NSF WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH
KITT PEAK NATIONAL OBSERVATORY

CENTER FOR ASTRONOMY OUTREACH REDESIGN

ISSUED FOR CONSTRUCTION
JANUARY 08, 2021

DRAWING SHEET INDEX

DESCRIPTION

RENOVATION OF EXISTING OFFICE SPACE INTO EDUCATIONAL SPACES THROUGH EXHIBITS, GALLERIES AND VISUALIZATION SYSTEMS. INCLUDES ARCHITECTURAL, STRUCTURAL, MECHANICAL AND ELECTRICAL WORK.

APPLIED CODES:

CONTRACTOR TO ADHERE TO THE CODES AND REGULATIONS NOTED BELOW, INCLUDING BUT NOT LIMITED TO:

-2018 INTERNATIONAL BUILDING CODE (IBC)
-2018 INTERNATIONAL MECHANICAL CODE (IMC)
-2018 INTERNATIONAL PLUMBING CODE (IPC)
-2018 INTERNATIONAL ENERGY CONSERVATION CODE (IECC)
-2018 INTERNATIONAL FIRE CODE (IFC)
-2018 INTERNATIONAL FUEL GAS CODE (IFGC)
-2017 NATIONAL ELECTRICAL CODE (NEC)
-2010 ADA STANDARDS FOR ACCESSIBLE DESIGN

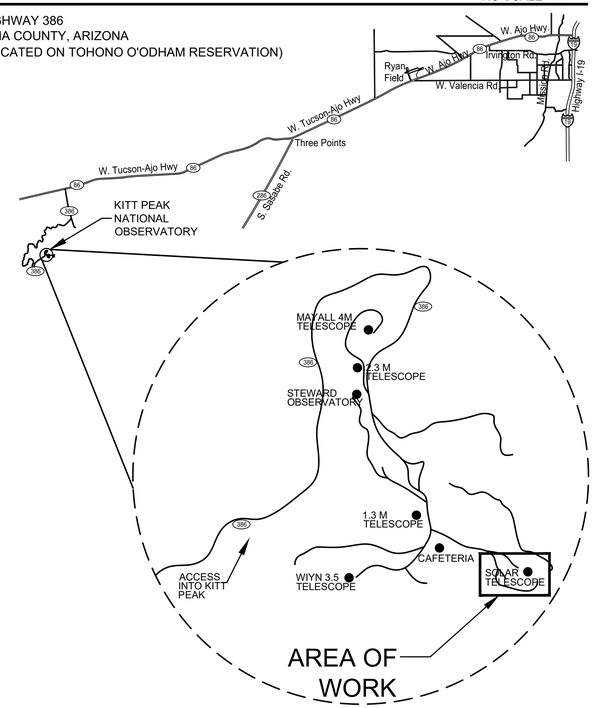
BID ALTERNATES:

- PROVIDE BID ALTERNATE PRICING FOR REMOVAL OF EARTH WORK FOR A NEW WATERPROOF MEMBRANE. REFER TO SHEET A2.5 FOR MORE INFO.

PROJECT LOCATION

NO SCALE

HIGHWAY 386
PIMA COUNTY, ARIZONA
(LOCATED ON TOHONO O'ODHAM RESERVATION)



REGISTERED ARCHITECT
CERTIFICATE NO. 49199
IAN MATTHEW REGAN
DATE SIGNED 01/08/21
ARIZONA
Expires 3/31/2021

ADVANTECH
FACILITY DESIGN INC
ARCHITECTURE - ENGINEERING
3280 E. HEMISPHERE LOOP STE. 110 TUCSON AZ 85706 520-806-0903
1889 E. BROADWAY, TEMPE AZ 85258

WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

KITT PEAK - Sells, AZ 85634

△	DATE	DESCRIPTION
0	01/08/21	I.F.C.

PROJECT NUMBER:	11904.00
DRAWN BY:	AO
CHECKED BY:	AO
CAD FILE:	11904.00-CVR
SCALE:	AS NOTED

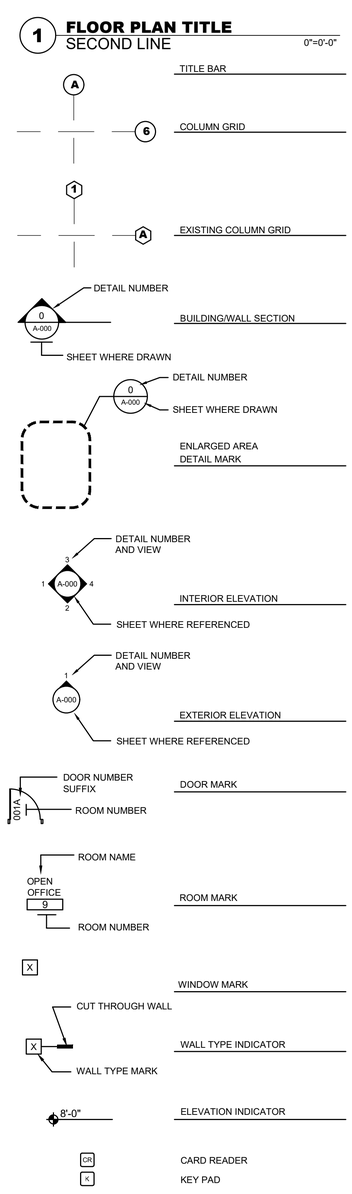
COVER SHEET

CVR

ABBREVIATIONS

@	AT
A/C	AIR CONDITIONING
AB	ANCHOR BOLT
ABC	AGGREGATE BASE COURSE
ABV	ABOVE
ADJ	ADJACENT
AFF	ABOVE FINISH FLOOR
AGG	AGGREGATE
ALT	ALTERNATE
AL(UM)	ALUMINUM
ANCH	ANCHOR, ANCHORAGE
ANOD	ANODIZED
BD	BOARD
BLDG	BUILDING
BLK(G)	BLOCK(ING)
BO	BOTTOM OF
BOT	BOTTOM
BSMT	BASEMENT
C/C	CENTER TO CENTER
CA	CLEAR ANODIZED
CAB	CABINET
CB	CATCH BASIN
CG	CORNER GUARD
CI	CAST IRON
CIP	CAST IN PLACE
CJ	CONTROL JOINT
CLG	CEILING
CLR	CLEAR(ANCE)
CMP	CORRUGATED METAL PIPE
CMTS	COMMENTS
CMU	CONCRETE MASONRY UNIT
CO	CLEAN OUT
COL	COLUMN
CONC	CONCRETE
CONN	CONNECTION
CONST	CONSTRUCTION
CONT	CONTINUOUS OR CONTINUE
CONTR	CONTRACTOR
CORR	CORRIDOR OR CORRUGATED
CPT	CARPET
CR	CARD READER
CRC	CLEANROOM CEILING (SYSTEM)
CRF	CLEANROOM FLOOR (SYSTEM)
CT	CERAMIC TILE
D	DEPTH
DEMO	DEMOLISH, DEMOLITION
DF	DRINKING FOUNTAIN
DIA	DIAMETER
DIAG	DIAGONAL
DIM	DIMENSION
DISP	DISPENSER
DN	DOWN
DO	DITTO
DR	DOOR
DS	DOWNSPOUT
DTL	DETAIL
DWG	DRAWING
DWC	DRYWALL CHANNELS (HAT)
(E)	EXISTING
E	EAST
EA	EACH
EIFS	EXTERIOR INSULATING FINISH SYSTEM
EJ	EXPANSION JOINT
ELEC	ELECTRIC(AL)
ELEV	ELEVATION OR ELEVATOR
EMER	EMERGENCY
EP	EPOXY PAINT
EQ	EQUAL
EQUIP	EQUIPMENT
ES	EXPOSED STRUCTURE
EW	EACH WAY
EWC	ELECTRIC WATER COOLER
EXH	EXHAUST
EXIST	EXISTING
EXP	EXPANSION
EXT	EXTERIOR
FA	FIRE ALARM
FD	FLOOR DRAIN
FDN	FOUNDATION
FE(C)	FIRE EXTINGUISHER(CABINET)
FF	FINISH FLOOR OR FACTORY FINISH
FHR	FIREHOSE RACK
FIN	FINISH(ED)
FLA	FLASHING
FLEX	FLEXIBLE
FLUOR	FLUORESCENT
FO	FACE OF
FP	FIREPROOF
FR	FIRE RETARDANT
FRP	FIBER REINFORCED PLASTIC
FT	FOOT, FEET
FTG	FOOTING
FUR	FURRED(ING)
FUT	FUTURE
F.V.	FEILD VERIFY
GA	GAGE,(GUAGE)
GALV	GALVANIZED
GD	GRADE
GL	GLASS, GLAZING
GWB	GYPSUM WALLBOARD
GYP	GYPSUM
H(T)	HEIGHT
HB	HOSE BIBB
HC	HOLLOW CORE OR HANDICAPPED
HDBD	HARDBOARD
HD	HEAVY DUTY
HDWD	HARDWOOD
HDWR	HARDWARE
HM	HOLLOW METAL
HORZ	HORIZONTAL
HP	HIGH POINT
HR	HOUR
HVAC	HEATING/VENTILATING/ AIR CONDITIONING
HW	HOT WATER
ICB	INTEGRAL COLE BASE
ID	INSIDE DIAMETER
IN	INCHE(S)
INV	INVERT
INCL	INCLUDING
INSUL	INSULATION
INT	INTERIOR
JC	JANITORS CLOSET
JST	JOIST
JT	JOINT
KO	KNOCK OUT
KP	KICK PLATE
LAB	LABORATORY
LAV	LAVATORY
LF	LINEAL FEET
LH	LEFT HAND
LL	LIVE LOAD
LLH	LONG LEG HORIZONTAL
LLV	LONG LEG VERTICAL
LP	LOW POINT
LT	LIGHT
LTWT	LIGHTWEIGHT
LVL	LEVEL
LVR	LOUVER
MAS	MASONRY
MATL	MATERIAL
MAX	MAXIMUM
MECH	MECHANICAL
MET	METAL
MEZZ	MEZZANINE
MFR	MANUFACTURER
MH	MANHOLE
MIN	MINIMUM
MISC	MISCELLANOUS
MO	MASONRY OPENING
MOV	MOVABLE
MTD	MOUNTED
N	NORTH
NA	NOT APPLICABLE
NIC	NOT IN CONTRACT
NO	NUMBER
NOM	NOMINAL
NRC	NOISE REDUCTION COEFFICIENTS
NTS	NOT TO SCALE
OA	OVERALL
OC	ON CENTER(S)
OD	OUTSIDE DIAMETER
OFF	OFFICE
OH	OVERHEAD OR OPPOSITE HAND
OPG	OPENING
OPP	OPPOSITE
ORD	OVERFLOW ROOF DRAIN
P	PAINT(ED)
PB	PARTICLE BOARD
PC	PIECE
PERF	PERFORATED
PERIM	PERIMETER
PERP	PERPENDICULAR
PJ	PANEL JOINT
PL	PLASTER, PLATE OR PROPERTY LINE
PLAM	PLASTIC LAMINATE
PLBG	PLUMBING
PR	PAIR
PREFAB	PREFABRICATED
PSF	POUNDS PER SQUARE FOOT
PSI	POUNDS PER SQUARE INCH
PT	POINT
PVC	POLYVINYL CHLORIDE
PVMT	PAVEMENT
PWD	PLYWOOD
QT	QUARRY TILE
QTY	QUANTITY
R	RADIUS, RISER OR ROUND
RA	RETURN AIR
RB	RESILIENT BASE
RCP	REFLECTED CEILING PLAN
RD	ROOF DRAIN
REC	RESINOUS EPOXY COATING
RE(F)	REFERENCE
RELO	RELOCATION
REPL	REPLACE
REQD	REQUIRED
REV	REVISION(S), REVISED
RF	RAISED FLOOR(ING)
RH	RIGHT HAND
RM	ROOM
RO	ROUGH OPENING
RWL	RAINWATER LEADER
(S)	SURFACE MOUNTED
S	SEALED, SOUTH
SCW	SOLID CORE WOOD
SCHED	SCHEDULE
SECT	SECTION
SD	STORM DRAIN
SF	SQUARE FEET
SHT	SHEET
SHWR	SHOWER
SIM	SIMILAR
SM	SHEET METAL
SPECS	SPECIFICATIONS
SPKR	SPEAKER
SQ	SQUARE
SS/EW	SAFETY SHOWER/EYE WASH
SST	STAINLESS STEEL
STC	SOUND TRANSMISSION COEFFICIENT
STD	STANDARD
STL	STEEL
STOR	STORAGE
STRUC	STRUCTURAL
SUSP	SUSPENDED
SV	SEAMLESS VINYL
T	TEMPERED GLASS
TB	TACKBOARD
TD	TRENCH DRAIN
TEL	TELEPHONE
TEMP	TEMPERATURE,TEMPORARY
THK	THICK(NESS)
TO	TOP OF
TOC	TOP OF CONCRETE
TOIL	TOILET
TOP	TOP OF PARAPET
TOS	TOP OF STEEL
TOW	TOP OF WALL
TYP	TYPICAL
UG	UNDERGROUND
UL	UNDERWRITERS LABORATORY
UNO	UNLESS NOTED OTHERWISE
VB	VAPOR BARRIER
VCT	VINYL COMPOSITION TILE
VERT	VERTICAL
VT	VINYL TILE
W	WIRE GLASS
W/	WITH
W/O	WITHOUT
WD	WOOD
WDW	WINDOW
WM	WIRE MESH
WWF	WELDED WIRE FABRIC
YD	YARD

SYMBOLS



GENERAL INFORMATION

1. FINISH FLOOR ELEVATIONS:

2. DIMENSIONS:

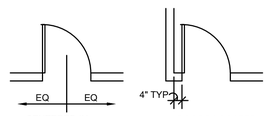
3. FIRE RATINGS:
   MAINTAIN INTEGRITY OF FIRE RATED PARTITIONS BY PROVIDING FIRE BARRIERS AT GAPS AND VOIDS CREATED BY PENETRATIONS, STRUCTURAL MEMBERS, AND INTERSECTIONS WITH ADJACENT SURFACES. INSTALL FIRE STOPPING MATERIALS IN ACCORDANCE WITH SPECIFICATIONS AND TESTED ASSEMBLIES.

4. VERIFY IN FIELD:
   ALL DIMENSIONS AND CONDITIONS SHALL BE VERIFIED IN THE FIELD. REPORT ALL DISCREPANCIES FOUND IN THE CONTRACT DOCUMENTS TO THE CONSTRUCTION MANAGER PRIOR TO COMMENCING AFFECTED WORK.

5. ACCESS DOORS:
   COORDINATE ACCESS DOOR LOCATIONS FOR CONCEALED ITEMS WITH APPROPRIATE CONTRACTOR.

6. CEILINGS:
   CEILING HEIGHTS ARE MEASURED FROM FINISHED FLOOR (OR ACCESS FLOOR) TO BOTTOM OF FINISHED CEILING MATERIAL.

7. DOORS:
   UNLESS NOTED OTHERWISE ON PLANS, DOORS SHOWN ON PLANS ARE TYPICALLY LOCATED AS FOLLOWS:



MATERIALS

SECTION

- EARTH
- POROUS FILL, STONE,GRAVEL
- CONCRETE
- METAL (LARGE SCALE)
- METAL (SMALL SCALE)
- ACOUSTICAL PANEL/TILE
- INSULATION BLANKET,BATTS
- RIGID INSULATION
- PLASTER, SAND CEMENT, & GROUT

ELEVATION

- CONCRETE EIFS
- METAL WALL PANELS
- WOOD
- T — TEMPERED GLASS
- GLASS
- CERAMIC TILE
- PLASTER GWB

GENERAL NOTES

1. THE CONTRACTOR IS RESPONSIBLE FOR IDENTIFYING ALL AREAS ON THE PROJECT WHICH REQUIRE TOLERANCES BETWEEN ROUGH OPENINGS AND/OR FINISH MATERIALS AND PROVIDE FOR THE PROPER TOLERANCES TO COMPLETE THE CONSTRUCTION IN ACCORDANCE WITH THE REQUIREMENTS OF THE CONTRACT DOCUMENTS.
2. THE CONTRACTOR AND SUBCONTRACTORS SHALL BE RESPONSIBLE FOR THE REVIEW AND COORDINATION OF ALL DRAWINGS AND SCHEDULES INCLUDING, BUT NOT LIMITED TO ARCHITECTURAL, STRUCTURAL, MECHANICAL, AND ELECTRICAL. ANY DISCREPANCIES, OMISSIONS OR ERRORS THAT OCCUR SHALL BE BROUGHT TO THE ATTENTION OF FACILITIES ENGINEERING IN WRITING PRIOR TO THE SUBMISSION OF BIDS SO THAT CLARIFICATION CAN BE ISSUED.
3. ANY WORK PERFORMED IN CONFLICT WITH ANY PART OF THE CONTRACT DOCUMENTS OR ANY CODE REQUIREMENT SHALL BE CORRECTED BY THE CONTRACTOR AT HIS OWN EXPENSE AND AT NO EXPENSE TO THE OWNER OR ARCHITECT.
4. THE CONTRACTOR AND SUBCONTRACTORS SHALL BE RESPONSIBLE FOR COORDINATION OF THEIR WORK WITH THE WORK OF OTHER TRADES. SUBCONTRACTORS SHALL VERIFY THAT ANY WORK RELATED TO THEM, WHICH, MUST BE PROVIDED BY OTHERS, HAS BEEN COMPLETED AND IS ADEQUATE PRIOR TO COMMENCING THEIR WORK.
5. ALL DIMENSIONS SHALL TAKE PRECEDENCE OVER SCALE SHOWN ON PLANS, SECTIONS, AND DETAILS. DIMENSIONS ARE TO FACE OF FINISH OR SLAB UNLESS NOTED OTHERWISE ON DRAWINGS. DO NOT SCALE DRAWINGS.
6. THE GENERAL CONTRACTOR IS SOLELY RESPONSIBLE FOR SAFETY ITEMS AND PROCEDURES DURING THE TERM OF CONSTRUCTION (FROM START OF CONSTRUCTION THROUGH CLOSEOUT).
7. KEYNOTES ARE REPRESENTATIVE OF ITS OWN SHEET. KEYNOTES ARE NOT TO BE USED FOR OTHER SHEETS U.N.O.

FIRE DEPARTMENT NOTES

DOORS:

1. EXIT DOORS SHALL BE OPERABLE FROM THE INSIDE WITHOUT THE USE OF A KEY OR SPECIAL KNOWLEDGE OR EFFORT. HAND-ACTIVATED DOOR OPENING HARDWARE SHALL BE CENTERED BETWEEN 30" AND 44" ABOVE FINISHED FLOOR. LATCHING AND LOCKING DOORS THAT ARE HAND- ACTIVATED AND WHICH ARE IN A PATH OF TRAVEL, SHALL BE OPERABLE WITH A SINGLE EFFORT BY LEVER-TYPE HARDWARE, BY PANIC BARS, PUSH-PULL ACTIVATING BARS, OR OTHER HARDWARE DESIGNED TO PROVIDE PASSAGE WITHOUT REQUIRING THE ABILITY TO GRASP THE OPENING HARDWARE. LOCKED EXIT DOORS SHALL OPERATE AS ABOVE IN EGRESS DIRECTION. U.B.C. SEC 1004.3 & U.F.C. SEC. 1207.3
2. EXIT DOORS SERVING MORE THAN 50 0CCUPANTS SHALL HAVE PANIC HARDWARE PER U.B.C. SEC. 1004.
3. FIRE RATED DOORS SHALL BE PROTECTED BY A TIGHT FITTING SMOKE AND DRAFT CONTROL ASSEMBLY HAVING A FIRE PROTECTION RATING AS INDICATED ON THE DOOR SCHEDULE PER U.B.C. STANDARD 7-2. THE DOOR AND FRAME SHALL BEAR AN APPROVED LABEL INCLUDING THE NAME OF THE MANUFACTURER, INSPECTION SERVICE, MATERIALS AND WORKMANSHIP. DOORS SHALL BE SELF CLOSING OR ACTIVATED BY ACTIVATION OF SMOKE DETECTOR PER U.B.C. 713.
4. GLAZING WITHIN 24" OF ANY DOOR OR WITHIN 60" OF A WALKING SURFACE MUST BE OF SAFETY GLAZING MATERIAL FOR A MINIMUM OF 1'-6" IN HEIGHT.

EXIT SIGNS:

1. PROVIDE EXIT SIGNS AND FLOOR LEVEL EXIT SIGNS AS INDICATED ON PLANS AND PER U.B.C. SECTIONS 1012 AND 1013. CONNECT TO A SOURCE OF EMERGENCY BACK-UP POWER. EXIT SIGNS MUST BE INTERNALLY ILLUMINATED, THE WORD "EXIT" SHALL BE LETTERED IN GREEN WITH OPAQUE BACKGROUND. U.F.C. SEC. 1212.4 AND U.B.C. SEC. 1013.3.
2. PROVIDE TWO SEPARATE SOURCES OF POWER FOR EXIT SIGNS CONFORMING TO CODE SECTIONS U.B.C. SEC. 1013.4, U.F.C. 1212.5. PROVIDE EXIT ILLUMINATION, CONNECTED TO A SOURCE OF EMERGENCY BACK-UP POWER, IN ROOMS AND PORTIONS OF THE EXIT SYSTEM THAT SERVE/CONTAIN AN OCCUPANT LOAD OF100 OR MORE OCCUPANTS.

REGISTERED ARCHITECT
CERTIFICATE NO.
49199
IAN MATTHEW REGAN
DATE SIGNED 03/31/21
ARIZONA
Expires 3/31/2021

ADVANTECH
FACILITY DESIGN INC
ARCHITECTURE - ENGINEERING
3280 E. HEMISPHERE LOOP STE. 110 TUCSON AZ 85706 520-806-0903
1889 E. BROADWAY, TEMPE AZ 85258

WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

NOIR Lab

NSF

KITT PEAK - Sells, AZ 85634

△	DATE	DESCRIPTION
0	01/08/21	I.F.C.

PROJECT NUMBER:	11904.00
DRAWN BY:	FH
CHECKED BY:	IR
CAD FILE:	11904.00-G0.0
SCALE:	AS NOTED

GENERAL INFORMATION

G0.0

SECTION 01100 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY OF WORK

A. WORK CONSISTS OF PROVIDING LABOR, MATERIALS, EQUIPMENT, SERVICES, AND ADMINISTRATION REQUIRED IN CONJUNCTION WITH OR PROPERLY INCIDENTAL TO PROJECT CONSTRUCTION.
B. DRAWINGS AND PROJECT MANUALS INDICATE BASIC QUALITY OF MATERIALS AND QUALITY OF CONSTRUCTION.
C. PROVIDE ITEMS REQUIRED FOR COMPLETE OPERATING SYSTEMS, INCLUDING ITEMS NOT NECESSARILY SPECIFIED OR SHOWN IN THESE DOCUMENTS, BUT THAT CAN BE REASONABLY INFERRED AS BEING NECESSARY.

1.2 CONSTRUCTION SEQUENCE

A. COORDINATE ALL WORK WITH OWNER PRIOR TO INITIATION OF WORK.

1.3 WORK RESTRICTIONS

A. COORDINATE USE OF PREMISES WITH OWNER.
B. ASSUME RESPONSIBILITY FOR PROTECTION AND SAFEKEEPING OF PRODUCTS STORED ON SITE UNDER THIS CONTRACT.
C. MOVE STORED PRODUCTS THAT INTERFERE WITH OPERATIONS OF OWNER OR SEPARATE CONTRACTORS.
D. CONDUCT OPERATIONS TO ENSURE LEAST INCONVENIENCE TO PUBLIC AND TO OCCUPIED AREAS.
E. OBTAIN AND PAY FOR USE OF ADDITIONAL STORAGE OR STAGING AREAS NEEDED FOR OPERATIONS.
F. DO NOT LOAD STRUCTURE WITH WEIGHT THAT WOULD JEOPARDIZE ITS SAFETY.
G. OWNER OCCUPANCY:
   1. OWNER WILL FULLY OCCUPY PREMISES DURING ENTIRE CONSTRUCTION PERIOD.
   2. COOPERATE WITH OWNER DURING CONSTRUCTION OPERATIONS TO MINIMIZE CONFLICTS AND TO FACILITATE OWNER USAGE.
   3. PERFORM WORK TO AVOID INTERFERENCE AND TO MINIMIZE INCONVENIENCE WITH OWNER OPERATIONS.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

SECTION 01330 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUBMITTAL PROCEDURES

A. SCHEDULE SUBMITTALS TO EXPEDITE PROJECT IN ACCORDANCE WITH APPROVED CONSTRUCTION PROGRESS SCHEDULES AND IN SUCH SEQUENCE AS TO CAUSE NO DELAY IN THE WORK OR IN THE ACTIVITIES OF OWNER OR OF SEPARATE CONTRACTORS.
B. DELIVER SUBMITTALS TO OWNER AND ARCHITECT'S OFFICE.
C. IDENTIFY PROJECT, CONTRACTOR, SUBCONTRACTOR OR SUPPLIER, PERTINENT DRAWING SHEETS AND DETAIL NUMBERS, AND SPECIFICATION SECTION NUMBER, AS APPROPRIATE.
D. APPLY CONTRACTOR'S STAMP, SIGN OR INITIAL AND DATE CERTIFYING THAT REVIEW, VERIFICATION OF PRODUCTS, FIELD DIMENSIONS, ADJACENT CONSTRUCTION WORK, AND COORDINATION OF INFORMATION, IS IN ACCORDANCE WITH REQUIREMENTS OF WORK AND CONTRACT DOCUMENTS.
E. SUBMITTALS WILL BE RETURNED WITHOUT PROCESSING IF THEY HAVE NOT BEEN REVIEWED AND STAMPED BY CONTRACTOR FOR COORDINATION OF WORK AND CONFORMANCE WITH THE DRAWINGS AND SPECIFICATIONS PRIOR TO SUBMISSION TO ARCHITECT; IF THEY ARE NOT INITIALED OR SIGNED BY AUTHORIZED PERSON; IF THEY ARE NOT DATED; OR IF IT BECOMES EVIDENT THAT THEY HAVE NOT BEEN PROPERLY REVIEWED. DELAYS RESULTING THEREFROM ARE NOT RESPONSIBILITY OF ARCHITECT.
F. CLEARLY IDENTIFY ON SUBMITTALS, OR IN WRITING AT TIME OF SUBMISSION, DEVIATIONS IN SUBMITTALS FROM REQUIREMENTS OF CONTRACT DOCUMENTS.
G. DO NOT PERFORM WORK ON ANY ELEMENT REQUIRING SUBMITTAL AND REVIEW OF SHOP DRAWINGS, PRODUCT DATA, SAMPLES, OR OTHER SIMILAR SUBMITTALS UNTIL RESPECTIVE SUBMITTAL HAS BEEN APPROVED BY ARCHITECT.
H. MAINTAIN IN FIELD OFFICE A COPY OF SUBMITTAL SCHEDULE AND LOG OF SUBMITTALS INDICATING CURRENT STATUS OF EACH ITEM.

1.2 PRODUCT DATA
A. SUBMIT QUANTITY OF COPIES REQUIRED BY CONTRACTOR, PLUS 1 COPY TO BE RETAINED BY ARCHITECT.
B. MARK EACH COPY TO IDENTIFY APPLICABLE PRODUCTS, MODELS, OPTIONS, AND OTHER DATA.
   1. SUPPLEMENT MANUFACTURERS' STANDARD DATA TO PROVIDE INFORMATION UNIQUE TO PROJECT.
   2. DELETE INAPPLICABLE DATA.
   3. PLACE APPLICABLE SPECIFICATION SECTION PARAGRAPH NUMBER ON EACH SHEET OF PRODUCT DATA.

1.3 ARCHITECT REVIEW
A. ARCHITECT WILL REVIEW CONSTRUCTION PROGRESS SCHEDULES, SUBMITTAL SCHEDULES, PRODUCT LISTS, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES AND RETURN WITHIN 5 WORKING DAYS OF RECEIPT.
B. DO NOT MAKE "MASS" SUBMITTALS (6 OR MORE SUBMITTALS) TO ARCHITECT AT ONE TIME. IF MASS SUBMITTALS ARE RECEIVED, ARCHITECT'S REVIEW TIME STATED ABOVE WILL BE EXTENDED AS NECESSARY TO PERFORM PROPER REVIEW. ARCHITECT WILL REVIEW MASS SUBMITTALS BASED UPON PRIORITY DETERMINED BY ARCHITECT AFTER CONSULTATION WITH OWNER AND CONTRACTOR
C. ARCHITECT'S REVIEW OF SUBMITTALS IS FOR LIMITED PURPOSE OF CHECKING FOR CONFORMANCE WITH INFORMATION GIVEN AND DESIGN CONCEPT EXPRESSED IN CONTRACT DOCUMENTS. ARCHITECT'S REVIEW AND APPROVAL OF SUBMITTALS DOES NOT RELIEVE CONTRACTOR OF RESPONSIBILITY FOR DEVIATIONS FROM CONTRACT DOCUMENT REQUIREMENTS AND DOES NOT INDICATE ACCEPTANCE OF CHANGES IN CONTRACT TIME OR COST.
D. SUBMITTALS STAMPED "NO EXCEPTION NOTED: WORK COVERED BY SUBMITTAL MAY PROCEED, PROVIDED IT COMPLIES WITH CONTRACT DOCUMENTS. FINAL PAYMENT DEPENDS ON THAT COMPLIANCE.
E. SUBMITTALS STAMPED "EXCEPTIONS NOTED AS INDICATED": WORK COVERED BY SUBMITTAL MAY PROCEED, PROVIDED IT COMPLIES WITH NOTATIONS OR CORRECTIONS ON SUBMITTAL AND WITH CONTRACT DOCUMENTS. FINAL PAYMENT DEPENDS ON THAT COMPLIANCE.
   1. IF FOR ANY REASON NOTED CORRECTIONS AND MODIFICATIONS CAN NOT BE FULLY COMPLIED WITH, RESUBMIT FOR REVIEW REQUESTING CLARIFICATION; DO NOT PROCEED WITH AFFECTED WORK.
F. SUBMITTALS STAMPED "CORRECT AS SHOWN IN RED": DO NOT PROCEED WITH WORK COVERED BY SUBMITTAL. REVISE SUBMITTAL IN ACCORDANCE WITH NOTATIONS, AND RESUBMIT WITHOUT DELAY TO OBTAIN A DIFFERENT ACTION MARKING.
G. SUBMITTALS STAMPED "UNACCEPTABLE" DO NOT PROCEED WITH WORK COVERED BY SUBMITTAL. REVISE SUBMITTAL TO COMPLY WITH CONTRACT DOCUMENTS, AND RESUBMIT WITHOUT DELAY TO OBTAIN A DIFFERENT ACTION MARKING.
H. SUBMITTAL APPROVAL DOES NOT AUTHORIZE CHANGES TO CONTRACT REQUIREMENTS UNLESS ACCOMPANIED BY A CHANGE ORDER, ARCHITECT'S SUPPLEMENTAL INSTRUCTION, OR CONSTRUCTION CHANGE DIRECTIVE.
I. SUBMITTALS WHICH ARE UNSOLICITED WILL BE RETURNED WITHOUT ACTION TAKEN.

PART 2 _ PRODUCTS

NOT USED

PART 3 _ EXECUTION

NOT USED

SECTION 01735 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES INCIDENTAL CUTTING, FITTING, AND PATCHING WITHIN NEW CONSTRUCTION REQUIRED TO COMPLETE WORK OR TO MAKE ITS SEVERAL PARTS FIT TOGETHER.

1.2 SUBMITTALS
A. SUBMIT WRITTEN REQUEST TO PERFORM CUTTING AND PATCHING 2 WEEKS IN ADVANCE OF CUTTING OR ALTERATION WHICH AFFECTS:
   1. STRUCTURAL VALUE OR INTEGRITY OF ANY ELEMENT OF PROJECT.
   2. INTEGRITY OR EFFECTIVENESS OF WEATHER EXPOSED OR MOISTURE RESISTANT ELEMENTS OR SYSTEMS.
   3. EFFICIENCY, OPERATION, MAINTENANCE, OR SAFETY OF OPERATIONAL EQUIPMENT.
   4. VISUAL QUALITIES OF ELEMENTS EXPOSED TO VIEW.
B. COMPLY WITH ALL OWNER AND ARCHITECT REQUIREMENTS PRIOR TO INITIATION OF WORK.
C. INCLUDE IN REQUEST:
   1. IDENTIFICATION OF PROJECT AND LOCATION AND DESCRIPTION OF AFFECTED WORK.
   2. DESCRIPTION OF PROPOSED WORK:
      a. SCOPE OF CUTTING, FITTING, PATCHING, OR ALTERATION.
      b. LISTING OF APPLICABLE TRADES.
      c. PROPOSED PRODUCTS AND MATERIALS.
      d. EXTENT OF REFINISHING.
   3. NECESSITY FOR CUTTING OR ALTERATION.
   4. ALTERNATIVES TO CUTTING AND PATCHING.
   5. EFFECT ON STRUCTURAL, WEATHERPROOF INTEGRITY OF WORK.
   6. EFFECT ON THE BUILDING'S APPEARANCE AND SIGNIFICANT VISUAL ELEMENTS.
   7. LIST UTILITIES AFFECTED BY CUTTING AND PATCHING.
   8. DATE AND TIME OF EXECUTION.
D. SHOULD CONDITIONS OR SCHEDULE REQUIRE CHANGE OF PRODUCTS OR METHODS DIFFERENT THAN ORIGINAL INSTALLATION, SUBMIT WRITTEN RECOMMENDATION TO ARCHITECT EXPLAINING CONDITIONS NECESSITATING CHANGE AND REQUIREMENTS OF ALTERNATIVE MATERIALS OR METHODS.
E. APPROVAL BY ARCHITECT TO PROCEED WITH CUTTING AND PATCHING DOES NOT WAIVE ARCHITECT'S RIGHT TO LATER REQUIRE COMPLETE REMOVAL AND REPLACEMENT OF UNSATISFACTORY WORK.

PART 2 _ PRODUCTS
2.1 MATERIALS
A. PRIMARY PRODUCTS AND MATERIALS: THOSE REQUIRED FOR ORIGINAL INSTALLATION; COMPLY WITH SPECIFICATIONS FOR EACH SPECIFIC PRODUCT INVOLVED.

PART 3 _ EXECUTION
3.1 EXAMINATION
A. AFTER UNCOVERING EXISTING WORK, EXAMINE CONDITIONS AFFECTING INSTALLATION OF PRODUCTS AND PERFORMANCE OF WORK.

3.2 PREPARATION
A. PROVIDE TEMPORARY SUPPORTS TO ENSURE STRUCTURAL INTEGRITY OF AFFECTED PORTIONS OF WORK.
B. PROVIDE DEVICES AND METHODS TO PROTECT OTHER PORTIONS OF PROJECT FROM DAMAGE.
C. PROVIDE PROTECTION FROM ELEMENTS FOR AREAS WHICH MAY BE EXPOSED BY UNCOVERING WORK; MAINTAIN EXCAVATIONS FREE OF WATER.
D. PROVIDE MATERIALS AND CONTROL OPERATIONS TO PREVENT SPREAD OF DUST IN SURROUNDING AREA. PROVIDE DROP CLOTHS OR OTHER SUITABLE BARRIERS.
E. AVOID INTERFERENCE WITH USE OF ADJOINING AREAS OR INTERRUPTION OF FREE PASSAGE TO ADJOINING AREAS.
F. AVOID CUTTING IN SERVICE PIPES, DUCTS, OR CONDUIT UNTIL PROVISIONS HAVE BEEN MADE TO BYPASS THEM.

3.3 PERFORMANCE
A. CUT INTO CONSTRUCTION TO PROVIDE FOR INSTALLATION OF OTHER WORK AND SUBSEQUENT FITTING AND PATCHING REQUIRED TO RESTORE SURFACE TO ORIGINAL CONDITION.
B. CUT, FIT, PATCH, EXCAVATE, AND BACKFILL TO COMPLETE WORK AND TO:
   1. FIT SEVERAL PARTS TOGETHER, TO INTEGRATE WITH OTHER WORK.
   2. UNCOVER PORTIONS OF WORK TO PROVIDE FOR INSTALLATION OF ILL_TIMED WORK.
   3. REMOVE AND REPLACE DEFECTIVE WORK.
   4. REMOVE AND REPLACE WORK NOT CONFORMING TO REQUIREMENTS OF CONTRACT DOCUMENTS.
   5. REMOVE SAMPLES OF INSTALLED WORK AS NECESSARY FOR TESTING.
   6. PROVIDE OPENINGS IN ELEMENTS OF WORK FOR PENETRATIONS OF PLUMBING, MECHANICAL, AND ELECTRICAL WORK.
   7. UNCOVER WORK TO ALLOW FOR ARCHITECT'S OBSERVATION OF COVERED WORK WHICH HAS BEEN COVERED UP PRIOR TO REQUIRED OBSERVATION BY ARCHITECT.
C. EXECUTE IN MANNER WHICH DOES NOT VOID REQUIRED OR EXISTING WARRANTIES.
D. EXECUTE BY METHODS WHICH WILL PREVENT DAMAGE TO OTHER WORK AND WHICH WILL PRODUCE APPROPRIATE SURFACES TO RECEIVE INSTALLATION OF NEW WORK:
   1. USE HAND OR SMALL POWER TOOLS DESIGNED FOR SAWING OR GRINDING, NOT HAMMERING OR CHOPPING.
   2. CUT HOLES AND SLOTS AS SMALL AS POSSIBLE, NEATLY TO SIZE REQUIRED, WITH MINIMUM DISTURBANCE OF ADJACENT SURFACES.
   3. TEMPORARILY COVER OPENINGS WHEN NOT IN USE.
   4. TO AVOID MARRING EXISTING FINISHED SURFACES, CUT OR DRILL FROM EXPOSED OR FINISHED SIDE INTO CONCEALED SURFACES.
E. DO NOT CUT AND PATCH STRUCTURAL ELEMENTS IN MANNER THAT WOULD RESULT IN REDUCTION OF LOAD CARRYING CAPACITY OR OF LOAD DEFLECTION RATIO.
F. DO NOT CUT AND PATCH OPERATIONAL ELEMENTS OR SAFETY RELATED COMPONENTS IN MANNER THAT WOULD RESULT IN REDUCTION OF THEIR CAPACITY TO PERFORM IN MANNER INTENDED, INCLUDING ENERGY PERFORMANCE, THAT WOULD RESULT IN INCREASED MAINTENANCE, DECREASED OPERATIONAL LIFE, OR DECREASED SAFETY.
G. AT PENETRATIONS OF FIRE_RATED ASSEMBLIES, COMPLETELY SEAL WITH FIRESTOPS IN ACCORDANCE WITH APPLICABLE CODE.
H. WHERE UTILITIES ARE TO BE REMOVED, RELOCATED, OR ABANDONED, BY-PASS BEFORE CUTTING. CUT-OFF PIPE OR CONDUIT IN WALLS OR PARTITIONS TO BE REMOVED. CAP, VALVE, OR PLUG AND SEAL THE REMAINING PORTION OF PIPE, DUCT, OR CONDUIT TO PREVENT ENTRANCE OF MOISTURE OR MATTER AFTER BY_PASSING AND CUTTING.
I. RESTORE EXPOSED FINISHES OF PATCHED AREAS TO MATCH ADJACENT SURFACE AND WHERE NECESSARY EXTEND FINISH RESTORATION INTO ADJACENT SURFACES IN MANNER WHICH WILL ELIMINATE EVIDENCE OF PATCHING AND REFINISHING TO MATCH EXISTING.

SECTION 01740 - CLEANING

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES: CONSTRUCTION AND FINAL CLEANING PRIOR TO CERTIFICATION OF SUBSTANTIAL COMPLETION.
B. EXECUTE CLEANING DURING PROGRESS OF WORK AND AT COMPLETION OF WORK AS REQUIRED BY THIS SECTION AND THE CONDITIONS OF THE CONTRACT.
C. HAZARDS CONTROL:
   1. STORE VOLATILE WASTES IN COVERED SAFETY CONTAINERS.
   2. REMOVE CONTAINERS FROM PREMISES DAILY.
   3. PREVENT ACCUMULATION OF WASTE WHICH CREATES HAZARDOUS CONDITIONS.
   4. PROVIDE ADEQUATE VENTILATION DURING USE OF VOLATILE OR NOXIOUS SUBSTANCES.
D. CONDUCT CLEANING AND DISPOSAL OPERATIONS TO COMPLY WITH LOCAL ORDINANCES, OWNERS REQUIREMENTS AND ANTI_POLLUTION LAWS.
   1. DO NOT BURN OR BURY RUBBISH AND WASTE MATERIALS ON PROJECT SITE.
   2. DO NOT DISPOSE OF VOLATILE WASTES OR HAZARDOUS MATERIALS SUCH AS MINERAL SPIRITS, OIL, OR PAINT THINNER IN STORM OR SANITARY DRAINS.
   3. DO NOT DISPOSE OF WASTES INTO STREAMS OR WATERWAYS.

PART 2 - PRODUCTS

2.1 CLEANING MATERIALS
A. USE ONLY MATERIALS AND METHODS RECOMMENDED BY MANUFACTURER OF MATERIAL BEING CLEANED.
B. DO NOT USE MATERIALS WHICH WILL CREATE HAZARDS TO HEALTH OR PROPERTY, OR WHICH WILL DAMAGE SURFACES.
C. PROVIDE COVERED CONTAINERS FOR DEPOSIT OF WASTE MATERIALS, DEBRIS, AND RUBBISH.

PART 3 - EXECUTION

3.1 CLEANING DURING CONSTRUCTION
A. EXECUTE PERIODIC CLEANING TO KEEP BUILDING, SITE, AND ADJACENT PROPERTIES FREE OF ACCUMULATIONS OF WASTE MATERIALS, DEBRIS, RUBBISH, AND WIND BLOWN DEBRIS RESULTING FROM CONSTRUCTION OPERATIONS.
B. PRIOR TO SUBSTANTIAL COMPLETION REMOVE CONSTRUCTION TOOLS, SCAFFOLDING, EQUIPMENT, MACHINERY, AND SURPLUS MATERIALS.
C. BROOM CLEAN AND VACUUM INTERIOR AREAS PRIOR TO START OF SURFACE FINISHING, AND CONTINUE CLEANING TO ELIMINATE DUST.
D. SCHEDULE CLEANING OPERATIONS SO THAT DUST AND OTHER CONTAMINANTS WILL NOT FALL ON OR ADHERE TO WET OR NEWLY_COATED SURFACES.
E. REMOVE DEBRIS AND RUBBISH FROM PIPE CHASES, PLENUMS, ATTICS, CRAWL SPACES, AND OTHER CLOSED OR REMOTE SPACES, PRIOR TO ENCLOSING SPACE.
F. DO NOT THROW MATERIALS FROM HEIGHTS.
G. COMPLY WITH MANUFACTURER'S INSTRUCTIONS.
H. REMOVE TOOLS, CONSTRUCTION EQUIPMENT, MACHINERY, AND SURPLUS MATERIAL FROM PROJECT SITE.
I. EMPLOY EXPERIENCED PERSONNEL OR PROFESSIONAL CLEANING FIRM.
J. CLEANING:
   1. CLEAN EXPOSED EXTERIOR AND INTERIOR HARD_SURFACED FINISHES TO DIRT_FREE CONDITION, FREE OF STAINS, FILMS, AND SIMILAR FOREIGN SUBSTANCES.
   2. REMOVE LABELS WHICH ARE NOT REQUIRED AS PERMANENT LABELS.
   3. CLEAN GLOSSY MATERIALS TO POLISHED CONDITION; REMOVE FOREIGN SUBSTANCES.
   4. CLEAN CONCRETE FLOORS IN UNOCCUPIED SPACES.
   5. CLEAN RESILIENT FLOORING, STONE FLOORING, TILE, PAVERS, AND OTHER SIMILAR HARD_SURFACE FLOORING, INCLUDING ASSOCIATED BASES. REFER TO INDIVIDUAL SPECIFICATION SECTIONS FOR REQUIREMENTS OF SEALING, BUFFING, WAXING, AND POLISHING.
   6. CLEAN EXPOSED SURFACES OF EQUIPMENT; REMOVE EXCESS LUBRICATION.
   7. CLEAN PLUMBING FIXTURES, DRINKING FOUNTAINS, AND SIMILAR EQUIPMENT TO SANITARY CONDITION.
K. AVOID DISTURBING NATURAL WEATHERING OF EXTERIOR SURFACES.
L. SITE:
   1. CLEAN AREAS DISTURBED BY CONSTRUCTION ACTIVITIES, INCLUDING LANDSCAPE AREAS, FREE OF RUBBISH, LITTER AND FOREIGN SUBSTANCES.
   2. SWEEP PAVED AREAS TO BROOM CLEAN CONDITION.
   3. REMOVE STAINS, SPILLS, AND OTHER FOREIGN DEPOSITS.
M. REMOVE WASTE, FOREIGN MATTER, AND DEBRIS FROM ROOFS, GUTTERS, AREAWAYS, AND DRAINAGE SYSTEMS.
N. PRIOR TO FINAL COMPLETION, CONDUCT INSPECTION OF SIGHT_EXPOSED INTERIOR SURFACES, EXTERIOR SURFACES, AND ASSOCIATED WORK AREAS TO VERIFY THAT ENTIRE WORK IS CLEAN.
O. MAINTAIN CLEANING UNTIL PROJECT, OR PORTION THEREOF, IS ACCEPTED BY OWNER.

SECTION 01770 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 PREREQUISITES TO SUBSTANTIAL COMPLETION
A. COMPLETE ITEMS IN FOLLOWING PARAGRAPHS BEFORE REQUESTING CERTIFICATION OF SUBSTANTIAL COMPLETION, EITHER FOR ENTIRE WORK OR FOR PORTIONS OF WORK.
B. CONDUCT INSPECTION TO SUBSTANTIATE BASIS FOR REQUEST THAT WORK IS SUBSTANTIALLY COMPLETE. CREATE COMPREHENSIVE LIST (INITIAL PUNCH LIST) INDICATING ITEMS TO BE COMPLETED OR CORRECTED, VALUE OF INCOMPLETE OR NON-CONFORMING WORK, REASON FOR BEING INCOMPLETE, AND DATE OF ANTICIPATED COMPLETION FOR EACH ITEM. INCLUDE COPY OF LIST WITH REQUEST FOR CERTIFICATE OF SUBSTANTIAL COMPLETION.
C. SUBMIT STATEMENT SHOWING ACCOUNTING OF CHANGES TO CONTRACT SUM.
D. ADVISE OWNER OF PENDING INSURANCE CHANGE_OVER REQUIREMENTS AT FINAL PAYMENT.
E. OBTAIN AND SUBMIT RELEASES ENABLING OWNER'S FULL, UNRESTRICTED USE OF PROJECT AND ACCESS TO SERVICES AND UTILITIES. INCLUDE CERTIFICATE OF OCCUPANCY, OPERATING CERTIFICATES, AND SIMILAR RELEASES FROM AUTHORITIES HAVING JURISDICTION AND UTILITY COMPANIES.
F. SUBMIT PROJECT RECORD DOCUMENTS IN COMPLIANCE WITH SECTION 01780, MAINTENANCE MANUALS, AND OTHER SIMILAR FINAL RECORD DATA.
G. DELIVER TOOLS, SPARE PARTS, EXTRA STOCKS OF MATERIAL, AND SIMILAR PHYSICAL ITEMS TO OWNER.
H. COMPLETE FACILITY STARTUP, TESTING, ADJUSTING, AND BALANCING OF SYSTEMS AND EQUIPMENT, DEMONSTRATIONS, AND INSTRUCTIONS TO OWNER'S OPERATING AND MAINTENANCE PERSONNEL.
I. PERFORM FINAL CLEANING.
J. TOUCH_UP AND OTHERWISE REPAIR AND RESTORE MARRED EXPOSED FINISHES.

1.2 SUBSTANTIAL COMPLETION REVIEW
A. WHEN CONTRACTOR CONSIDERS WORK TO BE SUBSTANTIALLY COMPLETE, SUBMIT TO ARCHITECT:
   1. WRITTEN CERTIFICATE THAT WORK, OR DESIGNATED PORTION, IS SUBSTANTIALLY COMPLETE.
   2. LIST OF ITEMS TO BE COMPLETED OR CORRECTED (INITIAL PUNCH LIST).

B. WITHIN 7 DAYS AFTER RECEIPT OF REQUEST FOR SUBSTANTIAL COMPLETION, ARCHITECT AND OWNER WILL MAKE SITE REVIEW TO DETERMINE WHETHER WORK OR DESIGNATED PORTION IS SUBSTANTIALLY COMPLETE FOLLOWING PROCEDURES INDICATED IN CONDITIONS OF THE CONTRACT.

C. SHOULD ARCHITECT [OWNER] DETERMINE THAT WORK IS NOT SUBSTANTIALLY COMPLETE:
   1. ARCHITECT [OWNER] WILL PROMPTLY NOTIFY CONTRACTOR IN WRITING, STATING REASONS FOR ITS OPINION.
   2. CONTRACTOR SHALL REMEDY DEFICIENCIES IN WORK AND SEND SECOND WRITTEN REQUEST FOR SUBSTANTIAL COMPLETION TO ARCHITECT [OWNER].
   3. ARCHITECT [OWNER] WILL RE-PERFORM REVIEW OF WORK.

D. WHEN ARCHITECT [OWNER] FINDS THAT WORK IS SUBSTANTIALLY COMPLETE, ARCHITECT [OWNER] WILL:
   1. PREPARE CERTIFICATE OF SUBSTANTIAL COMPLETION ON AIA FORM G704, ACCOMPANIED BY CONTRACTOR'S LIST OF ITEMS TO BE COMPLETED OR CORRECTED AS VERIFIED AND AMENDED BY ARCHITECT AND OWNER (FINAL PUNCH LIST).
   2. SUBMIT CERTIFICATE TO OWNER AND CONTRACTOR FOR THEIR WRITTEN ACCEPTANCE OF RESPONSIBILITIES ASSIGNED TO THEM IN THE CERTIFICATE.
   3. THE PROJECT WILL NOT BE DEEMED SUBSTANTIALLY COMPLETE UNTIL THE CERTIFICATE IS ISSUED IRRESPECTIVE OF OWNER OCCUPANCY.
E. AFTER WORK IS SUBSTANTIALLY COMPLETE, CONTRACTOR SHALL:
   1. ALLOW OWNER OCCUPANCY OF PROJECT UNDER PROVISIONS STATED IN CERTIFICATE OF SUBSTANTIAL COMPLETION.
   2. COMPLETE WORK LISTED FOR COMPLETION OR CORRECTION WITHIN TIME PERIOD STIPULATED.

1.3 PREREQUISITES FOR FINAL COMPLETION
A. COMPLETE ITEMS IN FOLLOWING PARAGRAPHS BEFORE REQUESTING FINAL ACCEPTANCE AND FINAL PAYMENT. LIST KNOWN EXCEPTIONS, IF ANY, IN REQUEST.
B. WHEN CONTRACTOR CONSIDERS WORK TO BE COMPLETE, SUBMIT WRITTEN CERTIFICATION THAT:
   1. CONTRACT DOCUMENTS HAVE BEEN REVIEWED.
   2. WORK HAS BEEN EXAMINED FOR COMPLIANCE WITH CONTRACT DOCUMENTS.
   3. WORK HAS BEEN COMPLETED IN ACCORDANCE WITH CONTRACT DOCUMENTS.
   4. WORK IS COMPLETED AND READY FOR FINAL INSPECTION.
C. SUBMIT FINAL PUNCH LIST INDICATING ALL ITEMS HAVE BEEN COMPLETED OR CORRECTED.
D. SUBMIT FINAL PAYMENT REQUEST WITH FINAL RELEASES AND SUPPORTING DOCUMENTATION NOT PREVIOUSLY SUBMITTED AND ACCEPTED. INCLUDE CERTIFICATES OF INSURANCE FOR PRODUCTS AND COMPLETED OPERATIONS WHERE REQUIRED.
E. SUBMIT SPECIFIED WARRANTIES, WORKMANSHIP/MAINTENANCE BONDS, MAINTENANCE AGREEMENTS, AND OTHER SIMILAR DOCUMENTS IN ACCORDANCE WITH SECTION 01780.
F. SUBMIT UPDATED ACCOUNTING STATEMENT FOR FINAL CHANGES TO CONTRACT SUM.
G. SUBMIT CONSENT OF SURETY TO FINAL PAYMENT.
H. PERFORM FINAL CLEANING FOR CONTRACTOR SOILED AREAS IN ACCORDANCE WITH SECTION 01740.

1.4 FINAL COMPLETION REVIEW
A. WITHIN 7 DAYS AFTER RECEIPT OF REQUEST FOR FINAL REVIEW, ARCHITECT [OWNER] WILL MAKE SITE REVIEW TO DETERMINE WHETHER WORK OR DESIGNATED PORTION IS COMPLETE FOLLOWING PROCEDURES INDICATED IN CONDITIONS OF THE CONTRACT.

B. SHOULD ARCHITECT [OWNER] CONSIDER WORK TO BE INCOMPLETE OR DEFECTIVE:
   1. ARCHITECT [OWNER] WILL PROMPTLY NOTIFY CONTRACTOR, IN WRITING, LISTING INCOMPLETE OR DEFECTIVE WORK.
   2. CONTRACTOR SHALL TAKE IMMEDIATE STEPS TO REMEDY STATED DEFICIENCIES AND SEND SECOND WRITTEN REQUEST TO ARCHITECT [OWNER] THAT WORK IS COMPLETE.
   3. ARCHITECT [OWNER] WILL REINSPECT WORK.

1.5 REVISITS FOR SITE REVIEWS
A. SHOULD ARCHITECT HAVE TO RE-PERFORM SITE REVIEWS DUE TO FAILURE OF WORK TO COMPLY WITH CLAIMS OF COMPLETION MADE BY CONTRACTOR, OWNER WILL REIMBURSE ARCHITECT FOR SUCH ADDITIONAL SERVICES AND WILL DEDUCT AMOUNT OF COMPENSATION FROM FINAL PAYMENT TO CONTRACTOR.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

REGISTERED ARCHITECT
CERTIFICATE NO.
49199
IAN MATTHEW
REGAN
DATE SIGNED 01-08-21
ARIZONA U.S.A.
[illegible]
Expires 3/31/2021

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WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

KITT PEAK - Sells, AZ 85634

△	DATE	DESCRIPTION
0	01/08/21	I.F.C.

PROJECT NUMBER: 11904.00
DRAWN BY: FH
CHECKED BY: IR
CAD FILE: 41960.00-G1.1
SCALE: AS NOTED

GENERAL SPECIFICATIONS

G0.1

CODE REVIEW - INTERNATIONAL BUILDING CODE 2018

CHAPTER 3 **USE AND OCCUPANCY CLASSIFICATIONS**

303.4 GROUND FLOOR: ASSEMBLY "A-3" — 7,175 S.F. GROSS

CHAPTER 5 **BUILDING HEIGHTS AND AREAS**

		REQUIRED	PROVIDED/ EXISTING
504.3	ALLOWABLE BUILDING HEIGHT:	55'-0" MAX	15'-0" AT PARKING LEVEL
	* TELESCOPE TOWER IS UNLIMITED IN HEIGHT PER SECTION 504.3 EXCEPTION		
504.4	ALLOWABLE STORIES:	2 MAX	2
506.2	ALLOWABLE BUILDING AREA:	9,500 S.F. MAX	7,175 S.F.

CHAPTER 6 **TYPES OF CONSTRUCTION:** II-B

		REQUIRED	PROVIDED/ EXISTING
TABLE 601	FIRE RESISTANCE RATING FOR BUILDING ELEMENTS		
	STRUCTURAL FRAME:	0	0
	BEARING WALLS - EXTERIOR:	0	0
	(NO EXT. BEARING WALLS THIS PROJECT)		
	BEARING WALLS - INTERIOR:	0	0
	NON-BEARING WALLS - EXTERIOR:	0	0
	NON-BEARING WALLS - INTERIOR:	0	0
	FLOOR CONSTRUCTION:	0	0
	ROOF CONSTRUCTION:	0	0

CHAPTER 8 **INTERIOR FINISHES**

		REQUIRED
TABLE 803.13	INTERIOR WALL AND CEILING FINISH REQUIREMENTS	
	'A-3' OCCUPANCY - NON-SPRINKLED	
	INTERIOR EXIST STAIRWAYS, INTERIOR EXIT RAMPS AND EXIT PASSAGEWAYS	CLASS B
	CORRIDORS AND ENCLOSURE FOR EXIT ACCESS STAIRWAYS AND EXIT ACCESS RAMPS	CLASS B
	ROOMS AND ENCLOSED SPACES	CLASS C

CHAPTER 9 **FIRE PROTECTION SYSTEMS**

903.2 AUTOMATIC SPRINKLER SYSTEMS: — NOT REQUIRED / NON PROVIDED

906 PORTABLE FIRE EXTINGUISHERS

	TYPE	MAX. FLOOR AREA PER UNIT	MAX. FLOOR AREA PER EXTINGUISHER	MAX. TRAVEL DISTANCE
LIGHT HAZARD OCCUPANCY	2-A	3,000 SF	11,250 SF	75 FT

3 TYPE 2A EXTINGUISHERS PROVIDED

CHAPTER 10 **MEANS OF EGRESS**

1004

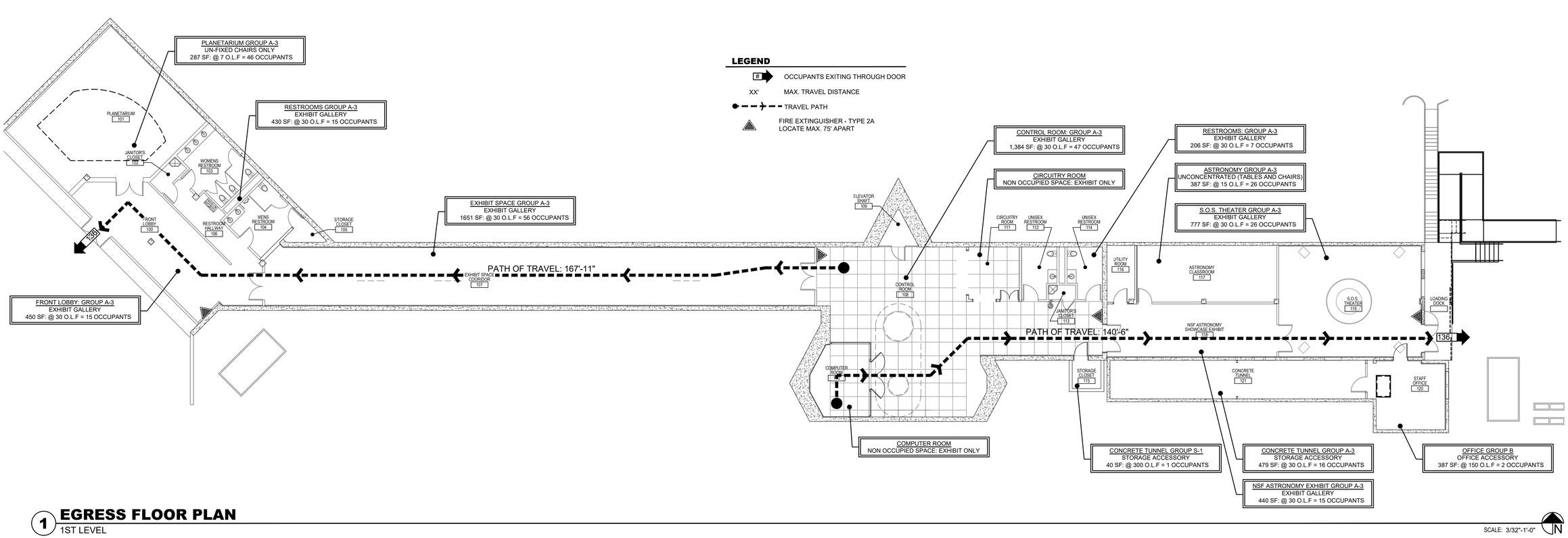
ALLOWABLE OCCUPANCY

ROOM NAME	NET S.F.	OCC.	FUNCTION OF SPACE	O.L.F.	OCC. LOAD
PLANETARIUM	322	A-3	UN-FIXED CHAIRS	7	46
FRONT LOBBY	450	A-3	EXHIBIT GALLERY	30	15
RESTROOMS	430	A-3	EXHIBIT GALLERY	30	15
EXHIBIT SPACE COORD	1,651	A-3	EXHIBIT GALLERY	30	56
CONTROL ROOM	1,387	A-3	EXHIBIT GALLERY	30	47
COMPUTER ROOM	195	A-3	UNINHABITAL EXHIBIT SPACE	0	0
RESTROOMS	206	A-3	EXHIBIT GALLERY	30	7
CIRCUITRY ROOM	129	A-3	UNINHABITAL EXHIBIT SPACE	0	0
STORAGE SPACE	40	S-1	ACCESSORY STORAGE	300	1
UTILITY ROOM	77	A-3	UNINHABITAL EXHIBIT SPACE	0	0
ASTRONOMY CLASSRO	387	A-3	UNCOCENTRATED T & C	15	26
NSF ASTONOMY EXHIBIT	440	A-3	EXHIBIT GALLERY	30	15
S.O.S. THEATER	777	A-3	UN-FIXED CHAIRS	30	26
OFFICE	234	B	ACCESSORY OFFICE	150	2
CONCRETE TUNNEL	479	A-3	UNINHABITAL EXHIBIT SPACE	30	16
	7204		**TOTAL OCCUPANCY**		272

		FACTOR	REQUIRED	PROVIDED
1005	MINIMUM EGRESS WIDTH			
	OCCUPANT LOAD: 325	0.20	65"	(2) 72"= 144"
1006.3.2	ACCESSIBLE MEANS OF EGRESS: OCCUPANT LOAD: 325 >49 & < 500		REQUIRED 2	PROVIDED 2
1017 TABLE 1017.2	EXIT ACCESS TRAVEL DISTANCE MAXIMUM TRAVEL DISTANCE:		REQUIRED 200'-0" MAX	PROVIDED 167'-11"

CHAPTER 29 **PLUMBING FIXTURES**

		REQUIRED	PROVIDED
2902.1	A-3: ASSEMBLY SPACE		
	WATER CLOSET	2-MEN 3-WOMEN	3-MEN 4-WOMEN
	LAVATORIES	1-MEN 1-WOMEN	3-MEN 4-WOMEN
	DRINKING FOUNTAINS	1 REQUIRED	3 PROVIDED
	SERVICE SINK	1 REQUIRED	2 PROVIDED



1 EGRESS FLOOR PLAN

1ST LEVEL

SCALE: 3/32"-1'-0"

REGISTERED ARCHITECT
CERTIFICATE NO. 49199
IAN MATTHEW REGAN
DATE SIGNED 03/08/21
ARIZONA
Expires 3/31/2021

ADVANTECH
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WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

NOIR Lab

NSF

KITT PEAK - Sells, AZ 85634

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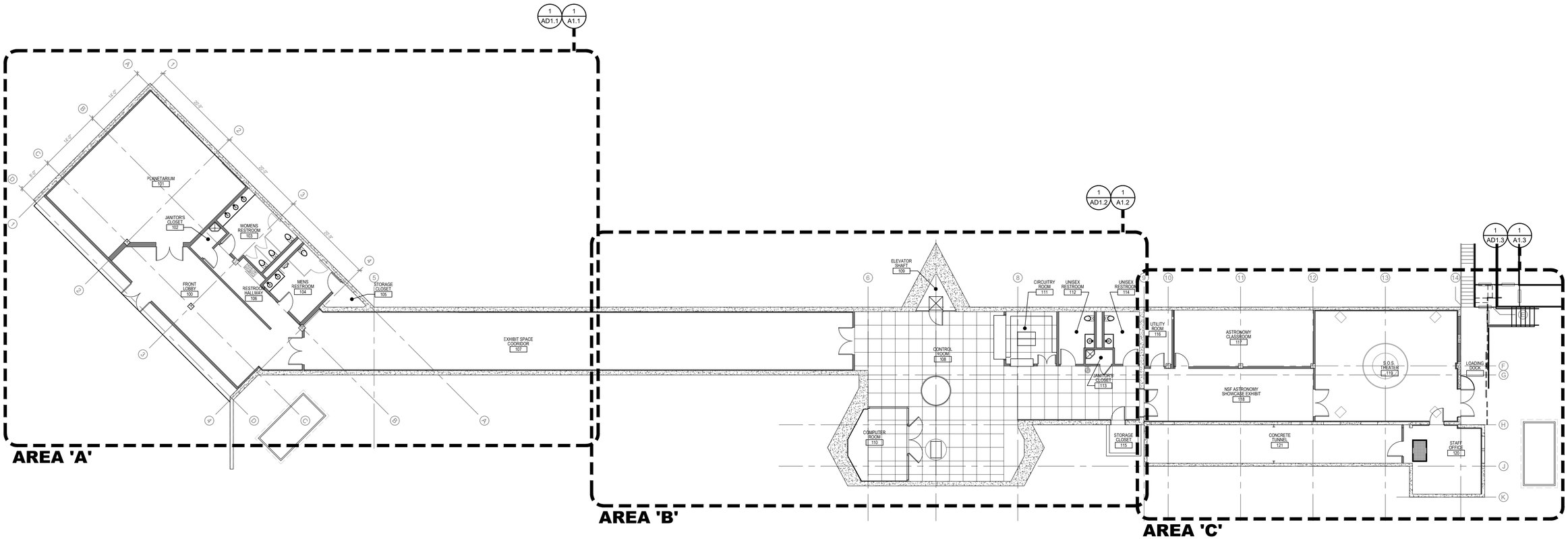
PROJECT NUMBER:	11904.00
DRAWN BY:	LM
CHECKED BY:	IR
CAD FILE:	11904.00-G1.0
SCALE:	AS NOTED

EGRESS PLAN

G1.0

DEMOLITION GENERAL NOTES:

A. REFER TO THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
B. COORDINATE ALL WORK WITH STRUCTURAL, ELECTRICAL, MECHANICAL DRAWINGS & OTHER DISCIPLINES INVOLVED.
C. VERIFY ALL FIELD CONDITIONS & DIMENSIONS, NOTIFY ARCHITECT OF ANY DISCREPANCIES PRIOR TO COMMENCEMENT OF WORK.
D. UNLESS NOTED OTHERWISE, ALL WORK DESCRIBED SHALL BE PERFORMED BY CONTRACTOR. FOR ITEMS REQUIRING OWNER DIRECTION, CONTRACTOR SHALL COORDINATE DIRECTLY WITH OWNER. THIS INCLUDES BUT IS NOT LIMITED TO FURNITURE RELOCATION, EQUIPMENT RELOCATION, I.T. ITEMS, ETC.
E. DO NOT SCALE DRAWINGS, IF DIMENSIONS ARE NOT PROVIDED, CONTACT ARCHITECT FOR CLARIFICATION.
F. CONTRACTOR TO PROVIDE DETAILED PHASING, DEBRIS, DUST CONTROL METHODS, ISOLATION, AND ACCESS TO RESTROOMS TO OWNER FOR APPROVAL PRIOR TO INITIATION OF WORK.
G. MAINTAIN A SAFE AND CLEAN WORK AREA - REMOVE ALL TRASH AND DEBRIS AT THE END OF EACH WORK SHIFT.
H. PROVIDE PERSONNEL PROTECTION FROM DEBRIS & MATERIAL FALL PER OWNER STANDARDS. INCLUDING BUT NOT LIMITED TO SCAFFOLDING FOR OVERHEAD PROTECTION WITH TOE BOARDS, & VISQUEEN DUST BARRIER.
I. CONTRACTOR TO AVOID MOVING MATERIALS OR TOOLS THROUGH OPERATING AREAS.
J. CONTRACTOR TO VERIFY AND COORDINATE WITH OWNER BEFORE DISCONNECTING OR SHUTTING OFF ANY UTILITIES DURING CONSTRUCTION.
K. COORDINATE ALL DISMANTLING, REMOVALS, STAGING, AND OTHER WORK WITH OWNER PRIOR TO INITIATION OF WORK.
L. PROVIDE TEMPORARY INDEPENDENT SUPPORT FOR SYSTEMS AND EQUIPMENT SERVING OPERATIONAL AREAS, INCLUDING BUT NOT LIMITED TO; FIRE PROTECTION, LIGHTING, PIPING, CONDUITS, ETC.
M. ALL INTERIOR AND EXTERIOR STRUCTURE IS EXISTING TO REMAIN UNLESS NOTED OTHERWISE.



1 ARCHITECTURAL COMPOSITE PLAN
1ST. LEVEL

SCALE: 3/32" = 1'-0"

REGISTERED ARCHITECT
CERTIFICATE NO. 49199
IAN MATTHEW REGAN
DATE SIGNED 01/08/21
ARIZONA U.S.A.
Expires 3/31/2021

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WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

NOIRLab | NSF

KITT PEAK - Sells, AZ 85634

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0	01/08/21	I.F.C.

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CHECKED BY:	IR
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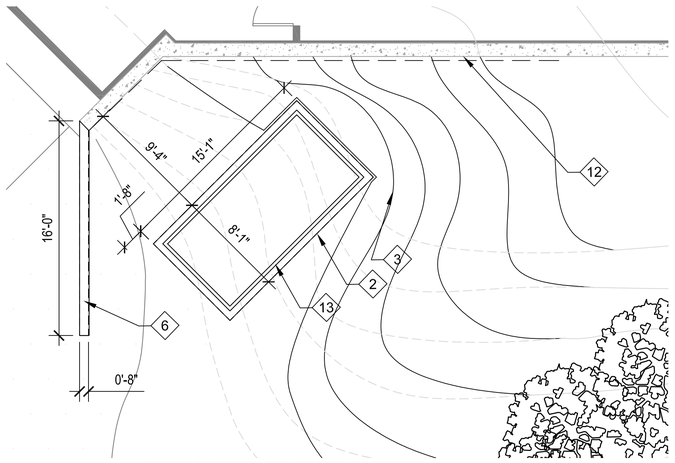
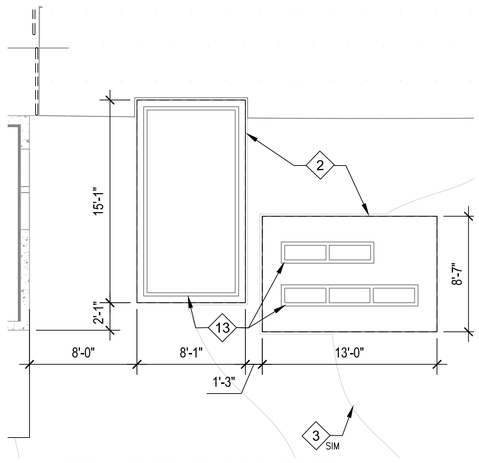
ARCHITECTURAL COMPOSITE PLAN

G2.0



2 EQUIPMENT PAD WEST
SITE

SCALE: 3/16" = 1'-0"



3 EQUIPMENT PAD EAST
SITE

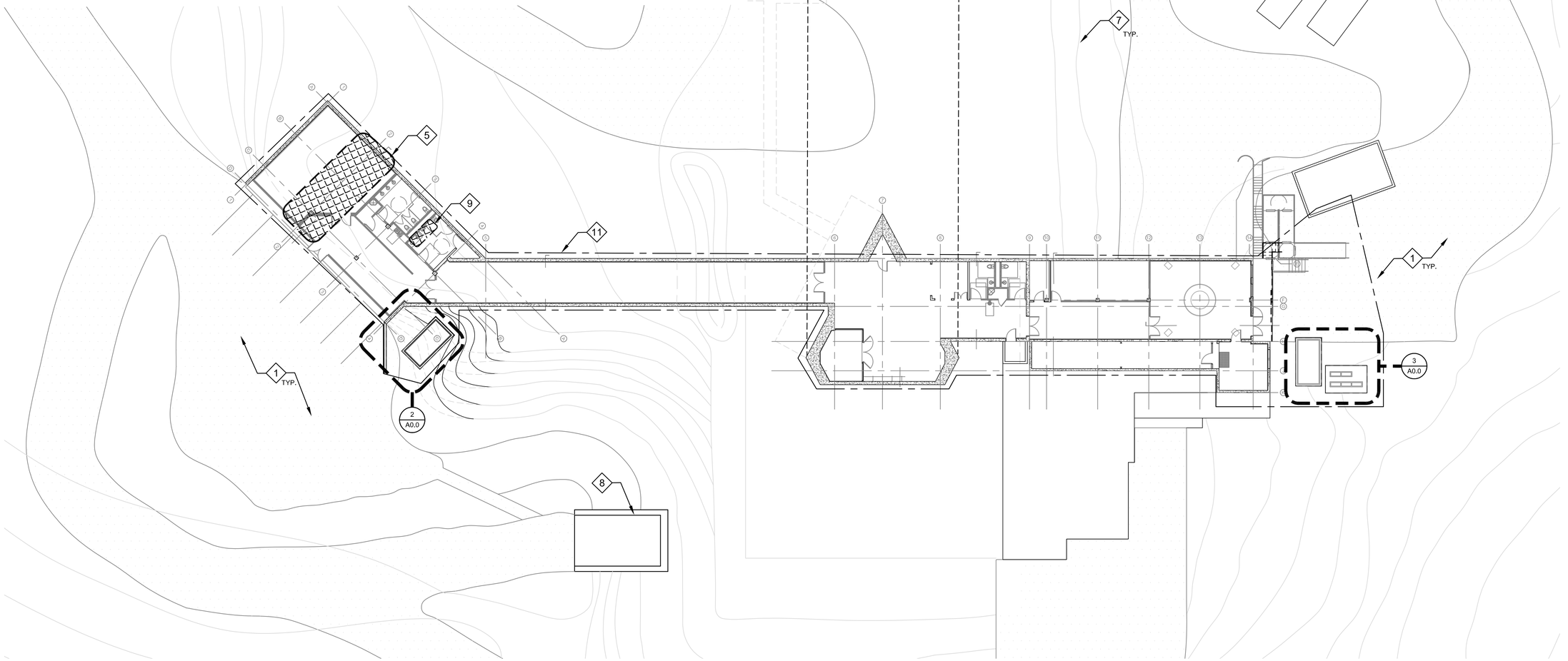
SCALE: 3/16" = 1'-0"

SITE PLAN GENERAL NOTES:

A. SEE GENERAL STRUCTURAL NOTES FOR ADDITIONAL INFORMATION, AS NEEDED. SEE SHEET S1.0
B. CONTRACTOR SHALL COORDINATE AND VERIFY DIMENSIONS AND LOCATIONS AND QUANTITY OF ANY/ALL RAISED CURBS SHOWN ON DRAWINGS WITH TANK MANUFACTURER AND PROCESS PIPING INSTALLER. IMMEDIATELY SUBMIT ANY DISCREPANCIES TO ARCHITECT.
C. DO NOT SCALE THE DRAWINGS
D. CONTRACTOR TO VERIFY CONDITIONS AND DIMENSIONS PRIOR TO CONSTRUCTION. NOTIFY ARCHITECT OF DISCREPANCIES PRIOR TO COMMENCEMENT OF THE WORK.

FLOOR PLAN KEYNOTES:

1. ASPHALT TO BE PROTECTED IN PLACE.
2. MECHANICAL EQUIPMENT PADS, SEE MECHANICAL AND STRUCTURAL DRAWINGS.
3. REMOVE EXISTING EARTHWORK AND VEGETATION, REGRADE SLOPE AS NEEDED FOR NEW EQUIPMENT PADS. PROVIDE UNGROUTED RIPRAP TO STABILIZE NEW SLOPE.
4. TELESCOPE ABOVE. PROTECT ALL METAL SIDING AS NEEDED DURING CONSTRUCTION.
5. PORTION OF EARTHWORK TO BE REMOVED OVER STRUCTURE FOR NEW BEAM INSTALL. SEE STRUCTURAL.
6. PROVIDE NEW FOUNDATION FOR NEW SIGNAGE. TBD.
7. EXISTING TOPOGRAPHY TO REMAIN.
8. ACCESS TO UNDERGROUND ALUMINIZATION ROOM TO REMAIN.
9. REMOVE EXISTING EARTHWORK AND VEGETATION AS NEEDED FOR NEW EXHAUST VENTILATION, COORDINATE WITH MECHANICAL.
10. UNDERGROUND TUNNELS, FOR REFERENCE ONLY. SEE ELECTRICAL FOR SCOPE.
11. CONTRACTOR EXTENT OF SCOPE. COORDINATE WITH OWNER FOR LAYDOWN AREAS, HOURS OF OPERATION, AND ACCESS TO SITE FOR ALL SUB-CONTRACTORS.
12. POWERWASH AND SEAL NEWLY EXPOSED CONCRETE WALL.
13. PROVIDE 12" HIGH PAINTED STEEL SUPPORT STRUCTURE UNDER HVAC EQUIPMENT. COORDINATE SIZE AND LOCATION WITH MECHANICAL UNIT. ANCHOR SUPPORT FRAME TO CONCRETE EQUIPMENT PAD W/ EPOXY ANCHORS.



1 OVERALL EXISTING SITE PLAN
GROUND LEVEL

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

REGISTERED ARCHITECT
CERTIFICATE NO.
49199
IAN MATTHEW REGAN
DATE SIGNED 01/08/21
ARIZONA U.S.A.
Expires 3/31/2021

ADVANTECH
FACILITY DESIGN INC
ARCHITECTURE - ENGINEERING
3280 E. HEMISPHERE LOOP STE. 110 TUCSON AZ 85706 520-806-0903
1889 E. BROADWAY, TEMPE AZ 85258

WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

NOIR Lab | NSF

KITT PEAK - Sells, AZ 85634

△	DATE	DESCRIPTION
0	01/08/21	I.F.C.

PROJECT NUMBER:	11904.00
DRAWN BY:	
CHECKED BY:	IR
CAD FILE:	11904.00-A0.0
SCALE:	AS NOTED

OVERALL SITE PLAN

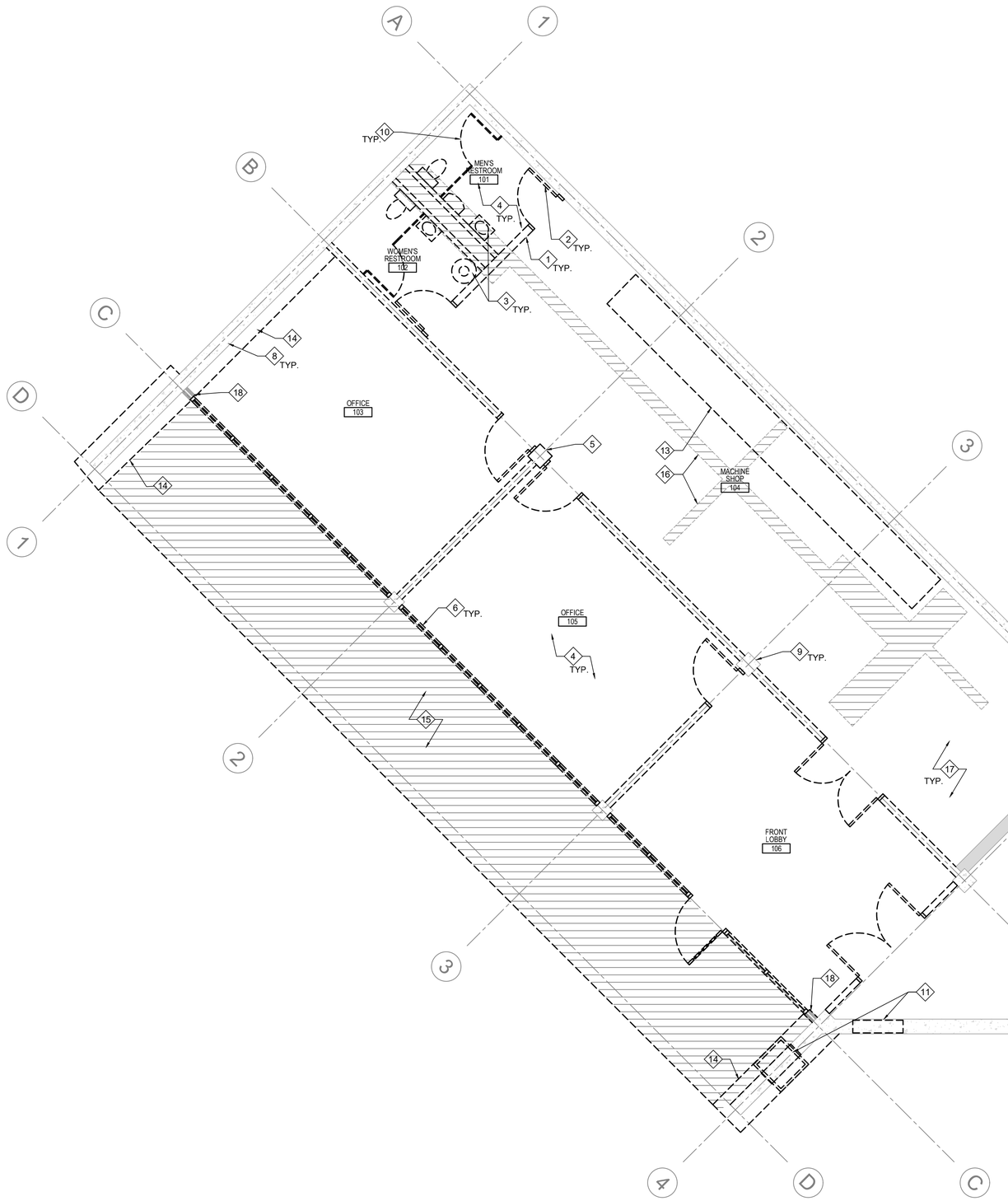
A0.0

FLOOR PLAN KEYNOTES:

1. DEMOLISH (E) WALL. PATCH AND REPAIR ADJACENT WALL WHERE ANCHORED.
2. REMOVE DOOR AND FRAME. PROTECT ADJACENT WALLS FROM DAMAGE DURING WORK.
3. DEMOLISH PLUMBING FIXTURES. SEE MECHANICAL SHEETS.
4. REMOVE FLOORING AND BASE BOARD, PREP FOR NEW FLOORING PER FINISH SCHEDULE.
5. DEMOLISH (E) COLUMN. SUPPORT ROOF AS REQUIRED. SEE STRUCTURAL SHEETS.
6. DEMOLISH (E) STOREFRONT WINDOW.
7. REMOVE ENTIRE FLOORING AND STRUCTURAL SYSTEM OF ENTIRE MEZZANINE. COORDINATE WITH MECHANICAL AND ELECTRICAL FOR DEMOLITION OF FIXTURES AND DIFFUSERS.
8. (E) WALL TO REMAIN. PREP SURFACE FOR NEW FINISH, SEE RENOVATION PLANS AND FINISH SCHEDULE.
9. (E) COLUMN TO REMAIN.
10. REMOVE FLOOR MOUNTED TOILET PARTITIONS.
11. REMOVE PORTION EXISTING CONCRETE WALL FOR NEW MECHANICAL PENETRATION. COORDINATE WITH MECHANICAL.
12. EXISTING WALL HUNG EQUIPMENT TO REMAIN.
13. REMOVE EXISTING MILLWORK AS SHOWN
14. REMOVE VENEER
15. REMOVE EXISTING FRONT CONCRETE APRON.
16. REMOVE EXISTING CONCRETE AS REQUIRED FOR NEW UNDERGROUND PLUMBING AND ELECTRICAL, REFER TO MECHANICAL AND ELECTRICAL SHEETS FOR MORE INFO.
17. EXISTING CONCRETE FLOORING TO BE PREPPED FOR NEW FLOORING PER FINISH SCHEDULE.
18. REMOVE PORTION EXISTING CONCRETE WALL.

DEMOLITION GENERAL NOTES:

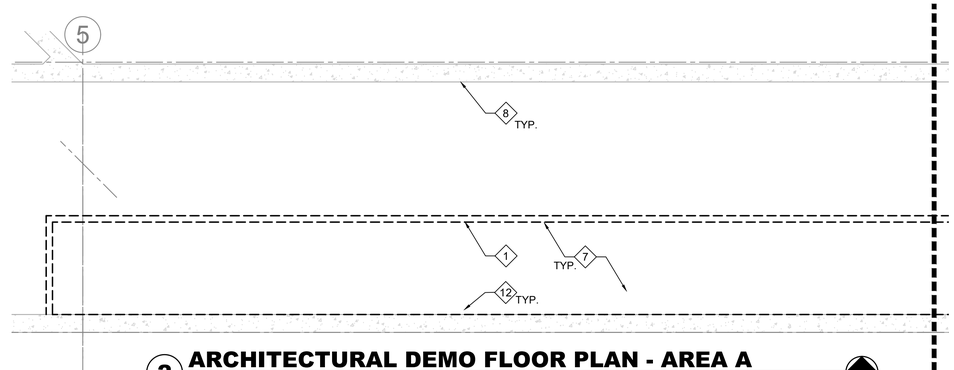
A. REFER TO THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
B. COORDINATE ALL WORK WITH STRUCTURAL, ELECTRICAL, MECHANICAL DRAWINGS & OTHER DISCIPLINES INVOLVED.
C. VERIFY ALL FIELD CONDITIONS & DIMENSIONS, NOTIFY ARCHITECT OF ANY DISCREPANCIES PRIOR TO COMMENCEMENT OF WORK.
D. UNLESS NOTED OTHERWISE, ALL WORK DESCRIBED SHALL BE PERFORMED BY CONTRACTOR. FOR ITEMS REQUIRING OWNER DIRECTION, CONTRACTOR SHALL COORDINATE DIRECTLY WITH OWNER. THIS INCLUDES BUT IS NOT LIMITED TO FURNITURE RELOCATION, EQUIPMENT RELOCATION, I.T. ITEMS, ETC.
E. DO NOT SCALE DRAWINGS, IF DIMENSIONS ARE NOT PROVIDED, CONTACT ARCHITECT FOR CLARIFICATION.
F. CONTRACTOR TO PROVIDE DETAILED PHASING, DEBRIS, DUST CONTROL METHODS, ISOLATION, AND ACCESS TO RESTROOMS TO OWNER FOR APPROVAL PRIOR TO INITIATION OF WORK.
G. MAINTAIN A SAFE AND CLEAN WORK AREA - REMOVE ALL TRASH AND DEBRIS AT THE END OF EACH WORK SHIFT.
H. PROVIDE PERSONNEL PROTECTION FROM DEBRIS & MATERIAL FALL PER OWNER STANDARDS. INCLUDING BUT NOT LIMITED TO SCAFFOLDING FOR OVERHEAD PROTECTION WITH TOE BOARDS, & VISQUEEN DUST BARRIER.
I. CONTRACTOR TO AVOID MOVING MATERIALS OR TOOLS THROUGH OPERATING AREAS.
J. CONTRACTOR TO VERIFY AND COORDINATE WITH OWNER BEFORE DISCONNECTING OR SHUTTING OFF ANY UTILITIES DURING CONSTRUCTION.
K. COORDINATE ALL DISMANTLING, REMOVALS, STAGING, AND OTHER WORK WITH OWNER PRIOR TO INITIATION OF WORK.
L. PROVIDE TEMPORARY INDEPENDENT SUPPORT FOR SYSTEMS AND EQUIPMENT SERVING OPERATIONAL AREAS, INCLUDING BUT NOT LIMITED TO; FIRE PROTECTION, LIGHTING, PIPING, CONDUITS, ETC.
M. ALL INTERIOR AND EXTERIOR STRUCTURE IS EXISTING TO REMAIN UNLESS NOTED OTHERWISE.



1 ARCHITECTURAL ENLARGED DEMO FLOOR PLAN - AREA A

1ST. LEVEL

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



2 ARCHITECTURAL DEMO FLOOR PLAN - AREA A

MEZZANINE LEVEL

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

MATCHLINE - SEE SHEET AD1.2 FOR CONTINUATION

REGISTERED ARCHITECT
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SCALE:	AS NOTED

ENLARGED DEMO FLOOR PLAN AREA A

AD1.1

FLOOR PLAN KEYNOTES:

1. DEMOLISH (E) WALL. PATCH AND REPAIR ADJACENT WALL WHERE ANCHORED AS NEEDED.
2. REMOVE DOOR AND FRAME. PROTECT ADJACENT WALLS FROM DAMAGE DURING WORK.
3. DEMOLISH PLUMBING FIXTURES. SEE MECHANICAL SHEETS.
4. PROTECT & PREP FOR NEW FINISH PER FINISH PLAN. RETAIN FOR REINSTALLATION CLEAN UNDER FLOOR.
5. REMOVE EXISTING OUTLET COVERS AND LIGHT FIXTURE SWITCH PLATES UNO
6. NO WORK THIS AREA.
7. REMOVE EXISTING FLOORING AND WALL BASE UNO.
8. (E) WALL TO REMAIN.
9. PIT BELOW FOR REFERENCE ONLY.
10. (E) DOOR TO REMAIN.
11. REMOVE PANELING CLOSING WINDOW PENETRATIONS.
12. (E) MILLWORK / EQUIPMENT TO REMAIN AND BE PROTECTED DURING DEMOLITION. COORDINATE WITH OWNER FOR WIREWAYS AND MISC. ELECTRICAL EQUIPMENT TO REMAIN FOR SHOW EXHIBITION.
13. PREP EXISTING CONCRETE FLOORING FOR NEW FLOORING PER FINISH SCHEDULE.
14. REMOVE EXISTING MILLWORK.
15. REMOVE EXISTING EXPOSED DUCTWORK LOCATED INSIDE SPACE. SEE MECHANICAL.
16. REMOVE ACOUSTICAL TILE TREATMENT ON WALLS. PREP FOR DRYWALL REPAIR.
17. REMOVE EXISTING CONCRETE FOR UNDERGROUND PLUMBING, SEE MECHANICAL.
18. REMOVE WOOD PANELING ON EXISTING WALL
19. REMOVE EXISTING COOLANT LINES. REFER TO MECHANICAL DEMOLITION FOR MORE INFO.
20. REMOVE ENTIRE FLOORING STRUCTURAL SYSTEM. ENTIRE MEZZANINE TO BE REMOVED.
21. EQUIPMENT TO BE REMOVED AND RETURNED TO OWNER.
22. WALL FUR OUT TO BE REMOVED
23. 3/4" THICK ALUMINUM MOUNTING PLATE TO BE REMOVED.

DEMOLITION GENERAL NOTES:

A. REFER TO THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
B. COORDINATE ALL WORK WITH STRUCTURAL, ELECTRICAL, MECHANICAL DRAWINGS & OTHER DISCIPLINES INVOLVED.
C. VERIFY ALL FIELD CONDITIONS & DIMENSIONS, NOTIFY ARCHITECT OF ANY DISCREPANCIES PRIOR TO COMMENCEMENT OF WORK.
D. UNLESS NOTED OTHERWISE, ALL WORK DESCRIBED SHALL BE PERFORMED BY CONTRACTOR. FOR ITEMS REQUIRING OWNER DIRECTION, CONTRACTOR SHALL COORDINATE DIRECTLY WITH OWNER. THIS INCLUDES BUT IS NOT LIMITED TO FURNITURE RELOCATION, EQUIPMENT RELOCATION, I.T. ITEMS, ETC.
E. DO NOT SCALE DRAWINGS, IF DIMENSIONS ARE NOT PROVIDED, CONTACT ARCHITECT FOR CLARIFICATION.
F. CONTRACTOR TO PROVIDE DETAILED PHASING, DEBRIS, DUST CONTROL METHODS, ISOLATION, AND ACCESS TO RESTROOMS TO OWNER FOR APPROVAL PRIOR TO INITIATION OF WORK.
G. MAINTAIN A SAFE AND CLEAN WORK AREA - REMOVE ALL TRASH AND DEBRIS AT THE END OF EACH WORK SHIFT.
H. PROVIDE PERSONNEL PROTECTION FROM DEBRIS & MATERIAL FALL PER OWNER STANDARDS. INCLUDING BUT NOT LIMITED TO SCAFFOLDING FOR OVERHEAD PROTECTION WITH TOE BOARDS, & VISQUEEN DUST BARRIER.
I. CONTRACTOR TO AVOID MOVING MATERIALS OR TOOLS THROUGH OPERATING AREAS.
J. CONTRACTOR TO VERIFY AND COORDINATE WITH OWNER BEFORE DISCONNECTING OR SHUTTING OFF ANY UTILITIES DURING CONSTRUCTION.
K. COORDINATE ALL DISMANTLING, REMOVALS, STAGING, AND OTHER WORK WITH OWNER PRIOR TO INITIATION OF WORK.
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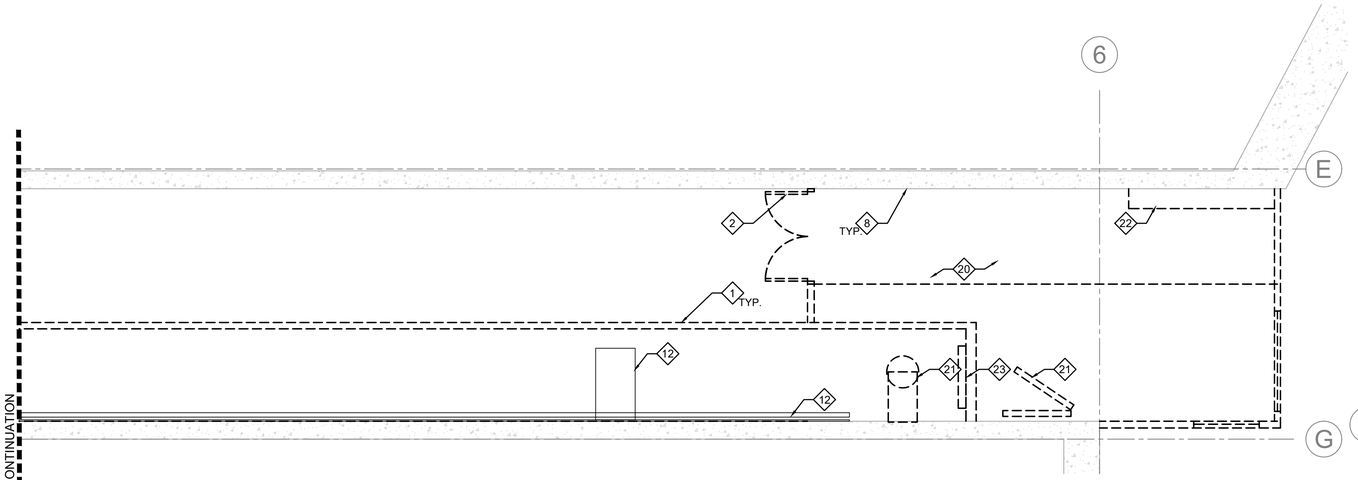
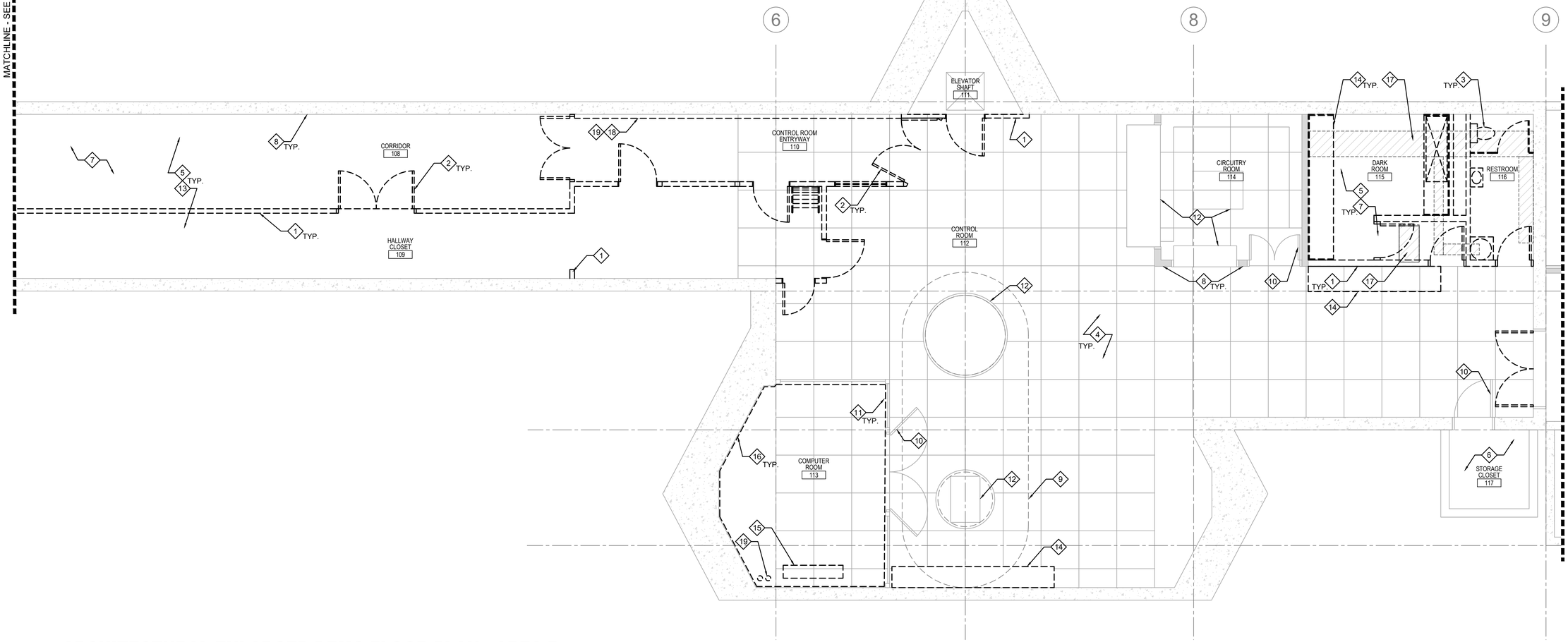
M. ALL INTERIOR AND EXTERIOR STRUCTURE IS EXISTING TO REMAIN UNLESS NOTED OTHERWISE.



2 ARCHITECTURAL ENLARGED DEMO FLOOR PLAN - AREA B
MEZZANINE LEVEL

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

MATCHLINE - SEE SHEET AD1.1 FOR CONTINUATION



1 ARCHITECTURAL ENLARGED DEMO FLOOR PLAN - AREA B
1ST. LEVEL

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

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WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

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KITT PEAK - Sells, AZ 85634

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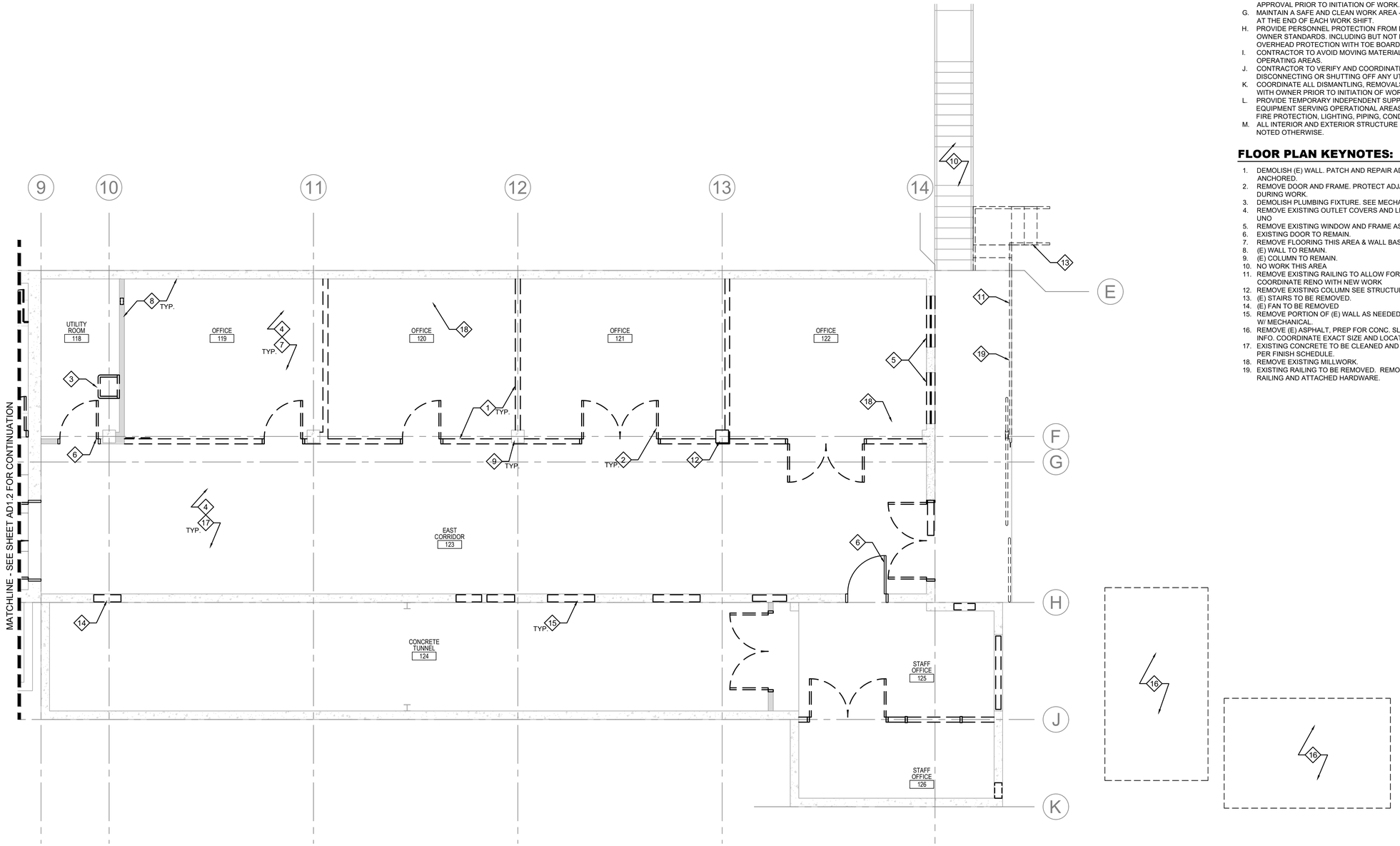
ENLARGED DEMO FLOOR PLAN AREA B

AD1.2



1 ARCHITECTURAL ENLARGED DEMO FLOOR PLAN - AREA C

1ST. LEVEL

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

DEMOLITION GENERAL NOTES:

A. REFER TO THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
B. COORDINATE ALL WORK WITH STRUCTURAL, ELECTRICAL, MECHANICAL DRAWINGS & OTHER DISCIPLINES INVOLVED.
C. VERIFY ALL FIELD CONDITIONS & DIMENSIONS, NOTIFY ARCHITECT OF ANY DISCREPANCIES PRIOR TO COMMENCEMENT OF WORK.
D. UNLESS NOTED OTHERWISE, ALL WORK DESCRIBED SHALL BE PERFORMED BY CONTRACTOR. FOR ITEMS REQUIRING OWNER DIRECTION, CONTRACTOR SHALL COORDINATE DIRECTLY WITH OWNER. THIS INCLUDES BUT IS NOT LIMITED TO FURNITURE RELOCATION, EQUIPMENT RELOCATION, I.T. ITEMS, ETC.
E. DO NOT SCALE DRAWINGS, IF DIMENSIONS ARE NOT PROVIDED, CONTACT ARCHITECT FOR CLARIFICATION.
F. CONTRACTOR TO PROVIDE DETAILED PHASING, DEBRIS, DUST CONTROL METHODS, ISOLATION, AND ACCESS TO RESTROOMS TO OWNER FOR APPROVAL PRIOR TO INITIATION OF WORK.
G. MAINTAIN A SAFE AND CLEAN WORK AREA - REMOVE ALL TRASH AND DEBRIS AT THE END OF EACH WORK SHIFT.
H. PROVIDE PERSONNEL PROTECTION FROM DEBRIS & MATERIAL FALL PER OWNER STANDARDS. INCLUDING BUT NOT LIMITED TO SCAFFOLDING FOR OVERHEAD PROTECTION WITH TOE BOARDS, & VISQUEEN DUST BARRIER.
I. CONTRACTOR TO AVOID MOVING MATERIALS OR TOOLS THROUGH OPERATING AREAS.
J. CONTRACTOR TO VERIFY AND COORDINATE WITH OWNER BEFORE DISCONNECTING OR SHUTTING OFF ANY UTILITIES DURING CONSTRUCTION.
K. COORDINATE ALL DISMANTLING, REMOVALS, STAGING, AND OTHER WORK WITH OWNER PRIOR TO INITIATION OF WORK.
L. PROVIDE TEMPORARY INDEPENDENT SUPPORT FOR SYSTEMS AND EQUIPMENT SERVING OPERATIONAL AREAS, INCLUDING BUT NOT LIMITED TO; FIRE PROTECTION, LIGHTING, PIPING, CONDUITS, ETC.
M. ALL INTERIOR AND EXTERIOR STRUCTURE IS EXISTING TO REMAIN UNLESS NOTED OTHERWISE.

FLOOR PLAN KEYNOTES:

1. DEMOLISH (E) WALL. PATCH AND REPAIR ADJACENT WALL WHERE ANCHORED.
2. REMOVE DOOR AND FRAME. PROTECT ADJACENT WALLS FROM DAMAGE DURING WORK.
3. DEMOLISH PLUMBING FIXTURE. SEE MECHANICAL SHEETS.
4. REMOVE EXISTING OUTLET COVERS AND LIGHT FIXTURE SWITCH PLATES UNO
5. REMOVE EXISTING WINDOW AND FRAME AS SHOWN
6. EXISTING DOOR TO REMAIN.
7. REMOVE FLOORING THIS AREA & WALL BASE UNO
8. (E) WALL TO REMAIN.
9. (E) COLUMN TO REMAIN.
10. NO WORK THIS AREA.
11. REMOVE EXISTING RAILING TO ALLOW FOR NEW CONSTRUCTION, COORDINATE RENO WITH NEW WORK
12. REMOVE EXISTING COLUMN SEE STRUCTURAL
13. (E) STAIRS TO BE REMOVED.
14. (E) FAN TO BE REMOVED
15. REMOVE PORTION OF (E) WALL AS NEEDED FOR MECHANICAL. COORDINATE W/ MECHANICAL.
16. REMOVE (E) ASPHALT, PREP FOR CONC. SLAB, SEE MECHANICAL FOR MORE INFO. COORDINATE EXACT SIZE AND LOCATION PER MECHANICAL DRAWINGS.
17. EXISTING CONCRETE TO BE CLEANED AND PREPARED FOR NEW FLOORING PER FINISH SCHEDULE.
18. REMOVE EXISTING MILLWORK.
19. EXISTING RAILING TO BE REMOVED. REMOVE ALL ASSOCIATED FLOOR RAILING AND ATTACHED HARDWARE.

REGISTERED ARCHITECT
CERTIFICATE NO.
49199
IAN MATTHEW REGAN
DATE SIGNED 01/08/21
ARIZONA
Expires 3/31/2021

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FACILITY DESIGN INC
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WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

NOIR Lab | NSF

KITT PEAK - Sells, AZ 85634

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PROJECT NUMBER:	11904.00
DRAWN BY:	
CHECKED BY:	IR
CAD FILE:	11904.00-AD1.3
SCALE:	AS NOTED

ENLARGED DEMO FLOOR PLAN AREA C

AD1.3

RCP KEYNOTES:

1. REMOVE EXISTING DROP CEILING SYSTEM. REMOVE ALL ABANDONED COMPONENTS. PREP FOR NEW FINISH, SEE RENOVATION RCP.
2. REMOVE LIGHTING, CONDUITS, AND SWITCHING. , SEE ELECTRICAL.
3. EXISTING SCUPPER TO REMAIN
4. DEMOLISHED WALL BELOW. SHOWN FOR REFERENCE.
5. EXISTING WALL TO REMAIN. SHOWN FOR REFERENCE.
6. REMOVE FRAMED SOFFIT POP-OUT COORDINATE WITH ELECTRICAL.
7. PREP CEILING FOR FINISH PER FINISH SCHEDULE
8. EXISTING EQUIPMENT TO REMAIN. PROTECT DURING CONSTRUCTION.
9. REMOVE EXISTING MILLWORK

DEMOLITION GENERAL NOTES:

A. REFER TO THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
B. COORDINATE ALL WORK WITH STRUCTURAL, ELECTRICAL, MECHANICAL DRAWINGS & OTHER DISCIPLINES INVOLVED .
C. VERIFY ALL FIELD CONDITIONS & DIMENSIONS, NOTIFY ARCHITECT OF ANY DISCREPANCIES PRIOR TO COMMENCEMENT OF WORK.
D. UNLESS NOTED OTHERWISE, ALL WORK DESCRIBED SHALL BE PERFORMED BY CONTRACTOR. FOR ITEMS REQUIRING OWNER DIRECTION, CONTRACTOR SHALL COORDINATE DIRECTLY WITH OWNER. THIS INCLUDES BUT IS NOT LIMITED TO FURNITURE RELOCATION, EQUIPMENT RELOCATION, I.T. ITEMS, ETC.
E. DO NOT SCALE DRAWINGS, IF DIMENSIONS ARE NOT PROVIDED, CONTACT ARCHITECT FOR CLARIFICATION.
F. CONTRACTOR TO PROVIDE DETAILED PHASING, DEBRIS, DUST CONTROL METHODS, ISOLATION, AND ACCESS TO RESTROOMS TO OWNER FOR APPROVAL PRIOR TO INITIATION OF WORK.
G. MAINTAIN A SAFE AND CLEAN WORK AREA - REMOVE ALL TRASH AND DEBRIS AT THE END OF EACH WORK SHIFT.
H. PROVIDE PERSONNEL PROTECTION FROM DEBRIS & MATERIAL FALL PER OWNER STANDARDS. INCLUDING BUT NOT LIMITED TO SCAFFOLDING FOR OVERHEAD PROTECTION WITH TOE BOARDS, & VISQUEEN DUST BARRIER.
I. CONTRACTOR TO AVOID MOVING MATERIALS OR TOOLS THROUGH OPERATING AREAS.
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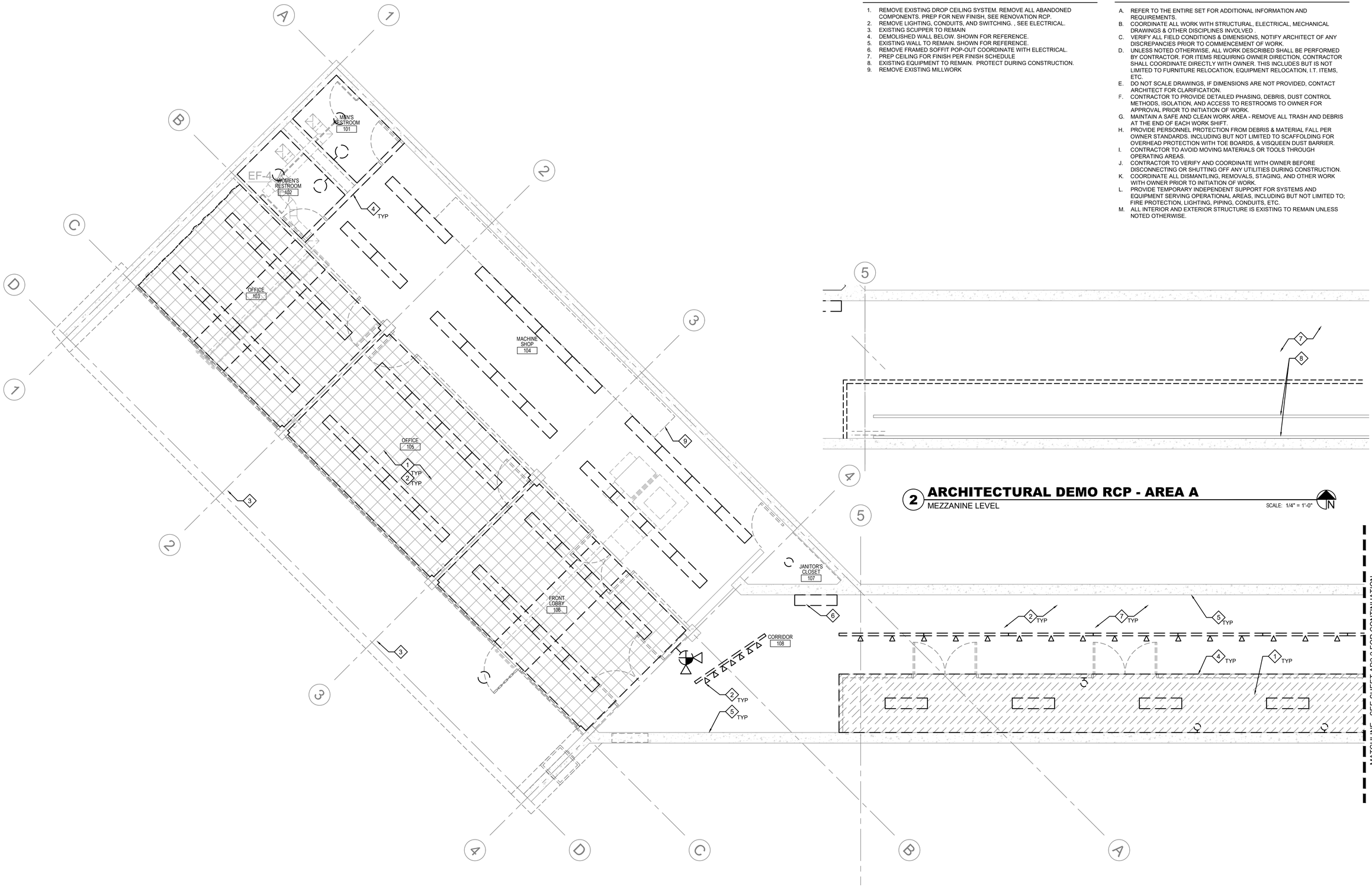
M. ALL INTERIOR AND EXTERIOR STRUCTURE IS EXISTING TO REMAIN UNLESS NOTED OTHERWISE.



1 ARCHITECTURAL ENLARGED DEMO REFLECTED CEILING PLAN - AREA A
1ST. LEVEL
SCALE: 1/4" = 1'-0"

2 ARCHITECTURAL DEMO RCP - AREA A
MEZZANINE LEVEL
SCALE: 1/4" = 1'-0"

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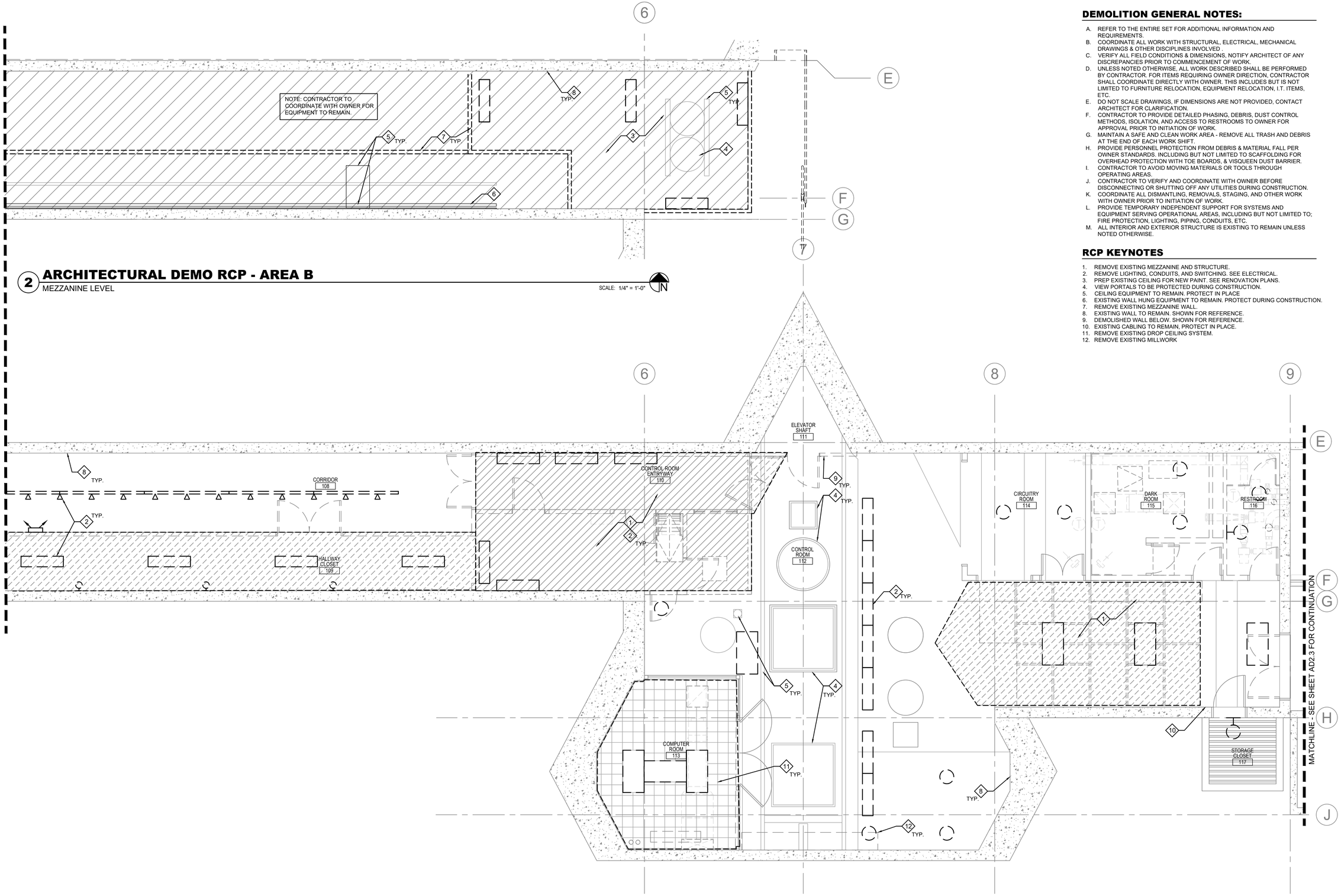
ENLARGED DEMO REFLECTED CEILING AREA A

AD2.1



2 ARCHITECTURAL DEMO RCP - AREA B

MEZZANINE LEVEL

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

1 ARCHITECTURAL ENLARGED DEMO REFLECTED CEILING PLAN - AREA B

1ST. LEVEL

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

DEMOLITION GENERAL NOTES:

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G. MAINTAIN A SAFE AND CLEAN WORK AREA - REMOVE ALL TRASH AND DEBRIS AT THE END OF EACH WORK SHIFT.
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M. ALL INTERIOR AND EXTERIOR STRUCTURE IS EXISTING TO REMAIN UNLESS NOTED OTHERWISE.

RCP KEYNOTES

1. REMOVE EXISTING MEZZANINE AND STRUCTURE.
2. REMOVE LIGHTING, CONDUITS, AND SWITCHING. SEE ELECTRICAL.
3. PREP EXISTING CEILING FOR NEW PAINT. SEE RENOVATION PLANS.
4. VIEW PORTALS TO BE PROTECTED DURING CONSTRUCTION.
5. CEILING EQUIPMENT TO REMAIN. PROTECT IN PLACE
6. EXISTING WALL HUNG EQUIPMENT TO REMAIN. PROTECT DURING CONSTRUCTION.
7. REMOVE EXISTING MEZZANINE WALL.
8. EXISTING WALL TO REMAIN. SHOWN FOR REFERENCE.
9. DEMOLISHED WALL BELOW. SHOWN FOR REFERENCE.
10. EXISTING CABLING TO REMAIN, PROTECT IN PLACE.
11. REMOVE EXISTING DROP CEILING SYSTEM.
12. REMOVE EXISTING MILLWORK

REGISTERED ARCHITECT
CERTIFICATE NO. 49199
IAN MATTHEW REGAN
DATE SIGNED 03/31/21
ARIZONA U.S.A.
Expires 3/31/2021

ADVANTECH
FACILITY DESIGN INC
ARCHITECTURE - ENGINEERING
3280 E. HEMISPHERE LOOP STE. 110 TUCSON AZ 85706 520-806-0903
1889 E. BROADWAY, TEMPE AZ 85258

WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

NOIRLab | NSF

KITT PEAK - Sells, AZ 85634

△	DATE	DESCRIPTION
0	01/08/21	I.F.C.

PROJECT NUMBER:	11904.00
DRAWN BY:	
CHECKED BY:	IR
CAD FILE:	11904.00-AD2.2
SCALE:	AS NOTED

ENLARGED DEMO REFLECTED CEILING AREA B

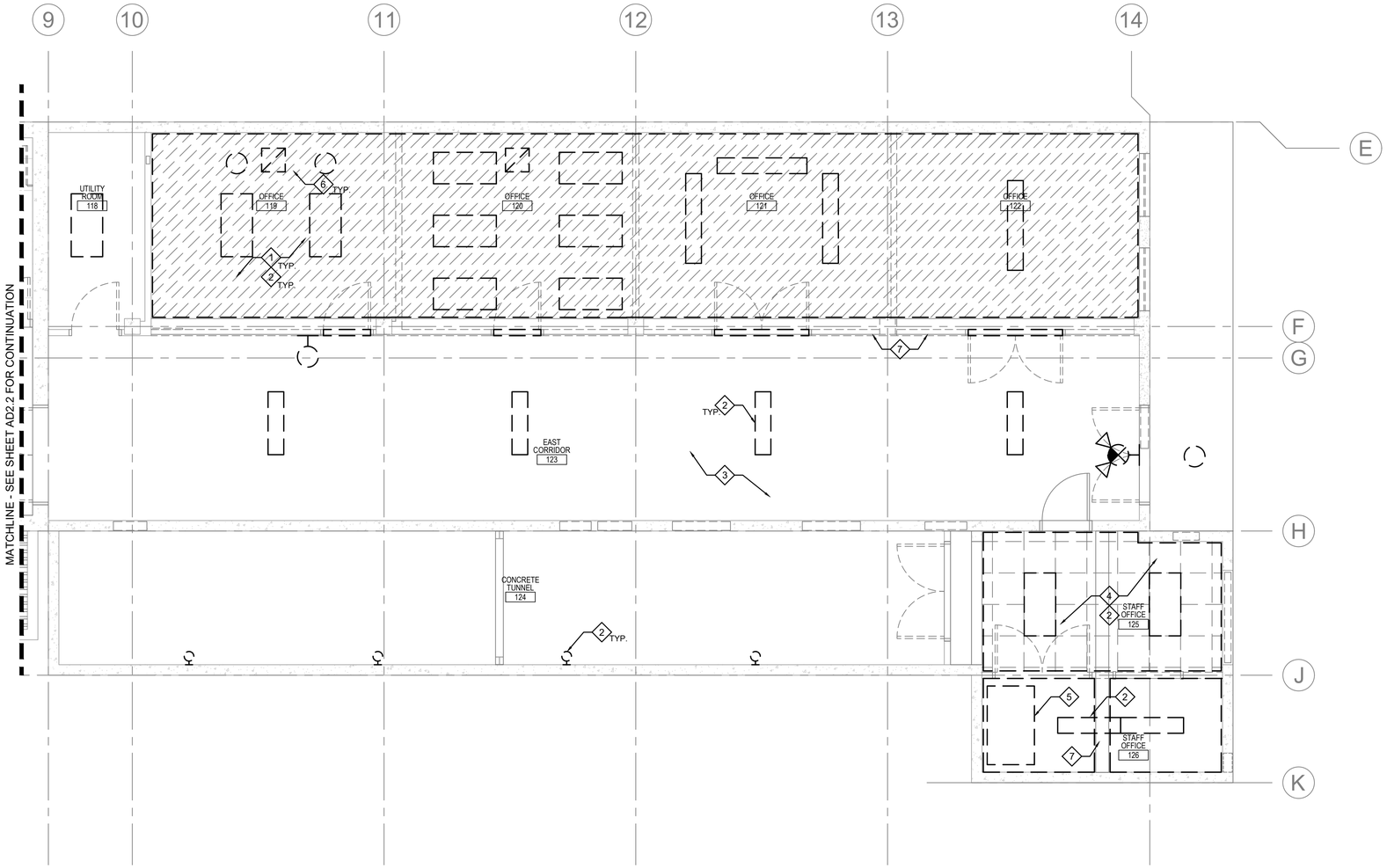
AD2.2

DEMOLITION GENERAL NOTES:

A. REFER TO THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
B. COORDINATE ALL WORK WITH STRUCTURAL, ELECTRICAL, MECHANICAL DRAWINGS & OTHER DISCIPLINES INVOLVED.
C. VERIFY ALL FIELD CONDITIONS & DIMENSIONS, NOTIFY ARCHITECT OF ANY DISCREPANCIES PRIOR TO COMMENCEMENT OF WORK.
D. UNLESS NOTED OTHERWISE, ALL WORK DESCRIBED SHALL BE PERFORMED BY CONTRACTOR. FOR ITEMS REQUIRING OWNER DIRECTION, CONTRACTOR SHALL COORDINATE DIRECTLY WITH OWNER. THIS INCLUDES BUT IS NOT LIMITED TO FURNITURE RELOCATION, EQUIPMENT RELOCATION, I.T. ITEMS, ETC.
E. DO NOT SCALE DRAWINGS, IF DIMENSIONS ARE NOT PROVIDED, CONTACT ARCHITECT FOR CLARIFICATION.
F. CONTRACTOR TO PROVIDE DETAILED PHASING, DEBRIS, DUST CONTROL METHODS, ISOLATION, AND ACCESS TO RESTROOMS TO OWNER FOR APPROVAL PRIOR TO INITIATION OF WORK.
G. MAINTAIN A SAFE AND CLEAN WORK AREA - REMOVE ALL TRASH AND DEBRIS AT THE END OF EACH WORK SHIFT.
H. PROVIDE PERSONNEL PROTECTION FROM DEBRIS & MATERIAL FALL PER OWNER STANDARDS. INCLUDING BUT NOT LIMITED TO SCAFFOLDING FOR OVERHEAD PROTECTION WITH TOE BOARDS, & VISQUEEN DUST BARRIER.
I. CONTRACTOR TO AVOID MOVING MATERIALS OR TOOLS THROUGH OPERATING AREAS.
J. CONTRACTOR TO VERIFY AND COORDINATE WITH OWNER BEFORE DISCONNECTING OR SHUTTING OFF ANY UTILITIES DURING CONSTRUCTION.
K. COORDINATE ALL DISMANTLING, REMOVALS, STAGING, AND OTHER WORK WITH OWNER PRIOR TO INITIATION OF WORK.
L. PROVIDE TEMPORARY INDEPENDENT SUPPORT FOR SYSTEMS AND EQUIPMENT SERVING OPERATIONAL AREAS, INCLUDING BUT NOT LIMITED TO; FIRE PROTECTION, LIGHTING, PIPING, CONDUITS, ETC.
M. ALL INTERIOR AND EXTERIOR STRUCTURE IS EXISTING TO REMAIN UNLESS NOTED OTHERWISE.

RCP KEYNOTES:

1. REMOVE EXISTING GYP BOARD FRAMED CEILING. REMOVE ALL ABANDONED COMPONENTS. PREP FOR NEW FINISH, SEE RENOVATION RCP.
2. REMOVE LIGHTING, CONDUITS, AND SWITCHING. , SEE ELECTRICAL.
3. EXISTING CEILING TO BE PREP'D FOR NEW FINISH.
4. REMOVE ACOUSTIC CEILING GRID AND TILE. PREP CEILING FOR NEW FINISH.
5. REMOVE EXISTING MECHANICAL AND CONDENSATE PIPE. SEE MECHANICAL.
6. EXISTING MECHANICAL TO BE REMOVED, SEE MECHANICAL.
7. EXISTING BEAM AND STRUCTURE TO REMAIN, PROTECT DURING CONSTRUCTION.



1 ARCHITECTURAL ENLARGED DEMO REFLECTED CEILING PLAN - AREA C

1ST. LEVEL

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

REGISTERED ARCHITECT
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KITT PEAK - Sells, AZ 85634

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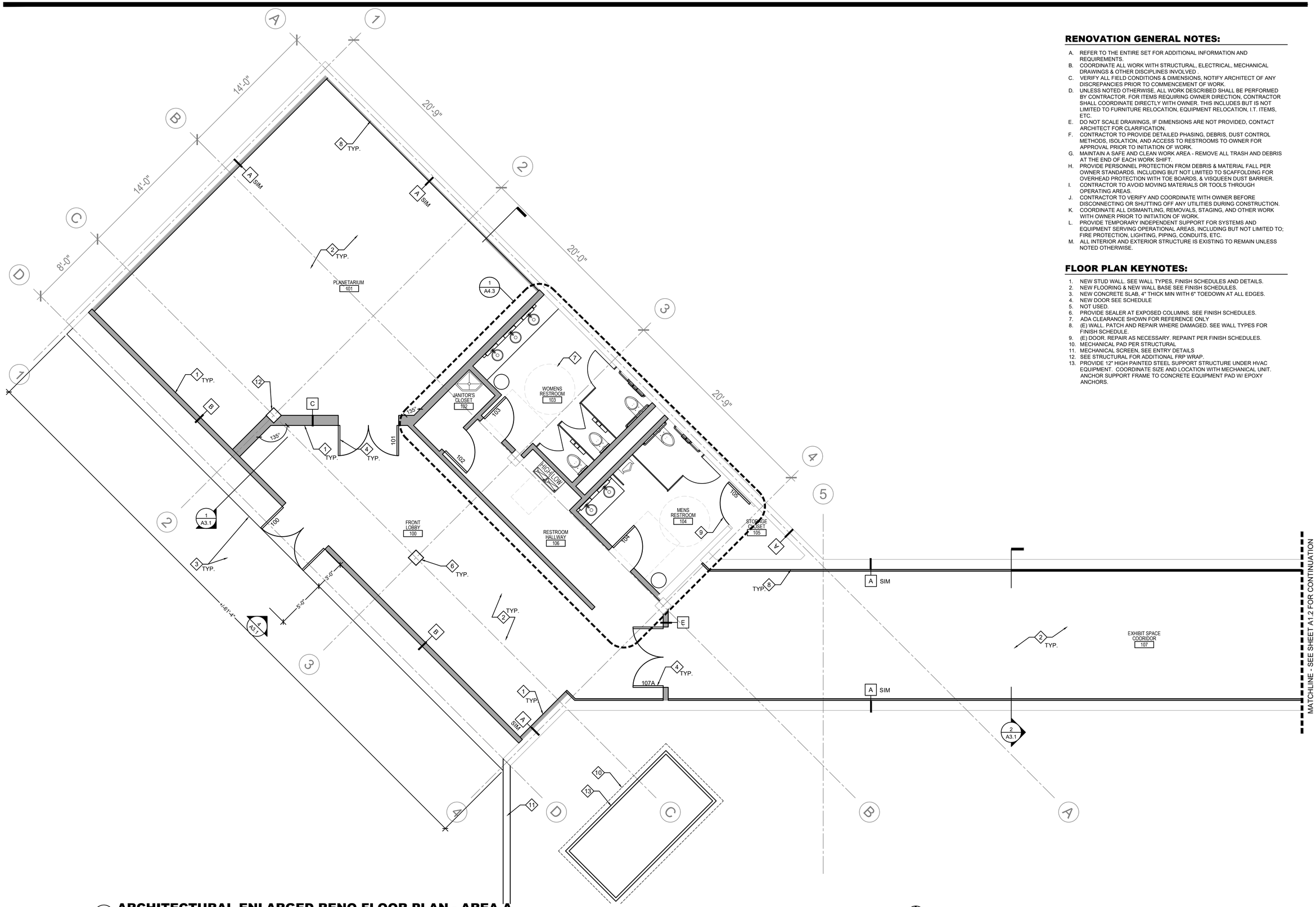
SCALE:	AS NOTED

ENLARGED DEMO REFLECTED CEILING AREA C

AD2.3



1 **ARCHITECTURAL ENLARGED RENO FLOOR PLAN - AREA A**

1ST. LEVEL

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

RENOVATION GENERAL NOTES:

A. REFER TO THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
B. COORDINATE ALL WORK WITH STRUCTURAL, ELECTRICAL, MECHANICAL DRAWINGS & OTHER DISCIPLINES INVOLVED.
C. VERIFY ALL FIELD CONDITIONS & DIMENSIONS, NOTIFY ARCHITECT OF ANY DISCREPANCIES PRIOR TO COMMENCEMENT OF WORK.
D. UNLESS NOTED OTHERWISE, ALL WORK DESCRIBED SHALL BE PERFORMED BY CONTRACTOR. FOR ITEMS REQUIRING OWNER DIRECTION, CONTRACTOR SHALL COORDINATE DIRECTLY WITH OWNER. THIS INCLUDES BUT IS NOT LIMITED TO FURNITURE RELOCATION, EQUIPMENT RELOCATION, I.T. ITEMS, ETC.
E. DO NOT SCALE DRAWINGS, IF DIMENSIONS ARE NOT PROVIDED, CONTACT ARCHITECT FOR CLARIFICATION.
F. CONTRACTOR TO PROVIDE DETAILED PHASING, DEBRIS, DUST CONTROL METHODS, ISOLATION, AND ACCESS TO RESTROOMS TO OWNER FOR APPROVAL PRIOR TO INITIATION OF WORK.
G. MAINTAIN A SAFE AND CLEAN WORK AREA - REMOVE ALL TRASH AND DEBRIS AT THE END OF EACH WORK SHIFT.
H. PROVIDE PERSONNEL PROTECTION FROM DEBRIS & MATERIAL FALL PER OWNER STANDARDS. INCLUDING BUT NOT LIMITED TO SCAFFOLDING FOR OVERHEAD PROTECTION WITH TOE BOARDS, & VISQUEEN DUST BARRIER.
I. CONTRACTOR TO AVOID MOVING MATERIALS OR TOOLS THROUGH OPERATING AREAS.
J. CONTRACTOR TO VERIFY AND COORDINATE WITH OWNER BEFORE DISCONNECTING OR SHUTTING OFF ANY UTILITIES DURING CONSTRUCTION.
K. COORDINATE ALL DISMANTLING, REMOVALS, STAGING, AND OTHER WORK WITH OWNER PRIOR TO INITIATION OF WORK.
L. PROVIDE TEMPORARY INDEPENDENT SUPPORT FOR SYSTEMS AND EQUIPMENT SERVING OPERATIONAL AREAS, INCLUDING BUT NOT LIMITED TO; FIRE PROTECTION, LIGHTING, PIPING, CONDUITS, ETC.
M. ALL INTERIOR AND EXTERIOR STRUCTURE IS EXISTING TO REMAIN UNLESS NOTED OTHERWISE.

FLOOR PLAN KEYNOTES:

1. NEW STUD WALL. SEE WALL TYPES, FINISH SCHEDULES AND DETAILS.
2. NEW FLOORING & NEW WALL BASE SEE FINISH SCHEDULES.
3. NEW CONCRETE SLAB, 4" THICK MIN WITH 6" TOEDOWN AT ALL EDGES.
4. NEW DOOR SEE SCHEDULE
5. NOT USED.
6. PROVIDE SEALER AT EXPOSED COLUMNS. SEE FINISH SCHEDULES.
7. ADA CLEARANCE SHOWN FOR REFERENCE ONLY
8. (E) WALL. PATCH AND REPAIR WHERE DAMAGED. SEE WALL TYPES FOR FINISH SCHEDULE.
9. (E) DOOR. REPAIR AS NECESSARY. REPAINT PER FINISH SCHEDULES.
10. MECHANICAL PAD PER STRUCTURAL
11. MECHANICAL SCREEN, SEE ENTRY DETAILS
12. SEE STRUCTURAL FOR ADDITIONAL FRP WRAP.
13. PROVIDE 12" HIGH PAINTED STEEL SUPPORT STRUCTURE UNDER HVAC EQUIPMENT. COORDINATE SIZE AND LOCATION WITH MECHANICAL UNIT. ANCHOR SUPPORT FRAME TO CONCRETE EQUIPMENT PAD W/ EPOXY ANCHORS.

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WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

NOIR Lab

NSF

KITT PEAK - Sells, AZ 85634

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CAD FILE:	11904.00-A1.1
SCALE:	AS NOTED

ENLARGED RENO FLOOR PLAN AREA A

A1.1

FLOOR PLAN KEYNOTES:

1. NEW STUD WALL. SEE WALL TYPES, FINISH SCHEDULES AND DETAILS.
2. NEW FLOORING & WALL BASE SEE FINISH SCHEDULES.
3. ADA CLEARANCE, SHOWN FOR REFERENCE ONLY
4. NEW DOOR AS SHOWN SEE SCHEDULE
5. NEW PLUMBING FIXTURES. SEE MECHANICAL SHEETS.
6. EXISTING WALLS TO BE PAINTED, SEE FINISH SCHEDULE
7. PROVIDE NEW CARPET OVER EXISTING RAISED FLOORING SYSTEM, COORDINATE WITH OWNER FOR PROTECTION OF EXISTING EQUIPMENT.
8. (E) WALL TO REMAIN. PATCH AND REPAIR WHERE DAMAGED TO MATCH EXISTING.
9. (E) DOOR. REPAIR IF NECESSARY. REPAINT PER FINISH SCHEDULES.
10. REFINISH EXISTING WALL. PATCH AND REPAIR 1X1 TILES AS NEEDED.
11. NEW DRINKING FOUNTAIN, SEE MECHANICAL
12. NO WORK THIS AREA.
13. ALIGN WALL WITH RAISED FLOOR EDGE.
14. EXISTING MILLWORK / EQUIPMENT TO REMAIN AND BE PROTECTED DURING RENOVATION.

RENOVATION GENERAL NOTES:

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C. VERIFY ALL FIELD CONDITIONS & DIMENSIONS, NOTIFY ARCHITECT OF ANY DISCREPANCIES PRIOR TO COMMENCEMENT OF WORK.
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F. CONTRACTOR TO PROVIDE DETAILED PHASING, DEBRIS, DUST CONTROL METHODS, ISOLATION, AND ACCESS TO RESTROOMS TO OWNER FOR APPROVAL PRIOR TO INITIATION OF WORK.
G. MAINTAIN A SAFE AND CLEAN WORK AREA - REMOVE ALL TRASH AND DEBRIS AT THE END OF EACH WORK SHIFT.
H. PROVIDE PERSONNEL PROTECTION FROM DEBRIS & MATERIAL FALL PER OWNER STANDARDS. INCLUDING BUT NOT LIMITED TO SCAFFOLDING FOR OVERHEAD PROTECTION WITH TOE BOARDS, & VISQUEEN DUST BARRIER.
I. CONTRACTOR TO AVOID MOVING MATERIALS OR TOOLS THROUGH OPERATING AREAS.
J. CONTRACTOR TO VERIFY AND COORDINATE WITH OWNER BEFORE DISCONNECTING OR SHUTTING OFF ANY UTILITIES DURING CONSTRUCTION.
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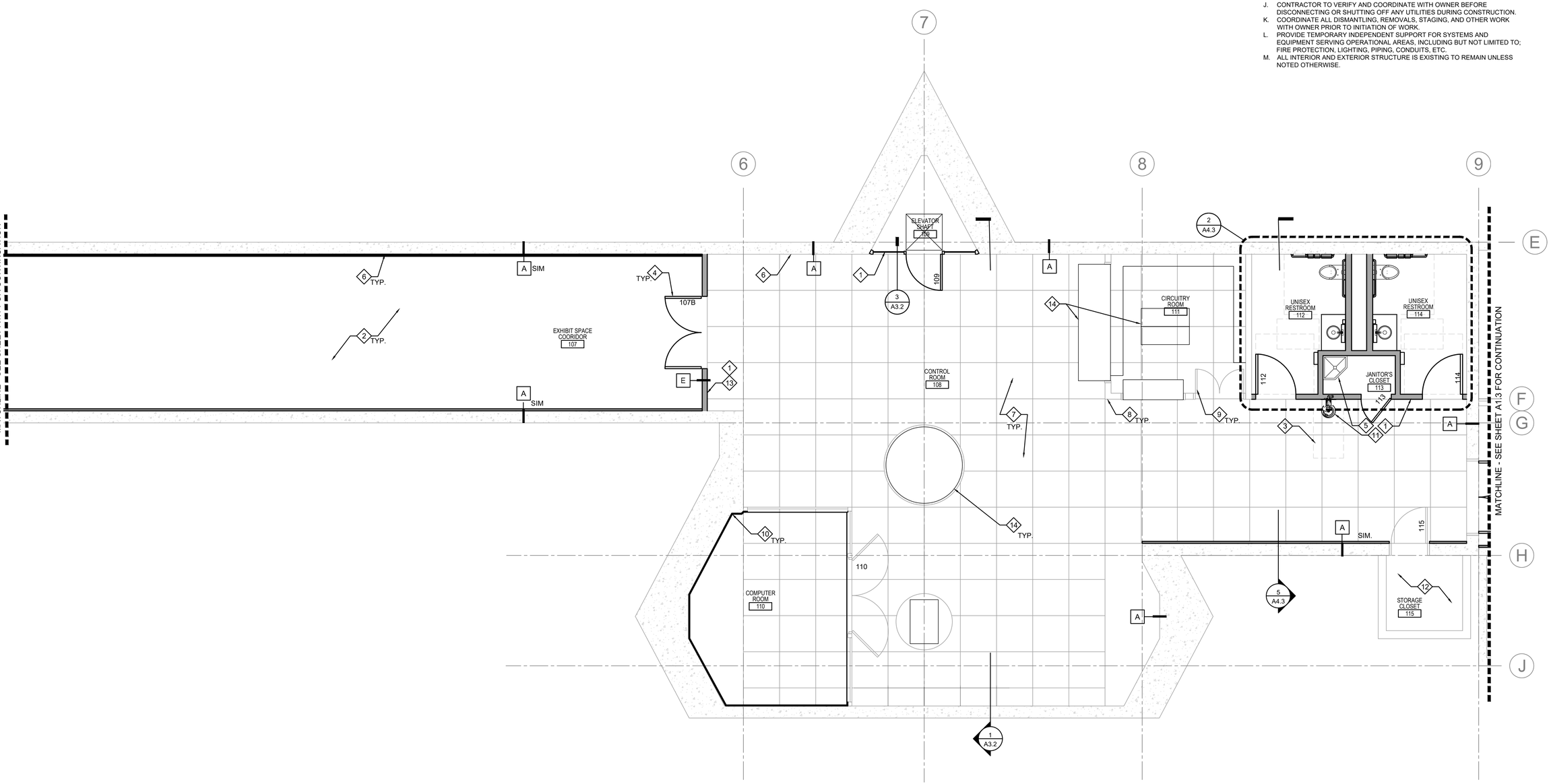

1 ARCHITECTURAL ENLARGED RENO PLAN - AREA B

1ST. LEVEL

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

REGISTERED ARCHITECT
CERTIFICATE NO.
49199
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WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

NOIR Lab | NSF

KITT PEAK - Sells, AZ 85634

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CAD FILE:	11904.00-A1.2
SCALE:	AS NOTED

ENLARGED RENO FLOOR PLAN AREA B

A1.2

FLOOR PLAN KEYNOTES:

1. NEW STUD WALL. SEE WALL TYPES, FINISH SCHEDULES AND DETAILS.
2. NEW FLOORING & WALL BASE SEE FINISH SCHEDULES.
3. NEW HEAVY DUTY ALUMINUM ACCESS RAMP, RAILING, AND LANDING BY AMERICAN ACCESS INC OR SIMILAR. SEE DETAILS SHEET A4.4 AND STRUCTURAL DRAWINGS FOR MORE INFO. PAINT TO MATCH EXISTING
4. NEW DOOR. SEE FINISH SCHEDULES.
5. EXISTING STAIRS TO REMAIN.
6. SOS THEATER EQUIPMENT, BY OTHERS.
7. NEW HEAVY DUTY ALUMINUM STEPS, RAILING, AND LANDING BY AMERICAN ACCESS INC. OR SIMILAR. SEE DETAILS SHEET A4.4 AND STRUCTURAL DRAWINGS FOR MORE INFO. PAINT TO MATCH EXISTING.
8. (E) WALL. PATCH AND REPAIR WHERE DAMAGED TO MATCH EXISTING.
9. (E) DOOR. REPAIR IF NECESSARY. REPAINT PER FINISH SCHEDULES.
10. NEW CUT OUTS @ EXISTING CONCRETE FOR MECHANICAL DUCTWORK, COORDINATE WITH MECHANICAL FOR EXACT PLACEMENT.
11. EXISTING RAILING TO BE PAINTED, COLOR TBD.
12. NEW INFILL OPENING. SEE WALL TYPES AND FINISH SCHEDULES. EXTERIOR PAINT TO MATCH EXISTING.
13. NO WORK THIS AREA.
14. MECHANICAL PAD PER STRUCTURAL.
15. MECHANICAL UNITS SHOWN FOR REFERENCE. SEE MECHANICAL.
16. 2X2 HSS PLATFORM 48" HIGH TO MATCH HEIGHT OF TUNNEL. PROVIDE 1/4 GRATING.
17. ACOUSTICAL PANELING, REFER TO WALL TYPES.
18. PROVIDE 12" HIGH PAINTED STEEL SUPPORT STRUCTURE UNDER HVAC EQUIPMENT. COORDINATE SIZE AND LOCATION WITH MECHANICAL UNIT. ANCHOR SUPPORT FRAME TO CONCRETE EQUIPMENT PAD W/ EPOXY ANCHORS.

RENOVATION GENERAL NOTES:

A. REFER TO THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
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E. DO NOT SCALE DRAWINGS, IF DIMENSIONS ARE NOT PROVIDED, CONTACT ARCHITECT FOR CLARIFICATION.
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G. MAINTAIN A SAFE AND CLEAN WORK AREA - REMOVE ALL TRASH AND DEBRIS AT THE END OF EACH WORK SHIFT.
H. PROVIDE PERSONNEL PROTECTION FROM DEBRIS & MATERIAL FALL PER OWNER STANDARDS. INCLUDING BUT NOT LIMITED TO SCAFFOLDING FOR OVERHEAD PROTECTION WITH TOE BOARDS, & VISQUEEN DUST BARRIER.
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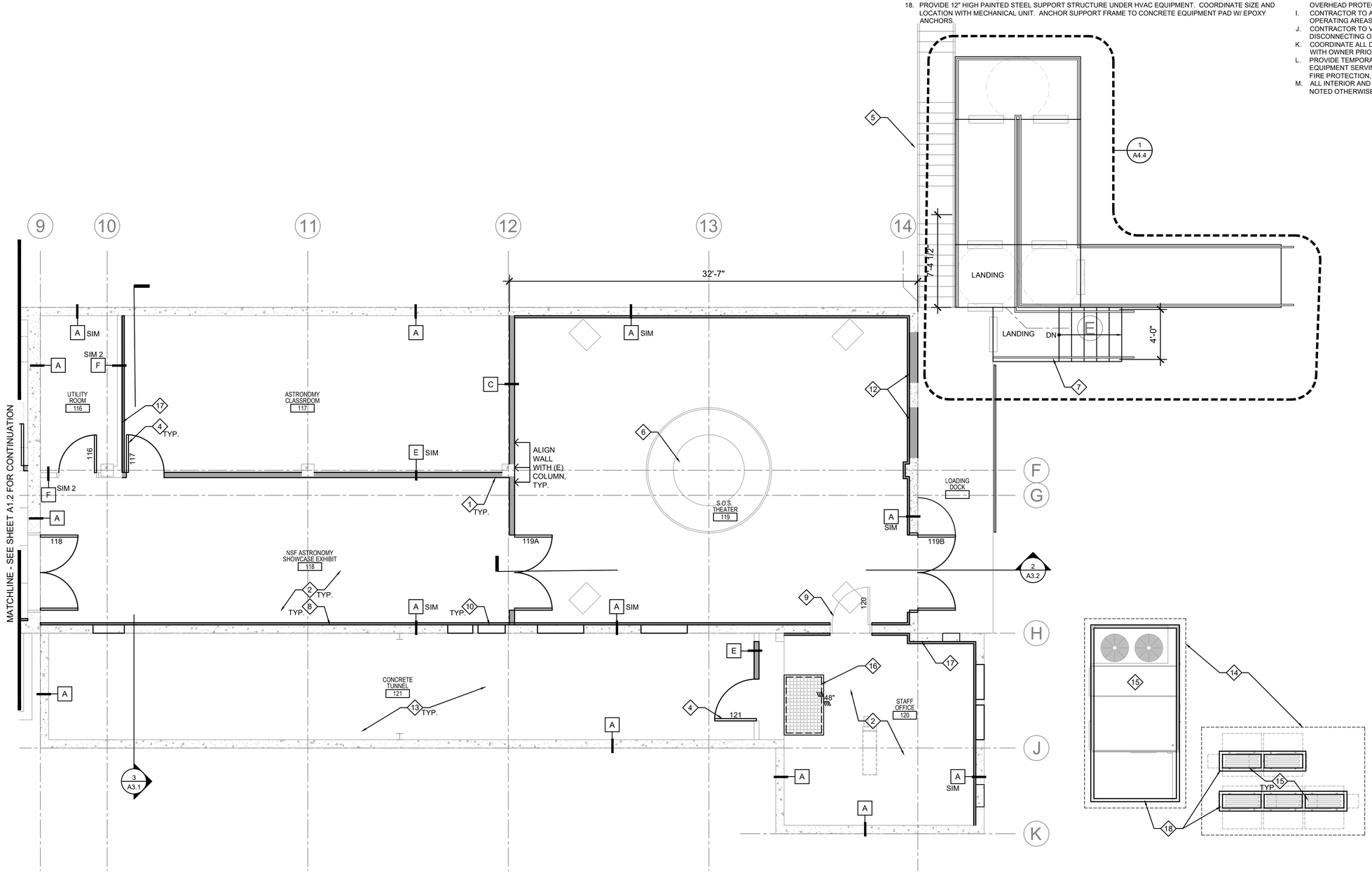

1 ARCHITECTURAL ENLARGED RENO FLOOR PLAN - AREA C
1ST. LEVEL

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

REGISTERED ARCHITECT
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49199
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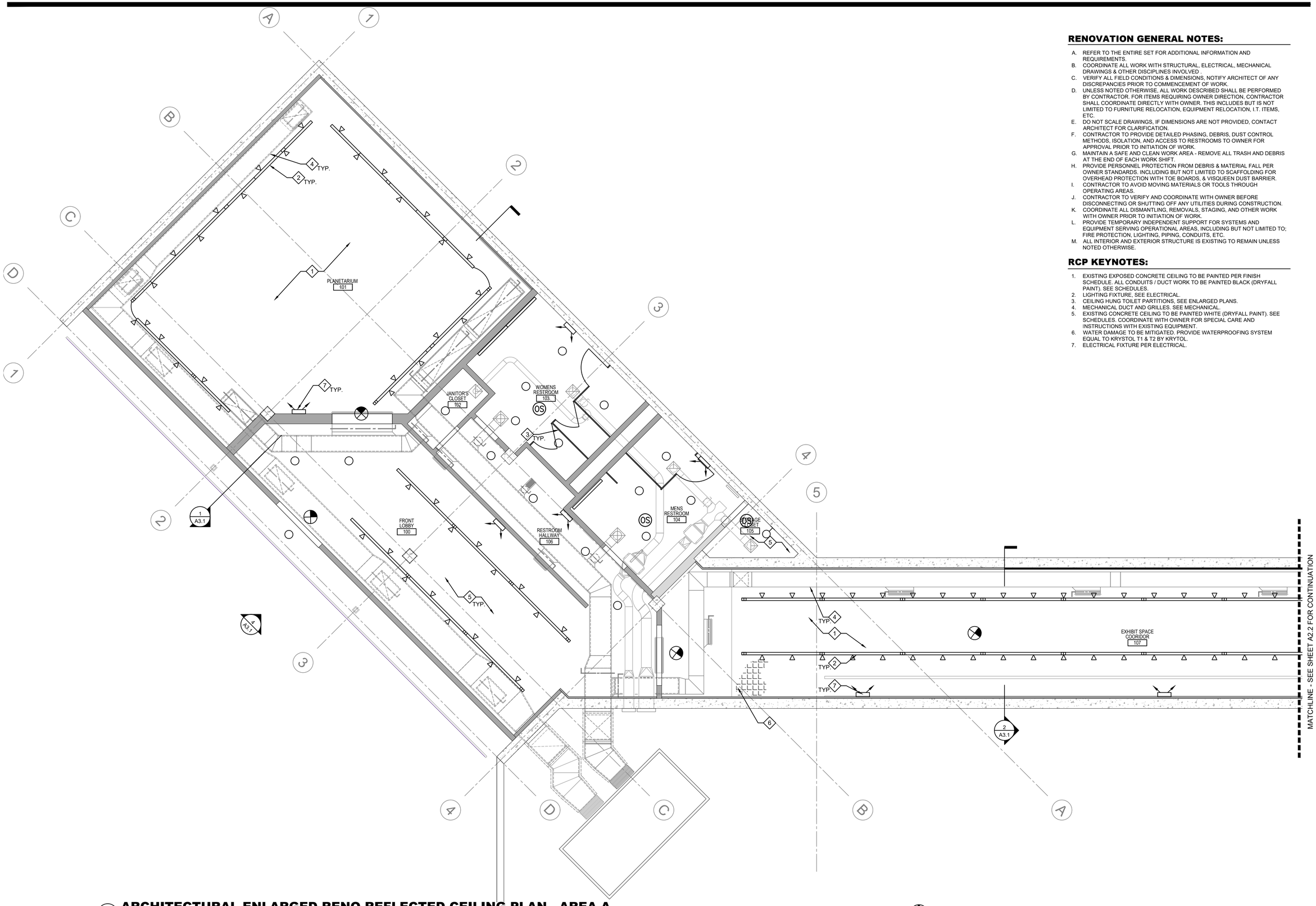
ENLARGED RENO FLOOR PLAN AREA C

A1.3



1 ARCHITECTURAL ENLARGED RENO REFLECTED CEILING PLAN - AREA A

1ST. LEVEL

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

MATCHLINE - SEE SHEET A2.2 FOR CONTINUATION

RENOVATION GENERAL NOTES:

A. REFER TO THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
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M. ALL INTERIOR AND EXTERIOR STRUCTURE IS EXISTING TO REMAIN UNLESS NOTED OTHERWISE.

RCP KEYNOTES:

1. EXISTING EXPOSED CONCRETE CEILING TO BE PAINTED PER FINISH SCHEDULE. ALL CONDUITS / DUCT WORK TO BE PAINTED BLACK (DRYFALL PAINT). SEE SCHEDULES.
2. LIGHTING FIXTURE, SEE ELECTRICAL.
3. CEILING HUNG TOILET PARTITIONS, SEE ENLARGED PLANS.
4. MECHANICAL DUCT AND GRILLES. SEE MECHANICAL.
5. EXISTING CONCRETE CEILING TO BE PAINTED WHITE (DRYFALL PAINT). SEE SCHEDULES. COORDINATE WITH OWNER FOR SPECIAL CARE AND INSTRUCTIONS WITH EXISTING EQUIPMENT.
6. WATER DAMAGE TO BE MITIGATED. PROVIDE WATERPROOFING SYSTEM EQUAL TO KRYSTOL T1 & T2 BY KRYTOL.
7. ELECTRICAL FIXTURE PER ELECTRICAL.

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ENLARGED RENO REFLECTED CEILING AREA A

A2.1

RCP KEYNOTES:

1. EXISTING EXPOSED CONCRETE CEILING TO BE PAINTED PER FINISH SCHEDULE. ALL CONDUITS / DUCT WORK TO BE PAINTED BLACK (DRYFALL PAINT). SEE SCHEDULES.
2. LIGHTING FIXTURE, SEE ELECTRICAL.
3. NOT USED.
4. MECHANICAL DUCT AND GRILLES. SEE MECHANICAL.
5. EXISTING CONCRETE CEILING TO BE PAINTED WHITE (DRYFALL PAINT). SEE SCHEDULES. COORDINATE WITH OWNER FOR SPECIAL CARE AND INSTRUCTIONS WITH EXISTING EQUIPMENT.
6. WATER DAMAGE TO BE MITIGATED. PROVIDE WATERPROOFING SYSTEM EQUAL TO KRYSTOL T1 & T2 BY KRYTOL..
7. ELECTRICAL FIXTURE PER ELECTRICAL.
8. HEAT PUMP COIL FAN, TYP. SEE MECHANICAL, SEE ELECTRICAL.
9. ALL EQUIPMENT AND PORTALS TO BE PROTECTED IN PLACE

RENOVATION GENERAL NOTES:

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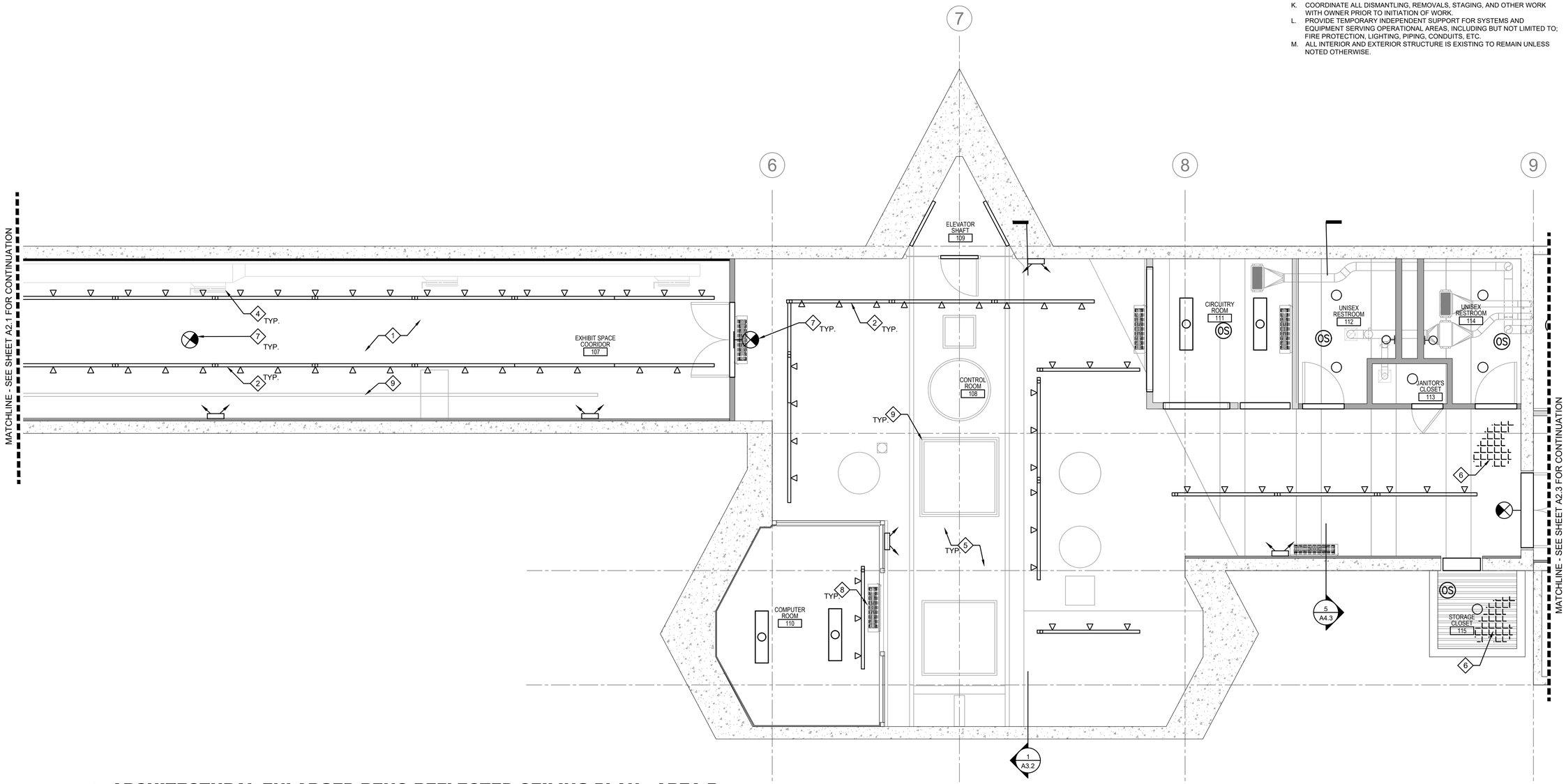


1 ARCHITECTURAL ENLARGED RENO REFLECTED CEILING PLAN - AREA B
1ST. LEVEL

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

REGISTERED ARCHITECT
CERTIFICATE NO.
49199
IAN MATTHEW REGAN
DATE SIGNED 03/31/21
ARIZONA
Expires 3/31/2021

ADVANTECH
FACILITY DESIGN INC
ARCHITECTURE - ENGINEERING
3280 E. HEMISPHERE LOOP STE. 110 TUCSON AZ 85706 520-806-0903
1889 E. BROADWAY, TEMPE AZ 85258

WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

NOIR Lab | NSF

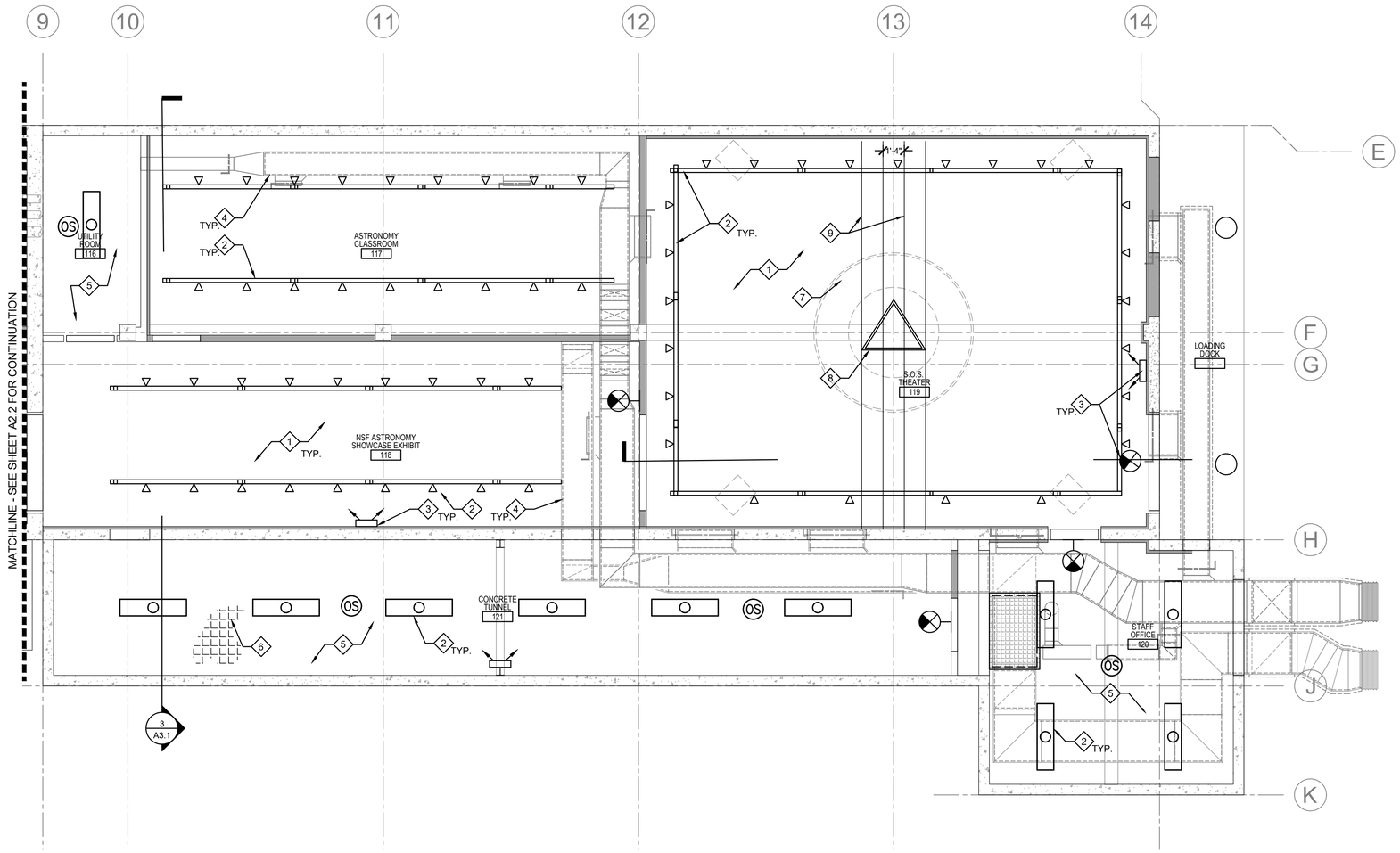
KITT PEAK - Sells, AZ 85634

△	DATE	DESCRIPTION
0	01/08/21	I.F.C.

PROJECT NUMBER:	11904.00
DRAWN BY:	
CHECKED BY:	IR
CAD FILE:	11904.00-A2.2
SCALE:	AS NOTED

ENLARGED RENO REFLECTED CEILING AREA B

A2.2



1 ARCHITECTURAL ENLARGED RENO REFLECTED CEILING PLAN - AREA C

1ST. LEVEL

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

RENOVATION GENERAL NOTES:

A. REFER TO THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
B. COORDINATE ALL WORK WITH STRUCTURAL, ELECTRICAL, MECHANICAL DRAWINGS & OTHER DISCIPLINES INVOLVED.
C. VERIFY ALL FIELD CONDITIONS & DIMENSIONS, NOTIFY ARCHITECT OF ANY DISCREPANCIES PRIOR TO COMMENCEMENT OF WORK.
D. UNLESS NOTED OTHERWISE, ALL WORK DESCRIBED SHALL BE PERFORMED BY CONTRACTOR. FOR ITEMS REQUIRING OWNER DIRECTION, CONTRACTOR SHALL COORDINATE DIRECTLY WITH OWNER. THIS INCLUDES BUT IS NOT LIMITED TO FURNITURE RELOCATION, EQUIPMENT RELOCATION, I.T. ITEMS, ETC.
E. DO NOT SCALE DRAWINGS, IF DIMENSIONS ARE NOT PROVIDED, CONTACT ARCHITECT FOR CLARIFICATION.
F. CONTRACTOR TO PROVIDE DETAILED PHASING, DEBRIS, DUST CONTROL METHODS, ISOLATION, AND ACCESS TO RESTROOMS TO OWNER FOR APPROVAL PRIOR TO INITIATION OF WORK.
G. MAINTAIN A SAFE AND CLEAN WORK AREA - REMOVE ALL TRASH AND DEBRIS AT THE END OF EACH WORK SHIFT.
H. PROVIDE PERSONNEL PROTECTION FROM DEBRIS & MATERIAL FALL PER OWNER STANDARDS. INCLUDING BUT NOT LIMITED TO SCAFFOLDING FOR OVERHEAD PROTECTION WITH TOE BOARDS, & VISQUEEN DUST BARRIER.
I. CONTRACTOR TO AVOID MOVING MATERIALS OR TOOLS THROUGH OPERATING AREAS.
J. CONTRACTOR TO VERIFY AND COORDINATE WITH OWNER BEFORE DISCONNECTING OR SHUTTING OFF ANY UTILITIES DURING CONSTRUCTION.
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RCP KEYNOTES:

1. EXISTING EXPOSED CONCRETE CEILING TO BE PAINTED PER FINISH SCHEDULE. ALL CONDUITS / DUCT WORK TO BE PAINTED BLACK (DRYFALL PAINT). SEE SCHEDULES.
2. LIGHTING FIXTURE, SEE ELECTRICAL.
3. ELECTRICAL FIXTURE PER ELECTRICAL.
4. MECHANICAL DUCT AND GRILLES. SEE MECHANICAL.
5. EXISTING CONCRETE CEILING TO BE PAINTED WHITE (DRYFALL PAINT). SEE SCHEDULES. COORDINATE WITH OWNER FOR SPECIAL CARE AND INSTRUCTIONS WITH EXISTING EQUIPMENT.
6. WATER DAMAGE TO BE MITIGATED. PROVIDE WATERPROOFING SYSTEM EQUAL TO KRYSTOL T1 & T2 BY KRYTOL.
7. NEW EQUIPMENT BELOW. SHOWN FOR REFERENCE ONLY.
8. SOS SHERE HANGING SYSTEM, BY OWNERS. CONTRACTOR INSTALLED. USE SIMPSON TITAN HD 1/4" X 2" GALVANIZED SCREWS INTO CONCRETE BEAM.
9. REFER TO STRUCTURAL FOR NEW CONCRETE BEAMS.

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WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

NOIR Lab
NSF
KITT PEAK - Sells, AZ 85634

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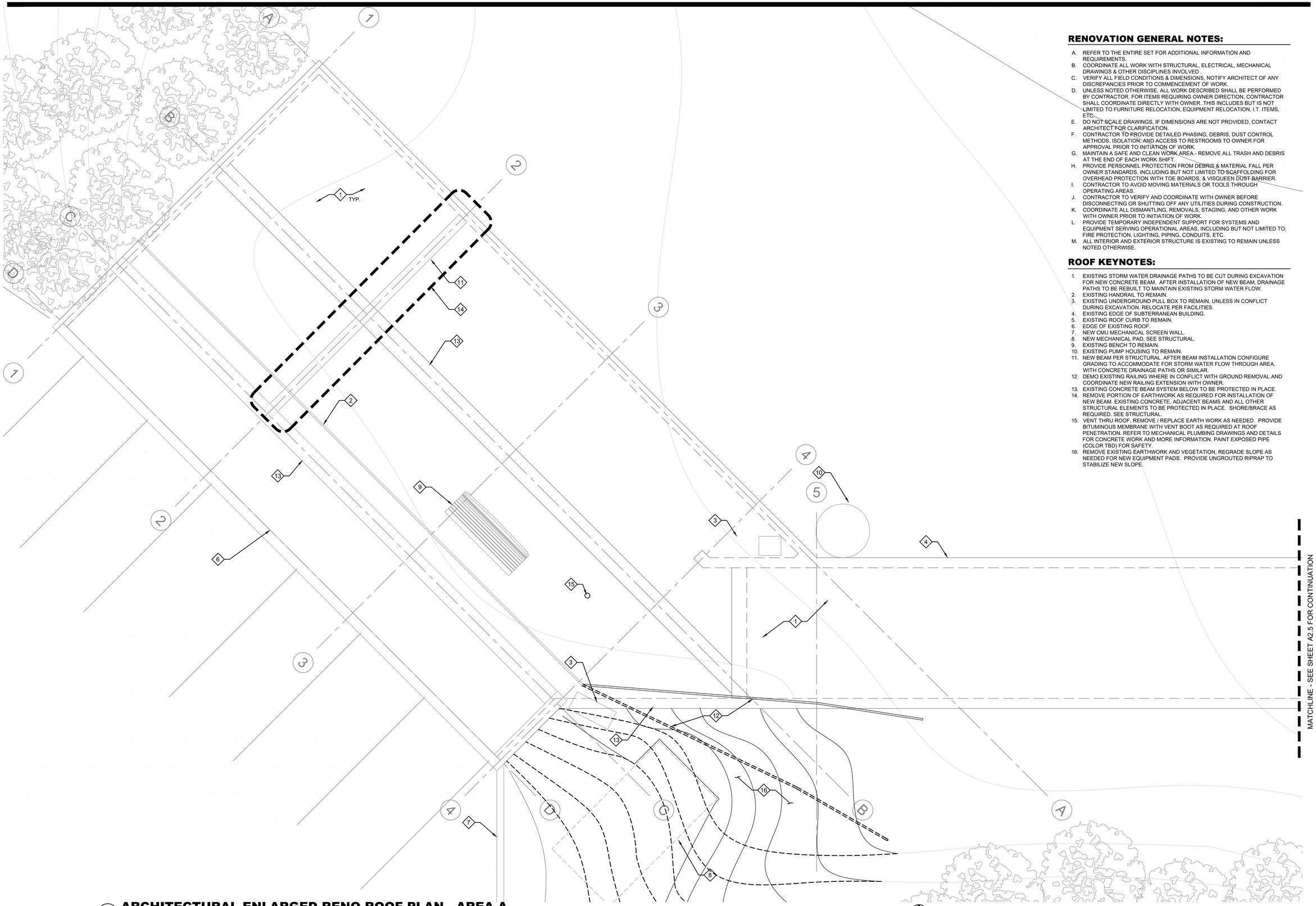
SCALE:	AS NOTED

ENLARGED RENO REFLECTED CEILING AREA C

A2.3



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ROOF KEYNOTES:

1. EXISTING STORM WATER DRAINAGE PATHS TO BE CUT DURING EXCAVATION FOR NEW CONCRETE BEAM. AFTER INSTALLATION OF NEW BEAM, DRAINAGE PATHS TO BE REBUILT TO MAINTAIN EXISTING STORM WATER FLOW.
2. EXISTING HANDRAIL TO REMAIN.
3. EXISTING UNDERGROUND PULL BOX TO REMAIN, UNLESS IN CONFLICT DURING EXCAVATION. RELOCATE PER FACILITIES.
4. EXISTING EDGE OF SUBTERRANEAN BUILDING.
5. EXISTING ROOF CURB TO REMAIN.
6. EDGE OF EXISTING ROOF.
7. NEW CMU MECHANICAL SCREEN WALL.
8. NEW MECHANICAL PAD, SEE STRUCTURAL.
9. EXISTING BENCH TO REMAIN.
10. EXISTING PUMP HOUSING TO REMAIN.
11. NEW BEAM PER STRUCTURAL. AFTER BEAM INSTALLATION CONFIGURE GRADING TO ACCOMMODATE FOR STORM WATER FLOW THROUGH AREA. WITH CONCRETE DRAINAGE PATHS OR SIMILAR.
12. DEMO EXISTING RAILING WHERE IN CONFLICT WITH GROUND REMOVAL AND COORDINATE NEW RAILING EXTENSION WITH OWNER.
13. EXISTING CONCRETE BEAM SYSTEM BELOW TO BE PROTECTED IN PLACE.
14. REMOVE PORTION OF EARTHWORK AS REQUIRED FOR INSTALLATION OF NEW BEAM. EXISTING CONCRETE, ADJACENT BEAMS AND ALL OTHER STRUCTURAL ELEMENTS TO BE PROTECTED IN PLACE. SHORE/BRACE AS REQUIRED. SEE STRUCTURAL.
15. VENT THRU ROOF, REMOVE / REPLACE EARTH WORK AS NEEDED. PROVIDE BITUMINOUS MEMBRANE WITH VENT BOOT AS REQUIRED AT ROOF PENETRATION. REFER TO MECHANICAL PLUMBING DRAWINGS AND DETAILS FOR CONCRETE WORK AND MORE INFORMATION. PAINT EXPOSED PIPE (COLOR TBD) FOR SAFETY.
16. REMOVE EXISTING EARTHWORK AND VEGETATION, REGRADE SLOPE AS NEEDED FOR NEW EQUIPMENT PADS. PROVIDE UNGROUTED RIPRAP TO STABILIZE NEW SLOPE.

MATCHLINE - SEE SHEET A2.5 FOR CONTINUATION

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

1 ARCHITECTURAL ENLARGED RENO ROOF PLAN - AREA A
1ST. LEVEL

REGISTERED ARCHITECT
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WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

NOIR Lab
NSF

KITT PEAK - Sells, AZ 85634

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SCALE:	AS NOTED

ENLARGED RENO ROOF AREA A

A2.4

ROOF KEYNOTES:

1. EXISTING SUBTERRANEAN STRUCTURE TO REMAIN.
2. EXISTING STORM WATER DRAINAGE PATHS TO REMAIN.
3. NOT USED
4. EXISTING TELESCOPE SHAFT TO BE PROTECTED DURING CONSTRUCTION.
5. EXISTING FENCING TO REMAIN.
6. EXISTING SEALANT BETWEEN STONE AND EXTERIOR WALL IS DETERIORATING. REMOVE EXISTING SEALANT, CLEAN JOINT, AND REPLACE WITH SIKAFLEX-15 LM OR EQUAL.
7. BID ALTERNATE # 1: CONTRACTOR TO PROVIDE ALTERNATE PRICING FOR REMOVAL OF EXISTING EARTH WORK BACKFILL (+/- 20' DEEP) TO FULLY EXPOSE RETAINING WALL. PROVIDE A FULLY ADHERED WATERPROOF MEMBRANE SYSTEM. BASIS OF DESIGN: DELTA - MS - BELOW GRADE DIMPLED MEMBRANE. CONTRACTOR TO REINSTALL / COMPACT BACKFILL AS REQUIRED. RE-INSTALL GROUND COVER PER EXISTING CONDITIONS.

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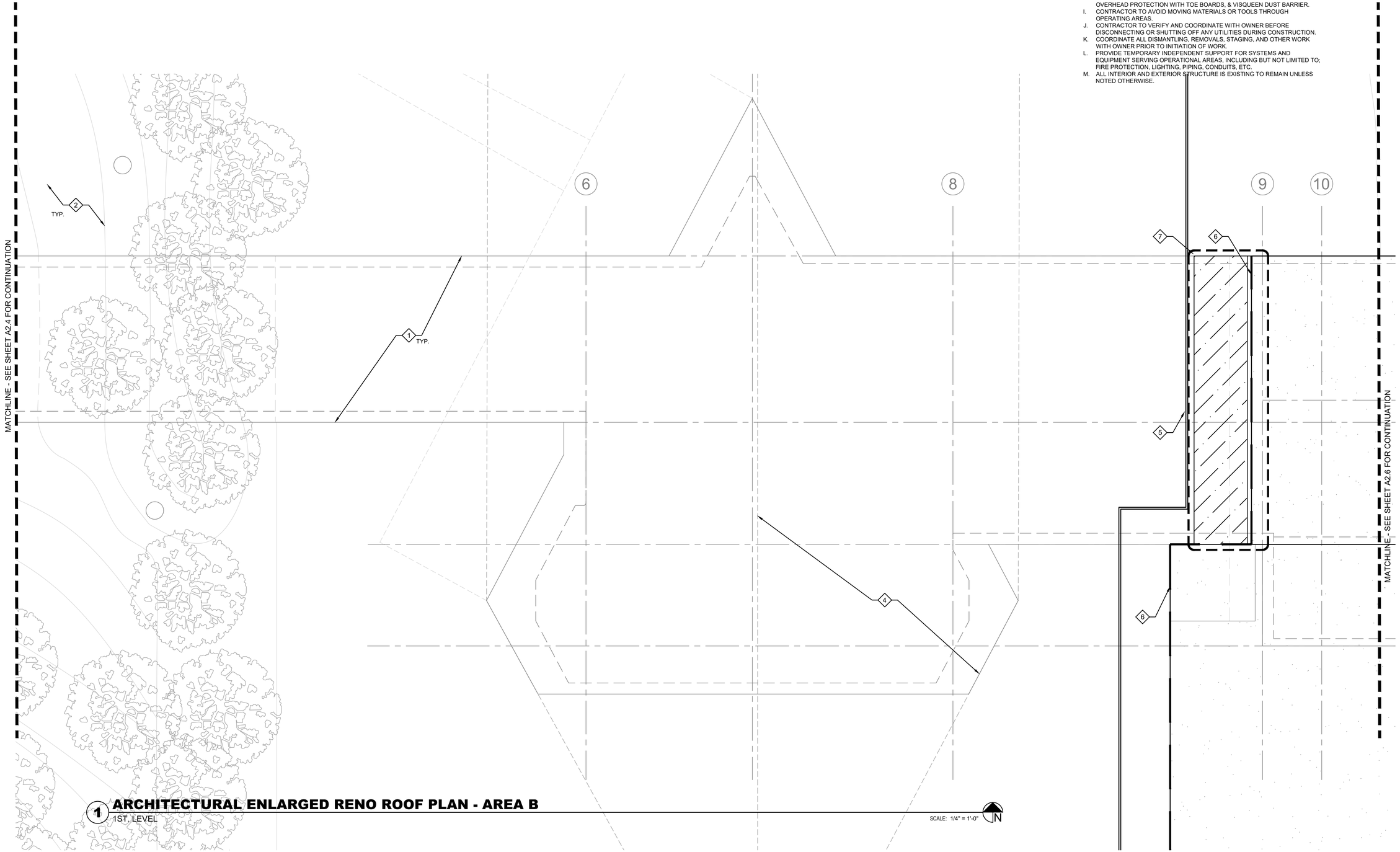

1 ARCHITECTURAL ENLARGED RENO ROOF PLAN - AREA B
1ST. LEVEL

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

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WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

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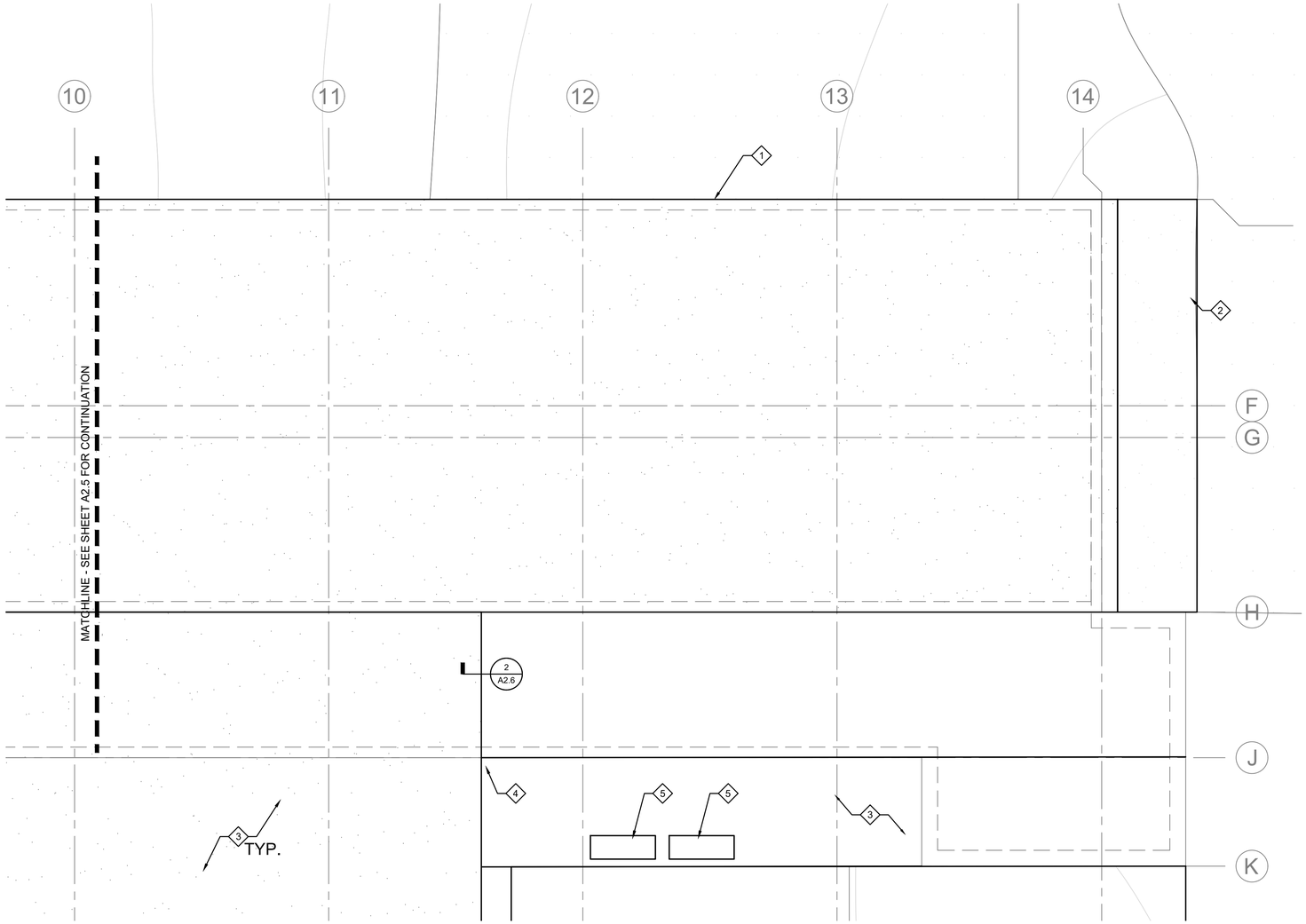
SCALE:	AS NOTED

ENLARGED RENO ROOF AREA B

A2.5



1 ARCHITECTURAL ENLARGED RENO ROOF PLAN - AREA C

1ST. LEVEL

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

RENOVATION GENERAL NOTES:

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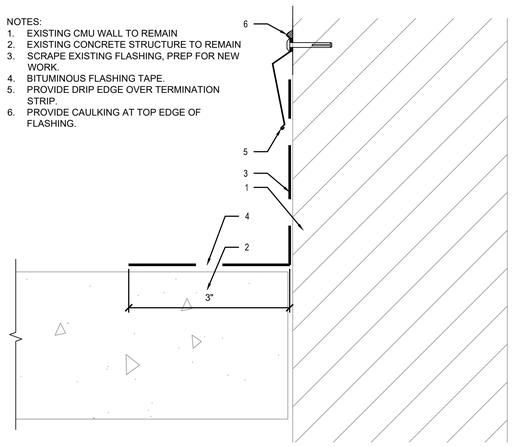
RCP KEYNOTES:

1. EXISTING BUILDING OVER SOS THEATER TO REMAIN.
2. BROKEN WINDOW TO BE REPAIRED TO AVOID FUTURE WEATHER ISSUES ABOVE THEATER.
3. EXISTING ROOFING AND FLASHING TO BE REPAIRED WHERE NEEDED.
4. IDENTIFIED FLASHING/ROOFING ISSUE TO BE REPAIRED.
5. EXISTING MECHANICAL TO BE PROTECTED IN PLACE AND TO REMAIN.

NOTES:
1. EXISTING CMU WALL TO REMAIN
2. EXISTING CONCRETE STRUCTURE TO REMAIN
3. SCRAPE EXISTING FLASHING, PREP FOR NEW WORK.
4. BITUMINOUS FLASHING TAPE.
5. PROVIDE DRIP EDGE OVER TERMINATION STRIP.
6. PROVIDE CAULKING AT TOP EDGE OF FLASHING.



2 EX. CONCRETE JOINT SEAL

SCALE: 3"=1'-0"

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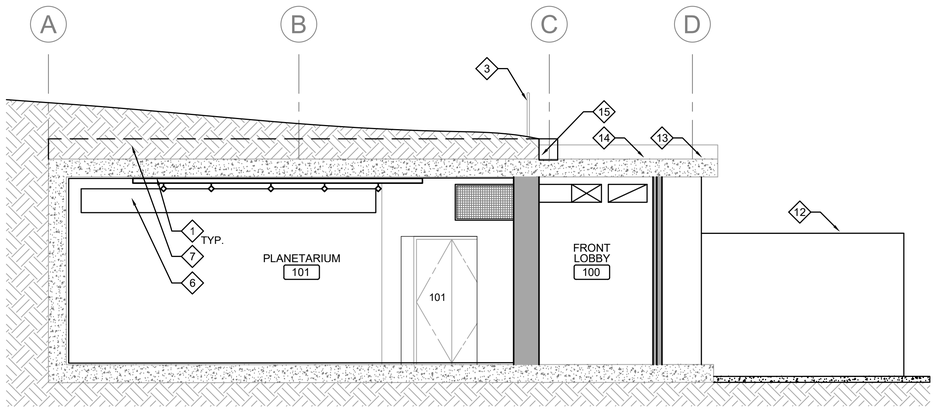
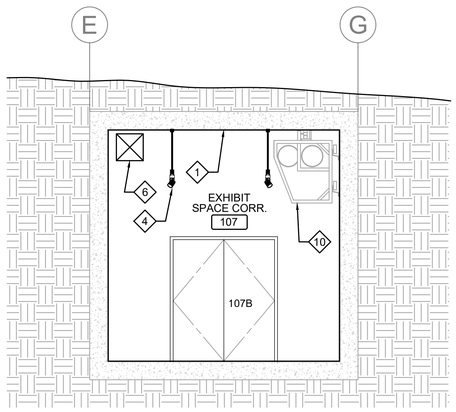
ENLARGED RENO ROOF AREA C

A2.6



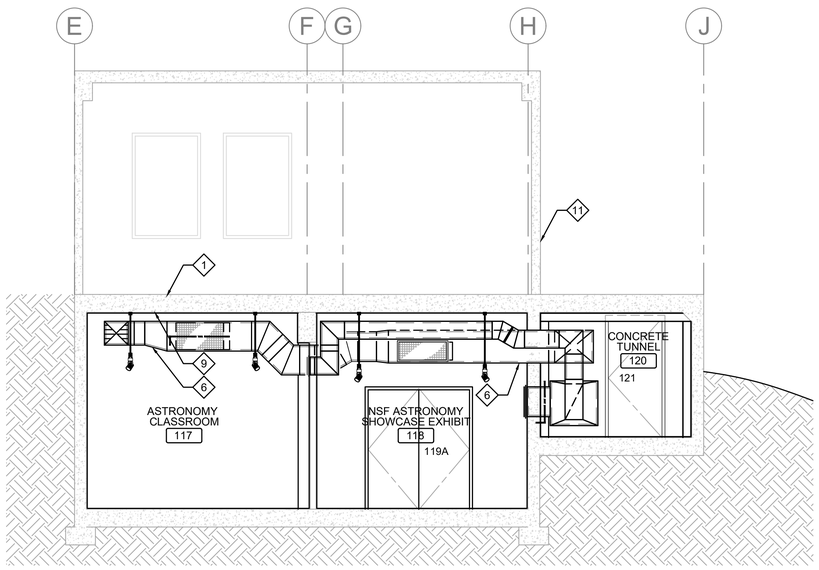
1 ARCHITECTURAL BUILDING SECTION
1ST. LEVEL

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



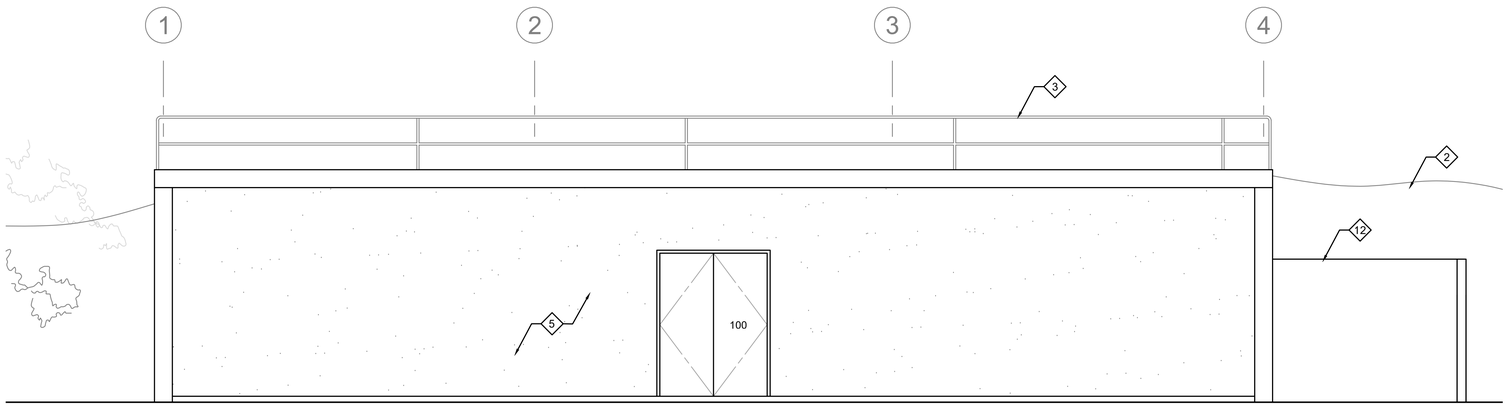
2 ARCHITECTURAL BUILDING SECTION
1ST. LEVEL

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



3 ARCHITECTURAL BUILDING SECTION
1ST. LEVEL

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



4 ARCHITECTURAL BUILDING ELEVATION
1ST. LEVEL

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

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KEYNOTES:

1. EXISTING CONCRETE CEILING TO REMAIN
2. EXISTING ROCK WALL BEYOND TO REMAIN
3. EXISTING PIPE RAILING BEYOND TO REMAIN
4. NEW LIGHTING, REFER TO ELECTRICAL FOR MORE INFO.
5. NEW WALL PARTITION SEE FLOOR PLAN FOR MORE INFORMATION
6. NEW MECHANICAL DUCT SEE MECHANICAL FOR MORE INFORMATION
7. REFER TO STRUCTURAL FOR NEW BEAM LOCATED ABOVE CONCRETE DECK. EARTHWORK TO BE REMOVED AND REINSTALLED.
8. NOT USED.
9. CEILING FINISH PER FINISH SCHEDULE.
10. (E) SPECTROGRAPH/ TRACK SYSTEM TO REMAIN, PROTECT DURING CONSTRUCTION.
11. (E) SECOND STORY BUILDING TO REMAIN.
12. CMU MECHANICAL SCREEN WALL. SEE SITE PLAN.
13. EXISTING ROOF CURB TO REMAIN
14. EXISTING CURB BEYOND.
15. EXISTING BEAM TO BE PROTECTED IN PLACE.

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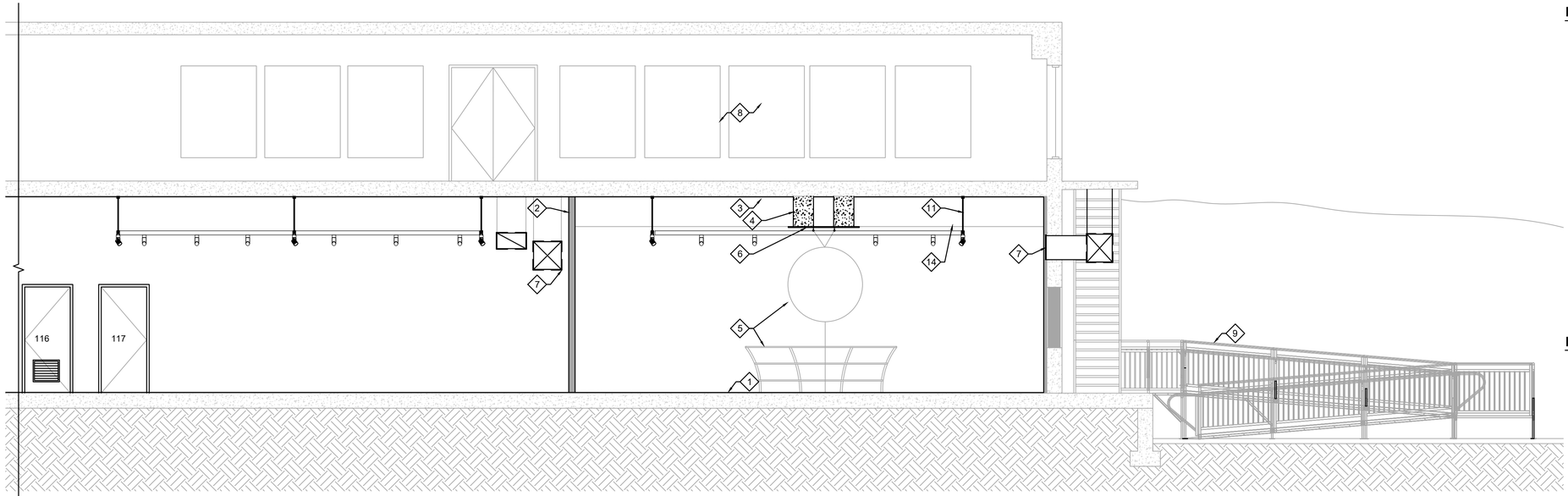
BUILDING SECTIONS AND ELEVATION

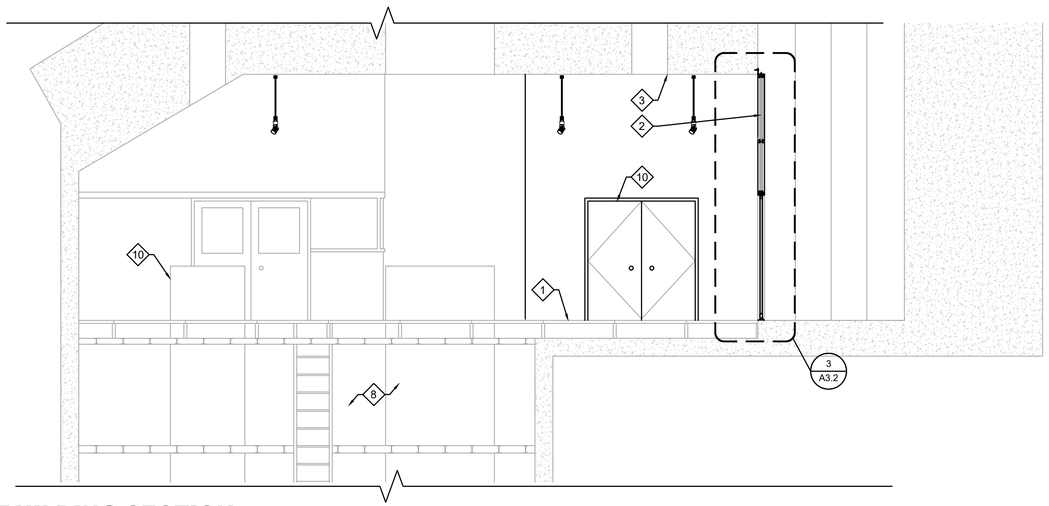
A3.1



2 ARCHITECTURAL BUILDING SECTION
1ST. LEVEL

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

NOTE:
ALL VIEW PORTS AND EXISTING CEILING MOUNTED EQUIPMENT TO BE PROTECTED IN PLACE, TYP.



1 ARCHITECTURAL BUILDING SECTION
1ST. LEVEL

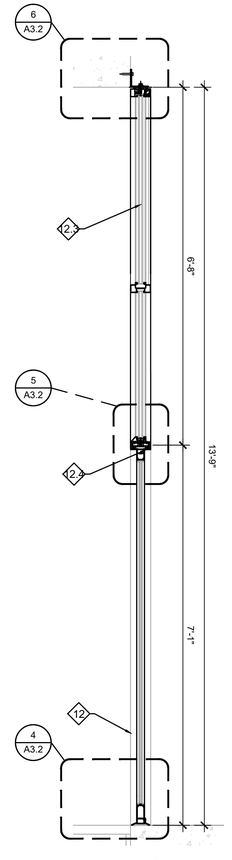
SCALE: 1/4" = 1'-0"

RENOVATION GENERAL NOTES:

A. REFER TO THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
B. COORDINATE ALL WORK WITH STRUCTURAL, ELECTRICAL, MECHANICAL DRAWINGS & OTHER DISCIPLINES INVOLVED .
C. VERIFY ALL FIELD CONDITIONS & DIMENSIONS, NOTIFY ARCHITECT OF ANY DISCREPANCIES PRIOR TO COMMENCEMENT OF WORK.
D. UNLESS NOTED OTHERWISE, ALL WORK DESCRIBED SHALL BE PERFORMED BY CONTRACTOR. FOR ITEMS REQUIRING OWNER DIRECTION, CONTRACTOR SHALL COORDINATE DIRECTLY WITH OWNER. THIS INCLUDES BUT IS NOT LIMITED TO FURNITURE RELOCATION, EQUIPMENT RELOCATION, I.T. ITEMS, ETC.
E. DO NOT SCALE DRAWINGS, IF DIMENSIONS ARE NOT PROVIDED, CONTACT ARCHITECT FOR CLARIFICATION.
F. CONTRACTOR TO PROVIDE DETAILED PHASING, DEBRIS, DUST CONTROL METHODS, ISOLATION, AND ACCESS TO RESTROOMS TO OWNER FOR APPROVAL PRIOR TO INITIATION OF WORK.
G. MAINTAIN A SAFE AND CLEAN WORK AREA - REMOVE ALL TRASH AND DEBRIS AT THE END OF EACH WORK SHIFT.
H. PROVIDE PERSONNEL PROTECTION FROM DEBRIS & MATERIAL FALL PER OWNER STANDARDS. INCLUDING BUT NOT LIMITED TO SCAFFOLDING FOR OVERHEAD PROTECTION WITH TOE BOARDS, & VISQUEEN DUST BARRIER.
I. CONTRACTOR TO AVOID MOVING MATERIALS OR TOOLS THROUGH OPERATING AREAS.
J. CONTRACTOR TO VERIFY AND COORDINATE WITH OWNER BEFORE DISCONNECTING OR SHUTTING OFF ANY UTILITIES DURING CONSTRUCTION.
K. COORDINATE ALL DISMANTLING, REMOVALS, STAGING, AND OTHER WORK WITH OWNER PRIOR TO INITIATION OF WORK.
L. PROVIDE TEMPORARY INDEPENDENT SUPPORT FOR SYSTEMS AND EQUIPMENT SERVING OPERATIONAL AREAS, INCLUDING BUT NOT LIMITED TO; FIRE PROTECTION, LIGHTING, PIPING, CONDUITS, ETC.
M. ALL INTERIOR AND EXTERIOR STRUCTURE IS EXISTING TO REMAIN UNLESS NOTED OTHERWISE.

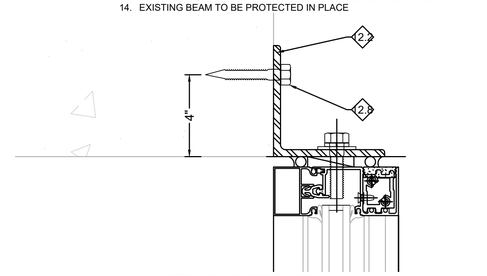
KEYNOTES:

1. NEW FLOORING PER FINISH PLAN ON SHEET A4.1.
2. NEW WALL, SEE WALL TYPES ON SHEET A4.2.
3. NEW CEILING PER FINISH SCHEDULE ON A4.1
4. NEW BEAM, SEE STRUCTURAL
5. DISPLAY EQUIPMENT BY OWNERS, SHOWN FOR REFERENCE ONLY.
6. COORDINATE WITH OWNER AND STRUCTURAL FOR MOUNTING HOOKS AS REQUIRED.
7. NEW DUCTWORK, SEE MECHANICAL
8. NO WORK IN THIS AREA
9. NEW RAMP BEYOND, REFER TO RAMP DETAILS AND ELEVATIONS
10. NEW DOOR, SEE DOOR SCHEDULE ON SHEET A4.1
11. NEW LIGHTING, SEE ELECTRICAL
12. NEW 6" STOREFRONT WALL SYSTEM, SEE DOOR FRAMES ON SHEET A4.1
    12.1. STORE FRONT HEADER CONDITION
    12.2. ATTACHED L6X6X1/8" BENT PLATE TO EDGE OF EXISTING CONCRETE WALL.
    12.3. GLAZING SYSTEM
    12.4. DOOR HEADER
    12.5. DOOR, SEE DOOR SCHEDULE
    12.6. PROVIDE DOOR BOTTOM.
    12.7. PROVIDE THRESHOLD
    12.8. 3/8" SIMPSON TIE TITAN HD SCREW WITH 2.5" EMBEDMENT @ 24" O.C.
13. EXISTING EQUIPMENT TO BE PROTECTED IN PLACE AND TO REMAIN.
14. EXISTING BEAM TO BE PROTECTED IN PLACE



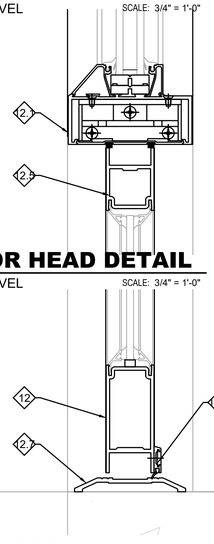
3 WALL SECTION
1ST. LEVEL

SCALE: 3/4" = 1'-0"



6 HEAD DETAIL
1ST. LEVEL

SCALE: 3/4" = 1'-0"



5 DOOR HEAD DETAIL
1ST. LEVEL

SCALE: 3/4" = 1'-0"

4 SILL DETAIL
1ST. LEVEL

SCALE: 3/4" = 1'-0"

REGISTERED ARCHITECT
CERTIFICATE NO.
49199
IAN MATTHEW REGAN
DATE SIGNED 01/08/21
ARIZONA U.S.A.
Expires 3/31/2021

ADVANTECH
FACILITY DESIGN INC
ARCHITECTURE - ENGINEERING
3280 E. HEMISPHERE LOOP STE. 110 TUCSON AZ 85706 520-806-0903
1889 E. BROADWAY, TEMPE, AZ 85258

WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

NOIR Lab | NSF

KITT PEAK - Sells, AZ 85634

△	DATE	DESCRIPTION
0	01/08/21	I.F.C.

PROJECT NUMBER:	11904.00
DRAWN BY:	FH
CHECKED BY:	IR
CAD FILE:	11904.00-A3.2
SCALE:	AS NOTED

BUILDING SECTION

A3.2

DOOR SCHEDULE

DOOR NUMBER	DOOR					FRAME					LABEL	HDWR SET NO.	NOTES
	ROOM	TYPE	SIZE	MAT'L	FIN	MAT'L	TYPE	FIN	DETAILS HEAD	DETAILS JAMB			
100	FRONT LOBBY	D	(2) 3'-0" 7'-0"	HM	PAINT	ALUM	2	DK BRZ ANO	5/A4.2	6/A4.2	---	2	1,2, 3, 6
101	PLANETARIUM	B	(2) 3'-0" 7'-0"	SCWD	STAIN	HM	1	PAINT	5/A4.2	6/A4.2	---	3	1, 3,6
102	JAN. CLOSET (WEST)	B	3'-0" 7'-0"	SCWD	STAIN	HM	1	PAINT	4/A4.2	5/A4.2	---	5	3
103	WOMEN RESTROOM (WEST)	B	3'-0" 7'-0"	SCWD	STAIN	HM	1	PAINT	4/A4.2	5/A4.2	---	5	
104	MEN RESTROOM (WEST)	B	3'-0" 7'-0"	SCWD	STAIN	HM	1	PAINT	4/A4.2	5/A4.2	---	5	
105	STORAGE CLOSET	-	-	-	STAIN	-	-	PAINT	-	-	---	-	3
107A	EXHIBIT SPACE CORR.	B	(2) 3'-0" 7'-0"	SCWD	STAIN	HM	1	PAINT	4/A4.2	5/A4.2	---	3	3, 6
107B	CONTROL ROOM	A	(2) 3'-0" 7'-0"	SCWD	STAIN	HM	1	PAINT	4/A4.2	5/A4.2	---	3	3, 6
109	ELEVATOR LIFT	E	3'-0" 7'-0"	ALUM	DK ANO	ALUM	2	DR BRZ ANO	2/A4.2	5/A4.2	---	5	3, 4, 5
110	COMPUTER RM	-	-	-	STAIN	-	-	STAIN	-	-	---	-	3
111	CIRCUITRY RM	-	-	-	PAINT	-	-	PAINT	-	-	---	-	3, 7
112	UNISEX RESTROOM	C	3'-0" 7'-0"	SCWD	STAIN	HM	1	PAINT	1/A4.2	2/A4.2	---	5	3, 7
113	JAN. CLOSET (EAST)	C	3'-0" 7'-0"	SCWD	STAIN	HM	1	PAINT	5/A4.2	6/A4.2	---	5	3, 7
114	UNISEX RESTROOM	C	3'-0" 7'-0"	SCWD	STAIN	HM	1	PAINT	1/A4.2	2/A4.2	---	5	3, 7
115	STORAGE CLOSET	-	-	-	PAINT	-	-	PAINT	-	-	---	-	3
116	UTILITY ROOM	-	-	-	PAINT	-	-	PAINT	-	-	---	-	3
117	ASTRONOMY CLASS RM	A	3'-0" 7'-0"	SCWD	STAIN	HM	1	PAINT	1/A4.2	2/A4.2	---	1	1, 3
118	NSF ASTRONOMY EXHIBIT	A	(2) 3'-0" 7'-0"	SCWD	STAIN	HM	1	PAINT	3/A4.2	2/A4.2	---	3	1, 3, 6
119A	SCI ON SPHERE	B	(2) 3'-0" 7'-0"	SCWD	STAIN	HM	1	PAINT	1/A4.2	2/A4.2	---	3	1, 3, 6
119B	SCI ON SPHERE	D	(2) 3'-0" 7'-0"	HM	PAINT	HM	1	PAINT	9/A4.2	9/A4.2 SIM	---	2	1, 2 , 3, 6
120	STAFF OFFICE	-	-	-	PAINT	-	-	PAINT	-	-	---	-	3
121	CONCRETE TUNNEL	B	3'-0" 6'-8"	SCWD	PAINT	HM	1	PAINT	4/A4.2	5/A4.2 SIM	---	5	3

DOOR HARDWARE

SET 1-CLASSROOMS
1-1/2 PR HINGES
1 SET OF SILENCERS
1 SET DOOR SEALS
WALL BUMPER
FOOT HOLD OPEN
1 HEAVY DUTY CLOSER
1 CLASSROOM LOCKSET

SET 2-ENTRY:
1-1/2 PR HINGES
1 SET OF SILENCERS
1 SET DOOR SEALS
1 THRESHOLD - ADA COMPLIANT WHEN NEEDED
1 HEAVY DUTY CLOSER
1 HEAVY DUTY PANIC BAR
1 ENTRANCE LOCKSET

SET 3-MULTI PURPOSE
1-1/2 PR HINGES PER DOOR
2 SET OF SILENCERS
2 SET DOOR SEALS
2 WALL BUMPERS
2 FOOT HOLD OPEN
2 HEAVY DUTY PANIC BAR
2 HEAVY DUTY CLOSER
1 CLASSROOM LOCKSET
VERTICAL ROD

SET 4-OFFICE
1-1/2 PR HINGES
1 SET OF SILENCERS
1 SET DOOR SEALS
WALL BUMPER
1 OFFICE LOCKSET

SET 5-STORAGE
1-1/2 PR HINGES
1 SET OF SILENCERS
1 SET DOOR SEALS
WALL BUMPER
1 STORAGE LOCKSET
FOOT HOLD OPEN
KICK PLATE

ABBREVIATIONS:

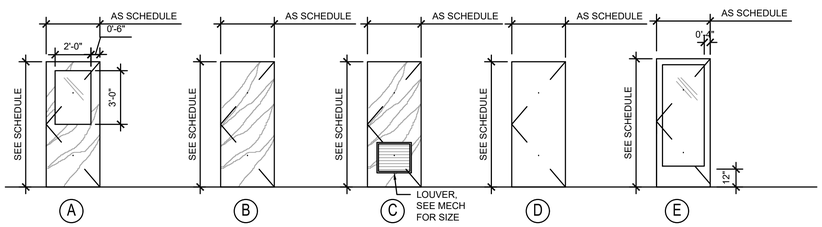
(E)	EXISTING	HM	HOLLOW METAL
SCWD	SOLID CORE WOOD	V	VARNISH
MTL	METAL	P	PAINTED
		T	TEMPERED GLASS

DOOR SCHEDULES GENERAL NOTES

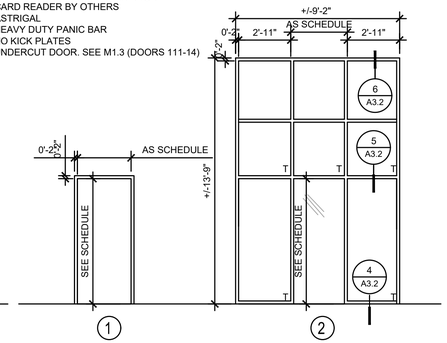
A. CONTRACTOR TO SURVEY AND FIELD VERIFY EXISTING OPENINGS, SIZES, CONDITIONS AND COORDINATE WITH NEW CONSTRUCTION EXISTING WOOD DOORS - CONTRACTOR TO PATCH/REPAIR, READJUST DOOR AND HARDWARE AND SAND/TOUCH-UP FINISH TO RENDER DOOR TO NEW CONDITION TO GREATEST EXTENT POSSIBLE
B. REMOVE ALL HARDWARE, FASTENERS AND ACCESSORIES PRIOR TO PAINTING/REFINISHING. REINSTALL
C. VERIFY EXISTING OPENING DIMENSIONS MODIFY FRAME/ DOOR DETAILS/ DIMENSIONS TO FIT EXISTING OPENING. SURVEY EXISTING DOOR/ FRAME AND STRIKE FOR NEW HDWR AS REQUIRED.
D. REWORK EXISTING DOOR/ FRAME FOR INSTALLATION. PROVIDE BACKING AND SUPPORTS AS REQUIRED FOR NEW HDWR. PAINT EXISTING DOOR AND FRAME, TYPICAL.
E. CONTRACTOR TO CLEAN AND ADJUST EXISTING DOOR/ HDWR.
F. CONTRACTOR TO COORDINATE NEW DOOR/ FRAME/ ANCHORS WITH (E) TRAILER WALL CONSTRUCTION. PROVIDE ADDITIONAL FRAMING/ SUPPORTS FOR FRAME AND AUTO OPERATOR. COORDINATE INSTALL WITH ELECTRICAL CONNECTION.

DOOR NOTES:

1. OVER SIZED THROAT, 6" WALL
2. DH FIRE RATED GLASS: FIRELIGHT NT FILM
3. PROVIDE ELECTRIC STRIKE. COORDINATE W/ ELECTRICAL
4. LOCKABEL PER MANF.-CHANGABLE CORES IN DK BRONZE
5. DESIGN BASED ON MILGARD, ALUM SERIES, CLEAR GLASS, SEE PALO VERDE GLASS-855-6010 ATTENTION DEBBIE
6. FRAME TO BE GROUTED SOLID
7. ALL HARDWARE TO BE DARK BRONZE
8. CARD READER BY OTHERS
9. ASTRIGAL
10. HEAVY DUTY PANIC BAR
11. NO KICK PLATES
12. UNDERCUT DOOR. SEE M1.3 (DOORS 111-14)



2 DOOR TYPES



3 FRAME TYPES

ROOM FINISH GENERAL NOTES:

A. REFER TO FINISH PLAN BELOW FOR ALL FLOOR AND WALL FINISHES.
B. ALL CEILINGS IN PROJECT ARE TO BE EXPOSED. PREP AS REQUIRED FOR PAINT AS INDICATED BELOW.
C. PROTECT ALL CEILING HUNG EQUIPMENT FROM OVER SPRAY.

CEILING FINISH SCHEDULE

ROOM NUMBER	ROOM	FINISH
100	FRONT LOBBY	PNT-3
101	PLANETARIUM	PNT-4
102	JANITOR'S CLOSET (WEST)	PNT-3
103	WOMEN'S RESTROOM (WEST)	PNT-3
104	MEN'S RESTROOM (WEST)	PNT-3
105	STORAGE CLOSET	PNT-3
106	RESTROOM HALLWAY	PNT-3
107	EXHIBIT SPACE CORRIDOR	PNT-4
108	CONTROL ROOM	PNT-3
109	ELEVATOR SHAFT	-
110	COMPUTER ROOM	PNT-3
111	CIRCUITRY ROOM	PNT-3
112	UNISEX RESTROOM	PNT-3
113	JANITOR'S CLOSET EAST	PNT-3
114	UNISEX RESTROOM	PNT-3
115	STORAGE CLOSET	PNT-3
116	UTILITY ROOM	PNT-3
117	ASTRONOMY CLASSROOM	PNT-4
118	NSF ASTRONOMY SHOWCASE EXHIBIT	PNT-4
119	S.O.S. THEATER	PNT-4
120	STAFF OFFICE	PNT-3
121	CONCRETE TUNNEL	-

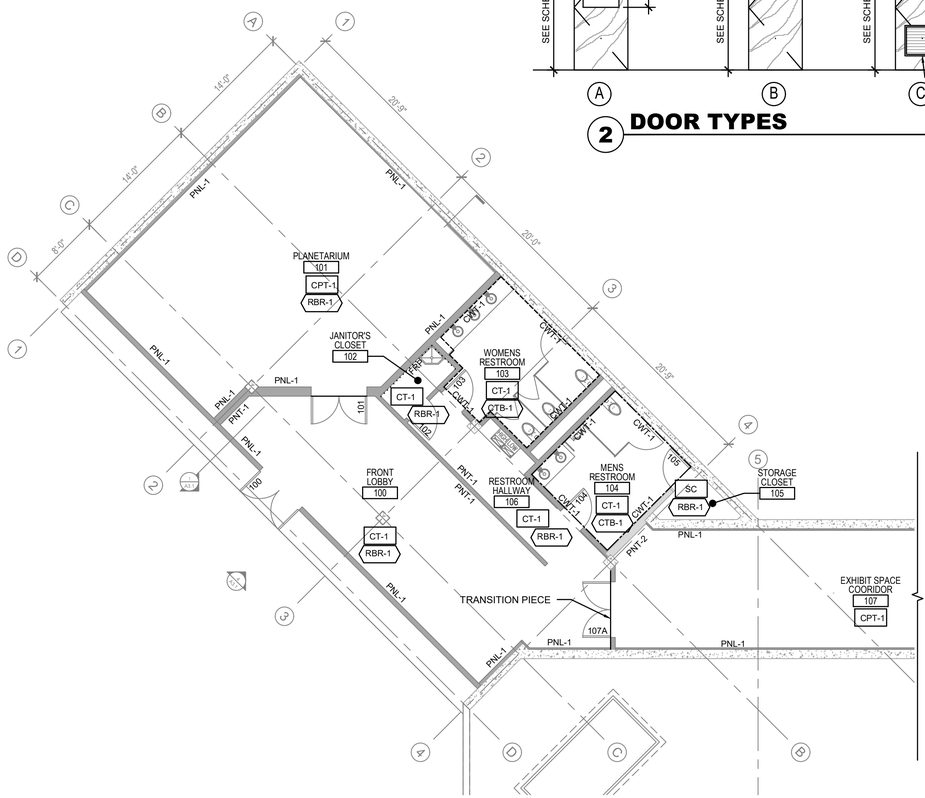
FINISH SCHEDULE LEGEND

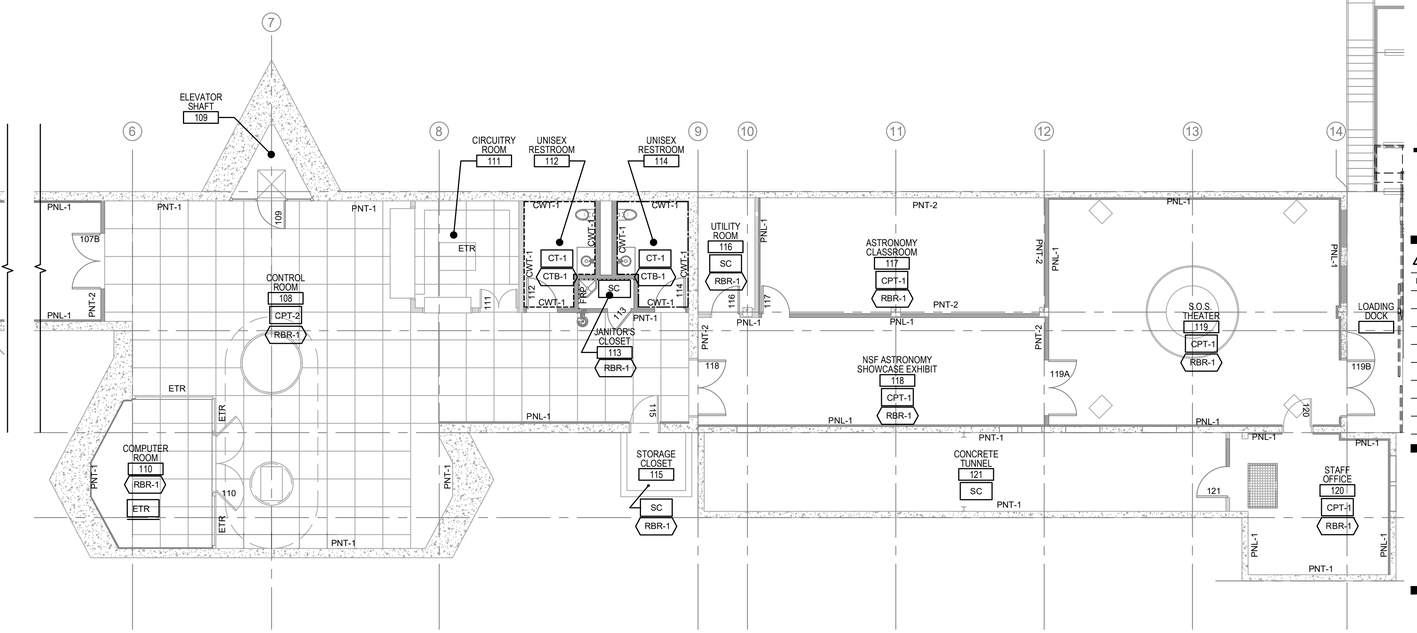
FLOOR
- CPT-1 CARPET TILE: TBD
- CPT-2 CARPET TILE: TBD
- CT-1 CERAMIC TILE: TBD
- SC SEALED CONCRETE
- ETR EXISTING TO REMAIN: EXISTING FLOORING TO BE PROTECTED IN PLACE AND CLEANED

BASE
- RBR-1 RUBBER BASE: TBD
- CTB-1 CERAMIC TILE BASE: TBD

WALL
- CWT-1 CERAMIC WALL TILE: TBD TILE FROM F.F.E. UP TO 5' A.F.F. PAINT THE REST
- PNT-1 PAINT: TBD (ALL WALLS NOT DETERMINED BY OTHER FINISHES ARE TO BE PAINTED TO MATCH CEILING COLOR
- PNT-2 PAINT: TBD
- PNL-1 ACOUSTICAL PANELING EQUAL TO ACOUSITCORD. COLOR AND STYLE TBD BY OWNER.

CEILING
- PNT-3 WHITE DRYFALL PAINT MANUFACTURE TBD
- PNT-4 BLACK DRYFALL PAINT MANUFACTURE TBD





1 FINISH FLOOR PLAN

REGISTERED ARCHITECT
CERTIFICATE NO. 49199
IAN MATTHEW REGAN
DATE SIGNED 03/31/21
ARIZONA
Expires 3/31/2021

ADVANTECH
FACILITY DESIGN INC
ARCHITECTURE - ENGINEERING
3280 E. HEMISPHERE LOOP STE. 110 TUCSON AZ 85706 520-806-0903
1889 E. BROADWAY, TEMPE AZ 85258

WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

NOIR Lab | NSF

KITT PEAK - Sells, AZ 85634

	DATE	DESCRIPTION
0	01/08/21	I.F.C.

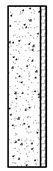
PROJECT NUMBER: 11904.00
DRAWN BY: FH
CHECKED BY: IR
CAD FILE: 11904.00-A4.1
SCALE: AS NOTED

ARCHITECTURAL SCHEDULES & DETAILS

A4.1

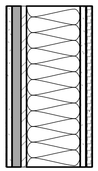
A

EXISTING CONCRETE WALL CLEANED AND PAINTED. FINAL COLOR PER OWNER.



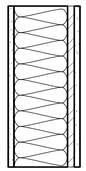
A SIM

EXISTING CONCRETE WALL CLEANED AND PREPARED FOR ACOUSTICAL PANELING. COLOR AND FINISH PER OWNER.



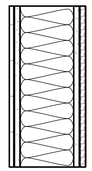
B

NON-RATED STUD WALL: 6" X 20 GAUGE METAL STUDS 16" ON CENTER W/ BATT, EXTERIOR WITH ONE LAYER OF 5/8" DENSELEMENT,1" THICK EXTRUDED POLYISO INSULATION BOARD BARRIER SYSTEM, 1/2" THICK STUCCO SYSTEM INCLUDING REINFORCING MESH EMBEDDED IN BASE COAT AND FINISHED COAT. INTERIOR 5/8" TYPE 'X' GWB, 1 LAYER ACOUSTICAL PANELING. WALL UP TO CEILING HEIGHT, COLOR AND FINISH PER OWNER.



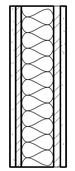
C

NON-RATED STUD WALL: 6" X 20 GAUGE METAL STUDS 16" ON CENTER W/ BATT, WITH ONE LAYER OF 5/8" TYPE 'X' GWB ON ONE SIDE AND OTHER SIDE W/ 5/8" TYPE 'X' GWB, 1 LAYER ACOUSTICAL PANELING. WALL UP TO CEILING HEIGHT, COLOR AND FINISH PER OWNER.



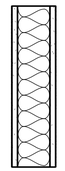
C SIM

NON-RATED STUD WALL: 6" X 20 GAUGE METAL STUDS 16" ON CENTER W/ BATT, WITH TILE OVER ONE LAYER OF 5/8" TYPE 'X' GWB ON ONE SIDE AND OTHER SIDE W/ 5/8" TYPE 'X' GWB, 1 LAYER ACOUSTICAL PANELING. WALL UP TO CEILING HEIGHT, COLOR AND FINISH PER OWNER.



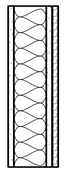
D

NON-RATED STUD WALL: 3-5/8" X 20 GAUGE METAL STUDS 16" ON CENTER W/ BATT, ONE LAYER OF 5/8" TYPE 'X' GWB OVER ONE LAYER 3/4" PLY ON BOTH SIDES. WALL UP TO CEILING HEIGHT, COLOR AND FINISH PER OWNER.



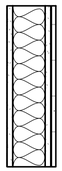
E

NON-RATED STUD WALL: 3-5/8" X 20 GAUGE METAL STUDS 16" ON CENTER W/ BATT, ONE LAYER OF 5/8" TYPE 'X' GWB ON BOTH SIDES. WALL UP TO CEILING HEIGHT, COLOR AND FINISH PER OWNER.



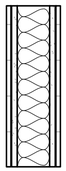
E SIM

NON-RATED STUD WALL: 6" METAL STUDS 16" ON CENTER W/ BATT, ONE LAYER OF 5/8" TYPE 'X' GWB ON ONE SIDE AND OTHER SIDE W/ 5/8" TYPE 'X' GWB, 1 LAYER ACOUSTICAL PANELING. WALL UP TO CEILING HEIGHT, COLOR AND FINISH PER OWNER.



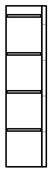
E SIM 2

NON-RATED STUD WALL: 3-5/8" X 20 GAUGE METAL STUDS 16" ON CENTER W/ BATT, ONE LAYER OF 5/8" TYPE 'X' GWB ON ONE SIDE AND OTHER SIDE W/ 5/8" TYPE 'X' GWB, 1 LAYER TILE. WALL UP TO CEILING HEIGHT, COLOR AND FINISH PER OWNER.



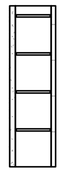
E SIM 3

NON-RATED STUD WALL: 3-5/8" X 20 GAUGE METAL STUDS 16" ON CENTER W/ BATT, WITH TILE ON TOP OF ONE LAYER OF 5/8" TYPE 'X' GWB ON BOTH SIDES. WALL UP TO CEILING HEIGHT, COLOR AND FINISH PER OWNER.



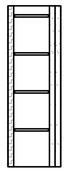
F

EXISTING CMU WALL CLEANED AND PREPARED FOR TILE. FINAL COLOR AND FINISH PER OWNER.



F SIM

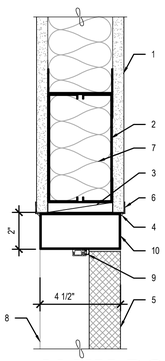
EXISTING CMU WALL CLEANED AND PREPARED FOR TILE ON ONE SIDE, ONE LAYER 5/8" W.R. TYPE 'X' GWB ON THE OTHER SIDE. FINAL COLOR AND FINISH PER OWNER.



F SIM 2

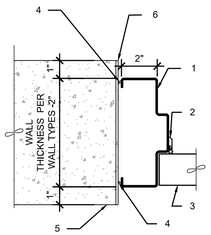
EXISTING CMU WALL CLEANED AND PREPARED FOR ACOUSTICAL PANELING ON ONE SIDE, AND TWO LAYERS 5/8" W.R. TYPE 'X' GWB ON THE OTHER SIDE. FINAL COLOR AND FINISH PER OWNER.

WALL TYPES



NOTES:
1. WALL PARTITION PER WALL TYPES.
2. 6" METAL STUD BOX BEAM AT HEAD.
3. SHIM AS NEEDED.
4. CAULK BOTH SIDES OF WALL, TYP.
5. DOOR PER SCHEDULE
6. METAL CORNER BEAD AT HEAD & JAMB, TYP.
7. ENCAPSULATE SOUND BATT IN BOX HEADER.
8. DOOR FRAME BEYOND.
9. PEMKO 29310CV DOOR SEAL.
10. ALUMINUM DOOR FRAME PER SCHEDULE.

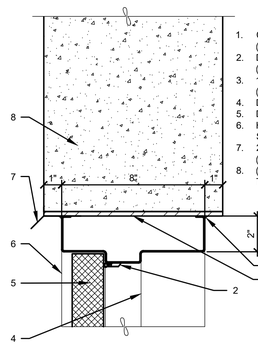
1 ALUM DOOR HEAD 3-5/8" STUD WALL
SCALE: 3"=1'-0"



1. HOLLOW METAL FRAME PER SCHEDULE ANCHOR TO (E) CONCRETE WALL AT TOP MIDDLE & BOTTOM (TYP.)
2. DOOR SEAL PER DOOR SCHEDULE (TYP.)
3. DOOR PER SCHEDULE (TYP.)
4. CAULK BOTH SIDES OF DOOR (TYP.)
5. (E) CONCRETE WALL PER WALL TYPES.
6. ¼" STEEL PLATE, SECURE TO (E) CONCRETE WALL.

NOTE: VERIFY WALL THICKNESS PRIOR TO ORDERING FRAMES

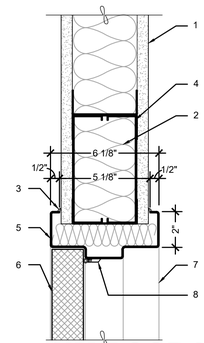
2 DR JAMB @ (E) CONC.
SCALE: 3"=1'-0"



1. CAULK BOTH SIDES OF DOOR (TYP.)
2. DOOR SEAL PER SCHEDULE (TYP.)
3. 1/4" STEEL PLATE, SECURE TO (E) CONCRETE
4. DOOR FRAME (BEYOND).
5. DOOR PER SCHEDULE (TYP.)
6. HOLLOW METAL FRAME PER SCHEDULE (TYP.)
7. 24 GA. METAL DRIP FLASHING (TYP.)
8. (E) CONCRETE PER WALL TYPES.

NOTE: VERIFY WALL THICKNESS PRIOR TO ORDERING FRAMES

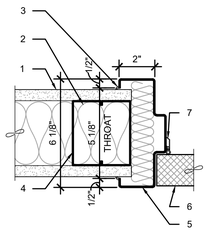
3 HM DOOR HEAD @ (E) CONCRETE
SCALE: 3"=1'-0"



1. WALL PARTITION PER WALL TYPES.
2. ENCAPSULATE SOUND BATT IN BOX HEADER.
3. CAULK BOTH SIDES OF WALL, TYP.
4. 6" METAL STUD BOX BEAM AT HEAD.
5. HOLLOW METAL FRAME, FILL VOID WITH SOUND BATT INSULATION.
6. DOOR PER SCHEDULE.
7. DOOR FRAME BEYOND.
8. PEMKO DOOR SEAL 316AV, TYP.

NOTE: VERIFY WALL THICKNESS PRIOR TO ORDERING FRAMES

4 HM DOOR HEAD 3-5/8" STUD WALL
SCALE: 3"=1'-0"



1. WALL PARTITION PER WALL TYPES.
2. ENCAPSULATE SOUND BATT IN JAMB.
3. CAULK BOTH SIDES OF WALL, TYP.
4. DOUBLE STUD JAMB TYP. EACH SIDE.
5. HOLLOW METAL FRAME, FILL VOID WITH SOUND BATT INSULATION.
6. DOOR PER SCHEDULE.
7. PEMKO DOOR SEAL 316AV, TYP.

NOTE: VERIFY WALL THICKNESS PRIOR TO ORDERING FRAMES

5 HM DOOR JAMB 3-5/8" STUD WALL
SCALE: 3"=1'-0"

REGISTERED ARCHITECT
CERTIFICATE NO.
49199
IAN MATTHEW REGAN
DATE SIGNED 03/31/21
ARIZONA
Expires 3/31/2021

ADVANTECH
FACILITY DESIGN INC
ARCHITECTURE - ENGINEERING
3280 E. HEMISPHERE LOOP STE. 110 TUCSON AZ 85706 520-806-0903
1889 E. BROADWAY, TEMPE AZ 85258

WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

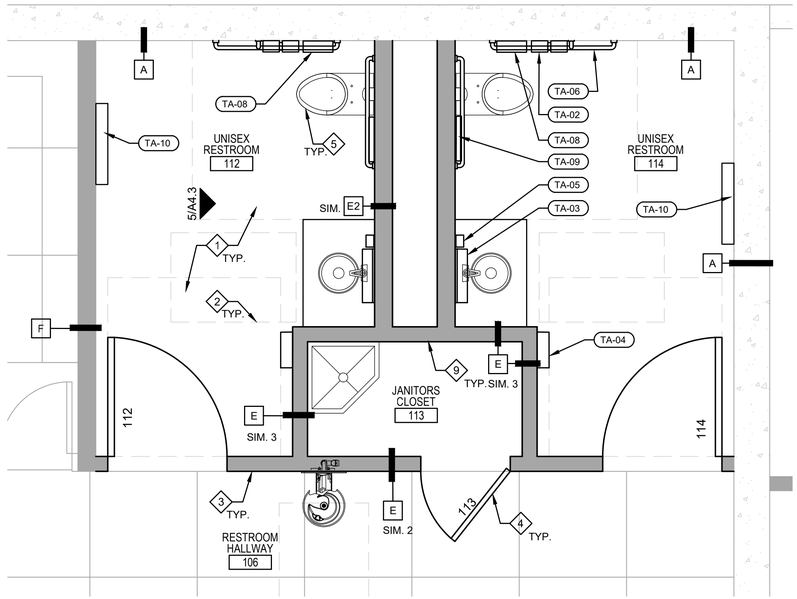
NOIR Lab
NSF
KITT PEAK - Sells, AZ 85634

△	DATE	DESCRIPTION
0	01/08/21	I.F.C.

PROJECT NUMBER:	11904.00
DRAWN BY:	FH
CHECKED BY:	IR
CAD FILE:	11904.00-A4.2
SCALE:	AS NOTED

ARCHITECTURAL
WALL TYPES & DETAILS

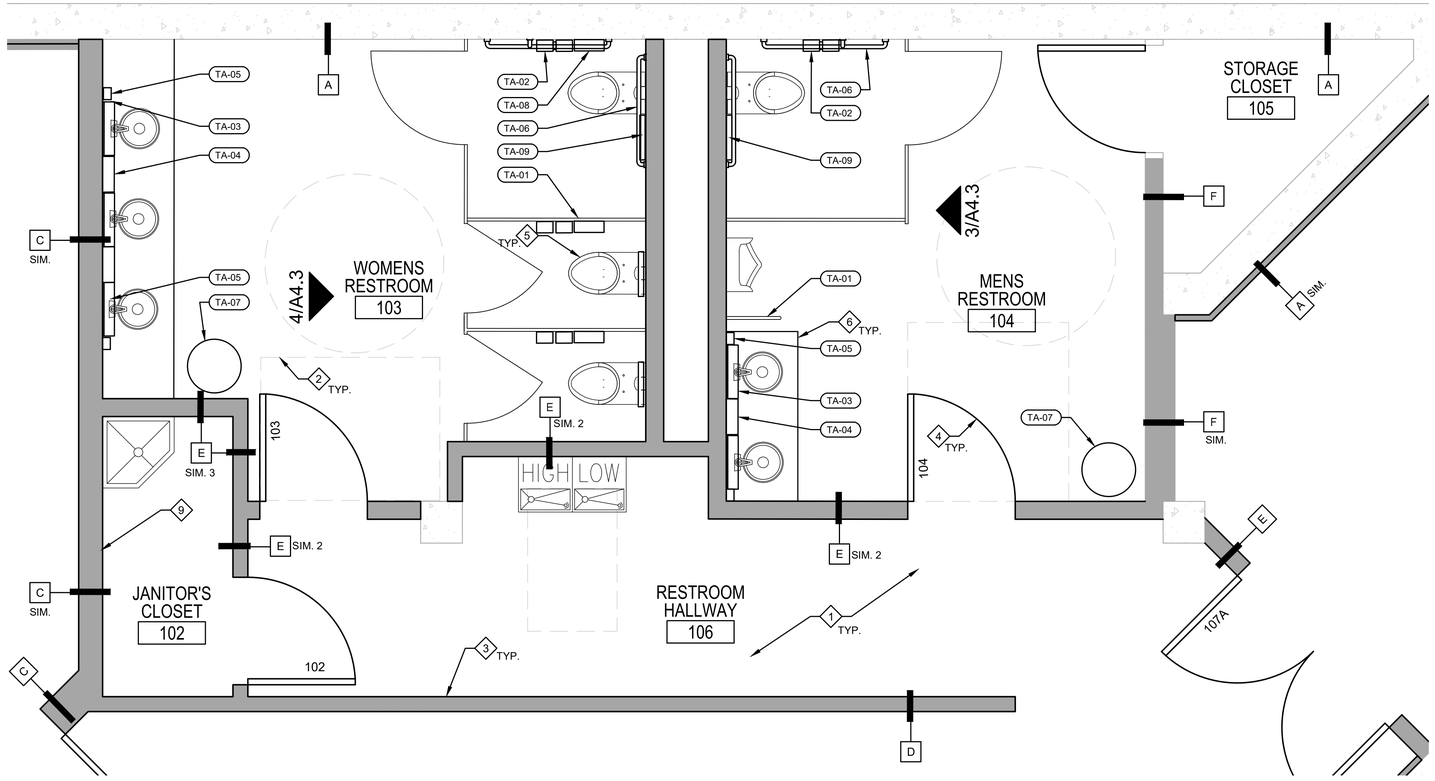
A4.2



2 RESTROOM FLOOR PLAN

1ST. LEVEL

SCALE: 1/2" = 1'-0"



1 RESTROOM FLOOR PLAN

1ST. LEVEL

SCALE: 1/2" = 1'-0"

TA-XX TOILET ACCESSORIES:

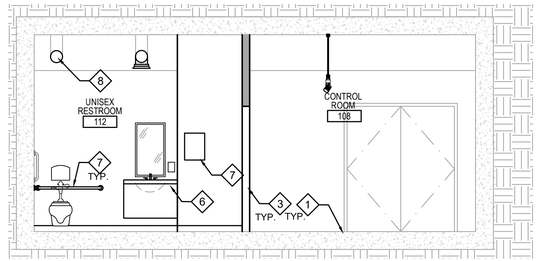
TA-01. METAL TOILET PARTITION,TYP.
TA-02. BOBRICK SURFACE MT. TISSUE B-7687, IN BRUSHED FINISH, TYPICAL IN ALL RESTROOMS
TA-03. BOBRICK MIRROR (18 X 36) WITH CELL PHONE SHELF, B-2921836, IN BRUSHED FINISH, TYPICAL IN ALL RESTROOMS
TA-04. BOBRICK SURFACE MT. PAPER TOWEL DISPENSER,B-262 IN BRUSHED FINISH, TYPICAL IN ALL RESTROOMS
TA-05. BOBRICK SURFACE MT. SOAP DISPENSER, B-211 IN BRUSHED FINISH, TYPICAL IN ALL RESTROOMS
TA-06. ADA COMPLIANT GRAB BARS IN BRUSHED FINISH, TYPICAL IN ALL RESTROOMS.
TA-07. TRASH BIN
TA-08. BOBRICK SANITARY TRASH B-254, IN BRUSHED FINISH
TA-09. BOBRICK SEAT COVER DISPENSER B-221, IN BRUSHED FINISH, TYPICAL IN ALL RESTROOMS
TA- 10. BOBRICK BABY CHANGING STATION

X KEYNOTES:

1. NEW FLOORING PER FINISH SCHEDULE.
2. ADA DASHED LINES SHOWN FOR REFERENCE ONLY.
3. NEW/ REFURBISHED WALL PER WALL TYPES, SEE A4.2 FOR MORE INFO.
4. NEW DOOR, SEE DOOR SCHEDULES ON A4.1
5. PLUMBING FIXTURE, SEE MECHANICAL.
6. NEW MILLWORK. SEE SCHEDULES.
7. TOILET ACCESSORY, SEE ENLARGED PLANS
8. NEW DUCTS, SEE MECHANICAL FOR MORE INFO.
9. PROVIDE FRP PANELING 4' ABOVE FINISH FLOOR AT ALL WET WALL LOCATIONS OF JANITOR CLOSETS

RENOVATION GENERAL NOTES:

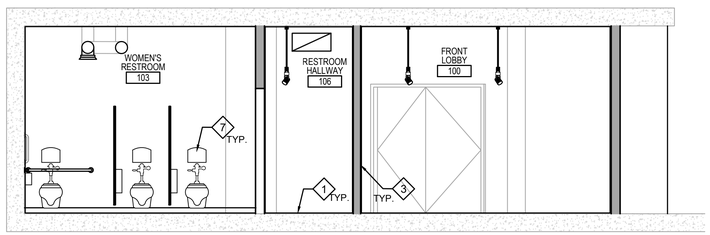
A. REFER TO THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
B. COORDINATE ALL WORK WITH STRUCTURAL, ELECTRICAL, MECHANICAL DRAWINGS & OTHER DISCIPLINES INVOLVED.
C. VERIFY ALL FIELD CONDITIONS & DIMENSIONS, NOTIFY ARCHITECT OF ANY DISCREPANCIES PRIOR TO COMMENCEMENT OF WORK.
D. UNLESS NOTED OTHERWISE, ALL WORK DESCRIBED SHALL BE PERFORMED BY CONTRACTOR. FOR ITEMS REQUIRING OWNER DIRECTION, CONTRACTOR SHALL COORDINATE DIRECTLY WITH OWNER. THIS INCLUDES BUT IS NOT LIMITED TO FURNITURE RELOCATION, EQUIPMENT RELOCATION, I.T. ITEMS, ETC.
E. DO NOT SCALE DRAWINGS, IF DIMENSIONS ARE NOT PROVIDED, CONTACT ARCHITECT FOR CLARIFICATION.
F. CONTRACTOR TO PROVIDE DETAILED PHASING, DEBRIS, DUST CONTROL METHODS, ISOLATION, AND ACCESS TO RESTROOMS TO OWNER FOR APPROVAL PRIOR TO INITIATION OF WORK.
G. MAINTAIN A SAFE AND CLEAN WORK AREA - REMOVE ALL TRASH AND DEBRIS AT THE END OF EACH WORK SHIFT.
H. PROVIDE PERSONNEL PROTECTION FROM DEBRIS & MATERIAL FALL PER OWNER STANDARDS. INCLUDING BUT NOT LIMITED TO SCAFFOLDING FOR OVERHEAD PROTECTION WITH TOE BOARDS, & VISQUEEN DUST BARRIER.
I. CONTRACTOR TO AVOID MOVING MATERIALS OR TOOLS THROUGH OPERATING AREAS.
J. CONTRACTOR TO VERIFY AND COORDINATE WITH OWNER BEFORE DISCONNECTING OR SHUTTING OFF ANY UTILITIES DURING CONSTRUCTION.
K. COORDINATE ALL DISMANTLING, REMOVALS, STAGING, AND OTHER WORK WITH OWNER PRIOR TO INITIATION OF WORK.
L. PROVIDE TEMPORARY INDEPENDENT SUPPORT FOR SYSTEMS AND EQUIPMENT SERVING OPERATIONAL AREAS, INCLUDING BUT NOT LIMITED TO; FIRE PROTECTION, LIGHTING, PIPING, CONDUITS, ETC.
M. ALL INTERIOR AND EXTERIOR STRUCTURE IS EXISTING TO REMAIN UNLESS NOTED OTHERWISE.



5 RESTROOM 112/ 114 ELEVATION

1ST. LEVEL

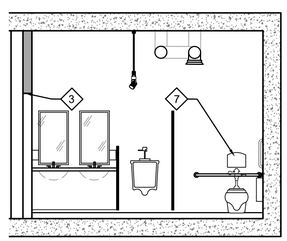
SCALE: 1/4" = 1'-0"



4 RESTROOM 103 ELEVATION

1ST. LEVEL

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



3 RESTROOM 104 ELEVATION

1ST. LEVEL

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

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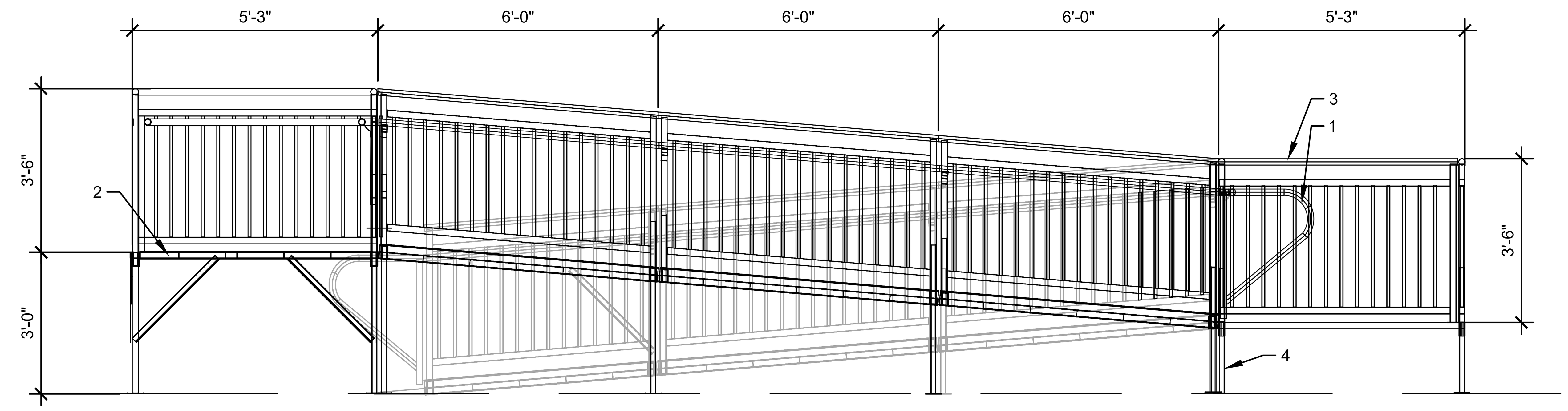
ARCHITECTURAL
RESTROOM PLANS
AND ELEVATIONS

A4.3

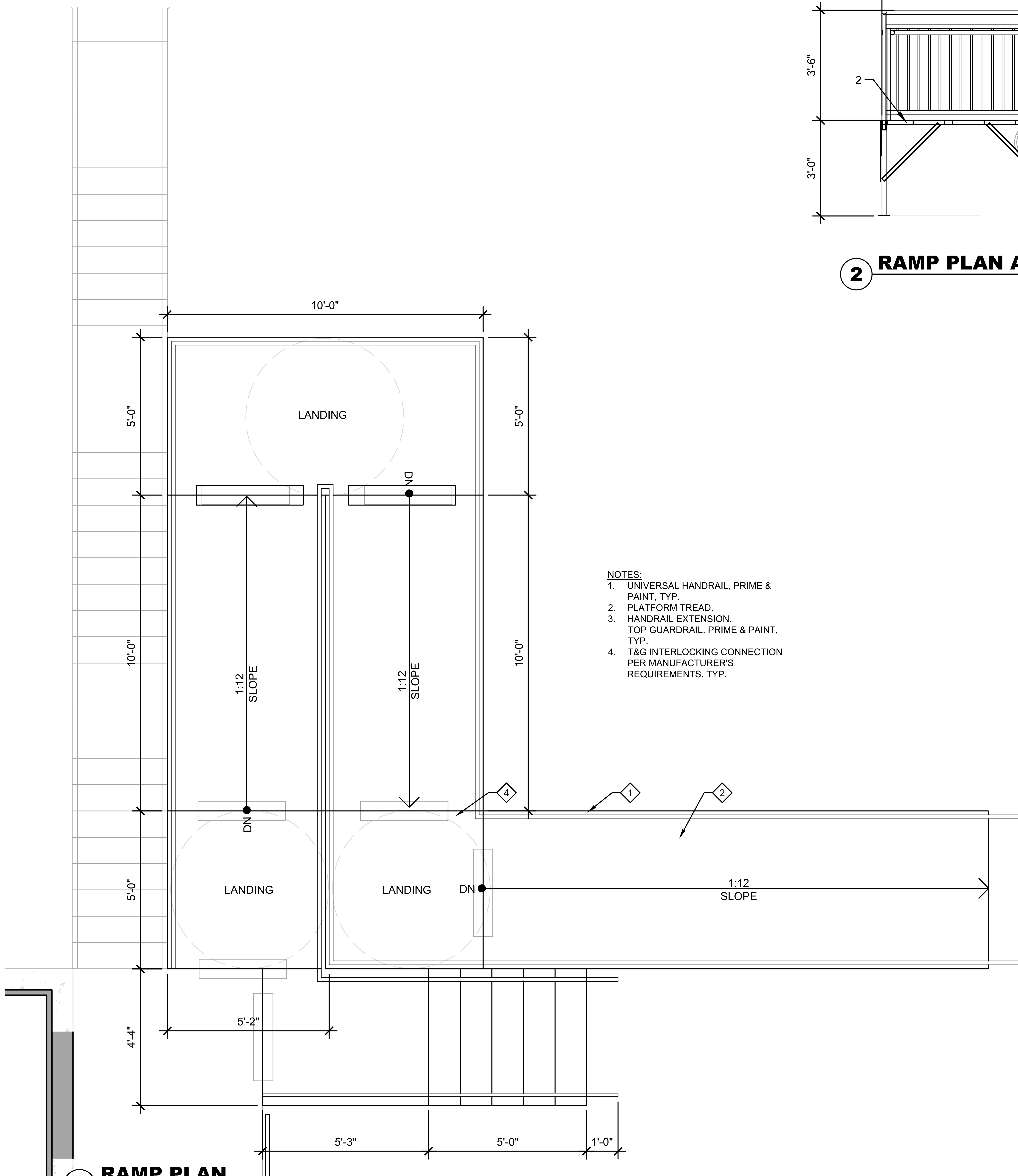


2 RAMP PLAN AND ELEVATION

SCALE: 1/2" = 1'-0"

1. UNIVERSAL HANDRAIL, PRIME & PAINT, TYP.
2. PLATFORM TREAD.
3. TOP GUARDRAIL.
4. TYP. LEG POST.

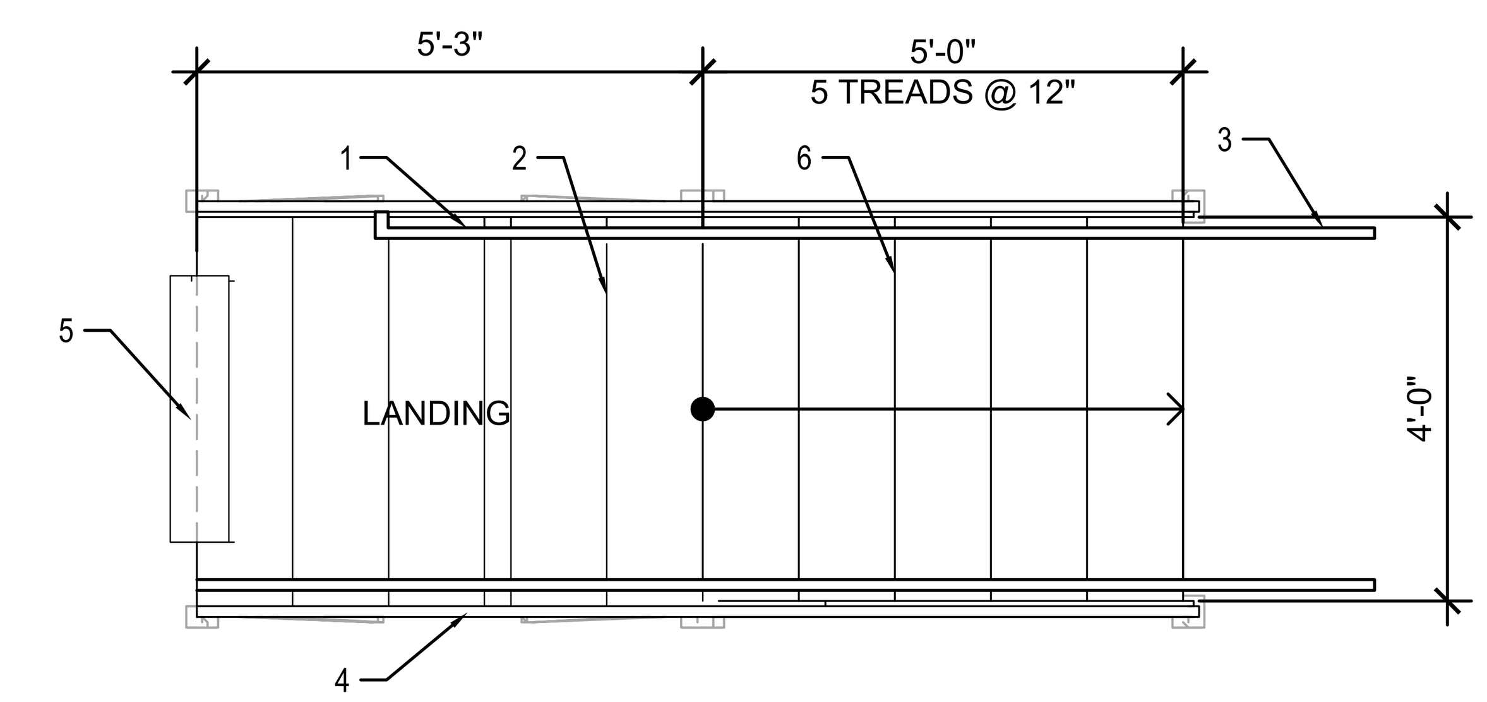
NOTE: STAIR AND RAMP TO BE PREFAB EQUAL TO AMERICAN ACCESS.



NOTES:
1. UNIVERSAL HANDRAIL, PRIME & PAINT, TYP.
2. PLATFORM TREAD.
3. HANDRAIL EXTENSION.
   TOP GUARDRAIL. PRIME & PAINT, TYP.
4. T&G INTERLOCKING CONNECTION PER MANUFACTURER'S REQUIREMENTS. TYP.

1 RAMP PLAN

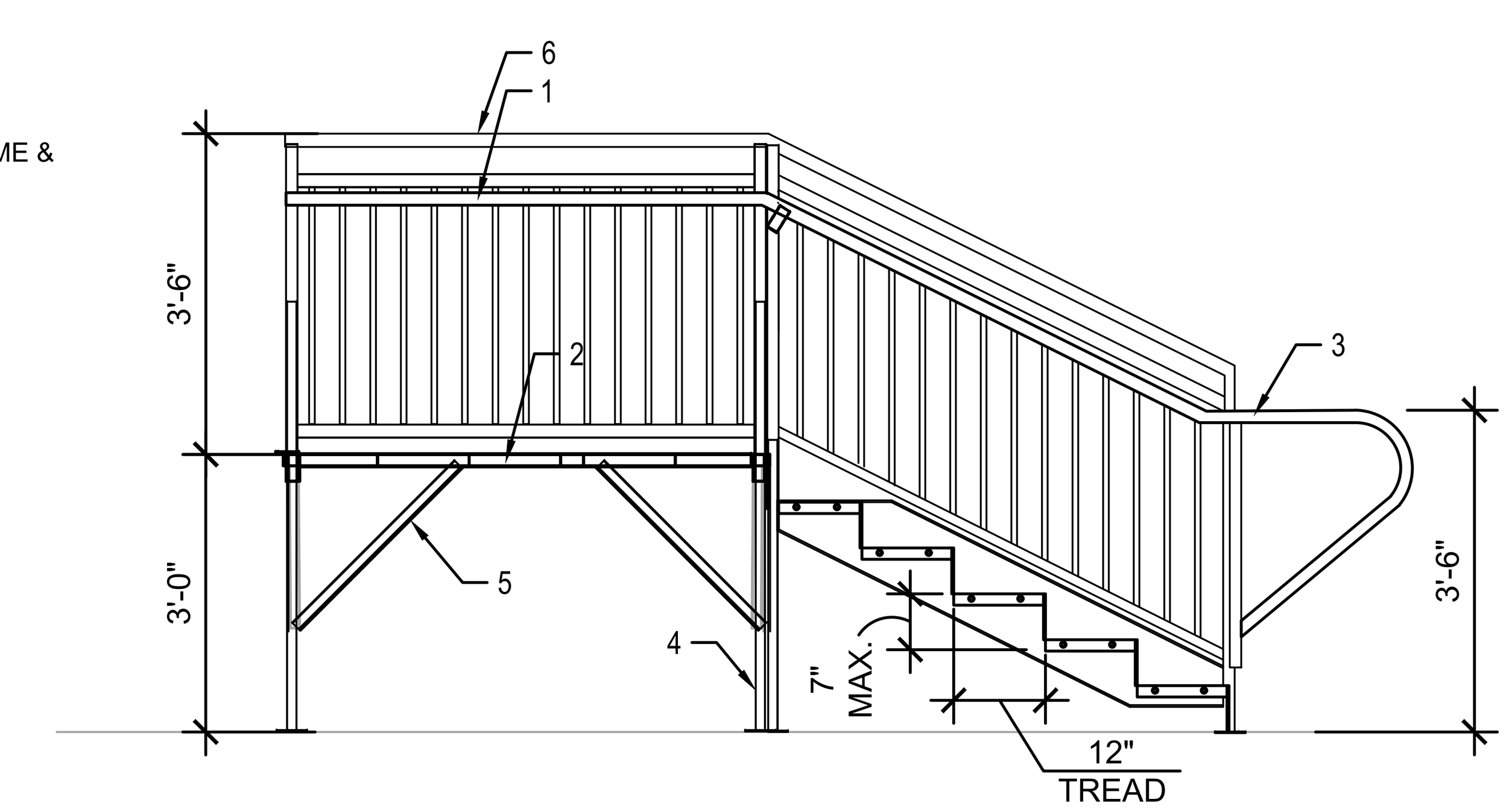
1. UNIVERSAL HANDRAIL, PRIME & PAINT, TYP.
2. PLATFORM TREAD, TYP.
3. HANDRAIL EXTENSION.
   TOP GUARDRAIL. PRIME & PAINT, TYP.
4. T&G INTERLOCKING CONNECTION PER MANUFACTURER'S REQUIREMENTS.
5. TREAD TYP.



4 STAIR PLAN

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

1. UNIVERSAL HANDRAIL, PRIME & PAINT, TYP.
2. PLATFORM TREAD.
3. HANDRAIL EXTENSION.
4. TYP. LEG POST.
5. TYP. ANGLE BRACING.
6. TOP GUARDRAIL.



3 STAIR SECTION

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

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CERTIFICATE NO.
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DATE SIGNED 01-08-21
ARIZONA U.S.A.
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1889 E. BROADWAY, TEMPE AZ 85258

WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

KITT PEAK - Sells, AZ 85634

△	DATE	DESCRIPTION
0	01/08/21	I.F.C.

PROJECT NUMBER:	11904.00
DRAWN BY:	FH
CHECKED BY:	IR
CAD FILE:	11904.00-A4.4
SCALE:	AS NOTED

ARCHITECTURAL RAMP & STAIR DETAILS

A4.4

GENERAL STRUCTURAL NOTES

(APPLY UNLESS NOTED OTHERWISE)

DESIGN CRITERIA:

2018 EDITION OF THE INTERNATIONAL BUILDING CODE, WITH LOCAL AMENDMENTS.
RISK CATEGORY II.

LOADS:

ROOF LIVE LOAD = 20 PSF (REDUCIBLE).
SUPERIMPOSED DEAD LOAD ON ROOF = 5 PSF
GROUND SNOW LOAD = 40 PSF.
FLOOR LIVE LOAD = 80 PSF (REDUCIBLE).
WIND DESIGN: BASIC WIND SPEED(V) = 105 MPH (3 SECOND GUST). ALLOWABLE STRESS DESIGN WIND SPEED (Vasd) = 85 MPH. EXPOSURE C.
INTERNAL PRESSURE COEFFICIENT (GCpi) = +-0.18. C&C = +-25.6 PSF FOR ZONE 4
REGIONS PER ASCE 7-16. NET UPLIFT (ASD) = 5 PSF NET.
SEISMIC DESIGN: Ie = 1.0. Ss = 0.204. S1 = 0.083. SOIL SITE CLASS = D.
Sds = 0.177. SD1 = 0.083. SEISMIC DESIGN CATEGORY B.

GENERAL:

1. THE STRUCTURAL CONSTRUCTION DOCUMENTS REPRESENT THE FINISHED STRUCTURE. THEY DO NOT INDICATE THE METHOD OR SEQUENCE OF CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR AND PROVIDE ALL MEASURES NECESSARY TO PROTECT THE STRUCTURE DURING CONSTRUCTION. SUCH MEASURES SHALL INCLUDE, BUT NOT BE LIMITED TO, BRACING, SHORING FOR LOADS DUE TO CONSTRUCTION EQUIPMENT, ETC. THE STRUCTURAL ENGINEER SHALL NOT BE RESPONSIBLE FOR THE CONTRACTOR'S MEANS, METHODS, TECHNIQUES, SEQUENCES FOR PROCEDURE OF CONSTRUCTION, OR THE SAFETY PRECAUTIONS AND THE PROGRAMS INCIDENT THERETO (NOR SHALL OBSERVATION VISITS TO THE SITE INCLUDE INSPECTION OF THESE ITEMS). THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE DESIGN AND IMPLEMENTATION OF ALL SCAFFOLDING, BRACING AND SHORING.
2. CONSTRUCTION MATERIALS SHALL BE SPREAD OUT IF PLACED ON FRAMED CONSTRUCTION. LOAD SHALL NOT EXCEED THE DESIGN LIVE LOAD PER SQUARE FOOT.
3. WHERE REFERENCE IS MADE TO VARIOUS TEST STANDARDS FOR MATERIALS, SUCH STANDARDS SHALL BE THE LATEST EDITION AND/OR ADDENDA.
4. ESTABLISH AND VERIFY ALL OPENINGS AND INSERTS FOR ARCHITECTURAL, MECHANICAL, PLUMBING, AND ELECTRICAL WITH APPROPRIATE TRADES, DRAWINGS, AND SUBCONTRACTORS PRIOR TO CONSTRUCTION.
5. OPTIONS ARE FOR CONTRACTOR'S CONVENIENCE. IF AN OPTION IS CHOSEN, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL NECESSARY CHANGES AND SHALL COORDINATE ALL DETAILS WITH ALL TRADES.
6. NOTES AND DETAILS ON DRAWINGS SHALL TAKE PRECEDENCE OVER GENERAL STRUCTURAL NOTES AND TYPICAL DETAILS. WHERE NO DETAILS ARE SHOWN, CONSTRUCTION SHALL CONFORM TO SIMILAR WORK ON THE PROJECT. FOR BIDDING PURPOSES, WHERE ANY MEMBER IS SHOWN BUT NOT CALLED OUT, THE LARGEST SIMILAR MEMBER SHALL BE UTILIZED.
7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFICATION OF ALL DIMENSIONS WITH ARCHITECTURAL DRAWINGS PRIOR TO START OF CONSTRUCTION. RESOLVE ANY DISCREPANCY WITH THE ARCHITECT. DO NOT USE SCALED DIMENSIONS.
8. ALL DETAILS SHALL BE INCORPORATED INTO THE PROJECT AT ALL APPROPRIATE LOCATIONS, WHETHER SPECIFICALLY CUT OR NOT. TYPICAL DETAILS MAY NOT NECESSARILY BE CUT ON PLANS, BUT APPLY UNLESS NOTED OTHERWISE. FOR CLARITY, DETAILS MAY SHOW ONLY ONE SIDE OF FRAMING CONDITION.
9. WHERE DISCREPANCIES OCCUR BETWEEN PLANS, DETAILS, GENERAL STRUCTURAL NOTES AND SPECIFICATIONS, THE GREATER REQUIREMENTS SHALL GOVERN.
10. ANY ENGINEERING DESIGN, PROVIDED BY OTHERS AND SUBMITTED FOR REVIEW, SHALL BEAR THE SEAL OF AN ENGINEER REGISTERED IN THE STATE IN WHICH THE PROJECT OCCURS.

EXISTING STRUCTURES:

1. THESE PLANS HAVE BEEN PREPARED BASED ON LIMITED VISUAL OBSERVATIONS AND/OR LIMITED AS-BUILT DOCUMENTS. CERTAIN CHANGES MAY BE REQUIRED BECAUSE OF POSSIBLE AMBIGUITIES OR INCONSISTENCIES IN RECORD DRAWINGS.
2. IF FIELD CONDITIONS DIFFER FROM THOSE DEPICTED, NOTIFY THE STRUCTURAL ENGINEER THROUGH THE ARCHITECT PRIOR TO PROCEEDING. THE CONTRACTOR (INCLUDING ALL SUBCONTRACTORS) SHALL REPORT ALL DIFFERENCES AND DEFECTS PROMPTLY TO THE ARCHITECT.
3. VERIFY EXISTING CONDITIONS PRIOR TO CONSTRUCTION.
4. THE CONTRACTOR SHALL HAVE APPROPRIATE CONTINGENCIES TO ACCOUNT FOR BOTH DESIGN AND CONSTRUCTION CONDITIONS THAT MAY ARISE FROM THE DISCOVERY OF CONCEALED OR UNKNOWN CONDITIONS IN THE EXISTING STRUCTURE.

FOUNDATIONS:

1. FOUNDATION DESIGN IS BASED UPON AS-BUILT DRAWINGS. SPREAD FOOTINGS BEARING ON FIRM, UNDISTURBED COMPETENT ROCK PER THE SOILS REPORT. DESIGN SOIL BEARING VALUE =6,000 PSF AT SOIL AT 1'-6" BELOW LOWEST ADJACENT FINISHED GRADE.
2. PROVIDE POSITIVE DRAINAGE SLOPES, BOTH DURING AND AFTER CONSTRUCTION, FOR SURFACE AND ROOF RUNOFF. THERE SHALL BE A MINIMUM OF 10'-0" OF POSITIVE DRAINAGE FROM BUILDING FOUNDATIONS.
3. DO NOT BACKFILL AGAINST BASEMENT OR RESTRAINED WALLS UNTIL FRAMING TO SUPPORT WALL IS PERMANENTLY ATTACHED. DO NOT EXCEED 1'-0" DIFFERENTIAL IN FILL LEVEL ON OPPOSITE SIDES OF FOUNDATION WALLS.
4. THE STRUCTURAL ENGINEER IS NOT RESPONSIBLE FOR ANY GEOTECHNICAL ASPECTS OF THIS PROJECT. THE OWNER SHALL EMPLOY A REGISTERED GEOTECHNICAL ENGINEER TO PERFORM NECESSARY TESTING AND QUALITY CONTROL INSPECTIONS TO ENSURE THAT THE REQUIREMENTS OF THE SOILS REPORT ARE COMPLIED WITH. ALL EARTHWORK SHALL BE INSPECTED AND APPROVED BY THE GEOTECHNICAL ENGINEER.
5. FOR CLARITY, ALL EXTERIOR SLABS AND SIDEWALKS MAY NOT BE SHOWN. FOR EXACT DIMENSIONS, LOCATIONS, JOINT AND SLOPE LINES, ETC. SEE ARCHITECTURAL DRAWINGS.

CONCRETE:

1. ALL CONCRETE WORK SHALL CONFORM TO THE REQUIREMENTS OF ACI 301 AND ACI 318. CEMENT SHALL CONFORM TO ASTM C150, TYPE II. AGGREGATE SHALL CONFORMTO ASTM C33. CONCRETE SHALL BE READY MIXED IN ACCORDANCE WITH ASTM C94 AND SHALL BE DESIGNED FOR A MINIMUM 28-DAY COMPRESSIVE STRENGTH AS FOLLOWS:

   FLAT SLABS, BEAMS, WALLS AND GRADE BEAMS -- 4,000 PSI
   SLABS ON GRADE ---------- 3,000 PSI*
   * DESIGNED FOR 2,500 PSI
   * SEE NOTE 8 FOR SLABS CAST DIRECTLY ON A VAPOR BARRIER/RETARDER.

2. FLY ASH - SHALL CONFORM TO ASTM C618, CLASS F AND SHALL BE LIMITED TO 25% OF CEMENTITIOUS MATERIALS BY WEIGHT AND SHALL HAVE A REPLACEMENT FACTOR OF 1.2 RELATIVE TO CEMENT REPLACED. CONCRETE SHALL BE FREE OF CHLORIDE. MAXIMUM SLUMP 4 1/2" FOR CONCRETE WITHOUT PLASTICIZER. IF PLASTICIZER IS USED, AN 8" MAXIMUM SLUMP IS ALLOWED AT PLACEMENT. ALL MIX DESIGNS SHALL BE DESIGNED BY THE CONCRETE PRODUCTION FACILITY IN ACCORDANCE WITH ACI 301 AND SHALL BE REVIEWED BY THE STRUCTURAL ENGINEER PRIOR TO PLACEMENT. MIX DESIGNS FOR POST-TENSIONING CONCRETE SHALL BE PROPORTIONED SO AS TO MINIMIZE SHRINKAGE CRACKING.
3. MECHANICALLY VIBRATE ALL CONCRETE WHEN PLACED, EXCEPT THAT SLABS ON GRADE NEED BE VIBRATED ONLY AROUND UNDER-FLOOR DUCTS, ETC. DO NOT DROP CONCRETE MORE THAN FIVE FEET WITH OUT THE USE OF TREMIES. REVIBRATE TOPS OF CAISSONS 15 MINUTES AFTER PLACING CONCRETE. UNLESS APPROVED OTHERWISE IN WRITING BY THE ARCHITECT, ALL CONCRETE SLABS ON GRADE SHALL BE BOUND BY CONTROL JOINTS (KEYED OR SAW CUT), AS SHOWN ON THE FOUNDATION PLAN, SUCH THAT THE ENCLOSED AREA DOES NOT EXCEED 225 SQUARE FEET. KEYED CONTROL JOINTS NEED ONLY OCCUR AT EXPOSED EDGES DURING POURING, ALL OTHER JOINTS MAY BE SAW CUT. CAST CLOSURE POUR AROUND COLUMNS AFTER COLUMN DEAD LOAD IS APPLIED.
4. PROVIDE SLEEVES FOR ALL UTILITY OPENINGS. DO NOT CUT ANY REINFORCING AT OPENINGS. CONCRETE WHICH HAS CONTAINED WATER FOR MORE THAN 90 MINUTES (60 MINUTES IF AIR TEMPERATURE EXCEEDS 85 DEGREES) SHALL NOT BE USED. RETEMPERING OF CONCRETE AFTER INITIAL SET IS NOT ALLOWED. CURE EXPOSED CONCRETE PER ACI 301 FOR A MINUMUM OF 7 DAYS.
5. TESTING OF COMPRESSIVE STRENGTH AND SLUMP SHALL CONFORM TO ASTM C31, C39 AND C143. PROVIDE A MINIMUM OF 3 CYLINDERS FOR EACH DAY'S PLACEMENT U.N.O. A QUALIFIED TESTING LABORATORY SHALL TEST ONE CYLINDER AT 7 DAYS AND TWO CYLINDERS AT 28 DAYS, THREE CYLINDERS IF 4"X8" SAMPLES ARE USED.
6. MACRO FIBER - HIGH VOLUME SYNTHETIC FIBER MAY BE SUBSTITUTED AT A RATE OF 4 POUNDS PER CUBIC YARD OF CONCRETE FOR WELDED WIRE FABRIC IN SLABS ON GRADE AND SLABS ON METAL DECK. ACCEPTABLE PRODUCTS INCLUDE GRACE STRUX 90/40, PROPEX FIBERMESH 650, EUCLID TUF-STRAND SF, FORTA FERRO.
7. THE SLABS ON GRADE ON THIS PROJECT ARE DIRECTLY CAST ONTO A VAPOR BARRIER/RETARDER. VAPOR BARRIERS/RETARDERS HAVE BEEN REPORTED TO AFFECT THE BEHAVIOR OF THE CONCRETE IN THE SLAB BY INCREASING FINISHING TIME, PROMOTING CRACKING, INCREASING SLAB CURLING, AND REDUCING STRENGTH. THEREFORE, THE CONTRACTOR SHALL BE RESPONSIBLE FOR USING THEIR EXPERIENCE FOR APPLYING AND EMPLOYING MEASURES AND INSTALLING THE CONCRETE IN SUCH A WAY AS TO MITIGATE THESE UNDESIRABLE EFFECTS. THE FOLLOWING ARE SOME RECOMMENDATIONS THAT THE CONTRACTOR MAY CONSIDER IN THEIR CONCRETE PLACEMENT PLANS.

   A) USE OF CONCRETE MIXES WHICH USE THE LARGEST SIZE AGGREGATE POSSIBLE AND EVENLY DISTRIBUTED AGGREGATE MIXES WITH LIMITED GAP GRADING.
   B) USE OF SHRINKAGE REDUCING ADMIXTURES.
   C) USE OF MACRO FIBER ADMIXTURES WHICH REDUCE CURLING.
   D) CUTTING SLAB JOINTS WITHIN 12 HOURS USING AN EARLY ENTRY SAW.
   E) USING THE MAXIMUM AMOUNT OF FLYASH ALLOWABLE TO REDUCE CEMENT.
   F) REDUCE WATER CEMENT RATIOS WHILE USING WATER-REDUCING ADMIXTURES THAT DON'T INCREASE SHRINKAGE.
   G) AGGRESSIVE CURING MEASURES THAT RETARD THE EVAPORATION OF WATER FROM THE SURFACE OF THE CONCRETE.

REINFORCING STEEL:

1. REINFORCING STEEL SHALL CONFORM TO ASTM A615 (Fy = 60 KSI) DEFORMED BARS FOR ALL REBAR. ALL REINFORCING TO BE WELDED SHALL BE ASTM A706. WELDED WIRE FABRIC PER ASTM A185, WIRE PER ASTM A82. NO TACK WELDING OF REINFORCINGBARS ALLOWED WITHOUT PRIOR REVIEW OF PROCEDURE WITH THE STRUCTURAL ENGINEER. LATEST ACI CODE AND DETAILING MANUAL APPLY.
2. ACCURATELY PLACE OR SUPPORT ALL REINFORCING, INCLUDING WELDED WIRE FABRIC, WITH GALVANIZED METAL CHAIRS, SPACERS OR HANGERS FOR THE FOLLOWING CLEAR CONCRETE COVERAGES:

   CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH --- 3"
   EXPOSED TO EARTH OR WEATHER
   #6 OR LARGER ---------- 2"
   #5 AND SMALLER ---------- 1 1/2"
   COLUMNS (TO TIES) ---------- 1 1/2"
   BEAMS (TO STIRRUPS) ---------- 1 1/2"
   FLAT SLAB ---------- 3/4"
   ALL OTHER PER LATEST EDITION OF ACI 318.

3. LAP SPLICES, UNLESS NOTED OTHERWISE, SHALL BE CLASS "B" TENSION LAP SPLICES PER LATEST EDITION OF ACI 318. LAP SPLICES IN CONCRETE COLUMNS SHALL BE STANDARD COMPRESSION LAP SPLICES. STAGGER SPLICES A MINIMUM OF ONE LAP LENGTH. LAPS IN WELDED WIRE FABRIC SHALL BE MADE SO THAT THE OVERLAP, MEASURED BETWEEN OUTERMOST CROSS WIRES OF EACH FABRIC SHEET, IS NOT LESS THAN THE SPACING OF CROSS WIRES PLUS 2 INCHES.
4. ALL SPLICE LOCATIONS ARE SUBJECT TO APPROVAL BY THE STRUCTURAL ENGINEER. SPLICED BARS SHALL BE PLACED AT THE SAME EFFECTIVE DEPTH U.N.O. ALL REINFORCING NOTED AS "CONTINUOUS" SHALL BE FULLY CONTINUOUS AND SPLICED. PROVIDE BENT CORNER BARS TO MATCH AND LAP WITH HORIZONTAL BARS AT ALL CORNERS AND INTERSECTIONS PER TYPICAL DETAILS.
5. REINFORCING BAR SPACING GIVEN ARE MAXIMUM ON CENTERS. ALL BARS PER CRSI SPECIFICATIONS AND HANDBOOK. DOWEL ALL VERTICAL REINFORCING TO FOUNDATION WITH STANDARD 90 DEGREE HOOKS UNLESS NOTED OTHERWISE. SKEW HOOKS AS REQUIRED TO MAINTAIN CONCRETE COVER. SECURELY TIE ALL BARS IN LOCATION BEFORE PLACING CONCRETE. CONCRETE COLUMN DOWEL EMBEDMENT SHALL BE A STANDARD COMPRESSION DOWEL WITH EMBEDMENT LENGTH ACCORDING TO THE LATEST EDITION OF ACI 318.

LOW VELOCITY POWDER ACTUATED FASTENERS (P.A.F.):

1. LOW VELOCITY P.A.F. SHALL BE HILTI X-U FASTENERS WITH A MINIMUM SHANK DIAMETER OF .157" INSTALLED AND COMPLYING WITH ICC ES REPORT NO. 2269 OR DEWALT CSI FASTENERS WITH A MINIMUM SHANK DIAMETER OF .157" INSTALLED AND COMPLYING WITH ICC ES REPORT NO. 2024.

POST-INSTALLED ANCHORS:

1. EPOXY BOLTS OR DOWELS SHALL BE A THREADED ROD OR REINFORCING STEEL INSTALLED WITH THE ONE OF THE FOLLOWING APPROVED PRODUCTS SATISFYING CRACKED CONCRETE REQUIREMENTS IN ACCORDANCE WITH ACI APPENDIX D.

SIMPSON	"SET-3G"	ICC REPORT ESR-4057
DEWALT	"PURE110+"	ICC REPORT ESR-3298
DEWALT	"AC200+"	ICC REPORT ESR-4027

2. EXPANSION BOLTS FOR CONCRETE SHALL BE ONE OF THE FOLLOWING APPROVED PRODUCTS SATISFYING CRACKED CONCRETE REQUIREMENTS IN ACCORDANCE WITH ACI APPENDIX D.

HILTI	"KWIK BOLT TZ"	ICC REPORT ESR-1917
HILTI	"HDA UNDERCUT ANCHOR"	ICC REPORT ESR-1546
HILTI	"HSL-3 HD EXPANSION ANCHOR"	ICC REPORT ESR-1545
SIMPSON	"STRONG BOLT 2 WEDGE ANCHOR"	ICC REPORT ESR-3037
SIMPSON	"TORQ-CUT"	ICC REPORT ESR-2705
DEWALT	"POWER-STUD+SD1 WEDGE ANCHOR"	ICC REPORT ESR-2818
DEWALT	"POWER-STUD+SD2 WEDGE ANCHOR"	ICC REPORT ESR-2502
DEWALT	"ATOMIC+UNDERCUT ANCHOR"	ICC REPORT ESR-3067
DEWALT	"POWER-BOLT+ EXPANSION ANCHOR"	ICC REPORT ESR-3260

3. SCREW BOLTS FOR CONCRETE SHALL BE ONE OF THE FOLLOWING APPROVED PRODUCTS SATISFYING CRACKED CONCRETE REQUIREMENTS IN ACCORDANCE WITH ACI APPENDIX D.

SIMPSON	"TITEN HD"	ICC REPORT ESR-2713
DEWALT	"SCREW-BOLT+"	ICC REPORT ESR-3889

4. THE CONTRACTOR MAY NOT USE SUBSTITUTES FOR EPOXY OR EXPANSION ANCHORS WITHOUT PRIOR APPROVAL OF THE STRUCTURAL ENGINEER.
5. FOR MINIMUM EMBEDMENT LENGTH SEE DETAILS. INSTALL ALL BOLTS AS OUTLINED IN MANUFACTURER'S SPECIFICATIONS, UTILIZING PROPER SIZE AND TYPE OF DRILL, CLEANING HOLE, DRIVING AND TIGHTENING BOLT.
6. SPECIAL INSPECTION OF ALL POST-INSTALLED ANCHORS IS REQUIRED.

FIBER REINFORCED POLYMER (FRP) STRENGTHENING SYSTEM:

1. THIS SPECIFICATION IS INTENDED FOR USE IN DEFINING THE REQUIREMENTS FOR STRUCTURAL STRENGTHENING USING A FIBER REINFORCED COMPOSITE SYSTEM.
2. CONTRACTOR SHALL FURNISH ALL MATERIALS, TOOLS, EQUIPMENT, TRANSPORTATION, NECESSARY STORAGE, LABOR, AND SUPERVISION REQUIRED FOR THE APPLICATION OF THE FIBER REINFORCED POLYMER (FRP) FOR MASONRY STRENGTHENING AS NOTED ON THE DRAWINGS AND DESCRIBED IN THIS SECTION. CONTRACTOR SHALL HAVE A MINIMUM OF TWO (2) YEARS EXPERIENCE APPLYING COMPOSITE FIBER-EPOXY STRENGTHENING SYSTEM TO EXISTING MASONRY ELEMENTS.
3. FIBER REINFORCED POLYMER (FRP) SHALL COMPLY WITH ASTM D3039, ICC AC125, ICC AC178, ACI 440.2R-02, ACI 440 R-96, AND ACI 503R.
4. INSPECTION SHALL BE PERFORMED BY THE TESTING AGENCY PAID BY THE OWNER. THE TESTING AGENCY SHALL BE PRESENT AT THE JOB SITE FULL TIME DURING INSTALLATION OF THE EPOXY INJECTED OPERATIONS TO INSPECT SURFACE PREPARATION, MIXING PROCEDURES, INJECTION METHODS AND CURING PROCESS. ALL TESTING AND INSPECTION SHALL BE IN CONFORMANCE WITH THE SPECIAL INSPECTION REQUIREMENTS OF CHAPTER 17 OF THE IBC.
5. CONTRACTOR SHALL SUBMIT HEALTH AND SAFETY SHEETS AND MATERIAL SAFETY DATA SHEETS (MSDS) OF EACH PRODUCT USED ON SITE. COMPLETE SHOP DRAWINGS CONTAINING DETAILS OF THE NUMBER AND THICKNESS OF LAYERS, JOINT AND END DETAILS AND LOCATIONS TO SATISFY PROJECT REQUIREMENTS. SMALL SAMPLES OF ALL RFP MATERIALS PROPOSED FOR THIS WORK.
6. INSTALL FIBER REINFORCED POLYMER (FRP) PER MANUFACTURER'S REQUIREMENTS.
7. APPROVED PRODUCTS ARE:

   A) QUAKEWRAP FABRICS AND QUAKEBOND EPOXY RESINS
   QUAKEWRAP, INC. (QWI)
   P.O. BOX 64757
   TUCSON, AZ 85728-4757
   PHONE: (520) 791-7000; FAX: (520) 791-0600

   B) ALTERNATE PRODUCTS MUST BE SUMITTED AND APPROVED BY THE ENGINEER OF RECORD A MINIMUM OF TWO WEEKS PRIOR TO THE BID DATE.

8. FRP REINFORCEMENT FABRIC SHALL BE HIGH STRENGTH, HIGH MODULUS, FIBER FABRIC, OF THE TYPE AND SIZE INDICATED BY THE MANUFACTURER. FRP REINFORCEMENT FABRIC SHALL BE LAMINATED WITH THE MANUFACTURER'S EPOXY SATURATING RESIN. TACK COAT SHALL BE TWO COMPONENT, 100% SOLIDS, HIGH MODULUS, HIGH STRENGTH STRUCTURAL EPOXY WITH HIGH TACK CONSISTENCY. SATURATING RESIN SHALL BE TWO COMPONENT, 100% SOLIDS, HIGH STRENGTH, HIGH MODULUS, LOW VISCOSITY STRUCTURAL EPOXY. PROTECTIVE COATING SHALL BE POLYMER OR ACRYLIC BASED AND SHALL BE UV RESISTANT IF FRP WILL BE DIRECTLY EXPOSED TO SUN LIGHT.
9. FULL TIME INSPECTION SHALL BE PROVIDED BY A CERTIFIED SPECIAL INSPECTOR, APPROVED BY THE OWNER TO OBSERVE ALL ASPECTS OF PREPARATION, MIXING, AND APPLICATION OF MATERIALS, INCLUDING THE FOLLOWING:

   A) MATERIAL CONTAINER LABELS
   B) SURFACE PREPARATION
   C) MIXING OF EPOXY
   D) APPLICATION OF EPOXY TO THE FIBER
   E) APPLICATION OF COMPOSITE SYSTEM
   F) CURING OF COMPOSITE MATERIAL
   G) PREPARATION AND LABELING OF TEST SAMPLES

10. THE COMPOSITE CASING SHALL BE COMPLETELY INSPECTED BY THE SPECIAL INSPECTOR DURING AND IMMEDIATELY FOLLOWING APPLICATION OF THE COMPOSITE. THE CONTRACTOR SHALL MONITOR THE MIXING OF ALL EPOXY COMPONENTS FOR PROPER RATIO AND ADHERENCE TO MANUFACTURER'S RECOMMENDATIONS.

MASONRY:

1. C.M.U. SHALL CONFORM TO ASTM C90, NORMAL OR MEDIUM WEIGHT, F'm =2,000 PSI AT 28 DAYS, RUNNING BOND, WITH A NET COMPRESSIVE STRENGTH OF 2000 PSI PER ASTM C140. SOLID BRICK MASONRY UNITS SHALL CONFORM TO ASTM C216, GRADE MW, TYPE FBS. F'm =1,500 PSI, RUNNING BOND, WITH A NET COMPRESSIVE STRENGTH OF 3000 PSI PER ASTM C67. HOLLOW BRICK MASONRY SHALL CONFORM TO ASTM C652, GRADE MW, TYPE HBS, F'm =2,300 PSI, RUNNING BOND, MORTAR TYPE S, 1,800 PSI AT 28 DAYS, TESTED PER ASTM C109.
2. MORTAR SHALL CONFORM TO ASTM C270, TYPE S, 2,000 PSI USING PORTLAND CEMENT. FINE OR COURSE GROUT PER ASTM C476, 2,000 PSI AT 28 DAYS, TESTED PER ASTM C1019. GROUT SHALL BE FREE OF CHLORIDE. GROUT MAY CONTAIN UP TO 18% FLY ASH AT THE APPROVAL OF THE ARCHITECT.
3. SEE DRAWINGS FOR SIZE AND SPACING OF REINFORCING. LAP SPLICE ALL REINFORCING A MINIMUM OF 40 BAR DIAMETERS FOR GRADE 40 BARS AND 48 BAR DIAMETERS FOR GRADE 60 BARS. LAP SPLICES SHALL BE 1.3 X LAP LENGTH WHEN ADJACENT SPLICES ARE SEPARATED BY 3" OR LESS. ALL REINFORCING SHALL BE ACCURATELY LOCATED PRIOR TO AND DURING GROUTING. TIE ALL VERTICAL REINFORCING AT 8'-0" VERTICALLY WITH SINGLE WIRE LOOP TIE BY A.A. WIRE PRODUCTS COMPANY. DOWEL ALL VERTICAL REINFORCING TO FOUNDATION WITH DOWELS TO MATCH SIZE AND SPACING OF VERTICAL REINFORCING. PROVIDE BENT BARS TO MATCH HORIZONTAL BOND BEAM REINFORCING AT CORNERS AND WALL INTERSECTIONS.

SCHNEIDER STRUCTURAL ENGINEERS
CREATING ELEGANT SOLUTIONS
435 East 9th Street | Tucson, AZ 85705 | 520.512.8183 | www.sastructural.com

Project Number: 119103

Registered Professional Engineer (Structural)
CERTIFICATE NO. 27349
RONALD H. SCHNEIDER
DATE SIGNED 01/08/21
ARIZONA, U.S.A.

This Electronic Signature Has Been Authorized By Me This 01/08/21

ADVANTECH
FACILITY DESIGN INC
ARCHITECTURE - ENGINEERING
3200 E. HEMISPHERE LOOP STE. 110 TUCSON AZ 85706 520-806-0903
1889 E. BROADWAY, TEMPE AZ 85256

WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

NOIR Lab | NSF

KITT PEAK - Sells, AZ 85634

△	DATE	DESCRIPTION
0	01/08/21	I.F.C.

PROJECT NUMBER: 11904.00
DRAWN BY: SAM
CHECKED BY: RHS
CAD FILE:
SCALE: NTS

S1.0

GENERAL STRUCTURAL NOTES

GENERAL STRUCTURAL NOTES

(APPLY UNLESS NOTED OTHERWISE)

4. HORIZONTAL JOINT REINFORCING SHALL BE 9 GAGE LADDER OR TRUSS TYPE JOINT REINFORCEMENT PER ASTM A82 AT 16" O.C. WITH 12" SPLICES. USE TRUSS TYPE JOINT REINFORCEMENT IN BRICK OR COMPOSITE WALLS.

5. ALL CELLS AND COURSES WITH REINFORCING AND ADDITIONAL CELLS AND COURSES NOTED ON DRAWINGS SHALL BE GROUTED SOLID. ALL MASONRY BELOW FINISHED FLOOR OR GRADE SHALL BE GROUTED SOLID. MECHANICALLY VIBRATE GROUT IN VERTICAL SPACES IMMEDIATELY AFTER POURING AND AGAIN ABOUT 5 MINUTES LATER. PROVIDE CLEANOUTS IF GROUT POUR HEIGHT EXCEEDS 5'-4" IN BLOCK WALLS. IF THE MASONRY HAS CURED FOR AT LEAST 4 HOURS, THE GROUT SLUMP IS MAINTAINED BETWEEN 10" AND 11", AND NO INTERMEDIATE BOND BEAMS ARE PLACED BETWEEN THE TOP AND BOTTOM OF THE POUR HEIGHT, THEN GROUT MAY BE PLACED IN LIFTS UP TO 12'8" TALL. STOP ALL GROUT LIFTS 1-1/2" BELOW THE TOP COURSE OF THE LIFT. PLACE GROUT LIFTS CONTINUOUS FOR HEIGHT OF LINTELS. DO NOT INTERRUPT GROUTING FOR MORE THAN ONE HOUR. FOG SPRAY ERECTED CMU EVERY 8 HOURS FOR 48 HOURS FOLLOWING INSTALLATION WHEN TEMPERATURES EXCEED 100 DEGREES OR WHEN THE TEMPERATURE EXCEEDS 90 DEGREES AND THE WIND SPEED IS GREATER THAN 8 MPH.

6. LAY UP TWO-WYTHE WALL WITH FULL HEAD AND BED MORTAR JOINTS. ALL LONGITUDINAL VERTICAL JOINTS SHALL BE GROUTED SOLID. ONE TIER MAY BE CARRIED UP 16" BEFORE GROUTING, BUT THE OTHER TIER SHALL BE LAID UP AND GROUTED IN LIFTS NOT TO EXCEED SIX TIMES THE WIDTH OF THE GROUT SPACE OR 8" MAXIMUM. ROD GROUT IN VERTICAL SPACES IMMEDIATELY AFTER PLACING AND AGAIN ABOUT 5 MINUTES LATER.

7. UNLESS NOTED OTHERWISE ON THE PLANS, PLACE CONTROL JOINTS IN MASONRY WALLS SUCH THAT NO STRAIGHT RUN OF WALL EXCEEDS 25'-0". CONTROL JOINTS SHALL NOT OCCUR AT WALL CORNERS, INTERSECTIONS, ENDS, WITHIN 24" OF CONCENTRATED POINTS OF BEARING OR JAMBS, OR OVER OPENINGS UNLESS SPECIFICALLY SHOWN ONTHE STRUCTURAL DRAWINGS.

8. MORTAR AND GROUT SHALL BE TESTED BY A QUALIFIED TESTING AGENCY. TEST MORTAR, GROUT, AND MASONRY UNITS AT THE FREQUENCY AND SAMPLING REQUIRED BY THE CONSTRUCTION DOCUMENT TESTING TABLES.

9. ADHERED VENEER SHALL WEIGH LESS THAN 15 PSF. ADHESION DEVELOPED BETWEEN ADHERED VENEER UNITS AND BACKING SHALL HAVE A SHEAR TRANSFER STRENGTH OF AT LEAST 50 PSI BASED ON GROSS UNIT SURFACE AREA.

SHOP DRAWINGS AND PRODUCT DATA SUBMITTALS:

1. SUBMIT SHOP DRAWINGS AND/OR PRODUCT DATA FOR ALL ITEMS DEFINED BY THE STRUCTURAL DRAWINGS AND SPECIFICATIONS, AS WELL AS STRUCTURAL ITEMS DEFINED BY THE ARCHITECTURAL DRAWINGS AND SPECIFICATIONS, PRIOR TO FABRICATION AND/OR CONSTRUCTION IN THE FIELD.

2. PROVIDE SUBMITTALS IN A TIMELY MANNER TO ALLOW FIVE WORKING DAYS FOR THE ENGINEER'S REVIEW. FOR HARD COPY SUBMITTALS, PROVIDE NO MORE THAN FOUR SETS FOR REVIEW (ONE COPY TO BE RETAINED BY THE ENGINEER). FOR ELECTRONIC SUBMITTALS, PROVIDE PDF FILES ONLY. ALL SUBMITTALS WITH A REQUESTED REVIEW TIME OF LESS THAN FIVE WORKING DAYS MAY BE RETURNED WITHOUT REVIEW AT THE ENGINEER'S DISCRETION.

3. CONSTRUCTION DOCUMENTS SHALL NOT BE REPRODUCED FOR USE AS SHOP DRAWINGS. THE MANUFACTURER OR FABRICATOR SHALL CLOUD ANY CHANGES, SUBSTITUTIONS, AND/OR DEVIATIONS FROM THE CONTRACT DOCUMENTS. ANY CHANGES, SUBSTITUTIONS, AND/OR DEVIATIONS THAT ARE NOT CLOUDED OR FLAGGED SHALL NOT BE CONSIDERED ALLOWED AFTER THE ENGINEER'S REVIEW, UNLESS NOTED ACCORDINGLY BY THE ENGINEER.

4. THE CONTRACTOR SHALL REVIEW ALL SHOP DRAWINGS PRIOR TO SUBMITTAL TO THE ENGINEER. CLEARLY INDICATE ITEMS NOT IN ACCORDANCE WITH THE CONTRACT DOCUMENTS. VERIFY DIMENSIONS WITH THE ARCHITECT.

5. THE ENGINEER'S REVIEW IS INTENDED ONLY AS AN AID TO THE CONTRACTOR IN OBTAINING CORRECT SHOP DRAWINGS. RESPONSIBILITY FOR CORRECTNESS AND COMPLETENESS SHALL REST WITH THE CONTRACTOR. SHOP DRAWINGS WILL BE RETURNED FOR RESUBMITTAL IF SIGNIFICANT ERRORS ARE FOUND DURING REVIEW.

6. THE SHOP DRAWINGS DO NOT REPLACE THE CONTRACT DOCUMENTS. SHOP DRAWINGS PROCESSED BY THE ENGINEER SHALL NOT BE CONSIDERED CHANGE ORDERS. ITEMS THAT ARE OMITTED OR SHOWN INCORRECTLY AND THAT ARE NOT FLAGGED BY THE ENGINEER ARE NOT TO BE CONSIDERED CHANGES TO CONTRACT DOCUMENTS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO CONSTRUCT ITEMS ACCORDING TO THE CONTRACT DOCUMENTS. SHOULD A DISCREPANCY EXIST BETWEEN THE PROCESSED SHOP DRAWINGS AND THE CONTRACT DOCUMENTS, THE CONTRACT DOCUMENTS SHALL GOVERN.

7. THE ENGINEER RESERVES THE RIGHT TO MAKE CHANGES TO THE CONTRACT DOCUMENTS, AT ANY TIME BEFORE OR AFTER SHOP DRAWING REVIEW.

8. THE ADEQUACY OF ENGINEERING DESIGNS AND LAYOUT PERFORMED BY OTHERS RESTS WITH THE DESIGNING OR SUBMITTING PARTY.

DEFERRED SUBMITTALS (PER 2018 IBC 107.3.4.1):

1. FOR THE PURPOSES OF THIS SECTION, DEFERRED SUBMITTALS ARE DEFINED AS THOSE PORTIONS OF THE DESIGN THAT ARE NOT SUBMITTED AT THE TIME OF THE APPLICATION AND WHICH ARE TO BE SUBMITTED TO THE BUILDING OFFICIAL WITHIN A SPECIFIED PERIOD.

2. DEFERRAL OF ANY SUBMITTAL ITEMS SHALL HAVE PRIOR APPROVAL OF THE BUILDING OFFICIAL. THE ARCHITECT OR ENGINEER OF RECORD SHALL LIST THE DEFERRED SUBMITTALS ON THE PLANS AND THE CONTRACTOR SHALL SUBMIT THE DEFERRED SUBMITTAL DOCUMENTS FOR REVIEW BY THE BUILDING OFFICIAL.

3. SUBMITTAL DOCUMENTS FOR DEFERRED SUBMITTAL ITEMS SHALL BE SUBMITTED TO THE ARCHITECT OR ENGINEER OF RECORD A MINIMUM OF 30 DAYS PRIOR TO FABRICATION. THE DOCUMENTS SHALL BE REVIEWED FOR GENERAL CONFORMANCE WITH THE DRAWINGS. A COPY OF THE DEFERRED SUBMITTAL DOCUMENTS SHALL BE SUBMITTED TO THE BUILDING OFFICIAL WITH A NOTATION INDICATING THAT THE DEFERRED SUBMITTAL DOCUMENTS HAVE BEEN REVIEWED. THE DEFERRED SUBMITTAL ITEMS SHALL NOT BE INSTALLED UNTIL THEIR DESIGN AND SUBMITTAL DOCUMENTS HAVE BEEN APPROVED BY THE BUILDING OFFICIAL.

4. DEFERRED SUBMITTAL ITEMS:

   FRP DESIGN

SPECIAL INSPECTIONS AND TESTING (PER 2018 IBC 1704):

1. THE OWNER (OR REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE ACTING AS THE OWNER'S AGENT) SHALL EMPLOY ONE OR MORE SPECIAL INSPECTORS TO PROVIDE INSPECTION AND TESTING DURING CONSTRUCTION OF THE TYPES OF WORK REQUIRING SPECIAL INSPECTION AS INDICATED ON THE DRAWINGS.

2. EACH SPECIAL INSPECTOR SHALL BE A QUALIFIED PERSON WHO SHALL DEMONSTRATE COMPETENCE, TO THE SATISFACTION OF THE BUILDING OFFICIAL AND STRUCTURAL ENGINEER OF RECORD, FOR INSPECTION OF THE PARTICULAR TYPE OF CONSTRUCTION OR OPERATION REQUIRING SPECIAL INSPECTION.

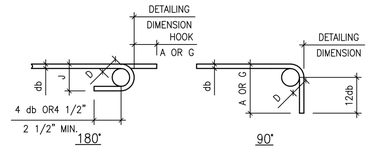
3. THE CONTRACTOR SHALL CONVENE A MEETING WITH THE SPECIAL INSPECTION AGENCY (AGENCIES), THE BUILDING OFFICIAL, THE ARCHITECT, AND THE STRUCTURAL ENGINEER OF RECORD TO REVIEW INSPECTION REQUIREMENTS AND PROCEDURES, PRIOR TO COMMENCING WITH CONSTRUCTION.

4. DUTIES AND RESPONSIBILITIES OF THE SPECIAL INSPECTOR:

   A) THE SPECIAL INSPECTOR SHALL OBSERVE THE WORK ASSIGNED FOR CONFORMANCE TO THE APPROVED CONSTRUCTION DOCUMENTS.

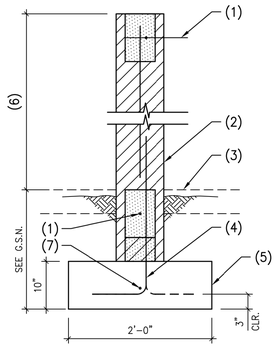
   B) THE SPECIAL INSPECTOR SHALL FURNISH INSPECTION REPORTS TO THE BUILDING OFFICIAL, AND TO THE ENGINEER OR ARCHITECT OF RECORD. REPORTS SHALL INDICATE THAT WORK INSPECTED WAS DONE IN CONFORMANCE TO APPROVED CONSTRUCTION DOCUMENTS. DISCREPANCIES SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE CONTRACTOR FOR CORRECTION, THEN, IF UNCORRECTED, TO THE ENGINEER OR ARCHITECT OF RECORD AND THE BUILDING OFFICIAL PRIOR TO THE COMPLETION OF THAT PHASE OF THE WORK.

   C) UPON COMPLETION OF THE ASSIGNED WORK, THE SPECIAL INSPECTOR SHALL COMPLETE AND SIGN THE APPROPRIATE FORMS CERTIFYING THAT, TO THE BEST OF HIS KNOWLEDGE, THE WORK IS IN CONFORMANCE WITH THE APPROVED CONSTRUCTION DOCUMENTS, AND THE APPLICABLE WORKMANSHIP PROVISIONS OF THE CODE.



END HOOKS, ALL GRADES					
BAR SIZE	FINISHED BEND DIA. D, IN.	180° HOOKS		90° HOOKS	
		A OR G, IN.	J, IN.	A OR G, IN.	
#3	2.25	5	3	6	
#4	3	6	4	8	
#5	3.75	7	5	10	
#6	4.5	8	6	12	
#7	5.25	10	7	14	
#8	6	11	8	16	
#9	9.5	15	11.75	19	
#10	10.75	17	13.25	22	
#11	12	19	14.75	24	
#14	18.25	27	21.75	31	
#18	24	36	28.5	41	

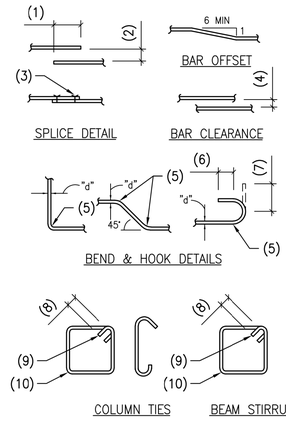
01 *TYPICAL REINFORCING HOOK SCHEDULE*
SCALE: NOT TO SCALE 200-045-TYP



NOTES:
1. (1) #5 CONTINUOUS IN 8" DEEP GROUTED BOND BEAM.
2. 8" MASONRY WALL WITH #5 VERTICALS AT 48" O.C. GROUT SOLID BELOW GRADE.
3. FINISHED GRADE OR CONCRETE SLAB WHERE OCCURS.
4. DOWELS TO MATCH AND LAP VERTICAL WALL REINFORCING PER G.S.N. – ALTERNATE BENDS.
5. CONCRETE FOOTING.
6. FOR TOP OF WALL, SEE ARCHITECTURAL DRAWINGS – 6'-0" MAX.
7. (1) #4 CONTINUOUS.

NOTE:
AT CONTRACTOR'S OPTION, USE CONCRETE STEM WALL WITH SAME REINFORCING.

03 *6'-0" MAXIMUM FREESTANDING MASONRY WALL AND FOOTING*
SCALE: NOT TO SCALE 290-003



NOTES:
1. LAP – SEE G.S.N.
2. MAXIMUM 1/5 LAP BUT NOT MORE THAN 6".
3. WIRE TIES.
4. 1d (1" MINIMUM).
5. RADIUS=3d FOR BARS NOT OVER #8; 4d FOR #9, #10 AND #11 BARS; 5d FOR #14 AND #18 BARS. 5d FOR ALL GRADE 40 BARS WITH 180 DEGREE HOOK.
6. 4d (2 1/2" MINIMUM).
7. 12d (90 DEGREE HOOK).
8. 6d.
9. 135 DEGREE BEND.
10. BEND AROUND 1 1/2" PIN FOR #3 BARS. BEND AROUND 2" PIN FOR #4 BARS. BEND AROUND 2 1/2" PIN FOR #5 BARS.

02 *TYPICAL CONCRETE REINFORCING BAR DETAILS*
SCALE: NOT TO SCALE 200-050-TYP

TABLE 1: REQUIRED STRUCTURAL SPECIAL INSPECTIONS 891.0-IBC12

SYSTEM OR MATERIAL	INSPECTION				REMARKS
	IBC CODE REFERENCE	CODE OR STANDARD REFERENCE	FREQUENCY		
			CONTINUOUS	PERIODIC	
1. FABRICATORS					
FABRICATED SYSTEMS AND ELEMENTS	1704.2.5			X	SPECIAL INSPECTIONS APPLY TO VERIFICATION OF DETAILED FABRICATION AND QUALITY CONTROL PROCEDURES, INCLUDING REVIEW FOR COMPLETENESS AND ADEQUACY RELATIVE TO THE CODE REQUIREMENTS. SPECIAL INSPECTIONS ARE NOT REQUIRED FOR WORK DONE ON THE PREMISES OF A FABRICATOR REGISTERED AND APPROVED TO PERFORM SUCH WORK WITHOUT SPECIAL INSPECTION. APPROVED FABRICATORS, UPON COMPLETION OF COMPONENT MANUFACTURING, SHALL SUBMIT A CERTIFICATE OF COMPLIANCE TO THE BUILDING OFFICIAL STATING THAT THE WORK WAS PERFORMED IN ACCORDANCE WITH THE APPROVED CONSTRUCTION DOCUMENTS.
2. CONCRETE					
REINFORCING STEEL AND PRESTRESSING TENDON PLACEMENT	1705.3	ACI 318 1.3 ACI 318 3.5 ACI 318 7.5		X	
WELDING OF REINFORCING STEEL	1705.3	ACI 318 1.3 ACI 318 3.5.2 AWS D1.4			REFER TO STEEL FOR WELDING REQUIREMENTS
PLACEMENT OF CAST-IN-PLACE ANCHOR BOLTS	1705.3 1908.5 1909.1	ACI 318 1.3 ACI 318 1.3 ACI 318 D.9		X	ALL BOLTS VISUALLY INSPECTED
VERIFY USE OF REQUIRED MIX DESIGN(S)	1705.3 1904.2 1910.2 1910.3	ACI 318 1.3 ACI 318, CHAPTER 4		X	
CONCRETE PLACEMENT	1705.3	ACI 318 1.3 ACI 318 5.9, 5.10	X		
CONCRETE PLACEMENT AT COMPOSITE SLABS	1705.3	ACI 318 1.3 ACI 318 5.10	X		
CONCRETE CURING	1705.3 1910.9	ACI 318 1.3 ACI 318 5.11-5.13		X	
VERIFICATION OF IN-SITU CONCRETE STRENGTH PRIOR TO STRESSING OF TENDONS IN POST-TENSIONED CONCRETE	1705.3	ACI 318 1.3 ACI 318 6.2		X	
STRESSING OF TENDONS IN POST-TENSIONED CONCRETE	1705.3	ACI 318 1.3 ACI 318 18.18.4 ACI 318 18.20	X		
ERECTION OF PRECAST MEMBERS	1705.3	ACI 318 1.3 ACI 318 16.9		X	ALL CONNECTIONS VISUALLY INSPECTED. REFER TO ANCHOR BOLT AND WELDING REQUIREMENTS
VERIFICATION OF IN-SITU CONCRETE PRIOR TO REMOVAL OF FORMS AND SHORES FROM ELEVATED BEAMS AND SLABS	1705.3	ACI 318 1.3 ACI 318 6.2		X	
VERIFICATION OF FORMWORK	1705.3	ACI 318 1.3 ACI 318 6.1		X	SPECIAL INSPECTIONS APPLY TO SHAPE, LOCATION AND DIMENSIONS OF THE CONCRETE MEMBER BEING FORMED

TABLE 2: REQUIRED TESTING FOR SPECIAL INSPECTIONS 894-IBC12

SYSTEM OR MATERIAL	INSPECTION			REMARKS
	IBC CODE REFERENCE	CODE OR STANDARD REFERENCE	FREQUENCY	
			CONTINUOUS	PERIODIC
1. CONCRETE				
CONCRETE STRENGTH	1705.3 1905.6	ASTM C39	EACH 150 CY NOT LESS THAN ONE TEST EACH 5000 SF OF SLAB OR WALL PLACED EACH DAY	FABRICATE SPECIMENS AT TIME FRESH CONCRETE IS PLACED
CONCRETE SLUMP		ASTM C143		
CONCRETE AIR CONTENT		ASTM C231		
CONCRETE TEMPERATURE		ASTM C1064		
2. STEEL				
MAGNETIC PARTICLE (MT) AND ULTRASONIC (UT) TESTING OF WELDS		MT – AWS D1.1 6.14.4 UT – AWS D1.1 6.13 & 6.14.3	PER DRAWINGS	SEE AISC 360 FOR QA ON GROOVE WELDS, ACCESS HOLES, AND FATIGUE WELDS
PRE-CONSTRUCTION TESTING OF WELDING STUDS	1705.2	AWS D1.1 7.7.1	EACH SIZE AND TYPE OF STUD EACH SHIFT	
PRE-INSTALLATION TESTING OF WELDING STUDS WELDED THROUGH DECKING	1705.2	AWS D1.1 7.6	EACH STUD SIZE AND DECK GAGE COMBINATION	

SCHNEIDER STRUCTURAL ENGINEERS
CREATING ELEGANT SOLUTIONS
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Project Number: 119103

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Registered Professional Engineer (Structural)
CERTIFICATE NO. 27349
RONALD H. SCHNEIDER
DATE SIGNED 1/08/21
ARIZONA, U.S.A.
This Electronic Signature Has Been Authorized By Me This 01/08/21

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WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

NOIR Lab

NSF

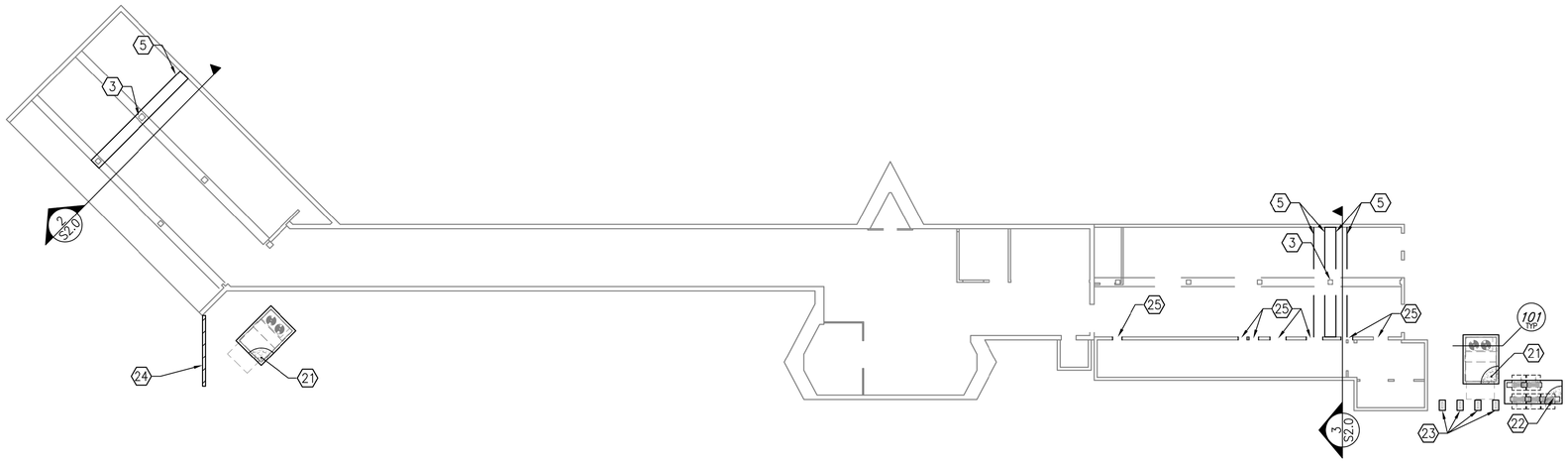
KITT PEAK - Sells, AZ 85634

△	DATE	DESCRIPTION
0	01/08/21	I.F.C.

PROJECT NUMBER: 11904.00
DRAWN BY: SAM
CHECKED BY: RHS
CAD FILE:
SCALE: NTS

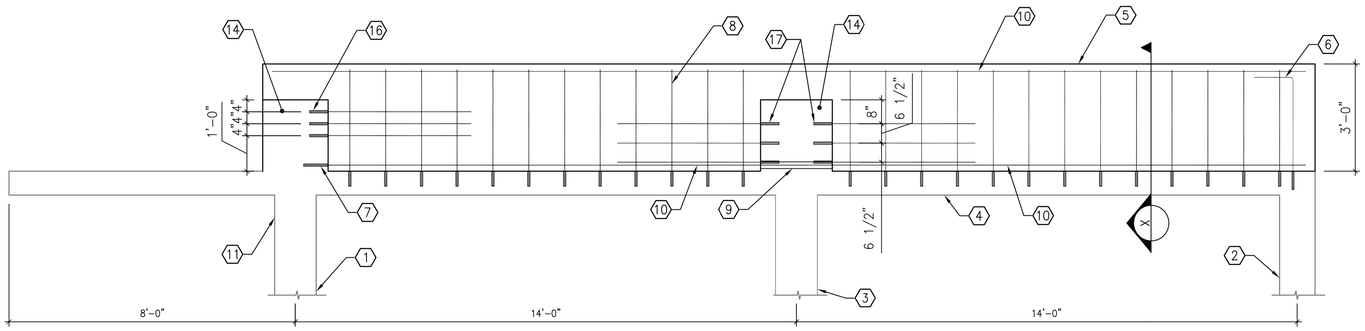
S1.1

G.S.N, S.I.T. AND TYPICAL DETAILS



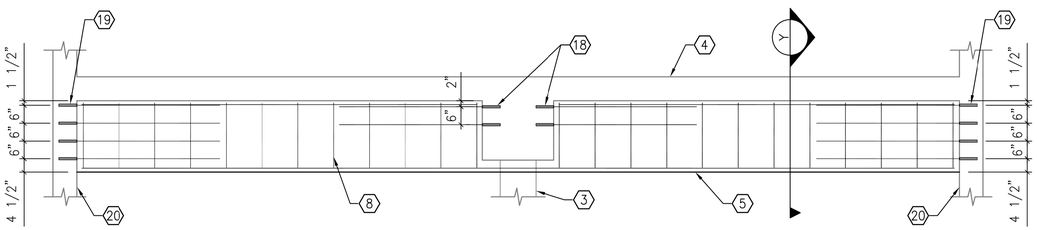
1 ROOF PLAN

SCALE: 1/16"=1'-0"



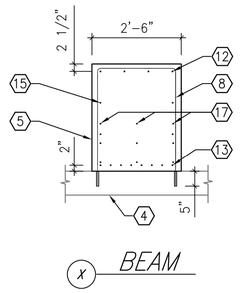
2 BEAM SECTION

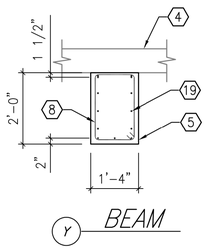
SCALE: 1/2"=1'-0"



3 BEAM SECTION

SCALE: 1/2"=1'-0"





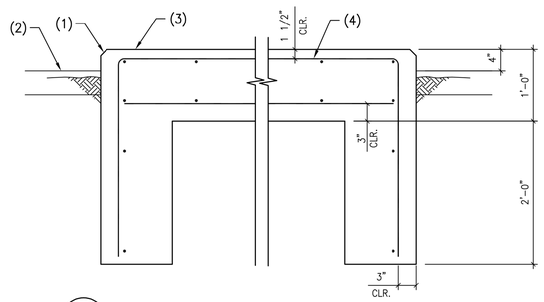
KEYNOTES:

1. EXISTING 14" SQUARE COLUMN.
2. EXISTING 12" THICK WALL.
3. COLUMN TO BE REMOVED AFTER NEW BEAM IS IN PLACE AND HAS REACHED DESIGN STRENGTH.
4. EXISTING 8" CONCRETE SLAB.
5. NEW CONCRETE BEAM.
6. (4) #5 DRILLED AND EPOXIED INTO SLAB WITH 6" EMBED.
7. DRILL AND EPOXY BOTTOM BARS INTO BEAM WITH 8" EMBED.
8. #4 TIES AT 12" O.C. DRILLED AND EPOXIED INTO EXISTING SLAB.
9. 2 1/4" DIA. FILLED WITH NON-SHRINK GROUT AFTER BAR IS INSTALLED.
10. DO NOT SPLICE BARS.
11. REINFORCE COLUMN WITH FRP TO SUPPORT 84 KIP DL, 23 KIP LL, 105 KIP SOIL LOAD.
12. (4) #9 x CONTINUOUS TOP REINFORCING BARS.
13. (7) #11 x CONTINUOUS BOTTOM REINFORCING BARS.
14. EXISTING CONCRETE BEAM.
15. #5 MID HEIGHT BARS TYPICAL AS SHOWN.
16. 2 ROWS OF (3) #6 x4'-0" LONG DRILLED AND EPOXIED INTO EXISTING BEAM WIT 6" EMBEDMENT.
17. 3 ROWS OF (3) #6 x4'-0" LONG DRILLED AND EPOXIED INTO EXISTING BEAM WIT 6" EMBEDMENT.
18. 2 ROWS OF (2) #6 x4'-0" LONG DRILLED AND EPOXIED INTO EXISTING BEAM WIT 6" EMBEDMENT.
19. 2 ROWS OF (4) #6 x4'-0" LONG DRILLED AND EPOXIED INTO EXISTING BEAM WIT 6" EMBEDMENT.
20. EXISTING 8" THICK CONCRETE WALL.
21. 11'-0"x8'-0"x12" THICK CONCRETE PAD.
22. 13'-0"x5'-4"x12" THICK CONCRETE PAD.
23. 1'-5"x2'-4"x12" THICK CONCRETE PAD.
24. 16'-0" LONG CMU WALL – SEE TYPICAL DETAIL 03.
25. NEW SAWCUT WALL OPENING. DO NOT OVERCUT OPENING. NO LINTEL IS REQUIRE IF AT LEAST 2 FEET OF SOLID CONCRETE IS ABOVE TOP OF OPENING

30" / 30"

NOTES:

1. CHAMFER EDGES.
2. CONCRETE SLAB OR FINISHED GRADE WHERE OCCURS.
3. CONCRETE EQUIPMENT SLAB.
4. #4 AT 12" O.C. EACH WAY TOP AND BOTTOM.



101 CONCRETE PAD

SCALE: NOT TO SCALE

119103-S2.0-101

Registered Professional Engineer (Structural)
CERTIFICATE NO. 27349
RONALD H. SCHNEIDER
Date Signed
ARIZONA, U.S.A.

This Electronic Signature Has Been Authorized By Me This 01/08/21

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S2.0

PLAN, SECTION AND DETAIL

ABBREVIATIONS

AD	ACCESS DOOR
AFF	ABOVE FINISHED FLOOR
AHU	AIR HANDLING UNIT
ARCH	ARCHITECTURAL/ARCHITECT
BTM	BOTTOM
BOD	BOTTOM OF DUCT
BOP	BOTTOM OF PIPE
CA	COMPRESSED AIR
CD	COOLER DRAIN/CONDENSATE DRAIN
CD(P)	PUMPED CONDENSATE DRAIN
C	COMMON
CFM	CUBIC FEET PER MINUTE
CHWS/CWS	CHILLED WATER SUPPLY
CHWR/CWR	CHILLED WATER RETURN
DCW	DOMESTIC COLD WATER
DCS	DIGITAL CONTROL SYSTEM
DTW	DUCT THROUGH WALL
DI	DEIONIZED WATER
DWG(S)	DRAWING(S)
<E>	EXISTING
EXH	EXHAUST
FC	FAIL CLOSE
FO	FAIL OPEN
FAS	FIRE ALARM SYSTEM
FMCS/EMCS	FACILITIES/ENERGY MANAGEMENT CONTROL SYSTEM
GA	GAUGE
GALV.	GALVANIZED
GSM	GALVANIZED SHEET METAL
HOA	HAND-OFF-AUTO
HB	HOSE BIBB
HWS	HEATING WATER SUPPLY
HWR	HEATING WATER SUPPLY
MAXIMUM	
MBD	MANUAL BALANCE DAMPER
MCC	MOTOR CONTROL CENTER
MMS	MANUAL MOTOR STARTER
MUA	MAKEUP AIR
OC/O.C.	ON CENTER
OAD	OUTSIDE AIR DUCT
OA/OSA	OUTSIDE AIR
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
PLC	PROGRAMMABLE LOGIC CONTROLLER
POC	POINT OF CONNECTION
RA	RETURN AIR
RAD	RETURN AIR DUCT
<R>	RELOCATED
SHT MTL	SHEET METAL
SA	SUPPLY AIR
SAD	SUPPLY AIR DUCT
SD	SMOKE DAMPER
TRANS	TRANSITION
TYP	TYPICAL
U.L.	UNDERWRITERS LABORATORIES
VAC	VACUUM
VFD	VARIABLE FREQUENCY DRIVE
W/	WITH

INSTRUMENT & CONTROL SIGNAL SYMBOLS

LINES CONNECTED
PNEUMATIC ANALOG SIGNAL LINE
LINES NOT CONNECTED
SOFTWARE LINK
LINES CONNECTED
ELECTRICAL ANALOG OR DIGITAL SIGNAL LINE
LINES NOT CONNECTED

INSTRUMENT & CONTROL DEVICE SYMBOLS

DISTRIBUTED CONTROL LOGIC CONTROLLER OR PLC
LOCALLY MOUNTED DEVICE NOT ON PANEL OR ASSEMBLY
PANEL MOUNTED DEVICE
DEVICE MOUNTED INSIDE ENCLOSURE
LOGIC SYMBOL-DIGITAL OR RELAY
VARIABLE (MEASURED OR INITIATING)
INSTRUMENT FUNCTION
P SV 100 O_2 ← CLARIFYING SYMBOL (IF REQUIRED)
INSTRUMENT OR DEVICE TAG NUMBER
INSTRUMENT CODE (SEE LIST)

SYSTEMS OPERATION

A. INDICATIONS AND ALARMS: PROVIDE AS SHOWN ON DRAWINGS AND PROVIDE HIGH AND LOW ALARMS FOR EACH ANALOG INPUT, DEVIATION ALARMS FOR ALL CONTROL POINTS, AND ABNORMAL STATUS FOR ALL DIGITAL POINTS.

B. NON-ALARM CONDITION: DURING EQUIPMENT SHUTDOWN, DISABLE ALARM POINTS. UPON STARTING THE UNIT, PHASE IN ALARM POINTS, ALLOWING TIME FOR EACH VARIABLE TO STABILIZE TO PREVENT NUISANCE ALARMING. SOFT START AND STOP ALL CONTROL LOOPS AS STATED IN ITEMS 1 THROUGH 4 UNLESS SPECIFIED TO THE CONTRARY IN SEQUENCE OF OPERATION.

1. COOLING CONTOL VALVES: FAIL POSITION.
2. PRE-HEAT AND REHEAT VALVES: FAIL POSITION.
3. DAMPERS: FAIL POSITION.
4. FANS AND PUMPS: MINIMUM VOLUME/ZERO HZ.

C. START-UP, POWER OUTAGE, EMERGENCY GENERATOR POWER, AND POWER RESTORATION

D. ALL SETPOINTS NOTED IN THESE CONSTRUCTION DOCUMENTS SHALL BE ADJUSTABLE.

CONTROLS

INSTRUMENT TYPE CODES

FIRST LETTER VARIABLE

A	ANALYSIS
B	BURNER FLAME
C	CONDUCTIVITY
D	DENSITY
E	VOLTAGE
F	FLOW
G	GAUGING
H	HAND (MANUAL)
I	CURRENT
J	POWER
K	TIME
L	LEVEL
M	MOISTURE (HUMIDITY) OR (M) MOTOR
N	SMOKE
P	PRESSURE OR VACUUM
S	SPEED OR SOLENOID
T	TEMPERATURE
U	MULTI-VARIABLE
V	VIBRATION
W	WEIGHT
X	SPECIAL (REFER TO CLARIFYING SYMBOLS)
Y	STRAIN
Z	POSITION

SECOND OR SUCCEEDING LETTERS (INSTRUMENT FUNCTION)

A	ALARM
C	CONTROLLER
D	DIFFERENTIAL
E	PRIMARY ELEMENT
G	GLASS
H	HIGH
I	INDICATE
L	LIGHT (PILOT), LOW
Q	INTEGRATE, TOTALIZE
R	RECORDER
S	SWITCH
T	TRANSMITTER
V	VALVE OR DAMPER
W	WELL
X	SPECIAL (REFER TO CLARIFYING SYMBOLS)
Y	RELAY-SIGNAL CONVERTER, COMPUTING
Z	POWER POSITIONER/CONTROL DRIVE

CLARIFYING SYMBOLS LIST

I/P	CURRENT TO PNEUMATIC TRANSDUCER
N_2	NITROGEN
O_2	OXYGEN
SP	SET POINT
Δ	DIFFERENTIAL
$\sqrt{}$	SQUARE ROOT
$\int$	INTEGRAL
$\not<$	NOT LESS THAN
$\not>$	NOT GREATER THAN
$<$	LESS THAN
$>$	GREATER THAN
$\pm$	BIASING OR ADDER/SUBTRACTOR
$\times$	MULTIPLIER
$\div$	DIVIDER
Σ	SUMMATION

PIPE LINE SYMBOLS

PRIMARY SERVICE
SECONDARY SERVICE

LINE SYMBOLS

DUCTED AIR FLOW
NON-DUCTED AIR FLOW

FITTINGS

CAP
CONNECTION, TOP
ELBOW, TURNED UP
ELBOW, TURNED DOWN
CONNECTION, BOTTOM
UNION
FLANGED CONNECTION
REDUCER, CONCENTRIC
REDUCER, ECCENTRIC
TEE, TURNED DOWN
TEE, TURNED UP

SYMBOLS

PIPING SPECIALTIES

FLEXIBLE CONNECTION
T TRAP ASSEMBLY
"Y" STRAINER WITH BLOWDOWN
FI INLINE FLOW INDICATOR
PIPE REDUCER

VALVES

GATE
GLOBE
BUTTERFLY
CHECK
BALL
SELF CONTAINED PRESSURE REDUCING
CIRCUIT SETTER
FCV FLOW CONTROL
PLUG
FLOAT
DIAPHRAGM
PRESSURE RELIEF OR SAFETY
VACUUM RELIEF
PNEUMATIC CYLINDER OPERATED
S SOLENOID OPERATED
OR E ELECTRIC ACTUATOR
IAS VENT F.O. RESTRICTED VENT SOLENOID
3-WAY
DIAPHRAGM OPERATED
P I.A.S. OPERATOR POSITIONER
TDV TRIPLE DUTY VALVE

DESIGN CONDITIONS

- PER THE OWNER THE SPACES DO NOT HAVE DEFINED TEMPERATURE AND HUMIDITY CONDITIONS.
- THERE WILL BE NO HUMIDIFICATION OR DEHUMIDIFICATION ON THIS PROJECT.
- PLANETARIUM, HALLWAY, EXHIBIT CORRIDOR, AND RESTROOMS ARE SERVED BY A SINGLE HEAT PUMP UNIT. THERMOSTAT FOR THIS UNIT SHALL BE LOCATED IN THE PLANETARIUM AND USED TO MAINTAIN TEMPERATURE IN THIS SPACE WHILE THE REMAINING AREAS WILL BE SLAVED TO THIS ONE SPACE.
- S.O.S. THEATER, CLASSROOM, AND SHOWCASE EXHIBIT CORRIDOR ARE SERVED BY A SINGLE HEAT PUMP UNIT. THERMOSTAT FOR THIS UNIT SHALL BE LOCATED IN THE S.O.OS. THEATER AND USED TO MAINTAIN TEMPERATURE IN THIS SPACE WHILE THE REMAINING AREAS WILL BE SLAVED TO THIS ONE SPACE.
- THE CONTROL ROOM IS TO REMAIN AS AN ACTIVE AND OPERATIONAL CONTROL ROOM FOR THE TELESCOPE OPERATIONS. WHEN THE TELESCOPE IS BEING USED FOR VIEWING, THE SPACE WILL BE ALLOWED TO ACCLIMATE TO THE AMBIENT CONDITIONS AS CURRENTLY BEING DONE.
- THE HEATING AND COOLING OF THE CONTROL ROOM IS UNIQUE SINCE IT IS INTENDED TO REMAIN OPERATIONAL AND HAS OPENINGS TO THE ATMOSPHERE. THE SPLIT SYSTEMS THAT WE HAVE DESIGNED FOR THE CONTROL ROOM SPACE ARE INTENDED TO TEMPER THE AIR BUT NOT MAINTAIN TIGHT CONTROL DURING SEASONAL EXTREMES.

EQUIPMENT SYMBOLS

CENTRIFUGAL FAN
PLUG FAN
FIXED LOUVERS

HEAT EXCHANGER

HW

CHW	CHILLED WATER
HW	HEATING WATER
RH	REHEAT

FILTERS

FIBROUS MEDIA 10-30% EFFICIENCY
30 ASHRAE EFFICIENCY
FIBROUS MEDIA 35-95% EFFICIENCY
90 ASHRAE EFFICIENCY

DAMPERS

OPPOSED BLADE
PARALLEL BLADE
BUTTERFLY
BACKDRAFT W/COUNTERWEIGHT
CONTROL, SMOKE, SMOKE/FIRE

FIRE (1 1/2 HOUR) (FD)
MANUAL (BALANCING) (MBD)
SMOKE (SD)
CONTROL (CD)
FIRE / SMOKE (F/S)
SLIDE (SD)
BACKDRAFT (BD)
CONTROL /SMOKE (C/S)

NOTE:
NOT ALL SYMBOLS AND ABBREVIATIONS ARE USED. SYMBOLS AND ABBREVIATIONS SHEETS HAVE BEEN SUMMARIZED FOR PROJECT SPECIFICS. IN THE EVENT THAT THERE ARE CONFLICTS WITH PLANS, CONTACT OWNER PRIOR TO BID. ANY CLARIFICATIONS CLARIFIED POST BID SHALL BE PART OF CONTRACT.

REFERENCE SYMBOLS

XX / XXX
SECTION NUMBER
BUILDING SECTION REFERENCE
SHEET WHERE SECTION IS TAKEN

XX / XXX
DETAIL NUMBER
DETAIL REFERENCE
SHEET WHERE DETAIL IS TAKEN

HVAC AIR MOVING DEVICES & COMPONENTS

20/12 DUCT SIZE, FIRST FIGURE IS SIDE SHOWN
DUCT SECTION, SUPPLY
DUCT SECTION, RETURN
DUCT SECTION, EXHAUST
UP CHANGE IN ELEVATION (UP), (DN)
ROUND DUCT VERTICAL OFFSET (USING 45° ELBOWS U.N.O.)
FLEXIBLE DUCT AND SPIN-IN
CEILING SUPPLY DIFFUSER
CEILING RETURN GRILL
CEILING EXHAUST GRILLE
#/# ### SIDEWALL/DUCT MOUNTED SUPPLY GRILLE W/NECKSIZE AND CFM
#/# ### SIDEWALL RET/EXH GRILLE W/NECKSIZE AND CFM
MITERED ELBOW W/TURNING VANES
SD SMOKE DETECTOR
SOUND ATTENUATOR
TRANSITION, RECTANGULAR TO ROUND
FILTER MODULE OR FAN FILTER UNIT

GENERAL NOTES

1. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH APPLICABLE CODES, RULES, REGULATIONS, AND BUILDING AND SAFETY LAWS.
2. ALL PIPING SHALL BE COORDINATED WITH DUCTWORK AND CONDUIT ROUTING PRIOR TO START OF ANY WORK. PIPING SHALL RUN PARALLEL TO DUCTWORK WHERE REQUIRED BY SPACE LIMITATIONS. PIPING RUNNING PERPENDICULAR TO DUCTWORK SHALL CROSS DUCTWORK HIGH BETWEEN JOISTS WHERE REQUIRED BY SPACE LIMITATIONS.
3. DRAWINGS ARE DIAGRAMMATIC. IT IS THE MECHANICAL CONTRACTOR'S RESPONSIBILITY TO COORDINATE WITH PLUMBING, ELECTRICAL, AND FIRE SPRINKLER CONTRACTORS AND ADJUST ROUTING AS NECESSARY, INCLUDING ADDITIONAL OFFSETS, RISES, & DROPS TO FIT WITH AVAILABLE SPACE. EVERY EFFORT HAS BEEN MADE TO PROVIDE THIS CONTRACTOR WITH ACCURATE INFORMATION REGARDING EXISTING CONDITIONS. THIS CONTRACTOR SHALL FIELD VERIFY ALL EXISTING CONDITIONS PRIOR TO BIDDING PROJECT. ANY CONFLICTS DISCOVERED BY THIS CONTRACTOR DURING THE PRE-BID PROCESS WHICH MAY AFFECT THE SCOPE OF WORK SHALL BE REPORTED TO THE ARCHITECT AND/OR ENGINEER PRIOR TO BIDDING. THE SUBMISSION OF A BID SHALL INDICATE THIS CONTRACTOR'S COMPLETE UNDERSTANDING OF THE CONTRACT DOCUMENTS AND ACCEPTANCE OF EXISTING CONDITIONS. THE NEW SYSTEMS INDICATED ON PLANS AND IN THE SPECIFICATIONS SHALL BE FULLY INSTALLED AND OPERATIONAL. ALL ITEMS INCIDENTAL TO THE COMPLETION OF THE WORK SHALL BE PROVIDED AT NO ADDITIONAL COST TO THE OWNER. THIS CONTRACTOR SHALL COORDINATE ALL CUTTING, PATCHING AND REPAIRING AS REQUIRED WITH GENERAL CONTRACTOR
4. SILICON BASED PRODUCT SHALL NOT BE USED.
5. MECHANICAL, PLUMBING AND PROCESS PIPING CONTRACTORS TO COORDINATE PIPING, DUCT AND ELECTRICAL WORK.
6. SOME DETAILS HAVE BEEN REFERENCED ON THE PLANS TO CLEARLY SHOW THE REQUIREMENTS OF A CONNECTION: HOWEVER, THE DETAILS SHOWN ON THESE DOCUMENTS ARE TYPICAL. ALL DUCT, PIPE, AND EQUIPMENT CONNECTIONS AND/ OR ASSEMBLES SHALL BE PER THE SPECIFIC DETAIL. TYPICAL DETAILS INDICATE MINIMUM REQUIREMENTS. WHERE CODE AND/OR MANUFACTURER'S REQUIREMENTS ARE MORE STRINGENT, THOSE REQUIREMENTS SHALL APPLY.
7. REFER TO ARCHITECTURAL DRAWINGS FOR ROOF MOUNTED EQUIPMENT CURBS AND FLASHING DETAILS.
8. PROVIDE IDENTIFICATION LABELS FOR ALL PIPING / DUCTWORK / UTILITIES.
9. PROVIDE FLEX CONNECTION TO ALL HVAC EQUIPMENT. ALL DUCT CONNECTIONS TO EQUIPMENT SHALL BE WITH FLEXIBLE NEOPRENE CONNECTIONS WITH INTEGRATED GALVANIZED METAL SUN SHIELD SECURED ON DUCT.
10. ALL EXTERIOR DUCTWORK AND CHILLED WATER PIPING SHALL HAVE DURABLE METAL JACKET,
11. EXTERIOR DUCTWORK SHALL BE PAINTED TO MATCH EXTERIOR BUILDING COLOR.
12. PROVIDE MANUAL BALANCING DAMPER (MBD) AT ALL BRANCH TAKE-OFFS FOR DUCTWORK, PROVIDE ALL NECESSARY MBD's FOR PROPER BALANCING OF THE SYSTEM EVEN IF IT NOT SHOWN, COORDINATE WITH TEST AND BALANCING CONTRACTOR PRIOR TO INITIATION OF WORK.
13. PROVIDE DUCT ACCESS DOORS IN DUCTWORK FOR ACCESS TO ALL CONTROL & FIRE DAMPERS. MAXIMUM 1'-0" FROM CONTROL & FIRE DAMPERS FROM EITHER SIDE OF WALL. ACCESS PANEL FIRE RATINGS TO MATCH THE CEILING FIRE RATING.
14. CONTRACTOR IS RESPONSIBLE TO COORDINATE ALL WORK WITH ALL TRADES. REFER TO SPECIFICATIONS.
15. ALL MECHANICAL EQUIPMENT, DUCTWORK, PIPING, AND SUPPORTS SHALL BE BY THE MECHANICAL CONTRACTOR.
16. COORDINATE ALL WALL PENETRATIONS WITH STRUCTURE PRIOR TO FABRICATION AND INITIATION OF WORK, PROVIDE ALL NECESSARY OFFSETS, FITTINGS, AND MATERIAL TO EXTEND THE PIPING OR DUCTWORK TO THE OPENING COORDINATED WITH THE STRUCTURE.
17. ALL END OF LINE VALVES FOR FUTURE CONNECTION SHALL HAVE PLUG, CAP, OR BLIND FLANGE AT THE END OF THE VALVE.
18. ALL DUCT TAKEOFFS WITH FUTURE DUCT RUNS SHALL HAVE DAMPER AND AIR AND WATER TIGHT END CAP. FUTURE CONNECTIONS SHALL NOT REQUIRE SYSTEM SHUTDOWNS OR SYSTEM IMPACTS TO CONNECT FUTURE EQUIPMENT.
19. ALL DUCTWORK/PIPING ELEVATIONS SHOWN ARE FOR REFERENCE. CONTRACTOR SHALL ROUTE ALL DUCTWORK/PIPING TIGHT TO DECK WITH MINIMUM OFFSETS. CONTRACTOR SHALL COORDINATE WITH ALL OTHER DISCIPLINES FOR ACTUAL ELEVATIONS.
20. COORDINATE ALL POCS WITH OWNER PRIOR TO FABRICATION AND INSTALLATION. FLAG ALL SPRINKLER HEADS TO AVOID COLLISION W/LIFTS & MOVING EQUIPMENT.
21. CONTRACTOR TO PROVIDE FIRE WATCH DURING SPRINKLER SHUT DOWN AT NON-OCCUPIED PERIODS. COORDINATE SPRINKLER SHUT DOWN W/SITE FIRE MARSHALL
22. PROVIDE DIELECTRIC CONNECTIONS AT ALL DISSIMILAR PIPE MATERIALS.
23. ALL EXHAUST DISCHARGE AND VENTS SHALL BE LOCATED MINIMUM OF 10 FEET FROM O.A. INTAKES.
24. CONTRACTOR TO PROVIDE 'BALANCE REPORT' AFTER COMPLETION OF THE HVAC SYSTEM AND MADE AVAILABLE FOR THE FINAL INSPECTION, REFERENCE 2012 IMC SECTION 403.7.
25. CONTRACTOR TO PROVIDE COMPLETE AIR AND WATER BALANCE OF SYSTEMS AS REQUIRED PER SPECIFICATIONS.
26. INSTALLATION TO COMPLY WITH THE LATEST ADOPTED EDITION OF THE INTERNATIONAL PLUMBING CODE WITH LOCAL AMENDMENTS.
27. OWNER SHALL PAY FOR ALL FEES AND PERMITS WITH THE AHJ. CONTRACTOR SHALL NOT COVER ANY WORK UNTIL INSPECTED. ANY RE-WORK REQUIRED TO EXPOSE COVERED WORK SHALL BE PERFORMED AT THE CONTRACTOR'S EXPENSE.
28. JOINTS IN COPPER PIPING ABOVE GRADE SHALL BE SOLDERED WITH 95-5 SOLDER, STAY-SAFE 50 SOLDER, OR OTHER NON-LEAD SOLDER, MINIMUM 4,000 PSI TENSILE STRENGTH USING NOKORODE SOLDER PASTE APPLIED WITH A BRUSH TO BOTH THE PIPE AND THE INSIDE OF THE FITTING SOCKET. NO ACID CORE SOLDER NOR FLUX CONTAINING ACID SHALL BE USED. PIPE SHALL BE CUT SQUARE AND REAMED.
29. ALL PIPING IN BLOCK WALLS OR PENETRATING CONCRETE SHALL BE SLEEVED. REFER TO PLANS FOR DETAILS.
30. SUBMIT THREE (3) COPIES OF SHOP DRAWINGS OR LITERATURE IN AN INDEXED 3-RING FOLDER ON THE FOLLOWING ITEMS: EQUIPMENT, PIPING, FITTINGS, VALVES, BRAZING MATERIAL, CLEANING CHEMICALS AND PIPE HANGER/SUPPORTS.
31. FURNISH THREE (3) SETS OF OPERATION MAINTENANCE AND WARRANTY LITERATURE IN A 3-RING BINDER.
32. CONTRACTOR SHALL GUARANTEE ALL PARTS AND LABOR FOR ONE (1) YEAR FROM DATE OF FINAL ACCEPTANCE OF PROJECT. THERE SHALL BE NO TIME LIMIT ON OMISSIONS. CONTRACTOR SHALL BE ENSURE THAT THE ENTIRE SYSTEM IS INSTALLED AND OPERATING PER THE DESIGN DOCUMENTS.
33. CONTRACTOR TO COORDINATE WITH OWNER REQUIREMENTS OF TEMPORARY AND/OR PERMANENT PATCHING TO MAINTAIN SMOKE PARTITION INTEGRITY THROUGHOUT CONSTRUCTION.
34. MAKE NOTE OF ANY CHANGES MADE IN LAYOUT AND INCORPORATE IN "RECORD" DRAWINGS.
35. ALL LIFE SAFETY DEVICES SHALL BE COMPATIBLE FOR INTERLOCKING AND INTEGRATION WITH THE EXISTING SIMPLEX LIFE SAFETY/FIRE ALARM CONTROL SYSTEM.
36. ALL CONTROLS AND DEVICES SHALL BE BACNET.
37. CONTRACTOR SHALL PROVIDE COMMISSIONING PER SPECIFICATIONS.
38. ALL PIPING AND DUCTWORK SHALL BE INSULATED PER SPECIFICATIONS.
39. IN ADDITION TO PROJECT SPECIFICATIONS, INSULATION SHALL BE INSTALLED CONTINUOUSLY THOROUGH HANGERS AND CLAMPS. PROVIDE RIGID BLOCKING WHERE INSULATION PASSES THROUGH SUPPORTS AND PROVIDE CONTINUOUS VAPOR BARRIER.
40. WITH THE EXCEPTION OF ITEMS CALLED OUT WITHIN THE DESIGN DOCUMENTS AS BEING RE-USED OR TURNED OVER TO OWNER THE CONTRACTORS ARE RESPONSIBLE FOR SEPARATING AND RECYCLING MATERIALS REM0VED FROM JOBSITE. MATERIAL WILL BE SEPARATED AS FOLLOWS:
   A. SCRAP METAL: ALL SHAPES, SIZES & TYPES. CONTRACTOR TO REMOVE ALL FOREIGN MATERIAL FROM METAL PRIOR TO PLACEMENT IN RECYCLE BIN.
   B. CARDBOARD: REMOVE ALL INTERNAL PACKING (FOAM, ETC.) AND FOLD FLAT.
   C. WOOD: ANY AND ALL WOOD - MUST BE FREE OF PACKAGING MATERIAL / DUNNAGE.

Registered Professional Engineer (Mechanical)
CERTIFICATE NO. 37915
FORREST K. ISAACS
Date Signed 01-08-21
ARIZONA, U.S.A.
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Expires 9-30-2023

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WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

KITT PEAK - Sells, AZ 85634

△	DATE	DESCRIPTION
0	01/08/21	I.F.C.

PROJECT NUMBER:	11904.00
DRAWN BY:	FI
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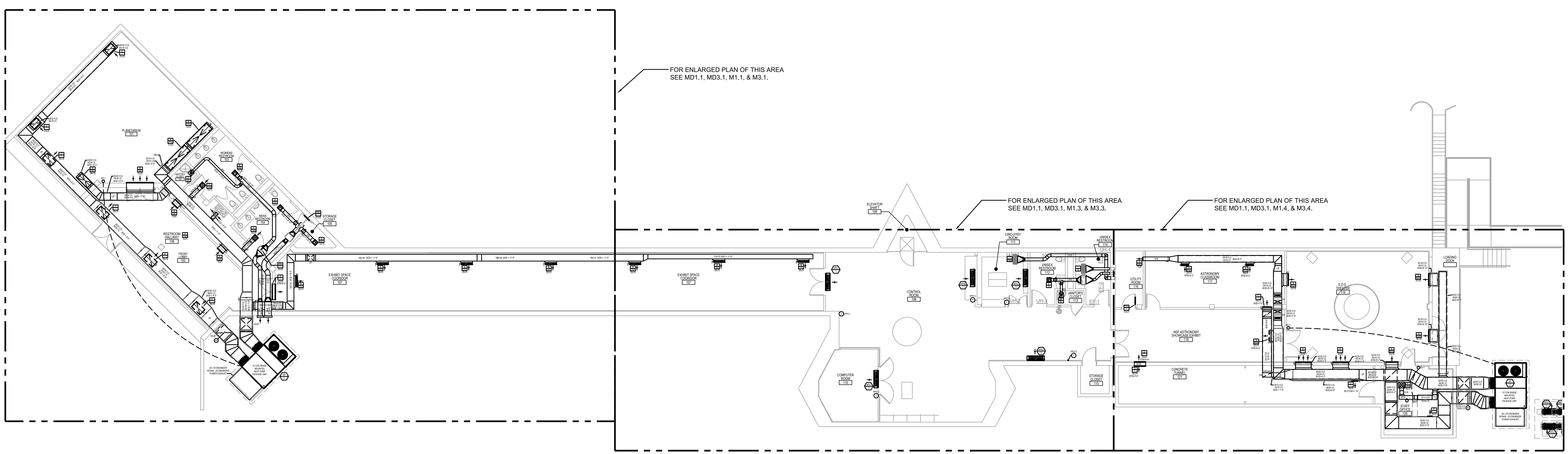
SCALE:	NONE

MECHANICAL SYMBOLS & ABBREVIATIONS

M0.0



MECHANICAL OVERALL PLAN

1 1ST LEVEL

SCALE: 3/32"-1'-0"

Registered Professional Engineer (Mechanical)
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WINDOWS ON
THE UNIVERSE
CENTER FOR
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NOIR Lab | NSF

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SCALE:	AS SHOWN

MECHANICAL
OVERALL PLAN

M0.1

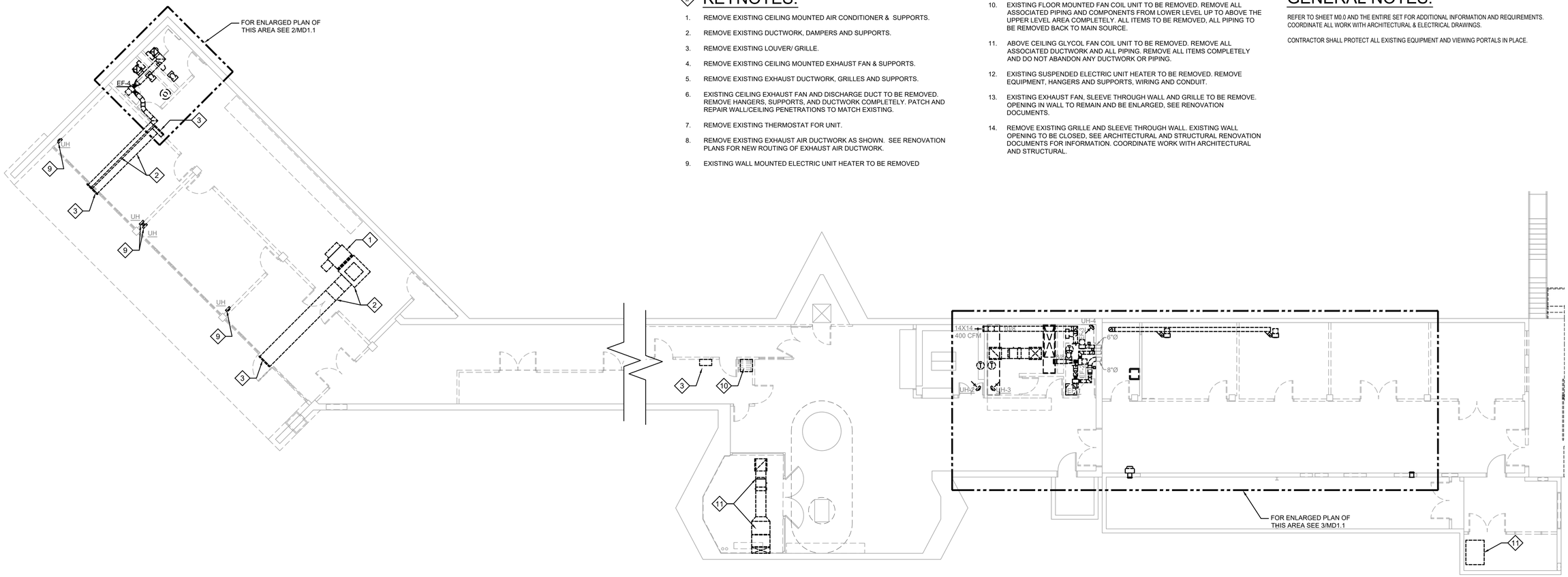
KEYNOTES:

1. REMOVE EXISTING CEILING MOUNTED AIR CONDITIONER & SUPPORTS.
2. REMOVE EXISTING DUCTWORK, DAMPERS AND SUPPORTS.
3. REMOVE EXISTING LOUVER/ GRILLE.
4. REMOVE EXISTING CEILING MOUNTED EXHAUST FAN & SUPPORTS.
5. REMOVE EXISTING EXHAUST DUCTWORK, GRILLES AND SUPPORTS.
6. EXISTING CEILING EXHAUST FAN AND DISCHARGE DUCT TO BE REMOVED. REMOVE HANGERS, SUPPORTS, AND DUCTWORK COMPLETELY. PATCH AND REPAIR WALL/CEILING PENETRATIONS TO MATCH EXISTING.
7. REMOVE EXISTING THERMOSTAT FOR UNIT.
8. REMOVE EXISTING EXHAUST AIR DUCTWORK AS SHOWN. SEE RENOVATION PLANS FOR NEW ROUTING OF EXHAUST AIR DUCTWORK.
9. EXISTING WALL MOUNTED ELECTRIC UNIT HEATER TO BE REMOVED
10. EXISTING FLOOR MOUNTED FAN COIL UNIT TO BE REMOVED. REMOVE ALL ASSOCIATED PIPING AND COMPONENTS FROM LOWER LEVEL UP TO ABOVE THE UPPER LEVEL AREA COMPLETELY. ALL ITEMS TO BE REMOVED, ALL PIPING TO BE REMOVED BACK TO MAIN SOURCE.
11. ABOVE CEILING GLYCOL FAN COIL UNIT TO BE REMOVED. REMOVE ALL ASSOCIATED DUCTWORK AND ALL PIPING. REMOVE ALL ITEMS COMPLETELY AND DO NOT ABANDON ANY DUCTWORK OR PIPING.
12. EXISTING SUSPENDED ELECTRIC UNIT HEATER TO BE REMOVED. REMOVE EQUIPMENT, HANGERS AND SUPPORTS, WIRING AND CONDUIT.
13. EXISTING EXHAUST FAN, SLEEVE THROUGH WALL AND GRILLE TO BE REMOVE. OPENING IN WALL TO REMAIN AND BE ENLARGED, SEE RENOVATION DOCUMENTS.
14. REMOVE EXISTING GRILLE AND SLEEVE THROUGH WALL. EXISTING WALL OPENING TO BE CLOSED, SEE ARCHITECTURAL AND STRUCTURAL RENOVATION DOCUMENTS FOR INFORMATION. COORDINATE WORK WITH ARCHITECTURAL AND STRUCTURAL.

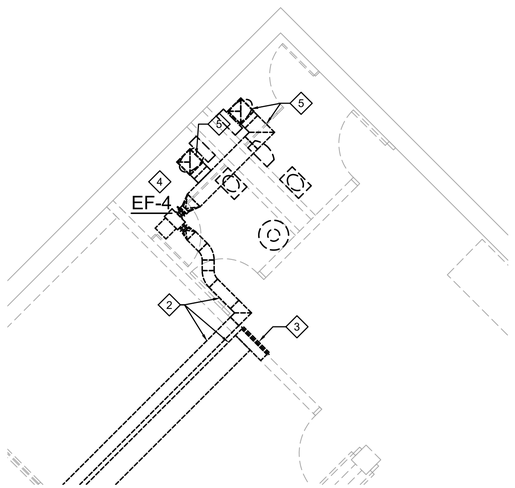
GENERAL NOTES:

REFER TO SHEET M0.0 AND THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS. COORDINATE ALL WORK WITH ARCHITECTURAL & ELECTRICAL DRAWINGS.

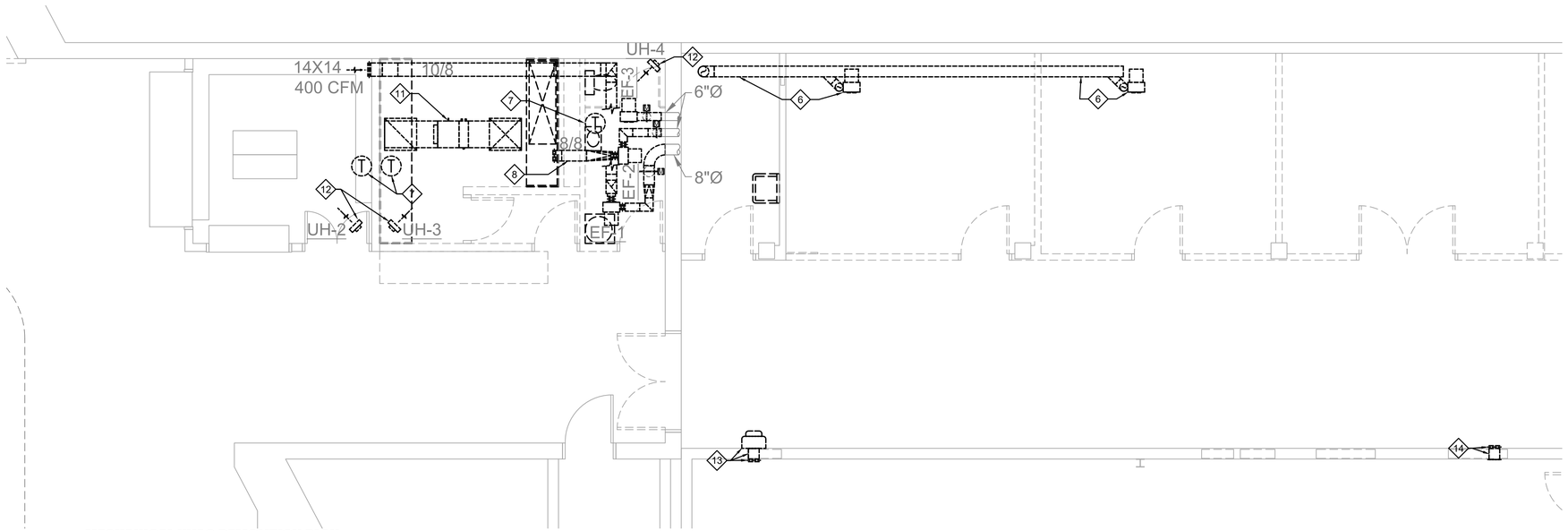
CONTRACTOR SHALL PROTECT ALL EXISTING EQUIPMENT AND VIEWING PORTALS IN PLACE.



1 **MECHANICAL HVAC DEMOLITION PLAN**
1ST LEVEL
SCALE: 1/8"-1'-0"



2 **MECHANICAL HVAC DEMOLITION PLAN**
1ST LEVEL
SCALE: 1/4"-1'-0"



3 **MECHANICAL HVAC DEMOLITION PLAN**
1ST LEVEL
SCALE: 1/4"-1'-0"

Registered Professional Engineer (Retired)
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STATE OF ARIZONA
Expires 9-50-2023

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WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

NOIR Lab

NSF

KITT PEAK - Sells, AZ 85634

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PROJECT NUMBER:	11904.00
DRAWN BY:	FI
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MECHANICAL
HVAC
DEMOLITION PLANS

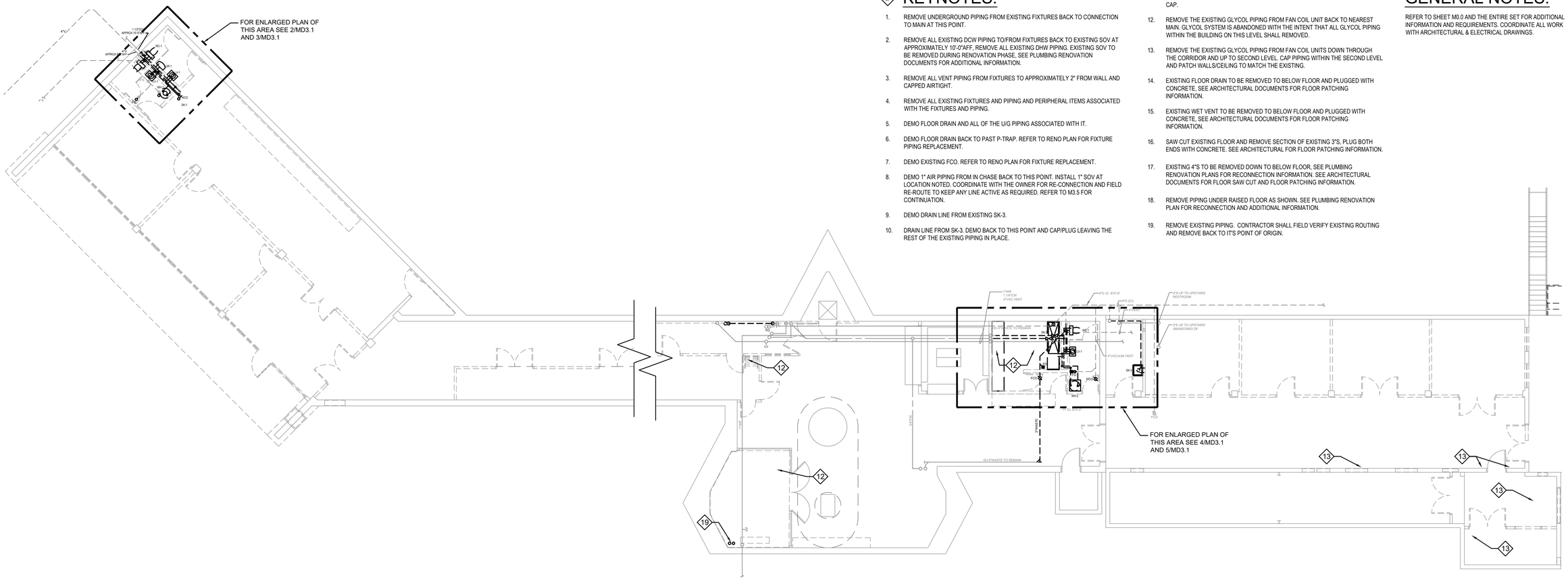
MD1.1

KEYNOTES:

1. REMOVE UNDERGROUND PIPING FROM EXISTING FIXTURES BACK TO CONNECTION TO MAIN AT THIS POINT.
2. REMOVE ALL EXISTING DCW PIPING TO/FROM FIXTURES BACK TO EXISTING SOV AT APPROXIMATELY 10'-0"AFF, REMOVE ALL EXISTING DHW PIPING. EXISTING SOV TO BE REMOVED DURING RENOVATION PHASE, SEE PLUMBING RENOVATION DOCUMENTS FOR ADDITIONAL INFORMATION.
3. REMOVE ALL VENT PIPING FROM FIXTURES TO APPROXIMATELY 2" FROM WALL AND CAPPED AIRTIGHT.
4. REMOVE ALL EXISTING FIXTURES AND PIPING AND PERIPHERAL ITEMS ASSOCIATED WITH THE FIXTURES AND PIPING.
5. DEMO FLOOR DRAIN AND ALL OF THE U/G PIPING ASSOCIATED WITH IT.
6. DEMO FLOOR DRAIN BACK TO PAST P-TRAP. REFER TO RENO PLAN FOR FIXTURE PIPING REPLACEMENT.
7. DEMO EXISTING FCO. REFER TO RENO PLAN FOR FIXTURE REPLACEMENT.
8. DEMO 1" AIR PIPING FROM IN CHASE BACK TO THIS POINT. INSTALL 1" SOV AT LOCATION NOTED. COORDINATE WITH THE OWNER FOR RE-CONNECTION AND FIELD RE-ROUTE TO KEEP ANY LINE ACTIVE AS REQUIRED. REFER TO M3.5 FOR CONTINUATION.
9. DEMO DRAIN LINE FROM EXISTING SK-3.
10. DRAIN LINE FROM SK-3. DEMO BACK TO THIS POINT AND CAP/PLUG LEAVING THE REST OF THE EXISTING PIPING IN PLACE.
11. DEMO CW AND HW LINES FROM SK-3 BACK TO NEAREST POINT OF ACCESS AND CAP.
12. REMOVE THE EXISTING GLYCOL PIPING FROM FAN COIL UNIT BACK TO NEAREST MAIN. GLYCOL SYSTEM IS ABANDONED WITH THE INTENT THAT ALL GLYCOL PIPING WITHIN THE BUILDING ON THIS LEVEL SHALL REMOVED.
13. REMOVE THE EXISTING GLYCOL PIPING FROM FAN COIL UNITS DOWN THROUGH THE CORRIDOR AND UP TO SECOND LEVEL. CAP PIPING WITHIN THE SECOND LEVEL AND PATCH WALLS/CEILING TO MATCH THE EXISTING.
14. EXISTING FLOOR DRAIN TO BE REMOVED TO BELOW FLOOR AND PLUGGED WITH CONCRETE, SEE ARCHITECTURAL DOCUMENTS FOR FLOOR PATCHING INFORMATION.
15. EXISTING WET VENT TO BE REMOVED TO BELOW FLOOR AND PLUGGED WITH CONCRETE, SEE ARCHITECTURAL DOCUMENTS FOR FLOOR PATCHING INFORMATION.
16. SAW CUT EXISTING FLOOR AND REMOVE SECTION OF EXISTING 3"S, PLUG BOTH ENDS WITH CONCRETE. SEE ARCHITECTURAL FOR FLOOR PATCHING INFORMATION.
17. EXISTING 4"S TO BE REMOVED DOWN TO BELOW FLOOR, SEE PLUMBING RENOVATION PLANS FOR RECONNECTION INFORMATION. SEE ARCHITECTURAL DOCUMENTS FOR FLOOR SAW CUT AND FLOOR PATCHING INFORMATION.
18. REMOVE PIPING UNDER RAISED FLOOR AS SHOWN. SEE PLUMBING RENOVATION PLAN FOR RECONNECTION AND ADDITIONAL INFORMATION.
19. REMOVE EXISTING PIPING. CONTRACTOR SHALL FIELD VERIFY EXISTING ROUTING AND REMOVE BACK TO IT'S POINT OF ORIGIN.

GENERAL NOTES:

REFER TO SHEET M0.0 AND THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS. COORDINATE ALL WORK WITH ARCHITECTURAL & ELECTRICAL DRAWINGS.



1 **MECHANICAL PLUMBING DEMOLITION PLAN**
1ST LEVEL
SCALE: 1/8"-1'-0"

2 **MECHANICAL PLUMBING DEMOLITION PLAN**
1ST LEVEL - SLAB AND BELOW
SCALE: 1/4"-1'-0"

3 **MECHANICAL PLUMBING DEMOLITION PLAN**
1ST LEVEL - SLAB AND ABOVE
SCALE: 1/4"-1'-0"

4 **MECHANICAL PLUMBING DEMOLITION PLAN**
1ST LEVEL - SLAB AND BELOW
SCALE: 1/4"-1'-0"

5 **MECHANICAL PLUMBING DEMOLITION PLAN**
1ST LEVEL - SLAB AND ABOVE
SCALE: 1/4"-1'-0"

Registered Professional Engineer (Retired)
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Date Signed 01-20-21
STATE OF ARIZONA
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WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

NOIR Lab

NSF

KITT PEAK - Sells, AZ 85634

△	DATE	DESCRIPTION
0	01/08/21	I.F.C.

PROJECT NUMBER:	11904.00
DRAWN BY:	FI
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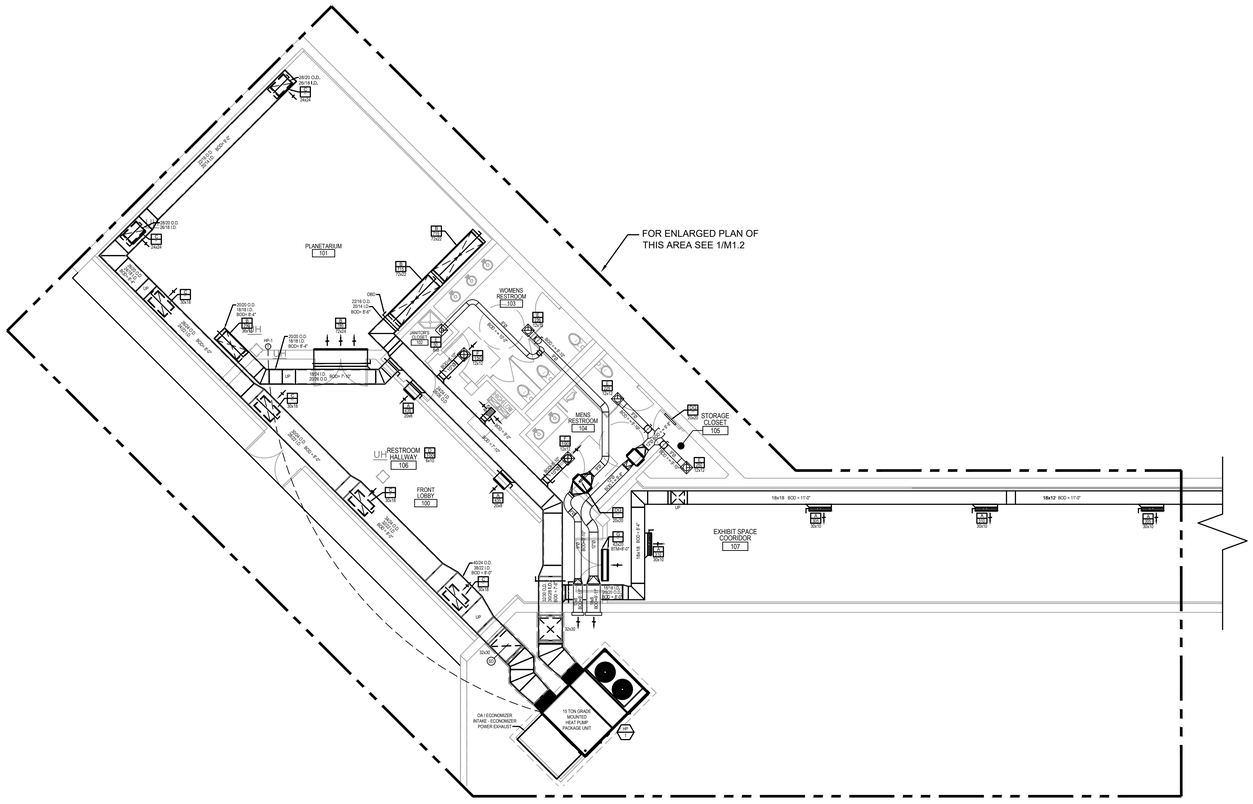
CAD FILE:	11904.00-MD3.1
SCALE:	AS SHOWN

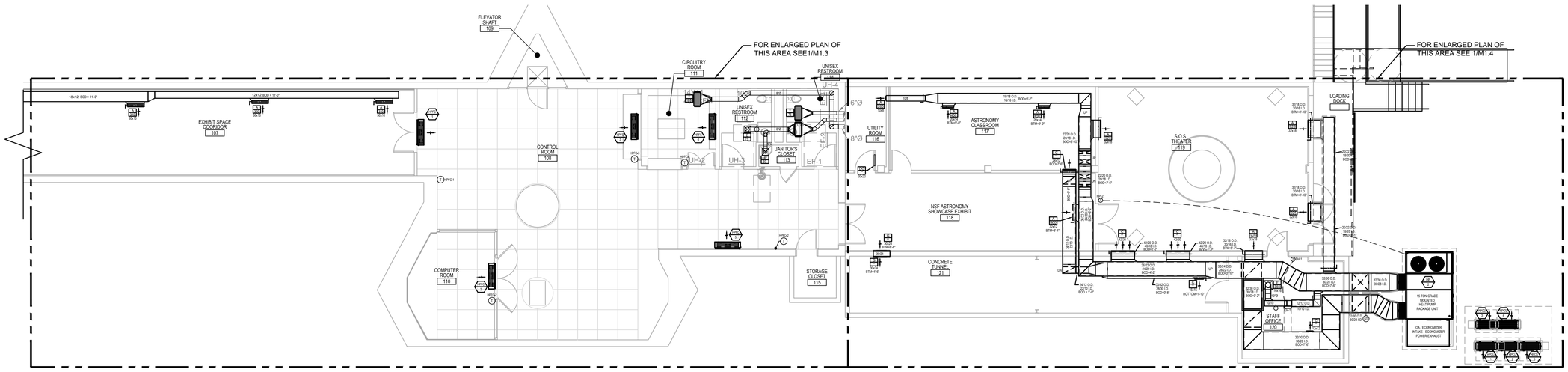
MECHANICAL PLUMBING DEMOLITION PLANS

MD3.1

GENERAL NOTES:

REFER TO SHEET M0.0 AND THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
COORDINATE ALL WORK WITH ARCHITECTURAL & ELECTRICAL DRAWINGS.





1 MECHANICAL HVAC RENOVATION PLAN
1ST LEVEL

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

Registered Professional Engineer (General)
CERTIFICATE NO
37915
FORREST K. ISAACS
Date Signed 01-05-21
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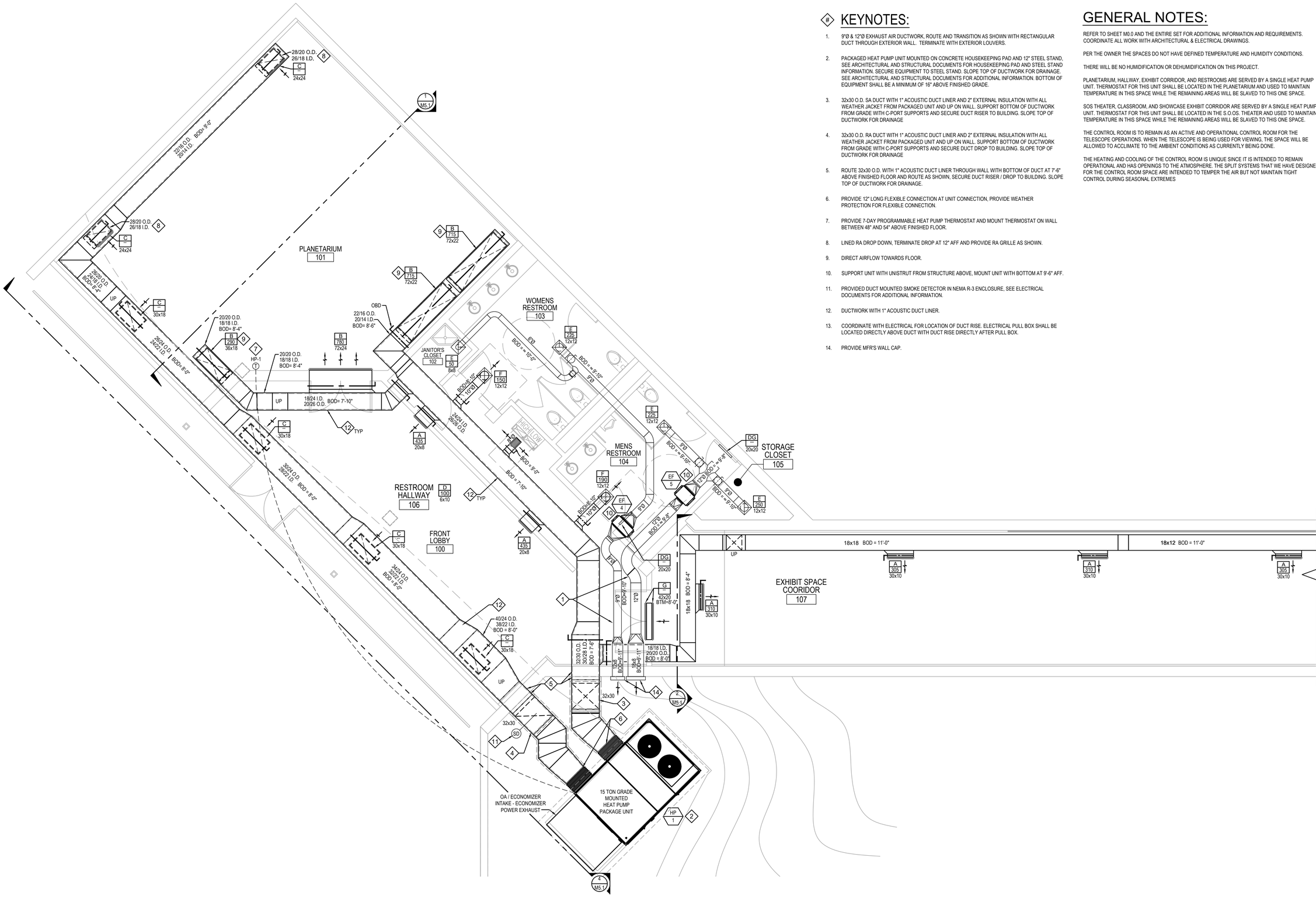
MECHANICAL
HVAC
RENOVATION PLANS

M1.1



KEYNOTES:

1. 9"Ø & 12"Ø EXHAUST AIR DUCTWORK, ROUTE AND TRANSITION AS SHOWN WITH RECTANGULAR DUCT THROUGH EXTERIOR WALL. TERMINATE WITH EXTERIOR LOUVERS.
2. PACKAGED HEAT PUMP UNIT MOUNTED ON CONCRETE HOUSEKEEPING PAD AND 12" STEEL STAND, SEE ARCHITECTURAL AND STRUCTURAL DOCUMENTS FOR HOUSEKEEPING PAD AND STEEL STAND INFORMATION. SECURE EQUIPMENT TO STEEL STAND. SLOPE TOP OF DUCTWORK FOR DRAINAGE. SEE ARCHITECTURAL AND STRUCTURAL DOCUMENTS FOR ADDITIONAL INFORMATION. BOTTOM OF EQUIPMENT SHALL BE A MINIMUM OF 16" ABOVE FINISHED GRADE.
3. 32x30 O.D. SA DUCT WITH 1" ACOUSTIC DUCT LINER AND 2" EXTERNAL INSULATION WITH ALL WEATHER JACKET FROM PACKAGED UNIT AND UP ON WALL. SUPPORT BOTTOM OF DUCTWORK FROM GRADE WITH C-PORT SUPPORTS AND SECURE DUCT RISER TO BUILDING. SLOPE TOP OF DUCTWORK FOR DRAINAGE
4. 32x30 O.D. RA DUCT WITH 1" ACOUSTIC DUCT LINER AND 2" EXTERNAL INSULATION WITH ALL WEATHER JACKET FROM PACKAGED UNIT AND UP ON WALL. SUPPORT BOTTOM OF DUCTWORK FROM GRADE WITH C-PORT SUPPORTS AND SECURE DUCT DROP TO BUILDING. SLOPE TOP OF DUCTWORK FOR DRAINAGE
5. ROUTE 32x30 O.D. WITH 1" ACOUSTIC DUCT LINER THROUGH WALL WITH BOTTOM OF DUCT AT 7'-6" ABOVE FINISHED FLOOR AND ROUTE AS SHOWN, SECURE DUCT RISER / DROP TO BUILDING. SLOPE TOP OF DUCTWORK FOR DRAINAGE.
6. PROVIDE 12" LONG FLEXIBLE CONNECTION AT UNIT CONNECTION, PROVIDE WEATHER PROTECTION FOR FLEXIBLE CONNECTION.
7. PROVIDE 7-DAY PROGRAMMABLE HEAT PUMP THERMOSTAT AND MOUNT THERMOSTAT ON WALL BETWEEN 48" AND 54" ABOVE FINISHED FLOOR.
8. LINED RA DROP DOWN, TERMINATE DROP AT 12" AFF AND PROVIDE RA GRILLE AS SHOWN.
9. DIRECT AIRFLOW TOWARDS FLOOR.
10. SUPPORT UNIT WITH UNISTRUT FROM STRUCTURE ABOVE, MOUNT UNIT WITH BOTTOM AT 9'-6" AFF.
11. PROVIDED DUCT MOUNTED SMOKE DETECTOR IN NEMA R-3 ENCLOSURE, SEE ELECTRICAL DOCUMENTS FOR ADDITIONAL INFORMATION.
12. DUCTWORK WITH 1" ACOUSTIC DUCT LINER.
13. COORDINATE WITH ELECTRICAL FOR LOCATION OF DUCT RISE. ELECTRICAL PULL BOX SHALL BE LOCATED DIRECTLY ABOVE DUCT WITH DUCT RISE DIRECTLY AFTER PULL BOX.
14. PROVIDE MFR'S WALL CAP.

GENERAL NOTES:

REFER TO SHEET M0.0 AND THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS. COORDINATE ALL WORK WITH ARCHITECTURAL & ELECTRICAL DRAWINGS.

PER THE OWNER THE SPACES DO NOT HAVE DEFINED TEMPERATURE AND HUMIDITY CONDITIONS.

THERE WILL BE NO HUMIDIFICATION OR DEHUMIDIFICATION ON THIS PROJECT.

PLANETARIUM, HALLWAY, EXHIBIT CORRIDOR, AND RESTROOMS ARE SERVED BY A SINGLE HEAT PUMP UNIT. THERMOSTAT FOR THIS UNIT SHALL BE LOCATED IN THE PLANETARIUM AND USED TO MAINTAIN TEMPERATURE IN THIS SPACE WHILE THE REMAINING AREAS WILL BE SLAVED TO THIS ONE SPACE.

SOS THEATER, CLASSROOM, AND SHOWCASE EXHIBIT CORRIDOR ARE SERVED BY A SINGLE HEAT PUMP UNIT. THERMOSTAT FOR THIS UNIT SHALL BE LOCATED IN THE S.O.OS. THEATER AND USED TO MAINTAIN TEMPERATURE IN THIS SPACE WHILE THE REMAINING AREAS WILL BE SLAVED TO THIS ONE SPACE.

THE CONTROL ROOM IS TO REMAIN AS AN ACTIVE AND OPERATIONAL CONTROL ROOM FOR THE TELESCOPE OPERATIONS. WHEN THE TELESCOPE IS BEING USED FOR VIEWING, THE SPACE WILL BE ALLOWED TO ACCLIMATE TO THE AMBIENT CONDITIONS AS CURRENTLY BEING DONE.

THE HEATING AND COOLING OF THE CONTROL ROOM IS UNIQUE SINCE IT IS INTENDED TO REMAIN OPERATIONAL AND HAS OPENINGS TO THE ATMOSPHERE. THE SPLIT SYSTEMS THAT WE HAVE DESIGNED FOR THE CONTROL ROOM SPACE ARE INTENDED TO TEMPER THE AIR BUT NOT MAINTAIN TIGHT CONTROL DURING SEASONAL EXTREMES

1 MECHANICAL HVAC RENOVATION PLAN
1ST LEVEL

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

Registered Professional Engineer (Mechanical)
CERTIFICATE NO.
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FORREST K. ISAACS
Date Signed 01-08-21
STATE OF ARIZONA
Expires 9-30-2023

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WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

NOIR Lab | NSF

KITT PEAK - Sells, AZ 85634

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0	01/08/21	I.F.C.

PROJECT NUMBER:	11904.00
DRAWN BY:	FI
CHECKED BY:	FI
CAD FILE:	11904.00-M1.2
SCALE:	AS SHOWN

MECHANICAL
HVAC
RENOVATION PLANS

M1.2

KEYNOTES:

1. CONNECT NEW 6"Ø EXHAUST AIR DUCT TO EXISTING 6"Ø AND ROUTE AS SHOW.
2. CONNECT NEW 8"Ø EXHAUST AIR DUCT TO EXISTING 8"Ø AND ROUTE AS SHOW.
3. UNDERCUT DOORS A MINIMUM 1". REFER TO ARCHITECTURAL DOCUMENTS FOR ADDITIONAL INFORMATION.
4. THERMOSTAT. MOUNT ON WALL @ 48" TO 54" AFF.
5. EXHAUST FAN WITH MFR'S PROVIDE WHITE ALUMINUM GRILLE.
6. REFRIGERANT PIPING, SEE M2 SERIES DOCUMENTS FOR ADDITIONAL INFORMATION.
7. PROVIDE 3 TON DUCTLESS SPLIT EVAPORATOR. INSTALL ON WALL USING MANUFACTURER'S WALL MOUNTING HARDWARE.

GENERAL NOTES:

REFER TO SHEET M0.0 AND THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS. COORDINATE ALL WORK WITH ARCHITECTURAL & ELECTRICAL DRAWINGS.

PER THE OWNER THE SPACES DO NOT HAVE DEFINED TEMPERATURE AND HUMIDITY CONDITIONS.

THERE WILL BE NO HUMIDIFICATION OR DEHUMIDIFICATION ON THIS PROJECT.

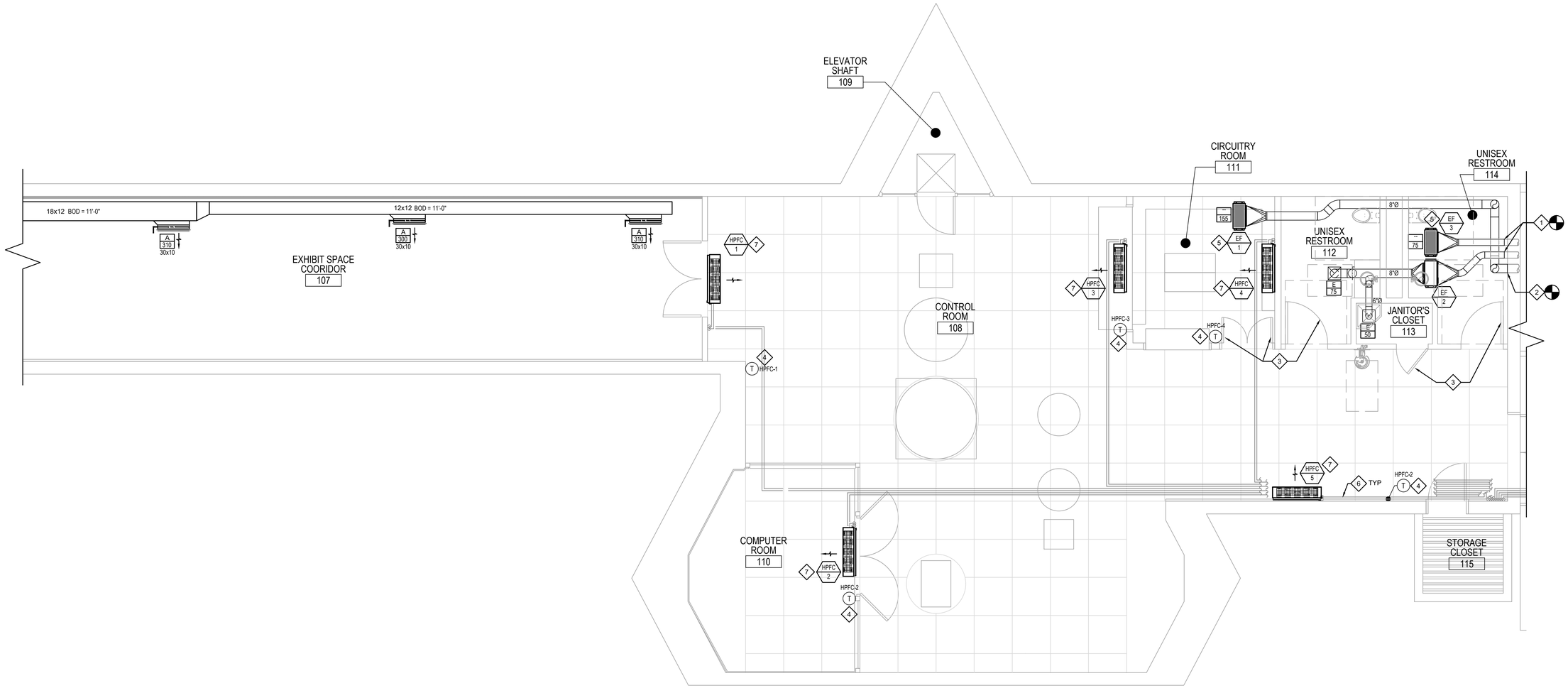
PLANETARIUM, HALLWAY, EXHIBIT CORRIDOR, AND RESTROOMS ARE SERVED BY A SINGLE HEAT PUMP UNIT. THERMOSTAT FOR THIS UNIT SHALL BE LOCATED IN THE PLANETARIUM AND USED TO MAINTAIN TEMPERATURE IN THIS SPACE WHILE THE REMAINING AREAS WILL BE SLAVED TO THIS ONE SPACE.

SOS THEATER, CLASSROOM, AND SHOWCASE EXHIBIT CORRIDOR ARE SERVED BY A SINGLE HEAT PUMP UNIT. THERMOSTAT FOR THIS UNIT SHALL BE LOCATED IN THE S.O.O.S. THEATER AND USED TO MAINTAIN TEMPERATURE IN THIS SPACE WHILE THE REMAINING AREAS WILL BE SLAVED TO THIS ONE SPACE.

THE CONTROL ROOM IS TO REMAIN AS AN ACTIVE AND OPERATIONAL CONTROL ROOM FOR THE TELESCOPE OPERATIONS. WHEN THE TELESCOPE IS BEING USED FOR VIEWING, THE SPACE WILL BE ALLOWED TO ACCLIMATE TO THE AMBIENT CONDITIONS AS CURRENTLY BEING DONE.

THE HEATING AND COOLING OF THE CONTROL ROOM IS UNIQUE SINCE IT IS INTENDED TO REMAIN OPERATIONAL AND HAS OPENINGS TO THE ATMOSPHERE. THE SPLIT SYSTEMS THAT WE HAVE DESIGNED FOR THE CONTROL ROOM SPACE ARE INTENDED TO TEMPER THE AIR BUT NOT MAINTAIN TIGHT CONTROL DURING SEASONAL EXTREMES.

CONTRACTOR SHALL PROTECT ALL EXISTING EQUIPMENT AND VIEWING PORTALS IN PLACE.



1 MECHANICAL HVAC RENOVATION PLAN
1ST LEVEL

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

Registered Professional Engineer (Mechanical)
CERTIFICATE NO.
37915
FORREST K. ISAACS
Date Signed 01-20-21
ARIZONA
Expires 9-30-2023

ADVANTECH
FACILITY DESIGN INC
ARCHITECTURE - ENGINEERING
3280 E. HEMISPHERE LOOP STE. 110 TUCSON AZ 85706 520-806-0903
1889 E. BROADWAY, TEMPE AZ 85258

WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

NOIR Lab

NSF

KITT PEAK - Sells, AZ 85634

△	DATE	DESCRIPTION
0	01/08/21	I.F.C.

PROJECT NUMBER:	11904.00
DRAWN BY:	FI
CHECKED BY:	FI
CAD FILE:	11904.00-M1.3
SCALE:	AS SHOWN

MECHANICAL
HVAC
RENOVATION PLANS

M1.3

KEYNOTES:

1. PACKAGED HEAT PUMP UNIT MOUNTED ON CONCRETE HOUSEKEEPING PAD AND 12" STEEL STAND, SEE ARCHITECTURAL AND STRUCTURAL DOCUMENTS FOR HOUSEKEEPING PAD AND STEEL STAND INFORMATION. SECURE EQUIPMENT TO STEEL STAND. SEE ARCHITECTURAL AND STRUCTURAL DOCUMENTS FOR ADDITIONAL INFORMATION. BOTTOM OF EQUIPMENT SHALL BE A MINIMUM OF 16" ABOVE FINISHED GRADE.
2. AIR COOLED CONDENSING UNIT MOUNTED ON CONCRETE HOUSEKEEPING PAD AND 12" STEEL STAND, SEE ARCHITECTURAL AND STRUCTURAL DOCUMENTS FOR HOUSEKEEPING PAD AND STEEL STAND INFORMATION. SECURE EQUIPMENT TO STEEL STAND. SEE ARCHITECTURAL AND STRUCTURAL DOCUMENTS FOR ADDITIONAL INFORMATION. BOTTOM OF EQUIPMENT SHALL BE A MINIMUM OF 16" ABOVE FINISHED GRADE.
3. 32x30 O.D. SA DUCT WITH 1" ACOUSTIC DUCT LINER AND 2" EXTERNAL INSULATION WITH ALL WEATHER JACKET FROM PACKAGED UNIT AND UP ON WALL. SUPPORT BOTTOM OF DUCTWORK FROM GRADE WITH C-PORT SUPPORTS AND SECURE DUCT RISER TO BUILDING. SLOPE TOP OF DUCTWORK FOR DRAINAGE.
4. 32x30 O.D. RA DUCT WITH 1" ACOUSTIC DUCT LINER AND 2" EXTERNAL INSULATION WITH ALL WEATHER JACKET FROM PACKAGED UNIT AND UP ON WALL. SUPPORT BOTTOM OF DUCTWORK FROM GRADE WITH C-PORT SUPPORTS AND SECURE DUCT TO BUILDING. SLOPE TOP OF DUCTWORK FOR DRAINAGE.
5. ROUTE 32x30 O.D. RA DUCT WITH 1" ACOUSTIC DUCT LINER THROUGH WALL WITH BOTTOM OF DUCT AT 7'-6" ABOVE FINISHED FLOOR AND ROUTE AS SHOWN. SECURE DUCT RISER/DROP TO BUILDING. SLOPE TOP OF DUCTWORK FOR DRAINAGE.
6. PROVIDE FLEXIBLE CONNECTION AT UNIT CONNECTION, PROVIDE WEATHER PROTECTION FOR FLEXIBLE CONNECTION.
7. PROVIDE 7-DAY PROGRAMMABLE HEAT PUMP THERMOSTAT AND MOUNT THERMOSTAT ON WALL BETWEEN 48" AND 54" ABOVE FINISHED FLOOR.
8. PROVIDE NEW OPENING IN EXISTING CONCRETE WALL. SEE ARCHITECTURAL AND STRUCTURAL DOCUMENTS FOR ADDITIONAL INFORMATION.
9. ENLARGE EXISTING OPENING IN CONCRETE WALL. SEE ARCHITECTURAL AND STRUCTURAL DOCUMENTS FOR ADDITIONAL INFORMATION.
10. REFRIGERANT PIPING, SEE M2 SERIES DOCUMENTS FOR ADDITIONAL INFORMATION.
11. PROVIDE ALUMINUM ALL WEATHER JACKET ON ALL EXTERIOR REFRIGERANT PIPING, SEE M2 SERIES DOCUMENTS FOR ADDITIONAL INFORMATION. SUPPORT PIPING FROM GRADE WITH C-PORT SUPPORTS.
12. ROUTE DUCT THROUGH EXISTING WALL OPENING, SEAL DUCT OPENINGS WEATHER TIGHT. SEE ARCHITECTURAL AND STRUCTURAL DOCUMENTS FOR ADDITIONAL INFORMATION.
13. PROVIDED DUCT MOUNTED SMOKE DETECTOR IN NEMA R-3 ENCLOSURE, SEE ELECTRICAL DOCUMENTS FOR ADDITIONAL INFORMATION.
14. SUSPEND DUCTWORK FROM OVERHANG AND ALSO SECURE SUPPORTS TO WALL TO PREVENT DUCT MOVEMENT AS A RESULT OF WIND LOAD.
15. 32x30 O.D. SA DUCT RISER WITH 1" ACOUSTIC DUCT LINER AND SECURE DUCT RISER/DROP TO BUILDING. SLOPE TOP OF DUCTWORK FOR DRAINAGE.
16. COORDINATE ALL WALL PENETRATIONS WITH ARCHITECTURAL AND STRUCTURAL DOCUMENTS. TYPICAL ALL.
17. DROP 32/30 DOWN TO APPROX 0'-2" AFF. PROVIDE CLEARANCE IN CORNER OF ROOM FOR STORAGE OF PORTABLE STAIR. COORDINATE WITH OWNER AND ARCHITECTURE FOR CLEARANCE CRITERIA PRIOR TO FABRICATION AND INSTALLATION OF DUCTWORK.
18. PROVIDE DUCT MOUNTED ELECTRIC HEATER FOR OFFICE AREA. LOCATE TO MAINTAIN MINIMUM 42" CLEARANCE IN FRONT OF THE ELECTRICAL PANEL.

GENERAL NOTES:

REFER TO SHEET M0.0 AND THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS. COORDINATE ALL WORK WITH ARCHITECTURAL & ELECTRICAL DRAWINGS.

PER THE OWNER THE SPACES DO NOT HAVE DEFINED TEMPERATURE AND HUMIDITY CONDITIONS.

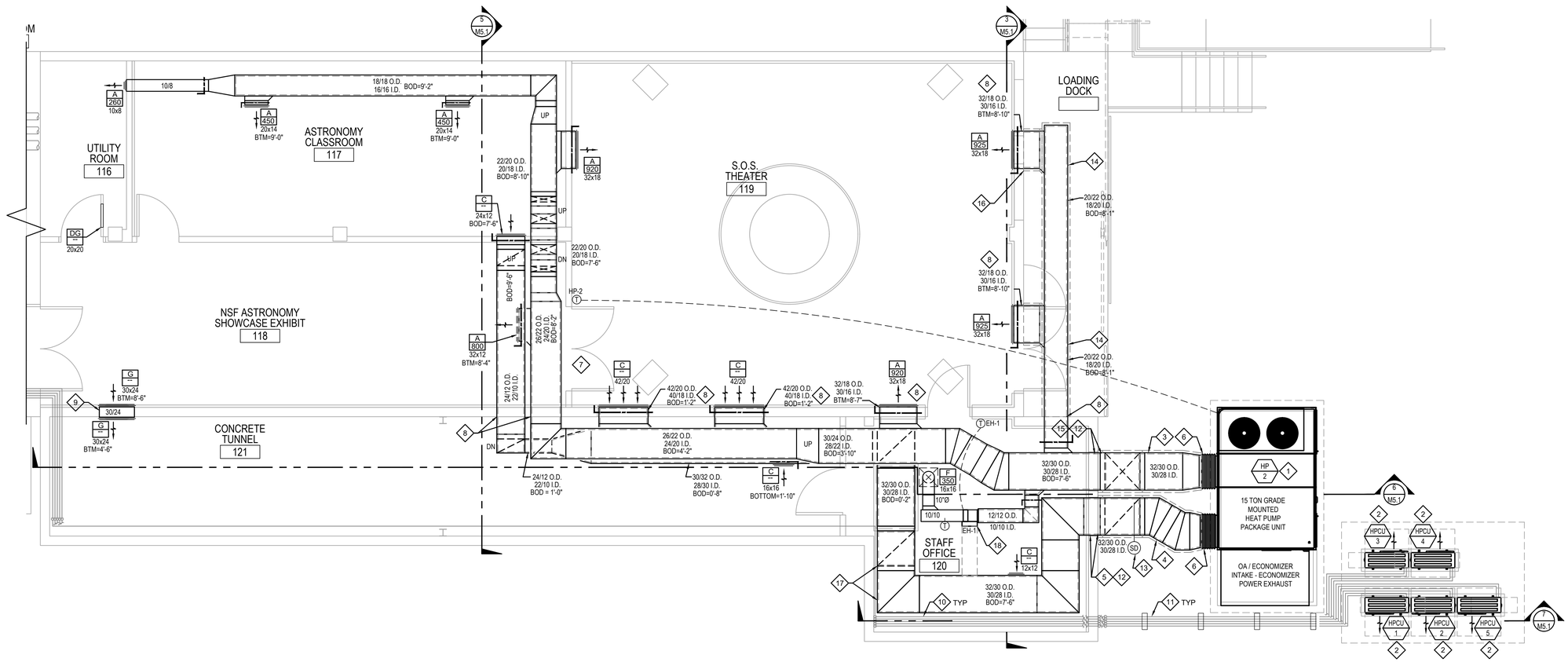
THERE WILL BE NO HUMIDIFICATION OR DEHUMIDIFICATION ON THIS PROJECT.

PLANETARIUM, HALLWAY, EXHIBIT CORRIDOR, AND RESTROOMS ARE SERVED BY A SINGLE HEAT PUMP UNIT. THERMOSTAT FOR THIS UNIT SHALL BE LOCATED IN THE PLANETARIUM AND USED TO MAINTAIN TEMPERATURE IN THIS SPACE WHILE THE REMAINING AREAS WILL BE SLAVED TO THIS ONE SPACE.

SOS THEATER, CLASSROOM, AND SHOWCASE EXHIBIT CORRIDOR ARE SERVED BY A SINGLE HEAT PUMP UNIT. THERMOSTAT FOR THIS UNIT SHALL BE LOCATED IN THE S.O.OS. THEATER AND USED TO MAINTAIN TEMPERATURE IN THIS SPACE WHILE THE REMAINING AREAS WILL BE SLAVED TO THIS ONE SPACE.

THE CONTROL ROOM IS TO REMAIN AS AN ACTIVE AND OPERATIONAL CONTROL ROOM FOR THE TELESCOPE OPERATIONS. WHEN THE TELESCOPE IS BEING USED FOR VIEWING, THE SPACE WILL BE ALLOWED TO ACCLIMATE TO THE AMBIENT CONDITIONS AS CURRENTLY BEING DONE.

THE HEATING AND COOLING OF THE CONTROL ROOM IS UNIQUE SINCE IT IS INTENDED TO REMAIN OPERATIONAL AND HAS OPENINGS TO THE ATMOSPHERE. THE SPLIT SYSTEMS THAT WE HAVE DESIGNED FOR THE CONTROL ROOM SPACE ARE INTENDED TO TEMPER THE AIR BUT NOT MAINTAIN TIGHT CONTROL DURING SEASONAL EXTREMES



1 MECHANICAL HVAC RENOVATION PLAN
1ST LEVEL

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

Registered Professional Engineer (Retired)
CERTIFICATE NO.
37915
FORREST K. ISAACS
Date Signed 01-20-21
STATE OF ARIZONA
Expires 9-30-2023

ADVANTECH
FACILITY DESIGN INC
ARCHITECTURE - ENGINEERING
3280 E. HEMISPHERE LOOP STE. 110 TUCSON AZ 85706 520-806-0903
1889 E. BROADWAY, TEMPE AZ 85258

WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

NOIR Lab | NSF

KITT PEAK - Sells, AZ 85634

△	DATE	DESCRIPTION
0	01/08/21	I.F.C.

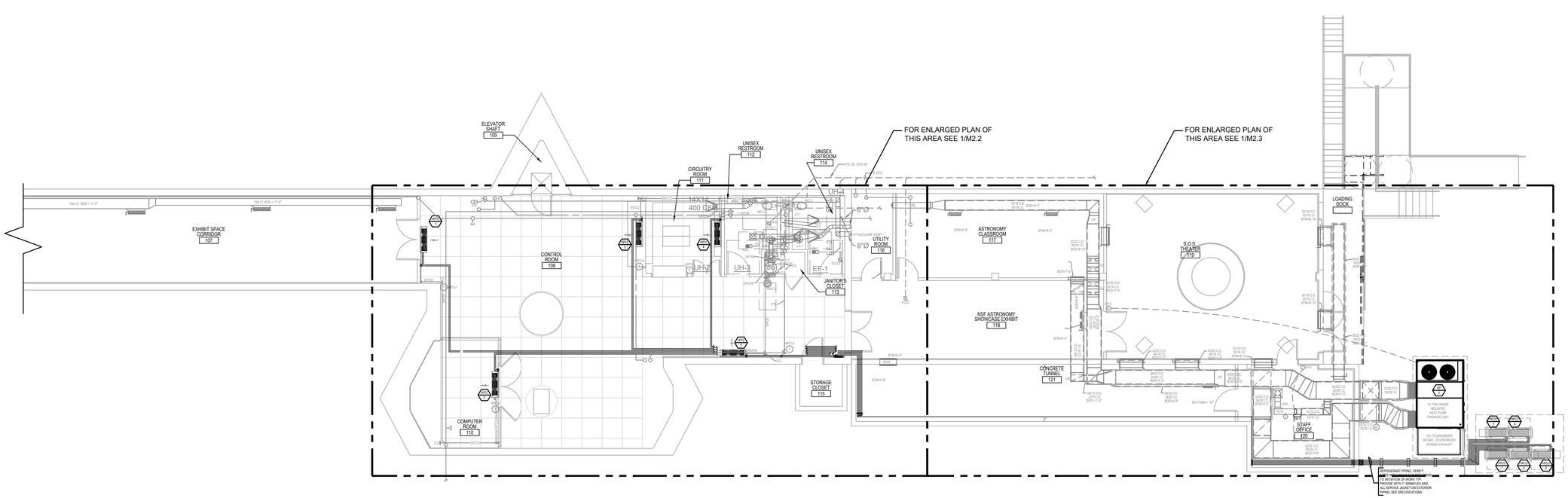
PROJECT NUMBER:	11904.00
DRAWN BY:	FI
CHECKED BY:	FI
CAD FILE:	11904.00-M1.4
SCALE:	AS SHOWN

MECHANICAL
HVAC
RENOVATION PLANS

M1.4

GENERAL NOTES:

A. REFER TO SHEET M0.0 AND THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS. COORDINATE ALL WORK WITH ARCHITECTURAL & ELECTRICAL DRAWINGS.



1 MECHANICAL PIPING RENOVATION PLAN
1ST LEVEL

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

Registered Professional Engineer (General)
CERTIFICATE NO
37915
FORREST K.
ISAACS
Date Signed 01-08-21
STATE OF ARIZONA
Expires 9-50-2023

ADVANTECH
FACILITY DESIGN INC
ARCHITECTURE - ENGINEERING
3280 E. HEMISPHERE LOOP STE. 110 TUCSON AZ 85706 520-806-0903
1889 E. BROADWAY, TEMPE AZ 85258

WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

NOIRLab

NSF

KITT PEAK - Sells, AZ 85634

△	DATE	DESCRIPTION
0	01/08/21	I.F.C.

PROJECT NUMBER:	11904.00
DRAWN BY:	FI
CHECKED BY:	FI
CAD FILE:	11904.00-M2.1
SCALE:	AS SHOWN

MECHANICAL PIPING RENOVATION PLANS

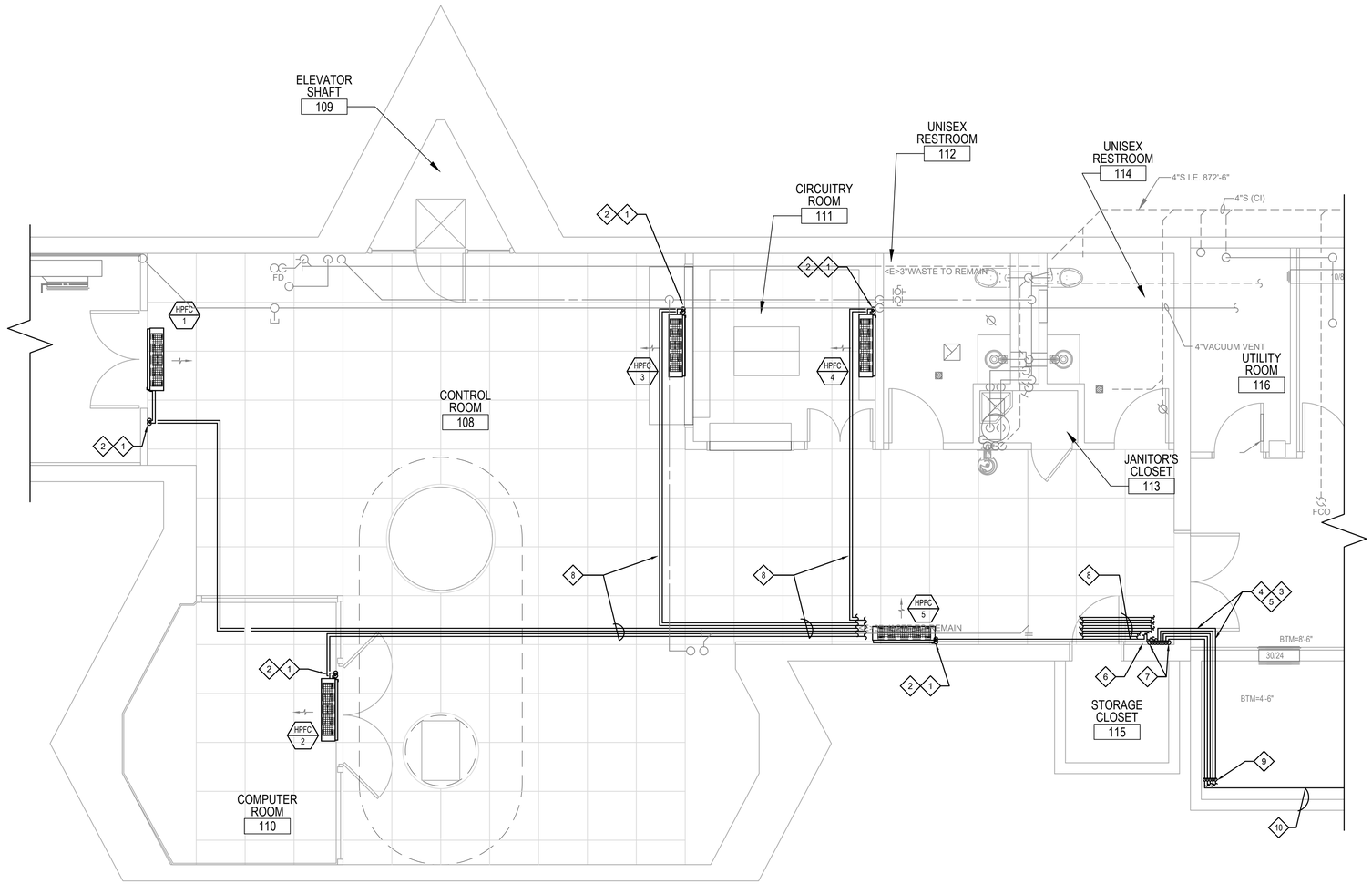
M2.1

GENERAL NOTES:

REFER TO SHEET M0.0 AND THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS. COORDINATE ALL WORK WITH ARCHITECTURAL & ELECTRICAL DRAWINGS.

◇# KEYNOTES:

1. REFRIGERANT LINES UP FROM BELOW RAISED FLOOR AND TO EVAPORATOR. PROVIDE REFRIGERANT TUBING SET FOR DUCTLESS SPLIT SYSTEM FROM EVAPORATOR TO CONDENSER AS SHOWN. FOLLOW MANUFACTURER'S RECOMMENDATIONS FOR LINE SIZES AND TUBING LENGTH LIMITS. ROUTING SHALL NOT PERMIT LINE LENGTHS LONGER THAN THE MANUFACTURER'S MAXIMUM 245 LINEAR FEET OF DEVELOPED LINE LENGTH.
2. CONNECT REFRIGERANT LINES TO EVAPORATOR PER MANUFACTURER'S INSTALLATION INSTRUCTIONS.
3. REFRIGERANT LINES THROUGH WALL, FLASH PENETRATIONS PER ARCHITECTURAL DRAWINGS. COORDINATE WALL PENETRATION WITH ARCHITECTURAL, STRUCTURAL AND ELECTRICAL DOCUMENTS. SEAL WATER TIGHT AROUND PIPE PENETRATIONS.
4. INSULATE REFRIGERANT LINES INDEPENDENTLY, PROVIDE 1" ARMAFLEX INSULATION.
5. REFRIGERANT LINES INTO CORRIDOR AREA. ROUTE TIGHT TO BELOW CEILING.
6. WRAP PIPING AROUND OTHER PIPING TIGHT TO DECK TO KEEP ON WALL. ROUTE ON WALL TO HPFC-5.
7. WRAP REFRIGERANT PIPING AROUND TIGHT TO WALL IN CORNER AND DROP TO BELOW RAISED FLOOR.
8. ROUTE REFRIGERANT PIPING BELOW RAISED FLOOR ON UNISTRUT SUPPORTS. FIELD OFFSET AROUND EXISTING PIPING, ELECTRICAL, AND OTHER CONFLICTS AS REQUIRED.
9. ROUTE PIPING UP TO TOP OF TUNNEL WITH PIPING 2 PIPES HIGH AND ROUTE INTO CORRIDOR AS HIGH AS POSSIBLE.
10. REFRIGERANT LINES INTO CONCRETE TUNNEL, RACK PIPING ON WALL WITH TOP OF PIPE AT APPROXIMATELY 5'-6" ABOVE TUNNEL FLOOR AND SUPPORT PIPING FROM WALL WITH UNISTRUT.



1 MECHANICAL PIPING RENOVATION PLAN
1ST LEVEL

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

Registered Professional Engineer (Mechanical)
CERTIFICATE NO.
37915
FORREST K. ISAACS
Date Signed 01-08-21
STATE OF ARIZONA
Expires 9–50–2023

ADVANTECH
FACILITY DESIGN INC
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3280 E. HEMISPHERE LOOP STE. 110 TUCSON AZ 85706 520-806-0903
1889 E. BROADWAY, TEMPE AZ 85258

WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

NOIRLab

NSF

KITT PEAK - Sells, AZ 85634

△	DATE	DESCRIPTION
0	01/08/21	I.F.C.

PROJECT NUMBER:	11904.00
DRAWN BY:	FI
CHECKED BY:	FI
CAD FILE:	11904.00-M2.2
SCALE:	AS SHOWN

MECHANICAL
PIPING
RENOVATION PLANS

M2.2

GENERAL NOTES:

A. REFER TO SHEET M0.0 AND THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS. COORDINATE ALL WORK WITH ARCHITECTURAL & ELECTRICAL DRAWINGS.

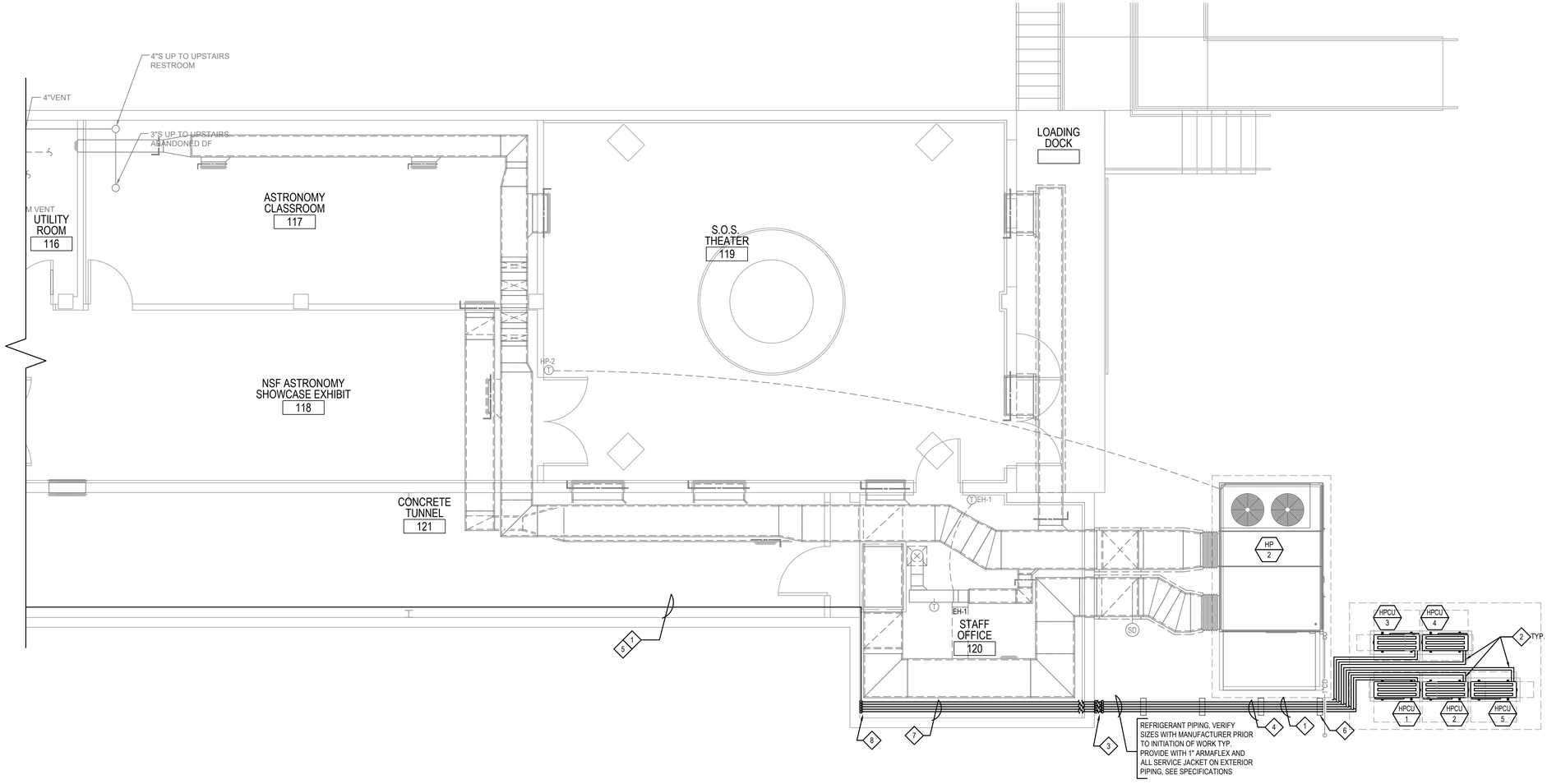
B. PROVIDE REFRIGERANT CHARGE AS REQUIRED FOR TUBING LENGTHS INSTALLED PER MANUFACTURER'S REQUIREMENTS.

C. HANG NEW PIPING PER DETAIL 6/M6.1 AND THE SPECIFICATIONS.

D. INSULATE REFRIGERANT LINES PER SPECIFICATIONS. INSULATION ON EXTERIOR OF BUILDING TO BE JACKETED PER SPECIFICATIONS.

KEYNOTES:

1. PROVIDE REFRIGERANT TUBING SET FOR DUCTLESS SPLIT SYSTEM FROM EVAPORATOR TO CONDENSER AS SHOWN. FOLLOW MANUFACTURER'S RECOMMENDATIONS FOR LINE SIZES AND TUBING LENGTH LIMITS. ROUTING SHALL NOT PERMIT LINE LENGTHS LONGER THAN THE MANUFACTURER'S MAXIMUM 245 LINEAR FEET OF DEVELOPED LINE LENGTH.
2. CONNECT REFRIGERANT LINES TO CONDENSER PER MANUFACTURER'S INSTALLATION INSTRUCTIONS.
3. REFRIGERANT LINES THROUGH WALL, FLASH PENETRATIONS PER ARCHITECTURAL DRAWINGS. COORDINATE PENETRATION WITH ARCHITECTURAL, STRUCTURAL AND ELECTRICAL DISCIPLINES. SEAL WATER TIGHT AROUND PIPE PENETRATIONS. PIPING SHALL BE ROUTED IN LEVELS WITH AT LEAST TWO LEVELS OF REFRIGERANT PIPING TO MINIMIZE THE WIDTH OF PIPING ROUTED THROUGH THE FACILITY. ROUTE PIPING AS HIGH AS POSSIBLE (APPROXIMATELY 10'-0" FOR TOP OF TOP PIPING).
4. INSULATE REFRIGERANT LINES INDEPENDENTLY. PROVIDE ALUMINUM ALL SERVICE JACKET (ASJ) ON EXTERIOR INSULATED PIPING.
5. REFRIGERANT LINES INTO CONCRETE TUNNEL, RACK PIPING ON WALL WITH TOP OF PIPE AT APPROXIMATELY 5'-6" ABOVE TUNNEL FLOOR AND SUPPORT PIPING FROM WALL WITH UNISTRUT.
6. PIPE AND EQUIPMENT SUPPORTS, SEE DETAILS SHEET M6.1
7. REFRIGERANT LINES IN OFFICE SPACE, STACK PIPING 2 PIPES HIGH AND SUPPORT WITH HANGERS FROM ROOF, ROUTE PIPING AS HIGH AS POSSIBLE TO MAINTAIN MAXIMUM HEAD CLEARANCE.
8. DROP REFRIGERANT LINES DOWN AND RACK ON WALL WITH TOP OF TOP PIPE AT APPROXIMATELY 8'-6" AFF.



1 MECHANICAL PIPING RENOVATION PLAN
1ST LEVEL

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

Registered Professional Engineer (Retired)
CERTIFICATE NO.
37915
FORREST K. ISAACS
Date Signed 01-08-21
ARIZONA U.S.A.
Expires 9-30-2023

ADVANTECH
FACILITY DESIGN INC
ARCHITECTURE - ENGINEERING
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WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

NOIR Lab

NSF

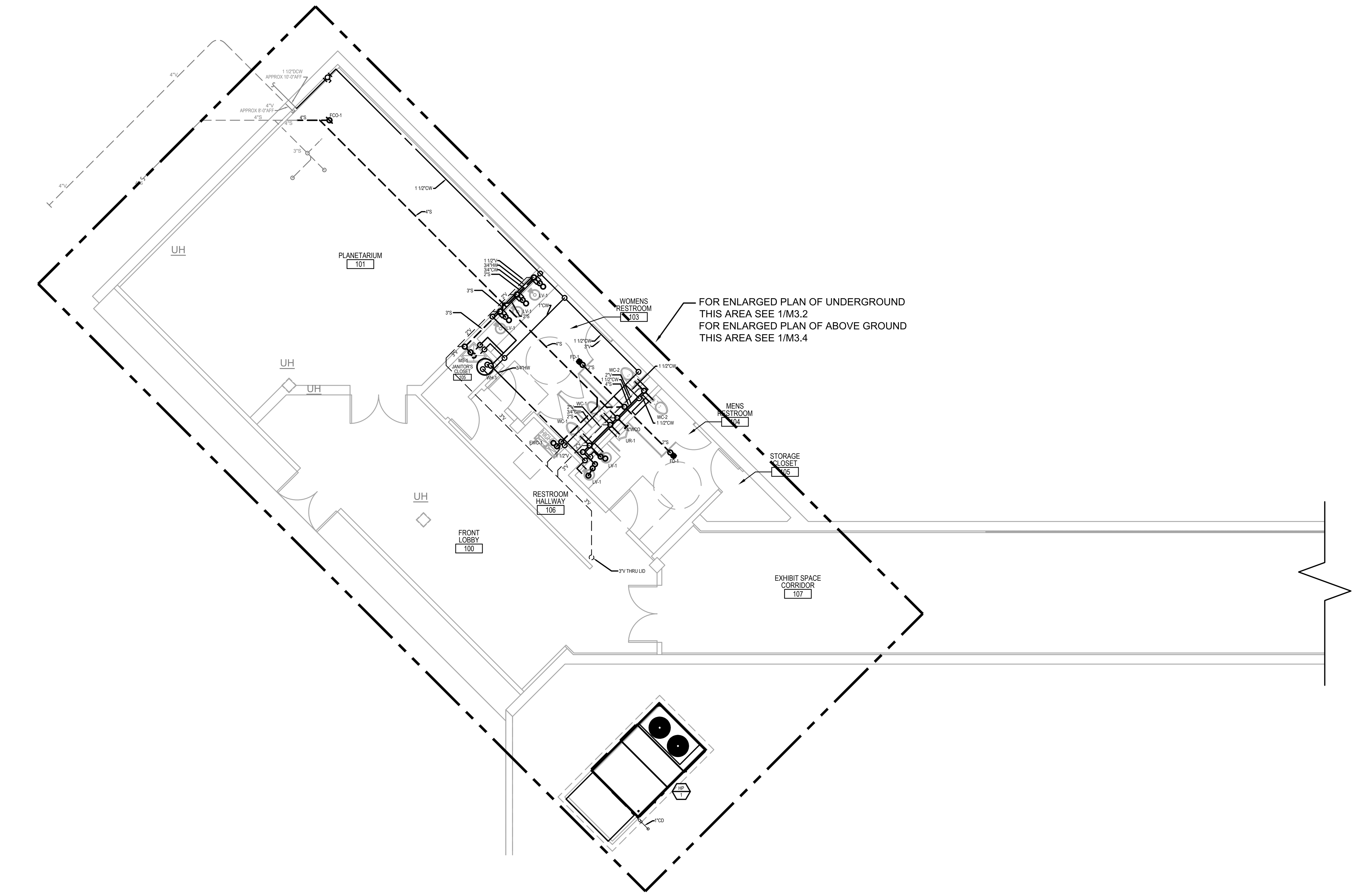
KITT PEAK - Sells, AZ 85634

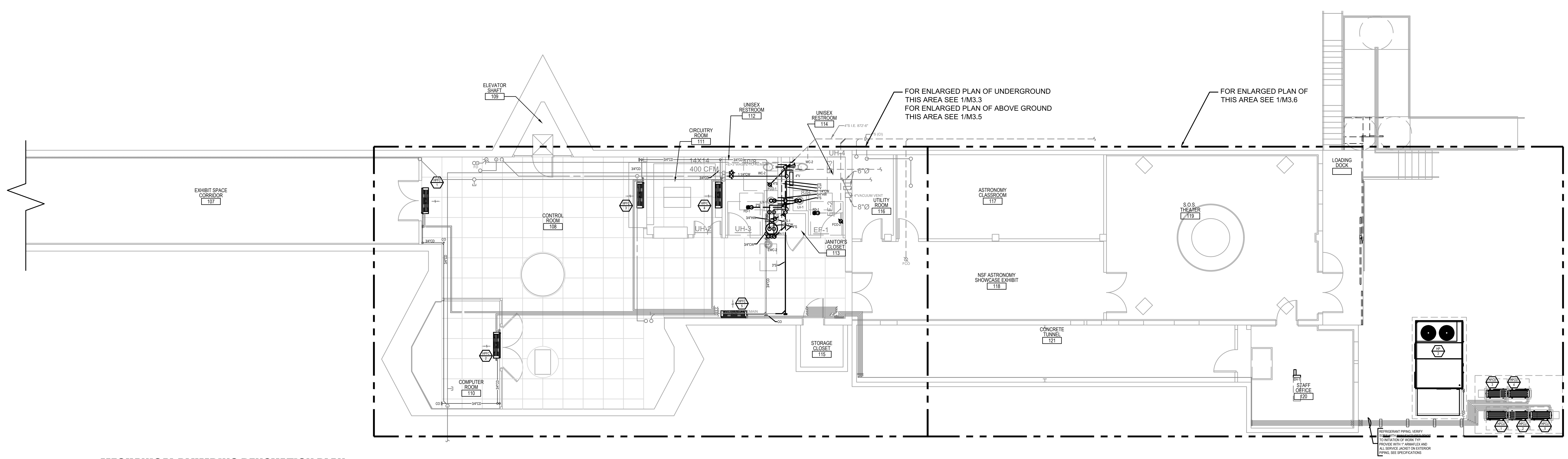
△	DATE	DESCRIPTION
0	01/08/21	I.F.C.

PROJECT NUMBER:	11904.00
DRAWN BY:	FI
CHECKED BY:	FI
CAD FILE:	11904.00-M2.3
SCALE:	AS SHOWN

MECHANICAL
PIPING
RENOVATION PLANS

M2.3





GENERAL NOTES:

A. REFER TO SHEET M0.0 AND THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS. COORDINATE ALL WORK WITH ARCHITECTURAL & ELECTRICAL DRAWINGS.

1 **MECHANICAL PLUMBING RENOVATION PLAN**
1ST LEVEL

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

N

Registered Professional Engineer (Mechanical)
CERTIFICATE NO.
37915
FORREST K.
ISAACS
Date Signed 01-08-21
ARIZONA, U.S.A.
[illegible]
Expires 9-30-2023

ADVANTECH
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WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

KITT PEAK - Sells, AZ 85634

△	DATE	DESCRIPTION
0	01/08/21	I.F.C.

PROJECT NUMBER:	11904.00
DRAWN BY:	FI
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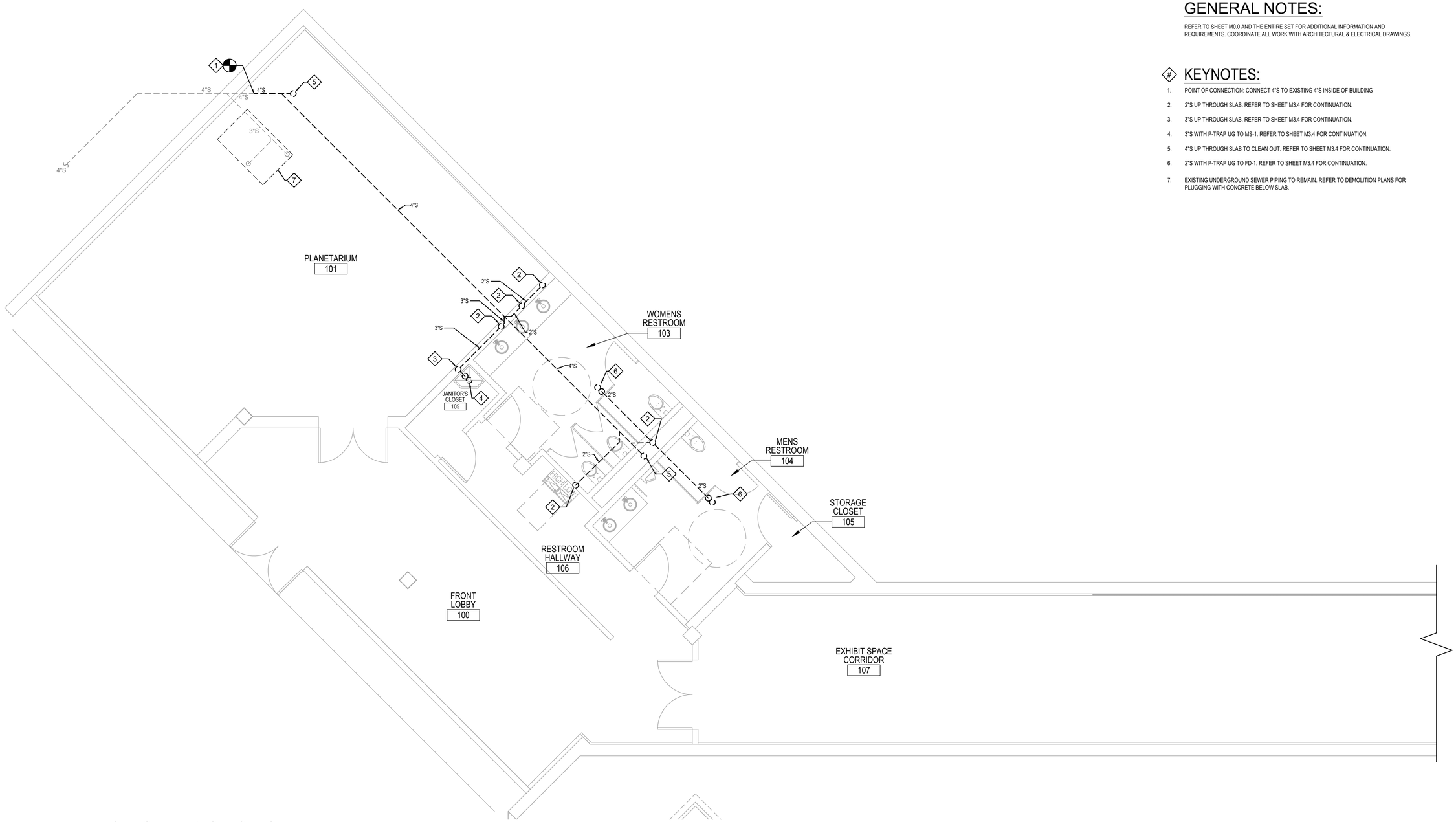
CAD FILE:	11904.00-M3.1
SCALE:	AS SHOWN

MECHANICAL PLUMBING RENOVATION PLANS



1 **MECHANICAL PLUMBING RENOVATION PLAN**
UNDERGROUND

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

GENERAL NOTES:

REFER TO SHEET M0.0 AND THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS. COORDINATE ALL WORK WITH ARCHITECTURAL & ELECTRICAL DRAWINGS.

KEYNOTES:

1. POINT OF CONNECTION: CONNECT 4"S TO EXISTING 4"S INSIDE OF BUILDING
2. 2"S UP THROUGH SLAB. REFER TO SHEET M3.4 FOR CONTINUATION.
3. 3"S UP THROUGH SLAB. REFER TO SHEET M3.4 FOR CONTINUATION.
4. 3"S WITH P-TRAP UG TO MS-1. REFER TO SHEET M3.4 FOR CONTINUATION.
5. 4"S UP THROUGH SLAB TO CLEAN OUT. REFER TO SHEET M3.4 FOR CONTINUATION.
6. 2"S WITH P-TRAP UG TO FD-1. REFER TO SHEET M3.4 FOR CONTINUATION.
7. EXISTING UNDERGROUND SEWER PIPING TO REMAIN. REFER TO DEMOLITION PLANS FOR PLUGGING WITH CONCRETE BELOW SLAB.

Registered Professional Engineer (Retired)
CERTIFICATE NO.
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ARIZONA U.S.A.
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WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

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KITT PEAK - Sells, AZ 85634

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PROJECT NUMBER:	11904.00
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CHECKED BY:	FI
CAD FILE:	11904.00-M3.2
SCALE:	AS SHOWN

MECHANICAL
PLUMBING
RENOVATION PLANS

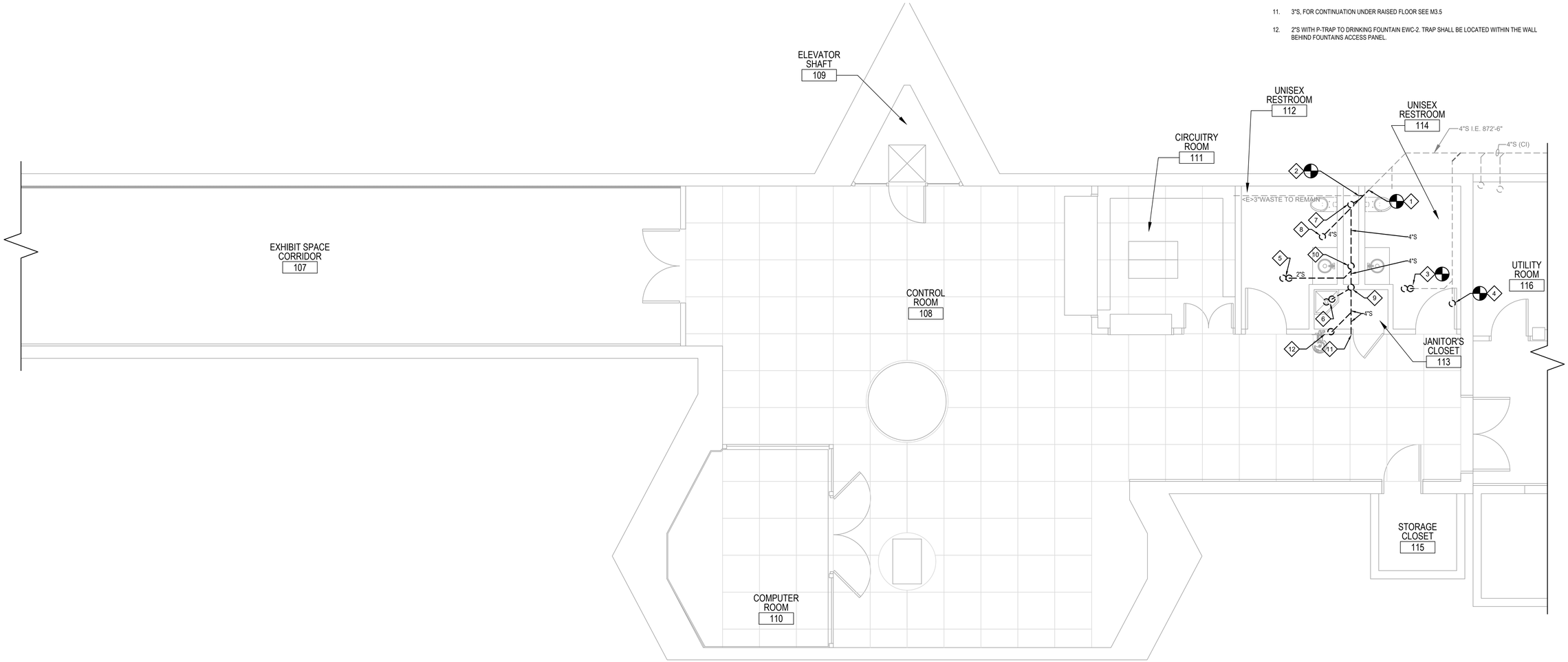
M3.2

GENERAL NOTES:

REFER TO SHEET M0.0 AND THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS.

◇# KEYNOTES:

1. CONNECT 4"S TO EXISTING 4"S.
2. CONNECT EXISTING 3"S TO NEW 4"S.
3. PROVIDE 2" FD-1 AND P-TRAP WITH TRAP SEAL AND AND CONNECT TO THE EXISTING 2"S UG. REFER TO M9 SHEET FOR FIXTURE INFORMATION.
4. PROVIDE 2"FCO AND CONNECT TO EXISTING SOIL BELOW SLAB. REFER TO M9 SHEET FOR FIXTURE INFORMATION.
5. 2" FD-1 AND P-TRAP WITH TRAP SEAL.
6. 3"S WITH P-TRAP TO MOP SINK MS-1.
7. 4"S UP THROUGH SLAB. REFER TO SHEET M3.5 FOR CONTINUATION.
8. 4"S UP TO 4"FCO. REFER TO SHEET M3.5 FOR CONTINUATION.
9. 3"S UP TO 3"WCO AND VENT. REFER TO SHEET M3.5 FOR CONTINUATION.
10. 2"S UP THROUGH SLAB FOR LAV'S. REFER TO SHEET M3.5 FOR CONTINUATION.
11. 3"S, FOR CONTINUATION UNDER RAISED FLOOR SEE M3.5
12. 2"S WITH P-TRAP TO DRINKING FOUNTAIN EWC-2. TRAP SHALL BE LOCATED WITHIN THE WALL BEHIND FOUNTAINS ACCESS PANEL.



1 MECHANICAL PLUMBING RENOVATION PLAN
UNDERGROUND

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

N

Registered Professional Engineer (Retired)
CERTIFICATE NO
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FORREST K. ISAACS
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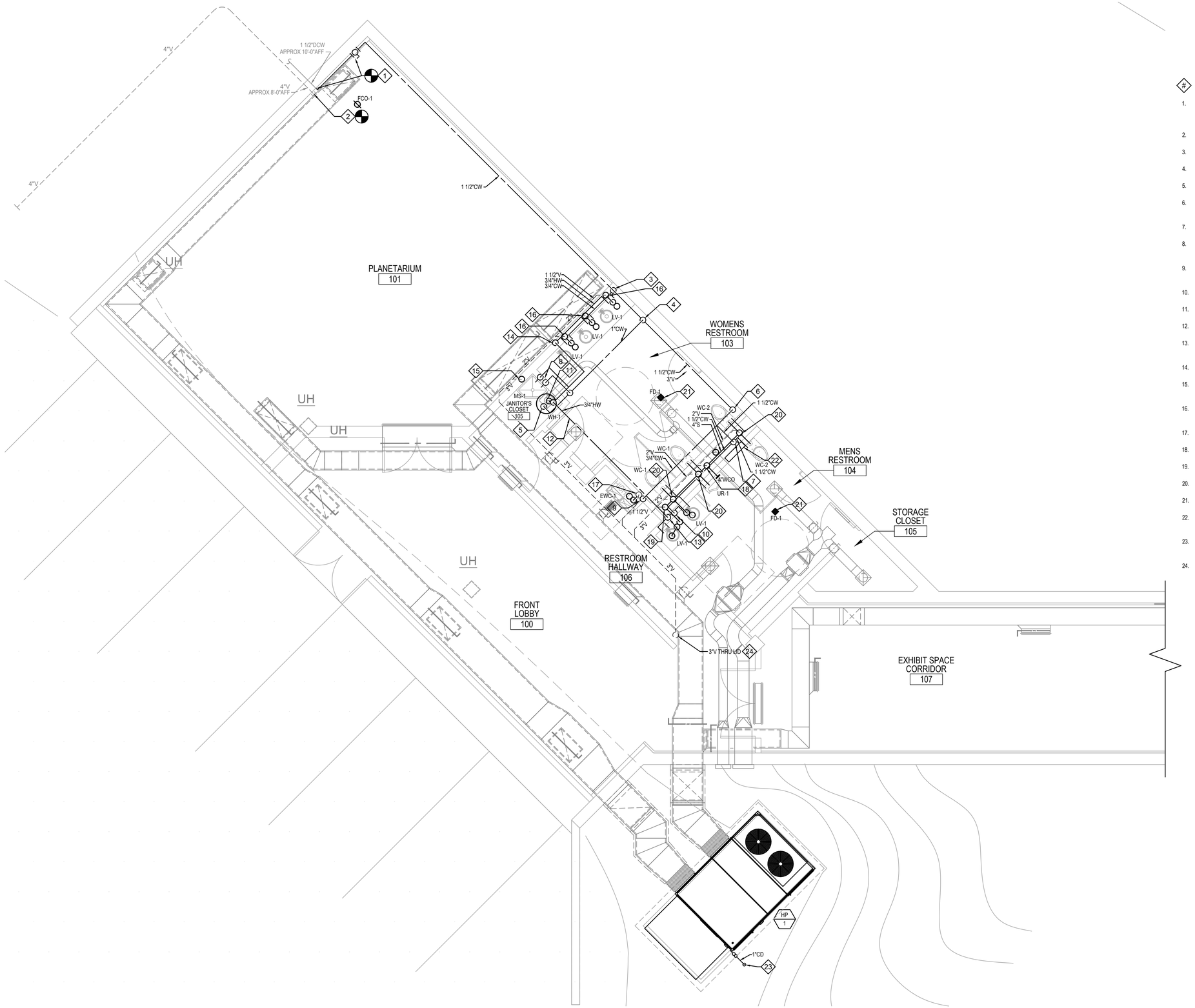
SCALE:	AS SHOWN

MECHANICAL PLUMBING RENOVATION PLANS

M3.3



1 MECHANICAL PLUMBING RENOVATION PLAN
1ST LEVEL

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

GENERAL NOTES:

REFER TO SHEET M0.0 AND THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS. COORDINATE ALL WORK WITH ARCHITECTURAL & ELECTRICAL DRAWINGS.

KEYNOTES:

1. POINT OF CONNECTION: CONNECT 1 1/2"CW TO EXISTING 1 1/2"CW AT APPROX 10'-0" AFF. INSTALL NEW SOV IN RUN WHERE SHUTOFF VALVE IS NOT BEHIND DUCTWORK, COORDINATE LOCATION WITH DUCT LAYOUT.
2. POINT OF CONNECTION: CAP EXISTING 4"V AND ABANDON IN PLACE.
3. 3/4"CW FROM 1 1/2"CW HEADER. DROP DOWN IN CHASE AND ROUTE TO FIXTURES.
4. 1"CW FROM TOP OF 1 1/2"CW HEADER. ROUTE OVERHEAD TO WH-1 IN JANITORS CLOSET.
5. 1"CW ROUTED TO WH-1. REFER TO M9 SHEET FOR WH-1 INFORMATION.
6. 1 1/2"CW ROUTED UP OVERHEAD, SPLIT AND ROUTE 3/4"CW TO WALL AT EWC-1, AND ROUTE 1 1/2"CW TO CHASE.
7. 1 1/2"CW ROUTED DOWN INTO CHASE TO SUPPLY FIXTURES.
8. 3/4"CW AND 3/4"HW DOWN IN WALL FOR CONNECTION TO MS-1. REFER TO M9 SHEET FOR FIXTURE INFORMATION.
9. 3/4"CW DOWN IN WALL. ELBOW OUT OF WALL AND TRANSITION TO 1/2"CW FOR CONNECTION TO EWC-1.
10. 3/4"CW DOWN IN WALL. ELBOW OUT OF WALL AND TRANSITION TO 1/2"CW FOR CONNECTION TO LV-1.
11. 1"HW FROM WH-1 TO DISTRIBUTION.
12. 3/4"HW ROUTED OVERHEAD TO CHASE TO SUPPLY LV-1 FIXTURES IN MEN'S RESTROOM.
13. 3/4"HW DOWN IN WALL, ELBOW OUT OF WALL, SPLIT, AND TRANSITION TO 1/2"HW TO FEED TWO LV-1 FIXTURES.
14. 3/4"HW DOWN IN WALL. ROUTE IN WALL TO SERVE LV-1 FIXTURES.
15. 3"S UP FROM UNDERGROUND, INSTALL 3"WCO AND TRANSITION TO 1 1/2"V, ROUTE VENT UP IN WALL TO OVERHEAD.
16. 2"S UP FROM UNDERGROUND, INSTALL 2"WCO AND TRANSITION TO 1 1/2"V, ROUTE VENT UP IN WALL TO OVERHEAD.
17. 2"S UP FROM UNDERGROUND, ROUTE UP IN WALL TO EWC-1.
18. 4"S UP FROM UNDERGROUND, SPLIT TO 4"S IN EACH DIRECTION.
19. 2"S UP IN CHASE.
20. 4"S UP IN CHASE FROM 4"S MAIN.
21. INSTALL FD-1. REFER TO UNDERGROUND SHEET M3.2 FOR CONTINUATION OF PIPING.
22. 2'-0" SQ ACCESS PANEL FOR SOV AND WHA. REFER TO M6 SHEET FOR DETAIL. REFER TO M8.1 SHEET FOR APPROX LOCATION.
23. 1"CONDENSATE FROM OUTDOOR HEAT PUMP UNIT. FIELD ROUTE AT GRADE AND ELBOW DOWN TO TERMINATE ABOVE THE DIRT AREA.
24. 3"V UP THROUGH CONCRETE LID, TERMINATE 36" ABOVE FINISHED GRADE. SEE DETAIL 11/M6.1, SEE ARCHITECTURAL AND STRUCTURAL DOCUMENTS FOR ADDITIONAL INFORMATION.

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WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

NOIR Lab

NSF

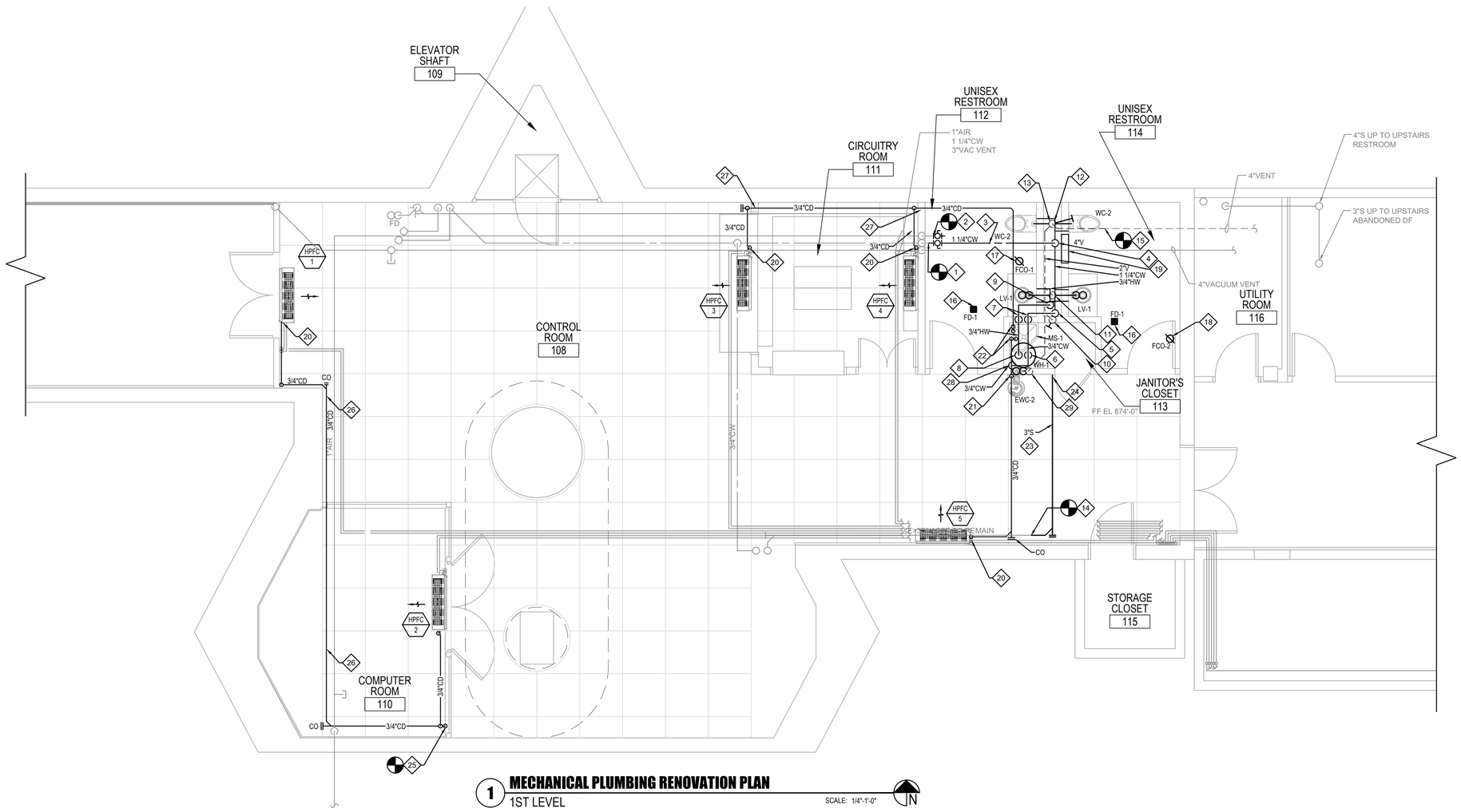
KITT PEAK - Sells, AZ 85634

△	DATE	DESCRIPTION
0	01/08/21	I.F.C.

PROJECT NUMBER:	11904.00
DRAWN BY:	FI
CHECKED BY:	FI
CAD FILE:	11904.00-M3.4
SCALE:	AS SHOWN

MECHANICAL
PLUMBING
RENOVATION PLANS

M3.4



1 **MECHANICAL PLUMBING RENOVATION PLAN**
1ST LEVEL

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

GENERAL NOTES:

REFER TO SHEET M0.0 AND THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS.

KEYNOTES:

1. POINT OF CONNECTION: CONNECT 1 1/4"CW TO EXISTING 1 1/4"CW. PROVIDE WITH LINE SIZE ISOLATION BALL VALVE AT POINT OF CONNECTION.
2. CONNECT 1" ISOLATION VALVE AND FIELD ROUTE AND CONNECT TO REMAINING ACTIVE LINES. COORDINATE WITH OWNER FOR SYSTEMS THAT SHALL REMAIN ACTIVE AND ROUTE AS REQUIRED. REFER TO DEMO PLANS FOR PIPING THAT WAS REMOVED.
3. 1 1/4"CW ROUTED OVERHEAD TO CHASE.
4. 1 1/4"CW FROM OVERHEAD. DROP DOWN INTO CHASE TO SUPPLY FIXTURES.
5. 1"CW UP IN CHASE TO OVERHEAD AND ROUTE WEST IN OVERHEAD TO SUPPLY MS-1 AND WH-1.
6. 3/4"CW ROUTED TO WH-1. REFER TO M9.1 SHEET FOR WH-1 INFORMATION.
7. 3/4"CW AND 3/4"HW DOWN IN WALL FOR CONNECTION TO MS-1. REFER TO M9.1 SHEET FOR FIXTURE INFORMATION.
8. 3/4"HW FROM WH-1 TO DISTRIBUTION.
9. 3/4"HW FROM 3/4"HW DISTRIBUTION ROUTED IN OVERHEAD TO CHASE TO SUPPLY LV-1 FIXTURES IN RESTROOMS.
10. 3"S UP FROM UNDERGROUND, INSTALL 3"WCO AND TRANSITION TO 1 1/2"V, ROUTE VENT UP IN WALL TO OVERHEAD.
11. 2"S UP FROM UNDERGROUND, INSTALL 2"WCO AND TRANSITION TO 1 1/2"V, ROUTE VENT UP IN WALL TO OVERHEAD.
12. 4"S UP FROM UNDERGROUND, ROUTE TO MAIN AND CONNECT.
13. 4"S UP FROM UNDERGROUND IN CHASE.
14. POINT OF CONNECTION, CONNECT NEW 3"S TO EXISTING 3"S IN RAISED FLOOR PLENUM.
15. POINT OF CONNECTION: 4"V FROM FIXTURES. CONNECT TO EXISTING 4"V PIPING IN OVERHEAD.
16. INSTALL FD-1. REFER TO UNDERGROUND SHEET FOR CONTINUATION OF PIPING.
17. INSTALL FCO-1. REFER TO UNDERGROUND SHEET FOR CONTINUATION OF PIPING.
18. INSTALL FCO-2. REFER TO UNDERGROUND SHEET FOR CONTINUATION OF PIPING.
19. 2'-0" SQ ACCESS PANEL FOR SOV AND WHA. REFER TO M6 SHEET FOR DETAIL. REFER TO M8.1 SHEET FOR APPROX LOCATION.
20. PROVIDE WITH SAUERMANN SI-30-208 CONDENSATE PUMP. PUMP CONDENSATE FROM UNIT UP AND ROUTE HORIZONTALLY WITH A MINIMUM 1/8" PER FOOT SLOPE AS SHOWN.
21. DROP 3/4"CD DOWN TO BELOW MAIN BEAM AND ELBOW INTO THE JANITORS ROOM.
22. 3/4"CD DROP DOWN EXPOSED ON WALL AND ELBOW AND TERMINATE ABOVE MOP SINK MS-1.
23. 3"S ROUTED UNDER RAISED FLOOR.
24. 3"S UNDER RAISED FLOOR AND TO UNDERGROUND, FOR CONTINUATION SEE M3.3.
25. 3/4"CD DOWN ON WALL TO BELOW RAISED FLOOR. CONNECT TO THE EXISTING 3/4" CONDENSATE ROUTED TO PIT BELOW.
26. ROUTE 3/4" CONDENSATE AS HIGH AS POSSIBLE AND ROUTE ALONG WALL AND OVER TO ABOVE SERVER CLOSET. ROUTE ABOVE SERVER CLOSET CEILING AS SHOWN.
27. ROUTE 3/4" CONDENSATE THOROUGH EXISTING WALL PENETRATIONS. ROUTE TO AVOID CONFLICT WITH EXISTING PIPING.
28. 3/4"DCW DOWN ON WALL TO FILTER PROVIDED WITH WATER DISPENSER EWC-2. PROVIDE ISOLATION VALVE UPSTREAM AND DOWN STREAM OF FILTER. MOUNT FILTER ON WALL AND PIPE FROM FILTER TO WATER DISPENSER.
29. 1-1/2"VENT FROM WATER COOLER TO ABOVE.

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WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

NOIR Lab

NSF

KITT PEAK - Sells, AZ 85634

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MECHANICAL PLUMBING RENOVATION PLANS

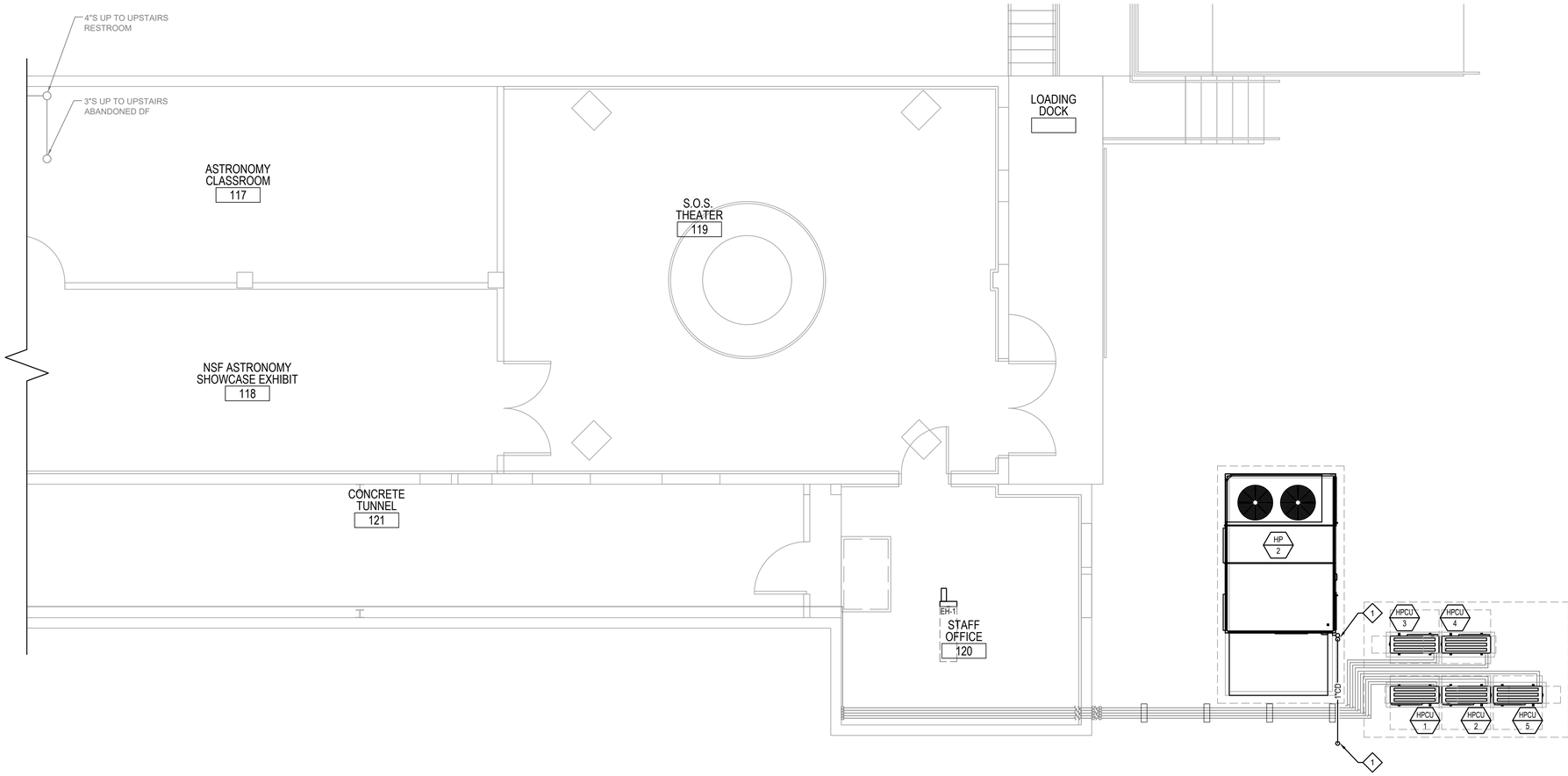
M3.5

GENERAL NOTES:

A. REFER TO SHEET M0.0 AND THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
B. PROVIDE REFRIGERANT CHARGE AS REQUIRED FOR TUBING LENGTHS INSTALLED PER MANUFACTURER'S REQUIREMENTS.
C. HANG NEW PIPING PER DETAIL 6/M6.1 AND THE SPECIFICATIONS.
D. INSULATE REFRIGERANT LINES PER SPECIFICATIONS. INSULATION ON EXTERIOR OF BUILDING TO BE JACKETED PER SPECIFICATIONS.
E. SUPPORT PIPING AT GRADE PER DETAIL 7/M6.1 AND SPECIFICATIONS

KEYNOTES:

1. 1"CONDENSATE FROM OUTDOOR HEAT PUMP UNIT. FIELD ROUTE AT GRADE AND ELBOW DOWN TO TERMINATE ABOVE THE DIRT AREA.



1 **MECHANICAL PLUMBING RENOVATION PLAN**
1ST LEVEL
SCALE: 1/4"-1'-0"

Registered Professional Engineer (Retired)
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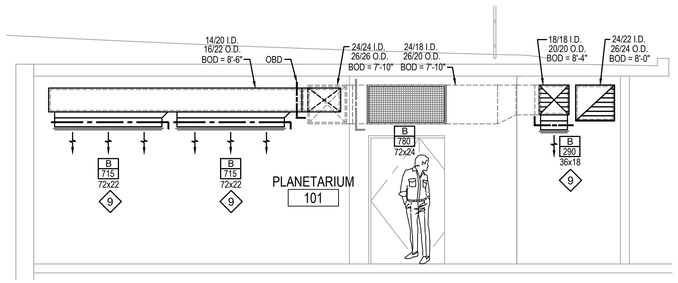
SCALE:	AS SHOWN

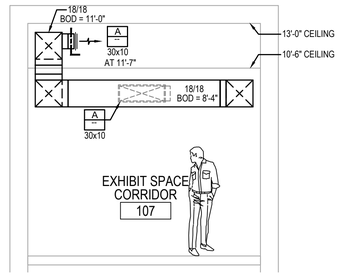
MECHANICAL
PLUMBING
RENOVATION PLANS

M3.6



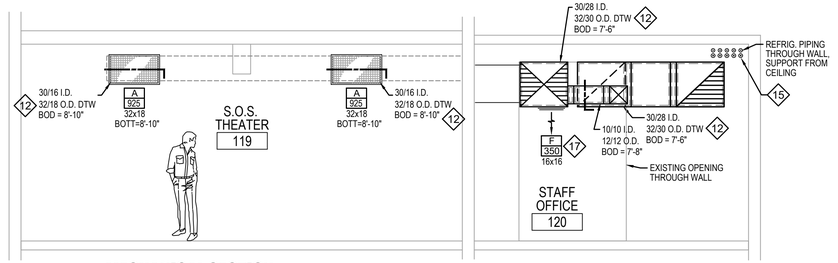
1 MECHANICAL SECTION
LOOKING SOUTHEAST

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



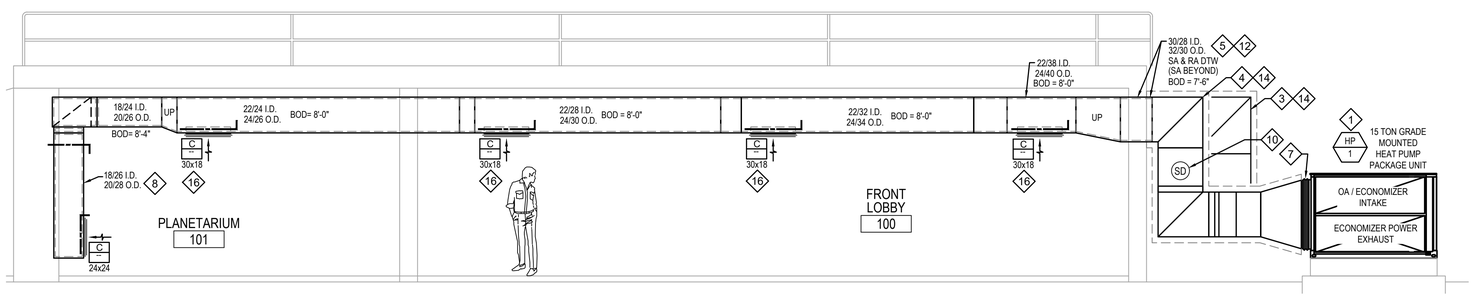
2 MECHANICAL SECTION
LOOKING EAST

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



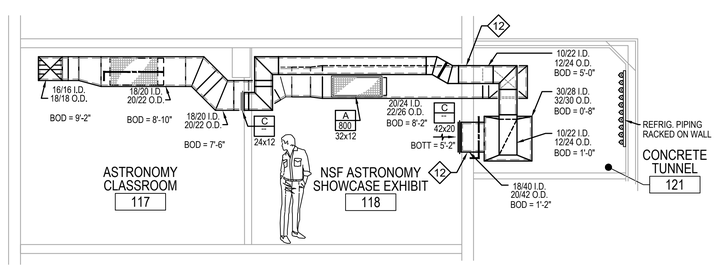
3 MECHANICAL SECTION
LOOKING EAST

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



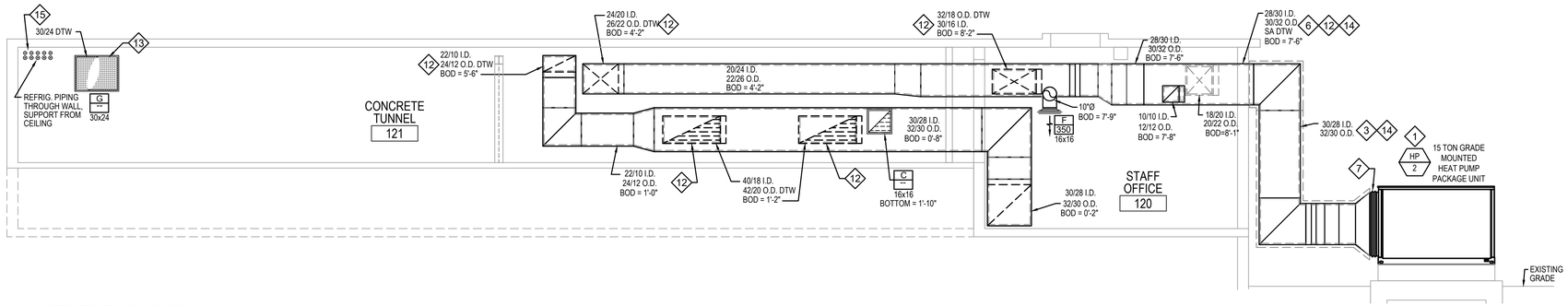
4 MECHANICAL SECTION
LOOKING NORTHEAST

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



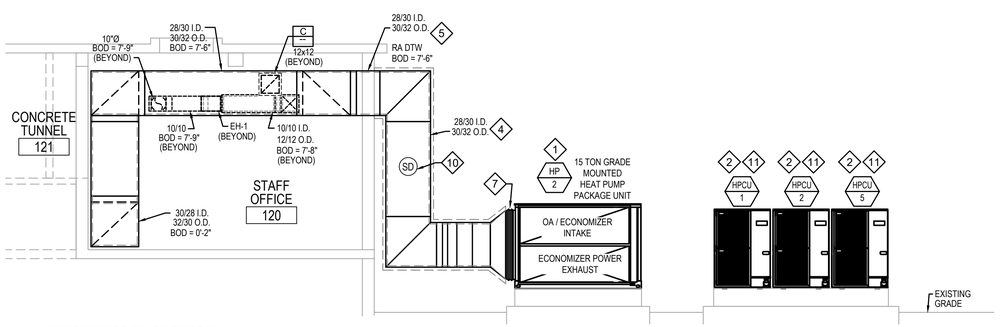
5 MECHANICAL SECTION
LOOKING EAST

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



6 MECHANICAL SECTION
LOOKING NORTH

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



7 MECHANICAL SECTION
LOOKING NORTH

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

GENERAL NOTES:

REFER TO SHEET M0.0 AND THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS.

ALL NEW PENETRATIONS INTO BUILDING SHALL BE WEATHER TIGHT.

KEYNOTES:

1. PACKAGED HEAT PUMP UNIT MOUNTED ON CONCRETE HOUSEKEEPING PAD AND 12" STEEL STAND, SEE ARCHITECTURAL AND STRUCTURAL DOCUMENTS FOR HOUSEKEEPING PAD AND STEEL STAND INFORMATION. SECURE EQUIPMENT TO STEEL STAND. SLOPE TOP OF DUCTWORK FOR DRAINAGE. SEE ARCHITECTURAL AND STRUCTURAL DOCUMENTS FOR ADDITIONAL INFORMATION. BOTTOM OF EQUIPMENT SHALL BE A MINIMUM OF 16" ABOVE FINISHED GRADE.
2. AIR COOLED CONDENSING UNIT MOUNTED ON CONCRETE HOUSEKEEPING PAD AND 12" STEEL STAND, SEE ARCHITECTURAL AND STRUCTURAL DOCUMENTS FOR HOUSEKEEPING PAD AND STEEL STAND INFORMATION. SECURE EQUIPMENT TO STEEL STAND. SEE ARCHITECTURAL AND STRUCTURAL DOCUMENTS FOR ADDITIONAL INFORMATION. BOTTOM OF EQUIPMENT SHALL BE A MINIMUM OF 16" ABOVE FINISHED GRADE.
3. 32x30 O.D. SA DUCT WITH 1" INTERNAL ACOUSTIC LINER AND 2" EXTERNAL INSULATION WITH ALL WEATHER JACKET FROM PACKAGED UNIT AND UP ON WALL. SUPPORT BOTTOM OF DUCTWORK FROM GRADE WITH C-PORT SUPPORTS AND SECURE DUCT TO BUILDING. SLOPE TOP OF DUCTWORK FOR DRAINAGE.
4. 32x30 O.D. RA DUCT WITH 1" ACOUSTIC DUCT LINER AND 2" EXTERNAL INSULATION WITH ALL WEATHER JACKET FROM PACKAGED UNIT AND UP ON WALL. SUPPORT BOTTOM OF DUCTWORK FROM GRADE WITH C-PORT SUPPORTS AND SECURE DUCT TO BUILDING. SLOPE TOP OF DUCTWORK FOR DRAINAGE.
5. ROUTE 32x30 O.D.DUCT WITH 1" DUCT LINER THROUGH WALL WITH BOTTOM OF DUCT AT 7'-6" ABOVE FINISHED FLOOR AND ROUTE AS SHOWN. SECURE DUCTWORK TO BUILDING. SLOPE TOP OF DUCTWORK FOR DRAINAGE.
6. ROUTE 30x26 O.D. SA DUCT WITH 1" ACOUSTIC DUCT LINER THROUGH WALL IN EXISTING 10'-0"x6'-0" WALL OPENING WITH BOTTOM OF DUCT AT 7'-10" ABOVE FINISHED FLOOR AND ROUTE AS SHOWN. SECURE DUCT THROUGH WALL TO BUILDING.
7. PROVIDE FLEXIBLE CONNECTION AT UNIT CONNECTION, PROVIDE WEATHER PROTECTION FOR FLEXIBLE CONNECTION.
8. LINED RA DROP DOWN, TERMINATE DROP AT 12" AFF AND PROVIDE RA GRILLE AS SHOWN.
9. DIRECT AIRFLOW TOWARDS FLOOR.
10. PROVIDED DUCT MOUNTED SMOKE DETECTOR IN NEMA R-3 ENCLOSURE, SEE ELECTRICAL DOCUMENTS FOR ADDITIONAL INFORMATION.
11. FOR REFRIGERANT PIPING SEE M2 SERIES DOCUMENTS FOR ADDITIONAL INFORMATION.
12. PROVIDE NEW OPENING IN EXISTING CONCRETE WALL. SEE ARCHITECTURAL AND STRUCTURAL DOCUMENTS FOR ADDITIONAL INFORMATION.
13. ENLARGE EXISTING OPENING IN CONCRETE WALL. SEE ARCHITECTURAL AND STRUCTURAL DOCUMENTS FOR ADDITIONAL INFORMATION.
14. PROVIDE 1" ACOUSTIC DUCT LINER AND 2" EXTERNAL INSULATION WITH ALL WEATHER JACKET. SECURE DUCT TO BUILDING WALL, WRAP DUCT AROUND CONNER AND SUSPEND DUCTWORK FROM LOADING DOCK OVERHANG AND ALSO SECURE SUPPORTS TO WALL TO PREVENT DUCT MOVEMENT AS A RESULT OF WIND LOAD.
15. COORDINATE PIPING PENETRATIONS WITH ARCHITECTURAL AND STRUCTURAL DOCUMENTS FOR ADDITIONAL INFORMATION. SEAL PENETRATIONS WEATHER TIGHT.
16. RA GRILLE WITH OBD MOUNTED ON BOTTOM OF DUCT.

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NOIRLab

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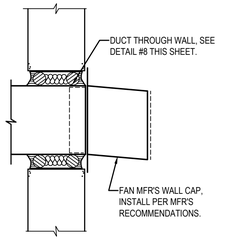
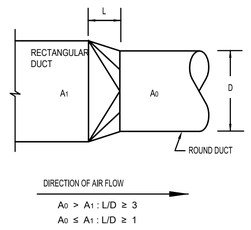
MECHANICAL SECTIONS

M5.1

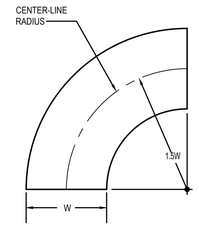


NOTE:
DETAIL IS FOR REFERENCE ONLY, SEE ARCHITECTURAL AND STRUCTURAL DOCUMENTS FOR ADDITIONAL INFORMATION.

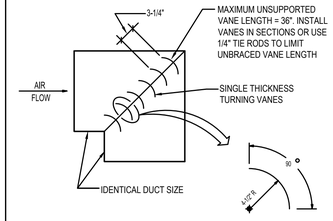
4 EXHAUST DISCHARGE AT WALL
NTS



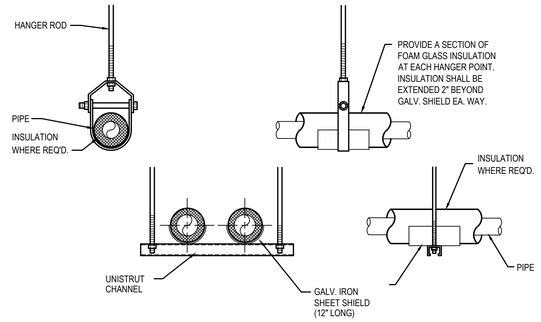
3 RECTANGULAR TO ROUND DUCT TRANSITION
NTS



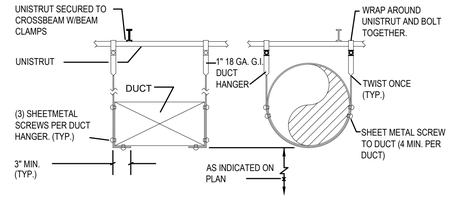
2 LONG RADIUS ELBOW
NTS



1 MITER ELBOW WITH TURNING VANES
NTS

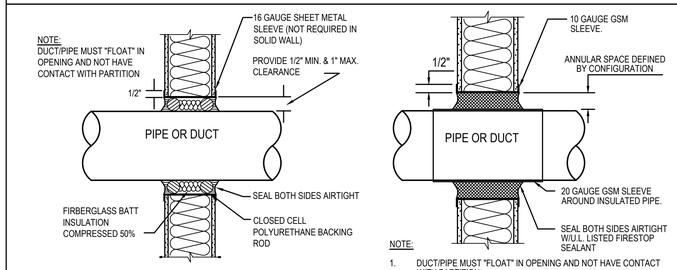


6 PIPE HANGERS
NTS

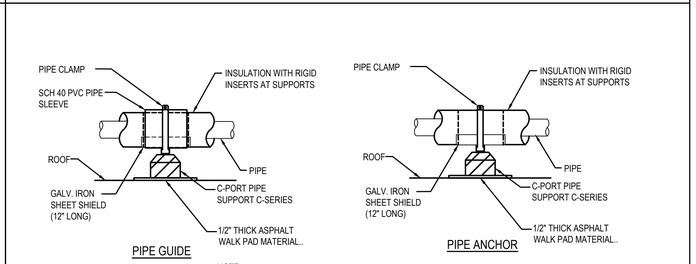


NOTE:
DO NOT ATTACH HANGER DIRECTLY TO UNDERSIDE OF ROOF DECK WITHOUT USE OF UNISTRUT.

5 DUCT HANGER DETAIL
NTS

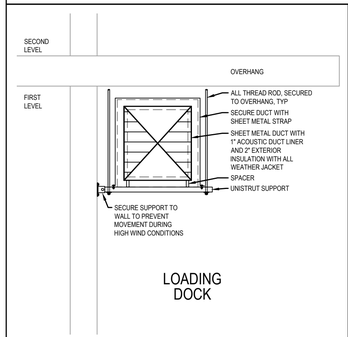


8 DUCT/PIPE THRU NON-RATED AND RATED PARTITION
NTS

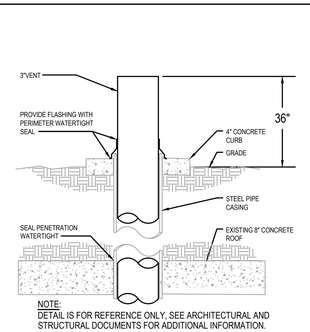


NOTE:
A. DETAIL IS FOR REFERENCE ONLY, SEE ARCHITECTURAL AND STRUCTURAL DOCUMENTS FOR ADDITIONAL INFORMATION.
B. PIPING SECURELY FASTENED TO GRADE AND BUILDING.
C. MAINTAIN MINIMUM 1'-0" CLEARANCE FROM SLAB ON GRADE TO BOTTOM OF PIPING.

7 PIPE SUPPORT ON ROOF OR GRADE SLAB
NTS



12 EXTERIOR DUCT SUPPORT DETAIL
NTS



NOTE:
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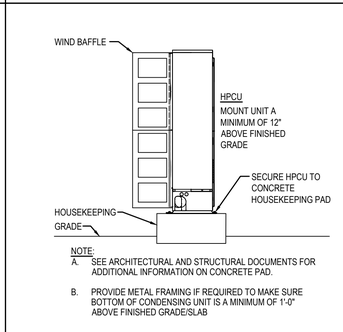
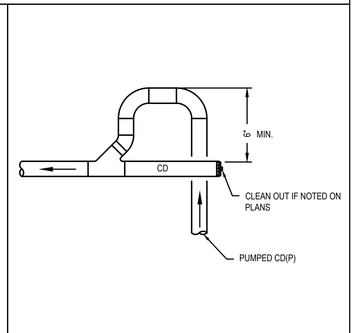
11 PLUMBING VENT TERMINATION
NTS



NOTE:
A. SEE ARCHITECTURAL AND STRUCTURAL DOCUMENTS FOR ADDITIONAL INFORMATION ON CONCRETE PAD.
B. PROVIDE METAL FRAMING IF REQUIRED TO MAKE SURE BOTTOM OF CONDENSING UNIT IS A MINIMUM OF 1'-0" ABOVE FINISHED GRADE/SLAB

10 CONDENSING UNIT AT GRADE
NTS



9 PUMPED CONDENSATE
NTS

Registered Professional Engineer (General)
CERTIFICATE NO.
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FORREST K. ISAACS
Date Signed 01-20-21
ARIZONA U.S.A.
Expires 9-30-2023

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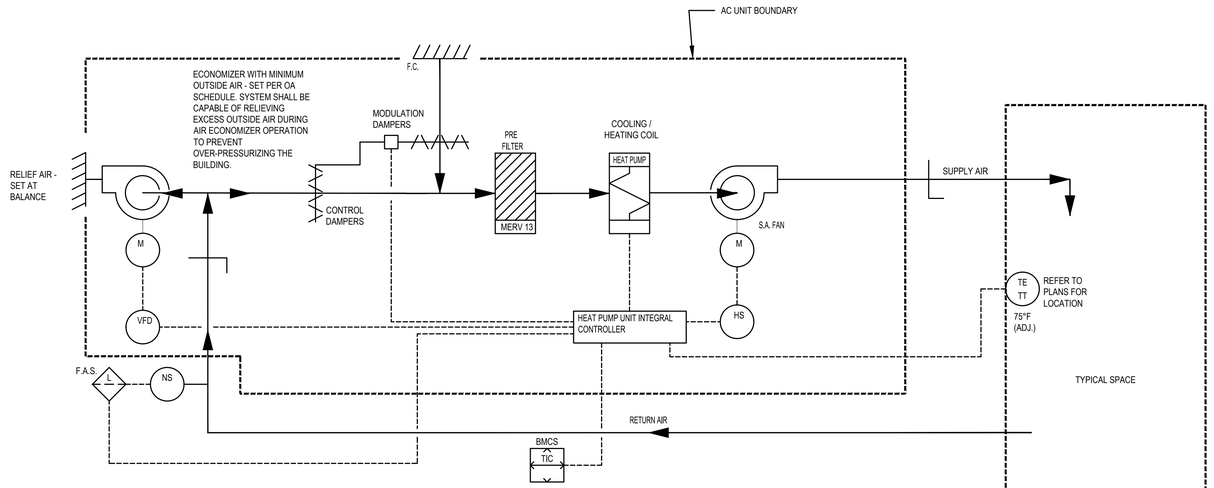
SCALE:	NONE

MECHANICAL DETAILS

M6.1

GENERAL NOTES:

A. ALL EQUIPMENT SHALL BE PROVIDED WITH BACNET CARDS AND SHALL BE CONNECTED TO THE SITE BMCS.
B. SITE BMCS SHALL BE CAPABLE OF MONITORING OF SYSTEM AND RESETTING OF TEMPERATURES BY CONTROLS CONTRACTOR.
C. CONTRACTOR SHALL CONNECT TO THE EXISTING ALERTON CONTROL PANEL WITH BACNET MSTP/IP AND INTEGRATE ALL NEW CONTROLS INTO THIS.
D. PROVIDE BID ALTERNATE FOR PROVIDING A NEW ALERTON CONTROL PANEL AND INTEGRATION INTO THE SITE BMCS.



SEQUENCE OF OPERATION - HEAT PUMP:

A. INTERLOCKS: UNIT HAS THE FOLLOWING INTERLOCKS:
(1) FIRE ALARM SYSTEM (REFER TO ELECTRICAL DOCUMENTS FOR FIRE ALARM SYSTEM).

B. STARTING THE UNIT: WITH ALL CIRCUIT BREAKERS AND DISCONNECTS IN THE OPERATING POSITION, UNIT MAY BE STARTED FROM THE H.O.A. SWITCH. INITIATING THE START SWITCH (HS) ENERGIZES SUPPLY FAN MOTOR AND HEAT PUMP CONDENSING UNIT.

C. ROOM TEMPERATURE IS MEASURED BY THE TEMPERATURE TRANSMITTER (TE/TT) LOCATED IN THE SPACE AND CONTROLLED BY THE TEMPERATURE CONTROLLER (TIC) BY MODULATING THE HEAT PUMP, SET POINT IS 75°F (ADJUSTABLE) SUMMER, AND 68°F (ADJUSTABLE) WINTER. THERMOSTATIC CONTROLS SHALL PROVIDE A TEMPERATURE RANGE OR DEADBAND OF AT LEAST 5°F WITHIN WHICH THE SUPPLY OF HEATING AND COOLING ENERGY TO THE ZONE IS CAPABLE OF BEING SHUT OFF OR REDUCED TO A MINIMUM, IN ACCORDANCE WITH C403.2.4.2, IECC 2018.

D. FIRE ALARM SYSTEM ALARM: UPON DETECTION OF SMOKE AN ALARM SIGNAL WILL BE SENT TO THE FIRE ALARM PANEL (FAP). THE FIRE ALARM SYSTEM WILL SHUT DOWN THE ASSOCIATED AIR HANDLING UNIT. THE FIRE ALARM SYSTEM SHALL SEND A COMMON TROUBLE ALARM ON DETECTION OF SMOKE TO THE BMCS..

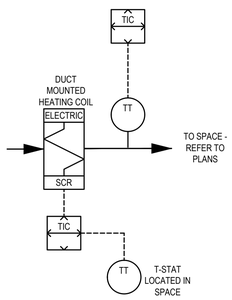
E. SHUTDOWN: UNIT MAY BE SHUT DOWN BY HAND SWITCH (HS).

F. ECONOMIZER CYCLE: INTEGRAL COMPARATIVE ENTHALPY ECONOMIZER OPERATING THROUGH THE PRIMARY TEMPERATURE CONTROLS TO AUTOMATICALLY UTILIZE OUTDOOR AIR FOR FREE COOLING. AUTOMATICALLY MODULATE RELIEF AIR FAN WITH ADJUSTABLE SETPOINTS TO MAINTAIN DISCHARGE AIR TEMPERATURE AT 55 DEG F (ADJ.)

G. SCHEDULE: OWNER/USER SHALL PROVIDE 7 DAY SCHEDULE OF OPERATIONS. BASED ON OWNER/USER SCHEDULE, UNIT SHALL SHUTDOWN DURING OFF HOURS AND AUTOMATICALLY RESTART WHEN SCHEDULE INDICATES TO RESUME OPERATIONS AS NOTED ABOVE.

1 HEAT PUMP UNIT DIAGRAM

HP-1 AND HP-2



SEQUENCE OF OPERATION - EXHAUST FAN(S):

A. INTERLOCKS: UNIT HAS THE FOLLOWING INTERLOCKS:
(1) ASSOCIATED EXISTING HEAT PUMP UNIT HP-2

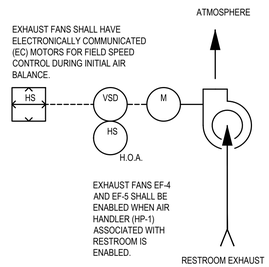
B. UNIT START: HEATER SHALL BE ENABLED WHEN ASSOCIATED HEAT PUMP UNIT IS ENABLED. DUCT HEATER SHALL MODULATE TO MAINTAIN SPACE TEMPERATURES OF 70°F (ADJUSTABLE).

C. DISCHARGE COIL TEMPERATURE SHALL BE MONITORED AT THE BMCS.

D. EMERGENCY POWER: UNIT IS NOT ON EMERGENCY POWER.

3 ELECTRIC COIL DIAGRAM

DUCT MOUNTED



SEQUENCE OF OPERATION - RESTROOM EXHAUST FAN(S):

A. EXHAUST FANS EF-4 AND EF-5 SHALL BE INTERLOCKED WITH ASSOCIATED AIR HANDLER SERVING RESTROOM(S) HP-1. EXHAUST FANS SHALL RUN WHENEVER ASSOCIATED AIR HANDLER IS ENABLED.

B. EXHAUST FANS EF-1, EF-2, AND EF-3 SHALL BE ENABLED FROM WALL SWITCH LOCATED IN THE ADJACENT UTILITY ROOM AND SHALL RUN CONTINUOUSLY WHEN BUILDING IS OCCUPIED.

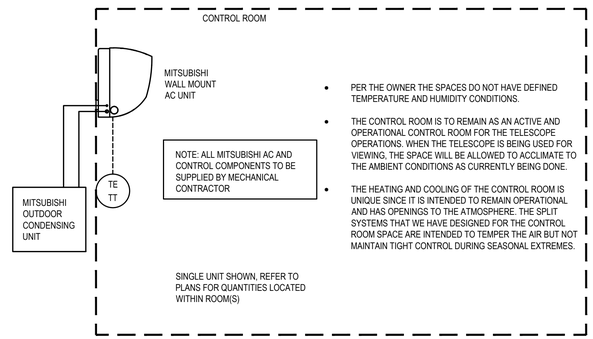
C. ALL EXHAUST FANS SHALL BE CONNECTED TO THE EMCS VIA BACNET.

D. EC MOTORS SHALL BE USED FOR INITIAL AIR BALANCE.

3 EXHAUST FAN DIAGRAM

2 DUCTLESS SPLIT UNIT P&ID

COOLING AND HEATING HEAT PUMP UNIT



SEQUENCE OF OPERATION - HEATING & COOLING:

A. INTERLOCKS: UNIT HAS THE FOLLOWING INTERLOCKS:
NONE

B. STARTING THE UNIT: WITH ALL CIRCUIT BREAKERS AND DISCONNECTS IN THE OPERATING POSITION, UNIT MAY BE STARTED FROM THE H.O.A. SWITCH. INITIATING THE START SWITCH (HS) ENERGIZES AC UNIT AND CONDENSING UNIT.

C. SUPPLY AIR DRY BULB TEMPERATURE: SUPPLY AIR IS MEASURED BY THE TEMPERATURE TRANSMITTER (TE/TT) LOCATED IN THE SPACE TO CONTROL THE HP UNIT.

D. SHUTDOWN: UNIT MAY BE SHUT DOWN BY HAND SWITCH (HS).

2 DUCTLESS SPLIT UNIT P&ID

COOLING AND HEATING HEAT PUMP UNIT

Registered Professional Engineer (General)
CERTIFICATE NO
37915
FORREST K. ISAACS
Date Signed 01-08-21
Expires 9-30-2023

ADVANTECH
FACILITY DESIGN INC
ARCHITECTURE - ENGINEERING
3280 E. HEMISPHERE LOOP STE. 110 TUCSON AZ 85706 520-806-0903
1889 E. BROADWAY, TEMPE AZ 85258

WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

NOIRLab

NSF

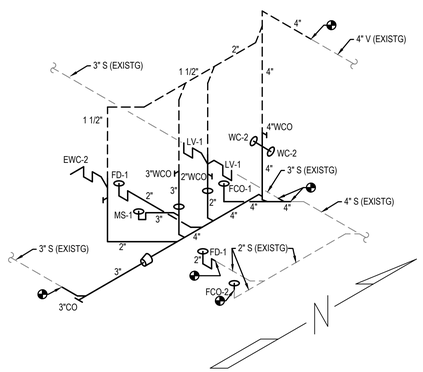
KITT PEAK - Sells, AZ 85634

△	DATE	DESCRIPTION
0	01/08/21	I.F.C.

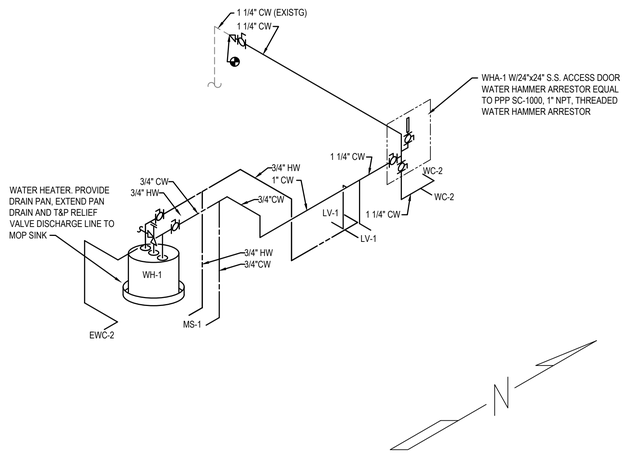
PROJECT NUMBER:	11904.00
DRAWN BY:	FI
CHECKED BY:	FI
CAD FILE:	11904.00-M7.1
SCALE:	NONE

MECHANICAL
P&ID'S

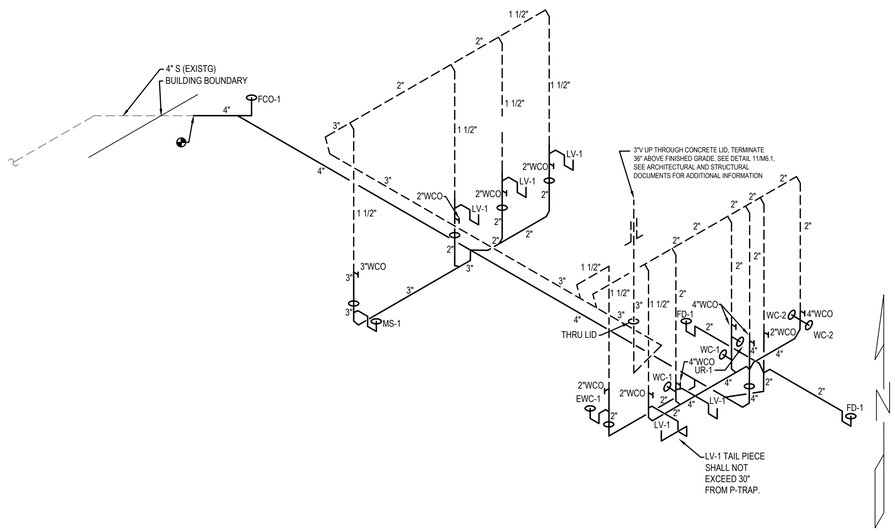
M7.1



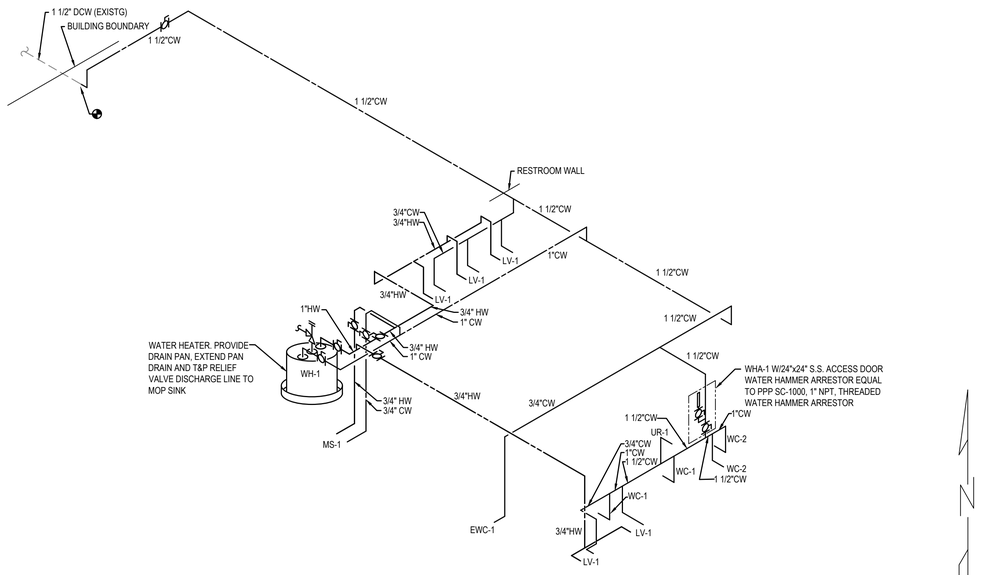
1 PLUMBING RISER - DRAIN AND VENT
EAST RESTROOM
SCALE: NONE



2 PLUMBING RISER - WATER
EAST RESTROOM
SCALE: NONE



3 PLUMBING RISER - DRAIN AND VENT
WEST RESTROOM
SCALE: NONE



4 PLUMBING RISER - WATER
WEST RESTROOM
SCALE: NONE

Registered Professional Engineer (General)
CERTIFICATE NO
37915
FORREST K.
ISAACS
Date Signed 01-20-21
Expires 9-30-2023

ADVANTECH
FACILITY DESIGN INC
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WINDOWS ON
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0	01/08/21	I.F.C.

PROJECT NUMBER:	11904.00
DRAWN BY:	TH
CHECKED BY:	FI
CAD FILE:	11904.00-M8.1
SCALE:	NONE

MECHANICAL
RISER
DIAGRAMS

M8.1

OUTSIDE AIR COMPLIANCE SCHEDULE PER IMC 2018

SORTED BY ROOMS												SUPPLY AIR		
SPACE DESCRIPTION						CODE AIR FLOW						DESIGN AIR FLOW		
ACTUAL TAG NAME	AC #	SPACE NAME	ROOM #	FLOOR AREA (SF)	RH %	OUTSIDE AIR						SA	OA SUPPLIED	OA	REMARKS
						PERS / 1000 SF	# OF PERS	CFM/ PERS	CFM/ SF	ACH	CFM	CFM	%	CFM	
HP-1	1	PLANETARIUM	101	866	0	40	35	8	0.06	-	312	2,500	20.4%	510	
HP-1	1	LOBBY	100	504	0	10	5	5	0.06	-	55	870	20.4%	178	
HP-1	1	STORAGE CLOSET	105	28	0	-	-	-	0.12	-	3	40	20.4%	8	
HP-1	1	MEN	104	153	0	-	-	-	-	-	-	150	20.4%	31	
HP-1	1	WOMEN	103	174	0	-	-	-	-	-	-	150	20.4%	31	
HP-1	1	CORRIDOR	107	1665	0	-	-	-	0.06	-	100	2,150	20.4%	439	
HP-1	1	JANITORS CLOSET	102	29	0	-	-	-	0.12	-	3	40	20.4%	8	
HPFC-1 & 3	3	CONTROL ROOM	108	1044	0	4	4	5	0.06	-	84	1,290	6.5%	84	
HPFC-2	4	COMPUTER ROOM	192	192	0	-	-	-	0.06	-	12	830	1.4%	12	
HPFC-5	6	CONTROL ROOM	108	340	0	-	-	-	0.06	-	20	200	73.1%	146	
HPFC-4, EF-1	5	CIRCUITRY ROOM	111	129	0	4	1	5	0.06	-	10	830	1.2%	10	
EF-2	6	UNISEX RESTROOM	112	82	0	-	-	-	-	-	-	75	73.1%	55	
EF-3	6	UNISEX RESTROOM	114	82	0	-	-	-	-	-	-	75	73.1%	55	
EF-2	6	JANITORS CLOSET	113	19	0	-	-	-	0.12	-	2	20	73.1%	15	
HP-2	2	UTILITY ROOM	116	74	0	-	-	-	0.12	-	9	60	18.3%	11	
HP-2	2	ASTRONOMY CLASS	117	387	0	35	14	10	0.12	-	182	1,000	18.3%	183	
HP-2	2	NFS ASTRO EXHIBIT	118	440	0	40	18	8	0.06	-	158	900	18.3%	165	
HP-2	2	SOS THEATER	119	777	0	150	117	5	0.06	-	629	3,690	18.3%	676	
HP-2	2	STAFF OFFICE	121	240	0	5	1	5	0.06	-	20	350	18.3%	64	
HP-1	1	RESTROOM HALLWAY	106	91	0	5	0	5	0.06	-	8	100	20.4%	20	

AIR HANDLER OUTSIDE AIR COMPLIANCE SCHEDULE PER IMC 2018

		Design Airflow			Table 403.3	CODE AIR FLOW (Section 403.3.2.3)								Design Airflow Based on Vot
		SA		OA	OA	Max	Sum	Sum					Vot	
ir Handling Un	AC #	CFM	%OA	CFM	CFM	Zp	Rp*Pz	Ra*Az	D	Vou	Ev	CFM	%OA	
HP-1	1	6,000	20.4%	1,225	482	0.12	287	194	1	481.7	1	482	8%	
HP-2	2	6,000	18.3%	1,100	999	0.18	856	143	1	998.9	0.9	1,110	18%	
HPFC-1 & 3	3	1,290	6.5%	84	84	0.06	21	63	1	83.5	1	84	6%	
HPFC-2	4	830	1.4%	12	12	0.01	0	12	-	11.5	1	12	1%	
HPFC-4, EF-1	5	830	1.2%	10	10	0.01	3	8	1	10.3	1	10	1%	
HPFC-5	6	370	73.1%	270	23	0.11	0	23	-	22.7	1	23	6%	

PLUMBING FIXTURES

WC-1
WATER CLOSET: (WALL HUNG, FLUSH VALVE)
AMERICAN STANDARD "AFWALL" MODEL #3351.101, WALL HUNG, VITREOUS CHINA, DIRECT-FED SIPHON JET ACTION, ELONGATED BOWL, 1-1/2" TOP SPUD, 1.6/1.1 GPF CONSUMPTION.
SEAT:
BEMIS MODEL #1955CT, WHITE ELONGATED SEAT, LESS COVER, OPEN FRONT, AND SELF-SUSTAINING CHECK HINGES.
CARRIER:
WATTS MODEL #CA-101, CA-121, CA-131, CA-141, CA-151 SERIES AS REQUIRED.
FLUSH VALVE:
AMERICAN STANDARD ULTIMA MODEL 6147.111.002 MANUAL TOILET FLUSH VALVE, DIAPHRAGM TYPE. 1.1GPF, SELF CLEANING, WITH WALL FLANGE AND COVER TUBE.

WC-2
WATER CLOSET: (WALL HUNG, FLUSH VALVE, ADA)
AMERICAN STANDARD "AFWALL" MODEL #3351.101, WALL HUNG, 16 1/2" HIGH, A.D.A. COMPLIANT, VITREOUS CHINA, DIRECT-FED SIPHON JET ACTION, ELONGATED BOWL, 1-1/2" TOP SPUD, 1.6/1.1 GPF CONSUMPTION.
SEAT:
BEMIS MODEL #1955CT, WHITE ELONGATED SEAT, LESS COVER, OPEN FRONT, AND SELF-SUSTAINING CHECK HINGES.
CARRIER:
WATTS MODEL #CA-101, CA-121, CA-131, CA-141, CA-151 SERIES AS REQUIRED.
FLUSH VALVE:
AMERICAN STANDARD ULTIMA MODEL 6147.111.002 MANUAL TOILET FLUSH VALVE, DIAPHRAGM TYPE. 1.1GPF, SELF CLEANING, WITH WALL FLANGE AND COVER TUBE.

EWC-1
ELECTRIC WATER COOLER:
ELKAY MODEL LZSTL8WSLP, EZH2O BI-LEVEL WATER COOLER WITH BOTTLE FILL STATION. WALL MOUNT UNIT WITH ELECTRIC BOTTLE FILL SENSOR, FRONT AND SIDE BUBBLER PUSH BAR, HANDS FREE. VISUAL FILTER MONITOR, AUTOMATIC FILTER STATUS RESET, LAMINAR FLOW FOR MINIMAL SPLASH, ANTIMICROBIAL PROTECTION ON KEY PLASTIC COMPONENTS.

EWC-2
NON-REFRIGERATED WATER FOUNTAIN:
MODEL 1001 WALL MOUNTED BARRIER-FREE DRINKING FOUNTAIN SHALL INCLUDE AN 18 GAUGE TYPE 304 STAINLESS STEEL SATIN FINISH BASIN WITH INTEGRAL SWIRL DESIGN, 14 GAUGE TYPE 304 STAINLESS STEEL WALL BRACKET, 100% LEAD-FREE WATERWAYS, PUSH-BUTTON OPERATED STAINLESS STEEL VALVE WITH FRONT-ACCESSIBLE CARTRIDGE AND FLOW ADJUSTMENT, POLISHED CHROME-PLATED BRASS VANDAL-RESISTANT BUBBLER HEAD WITH INTEGRAL LAMINARANTI-SQUIRT FLOW, CHROME-PLATED BRASS VANDAL-RESISTANT WASTE STRAINER, VANDAL-RESISTANT BOTTOM PLATE, AND1-1/4"O.D. WASTE PIPE. (P-TRAP AND STOP REQUIRE REAR ACCESS)

PROVIDE WITH:
FILTER: MODEL 6426, 12"X2", IN-LINE LEAD REMOVAL ELEMENT THAT REDUCES LEAD FROM INCOMING WATER SUPPLY. ACCESS PANEL:MODEL6603,SATINFINISHSTAINLESSSTEELACCESSPANEL. INCLUDES FRAME AND SCREWS. SUPPORT CARRIER: MODEL 6800 UNIVERSAL IN-WALL MOUNTING SUPPORT FOR USE WITH MOST FOUNTAINS.
BACKPANEL: MODEL BP6, SATIN FINISH STAINLESS STEEL BACK PANEL.

LV-1
LAVATORY:
AMERICAN STANDARD MODEL #0630.000 "ORBIT", 15 1/2" DIAMETER ROUND UNDERCOUNTER MOUNT SINK.VITREOUS CHINA, FRONT OVERFLOW WITH TEMPLATE AND MOUNTING KIT (047194-0070A).
FAUCET:
AMERICAN STANDARD MODEL # 7385.003.V05 SINGLE CONTROL LAVATORY FAUCERT, ALL METAL BODY WITH METAL LEVER HANDLE. CAST BRASS WATERWAY WITH FLEXIBLE HOSE CONNECTIONS WITH A WASHERLESS CERAMIC DISC VALVE CARTRIDGE WITH INTEGRAL HOT LIMIT SAFETY STOP AND BDT BELOW DECK THERMOSTATIC MIXING VALVE FOR HOT AND COLD WATER SUPPLY SERVICE WITH AERATOR AND 0.5 GPM FLOW RESTRICTOR. 4" CENTERSET WITH ELKAY MODEL LKAD174 OFFSET CHROME PLATED BRASS DRAIN WITH PERFORATED GRID, STRAINER AND 1 1/4" TAILPIECE.
TRAP:
PROFLO MODEL PFPTB401 1-1/4" X 1-1/2" CHROME PLATED SEMI-CAST BRASS P-TRAP WITH CLEANOUT.
SUPPLIES:
MCGUIRE MODEL MLFBV2165CCR15 1/2" X 3/8" OD CHROME PLATED LOOSE KEY QUARTER TURN BALL VALVE STYLE COMPRESSION ANGLE STOPS WITH 16" FLEXIBLE RISER TUBES AND ESCUTCHEONS.
NOTE:
INSULATE "P" TRAP AND WATER RISERS WITH TRUEBRO MODEL #102 WITH MODEL #105 HANDI LAV-GUARD INSULATING KIT.

MS-1
MOP BASIN:
FIAT MODEL #TSBC-3000 TERRAZZO CORNER MOP SERVICE BASIN, 24" X 24" X 12" DEEP, INTEGRAL 3" DRAIN, STRAINER.
FAUCET:
FIAT MODEL #830-AA SERVICE SINK FAUCET WITH VACUUM BREAKER, 3/4" HOSE THREAD-ON SPOUT, LEVER HANDLES, WALL BRACE, PAIL HOOK, INTEGRAL STOPS AND POLISHED CHROME-PLATED.
HOSE AND BRACKET:
FIAT MODEL #832-AA HOSE AND BRACKET.
MOP HANGER:
FIAT MODEL #889-CC MOP HANGER.

WH-1
WATER HEATER:
A.O.SMITH MODEL DEN-40 ELECTRIC WATER HEATER, TOP MOUNTED 3/4"NPT WATER CONNECTIONS, SIDE MOUNTED ELECTRICAL CONNECTIONS, 480V, 6KW (TWO 3 KW ELEMENTS-SIMULTANEOUS OPERATION). 41 GALLON PER HOUR RISE RECOVERY AT 60°F, RATED STORAGE VOLUME IS 40 GALLONS.

FD-1
FLOOR DRAIN:
ZURN MODEL #ZN415BZ1, C.I BODY, 6" POLISHED NICKEL BRONZE TOP AND STRAINER, NO-HUB OUTLET. 2" DRAIN SIZE. WITH SURESEAL TRAP SEAL MODEL SS2009V.

FCO-1
FLOOR CLEAN OUT:
ZURN MODEL #CO1-NH2-R6. NO HUB, 4" DRAIN SIZE, 6" ROUND TOP IN NICKEL BRONZE.

FCO-2
FLOOR CLEAN OUT:
ZURN MODEL #CO1-NH4-R6. NO HUB, 2" DRAIN SIZE, 6" ROUND TOP IN NICKEL BRONZE.

UR-1
URINAL:
AMERICAN STANDARD "WASHBROOK FLOWISE" MODEL #6590.503 VITREOUS CHINA, 0.125 GPF EXPOSED TOP SPUD URINAL AND MANUAL PISTON TYPE UNRINAL FLUSH VALVE. ULTRA HIGH EFFICIENCY, FLUSHING RIM WITH ELONGATED 14" RIM FROM FINISHED WALL. EXTENDED SIDES FOR PRIVACY, 3/4" INLET SPUD, OUTLET CONNECTION THREADED 2"INSIDE.
CARRIER:
WATTS MODEL #CA-311 OR #CA-321 SERIES AS REQUIRED.
FLUSH VALVE:
0.125 GPF MANUAL URINAL FLUSH VALVE (MODEL #6045.013).

DEMOLITION FIXTURE CONNECTION SCHEDULE

SYMBOL	FIXTURE	S	VT	DCW	DHW	TW	QTY	WATER F.U.	WATER TOT.	WASTE F.U.	WASTE TOT.	REMARKS
REMOVED FIXTURE CONNECTION SCHEDULE												
FD-1	FLOOR DRAIN	2"	1-1/2"	---	---	---	3	---	---	2	6	
LV-1	LAVATORY, ADA	1-1/2"	1-1/2"	---	---	1/2"	3	2	6	1	3	WALL HUNG
SK-1	SINK	3"	1-1/2"	3/4"	3/4"	---	1	3	3	2	2	
SK-2	SINK	2"	1-1/2"	1/2"	1/2"	---	1	3	3	2	2	
SK-3	SERVICE SINK	2"	1-1/2"	1/2"	1/2"	---	1	3	3	2	2	FLOOR MOUNTED
UR-1	URINAL	2"	1-1/2"	3/4"	---	---	1	5	5	2	2	WALL HUNG
WC-1	WATER CLOSET	4"	2"	1"	---	---	3	10	30	4	12	FLOOR MOUNTED
WATER TOTAL REMOVED									-50			
WASTE TOTAL REMOVED											-29	
NEW FIXTURE CONNECTION SCHEDULE												
EWC-1	ELECTRIC WATER COOLER	1-1/2"	1-1/2"	1/2"	---	---	1	0.25	0.25	0.5	0.5	
FD-1	FLOOR DRAIN	2"	1-1/2"	---	---	---	4	---	---	2	8	
LV-1	LAVATORY, ADA	1-1/2"	1-1/2"	---	---	1/2"	7	2	14	1	7	UNDER MOUNT
MS-1	MOP SINK	3"	1-1/2"	3/4"	3/4"	---	2	3	6	2	4	
WC-1	WATER CLOSET	4"	2"	1"	---	---	2	10	20	4	8	WALL MOUNTED
WC-2	WATER CLOSET, ADA	4"	2"	1"	---	---	4	10	40	4	16	WALL MOUNTED, ADA
UR-1	URINAL	4"	2"	1"	---	---	1	10	10	4	4	WALL MOUNTED
WATER TOTAL ADDED									+90.25			
WASTE TOTAL ADDED											+47.5	
WATER TOTAL CHANGE									+40.25			
WASTE TOTAL CHANGE											+18.5	

WATER CALCULATION

STATIC PRESSURE: 50 PSI (AT BUILDING ENTRANCE)
USE: 50 PSI (DESIGN PRESSURE)
SUBTRACT LOSSES: 25 PSI (PRESS. REQ'D AT W.C.)
5 PSI (ELEVATION)
5 PSI (MISC. LOSS)
---
15 PSI (REMAINING FOR PIPE LOSS)

DEVELOPED LENGTH: 100 FEET
EQUIVALENT PIPE LENGTH: 100 FEET X 1.25 = 125 FEET

CALCULATE ALLOWABLE PIPE LOSS PER 100 FEET OF PIPE

15 x 100 = 12 PSI LOSS PER 100 FEET
---
125 FEET

NOTE:
1. PIPING SIZE SHALL BE LIMITED TO 8 FEET/ SECOND MAX. VELOCITY
2. WHERE LOCAL STATIC PRESSURE IS IN EXCESS OF (80) POUNDS PER SQUARE INCH (PSI) AN APPROVED TYPE PRESSURE REGULATOR PRECEDED BY AN ADEQUATE STRAINER SHALL BE INSTALLED AND THE STATIC PRESSURE REDUCED TO (80) PSI.

PIPE MATERIAL SCHEDULE

SYSTEM	SERVICE	MATERIAL	PRESSURE WORKING PSI	PRESSURE MAX PSI	REMARKS
SANITARY SEWER (GRAVITY)	SANITARY	DWV CI NO-HUB	5	5	SEE NOTES
SANITARY VENT	SANITARY	DWV CI NO-HUB	5	5	SEE NOTES
DOMESTIC COLD WATER	DOMESTIC WATER	TYPE L COPPER	60	150	SEE NOTES
DOMESTIC HOT WATER	DOMESTIC WATER	TYPE L COPPER	60	150	SEE NOTES
CONDENSATE	HVAC	TYPE M COPPER	5	5	SEE NOTES
PUMPED CONDENSATE	HVAC	TYPE L COPPER	60	150	SEE NOTES
REFRIGERANT	HVAC	COPPER			PER MFR.'S RECOMMENDATIONS
COMPRESSED AIR	EQUIPMENT	TYPE L COPPER	60	150	SEE NOTES

1. ALL COPPER PIPING JOINTS SHALL BE SOLDERED WITH 95-5 NON-FLUX SOLDER (I.E. "SIL-FOS").
2. PROVIDE DI-ELECTRIC UNIONS AS REQUIRED.
3. PROVIDE PER NFPA 51 AND 51A.
4. CONDENSATE PIPING SHALL BE TYPE "M" COPPER WITH CAPPED TEES FOR CLEANOUTS. CAPS TO BE SCREW FITTING FOR REMOVAL WITH WRENCH, NOT SOLDERED.
5. REFERENCE SPECIFICATIONS.
6. IN ACCORDANCE WITH NFPA 13, NO THIN-WALL OR SCH 40 EQUIVALENT PIPING ALLOWED.
7. IN ACCORDANCE WITH ASTM D 2513, WITH TRACER WIRE. INSTALLED IN ACCORDANCE WITH MANUFACTURERS INSTALLATION INSTRUCTIONS. OUTDOOR USE ONLY.

Registered Professional Engineer (Mechanical)
CERTIFICATE NO.
37915
FORREST K. ISAACS
Date Signed 01-20-21
Expires 9-30-2023

ADVANTECH
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WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

NOIR Lab

KITT PEAK - Sells, AZ 85634

△	DATE	DESCRIPTION
0	01/08/21	I.F.C.

PROJECT NUMBER: 11904.00
DRAWN BY: FI
CHECKED BY: FI
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SCALE: NONE

MECHANICAL SCHEDULES & SPECIFICATIONS

M9.1

DUCT MOUNTED REHEAT COIL SCHEDULE

MARK	LOCATION	AIR SIDE CFM	AIR SIDE MAX P.D. "W.G.	HEAT SECTION ELECTRIC HEAT EAT °F DB	HEAT SECTION ELECTRIC HEAT LAT °F DB	MAX. FACE VEL (FPM)	ELECTRIC HEAT CAP (MBH)	ELECTRIC HEAT POWER	ELECTRIC HEAT Kw	ELECTRIC HEAT Amps	COIL WIDTH INCHES	COIL HEIGHT INCHES	UNIT WT (LBS)	MANUFACTURER & MODEL	REMARKS
EH-1	STAFF OFFICE 120	350	.2	58	83	650	9.5	208/3/60	3	--	10	10	--	WARREN CBK	SEE NOTES

NOTES:

1. ELECTRIC DUCT HEATERS SHALL BE OPEN COIL TYPE AS MANUFACTURED BY WARREN TECHNOLOGY. VOLTAGE, KW, SIZE NUMBER, AND ACCESSORIES SHALL BE AS SHOWN. UNITS SHALL BE U.L. LISTED FOR ZERO CLEARANCE AND MEET ALL APPLICABLE REQUIREMENTS OF THE LATEST NATIONAL ELECTRIC CODE AND A.N.S.I. STANDARDS.
2. HEATING ELEMENTS SHALL BE HIGH-GRADE NICKEL-CHROME. ELEMENT TEMPERATURE SHALL NOT EXCEED 400°F BELOW THE MELTING POINT OF THE ELEMENT ALLOWED WHEN ENERGIZED WITH DESIGN VOLTAGE IN STILL, FREE AIR AT 75°F AMBIENT.
3. HEATER FRAMES AND CONTROL BOXES SHALL BE CONSTRUCTED OF 20 GAUGE-GALVANIZED STEEL OR HEAVIER. FRAMES SHALL BE HOT DIPPED GALVANIZED AFTER FABRICATION IF SPOT WELDS ARE USED.
4. MOUNTING ASSEMBLIES FOR THE ELEMENT SUPPORT INSULATORS SHALL PASS BETWEEN THE INSULATORS PERMITTING FREE EXPANSION OF THE INSULATORS UNDER HIGH TEMPERATURE CONDITIONS WITHOUT CRACKING OR BREAKING.
5. HEATER SHALL BE FLANGED DUCT MOUNT.
6. UNIT SHALL INCLUDE HEATER COIL SUPPORTS FOR STANDARD AIR VELOCITIES AT 1550 FPM.
7. PROVIDE WITH SCR CONTROLS, FAN INTERLOCK RELAY, HINGED CONTROL PANEL WITH FUSED INTERLOCKING DISCONNECT SWITCH. PROVIDE WITH TRANSFORMER CLASS II AND 0-10V INTERFACE FOR SCR CONTROL.
8. PROVIDE WITH OVER-TEMPERATURE PROTECTION, OVER-CURRENT PROTECTION, TRANSFORMER PROTECTION, LOSS OF ARIFLOW PROTECTION WITH FAN INTERLOCK RELAY.
9. REHEAT COIL SHALL BE RATED FOR A MINIMUM OF 10 KAIC.

PACKAGED HEAT PUMP WITH ECONOMIZER W/ POWER EXHAUST SCHEDULE

PACKAGED HEAT PUMP

Mark	SAP NUMBER	Service	CAPACITY Supply SCFM	CAPACITY E.S.P. In W.G.	CAPACITY O.A. SCFM	COOLING CAPACITY Total MBH	COOLING CAPACITY Sensible MBH	HEATING Capacity MBH	ENTERING AIR DB°F	ENTERING AIR WB°F	AMBIENT Max. DB°F	AMBIENT Min. DB°F	HEAT PUMP ELECTRICAL Volts	Phase	MCA	MOP	MOTOR HP	MFR	Model	TONS	EER/ SEER	COP/ HSPF	Weight lbs.	Dimensions W/ Curb HxWxL
HP-1	--	BUILDING	6000	1.5	1100	172	111	80	81	66	100	72	460	3	36	45	3	TRANE	WSH180	15	10.6	3.2	2500	56"x85"x122"
HP-2	--	BUILDING	6000	1.5	1100	172	111	80	81	66	100	72	460	3	36	45	3	TRANE	WSH180	15	10.6	3.2	2500	56"x85"x122"

ECONOMIZER W/ POWER EXHAUST

Mark	CAPACITY Supply SCFM	CAPACITY Exhaust SCFM	CAPACITY E.S.P. In W.G.	POWER EXHAUST ELECTRICAL Volts	Phase	MCA	MOCP	MOTOR HP	MFR	Model	Weight lbs.	Dimensions W/ Curb HxWxL	Remarks
HP-1	6000	6000	0.4	460	3	8.6	10.75	5	CanFab	6114-HPE	1200	53"x43"x76"	See Notes
HP-2	6000	6000	0.4	460	3	8.6	10.75	5	CanFab	6114-HPE	1200	53"x43"x76"	See Notes

1. ELEVATION: 7000 FT.
2. PROVIDE HORIZONTAL UNIT.
3. HORIZONTAL DISCHARGE/RETURN.
4. HEATING EAT=54°F, LAT=67°F
5. PROVIDE 7-DAY PROGRAMMABLE HEAT PUMP THERMOSTAT IN MANUAL AND AUTOMATIC CHANGEOVER
6. PROVIDE UNIT WITH A SINGLE POINT OF POWER CONNECTION AND INTEGRATED ENTHALPY ECONOMIZER.
7. PROVIDE RETURN AIR SMOKE DETECTOR AND REMOTE ALARM FOR ALL UNITS 5 TONS AND LARGER, INTERLOCK TO UNIT.
8. COOLING LOADS NOTED ARE NET AND DO NOT ACCOUNT FOR TEMPERATURE AND ELEVATION. PROVIDE PERMANENT TAG ON EACH UNIT INDICATING AREA BEING SERVED PER IMC 304.12.
9. SEE OA COMPLIANCE SCHEDULE OF AREAS BEING SERVED BY EACH UNIT.
10. PROVIDE EQUAL OF TRANE OR CARRIER.
11. PROVIDE TOOL-LESS HAIL GUARDS.
12. PROVIDE UNIT CAPABLE OF COOLING MODE FROM 0°F TO 100°F AND CRANKCASE HEATER.
13. PROVIDE WITH HAIL GUARD, HINGED DOORS, OUTSIDE AIR HOOD

HEAT PUMP SPECIFICATIONS

GENERAL

THE UNITS SHALL BE CONVERTIBLE AIRFLOW. THE OPERATING RANGE SHALL BE BETWEEN 115°F AND 0°F IN COOLING AS STANDARD FROM THE FACTORY FOR ALL UNITS. COOLING PERFORMANCE SHALL BE RATED IN ACCORDANCE WITH ARI TESTING PROCEDURES. ALL UNITS SHALL BE FACTORY ASSEMBLED, INTERNALLY WIRED, FULLY CHARGED WITH R-22, AND 100 PERCENT RUN TESTED TO CHECK COOLING OPERATION, FAN AND BLOWER ROTATION AND CONTROL SEQUENCE, BEFORE LEAVING THE FACTORY. WIRING INTERNAL TO THE UNIT SHALL BE COLORED AND NUMBERED FOR SIMPLIFIED IDENTIFICATION. UNITS SHALL BE UL LISTED AND LABELED, CLASSIFIED IN ACCORDANCE TO UL 1995/CAN/CSA NO. 236-M90 FOR HEAT PUMPS. CANADIAN UNITS SHALL BE CSA CERTIFIED.

CASING

UNIT CASING SHALL BE CONSTRUCTED OF ZINC COATED, HEAVY GAUGE, GALVANIZED STEEL. EXTERIOR SURFACES SHALL BE CLEANED, PHOSPHATIZED, AND FINISHED WITH A WEATHER-RESISTANT BAKED ENAMEL FINISH. UNIT'S SURFACE SHALL BE TESTED 100 HOURS IN A SALT SPRAY TEST IN COMPLIANCE WITH ASTM B117. CABINET CONSTRUCTION SHALL ALLOW FOR ALL MAINTENANCE ON ONE SIDE OF THE UNIT. SERVICE PANELS SHALL HAVE LIFTING HANDLES AND BE REMOVED AND REINSTALLED BY REMOVING ONLY A SINGLE FASTENER WHILE PROVIDING A WATER AND AIR TIGHT SEAL. ALL EXPOSED VERTICAL PANELS AND TOP COVERS IN THE INDOOR AIR SECTION SHALL BE INSULATED WITH CLEANABLE FOIL FACED, FIRE-RETARDENT PERMANENT, ODORLESS GLASS FIBER MATERIAL. THE BASE OF THE UNIT SHALL BE INSULATED WITH 1/2 INCH, 1 POUND DENSITY FOIL-FACED, CLOSED-CELL MATERIAL. ALL INSULATION EDGES SHALL BE EITHER CAPTURED OR SEALED. THE UNIT'S BASE PAN SHALL HAVE NO PENETRATIONS WITHIN THE PERIMETER OF THE CURB OTHER THAN THE RAISED 11/8 INCH HIGH DOWNFLOW SUPPLY/RETURN OPENINGS TO PROVIDE AN ADDED WATER INTEGRITY PRECAUTION, IF THE CONDENSATE DRAIN BACKS UP. THE BASE OF THE UNIT SHALL HAVE PROVISIONS FOR FORKLIFT AND CRANE LIFTING, WITH FORKLIFT CAPABILITIES ON THREE SIDES OF THE UNIT.

UNIT TOP

THE TOP COVER SHALL BE ONE PIECE, OR WHERE SEAMS EXIST, DOUBLE HEMMED AND GASKET SEALED TO PREVENT WATER LEAKAGE. THE RIBBED TOP ADDS EXTRA STRENGTH AND PREVENTS WATER FROM POOLING ON UNIT TOP.

FILTERS

TWO INCH FILTERS SHALL BE FACTORY SUPPLIED ON ALL UNITS. PROVIDE TWO INCH PLEATED MEDIA FILTERS.

COMPRESSORS

ALL UNITS SHALL HAVE DIRECT-DRIVE, HERMETIC, SCROLL TYPE COMPRESSORS WITH CENTRIFUGAL TYPE OIL PUMPS. MOTOR SHALL BE SUCTION GAS-COOLED AND SHALL HAVE A VOLTAGE UTILIZATION RANGE OF PLUS OR MINUS 10 PERCENT OF UNIT NAMEPLATE VOLTAGE. INTERNAL OVERLOADS SHALL BE PROVIDED WITH THE SCROLL COMPRESSORS.

REFRIGERANT CIRCUITS

EACH REFRIGERANT CIRCUIT SHALL HAVE INDEPENDENT FIXED ORIFICE OR THERMAL EXPANSION DEVICES, SERVICE PRESSURE PORTS, AND REFRIGERANT LINE FILTER DRIERS FACTORY-INSTALLED AS STANDARD. AN AREA SHALL BE PROVIDED FOR REPLACEMENT SUCTION LINE DRIERS.

EVAPORATOR AND CONDENSER COILS

INTERNALLY FINNED, 3/8" COPPER TUBES MECHANICALLY BONDED TO A CONFIGURED ALUMINUM PLATE FIN SHALL BE STANDARD. COILS SHALL BE LEAK TESTED AT THE FACTORY TO ENSURE THE PRESSURE INTEGRITY. THE EVAPORATOR COIL AND CONDENSER COIL SHALL BE LEAK TESTED TO 200 PSIG AND PRESSURE TESTED TO 450 PSIG. THE CONDENSER COIL SHALL HAVE A PATENT PENDING 1 + 1 + 1 HYBRID COIL DESIGNED WITH SLIGHT GAPS FOR EASE OF CLEANING. A REVERSIBLE, REMOVEABLE, DOUBLE SLOPED CONDENSATE DRAIN PAN WITH PROVISION FOR THROUGH THE BASE CONDENSATE DRAIN IS STANDARD.

OUTDOOR FANS

THE OUTDOOR FAN SHALL BE DIRECT-DRIVE, STATICALLY AND DYNAMICALLY BALANCED, DRAW-THROUGH IN THE VERTICAL DISCHARGE POSITION. THE FAN MOTOR SHALL BE PERMANENTLY LUBRICATED AND SHALL HAVE BUILT-IN THERMAL OVERLOAD PROTECTION.

INDOOR FAN

ALL UNITS SHALL BE BELT DRIVEN. UNITS WITH BELT-DRIVE SHALL HAVE AN IDLER-ARM ASSEMBLY FOR QUICK-ADJUSTMENT OF FAN BELTS AND MOTOR SHEAVES. ALL MOTORS SHALL BE THERMALLY PROTECTED. OVERSIZED MOTORS SHALL BE AVAILABLE FOR HIGH STATIC APPLICATION. ALL INDOOR FAN MOTORS MEET THE U.S. ENERGY POLICY ACT OF 1992 (EPACT).

CONTROLS

UNIT SHALL BE COMPLETELY FACTORY WIRED WITH NECESSARY CONTROLS AND CONTACTOR PRESSURE LUGS OR TERMINAL BLOCK FOR POWER WIRING. UNIT SHALL PROVIDE AN EXTERNAL LOCATION FOR MOUNTING A FUSED DISCONNECT DEVICE. MICROPROCESSOR CONTROLS SHALL BE PROVIDED FOR ALL 24 VOLT CONTROL FUNCTIONS. THE RESIDENT CONTROL ALGORITHMS SHALL MAKE ALL HEATING, COOLING, AND/OR VENTILATING DECISIONS IN RESPONSE TO ELECTRONIC SIGNALS FROM SENSORS MEASURING INDOOR AND OUTDOOR TEMPERATURES. THE CONTROL ALGORITHM MAINTAINS ACCURATE TEMPERATURE CONTROL, MINIMIZES DRIFT FROM SET POINT, AND PROVIDES BETTER BUILDING COMFORT. A CENTRALIZED MICROPROCESSOR SHALL PROVIDE ANTI-SHORT CYCLE TIMING AND TIME DELAY BETWEEN COMPRESSORS TO PROVIDE A HIGHER LEVEL OF MACHINE PROTECTION.

DEFROST CONTROLS

ADAPTIVE DEMAND DEFROST SHALL BE PROVIDED TO PERMIT DEFROST WHEREVER COIL ICING CONDITIONS BEGIN TO SIGNIFICANTLY REDUCE UNIT CAPACITY.

ECONOMIZER -- SHALL BE EITHER FIELD OR FACTORY-INSTALLED AND SHALL BE AVAILABLE WITH OR WITHOUT BAROMETRIC RELIEF. THE ASSEMBLY INCLUDES FULLY MODULATING 0-100 PERCENT MOTOR AND DAMPERS, RELIEF, MINIMUM POSITION SETTING, PRESET LINKAGE, WIRING HARNESS WITH PLUG, SPRING RETURN ACTUATOR AND FIXED DRY BULB. THE BAROMETRIC RELIEF DAMPER PROVIDE A PRESSURE OPERATED DAMPER THAT SHALL BE GRAVITY CLOSING AND SHALL PROHIBIT ENTRANCE OF OUTSIDE AIR DURING THE EQUIPMENT "OFF" CYCLE. SOLID STATE ENTHALPY AND DIFFERENTIAL ENTHALPY CONTROL SHALL BE FACTORY OR FIELD-INSTALLED OPTIONS. THE FACTORY-INSTALLED ECONOMIZER ARRIVES IN THE SHIPPING POSITION AND SHALL BE MOVED TO THE OPERATING POSITION BY THE INSTALLING CONTRACTOR.

ENTHALPY ECONOMIZER SHALL BE PROVIDED.

CLOGGED FILTER/FAN FAILURE SWITCH --A FACTORY OR FIELD-INSTALLED DEDICATED DIFFERENTIAL PRESSURE SWITCH IS AVAILABLE TO ACHIEVE ACTIVE FAN FAILURE INDICATION AND/OR CLOGGED FILTER INDICATION. THESE INDICATIONS WILL BE REGISTERED WITH EITHER A ZONE SENSOR WITH STATUS INDICATION LIGHTS OR AN INTEGRATED COMFORT™SYSTEM.

OVERSIZED MOTORS -- FACTORY OR FIELD-INSTALLED DIRECT DRIVE OVERSIZED MOTORS SHALL BE AVAILABLE FOR HIGH STATIC APPLICATIONS.

THROUGH THE BASE UTILITIES ACCESS --

A FACTORY-INSTALLED ELECTRICAL SERVICE ENTRANCE SHALL BE PROVIDED ALLOWING ELECTRICAL ACCESS FOR BOTH CONTROL AND MAIN POWER CONNECTIONS INSIDE THE CURB AND THROUGH THE BASE OF THE UNIT. OPTION WILL ALLOW FOR FIELD INSTALLATION OF LIQUID-TIGHT CONDUIT AND AN EXTERNAL FIELD-INSTALLED DISCONNECT SWITCH.

HIGH PRESSURE CUTOUT -- THIS FACTORY-INSTALLED OPTION IS OFFERED FOR UNITS THAT DO NOT HAVE HIGH PRESSURE CUTOUT AS STANDARD. ALL 3-PHASE UNITS WITH SCROLL COMPRESSORS SHALL HAVE A HIGH PRESSURE CUTOUT AS STANDARD.

HINGED ACCESS DOORS -- SHEET METAL HINGES ARE AVAILABLE FACTORY-INSTALLED ON THE FILTER/EVAPORATOR, SUPPLY FAN/HEAT, AND THE COMPRESSOR/CONTROL ACCESS DOORS.

RETURN AIR SMOKE DETECTOR --FACTORY-INSTALLED, IF SMOKE IS DETECTED, ALL UNIT OPERATION WILL BE SHUT DOWN. RESET WILL BE MANUAL AT THE UNIT. RETURN AIR SMOKE DETECTORS REQUIRE MINIMUM ALLOWABLE AIRFLOW WHEN USED WITH CERTAIN MODELS. SEE THE INSTALLATION, OPERATION, AND MAINTENANCE (IOM) MANUAL FOR THE MODELS AFFECTED AND THE MINIMUM ALLOWABLE AIRFLOW REQUIRED.

AIR DEVICE SCHEDULE

MARK	SERVICE	PANEL SIZE	NECK SIZE INCHES	MOUNTING TYPE	MFR	MODEL	REMARKS
A	SUPPLY	SEE PLANS	SEE PLANS	SIDEWALL	KRUEGER	5880 - RECT	SEE NOTES 1 THROUGH 5
B	SUPPLY	SEE PLANS	SEE PLANS	SIDEWALL	KRUEGER	AF5880H	SEE NOTES 1 THROUGH 5
C	RETURN	SEE PLANS	SEE PLANS	SIDEWALL	KRUEGER	EGC5 - RECT.	SEE NOTES 1 THROUGH 5
D	SUPPLY	SEE PLANS	SEE PLANS	DUCT	KRUEGER	5DMGDR	SEE NOTES 1 THROUGH 5
E	EXHAUST	12" X 12"	SEE PLANS	DUCT MOUNTED	KRUEGER	EGC5 - RECT.	SEE NOTES 1 THROUGH 5
F	SUPPLY	SEE PLANS	SEE PLANS	DUCT MOUNTED	KRUEGER	5SH	SEE NOTES 1 THROUGH 5
G	TRANSFER	SEE PLANS	SEE PLANS	DUCT MOUNTED	KRUEGER	S585 - 35° DEFLECTION	SEE NOTES 1 THROUGH 5
DG	TRANSFER	SEE PLANS	SEE PLANS	DOOR MOUNTED	KRUEGER	5600A	NOTE 6

NOTES:

1. PROVIDE WITH ALUMINUM OBD BALANCING DAMPER.
2. PROVIDE SUPPLY 4-WAY DIFFUSERS UNLESS NOTED OTHERWISE.
3. PAINT BRITISH WHITE.
4. WHERE AIR DEVICE CONNECTION IS RECTANGULAR PROVIDE TRANSITION AS REQUIRED.
5. PROVIDE EQUAL OF PRICE.
6. ALUMINUM TRANSFER GRILLE WITH SINGLE FLAT FRAME (AUXILIARY FRAME), BRITISH WHITE PAINT.

EXHAUST FAN SCHEDULE

MARK	LOCATION	SERVICE	FAN TYPE	CFM	EXT. STATIC " W.G.	POWER FLA OR MAX. AMPS	ELEC. V/PH/HZ	MFR	MODEL	REMARKS
EF-1	CEILING SPACE	CIRCUITRY ROOM	CENT.	155	1	4.1 FLA	120/1/60	GREENHECK	SP-A700-VG	SEE NOTES 1,3,4,6
EF-2	CEILING SPACE	UNISEX RESTROOM	CENT.	125	1	4.1 FLA	120/1/60	GREENHECK	CSP-A700-VG	SEE NOTES 1,3,4,6
EF-3	CEILING SPACE	UNISEX RESTROOM	CENT.	75	1	4.1 FLA	120/1/60	GREENHECK	SP-A700-VG	SEE NOTES 1,3,4,6
EF-4	CEILING SPACE	WOMEN RESTROOM	CENT.	275	1	4.1 FLA	120/1/60	GREENHECK	CSP-A700-VG	SEE NOTES 1,2,3,4,6
EF-5	CEILING SPACE	MEN RESTROOM	CENT.	485	1	6 AMPS	120/1/60	GREENHECK	CSP-A780	SEE NOTES 1,2,3,4,6,7

NOTES:

1. ALTITUDE: 7000 FT.
2. PROVIDE WITH MFR'S RECTANGULAR WALL CAP.
3. PROVIDE EQUAL OF COOK.
4. PROVIDE FAN WITH GRAVITY BACKDRAFT DAMPER.
5. PROVIDE WITH EC MOTOR AND MOUNTED POTENTIOMETER DIAL FOR FIELD BALANCE.
6. PROVIDE WITH ISOLATION KIT.
7. PROVIDE SOLID STATE SPEED CONTROL.

MINI SPLIT HEAT PUMP UNIT SCHEDULE

EVAPORATOR - INDOOR AIR HANLDING UNIT

MARK	SERVICE	CAPACITY SUPPLY ACFM	CAPACITY OA ACFM	COOLING LOAD TOTAL/SENS MBH	HEATING LOAD TOTAL MBH	ENTERING AIR D.B. D.F.	ENTERING AIR W.B. D.F.	SEER	HSPF	ELECTRICAL V	PH.	HZ	MCA/FLA	UNIT MFR	MODEL	TONS	DIMS (IN.) HXWXD	WEIGHT LBS	REMARKS
HPFC-1	CONTROL ROOM	830	NONE	21 / 19	24.9	80	67	16.2	10	208	1	60	1	MITSUBISHI	PKA-A36KA7	3	14x46x12	50	NOTES: 1 THRU 9
HPFC-2	COMPUTER ROOM	830	NONE	21 / 19	24.9	80	67	16.2	10	208	1	60	1	MITSUBISHI	PKA-A36KA7	3	14x46x12	50	NOTES: 1 THRU 9
HPFC-3	CONTROL ROOM	830	NONE	21 / 19	24.9	80	67	16.2	10	208	1	60	1	MITSUBISHI	PKA-A36KA7	3	14x46x12	50	NOTES: 1 THRU 9
HPFC-4	CIRCUITRY ROOM	830	NONE	21 / 19	24.9	80	67	16.2	10	208	1	60	1	MITSUBISHI	PKA-A36KA7	3	14x46x12	50	NOTES: 1 THRU 9
HPFC-5	CONTROL ROOM	830	NONE	21 / 19	24.9	80	67	16.2	10	208	1	60	1	MITSUBISHI	PKA-A36KA7	3	14x46x12	50	NOTES: 1 THRU 9

CONDENSER - OUTDOOR UNIT

MARK	AMBIENT MAX. D.F.	AMBIENT MIN. D.F.	REFRIGERANT LINES/DRAIN LIQUID OD (IN.)	VAPOR OD (IN.)	DRAIN OD (IN.)	ELECTRICAL V	PH.	HZ	MCA/FLA	UNIT MFR	MODEL	TONS	DIMS (IN.) HXWXD	WEIGHT LBS	REMARKS
HPCU-1	100	0	5/8	3/8	5/8	208	1	60	28/--	MITSUBISHI	PUZ-HA36NHA5	3	38x38x14	175	NOTES: 1 THRU 10
HPCU-2	100	0	5/8	3/8	5/8	208	1	60	28/--	MITSUBISHI	PUZ-HA36NHA5	3	38x38x14	175	NOTES: 1 THRU 10
HPCU-3	100	0	5/8	3/8	5/8	208	1	60	28/--	MITSUBISHI	PUZ-HA36NHA5	3	38x38x14	175	NOTES: 1 THRU 10
HPCU-4	100	0	5/8	3/8	5/8	208	1	60	28/--	MITSUBISHI	PUZ-HA36NHA5	3	38x38x14	175	NOTES: 1 THRU 10
HPCU-5	100	0	5/8	3/8	5/8	208	1	60	28/--	MITSUBISHI	PUZ-HA36NHA5	3	38x38x14	175	NOTES: 1 THRU 10

NOTES:

1. ALTITUDE: 7000 FT.
2. DAIKIN, CARRIER, TRANE OR LENNOX ARE APPROVED EQUALS.
3. REFRIGERANT SHALL BE R410A
4. PROVIDE WITH TEMPERATURE SENSOR AND CONTROLLER AND ISOLATION. WIRE TO UNIT
5. PROVIDE WITH INTEGRAL CONDENSATE PUMP.PUMP SHALL BE EQUAL TO SAUERMANN SI-30. POWERED BY WALL MOUNTED UNIT AT 208/1/60.
6. CONDENSING UNIT SHALL BE LOCATED OUTDOORS AND SHALL BE RATED FOR OUTDOOR USE. 115 DEGREES F MAXIMUM AND 0 DEGREES F MINIMUM.
7. PROVIDE WITH SINGLE POINT OF POWER CONNECTION TO UNIT
8. PROVIDE WITH LOW AMBIENT KIT, WIND BAFFLE, EVAPORATOR DEFROST CONTROL, HEAD PRESSURE CONTROL, CRANKCASE HEATER, QUICK START KIT AND CONDENSING UNIT VIBRATION.
9. PROVIDE REFRIGERANT PIPING PER MANUFACTURERS RECOMMENDATIONS FOR THE APPLICATION, ROUTE, LENGTH, LOCATION AND SUITABILITY. PROVIDE PLANS AND SECTIONS TO THE MANUFACTURER AND SEEK INSTRUCTIONS PRIOR TO INITIATION OF WORK.
10. EQUIPMENT SHALL BE RATED FOR 245 LINEAR FEET OF PIPING RUN. CONTRACTOR SHALL BE RESPONSIBLE TO ROUTE PIPING AND LOCATE UNITS SUCH THAT THEY DO NOT EXCEED THE MANUFACTURES MAXIMUM PIPING RUNS.
11. PROVIDE 1" ARMAFLEX INSULATION ON ALL REFRIGERANT PIPING, PROVIDE ALL SERVICE JACKET ON ALL EXTERIOR INSULATION, SEE SPECIFICATION SECTION 15080 MECHANICAL INSULATION.

Registered Professional Engineer (Mechanical)
CERTIFICATE NO.
37915
FORREST K. ISAACS
Date Signed 01-08-21
ARIZONA, U.S.A.
Expires 9-30-2023

ADVANTECH
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WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

NOIR Lab | NSF

KITT PEAK - Sells, AZ 85634

△	DATE	DESCRIPTION
0	01/08/21	I.F.C.

PROJECT NUMBER: 11904.00
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SCALE: NONE

MECHANICAL SPECIFICATIONS

M9.2

SECTION 15010-MECHANICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 INTENT

A. IT IS THE INTENT OF THE CONTRACT DOCUMENTS TO CALL FOR FINISHED WORK, TESTED AND READY FOR OPERATION INCLUDING APPARATUS, APPLIANCES, MATERIALS, AND WORK. PROVIDE INCIDENTAL ACCESSORIES NECESSARY TO MAKE WORK COMPLETE AND READY FOR OPERATION WITHOUT ADDITIONAL EXPENSE TO THE OWNER. SHOULD THERE APPEAR TO BE DISCREPANCIES BETWEEN OR QUESTIONABLE INTENT OF THE CONTRACT DOCUMENTS, CONSULT THE OWNER AND THE ARCHITECT FOR CLARIFICATION, BEFORE ANY MATERIAL OR EQUIPMENT IS ORDERED OR WORK IS BEGUN.

B. MANUFACTURERS NAMED WITHIN THE CONTRACT DOCUMENTS HAVE BEEN SELECTED FOR THE SPECIFIC PURPOSE OF DESCRIBING THE TYPE, QUALITY AND DESIGN OF EQUIPMENT REQUIRED. VARIOUS PROJECT CONDITIONS HAVE PREDICATED SELECTION OF MANUFACTURER SCHEDULED ON DRAWINGS TO MEET SPECIFIC DESIGN AND DIMENSIONAL CRITERIA. CONTRACTOR MAY PREPARE HIS BID USING OTHER ACCEPTABLE MANUFACTURERS NAMED IN THE SPECIFICATIONS PROVIDED DIMENSIONS, SPACE LIMITATIONS, PAD, SUPPORT, CURB, ROOF OPENING, ELECTRICAL NEED AND OTHER MANUFACTURER VARIATIONS ARE FULLY COORDINATED WITH APPLICABLE DRAWINGS AND SPECIFICATION DIVISIONS WITHOUT ADDITIONAL COST TO OWNER.

C. WHERE CONTRACTORS PROPOSE TO SUBSTITUTE AN ITEM OF EQUIPMENT OTHER THAN THAT SPECIFIED OR DETAILED ON DRAWINGS, WHICH REQUIRES ANY REDESIGN OF THE STRUCTURE, PARTITIONS, FOUNDATIONS, PIPING, WIRING OR ANY OTHER PART OF MECHANICAL, ELECTRICAL, OR OWNER AND THE ARCHITECTURAL LAYOUT, SUCH REDESIGN, AND NEW DRAWINGS AND DETAILING REQUIRED THEREFORE, SHALL BE PREPARED BY THE CONTRACTOR AT HIS OWN EXPENSE AND SHALL BE SUBMITTED TO THE OWNER AND THE ARCHITECT FOR CONSIDERATION. WHERE SUCH APPROVED DEVIATION REQUIRES A DIFFERENT QUANTITY AND ARRANGEMENT OF DUCTWORK, PIPING, WIRING, CONDUIT, AND EQUIPMENT FROM THAT SPECIFIED OR INDICATED ON DRAWINGS, CONTRACTOR SHALL PROVIDE ANY SUCH DUCTWORK, PIPING, STRUCTURAL SUPPORTS, INSULATION, CONTROLLERS, MOTORS, STARTERS, EQUIPMENT, ELECTRICAL WIRING AND CONDUIT, AND ANY OTHER ADDITIONAL COMPONENTS REQUIRED BY THE SUBSTITUTED SYSTEM, AT NO ADDITIONAL COST TO THE OWNER.

1.2 DRAWINGS AND SPECIFICATIONS

A. DRAWINGS ARE GENERALLY DIAGRAMMATIC, INTENDED TO DEFINE SCOPE AND GENERAL ARRANGEMENT OF WORK. DRAWINGS DO NOT SHOW EVERY OFFSET, FITTING, OR STRUCTURAL DIFFICULTY THAT WILL BE ENCOUNTERED DURING COORDINATION AND INSTALLATION OF WORK. P&IDS SUPPLEMENT THE DRAWINGS, AND IN ADDITION TO DEFINING INSTRUMENTATION REQUIREMENTS, IDENTIFY VALVES, SPECIALTIES, AND DETAILS NOT NECESSARILY SHOWN ON THE DRAWINGS. SPECIFICATIONS DENOTE STYLE AND QUALITY OF WORKMANSHIP TO BE EMPLOYED. WHERE A CONFLICT EXISTS BETWEEN DRAWINGS AND SPECIFICATIONS, PROMPTLY NOTIFY OWNER AND THE ARCHITECT FOR INTERPRETATION AND RESOLUTION.

1.3 WARRANTY

A. PROVIDE MANUFACTURER'S WRITTEN WARRANTIES COVERING DEFECTS IN MATERIAL AND WORKMANSHIP OF PRODUCTS AND EQUIPMENT UTILIZED FOR THE PROJECT.

B. WARRANTIES SHALL BE FOR A PERIOD OF 1 YEAR FROM THE DATE OF SUBSTANTIAL COMPLETION UNLESS MORE STRINGENTLY SPECIFIED WITHIN INDIVIDUAL SECTIONS OF THIS DIVISION.

PARTS 2 AND 3 - PRODUCTS AND EXECUTION

2/3.1 TRADE COORDINATION

A. GENERAL:
1. REVIEW CONTRACT DOCUMENTS TO VERIFY THE LOCATION OF THE VARIOUS BUILDING COMPONENTS AND ITEMS TO BE INSTALLED BY OTHER TRADES. COORDINATE WORK SCHEDULE FOR A MINIMUM OF INTERFERENCE WITH WORK OF OTHER TRADES. ASCERTAIN TEMPORARY OPENING SIZES AND LOCATIONS NECESSARY FOR ADMISSION OF MECHANICAL EQUIPMENT AND COORDINATE REQUIREMENTS WITH WORK OF OTHER DIVISIONS. SHOULD CONDITIONS REQUIRE REVISIONS TO SPACE REQUIREMENTS OR MAJOR REARRANGEMENT TO SUIT THE EQUIPMENT PROPOSED FOR INSTALLATION, SUBMIT DETAILED SHOP DRAWINGS SHOWING CHANGES AND ARRANGEMENTS FOR SPACE AND REVISIONS TO WORK SPECIFIED UNDER OTHER DIVISIONS BEFORE PROCEEDING WITH WORK. DO NOT DECREASE SIZES OR MAKE RADICAL CHANGES IN INSTALLATION WITHOUT OBTAINING PRIOR WRITTEN CONSENT FROM THE OWNER AND THE ARCHITECT. CHANGES TO WORK, WHICH BECOME NECESSARY DUE TO FAILURE TO COORDINATE WORK, SHALL BE DONE AT THE INSTALLER'S EXPENSE.
2. COORDINATE WITH INSTALLERS FOR OTHER DIVISIONS AND SECTIONS TO DEFINE SPACE REQUIREMENTS AND CLEARANCE REQUIREMENTS WITH RESPECT TO OTHER EQUIPMENT IN THE BUILDING. OWNER AND THE ARCHITECT RESERVES THE RIGHT TO DETERMINE SPACE PRIORITIES WHERE INTERFERENCES OCCUR BETWEEN PIPING, CONDUIT AND EQUIPMENT OF VARIOUS TRADES.

B. VISITING THE PREMISES:
1. VISIT PREMISES AND BECOME THOROUGHLY FAMILIAR WITH THE GENERAL LAYOUT OF THE BUILDING SITE AND THE LOCATION OF EXISTING LINES TO WHICH CONNECTIONS ARE TO BE MADE BEFORE ORDERING MATERIAL OR STARTING WORK. CHECK PRESENT GRADES, DITCHES, PAVEMENTS, AND OTHER CONDITIONS WHICH MIGHT AFFECT UTILITY INSTALLATIONS.
2. VERIFY MEASUREMENTS AT THE PROJECT TO GREATEST EXTENT POSSIBLE PRIOR TO FABRICATION. WHERE SEQUENCE OF MEASURING BEFORE FABRICATION WOULD DELAY PROJECT, PROCEED WITH FABRICATION ALLOWING AMPLE TOLERANCES AND PROVIDING OFFSETS TO ACCOMMODATE AS-BUILT CONDITIONS. CONTRACTOR SHALL ASSUME FULL RESPONSIBILITY FOR MAKING A PROPER AND THOROUGH INVESTIGATION OF REQUIREMENTS. SUBMIT SIGNIFICANT DIFFERENCES FOUND TO OWNER AND THE ARCHITECT FOR CONSIDERATION BEFORE PROCEEDING WITH CORRECTIVE MEASURES.

C. INTERFERENCES:
1. LOCATIONS OF VARIOUS PARTS OF EQUIPMENT, DUCTWORK, AND PIPING ARE DIAGRAMMATIC AND APPROXIMATELY CORRECT. DETERMINE EXACT LOCATIONS ON THE JOB, BEING GOVERNED BY STRUCTURAL CONDITIONS OF THE BUILDING AND COORDINATION WITH WORK OF OTHER TRADES.
2. DO NOT PREVENT OR DISTURB OPERATION OF ACTIVE SERVICES WHICH ARE TO REMAIN. IF WORK MAKES TEMPORARY SHUTDOWN OF SERVICES UNAVOIDABLE, CONSULT WITH OWNER AS TO DATES, PROCEDURES AND ESTIMATED DURATION OF DOWN TIME PERIOD AT LEAST TEN WORKING DAYS PRIOR TO DATE OF SHUTDOWN. ARRANGE WORK FOR CONTINUOUS PERFORMANCE TO ASSURE THAT EXISTING OPERATING SERVICES WILL BE SHUT DOWN ONLY DURING TIME IT IS NECESSARY TO MAKE CONNECTIONS. IF A SYSTEM CANNOT BE SHUT DOWN, INSTALL TEMPORARY BYPASSES UNTIL FINAL CONNECTIONS ARE COMPLETE.
3. LOCATIONS OF EXISTING UTILITY SERVICES OR INSTALLATIONS HAVE BEEN OBTAINED FROM THE BEST AVAILABLE INFORMATION. DETERMINE EXACT LOCATION OF EXISTING SERVICE LINES OR INSTALLATIONS ENCOUNTERED IN PERFORMANCE OF WORK AND PROVIDE SUITABLE PROTECTION, SUPPORT AND MAINTENANCE.
4. IMMEDIATELY REPAIR OR REPLACE UTILITY SERVICES OR INSTALLATIONS DAMAGED IN PERFORMANCE OF WORK. OBTAIN WRITTEN APPROVAL OF REPAIR OR REPLACEMENT FROM THE OWNER AND THE ARCHITECT AND UTILITY COMPANY.
5. IF EXISTING ACTIVE UTILITY SERVICES ARE ENCOUNTERED WHICH REQUIRE RELOCATION, MAKE REQUEST OF PROPER AUTHORITIES FOR DETERMINATION OF PROCEDURES. PROPERLY TERMINATE EXISTING SERVICES TO BE ABANDONED IN CONFORMANCE WITH REQUIREMENTS OF AUTHORITIES HAVING JURISDICTION.
6. ALL REMOVED EQUIPMENT SHALL REMAIN THE OWNER'S PROPERTY UNLESS OTHERWISE STATED IN OTHER ARTICLES OF THESE SPECIFICATIONS.

D. ACCESS TO MECHANICAL EQUIPMENT:
1. INSTALL EQUIPMENT TO PROVIDE FOR MANUFACTURERS RECOMMENDED ACCESS AREA AND TO PROVIDE SPACE FOR SERVICE, MAINTENANCE AND OPERATIONAL ACCESS TO EQUIPMENT.
2. MARK LOCATION OF THE EQUIPMENT PRIOR TO INSTALLATION AND SEEK OWNER APPROVAL PRIOR TO INSTALLATION.

E. SERVICE CONNECTIONS:
1. THE DRAWINGS INDICATE ONLY APPROXIMATE LOCATIONS OF UTILITY ROUGH-INS. EXACT ROUGH-IN LOCATIONS SHALL BE DETERMINED FROM LARGE SCALE CERTIFIED DRAWINGS. THE CONTRACTOR SHALL OBTAIN LARGE SCALE CERTIFIED ROUGH-IN DRAWINGS BEFORE PROGRESSING WITH ANY WORK FOR ROUGH-IN CONNECTIONS.

F. EXCAVATING FOR MECHANICAL WORK:
1. THE WORK OF THIS ARTICLE IS DEFINED TO INCLUDE EXCAVATING AND BACKFILLING NECESSARY FOR INSTALLATION OF MECHANICAL WORK. COORDINATE WORK OF THIS ARTICLE WITH OTHER WORK IN THE SAME AREA, INCLUDING: DEWATERING, FLOOD PROTECTION, OTHER TEMPORARY FACILITIES, EXISTING UNDERGROUND FACILITIES, LANDSCAPE DEVELOPMENT, PAVING, FLOOR SLABS ON GRADE, AND OTHER UNDERGROUND SERVICES.
   a. PROVIDE SEPARATE TRENCHES FOR ALL LINES UNLESS OTHERWISE NOTED.
   b. PLACE EXTERIOR UNDERGROUND WATER-BEARING PIPE (INCLUDING DRAINAGE LINES) A MINIMUM OF 0.76 M [(2'_6")] BELOW GRADE (MEASURED TO TOP OF PIPE) OR BELOW FROST LINE, WHICHEVER IS GREATER UNLESS OTHERWISE APPROVED IN WRITING BY THE OWNER AND THE ARCHITECT "OR" UNLESS NOTED OTHERWISE OR NECESSITATED BY DRAINAGE SLOPE REQUIREMENTS.
2. SUPPORT PIPE IN SIZES DN 125 [(5 INCHES)] AND SMALLER DIRECTLY ON UNDISTURBED SOIL. SUPPORT LARGER SIZES AND OTHER PREFABRICATED WORK (TANKS, METERS, ETC.) ON COMPACTED AND SHAPED SUBBASE MATERIAL NOT LESS THAN 150 MM [(6 INCHES)] DEEP. BELL HOLES SHALL BE EXCAVATED SO THAT PIPE WILL REST DIRECTLY ON SOLID GROUND FOR ITS ENTIRE LENGTH. COMPACT PREVIOUSLY DISTURBED SUBSOIL TO PROVIDE ADEQUATE AND UNIFORM SUPPORT; EXCAVATE UNSATISFACTORY SUBSOIL TO GREATER DEPTH AND REPLACE WITH STABLE COMPACTED SUBBASE MATERIAL OR LOW SLUMP CONCRETE TO ASSURE ADEQUATE SUPPORT. BACKFILL BY HAND AND COMPACT THOROUGHLY WITH MECHANICAL TAMPER.
3. WHERE PIPING LOCATED OUTSIDE OF THE BUILDING, UNDER DRIVES, ROADS, OR PARKING LOTS IS LESS THAN 0.76 M [(2'_6")] BELOW FINAL SURFACE ELEVATION, PROVIDE ENCASEMENT CONSISTING OF CLASS 2500 CONCRETE, 100 MM [(4 INCHES)] MINIMUM COVERAGE ALL AROUND.
4. DO NOT BACKFILL OR ENCASE UNDERGROUND PIPING UNTIL TESTING HAS BEEN COMPLETED.

2/3.2 MECHANICAL PROCEDURES AND CONTROLS

A. TESTING REQUIREMENTS:
1. ARRANGE FOR TESTING OF INSTALLED SYSTEMS IN ACCORDANCE WITH REQUIREMENTS OF AUTHORITIES HAVING JURISDICTION AND THE REQUIREMENTS OF DIVISION 1 AND DIVISION 15. TESTING PROCEDURES SHALL INCLUDE PROVISION OF LABOR, MATERIALS, INSTRUMENTS, AND POWER NECESSARY FOR SUCCESSFUL COMPLETION. TEST DURATION SHALL BE PER SPECIFICATIONS EXCEPT WHEN THE AUTHORITY HAVING JURISDICTION REQUIRES A LONGER TEST PERIOD. COMPLY WITH ADDITIONAL TESTING REQUIREMENTS OF DIVISION 1 FOR PROCEDURES AND CONTROLS.
2. SPECIFIC REQUIREMENTS:
   a. TEST EQUIPMENT AND SYSTEMS WHICH NORMALLY OPERATE DURING CERTAIN SEASONS OF YEAR DURING THE APPROPRIATE SEASON. PERFORM TESTS ON INDIVIDUAL EQUIPMENT, SYSTEMS AND THEIR CONTROLS. WHENEVER EQUIPMENT OR SYSTEMS UNDER TEST ARE INTERRELATED WITH OTHER EQUIPMENT OR SYSTEMS, THE LATTER SHALL BE OPERATED SIMULTANEOUSLY WITH EQUIPMENT OR SYSTEMS BEING TESTED.
   b. NO PIPING OR DUCTWORK IS TO BE CLOSED UP, FURRED IN OR COVERED BEFORE TESTING. PRESSURE TEST PIPING BEFORE CONNECTING TO EQUIPMENT. SUBJECT NO PIPING, EQUIPMENT, OR ACCESSORIES TO TESTING BEYOND RATED PRESSURES.
   c. DRAIN WATER USED FOR TESTING FROM SYSTEM AFTER TESTS ARE COMPLETE. WORK REQUIRED TO REPAIR OR REPLACE DAMAGE CAUSED BY FREEZING OF WATER LEFT IN SYSTEM SHALL BE DONE AT CONTRACTOR'S EXPENSE.
   d. REPAIR OR REPLACE DEFECTIVE WORK AND REPEAT TESTS UNTIL PARTICULAR SYSTEM AND COMPONENT PARTS THEREOF RECEIVE APPROVAL OF THE REGULATING AUTHORITY. REPAIR ANY DAMAGE RESULTING FROM TESTS AND REPLACE DAMAGED MATERIALS AT NO COST TO OWNER.
   e. MAKE FINAL TESTS IN PRESENCE OF APPROPRIATE INSPECTOR.
   f. EQUIPMENT AND ASSOCIATED PIPING, DUCTWORK, ETC.
   g. FURNISH COPIES OF TEST REPORTS AND CERTIFICATES OF ACCEPTANCE, SIGNED BY THE INSPECTOR, TO OWNER AND THE ARCHITECT BEFORE MAKING CLAIMS FOR FINAL PAYMENT; SUCH CLAIMS WILL NOT BE PROCESSED UNTIL THESE SUBMITTALS HAVE BEEN MADE.

B. SUBMITTALS: SUBMIT SHOP DRAWINGS, BROCHURES, AND SCHEDULES AS DEFINED BY INDIVIDUAL TECHNICAL SECTIONS OF SPECIFICATIONS. SUBMIT MANUFACTURER'S PRINTED INSTALLATION INSTRUCTIONS FOR PRODUCTS AND INSTALL IN ACCORDANCE THEREWITH AND AS DEFINED BY INDIVIDUAL TECHNICAL SECTIONS OF THE SPECIFICATIONS.

C. CODES, FEES, AND LATERAL COSTS:
1. COMPLY WITH APPLICABLE CODES, RULES, REGULATIONS, AND BUILDING AND SAFETY LAWS RELATING TO CONSTRUCTION, PUBLIC HEALTH AND SAFETY.
2. GIVE NECESSARY NOTICES, OBTAIN PERMITS, AND PAY TAXES, FEES AND OTHER COSTS IN CONNECTION WITH THE WORK; FILE NECESSARY PLANS, PREPARE DOCUMENTS AND OBTAIN NECESSARY APPROVALS OF REGULATING AUTHORITIES HAVING JURISDICTION; OBTAIN CERTIFICATES OF INSPECTION FOR WORK AND DELIVER TO OWNER AND THE ARCHITECT BEFORE REQUEST FOR ACCEPTANCE AND FINAL PAYMENT OF CONTRACT.
3. PROVIDE ALL LABOR, MATERIALS, SERVICES, APPARATUS, AND DRAWINGS (IN ADDITION TO CONTRACT DOCUMENTS) TO COMPLY WITH APPLICABLE LAWS, ORDINANCES, RULES, AND REGULATIONS.
4. CONTRACT DOCUMENTS TAKE PRECEDENCE WHEN MORE STRINGENT THAN CODES, ORDINANCES, STANDARDS, AND STATUTES. CODES, ORDINANCES, STANDARDS AND STATUTES TAKE PRECEDENCE WHEN MORE STRINGENT OR IN CONFLICT WITH DRAWINGS AND SPECIFICATIONS. THE FOLLOWING INDUSTRY STANDARDS, SPECIFICATIONS AND CODES ARE MINIMUM REQUIREMENTS (LATEST ISSUE AS ADOPTED BY LOCAL JURISDICTION AS OF DATE OF CONTRACT UNLESS NOTED OTHERWISE ON DRAWINGS):
   a. AIR CONDITIONING AND REFRIGERATION INSTITUTE STANDARDS.
   b. AMERICAN GAS ASSOCIATION.
   c. AMERICAN NATIONAL STANDARDS INSTITUTE.
   d. APPLICABLE MUNICIPAL, COUNTY, AND STATE MECHANICAL, ELECTRICAL, GAS, PLUMBING, HEALTH AND SANITARY CODES, LAWS AND ORDINANCES.
   e. AMERICAN SOCIETY OF HEATING, REFRIGERATING, AND AIR_CONDITIONING ENGINEERS.
   f. AMERICAN SOCIETY OF MECHANICAL ENGINEERS BOILER AND PRESSURE VESSEL CODES.
   g. AMERICAN SOCIETY FOR TESTING MATERIALS STANDARDS.
   h. AMERICAN WATER WORKS ASSOCIATION.
   i. AMERICAN WELDING SOCIETY.
   j. EXPANSION JOINT MANUFACTURERS ASSOCIATION STANDARDS.
   k. MANUFACTURERS STANDARD SOCIETY STANDARDS.
   l. NATIONAL COMMERCIAL AND INDUSTRIAL INSULATION STANDARDS.
   m. NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION STANDARDS.
   n. NATIONAL ELECTRICAL SAFETY CODE.
   o. NATIONAL FIRE PROTECTION ASSOCIATION STANDARDS.
   p. OCCUPATIONAL SAFETY AND HEALTH ACT.
   q. SHEET METAL AND AIR CONDITIONING CONTRACTOR'S NATIONAL ASSOCIATION STANDARDS.
   r. STANDARDS AND REQUIREMENTS OF LOCAL UTILITY COMPANIES.
   s. UNDERWRITER'S LABORATORIES, INC. STANDARDS.

D. MECHANICAL SYSTEM IDENTIFICATION: TYPES OF SERVICES AND EQUIPMENT REQUIRING IDENTIFICATION INCLUDE, BUT ARE NOT NECESSARILY LIMITED TO, THE FOLLOWING: PIPING SYSTEMS, AIR HANDLING SYSTEMS, DUCTWORK, VALVES, DAMPERS, SWITCHES, AND OTHER CONTROL UNITS IN PIPING, WIRING SYSTEMS, AND MECHANICAL EQUIPMENT REQUIRING OPERATIONAL IDENTIFICATION; WARNING, INSTRUCTIONAL OR MAINTENANCE SIGNAGE.

2/3.3 MECHANICAL GENERAL EQUIPMENT PROVISIONS

A. MATERIAL AND EQUIPMENT:
1. PROVIDE MATERIALS AND EQUIPMENT THAT ARE STANDARD PRODUCTS OF A REPUTABLE MANUFACTURER REGULARLY ENGAGED IN THE MANUFACTURE THEREOF. MULTIPLE ITEMS SHALL BE THE PRODUCT OF THE SAME MANUFACTURER UNLESS SPECIFIED OTHERWISE.
2. INSTALL MATERIAL AND EQUIPMENT IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. CONTACT OWNER AND THE ARCHITECT IMMEDIATELY IF VARIANCE OCCURS BETWEEN CONTRACT DOCUMENTS AND MANUFACTURER'S RECOMMENDATIONS SO THAT VARIATIONS IN INSTALLATION CAN BE KNOWN BY ALL PARTIES CONCERNED.
3. DELIVER MATERIALS OR EQUIPMENT TO THE PROJECT IN THE MANUFACTURER'S ORIGINAL, UNOPENED, LABELED CONTAINERS. MATERIALS RECEIVED IN DAMAGED, UNSEALED, OR OPEN CONTAINERS SHALL BE REJECTED IMMEDIATELY. ADDED COSTS ASSOCIATED WITH REORDERING, EXPEDITING ORDERS, OR PROJECT DELAYS DUE TO REJECTED MATERIALS SHALL BE BORNE BY THE CONTRACTOR. PROTECT FROM DAMAGE WHICH MAY BE CAUSED BY THEFT, WEATHER, AND BUILDING OPERATIONS. FAILURE TO PROTECT MATERIALS AND APPARATUS ADEQUATELY SHALL BE SUFFICIENT CAUSE FOR REJECTION OF ANY DAMAGED MATERIAL OR EQUIPMENT. CLOSE PIPE AND EQUIPMENT OPENINGS TO PREVENT INTRUSION OF OBSTRUCTIONS AND DAMAGE.
4. REPLACE WORK WHICH IS NOT IN ACCORDANCE WITH CONTRACT DOCUMENTS WITHOUT DELAY AND WITHOUT ADDITIONAL COST TO THE OWNER.

2/3.4 START-UP PROVISIONS FOR MECHANICAL WORK

A. ADJUSTING AND ALIGNING EQUIPMENT: ADJUST ALL EQUIPMENT. CHECK ALL MOTORS FOR PROPER ROTATION.

B. CLEANING:
1. REMOVE TOOLS, SCAFFOLDING, SURPLUS MATERIALS, BARRICADES, TEMPORARY WALKS, DEBRIS, AND RUBBISH FROM THE PROJECT PROMPTLY UPON COMPLETION OF THE WORK OF EACH SECTION. LEAVE THE AREA OF OPERATIONS COMPLETELY CLEAN AND FREE OF THESE ITEMS.
2. DURING ALL PHASES OF ON-SITE STORAGE AND ALL COURSES OF CONSTRUCTION, PROTECT OPEN ENDS OF DUCTS AND CAP PIPE TO ENSURE ADEQUATE PROTECTION AGAINST ENTRANCE OF FOREIGN SUBSTANCES.
3. DISCONNECT, CLEAN AND RECONNECT WHEREVER NECESSARY TO LOCATE AND REMOVE OBSTRUCTIONS FROM ANY SYSTEM STOPPED BY ANY FOREIGN MATTER AFTER BEING PLACED IN OPERATION. REPAIR OR REPLACE ANY WORK DAMAGED IN COURSE OF REMOVING OBSTRUCTION AT NO ADDITIONAL COST TO THE OWNER.

C. LUBRICATION:
1. EXTEND GREASE FITTINGS, ON BEARINGS REQUIRING ROUTINE LUBRICATION, TO POINTS OF READY AND EASY ACCESSIBILITY.
2. LUBRICATE MOTOR AND FAN BEARINGS, ETC., BEFORE OPERATION OF ANY EQUIPMENT.
3. PROVIDE A FINAL LUBRICATION TO EQUIPMENT IMMEDIATELY BEFORE TURNING OVER TO OWNER.

D. COMMISSIONING:
1. IT IS THE INTENT OF THIS SPECIFICATION ARTICLE TO ENSURE THAT INSTALLED EQUIPMENT PERFORMANCE AND OPERATION MEETS ALL DESIGN CRITERIA.
2. IT IS THE RESPONSIBILITY OF THE MANUFACTURERS/VENDORS, TO IDENTIFY IN WRITING, AT TIME, OF SUBMISSION, ALL OPTIONS, DIFFERENCES, SUBSTITUTION, ETC., WHICH ARE INCLUDED IN THEIR SUBMISSION.
3. EQUIPMENT WHICH IS FOUND NOT TO FUNCTION PER DESIGN AND SUBMISSION CRITERIA, SHALL BE REMOVED FROM THE PROJECT AND REPLACED BY THE INSTALLING CONTRACTOR AT HIS COST.
4. FIELD MODIFICATIONS AND REPAIRS TO NEW EQUIPMENT SHALL NOT BE PERMITTED.
5. ALL PROJECT LATERAL COST AND DELAY COST PROVEN RELATED TO NONFUNCTIONING EQUIPMENT, SHALL BE BORNE BY THE INSTALLING CONTRACTOR.
6. STARTUP PERSONNEL SHALL PROVIDE A CHECK-OUT REPORT PROVIDING DETAILED READOUT ON EQUIPMENT PERFORMANCE.
7. EQUIPMENT STARTUP PERSONNEL SHALL COORDINATE THEIR EFFORTS WITH OTHER TRADES SO AS TO PERMIT EQUIPMENT TO BE CHECKED-OUT IN EVERY MODE OF OPERATION.
8. ALL EQUIPMENT SHALL BE COMMISSIONED UNDER THE SUPERVISION OF A FACTORY TRAINED AUTHORIZED REPRESENTATIVE. SEPARATE LETTERS OF AUTHORIZATION FROM THE MANUFACTURERS SHALL BE PROVIDED TO THE CONTRACTOR, PRIOR TO STARTING EQUIPMENT.
9. ALL COMPONENTS AND CONTROL FUNCTIONS OF EQUIPMENT SHALL BE THOROUGHLY EXAMINED, TESTED, AND PROVEN 100 PERCENT OPERATIONAL.
10. ALL INTER-RELATED CONTROLS, ELECTRICAL CONNECTIONS, AND SERVICE CONNECTION SHALL BE COMPLETED AND PROVEN FUNCTIONAL PRIOR TO STARTING EQUIPMENT.
11. NO TEMPORARY SERVICE HOOKUPS ARE PERMITTED.

E. OPERATION BY OWNER:
1. OWNER MAY REQUIRE OPERATION OF CERTAIN SYSTEMS OR PARTS THEREOF, PRIOR TO FINAL ACCEPTANCE.
2. OPERATION IS NOT TO BE CONSTRUED AS ACCEPTANCE OF WORK.

F. INSTRUCTIONS OF OWNER'S PERSONNEL:
1. PRIOR TO ACCEPTANCE OF WORK, AND DURING TIME DESIGNATED BY THE OWNER AND THE ARCHITECT, PROVIDE NECESSARY QUALIFIED PERSONNEL TO OPERATE EACH SYSTEM FOR A PERIOD OF 2 CONSECUTIVE, FULL WORKING DAYS.
2. DURING OPERATING PERIOD, FULLY INSTRUCT OWNER'S REPRESENTATIVE IN COMPLETE OPERATION, ADJUSTMENT, CARE, AND MAINTENANCE OF EACH RESPECTIVE SYSTEM AND PIECE OF EQUIPMENT.

G. INSTRUCTION MANUAL: PRIOR TO COMPLETION OF INSTALLATION AND FINAL INSPECTION OF WORK, FURNISH TO OWNER AND THE ARCHITECT 3 COPIES OF COMPLETE INSTRUCTION MANUAL, BOUND IN BOOKLET FORM AND INDEXED FOR EACH RESPECTIVE MECHANICAL SPECIFICATION SECTION. MANUALS SHALL CONTAIN THE FOLLOWING:
1. LIST OF EQUIPMENT WITH MANUFACTURER'S NAME, MODEL NUMBER, LOCAL REPRESENTATIVE, SERVICE FACILITIES, AND NORMAL CHANNEL OF SUPPLY FOR EACH ITEM.
2. MANUFACTURER'S LITERATURE DESCRIBING EACH ITEM OF EQUIPMENT WITH DETAILED PARTS LIST.
3. NAME, ADDRESS, AND PHONE NUMBER OF CONTRACTORS INVOLVED IN WORK UNDER THIS DIVISION.
4. DETAILED STEP-BY-STEP INSTRUCTIONS FOR STARTING, SUMMER OPERATION, WINTER OPERATION, AND SHUTDOWN OF EACH SYSTEM.
5. DETAILED MAINTENANCE INSTRUCTIONS FOR STARTING, SUMMER OPERATION, WINTER OPERATION, AND SHUTDOWN OF EACH SYSTEM.
6. COPY OF VALVE CHART.
7. COPY OF EACH AUTOMATIC CONTROL DIAGRAM WITH RESPECTIVE SEQUENCE OF OPERATION.
8. INDIVIDUAL EQUIPMENT WARRANTIES.
9. CERTIFICATES OF INSPECTION.
10. RECORD PRINTS AND RELATED SHOP DRAWINGS.
11. AIR AND WATER BALANCE REPORT.

2/3.5 ELECTRICAL COORDINATION
1. ALL LOW VOLTAGE WIRING (IE LESS THAN 120V) IS THE RESPONSIBILITY OF THE MECHANICAL CONTRACTOR. ALL WIRING ABOVE 120V IS THE RESPONSIBILITY OF THE ELECTRICAL SUB-CONTRACTOR.
2. ALL LOW VOLTAGE WIRING TO BE INSTALLED IN CONDUIT PER THE ELECTRICAL SPECIFICATIONS.

END OF SECTION

SECTION 15060 - PIPE AND PIPE FITTINGS - GENERAL

PART 1 - GENERAL

1.1 DEFINITIONS

DESIGN PRESSURE:
THE DESIGN PRESSURE FOR EACH COMPONENT IN A PIPING SYSTEM IS EQUAL TO THE SYSTEM PRESSURE AT THE MOST SEVERE CONDITION.
SOURCES OF PRESSURE VARIATION TO CONSIDER INCLUDE AMBIENT INFLUENCES, PRESSURE OSCILLATIONS AND SURGES, IMPROPER OPERATION, AND FAILURE OF CONTROL DEVICES.
DESIGN TEMPERATURE: THE DESIGN TEMPERATURE FOR EACH COMPONENT IN A PIPING SYSTEM IS EQUAL TO THE SYSTEM TEMPERATURE AT THE MOST SEVERE CONDITION.
HIGH PRESSURE WATER PIPING APPLIES TO SYSTEMS WITH PRESSURE MORE THAN 103 KPA GAGE [(15 PSIG)]
LOW PRESSURE WATER PIPING APPLIES TO SYSTEMS WITH PRESSURES OF 103 KPA GAGE [(15 PSIG)]

1.2 SYSTEM DESCRIPTION

GENERAL: IN ADDITION TO REQUIREMENTS SHOWN AND SPECIFIED, COMPLY WITH APPLICABLE PROVISIONS OF THE DRAWINGS FOR DESIGN, MATERIALS, FABRICATION, AND INSTALLATION OF COMPONENT PARTS.
DESIGN REQUIREMENTS:
DRAWINGS ARE DIAGRAMMATIC AND ARE INTENDED TO ESTABLISH BASIC DIMENSION OF UNITS, SIGHT LINES, AND PROFILES OF UNITS. ACCOMPANYING DRAWINGS ARE INTENDED FOR CONTRACTOR'S GUIDANCE, AND HE SHALL VERIFY THEIR ACCURACY AND IMMEDIATELY NOTIFY OWNER AND THE ARCHITECT OF ANY DISCREPANCIES SO THAT THEY MAY BE RESOLVED PRIOR TO ACTUAL FABRICATION OR INSTALLATION OF WORK. MINOR CHANGES IN POSITION OF PIPING TO MEET JOB CONDITIONS SHALL NOT BE MADE THE BASIS FOR CHANGE ORDER. CHANGES AFFECTING ACCESSIBILITY TO AND CLEARANCE ABOUT EQUIPMENT OR ACCESSORIES SHALL BE PROMPTLY COMMUNICATED TO THE OWNER AND THE ARCHITECT. CONSTRUCTION DOCUMENTS MAY INCLUDE PIPING DIAGRAMS, RISER DIAGRAMS AND

DETAILS ARE NOT FOR THE PURPOSE OF GIVING PHYSICAL DIMENSIONS AND LOCATIONS BUT RATHER TO MAKE CLEAR THE INTERCONNECTIONS, BY THE PIPING, OF THE VARIOUS UNITS OF THE PROCESS. IF MECHANICAL COMPONENTS ARE SHOWN ON EITHER THE DIAGRAMS OR THE PIPING DETAIL DRAWINGS, BUT NOT ON BOTH, THE CONTRACTOR SHALL INCLUDE IN HIS COST ESTIMATE, INCLUDING INSTALLATION THEREOF.
CONFLICTS OR INCONSISTENCIES OF PIPE SIZES, ARRANGEMENTS, AND DETAILS FOR FINAL CONNECTIONS SHALL BE RESOLVED BY THE ARCHITECT.

1.3 SUBMITTALS

GENERAL: SUBMIT IN ACCORDANCE WITH DIVISION 1 SECTION - SUBMITTAL PROCEDURES.PRODUCT DATA: SUBMIT VENDOR PRODUCT DATA FOR ALL VALVES, FITTINGS AND PIPE MATERIAL.
CERTIFICATIONS: SUBMIT MANUFACTURER'S CERTIFICATION THAT PRODUCTS FURNISHED FOR PROJECT MEET OR EXCEED SPECIFIED REQUIREMENTS.
SUBMIT FOLLOWING INFORMATIONAL SUBMITTALS:
TEST REPORTS:
WRITTEN RESULTS OF TESTING SPECIFIED AS PART FIELD QUALITY CONTROL ARTICLES.
CERTIFIED TEST REPORTS OF CLEANING AND TESTING FOR EACH SYSTEM.
SUBMIT CERTIFICATION OF DOMESTIC WATER SYSTEM DISINFECTION.
QUALIFICATION DATA:
FABRICATOR'S AND INSTALLER'S QUALIFICATIONS VERIFYING YEARS OF EXPERIENCE.
INCLUDE LIST OF COMPLETED PROJECTS HAVING SIMILAR SCOPE OF WORK IDENTIFIED BY NAME, LOCATION, DATE, REFERENCE NAMES, AND PHONE NUMBERS.

1.4 QUALITY ASSURANCE

WELDING MATERIALS AND LABOR SHALL CONFORM TO ASME CODES, AWS STANDARDS, AND APPLICABLE STATE LABOR REGULATIONS.
WELDERS SHALL BE FULLY QUALIFIED AND CERTIFIED. EACH WELDER SHALL IDENTIFY HIS WORK WITH A MARKING STAMPED ON EACH WELD JOINT OF PIPE, VALVE OR FITTING. A LISTING OF THE NAMES OF THE WELDERS, TOGETHER WITH CORRESPONDING MARKS, SHALL BE SUBMITTED. WELDERS MAKING DEFECTIVE WELDS AFTER PASSING QUALIFICATION TEST SHALL BE GIVEN A REQUALIFICATION TEST AND UPON FAILING TO PASS SHALL NOT BE PERMITTED TO WORK ON THIS PROJECT.
DOMESTIC WATER, DRAINAGE, AND VENT PIPING PER EACH APPLICABLE BUILDING CODE.
SINGLE SOURCE RESPONSIBILITY: TO ENSURE QUALITY OF APPEARANCE AND PERFORMANCE, OBTAIN:
PIPE FOR A SYSTEM FROM A SINGLE MANUFACTURER.
FITTINGS FOR A SYSTEM FROM A SINGLE MANUFACTURER.
VALVES OF A COMMON SIZE FOR A SYSTEM FROM A SINGLE MANUFACTURER.

1.5 PRE-INSTALLATION CONFERENCE

CONDUCT PRE-INSTALLATION CONFERENCE WITH OWNER.

1.6 DELIVERY, STORAGE, AND HANDLING

PROTECT FINISHED SURFACES AS NECESSARY TO PREVENT DAMAGE.
DO NOT USE ADHESIVE PAPERS OR SPRAYED COATINGS WHICH BECOME FIRMLY BONDED WHEN EXPOSED TO SUN.
DO NOT LEAVE COATING RESIDUE ON ANY SURFACES.

1.7 WARRANTY

PROVIDE WRITTEN WARRANTY JOINTLY SIGNED BY MANUFACTURER, INSTALLER AND CONTRACTOR AGREEING TO REPAIR AND/OR REPLACE ASSEMBLIES WHICH FAIL IN MATERIAL OR WORKMANSHIP DURING WARRANTY PERIOD FROM DATE OF SUBSTANTIAL COMPLETION.

PART 2 - PRODUCTS

2.1 MATERIAL

PIPING SHALL CONFORM TO THE MATERIAL CLASS SPECIFICATIONS LISTED IN THE SCHEDULE ON THIS SHEET:

PART 3 - EXECUTION

3.1 EXAMINATION

EXAMINE CONDITIONS AND COORDINATE WITH OWNER PRIOR TO INITIATION OF WORK.
VERIFY SUPPORTING MEMBERS ARE AT PROPER ELEVATION AND ARE CAPABLE OF SUPPORTING PIPE LOADS.

3.2 DRAWINGS

PREPARE DETAILED FABRICATION AND INSTALLATION DRAWINGS FOR CONTRACTOR'S USE ON SITE SHOWING ALL WELDED AND ASSEMBLY ITEMS. SHOW LOCATION AND TYPE OF SUPPORT, ANCHORS, AND GUIDES, ETC. COORDINATE FABRICATION DRAWINGS WITH ALL APPLICABLE TRADES PRIOR TO FABRICATION AND INSTALLATION.

3.3 FABRICATION

GENERAL: PROVIDE LABOR QUALIFIED BY TRAINING AND EXPERIENCE TO PERFORM THE SPECIFIED WORK IN ACCORDANCE WITH THE APPLICABLE CODES AND STANDARDS.
CONTRACTOR QUALITY CONTROL: DESIGNATE A QUALITY CONTROL REPRESENTATIVE TO INSPECT THE INSTALLATION AND DOCUMENT CLEANING AND TESTING OF PIPING SYSTEMS. THE QC REPRESENTATIVE SHALL BE QUALIFIED AS WELDING INSPECTOR PER AWS-QC2. MAINTAIN ON SITE RECORDS FOR OWNER AND ARCHITECT REVIEW.
FABRICATE PIPING IN ACCORDANCE WITH THE DETAILED DRAWINGS AND APPLICABLE CODES.
VENTS AND DRAINS:
VENTS AND DRAINS REQUIRED FOR SYSTEM OPERATION ARE SHOWN ON THE P&IDS. IN ADDITION, PROVIDE VENTS AND DRAINS AT ALL HIGH AND LOW POINTS IN EACH SYSTEM REQUIRED FOR FILLING AND DRAINING THE SYSTEMS FOR TESTING, CLEANING AND OPERATION. VENTS AND DRAINS FOR PIPES DN50 [(2 INCHES)] AND LESS DN15 [(1/2 INCH)] AND FOR PIPES DN65 [(2-1/2 INCHES)] AND LARGER DN20 [(3/4 INCH)]. PROVIDE BALL VALVE, HOSE CONNECTION AND CAP ON DRAINS.

3.3 FABRICATION

GENERAL: PROVIDE LABOR QUALIFIED BY TRAINING AND EXPERIENCE TO PERFORM THE SPECIFIED WORK IN ACCORDANCE WITH THE APPLICABLE CODES AND STANDARDS.
CONTRACTOR QUALITY CONTROL: DESIGNATE A QUALITY CONTROL REPRESENTATIVE TO INSPECT THE INSTALLATION AND DOCUMENT CLEANING AND TESTING OF PIPING SYSTEMS. THE QC REPRESENTATIVE SHALL BE QUALIFIED AS WELDING INSPECTOR PER AWS-QC2. MAINTAIN ON SITE RECORDS FOR OWNER AND ARCHITECT REVIEW.
FABRICATE PIPING IN ACCORDANCE WITH THE DETAILED DRAWINGS AND APPLICABLE CODES.
VENTS AND DRAINS:
VENTS AND DRAINS REQUIRED FOR SYSTEM OPERATION ARE SHOWN ON THE P&IDS. IN ADDITION, PROVIDE VENTS AND DRAINS AT ALL HIGH AND LOW POINTS IN EACH SYSTEM REQUIRED FOR FILLING AND DRAINING THE SYSTEMS FOR TESTING, CLEANING AND OPERATION. VENTS AND DRAINS FOR PIPES DN50 [(2 INCHES)] AND LESS DN15 [(1/2 INCH)] AND FOR PIPES DN65 [(2-1/2 INCHES)] AND LARGER DN20 [(3/4 INCH)]. PROVIDE BALL VALVE, HOSE CONNECTION AND CAP ON DRAINS.

3.4 INSTALLATION

PREPARATION:
1. REAM PIPES AND TUBES TO FULL INSIDE DIAMETER. CLEAN OFF SCALE AND DIRT, INSIDE AND OUTSIDE, BEFORE ASSEMBLY. REMOVE WELDING SLAG OR OTHER FOREIGN MATERIAL FROM PIPING.
2. GENERAL:
3. INSTALL IN ACCORDANCE WITH FABRICATION DRAWINGS AND APPLICABLE MANUFACTURER'S DRAWINGS AND INSTRUCTIONS.
4. INSTALL COMPONENTS PLUMB, LEVEL, SQUARE, AND FREE FROM WARP OR TWIST WHILE MAINTAINING DIMENSIONAL TOLERANCES AND ALIGNMENT WITH SURROUNDING CONSTRUCTION.
5. RUN PIPING STRAIGHT AND PARALLEL WITH ADJACENT WALLS AND FOUNDATIONS TO PRESENT A UNIFORM AND NEAT APPEARANCE.
6. IN ASSEMBLING PIPING SYSTEMS, UTILIZE LONGEST AVAILABLE COMMERCIAL STANDARD PIPING LENGTHS TO MINIMIZE NUMBER OF PIPING JOINTS. ACCURATELY CUT PIPE TO FIELD MEASUREMENTS TO PERMIT PLACEMENT WITHOUT FORCING OR SPRINGING, EXCEPT FOR COLD SPRINGING OF EXPANSION LOOP LEGS.
7. INSTALL PIPING IN ACCORDANCE WITH APPLICABLE ASME B31 SERIES CODES, NFPA, AND BUILDING CODES.
8. PROVIDE SLEEVES FOR PENETRATIONS THROUGH ALL BUILDING WALLS, FLOORS, SLABS, AND ROOFS. NOTE: FIRE RATED PENETRATION ASSEMBLIES WHICH DO NOT REQUIRE SLEEVES ARE EXCLUDED.
9. WHERE PIPES PENETRATE FIRE AND/OR SMOKE RATED CONSTRUCTION, PROVIDE FIRE STOPPING .
10. PROVIDE CHROME ESCUTCHEONS FOR PIPE PENETRATIONS IN EXPOSED FINISHED AREAS.

ROUTE AND GRADES
1. ROUTE PIPING IN ORDERLY MANNER AND MAINTAIN PROPER GRADES. INSTALL TO CONSERVE HEADROOM AND INTERFERE AS LITTLE AS POSSIBLE WITH USE OF SPACE. RUN EXPOSED PIPING PARALLEL TO WALLS. GROUP PIPING WHENEVER PRACTICAL AT COMMON ELEVATIONS. COORDINATE PIPE ROUTING, ELEVATIONS AND GRADES WITH THE WORK OF OTHER TRADES.
2. IN CASE OF CONFLICT, OWNER AND THE ARCHITECT RESERVES THE RIGHT TO DESIGNATE PRIORITY FOR ELEVATIONS, LOCATION, ETC.
3. MAKE REDUCTIONS IN WATER PIPES WITH ECCENTRIC REDUCING FITTINGS INSTALLED TO PROVIDE DRAINAGE AND VENTING.
4. GRADE HORIZONTAL DRAINAGE AND VENTING.
5. INSTALL PIPING TO ALLOW FOR EXPANSION AND CONTRACTION WITHOUT STRESSING PIPE OR CONNECTED EQUIPMENT.

CONNECTIONS: REFER TO INDIVIDUAL PIPING SPECIFICATION SECTIONS FOR REQUIREMENTS.
1. JOIN PIPING SECTIONS BY SCREWING, WELDING, BRAZING, SWEATING, OR BOLTING IN ACCORDANCE WITH THE PIPE SYSTEM MATERIAL CLASS SPECIFICATION REQUIREMENTS.
2. ON THREADED JOINTS USE FULL-CUT STANDARD TAPER PIPE THREADS PER ANSI/ASME B1.20.1. MAKE UP JOINTS USING TEFLON TAPE OR NONTOXIC JOINT COMPOUND AS RELATED TO THE PIPING SYSTEM INVOLVED. APPLY TO MALE THREADS ONLY.
3. USE MAIN-SIZED "WELD-O-LET" OR "THREAD-O-LET" BRANCH CONNECTIONS OR "STUB-IN" IN STEEL PIPING IF MAIN IS AT LEAST 1 PIPE SIZE LARGER THAN THE BRANCH FOR UP TO 300 MM [(6 INCH)] MAINS AND IF MAIN IS AT LEAST 2 PIPE SIZES LARGER THAN BRANCH FOR 200 MM [(8 INCHES)] AND LARGER MAINS. DO NOT PROJECT BRANCH PIPES INSIDE THE MAIN PIPE.
4. JOINTS FOR CAST IRON BELL AND SPIGOT PIPE SHALL HAVE A NEOPRENE GASKETING SYSTEM. JOINTS FOR PLAIN END PIPE SHALL HAVE CLAMP-TYPE MECHANICAL FASTENERS AND GASKETS.
5. MAKE CONNECTIONS TO EQUIPMENT AND BRANCH MAINS WITH UNIONS OR FLANGES.
6. PROVIDE NONCONDUCTING TYPE CONNECTIONS WHEREVER JOINING DISSIMILAR METALS IN ALL SYSTEMS. BRASS ADAPTERS AND VALVES ARE ACCEPTABLE.

3.5 TESTING

GENERAL:
1. PRESSURE TESTING REQUIREMENTS APPLY TO ALL PIPING SYSTEMS UNLESS SPECIFIED IN SPECIFIC PIPING SYSTEM SPECIFICATION SECTIONS.
2. PERFORM TESTS AFTER ERECTION AND PRIOR TO INSULATION OR OTHER FINISH WORK. DO NOT COVER WORK BEFORE ACCEPTANCE.
3. TEST PIPING SYSTEMS THAT ARE GOVERNED BY ASME B31.1, B31.3, OR B31.9 IN ACCORDANCE WITH THE APPLICABLE CODE. WHERE SPECIFIC REQUIREMENTS EXCEED CODE REQUIREMENTS, CONDUCT TEST IN ACCORDANCE WITH THE SPECIFIC SYSTEM REQUIREMENTS.
4. TEST FUEL AND FIRE PROTECTION SYSTEMS IN ACCORDANCE WITH APPLICABLE NFPA CODES.
5. EXCEPT WHERE NOTED OTHERWISE IN SPECIFIC SPECIFICATION SECTIONS, AND WHERE ALLOWED BY THIS SPECIFICATION, CONDUCT PNEUMATIC TESTS AT 1.1 TIMES THE DESIGN PRESSURE AND HYDROSTATIC TESTS AT 1.5 TIMES THE DESIGN PRESSURE. DESIGN PRESSURES ARE STATED IN THE PIPING SERVICE SCHEDULES.
6. EXCEPT WHERE NOTED OTHERWISE IN SPECIFIC SPECIFICATION SECTIONS, CONDUCT TESTS FOR A 4 HOUR DURATION WITHOUT PRESSURE DEGRADATION.
7. PERFORM TESTS IN THE PRESENCE OF THE OWNER'S REPRESENTATIVE.

PROCEDURES:
1. MAINTAIN CALIBRATION RECORDS FOR GAUGES UTILIZED FOR PRESSURE TESTING.
2. CONDUCT TESTS WITH 2 GAUGES INSTALLED AS CLOSE AS POSSIBLE TO THE LOW POINT OF THE PIPING SYSTEM.
3. VENT ALL AIR FROM HYDRONIC SYSTEMS BEFORE APPLYING TEST PRESSURE.
4. IF PRESSURE VESSELS ARE RATED FOR CONDITIONS EQUAL TO OR EXCEEDING THE MAXIMUM OPERATING CONDITIONS OF THE CONNECTING PIPING SYSTEM, CONDUCT TESTS INCLUDING THE VESSEL(S); OTHERWISE, ISOLATE VESSELS FROM THE PIPING SYSTEM FOR TESTING.
5. DO NOT TEST RELIEF VALVES, PRESSURE REDUCING VALVES, VALVES OR OTHER EQUIPMENT BEYOND THEIR RATED CAPACITY.
6. DO NOT USE VALVES AS BLANKING DEVICES FOR PRESSURE TESTING.
7. PROVIDE ALL EQUIPMENT, MATERIAL AND PIPE TAPS REQUIRED TO PERFORM PRESSURE TESTING.
8. VISUALLY EXAMINE ALL JOINTS AND CONNECTIONS FOR LEAKS. REPAIR TO ELIMINATE LEAK.
9. IF PRESSURE FALLS AFTER SHUT DOWN OF PRESSURIZING MEDIUM DETERMINE THE SOURCE OF PRESSURE LOSS AND REPAIR TO MAINTAIN PRESSURE INTEGRITY.
10. RECOGNIZE THE HAZARDS ASSOCIATED WITH PNEUMATIC PRESSURE TESTING AND TAKE NECESSARY PRECAUTIONS TO PROTECT ALL PERSONNEL AND ADJACENT SYSTEMS IN THE EVENT OF A JOINT FAILURE.
11. USE FRESH RAW WATER FOR HYDROSTATIC TESTING UNLESS A DEFINITIVE WATER QUALITY IS REQUIRED UNDER SPECIFIC SPECIFICATION SECTIONS.
12. UPON COMPLETION OF TESTING AND ACCEPTANCE, DRAIN SYSTEM AND DIRECT TO APPROPRIATE WASTE SYSTEM. OPEN ALL VENTS TO AVOID PULLING A VACUUM DURING DRAINING.

3.6 CONNECTION TO EXISTING SYSTEM
1. PRIOR TO CONNECTION TO THE EXISTING PLANT PIPING, FLUSH PIPING AND ENSURE NO DEBRIS IS PRESENT. PROVIDE A DEDICATED TEMPORARY RECIRCULATION PUMP AND STRAINER TO REMOVE ANY ALL DEBRIS.
2. ALERT OWNER MINIMUM 3 BUSINESS DAYS PRIOR TO FLUSHING. OWNER RESERVES THE RIGHT TO WITNESS THE FLUSHING PROCESS AND FINAL CONNECTION.
3. COORDINATE WITH OWNER PRIOR TO ENERGIZING THE NEW PIPING AND OPENING VALVES CONNECTED TO THE EXISTING PLANT..

3.7 LEAK REPAIR
1. REPAIR ALL DEFECTS WHICH DEVELOP UNDER TESTS.
2. REPAIR LEAKS IN SOLDERED SYSTEMS BY MELTING OUT THE JOINT, THOROUGHLY CLEANING PARTS, AND/OR REPLACING THE FITTING AND RESOLDERING THE JOINT.
3. REPAIR MINOR LEAKS IN WELDED JOINTS BY CHIPPING OUT AND REWELDING.
4. REPAIR LEAKS IN THREADED JOINTS BY REPLACING THE THREAD, THE FITTING OR BOTH.
5. ON FLANGED JOINTS REPLACE DEFECTIVE OR DAMAGED GASKETS DURING TESTING AND FLUSHING. USE NEW GASKETS EACH TIME A FLANGED JOINT IS MADE UP.
6. RETEST REPAIRED PIPING SYSTEMS UNTIL ACCEPTANCE IS OBTAINED.
7. REPAIR LEAKS WHICH OCCUR DURING THE WARRANTY.

3.8 POTABLE WATER STERILIZATION
1. DISINFECT ALL POTABLE WATER LINES BEFORE PLACING INTO SERVICE.
2. UTILIZE A CHLORINE-WATER SOLUTION HAVING A FREE CHLORINE RESIDUAL OF 50 PPM. PREPARE STERILIZING MIXTURE BY INJECTING CALCIUM OR SODIUM HYPOCHLORITE AND WATER MIXTURE INTO PIPELINE AT A MEASURED RATE WHILE FRESH WATER IS ALLOWED TO GO THROUGH THE PIPE LINE AT A MEASURED RATE SUCH THAT THE COMBINED MIXTURE IS OF THE SPECIFIED CONCENTRATION.
3. OPERATE ALL VALVES, HYDRANTS, AND OTHER APPURTENANCES DURING STERILIZATION TO ENSURE THAT THE MIXTURE IS DISPERSED INTO ALL PARTS OF THE SYSTEM.
4. RETAIN WATER IN PIPELINE A MINIMUM OF 24 HOURS AND LONG ENOUGH TO DESTROY ALL NONSPORE-FORMING BACTERIA. RESIDUAL STRENGTH OF MIXTURE AT END OF RETENTION PERIOD SHALL BE NOT LESS THAN 10 PPM OF CHLORINE.
5. FLUSH STERILIZING SOLUTION FROM THE SYSTEM UTILIZING THE PERMANENT SOURCE OF SUPPLY UNTIL THE SYSTEM IS CHEMICALLY AND BACTERIOLOGICALLY EQUAL TO THE SOURCE WATER.
6. PROVIDE ADEQUATE WARNING LABELS OR SIGNS AT ALL POINTS OF POSSIBLE USE DURING THE DISINFECTION/FLUSHING PROCEDURE.

3.9 SPECIFIC SYSTEM REQUIREMENTS

DOMESTIC WATER:
7. PRESSURE TEST COMPLETE SYSTEM WITH WATER. USE HIGHER PRESSURE WHERE INDICATED OR WHERE REQUIRED FOR BUILDING HEIGHT OR BY AUTHORITIES HAVING JURISDICTION. VISUALLY INSPECT JOINTS FOR LEAKS, REPAIR OR REPLACE AND RETEST.
8. FLUSH PIPE FREE OF DIRT AND DEBRIS WITH FRESH WATER.
9. DISINFECT LINES WITH FLUID CHLORINE OR HYPOCHLORITE, INTRODUCE SUFFICIENT CHLORINE TO PROVIDE AN INITIAL CONCENTRATION OF 50 PPM. DISINFECT FOR 24 HOUR PERIOD, OPENING AND CLOSING VALVES IN SYSTEM AT VARIOUS POINTS DURING DISINFECTION. FOLLOWING CHLORINATION, THOROUGHLY FLUSH COMPLETE SYSTEM UNTIL REPLACEMENT WATER IS SAME QUALITY AS INCOMING WATER. SUBMIT CERTIFICATION.

3.10 ACCEPTANCE
1. MAINTAIN TEST RECORDS FOR EACH SYSTEM TESTED, FLUSHED, CHEMICAL TREATED OR STERILIZED. IDENTIFY PROCEDURES, REPAIRS, AND TEST RESULTS.
2. OBTAIN SIGNATURE AND DATE FOR ALL PERSONNEL PERFORMING AND WITNESSING TESTS.
3. ACCEPTANCE OF EACH SYSTEM IS CONTINGENT UPON SIGN OFF BY OWNER'S REPRESENTATIVE FOR ALL REQUIRED TESTS.

3.11 IDENTIFICATION
1. IDENTIFY PIPING SYSTEMS IN ACCORDANCE WITH MECHANICAL IDENTIFICATION SPECIFICATION SECTION.

END OF SECTION

Registered Professional Engineer (Mechanical)
CERTIFICATE NO.
37915
FORREST K. ISAACS
Date Signed 01-08-21
ARIZONA, U.S.A.
Expires 9-30-2023

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WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

KITT PEAK - Sells, AZ 85634

△	DATE	DESCRIPTION
0	01/08/21	I.F.C.

PROJECT NUMBER: 11904.00
DRAWN BY: FI
CHECKED BY: FI
CAD FILE: 11904.00-M9.3
SCALE: NONE

MECHANICAL SPECIFICATIONS

M9.3

SECTION 15064 COPPER PIPING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY
A. THIS SECTION INCLUDES PIPE MATERIALS, FITTINGS, AND VALVES FOR COPPER PIPING SYSTEMS.

1.2 SUBMITTALS
A. GENERAL: SUBMIT IN ACCORDANCE WITH DIVISION 1 SECTION - SUBMITTAL PROCEDURES.
B. SUBMIT VENDOR PRODUCT DATA FOR PIPE, FITTING, AND SOLDER MATERIALS.
C. SUBMIT TEST AND CERTIFICATION REPORTS REQUIRED BY SECTION 15060.

PART 2 - PRODUCTS

2.1 PIPING SYSTEM
A. MATERIALS IN ACCORDANCE WITH PIPE MATERIAL CLASS SPECIFICATION SHEET.

PART 3 - EXECUTION
3.1 FABRICATION, ASSEMBLY AND ERECTION - GENERAL
A. INSTALL PIPING IN ACCORDANCE WITH SECTION 15060, RELATED SECTIONS REFERENCED THEREIN, AND MANUFACTURER'S INSTRUCTIONS.
B. COMPLY WITH APPLICABLE BUILDING CODES, ASME B31.9, AND ASTM B828.

3.2 TUBE PREPARATION
A. CUT TUBING SQUARE.
B. REAM CUT TUBE ENDS TO FULL INSIDE DIAMETER TO REMOVE BURRS. REMOVE BURRS ON OUTSIDE OF TUBING.
C. REMOVE ALL OXIDES AND SURFACE OIL FROM TUBE AND FITTING CUPS. CLEAN BY LIGHTLY ABRADING USING SAND CLOTH OR NYLON ABRASIVE PADS.
D. APPLY THIN EVEN COATING OF FLUX WITH A BRUSH TO BOTH TUBE AND FITTING.

3.3 JOINING
A. UNIFORMLY HEAT JOINT.
B. TAKE CARE TO PREVENT ANNEALING AND BURNING FLUX BY OVERHEATING.
C. WHEN JOINING SOLDER CUP VALVES, FULLY OPEN VALVE AND/OR REMOVE TEFLON AND ELASTOMER SEATS AND SEALS TO PREVENT DAMAGE.

3.4 INSPECTION, EXAMINATION, AND TESTING
A. COMPLY WITH THE REQUIREMENTS OF SECTION 15060.
B. COMPLY WITH THE BUILDING CODES AND ASME 31.9.
C. COMPLY WITH THE MOST STRINGENT REQUIREMENT OF THE ABOVE.

MATERIAL CLASS SPECIFICATION SHEET

1. MATERIAL CLASS: CU-01.

2. GENERAL MATERIAL: COPPER.

3. SERVICES:
A. DOMESTIC WATER, COLD AND HOT.
B. CONDENSATE DRAIN.

4. PRESSURE RATING: 862 KPA [(125 PSI)] COLD WATER NONSHOCK.

5. DESIGN TEMPERATURE: 82 DEGREES C [(180 DEGREES F)].

6. CODES: B31.9, BUILDING CODES.

7. PIPE:
A. ABOVEGROUND, COPPER, TYPE L, HARD DRAWN, ASTM B88, DN 100 [(4 INCHES)] MAXIMUM.
B. UNDERGROUND, COPPER, TYPE K, ANNEALED, ASTM B88, DN 100 [(4 INCHES)] MAXIMUM.
C. CONDENSATE DRAIN, COPPER, TYPE M, HARD DRAWN, ASTM B88.

8. FITTINGS:
A. CAST COPPER ALLOY THREADED FITTINGS ANSI/ASME B16.15.
B. WROUGHT COPPER AND COPPER ALLOY SOLDER JOINT PRESSURE FITTINGS, ANSI B16.22.
C. BRONZE PIPE FLANGES AND FLANGED FITTINGS, ANSI B16.24.
D. CAST COPPER ALLOY FITTINGS FOR FLARED COPPER TUBES, ANSI/ASME B16.26.

9. UNIONS:
A. DN 50 [(2 INCHES)] AND SMALLER: SOCKET JOINT, BRONZE RING NUT.
B. DN 65 [(2-1/2 INCHES)] AND LARGER: USE FLANGES.

10. BOLTING:
A. BOLTS, ASTM A307, GRADE B.
B. NUTS, ASTM A563,GRADE A, HEAVY HEX.

11. GASKETS: PREFORMED MICROCELLULAR PTFE, GARLOCK, GAYLON STYLE 3540, 7 MM [(1/16 INCH)] THICK, OR EQUAL.

12. SOLDER: 95-5 TIN-ANTIMONY, ASTM B32, OR AWS A5 CLASSIFICATION BCUP-5 ("SILFOS"), CONTRACTOR'S OPTION.

13. VALVES:
A. GATE VALVES:
1. DN 50 [(2 INCHES)] AND SMALLER: MSS-SP-80 TYPE 2, BRONZE BODY ASTM B61, CLASS 150, SOLID WEDGE, BRONZE DISC, PACKING, RISING STEM, UNION BONNET WITH THREADED OR SOLDERED ENDS.
2. DN 65 TO DN 100 [(2-1/2 INCHES TO 4 INCHES)]: MSS-SP-70 TYPE 1, CAST IRON BODY ASTM A126 CLASS B, CLASS 125, SOLID WEDGE BRONZE DISC, BRONZE TRIM AND SEATS, RISING STEM, BOLTED BONNET, OS&Y, FLANGED ENDS.
B. GLOBE VALVES:
1. DN 80 [(3 INCHES)] AND SMALLER: MSS-SP-80 TYPE 2, BRONZE BODY ASTM B62, CLASS 150, TEFLON DISC, UNION BONNET, THREADED OR SOLDERED ENDS.
C. CHECK VALVES:
1. DN 50 [(2 INCHES)] AND SMALLER: MSS-SP-80 TYPE 3, BRONZE BODY ASTM B62, CLASS 125, SWING DISC HOLDER WITH TFE DISC, THREADED CAP, THREADED OR SOLDERED ENDS.
2. DN 65 TO DN 100 [(2-1/2 INCHES TO 4 INCHES)]: MSS-SP-80 TYPE 3, BRONZE BODY ASTM B62 CLASS 150, SWING BRONZE DISC, BOLTED CAP, FLANGED ENDS.
D. BUTTERFLY VALVES:
1. DN 65 TO DN 100 [(2-1/2 INCHES TO 4 INCHES)]: MSS-SP-67, CAST DUCTILE IRON ASTM A395, 1370 KPA [(200 PSI)] RATING, DUCTILE IRON NICKEL PLATED DISC, EPDM SLEEVE, 316 STAINLESS STEEL STEM, LUG BODY, LEVER OPERATED.
E. BALL VALVES:
1. DN 50 [(2 INCHES)] AND SMALLER: BRONZE BODY ASTM B584, 2740 KPA [(400 PSI)] RATING, 3 PIECE, CHROME-PLATED BRASS BALL, FULL PORT OPENING, PTFE SEATS, LEVER OPERATED, THREADED OR SOLDERED ENDS.

END OF SECTION

SECTION 15065 - NONMETALLIC PIPE, FITTINGS, AND VALVES

PART 1 - GENERAL

1.1SUMMARY
A. SECTION INCLUDES PIPE, FITTINGS, AND VALVES TO BE USED IN SYSTEMS REQUIRING NONMETALLIC PIPING AND COMPONENTS.

1.2SUBMITTALS
A. SUBMIT SHOP DRAWINGS AND SAMPLES IN ACCORDANCE WITH DIVISION 1.
B. SUBMITTALS SHALL INCLUDE THE FOLLOWING:
1. COMPLIANCE WITH APPLICABLE ASTM CODES.
2. MANUFACTURER'S INSTALLATION INSTRUCTIONS.

PART 2 - PRODUCTS

2.1 POLYVINYL CHLORIDE PIPE (PVC)_FLAME RETARDANT
A. PIPE: SCHEDULE 40 OR SCHEDULE 80 PER ASTM D1784, ASTM D1785, OR ASTM D2241. REFER TO SECTION 15060.
B. FITTINGS:
1. SCHEDULE 40, SOCKET TYPE: ASTM D2466.
2. SCHEDULE 80, SOCKET TYPE: ASTM D2467.
3. SOLVENT CEMENT: ASTM D2564 WITH PRIMER RECOMMENDED BY MANUFACTURER.
4. THREAD LUBRICANT: AS RECOMMENDED BY PIPE AND FITTING MANUFACTURER.

2.2 POLYVINYL CHLORIDE PIPE (PVC)-DRAIN, WASTE, AND VENT

A. PIPE: SCHEDULE DWV, ASTM D2665.

B. FITTINGS:
1. THREADED: ASTM D2665.
2. SOCKET TYPE: ASTM D2665.
3. SOLVENT CEMENT: ASTM D2564 WITH PRIMER RECOMMENDED BY MANUFACTURER.
4. THREAD LUBRICANT: AS RECOMMENDED BY PIPE AND FITTING MANUFACTURER.

2.3 CPVC DRAIN, WASTE & VENT PIPING (WITHIN RETURN AIR PLENUMS) - FLAME RETARDENT

A. PIPE: SCHEDULE 40 PER ASTM F441, ASTM D1785, OR ASTM D2241. REFER TO SECTION 15060.
B. MATERIALS WITHIN PLENUMS SHALL BE NONCOMBUSTIBLE OR SHALL BE LISTED AND LABELED AS HAVING A FLAME SPREAD INDEX OF NOT MORE THAN 25 AND A SMOKE-DEVELOPED INDEX OF NOT MORE THAN 50 WHEN TESTED IN ACCORDANCE WITH ASTM E 84 OR UL 723.

C. FITTINGS:
1. SCHEDULE 40, SOCKET TYPE: ASTM F439.
2. SOLVENT CEMENT: ASTM D2846.
3. SCHEDULE 80, THREADED: ASTM F437.
4. THREADED JOINTS: ONLY USE ONCE PER EACH LINE AND ONLY IN VERTICAL ORIENTATION.
5. THREAD LUBRICANT: TEFLON® TAPE.

PART 3 - EXECUTION

3.1 INSTALLATION REFER TO SECTION 15060.

SECTION 15075 - MECHANICAL IDENTIFICATION

PART 1 - GENERAL

1.1SUMMARY
A. SECTION INCLUDES: THIS SECTION INCLUDES MECHANICAL IDENTIFICATION MATERIALS AND DEVICES.
B. PROVIDE PER OWNER STANDARDS. IF OWNER STANDARDS ARE NOT AVAILABLE AND/OR IF ADHERENCE IS NOT REQUIRED BY OWNER, PROVIDE AS FOLLOWS.

1.2SUBMITTALS
A. SUBMIT PRODUCT DATA FOR IDENTIFICATION MATERIALS AND DEVICES PER DIVISION 1.

1.3QUALITY ASSURANCE
A. COMPLY WITH ASME A13.1 "SCHEME FOR THE IDENTIFICATION OF PIPING SYSTEMS" FOR LETTERING SIZE, LENGTH OF COLOR FIELD, COLORS, AND VIEWING ANGLES OF IDENTIFICATION DEVICES.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS
A. BRADY; SIGNMARK DIV.; W.H. BRADY CO.
B. NATIONAL MARKER CO.
C. SETON NAME PLATE CO.
D. TERRA TAPE DIV.; REEF INDUSTRIES, INC.

2.2 IDENTIFYING DEVICES AND LABELS
A. GENERAL: PRODUCTS SPECIFIED ARE MANUFACTURER'S STANDARD PRODUCTS OF CATEGORIES AND TYPES REQUIRED FOR EACH APPLICATION AS REFERENCED IN OTHER DIVISION 15 SECTIONS. WHERE MORE THAN SINGLE TYPE IS SPECIFIED FOR LISTED APPLICATION, SELECTION IS INSTALLER'S OPTION, BUT PROVIDE SINGLE SELECTION FOR EACH PRODUCT CATEGORY.
B. SNAP-ON PLASTIC PIPE MARKERS: MANUFACTURER'S STANDARD PRE-PRINTED, SEMI-RIGID SNAP-ON, COLOR-CODED PIPE MARKERS CONFORMING TO ASME A13.1.
C. PRESSURE-SENSITIVE PIPE MARKERS: MANUFACTURER'S STANDARD PRE-PRINTED, COLOR-CODED, PRESSURE_SENSITIVE VINYL PIPE MARKERS, WITH PERMANENT ADHESIVE CONFORMING TO ASME A13.1.
D. PIPES DN 125 [(5 INCHES)] AND SMALLER: FULL-BAND PIPE MARKERS, EXTENDING 360 DEGREES AROUND PIPE AT EACH LOCATION.
E. PIPES DN 150 [(6 INCHES)] AND LARGER: EITHER FULL-BAND OR STRIP-TYPE PIPE MARKERS, AT LEAST 3 TIMES THE LETTER HEIGHT AND OF LENGTH REQUIRED FOR LABEL.
F. PLASTIC DUCT MARKERS: MANUFACTURER'S STANDARD LAMINATED PLASTIC, DUCT MARKERS IN THE FOLLOWING COLOR CODE:
1. GREEN: COLD AIR.
2. YELLOW: HOT AIR.
3. YELLOW/GREEN: SUPPLY AIR.
4. BLUE: EXHAUST, OUTSIDE, RETURN, AND MIXED AIR.
5. FOR HAZARDOUS MATERIALS EXHAUSTS, USE COLORS AND DESIGNS RECOMMENDED BY ASME A13.1.
6. TERMINOLOGY: INCLUDE DIRECTION OF AIR FLOW, DUCT SYSTEM (MAKEUP AIR, AHU-1, SOLVENT EXHAUST, ETC.), AND DUCT SERVICE (SUPPLY, RETURN, EXHAUST, ETC.).
G. PLASTIC TAPE: MANUFACTURER'S STANDARD COLOR-CODED, PRESSURE-SENSITIVE, SELF-ADHESIVE, VINYL TAPE, AT LEAST 3 MILS THICK.
1. WIDTH: 40 MM [(1-1/2 INCHES)] WIDE ON PIPES WITH OUTSIDE DIAMETERS (INCLUDING INSULATION) LESS THAN 150 MM [(6 INCHES)]; [(2-1/12 INCHES)] WIDE FOR LARGER PIPES.
2. COLOR: COMPLY WITH ASME A13.1, EXCEPT WHERE ANOTHER COLOR SELECTION IS INDICATED.
H. ENGRAVED PLASTIC-LAMINATE SIGNS: ASTM D709, TYPE I, CELLULOSE, PAPER-BASE, PHENOLIC-RESIN-LAMINATE ENGRAVING STOCK; GRADE ES-2, BLACK SURFACE, BLACK PHENOLIC CORE, WITH WHITE (LETTER COLOR) MELAMINE SUBCORE, EXCEPT WHEN OTHER COLORS ARE INDICATED. FABRICATE IN SIZES REQUIRED FOR MESSAGE. PROVIDE HOLES FOR MECHANICAL FASTENING.
1. ENGRAVED WITH ENGRAVER'S STANDARD LETTER STYLE, OF SIZES AND WITH TERMS TO MATCH EQUIPMENT IDENTIFICATION.
2. THICKNESS: 3 MM [(1/16 INCH)], FOR UNITS UP TO 20 SQUARE INCHES OR 8 INCHES LENGTH; 6 MM [(1/8 INCH)] FOR LARGER UNITS.
3. FASTENERS: SELF-TAPPING STAINLESS STEEL SCREWS OR CONTACT-TYPE PERMANENT ADHESIVE.
I. LETTERING: USE PIPING SYSTEM TERMS AS INDICATED IN SECTION 15060 AND ABBREVIATE ONLY AS NECESSARY FOR EACH APPLICATION LENGTH.
1. ARROWS: EITHER INTEGRAL WITH SERVICE LETTERING (TO ACCOMMODATE BOTH DIRECTIONS), OR AS SEPARATE UNIT, ON EACH PIPE/DUCT MARKER TO INDICATE DIRECTION OF FLOW.

PART 3 - EXECUTION

3.1 LABELING AND IDENTIFYING

A. PIPING SYSTEMS: INSTALL PIPE MARKERS ON EACH SYSTEM IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. INCLUDE ARROWS SHOWING NORMAL DIRECTION OF FLOW.
B. LOCATE PIPE MARKERS AS FOLLOWS WHEREVER PIPING IS EXPOSED IN FINISHED SPACES, ACCESSIBLE MAINTENANCE SPACES AND EXTERIOR NONCONCEALED LOCATIONS.
1. NEAR EACH DEVICE, BRANCH CONNECTION, EXCLUDING SHORT TAKE-OFFS FOR FIXTURES AND WHERE FLOW PATTERN IS NOT OBVIOUS.
2. NEAR PENETRATIONS THROUGH BARRIERS INTOR NONACCESSIBLE ENCLOSURES.
3. SPACED AT A MAXIMUM OF 15 M [(50 FEET)] INTERVALS ALONG EACH RUN. REDUCE INTERVALS TO 7 M [(25 FEET)] IN CONGESTED AREAS OF PIPING AND EQUIPMENT.
C. EQUIPMENT: INSTALL ENGRAVED PLASTIC LAMINATE SIGNS OR EQUIPMENT MARKERS ON OR NEAR EACH MAJOR ITEM OF MECHANICAL EQUIPMENT.
D. DUCT SYSTEMS: IDENTIFY AIR SUPPLY, RETURN, EXHAUST, INTAKE, AND RELIEF DUCTS WITH DUCT MARKERS; AND ARROWS SHOWING DUCT SYSTEM SERVICE AND DIRECTION OF FLOW WHERE EXPOSED OR VISIBLE BY REMOVING A COVER AT MAXIMUM INTERVALS OF 15 M [(50 FEET)].

3.2 ADJUSTING AND CLEANING
A. RELOCATE MECHANICAL IDENTIFICATION MATERIALS AND DEVICES WHICH HAVE BECOME VISUALLY BLOCKED BY WORK OF THIS DIVISION OR OTHER DIVISIONS.
B. CLEAN FACE OF IDENTIFICATION DEVICES, AND GLASS FRAMES OF VALVE CHARTS.

END OF SECTION

SECTION 15080 MECHANICAL INSULATION

PART 1 - GENERAL

1.1SUMMARY
A. THIS SECTION INCLUDES PIPE, DUCT, AND EQUIPMENT INSULATION.
B. REFERENCES:
1. NATIONAL COMMERCIAL AND INDUSTRIAL INSULATION STANDARDS.

1.2DEFINITIONS
A. HOT SURFACES: NORMAL OPERATING TEMPERATURES OF 38 DEGREES C [(100 DEGREES F)] OR HIGHER.
B. COLD SURFACES: NORMAL OPERATING TEMPERATURES LESS THAN 16 DEGREES C [(60 DEGREES F)]. NOTE, DOMESTIC COLD WATER TEMPERATURES VARY BY SEASON AND INSULATION REQUIREMENT IS BASED ON MINIMUM TEMPERATURE.
C. THERMAL CONDUCTIVITY (K-VALUE): MEASURE OF HEAT FLOW THROUGH A MATERIAL AT A GIVEN TEMPERATURE DIFFERENCE; CONDUCTIVITY IS EXPRESSED IN UNITS OF W X M/SQ. M X K [(BTU BY INCH/H BY SQ. FT. BY DEGREES F)].
D. DENSITY: IS EXPRESSED IN KG/CU. M [(PCF)].

1.3SUBMITTALS
A. GENERAL: SUBMIT THE FOLLOWING IN ACCORDANCE WITH CONDITIONS OF CONTRACT AND DIVISION 1 - SUBMITTAL PROCEDURES.
B. PRODUCT DATA FOR EACH TYPE OF MECHANICAL INSULATION IDENTIFYING K-VALUE, THICKNESS, AND ACCESSORIES.

1.4QUALITY ASSURANCE
A. COORDINATION: COORDINATE WITH THE INSTALLING CONTRACTOR FOR PIPING, HANGERS, AND SUPPORTS THE INSULATION MATERIALS AND THICKNESS THAT WILL BE FURNISHED FOR EACH INSULATED SYSTEM.
B. FIRE PERFORMANCE CHARACTERISTICS: CONFORM TO THE FOLLOWING CHARACTERISTICS FOR INSULATION INCLUDING FACINGS, CEMENTS, AND ADHESIVES, WHEN TESTED ACCORDING TO ASTM E84, BY UL OR OTHER LISTING ORGANIZATION ACCEPTABLE TO THE AUTHORITY HAVING JURISDICTION. LABEL INSULATION WITH APPROPRIATE MARKINGS OF TESTING LABORATORY.
1. INTERIOR INSULATION: FLAME SPREAD RATING OF 25 OR LESS AND A SMOKE DEVELOPED RATING OF 50 OR LESS.
2. EXTERIOR INSULATION: FLAME SPREAD RATING OF 75 OR LESS AND A SMOKE DEVELOPED RATING OF 150 OR LESS.
C. FIELD-CONSTRUCTED MOCK-UP: BEFORE INSTALLATION, ERECT MOCK-UP OF SIZE AND AT LOCATIONS INDICATED TO DEMONSTRATE WORKMANSHIP QUALITY. INCLUDE METHOD OF ATTACHMENT AND FINISHING FOR EACH.
1. INTERIOR AND EXTERIOR EQUIPMENT.
2. INTERIOR AND EXTERIOR DUCT SYSTEMS.
3. INTERIOR AND EXTERIOR PIPING SYSTEMS.
4. RETAIN AND PROTECT MOCK-UPS DURING CONSTRUCTION AS A STANDARD FOR JUDGING COMPLETED UNIT OF WORK.
5. REMOVE MOCK-UPS FROM PROJECT SITE WHEN DIRECTED.
6. ACCEPTED MOCK-UPS MAY BECOME PART OF COMPLETED UNIT OF WORK.

1.5SEQUENCING AND SCHEDULING

A. SCHEDULE INSULATION APPLICATION AFTER TESTING OF PIPING AND DUCT SYSTEMS HAS BEEN ACCEPTED.
B. SCHEDULE INSULATION APPLICATION AFTER INSTALLATION AND TESTING OF HEAT TRACE TAPE.
C. SCHEDULE INSULATION APPLICATION PRIOR TO CONCEALMENT.

1.6WARRANTY
A. INSTALLING CONTRACTOR'S WRITTEN WARRANTY COVERING MATERIALS AND LABOR FURNISHED.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY THE FOLLOWING:
1. GLASS FIBER:
a. CERTAINTEED MASON.
b. KNAUF FIBERGLASS GMBH.
c. MANVILLE (SCHULLER INTERNATIONAL, INC.).
d. OWENS-CORNING FIBERGLAS CORPORATION.
2. CELLULAR GLASS: PITTSBURGH CORNING CORPORATION.
3. CALCIUM SILICATE:
a. MANVILLE (SCHULLER INTERNATIONAL, INC.).
b. OWENS-CORNING FIBERGLAS CORPORATION.
c. PABCO
4. PVC FITTING COVERS AND JACKETING:
a. CEEL-CO.
b. MANVILLE (SCHULLER INTERNATIONAL, INC.).
c. PROMAT.
d. PROTO CORP.

2.2 GLASS FIBER

A. MATERIAL: INORGANIC GLASS FIBERS, BONDED WITH A THERMOSETTING RESIN.
B. JACKET: ALL-PURPOSE, (ASJ) FACTORY-APPLIED, LAMINATED GLASS-FIBER-REINFORCED, FLAME-RETARDANT KRAFT PAPER AND ALUMINUM FOIL HAVING SELF-SEALING LAP.
C. BOARD: ASTM C 612, TYPE IB, SEMI-RIGID JACKETED BOARD.
1. THERMAL CONDUCTIVITY: 0.037 W X M/SQ. M X K [(0.26 BTU BY INCH/H BY SQ. FT. BY DEGREES F)] AVERAGE MAXIMUM, AT 24 DEGREES C [(75 DEGREES F)] MEAN TEMPERATURE.
2. DENSITY: 192 KG/CU. M [(12 PCF)] AVERAGE MAXIMUM.
D. PREFORMED PIPE INSULATION: ASTM C 547, CLASS 1, RIGID PIPE INSULATION, JACKETED.
1. THERMAL CONDUCTIVITY: 0.037 W X M/SQ. M X K [(0.26 BTU BY INCH/H BY SQ. FT. BY DEGREES F)] AVERAGE MAXIMUM AT 24 DEGREES C [(75 DEGREES F)] MEAN TEMPERATURE.
2. DENSITY: 160 KG/CU. M [(10 PCF)] AVERAGE MAXIMUM.
E. BLANKET: ASTM C 553, TYPE II, CLASS F-1, JACKETED FLEXIBLE BLANKETS.
1. THERMAL CONDUCTIVITY: 0.043 W X M/SQ. M X K [(0.30 BTU BY INCH/H BY SQ. FT. BY DEGREES F)] AVERAGE MAXIMUM, AT 24 DEGREES C [(75 DEGREES F)] MEAN TEMPERATURE.
2. DENSITY: 16 KG/CU.M [(1.0 PCF)] AVERAGE.
F. ADHESIVE: PRODUCED UNDER THE UL CLASSIFICATION AND FOLLOW-UP SERVICE.
1. TYPE: NON-FLAMMABLE, SOLVENT-BASED.
2. SERVICE TEMPERATURE RANGE: MINUS 29 TO 82 DEGREES C [(MINUS 20 TO 180 DEGREES F)].
G. VAPOR BARRIER COATING: WATERPROOF COATING RECOMMENDED BY INSULATION MANUFACTURER FOR OUTSIDE SERVICE.

2.5 INSULATING CEMENTS
HYDRAULIC-SETTING MINERAL FIBER CEMENT IS FOR TEMPERATURES FROM 38 DEGREES C TO 649 DEGREES C [(100 DEGREES F TO 1200 DEGREES F) AND FOR A SMOOTH SURFACE.
A. MINERAL FIBER, HYDRAULIC-SETTING INSULATING AND FINISHING CEMENT: ASTM C449.
1. THERMAL CONDUCTIVITY: 0.173 W X M/SQ. M X K [(1.2 BTU BY INCH/H BY SQ. FT. BY DEGREES F)] AVERAGE MAXIMUM AT 204 DEGREES C [(400 DEGREES F)] MEAN TEMPERATURE.
2. COMPRESSIVE STRENGTH: 690 KPA [(100 PSI)] AT 5 PERCENT DEFORMATION.

2.6 ADHESIVES
A. FLEXIBLE ELASTOMERIC CELLULAR INSULATION ADHESIVE: SOLVENT-BASED, CONTACT ADHESIVE RECOMMENDED BY INSULATION MANUFACTURER.
THE MIL SPEC REFERENCED BELOW IS THE ONLY STANDARD AVAILABLE AT THE TIME OF THIS UPDATE. MIL-A-3316C WAS LAST UPDATED OCTOBER 1987.
B. LAGGING ADHESIVE: MIL-A-3316C, NON-FLAMMABLE ADHESIVE IN THE FOLLOWING CLASSES AND GRADES:
1. CLASS 1, GRADE A FOR BONDING GLASS CLOTH AND TAPE TO UNFACED GLASS FIBER INSULATION, SEALING EDGES OF GLASS FIBER INSULATION, AND BONDING LAGGING CLOTH TO UNFACED GLASS FIBER INSULATION.
2. CLASS 2, GRADE A FOR BONDING GLASS FIBER INSULATION TO METAL SURFACES.

2.7 JACKETS
INSULATION JACKETS BELOW ARE FOR FIELD APPLIED APPLICATIONS. DELETE BELOW IF JACKETS ARE ALL FACTORY APPLIED.
A. GENERAL: ASTM C921, TYPE 1, EXCEPT AS OTHERWISE INDICATED OR RECOMMENDED BY MANUFACTURER.
B. FOIL AND PAPER JACKET: LAMINATED GLASS-FIBER-REINFORCED, FLAME-RETARDANT KRAFT PAPER AND ALUMINUM FOIL.
1. WATER VAPOR PERMEANCE: 1.2 NG/PA/S/SQ. M MAXIMUM, WHEN TESTED ACCORDING TO ASTM E96.
2. PUNCTURE RESISTANCE: 50 BEACH UNITS MINIMUM, WHEN TESTED ACCORDING TO ASTM D781.
C. PVC JACKETING: HIGH-IMPACT, ULTRA-VIOLET-RESISTANT PVC, 0.50 MM [(20 MILS)] THICK, ROLL STOCK READY FOR SHOP OR FIELD CUTTING AND FORMING TO INDICATED SIZES.
1. ADHESIVE: AS RECOMMENDED BY INSULATION MANUFACTURER.
D. PVC FITTING COVERS: FACTORY-FABRICATED FITTING COVERS MANUFACTURED FROM 0.50 MM [(20 MILS)] THICK, HIGH-IMPACT, ULTRA-VIOLET-RESISTANT PVC, PREFORMED FOR ELBOWS, TEES, VALVES, FLANGES, REDUCERS, END CAPS, ETC.
1. ADHESIVE: AS RECOMMENDED BY INSULATION MANUFACTURER.

2.8 ACCESSORIES AND ATTACHMENTS
E. GLASS CLOTH AND TAPE: WOVEN GLASS FIBER FABRICS, PLAIN WEAVE, PRESIZED A MINIMUM OF 272 GM PER SQ. M [(8 OUNCES PER SQUARE YARD)].
1. TAPE WIDTH: 102 MM [(4 INCHES)].
2. CLOTH STANDARD: MIL-C-20079H, TYPE I.
3. TAPE STANDARD: MIL-C-20079H, TYPE II.
B. BANDS: 19 MM [(3/4 INCH)] WIDE, IN ONE OF THE FOLLOWING MATERIALS COMPATIBLE WITH JACKET:
1. STAINLESS STEEL: TYPE 304, 0.5 MM [(0.020 INCH)] THICK.
2. GALVANIZED STEEL: 0.13 MM [(0.005 INCH)] THICK.
3. ALUMINUM: 0.18 MM [(0.007 INCH)] THICK.
C. WIRE: 1.6 MM [(14 GAGE)] NICKEL COPPER ALLOY, 1.6 MM [(16 GAGE)], SOFT-ANNEALED STAINLESS STEEL, OR 1.6 MM [(16 GAGE)], SOFT-ANNEALED GALVANIZED STEEL.
D. CORNER ANGLES: 0.3 MM [(28 GAGE)], 25 MM BY 25 MM [(1 INCH BY 1 INCH)] ALUMINUM, ADHERED TO 50 MM BY 50 MM [(2 INCHES BY 2 INCHES)] KRAFT PAPER.
E. ANCHOR PINS: WELDED, CUPPED HEAD PINS. PROVIDE PINS OF SIZES AND DIAMETERS AS RECOMMENDED BY THE MANUFACTURER FOR INSULATION TYPE AND THICKNESS.

2.9 SEALING COMPOUNDS
A. VAPOR BARRIER COMPOUND: WATER-BASED, FIRE-RESISTIVE COMPOSITION.
1. WATER VAPOR PERMEANCE: 4.6 NG/PA/S/SQ M [(0.08 PERM)] MAXIMUM.
2. TEMPERATURE RANGE: MINUS 29 TO 82 DEGREES C [(MINUS 20 TO 180 DEGREES F)].
B. WEATHERPROOF SEALANT: FLEXIBLE-ELASTOMER-BASED, VAPOR-BARRIER SEALANT DESIGNED TO SEAL METAL JOINTS.
1. WATER VAPOR PERMEANCE: 1.2 NG/PA/S/SQ M [(0.02 PERM)] MAXIMUM.
2. TEMPERATURE RANGE: MINUS 46 TO 121 DEGREES C [(MINUS 50 TO 250 DEGREES F)].
3. COLOR: ALUMINUM.

PART 3 - EXECUTION

3.1 PREPARATION
A. SURFACE PREPARATION: CLEAN, DRY, AND REMOVE FOREIGN MATERIALS SUCH AS RUST, SCALE, AND DIRT.
B. MIX INSULATING CEMENTS WITH CLEAN POTABLE WATER. MIX INSULATING CEMENTS CONTACTING STAINLESS-STEEL SURFACES WITH DEMINERALIZED WATER. FOLLOW CEMENT MANUFACTURER'S PRINTED INSTRUCTIONS FOR MIXING AND PORTIONS.

3.2 INSTALLATION, GENERAL

A. PERFORM WORK AFTER ACCEPTANCE OF SYSTEMS TESTING AND INSTALLATION OF APPLICABLE HEAT TRACING, AND PRIOR TO CONCEALMENT. COORDINATE WITH OTHER TRADES.
B. SELECT ACCESSORIES COMPATIBLE WITH MATERIALS SUITABLE FOR THE SERVICE. SELECT ACCESSORIES THAT DO NOT CORRODE, SOFTEN, OR OTHERWISE ATTACK THE INSULATION OR JACKET IN EITHER THE WET OR DRY STATE.
C. INSTALL VAPOR BARRIERS ON INSULATED PIPES, INCLUDING STORM DRAINS, DUCTS, AND EQUIPMENT HAVING SURFACE OPERATING TEMPERATURES BELOW 16 DEGREES C [(60 DEGREES F)].
D. INSTALL INSULATION WITH SMOOTH, STRAIGHT, AND EVEN SURFACES.
E. SEAL JOINTS AND SEAMS TO MAINTAIN VAPOR BARRIER ON INSULATION REQUIRING A VAPOR BARRIER.
F. SEAL PENETRATIONS FOR HANGERS, SUPPORTS, ANCHORS, AND OTHER PROJECTIONS IN INSULATION REQUIRING A VAPOR BARRIER.
G. SEAL ENDS: TAPER ENDS AT 45 DEGREE ANGLE AND SEAL WITH LAGGING ADHESIVE.
H. APPLY ADHESIVES AND COATINGS AT MANUFACTURER'S RECOMMENDED COVERAGE-PER-GALLON RATE.
I. KEEP INSULATION MATERIALS DRY DURING STORAGE, APPLICATION, AND FINISHING. PROTECT MATERIALS FROM DAMAGE DURING CONSTRUCTION.

3.3 PIPE INSULATION INSTALLATION, GENERAL

A. TIGHTLY BUTT LONGITUDINAL SEAMS AND END JOINTS. BOND WITH ADHESIVE.
B. STAGGER JOINTS ON DOUBLE LAYERS OF INSULATION.
C. APPLY INSULATION CONTINUOUSLY OVER FITTINGS, VALVES, AND SPECIALTIES, EXCEPT AS OTHERWISE INDICATED.
D. APPLY INSULATION WITH A MINIMUM NUMBER OF JOINTS.
E. APPLY INSULATION WITH INTEGRAL JACKETS AS FOLLOWS:
1. PULL JACKET TIGHT AND SMOOTH.
2. COVER CIRCUMFERENTIAL JOINTS WITH BUTT STRIPS, AT LEAST 76 MM [(3 INCHES)] WIDE, AND OF SAME MATERIAL AS INSULATION JACKET. SECURE WITH ADHESIVE.
3. LONGITUDINAL SEAMS: OVERLAP SEAMS AT LEAST 40 MM [(1-1/2 INCHES)]. APPLY INSULATION WITH LONGITUDINAL SEAMS AT BOTTOM OF PIPE. CLEAN AND DRY SURFACE TO RECEIVE SELF-SEALING LAP.
4. VAPOR BARRIER COATINGS: WHERE VAPOR BARRIERS ARE INDICATED, APPLY ON SEAMS AND JOINTS, OVER STAPLES, AND AT ENDS BUTT TO FLANGES, UNIONS, VALVES, AND FITTINGS.
5. AT PENETRATIONS IN JACKETS FOR THERMOMETERS AND PRESSURE GAGES, FILL AND SEAL VOIDS WITH VAPOR BARRIER COATING.
6. REPAIR DAMAGED INSULATION JACKETS, EXCEPT METAL JACKETS, BY APPLYING JACKET MATERIAL AROUND DAMAGED JACKET. ADHERE AND SEAL. EXTEND PATCH AT LEAST 50 MM [(2 INCHES)] IN BOTH DIRECTIONS BEYOND DAMAGED INSULATION JACKET AND AROUND THE ENTIRE CIRCUMFERENCE OF THE PIPE.
F. INTERIOR WALLS AND PARTITIONS PENETRATIONS: APPLY INSULATION CONTINUOUSLY THROUGH WALLS AND PARTITIONS, EXCEPT FIRE-RATED WALLS AND PARTITIONS. APPLY AN ALUMINUM JACKET WITH FACTORY-APPLIED MOISTURE BARRIER OVER INSULATION. EXTEND 50 MM [(2 INCHES)] FROM BOTH SURFACES OF WALL OR PARTITION. SECURE ALUMINUM JACKET WITH METAL BANDS AT BOTH ENDS. SEAL ENDS OF JACKET WITH VAPOR BARRIER COATING. SEAL AROUND PENETRATION WITH JOINT SEALER. REFER TO DIVISION 7 SECTION - JOINT SEALANTS.
G. FIRE-RATED WALLS, PARTITIONS, AND FLOOR PENETRATIONS: CONTINUOUSLY INSULATE OR TERMINATE INSULATION AT PENETRATIONS THROUGH FIRE-RATED WALLS AND PARTITIONS IN ACCORDANCE WITH LISTED FIRE RATED ASSEMBLY. WHEN INSULATION IS TERMINATED, SEAL INSULATION ENDS WITH VAPOR BARRIER COATING. COORDINATE INSTALLATION WITH WORK OF SECTION 07840 - FIRESTOPPING. MAINTAIN VAPOR BARRIER INTEGRITY.
H. FLANGES, FITTINGS, AND VALVES - INTERIOR EXPOSED AND CONCEALED: COAT PIPE INSULATION ENDS WITH VAPOR BARRIER COATING. APPLY SEGMENTS OF INSULATION AROUND FLANGES, UNIONS, VALVES, AND FITTINGS. MAKE JOINTS TIGHT. BOND WITH ADHESIVE.
1. USE SAME MATERIAL AND THICKNESS AS ADJACENT PIPE INSULATION.
2. OVERLAP NESTING INSULATION BY 50 MM [(2 INCHES)] OR 1-PIPE DIAMETER, WHICH EVER IS GREATER.
3. APPLY MATERIALS WITH ADHESIVE, FILL VOIDS WITH MINERAL FIBER INSULATING CEMENT. SECURE WITH WIRE OR TAPE.
4. COVER INSULATION, EXCEPT FOR METAL JACKETED INSULATION, WITH PVC FITTING COVERS AND SEAL CIRCUMFERENTIAL JOINTS WITH BUTT STRIPS.
I. HANGERS AND ANCHORS: APPLY INSULATION CONTINUOUSLY THROUGH HANGERS AND AROUND ANCHOR ATTACHMENTS. INSTALL SADDLES, SHIELDS, AND INSERTS AS SPECIFIED IN SECTION 15090 - HANGERS AND SUPPORTS. FOR COLD SURFACE PIPING, EXTEND INSULATION ON ANCHOR LEGS AND SEISMIC BRACING A MINIMUM OF 300 MM [(12 INCHES)], TAPER, AND SEAL INSULATION ENDS.

3.4 GLASS FIBER PIPE INSULATION INSTALLATION
A. SEAL EXPOSED ENDS WITH LAGGING ADHESIVE.
B. SEAL SEAMS AND JOINTS WITH VAPOR BARRIER COMPOUND.

3.5 APPLICATIONS

A. GENERAL: MATERIALS AND THICKNESSES ARE SPECIFIED IN SCHEDULES AT THE END OF THIS SECTION.
B. ITEMS NOT INSULATED: UNLESS OTHERWISE INDICATED DO NOT APPLY INSULATION TO THE FOLLOWING SYSTEMS, MATERIALS, AND EQUIPMENT:
1. METAL DUCTS WITH DUCT LINER.
2. FACTORY-INSULATED FLEXIBLE DUCTS.
3. FACTORY-INSULATED PLENUMS, CASINGS, TERMINAL BOXES, AND FILTER BOXES AND SECTIONS.
4. FLEXIBLE CONNECTORS FOR DUCTS AND PIPES, EXCEPT CHILLED WATER PIPING.
5. VIBRATION CONTROL DEVICES.
6. TESTING LABORATORY LABELS AND STAMPS.
7. NAMEPLATES AND DATA PLATES.
8. ACCESS PANELS AND DOORS IN AIR DISTRIBUTION SYSTEMS.
9. FIRE PROTECTION PIPING SYSTEMS.
10. SANITARY DRAINAGE AND VENT PIPING.
11. DRAINAGE PIPING LOCATED IN CRAWL SPACES, UNLESS INDICATED OTHERWISE.
12. BELOW GRADE PIPING EXCEPT CHILLED AND HEATED WATER AND STEAM PIPING.
13. CHROME-PLATED PIPES AND FITTINGS, EXCEPT FOR PLUMBING FIXTURES FOR THE DISABLED.

C. INTERIOR, EXPOSED AND CONCEALED PIPING SYSTEMS: UNLESS OTHERWISE INDICATED, INSULATE THE FOLLOWING PIPING SYSTEMS:
1. DOMESTIC COLD WATER.
2. STORM AND OVERFLOW WATER. INSULATE ONLY ROOF DRAIN BODIES AND HORIZONTAL RAINWATER LEADERS OF STORM AND OVERFLOW WATER PIPING.
3. DOMESTIC HOT WATER SUPPLY AND RECIRCULATED RETURN.
4. INTERIOR, CONDENSATE DRAIN LINES.
5. SANITARY DRAINS FOR FIXTURES ACCESSIBLE TO THE DISABLED.
6. CHILLED WATER SYSTEMS, INCLUDING GLYCOL.
7. HEATING WATER SYSTEMS, INCLUDING GLYCOL.

D. INSULATION THICKNESS SCHEDULES
1. GENERAL: INSULATION THICKNESS SPECIFIED IN THE FOLLOWING PIPING SYSTEMS TABLES IS BASED ON GLASS FIBER. ALTERNATE, ACCEPTABLE MATERIALS MAY BE USED AS IDENTIFIED WITHIN THE RATED SERVICE TEMPERATURE. ADJUST INSULATION THICKNESS BY MULTIPLYING THICKNESS FOR GLASS FIBER WITH THE THICKNESS FACTOR IN THE SCHEDULE BELOW AND ROUNDING UP TO NEXT COMMERCIALLY AVAILABLE THICKNESS. MINIMUM INSULATION THICKNESS FOR ALL MATERIALS, UNLESS NOTED OTHERWISE IN THE SCHEDULES, IS 25 MM [(1 INCH)].

INSULATION THICKNESS ADJUSTMENT FACTOR RELATIVE TO GLASS FIBER

Material	Service Temperature	Thickness Factor
Glass Fiber (GF)	to 232°C [(450°F)]	1.0
Calcium Silicate (CS)	to 93°C [(200°F)]	1.33
Calcium Silicate (CS)	over 93°C [(200°F)] to 649°C [(1200°F)]	1.0
Cellular Glass (CG)	to 427°C [(800°F)]	1.33

PLUMBING PIPING SYSTEMS

Service	Acceptable Materials	Insulation Thickness - mm [(inches)] Pipe Sizes, DN [(Inches)]				
Domestic Cold Water	GF	13 [(½)]	13 [(½)]	25 [(1)]	25 [(1)]	25 [(1)]
Domestic Hot Water and Return	GF	25 [(1)]	25 [(1)]	38 [(1½)]	38 [(1½)]	38 [(1½)]
Sanitary Drain, Exposed, ADA Fixtures	GF	13 [(½)]	13 [(½)]	-- --	-- --	-- --

DUCTWORK

Service	Acceptable Materials	Insulation Thickness inches
Supply Air Ducts:		
Inside building, concealed	GF (Flexible)	2
Inside building, exposed	GF (Board)	2
Inside building, exposed within room served by duct	--	None
Downstream of terminal unit	GF (Lined	1½
Outside building	GF (Board)	2
Return Air Ducts:		
Inside building, concealed, non-conditioned spaces	GF (Flexible)	2
Inside building, exposed non-conditioned spaces	GF(Board)	2
Inside building, conditioned spaces	--	None
Outside building	GF (Board)	2
Outside Air Ducts:		
Inside building, concealed	GF (Flexible)	2
Inside building, exposed	GF (Board)	2
Outside building	--	None
HVAC General Exhaust, within 15 feet of fan	GF (Lined)	1

Registered Professional Engineer (Mechanical)
CERTIFICATE NO.
37915
FORREST K. ISAACS
Date Signed 01-08-21
ARIZONA, U.S.A.
Expires 9-30-2023

ADVANTECH
FACILITY DESIGN INC
ARCHITECTURE - ENGINEERING
3280 E. HEMISPHERE LOOP STE. 110 TUCSON AZ 85706 520-806-0903
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WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

NOIR Lab | NSF

KITT PEAK - Sells, AZ 85634

△	DATE	DESCRIPTION
0	01/08/21	I.F.C.

PROJECT NUMBER: 11904.00
DRAWN BY: FI
CHECKED BY: FI
CAD FILE: 11904.00-M9.4
SCALE: NONE

MECHANICAL SPECIFICATIONS

M9.4

SECTION 15090-SUPPORTS

PART 1 - GENERAL

1.1 SUMMARY

A. THIS SECTION INCLUDES HANGERS AND SUPPORTS FOR MECHANICAL SYSTEMS PIPING AND EQUIPMENT.

1.2 DEFINITIONS

A. TERMINOLOGY USED IN THIS SECTION IS DEFINED IN MSS SP-90.

1.3 PERFORMANCE REQUIREMENTS

A. GENERAL: DESIGN AND PROVIDE PIPE SUPPORT MATERIAL AND APPURTENANCES CONFORMING TO THE MINIMUM LEVEL OF ACCEPTANCE SET FORTH IN MANUFACTURERS STANDARDIZATION SOCIETY (MSS) SP_58. THIS SPECIFICATION INDICATES GENERAL MSS TYPES ONLY AND MANUFACTURERS' OTHER STANDARD PRODUCTS ARE ACCEPTABLE UNDER STANDARD SP-58, IF THEY MEET DIMENSIONAL AND LOAD RATING LIMITATION. SELECT SUPPORTS TO WITHSTAND ALL STATIC AND DYNAMIC CONDITION OF LOADING TO WHICH PIPING AND ASSOCIATED EQUIPMENT MAY BE SUBJECTED. DESIGN SUPPLEMENTARY STRUCTURAL MEMBERS FOR THE SPECIFIC LOADS THEY ARE TO SUPPORT IN ACCORDANCE WITH THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC) SPECIFICATION FOR THE DESIGN, FABRICATION, AND ERECTION OF STRUCTURAL STEEL FOR BUILDINGS. USE ALLOWABLE STRESS LEVELS LISTED IN TABLE 2 OF MSS SP-58 FOR CONTRACTOR'S APPLICATION OF HANGER ASSEMBLIES.

1.4 SUBMITTALS

A. GENERAL: SUBMIT THE FOLLOWING ACCORDING TO THE CONDITIONS OF THE CONTRACT AND DIVISION 1 SPECIFICATION SECTIONS.
B. PRODUCT DATA FOR EACH TYPE OF HANGER AND SUPPORT.
C. SUBMIT PIPE SUPPORT SCHEDULE SHOWING MANUFACTURER'S FIGURE NO., SIZE, LOCATION, AND FEATURES FOR EACH REQUIRED PIPE HANGER AND SUPPORT.

1.5 QUALITY ASSURANCE

A. COMPLY WITH REFERENCED CODES AND MANUFACTURER'S STANDARDS.
1. ANSI B31.9, BUILDING SERVICES PIPING
2. MSS SP-58, PIPE HANGERS AND SUPPORTS - MATERIALS, DESIGN AND MANUFACTURING.
3. MSS SP-69, PIPE HANGER AND SUPPORTS SELECTION AND APPLICATION.
4. MSS SP-89, PIPE HANGERS AND SUPPORTS FABRICATION AND INSTALLATION PRACTICES.
5. AWS D1.1, STRUCTURAL WELDING CODE.
6. SMACNA STANDARDS, 1985 EDITION.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. HANGERS:
1. GRINNELL
2. MICHIGAN
3. POWERSTRUT
4. SUPERIOR
5. SUPERSTRUT
6. UNISTRUT

B. CHANNEL FRAMING SYSTEMS:
1. UNISTRUT
2. POWERSTRUT
3. KIN-LINE
4. B-LINE SYSTEMS, INC.
5. SUPERSTRUT.

C. INSULATED PIPE SUPPORTS:
1. PIPE SHIELDS.
2. RILCO.

D. SLEEVES:
1. THUNDERLINE CORP.
2. PIPE SHIELDS
3. CALPICO

2.2 GENERAL REQUIREMENTS

A. HANGERS, SUPPORTS, AND COMPONENTS: FACTORY-FABRICATED ACCORDING TO MSS SP-58.
1. COMPONENTS INCLUDE GALVANIZED COATINGS WHERE INSTALLED FOR PIPING AND EQUIPMENT THAT WILL NOT HAVE A FIELD-APPLIED FINISH.
2. PIPE ATTACHMENTS INCLUDE NONMETALLIC COATING FOR ELECTROLYTIC PROTECTION WHERE ATTACHMENTS ARE IN DIRECT CONTACT WITH COPPER TUBING.

2.3 PIPE HANGERS AND SUPPORTS

A. SUPPORT FOR UNINSULATED PIPE: AN ADJUSTABLE WROUGHT STEEL CLEVIS MSS TYPE-1.
B. SUPPORT FOR COLD INSULATED PIPE, ALL SIZES: AN ADJUSTABLE WROUGHT STEEL CLEVIS, MSS TYPE-1, SIZED TO SUIT 360 DEGREES HIGH-DENSITY INSULATION INSERTS WITH MSS TYPE 40, GALVANIZED PROTECTION SADDLE.
C. SUPPORT DEVICES FOR ALL PLASTIC PIPES SHOULD NOT CAUSE POINT LOADING STRESSES ON THE PIPING. PIPE SHOULD BE SUPPORTED BY MEANS OF CLIPS WHICH DO NOT FIX THE PIPE IN AXIAL DIRECTION, SUCH AS CLIC SUPPORTS FOR DN 50 [(2 INCHES)] AND SMALLER PIPE SIZES AND AGRU/ASAHI POLYPROPYLENE COMPOSITE HANGER FOR DN 65 [(2-1/2 INCH)] AND LARGER PIPE SIZES.
D. INSULATED PIPE SUPPORTS SHALL BE UTILIZED ON INSULATED PIPE LINES. PROPER MODELS TO BE SELECTED BY HANGER LOAD, HANGER STYLE, AND PERMISSIBLE HANGER SPAN DISTANCES SPECIFIED HEREIN.
1. MODEL DESIGNATIONS ARE BY PIPE SHIELDS, INC., OR APPROVED EQUAL. EQUALS MUST SUBMIT DOCUMENTATION DEMONSTRATING COMPLIANCE WITH APPLICABLE MSS AND ANSI STANDARDS.
2. MODELS:
a. INSULATED PIPE SUPPORTS:
1) PIPE SUPPORTED ON ROD HANGERS: USE MODELS A1000, A2000, A3000, A4000, AND A9000.
2) PIPE SUPPORTED ON FLAT SURFACES: USE MODELS B1000, B2000, B5000, B6000, AND B7000 TO B7300 SERIES WITH TEFLON SLIDE ONLY..
3) PIPE SUPPORTED ON ADJUSTABLE ROLL HANGERS AND PIPE ROLLS: USE MODELS A3000, A4000, A5000, A6000, AND A8000 TO A8400 SERIES.
4) PIPE RISERS: MODELS E1000 TO E1300 SERIES AND E2000 TO E2300 SERIES.
E. VERTICAL SUPPORT: STEEL AND COPPER PIPE RISER CLAMPS, MSS TYPES-8 OR -42 AS APPLICABLE TO SERVICE.
F. ROD COUPLINGS: GRINNELL STRAIGHT FIGURE 136, UL/FM APPROVED OR EQUAL.
G. FLOOR SUPPORT FOR HOT AND COLD PIPES: ADJUSTABLE CAST IRON ROLL AND STAND WITH CONCRETE PIER OR STEEL SUPPORT, MSS TYPE-38.
H. CENTER BEAM CLAMPS: MSS TYPES -21 OR -28 AS REQUIRED BY UPPER ATTACHMENT APPLICATION.
I. PROVIDE ANGLES OR CHANNELS TO SPAN JOISTS AND DISTRIBUTE LOAD.
J. WELDED BEAM ATTACHMENTS: MSS TYPES-22 OR -57 AS REQUIRED TO SUIT HANGER APPLICATION.
K. PIPE GUIDES: GRINNELL FIGURE 255 SPIDER GUIDE OR EQUAL.
L. STEEL PIPE SLIDES: GRINNELL FIGURE 257, MSS TYPE-35.

2.4 PIPE ISOLATORS

A. PROVIDE EACH HANGER OR CLAMP FOR UNINSULATED PIPING WITH A METAL BACKED PIPE ISOLATING MATERIAL TO ISOLATE SOUND, VIBRATION AND ELECTROLYSIS.

2.5 FLASHING

A. STEEL FLASHING: 26 GAUGE GALVANIZED STEEL.
B. LEAD FLASHING: 20 KG/SQ M [(4 LB/SQ FT)] SHEET LEAD FOR WATERPROOFING; 5 KG/SQ M [(1 LB/SQ FT)] SHEET LEAD FOR SOUNDPROOFING.
C. SAFES: 25 KG/SQ M [(5 LB/SQ FT)] SHEET LEAD OR 8 MIL THICK NEOPRENE.
D. CAPS: STEEL, 22 GAUGE MINIMUM, 16 GAUGE AT FIRE-RESISTANT STRUCTURES.

2.6 SLEEVES

A. SLEEVES FOR PIPES PASSING THROUGH NONRATED, NONBEARING WALLS AND FLOORS: 20 GAUGE, GALVANIZED SHEET METAL TUBE WITH WELDED LONGITUDINAL JOINTS.
B. SLEEVES FOR PIPES PASSING THROUGH BEAMS AND FOOTINGS: SCHEDULE 40 BLACK STEEL PIPE. FOR WATERPROOF SLEEVES, USE THUNDERLINE LINK-SEAL OR CALPICO SEALING LINX.
C. PENETRATION THROUGH FIRE-RATED WALLS AND FLOOR: COORDINATE THE WORK OF THIS SECTION WITH THE REQUIREMENTS OF SECTION 07840 - FIRESTOPPING.
D. SIZE SLEEVES LARGE ENOUGH TO ALLOW FOR MOVEMENT DUE TO EXPANSION AND TO PROVIDE FOR CONTINUOUS INSULATION.

2.7 MISCELLANEOUS MATERIALS

A. STRUCTURAL STEEL: ASTM A36M [(ASTM A36)], STEEL PLATES, SHAPES, AND BARS, BLACK AND GALVANIZED, ASTM A123.
B. BOLTS AND NUTS: ASME B18.10 OR ASTM A183, STEEL, HEX-HEAD, TRACK BOLTS AND NUTS.
C. WASHERS: ASTM F844, STEEL, PLAIN, FLAT WASHERS.
D. GROUT: ASTM C1107, GRADE B, NONSHRINK, NONMETALLIC.
1. CHARACTERISTICS INCLUDE POST-HARDENING, VOLUME-ADJUSTING, DRY, HYDRAULIC-CEMENT-TYPE GROUT THAT IS NONSTAINING, NONCORROSIVE, NONGASEOUS AND IS RECOMMENDED FOR BOTH INTERIOR AND EXTERIOR APPLICATIONS.
2. DESIGN MIX: 34.5 MPA [(5000 PSI)], 28-DAY COMPRESSIVE STRENGTH.

PART 3 - EXECUTION

3.1 INSERTS AND EXPANSION SHIELDS

A. SET INSERTS FOR POURED-IN-PLACE-CONCRETE IN POSITION IN ADVANCE OF CONCRETE WORK. PROVIDE REINFORCEMENT ROD IN CONCRETE FOR INSERTS CARRYING PIPE OVER DN 100 [(4 INCHES)] IN DIAMETER OR DUCTS OVER 1500 MM [(60 INCHES)] WIDE.
B. DO NOT USE POWER-DRIVEN FASTENERS OR FRICTION SPRING-TYPE CLIPS.

3.2 SUPPORT APPLICATIONS

A. GENERAL HANGER SELECTIONS AND REQUIREMENTS ARE SPECIFIED IN THIS SECTION.
B. COMPLY WITH MSS SP-69 FOR PIPE HANGER SELECTIONS AND APPLICATIONS THAT ARE NOT SPECIFIED IN THIS SECTION OR IN PROCESS PIPING SPECIFICATION SECTIONS.
C. DO NOT USE WIRE FOR EITHER TEMPORARY OR PERMANENT HANGERS OR SUPPORTS.

3.3 SUPPORT INSTALLATION

A. GENERAL: COMPLY FULLY WITH MSS SP-58, SP-69 AND SP-89. INSTALL HANGERS, SUPPORTS, CLAMPS, AND ATTACHMENTS AS REQUIRED TO PROPERLY SUPPORT PIPING FROM BUILDING STRUCTURE.
B. INSTALL SUPPORTS WITH MAXIMUM SPACINGS COMPLYING WITH MSS SP-69, ASME B31 CODES, AND APPLICABLE BUILDING CODES. FOR THERMOPLASTIC AND PROCESS PIPING, SEE SPECIFIC PIPE SPECIFICATION SECTIONS.
C. INSTALL HANGERS AND SUPPORTS COMPLETE WITH NECESSARY INSERTS, BOLTS, RODS, NUTS, WASHERS, AND OTHER ACCESSORIES.
D. LOAD DISTRIBUTION: INSTALL HANGERS AND SUPPORTS SO THAT PIPING LIVE AND DEAD LOADING AND STRESSES FROM MOVEMENT WILL NOT BE TRANSMITTED TO CONNECTED EQUIPMENT.
E. PIPE SLOPES: INSTALL HANGERS AND SUPPORTS TO PROVIDE INDICATED PIPE SLOPES AND SO THAT MAXIMUM PIPE DEFLECTIONS ALLOWED BY ASME B31 SERIES CODES IS NOT EXCEEDED.
F. UNINSULATED PIPING: PROVIDE EACH HANGER OR CLAMP FOR UNINSULATED PIPING WITH A METAL-BACKED PIPE ISOLATING MATERIAL TO ISOLATE SOUND, VIBRATION, AND ELECTROLYSIS. ISOLATORS ARE NOT REQUIRED FOR FIRE PROTECTION SPRINKLER PIPING, WASTE, VENT, GAS, AND DOWNSPOUT PIPING.
G. WHERE PRACTICAL, SUPPORT RISER PIPING INDEPENDENTLY OF CONNECTED HORIZONTAL PIPING.
H. SUPPORT NONMETALLIC PIPING WITH A SUFFICIENT NUMBER OF HANGERS TO PREVENT SAGGING AND MISALIGNMENT.
I. ALL MINOR COMPONENTS SUCH AS STRAPS, THREADED RODS, NUTS, AND WASHERS SHALL BE GALVANIZED OR CADMIUM PLATED. ALL OTHER COMPONENTS, INCLUDING ANGLE IRON, CHANNELS, AND UNISTRUT, SHALL BE FACTORY OR FIELD PAINTED.

3.4 DUCT HANGERS AND SUPPORTS

A. SPECIFIC DETAILS SHOWN ON DRAWINGS TAKE PRECEDENCE OVER 1985 SMACNA REQUIREMENTS.

3.4 EQUIPMENT SUPPORTS

A. FABRICATE STRUCTURAL STEEL STANDS TO SUSPEND EQUIPMENT FROM STRUCTURE ABOVE OR SUPPORT EQUIPMENT ABOVE FLOOR.
B. GROUTING: PLACE GROUT UNDER SUPPORTS FOR EQUIPMENT, AND MAKE A SMOOTH BEARING SURFACE.

3.5 METAL FABRICATION

A. CUT, DRILL, AND FIT MISCELLANEOUS METAL FABRICATIONS FOR PIPE AND EQUIPMENT SUPPORTS.
B. FIT EXPOSED CONNECTIONS TOGETHER TO FORM HAIRLINE JOINTS. FIELD-WELD CONNECTIONS THAT CANNOT BE SHOP-WELDED BECAUSE OF SHIPPING SIZE LIMITATIONS.
C. FIELD WELDING: COMPLY WITH AWS D1.1 PROCEDURES FOR MANUAL SHIELDED METAL-ARC WELDING, APPEARANCE AND QUALITY OF WELDS, METHODS USED IN CORRECTING WELDING WORK, AND THE FOLLOWING:
1. USE MATERIALS AND METHODS THAT MINIMIZE DISTORTION AND DEVELOP STRENGTH AND CORROSION RESISTANCE OF BASE METALS.
2. OBTAIN FUSION WITHOUT UNDERCUT OR OVERLAP.
3. REMOVE WELDING FLUX IMMEDIATELY.
4. FINISH WELDS AT EXPOSED CONNECTIONS SO THAT NO ROUGHNESS SHOWS AFTER FINISHING, AND SO THAT CONTOURS OF WELDED SURFACES MATCH ADJACENT CONTOURS.

3.6 PRIMING

A. PRIME COAT EXPOSED STEEL HANGERS AND SUPPORTS WHICH ARE NOT GALVANIZED, CADMIUM PLATED, OR FACTORY PAINTED. HANGERS AND SUPPORTS LOCATED IN CRAWL SPACES, PIPES SHAFTS AND SUSPENDED CEILING SPACES ARE NOT CONSIDERED EXPOSED.

3.7 FLASHING

A. FLASH AND COUNTERFLASH WHERE MECHANICAL EQUIPMENT PASSES THROUGH WEATHER OR WATERPROOFED WALLS, FLOORS, AND ROOFS.

3.8 SLEEVES

A. SET SLEEVES IN POSITION IN ADVANCE OF CONCRETE WORK. PROVIDE SUITABLE REINFORCING AROUND SLEEVES.
B. WHERE PIPING PASSES THROUGH FLOOR, CEILING OR WALL, CLOSE OFF SPACE BETWEEN PIPE AND CONSTRUCTION WITH NONCOMBUSTIBLE INSULATION. PROVIDE TIGHT-FITTING METAL CAPS ON BOTH SIDES AND CAULK.
C. WATERPROOF SLEEVES SHALL BE THUNDERLINE LINK-SEAL OR CALPICO SEALING LINX.
D. SEAL PIPES PASSING THROUGH WALLS OR SLABS. USE MASTIC OR OAKUM SEAL IN THE ANNULAR SPACE IN NONFIRE-RATED WALLS.
E. INSULATED PIPE SHALL BE INSULATED IN SLEEVES, SEALED, AND POINTED AS ABOVE.
F. INSTALL RATED SLEEVES ON PIPES AS THEY ARE BEING HUNG, READY FOR PROPER PLACEMENT IN RATED WALLS AS WALLS ARE BEING CONSTRUCTED.

3.9 PAINTING

A. TOUCHING UP: CLEAN FIELD WELDS AND ABRADED AREAS OF SHOP PAINT AND PAINT EXPOSED AREAS IMMEDIATELY AFTER ERECTION OF HANGERS AND SUPPORTS. USE SAME MATERIALS AS USED FOR SHOP PAINTING. COMPLY WITH SSPC-PA 1 REQUIREMENTS FOR TOUCHING UP FIELD-PAINTED SURFACES.
B. APPLY BY BRUSH OR SPRAY TO PROVIDE A MINIMUM DRY FILM THICKNESS OF 0.05 MM [(2.0 MILS)].
C. GALVANIZED SURFACES: CLEAN WELDS, BOLTED CONNECTIONS, AND ABRADED AREAS AND APPLY GALVANIZING-REPAIR PAINT TO COMPLY WITH ASTM A780.

END OF SECTION 15090

SECTION 15190 AIR&WATER SYSTEM BALANCING

PART 1 - GENERAL

1.1 SUMMARY

A. TOTAL SYSTEM BALANCE, AS DEFINED BY NEBB OR AABC, WHICH CONSTITUTES THE PROCESS OF TESTING, ADJUSTING, AND BALANCING EACH SYSTEM COMPONENT SO THAT THE ENTIRE SYSTEM PRODUCES THE RESULTS FOR WHICH IT WAS DESIGNED.

1.2 REFERENCES

A. THE LATEST ISSUE OF THE FOLLOWING REFERENCES AND STANDARDS ARE APPLICABLE TO THE TESTING, ADJUSTING, AND BALANCING OF MECHANICAL EQUIPMENT AND SYSTEMS:
1. AABC: ASSOCIATED AIR BALANCE COUNCIL
2. ADC: AIR DIFFUSION COUNCIL
3. AMCA: AIR MOVING AND CONDITIONING ASSOCIATION
4. ANSI: AMERICAN NATIONAL STANDARD INSTITUTE
5. ASHRAE: AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS
6. ASNT: AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING
7. NEBB: NATIONAL ENVIRONMENTAL BALANCING BUREAU
B. "PROCEDURAL STANDARDS FOR TESTING - BALANCING - ADJUSTING OF ENVIRONMENTAL SYSTEMS"; PUBLISHED BY NEBB.
C. AMCA PUBLICATION 203, "A GUIDE TO THE MEASUREMENT OF FAN SYSTEM PERFORMANCE IN THE FIELD."
D. ASHRAE SYSTEMS AND APPLICATIONS HANDBOOK, CHAPTERS 52 AND 57 AS APPLICABLE.
E. ADC TEST CODE NO. 1062R3, "EQUIPMENT TEST CODE."
F. ANSI A 1.4, SPECIFICATION FOR SOUND LEVEL METERS.
G. ANSI S 1.11, SPECIFICATION FOR OCTAVE, HALF_OCTAVE, AND THIRD-OCTAVE BAND FILTER SETS.
H. "NATIONAL STANDARDS FOR TESTING AND BALANCING HEATINGS, VENTILATING AND AIR CONDITIONING SYSTEMS," PUBLISHED BY AABC.

1.3 DEFINITIONS

A. CERTIFICATION OF PERSONNEL IS THE ACTION OF DETERMINING, VERIFYING, OR ATTESTING IN WRITING TO THE QUALIFICATIONS OF AN INDIVIDUAL.
B. QUALIFICATIONS ARE THE CHARACTERISTICS OR ABILITIES GAINED THROUGH TRAINING, EXPERIENCE, OR BOTH, THAT ENABLES AN INDIVIDUAL TO PERFORM HIS WORK PROPERLY.
C. QUALIFIED PROCEDURES ARE THE TEST PROCEDURES DEVELOPED AND PUBLISHED BY AABC, AMCA, ASHRAE, NEBB, OR OTHER NATIONALLY RECOGNIZED TAB ASSOCIATION OR AGENCY.
D. SUPERVISION MEANS THAT TESTS PERFORMED UNDER THIS CONTRACT IN ANY OF TAB CATEGORIES STATED HEREIN SHALL BE UNDER THE DIRECTION AND SUPERVISION OF A TAB LEVEL III EMPLOYEE ON THE JOB SITE.

1.4 SUBMITTALS

A. SUBMIT TEST REPORTS IN ACCORDANCE WITH DIVISION 1.
B. THE TAB CONTRACTOR SHALL PERFORM EQUIPMENT AND SYSTEMS TESTS, COMPILE TEST DATA, AND SUBMIT REPORTS TO THE ARCHITECT. SPECIFIC PROCEDURES USED IN TESTS SHALL BE PERFORMED IN STRICT ACCORDANCE WITH NEBB REQUIREMENTS AND SHALL BE INCLUDED IN THE TEST REPORT. CONTRACTOR SHALL IDENTIFY EQUIPMENT BY DRAWING IDENTIFICATION CODE.
C. SUBMIT DATA ON PRINTED REPORT FORMS PUBLISHED BY AABC OR NEBB.
D. REPORTS SHALL BE CERTIFIED BY A TAB LEVEL III ENGINEER. EACH INDIVIDUAL REPORTING FORM SUBMITTED MUST BEAR THE SIGNATURE AND TAB LEVEL OF THE DATA RECORDING ENGINEER.
E. SUBMIT PERSONNEL QUALIFICATIONS AS IDENTIFIED WITHIN THIS SPECIFICATION.

PART 2 - PRODUCTS
NOT USED

PART 3 - EXECUTION

3.1 TESTING

A. OBTAIN AIR AND WATER BALANCING PERFORMED BY AN INDEPENDENT AIR AND WATER BALANCE AND TESTING AGENCY CURRENTLY CERTIFIED BY THE AABC OR NEBB. THE TESTING AGENCY SHALL BE A SPECIALIST IN THE BALANCING AND TESTING OF MECHANICAL SYSTEMS.

3.2 PERSONNEL QUALIFICATIONS

A. THERE SHALL BE 3 LEVELS OF QUALIFYING TAB PERSONNEL FOR EACH TAB CATEGORY HEREINAFTER LISTED:
1. TAB LEVEL I: A TAB LEVEL I INDIVIDUAL SHALL BE A HIGH SCHOOL GRADUATE AND SHALL HAVE SUFFICIENT TRAINING AND EXPERIENCE TO PERFORM THE NECESSARY TESTS IN THE TAB CATEGORY FOR WHICH HE IS CERTIFIED. A TAB LEVEL I INDIVIDUAL SHALL TAKE TEST DATA AND SHALL BE RESPONSIBLE TO A TAB LEVEL II OR TAB LEVEL III ENGINEER IN THE APPLICABLE TAB CATEGORY.
2. TAB LEVEL II:
a. A TAB LEVEL II INDIVIDUAL SHALL BE (1) A GRADUATE OF A 4 YEAR ACCREDITED ENGINEERING COLLEGE OR UNIVERSITY, AND SHALL HAVE 2 YEARS OF EXPERIENCE IN ENGINEERING, OR EQUIVALENT IN MANUFACTURING, CONSTRUCTION, AND INSTALLATION ACTIVITIES, OR (2) BE A HIGH SCHOOL GRADUATE, HAVING 4 YEARS OF EXPERIENCE IN ENGINEERING ACTIVITIES OR EQUIVALENT. IN EITHER CASE, 2 YEARS OF THIS EXPERIENCE SHALL BE IN TAB TESTING AND PROCEDURES.
b. A TAB LEVEL II INDIVIDUAL SHALL DIRECT AND CARRY OUT TESTS IN THE CATEGORY FOR WHICH HE IS CERTIFIED. HE MUST ALSO BE ABLE TO SET UP AND CALIBRATE INSTRUMENTS, INTERPRET TEST RESULTS, MODIFY PROCEDURES AS NECESSARY, ANALYZE DATA, AND RECORD THE TEST RESULTS ON APPROPRIATE FORMS.
3. TAB LEVEL III:
a. A TAB LEVEL III INDIVIDUAL SHALL BE (1) A GRADUATE OF A 4_YEAR ACCREDITED ENGINEERING OR SCIENCE COLLEGE OR UNIVERSITY, PLUS 5 YEARS OF EXPERIENCE IN ENGINEERING, OR EQUIVALENT MANUFACTURING, CONSTRUCTION, AND INSTALLATION ACTIVITIES, OR (2) BE A HIGH SCHOOL GRADUATE, 10 YEARS OF EXPERIENCE IN ENGINEERING, OR EQUIVALENT MANUFACTURING, CONSTRUCTION, AND INSTALLATION ACTIVITIES. IN EITHER CASE, 2 YEARS OF THIS EXPERIENCE SHALL BE IN TAB TESTING AND PROCEDURES.
b. A TAB LEVEL III ENGINEER SHALL ESTABLISH TEST PROCEDURES, DESIGNATE TEST METHODS AND PROCEDURES, AND INTERPRET TEST RESULTS. HE SHALL BE CAPABLE OF EVALUATING THE RESULTS, NOT ONLY IN TERMS OF EXISTING PROCEDURES, BUT ALSO SHALL POSSESS SUFFICIENT PRACTICAL BACKGROUND IN APPLICABLE HVAC TECHNOLOGY TO ASSIST IN ESTABLISHING TEST PROCEDURES WHEN NONE ARE OTHERWISE AVAILABLE. HE SHALL BE RESPONSIBLE FOR CONDUCTING EXAMINATIONS OF TAB LEVEL I AND TAB LEVEL II PERSONNEL.

3.3 INSTRUMENTS

A. INSTRUMENTS USED IN TESTING MECHANICAL SYSTEMS AND EQUIPMENT SHALL BE AS RECOMMENDED BY THE AABC, AMCA, ASHRAE, OR NEBB. TEST INSTRUMENTS USED SHALL BE INITIALLY AND PERIODICALLY CHECKED THEREAFTER TO VERIFY THEIR CALIBRATION ACCURACY AS DESCRIBED IN THE AABC OR NEBB PROCEDURES. PROVIDE CALIBRATION VERIFICATION OF EACH TEST INSTRUMENT WITH EACH TEST REPORT.
B. TEST EQUIPMENT SHALL BE FURNISHED BY THE CONTRACTOR AND SHALL REMAIN HIS PROPERTY.

3.4 GENERAL PROCEDURES

A. PROVIDE PER AABC OR NEBB STANDARDS.

3.5 PRELIMINARY PROCEDURES

A. CONFIRM THAT EQUIPMENT INSTALLED MATCHES DATA ON REPORT FORMS, INCLUDING MANUFACTURER, MODEL, TYPE, SIZE, CAPACITY, MOTOR HORSEPOWER, RPM, ETC.

3.6 AIR SYSTEM PROCEDURES

A. FOLLOW APPROPRIATE AABC OR NEBB PROCEDURES FOR TESTING AND BALANCING.
B. CONDUCT TESTS FOR CENTRAL AIR-HANDLING DISTRIBUTION SYSTEMS AT DESIGN AIR FLOW WITH SIMULATED CHANGEOUT FILTER RESISTANCE.
C. FOR VARIABLE VOLUME SYSTEMS, COORDINATE WITH EQUIPMENT SUPPLIER TO PROPERLY SET MAXIMUM AND MINIMUM VARIABLE FREQUENCY DRIVE SPEED SETTINGS. MAXIMUM SPEED SETTING SHALL CORRESPOND TO FULL LOAD CURRENT TIMES MOTOR SERVICE FACTOR OR MAXIMUM AIRFLOW AT SPECIFIED FAN HEAD, WHICHEVER IS LIMITING.
D. AFTER EACH AIR SYSTEM IS BALANCED, INDICATE EACH DAMPER SET POSITION WITH A FULLY VISIBLE, PAINTED RED OR SIMILAR, PERMANENT MARK.

3.7 HYDRONIC SYSTEM PROCEDURES

A. FOLLOW APPROPRIATE AABC OR NEBB PROCEDURES FOR TESTING AND BALANCING OF INDIVIDUAL SYSTEMS INVOLVED.
B. CENTRAL PLANT EQUIPMENT, SUCH AS BOILERS, CHILLERS, COMPRESSORS, COOLING TOWERS, ETC., SHALL BE STARTED BY AND OPERATED UNDER THE DIRECT SUPERVISION OF THE OWNER. PROJECT SPECIFIC EQUIPMENT INSTALLED IN THE FAB I EXPANSION SHALL BE STARTED BY AND OPERATED UNDER THE DIRECT SUPERVISION OF THE RESPONSIBLE INSTALLING CONTRACTOR/OWNER.
C. SPECIFIC SYSTEMS SHALL INCLUDE, BUT NOT NECESSARILY BE LIMITED TO, CHILLED AND/OR HOT WATER SYSTEMS, HEAT EXCHANGERS, PUMPS, AND ASSOCIATED APPURTENANCES.
D. TEST AND BALANCE EQUIPMENT PROVIDED WITH MANUAL BALANCING DEVICES, INCLUDING AIR-HANDLING UNIT HEAT EXCHANGER COILS, FAN COIL UNITS, ETC.
E. MARK OR SCORE BALANCING DEVICES, GAUGES, AND OTHER ADJUSTABLE DEVICES AT THEIR FINAL SETPOINTS.

3.8 REPORT FORMS

A. REPORT FORMS, AS THEY RELATE TO THE SPECIFIC PROJECT, SHALL BE FULLY IMPLEMENTED, INCLUDING A SEALED CERTIFICATION. REPORT FORMS SHALL INCLUDE, BUT NOT BE LIMITED TO: COILS, FANS, DUCT SYSTEMS, AIR OUTLETS, TERMINAL UNITS, ROOFTOP EQUIPMENT, HEAT EXCHANGERS, PUMPS, AND INSTRUMENT CALIBRATION.
B. REPORT FORMS SHALL BE STANDARD FORMS AS PUBLISHED BY AABC OR NEBB.

3.9 RETESTING

A. DURING THE PERIOD FOLLOWING COMPLETION OF A SPECIFIC TEST, AND WITHIN THE PROJECT TIME FRAME, THE ARCHITECT MAY, AT HIS DISCRETION, REQUEST A RECHECK OR RESETTING OF ANY OUTLET, SUPPLY AIR FAN, OR EXHAUST FAN AS ORIGINALLY COVERED IN THE SCOPE OF WORK OF THIS SPECIFICATION. RETESTING PROCEDURES, PERSONNEL QUALIFICATIONS, AND REPORT REQUIREMENTS SHALL BE THE SAME AS THE ORIGINAL REQUIREMENTS.

SECTION 15400 - PLUMBING

GENERAL: INSTALLATION SHALL COMPLY WITH THE ADOPTED INTERNATIONAL PLUMBING CODE & LOCAL AMENDMENTS. THE WORK COVERED BY THIS SPECIFICATION SHALL INCLUDE THE FURNISHING FOR ALL MATERIALS, LABOR TRANSPORTATION, TOOLS, PERMITS, FEES, INSPECTIONS, UTILITIES AND INCIDENTALS NECESSARY FOR THE COMPLETE INSTALLATION OF ALL MECHANICAL WORK REQUIRED BY THE CONTRACT DRAWINGS.

ALL FIXTURES SHALL HAVE ACCESSIBLE STOPS WHETHER SPECIFICALLY MENTIONED IN FIXTURE SPECIFICATION OR NOT.

CONTRACTOR SHALL FURNISH ANY MISCELLANEOUS ITEMS NORMALLY USED, SPECIFICALLY MENTIONED OR NOT, TO RENDER A COMPLETE INSTALLATION.

INSTALL EACH FIXTURE WITH APPROPRIATE TRAP, TRAPS, AND NUTS EXPOSED TO VIEW AND IN CASEWORK SHALL BE CHROME PLATED CAST BRASS WITH CLEANOUT AND COVER PLATE. TRAPS CONCEALED IN WALL CONSTRUCTION, CEILING SPACES OR BELOW FLOORS SHALL BE CAST IRON. ALL BRASS TRAPS SHALL BE READILY REMOVABLE FOR SERVICING.

SUPPLIES TO FIXTURES SHALL BE CHROME PLATED, RIGID OR FLEXIBLE BRASS, WITH APPROPRIATE REDUCERS AND ESCUTCHEONS. SUPPLIES SERVING FIXTURE SUPPLY TRIM NOT HAVING INTEGRAL STOPS SHALL BE PROVIDED WITH LOOSE KEY STOPS. SUPPLIES AND STOPS SHALL BE CHICAGO, EASTMAN, MCGUIRE, WOLVERENE, AMERICAN STANDARD, OR KOHLER.

PIPING: SANITARY SOIL PIPING SHALL BE SCHEDULE 40 ABS (ACRYLONITRILE-BUTADIENE-STYRENE PLASTIC) PIPING WITH SOLVENT JOINTS AS APPROVED BY CODE AGENCIES.

VENT PIPING SHALL BE SCHEDULE 40 ABS.

PIPE SHALL BE MANUFACTURED FROM VIRGIN RIGID ABS (ACRYLONITRILE-BUTADIENE-STYRENE) COMPOUNDS WITH A CELL CLASS OF 42222 AS IDENTIFIED IN ASTM D 3965. FITTINGS SHALL BE MANUFACTURED FROM VIRGIN RIGID ABS COMPOUNDS WITH A CELL CLASS OF 32222 AS IDENTIFIED IN ASTM D 3965.

ABS CELLULAR CORE PIPE SHALL BE IRON PIPE SIZE (IPS) CONFORMING TO ASTM F 628. ABS DWV FITTINGS SHALL CONFORM TO ASTM D 2661. PIPE AND FITTINGS SHALL BE MANUFACTURED AS A SYSTEM AND BE THE PRODUCT OF ONE MANUFACTURER. ALL PIPE AND FITTINGS SHALL BE MANUFACTURED IN THE UNITED STATES. ALL SYSTEMS SHALL UTILIZE A SEPARATE WASTE AND VENT SYSTEM. PIPE AND FITTINGS SHALL CONFORM TO NATIONAL SANITATION FOUNDATION STANDARD 14.

INSTALLATION OF PIPING SHALL COMPLY WITH THE LATEST INSTALLATION INSTRUCTIONS PUBLISHED BY MANUFACTURE AND SHALL CONFORM TO ALL APPLICABLE PLUMBING, FIRE, AND BUILDING CODE REQUIREMENTS. BURIED PIPE SHALL BE INSTALLED IN ACCORDANCE WITH ASTM D 2321 AND ASTM F 1668. SOLVENT CEMENT JOINTS SHALL BE MADE WITH A SOLVENT CEMENT CONFORMING TO ASTM D 2235. THE SYSTEM SHALL BE PROTECTED FROM CHEMICAL AGENTS, FIRE STOPPING MATERIALS, THREAD SEALANT, OR OTHER AGGRESSIVE CHEMICAL AGENTS NOT COMPATIBLE WITH ABS COMPOUNDS. SYSTEMS SHALL BE HYDROSTATICALLY TESTED AFTER INSTALLATION. WARNING! NEVER TEST WITH OR TRANSPORT/STORE COMPRESSED AIR OR GAS IN ABS PIPE OR FITTINGS.

INSULATION: INSULATE ALL DOMESTIC COLD WATER SUPPLY, HOT WATER SUPPLY AND HOT WATER RETURN PIPING WITH 1" THICK GLASS FIBER SECTIONAL PIPE INSULATION WITH ALL SERVICE JACKET. INSTALL INSULATION IN ACCORDANCE WITH MANUFACTURER'S PRINTED INSTRUCTIONS. PROVIDE SHEET METAL SADDLES AT HANGER LOCATIONS. TEST PIPING SYSTEMS PRIOR TO THE APPLICATION OF INSULATION.

PIPING SPECIALTIES: INSTALL DIELECTRIC UNIONS OR FLANGES WHERE COPPER OR BRASS PIPING CONNECTS TO FERROUS PIPING OR EQUIPMENT. INSTALL VACUUM BREAKERS ON EACH WATER SUPPLY LINE SERVING PLUMBING FIXTURES, EQUIPMENT, OR OTHER DEVICE HAVING A WATER SUPPLY BELOW THE RIM OF THE FIXTURE. INSTALL WATER HAMMER ARRESTORS (EQUAL TO J.R. SMITH #5000) WITH ACCESS DOORS (EQUAL TO J.R. SMITH SERIES #4760) WHERE SHOWN ON PLAN.

VALVES: VALVES FOR DOMESTIC HOT AND COLD WATER SHALL BE AS MANUFACTURED BY STOCKHAM, NIBCO, MILWAUKEE OR JENKINS.

BALL VALVES SHALL BE ASTM B-62 BRONZE BODY AND BALL, ASTM B-371 ALLOY 694 SILICON BRASS STEM, PTFE SEAT, PACKING AND GASKET, THREADED ENDS, TWO PIECE BODY AND CAP.

BALL VALVES MAY BE USED INTERCHANGEABLY FOR GATE VALVES FOR PIPE SIZES 2" AND SMALLER. VALVES MAY BE THREADED, FLANGE OR SOLDERED.

GATE VALVES SHALL BE CLASS 125, ASTM B-62 BRONZE BODY AND SCREWED BONNET, ASTM B-371 ALLOY 694 RISING STEM, SOLID WEDGE THREADED OR SOLDERED ENDS.

CHECK VALVES SHALL BE CLASS 125, ASTM B-62 BRONZE BODY, BRONZE DISC, SWING CHECK DESIGN, THREADED OR SOLDERED ENDS.

WHERE VALVE INSTALLATION IS CONCEALED IN PIPE CHASES, PROVIDE J.R. SMITH SERIES 4760, OR APPROVED EQUAL ACCESS DOORS WITH CONCEALED HINGE AND KEY OPERATED LOCKS. DOORS SHALL BE LARGE ENOUGH TO SERVICE VALVES AND SHALL BE INSTALLED FLUSH WITH FINISHED WALLS OR CEILINGS.

PLUMBING FIXTURES: FURNISH ALL STANDARD PRODUCTS OF AMERICAN STANDARD, KOHLER, ELJER, CRANE, DELTA, MOEN, ROYAL BRASS, CHICAGO, SLOAN, DELANY, ELKAY, HAWS, OASIS, SUNROC OR APPROVED EQUAL. REFER TO SCHEDULE FOR SPECIFIC REQUIREMENTS. PROVIDE STOPS AND FLOW CONTROL FITTINGS AT HOT AND COLD-WATER CONNECTIONS TO EACH FIXTURE.

EXECUTION: SLOPE DRAINAGE PIPING INSIDE AND OUTSIDE OF BUILDING AT A MINIMUM OF 2% AND IN ACCORDANCE WITH REQUIREMENTS OF THE GOVERNING PLUMBING CODES.

ESTABLISH GRADE LINES WITH SURVEYOR'S LEVEL. VERIFY LOCATION OF SEWER TAPS BEFORE START OF WORK AND MAKE NECESSARY GRADE ADJUSTMENTS. DRAIN VENT LINES BACK TO SOIL LINES.

LOCATE CLEAN OUTS AT EACH CHANGE OF LINE DIRECTION OF MORE THAN 135 DEG.

INSTALL WATER PIPING TO AVOID CONTACT WITH STRUCTURE WHEN POSSIBLE TO PREVENT EXCESSIVE WATER HAMMER NOISE TRANSMISSION.

WRAP METALLIC PIPE IN CONTACT WITH CONCRETE BLOCK, SLABS OR STUCCO WITH 10-MIL THICK PVC TAPE TO PREVENT CORROSION.

FLUSH PIPING CLEAN WITH WATER AFTER INSTALLATION.

TEST PIPING PRIOR TO COVERING OR BACKFILLING.

TEST WATER PIPING AT 100 PSIG FOR A CONTINUOUS PERIOD OF NOT LESS THAN FOUR (4) HOURS. DURING THIS TIME, CAREFULLY INSPECT THE SYSTEM FOR LEAKS. IF NECESSARY, REPAIR LEAKS AND TEST AGAIN UNTIL NO LEAKAGE IS DETECTED.

TEST SOIL, WASTE AND VENT SYSTEMS BY PLUGGING LINES AND FILLING SYSTEMS WITH WATER TO A STATIC HEAD OF 10 FEET OF WATER. OBSERVE WATER LEVEL FOR A TWO (2) HOUR PERIOD. IF LEVEL IS LOWERED, INDICATING LEAKAGE, REPAIR LEAKS AND TEST AGAIN UNTIL NO FURTHER LEAKAGE IS DETECTED.

SECTION 15840 - HVAC SHEET METAL DUCTWORK

PART 1 - GENERAL

1.1SUMMARY

A. SECTIONS INCLUDES SHEET METAL MATERIALS, FASTENERS, SUPPORTS AND DUCT CONSTRUCTION CLASSIFICATION FOR SUPPLY, RETURN, AND EXHAUST SYSTEMS.

1.2DEFINITIONS

A. DUCTWORK SIZES ON DRAWINGS STATE INSIDE CLEAR DIMENSIONS. FOR ACOUSTICALLY LINED AND INTERNALLY INSULATED DUCTWORK, MAINTAIN DUCTWORK SIZES INSIDE LINING OR INSULATION.

1.3REFERENCES, CODES, STANDARDS

A. CONSTRUCT DUCTWORK IN ACCORDANCE WITH REFERENCED CODES AND STANDARDS AS LISTED BELOW, UNLESS HEREIN MODIFIED AND LIMITED OTHERWISE.
1. 1985 SMACNA FIRST EDITION, HVAC DUCT CONSTRUCTION STANDARDS, METAL AND FLEXIBLE.
2. 1992 SMACNA ROUND AND RECTANGULAR INDUSTRIAL DUCT CONSTRUCTION STANDARDS.
3. 1993 SMACNA ACCEPTED INDUSTRY PRACTICE FOR INDUSTRIAL DUCT CONSTRUCTION.
4. INTERNATIONAL MECHANICAL CODE.
5. NFPA, 90-A, STANDARD FOR INSTALLATION OF AIR CONDITIONING AND VENTILATING SYSTEMS.
6. LATEST ASHRAE, DUCT DESIGN AND DUCT CONSTRUCTION.
7. 1992 21ST EDITION ACGIH INDUSTRIAL VENTILATION MANUAL OF RECOMMENDED PRACTICE.
8. ASTM 90, TEST METHOD FOR WEIGHT OF COATING ON ZINC COATED IRON OR STEEL ARTICLES.
9. ASTM A366, STEEL, SHEET, CARBON, COLD ROLLED COMMERCIAL QUALITY.
10. ASTM A569, STEEL, CARBON, HOT ROLLED SHEET AND STRIP COMMERCIAL QUALITY.
11. ASTM A653, STEEL SHEET, ZINC COATED (GALVANIZED) OR ZINC IRON ALLOY COATED (GALVANEALED) BY THE HOT-DIP PROCESS.

1.4DUCT CONSTRUCTION CRITERIA MODIFICATION AND LIMITATIONS

A. FORMED-ON FLANGES SHALL BE CONSTRUCTED AS A SMACNA T-24 FLANGE, WHOSE LIMITS ARE DEFINED ON PAGE 1-25 1985 SMACNA MANUAL, FIRST EDITION. FORMED-ON FLANGES SHALL ONLY BE ACCEPTED FOR USE ON DUCTWORK 42 INCHES WIDE OR LESS AND SUBJECTED TO 2 INCH W.G.S.P. OR LESS. NO OTHER CONSTRUCTION PERTAINING TO FORMED-ON FLANGES, WILL BE PERMITTED.
B. CONSTRUCT ROUND AND RECTANGULAR EXHAUST SYSTEM DUCTWORK 2 INCH W.G. STATIC NEGATIVE OR GREATER, IN ACCORDANCE WITH APPLICABLE CLASSIFICATION OF SMACNA INDUSTRIAL DUCT STANDARDS.
C. CONSTRUCT RECTANGULAR RETURN SYSTEMS DUCTWORK 3 INCH W.G. STATIC NEGATIVE OR GREATER, IN ACCORDANCE WITH SMACNA CLASS 1 INDUSTRIAL DUCT STANDARDS.
D. WHEN SMACNA 1985 FIRST EDITION IS APPLICABLE, RECTANGULAR DUCT INTERMEDIATE REINFORCEMENT SHALL BE IN ACCORDANCE WITH TABLES 1-3 THROUGH 1-19.
E. TRANSVERSE JOINTS AND INTERMEDIATE REINFORCEMENTS SHALL MAINTAIN THEIR STRUCTURAL INTEGRITY WITHIN THE OPERATING RANGE OF THE SYSTEM. NO DUCT DEFORMATION OR DEFLECTION WHICH EXCEEDS 1985 SMACNA MANUAL FIRST EDITION DEFLECTION CRITERIA WILL BE PERMITTED.
F. SMACNA 1985 FIRST EDITION TIE ROD OPTION CONSTRUCTION, PAGE 1-27, SHALL NOT BE PERMITTED ON NEGATIVE PRESSURE DUCT APPLICATIONS.
G. THE FOLLOWING HVAC DUCT CONSTRUCTION MEANS AND METHODS SHALL NOT BE PERMITTED.
1. 1995 SMACNA SECOND EDITION IN ITS ENTIRETY.
2. PVC CLIPS ON FLANGE SYSTEMS. PVC CLIPS MAY BE USED ONLY FOR LISTED FIRE DAMPER BREAK-AWAY CONNECTIONS.
H. PROPRIETARY DUCT CONSTRUCTION MEANS SHALL BE PERMITTED ONLY AS FOLLOWS:
1. SLIDE-ON CONNECTORS DUCTMATE 35, WARD J., OR WDCI FLANGE SYSTEMS WITH METAL CLIPS AND BOLTED CORNERS. COMPONENTS SHALL BE MANUFACTURED BY A SINGLE SOURCE. EACH COMPONENT SHALL BE STAMPED WITH MANUFACTURER'S NAME OR MARK. PVC CLIPS ARE NOT ALLOWED.

1.5SUBMITTALS

A. SUBMIT IN ACCORDANCE WITH DIVISION 1.
B. SUBMIT TYPICAL SHOP STANDARDS AND/OR SMACNA DETAILS FOR EACH CLASS OF DUCT SPECIFIED, INCLUDING PARTICULARS SUCH AS GAUGE SIZES, WELDS, JOINT DETAILS, AND FITTING CONFIGURATIONS PRIOR TO START OF WORK.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. MANUFACTURED ROUND DUCTWORK INCLUDING PREINSULATED DOUBLE WALL AND ACOUSTICAL DUCT:
1. SEMCO
2. SPIRAL METAL CORPORATION
3. UNITED MCGILL CORP.
B. PROPRIETARY MANUFACTURED DUCT JOINTS RECTANGULAR, ROUND, FLAT OVAL:
1. DUCTMATE INDUSTRIES (D.M. 35).
2. WARD J-CLASS.
3. W.D.C.I.

2.2 MATERIALS

A. GALVANIZED DUCTWORK: FABRICATED USING GALVANIZED STEEL SHEET OF LOCK FORMING QUALITY, HAVING ZINC COATING OF 1.25 OUNCES PER SQUARE FOOT FOR EACH SIDE PER ASTM A 653, G 90. ALL DUCTWORK, SUPPORTS, AND REINFORCEMENT SHALL BE GALVANIZED UNLESS OTHERWISE NOTED.
1. CARBON STEEL SHEETS: ASTM A 366, COLD-ROLLED SHEETS, COMMERCIAL QUALITY, WITH OILED, EXPOSED MATTE FINISH.
B. DUCT LINER: FOR LOW PRESSURE GALVANIZED DUCTWORK PROVIDE LINER WHERE NOTED ON THE DRAWINGS. LINER SHALL BE FOR THERMAL AND ACOUSTICAL PURPOSES AND SHALL BE TYPE 1 FLEXIBLE DUCT LINER 1" THICK, 1-1/2 LB/CU.FT DENSITY, MAXIMUM R VALUE AT 7 DEF. F, MEAN TEMPERATURE OF 0.28 BTU/IN/SF/DEGREE F/HR. LINER SHALL BE SUITABLE FOR TEMPERATURE RANGE OF 40F TO 250F AND MAXIMUM AIR VELOCITY OF 4000 FPM. INSTALL LINER IN ACCORDANCE WITH SMACNA DUCT LINER APPLICATION STANDARD.
C. REINFORCEMENT SHAPES AND PLATES: PROVIDE GALVANIZED STEEL.
D. FASTENERS: USE GALVANIZED BLIND RIVETS AND BOLTS THROUGHOUT.
E. PVC COMPONENTS SHALL NOT BE USED.
F. SEALANT MATERIAL: DUCT SEALER SHALL BE FLEXIBLE, WATER-BASED, ADHESIVE SEALANT DESIGNED FOR USE IN ALL PRESSURE DUCT SYSTEMS. AFTER CURING, IT SHALL BE RESISTANT TO ULTRAVIOLET LIGHT AND SHALL SEAL OUT WATER, AIR, AND MOISTURE. SEALER SHALL BE UL LISTED AND CONFORM TO ASTM E 84.
G. JOINTS, SEAMS:
1. ALL JOINTS SHALL BE IN ACCORDANCE WITH REFERENCED CODE AND STANDARDS BASED UPON SIZE AND PRESSURE CLASSIFICATION EXCEPT AS MODIFIED.
2. WELDED JOINTS SHALL BE IN ACCORDANCE WITH THE WELDING SHEET METAL CODE.
3. MANUFACTURED JOINTS, WHERE APPLICABLE MAY BE USED AS HEREIN SPECIFIED.
4. MAKE UP ALL LABORATORY EXHAUST SYSTEM DUCTWORK JOINTS WITH RACHEM THERMOFIT WRAP AROUND DUCT BANDS INSTALLED IN STRICT ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
H. FLANGED INTERIOR GASKET:
1. DUCTMATE 440 OR A BUTYL RUBBER GASKET WHICH MEETS MIL-C 18969B, TYPE II CLASS B, TT-C-1796 A, TYPE II CLASS B, AND TTS-S-001657 MUST ALSO PASS UL 723.

2.3 DUCT CONSTRUCTION CLASSIFICATIONS

A. GENERAL: CONSTRUCT AND SEAL DUCTWORK IN ACCORDANCE WITH SMACNA PRESSURE CLASSIFICATIONS AND SEAL CLASSES LISTED FOR DUCTWORK SYSTEMS LISTED BELOW:
1. SUPPLY AIR: PRESSURE CLASS 2" W.G., SEAL CLASS A, MATERIAL GSM
2. RETURN AIR: PRESSURE CLASS 2" W.G., SEAL CLASS A, MATERIAL GSM
3. EXHAUST AIR: PRESSURE CLASS 2" W.G., SEAL CLASS A, MATERIAL GSM
GSM= GALVANIZED SHEET METAL.

PART 3 - EXECUTION

3.1 FABRICATION

A. GENERAL: PROVIDE DUCTWORK PER SECTION 15840, ARTICLES 1.3 AND 1.4.
B. LAP METAL DUCTS IN DIRECTION OF AIR FLOW. HAMMER DOWN EDGES AND SLIPS TO LEAVE SMOOTH DUCT INTERIOR.
C. COORDINATE DUCTWORK SYSTEMS LAYOUT WITH OTHER TRADES PRIOR TO FABRICATION. PROVIDE OFFSETS, TRANSITIONS AND STREAM-LINERS AS REQUIRED TO CLEAR STRUCTURAL INTERFERENCES AND MECHANICAL OR ELECTRICAL SYSTEMS. WORKING PLANS DO NOT INDICATE ALL FITTINGS, OFFSETS, TRANSITIONS AND STREAM-LINERS THAT ARE REQUIRED TO INSTALL DUCTWORK SYSTEMS.
D. BALANCING DAMPERS ARE REQUIRED AT EVERY BRANCH OF ALL DUCTWORK SYSTEMS. USE OF O.B.D.S IN CEILING DIFFUSER OUTLET, SHALL NOT BE USED FOR SYSTEMS BALANCE.

3.2 INSTALLATION

A. INSTALL HARD DUCTWORK INDEPENDENT OF THE FABRIC HANGAR UNLESS FULLY COORDINATED WITH THE HANGAR MANUFACTURER.
B. INSTALL DUCTS WITH THE FEWEST POSSIBLE JOINTS.
C. CLEAN DUCTWORK AS IT IS INSTALLED TO REMOVE DIRT AND DUST. DURING INSTALLATION, CLOSE DUCT OPENINGS AND OPEN ENDS WITH TEMPORARY COVERS TO KEEP CONSTRUCTION DUST OUT OF DUCT SYSTEMS.
D. CONSTRUCT DUCTWORK WITH SUFFICIENT CLEARANCE AROUND EQUIPMENT TO ALLOW NORMAL OPERATING AND MAINTENANCE ACTIVITIES OF EQUIPMENT.

END OF SECTION

Registered Professional Engineer (Mechanical)
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WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

KITT PEAK - Sells, AZ 85634

△	DATE	DESCRIPTION
0	01/08/21	I.F.C.

PROJECT NUMBER: 11904.00
DRAWN BY: FI
CHECKED BY: FI
CAD FILE: 11904.00-M9.5
SCALE: NONE

MECHANICAL SPECIFICATIONS

M9.5

SECTION 15860 DUCT ACCESSORIES

PART 1 - GENERAL

1.1SUBMITTALS

A. SUBMIT IN ACCORDANCE WITH DIVISION 1.

B. SUBMIT DAMPER MANUFACTURER'S PRINTED INSTRUCTIONS FOR METAL STUD FRAMING FOR FIRE DAMPERS IN FIRE RATED DRYWALL PARTITIONS.

C. FOR EACH TYPE OF FIRE DAMPER AND COMBINATION FIRE-SMOKE DAMPER, PROVIDE A FIELD MOCK-UP INSTALLATION ASSEMBLY COMPLETE WITH WALL FRAMING, WALL BOARD, WALL OPENING FILLER PIECES, PERIMETER MOUNTING ANGLES, SLEEVE, BREAKAWAY DUCT CONNECTIONS, AND ACCESS DOOR. OBTAIN ARCHITECT'S APPROVAL OF MOCK-UP PRIOR TO STARTING DAMPER INSTALLATION.

D. PROVIDE A FIELD MOCK-UP SMOKE DAMPER INSTALLATION COMPLETE WITH DAMPER OPERATOR, LINKAGE, LIMIT SWITCH, AND ACCESS DOOR. OBTAIN ARCHITECT'S APPROVAL OF MOCK-UP PRIOR TO STARTING SMOKE DAMPER INSTALLATION.

1.2QUALITY ASSURANCE

A. CONSTRUCT AND TEST FIRE DAMPERS IN ACCORDANCE WITH UL STANDARD 555. EACH FIRE DAMPER SHALL HAVE A 1_1/2 OR 3 HOUR UL FIRE PROTECTION RATING, AS REQUIRED, AND SHALL INCLUDE A UL LABEL IN ACCORDANCE WITH ESTABLISHED UL LABELING PROCEDURES.

B. CONSTRUCT FIRE DAMPER FUSIBLE LINKS TO UL STANDARD 33, FUSIBLE LINKS FOR FIRE PROTECTION SERVICE, FOR SERVICE INTENDED.

C. DEMONSTRATE RESETTING OF FIRE DAMPERS TO AUTHORITIES HAVING JURISDICTION AND OWNER'S REPRESENTATIVE.

D. SMOKE DAMPERS SHALL BE CLASSIFIED BY UL AS A LEAKAGE RATED DAMPER FOR USE IN SMOKE CONTROL SYSTEMS, UNDER UL 555 S, AND SHALL BEAR A UL LABEL ATTESTING TO SAME.

E. THE OWNER RESERVES THE RIGHT TO TEST ALL CONSTANT VOLUME VALVES FOR PERFORMANCE. IF THEY DO NOT MEET SPECIFICATIONS, THE VALVES SHALL BE SENT BACK TO THE MANUFACTURER AND REPLACED AT THE MANUFACTURER'S EXPENSE.

1.3REFERENCES

A. ACCESSORIES SHALL MEET THE REQUIREMENTS OF NFPA 90 A AND NFPA 101, AS APPLICABLE.

B. FABRICATE IN ACCORDANCE WITH ASHRAE HANDBOOKS AND SMACNA DUCT MANUALS.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. CONTROL DAMPERS:
1. JOHNSON CONTROLS
2. GREENHICK
3. RUSKIN

B. BALANCING DAMPERS:
1. AIR BALANCE
2. GREENHECK
3. RUSKIN
4. CONTRACTOR FABRICATED

C. ACCESS DOORS - DUCTWORK:
1. DUCTMATE
2. MILCOR
3. RUSKIN
4. CONTRACTOR FABRICATED

2.2 CONTROL DAMPERS

A. GENERAL:
1. PROVIDE CONTROL DAMPERS WITH OPPOSED BLADES TO SUIT APPLICATION.
2. PROVIDE QUARTER TURN ELECTRIC ACTUATOR, 4 TO 20 MADC INPUT, AS MANUFACTURED BY HY-TORK/E.S.M.E. COORDINATE WITH CONTROL SUBCONTRACTOR FOR OPERATORS, CONTROL ACCESSORIES, AND SEQUENCE OF OPERATION.

B. RECTANGULAR DAMPERS:
1. PROVIDE AIRFOIL-SHAPED, DOUBLE SKIN BLADES, WITH 14 GAUGE EQUIVALENT THICKNESS, MAXIMUM 6 INCHES WIDE, HAVING SHAFTS/BEARINGS DESIGNED TO MEET TEMPERATURE AND MAXIMUM VELOCITY (3500 FPM) REQUIREMENTS. PROVIDE MINIMUM 3_1/2 INCHES BY 16 GAUGE GALVANIZED CHANNEL FRAME. SEAL BLADE EDGES WITH EXTRUDED VINYL AND JAMB WITH FLEXIBLE METAL COMPRESSION.
2. THE PRESSURE DROP FOR A 24 INCHES BY 24 INCHES DAMPER HANDLING 8500 CFM SHALL BE 0.08 INCH WG OR LESS UNDER STANDARD AIR CONDITIONS.
3. DAMPERS SHALL BE RUSKIN CD60 WITH FUSIBLE LINK.

C. ROUND DAMPERS:
1. CONSTRUCT BLADES WITH 2 LAYERS GALVANIZED STEEL 14 GAUGE EQUIVALENT THICKNESS, NEOPRENE SEALS SANDWICHED BETWEEN BLADE SHEETS, AND SHAFTS/BEARINGS DESIGNED TO MEET DYNAMIC AND TEMPERATURE REQUIREMENTS. PROVIDE 12 GAUGE REINFORCED GALVANIZED STEEL FRAME, NEOPRENE SANDWICHED BETWEEN BLADE SHEETS.
2. PRESSURE DROP FOR A 12 INCHES DIAMETER DAMPER HANDLING 2500 CFM SHALL BE 0.10 INCH WG OR LESS UNDER STANDARD AIR CONDITIONS.
3. DAMPERS SHALL BE RUSKIN CDRS_25.

2.3 BALANCING DAMPERS

A. GENERAL:
1. PROVIDE DAMPERS THROUGHOUT THE DUCT SYSTEMS TO FACILITATE COMPLETE BALANCING.
2. DAMPERS MAY BE VENDOR PURCHASED OR CONTRACTOR FABRICATED.

B. RECTANGULAR DAMPERS WITH EITHER WIDTH OR HEIGHT DIMENSION LESS THAN 24 INCHES:
1. BUTTERFLY TYPE DAMPERS WITH 18 GAUGE GALVANIZED STEEL OR DUCT CASING ANGLE REINFORCED AS REQUIRED.
2. PROVIDE SINGLE THICKNESS 16 GAUGE MINIMUM, GALVANIZED STEEL BLADES, WELDED OR BOLTED TO 1/2 INCH MINIMUM DIAMETER THROUGH SHAFT. PERMANENTLY MARK END OF SHAFT TO INDICATE BLADE POSITION AND FIT WITH A LOCKING QUADRANT MOUNTED ON OUTSIDE OF FRAME. BEARINGS SHALL BE PRESSED INTO FRAME AND DESIGNED FOR DYNAMIC REQUIREMENTS.

C. RECTANGULAR DAMPERS WITH BOTH WIDTH AND HEIGHT DIMENSIONS GREATER THAN 24 INCHES:
1. FRAME, 5 INCHES BY 1 INCH, 16 GAUGE GALVANIZED STEEL CHANNEL. BLADES, 8 INCHES MAXIMUM WIDTH, 16 GAUGE GALVANIZED STEEL, OPPOSED BLADE, HAVING SHAFTS/BEARINGS DESIGNED TO MEET DYNAMIC REQUIREMENTS, POSITIVELY LOCKED TO SHAFTS.
2. CONTROL SHAFT SHALL BE 3/8 INCH SQUARE, PLATED STEEL, PERMANENTLY MARKED TO INDICATE BLADE POSITION, AND FITTED WITH LOCKING QUADRANT MOUNTED ON OUTSIDE OF FRAME.
3. PRESSURE DROP FOR A 28 INCHES BY 28 INCHES DAMPER HANDLING 7600 CFM SHALL BE 0.05 INCH WG OR LESS UNDER STANDARD AIR CONDITIONS.
4. DAMPERS SHALL BE RUSKIN MD_35.

D. ROUND DAMPERS UP TO 24 INCHES DIAMETER:
1. FRAME SHALL BE 18 GAUGE GALVANIZED STEEL, OR DUCT CASING REINFORCED.
2. PROVIDE SINGLE THICKNESS 16 GAUGE GALVANIZED STEEL BLADES, WELDED OR PERMANENTLY BOLTED TO 1/2 INCH MINIMUM DIAMETER THROUGH SHAFT. PERMANENTLY MARK END OF SHAFT TO INDICATE BLADE POSITION AND FIT WITH A LOCKING QUADRANT MOUNTED ON OUTSIDE OF FRAME. BEARINGS SHALL BE PRESSED INTO FRAME AND DESIGNED FOR DYNAMIC REQUIREMENTS.

E. IDENTIFICATION: PROVIDE 1 INCH WIDE NYLON RIBBON FOR EACH DAMPER, COLOR AS FOLLOWS: SUPPLY AIR, RED; RETURN AIR, BLUE; EXHAUST AIR, YELLOW. TIE THROUGH HOLE AT END OF DAMPER QUADRANT, LEAVING AT LEAST 12 INCHES OF RIBBON HANGING FREE. ATTACH RIBBONS AT THE TIME EACH DAMPER IS INSTALLED.

2.4 ACCESS DOORS - DUCTWORK

A. CONSTRUCTION: CLOSE FITTING RIGID GALVANIZED STEEL ASSEMBLIES WITH SEALING GASKETS AND QUICK FASTENING LOCKING DEVICES. FOR INSULATED DUCTWORK, INSTALL MINIMUM 1 INCH THICK INSULATION WITH SHEET METAL COVER.

B. LOCKING DEVICES: PROVIDE 2 HINGES AND 2 SASH LOCKS OR 2 SPRING LOADED THREADED KNOBS AND BOLTS FOR SIZES UP TO 18 INCHES SQUARE; 2 HINGES AND 2 COMPRESSION LATCHES WITH OUTSIDE AND INSIDE HANDLES FOR SIZES UP TO 24 INCHES BY 48 INCHES. PROVIDE AN ADDITIONAL HINGE FOR LARGER SIZES.

C. OPTION: DOORS MAY BE VENDOR PURCHASED OR CONTRACTOR FABRICATED.

2.5 FLEXIBLE CONNECTIONS

A. FABRICATE OF NEOPRENE COATED FLAMEPROOF FABRIC TIGHTLY CRIMPED INTO METAL EDGING STRIP AND ATTACH TO DUCTING AND EQUIPMENT BY SCREWS OR BOLTS AT 6 INCH INTERVALS. FLEXIBLE DUCT CONNECTIONS SHALL BE PROVIDED WITH A SUFFICIENT MATERIAL WIDTH TO PREVENT INTERFERENCE WITH FREE OPERATION OF FAN VIBRATION ISOLATION SYSTEMS.

2.6 APPLICATION

A. ACCESS DOORS: PROVIDE FOR INSPECTION AND CLEANING BEFORE AND AFTER FILTERS, COILS, FANS, AUTOMATIC DAMPERS, AT FIRE DAMPERS, SMOKE DAMPERS, AND COMBINATION FIRE/SMOKE DAMPERS. REVIEW LOCATIONS PRIOR TO FABRICATION. DOORS SHALL BE SQUARE, SIZED TO 3/4 OF THE LARGER OF THE DUCT WIDTH OR HEIGHT, BUT NO SMALLER THAN 8 INCHES BY 8 INCHES NOR NO LARGER THAN 24 INCHES BY 24 INCHES. PROVIDE 4 INCHES BY 4 INCHES QUICK-OPENING DUCT ACCESS DOORS FOR INSPECTION AT BALANCING DAMPERS.

B. BALANCING DAMPERS, LOW PRESSURE: PROVIDE BALANCING DAMPERS AT ALL POINTS WHERE SUPPLY, RETURN, AND EXHAUST SYSTEM SUBMAINS, BRANCH MAINS AND BRANCHES ARE TAKEN FROM LARGER DUCTS, AND AS SHOWN IN TYPICAL DETAILS, DRAWINGS, AND DIAGRAMS.

C. BALANCING DAMPERS, MEDIUM AND HIGH PRESSURE: PROVIDE BALANCING DAMPERS ON SYSTEMS AS SHOWN IN TYPICAL DETAILS, DRAWINGS, AND DIAGRAMS. DO NOT USE SPLITTER DAMPERS EXCEPT WHERE SPECIFICALLY INDICATED ON DRAWINGS.

D. FLEXIBLE CONNECTIONS: PROVIDE IMMEDIATELY ADJACENT TO EQUIPMENT IN DUCTS ASSOCIATED WITH FANS AND EQUIPMENT SUBJECT TO FORCED VIBRATION. IN ADDITION, PROVIDE FLEXIBLE CONNECTIONS WHERE DUCTWORK CROSSES BUILDING EXPANSION JOINTS AND WHERE DUCTWORK CROSSES SEPARATIONS BETWEEN NEW AND EXISTING CONSTRUCTION.

PART 3 - EXECUTION

3.1 INSTALLATION

A. INSTALL ITEMS IN ACCORDANCE WITH MANUFACTURER'S PRINTED INSTRUCTIONS AND SMACNA STANDARDS.

B. FOR CONNECTIONS TO MEDIUM AND HIGH PRESSURE FANS, INSTALL 1/8 INCH THICK NEOPRENE PAD OVER FABRIC AND HOLD IN PLACE WITH ADDITIONAL METAL STRIPS.

C. LOCATE DUCT ACCESS DOORS FOR EASY ACCESS. LOCATE DOORS ABOVE ACCESSIBLE CEILINGS WHENEVER POSSIBLE. COORDINATE LOCATIONS OF CEILING ACCESS DOORS WITH CEILING INSTALLER AND WITH OTHER TRADES SUCH THAT CONDUIT AND PIPE DOES NOT PREVENT OR INTERFERE WITH ACCESS TO DUCTWORK. REFER TO SECTION 15010 FOR ACCESS DOOR REQUIREMENTS IN CEILINGS AND WALLS.

D. MOUNT DAMPER OPERATORS, CONTROL DEVICES, THERMOMETERS, AND GAUGES UPON EXTENSION BRACKETS OR DEVICES TO PREVENT INTERFERENCE WITH INSULATION OR VAPOR BARRIER INTEGRITY.

END OF SECTION

Registered Professional Engineer (Retired)
CERTIFICATE NO
37915
FORREST K.
ISAACS
Date Signed 01-20-21
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WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

NOIR Lab

NSF

KITT PEAK - Sells, AZ 85634

△	DATE	DESCRIPTION
0	01/08/21	I.F.C.

PROJECT NUMBER:	11904.00
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SCALE:	NONE

MECHANICAL SPECIFICATIONS

M9.6

SECTION 15069 REFRIGERANT PIPING

PART 1 - GENERAL

1.1SUMMARY

A. A. SECTION INCLUDES:
1. REFRIGERANT PIPING.
2. UNIONS, FLANGES, AND COUPLINGS.
3. PIPE HANGERS AND SUPPORTS.
4. REFRIGERANT MOISTURE AND LIQUID INDICATORS.
5. VALVES.
6. REFRIGERANT STRAINERS.
7. REFRIGERANT PRESSURE REGULATORS.
8. REFRIGERANT PRESSURE RELIEF VALVES.
9. REFRIGERANT FILTER-DRIERS.
10. REFRIGERANT SOLENOID VALVES.
11. REFRIGERANT EXPANSION VALVES.
12. ELECTRONIC EXPANSION VALVES.
13. REFRIGERANT RECEIVERS.

1.2REFERENCES

A. AIR-CONDITIONING AND REFRIGERATION INSTITUTE:
1. ARI 495 - REFRIGERANT LIQUID RECEIVERS.
2. ARI 710 - LIQUID-LINE DRIERS.
3. ARI 730 - FLOW-CAPACITY RATING AND APPLICATION OF SUCTION-LINE FILTERS AND FILTER DRYERS.
4. ARI 750 - THERMOSTATIC REFRIGERANT EXPANSION VALVES.
5. ARI 760 - SOLENOID VALVES FOR USE WITH VOLATILE REFRIGERANTS.

B. AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS:
1. ASHRAE 15 - SAFETY CODE FOR MECHANICAL REFRIGERATION.

C. AMERICAN SOCIETY OF MECHANICAL ENGINEERS:
1. ASME B16.22 -WROUGHT COPPER AND COPPER ALLOY SOLDER JOINT PRESSURE FITTINGS.
2. ASME B16.26 - CAST COPPER ALLOY FITTINGS FOR FLARED COPPER TUBES.
3. ASME B31.5 - REFRIGERATION PIPING.
4. ASME SECTION VIII - BOILER AND PRESSURE VESSEL CODE - PRESSURE VESSELS.

D. ASTM INTERNATIONAL:
1. ASTM A53/A53M - STANDARD SPECIFICATION FOR PIPE, STEEL, BLACK AND HOT-DIPPED, ZINC-COATED, WELDED AND SEAMLESS.
2. ASTM A234/A234M - STANDARD SPECIFICATION FOR PIPING FITTINGS OF WROUGHT CARBON STEEL AND ALLOY STEEL FOR MODERATE AND HIGH TEMPERATURE SERVICE.
3. ASTM B88 - STANDARD SPECIFICATION FOR SEAMLESS COPPER WATER TUBE.
4. ASTM B280 - STANDARD SPECIFICATION FOR SEAMLESS COPPER TUBE FOR AIR CONDITIONING AND REFRIGERATION FIELD SERVICE.
5. ASTM F708 - STANDARD PRACTICE FOR DESIGN AND INSTALLATION OF RIGID PIPE HANGERS.
6. ASTM B749 - STANDARD SPECIFICATION FOR LEAD AND LEAD ALLOY STRIP, SHEET, AND PLATE PRODUCTS.

E. AMERICAN WELDING SOCIETY:
1. AWS A5.8 - SPECIFICATION FOR FILLER METALS FOR BRAZING AND BRAZE WELDING.
2. AWS D1.1 - STRUCTURAL WELDING CODE - STEEL.

F. MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY:
1. MSS SP 58 - PIPE HANGERS AND SUPPORTS - MATERIALS, DESIGN AND MANUFACTURER.
2. MSS SP 69 - PIPE HANGERS AND SUPPORTS - SELECTION AND APPLICATION.
3. MSS SP 89 - PIPE HANGERS AND SUPPORTS - FABRICATION AND INSTALLATION PRACTICES.

G. UNDERWRITERS LABORATORIES INC.:
1. UL 429 - ELECTRICALLY OPERATED VALVES.

1.3 SYSTEM DESCRIPTION

A. WHERE MORE THAN ONE PIPING SYSTEM MATERIAL IS SPECIFIED, PROVIDE COMPATIBLE SYSTEM COMPONENTS AND JOINTS. USE BRASS BALL VALVE AND 6" LONG BRASS NIPPLE WHEN JOINING DISSIMILAR METALS IN THE SYSTEMS.

B. PROVIDE FLANGES, UNIONS, OR COUPLINGS AT LOCATIONS REQUIRING SERVICING. USE UNIONS, FLANGES, OR COUPLINGS DOWNSTREAM OF VALVES AND AT EQUIPMENT CONNECTIONS. DO NOT USE DIRECT WELDED OR THREADED CONNECTIONS TO VALVES OR EQUIPMENT.

C. PROVIDE RECEIVERS ON SYSTEMS IF RECOMMENDED BY EQUIPMENT SUPPLIER.

D. FLEXIBLE CONNECTORS: USE AT OR NEAR COMPRESSORS WHERE PIPING CONFIGURATION DOES NOT ABSORB VIBRATION.

1.4 PERFORMANCE REQUIREMENTS

A. LINE TEST PRESSURE FOR REFRIGERANT R-407C:
1. SUCTION LINES FOR AIR-CONDITIONING APPLICATIONS: 230 PSIG.
2. SUCTION LINES FOR HEAT-PUMP APPLICATIONS: 380 PSIG.
3. HOT-GAS AND LIQUID LINES: 380 PSIG.

B. LINE TEST PRESSURE FOR REFRIGERANT R-410A:
1. SUCTION LINES FOR AIR-CONDITIONING APPLICATIONS: 300 PSIG.
2. SUCTION LINES FOR HEAT-PUMP APPLICATIONS: 535 PSIG.
3. HOT-GAS AND LIQUID LINES: 535 PSIG.

1.5 SUBMITTALS

A. SHOP DRAWINGS: INDICATE LAYOUT OF REFRIGERATION PIPING SYSTEM, INCLUDING EQUIPMENT, CRITICAL DIMENSIONS, AND SIZES.

B. PRODUCT DATA:
1. PIPING: SUBMIT DATA ON PIPE MATERIALS, FITTINGS, AND ACCESSORIES.
2. VALVES: SUBMIT MANUFACTURERS CATALOG INFORMATION WITH VALVE DATA AND RATINGS FOR EACH SERVICE.
3. HANGERS AND SUPPORTS: SUBMIT MANUFACTURERS CATALOG INFORMATION INCLUDING LOAD CAPACITY.
4. REFRIGERANT SPECIALTIES: SUBMIT MANUFACTURERS CATALOG INFORMATION INCLUDING CAPACITY, COMPONENT SIZES, ROUGH-IN REQUIREMENTS, AND SERVICE SIZES FOR THE FOLLOWING:
a. REFRIGERANT. TYPE.
b. REFRIGERANT MOISTURE AND LIQUID INDICATORS.
c. REFRIGERANT STRAINERS.
d. REFRIGERANT PRESSURE REGULATORS.
e. REFRIGERANT PRESSURE RELIEF VALVES.
f. REFRIGERANT FILTER-DRIERS.
g. REFRIGERANT SOLENOID VALVES.
h. REFRIGERANT EXPANSION VALVES.
i. ELECTRONIC EXPANSION VALVES.

C. DESIGN DATA: INDICATE PIPE SIZE. INDICATE LOAD CARRYING CAPACITY OF TRAPEZE, MULTIPLE PIPE, AND RISER SUPPORT HANGERS.

D. TEST REPORTS: INDICATE RESULTS OF REFRIGERANT LEAK TEST.

E. MANUFACTURER'S INSTALLATION INSTRUCTIONS: SUBMIT HANGING AND SUPPORT METHODS, JOINING PROCEDURES AND ISOLATION.

F. WELDING CERTIFICATES.

PART 2 - PRODUCTS

2.1 REFRIGERANT PIPING

A. COPPER TUBING: ASTM B280, DRAWN

B. FITTINGS: ASME B16.22 WROUGHT COPPER ASTM B16.26 CAST COPPER.
1. JOINTS: BRAZE, AWS A5.8 BCUP SILVER/PHOSPHORUS/COPPER ALLOY WITH MELTING RANGE 1190 TO 1480 DEGREES F.

2.2 UNIONS, FLANGES, AND COUPLINGS

A. 2 INCHES AND SMALLER:
1. FERROUS PIPING: 150 PSIG MALLEABLE IRON, THREADED.
2. COPPER PIPE: BRONZE, SOLDERED JOINTS.

2.3 PIPE HANGERS AND SUPPORTS

A. A. MANUFACTURERS:
1. B-LINE.
2. TOLCO.
3. PHD.

B. CONFORM TO ASME B31.5.

C. HANGERS FOR PIPE SIZES 1/2 TO 1-1/2 INCH: MALLEABLE IRON CARBON STEEL, ADJUSTABLE SWIVEL, SPLIT RING.

D. HANGERS FOR COLD PIPE SIZES 2 INCHES AND LARGER: CARBON STEEL, ADJUSTABLE, CLEVIS.

E. HANGERS FOR HOT PIPE SIZES 2 TO 4 INCHES: CARBON STEEL, ADJUSTABLE, CLEVIS.

F. MULTIPLE OR TRAPEZE HANGERS: STEEL CHANNELS WITH WELDED SPACERS AND HANGER RODS.

G. WALL SUPPORT FOR PIPE SIZES 3 INCHES AND SMALLER: CAST IRON HOOKS.

H. VERTICAL SUPPORT: STEEL RISER CLAMP.

I. FLOOR SUPPORT FOR COLD PIPE: CAST IRON ADJUSTABLE PIPE SADDLE, LOCK NUT, NIPPLE, FLOOR FLANGE, AND CONCRETE PIER OR STEEL SUPPORT.

J. FLOOR SUPPORT FOR HOT PIPE 4 INCHES AND SMALLER: CAST IRON ADJUSTABLE PIPE SADDLE, LOCK NUT, NIPPLE, FLOOR FLANGE, AND CONCRETE PIER OR STEEL SUPPORT.

K. COPPER PIPE SUPPORT: CARBON STEEL RINGS, ADJUSTABLE, COPPER PLATED.

L. HANGER RODS: MILD STEEL THREADED BOTH ENDS, THREADED ONE END, OR CONTINUOUS THREADED.

M. INSERTS: MALLEABLE IRON CASE OF GALVANIZED STEEL SHELL AND EXPANDER PLUG FOR THREADED CONNECTION WITH LATERAL ADJUSTMENT, TOP SLOT FOR REINFORCING RODS, LUGS FOR ATTACHING TO FORMS; SIZE INSERTS TO SUIT THREADED HANGER RODS.

N. SHEET LEAD: ASTM B749.

2.4 REFRIGERANT MOISTURE AND LIQUID INDICATORS

A. MANUFACTURERS:
1. ALCO CONTROLS DIV, EMERSON ELECTRIC CO.
2. PARKER HANNIFIN CORP., REFRIG. & AIR COND. DIV.
3. SPORLAN VALVE DIVISION / PARKER HANNIFIN CORPORATION.

B. INDICATORS:
1. PORT: SINGLE OR DOUBLE, UL LISTED.
2. BODY: COPPER OR BRASS, FLARED OR SOLDER ENDS.
3. SIGHT GLASS: COLOR-CODED PAPER MOISTURE INDICATOR WITH REMOVABLE ELEMENT CARTRIDGE AND PLASTIC CAP.
4. MAXIMUM WORKING PRESSURE: 500 PSIG
5. MAXIMUM WORKING TEMPERATURE: 200 DEGREES F.

2.5 VALVES

A. MANUFACTURERS:
1. ALCO CONTROLS DIV, EMERSON ELECTRIC CO.
2. PARKER HANNIFIN CORP., REFRIG. & AIR COND. DIV.
3. SPORLAN VALVE DIVISION / PARKER HANNIFIN CORPORATION.

B. DIAPHRAGM PACKLESS VALVES:
1. UL LISTED, GLOBE OR ANGLE PATTERN, FORGED BRASS BODY AND BONNET SOLDER OR FLARED ENDS.
2. PHOSPHOR BRONZE AND STAINLESS STEEL DIAPHRAGMS, RISING STEM AND HAND WHEEL.
3. STAINLESS STEEL SPRING, NYLON SEATS, DISC WITH POSITIVE BACK SEATING.
4. MAXIMUM WORKING PRESSURE: 500 PSIG.
5. MAXIMUM WORKING TEMPERATURE: 275 DEGREES F.

C. PACKED ANGLE VALVES:
1. FORGED BRASS OR NICKEL-PLATED FORGED STEEL, SOLDER OR FLARED ENDS.
2. FORGED BRASS SEAL CAPS WITH COPPER GASKET, RISING STEM AND SEAT, MOLDED STEM PACKING.
3. MAXIMUM WORKING PRESSURE: 500 PSIG.
4. MAXIMUM WORKING TEMPERATURE: 275 DEGREES F.

D. BALL VALVES:
1. TWO-PIECE BOLTED FORGED BRASS BODY WITH TEFLON BALL SEALS AND COPPER TUBE EXTENSIONS, BRASS BONNET AND SEAL CAP, CHROME PLATED BALL, STEM WITH NEOPRENE RING STEM SEALS, SOLDERED OR THREADED ENDS.
2. MAXIMUM WORKING PRESSURE: 500 PSIG.
3. MAXIMUM WORKING TEMPERATURE: 325 DEGREES F.

E. E. SERVICE VALVES:
1. FORGED BRASS BODY WITH COPPER STUBS, BRASS CAPS, REMOVABLE VALVE CORE, INTEGRAL BALL CHECK VALVE, FLARED OR SOLDER ENDS.
2. MAXIMUM WORKING PRESSURE: 500 PSIG.

F. REFRIGERANT CHECK VALVES:
1. MANUFACTURERS:
a. ALCO CONTROLS DIV, EMERSON ELECTRIC CO.
b. PARKER HANNIFIN CORP., REFRIG. & AIR COND. DIV.
c. SPORLAN VALVE DIVISION / PARKER HANNIFIN CORPORATION.
2. GLOBE TYPE:
a. CAST BRONZE OR FORGED BRASS BODY, FORGED BRASS CAP WITH NEOPRENE SEAL, BRASS GUIDE AND DISC HOLDER, PHOSPHOR-BRONZE OR STAINLESS STEEL SPRING, TEFLON SEAT DISC.
b. MAXIMUM WORKING PRESSURE: 500 PSIG.
c. MAXIMUM WORKING TEMPERATURE: 300 DEGREES F.
3. STRAIGHT THROUGH TYPE:
a. SPRING, NEOPRENE SEAT.
b. MAXIMUM WORKING PRESSURE: 500 PSIG.
c. MAXIMUM WORKING TEMPERATURE: 250 DEGREES F.

2.6 REFRIGERANT STRAINERS

A. MANUFACTURERS:
1. ALCO CONTROLS DIV, EMERSON ELECTRIC CO.
2. PARKER HANNIFIN CORP., REFRIG. & AIR COND. DIV.
3. SPORLAN VALVE DIVISION / PARKER HANNIFIN CORPORATION.

B. B. STRAIGHT LINE OR ANGLE LINE TYPE:
1. BRASS OR STEEL SHELL, STEEL CAP AND FLANGE, AND REPLACEABLE CARTRIDGE, WITH SCREEN OF STAINLESS STEEL WIRE OR MONEL REINFORCED WITH BRASS.
2. MAXIMUM WORKING PRESSURE: 430 PSIG.

C. STRAIGHT LINE, NON-CLEANABLE TYPE:
1. STEEL SHELL, COPPER PLATED FITTINGS, STAINLESS STEEL WIRE SCREEN.

2.7 REFRIGERANT PRESSURE REGULATORS

A. MANUFACTURERS:
1. ALCO CONTROLS DIV, EMERSON ELECTRIC CO.
2. PARKER HANNIFIN CORP., REFRIG. & AIR COND. DIV.
3. SPORLAN VALVE DIVISION / PARKER HANNIFIN CORPORATION.

B. BRASS BODY, STAINLESS STEEL DIAPHRAGM, DIRECT ACTING OR PILOT OPERATED WITH REMOTE PRESSURE PILOT, ADJUSTABLE OVER 0 TO 80 PSIG RANGE, FOR MAXIMUM WORKING PRESSURE OF 450 PSIG.

2.8 REFRIGERANT PRESSURE RELIEF VALVES

A. MANUFACTURERS:
1. ALCO CONTROLS DIV, EMERSON ELECTRIC CO.
2. PARKER HANNIFIN CORP., REFRIG. & AIR COND. DIV.
3. SPORLAN VALVE DIVISION / PARKER HANNIFIN CORPORATION.

B. STRAIGHT THROUGH OR ANGLE TYPE: BRASS BODY AND DISC, NEOPRENE SEAT, FACTORY SEALED AND STAMPED WITH ASME UV AND NATIONAL BOARD CERTIFICATION NB; FOR STANDARD 425 PSIG SETTING; SELECTED TO ASHRAE 15.

2.9 REFRIGERANT FILTER-DRIERS

A. MANUFACTURERS:
1. ALCO CONTROLS DIV, EMERSON ELECTRIC CO. MO
2. PARKER HANNIFIN CORP., REFRIG. & AIR COND. DIV.
3. SPORLAN VALVE DIVISION / PARKER HANNIFIN CORPORATION.

B. REPLACEABLE CARTRIDGE ANGLE TYPE:
1. SHELL: ARI 710, UL LISTED, BRASS, STEEL, REMOVABLE CAP, FOR MAXIMUM WORKING PRESSURE OF 500 PSIG, INCHES OUTSIDE DIAMETER SIZE CONNECTIONS.
2. FILTER CARTRIDGE: PLEATED MEDIA WITH INTEGRAL END RINGS, STAINLESS STEEL SUPPORT, ARI 730 RATING.
3. FILTER/DRYER CARTRIDGE: PLEATED MEDIA WITH SOLID CORE SIEVE WITH ACTIVATED ALUMINA, ARI 730 RATING.
4. WAX REMOVAL CARTRIDGE: MOLDED BONDED CORE OF ACTIVATED CHARCOAL WITH INTEGRAL GASKETS, ARI 710 MOISTURE RATING.

2.10 REFRIGERANT SOLENOID VALVES

A. MANUFACTURERS:
1. ALCO CONTROLS DIV, EMERSON ELECTRIC CO.
2. PARKER HANNIFIN CORP., REFRIG. & AIR COND. DIV.
3. SPORLAN VALVE DIVISION / PARKER HANNIFIN CORPORATION.

B. VALVE: ARI 760, PILOT OPERATED, COPPER OR BRASS BODY AND INTERNAL PARTS, SYNTHETIC SEAT, STAINLESS STEEL STEM AND PLUNGER ASSEMBLY, INTEGRAL STRAINER, WITH FLARED, SOLDER, OR THREADED ENDS; FOR MAXIMUM WORKING PRESSURE OF 500 PSIG. STEM DESIGNED TO ALLOW MANUAL OPERATION IN CASE OF COIL FAILURE.

C. COIL ASSEMBLY: UL 429 LISTED, REPLACEABLE WITH MOLDED ELECTROMAGNETIC COIL, MOISTURE AND FUNGUS PROOF, WITH SURGE PROTECTOR AND COLOR CODED LEAD WIRES, INTEGRAL JUNCTION BOX.

2.11 REFRIGERANT EXPANSION VALVES

A. MANUFACTURERS:
1. ALCO CONTROLS DIV, EMERSON ELECTRIC CO.
2. PARKER HANNIFIN CORP., REFRIG. & AIR COND. DIV.
3. SPORLAN VALVE DIVISION / PARKER HANNIFIN CORPORATION.

B. ANGLE OR STRAIGHT THROUGH TYPE: ARI 750; DESIGN SUITABLE FOR REFRIGERANT, BRASS BODY, INTERNAL OR EXTERNAL EQUALIZER.

C. SELECTION: EVALUATE REFRIGERANT PRESSURE DROP THROUGH SYSTEM TO DETERMINE AVAILABLE PRESSURE DROP ACROSS VALVE. SELECT VALVE FOR MAXIMUM LOAD AT DESIGN OPERATING PRESSURE AND MINIMUM 10 DEGREES F SUPERHEAT. SELECT TO AVOID BEING UNDERSIZED AT FULL LOAD AND OVERSIZED AT PART LOAD.

2.12 2.12 ELECTRONIC EXPANSION VALVES

A. MANUFACTURERS:
1. ALCO CONTROLS DIV, EMERSON ELECTRIC CO.
2. PARKER HANNIFIN CORP., REFRIG. & AIR COND. DIV.
3. SPORLAN VALVE DIVISION / PARKER HANNIFIN CORPORATION.

B. VALVE:
1. BRASS BODIES WITH FLARED OR SOLDER CONNECTION, NEEDLE VALVE WITH FLOATING NEEDLE AND MACHINED SEAT, STEPPER MOTOR DRIVE.
2. CAPACITY: NOMINAL AS SHOWN ON DRAWINGS.

C. EVAPORATION CONTROL SYSTEM:
1. ELECTRONIC MICROPROCESSOR BASED UNIT IN ENCLOSED CASE, PROPORTIONAL INTEGRAL CONTROL WITH ADAPTIVE SUPERHEAT, MAXIMUM OPERATING PRESSURE FUNCTION, PRE-SELECTION ALLOWANCE FOR ELECTRICAL DEFROST AND HOT GAS BYPASS.

D. REFRIGERATION SYSTEM CONTROL: ELECTRONIC MICROPROCESSOR BASED UNIT IN ENCLOSED CASE, WITH PROPORTIONAL INTEGRAL CONTROL OF VALVE, ON/OFF THERMOSTAT, AIR TEMPERATURE ALARM (HIGH AND LOW), SOLENOID VALVE CONTROL, LIQUID INJECTION ADAPTIVE SUPERHEAT CONTROL, MAXIMUM OPERATING PRESSURE FUNCTION, NIGHT SETBACK THERMOSTAT, TIMER FOR DEFROST CONTROL.

2.13 REFRIGERANT RECEIVERS

A. INTERNAL DIAMETER 6 INCH AND SMALLER: ARI 495, UL LISTED, STEEL, BRAZED; 400 PSIG MAXIMUM PRESSURE RATING, WITH TAPS FOR INLET, OUTLET, AND PRESSURE RELIEF VALVE.

B. INTERNAL DIAMETER 6 INCH AND LARGER: ARI 495, WELDED STEEL, TESTED AND STAMPED IN ACCORDANCE WITH ASME SECTION VIII; 400 PSIG WITH TAPS FOR LIQUID INLET AND OUTLET VALVES, PRESSURE RELIEF VALVE, AND MAGNETIC LIQUID LEVEL INDICATOR.

PART 3 - EXECUTION

3.1 INSTALLATION - INSERTS

A. PROVIDE INSERTS FOR PLACEMENT IN CONCRETE FORMS.

B. PROVIDE INSERTS FOR SUSPENDING HANGERS FROM REINFORCED CONCRETE SLABS AND SIDES OF REINFORCED CONCRETE BEAMS.

C. PROVIDE HOOKED ROD TO CONCRETE REINFORCEMENT SECTION FOR INSERTS CARRYING PIPE 4 INCHES AND LARGER.

D. WHERE CONCRETE SLABS FORM FINISHED CEILING, LOCATE INSERTS FLUSH WITH SLAB SURFACE.

E. WHERE INSERTS ARE OMITTED, DRILL THROUGH CONCRETE SLAB FROM BELOW AND PROVIDE THROUGH-BOLT WITH RECESSED SQUARE STEEL PLATE AND NUT ABOVE SLAB.

3.2 INSTALLATION - PIPE HANGERS AND SUPPORTS

A. INSTALL HANGERS TO PROVIDE MINIMUM 1/2 INCH SPACE BETWEEN FINISHED COVERING AND ADJACENT WORK.

B. PLACE HANGERS WITHIN 12 INCHES OF EACH HORIZONTAL ELBOW.

C. INSTALL HANGERS TO ALLOW 1-1/2 INCH MINIMUM VERTICAL ADJUSTMENT. DESIGN HANGERS FOR PIPE MOVEMENT WITHOUT DISENGAGEMENT OF SUPPORTED PIPE.

D. SUPPORT VERTICAL PIPING AT EVERY FLOOR. SUPPORT RISER PIPING INDEPENDENTLY OF CONNECTED HORIZONTAL PIPING.

E. WHERE INSTALLING SEVERAL PIPES IN PARALLEL AND AT SAME ELEVATION, PROVIDE MULTIPLE PIPE HANGERS OR TRAPEZE HANGERS.

F. PRIME COAT EXPOSED STEEL HANGERS AND SUPPORTS IN ACCORDANCE WITH SPECIFICATIONS HEREIN. HANGERS AND SUPPORTS LOCATED IN CRAWL SPACES, PIPE SHAFTS, AND SUSPENDED CEILING SPACES ARE NOT CONSIDERED EXPOSED.

G. PROVIDE CLEARANCE IN HANGERS AND FROM STRUCTURE AND OTHER EQUIPMENT FOR INSTALLATION OF INSULATION AND ACCESS TO VALVES AND FITTINGS.

3.3 INSTALLATION - ABOVE GROUND PIPING SYSTEMS

A. ROUTE PIPING PARALLEL TO BUILDING STRUCTURE AND MAINTAIN GRADIENT.

B. INSTALL PIPING TO CONSERVE BUILDING SPACE, AND NOT INTERFERE WITH USE OF SPACE.

C. GROUP PIPING WHENEVER PRACTICAL AT COMMON ELEVATIONS.

D. PROVIDE SLEEVE FOR PIPE PASSING THROUGH PARTITIONS, WALLS AND FLOORS.

E. INSTALL PIPING TO ALLOW FOR EXPANSION AND CONTRACTION WITHOUT STRESSING PIPE, JOINTS, OR CONNECTED EQUIPMENT.

F. PROVIDE ACCESS WHERE VALVES AND FITTINGS ARE NOT EXPOSED.

G. ARRANGE REFRIGERANT PIPING TO RETURN OIL TO COMPRESSOR. PROVIDE TRAPS AND LOOPS IN PIPING, AND PROVIDE DOUBLE RISERS AS REQUIRED. SLOPE HORIZONTAL PIPING 0.40 PERCENT IN DIRECTION OF FLOW.

H. FLOOD REFRIGERANT PIPING SYSTEM WITH NITROGEN WHEN BRAZING.

I. WHERE PIPE SUPPORT MEMBERS ARE WELDED TO STRUCTURAL BUILDING FRAMING, SCRAPE, BRUSH CLEAN, AND APPLY ONE COAT OF ZINC RICH PRIMER TO WELDS.

J. PREPARE UNFINISHED PIPE, FITTINGS, SUPPORTS, AND ACCESSORIES, READY FOR FINISH PAINTING.

K. INSTALL VALVES WITH STEMS UPRIGHT OR HORIZONTAL, NOT INVERTED.

L. INSULATE PIPING AND EQUIPMENT PER THESE SPECIFICATIONS.

M. PROVIDE REPLACEABLE CARTRIDGE FILTER-DRYERS, WITH ISOLATION VALVES AND BYPASS WITH VALVE.

N. LOCATE EXPANSION VALVE SENSING BULB IMMEDIATELY DOWNSTREAM OF EVAPORATOR ON SUCTION LINE.

O. PROVIDE EXTERNAL EQUALIZER PIPING ON EXPANSION VALVES WITH REFRIGERANT DISTRIBUTOR CONNECTED TO EVAPORATOR.

P. INSTALL FLEXIBLE CONNECTORS AT RIGHT ANGLES TO AXIAL MOVEMENT OF COMPRESSOR, PARALLEL TO CRANKSHAFT.

Q. PROVIDE ELECTRICAL CONNECTION TO SOLENOID VALVES.

R. FULLY CHARGE COMPLETED SYSTEM WITH REFRIGERANT AFTER TESTING.

S. FOLLOW ASHRAE 15 PROCEDURES FOR CHARGING AND PURGING OF SYSTEMS AND FOR DISPOSAL OF REFRIGERANT.

T. INSTALL INSULATION AS REQUIRED.

3.4 INSTALLATION - REFRIGERANT SPECIALTIES

A. REFRIGERANT LIQUID INDICATORS:
1. INSTALL LINE SIZE LIQUID INDICATORS IN MAIN LIQUID LINE DOWNSTREAM OF CONDENSER.
2. WHEN RECEIVER IS PROVIDED, INSTALL LINE SIZE LIQUID INDICATORS IN LIQUID LINE DOWNSTREAM OF RECEIVER.
3. INSTALL LINE SIZE LIQUID INDICATORS DOWNSTREAM OF LIQUID SOLENOID VALVES.

B. REFRIGERANT VALVES:
1. INSTALL SERVICE VALVES ON COMPRESSOR SUCTION AND DISCHARGE.
2. INSTALL GAGE TAPS AT COMPRESSOR INLET AND OUTLET.
3. INSTALL GAGE TAPS AT HOT GAS BYPASS REGULATORS, INLET AND OUTLET.
4. INSTALL CHECK VALVES ON COMPRESSOR DISCHARGE.
5. INSTALL CHECK VALVES ON CONDENSER LIQUID LINES ON MULTIPLE CONDENSER SYSTEMS.
6. INSTALL REFRIGERANT CHARGING VALVE IN LIQUID LINE BETWEEN RECEIVER SHUT-OFF VALVE AND EXPANSION VALVE.

C. STRAINERS:
1. INSTALL LINE SIZE STRAINER UPSTREAM OF EACH AUTOMATIC VALVE.
2. WHERE MULTIPLE EXPANSION VALVES WITH INTEGRAL STRAINERS ARE USED, INSTALL SINGLE MAIN LIQUID-LINE STRAINER.
3. ON STEEL PIPING SYSTEMS, INSTALL STRAINER IN SUCTION LINE.
4. INSTALL SHUT-OFF VALVES ON EACH SIDE OF STRAINER.

D. INSTALL PRESSURE RELIEF VALVES ON ASME RECEIVERS. INSTALL RELIEF VALVE DISCHARGE PIPING TO TERMINATE OUTDOORS.

E. FILTER-DRYERS:
1. INSTALL PERMANENT FILTER-DRYERS IN LOW TEMPERATURE SYSTEMS.
2. INSTALL PERMANENT FILTER-DRYER IN SYSTEMS CONTAINING HERMETIC COMPRESSORS.
3. INSTALL REPLACEABLE CARTRIDGE FILTER-DRYER VERTICALLY IN LIQUID LINE ADJACENT TO RECEIVERS.
4. INSTALL REPLACEABLE CARTRIDGE FILTER-DRYER UPSTREAM OF EACH SOLENOID VALVE.

F. SOLENOID VALVES:
1. INSTALL IN LIQUID LINE OF SYSTEMS OPERATING WITH SINGLE PUMP-OUT OR PUMP-DOWN COMPRESSOR CONTROL.
2. INSTALL IN LIQUID LINE OF SINGLE OR MULTIPLE EVAPORATOR SYSTEMS.
3. INSTALL IN OIL BLEEDER LINES FROM FLOODED EVAPORATORS TO STOP FLOW OF OIL AND REFRIGERANT INTO SUCTION LINE WHEN SYSTEM SHUTS DOWN.

3.5 FIELD QUALITY CONTROL

A. TEST REFRIGERATION SYSTEM IN ACCORDANCE WITH ASME B31.5.
B. PRESSURE TEST REFRIGERATION SYSTEM WITH DRY NITROGEN TO 200 PSIG.
C. REPAIR LEAKS.
D. RETEST UNTIL NO LEAKS ARE DETECTED.

END OF SECTION

Registered Professional Engineer (Mechanical)
CERTIFICATE NO.
37915
FORREST K.
ISAACS
Date Signed 01-08-21
ARIZONA, U.S.A.
[illegible]
Expires 9-30-2023

ADVANTECH
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WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

KITT PEAK - Sells, AZ 85634

△	DATE	DESCRIPTION
0	01/08/21	I.F.C.

PROJECT NUMBER: 11904.00
DRAWN BY: FI
CHECKED BY: FI
CAD FILE: 11904.00-M9.7
SCALE: NONE

MECHANICAL SPECIFICATIONS

M9.7

ABBREVIATIONS

A or AMP	AMPERES
AC	ALTERNATING CURRENT, OR ABOVE COUNTER
ACU	AIR CONDITIONING UNIT
AF	AMP FRAME, AMP FUSE
AFC	ABOVE FINISHED CEILING
AFF	ABOVE FINISHED FLOOR
AIC	AMPERES INTERRUPTING CURRENT–INTEGRATED
AL	ALUMINUM
ARF	ABOVE RAISED FLOOR
ATS	AUTOMATIC TRANSFER SWITCH
AUX	AUXILIARY
AVE	AVERAGE
AWG	AMERICAN WIRE GAUGE
BC	BELOW COUNTER
BLDG	BUILDING
BMS	BUILDING MANAGEMENT SYSTEM
BOC	BOTTOM OF CONDUIT
BOD	BOTTOM OF DUCT
BOM	BILL OF MATERIAL
BOP	BOTTOM OF PIPE
BOS	BOTTOM OF STEEL
BOT	BOTTOM OF TRAY
C	CONDUIT
CB	CIRCUIT BREAKER
CC	CUBIC CENTIMETERS
CATV	CABLE ACCESS TELEVISION
CCTV	CLOSED CIRCUIT TELEVISION
CFM	CUBIC FEET PER MINUTE
CKT	CIRCUIT
℄	CENTER LINE
CT	CURRENT TRANSFORMER
CU	COPPER
dB	DECIBEL
DB	DUCT BANK
DC	DIRECT CURRENT
DDC	DIRECT DIGITAL CONTROL
DEMO	DEMOLITION
DIA	DIAMETER
DIM	DIMENSION
DIST	DISTRIBUTION
DIV	DIVISION
DN	DOWN
DPDT	DOUBLE POLE, DOUBLE THROW
DPST	DOUBLE POLE, SINGLE THROW
DTL	DETAIL
DWG	DRAWING
° or DEG	DEGREE
E or EM	EMERGENCY
ELEV	ELEVATION
EM	EMERGENCY
EMCS	ENERGY MONITORING CONTROL SYSTEM
EMI	ELECTROMAGNETIC INTERFERENCE
EMO	EMERGENCY MANUAL OFF
EMT	ELECTRICAL METALLIC TUBING
EOL	END–OF–LINE DEVICE
EPO	EMERGENCY POWER OFF
EPP	EMERGENCY POWER PANEL
EWC	ELECTRIC WATER COOLER
EXIST	EXISTING
EXH	EXHAUST
EX or (E)	EXISTING
EWC	ELECTRIC WATER COOLER

°F	FAHRENHEIT
FBO	FURNISHED BY OTHERS
FF	FINISH FLOOR
FG	FINISH GRADE
FLA	FULL LOAD AMPS
FLR	FLOOR
F/O	FIBER OPTIC
FT	FOOT/FEET
FVNR	FULL VOLTAGE NON–REVERSING
FVTS	FULL VOLTAGE TWO SPEED
GA	GAUGE
GAL	GALLONS
GALV	GALVANIZED
GFCB	GROUND FAULT CIRCUIT BREAKER
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GND,GRD	GROUND
HOA	HAND–OFF–AUTOMATIC SELECTOR SWITCH
HP	HORSEPOWER
HV	HIGH VOLTAGE
HVAC	HEATING, VENTILATING AND AIR CONDITIONING
HX	HEAT EXCHANGER
HZ	HERTZ
IEEE	INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS
I/O	INPUT/OUTPUT
I&C	INSTRUMENTATION AND CONTROL
IMC	INTERMEDIATE METALLIC CONDUIT
IN	INCH/INCHES
J or JBOX	JUNCTION BOX
KCMIL	THOUSAND CIRCULAR MILS
KG	KILOGRAMS
KHz	KILOHERTZ
KM	KILOMETER
KV	KILOVOLT
KVA	KILOVOLT AMPERE
kVAR	KILOVOLT–AMPERE–REACTIVE
KWH	KILOWATT HOUR
KW	KILOWATT
KK	KIRK KEY INTERLOCK
LAN	LOCAL AREA NETWORK
LED	LIGHT EMITTING DIODE
LP	LIGHTING PANEL
LSS	LIFE SAFETY SYSTEMS
LTF	LIQUID TIGHT FLEXIBLE CONDUIT
LTG	LIGHTING
LT	LIGHT
LV	LOW VOLTAGE
LVR	LINE VOLTAGE REGULATOR
MAX	MAXIMUM
MCB	MAIN CIRCUIT BREAKER
MCC	MOTOR CONTROL CENTER
MCP	MOTOR CIRCUIT PROTECTOR
MEZZ	MEZZANINE
MH	MANHOLE
MHZ	MEGAHERTZ
MIN	MINIMUM
MLO	MAIN LUG ONLY
MM	MILLIMETER
MNS	MASS NOTIFICATION SYSTEM
MS	MOTION SENSOR
MISC	MISCELLANEOUS
MTD	MOUNTED
MTG	MOUNTING
MTL	METAL
MTS	MANUAL TRANSFER SWITCH

N	NEUTRAL
NA	NON–AUTOMATIC
N/A	NOT APPLICABLE
N.C.	NORMALLY CLOSED
NEC	NATIONAL ELECTRIC CODE
NEMA	NATIONAL ELECTRIC MANUFACTURERS ASSOCIATION
NESC	NATIONAL ELECTRICAL SAFETY CODE
NF	NON–FUSIBLE
NFPA	NATIONAL FIRE PROTECTION ASSOC.
NIC	NOT IN CONTRACT
NL	NIGHT LIGHT
N.O.	NORMALLY OPEN
NO. or #	NUMBER
NTS	NOT TO SCALE
OA	OUTSIDE AIR
OC	ON CENTER
OD	OUTSIDE DIAMETER
OFCI	OWNER FURNISHED, CONTRACTOR INSTALLED
OFOI	OWNER FURNISHED, OWNER INSTALLED
OL	OVERLOAD RELAY
O/L	THERMAL OVERLOAD
OS	OCCUPANCY SENSOR
P	PEAK or POLE
PA	PUBLIC ADDRESS
PB	PULL BOX
PC	PHOTO CELL
PDM	POWER DISTRIBUTION MODULE
PF	POWER FACTOR
PH or ø	PHASE
PIN	PERSONAL IDENTIFICATION NUMBER
PIV	POST INDICATOR VALVE
PL	PLATE
POC	POINT OF CONNECTION
POU	POINT OF USE
PP	POWER PANEL
PR	PAIR
PRI	PRIMARY
PSI	POUNDS PER SQUARE INCH
PT	POTENTIAL TRANSFORMER
PVC	POLYVINYL CHLORIDE
PVD	PROVIDE
%	PERCENT
QTY	QUANTITY
RCPT	RECEPTACLE
RF	RADIO FREQUENCY
RGS	RIGID GALVANIZED STEEL CONDUIT
RH	RELATIVE HUMIDITY
RM	ROOM
RMS	ROOT MEAN SQUARE
RPM	REVOLUTIONS PER MINUTE
RTP	REMOTE TERMINAL PANEL
RVNR	REDUCED VOLTAGE NON–REVERSING
S	SPEAKER
SCH	SCHEDULE
SES	SERVICE ENTRANCE SUBSTATION
SHT	SHEET
SIM	SIMILAR
S/N	SOLID NEUTRAL
SPDT	SINGLE POLE, DOUBLE THROW
SPST	SINGLE POLE, SINGLE THROW
SQ	SQUARE
STP	SHIELDED TWISTED PAIR
SW	SWITCH
SWBD	SWITCHBOARD
SWGR	SWITCHGEAR
SYM	SYMMETRICAL

T or TELE	TELEPHONE, TRANSFORMER
TB	TERMINAL BLOCK
TBD	TO BE DETERMINED
T/C	TIME CLOCK
TC	TOP OF CONCRETE
TEMP	TEMPERATURE
TEP	TUCSON ELECTRIC POWER COMPANY
TOC	TOP OF CONCRETE
TOP	TOP OF PARAPET
TOS	TOP OF STEEL
T/S	TIME SWITCH
TSTAT	THERMOSTAT
TTB	TELEPHONE TERMINAL BOARD
TYP	TYPICAL
UC	UNDER COUNTER
UG	UNDERGROUND
UL	UNDERWRITERS' LABORATORIES, INC
UON	UNLESS OTHERWISE NOTED
UPS	UNINTERRUPTABLE POWER SUPPLY
UTP	UNSHIELDED TWISTED PAIR
V	VOLTS, ALTERNATING CURRENT
VA	VOLT AMPERES
VAC	VOLT ALTERNATING CURRENT
VAR	VARIABLE
VAV	VARIABLE AIR VOLUME
VESDA	VERY EARLY SMOKE DETECTION APPARATUS
VFD	VARIABLE FREQUENCY DRIVE
VOL	VOLUME
VP	VAPOR PROOF
W	WATTS, WIDE or WIRE
W/O	WITHOUT
WECO	WESTERN ELECTRIC COMPANY
WP	WEATHERPROOF
XFMR	TRANSFORMER
XP	EXPLOSION PROOF
YD	YARD
1/C or 2/C	ONE, TWO, etc., CONDUCTORS
4X	NEMA "4X" CONSTRUCTION, OWNER FURNISHED, CONTRACTOR INSTALLED

SPECIFICATIONS

The scope of the work covered by these specifications includes labor, equipment, and materials for the complete electrical system. Materials and equipment are new, of manufacturer's standard construction, installed in accordance with accepted practice. Comply with or exceed the requirements of the latest edition of the National Electric Code. All equipment shall be UL listed.

PANELBOARDS– NEMA PB–1, type 1 enclosure. Copper bus, full neutral and ground busses. Main and neutral lugs shall be compression type. Provide breakers as indicated, bolt–on type. Provide molded case breakers in accordance with NEMA AB–1, lockable handles. Provide locakable panelboard door with concealed hinge and panel directory sleeve.

Panelboards rated for use as service entrance equpment where required. Provide features per utility company requirements.

RACEWAYS – Provide conduit of types and sizes indicated with fittings and accessories for a complete system.

ELECTRICAL METALLIC TUBING (EMT)– For protected, dry locations like wall and ceiling cavities, branch circuits and communication raceway up to 2" trade size.

Use of flexible MC cable is acceptable where concealed and installed per NEC 334 and where EMT is used for final homerun.
Conceal all circuitry in walls or in ceiling space. In areas of exposed ceiling, install conduit parallel and perpendicular to building structure

WIRE AND CABLE – Provide indicated type/size wire/cable products.
#12AWG minimum, copper
Type XHHW for larger than #6 AWG and for all wire below grade.
Type THHN/THWN for #6 AWG and smaller except for wire below grade.

BOXES AND FITTINGS – Provide boxes and fittings of appropriate type for each application.
Use: Appleton, O.Z./Gedney, Hubbell.
Junction and Pull Boxes – Provide code–gage, galvanized sheet steel appropriate for each application. Construct with welded seams and screw covers attached with stainless steel fasteners.

WIRING DEVICES – Provide where indicated White wiring devices of configuration rating and type mounted 18" AFF unless otherwise noted. Standard ivory plates and devices UON. Acceptable manufacturers are G.E., Leviton and Hubbell.
Duplex Receptacle – 20 amp Hubbell specification series or equal.
Isolated Ground receptacles – 20 amp Hubbell specification series, Orange colored.
Ground Fault Circuit Interrupter (GFCI) – 20 amp Hubbell specification series or equal.

LIGHT SWITCHES – Provide where indicated White switches of configuration rating and type mounted 48" AFF unless otherwise noted. Plates to match receptacle plate type. Acceptable manufacturers are G.E., Leviton and Hubbell.
Toggle Switch – 20A, 120/277V, Hubble HBL1221W or equal.

DIMMER SWITCHES – Modular, full wave, solid state units with audible and electromagnetic noise filters. Quiet ON/OFF preset switches with continuous dimming slider switch. Plates to match receptacle plate type.
Toggle Switch – 20A, 120/277V, Hubble HBL1221W or equal.

ELECTRICAL IDENTIFICATION – Provide identification products as indicated including color codes, labels, signs and tags.
Cable/Conductor Marking – Vinyl Cloth, adhesive backed, preprinted.
Panel & Equipment Marking – Black with white core engraving stock, 3/8" letters.

GROUND the electrical system in accordance with the NEC and provide equipment grounding conductor in all conduits.

LIGHTING – Provide light fixtures of types, sizes and photometric qualities as indicated. Include lamp, ballast mounting hardware, trim, power cord/whip, lens lamp socket, lamp starting aid and other required or indicated accessories for a complete functional assembly.

BALLAST – Include with each fixture the required type of ballast. Select high power factor, low noise encapsulated type having proper characteristics for the lamp driven and line voltage. Provide 10% maximum THD, electronic ballasts for all fluorescent fixtures. Provide dimmable electronic ballasts where required.

EMERGENCY LIGHTING UNITS – Comply with UL 924, Sealed maintenance free battery, 10 year life. 90 minutes minimum operating time at full light output. Activates battery source on 80 percent of line voltage, automatically recharges when normal source is present. Recessed flush in ceiling.

FIRE ALARM – Provide Fire Alarm devices which are listed for use and are in compliance with all local codes. Provide a fully operational system in compliance with all National Codes and Standards. Provide functional testing, coordinate with building management. Provide NICET certified detailed design drawings for AHJ approval.

COMMUNICATIONS – Provide plaster rings in walls as indicated with pull string to accessible ceiling space. Provide conduit with pull string in walls and areas where ceiling is not accessible from below.

INSTALLATION – Install complete raceway system in progress with other trades and prior to pulling wire/cable. Follow NECA guidelines for neat, first class workmanship. Select proper supports and anchors for mounting of electrical work and allow air space when mounting to masonry or concrete surfaces. Use compression lugs for feeders 100 amps and larger. Place intumescent fill material in penetrations of fire rated assemblies.
Coordinate with other trades for final locations of equipment.
Remove all demolition and packing materials from site.
Provide mechanical and electrical continuity testing of all new electrical systems and components in accordance with NETA standards, submit test reports prior to final close–out, correct any deficiencies, balance loads on panelboards within 15%.

Coordinate with the serving utility company. Provide all equipment and labor required.

Coordinate locations, characteristics and capacities of electrical equipment with the requirements of Mechanical Equipment and other Appliances prior to the purchase and installation of electrical equipment.

Locate electrical equipment to allow working clearances in accordance with the National Electric Code.

Where discrepancies occur or interferences with existing conditions or work of other trades occur, notify the Engineer of Record in writing for resolution prior to installation.

SYMBOL LIST

POWER

- PANELBOARD, CONTROL PANEL, OR ENCLOSURE AS INDICATED ON DRAWINGS
- GROUNDING POINT
- CIRCUIT BREAKER
- JUNCTION BOX
- CIRCUIT HOME RUN 2–#12, 1–#12GND., 3/4" C FOR EACH 120V–20A CIRCUIT UON.
- CONDUIT–SURFACE MOUNTED
- CONDUIT, UNDERGROUND
- CONDUIT, CONCEALED
- EXISTING CONDUIT SURFACE, CONCEALED, OR UNDERGROUND
- MOTOR, HORSEPOWER INDICATED ON DRAWINGS
- FUSED SWITCH
- S_M MANUAL MOTOR STARTER, 120V, 20A, 1P WITH THERMAL OVERLOAD ELEMENT MATCHED TO MOTOR REQUIREMENTS, PROVIDE GREEN PILOT LIGHT, GLOWS WHEN SWITCH IS "ON".
- T TRANSFORMER, SHOWN ON FLOOR PLANS
- TRANSFORMER, SHOWN ON DIAGRAMS
- SAFETY DISCONNECT SWITCH
- COMBINATION STARTER AND SAFETY SW, SIZED PER MOTOR HP
- DUPLEX RECEPTACLE RECESSED IN FLOOR BOX WITH IN USE COVER PLATE.
- DUPLEX RECEPTACLE 125V, 20A WITH SINGLE COVER PLATE. MTD. 18" AFF UON. 'C' REPRESENTS CEILING MOUNT RECEPTACLE.
- QUAD RECEPTACLE (DOUBLE DUPLEX) 125V, 20A WITH SINGLE COVERPLATE. MTD. 18" AFF UON.
- SINGLE RECEPTACLE, NEMA TYPE AS NOTED WITH SINGLE COVERPLATE. MTD. 18" AFF UON.
- SPECIAL RECEPTACLE NEMA TYPE AS INDICATED.
- DUPLEX RECEPTACLE 125V, 20A WITH GROUND FAULT CIRCUIT INTERRUPTER (GFCI) CAPABILITY. MTD. 48" AFF UON.
- EPO EMERGENCY POWER OFF PUSH BUTTON.
- STOP/START PUSH BUTTON STATION
- FLUSH FLOOR BOX, WITH QUAD RECEPTACLE (DOUBLE DUPLEX) 125V, 20A WITH TRIM PLATE, (2) CAT 6 CABLING, AND (2) VOICE/DATA PORTS UON.
- COUNTER TOP PEDESTAL DUPLEX RECEPTACLE 125V, 20A WITH SINGLE COVER PLATE.
- COUNTER TOP PEDESTAL WITH VOICE/DATA OUTLET AND SINGLE COVER PLATE.

LIGHTING

- FLUORESCENT 2X4 LIGHT FIXTURE NOTE: USE CAPITAL LETTER TO INDICATE TYPE AND SIZE OF FIXTURE. SMALL LETTER FOR SWITCH GROUP.(TYPICAL)
- FLUORESCENT 2X4 LIGHT FIXTURE WITH 90 MINUTE EMERGENCY BATTERY
- FLUORESCENT 1X4 LIGHT FIXTURE
- FLUORESCENT 1X4 LIGHT FIXTURE WITH 90 MINUTE EMERGENCY BATTERY
- FLUORESCENT 2X2 LIGHT FIXTURE
- FLUORESCENT 2X2 LIGHT FIXTURE WITH 90 MINUTE EMERGENCY BATTERY
- LIGHTING TRACK WITH LIGHT FIXTURE HEAD 'A' DENOTES TRACK, 'B' DENOTES FIXTURE HEAD TYPE, 'a' DENOTES SWITCH DESIGNATION.
- DOWN LIGHT LIGHTING FIXTURE
- DOWN LIGHT LIGHTING FIXTURE WITH 90 MINUTE EMERGENCY BATTERY NOTE: USE CAPITAL LETTER TO INDICATE TYPE AND SIZE OF FIXTURE. SMALL LETTER FOR SWITCH GROUP.
- 4' DECORATIVE WALL SURFACE MOUNT
- 4' DECORATIVE WALL SURFACE MOUNT 90 MINUTE EMERGENCY BATTERY
- WALL SURFACE MOUNTED LIGHTING FIXTURE
- WALL SURFACE MOUNTED LIGHTING FIXTURE WITH 90 MINUTE EMERGENCY BATTERY
- RECESSED WALL MOUNTED LIGHTING FIXTURE
- DIRECTIONAL LIGHTING FIXTURE
- CEILING SURFACE MOUNTED LIGHTING FIXTURE
- CEILING PENDANT LIGHTING FIXTURE
- UNDER CABINET LIGHTING FIXTURE
- VANITY UNDER CABINET LIGHTING FIXTURE
- UNIVERSAL MOUNT SINGLE FACE EXIT SIGN, AND EMERGENCY LIGHTING UNIT, WITH REMOTE EM SPOT LIGHT HEAD AS SHOWN. 90 MINUTE EMERGENCY BATTERY PACK, DIRECTIONAL ARROW WHERE INDICATED.
- PC PHOTOCELL
- S_{WP} 125V, 20A SINGLE POLE WEATHERPROOF SWITCH
- S_D 120V DIMMER SWITCH, WATTAGE AS REQUIRED.
- S 125V, 20A SINGLE THROW TOGGLE– ADD 2, 3, OR 4 FOR POLES LOWER CASE LETTER INDICATES SWITCH GROUP
- OS OCCUPANCY SENSOR– PASSIVE INFARED SENSOR.

AUDIO VISUAL

REFER TO SHEETS AV1.01 AND AV1.02 FOR SYMBOLS AND LEGENDS

GENERAL

- CATV CABLE ACCESS TELEVISION TERMINAL BOARD
- CATV OUTLET(FOR CABLE ACCESS TELEVISION) BOX AND CONDUIT ONLY MTD. @ 18" AFF UNLESS OTHERWISE NOTED.
- COPPER GROUND BAR
- —G— COPPER GROUND CABLE, SIZE AS NOTED

FIRE ALARM

- F FIRE ALARM PULL STATION
- F FIRE ALARM HORN AND STROBE, CLG = CEILING MTD.
- L FIRE ALARM STROBE ONLY
- FS FIRE ALARM FLOW SWITCH
- TS FIRE ALARM TAMPER SWITCH
- SD SMOKE DETECTOR
- SD DUCT SMOKE DETECTOR
- HD HEAT DETECTOR
- MM FIRE ALARM MONITOR MODULE
- CM FIRE ALARM CONTROL MODULE RELAY
- FACP FIRE ALARM CONTROL PANEL
- FAAP FIRE ALARM ANNUNCIATOR PANEL

SECURITY

- CR MAGNETIC SWIPE / KEY PAD CARD READER, BOX. MOUNT 48" AFF WITH 3/4"C TO ACCESSIBLE ACCESSIBLE CEILING SPACE
- DS BALANCED MAGNETIC DOOR SWITCH
- ES ELECTRIC DOOR STRIKE
- CCTV CCTV OUTLET(FOR SECURITY CAMERA)
- PIR PASSIVE INFRARED MOTION DETECTOR–360 DEG COVERAGE CEILING SURFACE MOUNTED
- MS PASSIVE INFRARED MOTION DETECTOR–180 DEG COVERAGE WALL SURFACE MOUNTED
- P PANIC BUTTON STATION
- PL PANIC STROBE LIGHT

TELECOM

- VOICE/DATA OUTLET WITH 1"C STUBBED INTO ACCESSIBLE CLG. SPACE WITH (1) CAT 6 CABLES ROUTED TO IDF ABOVE CEILING USING J–HOOKS.
- VOICE/DATA OUTLET WITH 1"C STUBBED INTO ACCESSIBLE CLG. SPACE AND (2) CAT 6 CABLES ROUTED TO IDF ABOVE CEILING USING J–HOOKS.
- VOICE/DATA OUTLET WITH 3/4" C STUBBED INTO ACCESSIBLE CLG. SPACE WITH (2) CAT 6 CABLES ROUTED TO IDF ABOVE CEILING USING J–HOOKS.

GENERAL NOTES:

A. ALL ELECTRICAL WORK SHALL BE IN ACCORDANCE WITH THE LATEST VERSION OF THE NEC AND THE LOCAL AUTHORITY HAVING JURISDICTION.

B. FOR ALL PENETRATIONS IN FIRE RATED WALLS SHALL BE SEALED WITH FIRE STOP MATERIAL. SEE ARCHITECTURAL DRAWINGS FOR LOCATIONS.

C. ALL ELECTRICAL WORK SHALL COMPLY WITH SPECIFICATIONS, OSHA SAFETY STANDARDS.

D. PROVIDE RED–LINE AS–BUILT DRAWINGS FOR ALL CHANGES DIFFERENT FROM THE PERMITTED DRAWING SET, AND RETURN DRAWING SET TO THE ENGINEER.

E. CONCEAL ALL CIRCUITRY IN WALLS OR IN CEILING SPACE.

F. COORDINATE ALL LIGHT FIXTURE LOCATIONS WITH ARCHITECTURAL REFLECTED CEILING PLANS.

G. INDIVIDUAL HOMERUNS ARE SHOWN FOR CLARITY. GROUPING OF UP TO SIX CARRYING #12 AWG CONDUCTORS IN A COMMON CONDUIT IS ACCEPTABLE. NEUTRAL CONDUCTOR SHALL BE CONSIDERED CURRENT CARRYING.

H. COORDINATE LOCATIONS OF ALL ELECTRICAL EQUIPMENT WITH MECHANICAL EQUIPMENT PRIOR TO INSTALLATION.

I. ALL OUTDOOR EQUIPMENT SHALL BE RATED NEMA 3R, WEATHERPROOF.

J. ALL CIRCUITS SHALL BE WITH #12 AWG FOR EACH PHASE, NEUTRAL AND GROUND CONDUCTORS IN 3/4" CONDUIT UNLESS OTHERWISE NOTED.

K. LABEL ALL RECEPTACLES AND EQUIPMENT WITH PANEL NAME AND CKT. NUMBER WITH PERMANENT, PRINTED LABELS.

GENERAL DEMOLITION NOTES:

A. ALL LIGHTING FIXTURES NOT SCHEDULED FOR REMOVAL OR RELOCATION SHALL REMAIN IN PLACE AND ENERGIZED THROUGHOUT THE CONSTRUCTION PROJECT.

B. SCHEDULE ALL SHUTDOWNS WITH OWNER OF POWER, LIGHTING, FIRE ALARM, SECURITY AND PA SYSTEMS 24HR'S IN ADVANCE PRIOR TO COMMENCEMENT OF WORK.

C. WHERE ELECTRICAL SERVICES ARE TO BE REMOVED, REMOVE WIRE AND CONDUIT BACK TO SOURCES, LABEL RESULTING SPARE CIRCUIT BREAKERS AND UPDATE CIRCUIT DIRECTORIES.

D. CONTRACTOR SHALL FIELD VERIFY EXACT CONDITIONS PRIOR TO ROUGH–IN AND COMPLY AS REQUIRED

Registered Professional Engineer CERTIFICATE NO. 30210 CHARLES A. GIROUD Date Signed 01-08-21
Expires 6–30–2023

ADVANTECH FACILITY DESIGN INC
ARCHITECTURE - ENGINEERING
3280 E. HEMISPHERE LOOP STE. 110 TUCSON AZ 85706 520–806–0903
1889 E. BROADWAY, TEMPE, AZ 85256

WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

NOIR Lab

NSF

KITT PEAK - Sells, AZ 85634

△	DATE	DESCRIPTION
0	01/08/21	I.F.C.

PROJECT NUMBER:	11904.00
DRAWN BY:	CH
CHECKED BY:	CG
CAD FILE:	11904.00-E0.0
SCALE:	AS SHOWN

ELECTRICAL SYMBOLS & ABBREVIATIONS

E0.0

GENERAL NOTES:

REFER TO SHEET E0.0 AND THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS

KEYNOTES:

1. EXISTING 480V FEEDER TO REMAIN, RECONNECT TO NEW SERVICE ENTRANCE. SEE SHEETS E1.1 AND E7.0 FOR MORE INFORMATION.
2. PROVIDE NEW 480V FEEDER, SUPPORT ALONG TUNNEL WALL USING U-CHANNEL SUPPORTS. PROVIDE PULL BOXES AND OFF-SETS AS REQUIRED TO COORDINATE WITH TUNNEL ARCHITECTURE AND EXISTING EQUIPMENT. SEE SHEETS E1.1 AND E7.0 FOR MORE INFORMATION.
3. ROUTE NEW 480V FEEDER TIGHT TO STRUCTURE, PROVIDE PULL BOXES AND OFF-SETS AS REQUIRED TO COORDINATE WITH ARCHITECTURAL CEILING STRUCTURE AND PLUMB/HVAC EQUIPMENT.

REFRIGERATION RM. FOR ENLARGED PLAN OF THIS AREA SEE DETAIL 3, SHEET E2.1 AND DETAIL 3, SHEET ED2.1

FOR ENLARGED PLANS OF THIS AREA SEE E1.1, E2.1, E3.1, ED1.1, ED2.1, ED3.1.

NEW ELECTRICAL EQUIPMENT IN EXISTING STORAGE RM. AND IN CORRIDOR

FOR ENLARGED PLANS OF THIS AREA SEE E1.1, E2.1, E3.1, ED1.1, ED2.1, ED3.1.

NEW ELECTRICAL EQUIPMENT IN EXISTING ELECTRICAL RM.

1 ELECTRICAL OVERALL AND UNDERGROUND FEEDER PLAN
1ST LEVEL

SCALE: 3/32"-1'-0"

Registered Professional Engineer (Electrical)
CERTIFICATE NO.
30210
CHARLES A. GIROUD
Date Signed 01-08-21
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ELECTRICAL
OVERALL & UNDERGROUND
FEEDER PLAN

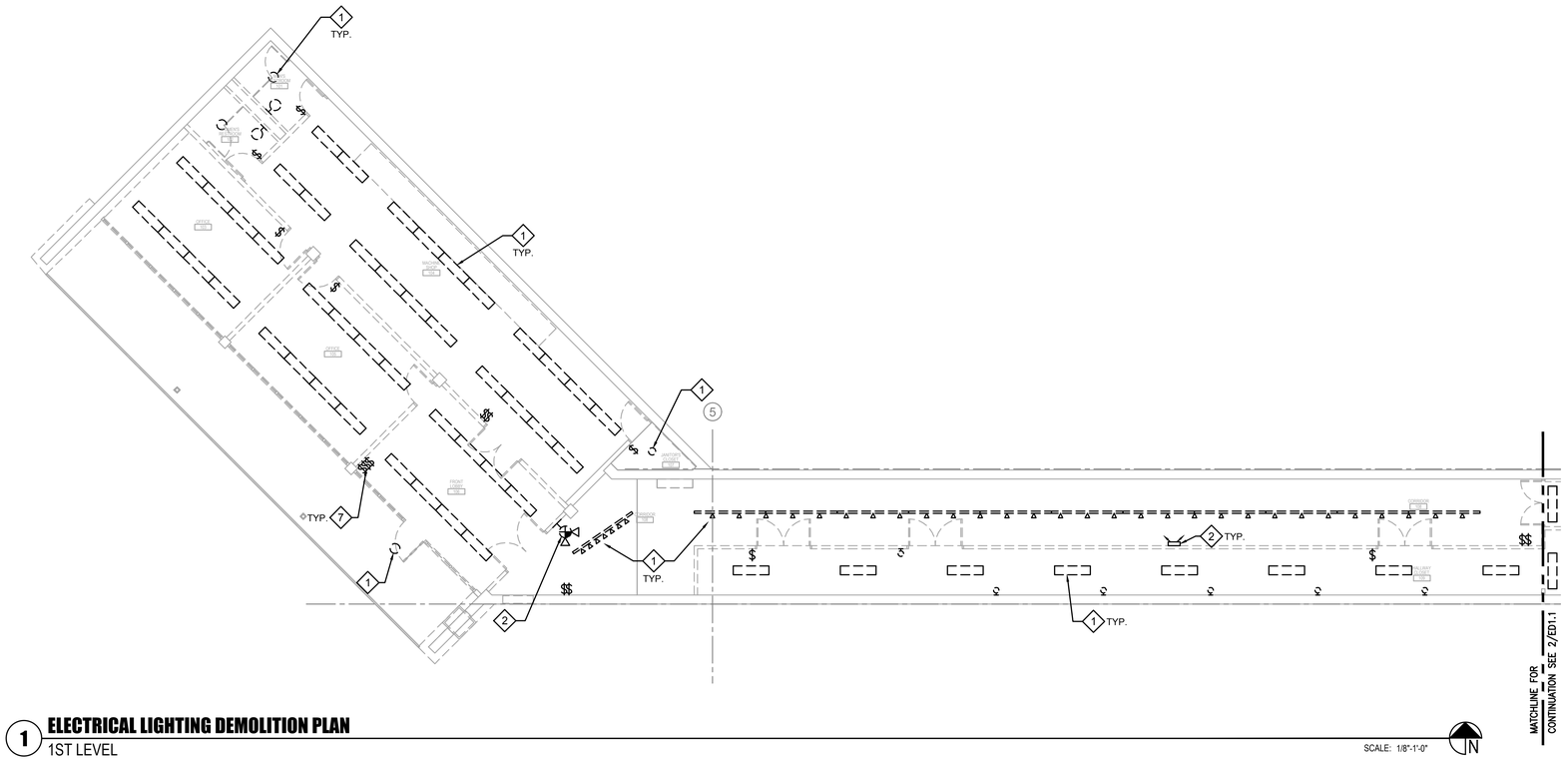
E0.1

GENERAL NOTES:

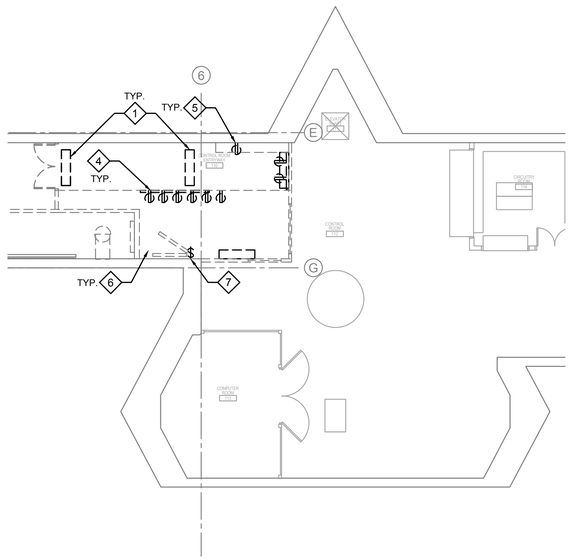
REFER TO SHEET E0.0 AND THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS

KEYNOTES:

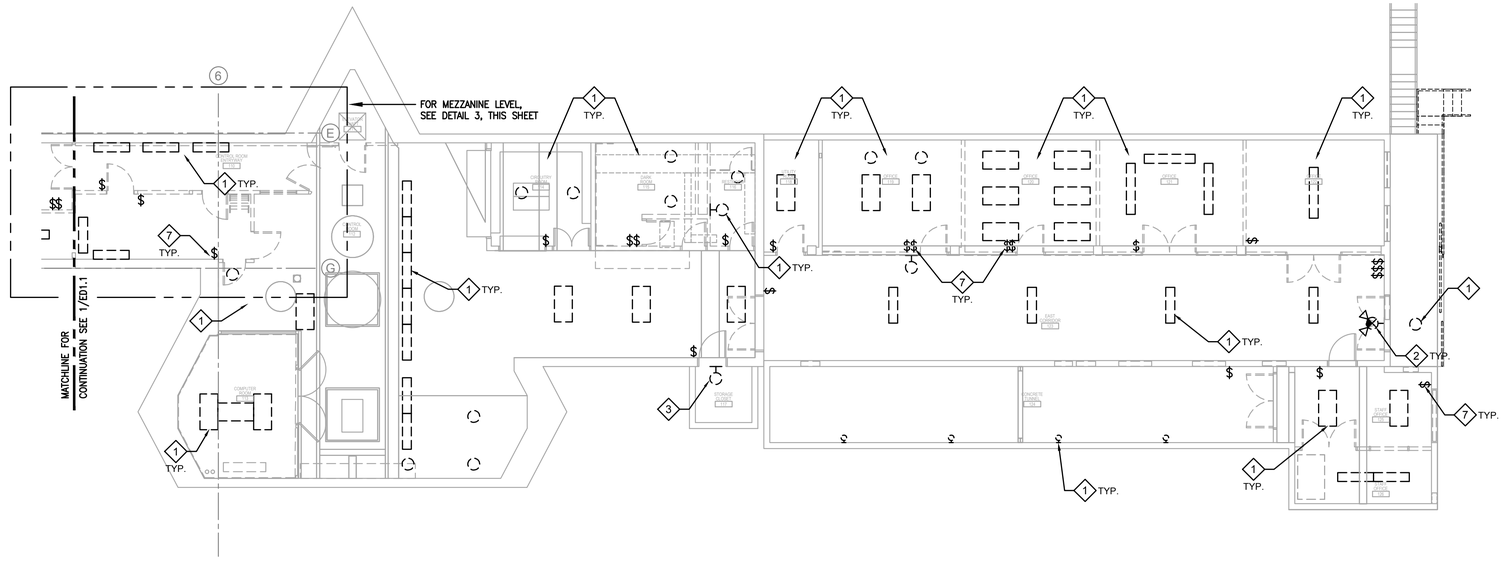
1. REMOVE LIGHT FIXTURE AND ASSOCIATED CIRCUITS BACK TO SOURCE.
2. REMOVE EMERGENCY/EXIT LIGHT AND ASSOCIATED CIRCUITS BACK TO SOURCE.
3. LIGHT FIXTURE TO REMAIN, RECONNECT TO NEW CIRCUITS.
4. REMOVE WIREMOLD, RECEPTACLES AND ASSOCIATED CIRCUITS BACK TO PANEL.
5. REMOVE RECEPTACLE AND ASSOCIATED CIRCUITS BACK TO NEAREST JUNCTION POINT.
6. REMOVE ALL ELECTRICAL DEVICES AND WIRING. VERIFY WITH OWNER PRIOR TO REMOVAL FOR TELESCOPE CONTROLS AND COMPONENTS REQUIRED TO MAINTAIN OPERATIONS OR BE TURNED OVER TO THE OWNER.
7. REMOVE LIGHT SWITCHES AND ASSOCIATED CIRCUITS TO SOURCE.



1 ELECTRICAL LIGHTING DEMOLITION PLAN
1ST LEVEL
SCALE: 1/8"-1'-0"



3 ELECTRICAL POWER AND LIGHTING DEMOLITION PLAN
MEZZANINE LEVEL
SCALE: 1/8"-1'-0"



2 ELECTRICAL LIGHTING DEMOLITION PLAN
1ST LEVEL
SCALE: 1/8"-1'-0"

Registered Professional Engineer (Electrical)
CERTIFICATE NO.
30210
CHARLES A. GIROUD
Date Signed 01-08-21
Expires 6-30-2023

ADVANTECH
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WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

NOIR Lab

NSF

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DRAWN BY:	CH
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CAD FILE:	11904.00-ED1.1
SCALE:	AS SHOWN

ELECTRICAL LIGHTING DEMOLITION PLANS

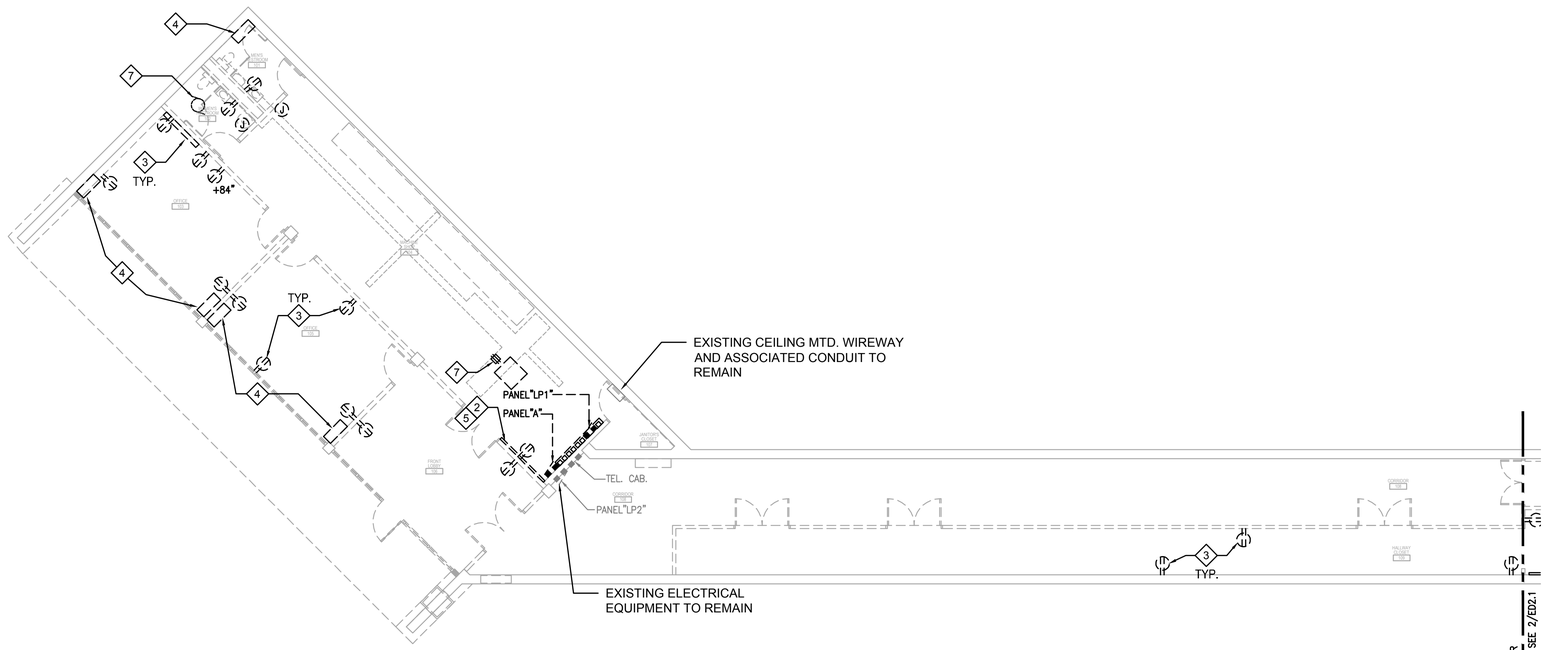
ED1.1

GENERAL NOTES:

REFER TO SHEET E0.0 AND THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS

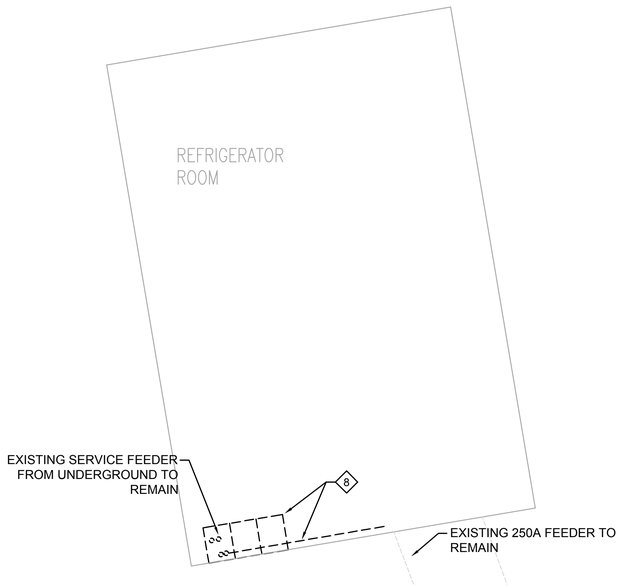
KEYNOTES:

1. REMOVE BUS DUCT AND ASSOCIATED CIRCUIT IN THIS ROOM BACK TO NEAREST ACTIVE POINT. ALL WIREMOLD IN THIS ROOM (113) TO REMAIN.
2. REMOVE WIREWAY AND ASSOCIATED CIRCUITS BACK TO NEAREST POWER SOURCE.
3. REMOVE RECEPTACLES AND ASSOCIATED CIRCUITS BACK TO NEAREST ACTIVE POINT.
4. REMOVE EXISTING ELECTRICAL UNIT HEATER CIRCUITING BACK TO PANEL.
5. REMOVE ELECTRICAL EQUIPMENT INCLUDING PANEL BOARD AND ASSOCIATED CIRCUITS BACK TO SOURCE.
6. REMOVE ELECTRICAL PANEL BOARDS, DISCONNECTS, GUTTER SYSTEMS, ETC. BACK TO SOURCE. VERIFY WITH OWNER ANY CIRCUITS REQUIRED TO REMAIN IN OPERATION PRIOR TO REMOVAL. FOR PRICING PURPOSES MAKE ALLOWANCE FOR THE RE-SUPPLY OF (10) 120V, CIRCUITS FROM NEW PANELS USING #10AWG CONDUCTORS IN CONDUIT.
7. REMOVE CONNECTIONS TO HVAC EQUIPMENT AND ASSOCIATED CIRCUITS BACK TO SOURCE.
8. REMOVE MCC AND PORTION OF EXISTING FEEDER CONDUIT. RETAIN FEEDER FOR RECONNECTION TO NEW SERVICE EQUIPMENT.



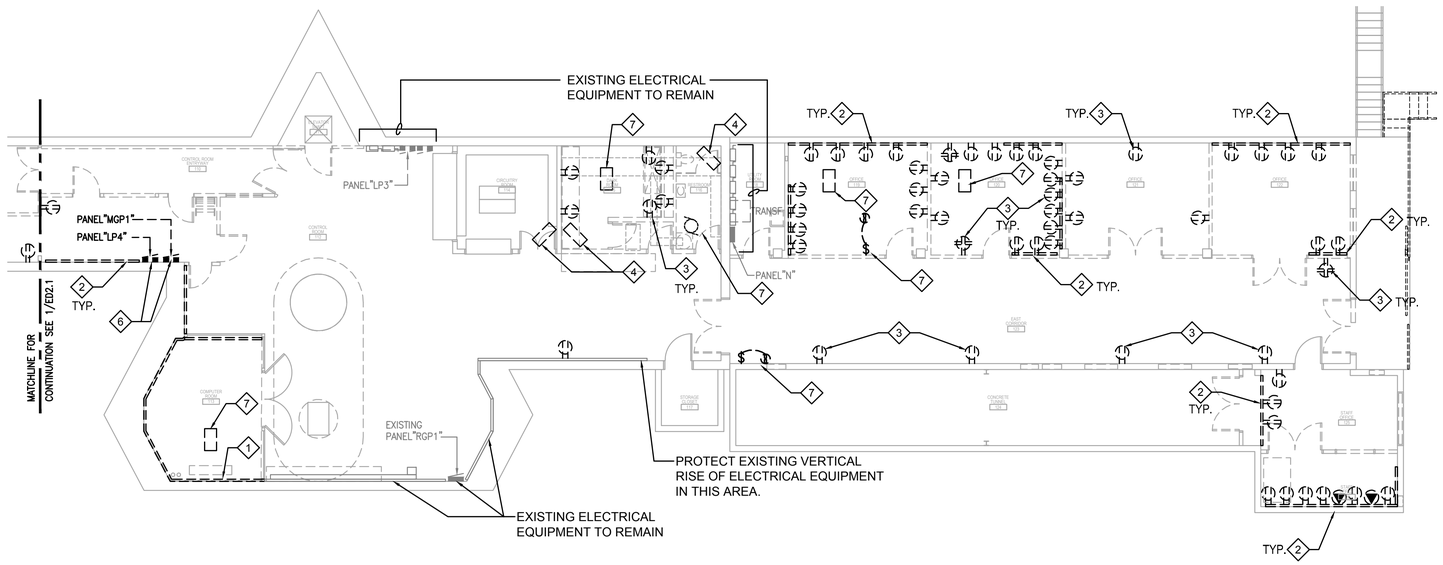
1 ELECTRICAL POWER DEMOLITION PLAN
1ST LEVEL

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



3 ELECTRICAL SERVICE DEMOLITION PLAN
REFERGERATOR BUILDING

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



2 ELECTRICAL POWER DEMOLITION PLAN
1ST LEVEL

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

Registered Professional Engineer (Electrical)
CERTIFICATE NO.
30210
CHARLES A. GIROUD
Date Signed 01-08-21
Expires 6-30-2023

ADVANTECH
FACILITY DESIGN INC
ARCHITECTURE - ENGINEERING
3280 E. HEMISPHERE LOOP STE. 110 TUCSON AZ 85706 520-806-0903
1889 E. BROADWAY, TEMPE AZ 85258

WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

NOIR Lab

NSF

KITT PEAK - Sells, AZ 85634

△	DATE	DESCRIPTION
0	01/08/21	I.F.C.

PROJECT NUMBER:	11904.00
DRAWN BY:	CH
CHECKED BY:	CG
CAD FILE:	11904.00-ED2.1
SCALE:	AS SHOWN

ELECTRICAL POWER DEMOLITION PLANS

ED2.1

GENERAL NOTES:

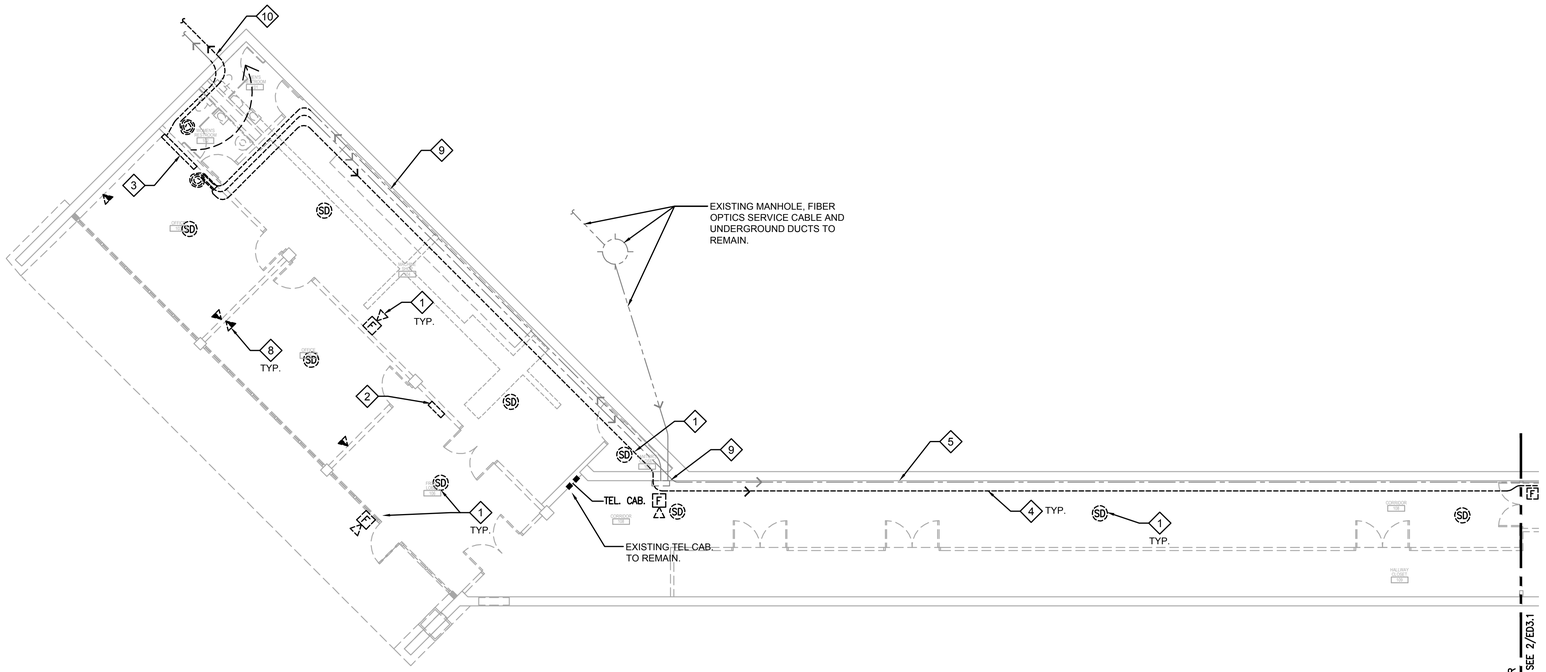
A. REFER TO SHEET E0.0 AND THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS.

B. PRIOR TO REMOVAL OF ANY FIBER OPTIC CABLING, CONSULT WITH OWNER TO DETERMINE WHICH CABLES ARE ACTIVE AND REQUIRE SYSTEM SHUT-DOWN IN ORDER TO RELOCATE AND WHICH CABLES ARE NON-OPERATIONAL AND ARE SCHEDULED FOR REMOVAL.

C. REMOVE ALL UN-USED CABLING AND CONDUIT TO RESULT IN A CLEAN AND PROFESSIONAL APPEARANCE.

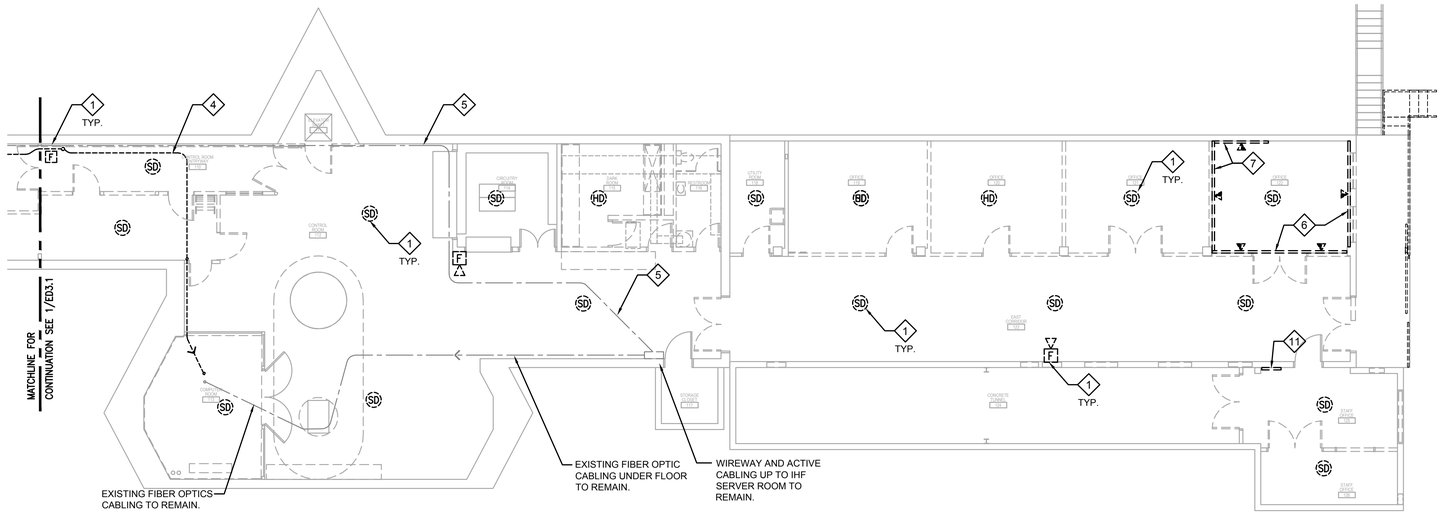
KEYNOTES:

1. REMOVE FIRE ALARM DEVICE AND ASSOCIATED WIRING/CONDUIT BACK TO SOURCE.
2. RELOCATE FIRE ALARM ANNUNCIATOR PANEL TO NEW WALL, EXTEND WIRE/CONDUIT TO NEW LOCATION.
3. RELOCATE EXISTING FIBER OPTICS, LIU AND PATCH PANEL AS INDICATED. REDIRECT EXISTING CIRCUITS AND CABLING TO NEW LOCATION. SEE RENOVATION PLAN FOR ADDITIONAL INFORMATION.
4. REMOVE NON OPERATIONAL FIBER OPTIC CABLES AND ASSOCIATED CABLING BACK TO SOURCE AND RETAIN CONDUIT FOR RE-USE.
5. REMOVE EXPOSED ACTIVE FIBER OPTIC CABLE AND INSTALL IN EXISTING CONDUIT MADE AVAILABLE BY REMOVAL OF EXIST NON OPERATIONAL FIBER OPTIC CABLE.
6. REMOVE TEL/DATA WIRE WAY LOCATED HIGH ON WALL AND ASSOCIATED CABLING BACK TO SOURCE.
7. REMOVE TEL/DATA WIRE WAY LOCATED LOW ON WALL AND ASSOCIATED CABLING BACK TO SOURCE.
8. REMOVE TEL/DATA COMMUNICATIONS DEVICE AND CABLING BACK TO SOURCE.
9. RELOCATE TEL/DATA SPLICE BOX IN SAME GENERAL LOCATION AT MAXIMUM HEIGHT. RETAIN INCOMING AND OUTGOING FIBER OPTIC CABLE CONNECTIONS. SUPPORT IN PULL BOX AS INDICATED ON RENOVATION PLANS.
10. REMOVE DEAD FIBER OPTIC CABLE COIL BACK TO SOURCE.
11. REMOVE EXISTING TEL BOARD AND ASSOCIATED CABLING AND EQUIPMENT.



1 ELECTRICAL SYSTEMS DEMOLITION PLAN
1ST LEVEL

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



2 ELECTRICAL SYSTEMS DEMOLITION PLAN
1ST LEVEL

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

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ELECTRICAL SYSTEMS DEMOLITION PLANS

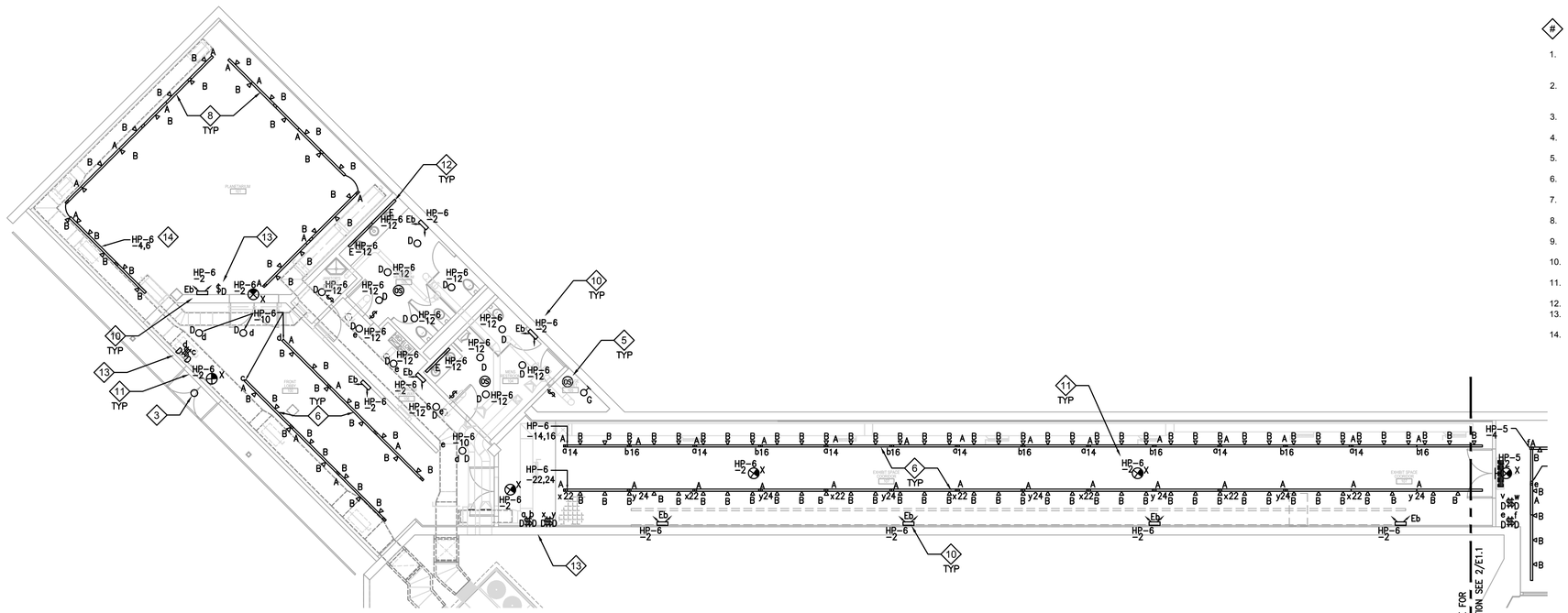
ED3.1

GENERAL NOTES:

A. REFER TO SHEET E0.0 AND ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
B. SMART TRACK IS TO BE MOUNTED 1'-0" BELOW CEILINGS EXCEPT WHERE HVAC DUCT IS IN CONFLICT, THE TRACKS SHALL BE INSTALLED 6" BELOW THE DUCT WORK UNLESS NOTED OTHERWISE.
C. ALL LIGHTING CONTROLS SHALL BE LOW VOLTAGE USING POWER PACKS AS THE LINE VOLTAGE RELAY INTERFACE AND DIMMING CONTROL POINT.

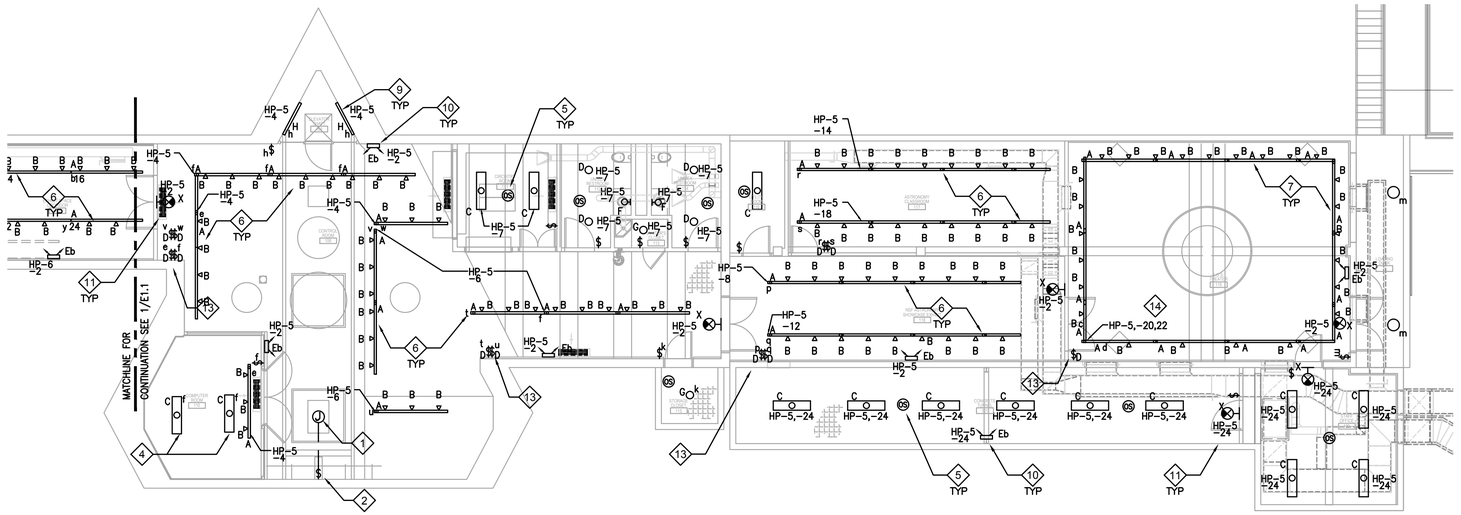
KEYNOTES:

1. PROVIDE WP J-BOX BELOW FLOOR IN TUNNEL. RUN 1"C TO WALL AND THEN THROUGH FLOOR UP TO SWITCH FOR FUTURE BELOW FLOOR LIGHTS. VERIFY EXACT LOCATION WITH OWNER.
2. PROVIDE SWITCH FOR BELOW FLOOR LIGHTS. RUN 1"C STUB INTO ELECTRICAL ROOM FOR FUTURE CIRCUITING OF BELOW FLOOR LIGHTS. VERIFY EXACT LOCATIONS WITH OWNER.
3. INSTALL RELOCATED RECESSED CAN LIGHT FROM DEMOLITION. CLEAN RE-LAMP AND INSTALL AS DIRECTED BY OWNER.
4. PROVIDE NEW FIXTURES AS SHOWN. RECONNECT TO EXISTING CIRCUIT AND LIGHTING CONTROL.
5. PROVIDE LOW VOLTAGE OCCUPANCY SENSOR WITH INTERFACE TO LOCAL POWER PACK.
6. PROVIDE SMART TRACK MOUNTED BELOW HVAC DUCT WORK AVOIDING CONFLICTS WITH MECHANICAL INSTALLATIONS.
7. PROVIDE INSTALLATION OF SMART TRACK, AND COORDINATION WITH SOS THEATER EQUIPMENT INSTALLATION.
8. PROVIDE INSTALLATION OF SMART TRACK, AND COORDINATION WITH PLANETARIUM EQUIPMENT INSTALLATION.
9. PROVIDE WALL WASHER LIGHT, INSTALL ABOVE VIEWING WINDOW FOR LIGHT-WELL AFFECT IN ELEVATOR SHAFT.
10. INSTALL EM BATTERY PACK LIGHTS AT 8'-0"AFF, CONNECT TO NON-SWITCHED PORTION OF LOCAL LIGHTING CKT.
11. PROVIDE BATTERY BACKED EXIT LIGHTS, CONNECT TO NON-SWITCHED PORTION OF LOCAL LIGHTING CKT.
12. INSTALL LIGHTS ABOVE MIRROR.
13. PROVIDE DIMMING SWITCH FOR EACH CONTROL GROUPS LISTED, IF NO GROUP IS LISTED, PROVIDE A COMMON DIMMING SWITCH FOR THE ENTIRE ROOM.
14. ALTERNATELY CIRCUIT EACH 8'L TRACK SECTION, CONTROL WITH A COMMON DIMMER SWITCH.



1 **ELECTRICAL LIGHTING RENOVATION PLAN**
1ST LEVEL

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



2 **ELECTRICAL LIGHTING RENOVATION PLAN**
1ST LEVEL

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

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ELECTRICAL LIGHTING RENOVATION PLANS

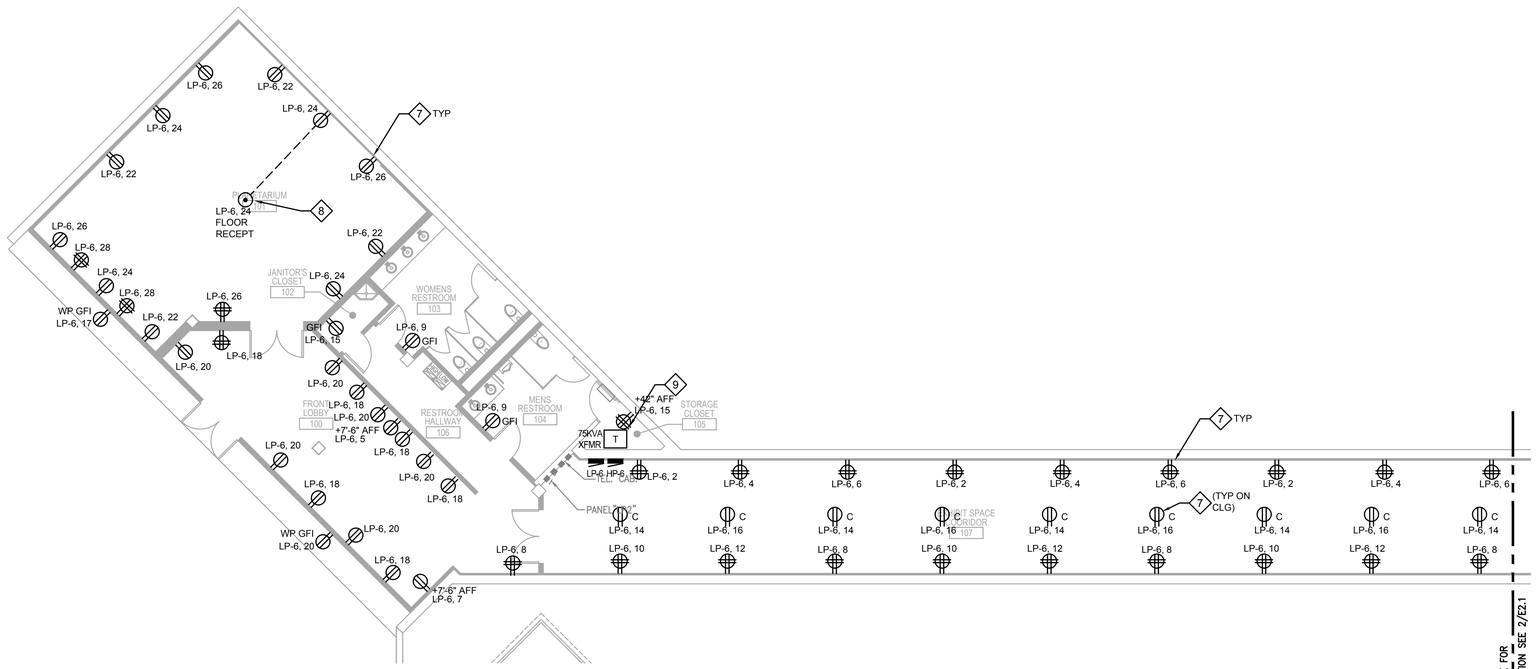
E1.1

GENERAL NOTES:

REFER TO SHEET E0.0 AND THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS

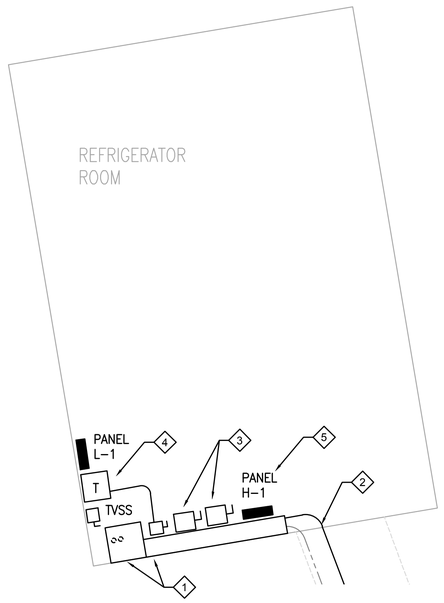
KEYNOTES:

1. PROVIDE NEW PULL BOX, WIREWAY AND EQUIPMENT FOR NEW SERVICE. SEE SHEET E7.0 FOR DETAILS.
2. NEW 400A FEEDER, SEE SHEET E0.1 AND E7.0 FOR DETAILS.
3. RECONNECT EXISTING 250A FEEDER TO NEW DISC. SW. AND PROVIDE NEW DISC. SW. FOR NEW 400A FEEDER.
4. INSTALL NEW XFMR ON U-CHANNEL FRAME (PAD).
5. NEW 480V PANEL UNDER ALTERNATE BID, SEE SHEET E7.0.
6. PROVIDE G4000 WIREMOLD AND RECEPTACLES AS SHOWN AT 48" AFF.
7. PROVIDE NEW RECEPT'S AS INDICATED.
8. SAWCUT FLOOR AND PROVIDE FLUSH FLOOR BOX WITH DEVICES INDICATED. PATCH AND REPAIR FLOOR SURFACE. INCLUDE (1) 3/4"C FOR POWER, AND (1) 1"C FOR FUTURE DATA. CONCEAL CONDUIT RISERS IN WALL TO CLG. SPACE.
9. SUPPORT XFMR FROM CLG. STRUCTURE AT 8'0" TO BOTTOM USING U-CHANNEL FRAME AND THREADED RODS.
10. INSTALL XFMR ON U-CHANNEL FRAME (PAD).



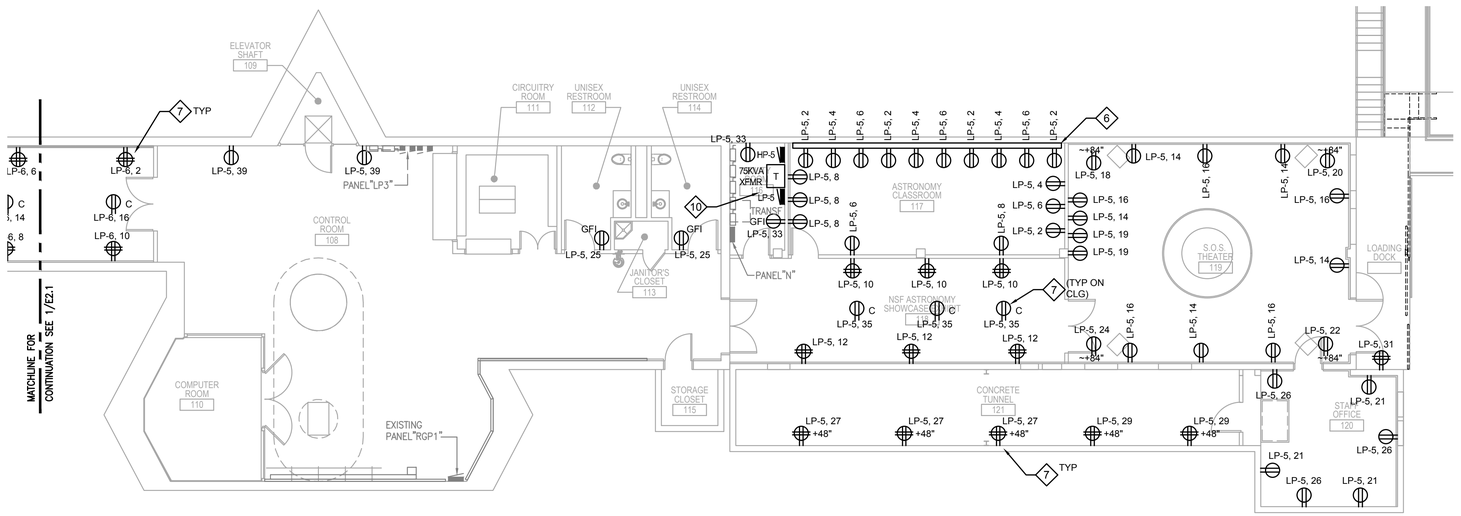
1 ELECTRICAL POWER RENOVATION PLAN
1ST LEVEL

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



3 ELECTRICAL SERVICE RENOVATION PLAN
REFERGERATOR BUILDING

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



2 ELECTRICAL POWER RENOVATION PLAN
1ST LEVEL

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

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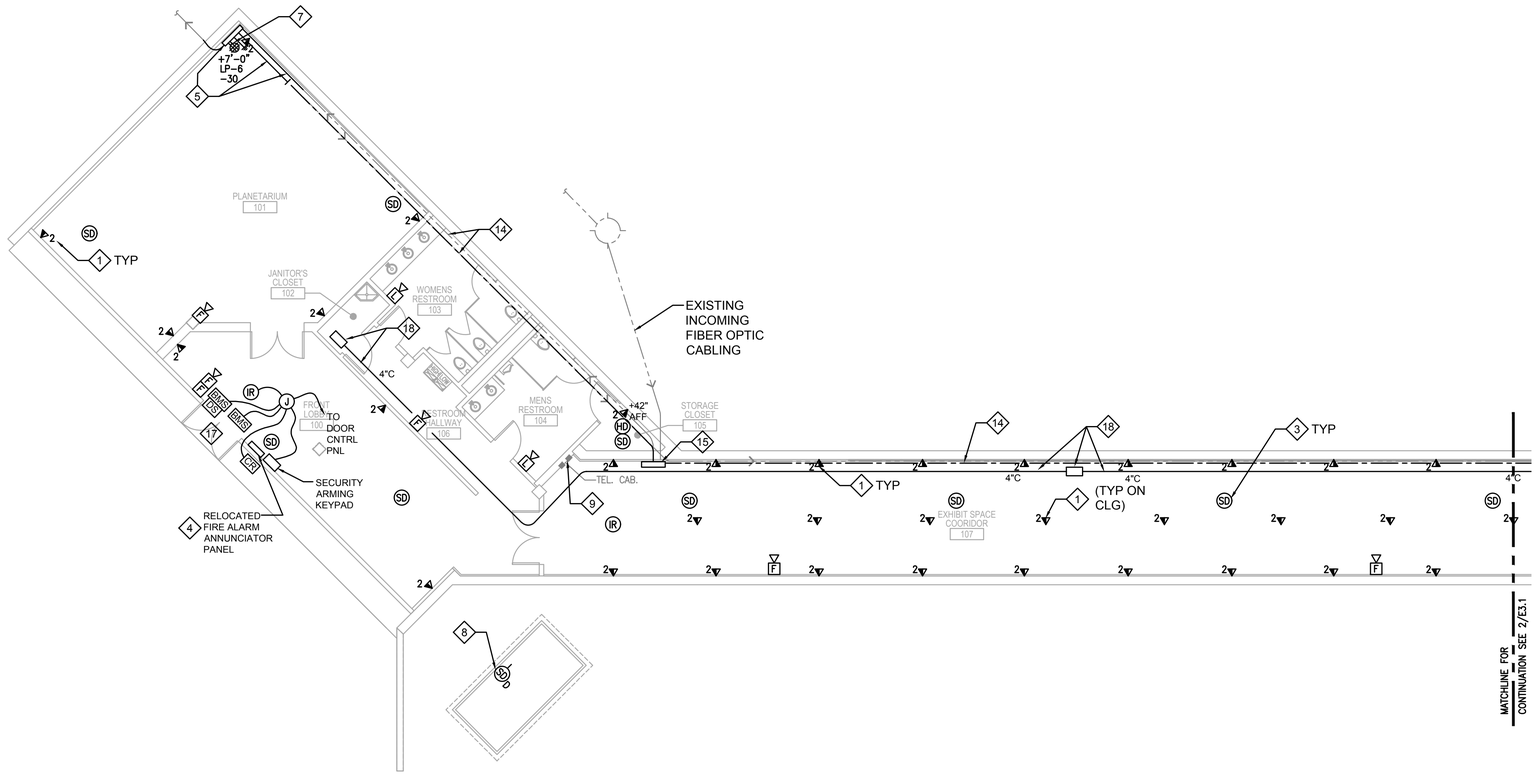
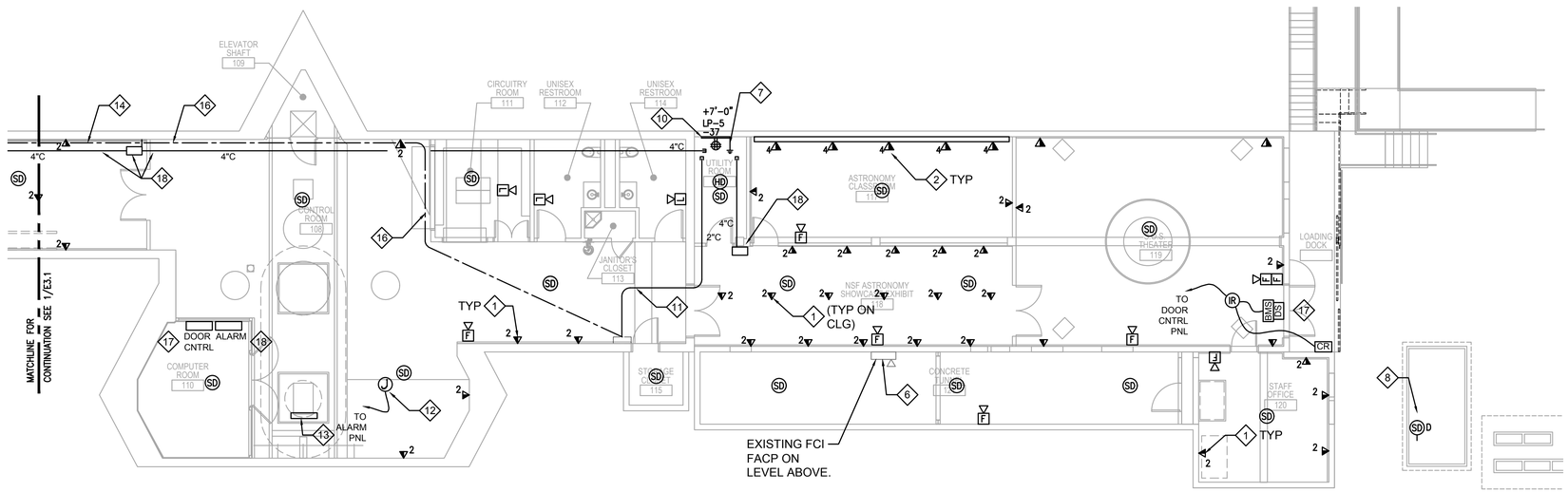
ELECTRICAL POWER RENOVATION PLANS

E2.1



1 ELECTRICAL SYSTEMS RENOVATION PLAN
1ST LEVEL

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



2 ELECTRICAL SYSTEMS RENOVATION PLAN
1ST LEVEL

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

GENERAL NOTES:

A. REFER TO SHEET E0.0 AND THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
B. PROVIDE A COMPLETE AND FUNCTIONAL VOICE/DATA CABLING SYSTEM FOR CONNECTION OF ALL OUTLETS TO THE IHF SERVER LOCATED ON THE 2ND LEVEL. INCLUDE COPPER CAT 6E STATION CABLING, FIBER CABLING, CONDUIT, PATCH PANELS, LABELING AND FIRE RATED PLYWOOD BACKBOARDS. COORDINATE CABLING STANDARDS WITH OWNER.

KEYNOTES:

1. PROVIDE TELE/DATA OUTLET EXTEND 1"C TO PATCH PANEL OR LOCAL PULL BOX.
2. PROVIDE TELE/DATA OUTLET G4000 WIREMOLD, STUB 1"C TO PATCH PANEL.
3. PROVIDE NEW FIRE ALARM DEVICE. EXTEND MANUFACTURER REQUIRED NETWORK CABLING IN CONDUIT TO EXISTING FACP ON 2ND LEVEL.
4. NEW LOCATION OF FAAP, EXTEND WIRE/CONDUIT TO NEW LOCATION.
5. NEW LOCATION OF FIBER HUB. REINSTALL BACKBOARD AND ASSOCIATED EQUIPMENT ON WALL AT 84"AFF. DIVERT EXISTING FIBER CABLING TO NEW HUB LOCATION.
6. PROVIDE ANALOG TELEPHONE LINES FROM EXISTING TEL CABINET TO EXISTING FACP FOR DIAL-UP MODEM.
7. PROVIDE # 6 GND FOR NEW PATCH PANEL AND SWITCH. BOND TO ELECTRICAL SYSTEM GROUND.
8. PROVIDE DUCT MTD. SMOKE DETECTOR CONNECT TO EXISTING FIRE ALARM SYSTEM.
9. EXISTING TEL BOARD W/ EXISTING ANALOG LINES AVAILABLE.
10. PROVIDE NEW IT HUB INCLUDING 12 STRAND FIBER OPTIC CABLING TO EXISTING IHF DATA CENTER ON 2ND LEVEL, LIU FIBER PATCH PANEL AND (2) 96 PORT COPPER STATION CABLE PATCH PANELS, SWITCH AND ACTIVE EQUIPMENT BY OWNER.
11. PROVIDE NEW FIBER OPTIC CABLE FROM IHF SERVER IN 2"C.
12. PROVIDE JUNCTION BOX AND 1" CONDUIT TO SECURITY ALARM PANEL BELOW RAISED FLOOR FOR SECURITY CONNECTION TO MOON ROCK EXHIBIT.
13. PROVIDE 4'L WIREWAY FOR CONCEALMENT OF EXISTING UNDER-FLOOR FIBER OPTIC CABLING FROM ENTRY HATCH VIEW.
14. RE-INSTALL EXISTING EXPOSED FIBER OPTIC CABLING THROUGH EMPTY CONDUIT MADE AVAILABLE FROM REMOVAL OF DEAD FIBER CABLING.
15. PROVIDE A WALL MTD. 36"LX36"HX18"D PULL BOX FOR CONCEALMENT OF EXISTING UTILITY FIBER SPLICE CLOSURE. INSTALL AT CEILING LEVEL. PROVIDE CONDUIT CONNECTIONS AND OR GROMMETS AS APPLICABLE FOR IN/OUT CABLING/CONDUIT.
16. PROVIDE NEW 1"C FOR REROUTED FIBER CABLING IN THIS AREA. STUB UP TO IHF DATA ROOM.
17. PROVIDE A COMPLETE TURN-KEY CARD ACCESS CONTROL SYSTEM FOR DOOR SECURITY. INCLUDE CENTRAL DOOR CONTROLLER, ELECTRONIC DOOR STRIKES, MAG STATUS SWITCHES AND PROXIMITY CARD READERS. INSTALL ALL CABLING IN CONDUIT. PROVIDE SYSTEM COMMISSIONING AND OWNER TRAINING. PROVIDE DATA CONNECTION TO IHF DATA CENTER FOR OWNER MONITORING AND PROGRAMMING.
18. PROVIDE CONDUIT AND PULL BOX FOR LOCAL DATA CABLING CONDUIT. INSTALL TIGHT TO CLG. STRUCTURE, CONCEAL AS MUCH AS POSSIBLE.

Registered Professional Engineer (Electrical)
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WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

NOIR Lab

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KITT PEAK - Sells, AZ 85634

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SCALE:	AS SHOWN

ELECTRICAL SYSTEMS RENOVATION PLANS

E3.1

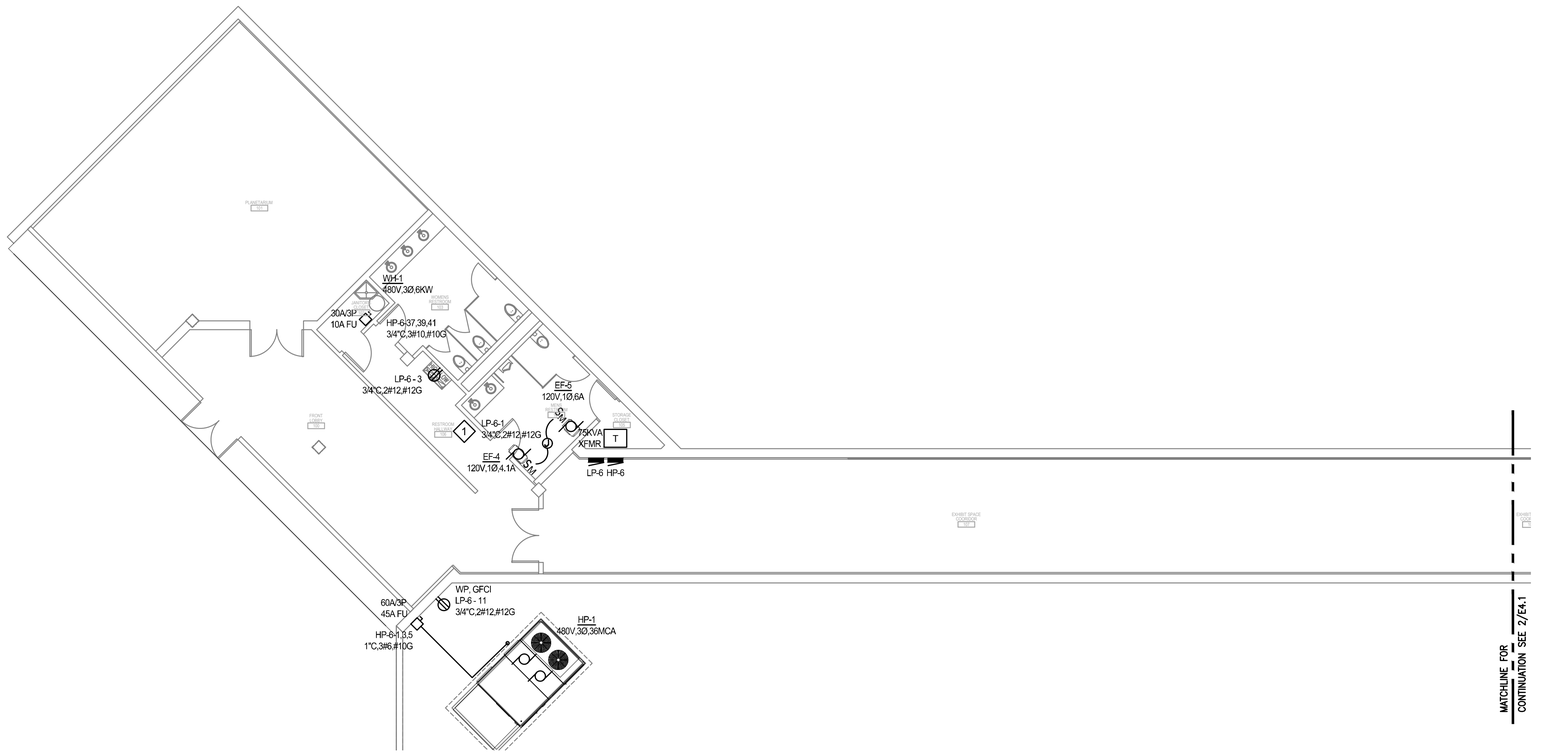
GENERAL NOTES:

A. REFER TO SHEET E0.0 AND THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS.

B. COORDINATE ALL CONDUIT RUNS AND ELECTRICAL DEVICE LOCATIONS WITH MECHANICAL EQUIPMENT.

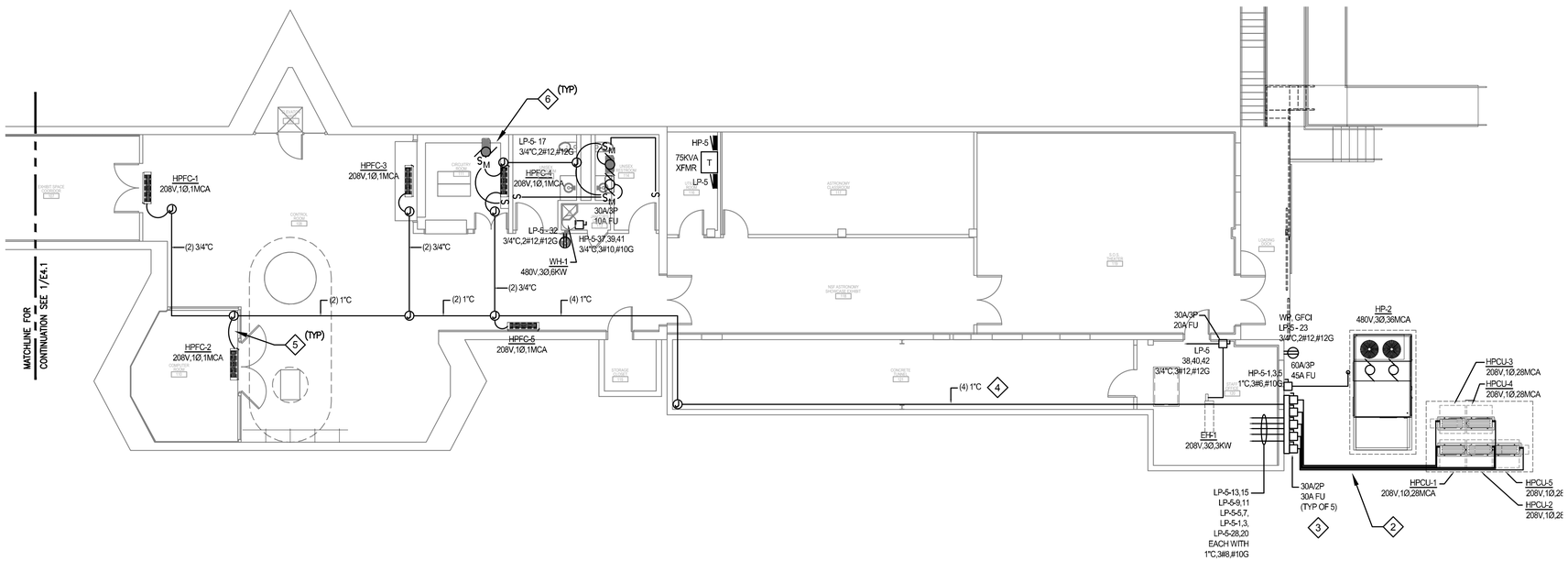
⟨#⟩ KEYNOTES:

1. PROVIDE RELAY FOR INTERLOCK OF EF-3 AND EF-4 WITH HP-1. WHEN HP-1 RUNS, FANS RUN.
2. EXTEND (2) 3/4"C FROM EACH HPCU TO THE WIREWAY. INSTALL CONDUITS ON PIPE RACK.
3. PROVIDE A NEMA 3R WIREWAY FOR POWER AND CONTROLS CKTS.
4. PROVIDE CONDUITS TO HPFC UNITS AS INDICATED. GROUP NO MORE THAN (3) POWER CKTS. PER CONDUIT. ALL CONTROLS WIRING CAN BE IN A COMMON CONDUIT.
5. PROVIDE (1) POWER CONDUIT AND (1) CONTROLS CONDUIT TO EACH HPFC UNIT. PROVIDE CABLING PER MFR'S RECOMMENDATIONS. NOTE THAT UNITS WILL PROVIDE ERROR SIGNAL IF CABLING IS TOO LARGE OR TOO SMALL.
6. PROVIDE LOCAL CONTROL SWITCH AT 48"AFF IN ADDITION TO THE MANUAL MOTOR STARTER DISC. SW. AT THE UNIT.



1 ELECTRICAL HVAC POWER RENOVATION PLAN
1ST LEVEL

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



2 ELECTRICAL HVAC POWER RENOVATION PLAN
1ST LEVEL

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

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ELECTRICAL
HVAC POWER
RENOVATION PLANS

E4.1

GENERAL NOTES:

A. REFER TO SHEET E0.0 AND THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS
B. LIGHT FIXTURES INDICATED ARE FOR BASIS OF DESIGN, SUBSTITUTIONS OF EQUAL QUALITY AND PERFORMANCE ARE ACCEPTABLE.

BASE OPTION TO BE BLACK TRIM, TYP. ALL FINAL FINISH SELECTIONS TO BE VERIFIED BY OWNER.

LIGHT FIXTURE SCHEDULE

SYMBOL	VOLTS	MOUNTING	DESCRIPTION	MANUFACTURER	LAMP TYPE	LAMP WATTS	LOCATION
A	MVOLT	SUSPENDED	SMARTTRACK 48V, 2-CIRCUIT TRACK SYSTEM. BLACK FINISH. LENGTH AS REQUIRED. PROVIDE 480W CURRENT LIMITER EVERY 8'-0". BRUCKLIGHTING.COM. PROVIDE MOUNTING HANGERS	BRUCK - LEDRABRANDS CONTACT ARIZONA LIGHTING, JARRAD REDWINE 1-520-392-8258	-	-	LOBBY, CLASS ROOMS, EXHIBITS, SOS, THEATER, ETC.
B	MVOLT	TRACK HEAD	LEDRABRANDS FIXTURE HEADS TO BE SELECTED BY OWNER. BRUCKLIGHTING.COM	BRUCK - LEDRABRANDS CONTACT ARIZONA LIGHTING, JARRAD REDWINE 1-520-392-8258	LED 80CRI	-	TRACK
C	MVOLT	SURFACE/ PENDANT	4'L INDUSTRIAL, LITHONIA UFIT LED	LITHONIA	LED 4000 LUMENS 80CRI, 4000K	30W	OFFICE/ TUNNEL / CIRCUITRY ROOM
D	MVOLT	PENDANT	SLIMFORM LED JSF 11IN MVOLT ZT WH. PROVIDE EBX. OWNER TO SELECT TRIM	JUNO	LED 1305 LUMENS 90 CRI 2700K	15.2W	-
E	MVOLT	SURFACE WALL SCONCE	8' SURFACE MOUNT EDGE 2 FIXTURE, SURFACE CORNER MOUNT, INTEGRAL NON DIMMING DRIVER	AXIS LIGHTING	LED 850 LUMENS PER LN FOOT 80CRI, 3500K	32.7W	MEN AND WOMEN'S REST ROOM
F	MVOLT	SURFACE WALL SCONCE	4' SURFACE MOUNT EDGE 2 FIXTURE, SURFACE CORNER MOUNT, INTEGRAL NON DIMMING DRIVER	AXIS LIGHTING	LED 4000 LUMENS PER LN FOOT 80CRI, 3500K	32W	MEN AND WOMEN'S REST ROOM
G	MVOLT	SURFACE WALL SCONCE	BLWP4 40LHE ADSM MVOLT EZ1	LITHONIA	LED LP835 4000 LUMENS 82CRI, 3500K	37W	JANITORS CLOSET
H	MVOLT	SURFACE	S2LS LLP 4	LITHONIA	LED 3200 LUMENS 80CRI, 3500K	28W	SOLOR TUBE LIGHT
Eb	MVOLT	SURFACE	LED EMERGENCY LIGHT FIXTURE WITH AIMABLE LAMPS, BATTERY BACK-UP, MULTI-VOLT, BLACK FINISH.	LITHONIA ELM6L SERIES	LED 1100 LUMENS	6.6	EMERGENCY EGRESS LIGHT FIXTURE
X	MVOLT	SUSPENDED/ SURFACE	LED EDGE LIT EXIT SIGN. RED LETTERS , BRUSHED ALUM FINISH, EDG, BATTERY BACK UP, MULTI-VOLT.	LITHONIA EDG	LED	3.9	PATH OF EGRESS

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CHECKED BY:	CG
CAD FILE:	31801-E6.0
SCALE:	AS NOTED

ELECTRICAL SCHEDULES

E6.0

PROJECT NAME: CENTER FOR ASTRONOMY OUTREACH VISITOR CENTER — PROJECT NUMBER: 11904.00

VOLTS 277/480V — PANEL **HP-5** — MAIN 400A MCB
PHASE 3PH, 4 WIRE — LOCATION SHOWCASE EXBIT 118 — BUS 400A
A.I.C. 35K — FED FROM BLDG. SERVICE — MOUNTING SURFACE

LOAD DESCRIPTION	LTG	REC	MTR	AMP	P	NO.	VA LOAD A	B	C	NO.	AMP	P	MTR	REC	LTG	LOAD DESCRIPTION
HP-2			1	60		1	7978									
										2	20	1				LIGHTS EMERG. EXIT
			1			3		7978								
								2280		4	20	1				LIGHTS - CONTROL ROOM TRACK
			1		3	5			7978							
									3000	6	20	1				LIGHTS - CONTROL RM TRACK/CORRIDOR
LIGHTS - REST ROOMS/CIRCIRT ROOM				20	1	7	191									
							2400			8	20	1				LIGHTS - NSF ASTRONOMY SHOW CASE
LIGHTS - TUNNEL/ STAFF OFFICES				20	1	9		363								
										10	20	1				SPARE
SPARE				20	1	11										
									2400	12	20	1				LIGHTS - NSF ASTRONOMY SHOW CASE
SPARE				20	1	13										
							2400			14	20	1				LIGHTS - ASTRONOMY CLASS ROOM
SPARE				20	1	15										
										16	20	1				SPARE
SPARE				20	1	17										
									2400	18	20	1				LIGHTS - ASTRONOMY CLASS ROOM
SPARE				20	1	19										
							3600			20	20	1				LIGHTS - SOS THEATER
SPARE				20	1	21										
								3600		22	20	1				LIGHTS - SOS THEATER
SPARE				20	1	23										
										24	20	1				SPARE
SPARE				20	1	25										
										26	20	1				SPARE
SPARE				20	1	27										
										28	20	1				SPARE
SPARE				20	1	29										
										30	20	1				SPARE
PANEL HP-6				200		31	21150									
										32	20	1				SPARE
						33		29715								
										34	20	1				SPARE
					3	35			21328							
										36	20	1				SPARE
WH-1				15		37	2000									
							12573			38	100					SUB FEED PANEL LP-5
						39		2000								
								14420		40						VIA 75 KVA TRANSFORMER
					3	41			2000							
									12546	42		3				
164300 VA - 3PH TOTAL CONNECTED							52292	60356	51652							

23934 VA - CONTINUOUS X 0.25 (*) = 5984 VA
VA - GP RECEPTS X (**) = VA
140366 VA - NON-CONTIN X 1.00 = 140366 VA

(* INCLUDES LIGHTING & LARGEST MOTOR) — 187052 FEEDER TOTAL (VA) (***)
(** 100% OF FIRST 10KW + 50% OF BALANCE) — TOTAL RECEPTACLES
(*** THREE TIMES LARGEST PHASE + 25% OF CONTINUOUS - 50% OF REC VA OVER 10KVA) — 225 LARGEST PHASE CURRENT — 1/8/2021 10:29

COMMENT:

PROJECT NAME: CENTER FOR ASTRONOMY OUTREACH VISITOR CENTER — PROJECT NUMBER:

VOLTS 120/208V — PANEL **LP-5** — MAIN 225A MCB
PHASE 3PH, 4 WIRE — LOCATION ELECTRIC ROOM — BUS 225A
A.I.C. 10K — FED FROM HP-5 — MOUNTING SURFACE

LOAD DESCRIPTION	LTG	REC	MTR	AMP	P	NO.	VA LOAD A	B	C	NO.	AMP	P	MTR	REC	LTG	LOAD DESCRIPTION
HPCU-1				40		1	2330									
							900			2	20	1		5		RECEPTACLES RM 117
					2	3		2330								
								720		4	20	1		4		RECEPTACLES RM 117
HPCU-2				40		5			2330							
									900	6	20	1		5		RECEPTACLES RM 117
					2	7	2330									
							720			8	20	1		4		RECEPTACLES RM 117
HPCU-3				40		9		2330								
								540		10	20	1		3		RECEPTACLES RM 118
					2	11			2330							
									540	12	20	1		3		RECEPTACLES RM 118
HPCU-4				40		13	2330									
							900			14	20	1		5		RECEPTACLES RM 119
					2	15		2330								
								900		16	20	1		5		RECEPTACLES RM 119
EF-1,2,& 3				20	1	17			1476							
									600	18	20	1				SOS THEATER RM 119 JUNCTION BOX
RECEPTACLE RM 119 - DEDICATED		2		20	1	19	360									
							600			20	20	1				SOS THEATER RM 119 JUNCTION BOX
RECEPTACLES RM 120		3		20	1	21		540								
								600		22	20	1				SOS THEATER RM 119JUNCTION BOX
EXTERIOR RECEPTACLE		1		20	1	23			180							
									600	24	20	1				SOS THEATER RM 119 JUNCTION BOX
REST ROOM RECEPTACLES		2		20	1	25	360									
							540			26	20	1		3		STAFF OFFICE RECEPTACLES RM 120
TUNNEL RECEPTACLES		6		20	1	27		1080								
								2330		28	40					HPCU-5
TUNNEL RECEPTACLES		4		20	1	29			720							
									2330	30		2				
EXTERIOR RECEPTACLE		2		20	1	31	360									
							483			32	20	1				ELEC WATER COOLER
RECEPTACLES RM 116		2		20	1	33		360								PROVIDE GFCI BREAKER
										34	20	1				SPARE
RECEPTACLES RM 118 CEILING		3		20	1	35			540							
										36	20	1				SPARE
RECEPTACLDE - DATA		2		20	1	37	360									
							1000			38	20					ELECTRIC DUCT RE-HEATER COIL
CONTROL ROOM 108 - RECEPTACLE		2		20	1	39		360								
								1000		40						EH-1
SPARE				20	1	41										
									1000	42		3				
42539 VA - 3PH TOTAL CONNECTED							13573	15420	13546							

VA - CONTINUOUS X 0.25 (*) = VA
11880 VA - GP RECEPTS X (**) = 10940 VA
30659 VA - NON-CONTIN X 1.00 = 30659 VA

(* INCLUDES LIGHTING & LARGEST MOTOR) — 45320 FEEDER TOTAL (VA) (***)
(** 100% OF FIRST 10KW + 50% OF BALANCE) — 66 TOTAL RECEPTACLES
(*** THREE TIMES LARGEST PHASE + 25% OF CONTINUOUS - 50% OF REC VA OVER 10KVA) — 126 LARGEST PHASE CURRENT — 1/8/2021 10:29

COMMENT:

PROJECT NAME: CENTER FOR ASTRONOMY OUTREACH VISITOR CENTER — PROJECT NUMBER: 11409.00

VOLTS 277/480V — PANEL **HP-6** — MAIN 200A MCB
PHASE 3PH, 4 WIRE — LOCATION WEST CORRIDOR — BUS 225A
A.I.C. 35K — FED FROM HP-5 — MOUNTING RECESSED

LOAD DESCRIPTION	LTG	REC	MTR	AMP	P	NO.	VA LOAD A	B	C	NO.	AMP	P	MTR	REC	LTG	LOAD DESCRIPTION
HP-1			1	60		1	7978									
										2	20	1				LIGHTING - EMERG. EXIT
			1			3		7978								
								2700		4	20	1				LIGHTING - GEODOME TRACK
			1		3	5			7978							
									2700	6	20	1				LIGHTING - GEODOME TRACK
SPARE				20	1	7										
										8	20	1				SPARE
SPARE				20	1	9										
								3657		10	20	1				LIGHTING - LOBBY
SPARE				20	1	11										
									370	12	20	1				LIGHTING - RESTROOMS
SPARE				20	1	13										
							4200			14	20	1				LIGHTING - CORRIDOR TRACK
SPARE				20	1	15										
								3600		16	20	1				LIGHTING - CORRIDOR TRACK
SPARE				20	1	17										
										18	20	1				SPARE
SPARE				20	1	19										
										20	20	1				SPARE
SPARE				20	1	21										
								4200		22	20	1				LIGHTING - CORRIDOR TRACK
SPARE				20	1	23										
									3600	24	20	1				LIGHTING - CORRIDOR TRACK
SPARE				20	1	25										
										26	20	1				SPARE
SPARE				20	1	27										
										28	20	1				SPARE
SPARE				20	1	29										
										30	20	1				SPARE
SPARE				20	1	31										
										32	20	1				SPARE
SPARE				20	1	33										
										34	20	1				SPARE
SPARE				20	1	35										
										36	20	1				SPARE
WH-1				15		37	2000									
							6972			38	100					SUB FEED PANEL LP-6
						39		2000								
								5580		40						VIA 75KVA TRANSFORMER
					3	41			2000							
									4680	42		3				
72193 VA - 3PH TOTAL CONNECTED							21150	29715	21328							

23934 VA - CONTINUOUS X 0.25 (*) = 5984 VA
VA - GP RECEPTS X (**) = VA
48259 VA - NON-CONTIN X 1.00 = 48259 VA

(* INCLUDES LIGHTING & LARGEST MOTOR) — 95129 FEEDER TOTAL (VA) (***)
(** 100% OF FIRST 10KW + 50% OF BALANCE) — TOTAL RECEPTACLES
(*** THREE TIMES LARGEST PHASE + 25% OF CONTINUOUS - 50% OF REC VA OVER 10KVA) — 115 LARGEST PHASE CURRENT — 1/8/2021 10:29

COMMENT:

PROJECT NAME: CENTER FOR ASTRONOMY OUTREACH VISITOR CENTER — PROJECT NUMBER:

VOLTS 120/208V — PANEL **LP-6** — MAIN 225A MCB
PHASE 3PH, 4 WIRE — LOCATION WEST CORRIDOR 106 — BUS 225A
A.I.C. 10K — FED FROM HP-6 — MOUNTING RECESSED

LOAD DESCRIPTION	LTG	REC	MTR	AMP	P	NO.	VA LOAD A	B	C	NO.	AMP	P	MTR	REC	LTG	LOAD DESCRIPTION
EF-4 & 5				20	1	1	1212									
							1440			2	20	1		8		RECEPTACLE CORRIDOR 107
ELEC WATER COOLER		1		20	1	3		180								
PROVIDE GFCI BREAKER								1080		4	20	1		6		RECEPTACLE CORRIDOR 107
LOBBY MONITOR		1		20	1	5			180							
									1080	6	20	1		6		RECEPTACLE CORRIDOR 107
LOBBY MONITOR		1		20	1	7	180									
							1440			8	20	1		8		RECEPTACLE CORRIDOR 107
REST ROOM RECEPTACLES		2		20	1	9		360								
								1440		10	20	1		8		RECEPTACLE CORRIDOR 107
EXTERIOR RECEPTACLE		1		20	1	11			180							
									1080	12	20	1		6		RECEPTACLE CORRIDOR 107
EXTERIOR RECEPTACLE		1		20	1	13	180									
							900			14	20	1		5		RECEPTACLE CORRIDOR 107 - CEILING
JANITOR CLOSET RECEPTACLE		2		20	1	15		360								
								900		16	20	1		5		RECEPTACLE CORRIDOR 107 - CEILING
RECEPTACLE - EXTERIOR		1		20	1	17			180							
									1260	18	20	1		7		RECEPTACLE LOBBY 100
SPARE				20	1	19										
										20	20	1		6		RECEPTACLE LOBBY 100
SPARE				20	1	21										
										22	20	1		4		RECEPTACLE RM 101
SPARE				20	1	23										
										24	20	1		5		RECEPTACLE RM 101
SPARE				20	1	25										
										26	20	1		5		RECEPTACLE RM 101
SPARE				20	1	27										
										28	20	1		4		RECEPTACLE RM 101
SPARE				20	1	29										
										30	20	1		2		RECEPTACLE - DATA
SPARE				20	1	31										
										32	20	1				SPARE
SPARE				20	1	33										
										34	20	1				SPARE
SPARE				20	1	35										
										36	20	1				SPARE
SPARE				20	1	37										
										38	20	1				SPARE
SPARE				20	1	39										
										40	20	1				SPARE
SPARE				20	1	41										
										42	20	1				SPARE
18312 VA - 3PH TOTAL CONNECTED							7332	5760	5220							

VA - CONTINUOUS X 0.25 (*) = VA
17100 VA - GP RECEPTS X (**) = 13550 VA
1212 VA - NON-CONTIN X 1.00 = 1212 VA

(* INCLUDES LIGHTING & LARGEST MOTOR) — 18446 FEEDER TOTAL (VA) (***)
(** 100% OF FIRST 10KW + 50% OF BALANCE) — 95 TOTAL RECEPTACLES
(*** THREE TIMES LARGEST PHASE + 25% OF CONTINUOUS - 50% OF REC VA OVER 10KVA) — 51 LARGEST PHASE CURRENT — 1/8/2021 10:29

COMMENT:

GENERAL NOTES:

REFER TO SHEET E0.0 AND THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS

Registered Professional Engineer (Electrical) CERTIFICATE NO. 30210 CHARLES A. GIROUD
Date Signed 10-08-21
Expires 6-30-2023

ADVANTECH FACILITY DESIGN INC
ARCHITECTURE - ENGINEERING
3280 E. HEMISPHERE LOOP STE. 110 TUCSON AZ 85706 520-806-0903
1889 E. BROADWAY, TEMPE AZ 85256

WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

NOIRLab — NSF — KITT PEAK - Sells, AZ 85634

△	DATE	DESCRIPTION
0	01/08/21	I.F.C.

PROJECT NUMBER: 11904.00
DRAWN BY: DLH
CHECKED BY: CG
CAD FILE: 31801-E6.1
SCALE: AS NOTED

ELECTRICAL SCHEDULES

E6.1

GENERAL NOTES:

REFER TO SHEET E0.0 AND THE ENTIRE SET FOR ADDITIONAL INFORMATION AND REQUIREMENTS

PROJECT NAME: CENTER FOR ASTRONOMY OUTREACH VISITOR CENTER PROJECT NUMBER:

VOLTS 120/208V | PANEL **L-1** | MAIN 60A MCB
PHASE 3PH, 4 WIRE | LOCATION Pump House | BUS 100A
A.I.C. 10K | FED FROM 15 KVA TRANSF. VIA MCC | MOUNTING SURFACE

LOAD DESCRIPTION	LTG	REC	MTR	AMP	P	NO.	VA LOAD A	VA LOAD B	VA LOAD C	NO.	AMP	P	MTR	REC	LTG	LOAD DESCRIPTION
PUMP HOUSE LIGHTS				15	1	1	840									
							1080			2	20	1		6		PUMP HOUSE RECEPTACLES
TUNNEL LIGHTS				15	1	3		840								
								720		4	15	1		4		TUNNEL RECEPTACLES
TUNNEL EXH. FAN ALARM				15	1	5			500							
									300	6	15	1				INTERCOM
INTERCOM				15	1	7	300									
										8	20	1				SPARE
CHILLER PUMP				50	1	9		3000								
										10	20	1				SPARE
						11										
										12	30	1				SPARE
						13										
										14						
						15										
										16						
						17										
										18						
						19										
										20						
						21										
										22						
						23										
										24						

7580 VA - 3PH TOTAL CONNECTED 2220 4560 800
VA - CONTINUOUS X 0.25 (*) = VA
1800 VA - GP RECEPTS X (**) = 1800 VA
5780 VA - NON-CONTIN X 1.00 = 5780 VA

(* INCLUDES LIGHTING & LARGEST MOTOR) 13680 FEEDER TOTAL (VA) (***)
(** 100% OF FIRST 10KW + 50% OF BALANCE) 10 TOTAL RECEPTACLES
(*** THREE TIMES LARGEST PHASE + 25% OF CONTINUOUS - 50% OF REC VA OVER 10KVA) 38 LARGEST PHASE CURRENT 4/20/2020 10:45

COMMENT:

PROJECT NAME: CENTER FOR ASTRONOMY OUTREACH VISITOR CENTER PROJECT NUMBER: 11904.00

VOLTS 277/480V | PANEL **H-1** | MAIN 100A
PHASE 3PH, 4 WIRE | LOCATION PUMP HOUSE | BUS 100A
A.I.C. 35KAIC | FED FROM SERVICE ENTRANCE | MOUNTING SURFACE

LOAD DESCRIPTION	LTG	REC	MTR	AMP	P	NO.	VA LOAD A	VA LOAD B	VA LOAD C	NO.	AMP	P	MTR	REC	LTG	LOAD DESCRIPTION
SPARE				30		1										
										2	30					SPARE
						3										
										4						
					3	5										
										6		3				
SPARE				30		7										
										8	30					SPARE
						9										
										10						
					3	11										
										12		3				
SPACE						13										
										14						SPACE
SPACE						15										
										16						SPACE
SPACE						17										
										18						SPACE
SPACE						19										
										20						SPACE
SPACE						21										
										22						SPACE
SPACE						23										
										24						SPACE
SPACE						25										
										26						SPACE
SPACE						27										
										28						SPACE
SPACE						29										
										30						SPACE

VA - 3PH TOTAL CONNECTED
VA - CONTINUOUS X 0.25 (*) = VA
VA - GP RECEPTS X (**) = VA
VA - NON-CONTIN X 1.00 = VA

(* INCLUDES LIGHTING & LARGEST MOTOR) FEEDER TOTAL (VA) (***)
(** 100% OF FIRST 10KW + 50% OF BALANCE) TOTAL RECEPTACLES
(*** THREE TIMES LARGEST PHASE + 25% OF CONTINUOUS - 50% OF REC VA OVER 10KVA) LARGEST PHASE CURRENT 1/8/2021 10:29

COMMENT:

Registered Professional Engineer (Electrical)
CERTIFICATE NO.
30210
CHARLES A. GIROUD
Date Signed 10-08-21
Expires 6-30-2023

ADVANTECH
FACILITY DESIGN INC
ARCHITECTURE - ENGINEERING
3280 E. HEMISPHERE LOOP STE. 110 TUCSON AZ 85706 520-806-0903
1889 E. BROADWAY, TEMPE AZ 85256

WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

NOIRLab

KITT PEAK - Sells, AZ 85634

△	DATE	DESCRIPTION
0	01/08/21	I.F.C.

PROJECT NUMBER: 11904.00
DRAWN BY: DLH
CHECKED BY: CG
CAD FILE: 11904.00-E6.2
SCALE: AS NOTED

ELECTRICAL SCHEDULES

E6.2

FAULT CURRENT CALCULATIONS

FAULT CURRENT AT THE SERVICE (MECH. PUMP HOUSE)

FAULT #1

$$f = \frac{1.732 \times 440 \times 32,600}{30,096 \times 480} = 0.33$$

$$m = \frac{1}{1+f} = \frac{1}{1+0.33} = 0.75$$

FAULT #1 @ MCC-1
32,600AIC X 0.75 = 24,450AIC

FAULT #2

$$f = \frac{1.732 \times 340 \times 24,450}{16,673 \times 480} = 1.80$$

$$m = \frac{1}{1+f} = \frac{1}{1+1.80} = 0.36$$

FAULT #2 @ TAP
24,450AIC X 0.36 = 8,802AIC

FAULT #3

$$f = \frac{1.732 \times 140 \times 8,802}{16,673 \times 480} = 0.27$$

$$m = \frac{1}{1+f} = \frac{1}{1+0.27} = 0.79$$

FAULT #3 @ HP-6
8,802AIC X 0.79 = 6,954AIC

FAULT #4

$$f = \frac{1.732 \times 60 \times 8,802}{16,673 \times 480} = 0.11$$

$$m = \frac{1}{1+f} = \frac{1}{1+0.11} = 0.90$$

FAULT #4 @ HP-5
8,802AIC X 0.90 = 7,922AIC

FAULT #5

$$f = \frac{1.732 \times 10 \times 32,600}{7,493 \times 480} = 0.16$$

$$m = \frac{1}{1+f} = \frac{1}{1+0.16} = 0.86$$

FAULT #2 @ HP-5
32,600AIC X 0.86 = 28,036AIC

LOAD CALCULATIONS
(MCC-1 600A, 277/480V-3P)

400A TAP (INCLUDES PANELS HP-5, HP-6)		
HP-5 (INCLUDES LP-5)	=	126A
HP-6 (INCLUDES LP-6)	=	116A
SUB TOTAL	=	242A
PANEL P-3	=	200A
PANEL L-1	=	38A
MCC-1 TOTAL		480A

GENERAL NOTES:

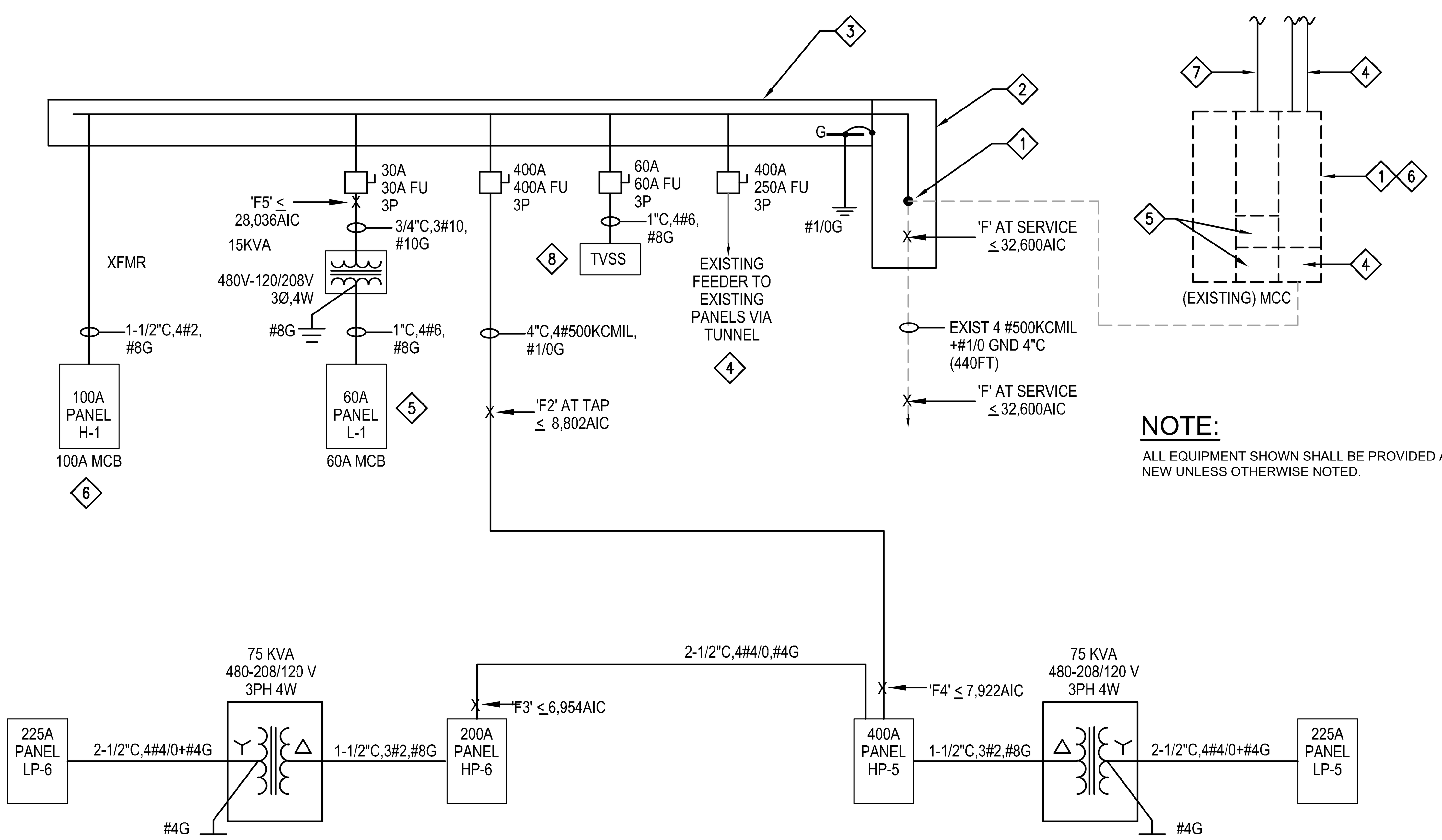
A. REFER TO SHEET E0.0 FOR SYMBOLS ABBREVIATIONS AND GENERAL NOTES.
B. ALL WORK IS NEW UNLESS NOTED OTHERWISE NOTED.
C. SCHEDULE POWER SHUTDOWNS WITH OWNER 2 WEEKS IN ADVANCE OF SCHEDULED WORK.
D. PRIOR TO POWER SHUT–DOWN, VERIFY WITH OWNER STATUS OF ALL EQUIPMENT CONNECTED TO THE MCC SCHEDULED FOR DEMOLITION.

KEYNOTES:

1. ASSESS ALL BRANCH CKTS. ORIGINATING FROM THE MCC. CONSULT WITH OWNER TO DETERMINE WHETHER LOADS ARE ACTIVE OR ABLE TO BE REMOVED FROM POWER SOURCE. SEE NOTE 6. REMOVE EXISTING MCC AND ASSOCIATED WIRE/CONDUIT CONNECTIONS TO NON-OPERATIONAL EQUIPMENT WITHIN THE REFRIGERATION RM. SPLICE EXISTING SERVICE CONDUCTORS WITH NEW AS INDICATED.
2. PROVIDE NEW 2'X2'X4'H PULL BOX OVER EXISTING CONDUIT SUTB-UPS.
3. PROVIDE NEW WIREWAY WITH SUITABLE LANDING LUGS FOR CONNECTION TO NEW EQUIPMENT.
4. RECONNECT EXISTING FEEDER LABELED ON MCC AS "PANEL 3L" TO NEW DISC. SW.
5. RETAIN EXISTING LIGHTING AND BRANCH CKTS. SUPPORTING REFRIGERATION RM. AND CONNECT TO NEW PANEL.
6. PROVIDE A COST ADD ALTERNATE FOR A NEW 480V PANEL IN THE EVENT THAT LOCAL, UNKNOWN EQUIPMENT REQUIRING 480V IS IN NEED OF RECONNECTION. FOR PRICING PURPOSES MAKE ALLOWANCE FOR (4) NEMA SIZE 1 MAGNETIC MOTOR STARTERS AND BRANCH CKTS. AT 30A/3P, 3/4"C,3#10,#10G, 75FT IN LENGTH. PRIOR TO PURCHASE, MAKE ADJUSTMENTS TO NEW PANEL BREAKERS AND BRANCH CKT. SIZING TO MATCH ACTUAL REQUIREMENTS. THIS WORK REQUIRES OWNER APPROVAL PRIOR TO EQUIPMENT PURCHASES. NOTE: EQUIPMENT MUST BE THOROUGHLY REVIEWED BEFORE DISCONNECTING / REMOVING IN ORDER TO ENSURE POWER TO IHF DOES NOT GET DISCONNECTED, AS IT IS CURRENTLY BEING FED FROM AN (E) BREAKER.
7. UNDER THE COST ALTERNATE IN NOTE 6, RETAIN CONTROL WIRING IN EXISTING CONDUIT AND TERMINATE IN A LOCAL 12"X12"X6"D JUNCTION BOX AND EXTEND TO NEW MOTOR CONTROL DEVICES AS REQUIRED. IF WIRING IS NOT REQUIRED UNDER NOTE 6. REMOVE BACK TO SOURCE.
8. PROVIDE SERVICE GRADE TRANSIENT VOLTAGE SURGE SUPPRESSOR, MATCH VOLTAGE AND PHASE REQUIREMENTS OF THE EXISTING SYSTEM.

SCHEDULE OF EQUIPMENT FOR 480V, 3PH MOTOR CONTROL CENTER 'M'					
ITEM	DESCRIPTION	CIRCUIT BREAKER POLES	CIRCUIT BREAKER TRIP	CIRCUIT & WIRING	REMARKS
A	MAIN BREAKER	3	600A	500 MCM	-
B	CONDENSER FAN	3	400A	-	DECOMMISSIONED
C	PANEL 3L BREAKER	3	250A	-	ACTIVE
D	BREAKER UNIT HEATER	2	20A	-	UNKNOWN
E	TRANSFORMER	3	40A	-	UNKNOWN
F	PUMP P2	-	-	-	DECOMMISSIONED
G	PUMP P-3	-	-	-	DECOMMISSIONED
H	PANEL L1	-	-	-	ACTIVE
K	XFMR FOR PNL L1 7.5KVA 120/240V SEC	-	-	-	ACTIVE
L	LIGHTNING PROTECTION	-	-	-	DECOMMISSIONED
M	CONTROL RELAY	-	-	-	UNKNOWN
N	AIR COMPRESSER	-	-	-	DECOMMISSIONED
P	FILL PUMP	-	-	-	DECOMMISSIONED
Q	TUNNEL PUMP	-	-		UNKNOWN
R	COMPRESER	-	-	-	DECOMMISSIONED
	UPS SYSTEM BREAKER ON EXTERIOR OF MCC	-	-	-	DECOMMISSIONED

2 **ORIGINAL MCC SCHEDULE (FOR REFERENCE ONLY)**



NOTE:

ALL EQUIPMENT SHOWN SHALL BE PROVIDED AS NEW UNLESS OTHERWISE NOTED.

1 **ONE LINE DIAGRAM**

CERTIFICATE NO. 30210
CHARLES A. GIROUD
Expires 6-30-2023

ADVANTECH FACILITY DESIGN INC
ARCHITECTURE · ENGINEERING
3280 E. HEMISPHERE LOOP STE. 110 TUCSON AZ 85706 520-806-0903
1859 E. BROADWAY, TEMPE AZ 85288

WINDOWS ON THE UNIVERSE CENTER FOR ASTRONOMY OUTREACH

NOIRLab | NSF

KITT PEAK - Sells, AZ 85634

△	DATE	DESCRIPTION
0	01/08/21	I.F.C.

PROJECT NUMBER:	11904.00
DRAWN BY:	DLH
CHECKED BY:	CG
CAD FILE:	11904.00-E7.0
SCALE:	AS NOTED

ELECTRICAL DIAGRAMS

E7.0