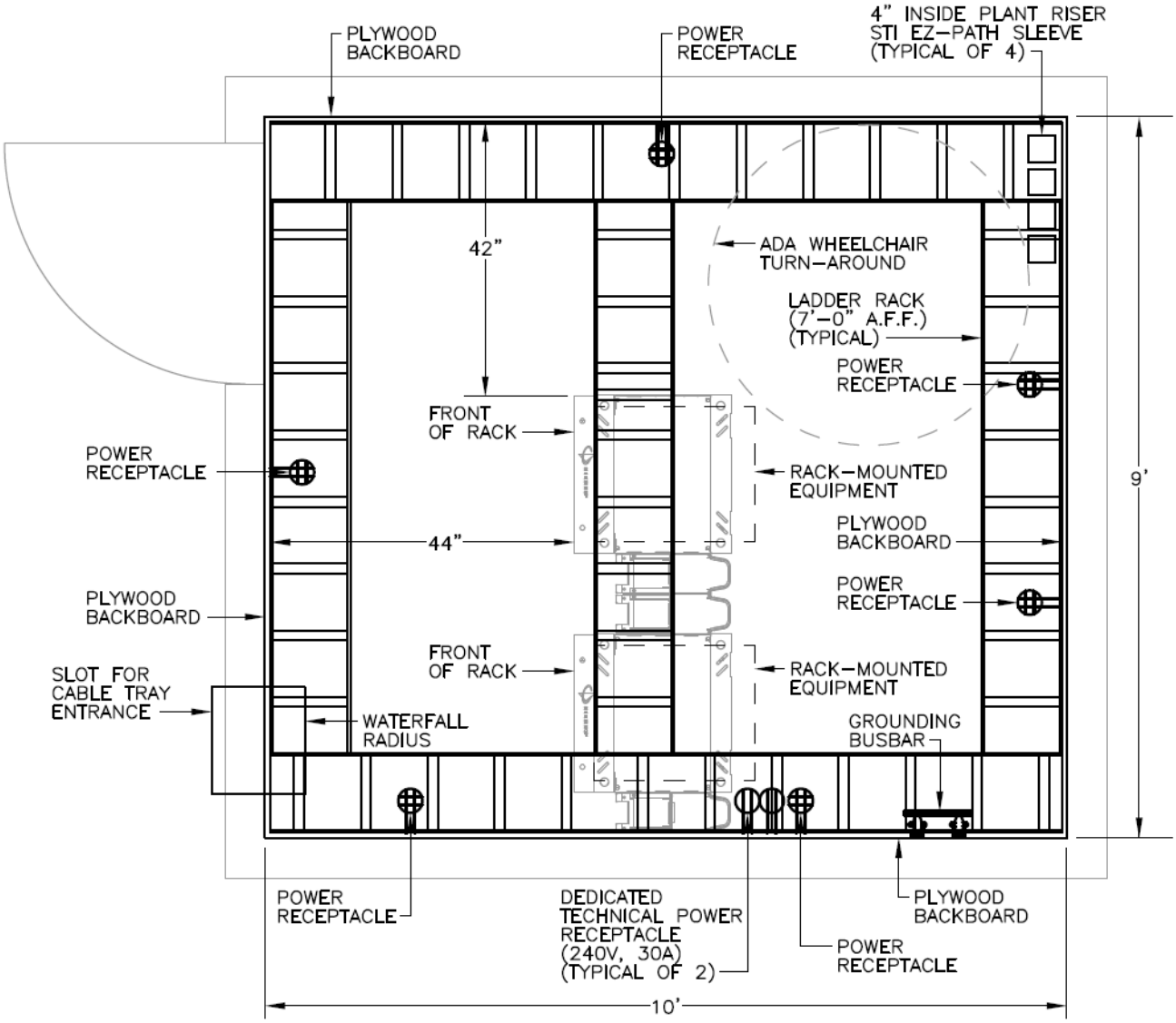
A one-rack room is rarely adequate, because it has very limited space for future equipment or cabling to be added. Therefore, it shall only be used as a last resort, and then only with the approval of the ITPM.



6.3.3 IDF: 2 RACKS – 10' X 9' (INTERIOR DIMENSIONS)

This example is suitable for a Day-1 design with a maximum of 192 horizontal cables (leaving room for future growth).

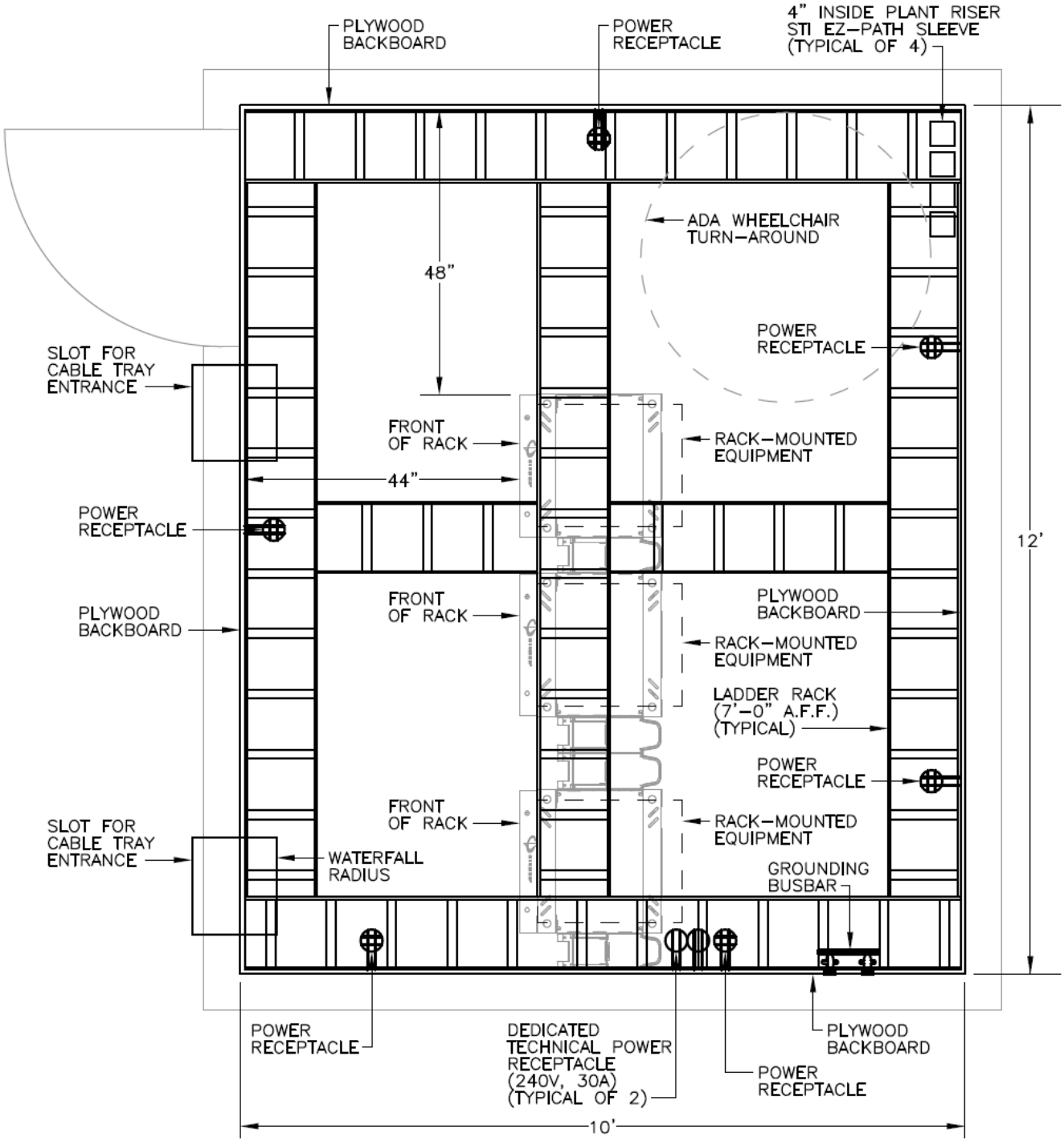
A two-rack room is rarely adequate, because it has very limited space for future equipment or cabling to be added. Therefore, it shall only be used as a last resort, and then only with the approval of the ITPM.



6.3.4 IDF: 3 RACKS – 10' X 12' (INTERIOR DIMENSIONS)

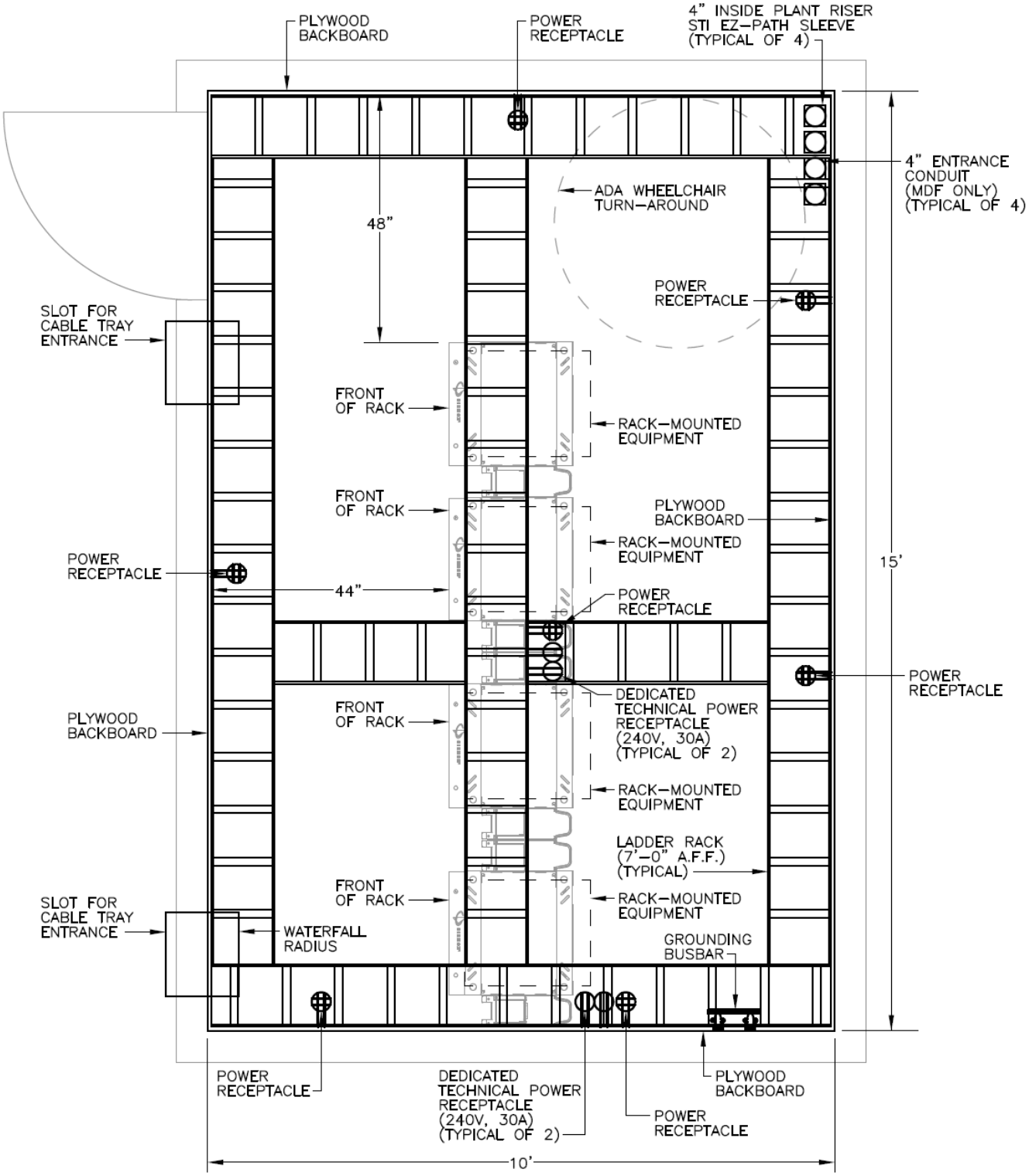
This example is suitable for a Day-1 design with a maximum of 288 horizontal cables (leaving room for future growth).

This is the standard IDF configuration.



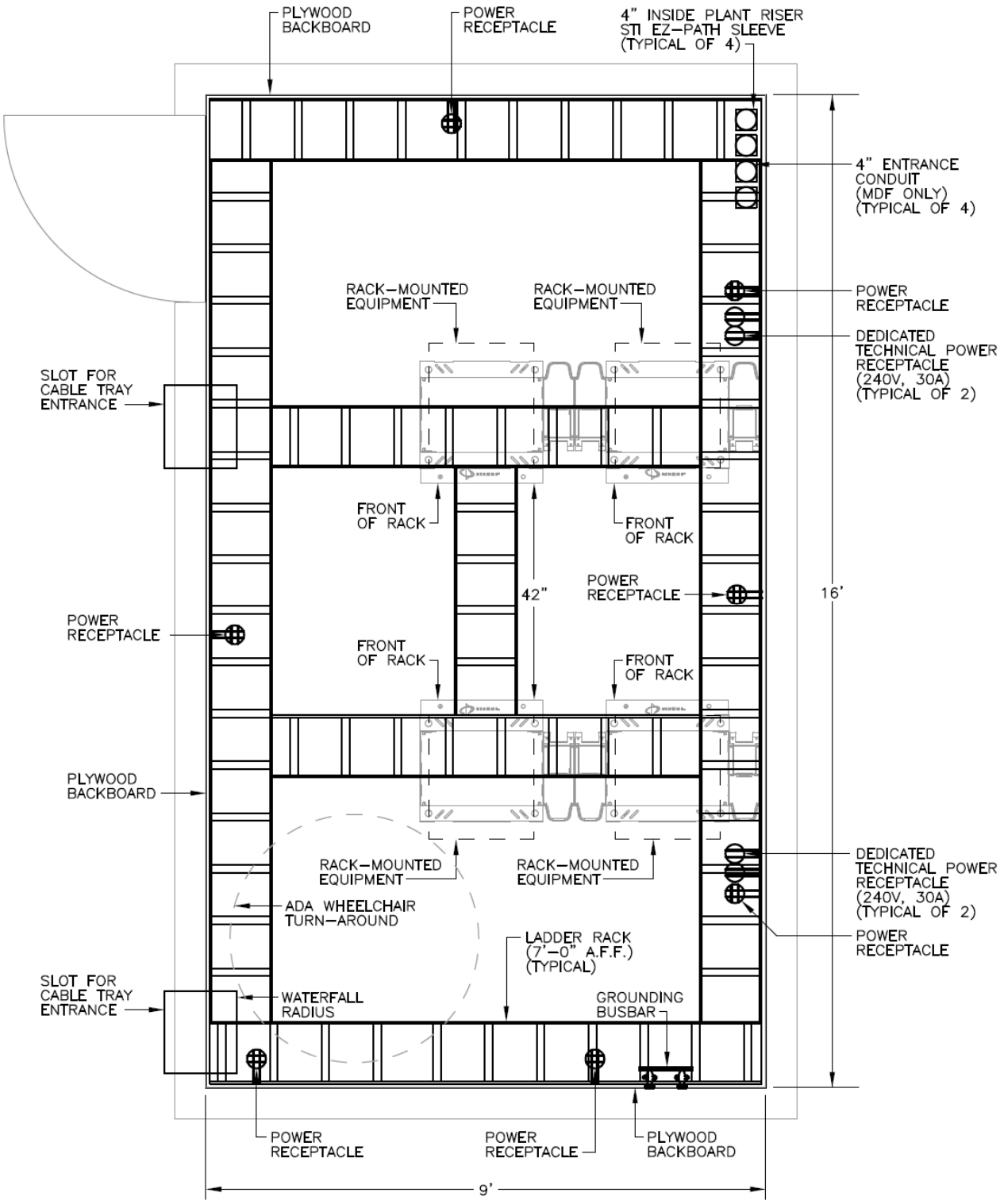
6.3.5 IDF / MDF: 4 RACKS – 10' X 15' (INTERIOR DIMENSIONS)

This example is suitable for a Day-1 design with a maximum of 336 horizontal cables and 6 fiber optic cables (leaving room for future growth).



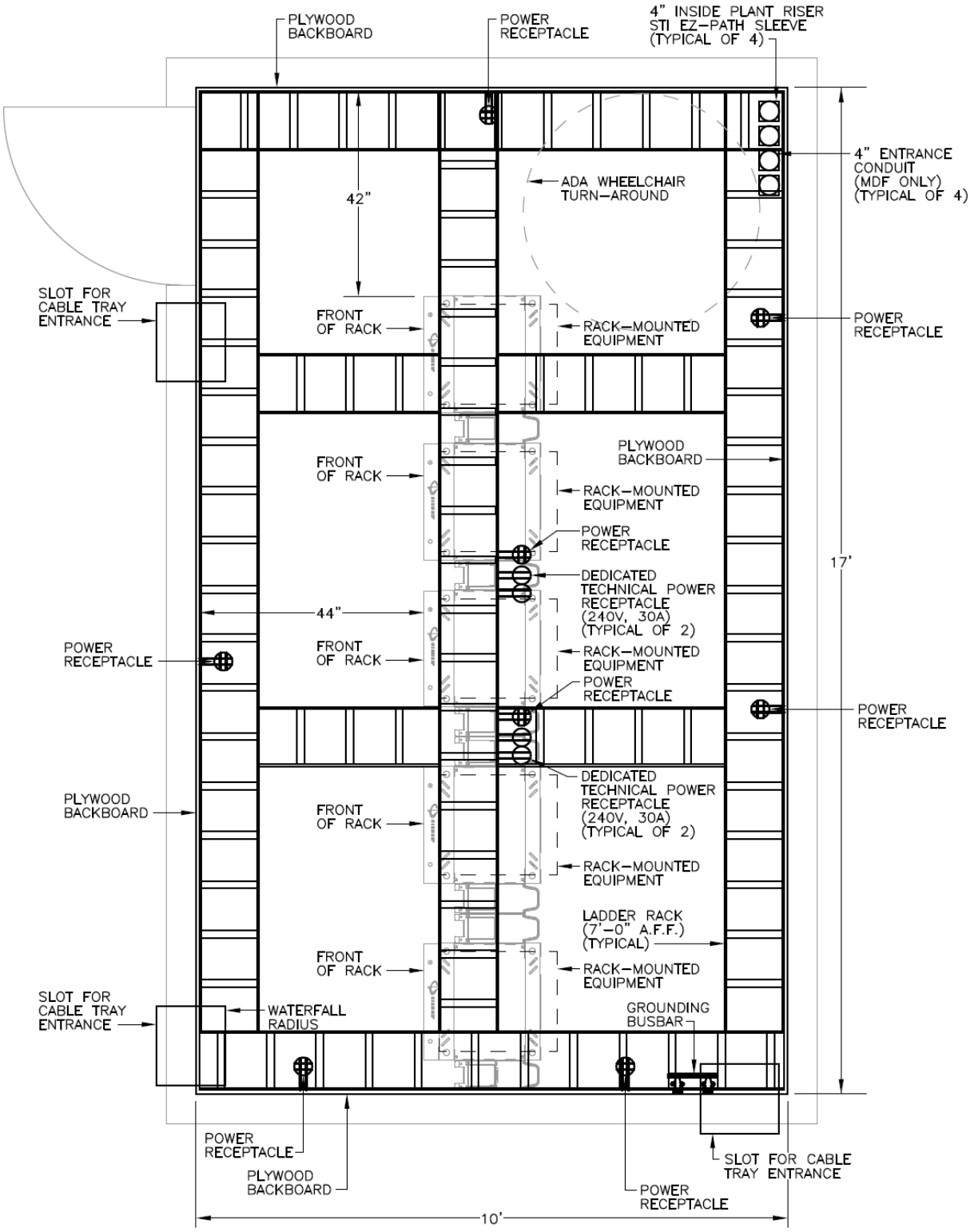
6.3.6 IDF / MDF: 4 RACKS (2 ROWS) – 9' X 16' (INTERIOR DIMENSIONS)

This example is suitable for a Day-1 design with a maximum of 336 horizontal cables and 6 fiber optic cables (leaving room for future growth).



6.3.7 MDF: 5 RACKS – 10' X 17' (INTERIOR DIMENSIONS)

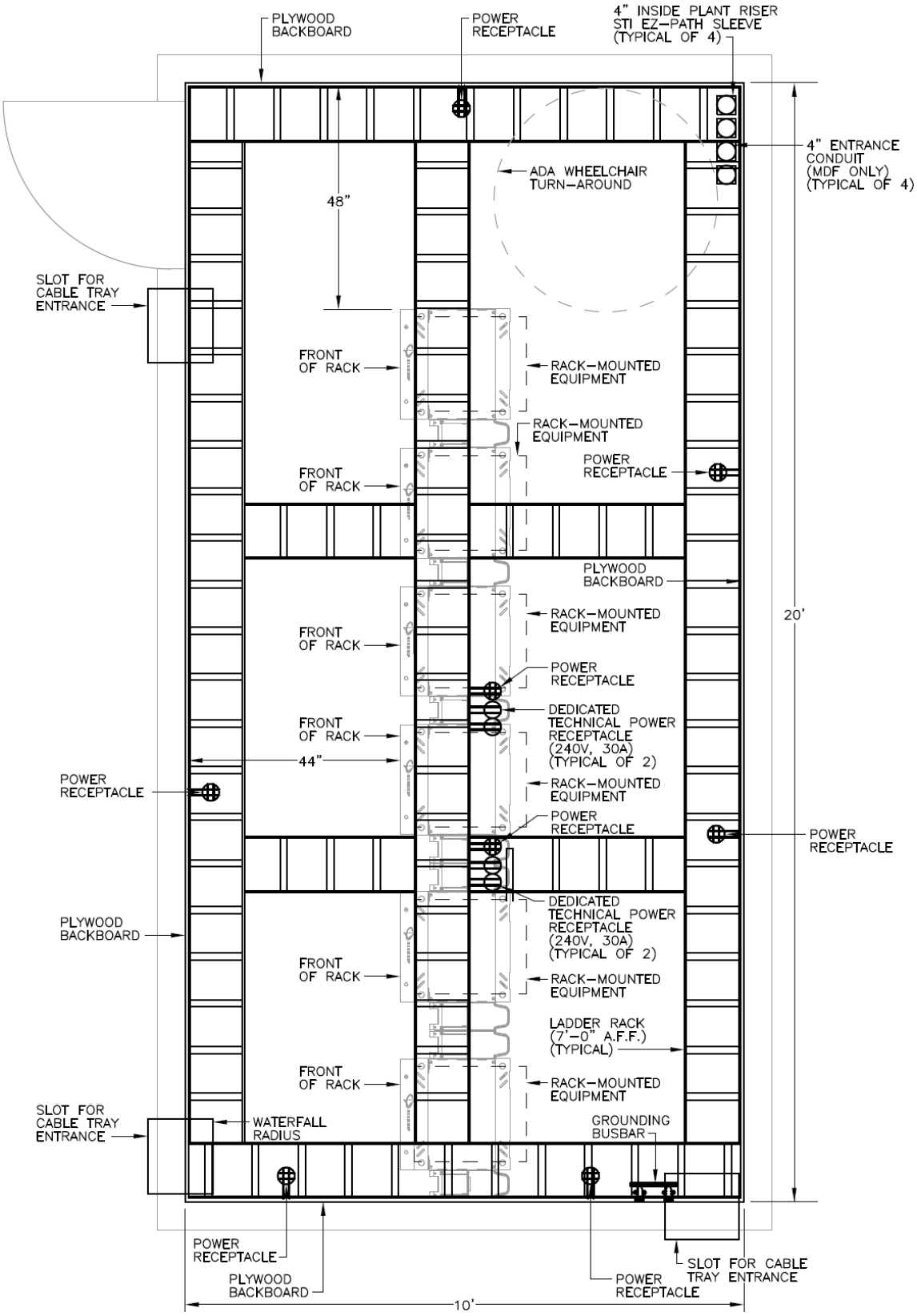
This example is suitable for a Day-1 design with a maximum of 336 horizontal cables and 8 fiber optic cables (leaving room for future growth).



6.3.8 MDF: 6 RACKS – 10' X 20' (INTERIOR DIMENSIONS)

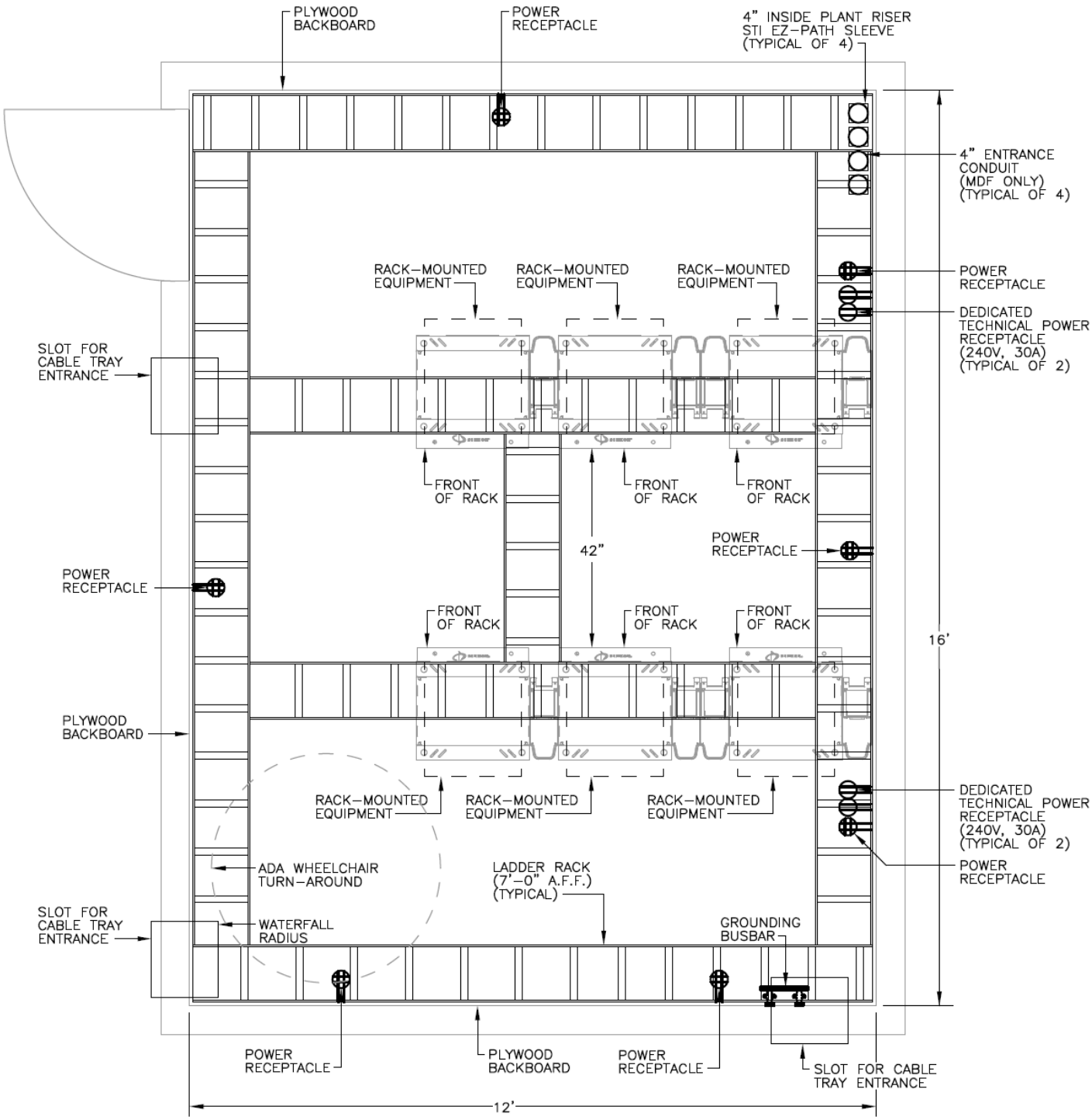
This example is suitable for a Day-1 design with a maximum of 336 horizontal cables and 13 fiber optic cables (leaving room for future growth).

This is the standard MDF configuration.



6.3.9 MDF: 6 RACKS (2 ROWS) – 12' X 16' (INTERIOR DIMENSIONS)

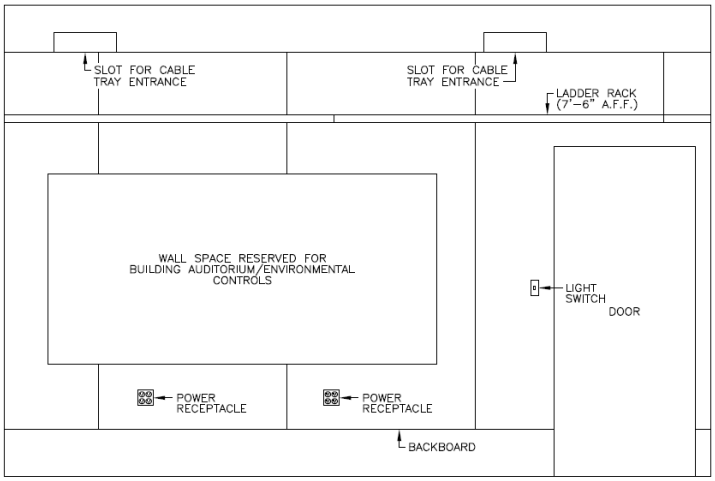
This example is suitable for a Day-1 design with a maximum of 336 horizontal cables and 13 fiber optic cables (leaving room for future growth).



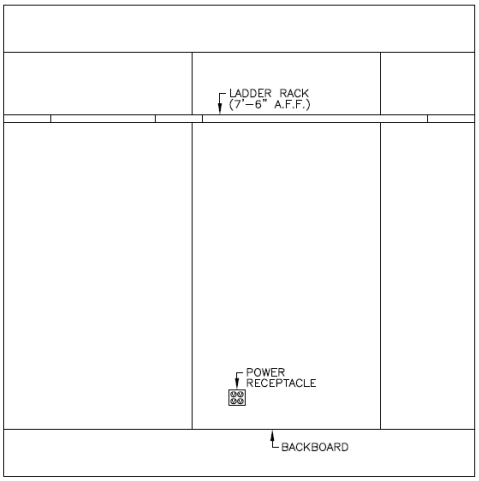
6.4 Sample Wall Elevation Detail

The Designer shall provide a scaled wall elevation detail, similar to the example below, for each new or existing telecommunications room wall affected by the project.

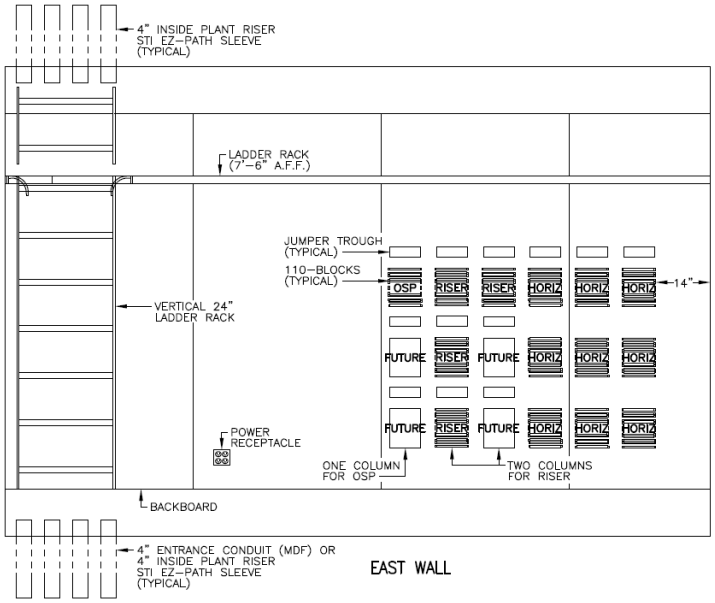
This information shall be provided in the Construction Documents.



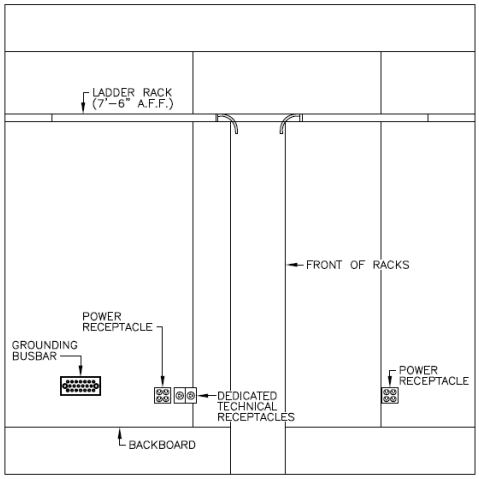
WEST WALL



NORTH WALL



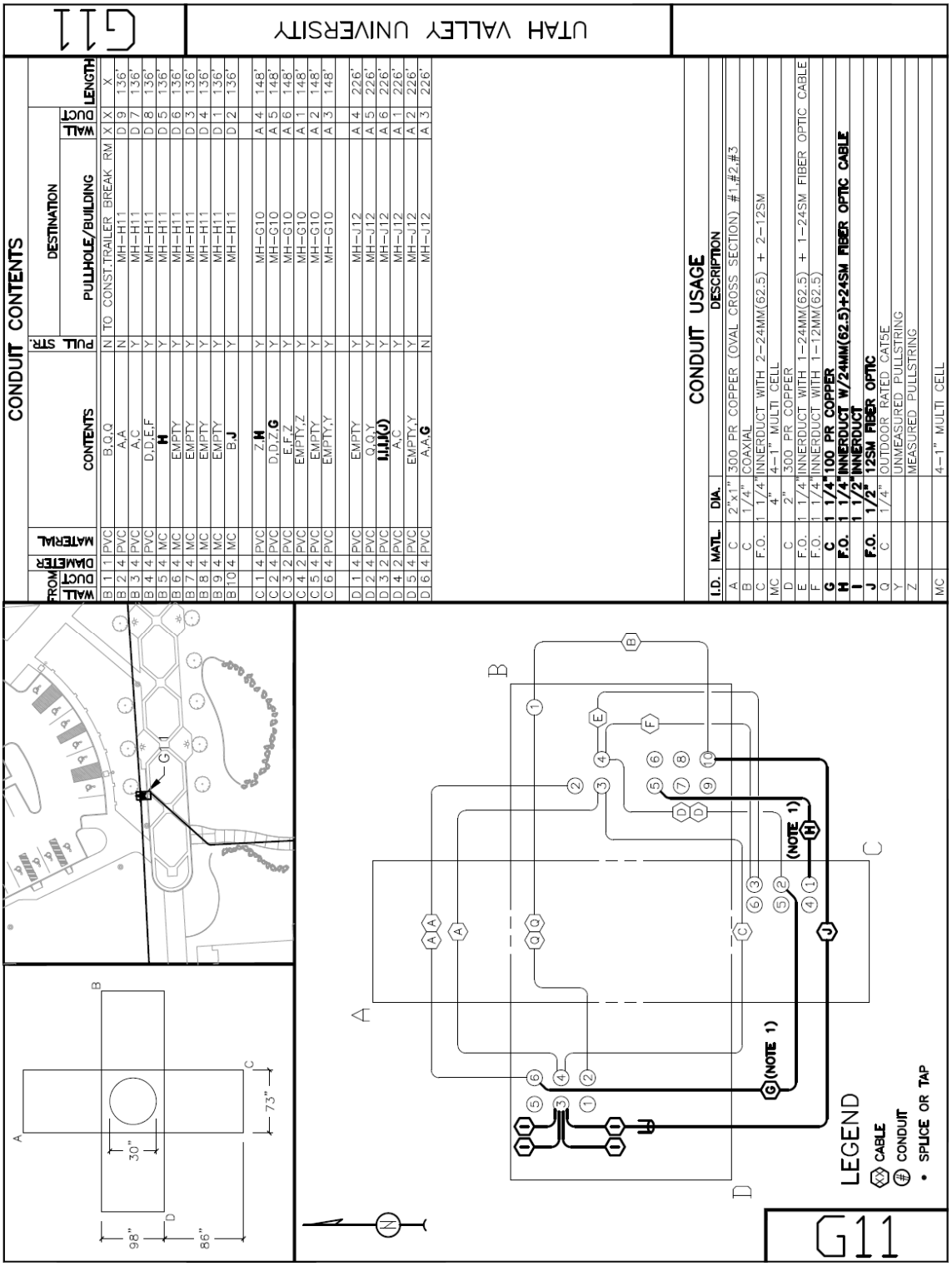
EAST WALL



SOUTH WALL

6.5 Sample Maintenance Hole Butterfly Diagram

For each outside plant handhole, pull hole and maintenance hole affected by a project (existing or new), the Designer shall provide a butterfly diagram similar to the example below:



6.6 Sample Fiber Optic Link-Loss Budget Analysis

The following is a sample Fiber Optic Link-Loss Budget Analysis that the Designer shall use for each new fiber optic cable designed in the project. The Designer shall submit the completed link-loss budget analyses to UVU in both electronic and paper forms. Upon request, UVU will provide an electronic spreadsheet of this form to be used as a template.

Cable ID: **Enter Cable ID Here**
From: **Enter MDF/Building Name Here**
To: **Enter IDF/Building Name Here**

	# of MM Strands
	# of SM Strands

			MM 850		MM 1300		SM 1310		SM 1550	
Passive Cable System Attenuation										
Fiber Loss at Operating Wavelength		Cable Length (in kilometers)								km
	x	Attenuation per km	x	3.75	x	1.5	x	0.5	x	0.5	dB/km
	=	**Total Fiber Loss**		0.00		0.00		0.00		0.00	dB
Connector Loss		Number of Connector Pairs		2		2		2		2	pairs
(Excluding Tx & Rx Connectors)	x	Individual Connector Pair Loss	x	0.5	x	0.5	x	0.5	x	0.5	dB/pair
	=	**Total Connector Loss**		1.00		1.00		1.00		1.00	dB
Splice Loss		Number of Splices									splices
	x	Individual Splice Loss	x	0.3	x	0.3	x	0.3	x	0.3	dB/splice
	=	**Total Splice Loss**		0.00		0.00		0.00		0.00	dB
Other Components Loss		**Total Components Loss**									dB
Total Passive Cable System Attenuation		Total Fiber Loss		0.00		0.00		0.00		0.00	dB
	+	Total Connector Loss	+	1.00	+	1.00	+	1.00	+	1.00	dB
	+	Total Splice Loss	+	0.00	+	0.00	+	0.00	+	0.00	dB
	+	Total Components Loss	+	0.0	+	0.0	+	0.0	+	0.0	dB
	=	**Total System Attenuation**		1.00		1.00		1.00		1.00	dB

			MM 850		MM 1300		SM 1310		SM 1550	
Link Loss Budget										
From Manufacturer's Specifications		Average Transmitter Output		-18.0		-18.0		-18.0		-18.0	dBm
		Receiver Sensitivity (10^9 BER)		-31.0		-31.0		-31.0		-31.0	dBm
System Gain		Average Transmitter Power		-18.0		-18.0		-18.0		-18.0	dBm
	-	Receiver Sensitivity	-	-31.0	-	-31.0	-	-31.0	-	-31.0	dBm
	=	**System Gain**	=	13.00	=	13.00	=	13.00	=	13.00	dB
Power Penalties		Operating Margin		2.0		2.0		3.0		3.0	dB
# of Fusion Splices		Receiver Power Penalties	+	0.0	+	0.0	+	0.0	+	0.0	dB
2 x 0.3 =	+	Repair Margin	+	0.6	+	0.6	+	0.6	+	0.6	dB
	=	**Total Power Penalties**	=	2.60	=	2.60	=	3.60	=	3.60	dB
Link Loss Budget		System Gain		13.00		13.00		13.00		13.00	dB
	-	Power Penalties	-	2.60	-	2.60	-	3.60	-	3.60	dB
	=	**Total Link Loss Budget**	=	10.40	=	10.40	=	9.40	=	9.40	dB

			MM 850		MM 1300		SM 1310		SM 1550	
Performance										
System Performance Margin		Link Loss Budget		10.40		10.40		9.40		9.40	dB
	-	Passive Cable System Attenuation	-	1.00	-	1.00	-	1.00	-	1.00	dB
	=	**System Performance Margin**	=	9.40	=	9.40	=	8.40	=	8.40	dB

Users of this spreadsheet shall verify prior to use that the parameters and calculations are appropriate for the project, equipment and materials that are used.

6.7 Acronym Glossary

A/E	Architect / Engineer
ACPM	Access Control Project Manager
AVCGS	Audio/Visual Construction Guide Specification
AVDG	Audio/Visual Design Guide
AVPM	Audio/Visual Project Manager
BAPM	Building Automation Project Manager
BIM	Building Information Model
CDF	Controlled-density fill
CGS	Construction Guide Specification
CGSP	Construction Guide Specification Preface
CMU	Concrete masonry unit
DFCM	(State of Utah) Division of Facilities Construction & Management
EMI	Electromagnetic interference
ESS	Electronic Safety and Security
FF&E	Furniture, fixtures and equipment
FPM	Facilities Project Manager
GC/CM	General Contractor/Construction Manager
HC	Horizontal cross-connect
HCP	Horizontal connection point
IC	Intermediate cross-connect
IDF	Intermediate Distribution Frame (secondary telecommunications rooms)
ISP	Inside plant
ITPM	Information Technology Project Manager
MC	Main cross-connect
MAC	Moves, adds or changes
MDF	Main Distribution Frame (main telecommunications room in the building)
O.D.	Outside Diameter
OSP	Outside plant
PDU	Power distribution unit
PII	Personally identifiable information
POE	Power over Ethernet
RCDD	Registered Communications Distribution Designer

RFI	Radio frequency interference
SVR	Standards Variance Request
TCGS	Telecommunications Construction Guide Specification
TDDG	Telecommunications Distribution Design Guide
TGB	Telecommunications grounding busbar
TIDG	Technology Infrastructure Design Guide
TPM	Telecommunications Project Manager
TR	Telecommunications room
UTC	Undercarpet telecommunications cabling
UTP	Unshielded twisted pair
WAP	Wireless access point

TECHNOLOGY INFRASTRUCTURE DESIGN GUIDE

DRAFT

October 21, 2015

Approved by: _____

IT Infrastructure Services — Date
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1 Preface

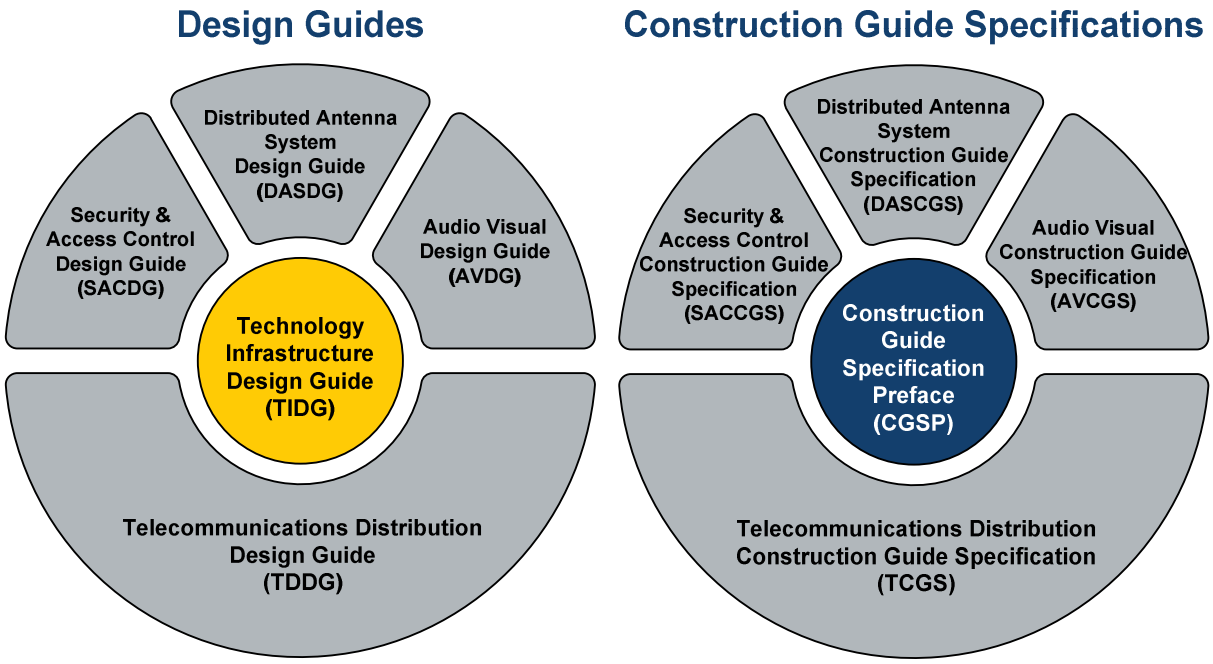
1.1 Introduction

A. The Technology Infrastructure Design Guide (TIDG) is written to communicate the requirements of Utah Valley University (UVU) for the design and installation of technology infrastructure and systems at UVU facilities.

- The TIDG is written for an audience of Architects, Engineers and Designers who are responsible for the design of new or remodeled facilities for UVU where telecommunications distribution systems currently exist or will be installed.
- It is also intended for other low voltage telecommunications Contractors and subcontractors installing telecommunications distribution systems at UVU facilities.
- This document also applies to infrastructure designed and installed by UVU staff, when a formal design is not developed.

B. The TIDG belongs to a set of documents (depicted below) that comprise the standard design and installation practices for all facets of technology infrastructure and systems at UVU's facilities. This document forms the core of the Design Guides document set.

Technology Infrastructure Standards Document Set



C. The Technology Infrastructure Design Guide (TIDG) contains information common to all of UVU's Design Guides.

D. The Construction Guide Specification Preface (CGSP) is a key companion to the TIDG.
- Designers shall adapt the various Construction Guide Specification sections "as written" for creating specifications for a particular project according to the instructions in the TIDG. In other words, Designers shall use the electronic specification section documents (provided by UVU in MSWord format) and then shall make any project-specific edits to the specifications in those documents. All changes to the specifications shall be done using the "Revision Tracking" features in MSWord.
- Rewriting sections in the Construction Guide Specification or modifying the format structure or requirements will not be accepted.

E. It is the responsibility of the Designer of technology infrastructure for UVU to coordinate with the other designers on a project (architectural, electrical, mechanical, etc.) to determine that other systems are both compatible with and complementary to the technology infrastructure. It is critical to coordinate between disciplines during the design phase of a project, rather than making adjustments in the field during construction.

F. This document was prepared by the Information Technology Services department at Utah Valley University and by Summit Engineering & Consulting, P.S. As technology and needs evolve, the document will be periodically updated.

- May 1, 2013 – Originally published
- November xx, 2015 – First Revision

1.2 Low Voltage Systems

Wherever practical, telecommunications pathway and cabling systems designed for UVU facilities are expected to support and integrate the complete set of building automation systems and other low voltage systems that convey information and operate facilities, and provide capacity for future growth. Telecommunications infrastructure shall be designed in accordance with the requirements in ANSI/TIA/EIA 862 – Building Automation Systems Cabling Standard for Commercial Buildings, and the requirements in this document, to support the Ethernet telecommunications channels on low-voltage devices. Throughout this document, references to "low voltage systems" shall include those referenced in ANSI/TIA/EIA 862, and shall be subject to specific requirements in that standard and as discussed below.

1.2.1 SHARED OSP MEDIA AND PATHWAY

A. The common outside plant (OSP) telecommunications media (cabling) shall be singlemode fiber optic cable and 24 AWG unshielded twisted pair (UTP) copper cable. The common OSP telecommunications media is intended for shared use by the following low-voltage systems, in addition to voice and data systems. The OSP telecommunications pathway infrastructure and media are intended for shared use by all low-voltage systems (not just voice and data systems).

B. Multimode fiber optic cabling shall not be installed at UVU facilities.

1.2.2 SHARED ISP MEDIA AND PATHWAY

A. The common inside plant (ISP) telecommunications ***pathway*** is intended for ***shared*** use by all low-voltage systems (not just voice and data systems).

B. The common inside plant telecommunications media shall be singlemode fiber optic backbone cabling, Category 6A-rated 24 AWG UTP copper cable for data and Category 3/5/5E-rated 24 AWG UTP copper cable for voice. ***Backbone*** cabling is permitted to be ***shared*** by all low-voltage systems (not just voice and data systems). ***Horizontal*** cabling serving these systems shall be dedicated (***not shared***) to each system.

C. Multimode fiber optic cabling shall not be installed at UVU facilities.

D. Inside plant telecommunications infrastructure intended to support Ethernet telecommunications (or other similar protocols for security, building automation/environmental and fire alarm systems) shall be designed in accordance with the inside plant telecommunications infrastructure requirements in this document and coordinated with the IT Project Manager. However, due to the critical nature of these systems, inside plant pathway and cabling serving these systems shall typically homerun to a Mechanical Room or other Low Voltage Electronics Room rather than to a common shared telecommunications room.

E. Where low-voltage systems require different media (other than fiber optic cabling and 24 AWG UTP), the systems shall be designed to comply with the pathway and space requirements of this document. UVU anticipates the future convergence of most low voltage systems and requires the pathways and spaces to be designed now to support telecommunications cabling in the future.

F. The Designer shall design pathway and cabling to serve these systems, in cooperation with the other design disciplines on a project.

1.3 Standards and Guidelines

A. Generally speaking, UVU adopts most industry standards for technology infrastructure. ANSI/TIA/EIA, BICSI, Infocomm and other organizations are primary producers of industry standards and best practices. Refer to each Design Guide for the specific standards and guidelines associated with each subject.

B. It is mandatory to adhere to and comply with the listed codes, standards and industry practices, as well as the UVU requirements contained in the Technology Infrastructure Standards Document Set. Refer to each Design Guide for the specific codes, standards and guidelines associated with each subject.

C. The requirements contained in UVU's Technology Infrastructure Standards are considered to be in compliance with those required under contract with the State of Utah. Where the requirements differ, the issue shall be brought to the attention of the UVU Facilities Project Manager – otherwise, the more stringent requirement shall apply.

D. In some cases, the Designer may be required to use products from specific manufacturers in the design (unless otherwise directed by UVU) and to design systems that will be suitable for the use of products from these manufacturers. The construction documents shall require that the Contractor's installation workmanship fully comply with the current installation requirements from the manufacturers of these products.

E. Any request to deviate from the requirements of the National Electrical Code will not be accepted.

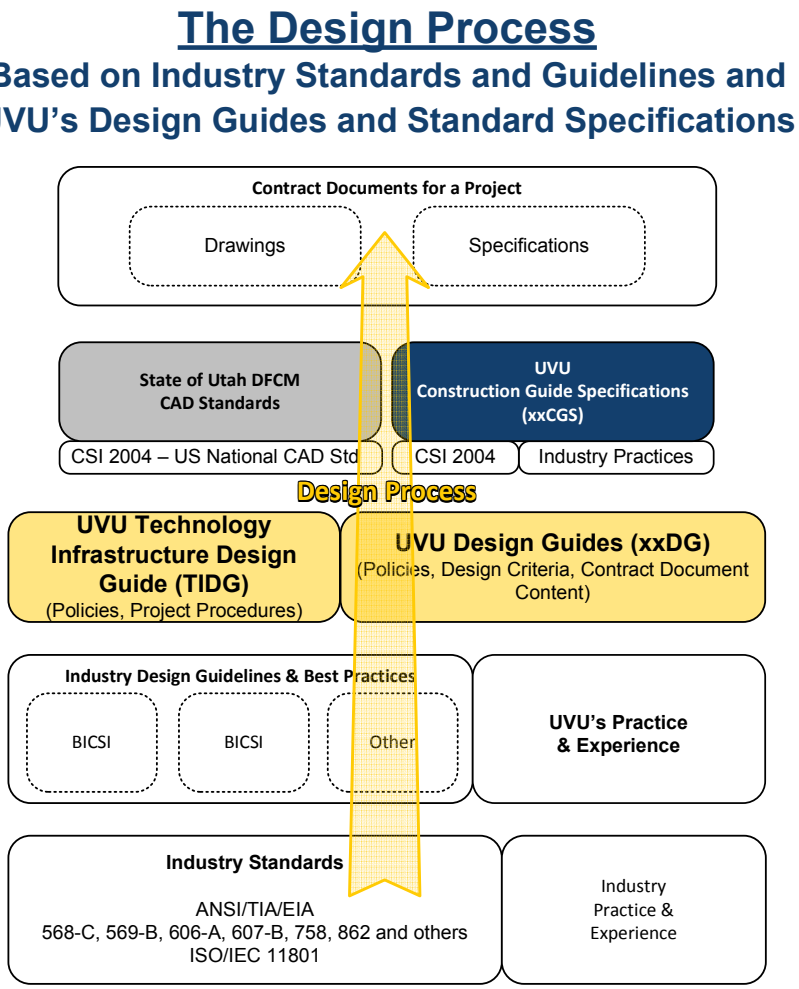
F. The Designer shall seek approval for designs that are not consistent with UVU's requirements. Requests to deviate from industry standards or UVU design solutions will be considered on a case-by-case basis by the applicable UVU Technology Project Manager (TechPM). Designers shall contact the TechPM to discuss proposed alternatives before spending significant time pursuing the option.

1.4 Document Intent

A. The Design Process diagram below depicts the relationships between industry standards, industry design guidelines/best practices, UVU's Design Guide, UVU's Construction Guide Specification documents and the project-specific Construction Documents.

B. UVU's Technology Infrastructure Standards provide directions for making standards-compliant design decisions that will, in due course, be reflected in Construction Documents for a project. The Construction Documents will be comprised of drawings and specifications that properly incorporate technology infrastructure and systems within a project. The Design Guides shall be used in conjunction with the Construction Guide

Specifications. Drawings shall conform to the guidelines contained in the Design Guide documents for content and completeness, and the specifications shall be based upon the Construction Guide Specifications.



1.5 Document Structure

The TIDG is organized in the following sections:

1. Preface
2. UVU Technology Infrastructure Procedures
3. Project Procedures
4. Appendices

A. The **Preface** (this section) describes this document, its intent and its relationship to industry standards, practices and the various audiences affected by the document. It also describes how to use this document.

B. The **UVU Technology Infrastructure Procedures** section applies specifically to UVU ***internal*** personnel. It describes internal UVU

telecommunications procedures, requirements, standard practices and processes for designing, installing and operating telecommunications infrastructure. UVU personnel should also be aware of the instructions, requirements and guidelines for Designers contained in the other sections of this document, with respect to their application on both large-scale telecommunications distribution projects and small-scale "moves/adds/changes" (MAC) projects. In addition, these requirements apply to in-house operations and maintenance of existing telecommunications distribution systems.

C. The **Project Procedures** section describes the required qualifications for telecommunications Designers as well as the procedures that Designers must follow when working on telecommunications infrastructure projects at UVU facilities. It includes activities that are required throughout the project as well as phase-specific requirements.

D. The **Appendices** section provides standard forms and diagrams along with example forms and diagrams that are required for UVU telecommunications infrastructure.

1.6 Types of Buildings and Spaces

Many of UVU's buildings have multiple building-type spaces within the building. For example, an academic building will have academic spaces and office spaces, and may also have research spaces, public gathering spaces, etc.

Building/Space Type	Definition
• Academic Buildings	Classrooms, lecture halls, auditoriums, teaching labs
• Research Spaces	Research labs, freezer/refrigerated spaces, or other spaces containing specialized research equipment
• Office Spaces	Offices and conference rooms
• Public Gathering Spaces	Student lounges, lobbies for stand-up meetings or gatherings, outdoor meeting spaces
• Warehousing or Industrial Buildings	Storage buildings for materials or equipment, campus utility buildings
• Converted Residential Offices	Homes converted into office space
• Data Centers	Data centers or other spaces supporting critical network equipment
• Fine Arts Production	Spaces for instruction, production and performance of artistic events
• Student Life and Wellness Center	Athletic and recreational facilities

The Designer shall assume that adherence to BICSI guidelines, referenced industry standards, and UVU's standards are required (unless specifically indicated otherwise) for all facility types. Where exceptions are permitted, this document set will specifically

highlight the construction type where UVU's requirements may differ from generally applicable practices and standards.

Adherence to applicable Code is always required.

1.7 Construction Types

For the purposes of this document set, construction projects are categorized by the extent of the construction work, as follows:

Construction Type	Definition
• New Construction	A new building
• Full Remodel	An existing building undergoing extensive remodeling, frequently including reallocation of internal spaces
• Minor Remodel (Workspace Remodel)	An existing building undergoing adjustments to office/work spaces. The project typically does not include changes to building systems (HVAC, electrical, etc.)
• Classroom Enhancement	An existing academic building undergoing updates to classrooms, including the technology features
• Tenant Improvement	An existing building undergoing adjustments to suit the purposes of a non-UVU tenant
• Technology Upgrade	Projects primarily focused on upgrading technology infrastructure or systems. These projects may involve minor remodeling
• Outside Plant	Projects involving the installation of or adjustment to cabling between buildings, including the in-building terminations

Some projects will qualify as multiple construction types, for example:

- Minor Remodel + Tenant Improvement

The Designer shall assume that adherence to BICSI guidelines, referenced industry standards, and the TIDG are required (unless specifically indicated otherwise) for all extents-of-construction. Where exceptions are permitted, this document will specifically highlight the construction type where UVU's requirements may differ from generally applicable practices and standards.

Adherence to applicable Code is always required.

1.8 UVU Personnel

A. There are several defined UVU personnel roles referenced in this document. The Designer shall interact with these individuals as direct points of contact:

- **Facilities Project Manager (FPM)** – responsible for project management, project oversight and project budget. There are two designated system project managers who report to the FPM:
    - **Access Control Project Manager (ACPM)** – responsible for access control systems and intrusion detection systems.
    - **Building Automation Project Manager (BAPM)** – responsible for building automation systems and environmental control systems.

- **Technology Project Managers (TechPM)** – responsible for oversight of an assigned subset of UVU's technology considerations, including interpretation of the requirements of this document. There are three designated technology project managers, who report to the Senior Director of IT:
    - **Information Technology Project Manager (ITPM)** – responsible for fiber optic cabling, television distribution, telecommunications rooms, outside plant pathways and cabling and distributed antenna systems – see the TDDG.
    - **Telecommunications Project Manager (TPM)** – responsible for oversight of all technology considerations related to the telecommunications infrastructure. Specifically focused on horizontal cabling and pathways, riser/backbone copper cabling and pathways – see the TDDG.
    - **Audio Visual Project Manager (AVPM)** – responsible for oversight of all technology considerations related to the audio / visual infrastructure, video surveillance infrastructure and related systems, and digital signage – see the AVDG.

B. The UVU Technology Infrastructure Policy section of this document (Section 2) applies specifically to internal UVU personnel. In addition to the UVU Technology Infrastructure Policy section, UVU personnel should be aware of the instructions, requirements and guidelines for Designers contained in the other sections of this document. Also, the Construction Guide Specification contains additional requirements related to technology infrastructure materials and installation methods applicable at UVU facilities.

C. UVU personnel should be familiar with these requirements with respect to their application on both large-scale technology projects and small-scale "moves/adds/changes" projects. These requirements also apply to in-house operations and maintenance of existing systems.

1.9 Technology Infrastructure Designers

Technology infrastructure Designers shall be responsible to apply the guidelines, instructions and requirements in this document and adapt the Construction Guide

Specification sections, in the course of designing technology infrastructure and systems at UVU facilities.

1.10 Contractors and Cabling Installers

Contractors and installers involved in projects without a formal engineering and design process shall be fluent with and adhere to the requirements of the Design Guide document set and also the requirements contained in the applicable Construction Guide Specification (xCGS) document set.

1.11 Required Manufacturers (Basis of Design)

A. This document set specifies certain manufacturers and materials comprising a Basis of Design.

B. Technology infrastructure shall be designed for construction using these materials and manufacturers.

C. UVU derives significant benefits from standardizing on specific materials for its technology infrastructure. To comply with applicable laws, UVU will also accept equal or better solutions comprised of manufacturers other than the ones required by UVU. However the following two conditions must be met:

- The Designer or Contractor proposing a different manufacturer or product line shall demonstrate that **all** of the properties of the alternative solution meet or exceed the performance characteristics of the manufacturers and products specified in these documents. The Designer or Contractor shall follow the Standards Variance Request process defined in the Technology Infrastructure Design Guide.
- Pre-approval of UVU TechPMs (in their sole judgment) must be sought and obtained prior to bidding or designing based on alternative manufacturers or product lines.

1.12 Copyright

Summit Engineering & Consulting retains the copyright for this document. Utah Valley University is authorized to edit and adapt the document.

Summit Engineering & Consulting has authored similar documents for many other organizations. The document is intended (in part) to describe best practices that are found in some segments of the industry. As a result, portions of this document are similar to comparable content in documents previously prepared by Summit Engineering & Consulting for other organizations. This document does not contain any information that is proprietary or confidential to other organizations.

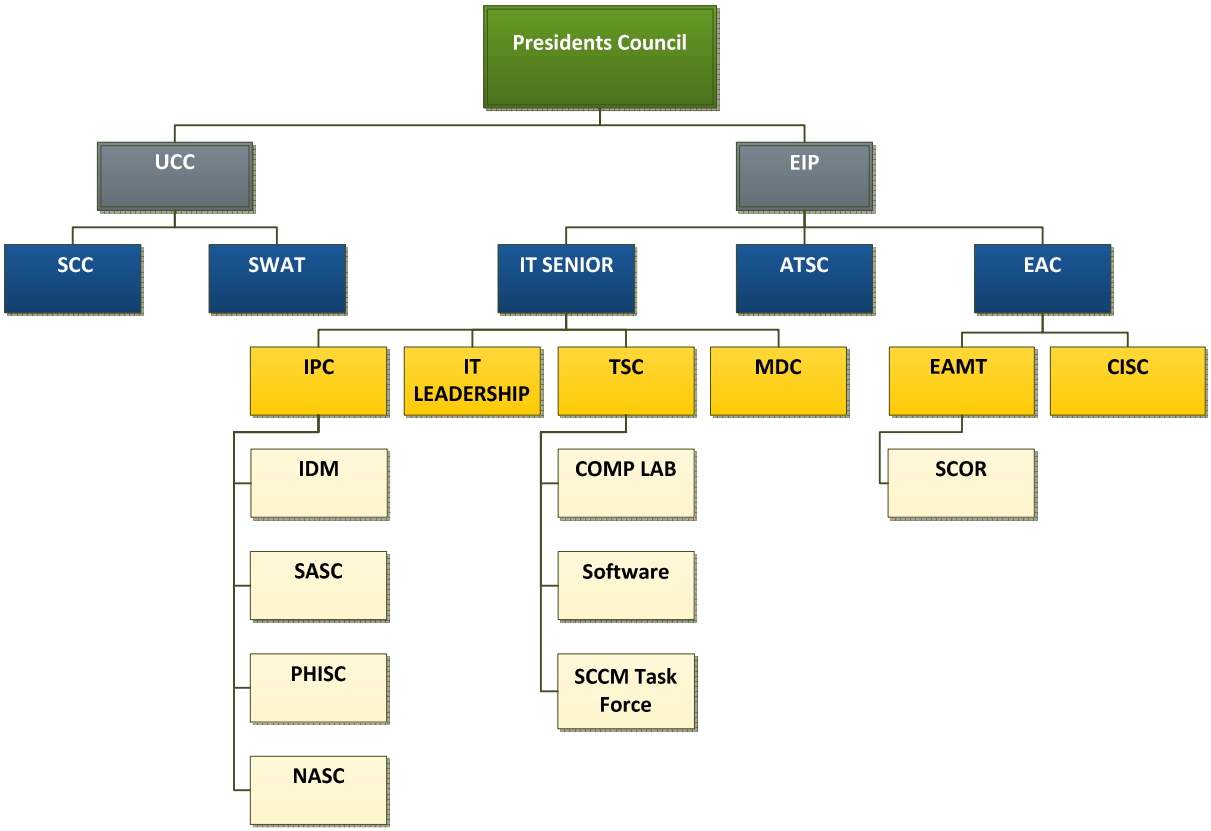
2 UVU Technology Infrastructure Procedures

This section describes internal UVU telecommunications procedures, requirements, standard practices and processes associated with designing, installing, maintaining and operating telecommunications infrastructure. It is intended for an internal audience of UVU personnel, including:

- Office of Information Technology (OIT)
- UVU Committees involved with IT
- Events Center
- Facilities
- Anyone that may be involved in the design, installation, maintenance or use of telecommunications infrastructure, network equipment or telephone equipment at a UVU facility.

2.1 UVU Committees Involved with IT

Below is an organization chart of the UVU Committees involved with IT, along with a description of their roles:



2.1.1 PRESIDENT'S COUNCIL

The President's Council is an administrative governing body that is responsible for approving items to forward to Board of Trustees, including curriculum, policies, tuition, benefits, student fees, etc. They are a resource to the President to give feedback on any number of University issues. In addition, they are representatives of their respective divisions and campus groups and are responsible for sharing information with these groups.

2.1.2 UNIVERSITY COMMUNICATIONS COMMITTEE

(UCC) The University Communications Committee assures continued improvement of our communications methods. The University Communications Committee has been implemented to oversee campus communications, including the web. This group has representation from across campus.

- (SCC) The Student Communications Committee is a subcommittee of the University Communications Committee (UCC), and they are involved in the oversight of student communications procedures, tools, and processes.
- (SWAT) The Strategic Web Action Team is under the direction of the University Communications Committee (UCC), and they direct the changes needed to keep UVU's Web current and dynamic.

2.1.3 EXECUTIVE INFRASTRUCTURE AND PLANNING COMMITTEE

(EIP) The Executive Infrastructure and Planning Committee handle all space and infrastructure requests and is the governing body for IT.

- (IT Senior) The Leadership Committee coordinates campus IT projects, manages IT resources, and internal projects.
- (ATSC) The Academic Technology Steering Committee makes recommendations about disbursement of academic technology funds, collaborates in making processes, and coordinates implementation of IT solutions.
- (EAC) The Enterprise Applications Committee makes decisions about enterprise applications and how data is used and stored.

2.1.3.1 IT SENIOR LEADERSHIP COMMITTEE

The IT Senior Leadership Committee has four subcommittees:

- (IPC) The Infrastructure Planning Committee assists in the planning, evaluation, and implementation of UVU's Information Technology Infrastructure.
- IT Leadership Committee is comprised of the Information Technology department directors, as well as the executive directors of the IT divisions, and the CIO. The purpose of this committee is for inter-departmental collaboration and communication about projects and issues pertaining to the effective management and use of technology and resources that are within the Information Technology Division's purview.

- (TSC) The Technology Support Committee exists to provide coordination between academic and administrative IT staff, LAN managers, and technicians. This committee establishes and maintains computer hardware and software standards, as well as technology procedures and practices for the students, faculty, and staff of the University. The goal of this committee is to provide and support a reliable, productive, and user-friendly technology for the campus community. TSC submits its standards, procedures, and practices to the Enterprise Infrastructure Planning (EIP) for review and ratification.
- (MDC) The Mobile Deployment Committee is a subcommittee of University Communications Committee (UCC) that focuses on mobile web and mobile applications at UVU.

2.1.3.1.1 INFRASTRUCTURE PLANNING COMMITTEE

The Infrastructure Planning Committee (IPC) has four subcommittees:

- (IDM) The Identity Management helps the Infrastructure Planning Committee (IPC) and identifies the future needs of identity management.
- (SASC) The Systems Administration subcommittee helps the Infrastructure Planning Committee (IPC) and identifies future needs of UVU's systems infrastructure.
- (PHISC) The Physical Infrastructure subcommittee helps the Infrastructure Planning Committee (IPC) and identifies future needs for UVU's physical infrastructure.
- (NASC) The Network Administration subcommittee helps the Infrastructure Planning Committee (IPC) and identifies future needs for UVU's network infrastructure.

2.1.3.1.2 TECHNOLOGY SUPPORT COMMITTEE

The Technology Support Committee (TSC) has three subcommittees:

- Computer LAB is a subcommittee of Technology Support Committee (TSC), and they coordinate standards and support issues specific to computer labs.
- Software is a subcommittee of Technology Support Committee (TSC), and they coordinate standards and support of campus wide end-user software operating systems and applications.
- (SCCM) System Center Configuration Manager is a subcommittee of (TSC) Technology Support Committee that coordinates and set standards for the use of Microsoft's enterprise desktop administration tool.

2.1.3.2 ENTERPRISE APPLICATIONS COMMITTEE

The Enterprise Applications Committee (EAC) has two subcommittees:

- (EAMT) The Enterprise Applications Management Team coordinates requests and concerns regarding the enterprise systems and applications.
    - SCOR Committee is Student Core users, under the EAMT. These are all stakeholders in the Student module of Banner.
- (CISC) The Campus Information Security Committee addresses issues associated with appropriate use of information technology by students, faculty, and staff at UVU.

2.2 Everyone

The following procedures apply to anyone that may be involved in the design, installation, maintenance or use of telecommunications infrastructure at a UVU facility.

2.2.1 DO NOT ALTER CABLING OR EQUIPMENT

Cabling and technical equipment shall not be altered by anyone outside IT Infrastructure Services. Doing so will cause interoperability problems with equipment and may void manufacturer warranties.

Please do not:

- Remove installed connectors
- Attempt to access locked panels
- Remove patch cables

Anyone needing assistance with cabling or technical equipment should contact the IT Servicedesk for assistance.

2.2.2 NEW PROJECTS

Please contact OIT as indicated above to discuss any new projects, new technologies needed or other requests.

2.2.3 PROCUREMENT

Procurement of telecommunications cabling, network electronics and telephone equipment shall be handled through OIT.

Please do not purchase any equipment that attaches to the University network or telephone system without involving OIT, even while following otherwise normal procurement procedures.

OIT's procurement procedures are fully detailed here:

http://www.uvu.edu/oit/technologysupport/standards/index.html

Non-standard items (particularly wireless access points (WAP) and network switches) will interfere with the University network. OIT will confiscate unapproved devices that are discovered on the network. Please work with OIT for all technology procurement.

Purchasing personnel meet twice monthly with OIT to coordinate the procurement of all technology needs.

2.2.4 GETTING HELP FROM THE IT SERVICEDESK

All requests for IT assistance should be submitted to:

- Call 801.863.8888
- Email servicedesk@uvu.edu
- See http://www.uvu.edu/servicedesk/

When your request is received, it will be evaluated by the IT Servicedesk and assigned to the appropriate specialists to address your needs.

The IT Servicedesk is most efficient in meeting your needs when you work through our normal channels. We are committed to applying our best efforts to address each request in a timely and professional manner.

All requests to the IT Servicedesk are analyzed and categorized into one of 4 types of request or incidences.

1. **Incident/Tickets** – All IT Servicedesk requests start as Incident/Tickets. The vast majority of all tickets are resolved by the IT Servicedesk immediately or within a few hours. Incident/Tickets are escalated into either Tasks or Escalations/Fires depending on the scope, complexity or urgency of the issue.

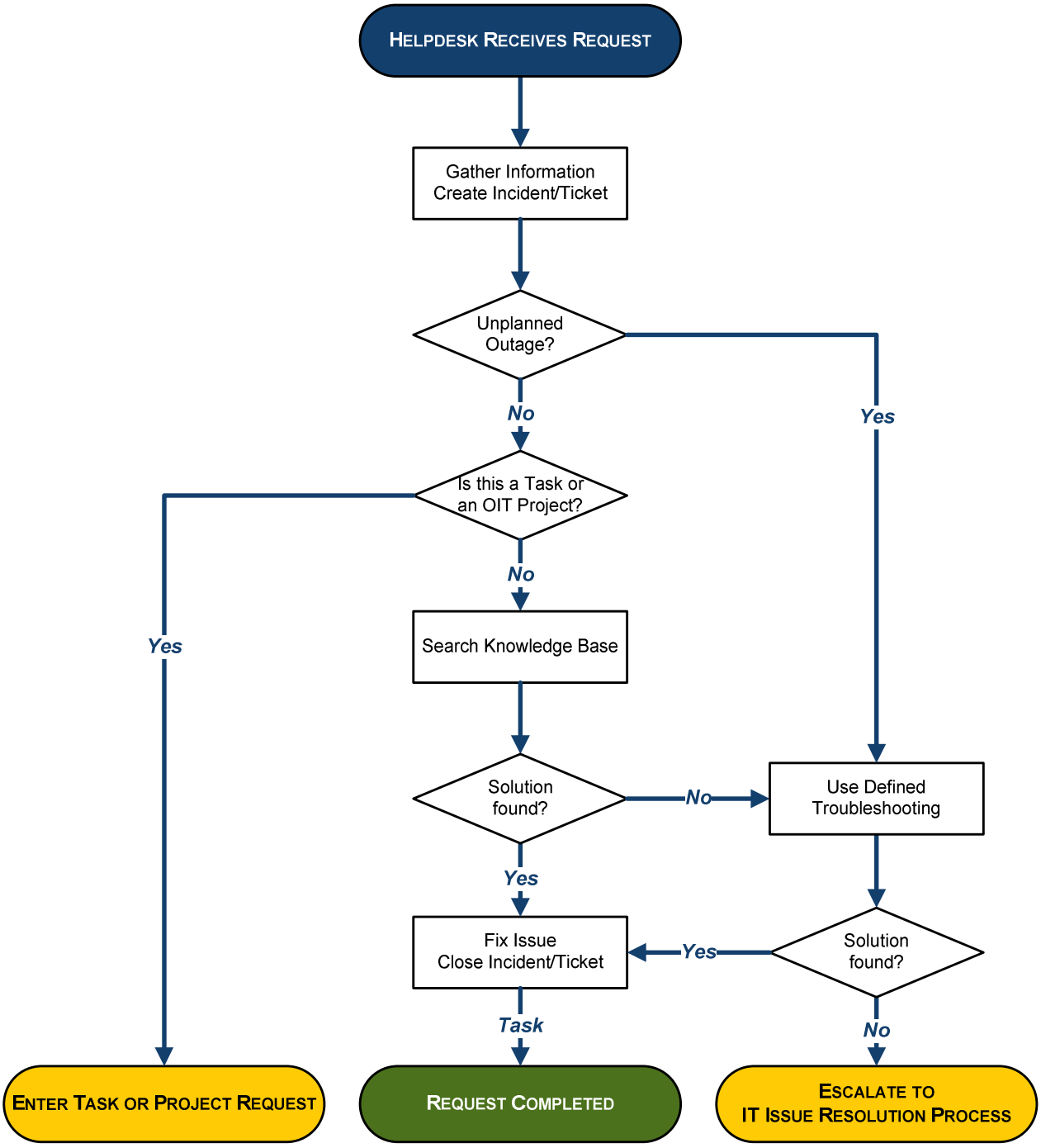
    a. **Tasks** – Requests made of IT Infrastructure Services that require either a high level technical skill set or a high level security access to systems.

    b. **Escalations/Fires** – Unplanned outages or unforeseen service issues from projects, upgrades or vendor issues.

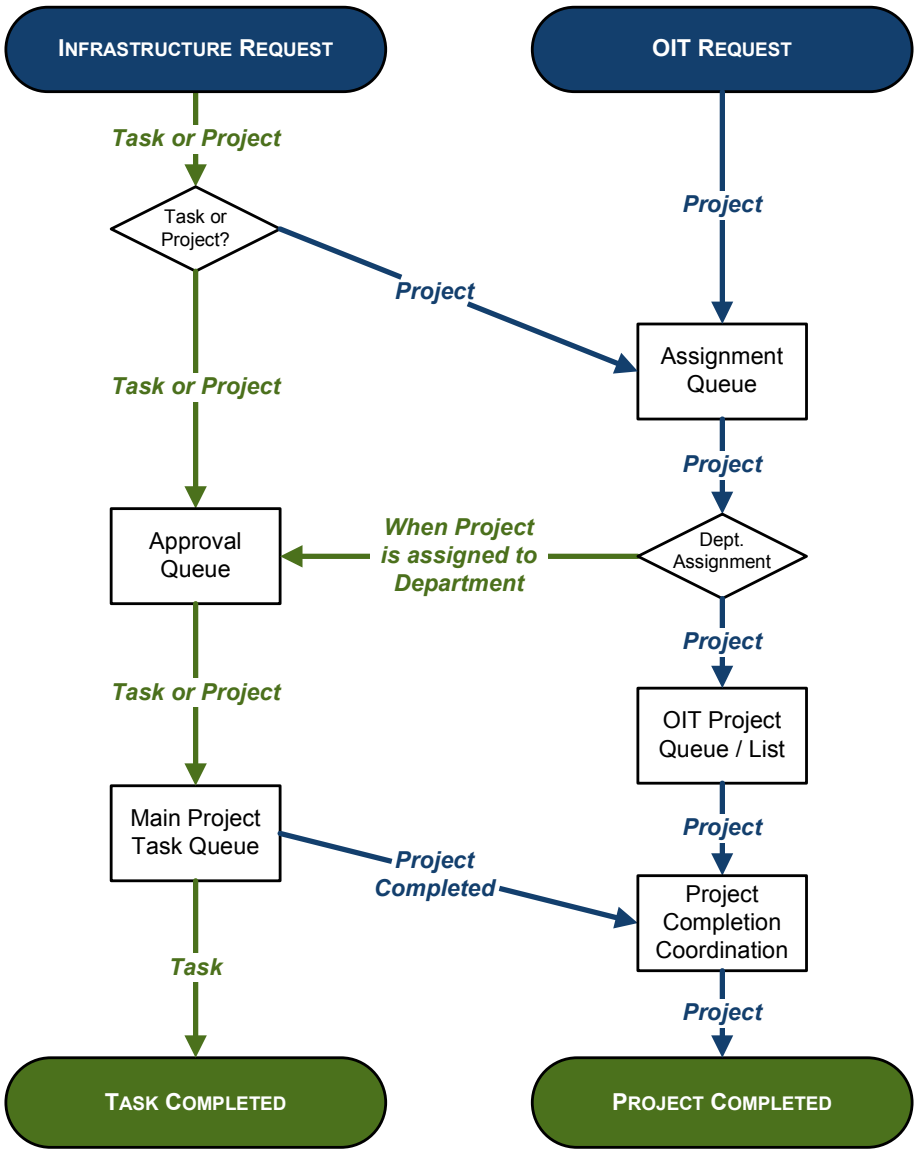
2. **OIT Projects** – Requests for help from any department within OIT meeting at least one of the following criteria:
    - Requiring more than 72 hours of effort
    - Creates a new system that must be managed and administered
    - Costs more than $3000
    - Activities with a high profile visibility

The following flowchart depicts the process used to handle each request received by the IT Servicedesk:

IT Helpdesk Request Handling



OIT Task and Project Handling



2.2.5 SERVICE OUTAGES

2.2.5.1 PLANNED OUTAGES

Planned telecommunications outages shall be scheduled with Facilities, who will then coordinate with ATSC, after which a notice is published.

Planned power outages shall be coordinated with IT and ATSC, after which a notice is published.

2.2.5.1.1 CALL BEFORE YOU DIG

Before digging on the UVU campus for any reason, the Facilities project manager supervising such work shall contact Blue Stakes of Utah. In turn, Blue Stakes will typically notify UVU to locate any University-owned outside plant ductbanks and cabling.

For faster service, the Facilities project manager is welcome to contact OIT directly after first contacting Blue Stakes.

2.2.5.2 UNPLANNED OUTAGES AND DAMAGE TO EXISTING INFRASTRUCTURE

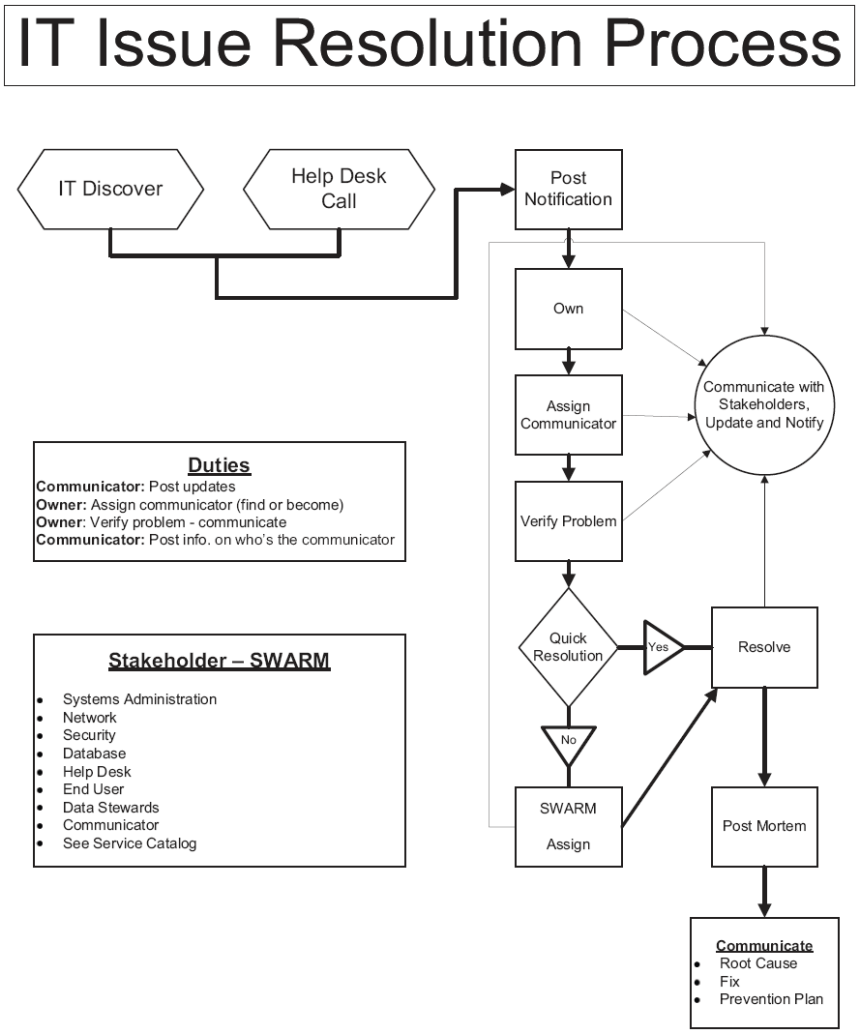
Construction, maintenance and other activities may result in damage to existing telecommunications infrastructure. In this event, regardless of the cause or party responsible, whoever observes a damage situation shall immediately contact the UVU OIT.

The party responsible for the damage to the telecommunications infrastructure shall be responsible for the total cost of the temporary repairs and the full restoration / replacement costs.

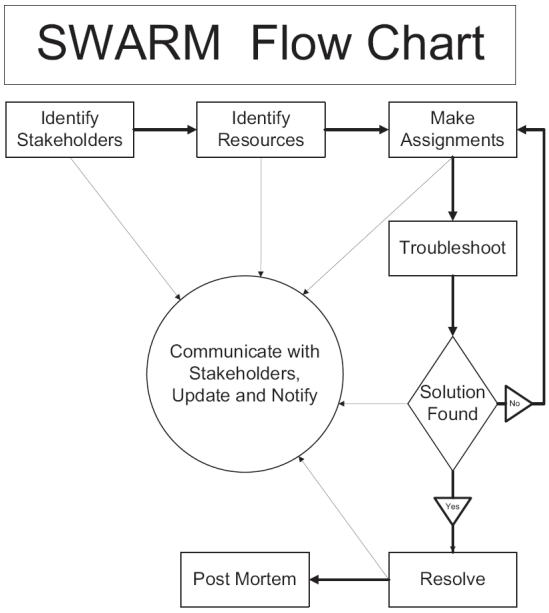
All damaged infrastructure shall be restored to within the scope of the original design/installation parameters. This shall include, but not be limited to, all repair or replacement work performed by certified cabling installation contractors of UVU's choosing, all testing and recertification of the infrastructure for full compliance with UVU's Telecommunications Standards, and applicable SCS warranty.

Please note that splicing will not constitute an acceptable repair for damaged fiber optic cabling. Damaged fiber must be replaced in its entirety.

OIT will determine the repair or replacement strategy for the damaged infrastructure as follows:



The "SWARM" portion of the flowchart is depicted in the diagram below:



2.2.5.3 POST-RESTORATION ASSESSMENT

After completing the restoration of damaged infrastructure, an assessment process is conducted. It is hoped that through these processes, institutional learning will occur that will lead to fewer unplanned outages and disruption.

If the event involved Facilities, EIP or ATSC, representatives from those organizations will be included in the process.

The Post-Restoration Assessment is conducted in the "Post-Mortem" blocks in the flowcharts above.

2.3 Events Center

Events Center telecommunications needs can vary greatly due to the diverse nature of events that take place at the University. These events can range from athletic events, trade shows, entertainment events, and conferences, and can be anything in between.

UVU's wireless network is not designed to support these events without advance coordination with OIT. The following technology-related requirements shall be addressed as conditions of the contract for all Event Center customers:

- All needs for network services shall be identified and addressed before the event takes place. The Event Coordinator shall coordinate with OIT to identify the services that will be required and when the services will be needed.
- UVU's wireless network is not a production network. The availability, stability, and security of the UVU wireless network cannot be guaranteed. The UVU wireless network is considered to be a network for convenience only.
- Wired connections will be provided as the standard practice for customer service networking needs. Wireless connections will only be provided as a last resort for situations where wired connections cannot be provided.
- The Event Coordinator is responsible to notify customers that the existing wireless network may not meet all of the customer's immediate needs.
- Non-secure payment card data transaction processing is strictly prohibited from being conducted through the University's network (wired or wireless). There shall not be any expectation of privacy via UVU networks (wired or wireless). The Event Coordinator is responsible to inform the customer of this limitation.
- Customers selling products at an event are strictly prohibited from using the University's network (wired or wireless) as a means of processing non-secure payment card data transactions. Customers are required to provide their own secure transaction processing system, independent of the University's network.
- Customers of the Events Center shall not be permitted to set-up or install their own wireless networking systems without coordinating with the Event Coordinator prior to installation. It is the Event Coordinator's responsibility to work with OIT prior to the event to arrange private customer wireless networking

systems. Non-coordinated wireless networks will interfere with existing wireless networks of the institution.

- If customers require private wireless networking systems for their event, this service shall be negotiated with the Event Coordinator at the time of booking. The Event Coordinator will then work with OIT to make any necessary arrangements prior to the start of the event.

Event Coordinators shall not make any technology commitments to customers without written approval from OIT.

2.4 Facilities

2.4.1 ACCESS TO UVU COMPUTING RESOURCES FOR NON-UVU TENANTS

The Vice-President of Finance & Administration (with assistance from the President's Cabinet) is responsible for establishing contracts with non-UVU tenants residing in UVU facilities.

While virtually all tenants require telephone and Internet services, there are numerous complications associated with providing these services, including:

- Handling of confidential information
- Quality of service expectations
- Loss of business due to service outages
- Support of commercial interests using State service resources

Therefore, including these services within the lease contract is strongly discouraged.

2.4.1.1 OBTAINING TELEPHONE AND INTERNET SERVICES

Non-UVU tenants shall obtain telephone and Internet services as follows:

- Tenants shall contract directly with the telephone and Internet utility service providers for the services they require.
- The ITPM will help coordinate new service provisions for tenants. Generally, tenant services shall demark in room #104 in the Woodbury Building or in room #608 in the Computer Science building.
- OIT will then assign dedicated campus backbone fiber and/or copper pairs to route the tenant's services from the demark to their space on campus.

Any technology-related tenant needs shall be addressed as conditions of the contract for all tenants.

2.4.1.2 CONSTRUCTION TRAILERS

Telephone and Internet services for construction trailers shall be provided as discussed above for non-UVU tenants. The Contractor shall then be required to provide their own cabling from the nearest telecommunications room to their trailer. Any underground or aerial routing to the trailer shall be coordinated in advance with OIT.

2.4.2 COORDINATION

Facilities and OIT have a mutual interest in the success of projects on campus. Regular coordination is essential to project success and is key to reducing the life-cycle costs of University assets.

2.4.2.1 MEETING SCHEDULE

The Facilities Services department holds a Facilities Coordination meeting at 8:30 AM every Monday. IT representatives attend this meeting to discuss applicable technology issues, including:

- New projects
- Tracking and review of current project status
- Projects without technology components, but which may offer attractive opportunities for expanding technology infrastructure
- Planned excavation activities

IT Services holds a Current/Future Project Coordination Meeting with Facility Project Managers and Designers at 2:00 PM on the first Wednesday of each month to discuss the technology requirements for active and planned construction projects, including:

- New projects
- Tracking and review of current project status
- Projects without technology components, but which may offer attractive opportunities for expanding technology infrastructure
- Planned excavation activities

2.4.3 INITIATING NEW PROJECTS

OIT's definition of a successful construction or renovation project involving technology includes the following facets:

- Appropriate selection of technical features
- Flexible solutions that are adaptable to support unknowable future requirements
- Favorable first cost
- Favorable long-term costs (life-cycle costs)

Several points of coordination between OIT and Facilities are key to successful projects:

2.4.3.1 OIT INVOLVEMENT FROM START OF PROJECT

All additions or modifications to telecommunications infrastructure, regardless of the size or scope of the project or quantity of cable involved, involve the appropriate UVU OIT representative(s) from the beginning of the project.

All new construction projects require the involvement of the appropriate OIT representatives from the beginning of the project.

2.4.3.2 STANDARDS COMPLIANCE IS REQUIRED

All telecommunications infrastructure shall be installed in compliance with the requirements of this document.

2.4.3.3 BUDGETING

OIT stands ready to assist Facilities with the preparation of budgets for new projects. Please request OIT involvement before finalizing any budgets.

Upon request, OIT can provide a set of general guidelines for establishing project budgets, including both the Construction budget and the Furniture, Fixtures and Equipment (FF&E) budget.

ATSC should also be involved in the budgeting process.

2.4.3.4 SYSTEM INTEGRATION

Great technical advances have been made in recent years resulting in numerous systems that now communicate via the campus network, and many of these systems now require a “quality of service” above certain levels. The following are examples of systems or processes that now require secure, stable networking:

- HVAC / environmental control systems
- Mechanical / DDC control systems
- Security and intrusion detection systems
- Access control systems
- Surveillance video systems
- Infrared scanner systems
- Handling of personally identifiable information (PII)
- Financial transactions

It is therefore crucial to the success of these systems that Facilities coordinate with OIT during the planning and design phases to ensure that adequate network and infrastructure are included in the design.

Do not expect wireless networking to provide the capacity, reliability or security required to handle these systems.

2.4.4 DOCUMENTATION

2.4.4.1 AS-BUILT / RECORD DRAWINGS

When a construction project is completed, the as-built drawings and record drawings need to be made available to OIT as follows:
The original copy of hard-copy as-built and record drawings shall be provided to UVU Facilities.

In addition to paper copies, at least two copies of the following electronic file sets shall be delivered to UVU (for Facilities and OIT):

- Full-size hard copy printed drawings – the portion of the drawing set that is applicable to technology. The full set is not required, just the sheets that depict the technology features of the project.

- Facilities shall maintain a network-accessible archive of both CAD files and PDFs of the record drawings, organized by building. OIT shall have unrestricted access to review the information via the network.

2.4.4.2 CABLE TEST REPORTS

At the conclusion of each project, the telecommunications cabling subcontractor is required (in the project specifications) to provide their cable test reports. The subcontractor is also required to register the manufacturer's warranty for the cabling infrastructure.

- Other technology subcontractors may also have similar test report and warranty requirements for their specialties.

The Facilities Project Manager should require the test results and warranty registrations at the time that record drawings are submitted, and prior to final payment.

2.5 UVU Administration

The optimal design solution balances first cost and ongoing costs. Since the ongoing costs for technology support, maintenance and replacement are typically not borne by capital funds, operating budgets must also increase in step with campus growth and technology improvements. OIT is committed to strategies that optimize stewardship of the University's resources. Please invite OIT to participate early in the planning processes.

When plans are being laid for a new or remodeled building, please be aware of the following indirect commitments that are made:

2.5.1 ADDITIONAL OIT STAFF REQUIRED

When new buildings are added to campus, the demand for OIT support staff increases.

For every additional 100,000 square feet of building space that is added to campus, the following additional full-time technical support personnel are required to maintain and operate the building:

Network	0.3 additional FTE
Telecommunications Cabling	0.15 additional FTE
Service Desk	0.75 additional FTE
Video Surveillance and Security (VSS)	0.15 additional FTE

Audio Visual	0.75 additional FTE

2.5.2 ADDITIONAL CENTRALIZED COMPUTING INFRASTRUCTURE REQUIRED

As the campus grows, adding buildings, students, faculty and staff, the demand on the existing computing infrastructure also increases. The data center, main communications facilities, telephone system, network infrastructure, audio visual systems and central points of service must all scale up to support the additional capacity required to handle the new growth.

In the future (with ongoing growth and construction), our existing centralized systems will cross thresholds where their capacity to scale will be exceeded and additional capital expenses will be incurred to support the requirements of another new building.

2.5.3 FUTURE EQUIPMENT MAINTENANCE AND REPLACEMENT REQUIRED

When new technology is purchased and installed on campus, it has a lifecycle during which it will wear out, break down or become obsolete. At that point, the University must replace the equipment in order to continue operations.

- Audio/visual equipment requires maintenance labor and spare parts and consumables (spare stand-by equipment to replace malfunctioning equipment, projector lamps, etc.)
- Every 7 years, the network equipment requires replacement due to obsolescence.
- Every 3 years, the wireless network equipment requires replacement due to obsolescence and expansion due to increased usage demands.
- Every 7 years, the audio/visual equipment requires replacement due to obsolescence. Some areas of our campus community will choose to fund a more frequent replacement cycle.
- Every 7 to 10 years, the security camera equipment requires replacement due to equipment wearing out and failure.
- Every 20 years, the telecommunication (network) cabling requires replacement due to obsolescence.

3 Project Procedures

A. The Project Procedures section contains guidelines for architects, engineers and technology infrastructure designers regarding the procedures that UVU requires for projects that include technology infrastructure and systems. This applies both to projects that entail primarily technology infrastructure work (such as telecommunications upgrade projects) as well as to architectural projects and other work (such as a new building) that involve technology as part of the building.

B. This section is not intended to supersede the State of Utah contract requirements, but rather to complement them, providing additional requirements that apply specifically to technology design in projects at UVU facilities.

C. It is intended that the requirements in this section be considered contractually binding for professional design firms providing technology design services.

3.1 Designer Qualifications

A. For the purposes of this document set, the term “Designer” shall be a person with specific technical expertise as defined in each individual Design Guide. There are unique qualification requirements for the designer of each technology subject.

B. The services of a professional engineer (PE) shall be required to design the following aspects of a complete technology infrastructure.

- Grounding and bonding
- Firestopping
- Electrical power distribution in telecommunications spaces
- Standby generator and associated other backup power systems
- Telecommunications room cooling systems

C. The services of a licensed fire protection engineer shall be required to design fire protection and life safety systems.

3.2 Architect/Engineer Teams

It is imperative that the technology infrastructure design be incorporated during the preliminary architectural design phase. To accomplish this, the architects and engineers on the design team shall work closely with the Designer, the UVU FPM, and the UVU TechPM beginning with the Pre-Design phase of the project.

3.2.1 CROSS-DISCIPLINE COORDINATION

Successful projects involving technology infrastructure require frequent, thorough design coordination between the disciplines involved in the project. The Designer shall be

primarily responsible to coordinate the technology requirements and design features with the designs produced by the other Designers on the project.

At a minimum, the following aspects of the design shall be coordinated:

3.2.1.1 OUTSIDE PLANT INFRASTRUCTURE

- Ductbank routing around obstacles (trees, tunnels, buildings, existing ductbanks, etc.)
- Coordinate the locations of maintenance holes and hand holes to determine that they are not located in areas of water concentration. Site requirements, drainage, traffic, joint usage, utility requirements, etc.
- Proximity of ductbanks to sources of EMI, including power distribution feeders
- Proximity of ductbanks to steam piping
- Routing of entrance conduits through buildings
- Backbone cabling requirements of other disciplines (fire alarm, HVAC, security, CATV, etc.)

3.2.1.2 INDOOR UTILITIES AND FUNCTIONS

- HVAC cooling requirements for telecommunications rooms (TR) and A/V equipment rooms
- HVAC ductwork routing (avoiding TR ceiling spaces and A/V equipment room spaces, and allocating space to access cable trays)
- Routing of wire basket cable trays through ceiling spaces in congested areas (HVAC ductwork, plumbing, electrical, etc.)
- Plumbing routing (avoiding TR spaces and A/V equipment room spaces)
- Lighting requirements for TRs, A/V equipment rooms, classrooms and conference rooms
- Power requirements for TRs and A/V equipment rooms
- Power requirements for work areas (receptacle locations near telecommunications outlet locations and other devices)
- Proximity of cabling to sources of EMI
- Routing of conduits through and location of pullboxes in congested areas (HVAC ductwork, plumbing, electrical, etc.)
- Walls, paint, doors and floors in TRs and A/V equipment rooms
- Proximity of microphone and speaker wiring to sources of EMI
- Acoustic treatments for Classrooms, Auditoriums and Conference Rooms

More information regarding the above requirements is available in the Design Criteria section in each individual Design Guide.

3.3 Design Review Process

As noted in Section 3.5 titled “Procedures Related to Project Phases”, the project documents will pass through the design review process at the end of each design phase plus follow-up reviews when necessary. These requirements are in addition to the State of Utah contract requirements.

On some projects, UVU may hire an Independent Review Consultant to provide technical project oversight to UVU. The Independent Review Consultant will be responsible to review the overall design, paying particular attention to areas of the design that are related to the current or future operation and maintenance of the technical systems, including low voltage systems other than voice and data. The Independent Review Consultant will identify issues that do not appear to be compliant with the requirements in UVU's Technology Infrastructure Standards.

The following steps correspond to the numbered activities shown on the Design Review Process diagram below:

① Each time a review is required, the Architect / Engineer shall provide copies of the complete project documents set (drawings and specifications for all disciplines involved in the project) for the following people:

- UVU Facilities Project Manager (FPM) (one set)
- Each UVU Technology Project Manager (xxPM) (one set)
- Independent Review Consultant (one set)

Ⓐ Ⓑ The Independent Review Consultant will have 3, 5, or 10 days (depending on the project phase) to review the design documents and provide written Independent Review Comments to the UVU FPM and the UVU TechPM.

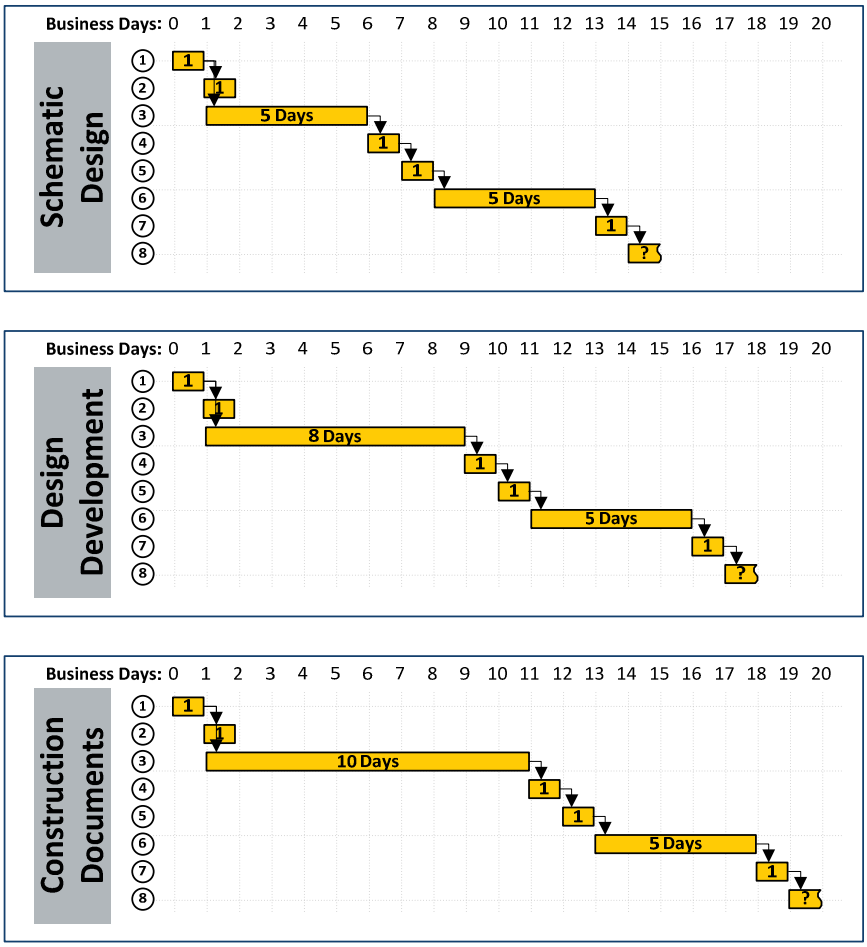
②③④ The UVU FPM and the UVU TechPM will have 5, 8, or 10 days (depending on the project phase) to review the design documents and the Independent Review Consultant's comments. The UVU TechPM will incorporate the Independent Review Comments into the TechPM's report. Following their review, they will distribute the complete set of comments to the Independent Review Consultant (if present on the project) and hold brief discussions about the comments. The UVU Technology Review Comments will then be sent to the UVU FPM for review.

⑤⑥ The UVU FPM will submit the Technology Review Comments to the Designer. The Designer will then be given five days to review the comments and respond to them in writing. Negative responses to any comment shall include a discussion of the reasons for non-compliance.

⑦⑧ Finally, a meeting or teleconference will be held with the UVU FPM, the UVU TechPM, the Independent Review Consultant and the Designer to discuss the review comments and the Designer's responses. Following the meeting, the Designer shall revise the design in accordance with UVU's resolution for each comment.

The following diagram depicts a typical technology design review process when an Independent Review Consultant is not involved in the review process. The number of days listed for #3 and #6 may need to be adjusted based on the scope or depth of the technology infrastructure and systems in a project.

Design Review Process Without an Independent Review Consultant



1. Designer sends hard copy printed Drawings and Specifications to UVU Technology Project Manager and UVU Facilities Project Manager.

2. UVU FPM reviews the drawings and specifications.

3. UVU TechPM reviews the drawings and specifications and then produces Review Comments.

4. UVU FPM and UVU TechPM meet to discuss and finalize the Review Comments.

5. UVU FPM issues the Technology Review Comments to the Designer for response.

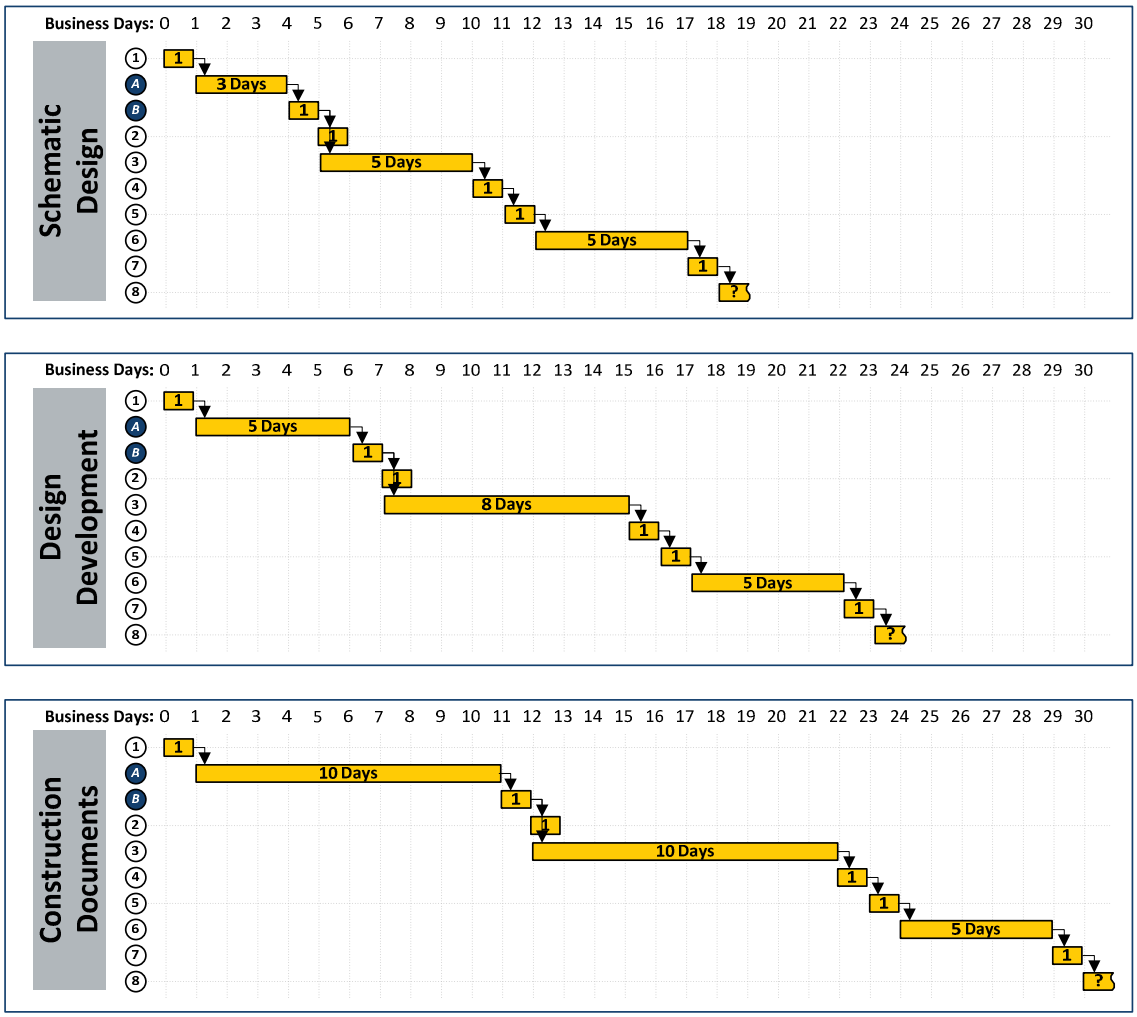
6. Designer provides a written response for each Review Comment and returns the Review Comments to UVU FPM.

7. UVU FPM and UVU TechPM meet to discuss the Designer's responses to the Review Comments and determine a course of action for each item.

8. Designer shall revise the design per the direction given in Step 7 (above). Designer shall then submit a second written response indicating how each Review Comment was resolved.

The following diagram depicts a typical technology design review process, including the Independent Review Consultant's role in the review process. The number of days listed for #A, #3 and #6 may need to be adjusted based on the scope or depth of the telecommunications systems on a project.

Design Review Process Involving an Independent Review Consultant



1. Designer sends hard copy printed Drawings and Specifications to Independent Review Consultant, UVU Technology Project Manager, and UVU Facilities Project Manager.

   A. Independent Review Consultant reviews the drawings and specifications and produces Review Comments.

   B. Independent Review Consultant delivers the Review Comments to UVU TechPM and UVU FPM.

2. UVU FPM reviews the Review Comments, drawings and specifications.

3. UVU TechPM reviews the Review Comments, drawings and specifications, and then adds additional Review Comments.

4. UVU FPM, UVU TechPM and Independent Review Consultant meet to discuss and finalize the Review Comments.

5. UVU FPM issues the complete set of Technology Review Comments to Designer for response.

6. Designer provides a written response for each Review Comment and returns the Review Comments to UVU FPM.

7. UVU FPM, UVU TechPM and Independent Review Consultant meet to discuss the Designer's responses to the Review Comments and determine a course of action for each item.

8. Designer shall revise the design per the direction given in Step 7 (above). Designer shall then submit a second written response indicating how each Review Comment was resolved.

A. The Designer shall require UVU to review the documents and respond with written review comments to the Designer at each phase of the design. The Designer shall not proceed with the next phase of design without receipt of written comments from UVU.

B. The Prime Consultant (typically the Architect) shall be responsible to determine that the review process is conducted in accordance with UVU's requirements, and shall participate in the review process to determine that the review comments are satisfactorily addressed.

3.3.1 INDEPENDENT REVIEW CONSULTANT

For projects where UVU hires an Independent Review Consultant, the prime consultant (Designer or A/E) shall provide one additional set of the drawings and specifications (from all disciplines involved in the project) for the Independent Review Consultant. The Independent Review Consultant will not perform any design services. The Independent Review Consultant could be asked to do the following:

3.3.1.1 TYPICAL DOCUMENT REVIEW SCOPE

1. Review telecommunications system design:

    - For compliance with UVU and industry standards
    - To identify apparent conflicts (routing, electromagnetic interference (EMI), etc.) with other disciplines' designs
    - For indications of coordination with television service providers or other utilities
    - For general document clarity

2. Review the completed needs analysis report.

3. Review the cutover plans.

The Independent Review Consultant shall review the documents according to UVU's requested review scope and then produce a report consistent with the format shown in the Appendix that addresses at a minimum the following items:

	Components to be Reviewed	Issues to be Considered
Pathways	Horizontal Conduit	Sizing, Sweep Radius
	Cable Tray	Sizing, Type
	Riser Conduit	Sizing, Sweep Radius
	Riser Sleeves	Sizing
	Firestopping	Locations, Type
	OSP Ductbank	Routes, Sizing, Sweep Radius
Spaces	Data Centers	Location, Sizing, Racks, Cable Protection and Termination, Grounding & Bonding
	Telecommunications Rooms and A/V Equipment Rooms	Location, Sizing, Racks, Cable Protection and Termination, Space for Wall-mounted Systems, Grounding & Bonding
	Application Spaces	Appropriate Arrangement of Conference Rooms and Classrooms
	Riser Shafts	Sizing, Vertical Stacking
	Maintenance Holes	Sizing, Location, Type
Cable Plant	Horizontal	CAT6A Copper (data), CAT5E Copper (voice), SM Fiber Optic
	Riser	UTP Copper, SM Fiber Optic
	Testing & Administration	Copper, SM Fiber Optic, Labeling Plan
Devices	Audio / Visual	Appropriate locations and quantities of A/V equipment, video surveillance devices and corresponding cabling
	Television	Appropriate locations and quantities of televisions and digital signage equipment and corresponding cabling

3.3.1.2 OTHER SERVICES (UPON SPECIFIC UVU REQUEST)

On some projects, UVU may also use an Independent Review Consultant to provide services during the construction phase. These services may include submittal review and "big-picture" construction observation services. In these situations however, the Designer always remains responsible for submittal review, construction observation, punchlist management, and other standard services as required under contract with the State of Utah.

In these situations, the Independent Review Consultant shall provide written comments to UVU. In turn, UVU will decide how to act on the written comments, and then direct the A/E, Designer or Contractor accordingly. The Independent Review Consultant shall not, under any circumstances, give direction to the A/E, Designer or Contractor.

3.4 General Procedures

3.4.1 PROCUREMENT AND INSTALLATION

A. The Designer shall inquire which procurement method will be used for a particular project. The construction documents prepared by the Designer shall be suited for the procurement method designated for the project. Some examples of procurement methods used at UVU include:

- Design-Bid-Build
- Design-Build
- General Contractor/Construction Manager (GC/CM)
- Blanket Purchase Agreement
- State Master Contract
- Direct to Contractor
- Request for Bid / Request for Proposal
- Job Order Contracting
- Owner Provided & Integrated

3.4.2 CAD FILES

The Designer shall coordinate with the Prime Consultant (typically the Architect) to determine that the electronic CAD files used for backgrounds for the technology infrastructure and systems design are consistent with the CAD file backgrounds used by the other disciplines on the project.

3.4.3 STANDARDS VARIANCE REQUEST (SVR)

A. It is not the intent of UVU to rigidly impose standards on every aspect of a design. Each design is unique and special requirements may lead to situations in which deviations from the standards are warranted.

B. UVU's Technology Infrastructure Standards document set identifies specific design solutions that are intended to meet the technical requirements at most

UVU facilities. Design issues that are not consistent with the requirements in this document shall require prior approval through the UVU Standards Variance Requests (SVR) process. Requests to deviate from industry standards or UVU design solutions will be considered on a case-by-case basis. Any request to deviate from applicable code requirements or from manufacturer's warranty requirements will not be approved.

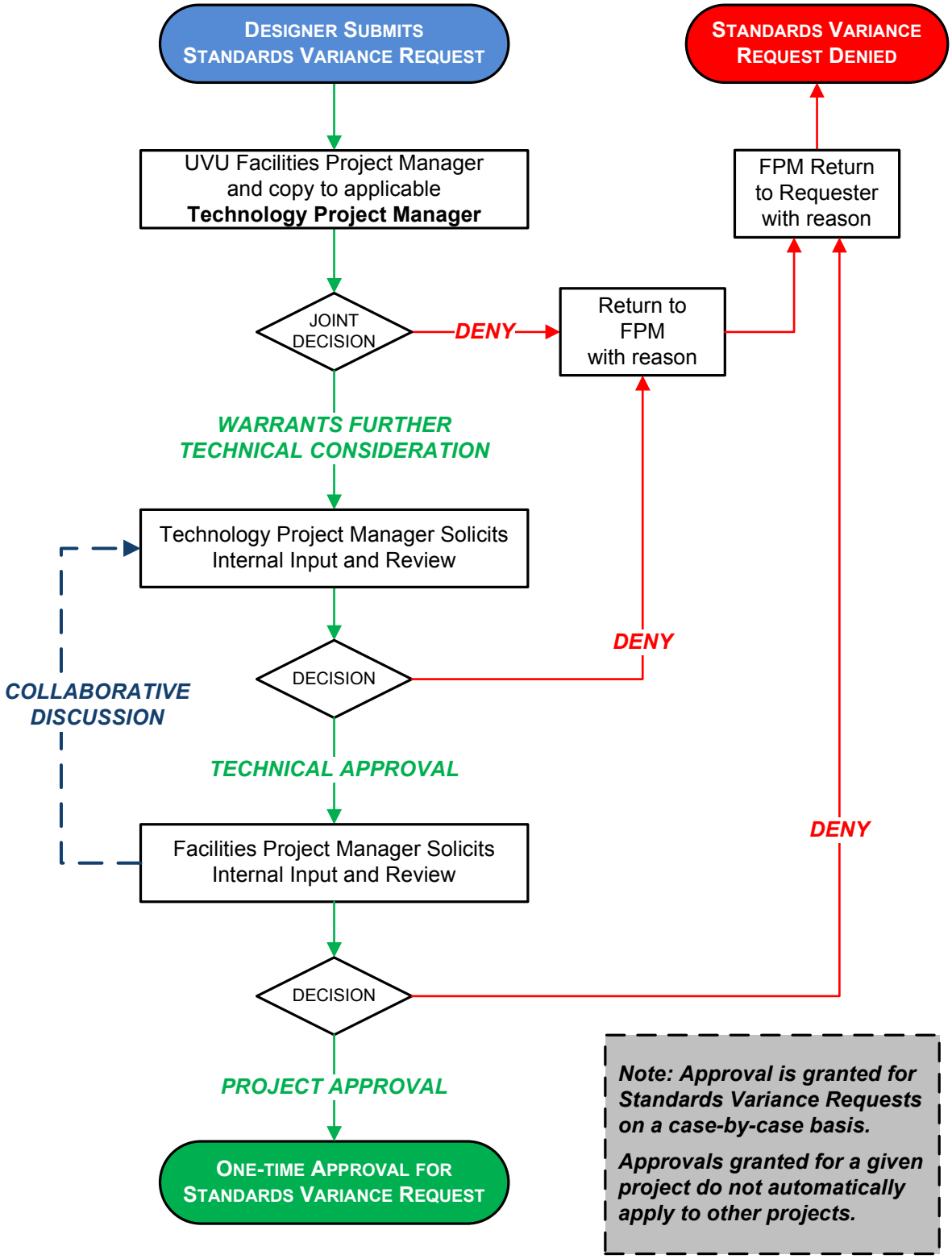
C. If the Designer feels that a solution is warranted which differs from a given standard, the Designer shall submit a written Standards Variance Request to UVU. The Designer may, upon written approval from UVU, incorporate the design deviation into the overall design. UVU approval is required on a project-by-project basis, and applies only to the designated instance(s) within that project. The Designer shall not assume that an approval for one project or one instance means that the practice is approved for use throughout that project, or that it will necessarily be approved for a subsequent project.

The request shall include a complete description of the proposed alternative design identifying:

1. The type of facility;
2. The conditions at the facility;
3. The approved design solution as described in this document or as described in the standards referenced in this document;
4. The proposed alternative design;
5. A list of the guidelines and standards referenced in this document with which the alternative design will not be in compliance, and the effect of non-compliance, both short and long term;
6. The reason for wishing to use the alternative design;
7. The Contractor or personnel performing the construction;
8. A written statement indicating that the proposed alternative design will meet the applicable UVU system performance requirements, and identifying any performance limitations, drawbacks and benefits from using the alternative design.

D. Both the Designer and the Prime Consultant (typically the Architect) on the project shall be jointly responsible to determine that the SVR process is properly conducted, and shall participate in the process (review, acknowledge and address issues) to determine that UVU's requirements are met.

Approval Process for Standards Variance Requests (SVR)



3.5 Procedures Related to Project Phases

In addition to the State of Utah contract requirements, Designers of technology infrastructure and systems for UVU facilities have the following responsibilities during each project phase:

3.5.1 PRE-DESIGN

A. During Pre-Design, the architect shall involve the Designer to incorporate the following considerations:

- Location and capacity of existing technologies and infrastructure that might be used to support the project.
- Identify any existing underground infrastructure that might conflict with the footprint of new work.
- Telecommunications room sizes and centralized locations.
- Audio/Visual equipment room sizes and desirable locations.

3.5.2 SCHEMATIC DESIGN AND FIELDWORK

A. Some projects at UVU campuses may require the Designer to conduct preliminary fieldwork to document the existing equipment, cabling and applications into which new technology will integrate. UVU believes that this information is vital to a successful project.

B. For projects that involve modifications to existing buildings, the Designer shall visit the project site during the Schematic Design phase to perform preliminary field investigation of the horizontal and intra-building backbone telecommunications infrastructure. The Designer shall create the following types of documentation based on information gathered while on site:

- Take digital photographs of existing pathways, spaces, equipment and cabling that affect or are affected by the new project work.
- Verify existing or create a new backbone schematic diagram showing the existing outside plant cabling in the area associated with the new project and the existing equipment connection strategy.

C. The Designer shall also conduct a needs analysis (involving UVU personnel) to identify and describe the required features and functionality of the new applications.

D. The information gathered during the fieldwork, combined with the results of the needs analysis, shall be the starting point for Schematic Design of the proposed new work.

E. The Designer shall discuss pathway type and size options with the UVU TechPM.

F. Schematic Design drawings shall show the following information:

- Building and OSP distribution
- Telecommunications Room sizes and locations
- Major distribution pathways inside the building, including cable trays
- Audio/Visual Equipment Room sizes and locations

G. Upon completion of the Schematic Design documents, the standard Design Review Process shall be conducted prior to progressing to the Design Development phase.

3.5.3 DESIGN DEVELOPMENT

A. The Designer shall modify the design documents to address the review comments received during the Schematic Design Phase.

B. In addition to the content shown on the Schematic Design documents, the Design Development documents shall show the following information:
- Schematic diagrams
- Device box locations and port (jack) counts for each box
- Equipment/Device types and locations
- Draft of specifications based on the Construction Guide Specifications

C. Upon completion of the Design Development documents, the standard Design Review Process shall be conducted prior to progressing to the Construction Document phase.

3.5.4 CONSTRUCTION DOCUMENTS

A. The Designer shall modify the design documents to reflect the accepted review comments received during the Design Development Phase.

B. It is expected that the Designer will expend considerable effort coordinating details between different disciplines during the design process. Non-coordinated pathway/raceway is not acceptable to UVU.

- In particular, accessible cable tray is crucial to UVU's operations. The Designer shall work with the mechanical designers to coordinate ductwork such that it does not obstruct access to the cable tray.

C. During the Construction Documents phase, the Designer shall obtain the assistance of manufacturer product representatives to review the CGS-based project specifications to determine that the correct part numbers have been included for each product in the specification. The specifications shall be adapted by the Designer from the UVU Construction Guide Specification.

D. Upon completion of the Construction Documents, the standard Design Review Process shall be conducted. The Designer shall then modify the documents to

reflect the accepted review comments associated with the Construction Documents prior to the Bidding Phase.

E. The Construction Documents are expected to contain the items discussed in the ***Construction Document Content*** of each Design Guide.

F. Upon completion of the Final Construction Documents, the standard Design Review Process shall be again conducted as described above. The Designer shall modify the documents to address the review comments associated with the Final Bid Documents prior to the bidding phase rather than "by addendum."

3.5.5 BIDDING

A. On projects where a pre-bid walkthrough is held, the Designer shall attend the walkthrough and shall discuss any materials and practice requirements that the bidders might find peculiar or which might affect the bids if such requirements were overlooked. Noteworthy items would typically be requirements that are more restrictive than practices considered acceptable for other commercial projects. The Designer shall consider the following items for inclusion on such a list, as well as any other items applicable to the project:

- The fact that most of the materials specified for use in UVU's technology applications are not designated as "or equal, according to the judgment of the contractor." Any material substitutions must be approved in advance by the Designer in counsel with the UVU TechPM.
- The requirement that the technology subcontractors must be pre-approved, prior to the bid, and that bids from subcontractors who have not been pre-approved will be considered to be non-responsive.
- The fact that UVU's technology infrastructure standards and specifications are more stringent than typical electrical installation requirements or the specifications on many other projects.
- The use of flex-conduit is prohibited.
- The installation of conduit under-slab or in-slab is prohibited for on-grade slabs, except where specifically noted.
- The requirement for no more than two 90 degree bends in any conduit run.

B. The Designer shall pay close attention to the addendums produced by other disciplines on the design team, noting any changes that conflict with technology infrastructure. The Designer shall promptly address any such conflicts, bringing them to the TechPM's attention in each case.

C. Approximately ten days prior to the date that bids are due, the Designer shall issue an addendum reiterating the requirement for technology subcontractors to have been preapproved. The addendum should also list the name and contact information for any subcontractors who have been preapproved. The objective is that the bidders should receive this finalized list of preapproved subcontractors not less than one week before the bids are due.

D. On projects where a contractor will design and install the work, the Contractor shall submit the following documentation with the bid, depicting what will be installed by the Contractor:

- Material cut-sheets
- Plan drawings of new devices, outlets and cable routing
- Drawings of the grounding/bonding plan (as appropriate, when required)

All drawings shall be prepared using professional design software. Drawings that are hand-drawn sketches or produced using bitmap graphics editors shall not be accepted.

3.5.6 CONSTRUCTION OBSERVATION

A. The Designer shall review the Contractor's submittals that are required by the Construction Documents. When the Contractor's submittals include materials or methods that deviate from UVU standards, the Designer shall either:
   - Reject the specific materials and methods that do not comply, when the Designer believes that they constitute undesirable solutions.
   - Pursue the SVR process to seek separate approval for each specific material and/or method that the Designer believes would constitute a better solution.

B. The Designer shall visit the construction site frequently to observe the construction quality and status. The Designer shall confer with the UVU FPM prior to proposing services for the project to determine an appropriate site-visit frequency for the project. The site-visit frequency will likely fluctuate during the construction phase as the technology-related activity increases and decreases.

   - In particular, the Designer shall observe any rough-in work that will be concealed in walls or pathways that will be buried or concrete-encased.

C. The Designer shall invite the ITPM to attend a construction observation meeting prior to the pouring of concrete to allow UVU IT to check the pathways that will then become concealed.

D. During all site visits, the Designer shall take digital photographs of existing and new pathways, spaces and cabling, both intra-building and outside plant, that are related to the project. In particular, the Designer shall photograph infrastructure that will later be concealed during the course of construction.

E. It is the responsibility of the Designer to verify that the Contractor properly labels all cabling in a manner consistent with UVU standard labeling practices (both inside plant and outside plant) during construction. Inadequate or incomplete labeling is not acceptable.

F. Accurate as-built drawings are considered critical for the efficient long-term operation of UVU facilities. During construction observation visits, the Designer shall observe and report on the Contractor's progress toward staying current with the as-built drawing notations.

G. After each construction observation visit, the Designer shall submit a written report describing the observed construction progress. Observations shall be documented in the report with annotated digital photographs and a written description of any problems, a description of the requirements in the Construction Documents and the resolution to the issues. For each item requiring corrective attention, the report shall describe the following:

- A description of the issue
- Applicable requirements in the Construction Documents
- Applicable UVU standards, industry standards and codes
- Corrective options available to UVU
- Designer's recommendation

H. The Designer shall submit the construction observation reports via email to the UVU FPM and the UVU TechPM as soon as possible following each site visit. The reports shall also be reviewed at the next construction meeting. A timely report submission will aid the Designer and UVU in identifying potential problems early in the construction process.

I. The Designer shall alert the Contractor that cable testing shall be performed after electrical systems have been powered on and after building operational conditions become similar to normal operations. Also, any dust-producing construction activities shall be completed prior to any cable testing. The intent is that testing not be done until normal operating conditions exist (and the associated electromagnetic interference is being generated by electrical systems in the building).

3.5.7 POST-CONSTRUCTION

A. The Designer shall review the Operation and Maintenance information provided by the Contractor for the telecommunications distribution system. The Designer shall verify that information is included for each component in the system. Upon approval of the content in the Operation and Maintenance information, the Designer shall submit the information to the designated UVU TechPM with written documentation indicating that the Designer has reviewed the information and that it appears to meet the requirements in the Construction Documents.

B. The Designer shall provide record drawings and record documentation to UVU (based on as-built documents that have been "red-lined" by the Contractor). Record documents shall be provided in electronic CAD format where applicable, in addition to requirements put forth by the Designer's contract with UVU.

- A separate full-size printed copy of any record drawings depicting technology infrastructure shall be furnished to the applicable TechPM.

C. The Designer shall review the test reports produced by the Contractor during the project. The Designer shall verify that the test reports are complete, properly performed and indicate passing results.

D. The Designer shall verify that the contractor provides the appropriate manufacturer warranty certification documentation to UVU.

3.6 Designing for Demolition

Some projects may involve existing buildings that require the demolition of existing telecommunications cabling and components. In these situations, the following activities are required:

3.6.1 SITE-SPECIFIC CODE REQUIREMENTS

The Designer shall clearly understand the site-specific, Code-based requirements for demolishing cabling and components that are no longer in use, and shall communicate these requirements to UVU.

- Generally, this means that all abandoned cabling shall be removed during demolition or after cutover.

3.6.2 PRESERVATION OBJECTIVES

UVU may wish to preserve some existing cables in operational condition. Such existing cables may not be used immediately following the completion of the work, but UVU may have plans for future use of those cables. It may be required in the Code that such cables be physically tagged for future use, or otherwise be subject to demolition.

The Designer shall inquire with UVU on a project-by-project basis about cabling, equipment and other materials that should be preserved in an operational condition during the course of a project.

3.6.3 SALVAGE OBJECTIVES

The Designer shall inquire with UVU on a project-by-project basis about cabling, equipment and other materials that should be removed and salvaged to the Owner, and also to determine how and where the salvaged materials will be delivered to the Owner.

4 Appendices

4.1 Sample Review Comment Report

The table below depicts an example Review Comment Report form that UVU may use.

Review comments from UVU would be entered on the left half of the page.

Responses from the Design Team (including architects, engineers and Technology Infrastructure Designers) shall be provided on the right half of the page.

DESIGN REVIEW COMMENTS

Date: 2/19/2013 | Returned to UVU: | Page: 1 of 1

Project Title: Utah Valley University Project Title | Contract No. UVU # | Architect: Architect Name

DWG. NO./ PAR. NO.	*ITEM NO.*	*Reviewer Initials*	*REVIEWER COMMENTS*	Initials / Firm	*DESIGN TEAM RESPONSE*
Sheet #	1	ES	Drawing Comment		
Sheet #	2	TT	Drawing Comment		
Sheet #	3	KO	Drawing Comment		Design Team Responses (Architects, Engineers, Designers)
Section # Para. #	4	KD	Specification Comment		
Section # Para. #	5	TB	Specification Comment		

4.2 Acronym Glossary

ACPM	Access Control Project Manager
AVCGS	Audio/Visual Construction Guide Specification
AVDG	Audio/Visual Design Guide
AVPM	Audio/Visual Project Manager
BAPM	Building Automation Project Manager
CGS	Construction Guide Specification
CGSP	Construction Guide Specification Preface
EMI	Electromagnetic interference
FPM	Facilities Project Manager
GC/CM	General Contractor/Construction Manager
ISP	Inside Plant
ITPM	Information Technology Project Manager
MAC	Moves/Adds/Changes
OSP	Outside Plant
SVR	Standards Variance Request
TCGS	Telecommunications Construction Guide Specification
TDDG	Telecommunications Distribution Design Guide
TIDG	Technology Infrastructure Design Guide
TechPM	Technology Project Manager(s), *also*
TPM	Telecommunications Project Manager
TR	Telecommunications room(s)
UTP	Unshielded twisted pair

I| owners project requirements

Owner Project Requirements (OPR)

Utah Valley University Performing Arts Complex
PROGRAMMING

12/20/15

Utah Valley University

DFCM

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OWNERS PROJECT STANDARDS

1.0 OVERVIEW

1.1. INTRODUCTION

The purpose of this OPR standard is to establish a common standard for creating an OPR and a description of what a Basis of Design response should be to each applicable OPR requirement. This guide is intended to be used by building owners, designers, commissioners and green building providers in producing OPR and BOD documents. Each probable component of the OPR is identified by the appropriate paragraph number while the required BOD response is shown below the OPR requirement in *italicized* font.

1.2. SCOPE OF OPR

The OPR should cover the entire scope of the project including site requirements, architectural requirements, sustainable requirements, mechanical-plumbing-electrical (MEP) requirements and operations and measurement and verification requirements.

The OPR should be used as a guidepost throughout the project to make sure the owners requirements are achieved through the design and construction delivery of the project.

1.3. PROCESS

The owner is responsible for production of the OPR and the designers are responsible for the production of the BOD. The commissioner is responsible to verify the project achieves the owner's requirements and that the design and construction do not deviate from the OPR without approval.

The OPR is a living document and is updated as required throughout the design and construction process when it is deemed appropriate by the owner.

In some cases the owner will seek assistance from the designers or commissioners is developing the OPR. This guide can be used as a starting point for what information the owner should include in a typical OPR.

2.0 STANDARD OPR

2.1. OPR EXECUTIVE SUMMARY

2.1.1. OBJECTIVES

The Owner's objective is to develop a high quality building by applying quality design and construction practices in accordance with the sustainable principles listed within the OPR.
This document is intended to systematically and clearly communicate the expectations of the owner. The objective of this OPR is to provide the base information required for the design and construction teams to deliver a well-planned and cost effective facility that meets the following goals:

a. A building that provides the occupants needs to fulfill their daily mission
b. A building that delivers a secure facility that is easily operated and maintained
c. A building that has low utility and maintenance costs
d. A building that provides excellent environmental quality and a healthy work and living environment
e. A building that achieves the sustainable goals listed in this OPR

2.1.2. DEVELOPING THE OPR

It is the owner's responsibility to develop an accurate OPR to provide the designers and constructors with the correct information to deliver the facility that meets the owner's desires. The OPR forms the basis from which all design, construction, acceptance and operational performance evaluations are made.

The project commissioner will review the owners OPR and will assist the owner in defining and clarifying their objectives and goals. These objectives and goals may include:

a. Owners expectation of how the facility will be used and operated
b. Functional requirements
c. Sustainability goals
d. Measurable performance
e. Success Criteria

2.1.3. OPR CONTENT

The OPR will contain general and detailed information for the owner's requirements. These requirements may include:

a. Specific project requirements to supplement the programming documents
b. Owners standards for systems, equipment and products
c. Owners goals for the use, sustainability and performance of the facility
d. The OPR is considered a living document and will be updated during the design, construction, acceptance and operation phase if items are discovered that need to be changed to keep the OPR document current with the owners ultimate goals.

2.1.4. BOD RESPONSE

The Basis of Design is a narrative document created by the designers that records the concepts, calculations, decisions and product selections used in the design to meet the goals of the OPR and to satisfy the applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and specific assumptions made by the designers.
The BOD documents the designers work and includes but is not limited to:

a. Ambient and space conditions used in the design
b. Input and output data utilized for the load calculations
c. Assumptions and safety factors utilized in the design
d. Specific codes, standards and guidelines considered and utilized for the design
e. Reasons for system selections made and reasons for systems selections that were rejected
f. Specific engineering studies that were done in determining selected systems, components or assemblies
g. Specific design elements that were used to meet sustainable goals

2.1.5. PROJECT TEAM INFORMATION:

Role	Name	Company	Address	Phone	Email
Owners Representatives					
Owners Representative	Clint Bunnell	DFCM		435-840-4192	cbunnell@utah.gov
Owner Energy Manager	John Burningham	DFCM		801-641-7270	johnburningham@utah.gov
Code Officials					
Authority Having Jurisdiction	Pat Tomansino	State of Utah		801-608-4833	ptomasino@utah.gov
Code Inspector		TBD		-	-
Fire Marshall	Richard Gee	State of Utah		801-284-6350	rgee@utah.gov
Special Inspections		TBD		-	-
User and Maintenance Representatives					
Project Manager	Kurt Baxter	UVU Facilities		(801) 863-8322	KBaxter@uvu.edu
User Representative	Linda Moore	UVU SOA		(801) 863-6827	Linda.Moore@uvu.edu
Facilities Manager	Frank Young	UVU Facilities		(801) 863-8322	frank.young@uvu.edu
Plumbing Shops Rep	Scott Draper	UVU Facilities		(801) 863-8322	JDraper@uvu.edu
Electrical Shops Rep.	Denny Rucker	UVU Facilities		(801) 863-8322	RUCKERDE@uvu.edu
Mechanical Shops Rep	Keith Sabin	UVU Facilities		(801) 863-8322	SABINKE@uvu.edu
Controls Shops Rep	Scott Draper	UVU Facilities		(801) 863-8322	JDraper@uvu.edu
Energy Manager	Scott Draper	UVU Facilities		(801) 863-8322	JDraper@uvu.edu
Owners Consultants					
Energy Modeler	Cordell Post	Colvin Engineering		801-322-2400	cpost@cea-ut.com
Commissioning Provider	TBD	-		-	-
Envelope Commissioning	Don Rasmussen	ATI		(385) 229-4980	drasmussen@archtest.com
Programming Design/Engineering Team					
Architect of Record	Joe Smith	Method Studio		801-532-4422	joe@method-studio.com
Design Architect	Todd Kelsey	Method Studio		801-532-4422	todd@method-studio.com
Cost Estimator	Kris Larsen	CCC		801-578-1201	klarson@cccutah.com
Kitchen Designer	n/a	n/a		-	-
Structural Engineer	Mark Harris	Reaveley Engineering		801-505-4028	MHarris@reaveley.com
Civil Engineer	Koby Morgan	Ensign Engineering		801-255-0529	kmorgan@ensignutah.com
Landscape Architect	Brandon Reed	Loft Six Four		(801) 580-3325	brandon@loftsixfour.com
Mechanical Engineer	Roger Hamlet	Colvin Engineering		(801) 505-5392	rhamlet@cea-ut.com
Plumbing Engineer	Roger Hamlet	Colvin Engineering		(801) 505-5392	rhamlet@cea-ut.com
Electrical Engineer	Dave Wesemann	Spectrum Engineering		(801) 401-8468	Dew@spectrum-engineers.com
Construction Team-TBD					
Project Executive	TBD				
Project Manager	TBD				
Superintendent	TBD				

Project Engineer	TBD				
Cost Estimator	TBD				

2.2. PROJECT DESCRIPTION

2.2.1. PROJECT DESCRIPTION

- The Art Complex will become a regional gathering space and visual landmark for the arts. It will provide a new campus "gateway" to the public. It will provide versatile learning and performance spaces to display the excellent quality of student and faculty expertise
- The location of the Art Complex is planned to be on the east side of campus connecting to the existing Noorda Theatre and Gunther Trades Building. Exact connection points and new building orientation will be determined during the design process
- The Art Complex will provide a gateway to the east side of the campus and will connect to existing parking and pedestrian pathways, while considering future campus developments
- The structure will be approximately 140,000 G.S.F.
- The Art Complex will house theatre, dance and music instruction and performance spaces. The majority of spaces in the new facility are multi-purposed with a focus of creating collaborative learning environments, which will be shared by departments within the School of Arts.
- The program will include a 900-seat Concert Hall, 501-seat Proscenium Theatre and 150-seat Dance Hall
- The project will also include studio offices, faculty offices, classrooms, music rehearsal rooms, productions shops and support spaces.
- It is anticipated that the project will be 3 levels for the main building with increased heights at the Concert Hall and Theatre
- The project will include remodeling a scene shop into the existing Noorda Theater basement with an adjacent scene shop extension.

2.2.2. PROJECT DELIVERY METHOD

The project is to be delivered by the design/bid/build method.

2.2.3. PROJECT BUDGET

The projects allowable budget is:

a.	Design	$ 0,000
b.	Consultants	$ 0,000
c.	Overhead	$ 0,000
d.	Site Work	$ 0,000
e.	Construction	$ 0,000
f.	Abatement	$ 0,000
g.	Contingency Fees	$ 0,000
h.	Total Project	$ 50,000,000

The project budget will be reviewed and updated by the owner at each milestone of the design to verify the design is meeting the project scope and budget.

2.2.4. UTILITY RATE SCHEDULES/METER

2.2.4.1. NATURAL GAS RATE SCHEDULE:

Decatherm: $8 per decatherm

2.2.4.2. ELECTRICAL RATE SCHEDULE

KWH Peak (Summer): $ .07.
Kohl Off-Peak (Summer): $.05
Kohl Peak (Winter): $.05
Kohl Off-Peak (Winter): $.04
KW Demand Peak (Summer): $12
KW Demand Peak (Winter): $10

2.2.4.3. METER

Natural Gas Meter Number: 1254887
Electrical Meter: 54789654

2.2.4.4. UTILITY INCENTIVES/REBATES

Rocky Mountain Incentives: Prescriptive
Questar gas Incentives: Custom
Responsibility for Documentation Control: CxA

2.2.5. ABATEMENT

Abatement is not anticipated at this time, to be fully analyzed during schematic design, include assessment of remodel spaces.

2.2.6. GREENHOUSE GAS EMISSIONS

CO2: DAQ Guideline
Methane: DAQ Guideline
Nitrous Oxide: DAQ Guideline

Direct Emissions Contributors: Generator, Boilers
Who is Responsible for filing the proper DAQ filings: A/E Team, Contractor, Owner

2.2.7. PROJECT SCHEDULE

Project Schedule		
Item	**Description**	**Target Date**
1.	Completion of the OPR	Schematic Design
2.	Schematic Design Phase Begin	1/20/2016
3.	Design Cx Kick Off Meeting	Schematic Design
4.	Draft Cx Plan Created	Schematic Design
5.	Schematic Design Phase End	Schematic Design
6.	Completion of the BOD	TBD
7.	Design Development Phase End (Construction Documents Complete)	TBD
8.	Pre Bid Meeting	TBD
9.	Complete Construction Contracts	TBD
10.	Construction Begin	TBD
11.	Submittals complete and approved	TBD
12.	Construction Cx Kick Off Meeting	TBD
13.	Construction Inspections	TBD
14.	Commissioning check sheets and forms completed	TBD
15.	Static and Electrical Tests Executed	TBD
16.	Envelope Tests Executed	TBD
17.	Start Up and Check Out Executed	TBD
18.	Test and Balance Executed	TBD
19.	Functional Performance Testes Executed	TBD
20.	O&M Documentation Completed and Reviewed	TBD
21.	Training Completed	TBD
22.	Final Project Completion	TBD
23	Expected Occupancy	TBD
24.	Final Cx Report	TBD
25.	Deferred testing	TBD
26.	Warranty follow up and report	TBD
27.	Utility Baseline Finalized	TBD
28.	Measurement & Verification Performance Evaluation	TBD

2.2.8. SPACE PLANNING

Space plan matrix is provided to indicate required spaces, their occupant load.

Space Plan Matrix						
Space Name	**Size (sqft)**	**Shift**	**Number of Occupants (FTE)**	**Occupied From**	**Occupied To**	**Notes**
TBD-				7:00 AM	10:00 PM	This will be updated in schematic design based on client direction

2.2.9. ADAPTABILITY FOR FUTURE EXPANSION

It is anticipated the building will be added to in the future, the campus main is expected to continue throughout the entire facility, future building size and type are not know at this time but reasonable infrastructure should be provided. Full analysis of future needs will occur during schematic design

2.2.10. APPLICABLE CODES AND STANDARDS AND LEED VERSION

The designers shall use applicable required local, regional or national codes and standards in design development of the project. Any special codes or standards to be utilized are listed below:

Incorporate DFCM and UVU standards, see online documents. LEED is not required, in lieu design and construction teams are required to meet DFCM High Performance Building Standards.

2.2.11. USER REQUIREMENTS

The facility users will require system training and instruction on the general and specific operation, maintenance, repair and troubleshooting of the systems and equipment supplied. To facilitate these requirements the project shall include:

2.2.11.1. FACILITY OPERATIONS AND MAINTENANCE

The owner will employ operating engineers and maintenance staff to provide for all operation and maintenance of the facility. These staff members must be trained by the design and construction teams to adequately operate and maintain the facility

2.2.11.2. OPERATOR TRAINING

The construction documents shall require operation and maintenance instruction on all systems equipment utilized on the project

i. If the systems are the same systems utilized on other facilities operated and maintained by the same staff as the new facility the training may be limited to only specific project details

    1. 4 hours Training required for all equipment and components
    2. 4 hours Training required for control systems operations

ii. If the systems are new to the owners staff sufficient training will be provided on site or off site to allow an average operator or maintenance technician to adequately operate and maintain the system or equipment

    1. 1 hour required for each type of equipment or component
    2. Two 4 hour training events for basic control system operation
    3. Two, one week offsite training classes provided by the control manufacture at a professional training facility for control programming and functional operations of the system provided

All operator training classroom and field training shall be Video tapped and produced on DVD format media; by a professional videographer proving that they have video tapped and edited video for this exact video training purpose at least for 20 previous projects.

All videotaped presentations will be evaluated by the personnel being trained. The personnel shall fill out evaluation forms in accordance with ASHRAE 0-2013 Appendix P. If the evaluations do not achieve at least a 2 average then the training shall recommence.

2.2.11.3. O&M MANUALS

All Operating and Maintenance manuals shall provide the information needed to understand startup, operate, maintain, shut down and repair equipment and assemblies used on the project. At a minimum O&M manuals shall include but not limited to:

i. Basic Description
ii. Name, address and contact information for the manufacture and local representative
iii. Startup, shutdown and operating instructions
iv. Parts list
v. Specific Maintenance information as to actions taken, material used and required frequency
vi. Troubleshooting guide and instructions
vii. Name, address and contact information for the authorized service and repair providers

2.2.11.4. SYSTEM MANUAL

The system manual shall be the repository of information and operating documents to provide systems based organizational information for system managers and operators. The systems manual may include but is not limited to:

ii. Recommended Standard Operating Procedures
iii. Pertinent Submittals and Shop Drawings
iv. Pertinent O&M Manuals
v. Final OPR
vi. Final BOD
vii. Pertinent Record drawings
viii. TAB and Testing Reports
ix. Pertinent training materials
x. Commissioning Report
xi. Re-Commissioning / Ongoing-Commissioning Requirements

2.2.11.5. UTILITY BASELINES

The owner assisted by the designers, energy modelers and the commissioner shall define and establish the projects utility baselines to be used by operators to evaluate future performance of the facility. A monthly utility baseline shall be developed for electrical usage, gas usage and water usage based upon the system design and its parameters.

2.2.11.6. MEASUREMENT AND VERIFICATION REQUIREMENTS

The owner plans to utilize a measurement and verification program to verify ongoing operations and commissioning of the facility. The facility will use the following M&V system and procedures:

i. Project shall utilize Level II M&V, which will include sub meters to separate loads to more accurately determine operator performance of electric, gas and water usage over time. At a minimum the building shall be provided with the following meters:

1. Main electric meter, lighting load sub-meter, and HVAC load sub-meter
2. Main water meter, landscape sub-meter, cooling tower sub-meter.
3. Natural gas meters: main building service gas meter.
4. BTU meters for heating water and chilled water services to the building.

The operators shall be provided with simple work tools to normalize the meter readings for weather and occupancy variations on a monthly basis.

2.2.11.7. OWNERS DIRECTIVES

None noted during program to be re-discussed at schematic design

2.2.11.8. LIFE CYCLE EXPECTATIONS

General Building: 50 years
Building Envelope Systems: 50 years
HVAC Systems: 50 years
Plumbing Systems: 50 years
Electrical Systems: 50 years

2.2.11.9. WARRANTY REQUIREMENTS

General warranty periods provided by manufacturers for building materials and systems equipment are for a period of one year after substantial completion as defined in the contract documents. Some specific materials, systems or equipment may have a longer warranty period. Typical extended warranties are:

a. Roofing – 20 year warranty for leakage and material failure
b. Windows – 10 year warranty for trim and glass
c. Sealants – 2 year warranty
d. HVAC Compressors – 5 year warranty parts and replacement labor
e. Water Heaters – 5 year warranty parts replacement
f. Elevator – 5 year warranty
g. DDC Control System – 2 years parts and labor
h. UPS Battery warranty – 2 years parts and labor
i. Generator Warranty - 2 years parts and labor
j. Lighting Ballast Warranty - 2 years parts and labor
k. Lighting Bulb Warranty - 2 years parts and labor
l. Access Control Warranty - 2 years parts and labor
m. Boiler Warranty - 2 years parts and labor
n. Chiller Warranty - 2 years parts and labor
o. Pump warranty - 2 years parts and labor
p. VFD Warranty - 2 years parts and labor
q. Air Handling Devise Warranty (including EF, MAU, RTU, Relief Fans, Smoke Fans, Transfer Fans) - 2 years parts and labor

2.3. OWNERS PROJECT REQUIREMENTS (OPR)

2.3.1. DESIGN DOCUMENT REQUIREMENTS

The following list of drawing requirements refers to content and not to required number of drawing sheets. Local code requirements may change the drawing requirements listed below and code requirements take precedence over the OPR.

2.3.1.1. DESIGN DOCUMENTS

In general all construction documents shall adhere to the following standards, any deviations must be approved by the owner's representative. The below requirements must be submitted by the design team.

a. Ownership:

   All drawings, specifications, addenda and special reports shall become the property of the owner at the completion of the project as PDF record documents.

b. Drawing standards. All drawings shall be produced in the latest version of AutoCAD and Revit.

c. All drawings shall be provided in "D" size drawings and in "IP" dimensions, weights and measures

d. Project Web Site: The designers shall maintain a Web based project site that maintains the latest design and construction documents in PDF format. This site shall be maintained from schematic design through the warranty period of the project and all document located on this site shall be the latest version of the document.

e. Distribution requirements: The Architect shall distribute drawings, specifications and addenda as required in the design contract

2.3.1.2. SPECIFIC DESIGN DOCUMENT REQUIREMENTS

a. Cover sheet for each section will have all legally required code calculations, certifications and reference materials and notes

a. Mechanical drawings shall include:
   i. Double line drawings for all duct and large bore pipe
   ii. Equipment shown on drawings shall be drawn to actual scale dimensions
   iii. All equipment and devices shall have a unique number identifier, including all equipment, terminal units and air distribution devices
   iv. Drawings or specifications shall include a complete sequence of control for all controlled components.

b. Electrical drawings shall include:
   i. All panels shall utilize the owners panel naming standards
   ii. Fire alarm schematic & wiring details
   iii. Security system schematic & wiring details
   iv. Communication systems schematics & details
   v. Grounding system riser diagram

2.3.2. DRAWINGS DELIVERALES

Drawings shall follow the below requirements:

2.3.2.1. SD DRAWINGS

SD Drawings shall include the following:

i. Owners Project Requirements (OPR)
ii. Schematics of all elevations of the exterior in a 3D format.
iii. Schematics in a 3D format shall be submitted for the following:
    a. Entrance
    b. Architectural Feature Spaced
    c. Other areas deemed necessary by the owner
iv. Specifications are not required to be included in the SD phase
v. Energy Modeler shall submit a preliminary energy model and potential Energy Efficient Measures for the project. (This shall be submitted in conjunction with the SD drawings by the Owner Hired Energy Modeler, Architect and Engineers shall assist the Energy Modeler in their model)

2.3.2.2. DD DRAWINGS

DD Drawings shall include the following:

i. A narrative of the following:
    a. Architectural
    b. Mechanical
        i. Including zoning areas (individual or by zones)
    c. Plumbing
        i. Include circulating temperatures
        ii. Include storage temperatures
    d. Electrical
    e. Lighting
    f. Landscaping
    g. Conformance to the OPR
ii. Basis of Design (including models, manufacturers THIS DOES NOT INCLUDE SIZING)
    a. Architectural (include samples of finishes)
        i. Exterior Cladding
        ii. Window Types
        iii. Interior Wall Finish
        iv. Woodworking
        v. Conveying Systems
        vi. Carpet
        vii. Tile
        viii. Wood flooring
        ix. Specialty Finishes
    b. Kitchen
        i. Kitchen equipment
        ii. Kitchen finishes
        iii. Kitchen requirements
    c. Mechanical (including models, manufacturers THIS DOES NOT INCLUDE SIZING)
        i. System Type
        ii. System Design Temperatures:
            1. Design OA Winter/Summer
            2. Hot Water Temperatures
            3. Chilled Water Temperatures
            4. Condenser Water Temperatures
            5. Direct Evaporative Temperatures
        iii. AHU Model
        iv. VAV Model

v. Built Up AHU
vi. RTU Model
vii. Sizing of Duct (FPM)
viii. Boiler Model
ix. Chiller Model
x. Evap Model
xi. Cooling Tower Model
xii. Chilled Beam Model
xiii. Heat pump Model
xiv. Split System Model
xv. VRF Model
xvi. FCU Model
xvii. Pump Model
xviii. Heat Exchanger Model
xix. Chemical Treatment Provider
xx. Pipe Material
xxi. Main Piping on Plans
xxii. Main Duct on Plans
xxiii. Controls Installers
xxiv. BTU/Energy Meters Manufacturer
xxv. Other Systems Model (this includes any equipment costing above 5,000 including installation)

d. Plumbing Systems (including models, manufacturers THIS DOES NOT INCLUDE SIZING)
    i. Domestic Water Piping
    ii. DWV Piping
    iii. W (Laboratory Water and Vent) Piping
    iv. RO Model
    v. DI Model
    vi. Master Mixing Valves Model
    vii. Local Mixing Valve Model
    viii. Plumbing Fixture Model (include manufacturer and models)
        1. Water Closet
        2. Urinal
        3. Lavatories
        4. Sinks
        5. Flush Valves
        6. Faucets
        7. Floor Drains
        8. Floor Sinks
        9. Emergency Showers
        10. Eye Wash Stations
        11. Grease Interceptors
        12. Sand/Oil Interceptors
        13. Compressed Air Piping
        14. Compressed Air model
        15. Service Sinks
    ix. Water Softener Model
    x. Storage Tanks Model
    xi. Solar Hot Water Heating Systems
    xii. Roof Drains
    xiii. Irrigation Systems
    xiv. Reduce Pressure Backflow Prevention Models
    xv. Valve Models
    xvi. Circulating Pumps

e. Electrical
    i. Lighting Controls Manufacturer
    ii. Daylighting Controls Manufacturer
    iii. Generator Manufacturer
    iv. ATS Manufacturer
    v. UPS Manufacturer
    vi. Occupancy Sensor Manufacturer
    vii. Switchgear Manufacturer
    viii. Panel board Manufacturer
    ix. Switch board Manufacture
    x. Main Distribution Manufacturer

2.3.2.3. CD DRAWINGS/BID SET

CD Drawings/Bid Set shall have all information needed to build the building with limited ASI, PR, Addenda, and RFIs. Any drawing set that needs more than two (2) addendum (not including alternates) will not be considered ready for use and the Architect shall bear all cost for delay to pull the drawings due to their delay. In addition addendum shall not delay the bid process while allowing at least 14 (calendar) days for contractors to price addendums.

2.3.2.4. CONFORM SETS

The architect shall issue a full new set of drawings and specifications to the contractor every time one of the following occurs (the Architect/Engineer Team shall NOT be compensated for new issues of drawings as if one of the below is true then the Architect has failed to complete their drawings to the Owners requirements in a timely manner):

i. RFIs exceeds more than One (1) per 1,000 sq.(i.e. is RFIs exceed 100 on a 99,000 sq. ft. building a new conformed set will be issued, this will occur in this instance every time RFIs exceed this limit for instance if RFIs exceed 200 on a 99,000 sq. building a new conformed set will be issued at 100 RFIs and a new conformed set will be issued at 198 RFIs)
ii. ASI exceed more than 15 or the resulting ASI result in more than an increase of contract value of 1%., documents shall be reissued at interval levels on all drawings and specifications at each ASI level (i.e. new conformed set at ASI 15 and new conformed set at ASI 30, etc.) and if the cost increases by 1% at each level (i.e. new conformed set at 1% increase in contract value and a new conformed set issued at 2% increase in contract value etc.)
iii. PR that increase the contract in total of more than 1% even if the Owner request more as this is still a failure on the Architectural team to find out what the owner/user wants. (i.e. new conformed set at 1% increase in contract value and a new conformed set issued at 2% increase in contract value etc.)

2.3.2.5. AS BUILT DRAWINGS

As built drawings shall be provided that record all revisions and changes to construction documents. The contractor is to maintain one set of as built record drawing that accurately reflects actual changes made to the project. Include a cross reference on the contract drawings that change has been made and where the change document is located. Identify and date each change, or revised drawing made.

The following shall be submitted by the individual identified below at the end of the project OR within 60 days of substantial completion:

i. The contractor shall mark-up the record set and scan approved marked up drawings in PDF format.
ii. The Architect shall submit one set of approved contract drawings in DXF format to be used by the owner for future renovations.
iii. A BIM model shall be produced by the contractor as well submitted in .rvt file format.
iv. A hard copy of all actual written or computer generator field markups shall also be submitted by the contractor.
v. The architect shall take all submitted redlines and incorporate on their DXF formatted files and PDF and shall submit to the owner the drawings with all below incorporations:
    a. All RFI, ASI, approved PRs, and Addenda
    b. All underground redlines including: underground plumbing with dimensions and elevation, underground electrical (comprising of 2” or more meaning that if three ¾” conduit are ran from within 2 feet of each other we expect to see a redline for it), other underground items that are larger than 2”.
    c. All above ground installation changes and all electrical distribution piping including pipe racks (comprising of 2” or more meaning that if three ¾” conduit are ran from within 2 feet of each other we expect to see a redline for it). Dimensions are not needed unless the piping of electrical, plumbing or mechanical is either not shown on the original drawings or has shifted to another space.

2.3.3. DESIGN DATA

The following data is to be utilized in the design of the facility. See space plan matrix for size, occupants and operating schedules, section 2.2.8 of this OPR.

Design Data Matrix										
Space Name	**Summer Temp**	**Summer Humidity**	**Winter Temp**	**Winter Humidity**	**Pressure Relationship**	**CO_2 Above Ambient**	**Air Quality**	**Sound Level**	**Light Level**	**Notes**
See programming document room data sheets	-	-	-	-	-	-	-	-	-	

2.3.4. SUSTAINABILITY REQUIREMENTS

The project goal is to achieve sustainability goals outlined in the DFCM High Performance Building requirements, see http://dfcm.utah.gov/high-performance-building-standard.html for full criteria.

2.4. COMMISSIONING REQUIREMENTS

The commissioner has been hired by the owner to assist in the delivery of a high performance fully functional building. To achieve these goals the owner has charged the commissioner with the following responsibilities in delivering technical commissioning for the project:

2.4.1. COMMISSIONING SCOPE OF WORK

Discipline	Commissioning Scope
Building Envelope	• Air Leakage Pressure Test • Thermal Barrier Inspection • Roof Inspection • Window & Door Inspection
Mechanical	• Installation Inspection • HVAC System PFT & FPT • HVAC Control System PFT & FPT
Plumbing	• Installation Inspection • Hot Water System PFT & FPT • Plumbing Fixtures PFT • Pressure Booster PFT & FPT • Water Softener PFT & FPT
Fire Protection	• Installation Inspection • Fire Protection PFT
Electrical	• Installation Inspection • Power PFT & FPT • Lighting PFT & FPT
Fire Alarm	• Installation Inspections • Fire Alarm PFT & FPT
Security	• Installation Inspections • System PFT & FPT
Communications	• Installation Inspections • System PFT & FPT

a. Commissioning responsibilities during phases of commissioning

Phase	Commissioning Responsibility
Pre Design Phase	• Review OPR • Review BOD
Design Phase	• Create Design Commissioning Plan • Create and Manage Design Issue Log • Review Design Documents • Supply Cx Specifications • Attend Pre Bid Meeting
Construction Phase	• Create Construction Commissioning Plan

	• Review Submittals • Create and Manage Construction Issue Log • Hold Commissioning Kick Off Meeting • Create PFT & FPT Check Sheets and Forms • Perform Site Inspections • Observe / Verify / Perform site PFT tests
Acceptance Phase	• Observe / Verify FPT • Review O&M Manuals and As Built Drawings • Verify Operator Training • Create Commissioning Report • Create Systems Manual
Warranty Phase	• Observe / Verify deferred testing • Perform a Warranty site visit and review report • Verify documentation of utility baselines
On Going Cx Phase	• Assist operators with maintaining baselines

2.5. PROJECT SPECIFIC REQUIREMENTS

2.5.1. ENERGY PERFORMANCE

The project will be designed to perform 20% better than ASHRAE 90.1-2010 unless it does not prove life cycle cost effective. Life cycle cost effect is interpreted to mean that the measure does not pay back within 12 years.

2.5.2. RENEWABLE AND SITE BASED RESOURCES

a. Solar: 5% of total energy
b. Wind: 5% of total energy
c. Ground Source: Use GSHP
d. Water Wells: Use water for Heat Pumps
e. Gas/Propane Generation of Electricity On-site: Provide 100% of electrical load
f. Municipal Requirements: Electrical cannot be but back on the grid

2.5.3. TRANSPORTATION REQUIREMENTS

a. Number of Parking Spaces: Code Minimum
b. Alternative Parking: 10 spaces for low emission vehicles or LEED minimum requirement
c. Alternative Transportation Provisions: Bicycles

2.5.4. BUILDING ENVELOPE

a. Air Leakage at 75 Pa: Less than .1 cfm/sq. ft.
b. Roof: Cool Roof
c. Insulation: R-20 walls, R-30 roof
d. Roof Warranty: 30 year

2.5.5. ACCESSIBILITY REQUIREMENTS

The facility shall meet all current ADA requirements and enhanced Utah state requirements. Systems requiring routine operation and maintenance, such as HVAC components and electrical panels shall be designed to provide adequate access and clearances for all operation and maintenance tasks. The facility shall also be designed to meet any additional requirements listed below:

2.5.6. AESTHETICS REQUIREMENTS

Private and open offices shall maintain the same interior design attributes as other office spaces. Exterior façade of the building shall maintain a uniform look and shall aesthetically fit in with the surrounding buildings as approved by the Owner. Comply with UVU campus standards.

2.5.7. MECHANICAL SYSTEM REQUIREMENTS

The HVAC system shall be designed to contribute to the overall energy goals and space controllability and to meet the design data matrix of this OPR. The system shall be constructed to industry best practices and shall be constructed of standard industry components that the operation and controllability of such are well understood by typical operators. All systems must be accessible and the design should take into consideration ease of operation and maintenance. To meet the energy, indoor comfort and quality levels the design should adequate levels of capacity and redundancy to fulfill these goals.

Specific system and equipment requirements of the Owner are as follows:

a. System Type:
b. Air Distribution System Type: Medium Pressure VAV with hot water reheat. Reheat coils shall be installed in the ductwork, and are not to be part of the VAV box.

Specific equipment and system manufactures allowed are as follows:

a. Chillers: Project will use existing chillers in existing central plants
b. Boilers: Project will use existing boilers in existing central plants
c. Pumps: Any Manufacture
d. VFD: ABB, Danfoss, Yaskawa
e. AHU: Alliance, ClimateCraft, Energy Labs, Haakon, Huntair, Unitech
f. FCU: Any Manufacture
g. Terminal Units: Any Manufacture
h. Exhaust Fans: Any Manufacture
i. Humidifiers: Any Manufacturer
j. DDC Control System: TAC StruxureWare BACnet system, installed by Utah Yamas Controls
k. DDC Valves and Actuators Manufacturer: Belimo or TAC

Specific functional and installation requirements shall be as follows:

a. General
    a. Room Comfort Control: Rooms with common exposure may share an adjustable T-stat. No more than three identical rooms on a common thermostat.
    b. Central plant heating water design supply temperature = 100°F. Design for 15°F temperature differential.
    c. Central plant chilled water design supply temperature = 48°F. Design for minimum 12°F temperature differential.
b. Building Recovery (from unoccupied temperatures and design outside air requirements)
    a. Heating: 1 hour
    b. Cooling: 1 Hour
c. Motors
    a. Efficiency: Premium
d. AHU
    a. Fan Redundancy (including VFDs): 100%~~83%~~ ability with single fan/vfd failure
    b. Filtration Requirements: 4” MERV 13 FF,
    c. Filtration Rack FPM: Do not exceed 450 FPM
    d. FPM Max across coils: 500 FPM
    e. Windows in Doors: Provide them in all access doors

f. Max FPI in coils: 10
g. Direct Evap:
    i. Pan Slope: ½" per foot
    ii. Sump Capacity: Enough to handle complete drain of pad without overflowing with full tank
    iii. Evap Piping Material: Copper
    iv. Evap Drain Time: Drain entire sump in 10 minutes
    v. Overflow Drain Size: 4"
    vi. Moisture Sensors: One on the floor of AHU and one in the overflow
h. AHU Walls Pressure Class Rating Minimum: 6"
i. AHU Set point: Pressures shall be rest based on VAV damper position

e. Pumps
    a. Pump Redundancy (including VFDs): n+1
    b. Impeller Size: Max Impellors on Pumps with VFDs, Trim for all others
    c. Pump Type: vertical inline, floor mounted.
    d. Accessories: Gauges piped to inlet outlet and before strainer on Pumps
    e. Suction Straighteners Pressure Drop: 1 psi

f. Controls
    a. Wiring Identification: Cabling that is part of the TAC BACnet bus shall have a yellow jacket
    b. Number of NAE/JACE/AS: One per floor
    c. Number of Spare Points: 20%of all spare points spread across the floor
    d. Graphics: Graphics to reflect campus standard
    e. Strategies: Duct Static Reset, Room Temp Reset based on OA, Pump Set point Reset based on Valve position,
    f. System Integration (other equipment): Generator, ATS, Lighting Controls,

g. FCU
    a. Filtration: Provide MERV 13 filter in filter door
    b. Access: Provide ability to remove entire unit out of the space without any removal of permanent construction, including the T-Grid Mains; provide code NEC required 30 x30 access in front of electrical panels; provide access to both sides of the FCU to access motor.
    c. .

h. VAV
    a. Access: Provide 30 x30 access to the controls and free and clear access of no less than 24 x24 to the valves and control valves.
    b. VAV minimums: Occupied mode - Provide lowest as code allowed for minimum. Unoccupied and standby modes – no minimum, allow box to close.
    c. Occupancy Sensors: Tie all offices, conference rooms, private spaces, work rooms, to occupancy sensors
        i. Standby Temperatures: Standby temperatures in the room shall be 67\78.

d. VAV boxes shall not be provided with factory mounted reheat coils. Use duct-mounted reheat coils selected for campus standard heating water supply temperature and temperature differential.

i. Humidifiers: Size humidifiers to serve a single room, electric type with replaceable steam cylinder. Must be capable of operating with normal tap water used on campus.

j. Labeling
    a. Equipment: Plastic Engraved Labels with Equipment tag, CFM, GPM, at rated SP or Head
    b. Concealed Equipment: Ceiling Grid Labels for Valves, Equipment, Drains, Vents

k. Test and Balance
    a. Procedural Standards: NEBB T&B Procedural Standard
    b. Contract Association: T&B Contractor shall be hired under the General Contractor Contract

2.5.8. PLUMBING SYSTEM REQUIREMENTS

The plumbing system shall be designed to provide excellent service to the occupants and to meet the sustainable water use goals of this OPR. The plumbing system shall utilize fixtures and components that are easily replaceable and that have ready local access to replacement parts and components.

Specific system and equipment requirements of the Owner are as follows:

a. Sanitary System Type: Service weight cast iron pipe and fittings with heavy-duty no-hub couplings rated to 30 psig pressure.
b. Cold & HW System Type: Copper Pipe system, soldered joints, min. type L copper tube

Specific equipment and system manufactures allowed are as follows:

a. Water Closets: Low flow, wall hung - Any Manufacture
b. Urinals: Ultra Low flow – Any Manufacture
c. Lavatories: Moen Model 8413F03 pivot action single-lever faucet with lifetime cartridge replacement – No exceptions
d. Sinks: Any Manufacture
e. Mop Sinks: Any Manufacture
f. Water Heaters: Gas-fired, tank-type, condensing – Any Manufacture
g. HW Return Pumps: Any Manufacture
h. Electric Water Coolers : Electric wall hung – Any Manufacture
i. Mixing Valve: Any Manufacturer
j. Bottle Fill Stations: Any Manufacturer; No filter installed

Specific functional and installation requirements shall be as follows:

a. Time to Lavatories for Hot Water: 15 seconds
b. Time to Showers for Hot Water: 15 seconds
c. Circulating Water Temperature: 120 F
d. Design Temperature Max and Min of Hot Water:
    a. At Lavatories: 110 F
    b. At Private Lavatories: 110 F
    c. At Showers: 120 F
    d. At Janitor Sinks: 120 F
    e. At Kitchen Sinks: 140 F
e. Capacity of the Hot Water System: Continuous Hot Water at Temperature for 10 gpm. Ability to have up to 100 gpm for 10 minutes of capacity.
f. Controls of Plumbing Fixtures:
    a. At Lavatories: Single lever
    b. At Private Lavatories: Single Lever
    c. At Toilets: Flushvalve, lever handle
    d. At Urinal: Sensor, battery powered
g. Isolation Requirements:
    a. Building Isolation: Yes
    b. Floor Isolation: Yes
    c. Room Isolation: Yes
    d. Fixture Isolation: Yes
h. Bottle Fill Stations: Shall be located: At each required pair of drinking fountains.
i. Labeling
    a. Equipment: Plastic Engraved Labels with Equipment tag, CFM, GPM, at rated SP or Head
    b. Concealed Equipment: Ceiling Grid Labels for Valves, Equipment, Drains, Vents
j. Specialty Waters
    a. Industrial Hot Water/Cold Water: Yes for industrial cold, no for industrial hot
    b. RO System: No
    c. DI System: No

d. Softwater System: Provide softwater to below x requirements.

2.5.9. FIRE PROTECTION SYSTEM REQUIREMENTS

The facility shall be fully sprinkled with a system that meets code requirements for the facility type, use and occupancy. The system shall be constructed of pipe no thinner than schedule 10 iron pipe. The fire sprinkler system shall be interconnected with the fire alarm system for alarm and notification.

"Insert any special fire sprinkler requirements of the owner"
Wet sprinkler system that complies with NFPA 13
Standpipe system that complies with NFPA 14

2.5.10. ELECTRICAL SYSTEM REQUIREMENTS

The electrical system shall be designed to provide all building power requirements for occupant transportation, HVAC, plug load, emergency load, lighting load and other special loads of the building as required by local or regional codes and the design of the other building components. The electrical system shall be designed with adequate capacity for future changes and renovations of the building and utilize high quality materials and components. The system shall be constructed to industry best practices and shall be constructed of standard industry components that the operation and controllability of such are well understood by typical operators. All systems must be accessible and the design should take into consideration ease of operation and maintenance.

Specific system and equipment requirements of the Owner are as follows:

a. Emergency System: Diesel Generator for emergency standby load only
b. Redundancy Power: No redundancy power is required
c. Power Quality: Power Quality adequate for operation of computer systems

Specific equipment and system manufactures allowed are as follows:

a. Switchgear: Any Manufacture
b. Transformers: Any Manufacture
c. Panels: Any Manufacture
d. Emergency Generators: CAT or equals as approved by UVU
e. UPS Systems: Schnieder or equals as approved by UVU
f. Occupancy Sensors: WattStopper or equals as approved by UVU
g. Network Lighting Controls: GE or equals as approved by UVU

Electrical Systems Functional Requirements

a. Outlets
    a. Voltage Drop: 5% at 20 amp load
    b. Labeling: Outlets Labeled by panel board and circuit number
b. Lighting strategy- Daylighting & outdoor views –
        1. Interface with the lighting controls system specified in specification section 260943 by means of a BACnet compliant connection. Perform all programming and setpoint adjustment of the lighting control system as described in specification section 260943 and by the relay schedules and tables on the drawings. Provide graphics on the 230900 system to show all lighting systems controlled through this interface. All lighting control system inputs/outputs are to be present on the same remote user interface as used for the HVAC controls, and all remote programming and adjustments shall be possible by using the same remote user interface.

c. Lights
    a. Lamp Type: LED
d. Occupancy Sensors
    a. Vacancy/Occupancy: Vacancy type
    b. Time Out: 20 minutes
e. Daylight Sensors
    a. Can occupant override: Yes
    b. Override Time: Until unoccupied
f. Network Lighting Controls
    a. Dark Building: Yes
    b. Switches for Override: 1 per floor
    c. Global Override: 1 per building
    d. Override Time: 2 hours
    e. Location of Switches: In janitors closet
    f. Lockout override switches during occupancy?: Yes
g. UPS System
    a. Loads to Backup: IDF/MDF Rooms
    b. Length of UPS Backup: 10 minute backup
    c. UPS systems may be either central, or Owner-furnished, rack-mounted. Coordinate with Owner and users during design.
h. Generator
    a. Loads to Backup: Life Safety, Emergency Lighting,
    b. Length of Generator Backup: 48 hours at full load
    c. Interface with the generator controls specified in specification section 263213 by means of a BACnet compliant connection. Monitor generator controls for status (on/off), summary alarm, fuel level, and 12 additional points that will be selected from the generator manufacturer's list of available points by UVU. Provide a graphical display of all generator systems on the 230900 controls system.
    d. Interface with each transfer switch specified in specification section 263600 by means of a BACnet compliant connection. There are two transfer switches on the project. Monitor each switch for normal power available, emergency power available, transfer switch position = normal power, and transfer switch position = emergency power. Provide a graphical display of all transfer switch data on the230900 system.
i. Transformers
    a. K Value
        i. Non-Linear Loads on Load Side: K-Rated as required by the specific loads.
        ii. Linear Loads on Load Size: K-1
j. Labeling
    a. Outlets/Light Switches: plastic P-Touch Type Labels; Clear with Black Lettering; Panel board and Circuit Number
    b. Panel board/Transformers/Relay Panels: Engraved Plastic Labels; Black with White Lettering: Red with White Lettering for emergency; Panel Designation; Feed From, Voltage, Safety labels with PPE designation, and kCAL designation; Label wiring inside panel; breakers; and typed schedule

2.5.11. FIRE ALARM REQUIREMENT

The building shall have a fire alarm and notification system throughout the facility. The system shall provide primary notification of any smoke or fire event directly to the building occupants and to a UL station.

Specific system and equipment requirements of the Owner are as follows:

a. Fire Alarm System: Addressable
b. System Integration: Integrated with the intrusion alarm system

Specific equipment and system manufactures allowed are as follows:

a. Fire Alarm: Select from one of the manufacturers that exist on campus.

2.5.12. SECURITY REQUIREMENTS

The building shall have a security system throughout the facility. The system shall provide access control, CCTV monitoring and intrusion alarm notification. All access doors will be monitored by CCTV and will have card access. All public spaces and parking lots shall have CCTV monitors. CCTV and card access systems shall be and extension of, and integrated into the existing security systems on UVU campus.

Specific system and equipment requirements of the Owner are as follows:

a. Card Access System: Proximity card type
b. CCTV: Color cameras system with network video recording archive capability

Specific equipment and system manufactures allowed are as follows:

a. Access Control: and Intrusion Alarm: Lenel
b. CCTV: Milestone platform with Axis cameras

2.5.13. COMMUNICATION REQUIREMENTS

The building shall be served by a modern phone system and Ethernet computer network for a high speed network. All offices, workstations, and conference rooms shall have the one network connection and one phone system connection. Conference rooms, corridors and public spaces shall be configured to accommodate the installation of future wireless access points. All communication cable within concealed spaces or walls shall be run in oversized conduit.

A distributed antenna system shall be provided for emergency responder radio systems in compliance with the IBC/IFC.

2.5.14. ACOUSTICAL REQUIREMENTS

The design shall prevent ambient noise from intruding into the building and causing noise levels above those indicated in the Design Data Matrix, 2.4.2 of this OPR. The design shall also prevent internal generated noise from rotating and vibrating equipment from infringing on adjacent spaces not to exceed those levels indicated in the Design Data Matrix. See programming document narrative and room data sheets for specific acoustical requirements

2.5.15. VIBRATION REQUIREMENTS

The design shall prevent occupants adjacent to rotating or vibrating equipment from sensing vibrations from equipment through the structure. The design will also prevent occupants from sensing vibrations caused by structural deflection as results of foot traffic in hallways or floors. Performance and music instruction spaces to have a high degree of vibration isolation, see programming narrative for additional information.

2.5.16. SEISMIC REQUIREMENTS

The facility design shall comply with all local, regional and national code requirements.

2.5.17. BENCHMARKING REQUIREMENTS

The design shall provide predicted utility usage benchmarks for each utility system to the building. These benchmarks shall be based upon the engineers design calculations or design modeling. The designer shall also include predicted possible uncertainty predictions for the baselines provided. These baselines will be utilized to evaluate future building performance and operator evaluation.

2.5.18. MEASUREMENT & VERIFICATION REQUIREMENTS

The design will provide the following infrastructure for Measurement and Verification of utility performance of the building:

a. Electric meters: Provide (1) Master utility meter, (1) HVAC Load Sub-Meter, (1) Plug Load Sub-Meter, (1) Lighting Load sub-Meter.
b. Water meters: Provide (1) Master utility meter, (1) Landscape water Sub-Meter, (1) Cooling tower water Sub-Meter, (1) Kitchen water Sub-Meter
c. Gas meters: Provide (1) Master utility meter, (1) Kitchen gas Sub-Meter, (1) Boiler gas Sub-Meter

The design shall provide a modeling tool that can be utilized to normalize the measurement data taken from the meters listed above; for ambient weather, occupant load and utility costs for monthly intervals.

END