KITT PEAK NATIONAL OBSERVATORY
FIRE ALARM RENOVATION
TUCSON, ARIZONA

GENERAL NOTES

1. ALL INSTALLATIONS SHALL COMPLY WITH ALL APPLICABLE NATIONAL, STATE AND LOCAL CODES.
2. ALL WORK SHALL COMPLY WITH THE CURRENT EDITION OF THE NATIONAL FIRE CODE AND ALL OTHER APPLICABLE FEDERAL, STATE AND LOCAL CODES. WHERE THE CONSTRUCTION DOCUMENTS INDICATE MORE RESTRICTIVE REQUIREMENTS, THE CONSTRUCTION DOCUMENTS SHALL GOVERN BUT THE CONSTRUCTION DOCUMENTS SHALL NOT BE INTERPRETED AS AUTHORITY TO VIOLATE ANY CODE OR REGULATION.
3. IN THE EVENT OF A CONFLICT OR INCONSISTENCY BETWEEN ITEMS INDICATED ON THE PLANS AND/OR SPECIFICATIONS OR WITH CODE REQUIREMENTS, THE NOTE, SPECIFICATION OR CODE WHICH PRESCRIBES AND ESTABLISHES THE MORE COMPLETE JOB OR THE HIGHER STANDARD SHALL PREVAIL.
4. OMISSIONS FROM THE DRAWINGS OR SPECIFICATIONS OR THE MISDESCRIPTION OF DETAILS OF WORK WHICH ARE MANIFESTLY NECESSARY TO CARRY OUT THE INTENT OF THE DRAWINGS AND SPECIFICATIONS, OR WHICH ARE CUSTOMARILY PERFORMED, SHALL NOT RELIEVE THE CONTRACTOR FROM PERFORMING SUCH OMITTED OR MISDESCRIBED DETAILS OF THE WORK BUT THEY SHALL BE PERFORMED AS IF FULLY AND CORRECTLY SET FORTH AND DESCRIBED IN THE DRAWINGS AND SPECIFICATIONS.
5. THE CONTRACTOR SHALL CHECK ALL DRAWINGS IMMEDIATELY UPON THEIR RECEIPT AND SHALL PROMPTLY NOTIFY A CUSTOMER REPRESENTATIVE OF ANY DISCREPANCIES. FIGURES MARKED ON DRAWINGS SHALL IN GENERAL BE FOLLOWED IN PREFERENCE TO SCALE MEASUREMENTS. LARGE SCALE DRAWINGS SHALL IN GENERAL GOVERN SMALL SCALE DRAWINGS. THE CONTRACTOR SHALL COMPARE ALL DRAWINGS AND VERIFY THE FIGURES BEFORE LAYING OUT THE WORK AND WILL BE RESPONSIBLE FOR ANY ERRORS WHICH MIGHT HAVE BEEN AVOIDED THEREBY.
6. ALL MATERIALS AND EQUIPMENT SHALL BE NEW AND SHALL BEAR THE UNDERWRITERS LABEL (UL) AND SHALL BE INSTALLED IN THE MANNER FOR WHICH THEY ARE DESIGNED AND APPROVED.
7. THE CONTRACTOR SHALL NOT BORE, NOTCH OR IN ANY WAY CUT INTO ANY STRUCTURAL MEMBER WITHOUT WRITTEN APPROVAL FROM A CUSTOMER REPRESENTATIVE.
8. FOR PURPOSES OF CLEARNESS AND LEGIBILITY, THE DRAWINGS ARE ESSENTIALLY DIAGRAMMATIC. THE CONTRACTOR SHALL VERIFY ALL CONDITIONS, INFORMATION AS INDICATED ON THE DRAWINGS AND IN THE SPECIFICATION SECTIONS WHERE WORK INTERFACES WITH OTHER TRADES.
9. THE CONTRACTOR SHALL MAINTAIN AS-BUILT DRAWINGS TO REFLECT ALL CHANGES MADE DURING CONSTRUCTION AND ANY DEVIATIONS FROM THE DRAWINGS. THIS INCLUDES DEVIATIONS FROM ANY ADDITION, DELETION OR RELOCATION OF WORK. IN ADDITION CONTRACTOR SHALL PROVIDE CAD FILES OF AS-BUILT DWGS.
10. A CUSTOMER REPRESENTATIVE IS TO BE NOTIFIED OF ANY CHANGE OF WORK CAUSED BY FIELD CONDITION CONFLICTS.
11. ALL CONDUITS AND PIPING SHALL BE CONCEALED IN PARTITIONS OR CEILING SPACE U.N.O. CONDUITS SHALL EXTEND TO NEAREST CABLE TRAY OR ACCESSIBLE CEILING SPACE U.N.O.
12. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVAL AND REPLACEMENT OF CEILING TILE INCLUDING REPLACEMENT OF BROKEN OR DAMAGED TILES.
13. ALL LOCATIONS PASSING THROUGH A FIRE OR A SMOKE BARRIER SYSTEM MUST BE FIRE STOPPED USING APPROVED (UL CLASSIFIED) FIRE STOP. MATERIAL INSTALLED PER THE MANUFACTURER'S INSTRUCTIONS. THIS SHALL INCLUDE WALL, FLOOR, OR CEILING PENETRATIONS FOR CONDUIT, SLEEVES, OR CABLE.
14. ANY DEVIATIONS FROM PLANS OR SPECS MUST BE APPROVED IN WRITING BY A CUSTOMER REPRESENTATIVE.
15. ALL WORK MUST BE COMPLETED IN A NEAT AND PROFESSIONAL MANNER. THE WORK SITE SHALL BE KEPT CLEAN AND ALL PROPERTY DAMAGE REPAIRED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONDUCTING DAILY CLEANUP OF THE WORK SITE.
16. ALL WORK IS TO BE PERFORMED ACCORDING TO STANDARDS AND MANUFACTURER'S SPECIFICATIONS.
17. CONTRACTOR SHALL PROVIDE ALL APPLICABLE PERMITS.
18. CONTRACTOR SHALL REFER TO ELECTRICAL SHEETS FOR EXACT LOCATIONS OF MODULAR FURNITURE.
19. CONTRACTOR SHALL REFER TO ARCHITECTURAL SHEETS FOR EXACT LOCATIONS OF ALL RATED WALL ASSEMBLIES.
20. DRAWINGS ARE DIAGRAMMATIC AND ARE INTENDED TO CONVEY SCOPE OF WORK AND TO INDICATE GENERAL ARRANGEMENT. THEY ARE NOT INTENDED TO SHOW EVERY DETAIL INCLUDING OFFSETS, FITTINGS OR EVERY STRUCTURAL DIFFICULTY THAT MAY BE ENCOUNTERED DURING WORK. EXCEPT AS OTHERWISE INDICATED, LOCATIONS OF ITEMS ARE APPROXIMATE ONLY. EXACT LOCATIONS NECESSARY TO SECURE PROPER CONDITIONS AND RESULTS MUST BE DETERMINED AT PROJECT SITE AND MUST BE APPROVED BY THE CLIENT'S REPRESENTATIVE.
21. EXCEPT OTHERWISE INDICATED, MAKE REASONABLE MODIFICATIONS IN LAYOUTS AS NEEDED TO PREVENT CONFLICT WITH OTHER WORK OR PROPER EXECUTION OF WORK.
22. INCLUDE WORK NOT USUALLY SHOWN OR SPECIFIED, BUT NECESSARY FOR PROPER INSTALLATION AND OPERATION OF A SYSTEM OR PIECE OF EQUIPMENT IN WORK.
23. ALL CONDUITS SPECIFIED SHALL BE FERROUS METAL TYPE. FLEXIBLE CONDUITS MAY BE USED IN RUNS OF 72" OR LESS. FLEXIBLE CONDUITS SHALL NOT BE ALLOWED WHERE ACCESS CANNOT BE PROVIDED TO THE FULL LENGTH OF THE CONDUIT RUN.

ABBREVIATIONS

ABBREVIATION	DESCRIPTION
AC	ABOVE COUNTER HEIGHT
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AV	AUDIO/VIDEO
AWG	AMERICAN WIRE GAUGE
BCH	BELOW COUNTER HEIGHT
CAT	CATEGORY
CCTV	CLOSED CIRCUIT TELEVISION
cd	CANDELA
CLG	CEILING
CMP	COMMUNICATIONS MEDIA PLENUM
CMR	COMMUNICATIONS MEDIA RISER
COAX	COAXIAL CABLE
CT	CABLE TRAY
CU	COPPER
dB	DECIBEL
DEMARC	DEMARCATION
DIA	DIAMETER
DIAG	DIAGRAM
DIST	DISTRIBUTION
DP	DISTRIBUTION PANEL
DWG	DRAWINGS
ELEC	ELECTRICAL
EMT	ELECTRICAL METALLIC TUBING
EXISTING	
F	FIXED
FA	FIRE ALARM
FAAP	FIRE ALARM ANNUNCIATOR PANEL
FACP	FIRE ALARM CONTROL PANEL
FDU	FIBER OPTIC DISTRIBUTION UNIT
FLR	FLOOR
FO	FIBER OPTIC
FUT	FUTURE
GRC	GALVANIZED RIGID CONDUIT
IDF	INTERMEDIATE DISTRIBUTION FRAME
J-BOX,JB	JUNCTION BOX
K	DIGITAL KEYPAD
LAN	LOCAL AREA NETWORK
LOMM	LASER OPTIMIZED MULTI MODE
mm	MILLIMETER
MDF	MAIN DISTRIBUTION FRAME
MIN	MINIMUM
MM	MULTI-MODE
MTD	MOUNTED
NA	NOT APPLICABLE
NAC	NOTIFICATION APPLIANCE CIRCUIT
NEC	NATIONAL ELECTRIC CODE
NEMA	NATIONAL ELECTRIC MANUFACTURERS ASSOCIATION
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NIC	NOT IN CONTRACT
NTS	NOT TO SCALE
(N)	NEW
OC	ON CENTER
OSP	OUTSIDE PLANT
PA	PUBLIC ADDRESS
PB	PULLBOX
PS	POWER SUPPY
PTZ	PAN TILT ZOOM (CAMERA)
PVC	POLYVINYL CHLORIDE
RM	ROOM
SCP	SECURITY CONTROL PANEL
SHT	SHEET
SLC	SIGNALING LINE CIRCUIT
SM	SINGLE MODE
SPEC	SPECIFICATION
SQ	SQUARE
STP	SHIELDED TWISTED PAIR
TC	TIME CLOCK
TB	TERMINAL BLOCK
TEL	TELEPHONE
TGB	TELECOMMUNICATIONS GROUND BUS
TIA	TELECOMMUNICATIONS INDUSTRY ASSOCIATION
TMGB	TELECOMMUNICATIONS MAIN GROUND BUS
TO	TELECOMMUNICATIONS OUTLET
TTB	TELEPHONE TERMINAL BOARD
TV	TELEVISION
TYP	TYPICAL
UG	UNDERGROUND
UGPB	UNDERGROUND PULL BOX
UL	UNDER WRITERS LABORATORY
UON	UNLESS OTHERWISE NOTED
UPS	UNINTERRUPTIBLE POWER SUPPLY
UTP	UNSHIELDED TWISTED PAIR
WAN	WIDE AREA NETWORK
WAP	WIRELESS ACCESS POINT
WP	WEATHERPROOF

SPECIFIC FIRE ALARM SYSTEM NOTES

1. MOUNT ALL VISUAL SIGNALING APPLIANCES AT +90" A.F.F. OR 6" B.F.C., WHICHEVER IS LOWER, PER ADA REQUIREMENTS.
2. ALL EQUIPMENT SHALL BE U.L. AND C.S.F.M. LISTED.
3. ALL WIRING SHALL BE IN ACCORDANCE WITH THE N.E.C. AND THE AUTHORITY HAVING JURISDICTION.
4. ALL JUNCTION BOXES SHALL BE IN ACCORDANCE WITH THE N.E.C.
5. GENERAL CONTRACTOR SHALL FURNISH ACCESS PANELS IN AREAS THAT WILL REQUIRE SERVING, TROUBLE SHOOTING, ETC.
6. ELECTRICAL CONTRACTOR SHALL NOT DEVIATE FROM CONDUIT RUNS SHOWN ON THE PLANS WITHOUT PRIOR APPROVAL.
7. ALL FAN SHUTDOWN FUNCTIONS, DAMPER CLOSURES AND ASSOCIATED MECHANICAL SYSTEM FIRE ALARM INTERFACE SHALL BE BY MECHANICAL CONTRACTOR.
8. ALL DUCT MOUNTED SMOKE DETECTORS SHALL BE MOUNTED BY THE MECHANICAL CONTRACTOR. DUCT SMOKE DETECTORS EXPOSED TO THE WEATHER SHALL BE WEATHER PROTECTEWD BY THE MECHANICAL CONTRACTOR. ALL AIR VELOCITY TESTING SHALL BE PERFORMED AND REPORTED BY THE MECHANICAL CONTRACTOR.
9. PROVIDE CONNECTIONSAND INTERFACE MODULES FOR ELEVATOR RECALL SYSTEM AS REQUIRED. COORDINATE WITH EXISTING ELEVATOR CONTROLS EQUIPMENT AND ELEVATOR CONRACTOR.
10. ALL MAGNETIC DOOR HOLDERS SHALL BE MOUNTED BY THE HARDWARE AND/OR ELECTRICAL CONTRACTORS.
11. POWER REQUIREMENTS FOR THE FIRE /LIFE SAFETY SYSTEM SHALL BE PROVIDED AND INSTALLED BY THE ELECTRICAL CONTRACTOR AND SHALL MEET THE REQUIREMENTS OF NFPA, NEC, LOCAL CODES, AND THE AUTHORITY HAVING JURISDICTION.
12. FIRE ALARM DEVICE BACKBOXES, TERMINAL CABINETS, GUTTERS, JUNTION BOXES, AND ASSOCIATED CONDUITS SHALL BE PROVIDED AND INSTALLED BY THE ELECTRICAL CONTRACTOR UNLESS NOTED OTHERWISE. SYSTEM SUPPLIED BACKBOXES SHALL BE INSTALLED BY THE ELECTRICAL CONTRACTOR.
13. SMOKE DETECTOR TESTING SHALL BE ACCOMPLISHED AS OUTLINED IN THE SPECIFICATIONS, PER NFPA 72, CHAPTER 7 TESTING METHODS AND PER MANUFACTURER'S RECOMMENDATIONS.
14. ALL WIRING, ANNUNIATION DEVICES AND ANNUNCIATOR PANELS SHALL BE SUPERVISED TO THE PRINCIPAL POINT OF ANNUNCIATION. THE FIRE ALARM CONTROL PANEL SHALL SUPERVISE THE ANNUNCIATOR PANEL, ALL INITIATING AND INDICATING DEVICE CIRCUITS.
15. ALL WIRING SHALL BE CUT FOR IN AND OUT TERMINATIONS AND SHALL NOT BE LOOPED THROUGH DEVICES.
16. POINT AND COMMON ANNUNCIATION AND T-TAPPING ARE PROHIBITED.
17. THE FIRE /LIFE SAFETY CONTRACTOR SHALL BE UL LISTED AND CERTIFIED BY THE MANUFACTURER FOR THE INSTALLATION OF THE SYSTEM.
18. CONDUITS SHALL BE 3/4" UNLESS OTHERWISE NOTED.
19. AUDIBLE SIGNALS SHALL SOUND IN THE TEMPORAL CODE PATTERN AND SHALL HAVE AN AUDIBILITY LEVEL NOT LESS THAN 15db ABOVE AMBIENT NOISE LEVELS PER NFPA 72.
20. THE SYSTEM SHALL TRANSMIT ALARMS, TROUBLES AND OTHER NOTIFICATIONS TO AN APPROVED CENTRAL MONITORING STATION CONFORMING TO THE REQUIREMENTS OF NFPA 72 AND THE LOCAL AUTHORITY HAVING JURISDICTION.
21. UPON COMPLETION OF THE INSTALLATION, AN ACCEPTANCE TEST SHALL BE PERFORMED IN THE PRESENCE OF THE FIRE MARSHAL AND/ OR THE AUTHORITY HAVING JURISDICTION PER NFPA 72. UPON FINAL ACCEPTANCE, A CERTIFICATE OF COMPLETION, PER NFPA 72, SHALL BE PROVIDED TO THE BUILDING OWNER ALONG WITH WRITTEN OPERATING, TESTING AND MAINTENANCE INSTRUCTIONS.

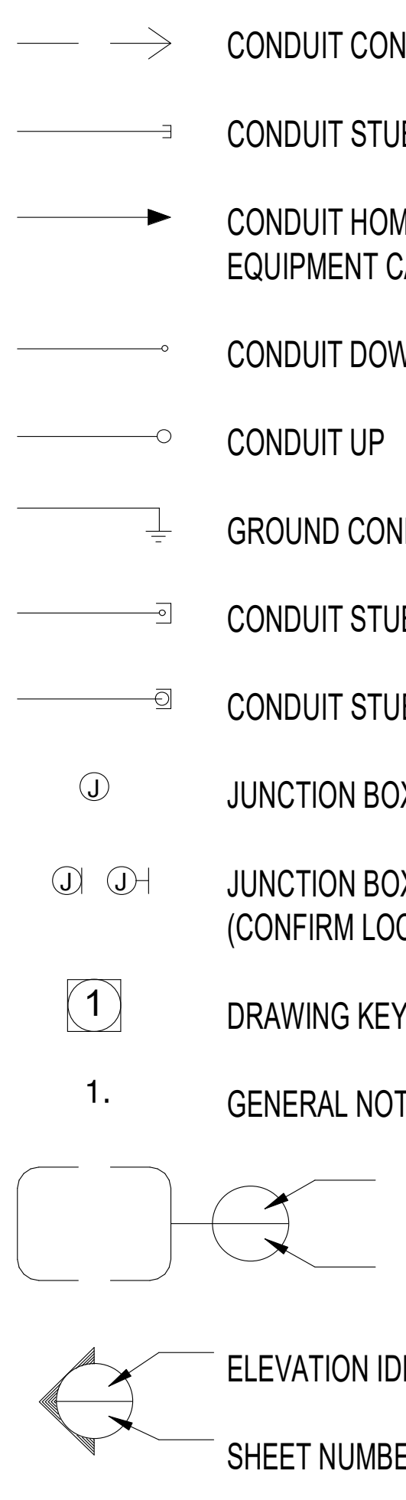
SYMBOL LEGEND

SYMBOL	MODEL	MFGR	DESCRIPTION	CSFM#
F	MS-7A	FCI	MANUAL PULL STATION WP=WEATHERPROOF	N/A
C 110cd	WALL - P2RL CLG - PC2RL	System Sensor	HORN/STROBE - WALL MTD C= CLG MTD, 110cd= CANDELA RATING	N/A
110cd	WALL - SRL CLG - SCRL	System Sensor	STROBE - WALL MTD C=CLG MTD, 110cd=CANDELA RATING	N/A
RI	RA100Z	FCI	REMOTE INDICATOR - WALL MTD C=CLG MTD	N/A
	ASD-PL3	FCI	SMOKE DETECTOR - PHOTOELECTRIC CLG MTD U.N.O.	N/A
SB	DET - PL3 BASE - B200S	FCI	SMOKE DETECTOR - PHOTO/CO W/ SOUNDER BASE	N/A
	ASD-PL3	FCI	SMOKE DETECTOR - PHOTOELECTRIC WALL MTD U.N.O.	N/A
	DNR-DNRW	FCI	DUCT SMOKE DETECTOR - PHOTOELECTRIC	N/A
H	MCS-COF	FCI	HEAT DETECTOR - CEILIING MTD	N/A
H	MCS-COF	FCI	HEAT DETECTOR - WALL MTD	N/A
TS	SEE FP DRAWINGS	SEE FP DRAWINGS	SPRINKLER TAMPER SWITCH (BY FIRE PROTECTION CONTRACTOR)	N/A
FS	SEE FP DRAWINGS	SEE FP DRAWINGS	SPRINKLER FLOW SWITCH (BY FIRE PROTECTION CONTRACTOR)	N/A
FACP	GWF-7075	FCI	FIRE ALARM CONTROL PANEL	N/A
FAAP	LDC-SLP	FCI	FIRE ALARM ANNUNCIATOR PANEL	N/A
FATC		FCI	FIRE ALARM TERMINAL CABINET	N/A
R	AOM-2RF	FCI	RELAY CONTROL MODULE	N/A
C R	AMM-2RIF	FCI	DUAL MONITOR RELAY CONTROL MODULE	N/A

DRAWING INDEX

LV0.00	FIRE ALARM COVER SHEET
LV0.01	SITE PLAN
LV1.01	FIRE BARN FLOOR PLAN
LV1.02	DORMATORY 1 FLOOR PLAN
LV1.03	DORMATORY 2 FLOOR PLAN
LV1.04	DORMATORY 3 FLOOR PLAN
LV1.05	DORMATORY 4 FLOOR PLAN
LV1.06	RESIDENCE 1 FLOOR PLAN
LV1.07	RESIDENCE 2 FLOOR PLAN
LV1.08	RESIDENCE 3 FLOOR PLAN
LV1.09	RESIDENCE 4 FLOOR PLAN
LV1.10	RESIDENCE 5 FLOOR PLAN
LV1.11	RESIDENCE 6 FLOOR PLAN
LV1.12	CALYPSO BUILDING FLOOR PLAN
LV1.13	ADMINISTRATION BUILDING FLOOR PLAN
LV1.14	DINING HALL FLOOR PLAN
LV6.01	FIRE ALARM DETAILS AND SEQUENCE OF OPERATION

SYMBOL LEGEND - PATHWAYS AND BACKBOXES



- CONDUIT CONCEALED IN FLOOR SLAB OR UNDERGROUND
- CONDUIT STUBBED OUT
- CONDUIT HOMERUN, CONTINUOUS RUN TO PANEL OR EQUIPMENT CABINET
- CONDUIT DOWN
- CONDUIT UP
- GROUND CONNECTION
- CONDUIT STUBBED DOWN
- CONDUIT STUBBED UP
- JUNCTION BOX, SIZE PER NEC
- JUNCTION BOX, WALL MOUNTED, SIZE PER NEC (CONFIRM LOCATION AND HEIGHT)
- DRAWING KEY NOTE
- GENERAL NOTE 1, UON
- DETAIL, OR PARTIAL PLAN IDENTIFICATION
- SHEET NUMBER
- ELEVATION IDENTIFICATION
- SHEET NUMBER

National Optical Astronomy Observatory
950 N. Cherry Avenue
Tucson, AZ 85719
http://www.noao.edu

KITT PEAK NATIONAL OBSERVATORY
FIRE ALARM RENOVATION
TUCSON, ARIZONA

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Issue	Date & Issue Description	By	Check
	04.13.2022 COORDINATION		

Seal/Signature

Project Name KITT PEAK NATIONAL OBSERVATORY

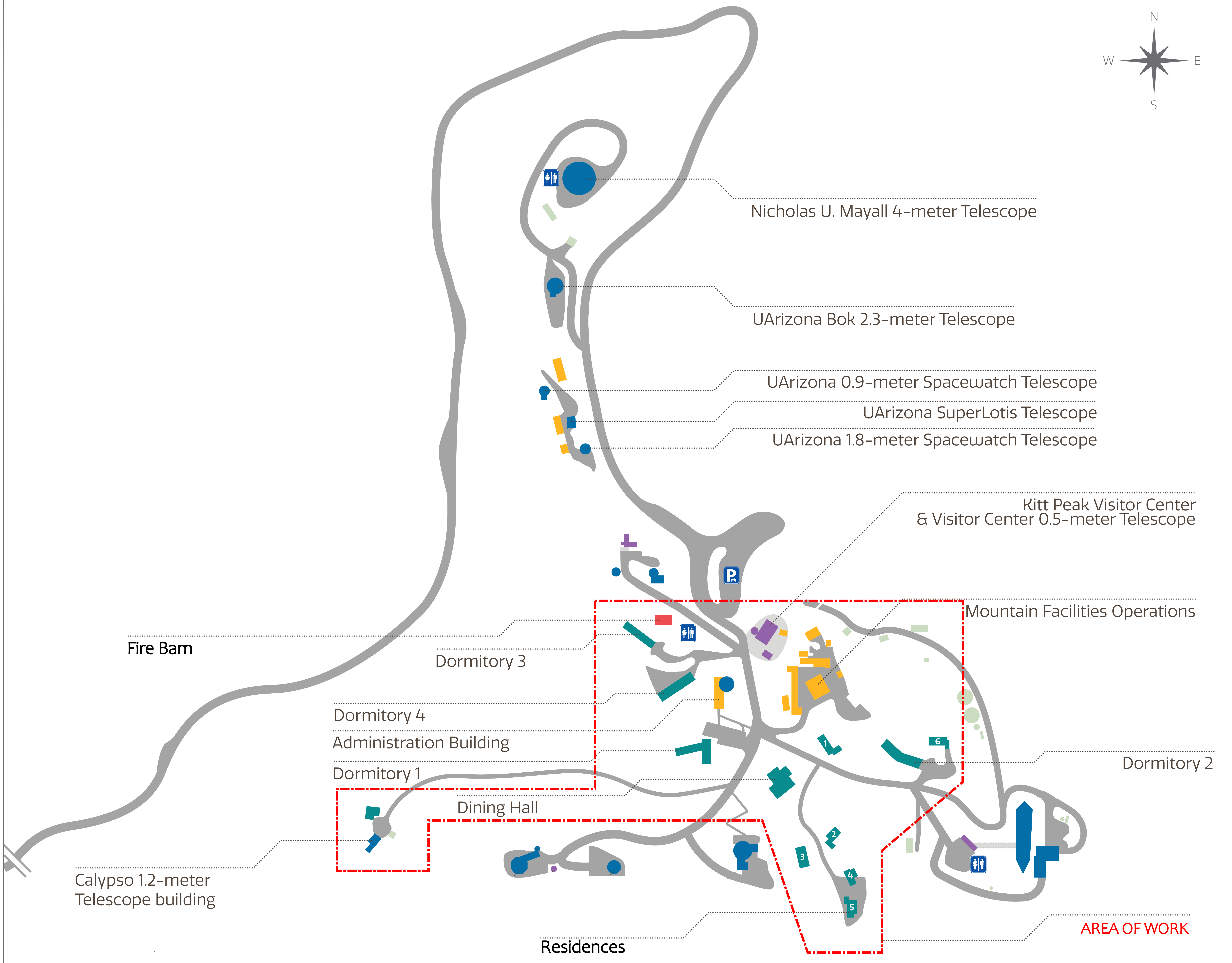
Project Number

CAD File Name

Description
LOW VOLTAGE COVER SHEET

Scale

LV0.00



SPECIFIC PLAN NOTES

GENERAL NOTES

KITT PEAK SITE PLAN

SCALE:

National Optical Astronomy Observatory
950 N. Cherry Avenue
Tucson, AZ 85719
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KITT PEAK NATIONAL OBSERVATORY

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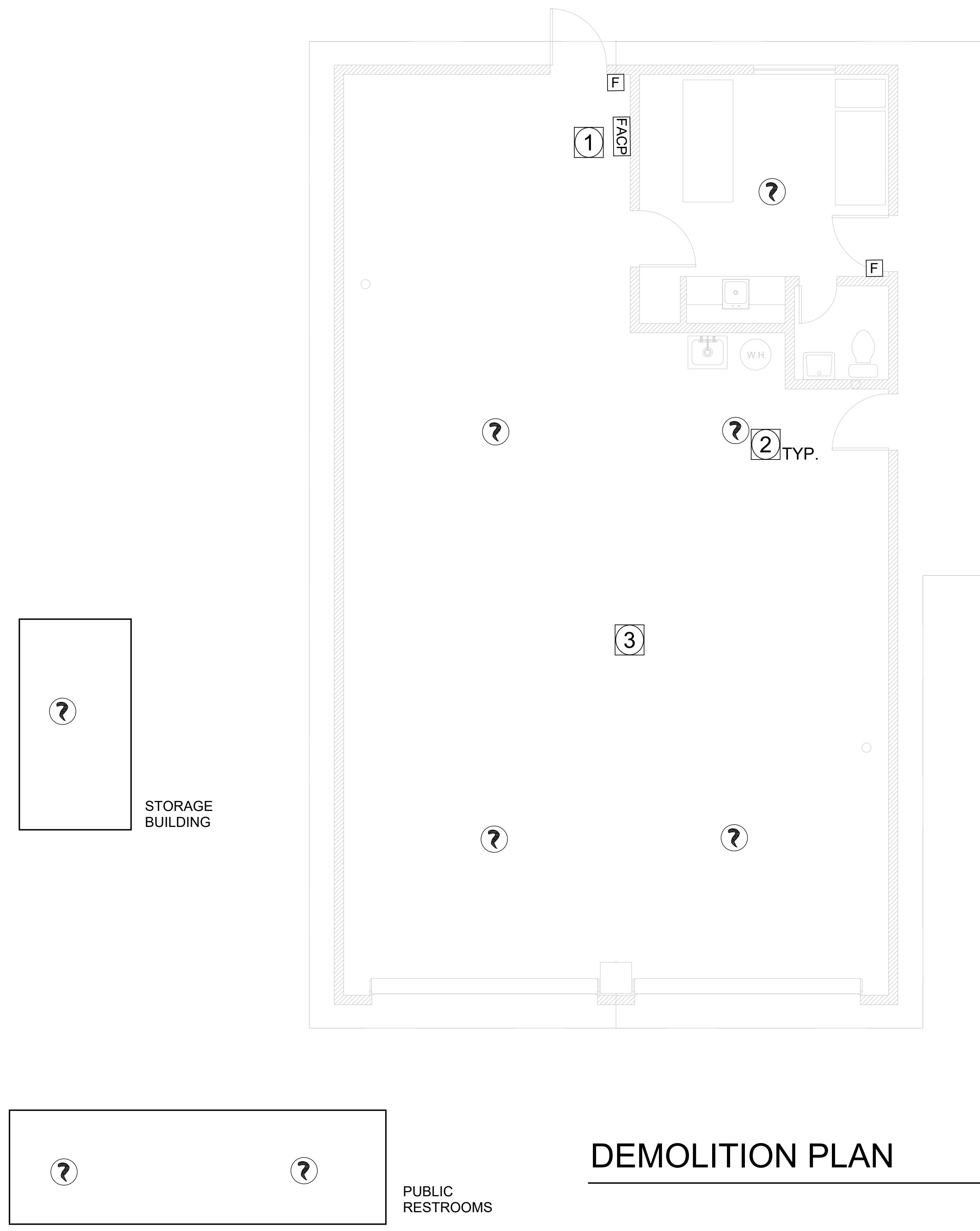
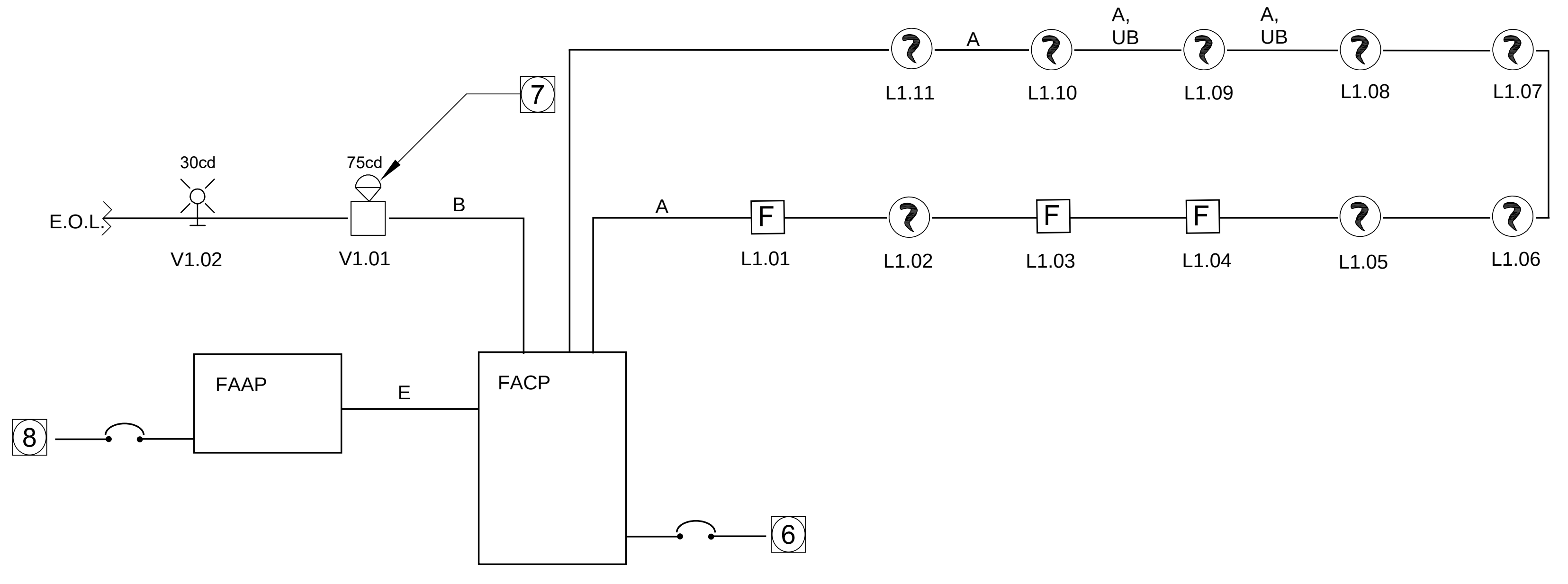
LV0.01



DEMOLITION PLAN



RISER DIAGRAM

KITT PEAK NATIONAL OBSERVATORY

NAC Voltage Drop Calculator
for Audio / Visual devices

This calculator provided voltage drop calculations in three formats (Point to Point, End of Line, and Load Centering).

Make sure that you know what method is accepted by, and the results do not exceed the limits set by the respective jurisdictior

Project Name	Kitt Peak Fire Alarm Renovation
Date	8/18/2022
Circuit Number	NAC CKT #1
Area Covered	Fire Barn
Nominal System Voltage	20.4
Minimum Device Voltage	16
Total Circuit Current	0.184

		Wire Gauge	Ohm's Per 1000
Distance from source to 1st device	25	14	3.07
Wire Gauge for balance of circuit		14	3.07

Point to Point Method			End of Line Method			Load Centering Method		
CIRCUIT IS WITHIN LIMITS			**CIRCUIT IS WITHIN LIMITS**			**CIRCUIT IS WITHIN LIMITS**		
Totals		Voltage	Totals		Voltage	Totals		Voltage
Current	Distance	Drop	Current	Distance	Drop	Current	Distance	Drop
0.184	49	**0.04**	0.184	49	**0.055**	0.184	49	**0.028**
End of Line Voltage		**20.36**	End of Line Voltage		**20.34**	End of Line Voltage		**20.37**
Percent Drop		0.18%	Percent Drop		0.27%	Percent Drop		0.14%

End of Line and Load Centering Methods use only the wire guage for the first device to source

Standard Wire Resistance in Ohms per 1000 feet.

18=7.77 16=4.89 14=3.07 12=1.98 10=1.24

18-14 Awg = Solid Conductors 12-10 Awg = Stranded Conductors

Notes:
Wire resistance is doubled in the calculations for two wires (Positive and Negative)
The voltage calculated to the last device in any method must not be lower then
the manufactures listed minimum operating voltage (IE: rated operating voltage 20-32 VDC).

Enter current in amps. .150 = 150 ma		Distance from	Voltage		
Device Number	Device Current	previous device	At Device	Drop from source	Percent Drop
Device 1	0.121	25	20.37	0.028	0.14%
Device 2	0.063	24	20.36	0.038	0.18%
END			20.36	0.038	0.18%
END			20.36	0.038	0.18%
END			20.36	0.038	0.18%
END			20.36	0.038	0.18%
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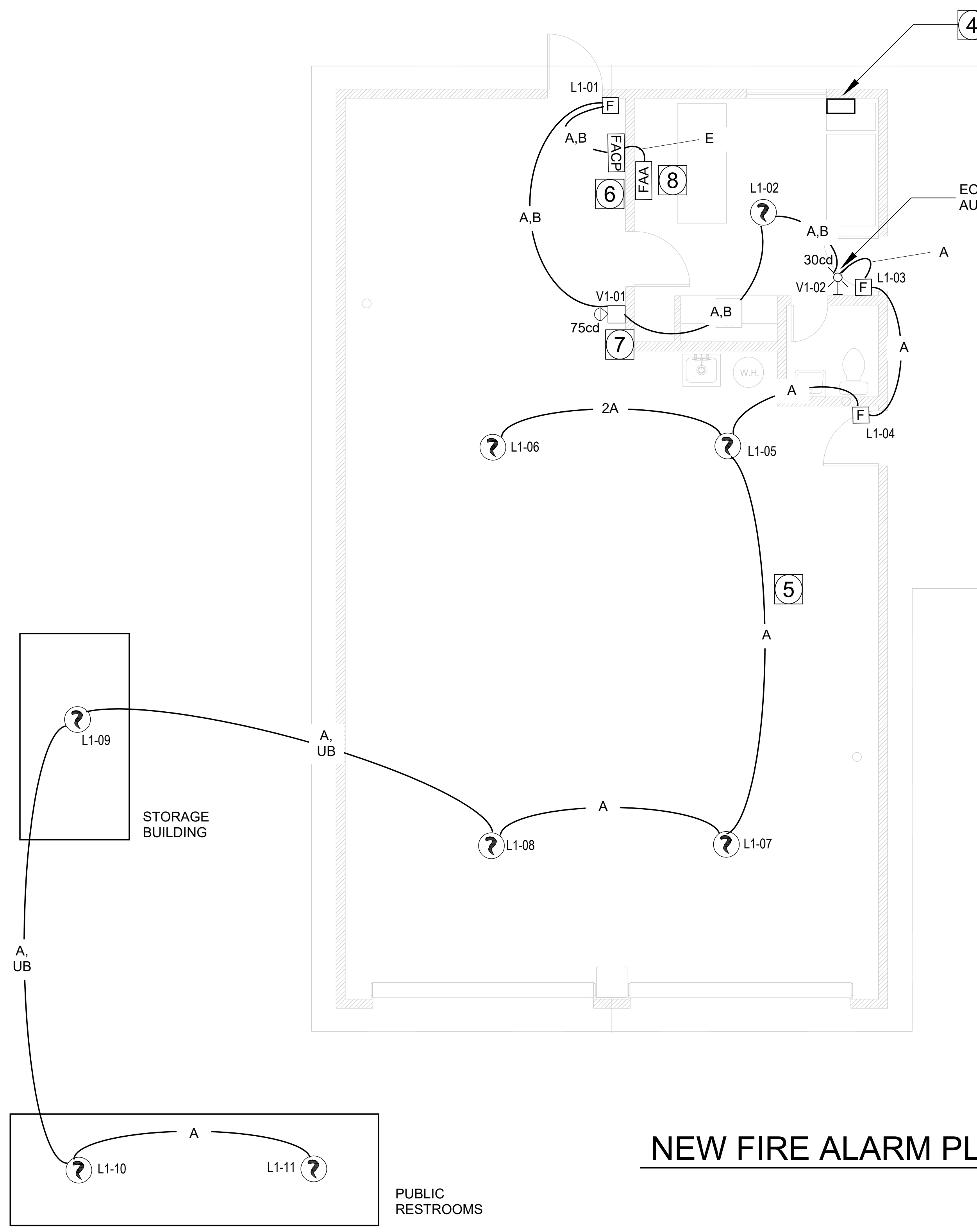
END			20.36	0.038	0.18%
END			20.36	0.038	0.18%
END			20.36	0.038	0.18%
Totals	0.184	49	End of Line Voltage	**20.36**	

Device Manufacturer			Device Manufacturer	System Sensor	
		Current			Current
Horn Strobes		@Rated	Strobe Only		@Rated
Model #	Candela	Voltage	Model #	Candela	Voltage
PR2L - 30cd	30	0.158	SRL - 15cd	15	0.043
PR2L - 75cd	75	0.121	SRL - 30cd	30	0.063
PR2L - 95cd	95	0.142	SRL - 75cd	75	0.107
PR2l - 110cd	110	0.162	SRL - 95cd	95	0.121

Fire Barn Fire Alarm Battery Calculations

Module	Description	Existing Qty	New Qty	Standby Current	Total Standby	Alarm Current	Total Alarm
Panel Equipment							
S3 Series	Fire Alarm Control Panel		**1**	0.111000	0.111000	0.243000	0.243000
LCD-SLP	Remote Fire Alarm Annunciator		**1**	0.030000	0.030000	0.065000	0.065000
DACT-E3	Digital Alarm Communications Transmitter		**1**	0.018000	0.018000	0.018000	0.018000
FSL-E3	SM Fiber Optic Channel Card		**1**	0.079000	0.079000	0.079000	0.079000
RPT-E3-UTP	Network Repeater Card		**1**	0.016000	0.016000	0.016000	0.016000
				Total Panel Stby	**0.254000**	**Total Panel Alarm**	**0.421000**
Peripheral Devices							
ASD-PL3	Photoelectric Smoke Detector		**8**	0.000200	0.001600	0.000200	0.001600
B200S	Sounder Base			0.000500		0.000500	
DNR-DNRW	Duct Mounted Smoke Detector			0.000200		0.000200	
MCS-COF	Heat Detector			0.200000		0.200000	
MS-7A	Double Action Pull Station		**3**	0.000300	0.000900	0.003000	0.009000
AMM-2RIF	Addressible Dual Monitor Relay Module			0.001300		0.024000	
AOM-2RF	Addressible Relay Module			0.000300		0.000300	
Miscellaneous Peripheral Devices							
P2RL	Horn Strobe - Wall Mtd - 75cd		**1**			0.121000	0.121000
PC2RL	Horn Strobe - Clg Mtd - 75cd					0.121000	
SRL	Strobe Light - Wall Mtd - 75cd		**1**			0.107000	0.107000
SCRL	Strobe Light - Clg Mtd - 75cd					0.107000	
XXXX-XXXX	Description						
				Total Periph Stby	**0.002500**	**Total Periph Alarm**	**0.238600**
				Total Standby Amps	**0.256500**	**Total Alarm Amps**	**0.659600**

Battery Set # 1			**Standby Current**		**Alarm Current**
Current Draws					
Panel Equipment			0.254		0.421
Peripherals			0.003		0.239
			0.257	**<--Grand Totals -->**	**0.660**
Additional Battery Capacity Required	**20%**		0.051		0.132
Standby Time =	**24**	Hrs	7.387	Standby Ah	
Alarm Time =	**15**	Mins.	0.198	Alarm Ah	
			7.585	Estimated Total Ah	
Battery Supplied	**12V10A 10AH**		**9.202**	**Total Ah**	



NEW FIRE ALARM PLAN

FIRE ALARM WIRE AND CABLE SCHEDULE

Cable Symbol	Stranded or Solid Wire AWG	# of Conductors	Twisted?	Application	Connect AIR Wire #
A	16	2	Y	Signal Line Circuit (SLC)	W161P-2633
B	14	2	N	Horn/Strobe Circuit (NAC)	W141P-2611
C	14	2	N	Strobe Circuit (NAC)	W141P-2611
D	16	2	Y	Speaker Circuit (NAC)	W161P-2633
E	16	2	Y	Network Data Riser	W161P-2633
F	16	2	Y	Network Audio Riser	W161P-2633
N	16	2	N	Control Module Output	W161P-2601
P	14	2	N	24VDC Power	W141P-2611

UB=Underground direct burial rated cable.

Not all cables may apply to this project

SPECIFIC PLAN NOTES

1. CONTRACTOR SHALL DEMO EXISTING FIRE ALARM CONTROL PANEL, ALL EXISTING DEVICES AND CABLES. MAINTAIN EXISTING FIRE ALARM SYSTEM PATHWAYS AND BACKBOXES FOR REUSE.
2. CONTRACTOR SHALL USE CARE WHEN REMOVING EXISTING EQUIPMENT AND RETURN TO OWNER FOR FIRST RIGHT OF REFUSAL.
3. DISPOSE OF ALL CABLE AND DEVICES NOT RETAINED BY OWNER IN A SAFE AND APPROPRIATE MANNER.
4. FIBER OPTIC POINT OF CONNECTION (FOPC). CONTRACTOR SHALL PROVIDE AND INSTALL 2-STRAND SINGLE MODE PATCH FIBER BETWEEN FACP AND FOPC. PATCH CABLE SHALL HAVE LC CONNECTORS ON BOTH ENDS.
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6. CONTRACTOR SHALL CONNECT NEW FACP TO EXISTING ELECTRICAL CIRCUIT.
7. HORN STROBE dB LEVEL SHALL BE 89dB (HIGH) UNLESS OTHERWISE NOTED.
8. CONTRACTOR SHALL PROVIDE A NEW 120V 20 AMP DUPLEX RECEPTACLE FOR ANNUNCUATOR.

GENERAL NOTES

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4. DETECTORS SHALL NOT BE LOCATED IN DIRECT AIR-FLOW, LOCATE DEVICES NOT CLOSER THAN 3 FEET FROM ANY SUPPLY DIFFUSER.
5. AUDIBLE ALARM NOTIFICATION APPLIANCES SHALL PROVIDE A SOUND PRESSURE LEVEL OF 15dBA ABOVE THE AVERAGE AMBIENT SOUND LEVEL OR 5dBA ABOVE THE MAXIMUM SOUND LEVEL HAVING DURATION OF AT LEAST 60 SECONDS, WHICH EVER IS GREATER.
6. THE FIRE ALARM EVACUATION SIGNAL SHALL BE CLEARLY HEARD AND COMPLY WITH 2019 NFPA 72 SECTION 18.4.4.1.
7. ALL PENETRATIONS THROUGH FIRE RATED WALLS OR FLOORS SHALL BE PROTECTED FROM THE SPREAD OF FIRE WITH AN APPROVED FIRE STOP SYSTEM EQUAL TO OR GREATER THAN THE FIRE RATING OF THE STRUCTURE/ SURFACE BEING PENETRATED.
8. ALL FIRE ALARM WIRING SHALL BE RUN IN EXISTING FA CONDUITS WHERE POSSIBLE. WHERE NEW CONDUIT OR PATHWAYS MUST BE RUN CONTRACTOR SHALL BE RESPONSIBLE FOR ALL SLEEVES, LOCATIONS AND SIZES OF CONDUITS AND SHALL ENSURE COMPLIANCE WITH LOCAL CODES AND STANDARDS.
9. IF SHIELDED WIRE IS USED, THE FOLLOWING SHALL BE OBSERVED:
    - A. METALLIC CONTINUITY OF THE SHIELD MUST BE MAINTAINED AND INSULATED THROUGHOUT THE ENTIRE LENGTH OF THE CABLE.
    - B. THE ENTIRE LENGTH OF THE CABLE MUST HAVE A RESISTANCE GREATER THAN 1MEGAOHM TO EARTH.

FIRE BARN
SCALE: 1/8"=1'-0"
1
– –

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KITT PEAK NATIONAL OBSERVATORY

FIRE ALARM RENOVATION
TUCSON, ARIZONA

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Issue	Date & Issue Description	By	Check
	04.13.2022 COORDINATION		

Seal/Signature

Project Name
KITT PEAK NATIONAL OBSERVATORY

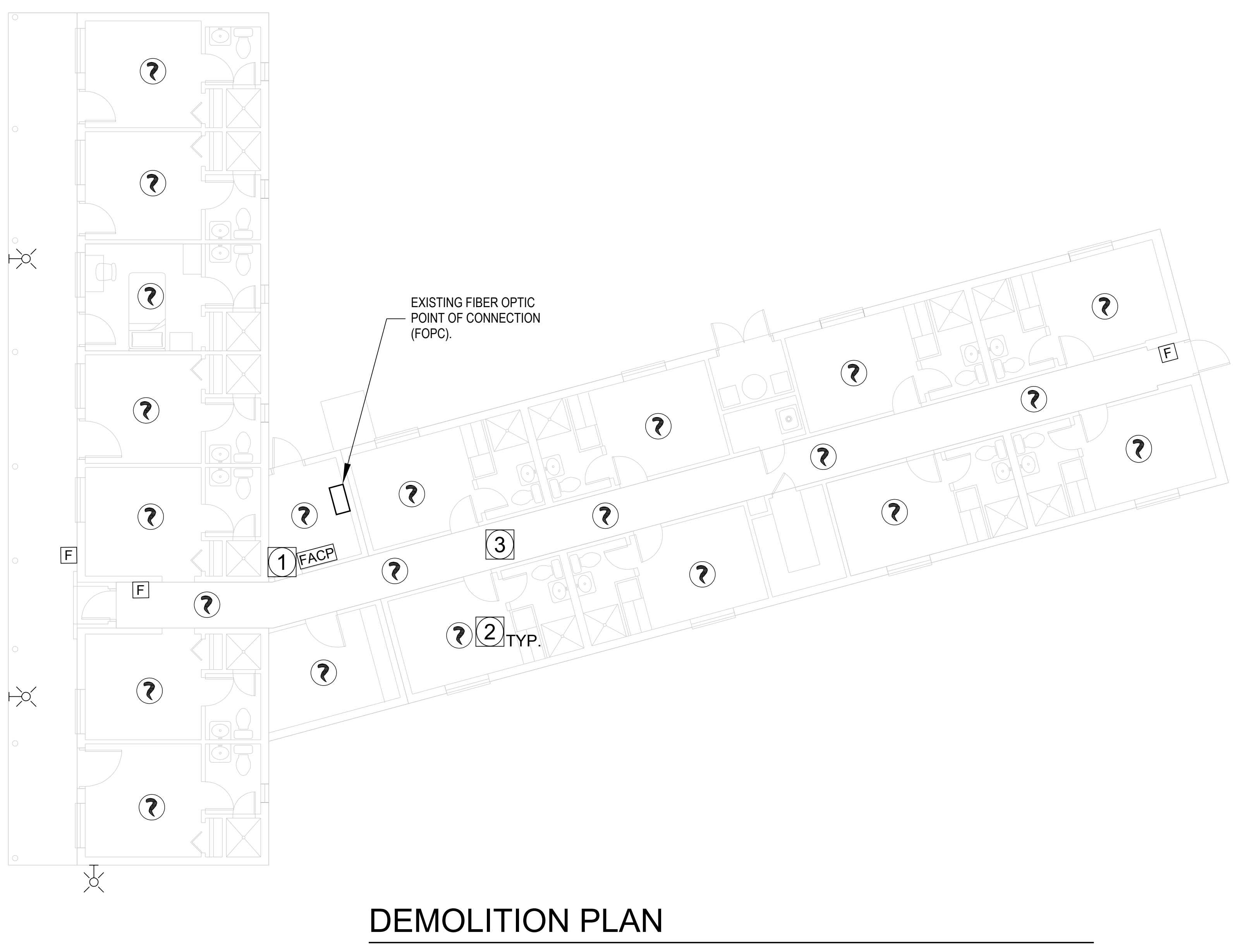
Project Number

CAD File Name

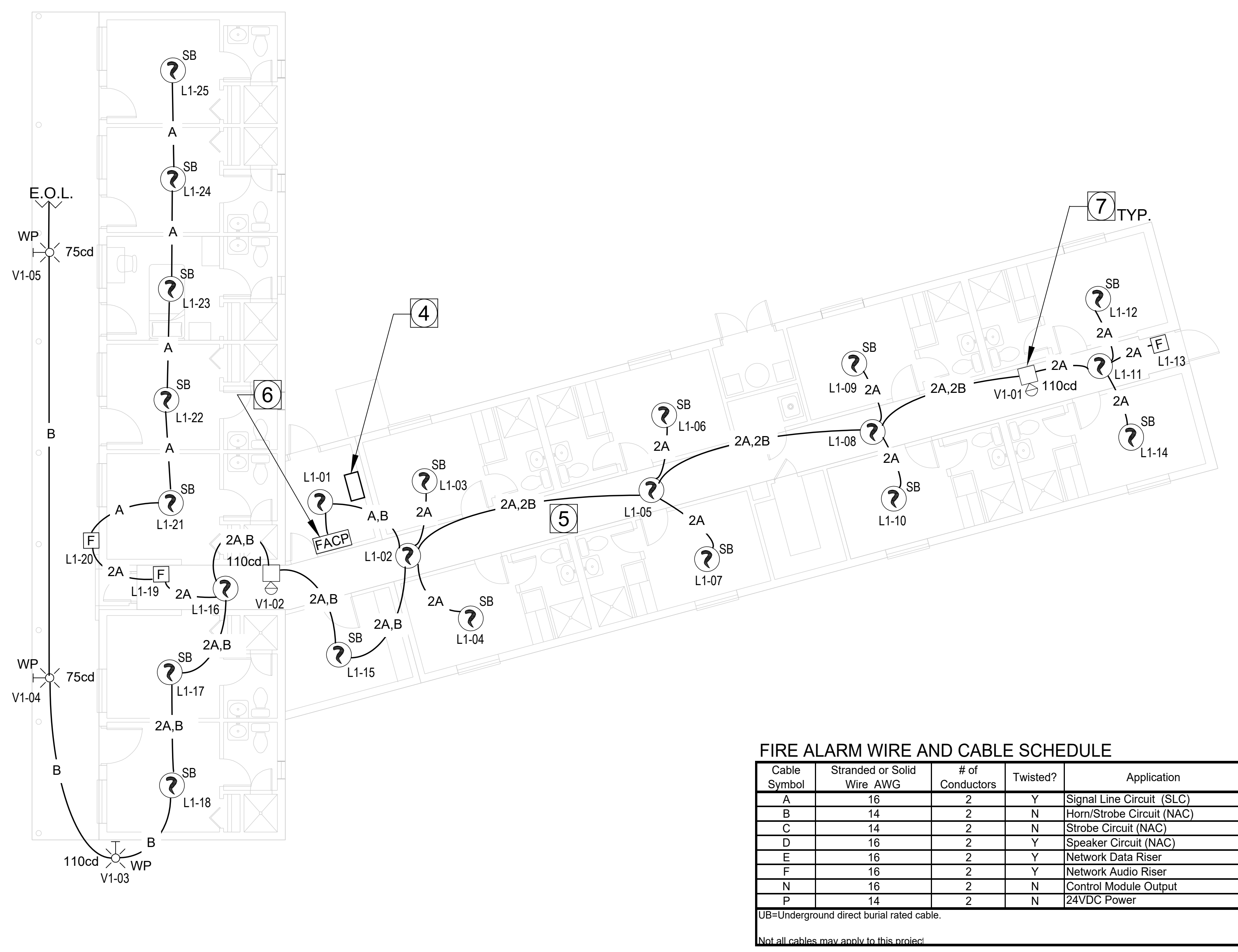
Description
LOW VOLTAGE FLOOR PLAN - FIRE BARN

Scale
1/8"=1'-0"

LV1.01



DEMOLITION PLAN



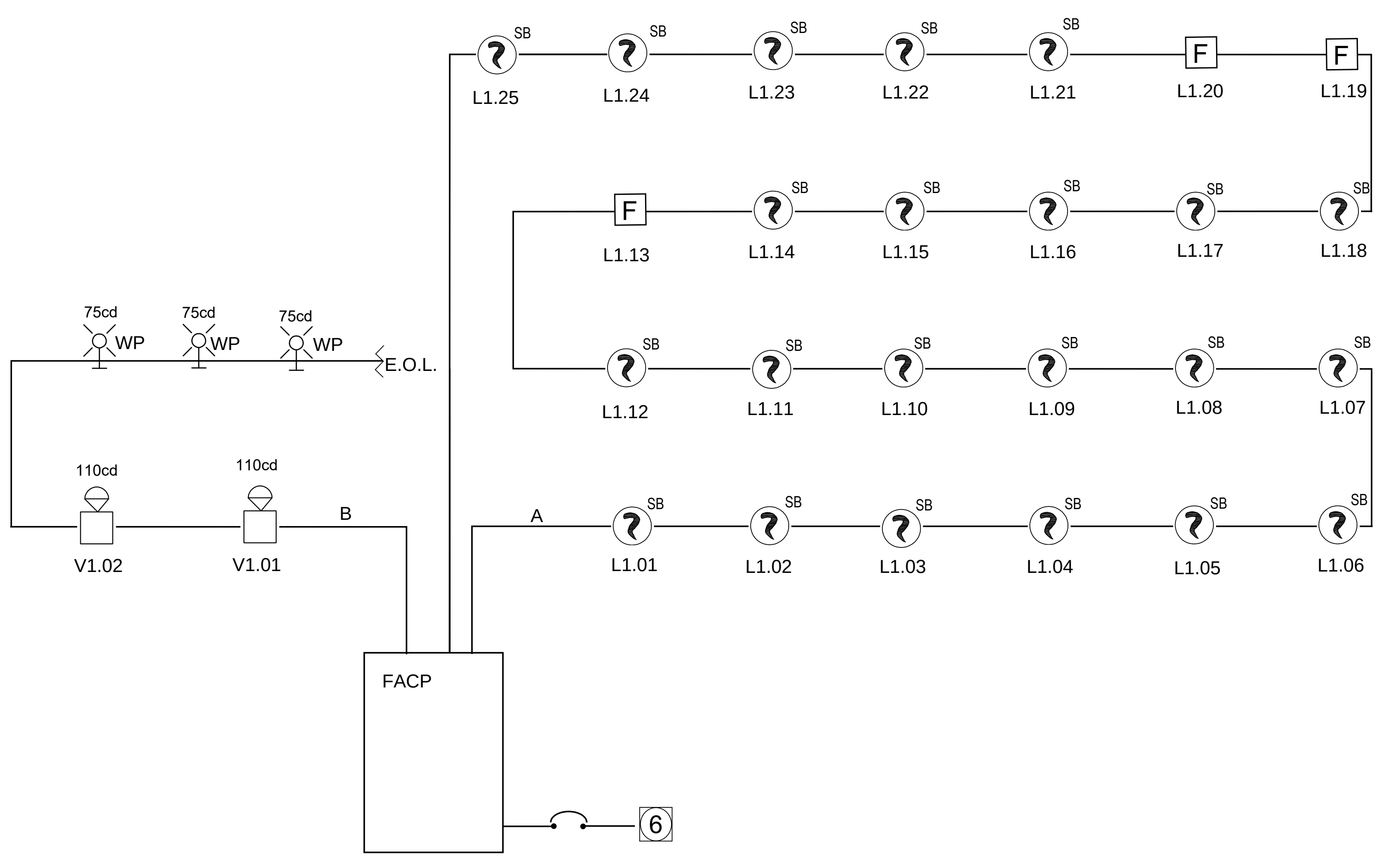
FIRE ALARM WIRE AND CABLE SCHEDULE

Cable Symbol	Stranded or Solid Wire AWG	# of Conductors	Twisted?	Application	Connect AIR Wire #
A	16	2	Y	Signal Line Circuit (SLC)	W161P-2633
B	14	2	N	Horn/Strobe Circuit (NAC)	W141P-2611
C	14	2	N	Strobe Circuit (NAC)	W141P-2611
D	16	2	Y	Speaker Circuit (NAC)	W161P-2633
E	16	2	Y	Network Data Riser	W161P-2633
F	16	2	Y	Network Audio Riser	W161P-2633
N	16	2	N	Control Module Output	W161P-2601
P	14	2	N	24VDC Power	W141P-2611

UB=Underground direct burial rated cable.

Not all cables may apply to this project

NEW FIRE ALARM PLAN



RISER DIAGRAM

KITT PEAK NATIONAL OBSERVATORY

NAC Voltage Drop Calculator
for Audio / Visual devices

This calculator provided voltage drop calculations in three formats (Point to Point, End of Line, and Load Centering).

Make sure that you know what method is accepted by, and the results do not exceed the limits set by the respective jurisdiction

Project Name	Kitt Peak Fire Alarm Renovation				
Date	8/18/2022				
Circuit Number	NAC CKT #1				
Area Covered	Dormatory 1				
Nominal System Voltage		20.4			
Minimum Device Voltage		16			
Total Circuit Current	0.643		Wire Gauge	Ohm's Per 1000	
Distance from source to 1st device		85	14	3.07	
Wire Gauge for balance of circuit			14	3.07	

Point to Point Method			End of Line Method			Load Centering Method		
CIRCUIT IS WITHIN LIMITS			**CIRCUIT IS WITHIN LIMITS**			**CIRCUIT IS WITHIN LIMITS**		
Totals		Voltage	Totals		Voltage	Totals		Voltage
Current	Distance	Drop	Current	Distance	Drop	Current	Distance	Drop
0.643	286	**0.75**	0.643	286	**1.129**	0.643	286	**0.565**
End of Line Voltage		**19.65**	End of Line Voltage		**19.27**	End of Line Voltage		**19.84**
Percent Drop		3.66%	Percent Drop		5.53%	Percent Drop		2.77%

End of Line and Load Centering Methods use only the wire guage for the first device to source

Standard Wire Resistance in Ohms per 1000 feet.

18=7.77 16=4.89 14=3.07 12=1.98 10=1.24

18-14 Awg = Solid Conductors 12-10 Awg = Stranded Conductors

Enter current in amps. .150 = 150 ma		Distance from	Voltage		
Device Number	Device Current	previous device	At Device	Drop from source	Percent Drop
Device 1	0.161	85	20.06	0.336	1.65%
Device 2	0.161	93	19.79	0.611	2.99%
Device 3	0.107	39	19.71	0.688	3.37%
Device 4	0.107	22	19.68	0.717	3.51%
Device 5	0.107	47	19.65	0.747	3.66%
END			19.65	0.747	3.66%
END			19.65	0.747	3.66%
END			19.65	0.747	3.66%
END			19.65	0.747	3.66%
END			19.65	0.747	3.66%
END			19.65	0.747	3.66%
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END			19.65	0.747	3.66%
END			19.65	0.747	3.66%
END			19.65	0.747	3.66%
END			19.65	0.747	3.66%
END			19.65	0.747	3.66%
END			19.65	0.747	3.66%
Totals	0.643	286	End of Line Voltage	**19.65**	

Notes:
Wire resistance is doubled in the calculations for two wires (Positive and Negative)
The voltage calculated to the last device in any method must not be lower then
the manufactures listed minimum operating voltage (IE: rated operating voltage 20-32 VDC).

Device Manufacturer	System Sensor	
Horn Strobes		Current @Rated Voltage
Model #	Candela	
PR2L - 30cd	30	0.158
PR2L - 75cd	75	0.121
PR2L - 95cd	95	0.142
PR2l - 110cd	110	0.162

Device Manufacturer	System Sensor	
Strobe Only		Current @Rated Voltage
Model #	Candela	
SRL - 15cd	15	0.043
SRL - 30cd	30	0.063
SRL - 75cd	75	0.107
SRL - 95cd	95	0.121

Dormatory 1 Fire Alarm Battery Calculations

Module	Description	Existing Qty	New Qty	Standby Current	Total Standby	Alarm Current	Total Alarm
Panel Equipment							
S3 Series	Fire Alarm Control Panel		**1**	0.111000	0.111000	0.243000	0.243000
LCD-SLP	Remote Fire Alarm Annunciator			0.030000		0.065000	
DACT-E3	Digital Alarm Communications Transmitter		**1**	0.018000	0.018000	0.018000	0.018000
FSL-E3	SM Fiber Optic Channel Card		**1**	0.079000	0.079000	0.079000	0.079000
RPT-E3-UTP	Network Repeater Card		**1**	0.016000	0.016000	0.016000	0.016000
				Total Panel Stby	**0.224000**	**Total Panel Alarm**	**0.356000**
Peripheral Devices							
ASD-PL3	Photoelectric Smoke Detector		**22**	0.000200	0.004400	0.000200	0.004400
B200S - LF	Sounder Base - Low Frequency		**17**	0.000500	0.008500	0.000500	0.008500
DNR-DNRW	Duct Mounted Smoke Detector			0.000200		0.000200	
MCS-COF	Heat Detector			0.200000		0.200000	
MS-7A	Double Action Pull Station		**3**	0.000300	0.000900	0.003000	0.009000
AMM-2RIF	Addressible Dual Monitor Relay Module			0.001300		0.024000	
AOM-2RF	Addressible Relay Module			0.000300		0.000300	
Miscellaneous Peripheral Devices							
P2RL	Horn Strobe - Wall Mtd - 110cd		**2**			0.161000	0.322000
PC2RL	Horn Strobe - Clg Mtd - 75cd					0.121000	
SRL	Strobe Light - Wall Mtd - 75cd		**3**			0.107000	0.321000
SCRL	Strobe Light - Clg Mtd - 75cd					0.107000	
XXXX-XXXX	Description						
				Total Periph Stby	**0.013800**	**Total Periph Alarm**	**0.664900**
				Total Standby Amps	**0.237800**	**Total Alarm Amps**	**1.020900**

Battery Set # 1			**Standby Current**		**Alarm Current**
Current Draws					
Panel Equipment			0.224		0.356
Peripherals			0.014		0.665
			0.238	**<--Grand Totals -->**	**1.021**
Additional Battery Capacity Required	**20%**		0.048		0.204
Standby Time =	**24**	Hrs	6.849	Standby Ah	
Alarm Time =	**15**	Mins.	0.306	Alarm Ah	
			7.155	Estimated Total Ah	
Battery Supplied	**12V10A 10AH**		**8.846**	**Total Ah**	

SPECIFIC PLAN NOTES

① CONTRACTOR SHALL DEMO EXISTING FIRE ALARM CONTROL PANEL, ALL EXISTING DEVICES AND CABLES. MAINTAIN EXISTING FIRE ALARM SYSTEM PATHWAYS AND BACKBOXES FOR REUSE.

② CONTRACTOR SHALL USE CARE WHEN REMOVING EXISTING EQUIPMENT AND RETURN TO OWNER FOR FIRST RIGHT OF REFUSAL.

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DORMITORY 1
SCALE: 1/8"=1'-0"
1

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KITT PEAK NATIONAL OBSERVATORY

FIRE ALARM RENOVATION
TUCSON, ARIZONA

PLANNET CONSULTING
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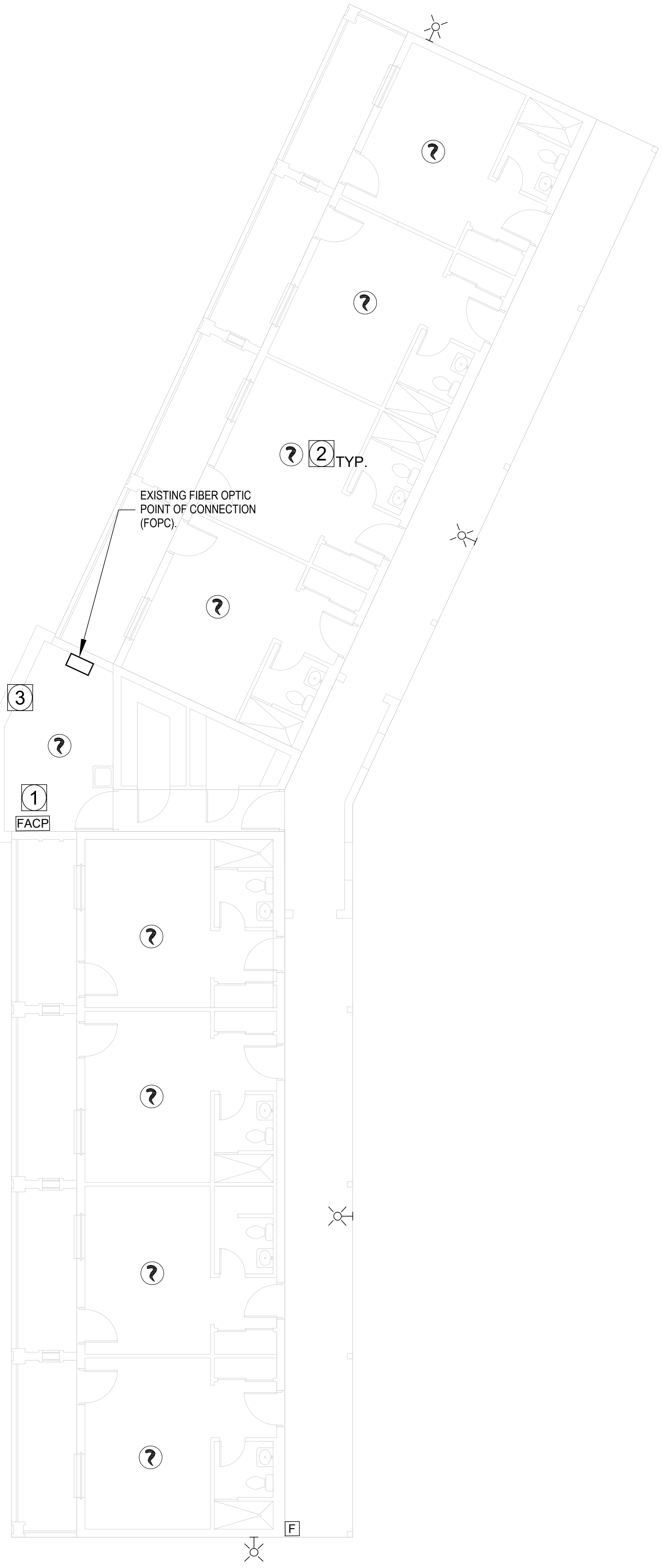
Phone: 714.982.5800 Fax: 714.982.5801
plannet.com

Issue	Date & Issue Description	By	Check
	04.13.2022 COORDINATION		

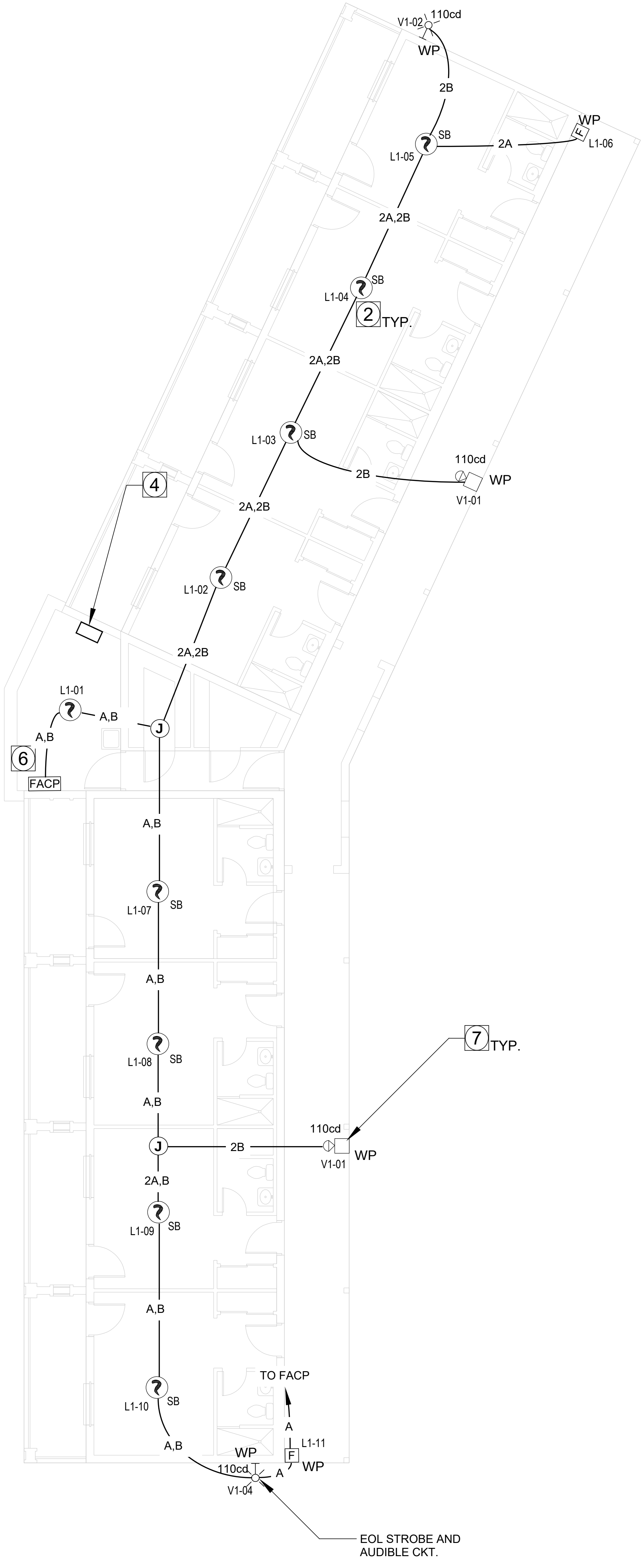
Seal/Signature

Project Name: KITT PEAK NATIONAL OBSERVATORY
Project Number
CAD File Name
Description: LOW VOLTAGE FLOOR PLAN - DORMITORY 1
Scale: 1/8"=1'-0"

LV1.02



DEMOLITION PLAN



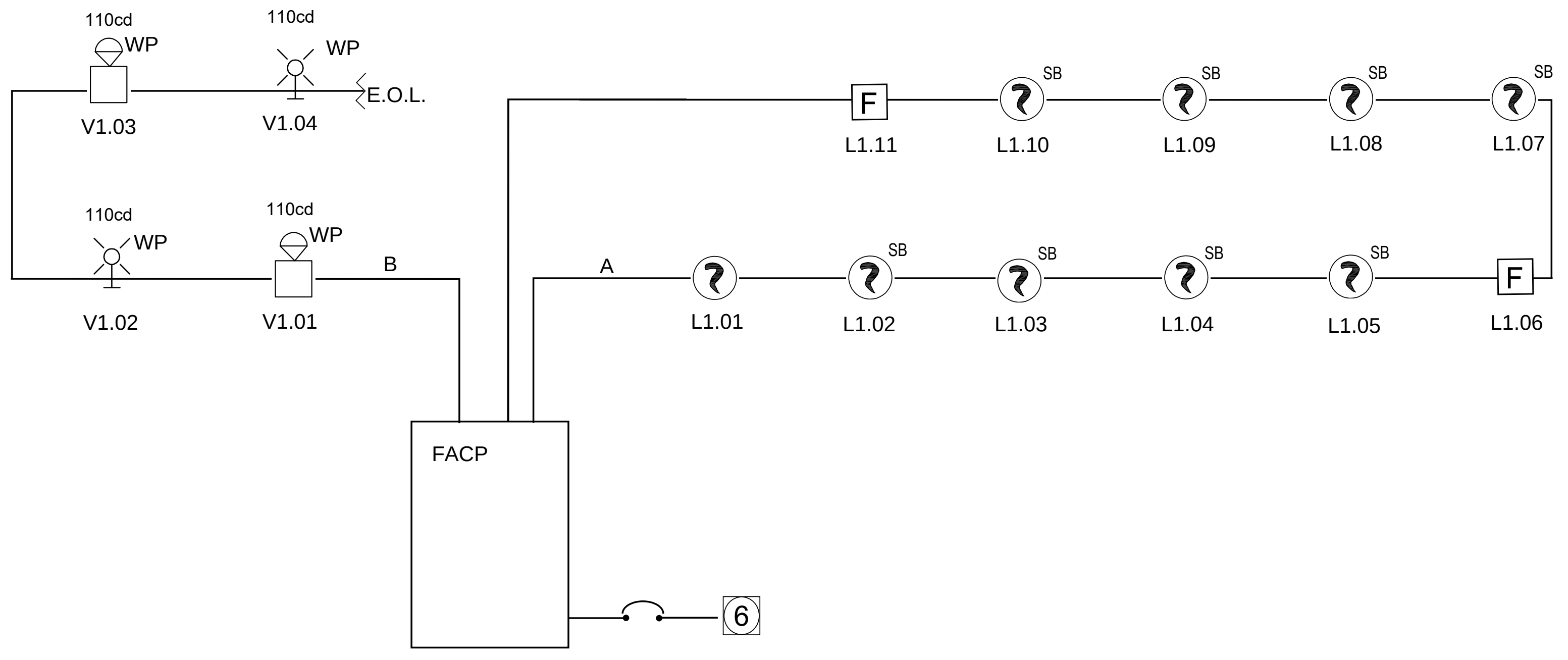
NEW FIRE ALARM PLAN

FIRE ALARM WIRE AND CABLE SCHEDULE

Cable Symbol	Stranded or Solid Wire AWG	# of Conductors	Twisted?	Application	Connect AIR Wire #
A	16	2	Y	Signal Line Circuit (SLC)	W161P-2633
B	14	2	N	Horn/Strobe Circuit (NAC)	W141P-2611
C	14	2	N	Strobe Circuit (NAC)	W141P-2611
D	16	2	Y	Speaker Circuit (NAC)	W161P-2633
E	16	2	Y	Network Data Riser	W161P-2633
F	16	2	Y	Network Audio Riser	W161P-2633
N	16	2	N	Control Module Output	W161P-2601
P	14	2	N	24VDC Power	W141P-2611

UB=Underground direct burial rated cable.

Not all cables may apply to this project



RISER DIAGRAM

KITT PEAK NATIONAL OBSERVATORY

NAC Voltage Drop Calculator
for Audio / Visual devices

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Make sure that you know what method is accepted by, and the results do not exceed the limits set by the respective jurisdiction

Project Name		Kitt Peak Fire Alarm Renovation			
Date		8/18/2022			
Circuit Number		NAC CKT #1			
Area Covered		Dormatory 2			
Nominal System Voltage			20.4		
Minimum Device Voltage			16		
Total Circuit Current		0.566		Wire	Ohm's
				Gauge	Per 1000
Distance from source to 1st device			65	14	3.07
Wire Gauge for balance of circuit				14	3.07

Enter current in amps. .150 = 150 ma		Distance	Voltage		
Device Number	Device Current	from previous device	At Device	Drop from source	Percent Drop
Device 1	0.162	65	20.17	0.226	1.11%
Device 2	0.121	65	20.01	0.387	1.90%
Device 3	0.162	131	19.79	0.615	3.01%
Device 4	0.121	60	19.74	0.659	3.23%
END			19.74	0.659	3.23%
END			19.74	0.659	3.23%
END			19.74	0.659	3.23%
END			19.74	0.659	3.23%
END			19.74	0.659	3.23%
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END			19.74	0.659	3.23%
END			19.74	0.659	3.23%
END			19.74	0.659	3.23%
END			19.74	0.659	3.23%
Totals	0.566	321	End of Line Voltage		19.74

Point to Point Method			End of Line Method			Load Centering Method		
CIRCUIT IS WITHIN LIMITS			**CIRCUIT IS WITHIN LIMITS**			**CIRCUIT IS WITHIN LIMITS**		
Totals		Voltage	Totals		Voltage	Totals		Voltage
Current	Distance	Drop	Current	Distance	Drop	Current	Distance	Drop
0.566	321	**0.66**	0.566	321	**1.116**	0.566	321	**0.558**
End of Line Voltage		**19.74**	End of Line Voltage		**19.28**	End of Line Voltage		**19.84**
Percent Drop		3.23%	Percent Drop		5.47%	Percent Drop		2.73%

End of Line and Load Centering Methods use only the wire guage for the first device to source

Standard Wire Resistance in Ohms per 1000 feet.

18=7.77 16=4.89 14=3.07 12=1.98 10=1.24

18-14 Awg = Solid Conductors 12-10 Awg = Stranded Conductors

Notes:

Wire resistance is doubled in the calculations for two wires (Positive and Negative)

The voltage calculated to the last device in any method must not be lower then the manufactures listed minimum operating voltage (IE: rated operating voltage 20-32 VDC).

Device Manufacturer	System Sensor	
Horn Strobes		Current @Rated Voltage
Model #	Candela	
PR2L - 30cd	30	0.158
PR2L - 75cd	75	0.121
PR2L - 95cd	95	0.142
PR2l - 110cd	110	0.162

Device Manufacturer	System Sensor	
Strobe Only		Current @Rated Voltage
Model #	Candela	
SRL - 15cd	15	0.043
SRL - 30cd	30	0.063
SRL - 75cd	75	0.107
SRL - 95cd	95	0.121

Dormatory 2 Fire Alarm Battery Calculations

Module	Description	Existing Qty	New Qty	Standby Current	Total Standby	Alarm Current	Total Alarm
Panel Equipment							
S3 Series	Fire Alarm Control Panel		1	0.111000	0.111000	0.243000	0.243000
LCD-SLP	Remote Fire Alarm Annunciator			0.030000		0.065000	
DACT-E3	Digital Alarm Communications Transmitter		1	0.018000	0.018000	0.018000	0.018000
FSL-E3	SM Fiber Optic Channel Card		1	0.079000	0.079000	0.079000	0.079000
RPT-E3-UTP	Network Repeater Card		1	0.016000	0.016000	0.016000	0.016000
				Total Panel Stby	**0.224000**	**Total Panel Alarm**	**0.356000**
Peripheral Devices							
ASD-PL3	Photoelectric Smoke Detector		9	0.000200	0.001800	0.000200	0.001800
B200S - LF	Sounder Base - Low Frequency		8	0.000500	0.004000	0.000500	0.004000
DNR-DNRW	Duct Mounted Smoke Detector			0.000200		0.000200	
MCS-COF	Heat Detector			0.200000		0.200000	
MS-7A	Double Action Pull Station		2	0.000300	0.000600	0.003000	0.006000
AMM-2RIF	Addressible Dual Monitor Relay Module			0.001300		0.024000	
AOM-2RF	Addressible Relay Module			0.000300		0.000300	
Miscellaneous Peripheral Devices							
P2RL	Horn Strobe - Wall Mtd - 110cd		2			0.162000	0.324000
PC2RL	Horn Strobe - Clg Mtd - 75cd					0.121000	
SRL	Strobe Light - Wall Mtd - 110cd		2			0.148000	0.296000
SCRL	Strobe Light - Clg Mtd - 75cd					0.107000	
XXXX-XXXX	Description						
				Total Periph Stby	**0.006400**	**Total Periph Alarm**	**0.631800**
				Total Standby Amps	**0.230400**	**Total Alarm Amps**	**0.987800**

Battery Set # 1			**Standby Current**		**Alarm Current**
Current Draws					
Panel Equipment			0.224		0.356
Peripherals			0.006		0.632
			0.230	**<--Grand Totals -->**	**0.988**
Additional Battery Capacity Required	**20%**		0.046		0.198
Standby Time =	**24**	Hrs	6.636	Standby Ah	
Alarm Time =	**15**	Mins.	0.296	Alarm Ah	
			6.932	Estimated Total Ah	
Battery Supplied	**12V10A 10AH**		**8.570**	**Total Ah**	

SPECIFIC PLAN NOTES

1. CONTRACTOR SHALL DEMO EXISTING FIRE ALARM CONTROL PANEL, ALL EXISTING DEVICES AND CABLES. MAINTAIN EXISTING FIRE ALARM SYSTEM PATHWAYS AND BACKBOXES FOR REUSE.
2. CONTRACTOR SHALL USE CARE WHEN REMOVING EXISTING EQUIPMENT AND RETURN TO OWNER FOR FIRST RIGHT OF REFUSAL.
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6. CONTRACTOR SHALL CONNECT NEW FACP TO EXISTING ELECTRICAL CIRCUIT.
7. HORN STROBE dB LEVEL SHALL BE 89dB (HIGH) UNLESS OTHERWISE NOTED.

GENERAL NOTES

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2. NOTIFICATION APPLIANCES IN ROOMS CONTAINING (2) OR MORE AUDIBLE OR VISUAL DEVICES SHALL BE SYNCHRONIZED PER 2019 NFPA 72. THIS SHALL INCLUDE AUDIBLE AND VISUALDEVICES LOATED IN ADJOINING /ADJACENT SPACES.
3. DO NOT DEVIATE FROM CONDUIT RUNS AS SHOWN ON THE CONSTRUCTION DOCUEMTNS WITHOUT PRIOR APPROVAL FROM SYSTEM SUPPLIER /ENGINEER. FACTORS SUCH AS EXCESSIVE VOLTAGE DROP, ADDITIONAL ARTS, ENGINEERING, ETC. THAT ARE A RESULT OF CONDUIT RUN DEVIATIONS SHALL BE THE RESPONSIBIOLITY OF THE CONTRACTOR.
4. DETECTORS SHALL NOT BE LOCATED IN DIRECT AIR-FLOW, LOCATE DEVICES NOT CLOSER THAN 3 FEET FROM ANY SUPPLY DIFFUSER.
5. AUDIBLE ALARM NOTIFICATION APPLIANCES SHALL PROVIDE A SOUND PRESSURE LEVEL OF 15dBA ABOVE THE AVERAGE AMBIENT SOUND LEVEL OR 5dBA ABOVE THE MAXIMUM SOUND LEVEL HAVING DURATION OF AT LEAST 60 SECONDS, WHICH EVER IS GREATER.
6. THE FIRE ALARM EVACUATION SIGNAL SHALL BE CLEARLY HEARD AND COMPLY WITH 2019 NFPA 72 SECTION 18.4.4.1.
7. ALL PENETRATIONS THROUGH FIRE RATED WALLS OR FLOORS SHALL BE PROTECTED FROM THE SPREAD OF FIRE WITH AN APPROVED FIRE STOP SYSTEM EQUAL TO OR GREATER THAN THE FIRE RATING OF THE STRUCTURE/ SURFACE BEING PENETRATED.
8. ALL FIRE ALARM WIRING SHALL BE RUN IN EXISTING FA CONDUITS WHERE POSSIBLE. WHERE NEW CONDUIT OR PATHWAYS MUST BE RUN CONTRACTOR SHALL BE RESPONSIBLE FOR ALL SLEEVES, LOCATIONS AND SIZES OF CONDUITS AND SHALL ENSURE COMPLIANCE WITH LOCAL CODES AND STANDARDS.
9. IF SHIELDED WIRE IS USED, THE FOLLOWING SHALL BE OBSERVED:
    - A. METALLIC CONTINUITY OF THE SHIELD MUST BE MAINTAINED AND INSULATED THROUGHOUT THE ENTIRE LENGTH OF THE CABLE.
    - B. THE ENTIRE LENGTH OF THE CABLE MUST HAVE A RESISTANCE GREATER THAN 1MEGAOHM TO EARTH.

DORMITORY 2

SCALE:
1/8"=1'-0"
1
--

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KITT PEAK NATIONAL OBSERVATORY

FIRE ALARM RENOVATION
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Issue	Date & Issue Description	By	Check
	04.13.2022 COORDINATION		

Seal/Signature

Project Name KITT PEAK NATIONAL OBSERVATORY

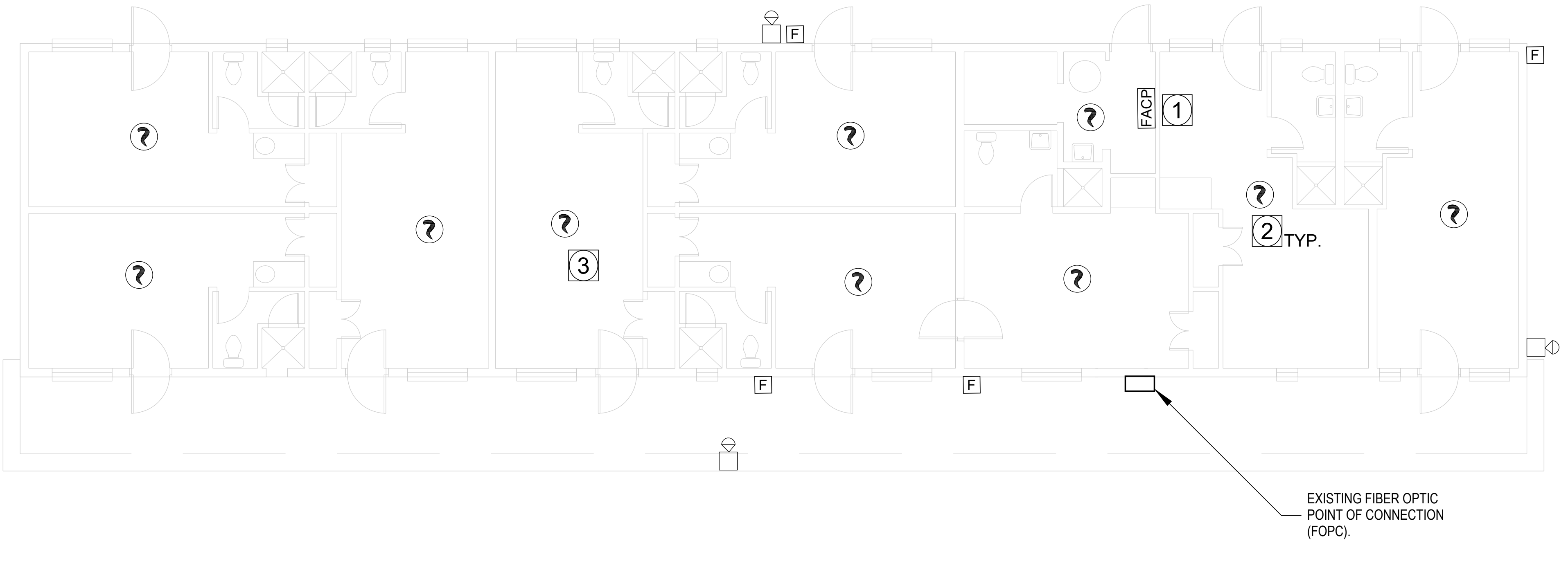
Project Number

CAD File Name

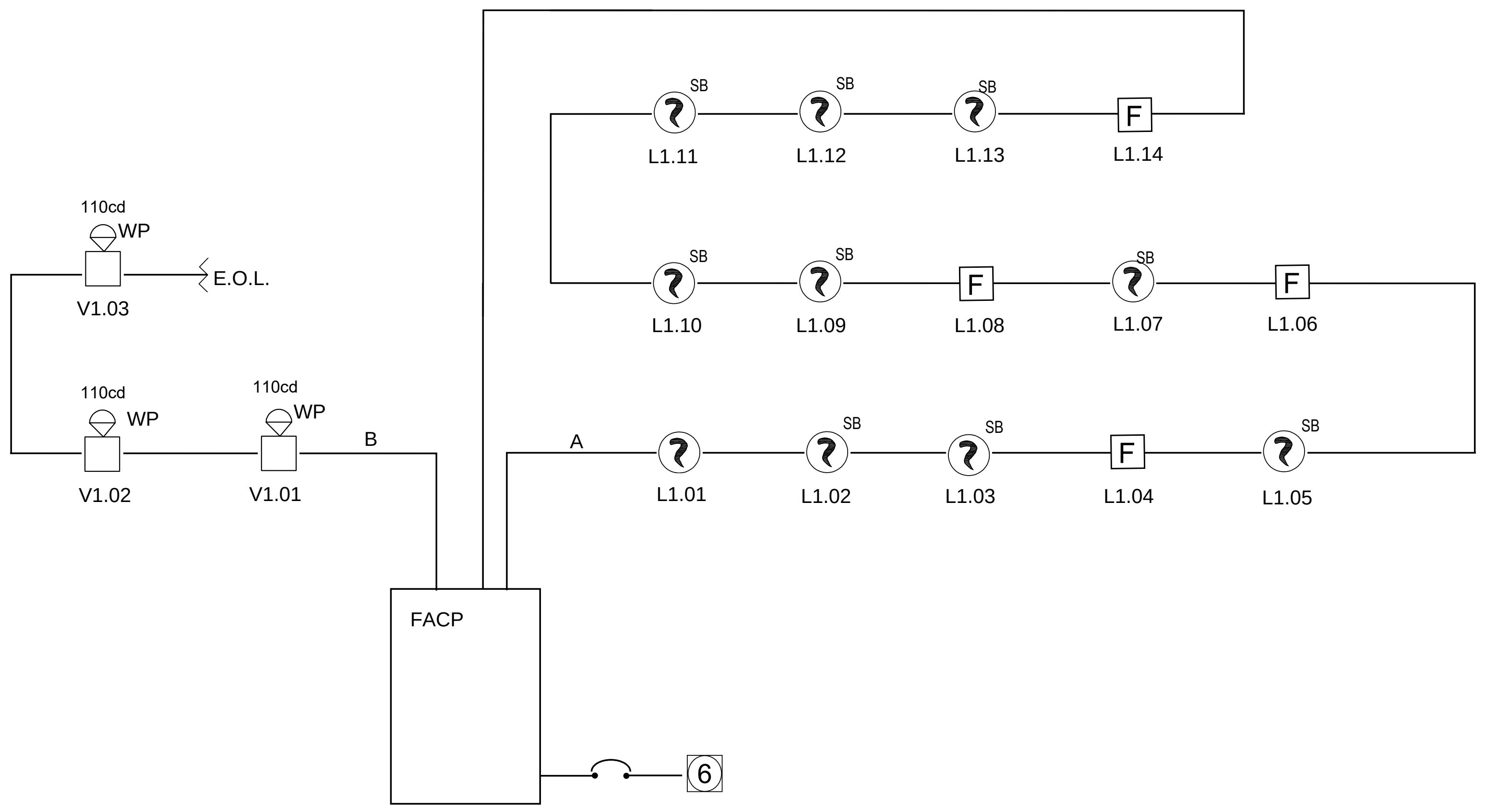
Description
LOW VOLTAGE FLOOR PLAN - DORMITORY 2

Scale
1/8"=1'-0"

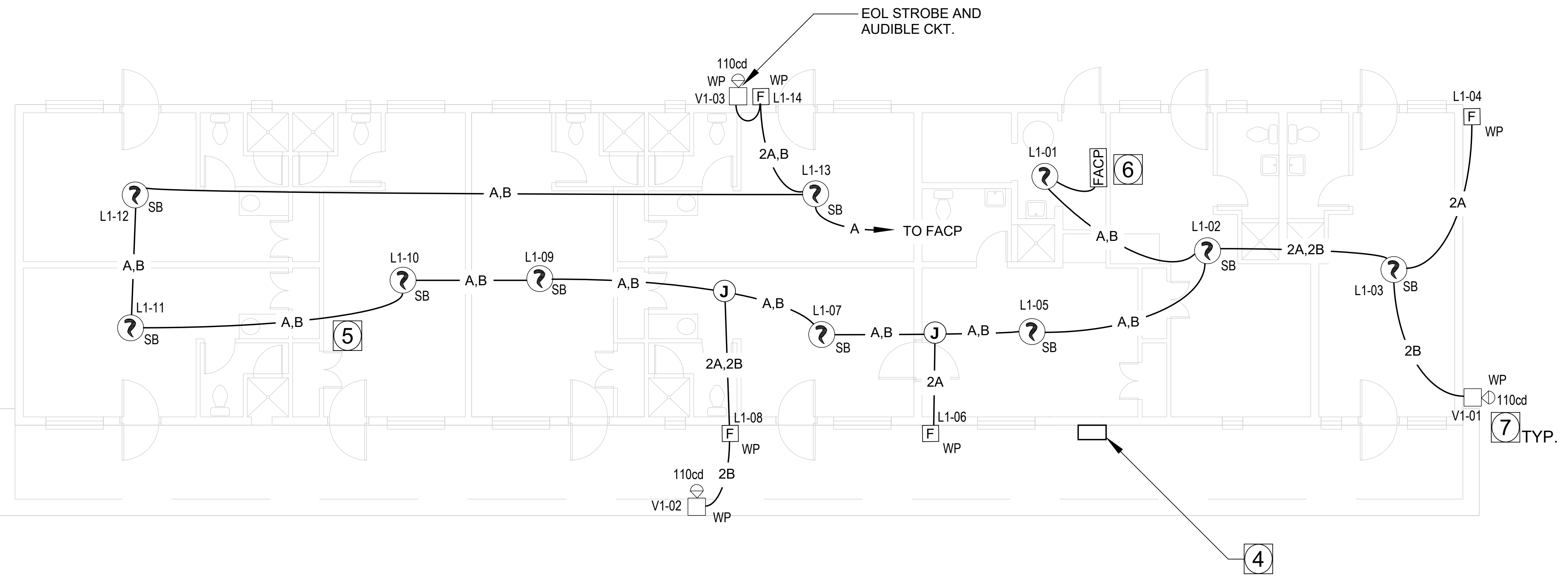
LV1.03



DEMOLITION PLAN



RISER DIAGRAM



NEW FIRE ALARM PLAN

FIRE ALARM WIRE AND CABLE SCHEDULE

Cable Symbol	Stranded or Solid Wire AWG	# of Conductors	Twisted?	Application	Connect AIR Wire #
A	16	2	Y	Signal Line Circuit (SLC)	W161P-2633
B	14	2	N	Horn/Strobe Circuit (NAC)	W141P-2611
C	14	2	N	Strobe Circuit (NAC)	W141P-2611
D	16	2	Y	Speaker Circuit (NAC)	W161P-2633
E	16	2	Y	Network Data Riser	W161P-2633
F	16	2	Y	Network Audio Riser	W161P-2633
N	16	2	N	Control Module Output	W161P-2601
P	14	2	N	24VDC Power	W141P-2611

UB=Underground direct burial rated cable.

Not all cables may apply to this project

KITT PEAK NATIONAL OBSERVATORY

NAC Voltage Drop Calculator
for Audio / Visual devices

This calculator provided voltage drop calculations in three formats (Point to Point, End of Line, and Load Centering).

Make sure that you know what method is accepted by, and the results do not exceed the limits set by the respective jurisdiction

Project Name		Kitt Peak Fire Alarm Renovation			
Date		8/18/2022			
Circuit Number		NAC CKT #1			
Area Covered		Dormatory 3			
Nominal System Voltage			20.4		
Minimum Device Voltage			16		
Total Circuit Current		0.485		Wire	Ohm's
				Gauge	Per 1000
Distance from source to 1st device			56	14	3.07
Wire Gauge for balance of circuit				14	3.07
Enter current in amps.		Distance			
.150 = 150 ma		from	Voltage		
Device Number	Device Current	previous device	At Device	Drop from source	Percent Drop
Device 1	0.162	56	20.23	0.167	0.82%
Device 2	0.161	98	20.04	0.361	1.77%
Device 3	0.162	155	19.88	0.515	2.53%
END			19.88	0.515	2.53%
END			19.88	0.515	2.53%
END			19.88	0.515	2.53%
END			19.88	0.515	2.53%
END			19.88	0.515	2.53%
END			19.88	0.515	2.53%
END			19.88	0.515	2.53%
END			19.88	0.515	2.53%
END			19.88	0.515	2.53%
END			19.88	0.515	2.53%
END			19.88	0.515	2.53%
END			19.88	0.515	2.53%
END			19.88	0.515	2.53%
END			19.88	0.515	2.53%
END			19.88	0.515	2.53%
END			19.88	0.515	2.53%
END			19.88	0.515	2.53%
END			19.88	0.515	2.53%
Totals	0.485	309	End of Line Voltage		19.88

Point to Point Method			End of Line Method			Load Centering Method		
CIRCUIT IS WITHIN LIMITS			CIRCUIT IS WITHIN LIMITS			CIRCUIT IS WITHIN LIMITS		
Totals		Voltage	Totals		Voltage	Totals		Voltage
Current	Distance	Drop	Current	Distance	Drop	Current	Distance	Drop
0.485	309	**0.52**	0.485	309	**0.920**	0.485	309	**0.460**
End of Line Voltage		**19.88**	End of Line Voltage		**19.48**	End of Line Voltage		**19.94**
Percent Drop		2.53%	Percent Drop		4.51%	Percent Drop		2.26%

End of Line and Load Centering Methods use only the wire guage for the first device to source

Standard Wire Resistance in Ohms per 1000 feet.

18=7.77 16=4.89 14=3.07 12=1.98 10=1.24

18-14 Awg = Solid Conductors 12-10 Awg = Stranded Conductors

Notes:
Wire resistance is doubled in the calculations for two wires (Positive and Negative)
The voltage calculated to the last device in any method must not be lower then
the manufactures listed minimum operating voltage (IE: rated operating voltage 20-32 VDC).

Device Manufacturer	System Sensor	
		Current
Horn Strobes		@Rated
Model #	Candela	Voltage
PR2L - 30cd	30	0.158
PR2L - 75cd	75	0.121
PR2L - 95cd	95	0.142
PR2l - 110cd	110	0.162

Device Manufacturer	System Sensor	
		Current
Strobe Only		@Rated
Model #	Candela	Voltage
SRL - 15cd	15	0.043
SRL - 30cd	30	0.063
SRL - 75cd	75	0.107
SRL - 95cd	95	0.121

Dormatory 3 Fire Alarm Battery Calculations

Module	Description	Existing Qty	New Qty	Standby Current	Total Standby	Alarm Current	Total Alarm
Panel Equipment							
S3 Series	Fire Alarm Control Panel		1	0.111000	0.111000	0.243000	0.243000
LCD-SLP	Remote Fire Alarm Annunciator			0.030000		0.065000	
DACT-E3	Digital Alarm Communications Transmitter		1	0.018000	0.018000	0.018000	0.018000
FSL-E3	SM Fiber Optic Channel Card		1	0.079000	0.079000	0.079000	0.079000
RPT-E3-UTP	Network Repeater Card		1	0.016000	0.016000	0.016000	0.016000
				Total Panel Stby	**0.224000**	**Total Panel Alarm**	**0.356000**
Peripheral Devices							
ASD-PL3	Photoelectric Smoke Detector		10	0.000200	0.002000	0.000200	0.002000
B200S - LF	Sounder Base - Low Frequency		9	0.000500	0.004500	0.000500	0.004500
DNR-DNRW	Duct Mounted Smoke Detector			0.000200		0.000200	
MCS-COF	Heat Detector			0.200000		0.200000	
MS-7A	Double Action Pull Station		4	0.000300	0.001200	0.003000	0.012000
AMM-2RIF	Addressible Dual Monitor Relay Module			0.001300		0.024000	
AOM-2RF	Addressible Relay Module			0.000300		0.000300	
Miscellaneous Peripheral Devices							
P2RL	Horn Strobe - Wall Mtd - 110cd		3			0.162000	0.486000
PC2RL	Horn Strobe - Clg Mtd - 75cd					0.121000	
SRL	Strobe Light - Wall Mtd - 110cd					0.148000	
SCRL	Strobe Light - Clg Mtd - 75cd					0.107000	
XXXX-XXXX	Description						
				Total Periph Stby	**0.007700**	**Total Periph Alarm**	**0.504500**
				Total Standby Amps	**0.231700**	**Total Alarm Amps**	**0.860500**

Battery Set # 1			**Standby Current**		**Alarm Current**
Current Draws					
Panel Equipment			0.224		0.356
Peripherals			0.008		0.505
			0.232	**<--Grand Totals -->**	**0.861**
Additional Battery Capacity Required	**20%**		0.046		0.172
Standby Time =	**24**	Hrs	6.673	Standby Ah	
Alarm Time =	**15**	Mins.	0.258	Alarm Ah	
			6.931	Estimated Total Ah	
Battery Supplied	**12V10A 10AH**		**8.516**	**Total Ah**	

SPECIFIC PLAN NOTES

① CONTRACTOR SHALL DEMO EXISTING FIRE ALARM CONTROL PANEL, ALL EXISTING DEVICES AND CABLES. MAINTAIN EXISTING FIRE ALARM SYSTEM PATHWAYS AND BACKBOXES FOR REUSE.

② CONTRACTOR SHALL USE CARE WHEN REMOVING EXISTING EQUIPMENT AND RETURN TO OWNER FOR FIRST RIGHT OF REFUSAL.

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DORMITORY 3
SCALE: 1/8"=1'-0"
1
– –

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KITT PEAK NATIONAL OBSERVATORY
FIRE ALARM RENOVATION
TUCSON, ARIZONA

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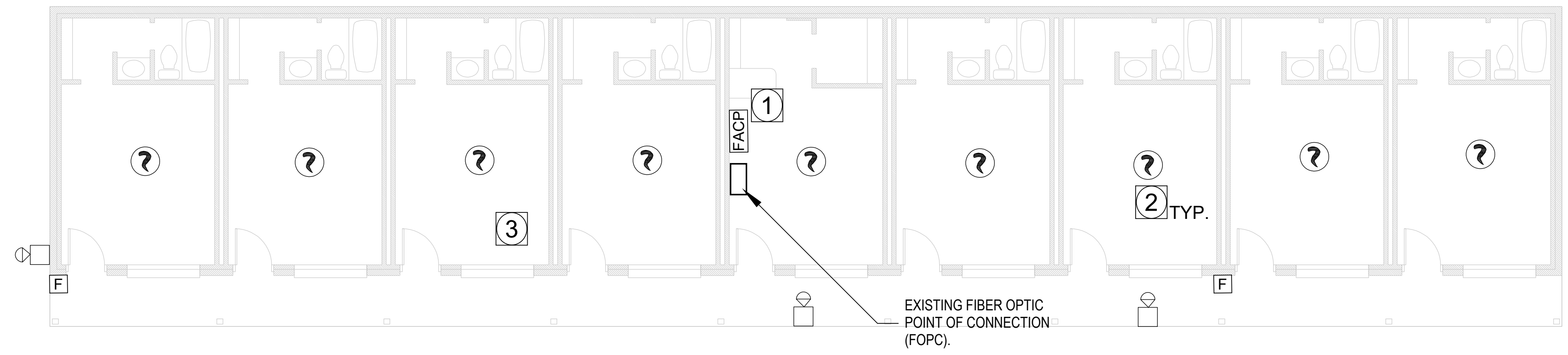
Issue	Date & Issue Description	By	Check
	04.13.2022 COORDINATION		

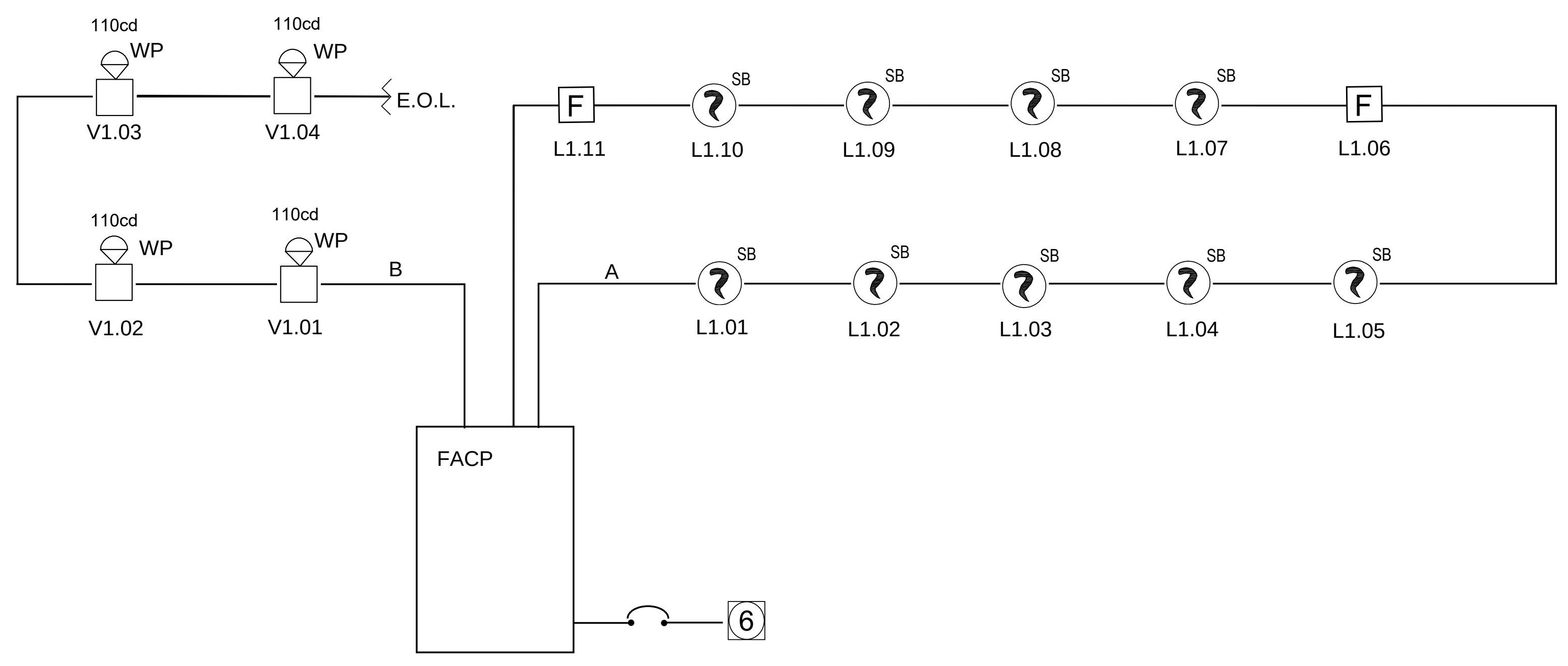
Seal/Signature

Project Name: KITT PEAK NATIONAL OBSERVATORY
Project Number
CAD File Name
Description: LOW VOLTAGE FLOOR PLAN - DORMITORY 3
Scale: 1/8"=1'-0"

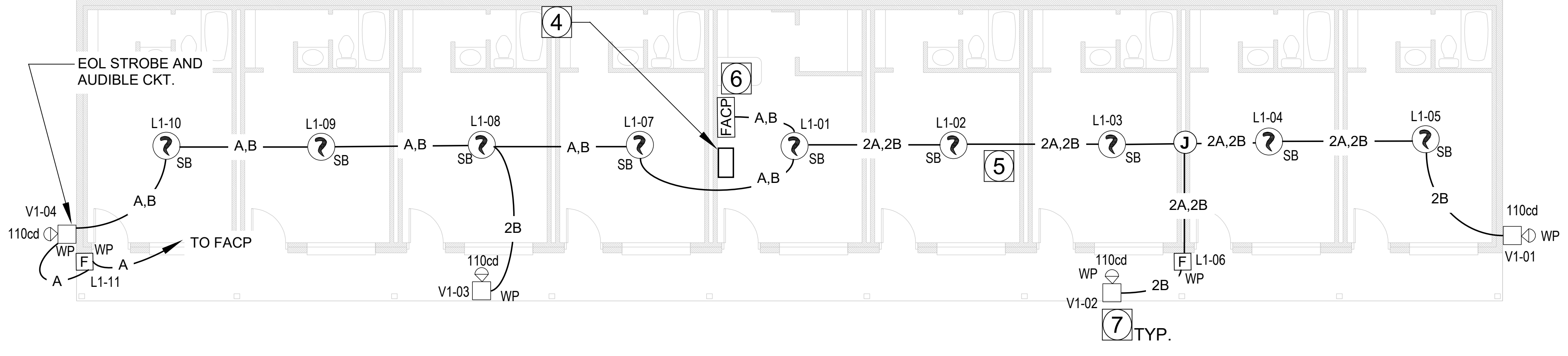
LV1.04



DEMOLITION PLAN



RISER DIAGRAM



NEW FIRE ALARM PLAN

KITT PEAK NATIONAL OBSERVATORY

NAC Voltage Drop Calculator
for Audio / Visual devices

This calculator provided voltage drop calculations in three formats (Point to Point, End of Line, and Load Centering).
Make sure that you know what method is accepted by, and the results do not exceed the limits set by the respective jurisdiction

Project Name	Kitt Peak Fire Alarm Renovation				
Date	8/18/2022				
Circuit Number	NAC CKT #1				
Area Covered	Dormatory 4				
Nominal System Voltage		20.4			
Minimum Device Voltage		16			
Total Circuit Current	0.648		Wire	Ohm's	
			Gauge	Per 1000	
Distance from source to 1st device		79	14	3.07	
Wire Gauge for balance of circuit			14	3.07	
Enter current in amps.	Distance				
.150 = 150 ma	from	Voltage			
Device Number	Device Current	previous device	At Device	Drop from source	Percent Drop
Device 1	0.162	79	20.09	0.314	1.54%
Device 2	0.162	48	19.94	0.458	2.24%
Device 3	0.162	92	19.76	0.641	3.14%
Device 4	0.162	58	19.70	0.698	3.42%
END			19.70	0.698	3.42%
END			19.70	0.698	3.42%
END			19.70	0.698	3.42%
END			19.70	0.698	3.42%
END			19.70	0.698	3.42%
END			19.70	0.698	3.42%
END			19.70	0.698	3.42%
END			19.70	0.698	3.42%
END			19.70	0.698	3.42%
END			19.70	0.698	3.42%
END			19.70	0.698	3.42%
END			19.70	0.698	3.42%
END			19.70	0.698	3.42%
END			19.70	0.698	3.42%
END			19.70	0.698	3.42%
END			19.70	0.698	3.42%
Totals	0.648	277	End of Line Voltage	19.70	

Point to Point Method			End of Line Method			Load Centering Method		
CIRCUIT IS WITHIN LIMITS			CIRCUIT IS WITHIN LIMITS			CIRCUIT IS WITHIN LIMITS		
Totals		Voltage	Totals		Voltage	Totals		Voltage
Current	Distance	Drop	Current	Distance	Drop	Current	Distance	Drop
0.648	277	**0.70**	0.648	277	**1.102**	0.648	277	**0.551**
End of Line Voltage		**19.70**	End of Line Voltage		**19.30**	End of Line Voltage		**19.85**
Percent Drop		3.42%	Percent Drop		5.40%	Percent Drop		2.70%

End of Line and Load Centering Methods use only the wire guage for the first device to source
Standard Wire Resistance in Ohms per 1000 feet.
18=7.77 16=4.89 14=3.07 12=1.98 10=1.24
18-14 Awg = Solid Conductors 12-10 Awg = Stranded Conductors

Notes:
Wire resistance is doubled in the calculations for two wires (Positive and Negative)
The voltage calculated to the last device in any method must not be lower then
the manufactures listed minimum operating voltage (IE: rated operating voltage 20-32 VDC).

Device Manufacturer: System Sensor

Horn Strobes		Current
		@Rated
Model #	Candela	Voltage
PR2L - 30cd	30	0.158
PR2L - 75cd	75	0.121
PR2L - 95cd	95	0.142
PR2l - 110cd	110	0.162

Device Manufacturer: System Sensor

Strobe Only		Current
		@Rated
Model #	Candela	Voltage
SRL - 15cd	15	0.043
SRL - 30cd	30	0.063
SRL - 75cd	75	0.107
SRL - 95cd	95	0.121

Dormatory 4 Fire Alarm Battery Calculations

Module	Description	Existing Qty	New Qty	Standby Current	Total Standby	Alarm Current	Total Alarm
Panel Equipment							
S3 Series	Fire Alarm Control Panel		1	0.111000	0.111000	0.243000	0.243000
LCD-SLP	Remote Fire Alarm Annunciator			0.030000		0.065000	
DACT-E3	Digital Alarm Communications Transmitter		1	0.018000	0.018000	0.018000	0.018000
FSL-E3	SM Fiber Optic Channel Card		1	0.079000	0.079000	0.079000	0.079000
RPT-E3-UTP	Network Repeater Card		1	0.016000	0.016000	0.016000	0.016000
				Total Panel Stby	**0.224000**	**Total Panel Alarm**	**0.356000**
Peripheral Devices							
ASD-PL3	Photoelectric Smoke Detector		9	0.000200	0.001800	0.000200	0.001800
B200S - LF	Sounder Base - Low Frequency		8	0.000500	0.004000	0.000500	0.004000
DNR-DNRW	Duct Mounted Smoke Detector			0.000200		0.000200	
MCS-COF	Heat Detector			0.200000		0.200000	
MS-7A	Double Action Pull Station		2	0.000300	0.000600	0.003000	0.006000
AMM-2RIF	Addressible Dual Monitor Relay Module			0.001300		0.024000	
AOM-2RF	Addressible Relay Module			0.000300		0.000300	
Miscellaneous Peripheral Devices							
P2RL	Horn Strobe - Wall Mtd - 110cd		4			0.162000	0.648000
PC2RL	Horn Strobe - Clg Mtd - 75cd					0.121000	
SRL	Strobe Light - Wall Mtd - 110cd					0.148000	
SCRL	Strobe Light - Clg Mtd - 75cd					0.107000	
XXXX-XXXX	Description						
				Total Periph Stby	**0.006400**	**Total Periph Alarm**	**0.659800**
				Total Standby Amps	**0.230400**	**Total Alarm Amps**	**1.015800**

Battery Set # 1			**Standby Current**		**Alarm Current**
Current Draws					
Panel Equipment			0.224		0.356
Peripherals			0.006		0.660
			0.230	**<--Grand Totals -->**	**1.016**
Additional Battery Capacity Required	**20%**		0.046		0.203
Standby Time =	**24**	Hrs	6.636	Standby Ah	
Alarm Time =	**15**	Mins.	0.305	Alarm Ah	
			6.940	Estimated Total Ah	
Battery Supplied	**12V10A 10AH**		**8.591**	**Total Ah**	

FIRE ALARM WIRE AND CABLE SCHEDULE

Cable Symbol	Stranded or Solid Wire AWG	# of Conductors	Twisted?	Application	Connect AIR Wire #
A	16	2	Y	Signal Line Circuit (SLC)	W161P-2633
B	14	2	N	Horn/Strobe Circuit (NAC)	W141P-2611
C	14	2	N	Strobe Circuit (NAC)	W141P-2611
D	16	2	Y	Speaker Circuit (NAC)	W161P-2633
E	16	2	Y	Network Data Riser	W161P-2633
F	16	2	Y	Network Audio Riser	W161P-2633
N	16	2	N	Control Module Output	W161P-2601
P	14	2	N	24VDC Power	W141P-2611

UB=Underground direct burial rated cable.

Not all cables may apply to this project

SPECIFIC PLAN NOTES

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3. DISPOSE OF ALL CABLE AND DEVICES NOT RETAINED BY OWNER IN A SAFE AND APPROPRIATE MANNER.
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6. CONTRACTOR SHALL CONNECT NEW FACP TO EXISTING ELECTRICAL CIRCUIT.
7. HORN STROBE dB LEVEL SHALL BE 89dB (HIGH) UNLESS OTHERWISE NOTED.

GENERAL NOTES

1. DRAWINGS ARE DIAGRAMMATIC AND ARE INTENDED TO CONVEY SCOPE OF WORK AND TO INDICATE GENERAL ARRANGEMENT. THEY ARE NOT INTENDED TO SHOW EVERY DETAIL INCLUDING OFFSETS, FITTINGS OR EVERY STRUCTURAL DIFFICULTY THAT MAY BE ENCOUNTERED DURING WORK. EXCEPT WHERE OTHERWISE INDICATED, LOCATIONS ARE APPROXIMATE ONLY. EXACT LOCATIONS NECESSARY TO ADHERE TO CODE REQUIREMENTS AND SECURE PROPER CONDITIONS AND RESULTS ARE THE RESPONSIBILITY OF THE CONTRACTOR AND MUST BE DETERMINED AT THE PROJECT SITE.
2. NOTIFICATION APPLIANCES IN ROOMS CONTAINING (2) OR MORE AUDIBLE OR VISUAL DEVICES SHALL BE SYNCHRONIZED PER 2019 NFPA 72. THIS SHALL INCLUDE AUDIBLE AND VISUALDEVICES LOATED IN ADJOINING /ADJACENT SPACES.
3. DO NOT DEVIATE FROM CONDUIT RUNS AS SHOWN ON THE CONSTRUCTION DOCUEMTNS WITHOUT PRIOR APPROVAL FROM SYSTEM SUPPLIER /ENGINEER. FACTORS SUCH AS EXCESSIVE VOLTAGE DROP, ADDITIONAL ARTS, ENGINEERING, ETC. THAT ARE A RESULT OF CONDUIT RUN DEVIATIONS SHALL BE THE RESPONSIBIOLITY OF THE CONTRACTOR.
4. DETECTORS SHALL NOT BE LOCATED IN DIRECT AIR-FLOW, LOCATE DEVICES NOT CLOSER THAN 3 FEET FROM ANY SUPPLY DIFFUSER.
5. AUDIBLE ALARM NOTIFICATION APPLIANCES SHALL PROVIDE A SOUND PRESSURE LEVEL OF 15dBA ABOVE THE AVERAGE AMBIENT SOUND LEVEL OR 5dBA ABOVE THE MAXIMUM SOUND LEVEL HAVING DURATION OF AT LEAST 60 SECONDS, WHICH EVER IS GREATER.
6. THE FIRE ALARM EVACUATION SIGNAL SHALL BE CLEARLY HEARD AND COMPLY WITH 2019 NFPA 72 SECTION 18.4.4.1.
7. ALL PENETRATIONS THROUGH FIRE RATED WALLS OR FLOORS SHALL BE PROTECTED FROM THE SPREAD OF FIRE WITH AN APPROVED FIRE STOP SYSTEM EQUAL TO OR GREATER THAN THE FIRE RATING OF THE STRUCTURE/ SURFACE BEING PENETRATED.
8. ALL FIRE ALARM WIRING SHALL BE RUN IN EXISTING FA CONDUITS WHERE POSSIBLE. WHERE NEW CONDUIT OR PATHWAYS MUST BE RUN CONTRACTOR SHALL BE RESPONSIBLE FOR ALL SLEEVES, LOCATIONS AND SIZES OF CONDUITS AND SHALL ENSURE COMPLIANCE WITH LOCAL CODES AND STANDARDS.
9. IF SHIELDED WIRE IS USED, THE FOLLOWING SHALL BE OBSERVED:
    - A. METALLIC CONTINUITY OF THE SHIELD MUST BE MAINTAINED AND INSULATED THROUGHOUT THE ENTIRE LENGTH OF THE CABLE.
    - B. THE ENTIRE LENGTH OF THE CABLE MUST HAVE A RESISTANCE GREATER THAN 1MEGAOHM TO EARTH.

DORMITORY 4
SCALE: 1/8"=1'-0"
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KITT PEAK NATIONAL OBSERVATORY

FIRE ALARM RENOVATION
TUCSON, ARIZONA

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Issue	Date & Issue Description	By	Check
	04.13.2022 COORDINATION		

Seal/Signature

Project Name: KITT PEAK NATIONAL OBSERVATORY

Project Number

CAD File Name

Description
LOW VOLTAGE FLOOR PLAN - DORMITORY 4

Scale
1/8"=1'-0"

LV1.05