AS-BUILT DRAWINGS

Volume XIII

Operations & Maintenance Manual
2016

Oversight / NHS	
FHWA REGION VIII OVERSIGHT?	□ NO ■ YES
NATIONAL HIGHWAY SYSTEM?	□ NO ■ YES

DEPARTMENT OF TRANSPORTATION
STATE OF COLORADO

RELEASED FOR CONSTRUCTION PLANS
FEDERAL AID PROJECT NO. C 0703-360
INTERSTATE NO. 70
CLEAR CREEK COUNTY AND SUMMIT COUNTY
CONSTRUCTION PROJECT CODE NO. 17810

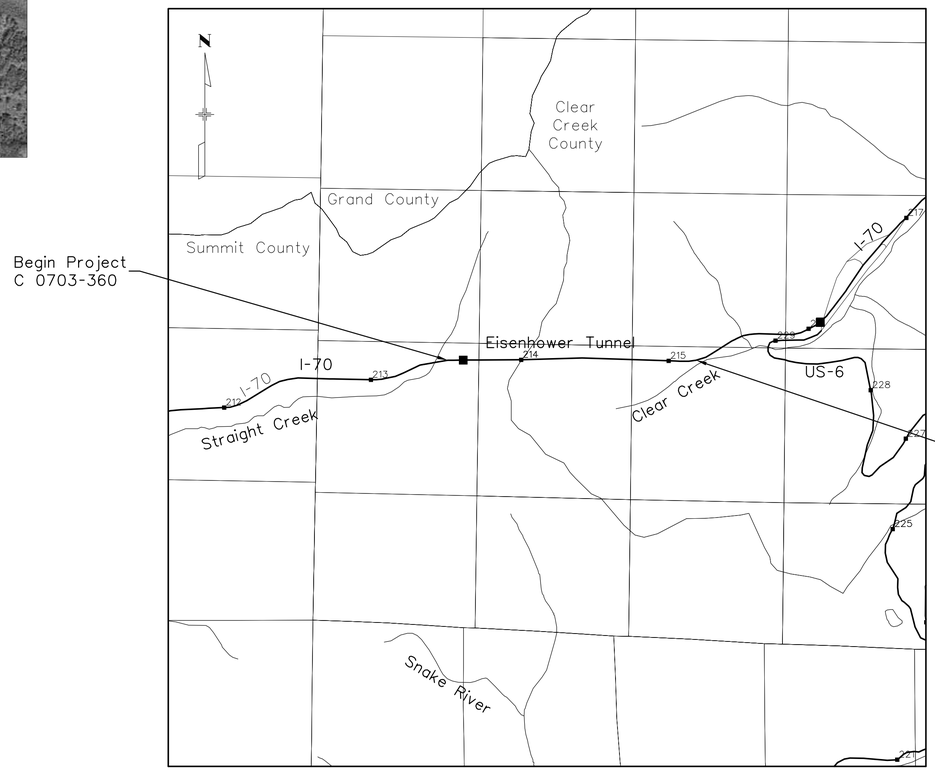
Related Projects:	
P. E. UNDER PROJECT: Project Number	C 0703-360
Project Code:	17810
R.O.W. Projects:	
R.O.W. Project Description	
XXXXXXXXXXXXXXX	

BEGIN PROJECT M.P. 213.60
(WEST VENTILATION BUILDING)

PROJECT LOCATION MAP

END PROJECT M.P. 215.40
(EAST VENTILATION BUILDING)

PROJECT LOCATION MAP



PROJECT LOCATION MAP

0' 200' 400' 800'

LOCATION – STATION –	ROADWAY		MAJOR STRUCTURE	
	LIN. FT.	MILES	LIN. FT.	MILES
BEG. PROJ. C 0703-360 APPROX. MP 213.60 ON I-70				
EISENHOWER/JOHNSON MEMORIAL TUNNELS			8,976	1.7
END PROJ. C 0703-360 APPROX. MP215.40 ON I-70	700	0.1		
TOTAL	700	0.1	8,976	1.7

SUMMARY	LIN. FT.	MILES
ROADWAY	700	0.1
STRUCTURE EJMT	8,976	1.7
GROSS & NET LENGTH	9,676	1.8

DESIGN DATA

MAXIMUM DEGREE OF CURVE	MATCH EXISTING
MAXIMUM GRADE	1.67%
MINIMUM S.S.D. - HORIZONTAL	NA
MINIMUM S.S.D. - VERTICAL	150'
MAXIMUM DESIGN SPEED	NA

Print Date: 2015-11-16		
File Name: RECORD DRAWINGS		
Horiz. Scale: As Noted	Vert. Scale: As Noted	
Unit Information	Unit Leader Initials	

Sheet Revisions		
Date:	Comments	Init.

Colorado Department of Transportation
425 A Corporate Circle
Golden, CO 80401
Phone: 720-497-6959 FAX: 720-497-6951
Region 1 JDS

As Constructed	
No Revisions:	
Revised:	
Void:	

Contract Information	
Contractor:	Barnard Construction
Resident Engineer:	Jana Spiker
Project Engineer:	Raelene Shelly
PROJECT STARTED: __/__/__	ACCEPTED: __/__/__
Comments:	_____

Project No./Code	
C 0703-360	
17810	
Sheet Number	TS

GENERAL INFORMATION DRAWING LIST

Number	Sheet Title
TS	TITLE SHEET
DL	DRAWING LISTS

ARCHITECTURAL DRAWING LIST

Number	Sheet Title
A1.0	FIRE PUMP AND MECH. BOILER ROOM
A1.1	ARCHITECTURAL TUNNEL OPERATIONS CENTER LAYOUT
A2.0	ARCHITECTURAL FAN LEVEL PLAN - WEST - NORTH
A2.1	ARCHITECTURAL FAN LEVEL PLAN - WEST - SOUTH
A2.2	ARCHITECTURAL FAN LEVEL PLAN - EAST - NORTH
A2.3	ARCHITECTURAL FAN LEVEL PLAN - EAST - SOUTH
A2.4	ARCHITECTURAL EMERGENCY GENERATOR PLAN
A6.0	ARCHITECTURAL DOOR DETAIL
A6.1	ARCHITECTURAL RAMP DETAIL
A6.2	ARCHITECTURAL ICE AND SNOW GUARD
A6.3	ARCHITECTURAL CORING DETAILS

CIVIL DRAWING LIST

Number	Sheet Title
C0.1	CIVIL NARRATIVE
C0.2	CIVIL MISCELLANEOUS DETAILS
C0.3	CIVIL NARRATIVE - FLOW CALCULATIONS
C1.0	EAST PORTAL BUILDING FFSS DRAINAGE PLAN
C1.1	EAST PORTAL BUILDING EXISTING UTILITIES
C1.2	SURVEY POINTS
C2.0	EAST PORTAL BUILDING FFSS DRAINAGE PLAN
C3.0	EAST PORTAL BUILDING FFSS DRAINAGE PLAN
C4.0	EAST PORTAL BUILDING FFSS DRAINAGE PROFILE
C5.0	EXISTING MANHOLE 1
C6.0	MANHOLE 2
C7.0	MANHOLE DETAILS
C8.0	DROP INLET DETAILS
C9.0	EATON TANK (1 OF 4)
C10.0	EATON TANK (2 OF 4)
C11.0	EATON TANK (3 OF 4)
C12.0	EATON TANK (4 OF 4)
C13.0	WEST SIDE FFSS SUPPLY PROFILE
C14.0	STORAGE TANK CONCRETE LINING - DETAILS (1-2)
C15.0	STORAGE TANK CONCRETE LINING - DETAILS (2-2)

ELECTRICAL DRAWING LIST

Number	Sheet Title
E1.0	ELECTRICAL GENERAL INFORMATION
E1.1	ELECTRICAL LEGEND
E1.2	ELECTRICAL SCHEDULES
E1.3	ELECTRICAL SCHEDULES
E2.1	WEST ELECTRICAL ONE-LINE DIAGRAM
E2.2	EAST ELECTRICAL ONE-LINE DIAGRAM
E3.2	ELECTRICAL SITE PLAN - EAST
E5.0	ELECTRICAL ROADWAY LEVEL PLAN - WEST
E5.1	ELECTRICAL MEZZANINE LEVEL PLAN - WEST
E6.0	ELECTRICAL ROADWAY LEVEL PLAN - EAST
E6.1	ELECTRICAL FAN LEVEL PLAN - EAST
E7.0	ELECTRICAL SPECIFICATIONS
E7.1	ELECTRICAL SPECIFICATIONS
E7.2	ELECTRICAL SPECIFICATIONS

ENVIRONMENTAL/LANDSCAPE DRAWING LIST

Number	Sheet Title
L1.0	WEST PORTAL ENVIRONMENTAL PLAN
L1.1	EAST PORTAL LANDSCAPE PLAN

FIRE ALARM DRAWING LIST

Number	Sheet Title
FA0.00	FIRE ALARM: COVER PAGE
FA0.01	FIRE ALARM: LEGEND
FA0.02	FIRE ALARM: NARRATIVE
FA0.03	FIRE ALARM: SEQUENCE OF OPERATIONS PART #1
FA0.04	FIRE ALARM: SEQUENCE OF OPERATIONS PART #2
FA0.05	FIRE ALARM: SEQUENCE OF OPERATIONS DETAILS
FA0.06	FIRE ALARM: TUNNEL VENTILATION SECTOR PLAN
FA0.07	FIRE ALARM: SITE KEY PLAN
FA1.01	FIRE ALARM: SITE PLAN - EAST
FA1.02	FIRE ALARM: SITE PLAN - WEST
FA2.E01	FIRE ALARM: LOWER LEVEL EAST
FA2.E02	FIRE ALARM: ROADWAY LEVEL EAST
FA2.E03	FIRE ALARM: FAN ROOM LEVEL EAST
FA2.N01	FIRE ALARM: EISENHOWER TUNNEL FP ZONES NT-01 TO NT-05
FA2.N02	FIRE ALARM: EISENHOWER TUNNEL FP ZONES NT-06 TO NT-15
FA2.N03	FIRE ALARM: EISENHOWER TUNNEL FP ZONES NT-16 TO NT-25
FA2.N04	FIRE ALARM: EISENHOWER TUNNEL FP ZONES NT-26 TO NT-35
FA2.N05	FIRE ALARM: EISENHOWER TUNNEL FP ZONES NT-36 TO NT-45
FA2.N06	FIRE ALARM: EISENHOWER TUNNEL FP ZONES NT-46 TO NT-55
FA2.N07	FIRE ALARM: EISENHOWER TUNNEL FP ZONES NT-56 TO NT-65
FA2.N08	FIRE ALARM: EISENHOWER TUNNEL FP ZONES NT-66 TO NT-75
FA2.N09	FIRE ALARM: EISENHOWER TUNNEL FP ZONES NT-76 TO NT-85
FA2.N10	FIRE ALARM: EISENHOWER TUNNEL FP ZONES NT-86 TO NT-90
FA2.S01	FIRE ALARM: JOHNSON TUNNEL FP ZONES ST-01 TO ST-05
FA2.S02	FIRE ALARM: JOHNSON TUNNEL FP ZONES ST-06 TO ST-15
FA2.S03	FIRE ALARM: JOHNSON TUNNEL FP ZONES ST-16 TO ST-25
FA2.S04	FIRE ALARM: JOHNSON TUNNEL FP ZONES ST-26 TO ST-35
FA2.S05	FIRE ALARM: JOHNSON TUNNEL FP ZONES ST-36 TO ST-45
FA2.S06	FIRE ALARM: JOHNSON TUNNEL FP ZONES ST-46 TO ST-55
FA2.S07	FIRE ALARM: JOHNSON TUNNEL FP ZONES ST-56 TO ST-65
FA2.S08	FIRE ALARM: JOHNSON TUNNEL FP ZONES ST-66 TO ST-75
FA2.S09	FIRE ALARM: JOHNSON TUNNEL FP ZONES ST-76 TO ST-85
FA2.S10	FIRE ALARM: JOHNSON TUNNEL FP ZONES ST-86 TO ST-93
FA2.W01	FIRE ALARM: ROADWAY LEVEL WEST
FA2.W02	FIRE ALARM: ROADWAY LEVEL WEST
FA2.W03	FIRE ALARM: FAN LEVEL WEST
FA3.01	FIRE ALARM: ONE LINE DIAGRAM FIRE ALARM
FA3.02	FIRE ALARM: ONE LINE DIAGRAM CCTV
FA4.01	FIRE ALARM: E. CONT. RM EST3 PANEL LAYOUT & CALCULATIONS
FA4.02	FIRE ALARM: W. CONT. RM EST3 PANEL LAYOUT & CALCULATIONS
FA4.03	FIRE ALARM: MGR OFF. EST3 PANEL LAYOUT & CALCULATIONS
FA4.04	FIRE ALARM: RCP #1 EST3 PANEL LAYOUT & CALCULATIONS
FA4.05	FIRE ALARM: RCP #2 EST3 PANEL LAYOUT & CALCULATIONS
FA4.06	FIRE ALARM: RCP #3 EST3 PANEL LAYOUT & CALCULATIONS
FA4.07	FIRE ALARM: RCP #4 EST3 PANEL LAYOUT & CALCULATIONS

Number	Sheet Title
FA4.08	FIRE ALARM: DELUGE RELEASING & FPC HEAT LOAD CALCS
FA4.09	FIRE ALARM: FPC01 THRU FPC04 BATTERY CALCULATIONS
FA4.10	FIRE ALARM: FPC05 THRU FPC08 BATTERY CALCULATIONS
FA4.11	FIRE ALARM: FPC09 THRU FPC12 BATTERY CALCULATIONS
FA4.12	FIRE ALARM: FPC13 THRU FPC16 BATTERY CALCULATIONS
FA4.13	FIRE ALARM: FPC17 THRU FPC20 BATTERY CALCULATIONS
FA4.14	FIRE ALARM: CONDUIT FILL CALCULATIONS
FA4.15	FIRE ALARM: CONDUIT FILL CALCULATIONS
FA5.01	FIRE ALARM FIRE PROTECTION PANEL FPC #01 WIRING DIAGRAM
FA5.02	FIRE ALARM FIRE PROTECTION PANEL FPC #02 WIRING DIAGRAM
FA5.03	FIRE ALARM FIRE PROTECTION PANEL FPC #03 WIRING DIAGRAM
FA5.04	FIRE ALARM FIRE PROTECTION PANEL FPC #04 WIRING DIAGRAM
FA5.05	FIRE ALARM FIRE PROTECTION PANEL FPC #05 WIRING DIAGRAM
FA5.06	FIRE ALARM FIRE PROTECTION PANEL FPC #06 WIRING DIAGRAM
FA5.07	FIRE ALARM FIRE PROTECTION PANEL FPC #07 WIRING DIAGRAM
FA5.08	FIRE ALARM FIRE PROTECTION PANEL FPC #08 WIRING DIAGRAM
FA5.09	FIRE ALARM FIRE PROTECTION PANEL FPC #09 WIRING DIAGRAM
FA5.10	FIRE ALARM FIRE PROTECTION PANEL FPC #10 WIRING DIAGRAM
FA5.11	FIRE ALARM FIRE PROTECTION PANEL FPC #11 WIRING DIAGRAM
FA5.12	FIRE ALARM FIRE PROTECTION PANEL FPC #12 WIRING DIAGRAM
FA5.13	FIRE ALARM FIRE PROTECTION PANEL FPC #13 WIRING DIAGRAM
FA5.14	FIRE ALARM FIRE PROTECTION PANEL FPC #14 WIRING DIAGRAM
FA5.15	FIRE ALARM FIRE PROTECTION PANEL FPC #15 WIRING DIAGRAM
FA5.16	FIRE ALARM FIRE PROTECTION PANEL FPC #16 WIRING DIAGRAM
FA5.17	FIRE ALARM FIRE PROTECTION PANEL FPC #17 WIRING DIAGRAM
FA5.18	FIRE ALARM FIRE PROTECTION PANEL FPC #18 WIRING DIAGRAM
FA5.19	FIRE ALARM FIRE PROTECTION PANEL FPC #19 WIRING DIAGRAM
FA5.20	FIRE ALARM FIRE PROTECTION PANEL FPC #20 WIRING DIAGRAM
FA5.21	FIRE ALARM: IVE CABINET DETAILS
FA5.22	FIRE ALARM: FIRE PROTECTION PANEL MOUNTING DETAILS
FA6.01	FIRE ALARM: DETAILS - LINEAR HEAT HANGER
FA6.02	FIRE ALARM: DETAILS - SYSTEM SIGNAGE
FA6.03	FIRE ALARM: DETAILS - EAST CONTROL RACK #1 - FRONT VIEW
FA6.04	FIRE ALARM: DETAILS - EAST CONTROL RACK #1 - REAR VIEW
FA6.05	FIRE ALARM: DETAILS - EAST CONTROL RACK #2 - FRONT VIEW
FA6.06	FIRE ALARM: DETAILS - EAST CONTROL RACK #2 - REAR VIEW
FA6.07	FIRE ALARM: DETAILS - WEST CONTROL RACK #1 - FRONT VIEW
FA6.08	FIRE ALARM: DETAILS - WEST CONTROL RACK #1 - REAR VIEW
FA6.09	FIRE ALARM: DETAILS - WEST CONTROL RACK #2 - FRONT VIEW
FA6.10	FIRE ALARM: DETAILS - WEST CONTROL RACK #2 - REAR VIEW
FA6.11	FIRE ALARM: DEVICE WIRING DETAILS
FA6.12	FIRE ALARM: DEVICE WIRING DETAILS
FA6.13	FIRE ALARM: DEVICE WIRING DETAILS
FA6.14	FIRE ALARM: FIRE PROTECTION BRACKET HANGER DETAILS
FA6.15	FIRE ALARM: FIRE PROTECTION BRACKET HANGER DETAILS

FIRE PROTECTION DRAWING LIST

Number	Sheet Title
FP0.0	COVER PAGE
FP0.1	FFSS NARRATIVE
FP1.0	NOZZLES AND MISSING VENTS
FP1.0N	EISENHOWER (NORTH) VARIABLE MESSAGE SIGN OBSTRUCTION
FP1.0S	JOHNSON (SOUTH) VARIABLE MESSAGE SIGN OBSTRUCTION
FP1.1	HANGERS AND SUPPORTS
FP1.2	TUNNEL ARCH PLENUM BRACKET
FP1.3	INSULATED VALVE ENCLOSURE
FP1.4	SEISMIC BRACING
FP2.0	PIPE EXPANSION AND DEFLECTION
FP3.0	DELUGE SYSTEM LOCATIONS - KEY
FP3.1	DELUGE SYSTEM LOCATION WEST, NT-01 TO NT-15 WEST, ST-01 TO ST-15
FP3.2	DELUGE SYSTEM LOCATION WEST, NT-16 TO NT-30 WEST, ST-16 TO ST-31
FP3.3	DELUGE SYSTEM LOCATION WEST, NT-31 TO NT-45 WEST, ST-32 TO ST-47
FP3.4	DELUGE SYSTEM LOCATION EAST, NT-46 TO NT-60 EAST, ST-48 TO ST-62
FP3.5	DELUGE SYSTEM LOCATION EAST, NT-61 TO NT-75 EAST, ST-63 TO ST-78
FP3.6	DELUGE SYSTEM LOCATION EAST, NT-76 TO NT-90 EAST, ST-79 TO ST-93
FP3.7	DELUGE SYSTEMS - EISENHOWER (NORTH) TUNNEL
FP3.8	DELUGE SYSTEMS - JOHNSON (SOUTH) TUNNEL
FP3.9	DELUGE SYSTEMS - SECTIONS
FP4.0	WEST PORTAL - EISENHOWER (NORTH) ROADWAY LEVEL
FP4.1	WEST PORTAL - JOHNSON (SOUTH) ROADWAY LEVEL
FP4.2	WEST PORTAL - ISOMETRIC
FP5.0	FIRE PUMP ROOM PLAN & ISOMETRIC
FP5.1	FIRE PUMP ROOM SECTIONS, WALL HYDRANT, FDC & TEST HEADER
FP6.0	EAST PORTAL - EISENHOWER (NORTH) ROADWAY LEVEL
FP6.1	EAST PORTAL - JOHNSON (SOUTH) ROADWAY LEVEL
FP6.2	EAST PORTAL - ISOMETRIC

MECHANICAL DRAWING LIST

Number	Sheet Title
M1.0	MECHANICAL GENERAL INFORMATION
M1.1	MECHANICAL NARRATIVE
M1.2	MECHANICAL HEATING CALCULATIONS
M2.0	MECHANICAL SCHEDULES
M2.1	MECHANICAL SCHEDULES
M3.0	BOILER SYSTEM SCHEMATIC
M4.0	MECHANICAL BOILER ROOM
M4.1	MECHANICAL SKID PLAN AND ELEVATION
M4.2	MECHANICAL SKID VIEWS
M4.3	MECHANICAL SKID BILL OF MATERIAL
M5.0	MECHANICAL SITE PLAN - WEST
M6.0	MECHANICAL ROADWAY LEVEL PLAN - WEST - NORTH
M6.1	MECHANICAL FAN LEVEL PLAN - WEST - NORTH
M6.2	MECHANICAL FAN LEVEL PLAN - WEST - SOUTH
M6.3	MECHANICAL ROADWAY LEVEL PLAN - WEST - SOUTH
M6.4	MECHANICAL LOWER LEVEL PLAN - EAST
M7.0	MECHANICAL DETAILS
M7.1	MECHANICAL DETAILS
M7.2	MECHANICAL GAS DETAILS
M8.0	MECHANICAL SPECIFICATIONS
M8.1	MECHANICAL SPECIFICATIONS
M8.2	MECHANICAL SPECIFICATIONS
M8.3	MECHANICAL SPECIFICATIONS

M&S STANDARD PLANS

Number	Sheet Title
M-206-1	EXCAVATION AND BACKFILL FOR STRUCTURES
M-603-2	REINFORCED CONCRETE PIPE
M-604-20	MANHOLES
M-604-25	VANE GRATE INLET
M-606-14	PRECAST TYPE 7 CONCRETE BARRIER
S-627-1	PAVEMENT MARKINGS

BARNARD EJMT TEAM

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions

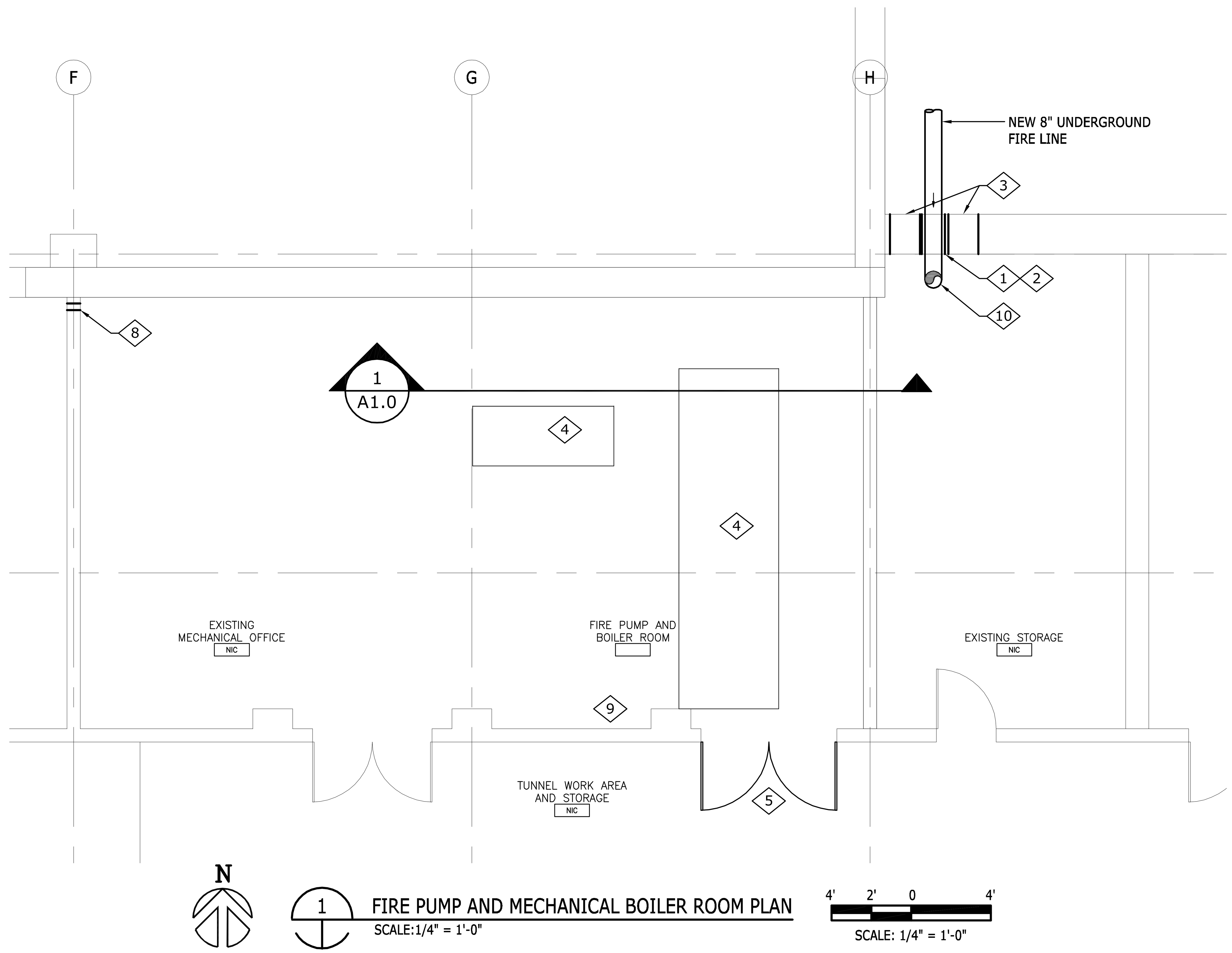
Num	Description	Date

DRAWN BY: JEB
CHECKED BY: JAM

DRAWING LISTS

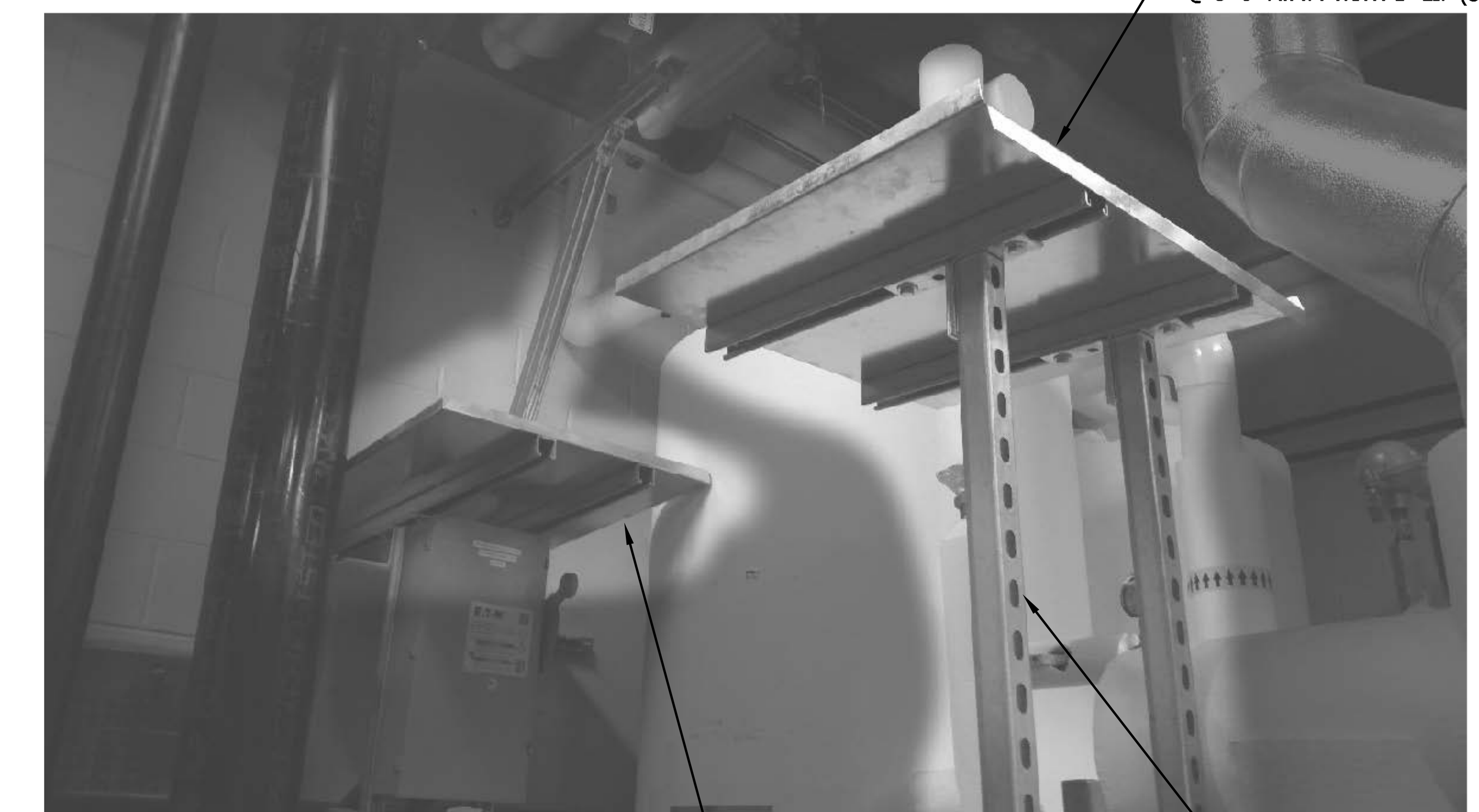
Drawing Number
DL

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE



1 FIRE PUMP AND MECHANICAL BOILER ROOM PLAN
SCALE:1/4" = 1'-0"

4' 2' 0 4'
SCALE: 1/4" = 1'-0"



2 ELECTRICAL PANEL PROTECTION
SCALE: NOT TO SCALE

GENERAL NOTES:

ASBESTOS EVALUATION AND ABATEMENT FOR CORE DRILLS AND HANGERS BY OTHERS. SEE ASBESTOS ABATEMENT WORK PLAN.

WORK NOTES:

1. CORE DRILL 10" HOLE ABOVE CONCRETE FOUNDATION FOR NEW FIRE LINE. SEE FIRE PROTECTION AND MECHANICAL SHEETS.
2. SEE FIRE PROTECTION AND MECHANICAL SHEETS.
3. SAW CUT OR CORE DRILL OPENINGS IN WALL FOR BOILER INTAKE AND EXHAUST. VERIFY SIZE WITH MECHANICAL. COORDINATE LOCATION WITH SAND SHED ON THE EXTERIOR OF THE BUILDING.
4. PROVIDE SKID MOUNT EQUIPMENT OR POUR 4" CONCRETE HOUSEKEEPING PAD FOR BOILER AND FIRE PUMP. COORDINATE WITH MECHANICAL AND FIRE PROTECTION DRAWINGS.
5. NEW 5'-0"x6'-8" DOUBLE HOLLOW METAL FRAME DOOR AND HARDWARE.
6. NOT USED.
7. NOT USED.
8. NOT USED.
9. SEE E5.0 AND MECHANICAL SHEETS FOR ELECTRICAL AND BOILER CONTROL PANELS.
10. COORDINATE ROUTING OF FIRE LINE WITH FIRE PROTECTION AND MECHANICAL SHEETS.

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BARNARD EJMT TEAM
RONDINELLI life safety
BARNARD
BCER engineering
Sturgeon ELECTRIC
Western States Fire Protection Co.
CONSULTING ENGINEERS

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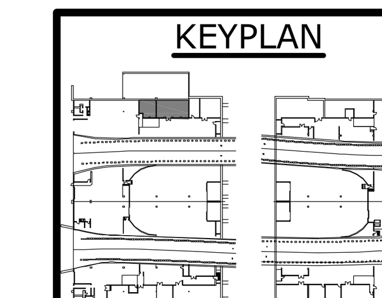
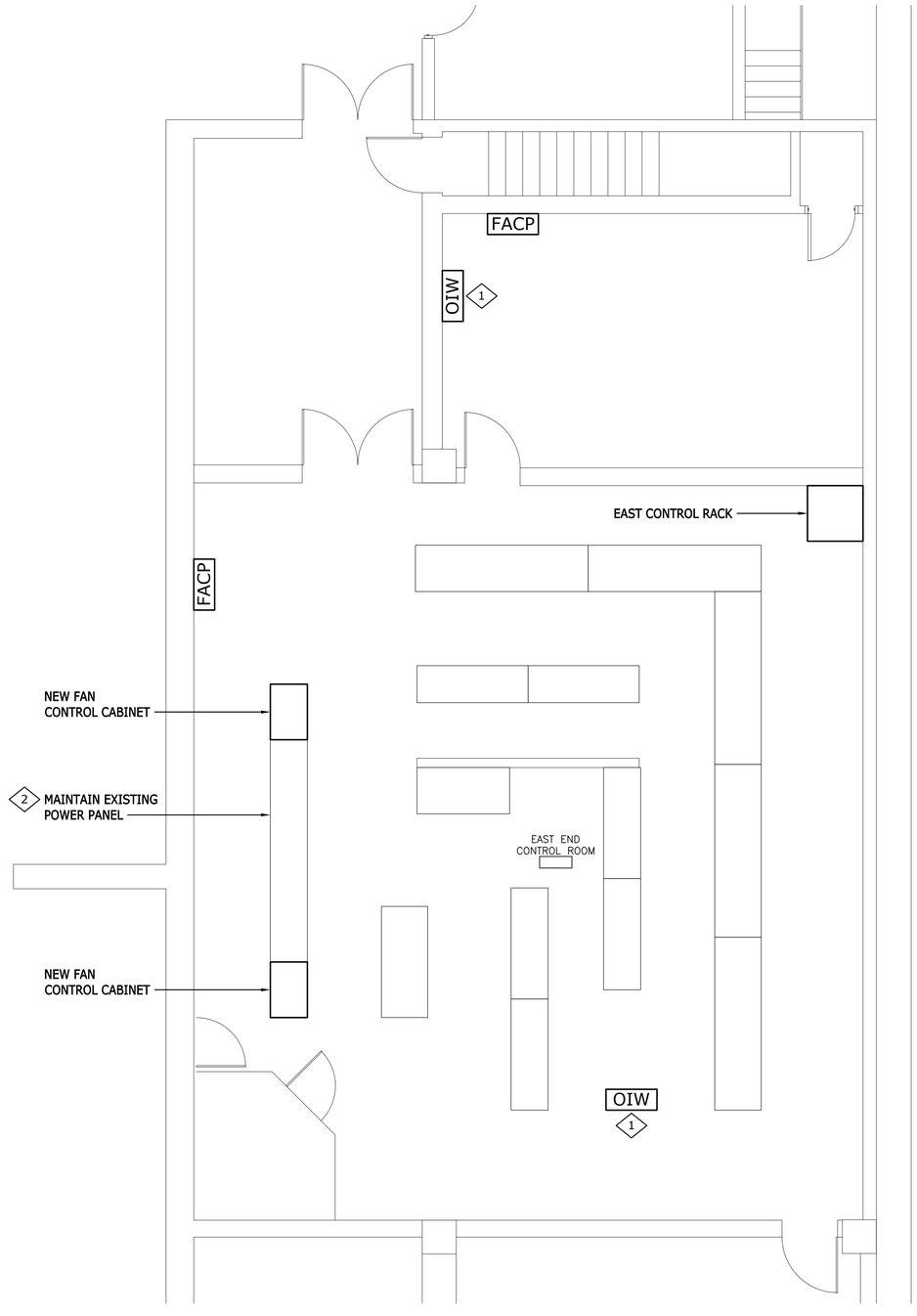
KEYPLAN


FIRE PUMP AND MECH. BOILER ROOM

Drawing Number
A1.0



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1 ARCHITECTURAL TUNNEL OPERATIONS CENTER LAYOUT
SCALE: 1/4" = 1'-0"

4' 2' 0 4'
SCALE: 1/4" = 1'-0"

GENERAL NOTES:

THERE ARE NO MODIFICATIONS TO THE EJMT CONTROL ROOM. ALL WORK EXCEPT AS NOTED HAS BEEN REMOVED FROM THIS CONTRACT.

WORK NOTES:

1. PROVIDE "FIREWORKS" MONITOR AND KEYBOARD, "FIREWORKS" SCREEN, 2 CCTV MONITORS (22 INCH) IN LOCATIONS DESIGNATED BY CDOT.
   NOTE: NO INTERFACE BETWEEN FIRE ALARM "FIREWORKS" AND SMOKE CONTROL SYSTEM OR OTHER SYSTEMS IS PROVIDED IN THIS SCOPE OF WORK.
2. INSTALL TWO NEW FAN CONTROL CABINETS AS SHOWN. 36"x24"x60"H FLOOR MOUNTED. CABINET WILL BE HINGED WITH HANDLE. COORDINATE LOCATION WITH RAISED FLOOR.

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

BARNARD EJMT TEAM

BCER engineering | BARNARD | RONDINELLI a KER group life safety | Western States Fire Protection Co. | CYP CONSULTING ENGINEERS | Sturgeon ELECTRIC

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
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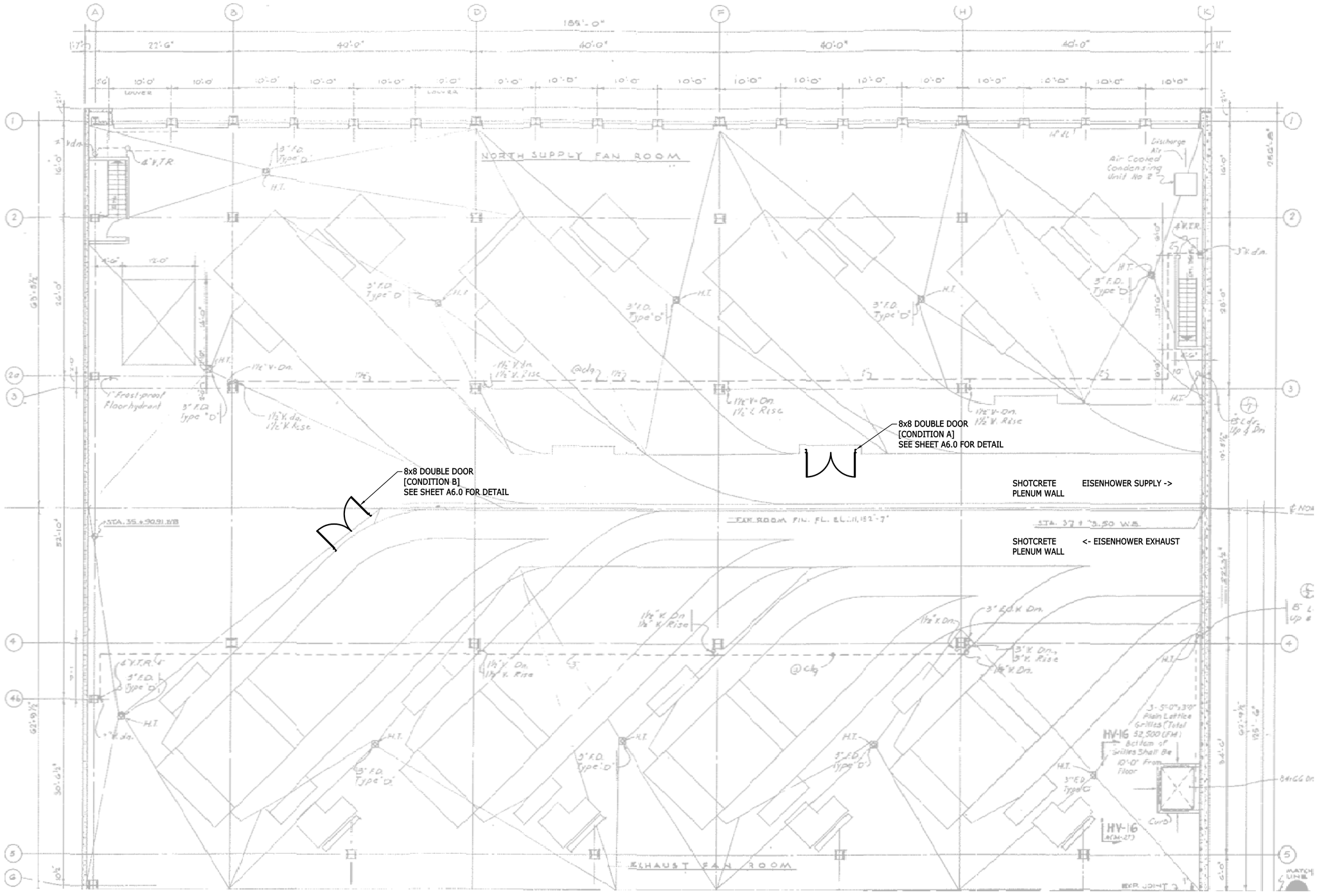
DRAWN BY: JEB | CHECKED BY: SCR

ARCHITECTURAL TUNNEL OPERATIONS CENTER LAYOUT

Drawing Number

A1.1



N

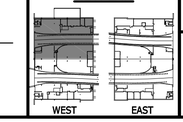
1 ARCHITECTURAL FAN LEVEL PLAN - WEST - NORTH (SHOTCRETE PLENUM CONDITION)
SCALE: 1/8" = 1'-0"

8' 4' 0 8'
SCALE: 1/8" = 1'-0"

GENERAL NOTE:

1. MAINTAIN EXISTING DOORS INTO PLENUM.
2. CONTRACTOR TO VERIFY ALL DOOR LOCATIONS WITH CDOT PRIOR TO DEMOLITION.

KEYPLAN



BARNARD EJMT TEAM

BARNARD · RONDINELLI · BCER engineering · Sturgeon Electric · Western States Fire Protection Co. · CONSULTING ENGINEERS

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
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Num	Description	Date

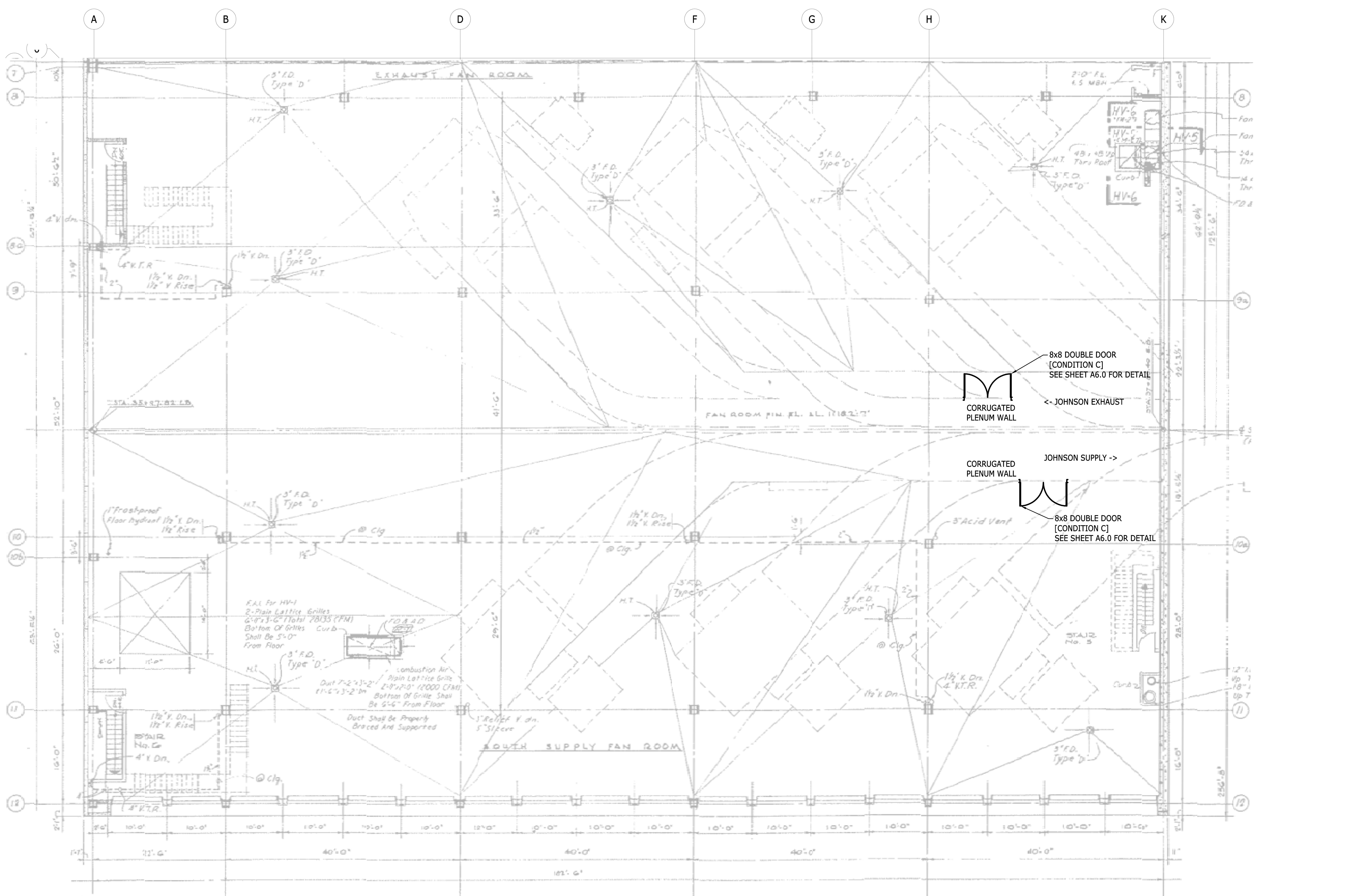
DRAWN BY: JEB | CHECKED BY: SCR

ARCHITECTURAL FAN LEVEL PLAN - WEST - NORTH

Drawing Number

A2.0

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE



N

1 ARCHITECTURAL FAN LEVEL PLAN - WEST - SOUTH (CORRUGATED PLENUM CONDITION)
SCALE: 1/8" = 1'-0"

8' 4' 0 8'
SCALE: 1/8" = 1'-0"

GENERAL NOTE:

1. MAINTAIN EXISTING DOORS INTO PLENUM.
2. CONTRACTOR TO VERIFY ALL DOOR LOCATIONS WITH CDOT PRIOR TO DEMOLITION.

KEYPLAN
WEST EAST

BARNARD EJMT TEAM

BARNARD
RONDINELLI life safety
BCER engineering
ILF CONSULTING ENGINEERS
Western States Fire Protection Co.
Systems Group
Sturgeon ELECTRIC

EISENHOWER/JOHNSON MEMORIAL TUNNEL
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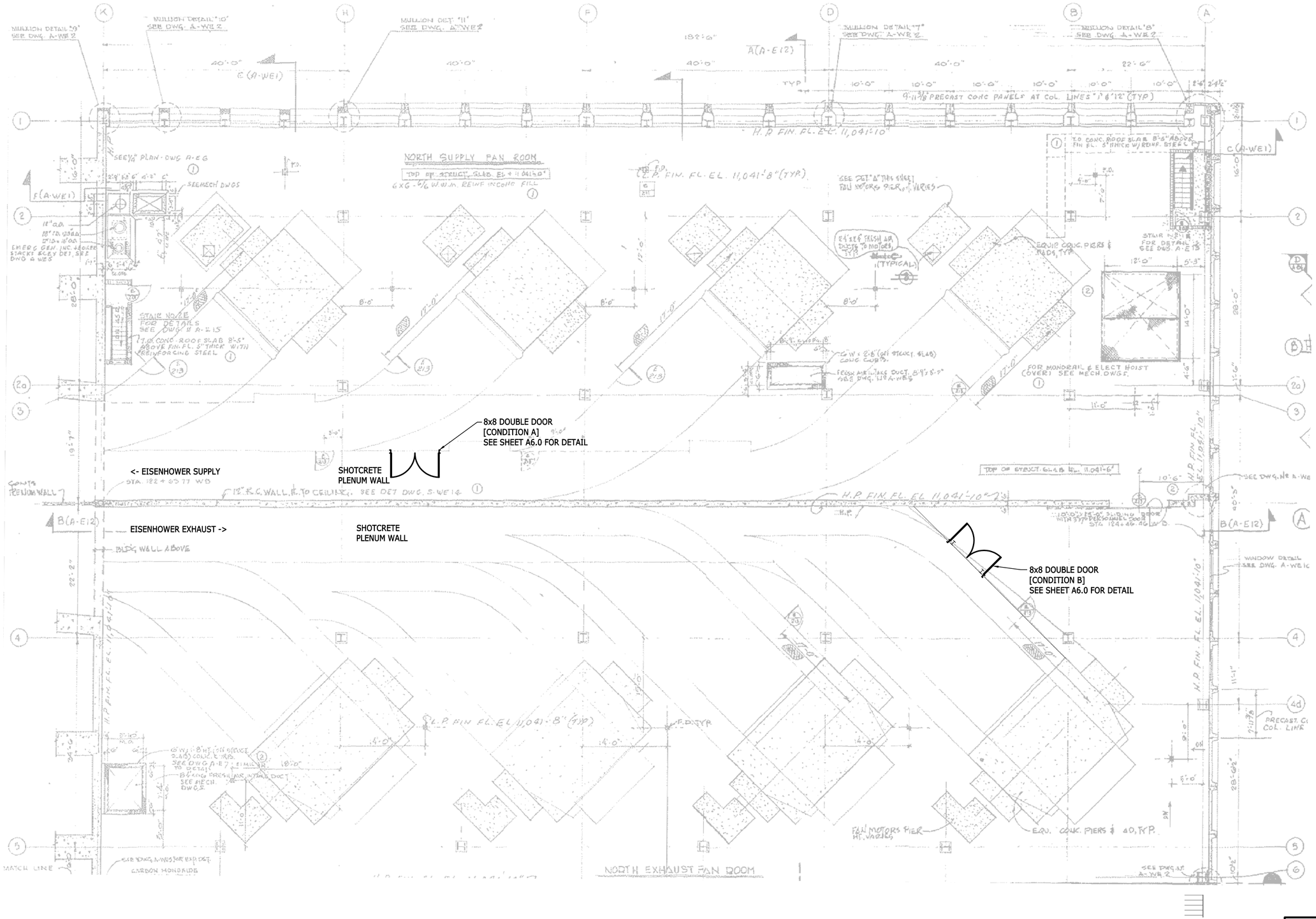
DRAWN BY: JEB CHECKED BY: SCR

ARCHITECTURAL FAN LEVEL PLAN - WEST - SOUTH

Drawing Number
A2.1

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

XREFS=(xx-tb, xx-keyplan, West Ventilation Building - Grid, West Ventilation Building - Fan Level) Layouts=(A2.2 ARCHITECTURAL FAN LEVEL PLAN - WEST - SOUTH)
DIMSCALE=1 F:\87914002\Dwg\ejmt - fixed fire suppression system\Sheets\Architectural\A2.2 ARCHITECTURAL FAN LEVEL PLAN - WEST - SOUTH.dwg JAN 25, 2015 8:41AM JBAKER



N

1 ARCHITECTURAL FAN LEVEL PLAN - EAST - NORTH (SHOTCRETE PLENUM CONDITION)

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

8' 4' 0 8'

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

GENERAL NOTE:

1. MAINTAIN EXISTING DOORS INTO PLENUM.
2. CONTRACTOR TO VERIFY ALL DOOR LOCATIONS WITH CDOT PRIOR TO DEMOLITION.

KEYPLAN

BARNARD EJMT TEAM

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions

Num	Description	Date

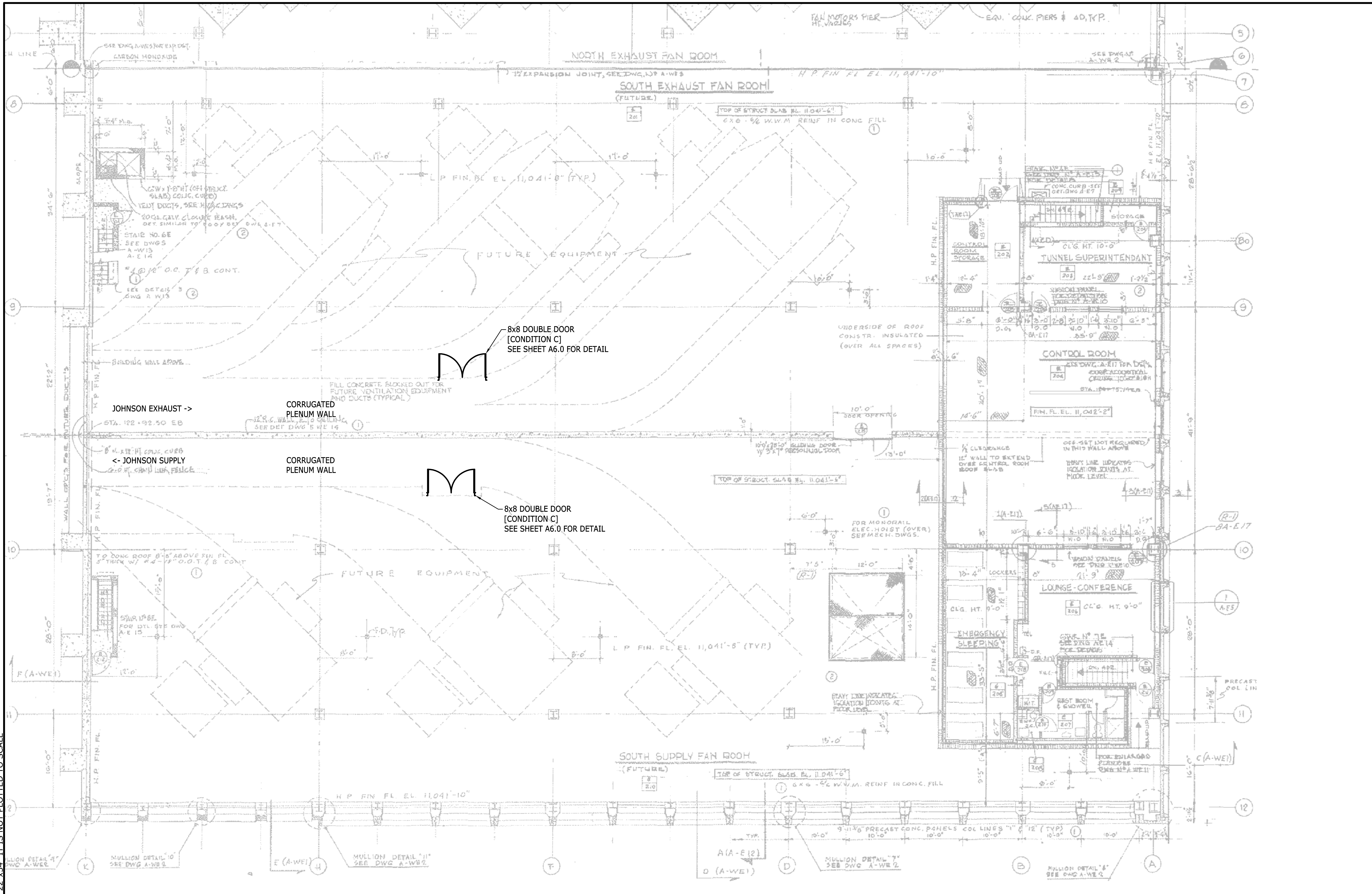
DRAWN BY: JEB CHECKED BY: SCR

ARCHITECTURAL FAN LEVEL PLAN - EAST - NORTH

Drawing Number

A2.2

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE



N

1 ARCHITECTURAL FAN LEVEL PLAN - EAST - SOUTH (CORRUGATED PLENUM CONDITION)

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

8' 4' 0 8'

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

GENERAL NOTE:

1. MAINTAIN EXISTING DOORS INTO PLENUM.
2. CONTRACTOR TO VERIFY ALL DOOR LOCATIONS WITH CDOT PRIOR TO DEMOLITION.

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

KEYPLAN

WEST EAST

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BARNARD

BCER Engineering

Sturgeon Electric

Western States Fire Protection Co.

ILF CONSULTING ENGINEERS

EISENHOWER/JOHNSON MEMORIAL TUNNEL

FIXED FIRE SUPPRESSION SYSTEM

DESIGN BUILD PROJECT

Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

Num	Revisions Description	Date

DRAWN BY: JEB CHECKED BY: SCR

ARCHITECTURAL FAN LEVEL PLAN - EAST - SOUTH

Drawing Number

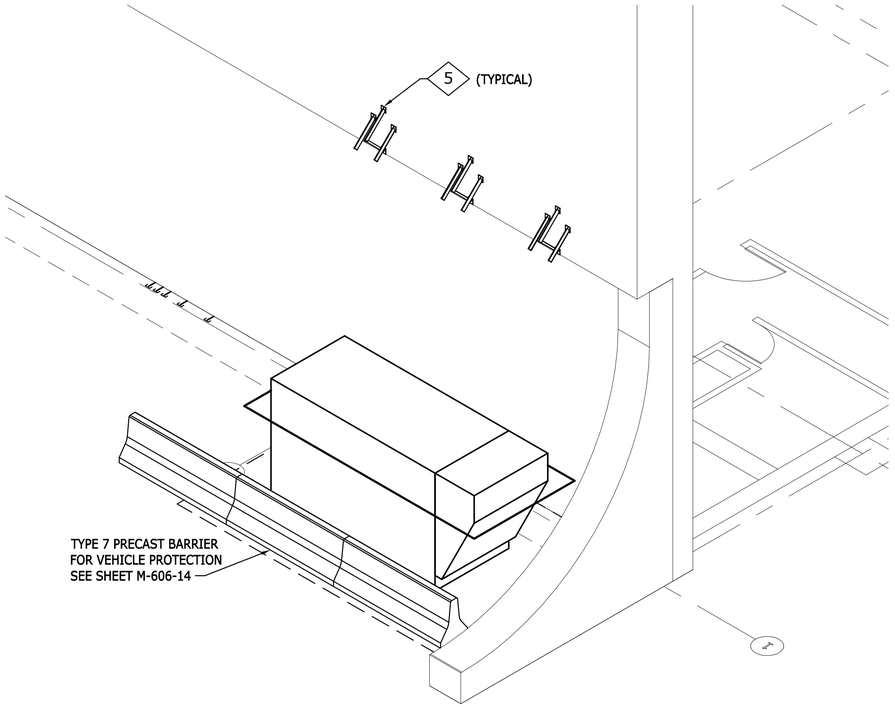
A2.3

GENERAL NOTES:

1. SAW CUT AND REMOVE EXISTING ASPHALT FOR NEW CONCRETE PAD.
2. ATTACH GENERATOR SKID BRACKETS TO NEW CONCRETE PAD PER MANUFACTURER'S RECOMMENDATION.
3. SEE ELECTRICAL DRAWINGS FOR EMERGENCY GENERATOR INSTALLATION DETAILS.
4. PAINT EMERGENCY GENERATOR FOREST SERVICE BROWN (FEDERAL STANDARD COLOR 20059 OR THE EQUIVALENT SHERWIN WILLIAMS COLOR SW2838).
5. SET THREE 8' TYPE 7 BARRIERS (SEE M&S SHEET M-606-14) TO PROVIDE VEHICLE PROTECTION FOR THE EMERGENCY GENERATOR, WALL HYDRANT AND FIRE DEPARTMENT CONNECTIONS. PAINT BARRIERS FOREST SERVICE BROWN, FEDERAL STANDARD COLOR 20059 OR THE EQUIVALENT SHERWIN WILLIAMS COLOR SW2838. COAT TYPE 7 BARRIERS WITH SHERWIN WILLIAMS PRO INDUSTRIAL ANTI-GRAFFITI COATING.

WORK NOTES:

1. CORE DRILL FOR WALL HYDRANT AND FIRE DEPARTMENT CONNECTION. SEE FIRE PROTECTION DRAWINGS.
2. MAINTAIN POSITIVE DRAINAGE AROUND NEW CONCRETE PAD.
3. COORDINATE NEW CONCRETE PAD SIZE WITH ELECTRICAL DRAWINGS AND EMERGENCY GENERATOR SIZE.
4. CORE DRILL FOR ELECTRICAL (SHEET E5.0) AND GAS CONNECTIONS (SHEET M6.1). SEE SHEET A6.3 FOR CORE DETAIL. FIELD LOCATE.
5. METAL ICE AND SNOW GUARD, MOUNT ~23'-0" ABOVE FINISH GRADE SEE DETAIL SHEET A6.2.

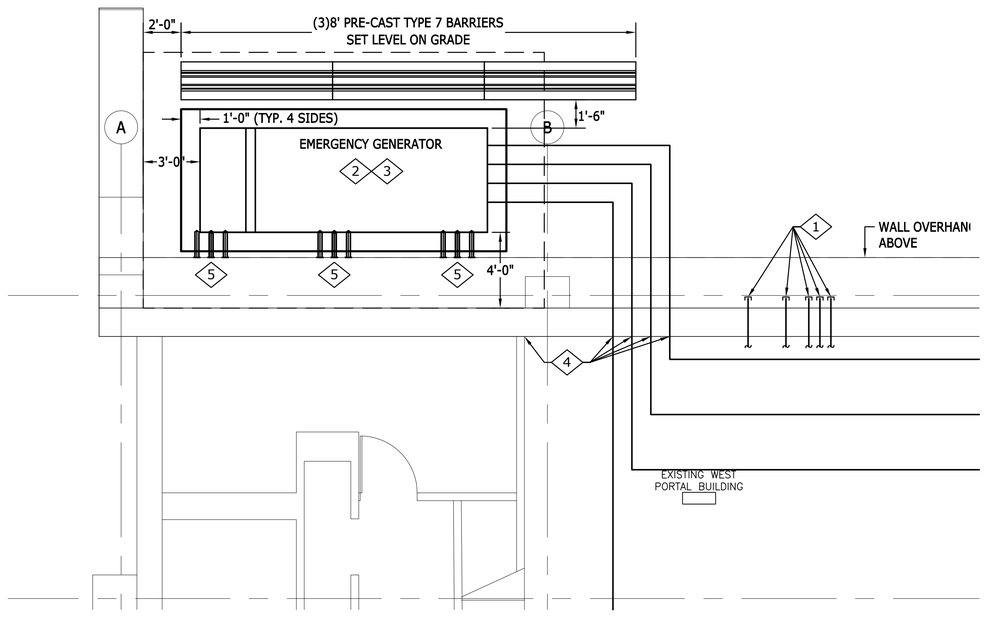


1 ARCHITECTURAL EMERGENCY GENERATOR ISOMETRIC

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

4' 2' 0 4'

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



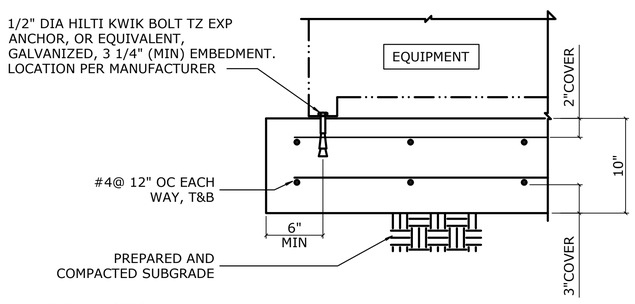
N

2 ARCHITECTURAL EMERGENCY GENERATOR PLAN

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

4' 2' 0 4'

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



DETAIL NOTES:

1. CONTRACTOR TO PROVIDE MIX THAT MEETS THE REQUIREMENT OF CLASS D AS OUTLINED IN TABLE 601-1 OF CDOT STANDARD SPECIFICATIONS.
2. TOP OF CONCRETE PAD SHALL BE STRAIGHT AND LEVEL IN ALL DIRECTIONS.
3. CONTROL JOINTS:
   - 2" DEPTH
   - MAXIMUM ASPECT RATIO OF 1.5 TO 1 FOR LAYOUT
   - MAXIMUM SPACING OF 12 FEET
   - TOP LAYER OF REINFORCING DOES NOT CONTINUE THROUGH JOINT

3 ARCHITECTURAL EMERGENCY GENERATOR PAD DETAIL

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

8" 4" 0 8"

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

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

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FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions

Num	Description	Date
3	CONCRETE MIX	2015-07-29

DRAWN BY: JEB

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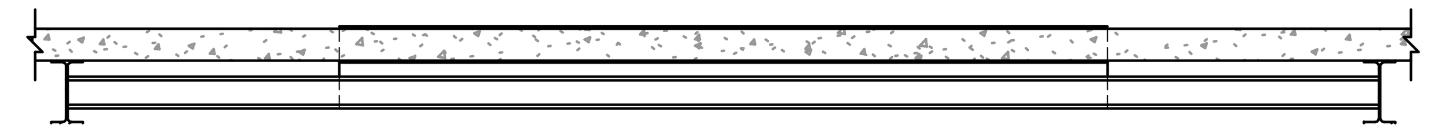
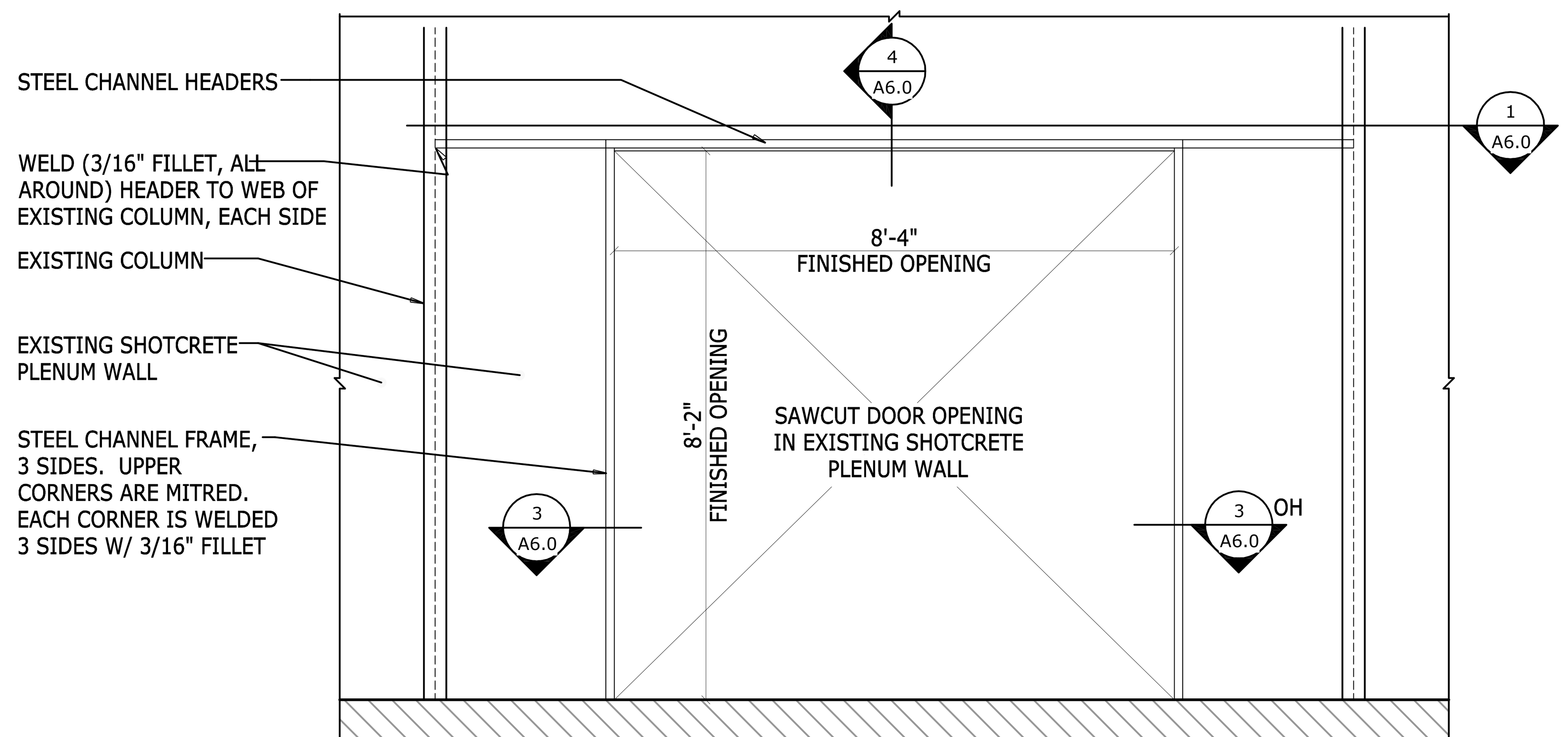
ARCHITECTURAL
EMERGENCY GENERATOR
PLAN

Drawing Number

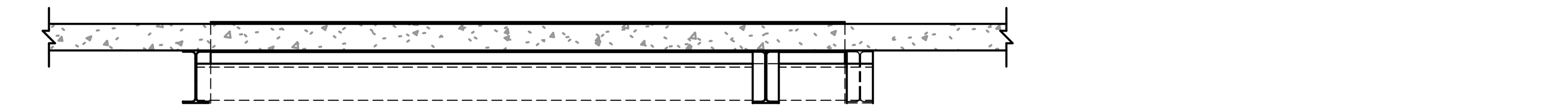
A2.4



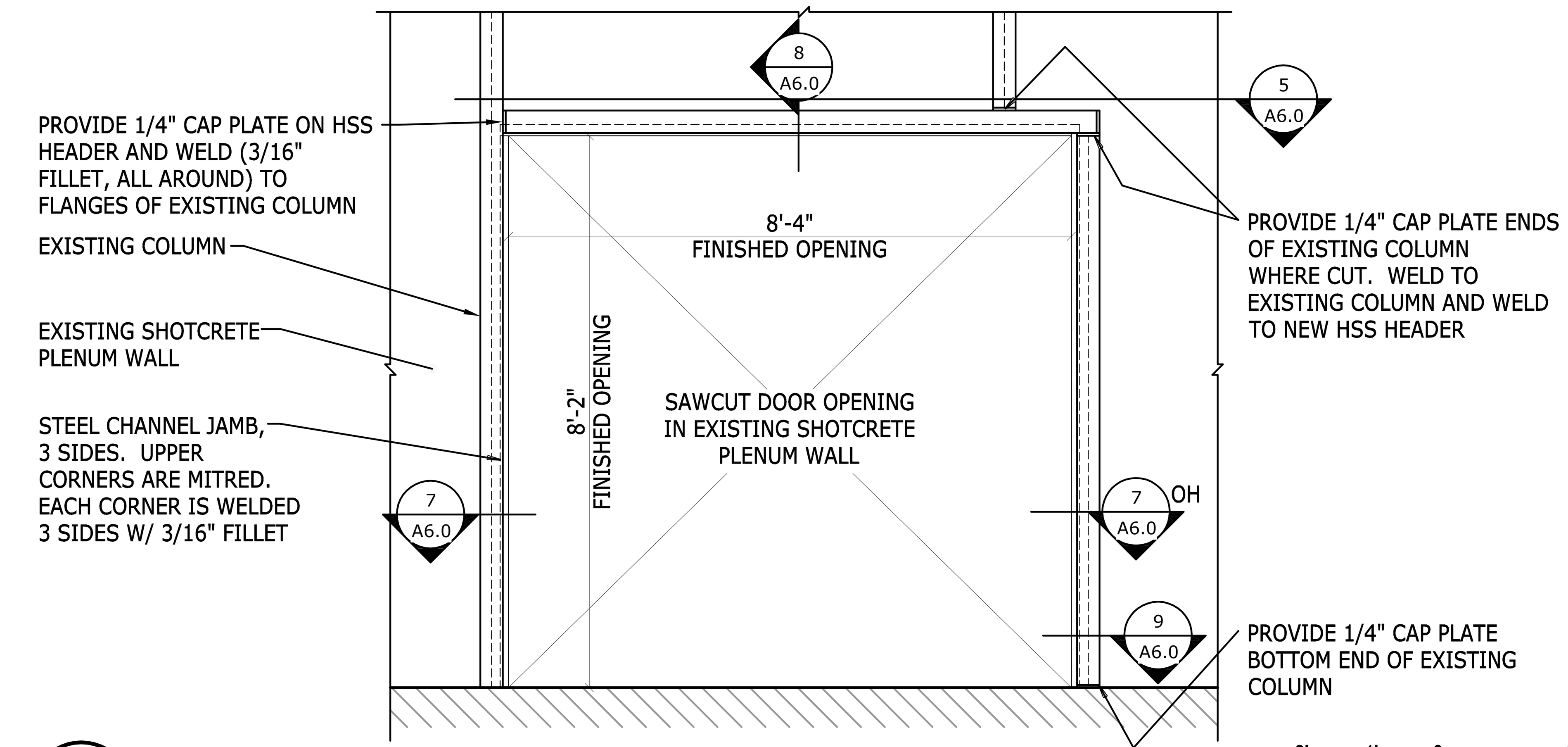
1 CONDITION A, HEADER PLAN
A6.0 A6.0
SCALE: 1/2" = 1'-0"
2' 1' 0 2'
SCALE: 1/2" = 1'-0"



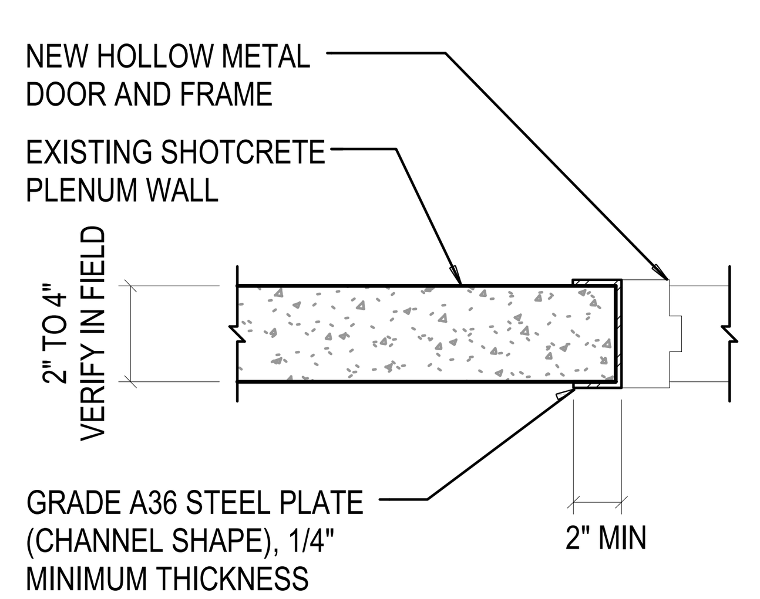
2 CONDITION A ELEVATION
A6.0 A6.0
SCALE: 1/2" = 1'-0"
2' 1' 0 2'
SCALE: 1/2" = 1'-0"



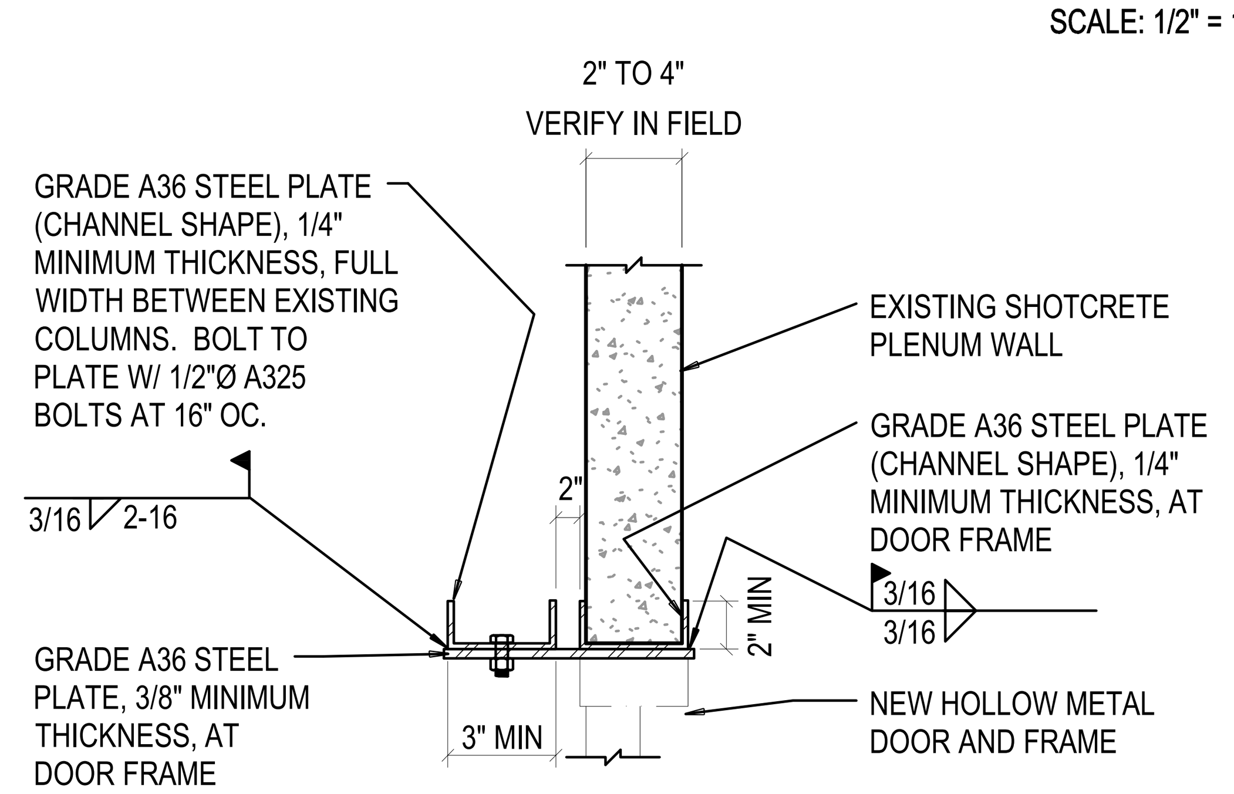
5 CONDITION B, HEADER PLAN
A6.0 A6.0
SCALE: 1/2" = 1'-0"
2' 1' 0 2'
SCALE: 1/2" = 1'-0"



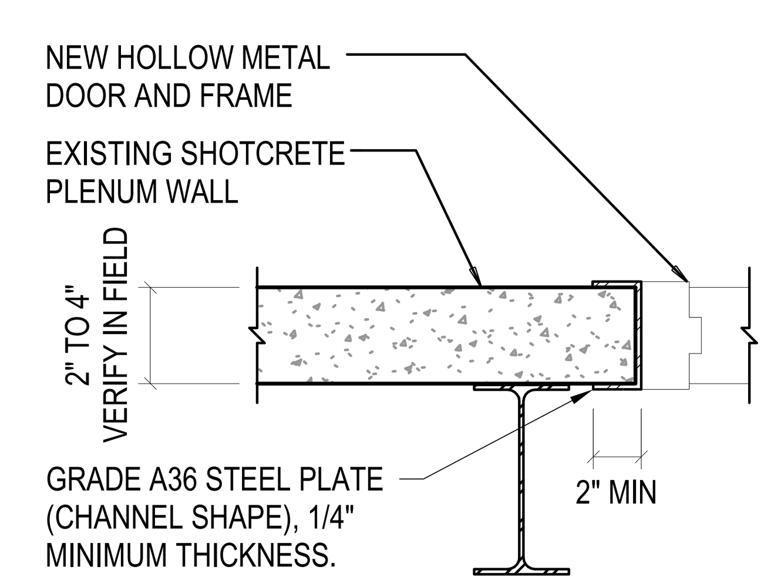
6 CONDITION B ELEVATION
A6.0 A6.0
SCALE: 1/2" = 1'-0"
2' 1' 0 2'
SCALE: 1/2" = 1'-0"



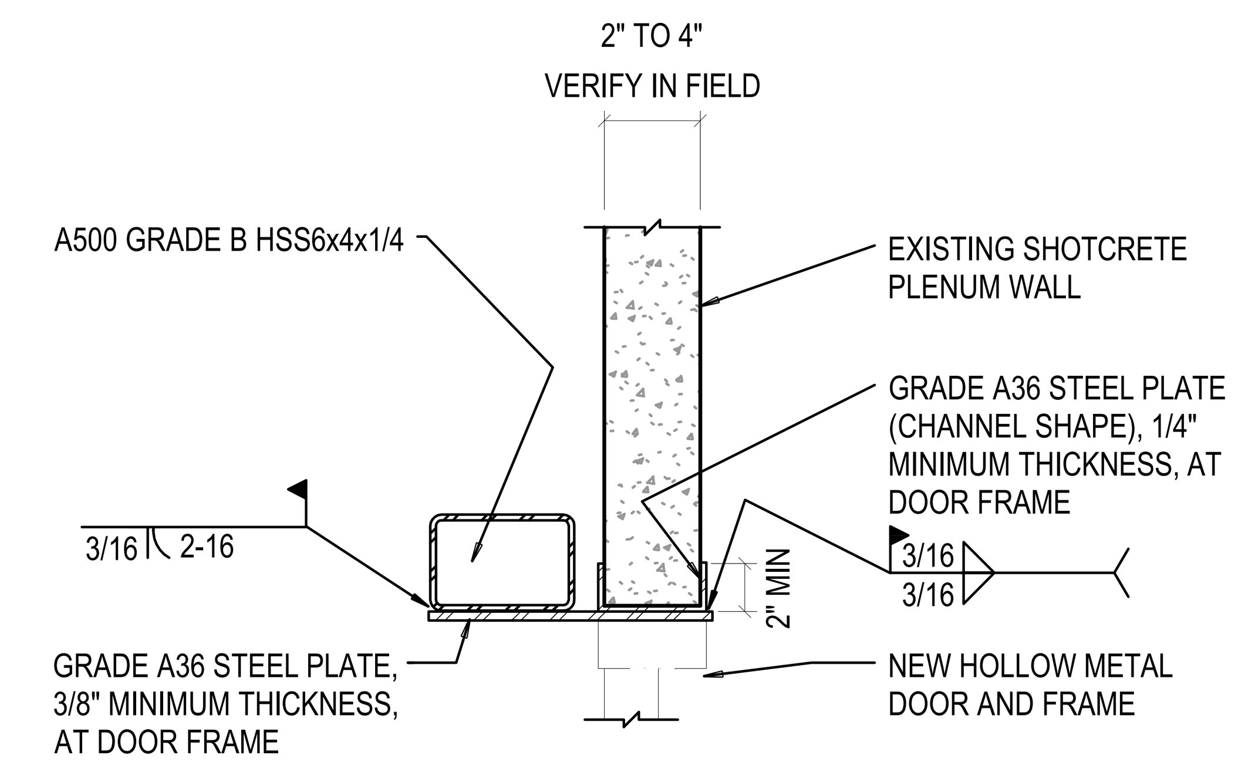
3 CONDITION A JAMB
A6.0 A6.0
SCALE: 1-1/2" = 1'-0"
1-1/2" 3/4" 0 1-1/2"
SCALE: 1/2" = 1'-0"



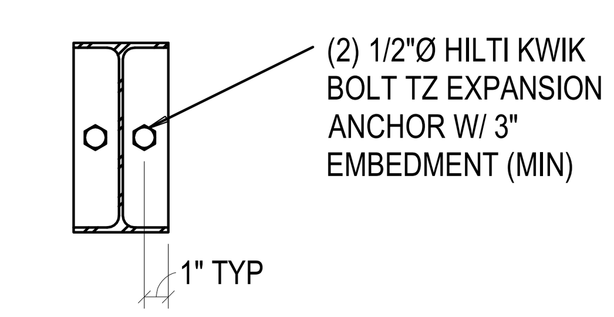
4 CONDITION A HEADER
A6.0 A6.0
SCALE: 1-1/2" = 1'-0"
1-1/2" 3/4" 0 1-1/2"
SCALE: 1/2" = 1'-0"



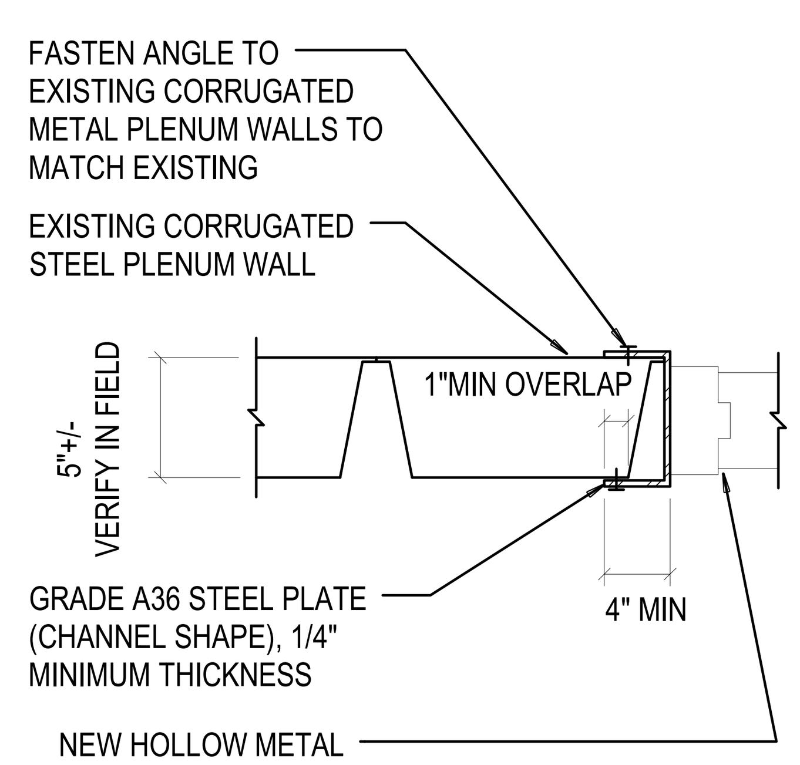
7 CONDITION B JAMB
A6.0 A6.0
SCALE: 1-1/2" = 1'-0"
1-1/2" 3/4" 0 1-1/2"
SCALE: 1/2" = 1'-0"



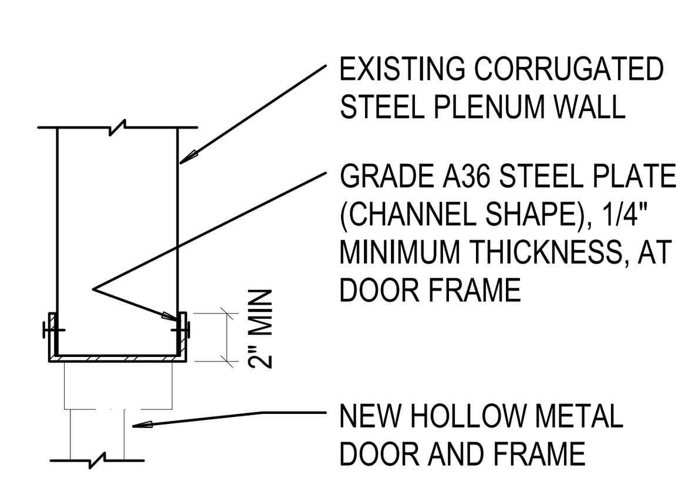
8 CONDITION B HEADER
A6.0 A6.0
SCALE: 1-1/2" = 1'-0"
1-1/2" 3/4" 0 1-1/2"
SCALE: 1/2" = 1'-0"



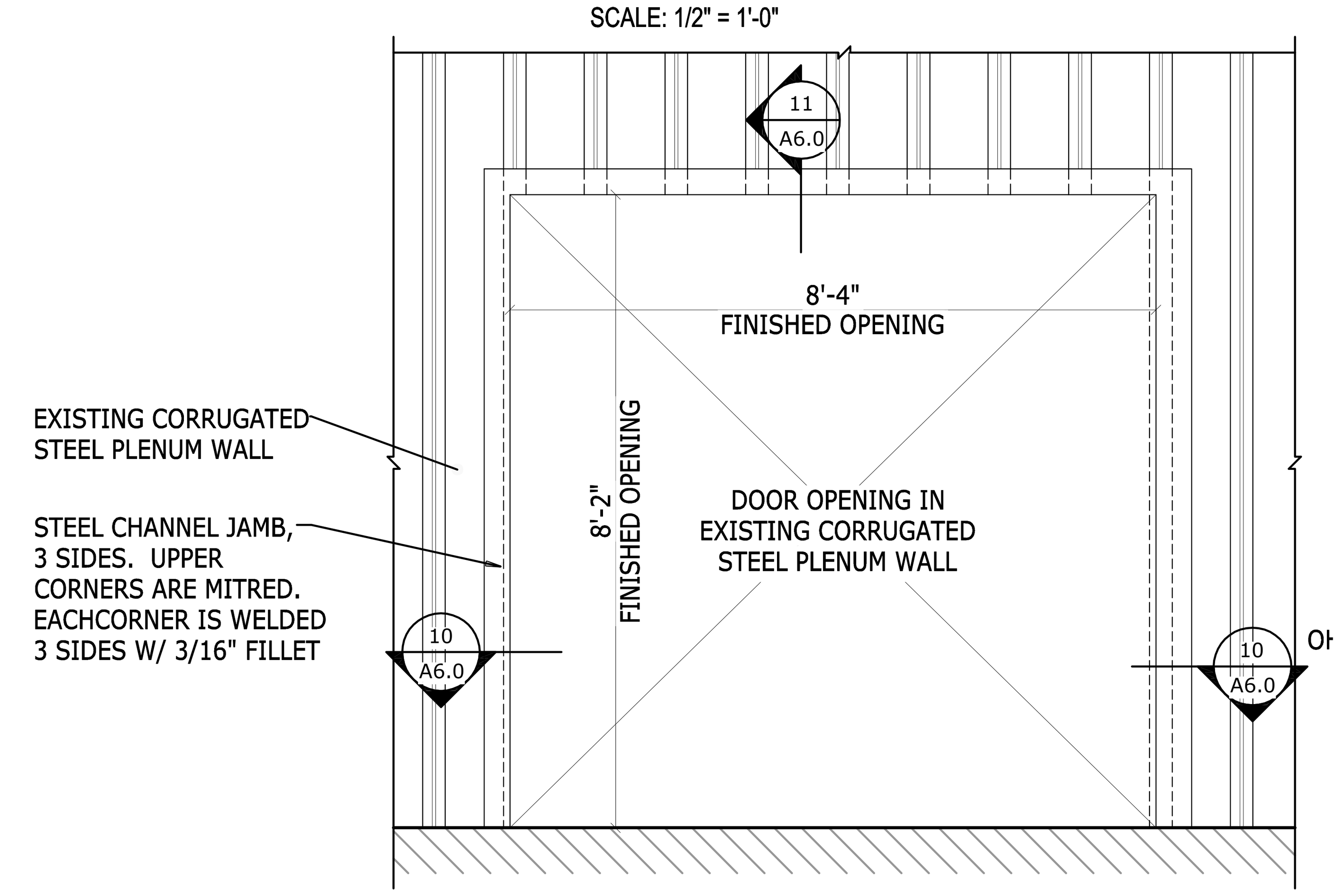
9 CONDITION B (E) COL BASE CONN
A6.0 A6.0
SCALE: 1-1/2" = 1'-0"
1-1/2" 3/4" 0 1-1/2"
SCALE: 1/2" = 1'-0"



10 CONDITION C JAMB
A6.0 A6.0
SCALE: 1-1/2" = 1'-0"
1-1/2" 3/4" 0 1-1/2"
SCALE: 1/2" = 1'-0"



11 CONDITION C HEADER
A6.0 A6.0
SCALE: 1-1/2" = 1'-0"
1-1/2" 3/4" 0 1-1/2"
SCALE: 1/2" = 1'-0"



12 CONDITION C ELEVATION
A6.0 A6.0
SCALE: 1/2" = 1'-0"
2' 1' 0 2'
SCALE: 1/2" = 1'-0"

GENERAL NOTES:

1. MAINTAIN EXISTING DOORS.
2. CONFIRM ROUGH OPENING FOR HOLLOW METAL DOOR AND STEEL. SAW CUT OPENING.
3. ADD NEW STEEL CHANNEL (GRADE 36) TO OPENING AS NOTED. SHORE OPENING AS NEEDED DURING FRAMING INSTALLATION.
4. CUT STEEL COLUMN AS NOTED. SHORE OPENING OF DOOR DURING COLUMN RELOCATION AND NEW BEAM (GRADE 36) INSTALLATION.
5. SEAL ALL VOIDS AND OPENINGS REMAINING AFTER INSTALLATION WITH GE SILICONE II PAINTABLE CAULK, GRAY OR EQUIVALENT.
6. PAINT ALL STRUCTURAL STEEL TO MATCH EXISTING. COATING MANUFACTURE TO BE SHERWIN WILLIAMS PRODUCTS: MACROPOXY 646 FINISH.

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

DRAWN BY: JEB
CHECKED BY: SCR

ARCHITECTURAL DOOR DETAIL

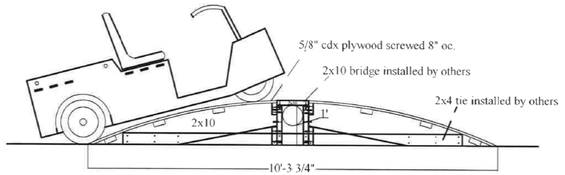
Drawing Number
A6.0

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

GENERAL NOTES:

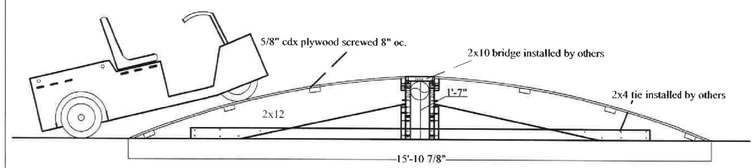
1. CONTRACTOR TO PROVIDE SHOP DRAWINGS FOR ENGINEER APPROVAL PRIOR TO FABRICATION AND INSTALLATION.

142 total



1 PLAN VIEW
PLENUM FLOOR RAMP (TYPICAL)
SCALE:NOT TO SCALE

29 total



1 PLAN VIEW
PLENUM FLOOR RAMP (TYPICAL)
SCALE:NOT TO SCALE

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FIXED FIRE SUPPRESSION SYSTEM
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Num | Description | Date

DRAWN BY: JEB | CHECKED BY: SCR

ARCHITECTURAL RAMP DETAIL

Drawing Number
A6.1

PHOTO REFERENCE #1
FOR ILLUSTRATION PURPOSES ONLY

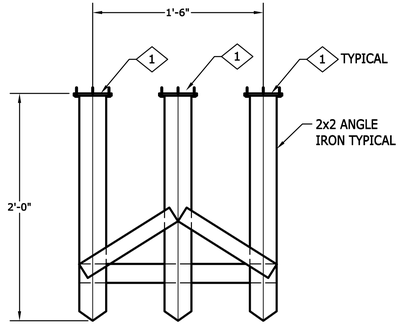
PHOTO REFERENCE #2
FOR ILLUSTRATION PURPOSES ONLY

GENERAL NOTES:

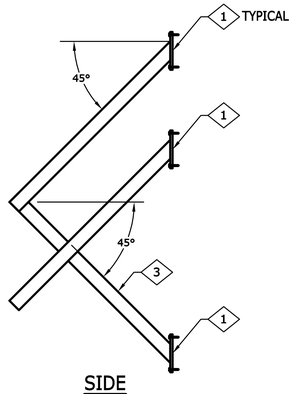
1. ALL METAL IS 2" x 2" STEEL ANGLE.
2. WELD ALL CONNECTIONS.
3. PRIME AND PAINT ICE GUARD USFS BROWN. FOREST SERVICE BROWN IS FEDERAL STANDARD COLOR 20059 OR THE EQUIVALENT IS SHERWIN WILLIAMS COLOR SW2838.
4. SEE PHOTOS OF EXISTING ICE AND SNOW GUARDS.

WORK NOTES:

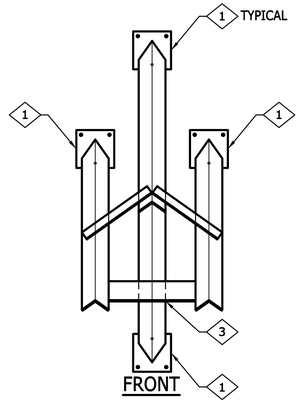
1. 4" x 4" x ¼" PLATE WITH 3-3/8" DRILL HOLES FOR MOUNTING. MOUNT TO EXISTING WALL WITH ⅜" x 4" THREAD CONCRETE ANCHOR BOLTS.
2. 3/16" FILLET WELD 2" x ¼" STEEL TO 2" x 2" STEEL ANGLE.
3. 2" x 2" STEEL ANGLE WELDED TO TOP ANGLE AND TO MOUNTING BRACKET ON WALL.
4. APPROXIMATE LOCATION OF ICE AND SNOW GUARD.



TOP



SIDE



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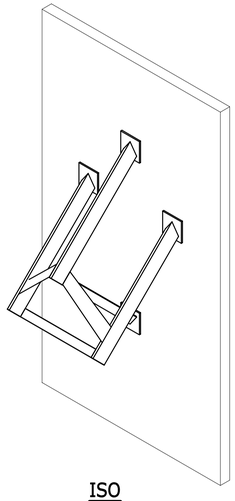

ISO

N

1 ARCHITECTURAL ICE AND SNOW GUARD
SCALE:1-1/2" = 1'-0"

8" 4" 0 8"
SCALE: 1-1/2" = 1'-0"

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RECORD DRAWINGS - 2015-11-16

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Num | Description | Date

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ARCHITECTURAL ICE AND SNOW GUARD

Drawing Number
A6.2

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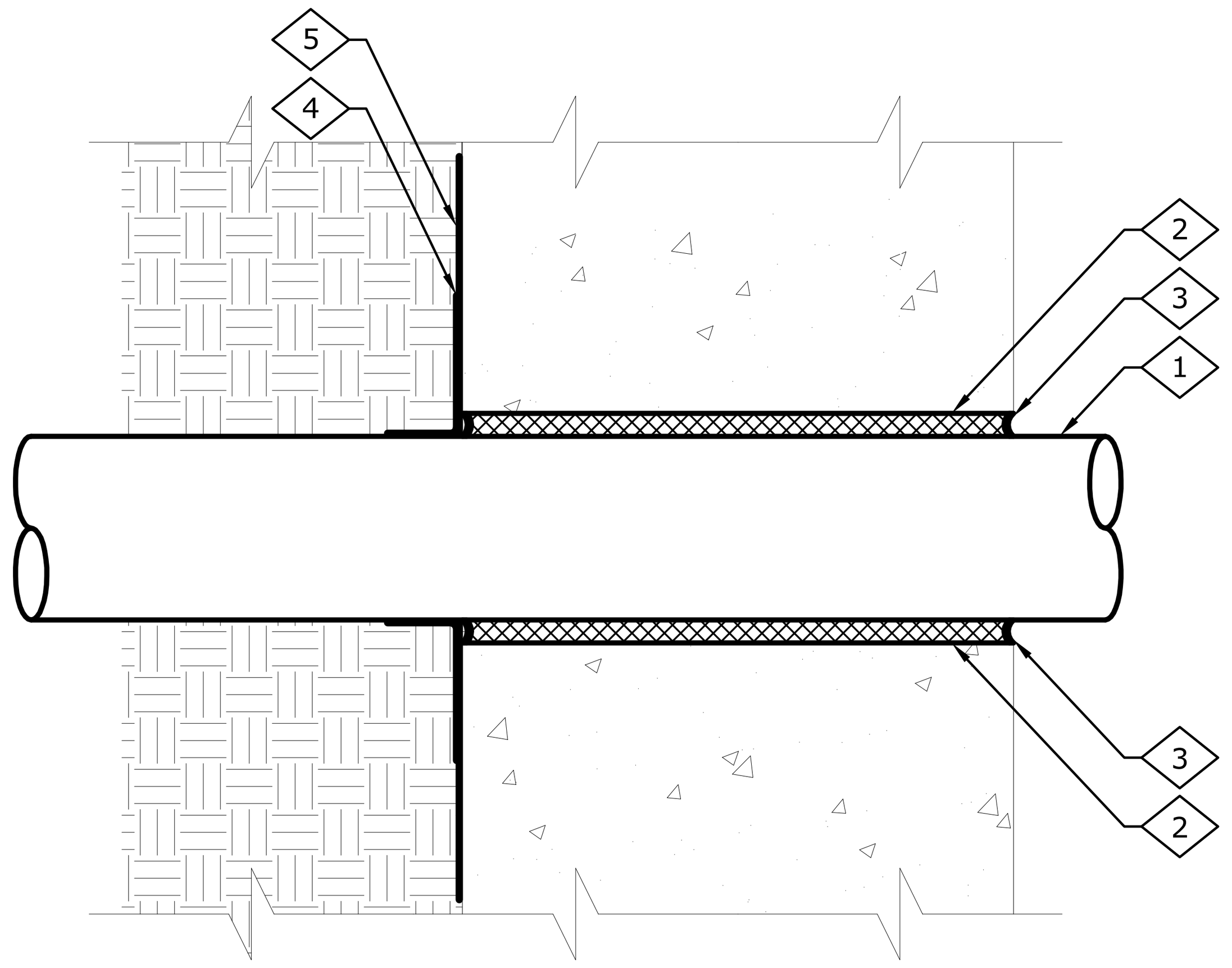
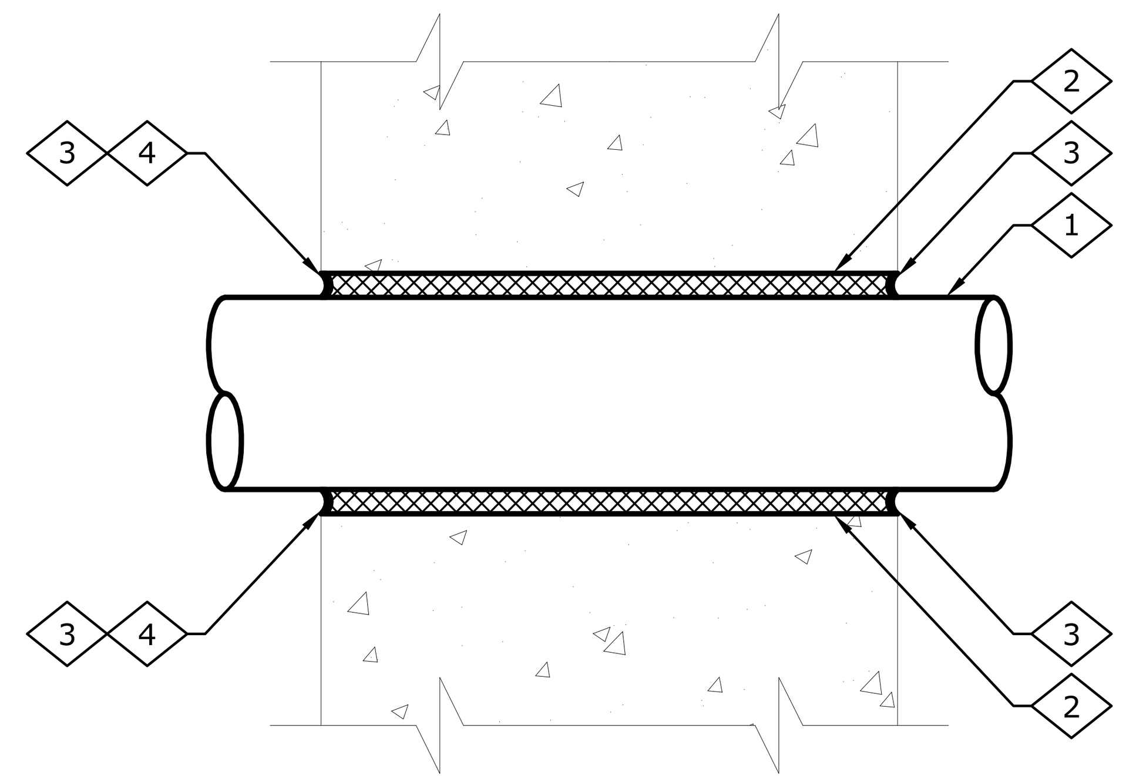


1 CORE DRILL DETAIL (WALL) UNDERGROUND/EXTERIOR-INTERIOR

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

8" 4" 0 8"

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

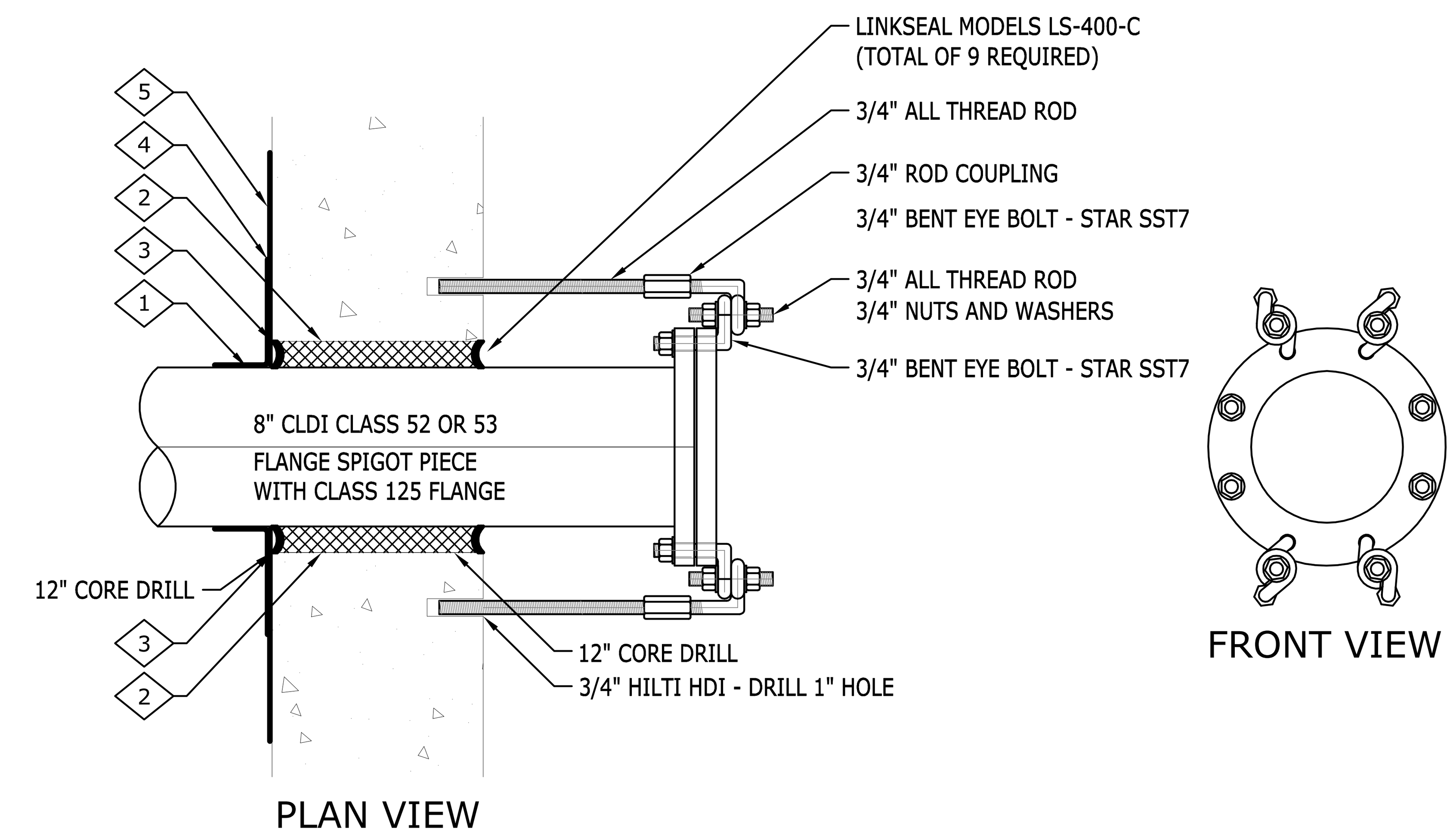


2 CORE DRILL DETAIL (WALL) INTERIOR - INTERIOR

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

8" 4" 0 8"

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

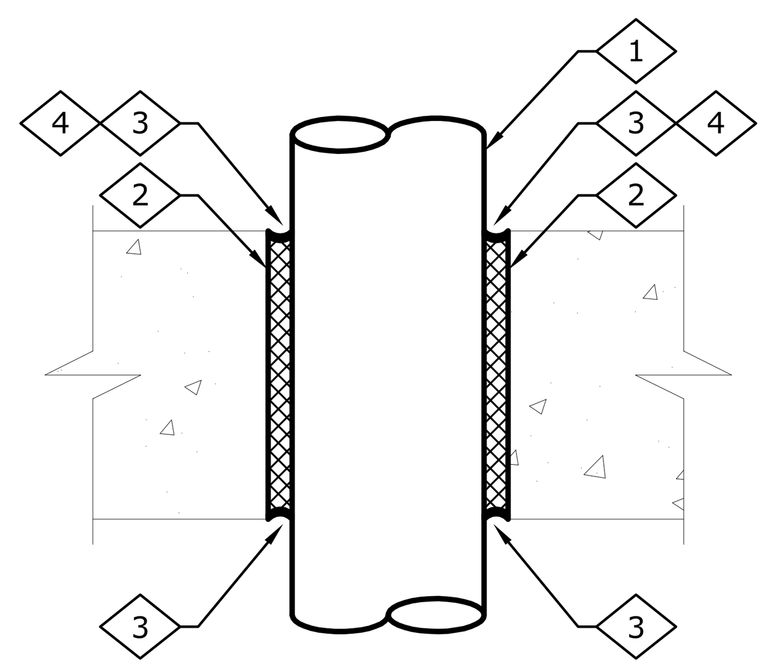


3 CORE DRILL DETAIL (WALL) WATER ENTRY CORE DETAIL

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

8" 4" 0 8"

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

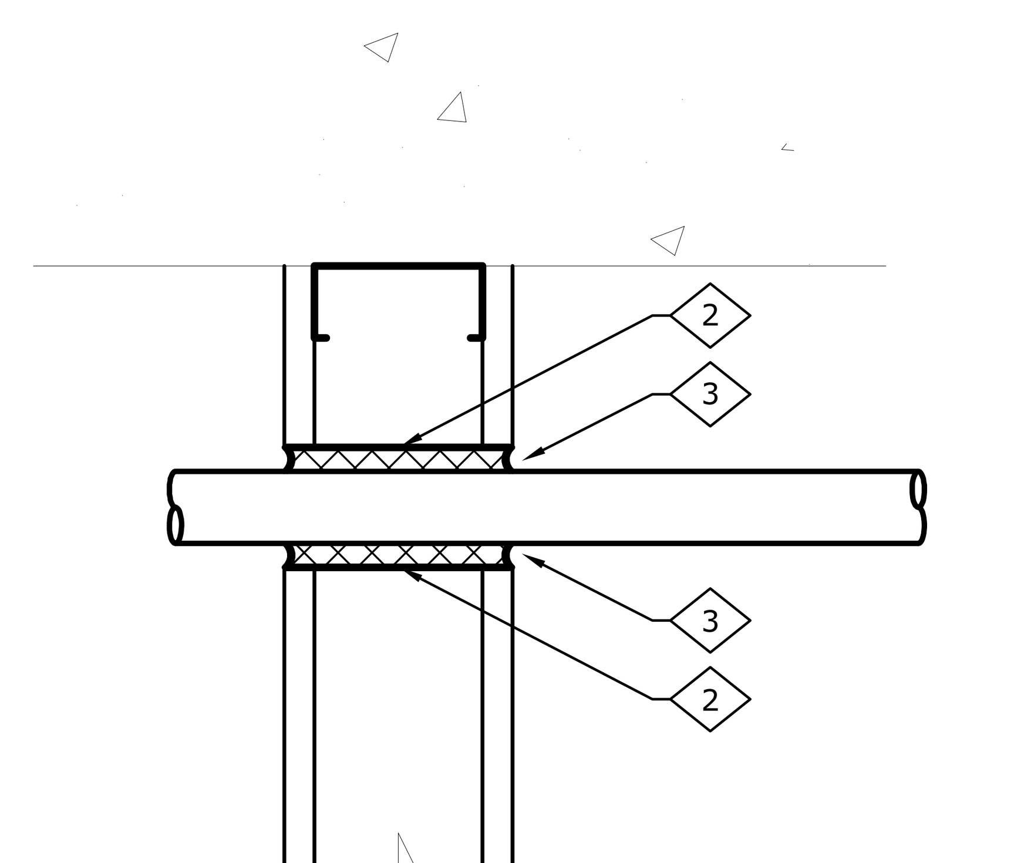


4 CORE DRILL DETAIL INTERIOR FLOOR AND CEILING

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

8" 4" 0 8"

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



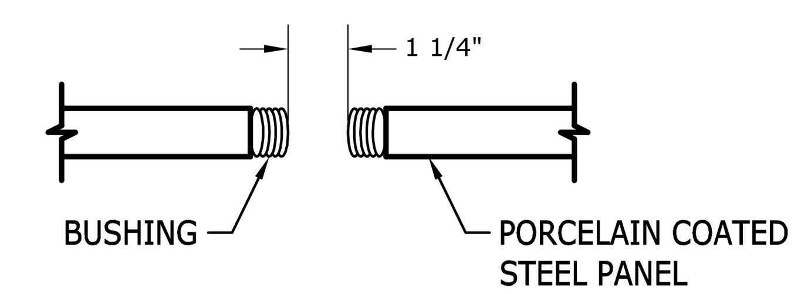
5 CORE DRILL DETAIL TYPICAL PENETRATION DETAIL

SCALE: 3" = 1'-0"

3" 1/2" 0 3"

SCALE: 3" = 1'-0"

NOTE: DETAIL FOR DRYWALL, CORRUGATED STEEL PLENUM AND SHOTCRETE.

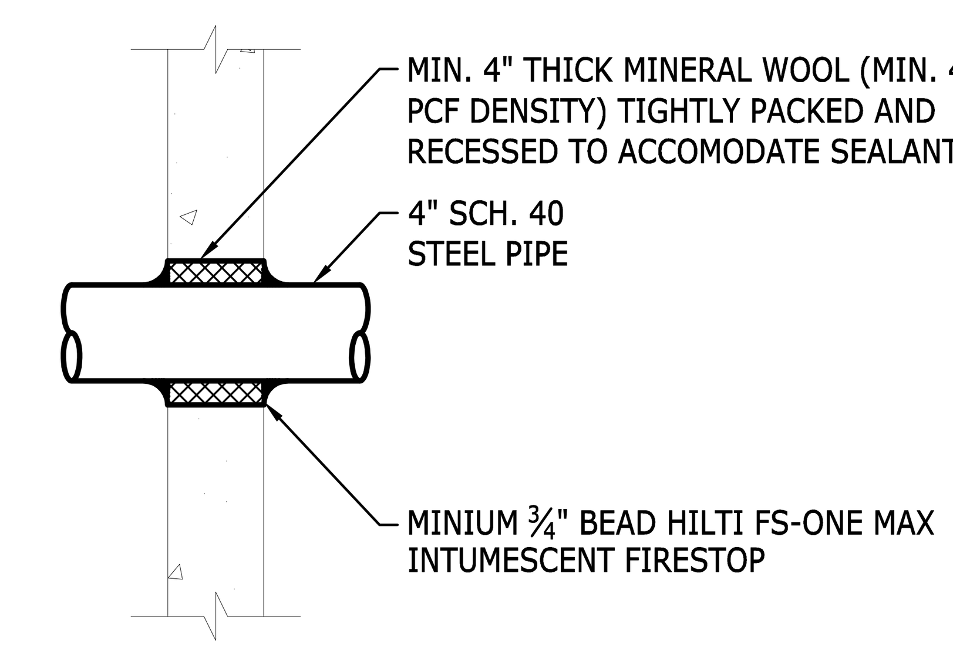


6 TYPICAL FOLHD ROADWAY CEILING PENETRATION DETAIL

SCALE: 3" = 1'-0"

3" 1/2" 0 3"

SCALE: 3" = 1'-0"



7 PLENUM DIVIDER WALL PIPE PENETRATION DETAIL

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

8" 4" 0 8"

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

GENERAL NOTES:

1. ASBESTOS EVALUATION AND ABATEMENT FOR CORE DRILLS AND HANGERS BY OTHERS. SEE ASBESTOS ABATEMENT WORK PLAN.
2. ALL PENETRATION TO BE SEALED AIRTIGHT.

WORK NOTES:

1. PIPE OR CONDUIT VARIES. COORDINATE WITH ELECTRICAL, MECHANICAL, FIRE ALARM OR FIRE PROTECTION SHEETS.
2. FILL VOID WITH NON-COMBUSTIBLE INSULATION MATERIAL.
3. FLEXIBLE CAULK MATERIAL TO FILL VOID BETWEEN INSULATION MATERIAL AND INTERIOR SPACE.
4. WATER RESISTANT FLEXIBLE CAULK FOR EXTERIOR OR CORE DRILL PENETRATIONS SUBJECT TO MOISTURE.
5. WATERPROOF MEMBRANE MATERIAL APPLIED ON EXTERIOR WALL SURFACE AND PIPE AT LEAST 12" IN ALL DIRECTIONS OF CORE DRILL OR MANUFACTURER'S RECOMMENDATION.
6. SLEEVE CORE DRILL PRIOR TO INSTALLATION OF PIPE /CONDUIT ON GYP WALLS ONLY.

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FIXED FIRE SUPPRESSION SYSTEM DESIGN BUILD PROJECT

Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

DRAWN BY: JEB CHECKED BY: SCR

ARCHITECTURAL CORING DETAILS

Drawing Number

A6.3

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

C0.2 CIVIL MISCELLANEOUS DETAILS

THE CIVIL DETAILS SHOWN ON C0.2 IDENTIFIES TYPICAL TRENCH AND ASPHALT REPLACEMENT DETAILS. ALL EXCAVATION AND BACKFILL FOR THE EJMT FFSS PROJECT SHALL BE IN ACCORDANCE WITH CDOT STANDARD PLAN NO. M-206-1.

C0.3 CIVIL NARRATIVE HYDRAULIC ANALYSIS

CONTAINS HYDRAULIC ANALYSIS REPORTS FOR DROP INLETS AND CONVEYANCE PIPING.

C1.0 - C3.0 EAST PORTAL BUILDING FFSS DRAINAGE PLAN VIEW:

THE CIVIL PLAN VIEWS FOR THE EAST PORTAL BUILDING FFSS DRAINAGE LAYOUT SHOW THE PROPOSED DRAINAGE WORK TO BE COMPLETED AS PART OF THE FFSS PROJECT. THE MAJORITY OF FLOW ASSOCIATED WITH THE FFSS AND THE EXISTING STANDPIPE SYSTEM WILL OCCUR WITHIN THE TUNNELS. IN THE TUNNELS THE FLOW WILL BE DIRECTED TO THE EXISTING DROP INLETS POSITIONED EVERY 150-FT (NOT SHOWN ON DRAWINGS). THIS FLOW WILL BE CAPTURED BY THE EXISTING DRAINAGE SYSTEM IN THE TUNNEL AND THE EAST PORTAL BUILDING BASEMENT SEWER TREATMENT PLANT. AS SHOWN IN THE MECHANICAL DRAWINGS, THE EXISTING 12-IN NORTH AND SOUTH INFLUENT VALVES WILL BE REPLACED WITH AUTOMATED VALVES CONTROLLED BY THE FIRE ALARM SYSTEM. A NEW 12-IN BYPASS PIPE WILL BE INSTALLED IN THE BASEMENT AND WILL CONNECT TO THE EXISTING 12-IN OBSOLETE PIPE WHICH WILL BE USED TO DIVERT THE FIRE WATER FROM THE SEWER TREATMENT PLANT TO MANHOLE 1. THE NORTH FLOW FROM THE BASEMENT WILL BE CAPTURED AT EXISTING MANHOLE 1. THIS FLOW WILL PASS THROUGH MANHOLE 1 (SHEET C5.0) AND INTO THE NEW MANHOLE 2 THROUGH THE 12-IN RCP 1.2. PIPE (SHEET C6.0).

SHEET C2.0 SHOWS THE PLAN VIEW CENTERED AROUND MANHOLE 2 WHERE MANHOLE 2 WILL CAPTURE THE FLOW FROM THE 12-IN RCP 1.2., EXISTING DROP INLET 1 THROUGH THE EXISTING 18-IN CSP LINE AND DROP INLET 2 THROUGH THE NEW 12-IN RCP D2.2. DROP INLETS DI4 AND DI3 WILL BE CONNECTED TO DROP INLETS D12 AND DI1 WITH 12-IN RCP CLASS V PIPE. DROP INLETS WILL BE CONNECTED TO THE NEW AND EXSITING DROP INLETS SUCH THAT THE FULL FLOW DISCHARGE WATER WILL BE CAPTURED OUTSIDE OF THE EAST PORTAL BUILDING AS DETAILED HYDRAULICALLY ON SHEET C0.3. ALL THREE INFLOW STREAMS WILL CONVERGE WITHIN THE MANHOLE VALVE ASSEMBLY, AS SHOWN ON SHEET C6.0. (SEE THE VALVE ORIENTATION TABLE ON SHEET C6.0 FOR FURTHER DETAILS ON THE VALVE ASSEMBLY AND VALVE POSITIONS) THE 18-IN OUTFLOW PIPE, 18-IN RCP 2.3., WILL ONLY CONTAIN FLOW WHEN THE FFSS IS ACTIVATED, AND DIRECT THIS FLOW TO THE STORAGE TANKS LOCATED IN THE TOP RIGHT CORNER OF THE SHEET C1.0 AND SHOWN AT AN ENLARGE SCALE ON SHEET C3.0.

THE PROVIDED CHANNEL ANALYSIS CALCULATIONS, SHOWN ON SHEET C0.3, SHOW THAT BOTH A 12-INCH PIPE AND 18-INCH PIPE ARE SUFFICIENT TO CARRY THE DESIGN FLOW RATE OF 4.076 CFS FOR THE DESIGN SLOPE OF THE PIPES; 1.0% FOR A 12-IN PIPE AND 1.00% AND 2.00% FOR THE 18-IN PIPES.. THE DESIGN FLOW FROM MANHOLE 5 TO TANKS 2 AND 3 IS ASSUMED TO BE HALF OF THE FULL FLOW, 2.038 CFS FOR EACH OF THE 8-IN PVC PIPES FEEDING TANKS 2 AND 3. ALL MANHOLES SHALL BE CONSTRUCTED IN ACCORDANCE WITH M&S M-604-20.

ALL PIPES ARE SIZED FOR THE DESIGN FLOW RATE OF 4.076 CFS AS DETAILED IN THE FINAL DRAINAGE REPORT, WITH THE EXCEPTION OF THE 8-IN PIPES AS STATED ABOVE. DETAILS REGARDING THE PROPOSED PIPE SLOPES, INVERTS AND LENGTHS CAN BE FOUND ON THE TABLE ON SHEET C1.0.

ALL EXISTING PIPES SHOWN ON SHEETS C1.0 THROUGH C3.0 WILL REMAIN IN USE WITH THE EXCEPTION OF THE 18-IN CSP PIPE IN WHICH A SHORT SECTION OF PIPE SHALL BE REMOVED UPSTREAM OF THE EXISTING MANHOLE 2 AND BROUGHT INTO THE NEW MANHOLE 2, SEE SHEET C6.0.

C4.0 EAST PORTAL BUILDING FFSS DRAINAGE PROFILE VIEW:

THE THREE PROFILE VIEWS DEPICT THE THREE PRIMARY RUNS OF DRAINAGE PIPE FOR THE FFSS AT THE EAST PORTAL. PROFILE 1: FFSS DRAINAGE ALIGNMENT FROM EXISTING MANHOLE 1 TO THE TANK 1 SHOWS THE 12-IN RCP PIPE 1.2 CONNECTING TO MANHOLE 2 WHERE FLOW FROM AN ACTIVATED FFSS AND STANDPIPE WATER WOULD CONTINUE TO THE STORAGE TANK THROUGH 18-IN RCP 2.3., TO TANK 1 THROUGH MANHOLES 3, 4, AND 5. PIPING TO CONVEY FLOW FROM THE NEW DROP INLET2IN THE EAST BOUND LANE OF TRAVEL IS SHOWN IN PROFILE 2: FFSS DRAINAGE ALIGNMENT FROM DROP INLET. PIPING TO COMPLETE FLOW FROM MANHOLE 5 TO THE DRAINAGE TANKS IS SHOWN ON PROFILE 3: FFSS MANHOLE 5 TO DISCHARGE STORAGE TANKS.

TOTAL STORAGE TANK VOLUME IS PROVIDED IN THE BOTTOM RIGHT FIGURE DEPICTING TANK 1 NO LONGER FILLING TO CAPACITY BUT TO A STORAGE VOLUME OF 38,240 GALLONS WITH TANKS 2 AND 3 AT A TOTAL CAPACITY OF 80,000 GALLONS. THIS PROVIDES FOR A TOTAL STORAGE CAPACITY OF 118,240GALLONS. THE TANK VOLUME CAPACITY IS BASED OFF THE INLET PIPE 12-IN PVC 5.T1. INVERT ELEVATION AT THE TANK 1 OF 10999.11 FT WHICH IS BELOW THE CROWN OF THE TANK 1 HOWEVER FLOW WILL START TO BACK UP AND FILL TANK 2 AND TANK 3 BEFORE TANK 1 FILLS TO EXISTING CAPACITY. TO ACHIEVE THE TOTAL STORAGE CAPACITY IT IS ASSUMED THAT FLOW WILL BACKUP TO THE INVERT OF PIPE RCP 18" 2.3. AT MANHOLE 2. CALCULATIONS ARE ALSO PROVIDED FOR THE MOST DEMANDING FFSS ACTIVATION OF TWO ZONES AND FULL USE OF THE EXISTING STANDPIPE SYSTEM.

C5.0 EXISTING MANHOLE 1

EXISTING MANHOLE 1 WILL BE MODIFIED TO CONNECT A 12-IN DIP PASS THROUGH PIPE THROUGH THE MANHOLE. THE NEW 12-IN DIP PIPE WILL CONNECT TO THE NEW 12-IN RCP 1.2. PIPE WHICH WILL REQUIRE CORING THROUGH THE EXISTING MANHOLE 1 EAST WALL. A DETAIL FOR CORING THROUGH THE EXISTING WALL IS PROVIDED.

C6.0 MANHOLE 2

THE MOTOR CONTROLLED BUTTERFLY VALVES LOCATED WITHIN MANHOLE 2 WILL BE CONTROLLED BY THE FIRE ALARM SYSTEM TO DIRECT FLOW TO CLEAR CREEK OR TO THE DISCHARGE STORAGE TANKS. UNDER NORMAL OPERATIONS THE VALVE 5, 12-IN VALVE , WILL BE OPEN AND VALVE 6, 12-IN VALVE, WILL BE CLOSED CAUSING ALL FLOW FROM THE INLETS TO BE DIRECTED TO THE EXISTING 36-IN CSP SEEPAGE LINE AND ON TO CLEAR CREEK. WHEN THE FFSS IS ACTIVATED, THE VALVE POSITIONS WILL SWITCH TO DIRECT FLOW TO THE DISCHARGE STORAGE TANKS. THE VALVES SHALL BE PENTAIR AR2 BUTTERFLY VALVES WITH A 150 PSI WORKING PRESSURE. THE VALVES SHALL BE FITTED WITH A PENTAIR KEYSTONE F777/778 ELECTRIC ACTUATORS WITH MODULATING CONTROLLER OPTION.

THE EXISTING 36-INCH CSP SHALL BE CUT TO ALLOW FOR FLOW CHANNELIZATION TO BE CONSTRUCTED WITHIN THE MANHOLE AS DETAILED IN M&S M-604-20.

C7.0 MANHOLE DETAILS

THE DRAWING SHOWS TYPICAL 48-IN DIAMETER MANHOLES (DETAILS 1 - 3) TO BE UTILIZED FOR ALL MANHOLE LOCATIONS WITH THE EXCEPTIONS OF MANHOLE 1, 2, 8 AND 9. MANHOLES 8 AND 9 SHALL BE CONSTRUCTED PER DETAIL 4, AS MANHOLES 8 AND 9 ARE FOR TANK ACCESS ONLY, THERE IS NO MANHOLE BASE, THE MANHOLE RISER SHALL BE PLACED ON THE CLASS 1 STRUCTURAL BACKFILLED AROUND THE TANK. MANHOLE INVERT AND RIM ELEVATIONS DETAILS ARE PROVIDED IN THE TABLE ON THE SHEET AND SHALL BE FIELD VERIFY PRIOR TO THE START OF CONSTRUCTION. ALL MANHOLES SHALL BE CONSTRUCTED IN ACCORDANCE WITH CDOT M&S M-604-20. NOTE, MANHOLES WITHIN THE ROAD WAY SHALL BE CONSTRUCTED WITH A FLAT TOP WHEN LIMITED COVER OVER THE CROWN OF PIPE IS ANTICIPATED, ALL OTHER MANHOLES SHALL BE CONSTRUCTED WITH ECCENTRIC CONE TOP. ALL MANHOLES SHALL BE CONSTRUCTED TO PROVIDE ADEQUATE SPACE FOR MAINTENANCE ACTIVES, ACCESS, AND CLEANOUTS. WHEN THE MANHOLE IS LOCATED IN UNPAVED AREAS, THE STRUCTURE RIM SHALL BE 6-INCHES ABOVE SURROUNDING GRADE (DIRT).

C8.0 DROP INLET STRUCTURE DETAILS

DETAILS ARE PROVIDED FOR DROP INLET STRUCTURES. ALL DROP INLET STRUCTURES SHALL BE CONSTRUCTED IN ACCORDANCE WITH CDOT STANDARD PLAN NO. M-604-25 AND SHALL BE HS-20 RATED. IT IS ASSUMED THAT THE ROADWAY SHOULDER FOR THE EAST BOUND LANE OF TRAVEL IS 9-FT WIDE AT THE DROP INLET LOCATIONS, CONTRACTOR TO CONFIRM SHOULDER WIDTH WITH SURVEY PRIOR TO THE START OF CONSTRUCTION. CURRENT LANE IMPACT WITH THE 5.5-FT INLET BOX, AND 2 FT APRON TRANSITION SHALL NOT IMPACT THE TRAVEL LANE AND APRON TRANSITION. THE APRON TRANSITION SHALL PROVIDE FOR A 1-IN SUMP AS SHOWN TO FACILITATE ROADWAY AND FFSS WATER DRAINAGE. THE CONCRETE AND/OR ASPHALT TO BE PLACED AT THE SURFACE OF THE DROP INLET BOX SHALL BE PLACED TO PROVIDE A CROSS-SLOPE GUTTER OF TO MATCH EXISTING CROSS SLOPES AND A MINIMUM GUTTER WIDTH OF 9.0FT. THE LONGITUDINAL SLOPE OF THE ROAD IS ASSUMED TO BE 0.016 (FT/FT) FOR THE EAST BOUND TRAVEL LANES AND 0.009 (FT/FT) FOR THE WEST BOUND TRAVEL LANES. CALCULATIONS COMPLETED FOR THE DESIGN OF THE DROP INLET ARE PROVIDED ON SHEET C0.3, CALCULATION WERE COMPLETED WITH THE USE OF THE HYDRAULIC TOOLBOX VERSION 4.2 FROM FEDERAL HIGHWAYS ADMINISTRATION.

C9.0 - C12.0 EATON TANK (1 - 4)

THE DRAWING SHOWN ON SHEETS C9.0 - C12.0 WERE CREATED BY EATON METAL PRODUCTS OF DENVER COLORADO. EATON WILL BE THE MANUFACTURER OF THE NEW FFSS STORAGE DISCHARGE TANKS 2 AND 3. THE TANKS AS DESIGNED BY EATON EACH PROVIDE FOR A STORAGE VOLUME OF 40,000 GALLONS.

THE TANKS ARE RATED FOR H20 LOADING AS NOTED BY EATON ON SHEET C9.0 WHEN BURIED 4-FT BELOW GRADE. PEA GRAVEL WILL BE USED FOR BACKFILL. THE TANKS SHALL SLOPE SLIGHTLY TO ENCOURAGE A COMPLETELY EMPTY SYSTEM WHEN SUCKED DRY. THERE ARE NO MECHANICAL COMPONENTS INSIDE THESE TANKS.

A LEVEL SENSOR SHALL BE INSTALLED AND WIRED TO THE FIRE ALARM SYSTEM FOR MONITORING.

C13.0 WEST SIDE FFSS SUPPLY PROFILE

THE 10-IN 150 CLASS DIP NEW SUPPLY LINE WILL CONNECT AT THE EXISTING 8-IN MAIN AT THE EXISTING STORAGE TANK. THE LINE WILL BE BURIED A MINIMUM OF 9-FT BELOW THE EXISTING GRADE. 4-IN OF BLUE BOARD INSULATION WILL BE PLACED ABOVE THE NEW 10-IN DIP TO FURTHER PROTECT AGAINST FREEZING. THE PIPE SHALL BE EXCAVATED AND BACKFILLED PER MS-206-1 WITH THE ADDITION OF THE BLUE BOARD INSULATION.

C14.0 - C15.0 SUPPLY TANK CONCRETE LINING DETAILS (1-2)

THE WATERPROOF CONCRETE LINING SHALL BE APPLIED AS INSTRUCTED TO THE AREAS SHOWN AND INDICATED ON THE DRAWINGS. THE COATING SHALL BE APPLIED TO ALL INTERIOR SURFACES OF THE EXISTING STORAGE TANK. AT A MINIMUM, THE CONTRACTOR SHALL FOLLOW THE WATERPROOF CONCRETE COATING APPLICATION SPECIFICATION LISTED WITHIN THE SHEET. ALL COATING MANUFACTURER APPLICATION INSTRUCTIONS SHALL SUPERSEDE APPLICATION SPECIFICATIONS LISTED.

THE VOLUME OF THE STORAGE TANK IS 121,064 GALLONS.

GENERAL NOTES:

1. ALL CONCRETE FOR STRUCTURES AND PIPES SHALL CONFORM TO CDOT STANDARD SPECIFICATIONS 601.
2. ALL REINFORCEMENT USED IN THE CONSTRUCTION OF DRAINAGE ELEMENTS SHALL CONFORM TO CDOT SECTION 701.1. ADDITIONALLY, REINFORCING SHALL CONSIST OF DEFORMED BARS ONLY PER ASTM A615.
3. ALL EXCAVATIONS AND BACKFILL SHALL CONFORM TO CDOT STANDARD PLANS M-206-1. ALL SURFACES SHALL BE BROUGHT BACK TO MATCH EXISTING GRADES. ALL ITEMS IDENTIFIED TO BE ABANDONED OR REMOVED SHALL BE DONE IN ACCORDANCE WITH CDOT STANDARD SPECIFICATION SECTION 202.
4. ALL MANHOLE STRUCTURES SHALL BE CONSTRUCTED IN ACCORDANCE WITH CDOT STANDARD PLAN M-204-20.
5. ALL REINFORCED CONCRETE PIPE SHALL BE CONSTRUCTED AND PLACED IN ACCORDANCE WITH CDOT STANDARD PLAN M-603-2. ALL REINFORCED CONCRETE PIPE SHALL BE CLASS III WITH THE EXCEPTION OF THE 12-IN LINES CONNECTING DROP INLETS , THESE LINE SHALL BE CLASS IV.
6. FOR ALL PVC PIPE WORK, DETECTION TAPE SHALE BE PLACED 6 TO 12 INCHES ABOVE PIPE.
7. GEOTECHNICAL BORINGS HAVE NOT BEEN COMPLETED, THE CONTRACTOR SHALL CONFIRM EXISTING GROUND CONDITIONS DURING CONSTRUCTION AND SELECT THE PROPER BEDDING MATERIAL IN ACCORDANCE WITH M-206-1. THE CONTRACTOR SHOULD ANTICIPATE EXCAVATION IN SOILS, COMPACTED FILL AND ROCK
8. NO DRAINAGE MODIFICATION WILL BE MADE TO THE WEST END OF THE TUNNEL OR ROADWAY SPACE OUTSIDE OF THE WEST END. IT IS ANTICIPATED THAT ACTIVATION OF THE TWO ZONES FURTHEST TO THE WEST IN BOTH TUNNELS MAY CAUSE A RELEASE OF FIRE FIGHTING WATER THAT IS NOT CAPTURED BY THE EXISTING OR MODIFIED EJMT DRAINAGE SYSTEM IN ACCORDANCE WITH THE CONTRACT.

UTILITIES:

WORK SHALL BE PERFORMED IN ACCORDANCE WITH CONTRACT BOOK 2 SECTION 7. THE UTILITY MEMORANDUM AND MAPS PROVIDED AS REFERENCE DOCUMENTS SHALL BE CONSULTED AS WELL AS THE UTILITY LINES SHOWN ON C1.1 WHICH ARE REPRESENTATIVE OF THE UTILITIES IN THE AREA. ALL UTILITIES SHALL BE LOCATED PRIOR TO THE START OF CONSTRUCTION. THE CONTRACTOR SHALL POTHOLE AND USE CAUTION WHEN EXCAVATING.

THE FOLLOWING IS A LIST OF UTILITY CONTACTS FOR THIS PROJECT:

XCEL ENERGY (GAS AND ELECTRIC) BUILDERS CALL LINE PHONE: 1-800-628-2121	CDOT TUNNEL UTILITIES TOM HURST PHONE: 1-303-512-5734	CENTURYLINK DAN LEWIS PHONE: 1-303-441-6021
COMCAST (CABLE) SCOTT MOORE PHONE: 1-720-413-0171	CDOT ITS (FIBER) JILL SCOTT PHONE: 1-303-512-5805	

ENVIRONMENTAL:

THE CONTRACTOR SHALL PROTECT ALL STORM SEWER FACILITIES AND WATERWAYS ADJACENT TO ANY WORK LOCATION INCLUDING, BUT NOT LIMITED TO, WHERE PAVEMENT CUTTING OPERATIONS INVOLVING SAW CUTTING, GRINDING, PAVING OR OTHER ACTIVITY THAT MAY RESULT IN POLLUTION PER THE STORM WATER MANAGEMENT PLAN OR AS DIRECTED BY THE ENGINEER. THE CONTRACTOR SHALL REMOVE AND PROPERLY DISPOSE OF ALL WATER PRODUCTS GENERATED BY OPERATIONS INCLUDING, BUT NOT LIMITED TO, SAID CUTTING OPERATIONS ON A DAILY BASIS. THE DISCHARGE OF ANY WATER CONTAMINATED BY WASTE PRODUCTS FROM CUTTING OPERATIONS TO THE STORM SEWER IS PROHIBITED. THERE SHALL BE NO STOCKPILING OR SIDE CASTING OF WATER MATERIALS ADJACENT TO ANY DRAINAGES.

THE CONTRACTOR SHALL MAINTAIN ADEQUATE DRAINAGE AT ALL TIMES DURING CONSTRUCTION.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING THE PRESENT CONDITION OF ANY EXISTING BUILDINGS, LANDSCAPING, FENCING, DRIVES, ETC. THE CONTRACTOR SHALL PROTECT ALL EXISTING SURVEY MONUMENTATION FROM DAMAGE DURING CONSTRUCTION ACTIVITIES.

THE CONTRACTOR SHALL ENSURE THAT NO MATERIALS, EQUIPMENT OF VEHICLES ARE STAGED OR PARKED WITHIN 50 FEET OF WETLAND AREAS. WORK IN WETLAND AREAS SHALL BE CONTAINED SO AS TO LIMIT THE DISTURBANCE.

ALL EROSION, SEDIMENT BMP'S SHALL BE PLACED AS NEEDED ACCORDING TO THE SWMP SITE MAPS AND AS APPROVED BY THE ENGINEER. ALL TEMPORARY BMP'S SHALL BE REMOVED AT THE END OF CONSTRUCTION.

CDOT STANDARD PLAN REFERENCES:

C1.0
- M-206-1
- M-603-2
- M-604-20
- M-604-25

C2.0
- M-206-1
- M-603-2
- M-604-20
- M-604-25
- M-627-1

C3.0
- M-604-20
- M-603-2
- M-627-1

C4.0
- M-604-20

C5.0
- M-206-1
- M-603-2

C6.0
- M-604-20
- M-603-2

C7.0
- M-603-2
- M-604-20

C8.0
- M-603.2
- M-604-25

C13.0
- M-206-1

CIVIL ABBREVIATIONS:

RCP - REINFORCED CONCRETE PIPE
DIP - DUCTILE IRON PIPE
CSP - CORRUGATED STEEL PIPE

BARNARD EJMT TEAM

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions

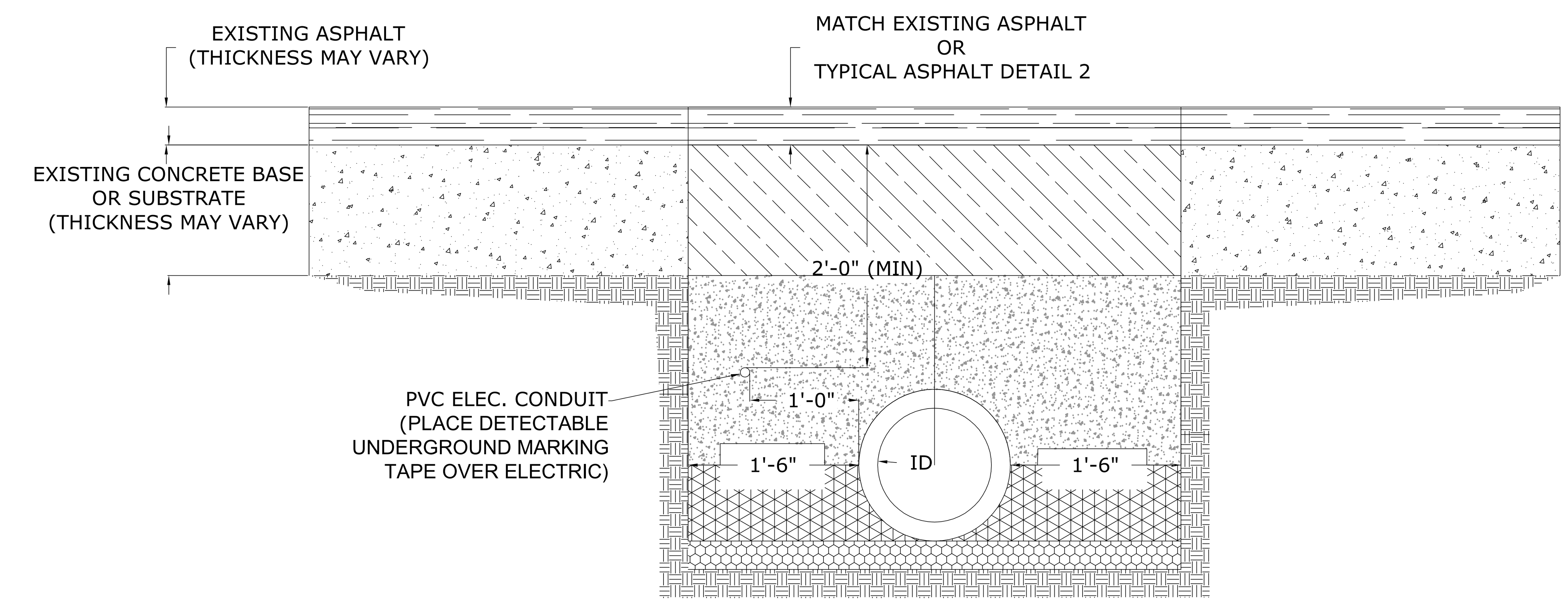
Num	Description	Date

DRAWN BY: JBC CHECKED BY: JM

CIVIL NARRATIVE

Drawing Number
C0.1

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE



1 PIPE IN ROADWAY TRENCH DETAIL
SCALE:1" = 1'-0"

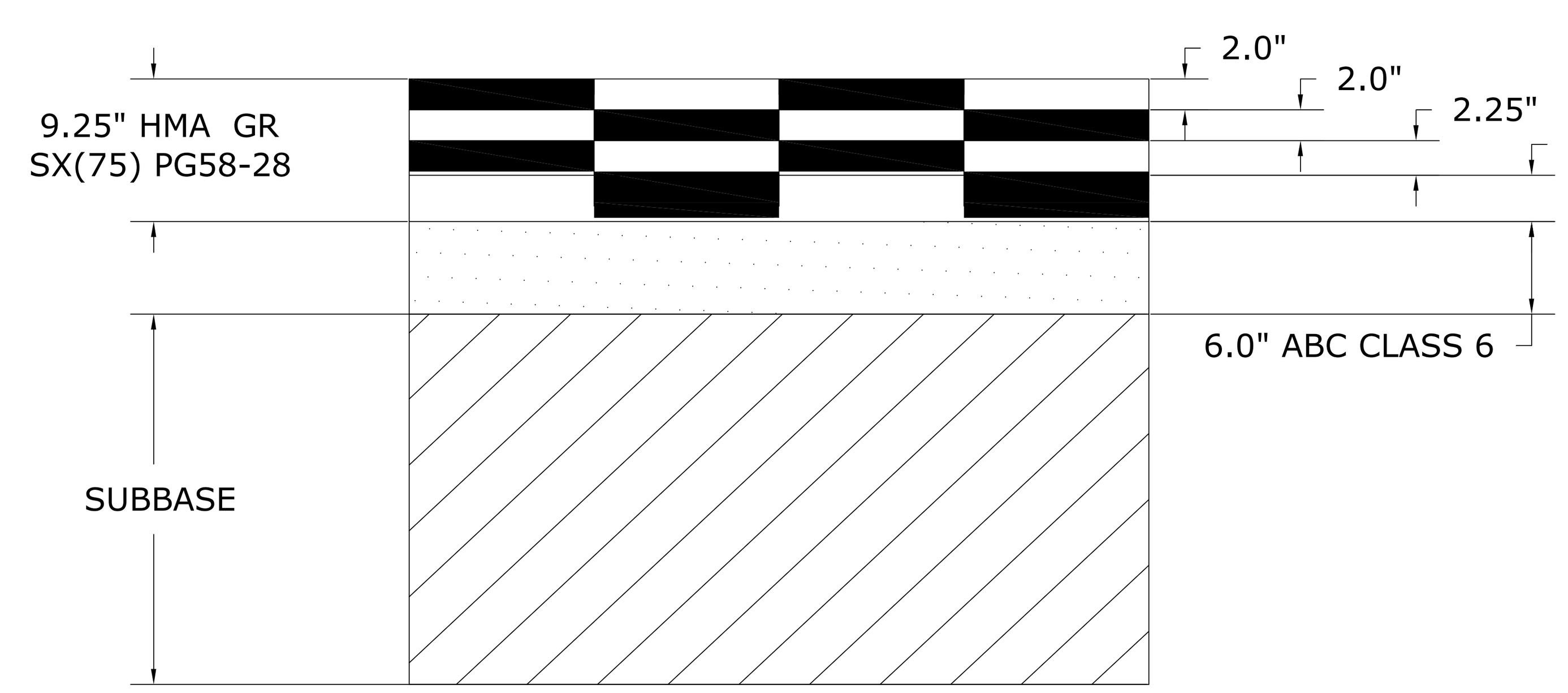
LEGEND

EARTH	BEDROCK
EMBANKMENT MATERIAL	ASPHALT
STRUCTURE BACKFILL**, CLASS 1 OR 2	STRUCTURE BACKFILL, CLASS 1
BEDDING MATERIAL*	FLOW-FILL**
EXISTING CONCRETE ROADWAY BASE	

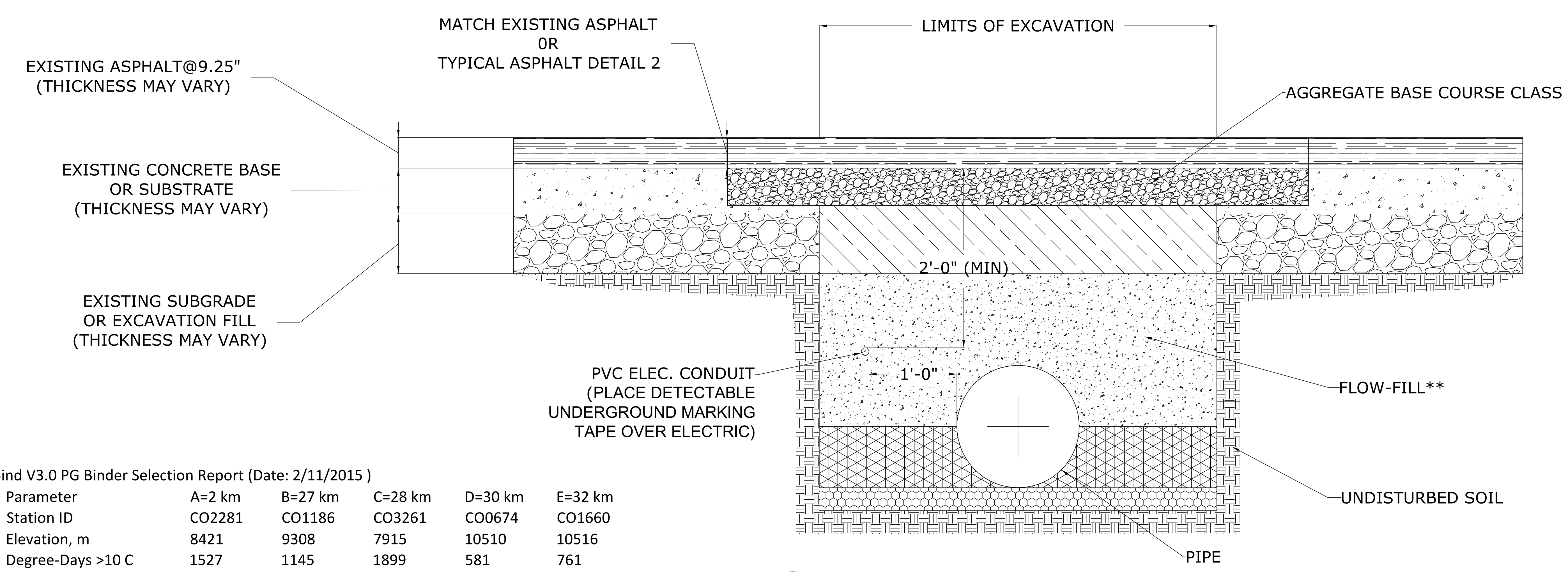
* BEDDING MATERIAL FOR RIGID PIPE IN SOIL SHALL BE 3 IN. OF LOOSE STRUCTURE BACKFILL (CLASS 1 OR 2). BEDDING IS NOT REQUIRED FOR FLEXIBLE PIPE IN SOIL. BEDDING MATERIAL FOR RIGID OR FLEXIBLE PIPE IN ROCK SHALL BE 12 IN. OF LOOSE STRUCTURE BACKFILL, CLASS 1.

** PER SECTION 206.02(a) - STRUCTURAL BACKFILL (FLOW-FILL) MEETING THE FOLLOWING REQUIREMENTS CAN BE SUBSTITUTED FOR CLASS 1 BACKFILL TO BACKFILL CULVERTS AND SEWER PIPES:

CEMENT	50 LBS/YD^3
COARSE AGGREGATE	1700 LBS/YD^3
FINE AGGREGATE	1840 LBS/YD^3
WATER	325 (OR AS NEEDED) LBS/YD^3



2 TYPICAL ASPHALT SECTION
SCALE:1/2" = 1'-0"



3 TYPICAL HIGHWAY TRENCH DETAIL
SCALE:1" = 1'-0"

ASPHALT GENERAL NOTES:

1. THE CONTRACTOR SHALL FOLLOW THE LTPP BIND AND LOCATION CLIMATE DATA REPORT (THIS PAGE) FOR SELECTION OF THE ASPHALT BINDER.
2. ALL PATCHING SHALL BE UNDERLAIN BY SIX INCHES OF AGGREGATE BASE COURSE CLASS 6. THE AGGREGATE BASE COURSE SHALL HAVE AN R-VALUE OF AT LEAST 78 WHEN TESTED BY THE HVEEM STABILOMETER METHOD.
3. ALL ASPHALT PATCHING AND PAVING SHALL BE HOT MIX ASPHALT (GRADING SX) (75) (PG58-28)
4. LIFTS SHALL BE PERFORMED AT A MINIMUM 2-IN AND A MAXIMUM OF 3-IN, LIFTS SHALL BE COMPLETED WITH THE THICKEST LIFT ON THE BOTTOM FOLLOWED BY THINNER LIFTS.
5. ASPHALT SMOOTHNESS SHALL CONFORM TO CDOT STANDARD SPECIFICATION SECTION 105.07.
6. FLOWFILL SHALL BE USED AS STRUCTURAL BACKFILL FOR THE BACKFILL OF PIPE 3.4. ACROSS THE WEST BOUND I-70 LANE OF TRAVEL AT THE EAST PORTAL SIDE. ALL OTHER TRENCH LOCATIONS SHALL BE BACKFILLED WITH NATIVE OR CLASS 1 BACKFILL.
7. MATERIAL SUPPLIER AND MANUFACTURED PRODUCTS SHALL BE ON CDOT's APPROVED VENDOR MATERIAL LIST.

LTPPBind V3.0 PG Binder Selection Report (Date: 2/11/2015)

Parameter	A=2 km	B=27 km	C=28 km	D=30 km	E=32 km
Station ID	CO2281	CO1186	CO3261	CO0674	CO1660
Elevation, m	8421	9308	7915	10510	10516
Degree-Days >10 C	1527	1145	1899	581	761
Low Air Temperature, C	-31.2	-27.2	-25.2	-30.3	-30.4
Low Air Temp. Std Dev	3.4	3.5	3.9	3.5	2.9

Input Data

Latitude, Degree	39.62
Yearly Degree-Days>10C	1183
Lowest Yearly Air Temp., Deg. C	-28.9
Low Temp. Std. Dev., Deg. C	3.4
Base HT PG	52

Traffic Adjustments for HT

Desired Reliability, Percent	98
Traffic Loading, Million ESAL	Up to 3 M. ESAL
Traffic Speed	Slow
High Temp. Adjustment	2.8

PG Temperature	HIGH	LOW
PG Temp. at 50% Reliability	38.4	-19.9
PG Temp. at Desired Reliability	40.0	-26.5
Adjustments for Traffic	2.8	
Adjustments for Depth	0.0	0.0
Adjusted PG Temperature	42.8	-26.5
Selected PG Binder Grade	46	-28

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BARNARD EJMT TEAM

BARNARD RONDINELLI BCER engineering Sturgeon ELECTRIC Western States Fire Protection Co. CONSULTING ENGINEERS

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions

Num	Description	Date

DRAWN BY: JBC CHECKED BY: JM

CIVIL MISCELLANEOUS DETAILS

Drawing Number
C0.2

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

Hydraulic Analysis Report - EAST BOUND 2 DROP INLETS

Project Data

Project Title:	EJMT FFSS EAST BOUND INLETS
Designer:	JBC
Project Date:	Thursday, May 28, 2015
Project Units:	U.S. Customary Units
Notes:	

Curb and Gutter Analysis: DI4 - Eastbound inlet 2 of 2 NEW

Notes: Assumes full flow with 25% Clogging factor taken after calculations

Gutter Input Parameters	
Longitudinal Slope of Road	0.016 ft/ft
Cross-Slope of Pavement	0.04 ft/ft
Depressed Gutter Geometry	
Cross-Slope of Gutter	0.05 ft/ft
Manning's n	0.015
Gutter Width	9 ft
Design Flow	4.076 cfs
Gutter Result Parameters	
Width of Spread	6.154 ft
Gutter Depression	1.08 in
Area of Flow	1.162 ft^2
Eo (Gutter Flow to Total Flow)	1
Gutter Depth at Curb	4.034 in
Inlet Input Parameters	
Inlet Location	Inlet on Grade
Inlet Type	Grate
Grate Type	Curved Vane
Grate Width	4.5 ft
Grate Length	2.5 ft
Local Depression	0 in
Inlet Result Parameters	
Intercepted Flow	3.997 cfs
Bypass Flow	0.079 cfs
Approach Velocity	4 ft/s
Splash-over Velocity	6.79 ft/s
Efficiency	0.98
Clogging at 25%	
Percent Clogging	25 %
Intercepted flow after clogging	2.998
Bypass flow after clogging	1.078

Curb and Gutter Analysis: DI2 - Eastbound inlet 1 of 2 (NEW)

Notes:

Gutter Input Parameters	
Longitudinal Slope of Road	0.016 ft/ft
Cross-Slope of Pavement	0.04 ft/ft
Depressed Gutter Geometry	
Cross-Slope of Gutter	0.05 ft/ft
Manning's n	0.015
Gutter Width	9 ft
Design Flow	1.078 cfs
Gutter Result Parameters	
Width of Spread	3.737 ft
Gutter Depression	1.08 in
Area of Flow	0.684 ft^2
Eo (Gutter Flow to Total Flow)	1
Gutter Depth at Curb	2.874 in
Inlet Input Parameters	
Inlet Location	Inlet on Grade
Inlet Type	Grate
Grate Type	Curved Vane
Grate Width	4.5 ft
Grate Length	2.5 ft
Local Depression	1 in
Inlet Result Parameters	
Intercepted Flow	1.072 cfs
Bypass Flow	0.006 cfs
Approach Velocity	2.26 ft/s
Splash-over Velocity	6.79 ft/s
Efficiency	0.995

Hydraulic Analysis Report - WEST BOUND 2 DROP INLETS

Project Data

Project Title	EJMT FFSS EAST BOUND INLETS
Designer	JBC
Project Date	Thursday, May 28, 2015
Project Units:	U.S. Customary Units
Notes	

Curb and Gutter Analysis: DI1 - Westbound inlet 1 of 2 (Existing)

Notes: Assumes full flow with 25% Clogging factor taken after calculations

Gutter Input Parameters	
Longitudinal Slope of Road	0.009 ft/ft
Cross-Slope of Pavement	0.059 ft/ft
Depressed Gutter Geometry	
Cross-Slope of Gutter	0.069 ft/ft
Manning's n	0.015
Gutter Width	9 ft
Design Flow	1.064 cfs
Gutter Result Parameters	
Width of Spread	3.3874 ft
Gutter Depression	1.08 in
Area of Flow	0.7435 ft^2
Eo (Gutter Flow to Total Flow)	1
Gutter Depth at Curb	3.4783 in
Inlet Input Parameters	
Inlet Location	Inlet on Grade
Inlet Type	Grate
Grate Type	Reticuline
Grate Width	3.33 ft
Grate Length	1.25 ft
Local Depression	1 in
Inlet Result Parameters	
Intercepted Flow	1.064 cfs
Bypass Flow	0.000 cfs
Approach Velocity	1.4311 ft/s
Splash-over Velocity	2.8684 ft/s
Efficiency	1.00

Curb and Gutter Analysis: DI3 - Westbound inlet 2 of 2 (NEW)

Notes

Gutter Input Parameters	
Longitudinal Slope of Road	0.009 ft/ft
Cross-Slope of Pavement	0.052 ft/ft
Depressed Gutter Geometry	
Cross-Slope of Gutter	0.062 ft/ft
Manning's n	0.015
Gutter Width	9 ft
Design Flow	4.076 cfs
Gutter Result Parameters	
Width of Spread	5.993 ft
Gutter Depression	1.08 in
Area of Flow	1.339 ft^2
Eo (Gutter Flow to Total Flow)	1
Gutter Depth at Curb	4.82 in
Inlet Input Parameters	
Inlet Location	Inlet on Grade
Inlet Type	Grate
Grate Type	Curved Vane
Grate Width	4.5 ft
Grate Length	2.5 ft
Local Depression	1 in
Inlet Result Parameters	
Intercepted Flow	4.016 cfs
Bypass Flow	0.06 cfs
Approach Velocity	3.045 ft/s
Splash-over Velocity	6.79 ft/s
Efficiency	0.985
Clogging at 25%	
Percent Clogging	25 %
Intercepted flow after clogging	3.012
Bypass flow after clogging	1.064

Hydraulic Analysis Report

Project Data

Project Title: EISENHOWER/JOHNSON MEMORIAL TUNNEL FFSS

Designer: JBC

Project Date: Thursday, May 28, 2015

Project Units: U.S. Customary Units

Notes:

Channel Analysis: 18" RCP @ 0.02 - CHANNEL ANALYSIS

Notes:

Input Parameters

Channel Type: Circular

Pipe Diameter: 1.5000 ft

Longitudinal Slope: 0.0200 ft/ft

Manning's n: 0.0120

Flow: 4.0760 cfs

Result Parameters

Depth: 0.5147 ft

Area of Flow: 0.5365 ft^2

Wetted Perimeter: 1.8775 ft

Hydraulic Radius: 0.2858 ft

Average Velocity: 7.5972 ft/s

Top Width: 1.4243 ft

Froude Number: 2.1814

Critical Depth: 0.7727 ft

Critical Velocity: 4.4419 ft/s

Critical Slope: 0.0046 ft/ft

Critical Top Width: 1.50 ft

Calculated Max Shear Stress: 0.6424 lb/ft^2

Calculated Avg Shear Stress: 0.3566 lb/ft^2

Channel Analysis: 12" RCP @ 0.01 - CHANNEL ANALYSIS

Notes:

Input Parameters

Channel Type: Circular

Pipe Diameter: 1.0000 ft

Longitudinal Slope: 0.0100 ft/ft

Manning's n: 0.0120

Flow: 4.0760 cfs

Result Parameters

Depth: 0.8828 ft

Area of Flow: 0.7338 ft^2

Wetted Perimeter: 2.4428 ft

Hydraulic Radius: 0.3004 ft

Average Velocity: 5.5545 ft/s

Top Width: 0.6433 ft

Froude Number: 0.9165

Critical Depth: 0.8540 ft

Critical Velocity: 5.7058 ft/s

Critical Slope: 0.0104 ft/ft

Critical Top Width: 0.71 ft

Calculated Max Shear Stress: 0.5509 lb/ft^2

Calculated Avg Shear Stress: 0.1875 lb/ft^2

Channel Analysis: 8" PVC @ 0.1483 - CHANNEL ANALYSIS

Notes:

Input Parameters

Channel Type: Circular

Pipe Diameter: 1.5000 ft

Longitudinal Slope: 0.1483 ft/ft

Manning's n: 0.0120

Flow: 2.0380 cfs

Result Parameters

Depth: 0.2202 ft

Area of Flow: 0.1611 ft^2

Wetted Perimeter: 1.1797 ft

Hydraulic Radius: 0.1366 ft

Average Velocity: 12.6485 ft/s

Top Width: 1.0618 ft

Froude Number: 5.7220

Critical Depth: 0.5383 ft

Critical Velocity: 3.5733 ft/s

Critical Slope: 0.0042 ft/ft

Critical Top Width: 1.44 ft

Calculated Max Shear Stress: 2.0379 lb/ft^2

Calculated Avg Shear Stress: 1.2640 lb/ft^2

Channel Analysis: 8" PVC @ 0.1043 - CHANNEL ANALYSIS

Notes:

Input Parameters

Channel Type: Circular

Pipe Diameter: 1.5000 ft

Longitudinal Slope: 0.1483 ft/ft

Manning's n: 0.0120

Flow: 2.0380 cfs

Result Parameters

Depth: 0.2202 ft

Area of Flow: 0.1611 ft^2

Wetted Perimeter: 1.1797 ft

Hydraulic Radius: 0.1366 ft

Average Velocity: 12.6485 ft/s

Top Width: 1.0618 ft

Froude Number: 5.7220

Critical Depth: 0.5383 ft

Critical Velocity: 3.5733 ft/s

Critical Slope: 0.0042 ft/ft

Critical Top Width: 1.44 ft

Calculated Max Shear Stress: 2.0379 lb/ft^2

Calculated Avg Shear Stress: 1.2640 lb/ft^2

BARNARD EJMT TEAM

EISENHOWER/JOHNSON MEMORIAL TUNNEL

FIXED FIRE SUPPRESSION SYSTEM DESIGN BUILD PROJECT

Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

Revisions

Num	Description	Date

DRAWN BY: - CHECKED BY: -

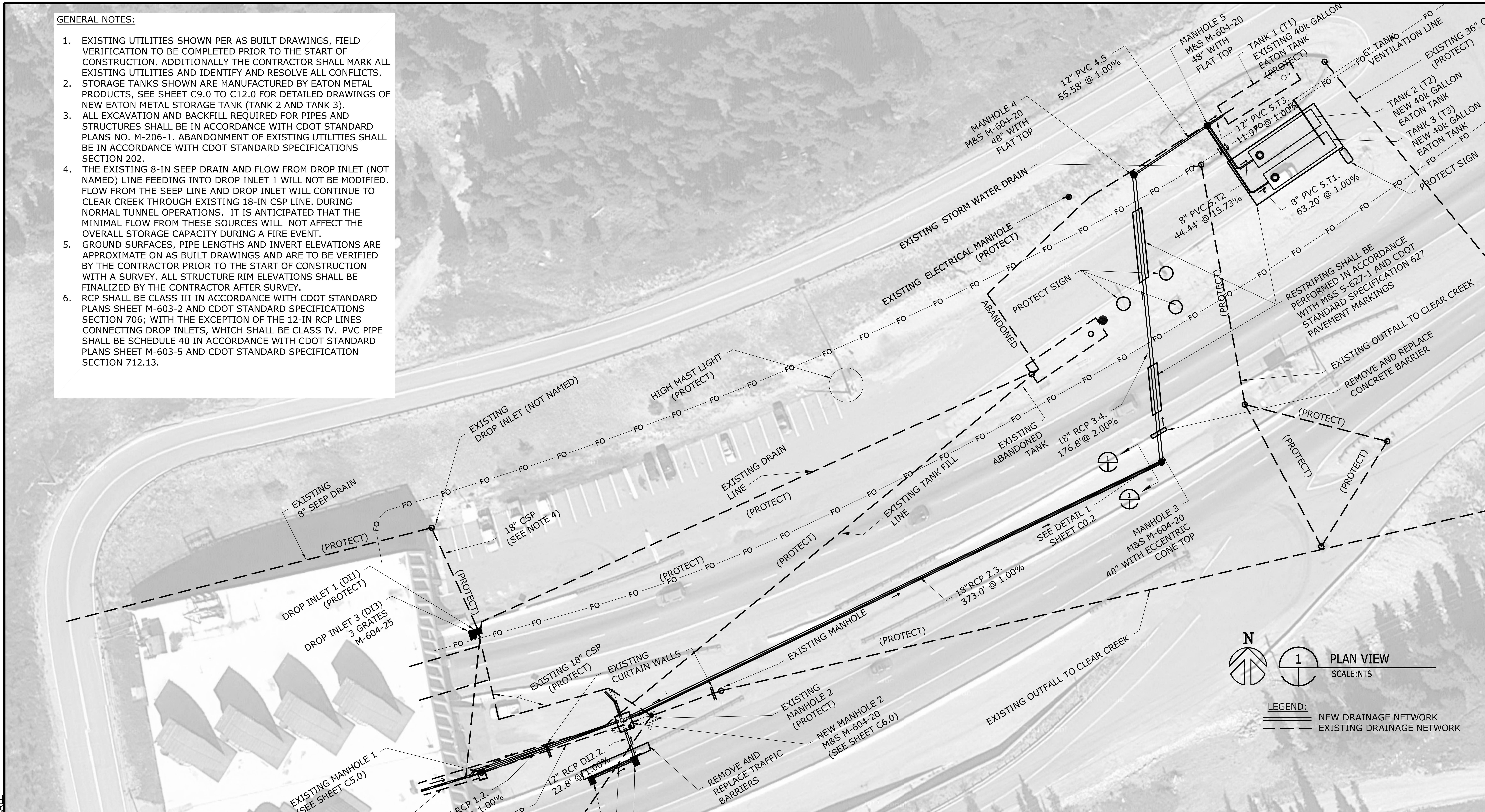
C0.3 HYDRAULIC ANALYSIS REPORTS

Drawing Number

C0.3

GENERAL NOTES:

1. EXISTING UTILITIES SHOWN PER AS BUILT DRAWINGS, FIELD VERIFICATION TO BE COMPLETED PRIOR TO THE START OF CONSTRUCTION. ADDITIONALLY THE CONTRACTOR SHALL MARK ALL EXISTING UTILITIES AND IDENTIFY AND RESOLVE ALL CONFLICTS.
2. STORAGE TANKS SHOWN ARE MANUFACTURED BY EATON METAL PRODUCTS, SEE SHEET C9.0 TO C12.0 FOR DETAILED DRAWINGS OF NEW EATON METAL STORAGE TANK (TANK 2 AND TANK 3).
3. ALL EXCAVATION AND BACKFILL REQUIRED FOR PIPES AND STRUCTURES SHALL BE IN ACCORDANCE WITH CDOT STANDARD PLANS NO. M-206-1. ABANDONMENT OF EXISTING UTILITIES SHALL BE IN ACCORDANCE WITH CDOT STANDARD SPECIFICATIONS SECTION 202.
4. THE EXISTING 8-IN SEEP DRAIN AND FLOW FROM DROP INLET (NOT NAMED) LINE FEEDING INTO DROP INLET 1 WILL NOT BE MODIFIED. FLOW FROM THE SEEP LINE AND DROP INLET WILL CONTINUE TO CLEAR CREEK THROUGH EXISTING 18-IN CSP LINE. DURING NORMAL TUNNEL OPERATIONS. IT IS ANTICIPATED THAT THE MINIMAL FLOW FROM THESE SOURCES WILL NOT AFFECT THE OVERALL STORAGE CAPACITY DURING A FIRE EVENT.
5. GROUND SURFACES, PIPE LENGTHS AND INVERT ELEVATIONS ARE APPROXIMATE ON AS BUILT DRAWINGS AND ARE TO BE VERIFIED BY THE CONTRACTOR PRIOR TO THE START OF CONSTRUCTION WITH A SURVEY. ALL STRUCTURE RIM ELEVATIONS SHALL BE FINALIZED BY THE CONTRACTOR AFTER SURVEY.
6. RCP SHALL BE CLASS III IN ACCORDANCE WITH CDOT STANDARD PLANS SHEET M-603-2 AND CDOT STANDARD SPECIFICATIONS SECTION 706; WITH THE EXCEPTION OF THE 12-IN RCP LINES CONNECTING DROP INLETS, WHICH SHALL BE CLASS IV. PVC PIPE SHALL BE SCHEDULE 40 IN ACCORDANCE WITH CDOT STANDARD PLANS SHEET M-603-5 AND CDOT STANDARD SPECIFICATION SECTION 712.13.



DRAINAGE PIPE HYDRAULIC INFORMATION *									
PIPE	TYPE / SIZE	INLET DETAILS			OUTLET DETAILS			SLOPE	LENGTH
		STRUCTURE	STATION, OFFSET	INVERT	STRUCTURE	STATION, OFFSET	INVERT	%	FT
PROFILE 1: FFSS DRAINAGE ALIGNMENT FROM MANHOLE 1 TO MANHOLE 5									
1.2.	RCP / 12"	MANHOLE 1	0+04	11005.42	MANHOLE 2	0+92.7	11004.47	1.00	88.70
2.3.	RCP / 18"	MANHOLE 2	1+00.3	11004.47	MANHOLE 3	4+62.1	10999.49	1.35	360.30
3.4.	RCP/18"	MANHOLE 3	4+66.1	10999.39	MANHOLE 4	5+76.2	10997.85	1.35	110.00
4.5.	RCP/18"	MANHOLE 4	5+80.2	10997.75	MANHOLE 5	6+30.4	10997.05	1.35	46.20
PROFILE 2: FFSS DRAINAGE ALIGNMENT FROM DROP INLETS									
DI2.2.	RCP / 12"	DROP INLET 2	0+97 , 15	11004.77	MANHOLE 2	0+97	11004.47	1.00	15.00
FFSS TANK CONNECTIONS: MANHOLES 4, 5 AND 6									
5.T3	PVC / 12"	MANHOLE 5	6+32.4, 2.0	10997.05	TANK 3	6+34.4 , 4.6	10997.02	1.00	2.90
5.6.	PVC / 12"	MANHOLE 5	6+34.4	10997.05	MANHOLE 6	6+47.48	10996.88	1.00	17.00
6.T2	PVC / 12"	MANHOLE 6	6+49.5, 2.0	10996.88	TANK 2	6+51.4, 4.8	10996.85	1.00	2.80
6.7.	PVC / 12"	MANHOLE 6	6+51.4	10996.88	MANHOLE 7	6+79.3	10996.55	1.00	31.80
7.T1	PVC / 12"	MANHOLE 7	6+81.3 , 2.0	10996.55	TANK 1	6+81.3 , 4.5	10996.51	1.00	4.50

* DESIGN FLOW RATE FOR ALL PIPE FLOWS IS 4.076 CFS.

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EISENHOWER/JOHNSON MEMORIAL TUNNEL

FIXED FIRE SUPPRESSION SYSTEM

DESIGN BUILD PROJECT

Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

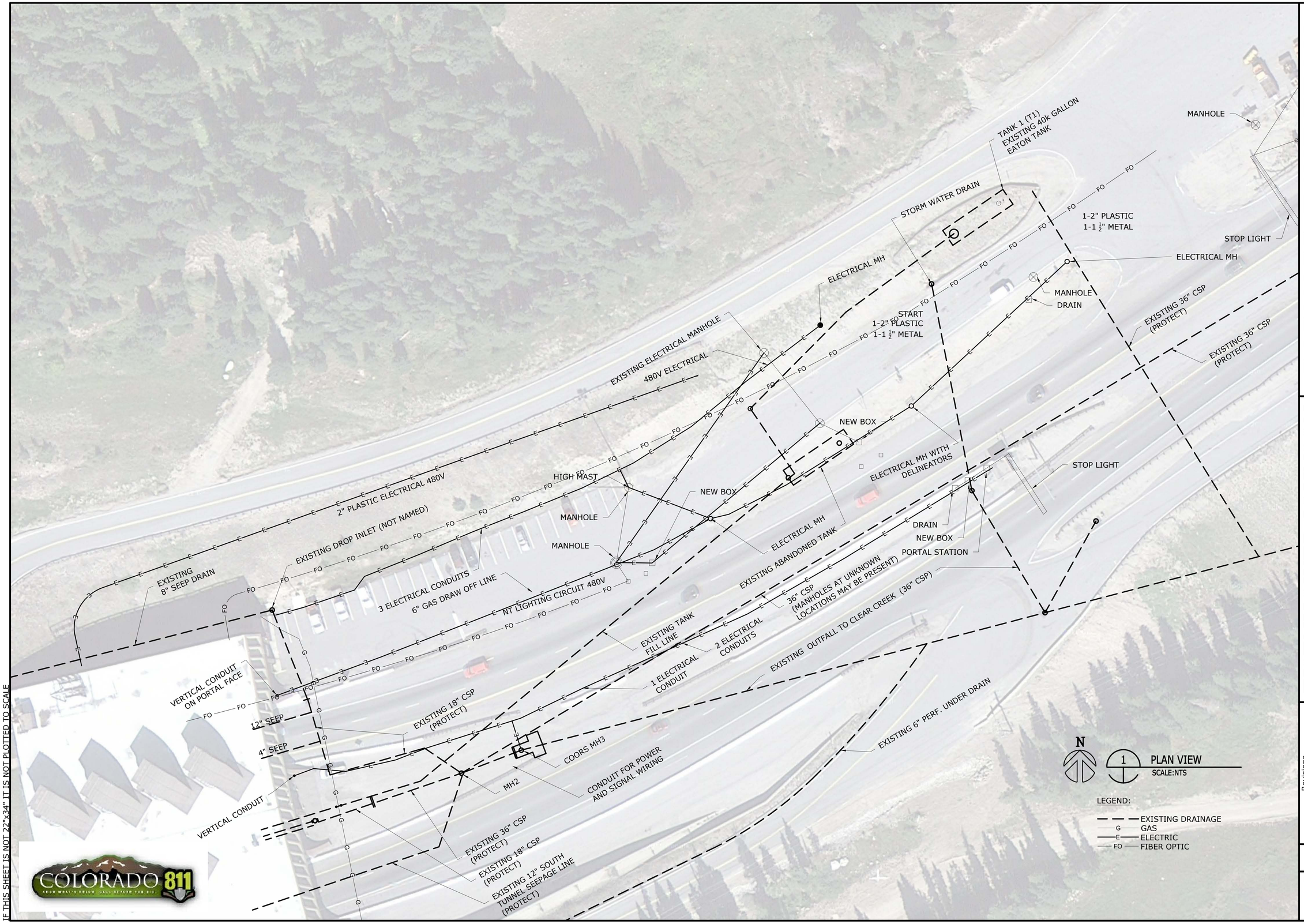
Num	Revisions Description	Date

DRAWN BY: JBC CHECKED BY: JM

EAST PORTAL BUILDING FFSS DRAINAGE PLAN

Drawing Number

C1.0



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Revisions

Num	Description	Date

DRAWN BY: JBC | CHECKED BY: JM

EAST PORTAL BUILDING
EXISTING UTILITIES

Drawing Number
C1.1

COLORADO COORDINATE SYSTEM, COLORADO CENTRAL ZONE

DATUM = NAD83(2011)
LATITUDE = 39° 40' 47.27144"
COMBINED FACTOR = 0.999460101
RECIPROCAL FACTOR = 1.000540191

TO GET STATE PLANE CENTRAL COORDINATES, MULTIPLY THE MODIFIED STATE PLANE COORDINATES SHOWN IN THIS ELECTRONIC FILE (OR WHICH ARE SHOWN HEREON) BY 0.999460101

ACCURACY CLASSIFICATION: NOAA THIRD ORDER-CLASS 1

US SURVEY FEET.

GENERAL NOTES:

1. THE FOLLOWING PROJECT COORDINATES DATUM SHALL BE UTILIZED FOR THE EJMT FFSS PROJECT AS TAKEN FROM THE COLORADO COORDINATE, COLORADO CENTRAL ZONE INFORMATION ABOVE.

   PROJECT COORDINATES ARE MODIFIED COLORADO STATE PLANE CENTRAL ZONE NAD'83/(07) COORDINATES. THE COMBINED ELEVATION /SCALE FACTOR USED TO MODIFY THE COORDINATES FROM STATE PLANE TO PROJECT COORDINATES IS 1.000510191. THE RESULTING PROJECT COORDINATES ARE TRUNCATED BY 1,000,000 FT IN THE NORTHING AND 2,000,000 FT IN THE EASTING AFTER CONVERTING FROM STATE PLANE COORDINATES TO PROJECT COORDINATES.

2. CONTRACTOR TO VERIFY AND COMMUNICATE TO THE ENGINEER THE HOLDPOINT INFORMATION SUMMARIZED IN TABLE 1. UPON CONFIRMATION OF DESIGN BY THE ENGINEER, CONTRACTOR WILL BE RELEASED IN WRITING TO PROCEED WITH THE WORK.

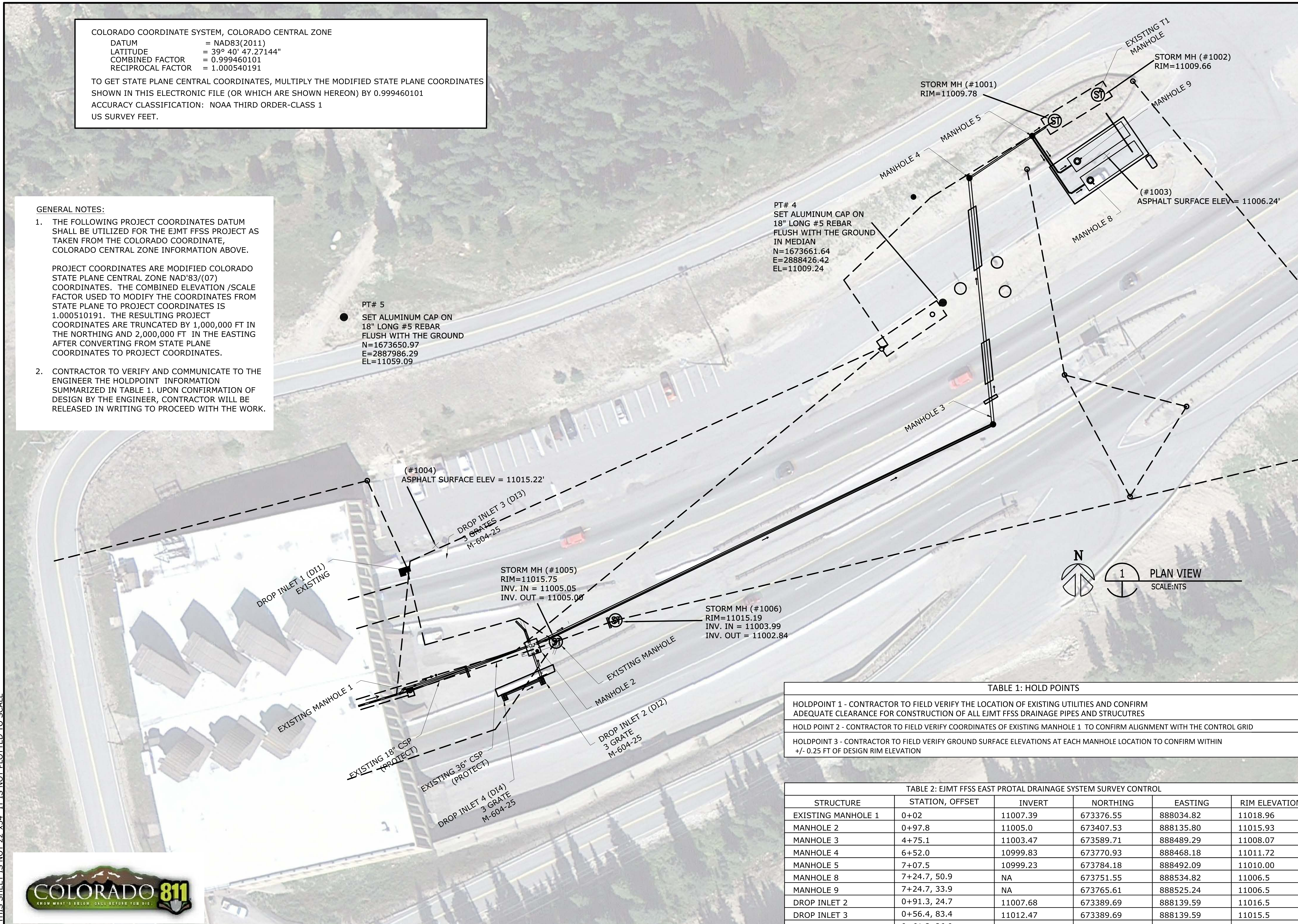

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TABLE 1: HOLD POINTS
HOLDPOINT 1 - CONTRACTOR TO FIELD VERIFY THE LOCATION OF EXISTING UTILITIES AND CONFIRM ADEQUATE CLEARANCE FOR CONSTRUCTION OF ALL EJMT FFSS DRAINAGE PIPES AND STRUCUTRES
HOLD POINT 2 - CONTRACTOR TO FIELD VERIFY COORDINATES OF EXISTING MANHOLE 1 TO CONFIRM ALIGNMENT WITH THE CONTROL GRID
HOLDPOINT 3 - CONTRACTOR TO FIELD VERIFY GROUND SURFACE ELEVATIONS AT EACH MANHOLE LOCATION TO CONFIRM WITHIN +/- 0.25 FT OF DESIGN RIM ELEVATION

TABLE 2: EJMT FFSS EAST PROTAL DRAINAGE SYSTEM SURVEY CONTROL

STRUCTURE	STATION, OFFSET	INVERT	NORTHING	EASTING	RIM ELEVATION
EXISTING MANHOLE 1	0+02	11007.39	673376.55	888034.82	11018.96
MANHOLE 2	0+97.8	11005.0	673407.53	888135.80	11015.93
MANHOLE 3	4+75.1	11003.47	673589.71	888489.29	11008.07
MANHOLE 4	6+52.0	10999.83	673770.93	888468.18	11011.72
MANHOLE 5	7+07.5	10999.23	673784.18	888492.09	11010.00
MANHOLE 8	7+24.7, 50.9	NA	673751.55	888534.82	11006.5
MANHOLE 9	7+24.7, 33.9	NA	673765.61	888525.24	11006.5
DROP INLET 2	0+91.3, 24.7	11007.68	673389.69	888139.59	11016.5
DROP INLET 3	0+56.4, 83.4	11012.47	673389.69	888139.59	11015.5
DROP INLET 4	0+61.3, 26.0	11013.15	673389.69	888139.59	11016.5

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FIXED FIRE SUPPRESSION SYSTEM DESIGN BUILD PROJECT

Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

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C1.2 SURVEY POINTS

Drawing Number

C1.2

GENERAL NOTES:

1. ALL EXCAVATION AND BACKFILL REQUIRED FOR PIPES AND STRUCTURES SHALL BE IN ACCORDANCE WITH CDOT STANDARD PLANS NO. M-206-1. ABANDONMENT OF EXISTING UTILITIES SHALL BE IN ACCORDANCE WITH CDOT STANDARD SPECIFICATIONS SECTION 202.
2. EXISTING UTILITIES SHOWN PER AS BUILT DRAWINGS, FIELD VERIFICATION TO BE COMPLETED PRIOR TO THE START OF CONSTRUCTION
3. THE EXISTING 8-IN SEEP DRAIN AND FLOW FROM THE DROP INLET (NOT NAMED) A LINE FEEDING INTO DROP INLET 1 WILL NOT BE MODIFIED. FLOW FROM THE SEEP LINE AND DROP INLET WILL CONTINUE TO CLEAR CREEK THROUGH THE EXISTING 18-IN CSP LINE DURING NORMAL TUNNEL OPERATIONS. IT IS ANTICIPATED THAT THE MINIMAL FLOW FROM THESE SOURCES WILL NOT AFFECT THE OVERALL STORAGE CAPACITY DURING A FIRE EVENT.
4. THE EXISTING 18-IN CSP PIPE TRANSITIONS TO THE EXISTING 36-IN CSP PIPE AT CURTAIN WALL 1.

EXISTING PIPING FROM EAST PORTAL BUILDING BASEMENT (18" DIP & 12" DIP)

SEAL EXISTING GAPS AND CRACKS IN BARRIER WITH TAR

EXISTING MANHOLE 1 (SEE SHEET C4.0)

RCP CONNECTION WAS MITERED, BUTTED TOGETHER, AND SEALED WITH CONCRETE COLLAR.

EXISTING U SIPHON

EXISTING 18" CSP

(PROTECT)

CURTAIN WALL 1 (SEE NOTE 3)

12" RCP 1.2. 89.3' @ 1.00%

EXISTING 12" SOUTH TUNNEL SEEPAGE LINE (PROTECT)

DROP INLET 4 (DI4) 3 GRATE M-604-25

EXISTING 36" CSP

12" RCP DI4.DI2. 25' @ 1.00%

12" RCP DI2.2. 15' @ 36%

EXISTING TANK FILL LINE

4 C6.0

RCP - CMP CONNECTION WAS SEALED WITH REINFORCED CONCRETE COLLAR.

MANHOLE 2
M&S M-604-20
(SEE SHEET C6.0 FOR STRUCTURE AND PIPE CONNECTION DETAILS)

RCP CONNECTION WAS MITERED, BUTTED TOGETHER, GROUTED ON THE INSIDE, AND SEALED WITH CONCRETE COLLAR.

DROP INLET 2 (DI2) 3 GRATE M-604-25

PRECAST BUMPER CURB

REMOVE AND REPLACE TRAFFIC BARRIERS

EXISTING MANHOLE 2 (PROTECT)

EXISTING 36" CSP

18" RCP 2.3. 373.08 @1.0%

EXISTING 12" SEEP LINE

EXISTING 4" SEEP LINE

EXISTING 8" SEEP DRAIN

EXISTING DROP INLET (NOT NAMED) (PROTECT)

DROP INLET 3 (DI3)

EXISTING 18" CSP

EXISTING DROP INLET 1 (D1) (SEE NOTE 2)

EXISTING 18" CSP (PROTECT)

N

1 PLAN VIEW
SCALE:NTS

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FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
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RECORD DRAWINGS - 2015-11-16

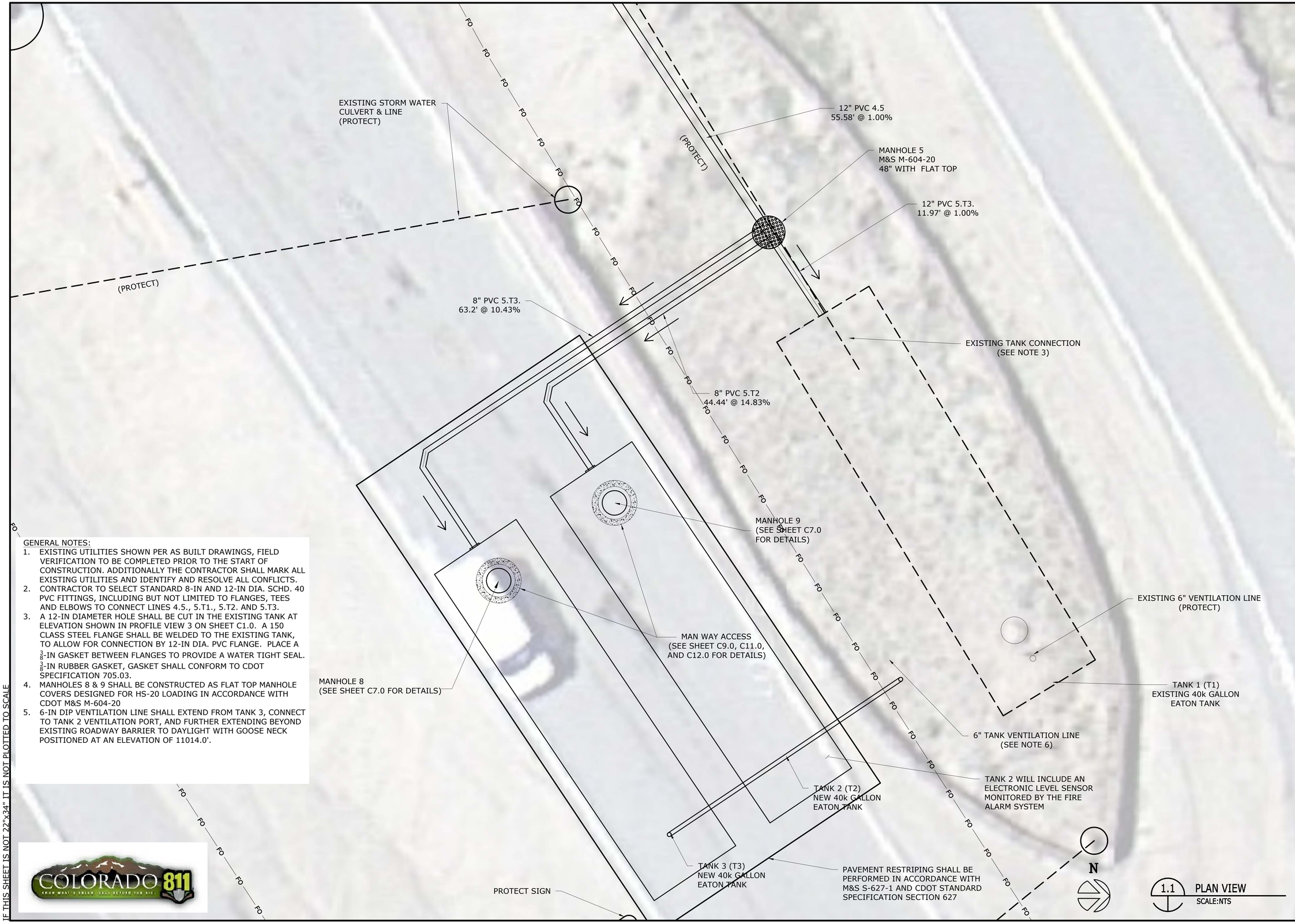
Revisions

Num	Description	Date

DRAWN BY: JBC CHECKED BY: JM

EAST PORTAL BUILDING FFSS DRAINAGE PLAN

Drawing Number
C2.0



GENERAL NOTES:

1. EXISTING UTILITIES SHOWN PER AS BUILT DRAWINGS, FIELD VERIFICATION TO BE COMPLETED PRIOR TO THE START OF CONSTRUCTION. ADDITIONALLY THE CONTRACTOR SHALL MARK ALL EXISTING UTILITIES AND IDENTIFY AND RESOLVE ALL CONFLICTS.
2. CONTRACTOR TO SELECT STANDARD 8-IN AND 12-IN DIA. SCHD. 40 PVC FITTINGS, INCLUDING BUT NOT LIMITED TO FLANGES, TEES AND ELBOWS TO CONNECT LINES 4.5., 5.T1., 5.T2. AND 5.T3.
3. A 12-IN DIAMETER HOLE SHALL BE CUT IN THE EXISTING TANK AT ELEVATION SHOWN IN PROFILE VIEW 3 ON SHEET C1.0. A 150 CLASS STEEL FLANGE SHALL BE WELDED TO THE EXISTING TANK, TO ALLOW FOR CONNECTION BY 12-IN DIA. PVC FLANGE. PLACE A [illegible]-IN GASKET BETWEEN FLANGES TO PROVIDE A WATER TIGHT SEAL. [illegible]-IN RUBBER GASKET, GASKET SHALL CONFORM TO CDOT SPECIFICATION 705.03.
4. MANHOLES 8 & 9 SHALL BE CONSTRUCTED AS FLAT TOP MANHOLE COVERS DESIGNED FOR HS-20 LOADING IN ACCORDANCE WITH CDOT M&S M-604-20
5. 6-IN DIP VENTILATION LINE SHALL EXTEND FROM TANK 3, CONNECT TO TANK 2 VENTILATION PORT, AND FURTHER EXTENDING BEYOND EXISTING ROADWAY BARRIER TO DAYLIGHT WITH GOOSE NECK POSITIONED AT AN ELEVATION OF 11014.0'.

1.1 PLAN VIEW
SCALE:NTS

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FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
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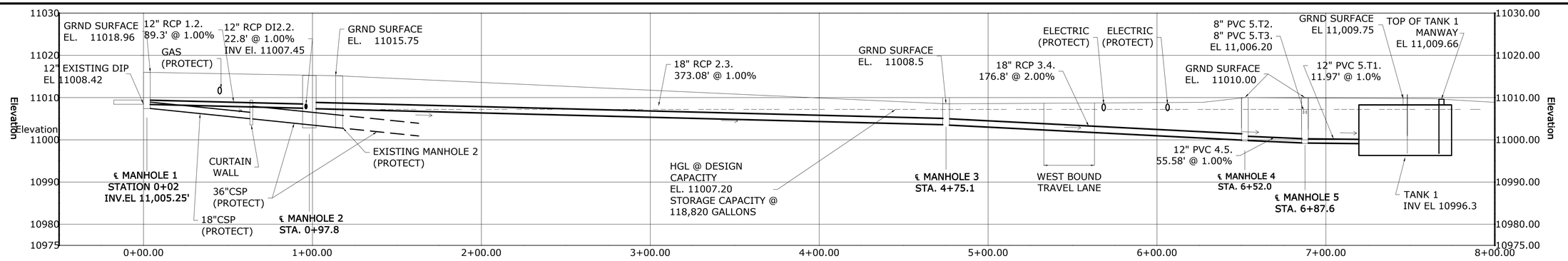
RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

DRAWN BY: JBC | CHECKED BY: JM

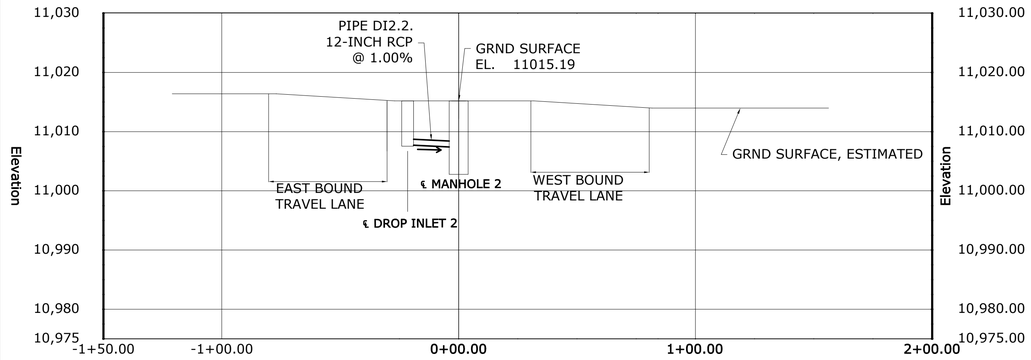
EAST PORTAL BUILDING
FFSS DRAINAGE PLAN

Drawing Number
C3.0



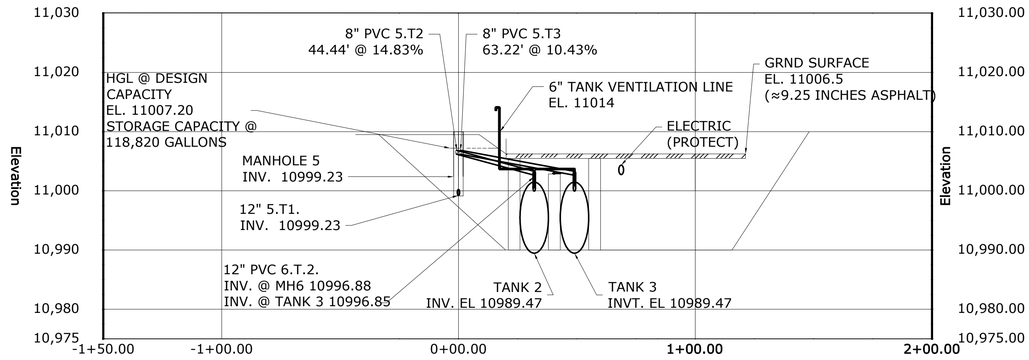
1 PROFILE 1: FFSS DRAINAGE ALIGNMENT FROM MANHOLE 1 TO TANK 1

SCALE:NTS



2 PROFILE 2: FFSS PIPE D2.2 ALIGNMENT

SCALE:NTS

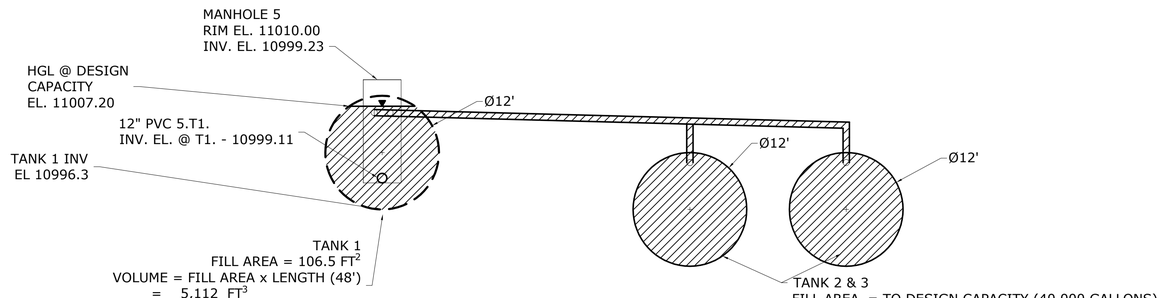


3 PROFILE 3: FFSS DRAINAGE MANHOLE 5 TO DISCHARGE STORAGE TANKS

SCALE:NTS

GENERAL NOTES:

1. GROUND SURFACE ELEVATIONS ARE ASSUMED BASED ON THE PROVIDED AS BUILT DRAWINGS AND SURVEY ELEVATION POINTS TAKEN. ALL ELEVATIONS INCLUDING; GROUND SURFACE, PIPE INVERTS, AND STRUCTURE RIM AND INVERTS, SHALL BE FIELD VERIFIED PRIOR TO START OF CONSTRUCTION.
2. DISCHARGE STORAGE TANKS SHOWN ARE MANUFACTURED BY EATON METAL PRODUCTS, SEE SHEETS C9.0 - C12.0 FOR DETAILED DRAWINGS OF NEW EATON METAL STORAGE TANK.
3. DETAILS REGARDING ELECTRONIC TANK LEVEL EQUIPMENT ARE PROVIDED ON FA SHEETS.
4. ALL NEW MANHOLES TO BE CONSTRUCTED SHALL CONFORM TO CDOT STANDARD PLAN NO. M-604-20.
5. THE DESIGN FLOW RATE FOR ALL PIPES IS 4.076 CFS WITH THE EXCEPTION OF 5.T2. AND 5.T3. WHICH ASSUMES EACH 8 INCH PIPE WILL CARRY HALF THE DESIGN FLOW AT 2.038 CFS. THE STATED FLOW RATES CORRELATE TO THE MOST DEMANDING FFSS TWO ZONES ACTIVATED AND THE EXISTING STANDPIPE SYSTEM.



TOTAL STORAGE TANK VOLUME
= TANK 1 + TANKS 2&3
≈ 118,240 GALLONS

MOST DEMANDING FFSS TWO ZONES =
1328 GPM x 60 MINUTES = 79,680 GAL
EXISTING STANDPIPE = 500 GPM x 60 MINUTES = 30,000 GAL
TOTAL DRAINAGE = 109,680 GAL

4 VOLUME CALCULATIONS

SCALE:NTS

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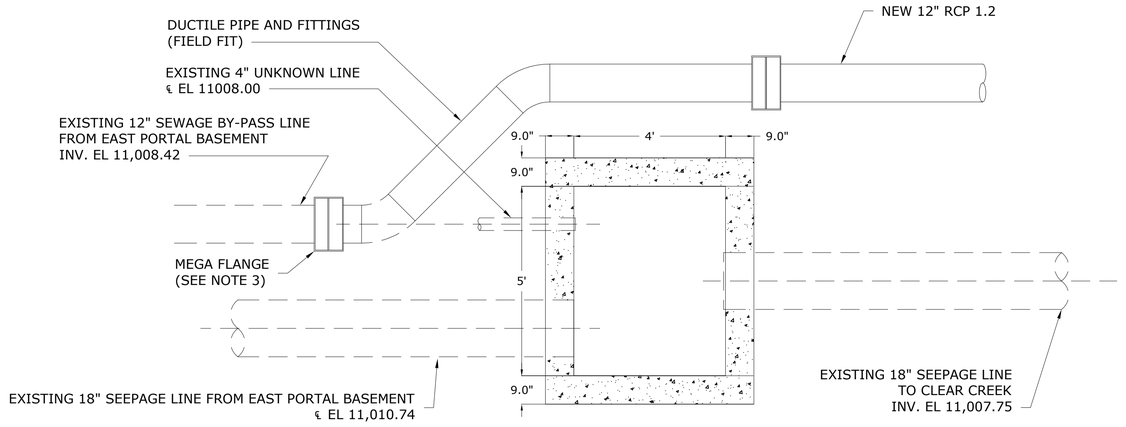
RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

DRAWN BY: JBC CHECKED BY: JM

EAST PORTAL BUILDING
FFSS DRAINAGE PROFILE

Drawing Number
C4.0



1 EXISTING MANHOLE 1 PLAN VIEW
SCALE:1/2" = 1'-0"

GENERAL NOTES:

1. ALL ELEVATIONS PROVIDED SHALL BE FIELD VERIFIED PRIOR TO START OF CONSTRUCTION.
2. CARE SHALL BE TAKEN TO LIMIT DAMAGE TO EXISTING PIPES AND STRUCTURES.
3. 150 CLASS FLANGE SHALL BE USED FOR CONNECTION OF 12-IN PIPE.
4. A PIPE JOINT SEALING COMPOUND SHALL BE USED IN ACCORDANCE WITH CDOT STANDARD SPECIFICATION 705.04 FOR ALL APPLICABLE PIPE JOINTS.
5. ALL EXCAVATIONS AND BACKFILL SHALL BE IN ACCORDANCE WITH CDOT STANDARD PLANS M-206-1.
6. THE CONTRACTOR SHALL VERIFY THE EXISTING ROADWAY MATERIAL PRIOR TO THE START OF CONSTRUCTION. MILL AND OVERLAY OF EXISTING ASPHALT WILL BE PROVIDED ADJACENT TO DRAINAGE PIPE IN ROADWAY.

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

COLORADO 811 KNOW WHAT'S BELOW CALL BEFORE YOU DIG.

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RONDINELLI
BCER Engineering
Sturgeon Electric
Western States Fire Protection Co.
CLW CONSULTING ENGINEERS

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810

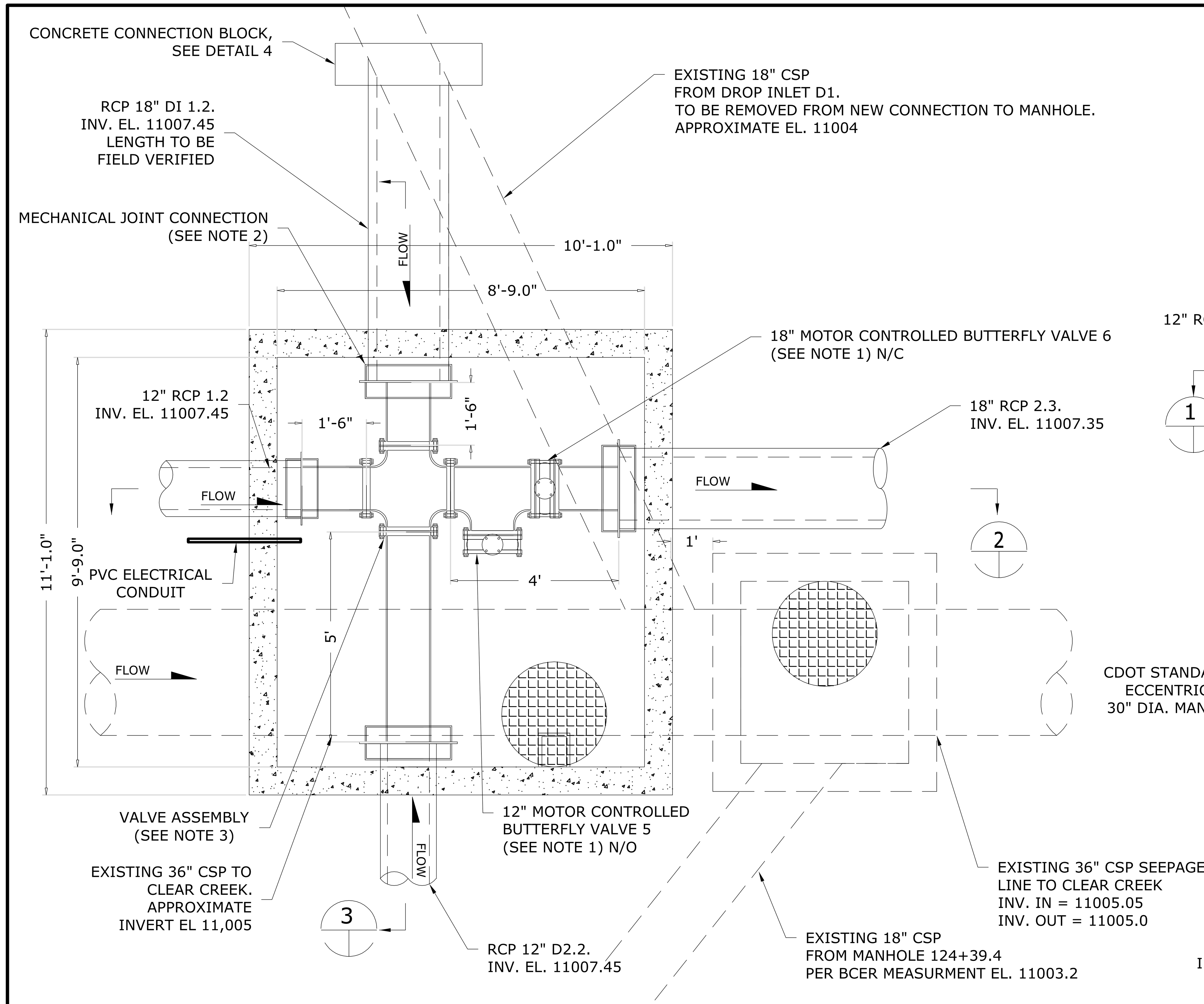
RECORD DRAWINGS - 2015-11-16

Revisions
Num | Description | Date

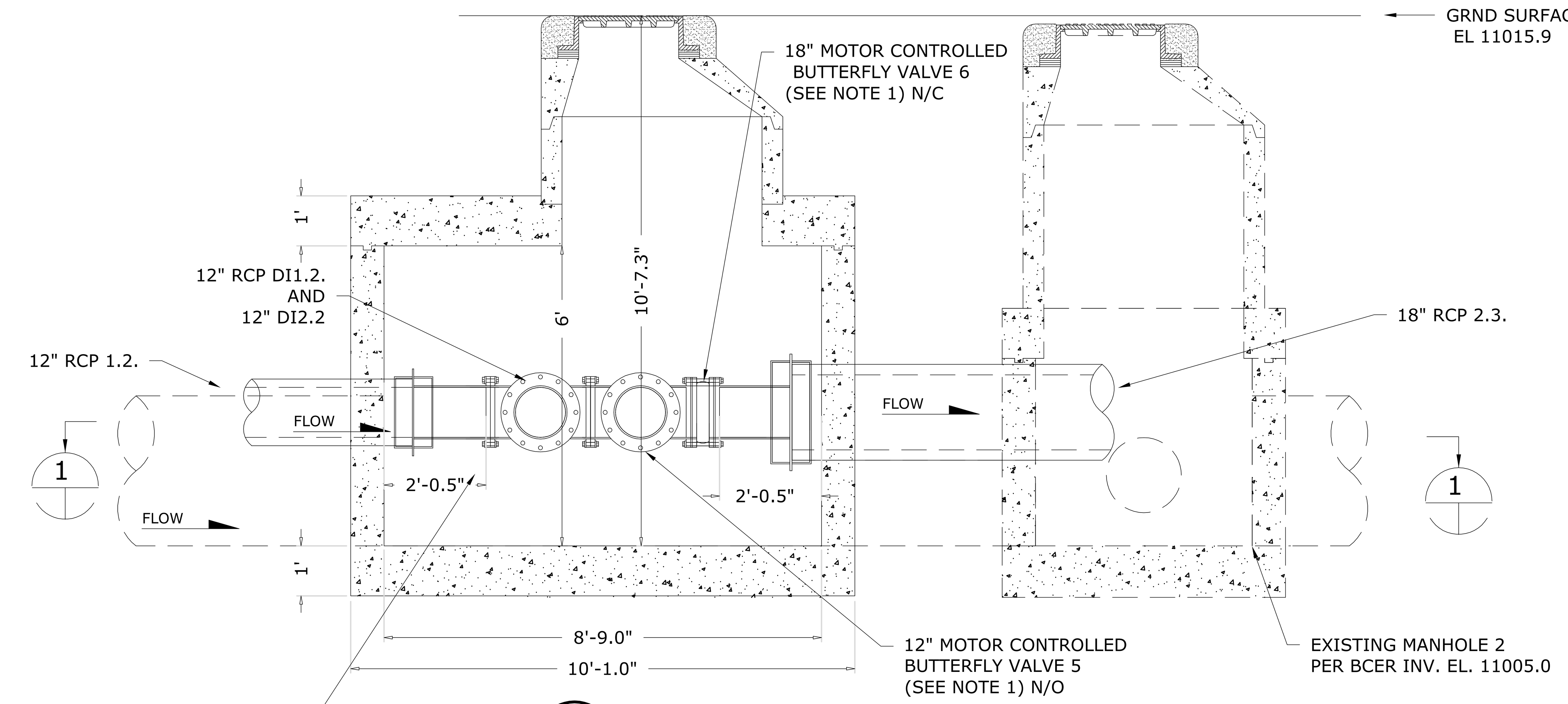
DRAWN BY: JBC | CHECKED BY: JM

EXISTING MANHOLE 1

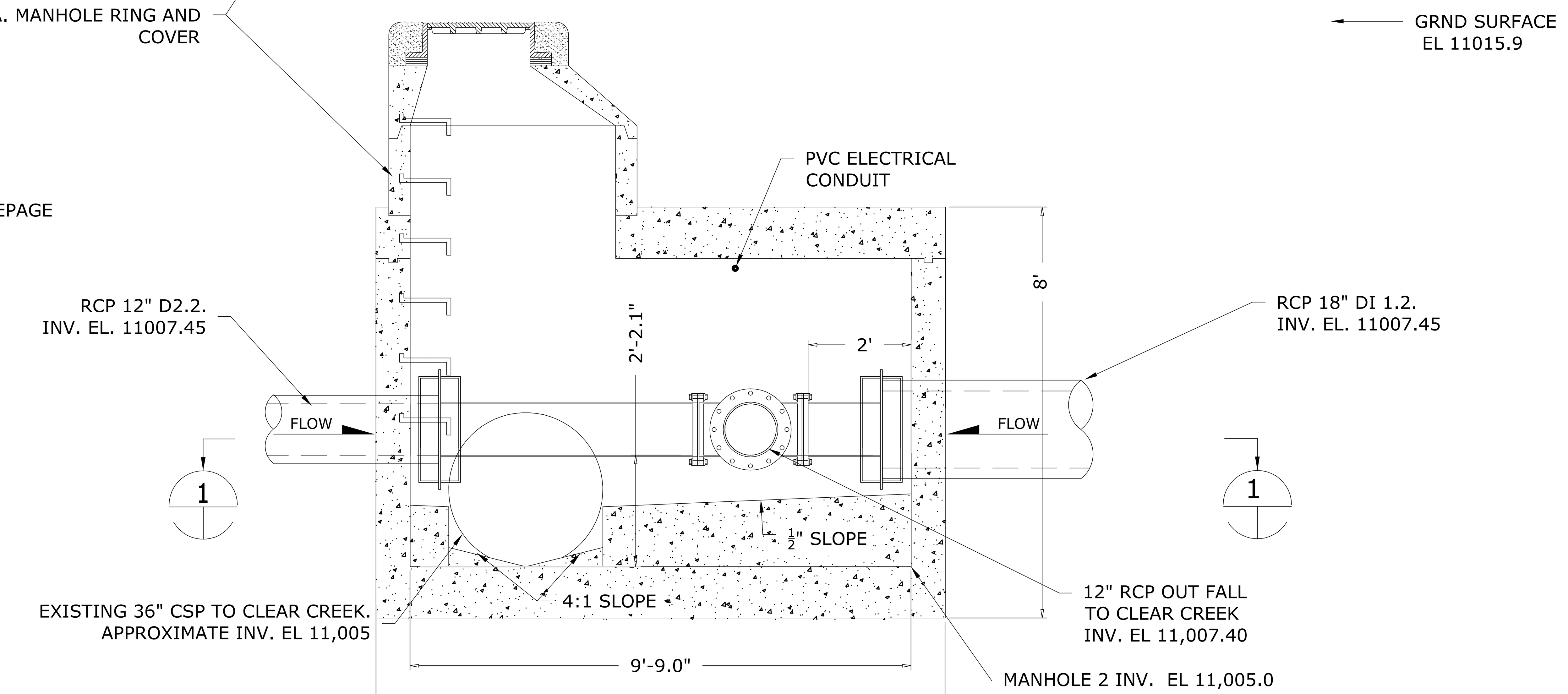
Drawing Number
C5.0



1 PLAN VIEW MANHOLE 2
SCALE:1/2" = 1'-0"



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



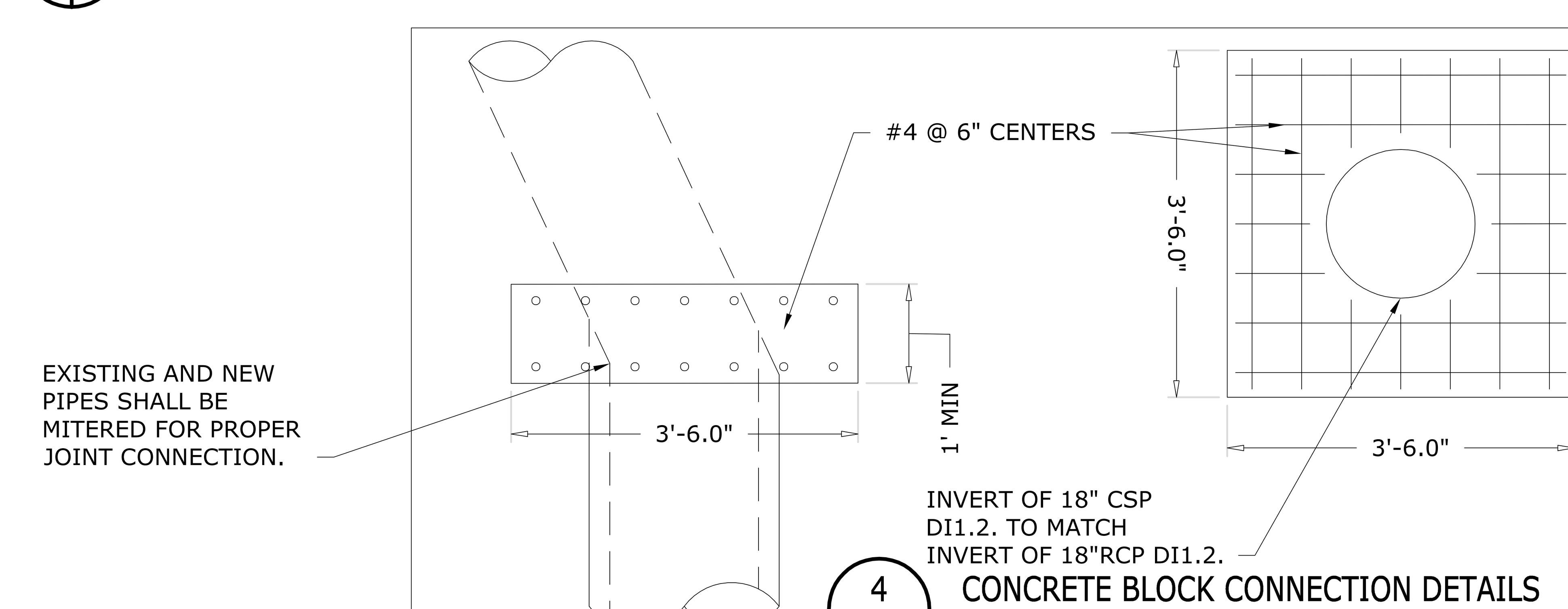
3 MANHOLE 2 SECTION
SCALE:1/2" = 1'-0"

GENERAL NOTES:

1. MOTOR CONTROLLED ELECTRONIC BUTTERFLY VALVES (SEE SHEET M6.4 FOR VALVE SPECIFICATIONS)
2. A MECHANICAL JOINT CONNECTION SIMILAR TO ROMAC FC4000 FLANGED SHALL BE USED BETWEEN CONNECTION OF ALL RCP PIPES TO STEEL PIPES INSIDE OF THE MANHOLE BOX. THE MECHANICAL JOINT SHALL BE CONSTRUCTED SUCH THAT THE PIPE INVERTS ARE MATCHING. THE REINFORCED CONCRETE PIPES SHALL BE PASS THROUGH THE MANHOLE WALL AND BE HAND PACKED WITH GROUT AT THE MANHOLE WALL.
3. THE VALVE ASSEMBLY SHALL BE FITTED TOGETHER UTILIZING 150 CLASS DIP CONNECTIONS AND VALVES. THE VALVE ASSEMBLE IS DISCUSSED AS ALL PIPE, FITTINGS AND VALVES CONNECTED WITHIN MANHOLE 2.
4. ALL ELEVATIONS PROVIDED SHALL BE FIELD VERIFIED PRIOR TO START OF CONSTRUCTION.
5. THE MANHOLE SHALL BE CONSTRUCTED IN ACCORDANCE WITH CDOT M&S M-604-20, INCLUDING BUT NOT LIMITED TO REINFORCEMENT, STEPS COVER AND FLOW CHANNEL. REINFORCEMENT SHALL CONSIST OF DEFORMED BARS ONLY PER ASTM A615.
6. RCP SHALL BE CLASS II IN ACCORDANCE WITH CDOT STANDARD PLANS SHEET M-603-2 AND CDOT STANDARD SPECIFICATIONS SECTION 706.
7. CARE SHALL BE TAKEN TO LIMIT DAMAGE TO EXISTING PIPES.
8. A PIPE JOINT SEALING COMPOUND SHALL BE USED IN ACCORDANCE WITH CDOT STANDARD SPECIFICATION 705.04 FOR ALL APPLICABLE PIPE JOINTS. RCP PIPE PROTRUSIONS THROUGH STRUCTURE WALL SHALL BE HAND PACKED WITH GROUT TO PROVIDE WATER TIGHT SEAL THROUGH STRUCTURE WALL.
9. THE PRECAST MANHOLE SUPPLIER SELECTED BY THE CONTRACTOR SHALL PROVIDE STAMPED STRUCTURAL REINFORCEMENT DRAWINGS AND CALCULATIONS FOR MANHOLE 2, PRIOR TO THE START OF MANHOLE 2 EXCAVATION AND PLACEMENT. CALCULATIONS SHALL SHOW THAT THE STRUCTURE IS DESIGNED FOR HS-20 LOADING.
10. THE 36-IN CSP PIPE SHALL BE OPEN WITHIN THE NEW MANHOLE 2. A FLOW CHANNEL SHALL BE CONSTRUCTED IN ACCORDANCE WITH M&S M-604-20.

VALVE DURATION TABLE

INFLOW	OPERATION	V5 12" VALVE	V6 12" VALVE	OUTFLOW
RCP 1.2, RCP D1.2, RCP D2.2	NORMAL TUNNEL OPERATION	OPEN	CLOSED	36" CSP TO CLEAR CREEK
RCP 1.2, RCP D1.2, RCP D2.2	FFSS EVENT	CLOSED	OPEN	RCP 2.3. TO TANKS



4 CONCRETE BLOCK CONNECTION DETAILS
SCALE:3/4" = 1'-0"

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

DRAWN BY: JBC
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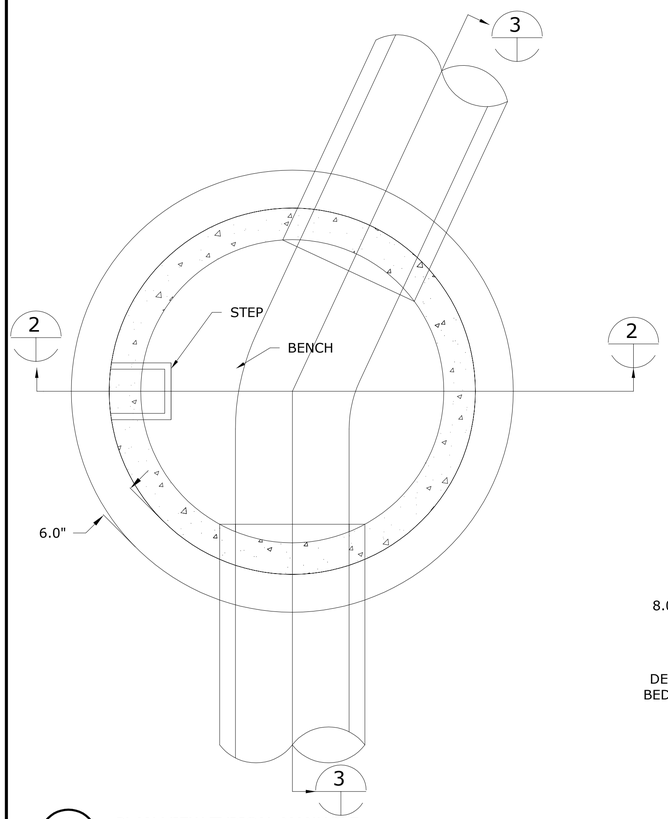
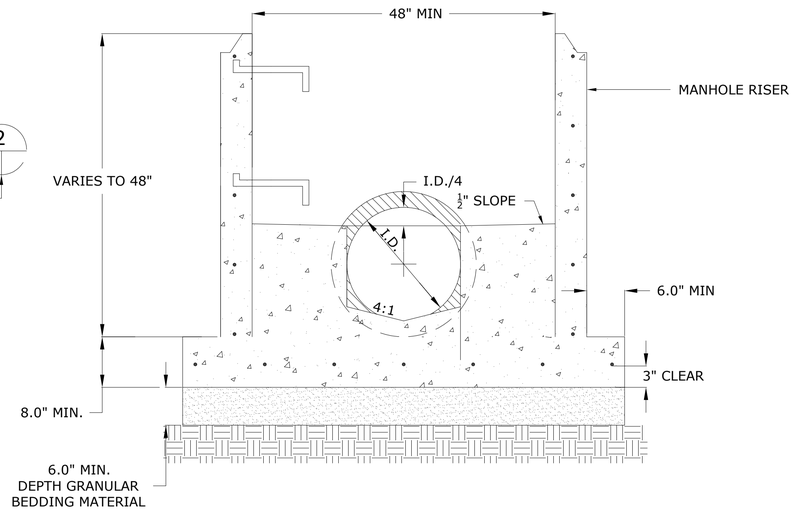
MANHOLE 2

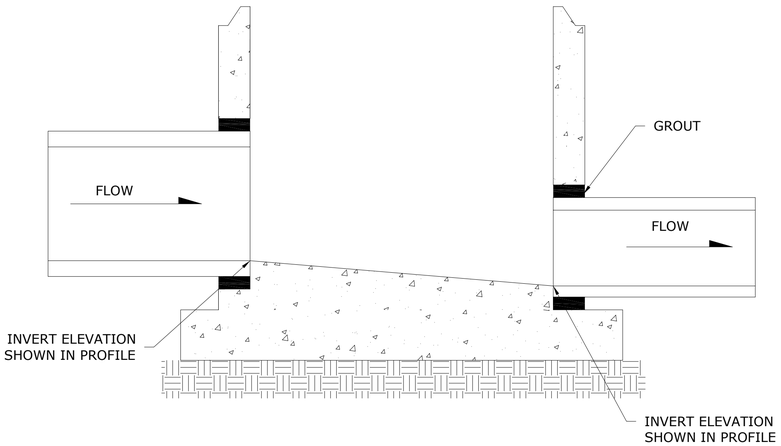
Drawing Number
C6.0



1 PLAN VIEW TYPICAL MANHOLE
SCALE:1" = 1'-0"



2 SECTION VIEW TYPICAL MANHOLE
SCALE:1" = 1'-0"



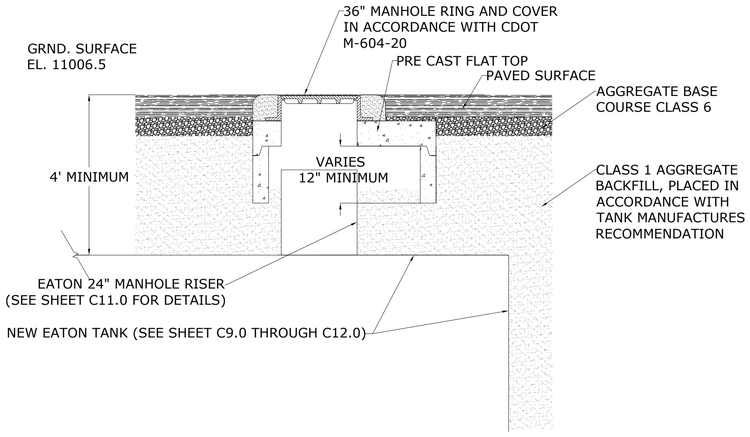
3 SECTION VIEW TYPICAL MANHOLE
SCALE:1" = 1'-0"

MANHOLE TABLE INFORMATION

STRUCTURE	TYPE / SIZE	STATION	OFFSET	INLET DETAILS			Angle	OUTLET DETAILS			DROP ACROSS MANHOLE
				PIPE	STATION	INVERT	deg	PIPE	STATION	INVERT	FT
MANHOLE 3	PRECAST 48–in ROUND	4+64.2	0.00	2.3.	4+64.2	10999.49	113.00	3.4.	4+68.2	10999.39	0.10
MANHOLE 4	PRECAST 48–in ROUND	5+80.2	0.00	3.4.	5+78.2	10997.85	118.00	4.5.	5+82.2	10997.75	0.10
MANHOLE 5	PRECAST 48–in ROUND	6+32.4	0.00	4.5.	6+30.4	10997.05	0.00	5.6., 5.T3.	6+34.4	10997.05	0.00
MANHOLE 6	PRECAST 48–in ROUND	6+49.5	0.00	5.6.	6+34.4	10996.88	0.00	6.7., 6.T2	6+51.4	10996.88	0.00
MANHOLE 7	PRECAST 48–in ROUND	6+81.3	0.00	6.7.	6+51.4	10996.55	0.00	7.T1	6+51.4	10996.55	0.00
MANHOLE 8	PRECAST 48–in ROUND	6+32.4	41.50	NA			NA	NA			0.00
MANHOLE 9	PRECAST 48–in ROUND	6+49.5	41.50	NA			NA	NA			0.00

GENERAL NOTES:

1. THE BASE SLAB SHALL BE POURED MONOLITHICALLY WITH BOTTOM RISER SECTION.
2. PRECAST MANHOLE BASES SHALL FIT THE CONDITIONS AND LOCATIONS FOR WHICH THEY ARE INTENDED WITHOUT ANY FIELD MODIFICATIONS.
3. PRECAST MANHOLE BASES SHALL BE BEDDED ON AN APPROVED GRANULAR BEDDING MATERIAL AS SPECIFIED IN CDOT STANDARD SPECIFICATION SECTION 603.05.
4. CONTRACTOR TO SELECT STANDARD 12-IN DIA. AND 8-IN DIA. SCHD. 40 PVC FITTINGS, INCLUDING BUT NOT LIMITED TO FLANGES, TEES AND ELBOWS TO CONNECT LINES 4.5., 5.T1., 5.T2., AND 5.T3..
5. ALL MANHOLES SHALL BE CONSTRUCTED IN ACCORDANCE WITH CDOT M&S M-604-20, INCLUDING BUT NOT LIMITED TO REINFORCEMENT, STEPS, COVER AND FLOW CHANNEL. REINFORCEMENT SHALL CONSIST OF DEFORMED BARS ONLY PER ASTM A615.
6. MANHOLE FRAMES AND COVERS CONSTRUCTED OUTSIDE OF THE ROADWAY SHALL BE PLACED 6-IN ABOVE FINAL GRADE.



4 SECTION VIEW MANHOLES 8 & 9
SCALE:1" = 1'-0"

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BARNARD EJMT TEAM
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CONSULTING ENGINEERS
BCER engineering
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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
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RECORD DRAWINGS - 2015-11-16

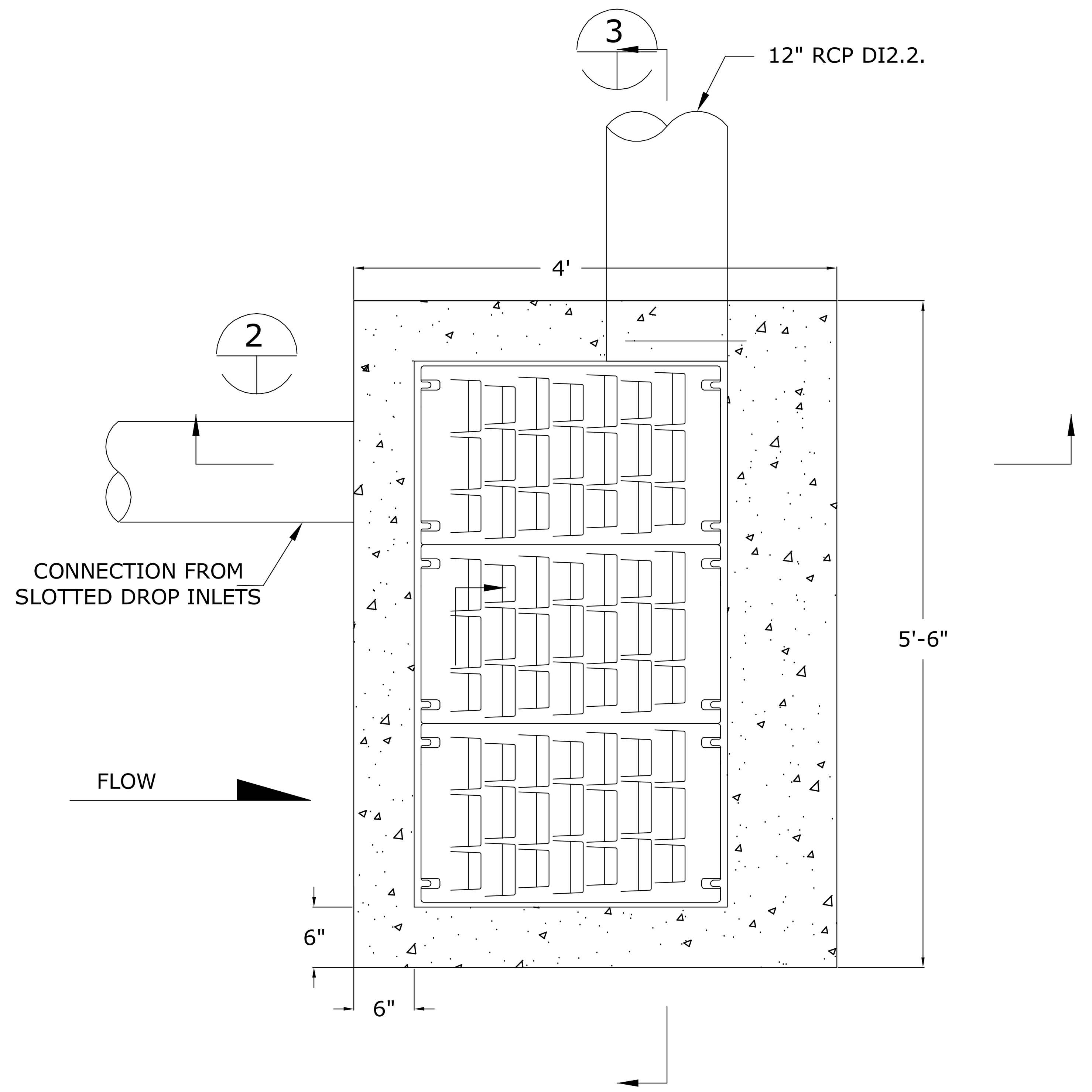
Revisions
Num | Description | Date
DRAWN BY: JBC | CHECKED BY: JM

MANHOLE DETAILS

Drawing Number
C7.0

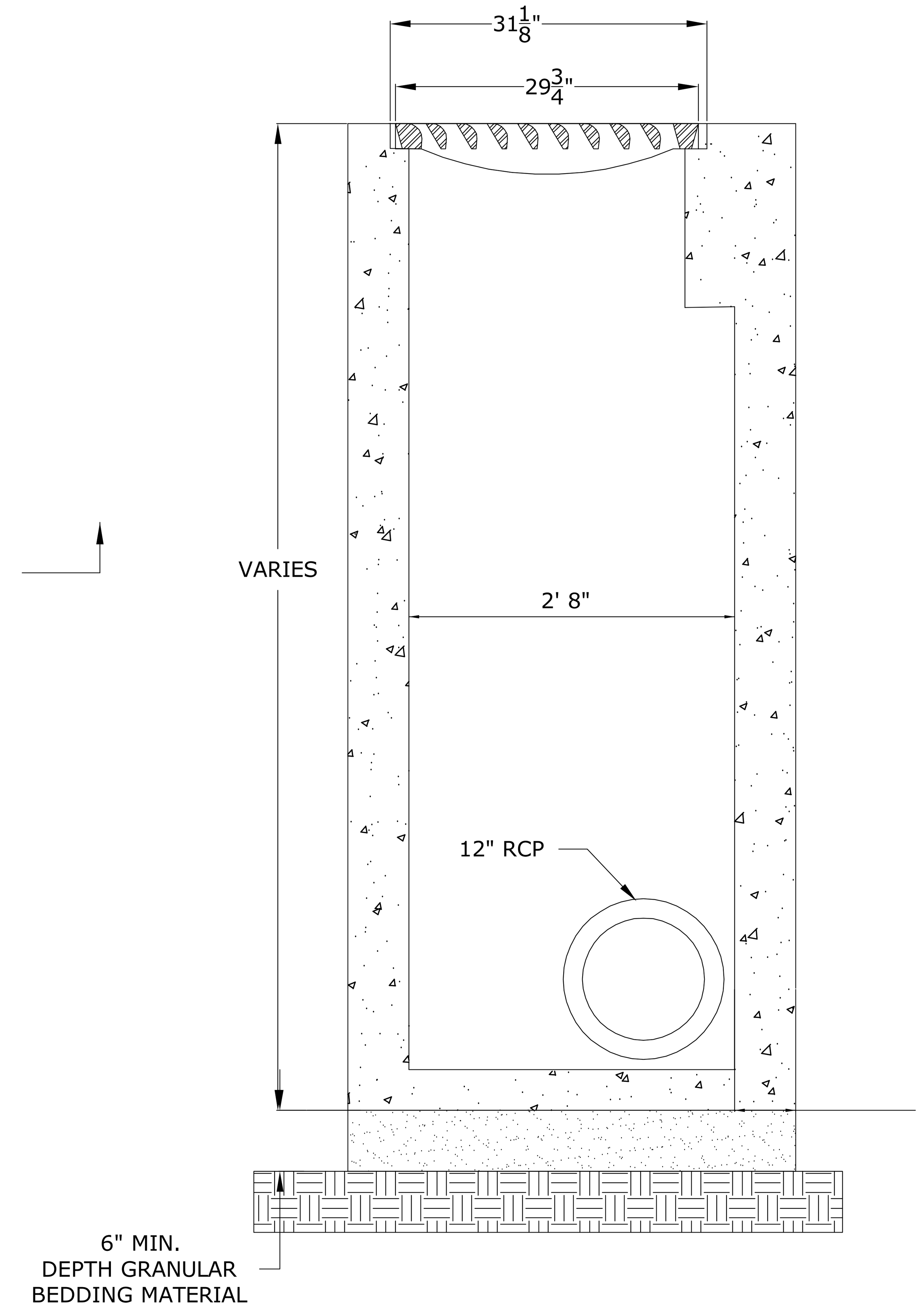
GENERAL NOTES:

1. DROP INLET STRUCTURES SHALL CONFORM TO CDOT STANDARD PLANS M-604-25, VANE GRATE INLET INCLUDING BUT NOT LIMITED TO REINFORCING.
2. PRECAST DROP INLET SHALL BE BEDDED ON AN APPROVED GRANULAR BEDDING MATERIAL AS SPECIFIED IN CDOT STANDARD SPECIFICATION SECTION 603.05.
3. IT IS ASSUMED THAT THE SHOULDER OF THE TRAVEL LANES IS 9 FT. CONTRACTOR WILL CONFIRM SHOULDER WIDTH WITH SURVEY PRIOR TO START OF CONSTRUCTION. CURRENT LANE IMPACT WITH 5.5 FT WIDE DROP INLET BOX AND 2 FT WIDE APPROACH CHANNEL WILL NOT IMPACT LANE CONFIGURATION.
4. CONTRACTOR TO CONFIRM SURFACE ELEVATION AND PROVIDE DROP INLET BOX WITH APPROPRIATE DEPTH SUCH THAT INVERT ELEVATIONS SHOWN IN THE DROP INLET INFORMATION TABLE AND THE SURFACE CAN BE LEVELED AS SHOWN IN THE DRAWINGS AND DISCUSSED IN NOTE 5 BELOW.
5. THE CONCRETE AND/OR ASPHALT TO BE PLACED AT THE SURFACE OF THE DROP INLET BOX SHALL BE PLACED TO MATCH THE EXISTING CROSS-SLOPE GUTTER AND A MINIMUM GUTTER WIDTH OF 9.0FT. THE LONGITUDINAL SLOPE OF THE ROAD IS ASSUMED TO BE 0.016 (FT/FT) FOR THE EAST BOUND LANE OF TRAVEL WITH A CROSS-SLOPE OF PAVEMENT ASSUMED AT 0.04 (FT/FT) AND 0.009 (FT/FT) FOR THE WEST BOUND LANE OF TRAVEL WITH A CROSS-SLOPE OF PAVEMENT ASSUMED AT 0.05 (FT/FT) .
6. A PIPE JOINT SEALING COMPOUND SHALL BE USED IN ACCORDANCE WITH CDOT STANDARD SPECIFICATION 705.04 FOR ALL APPLICABLE PIPE JOINTS. RCP PIPE PROTRUSIONS THROUGH STRUCTURE WALL SHALL BE HAND PACKED WITH GROUT TO PROVIDE WATER TIGHT SEAL THROUGH STRUCTURE WALL.



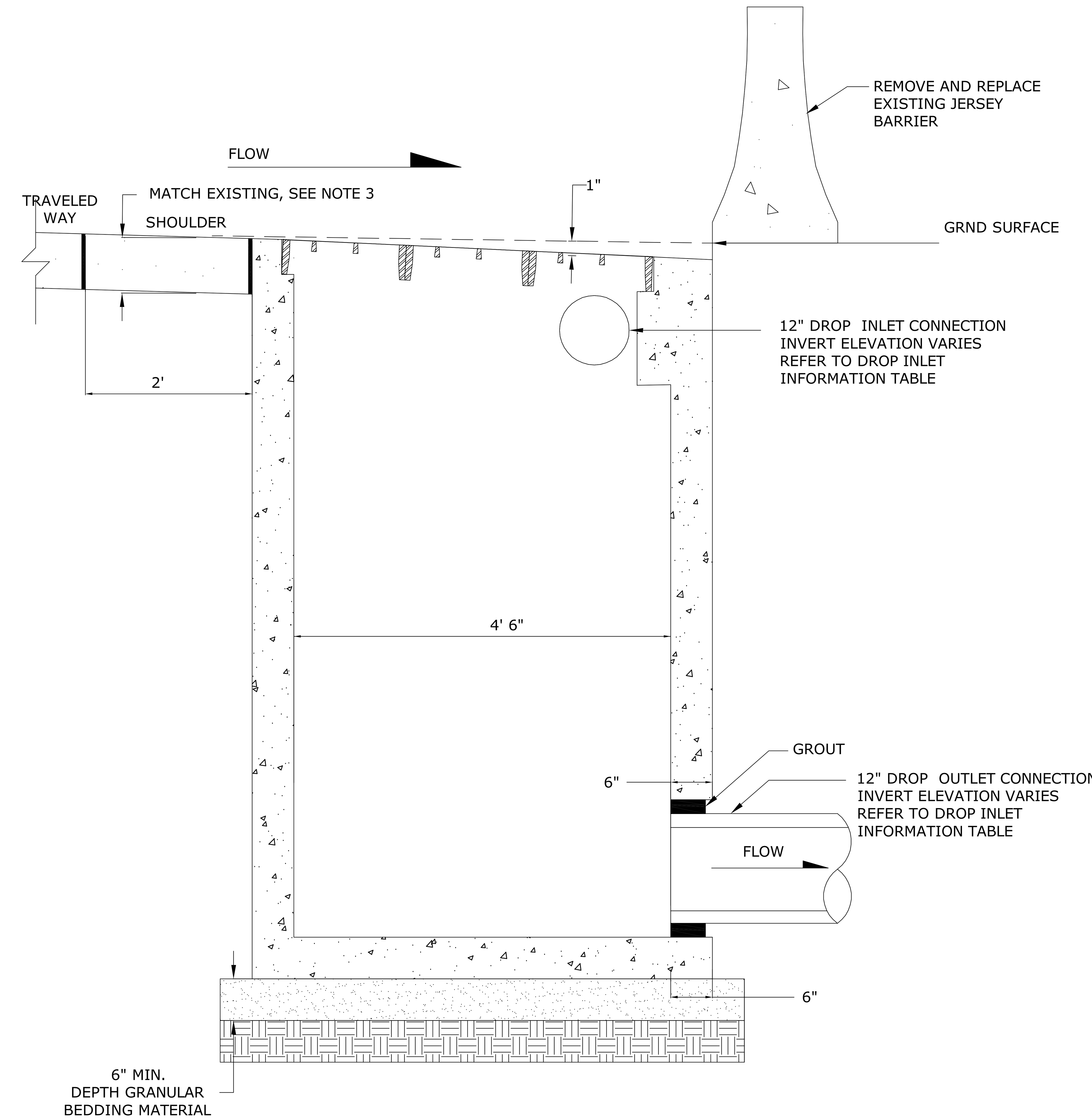
1 PLAN VIEW DROP INLET TYPICAL

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



2 SECTION VIEW TYPICAL DROP INLET

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



3 SECTION VIEW TYPICAL DROP INLET

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

DROP INLET INFORMATION TABLE

STRUCTURE	TYPE / SIZE	STATION	OFFSET	RIM ELEVATION	INLET DETAILS PIPE	INLET DETAILS STATION	INLET DETAILS INVERT	Angle deg	OUTLET DETAILS PIPE	OUTLET DETAILS STATION	OUTLET DETAILS INVERT
DROP INLET 1	EXISTING 40" X 40"	0+32.0	86.0	11015.5	DI3.DI1.	0+29.4	11012.22	0	EXISTING	NA	NA
DROP INLET 2	SEE SHEET 8.1 FOR DROP INLET 3 INFORMATION										
DROP INLET 3	VANE GRATE INLET (3 GRATE)	0+56.4	83.4	11015.5	NA	NA	NA	0	DI3.DI1.	0+54.3, 82.0	11012.47
DROP INLET 4	VANE GRATE INLET (3 GRATE)	0+61.3	26.0	11016.5	NA	NA	NA	0	DI4.DI2.	0+63.4, 27.4	11013.15

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BARNARD EJMT TEAM

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions

Num	Description	Date

DRAWN BY: JBC CHECKED BY: JM

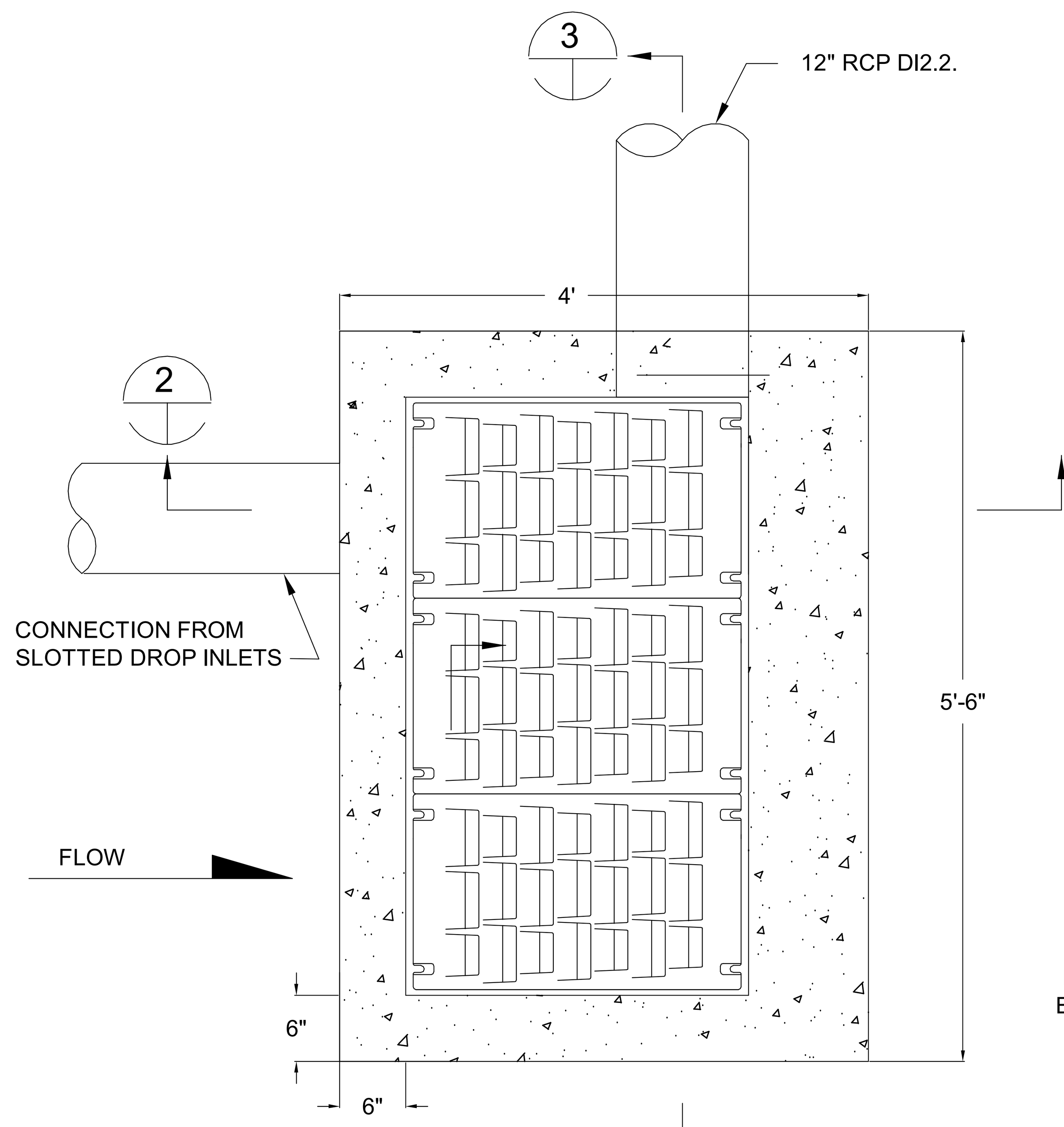
DROP INLET DETAILS

Drawing Number

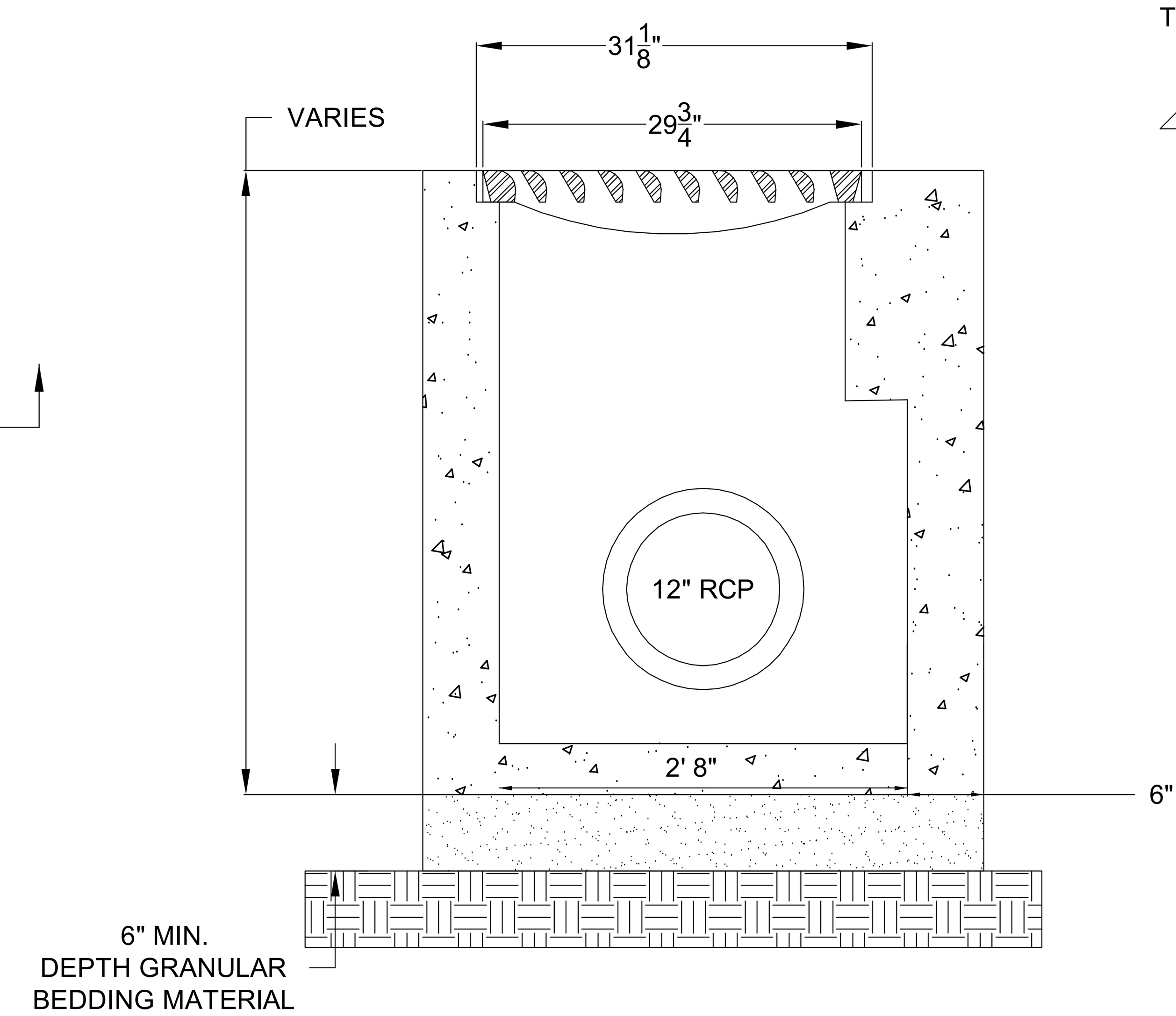
C8.0

GENERAL NOTES:

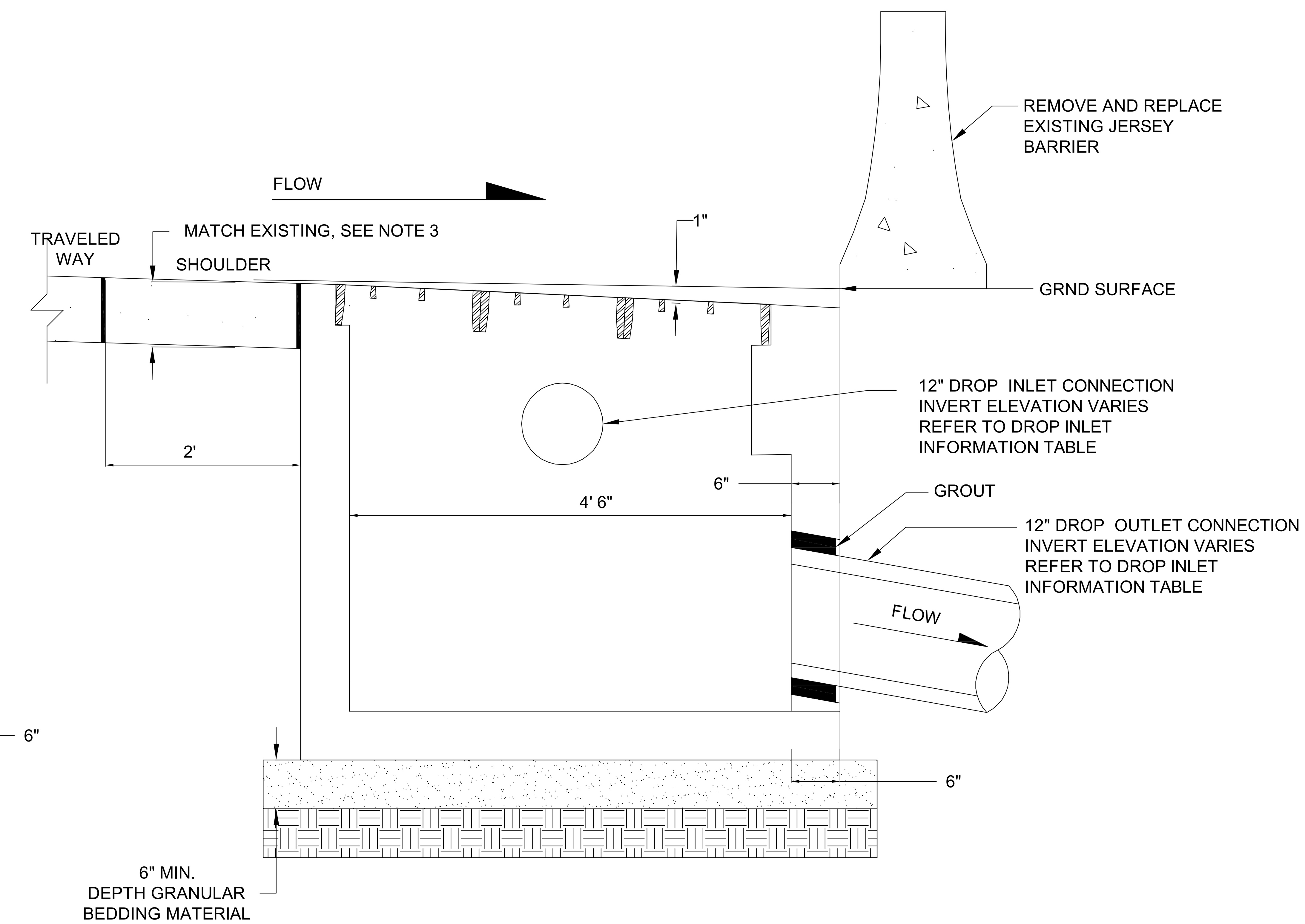
1. DROP INLET STRUCTURES SHALL CONFORM TO CDOT STANDARD PLANS M-604-25, VANE GRATE INLET INCLUDING BUT NOT LIMITED TO REINFORCING.
2. PRECAST DROP INLET SHALL BE BEDDED ON AN APPROVED GRANULAR BEDDING MATERIAL AS SPECIFIED IN CDOT STANDARD SPECIFICATION SECTION 603.05.
3. IT IS ASSUMED THAT THE SHOULDER OF THE TRAVEL LANES IS 9 FT. CONTRACTOR WILL CONFIRM SHOULDER WIDTH WITH SURVEY PRIOR TO START OF CONSTRUCTION. CURRENT LANE IMPACT WITH 5.5 FT WIDE DROP INLET BOX AND 2 FT WIDE APPROACH CHANNEL WILL NOT IMPACT LANE CONFIGURATION.
4. CONTRACTOR TO CONFIRM SURFACE ELEVATION AND PROVIDE DROP INLET BOX WITH APPROPRIATE DEPTH SUCH THAT INVERT ELEVATIONS SHOWN IN THE DROP INLET INFORMATION TABLE AND THE SURFACE CAN BE LEVELED AS SHOWN IN THE DRAWINGS AND DISCUSSED IN NOTE 5 BELOW.
5. THE CONCRETE AND/OR ASPHALT TO BE PLACED AT THE SURFACE OF THE DROP INLET BOX SHALL BE PLACED TO MATCH THE EXISTING CROSS-SLOPE GUTTER AND A MINIMUM GUTTER WIDTH OF 9.0FT. THE LONGITUDINAL SLOPE OF THE ROAD IS ASSUMED TO BE 0.016 (FT/FT) FOR THE EAST BOUND LANE OF TRAVEL WITH A CROSS-SLOPE OF PAVEMENT ASSUMED AT 0.04 (FT/FT) AND 0.009 (FT/FT) FOR THE WEST BOUND LANE OF TRAVEL WITH A CROSS-SLOPE OF PAVEMENT ASSUMED AT 0.05 (FT/FT) .
6. A PIPE JOINT SEALING COMPOUND SHALL BE USED IN ACCORDANCE WITH CDOT STANDARD SPECIFICATION 705.04 FOR ALL APPLICABLE PIPE JOINTS. RCP PIPE PROTRUSIONS THROUGH STRUCTURE WALL SHALL BE HAND PACKED WITH GROUT TO PROVIDE WATER TIGHT SEAL THROUGH STRUCTURE WALL.



1 PLAN VIEW DROP INLET TYPICAL
SCALE:1" = 1'-0"



2 SECTION VIEW TYPICAL DROP INLET
SCALE:1" = 1'-0"



3 SECTION VIEW TYPICAL DROP INLET
SCALE:1" = 1'-0"

DROP INLET INFORMATION TABLE

STRUCTURE	TYPE / SIZE	STATION	OFFSET	RIM ELEVATION	INLET DETAILS			Angle deg	OUTLET DETAILS		
					PIPE	STATION	INVERT		PIPE	STATION	INVERT
DROP INLET 2	VANE GRATE INLET (3 GRATE)	0+91.3	24.7	11016.5	DI4.DI2.	0+89.3 , 26.3	11012.9	90	DI2.2.	0+92.4, 24.6	11007.68

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XREFS=(xx-tb) Layouts=(C8.1 DROP INLET 3 DETAILS)
DIMSCALE=96 F:\87914002\Dwg\ejmt - fixed fire suppression system\Sheets\Civil\C8.1 DROP INLET 3 DETAILS.dwg DEC 14, 2015 12:38PM JBAKER

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
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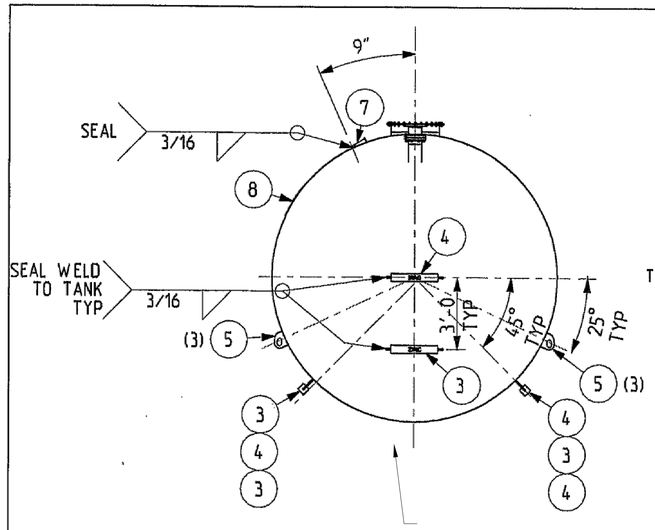
DRAWN BY: CHECKED BY:

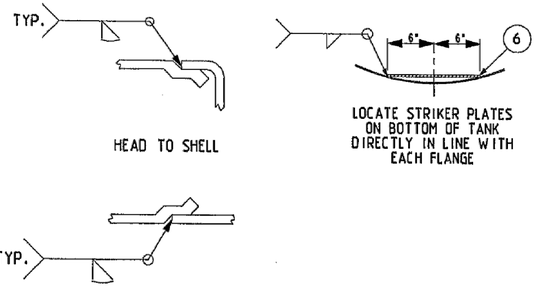
DROP INLET 2 DETAILS

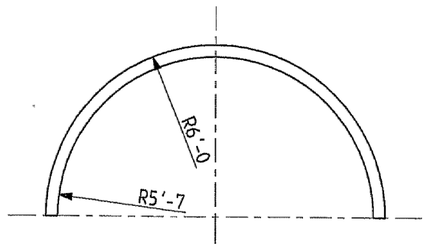
Drawing Number
C8.1



SECT (A)

MANWAY RISER HIDDEN FOR CLARITY

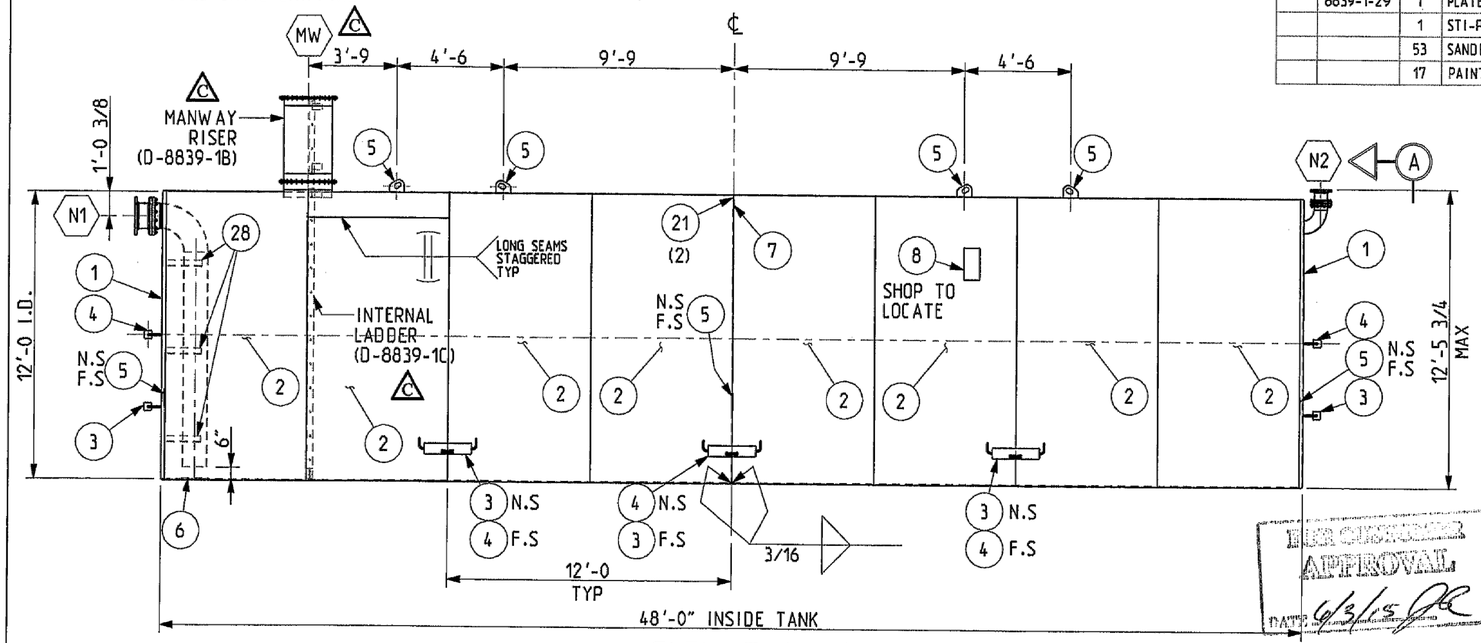




DETAIL (21)

1/2" PL.

SHOP NOTE: DO NOT REMOVE PLASTIC WRAP FROM ANODES UNTIL SHIPPING



ELEVATION (C)

3/16" FILLET WELD TYPICAL UNLESS OTHERWISE NOTE

BILL OF MATERIAL

Ship Pcs	Mark No.	Assy Pcs	Description	Length Inches	Material Spec	Weights	Component Part No.
	8839-1-1	2	HEAD 3/8" x 144" ID FF		A-36	3621	HD3/8x144
	8839-1-2	8	PLATE 3/8" x 72" ROLL	453 9/16	A-36	27784	PL3/8X72X454
	8839-1-3	5	10# WELD-ON ZINC ANODE		ZINC	50	STI-10# ANODE
	8839-1-4	5	9# WELD-ON MAG ANODE		MAGNESIUM	45	STI-9# ANODE
	8839-1-5	10	LIFT LUG - STI/UL TKS (L1-1)		A-36	35	LIFTLUG-STI/UL
	8839-1-6	1	STRIKER PLATE 1/4" X 12"	12	A-36	14	PL1/4X12X12
	8839-1-7	1	STI-P3 PP2 CLIP		A-36	-	STIPP2
	8839-1-8	1	NAME PLATE (EMP STD)			6	NAMEPLATE
	8839-1-9	1	MANWAY 24" B/L		A-36	141	
	8839-1-10	2	12" - 150# RF SLIP-ON		STEEL	114	FLGS015012001
	8839-1-11	1	PIPE 12" SCH 40S (.375 WALL)	107 5/8	STEEL	445	PIP-12.0-40S-108
	8839-1-12	1	WELD ELL 12" - NOM SCH 40 LR 90°		A-234-WPB	117	
	8839-1-13	1	PIPE 12" SCH 40S (.375 WALL)	8	STEEL	33	PIP-12.0-40S-8
	8839-1-15	1	12" - 150# ISOLATION KIT		NYLON	1	
	8839-1-16	12	7/8" HEX HEAD BOLTS W/ NUTS	4	A-307	12	
	8839-1-17	3	FLANGE, 6" - 150# RF SLIP-ON		SA-105	51	
	8839-1-18	1	PIPE 6" SCH 40 (.280 WALL)	6	A-106B	9	
	8839-1-19	1	6" - 150# ISOLATION KIT		NYLON	-	
	8839-1-20	8	3/4" HEX HEAD BOLTS W/ NUTS	3	A-307	5	
	8839-1-21	2	1/2" X 5"FB ROL HWY TO 144" OD	220	A-36	310	FB1/2x5x220
	8839-1-22	28	1/2" BOLT W/ NUT	1 1/2	STEEL	4	
1	8839-1-23		1/8" GSKT FOR 24" MANWAY		FIBER	2	
	8839-1-25	1	12" - 150# RFWN		SA-105	83	
	8839-1-26	1	PIPE 6" SCH 40 (.280 WALL)	3	A-106B	5	
	8839-1-27	1	WELD ELL 6" - NOM SCH 40 LR 90°		A-234-WPB	22	
	8839-1-28	3	ANGLE 3" x 3" x 1/4"	20	A-36	24	
	8839-1-29	1	PLATE 1/4" X 4" ROLL	76 3/8	A-36	26	
		1	STI-P3 LABEL KIT				STI-P3 LABEL KIT
		53	SANDBLAST OUTSIDE				SAND
		17	PAINT COAL TAR EPOXY				BITUMASTIC 300

APPROX. WEIGHT OF TANK IS 34000 LBS.

QTY SHOWN FOR (1) TANK.
(2) TANKS REQUIRED

NOTE: THIS TANK IS OK FOR HS20-44 LOADING PROVIDED THE TANK IS PROPERLY BACKFILLED AND THERE IS AT LEAST 4'-0 OF PROPERLY PLACED OVERBURDEN FILL. WITH EITHER AN ASPHALT OR CONCRETE PAVEMENT ON TOP.

APPROVED
FOR CONSTRUCTION
DATE_____BY_____

No.	Date	By	Chk'd	Revision Description
C	6/3/15	CG	RT	MOVED MW AND RISER TO OTHER END
B	2/13/15	CG	RT	REMOVED N3 NOZZLE AND CHGD TO 24" MANWAY
A	1/21/15	CG	RT	CHGD TANK SIZE & NOZZLES PER CUSTOMER

EATON SALES & SERVICE LLC
DENVER

144" DIA x 48'-0" LONG - 40000 GALLON STI-P3 HORIZONTAL UNDER GROUND STORAGE TANK UL-58

Drawn By:	CG
Date:	1/12/15
Chk'd By:	RT
Date:	1/14/15

P.O. # 0004718
Loc: DENVER, COLORADO
Cust: COLORADO DEPARTMENT OF TRANSPORTATION
EMP Job No. 8839-D01 | Dwg. No. D-8839-1 | BY C

BARNARD EJMT TEAM
RONDINELLI
BARNARD
Western States Fire Protection Co.
BCER Engineering
Sturgeon Electric
CONSULTING ENGINEERS

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

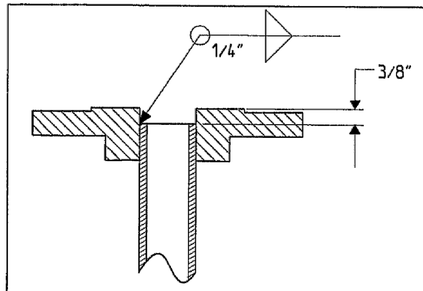
Revisions: Num | Description | Date
DRAWN BY: JBC | CHECKED BY: JM

EATON TANK (1 OF 4)

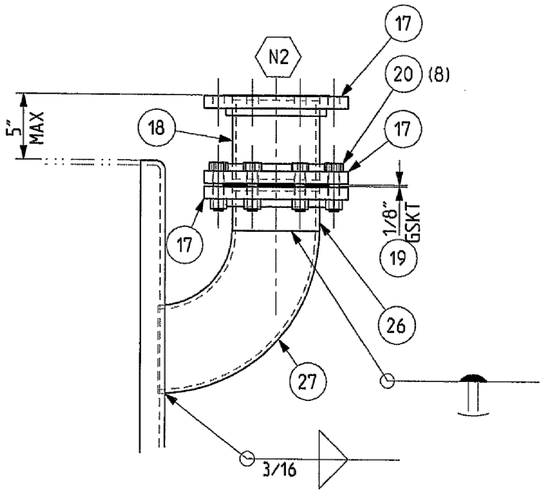
Drawing Number
C9.0

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

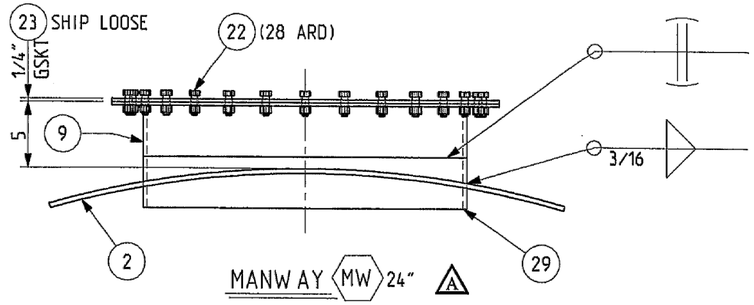
COLORADO 811 KNOW WHAT'S BELOW CALL BEFORE YOU DIG



FLANGE DETAIL

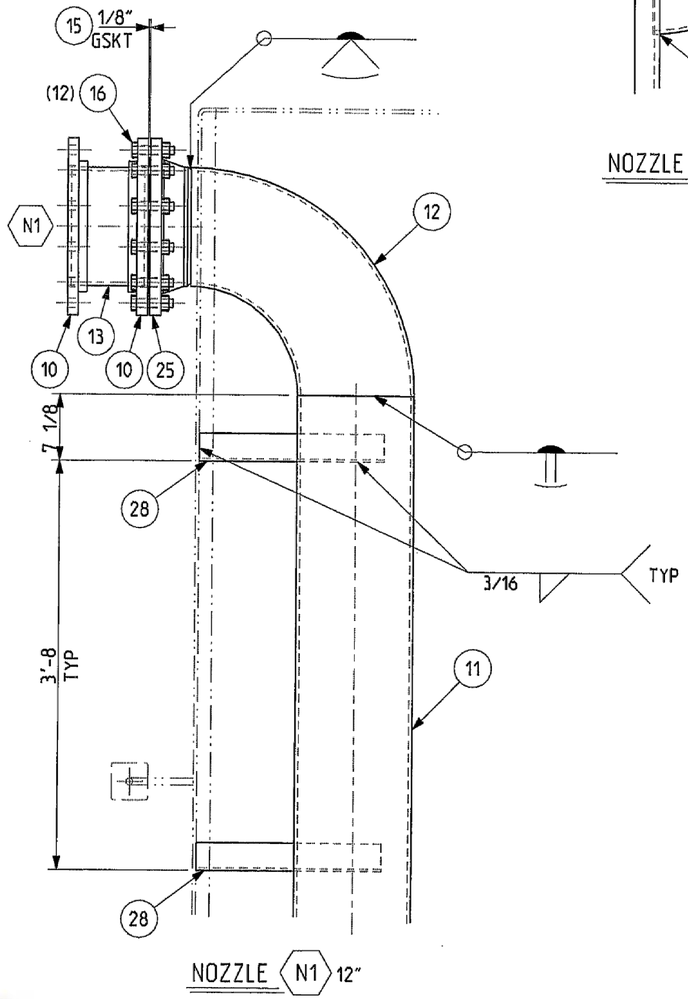


NOZZLE (N2) 6"



MANWAY (MW) 24" (A)

SHIP MANWAY WITH COVER ATTACHED
REMOVE COVER AND ATTACH MK-23 GASKET
AND RISER (D-8839-1B) AFTER SHIPPING



NOZZLE (N1) 12"

NOTES:

1. TANK SHALL BE CONSTRUCTED IN ACCORDANCE WITH UNDERWRITERS LAB INC. STANDARDS FOR UNDERGROUND STORAGE TANKS SUBJECT TO UL-58 LATEST REVISION (SWRI LABEL APPLIED).
2. LEAK TEST AT MORE THAN 3 P.S.I AND LESS THAN 5 P.S.I.
3. TANK IS DESIGNED FOR ZERO PRESSURE FOR ATMOSPHERIC CONDITION ONLY.
4. ALL OPENINGS SHALL BE COVERED TO PREVENT ENTRANCE OF DIRT & MOISTURE DURING SHIPMENT.
5. OUTSIDE ONLY TO BE SANDBLASTED (COMMERCIAL) & COATED W/COAL TAR EPOXY - BARBOLINE BITUMASTIC 300.

APPROVED
FOR CONSTRUCTION
DATE_____BY_____

FOR CUSTOMER APPROVAL
DATE 6/3/15

No.	Date	By	Chk'd	Revision Description
B	2/13/15	CG	RT	REMOVED NOZZLE N3
A	1/28/15	CG	RT	UPDATED NOZZLES PER CUSTOMER

EATON SALES & SERVICE LLC
DENVER

Drawn By:	CG
Date:	1/12/15
Chk'd By:	RT
Date:	1/14/15

144" DIA x 48'-0" LONG - 40000 GALLON STI-P3
HORIZONTAL UNDER GROUND STORAGE TANK UL-58
P.O. # 0004718
Loc: DENVER, COLORADO
Cust: COLORADO DEPARTMENT OF TRANSPORTATION
EMP Job No. 8839-D01 Dwg. No. D-8839-1A Rv B

WORK THIS DWG WITH D-8839-1

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

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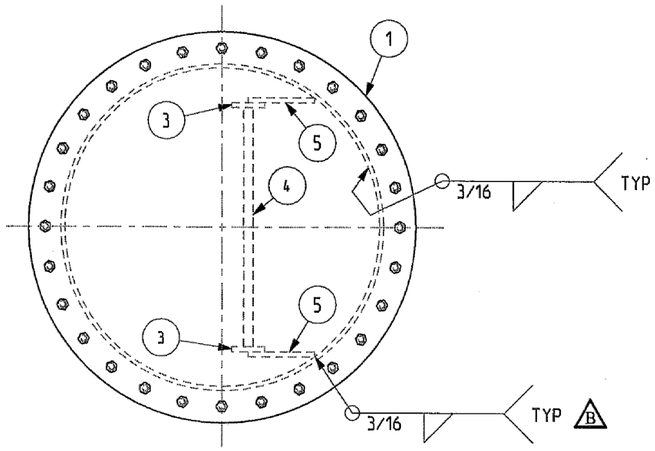
EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810

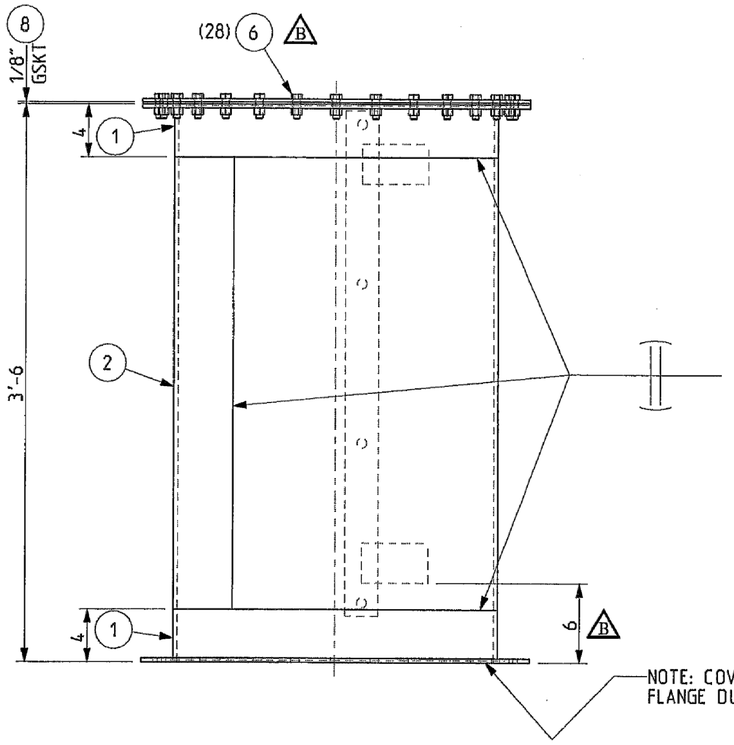
RECORD DRAWINGS - 2015-11-16

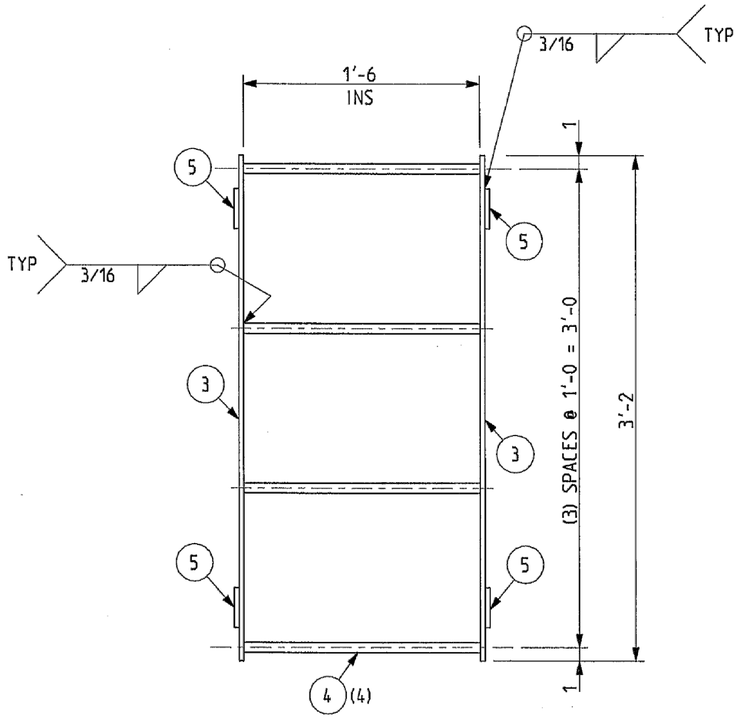
Revisions			
Num	Description	Date	
DRAWN BY: JBC		CHECKED BY: JM	

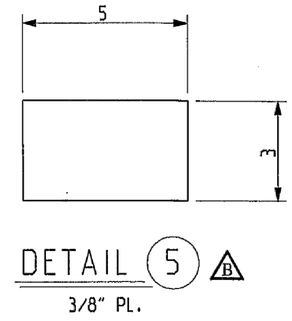
EATON TANK (2 OF 4)

Drawing Number
C10.0









BILL OF MATERIAL

Ship Pcs	Mark No.	Assy Pcs	Description	Length Inches	Material Spec	Weights	Component Part No.
B	8839-1B-1	2	MANWAY 24" B/L		A-36	265	
B	8839-1B-2	1	PLATE, 5/16" x 34" ROLLED	76 3/8	A-36	230	
	8839-1B-3	2	FB. 3/8" x 2 1/2" LADDER RAIL	38	A-36	20	
	8839-1B-4	4	LADDER RUNG 3/4" DIA.	18	A-36	9	
B	8839-1B-5	4	FB. 3/8" x 3"	5	A-36	6	
B	8839-1B-6	28	1/2" BOLT W/ NUT	1 1/2	STEEL	4	
B	8839-1B-8	1	1/8" GSKT FOR 24" MANWAY		FIBER	-	

QTY SHOWN FOR (1) TANK.
(2) TANKS REQUIRED

APPROVED
FOR CONSTRUCTION
DATE_____BY_____

FOR CUSTOMER APPROVAL
DATE 2/17/15

WORK THIS DWG WITH D-8839-1 & -1A

No.	Date	By	Chk'd	Revision Description
B	2/13/15	CG	RT	CHGD MANWAY SIZE & LADDER CLIP
A	1/28/15	CG	RT	UPDATED MANWAY AND LADDER HEIGHT

EATON METAL PRODUCTS CO LLC
DENVER – SALT LAKE CITY

MANWAY RISER W/LADDER DETAIL
144" DIA x 48'-0" LONG - 40000 GALLON STI-P3
P.O. # 0004718
Loc: DENVER, COLORADO
Cust: COLORADO DEPARTMENT OF TRANSPORTATION

Drawn By:	CG
Date:	1/12/15
Chk'd By:	RT
Date:	1/14/15

EMP Job No. 8839-D01 | Dwg. No. D-8839-1B | Rev B

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

Revisions: Num | Description | Date

DRAWN BY: JBC | CHECKED BY: JM

EATON TANK (3 OF 4)

Drawing Number
C11.0

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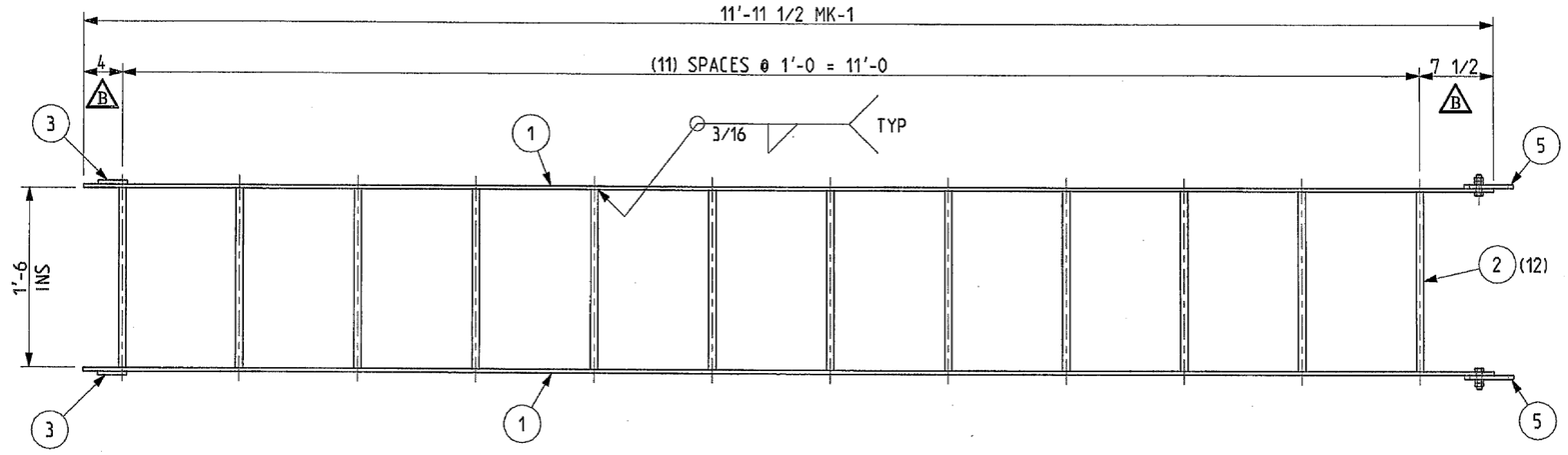
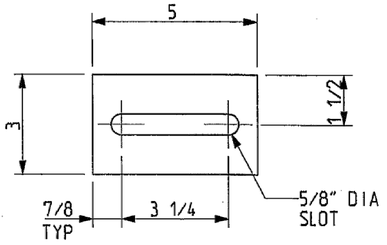
BILL OF MATERIAL

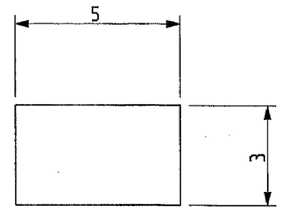
Ship Pcs	Mark No.	Assy Pcs	Description	Length Inches	Material Spec	Weights	Component Part No.
B	8839-1C-1	2	FB. 3/8" x 3" LADDER RAIL W/HOLE	143 1/2	A-36	92	
	8839-1C-2	12	LADDER RUNG 3/4" DIA.	18	A-36	27	
B	8839-1C-3	2	FB. 3/8" x 3"	5	A-36	3	
B	8839-1C-4	2	1/2" HEX HEAD BOLTS W/ 2-NUTS	1 3/4	A-307	-	
B	8839-1C-5	2	FB. 3/8" x 3" W/SLOT	5	A-36	3	

QTY SHOWN FOR (1) TANK.
(2) TANKS REQUIRED

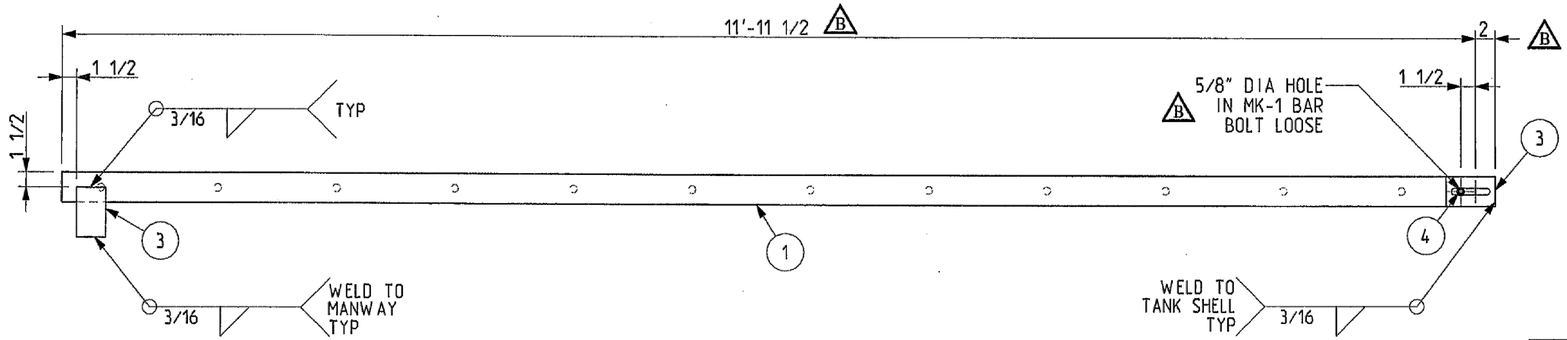




DETAIL 5 B
1/4" PL



DETAIL 3 B
3/8" PL



APPROVED
FOR CONSTRUCTION
DATE_____BY_____

FOR CUSTOMER APPROVAL
DATE 2/17/15 JR

WORK THIS DWG WITH D-8839-1 & -1A

No.	Date	By	Chk'd	Revision Description
B	2/13/15	CG	RT	CHGD LADDER LENGTH AND TOP & BTM CLIPS
A	1/28/15	CG	RT	UPDATED LADDER RUNG SPACING

EATON METAL PRODUCTS CO LLC
DENVER -- SALT LAKE CITY

INTERNAL LADDER DETAILS
144" DIA x 48'-0" LONG - 40000 GALLON STI-P3
P.O. # 0004718
Loc: DENVER, COLORADO
Cust: COLORADO DEPARTMENT OF TRANSPORTATION

Drawn By:	CG
Date:	1/12/15
Chk'd By:	RT
Date:	1/14/15

EMP Job No. 8839-D01 | Dwg. No. D-8839-1C | Rev B

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CONSULTING ENGINEERS

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions
Num | Description | Date

DRAWN BY: JBC | CHECKED BY: JM

EATON TANK (4 OF 4)

Drawing Number
C12.0

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

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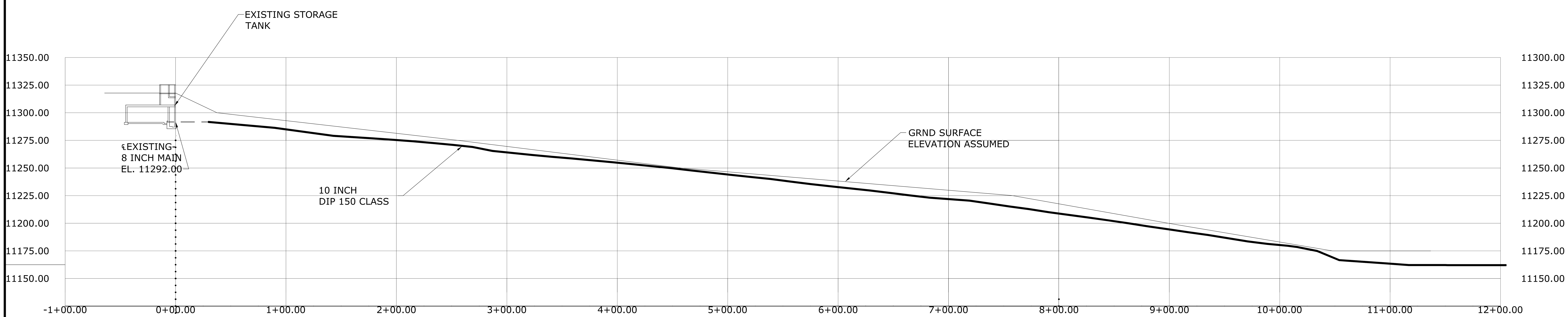
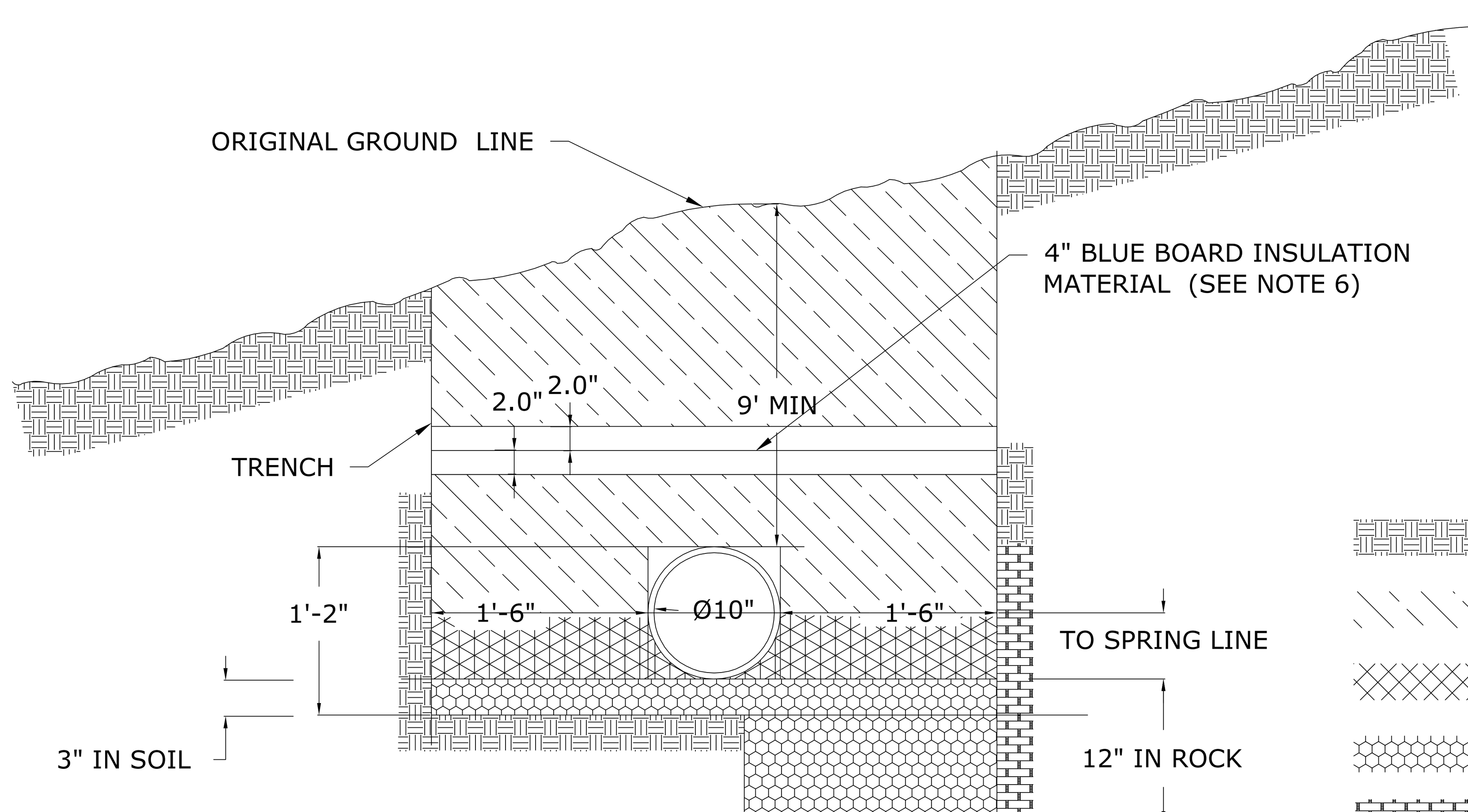


1 WEST SIDE FFSS SUPPLY PROFILE
SCALE:1/2" = 1'-0"

GENERAL NOTES:

1. GROUND SURFACE ELEVATIONS ARE ASSUMED BASED ON THE PROVIDED AS BUILT DRAWINGS AND MANUAL ELEVATION POINTS TAKEN. ALL ELEVATIONS INCLUDING; GROUND SURFACE, PIPE INVERTS, AND STRUCTURES, SHALL BE FIELD VERIFIED PRIOR TO START OF CONSTRUCTION.
2. DETAILS REGARDING ELECTRONIC TANK LEVEL EQUIPMENT WILL BE PROVIDED AT RFC DRAWING SUBMISSION.
3. PIPE LENGTHS AND ELEVATIONS ARE APPROXIMATE BASED ON AS BUILT DRAWINGS AND WILL BE VERIFIED PRIOR TO THE START OF CONSTRUCTION WITH A DETAILED SURVEY.
4. SEE M6.0 FOR THRUST BLOCK LOCATIONS AND DETAILS.
5. CONTRACTOR TO REMOVE EXISTING 8" SUPPLY PIPE AND CORE A 12" HOLE FOR PLACEMENT OF NEW 10" DIP. ANNULAR SPACE BETWEEN CORE AND NEW 10" PIPE SHALL BE HAND PACKED WITH GROUT AND MADE WATER TIGHT.
6. 4" OF BLUE BOARD INSULATION SHALL BE PLACED 6" TO 12" ABOVE BEDDED DIP PIPE. BLUE BOARD INSULATION SHALL BE PLACED ACROSS THE FULL WIDTH OF PIPE TRENCH.
7. FOR ROADWAY TRENCH DETAILS SEE DETAILS 2 SHEET C0.2



LEGEND

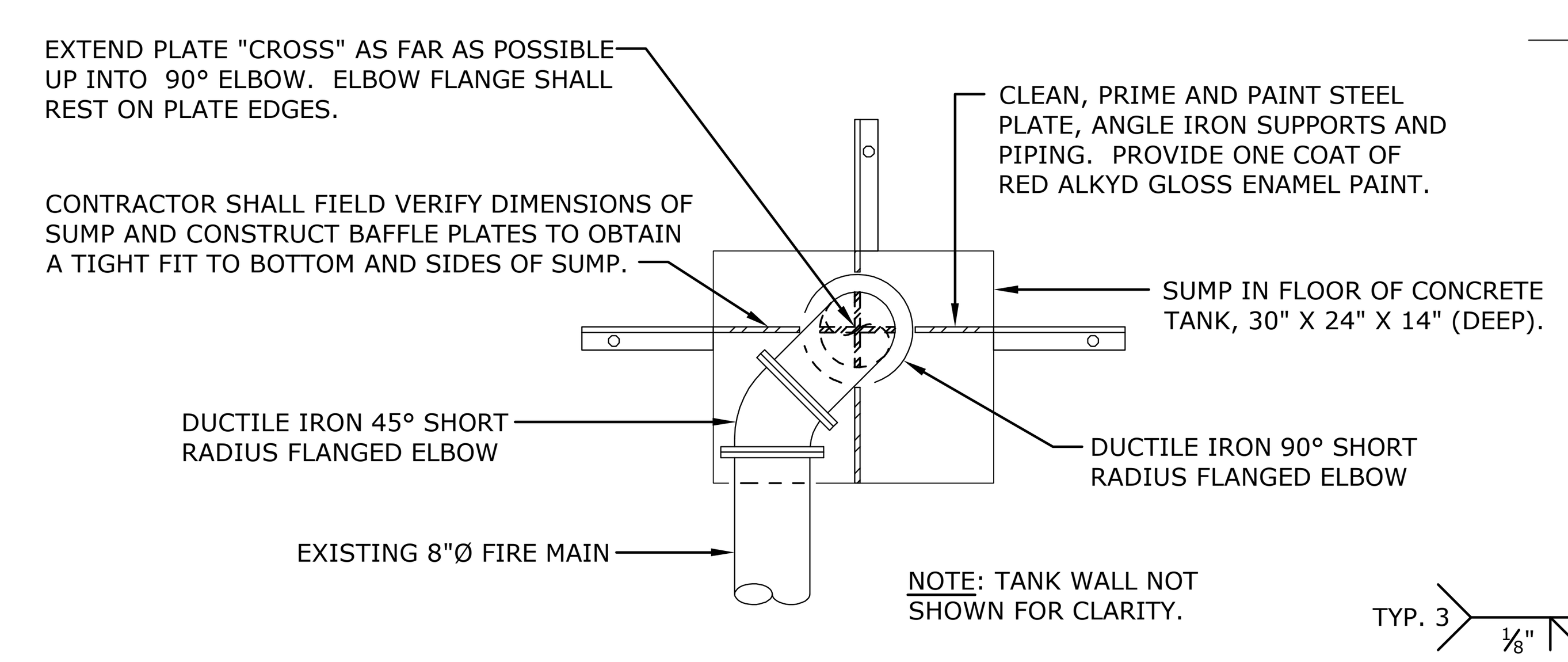
- EARTH
- EMBANKMENT MATERIAL
- STRUCTURE BACKFILL**, CLASS 1 OR 2
- BEDDING MATERIAL*
- BEDROCK
- STRUCTURE BACKFILL, CLASS 1

2 SUPPLY PIPE TRENCH DETAIL
SCALE:NTS

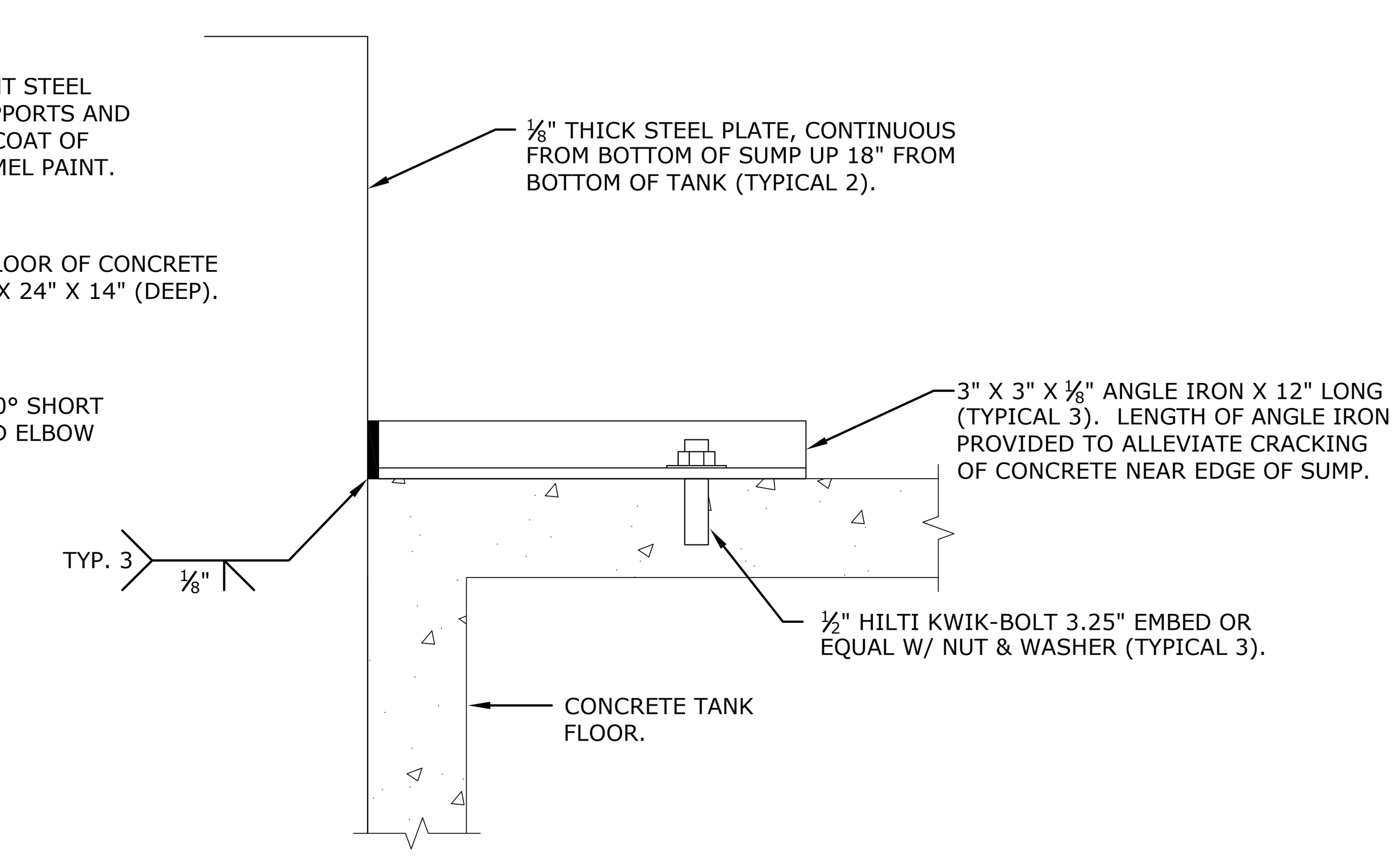
* BEDDING MATERIAL FOR RIGID PIPE IN SOIL SHALL BE 3 IN. OF LOOSE STRUCTURE BACKFILL (CLASS 1 OR 2). BEDDING IS NOT REQUIRED FOR FLEXIBLE PIPE IN SOIL. BEDDING MATERIAL FOR RIGID OR FLEXIBLE PIPE IN ROCK SHALL BE 12 IN. OR LOOSE STRUCTURE BACKFILL, CLASS 1.

** PER CDOT SECTION 206.02(a) - STRUCTURAL BACKFILL (FLOW-FILL) MEETING THE FOLLOWING REQUIREMENTS BE SUBSTITUTED FOR CLASS 1 OR CLASS 2 BACKFILL TO BACKFILL CULVERTS AND SEWER PIPES:

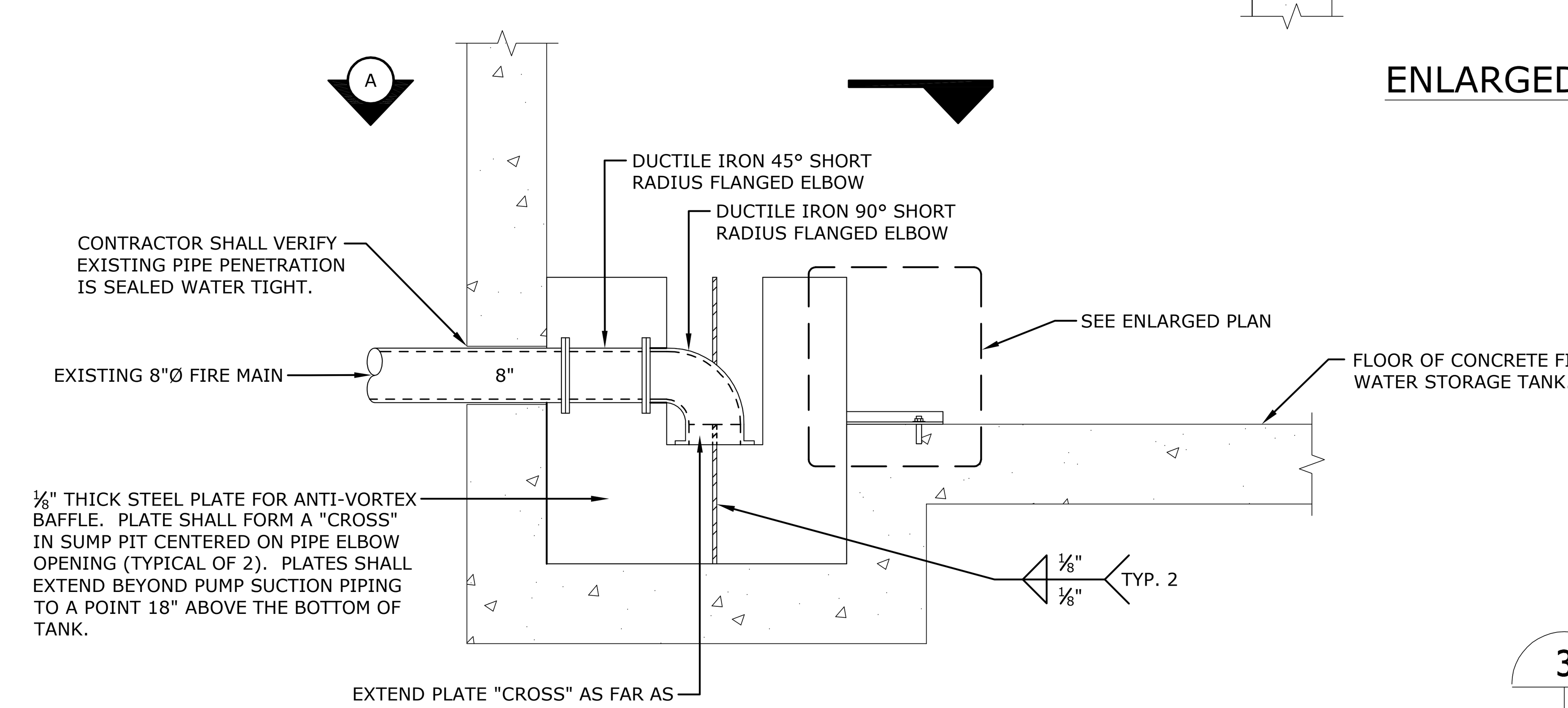
CEMENT	50 LBS/YD^3
COARSE AGGREGATE	1700 LBS/YD^3
FINE AGGREGATE	1840 LBS/YD^3
WATER	325 (OR AS NEEDED) LBS/YD^3



SECTION "A"



ENLARGED PLAN



3 ANTI-VORTEX BAFFLE DETAIL
SCALE:NOT TO SCALE

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

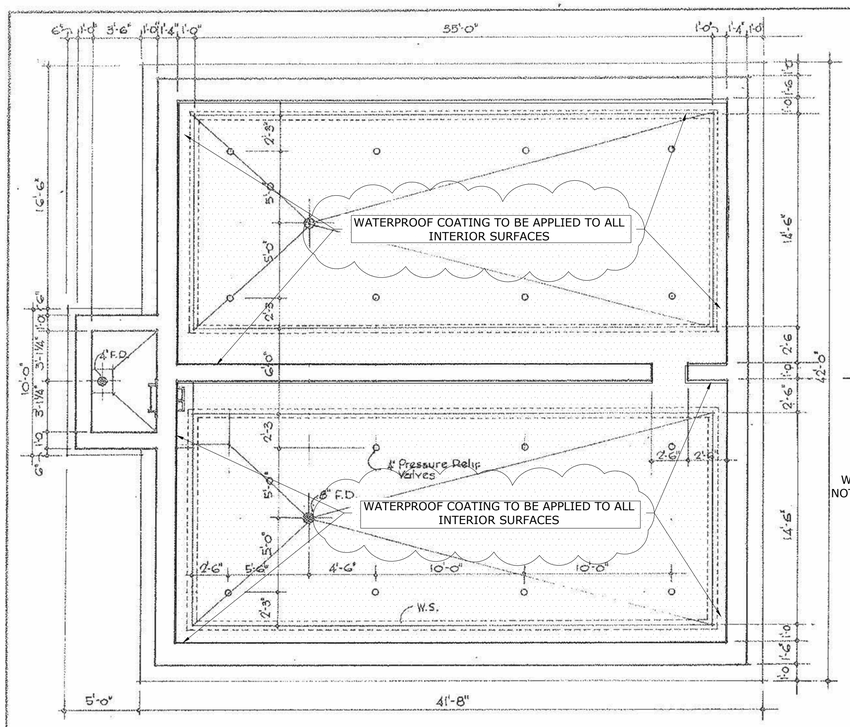
Revisions

Num	Description	Date

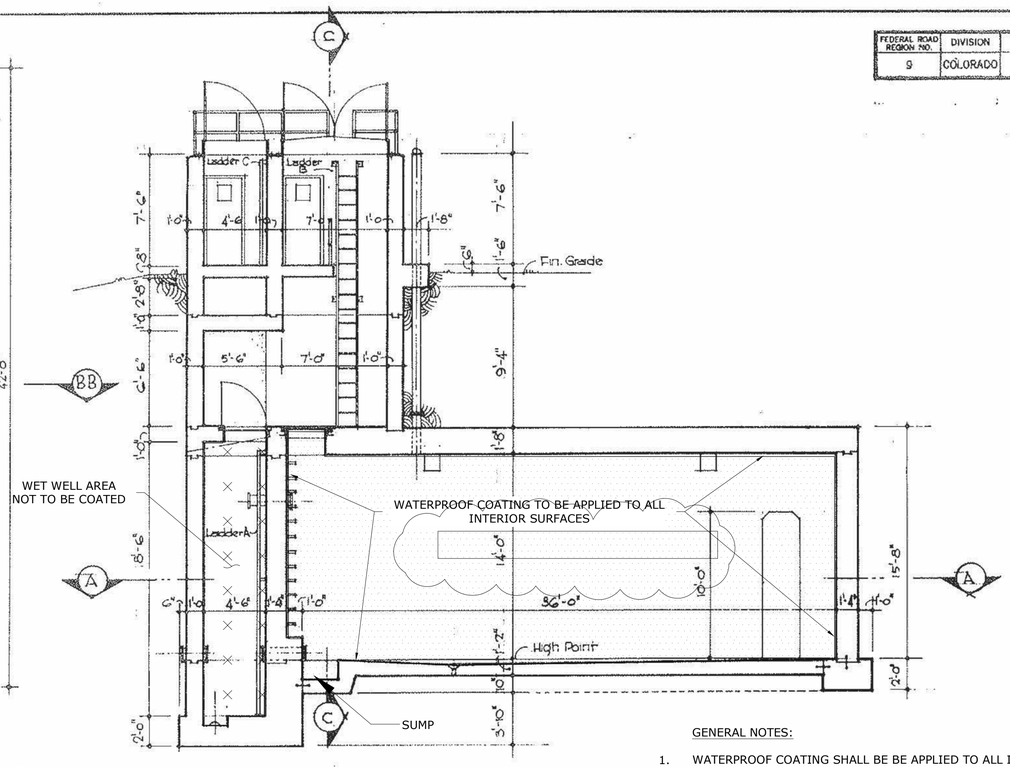
DRAWN BY: JBC CHECKED BY: JM

WEST SIDE FFSS SUPPLY PROFILE

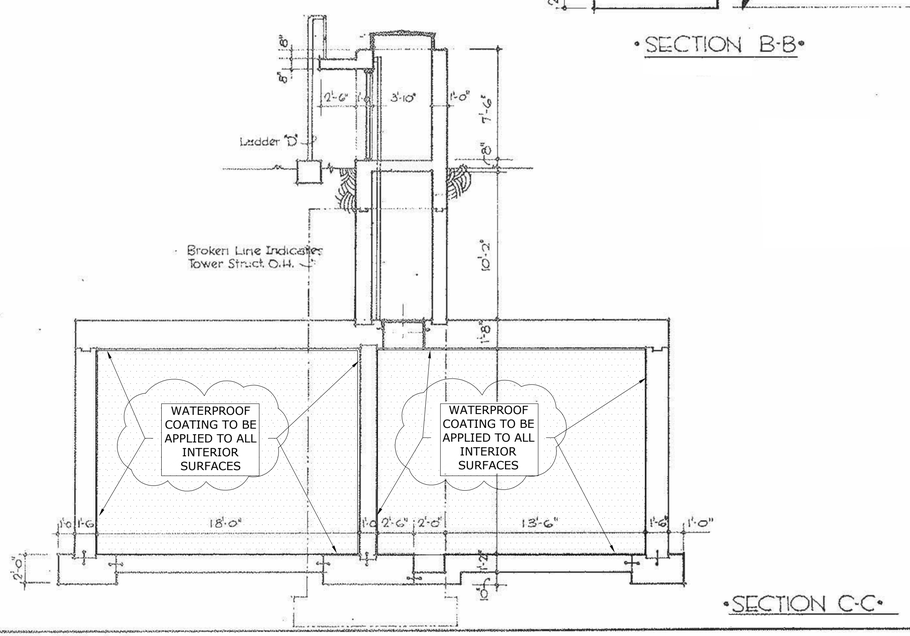
Drawing Number
C13.0



•SECTION A-A•



•SECTION B-B•



•SECTION C-C•

FEDERAL ROAD REGION NO.	DIVISION	PROJECT NO.	SHEET NO.	TOTAL SHEETS
9	COLORADO	I 70-3(34)220	22 BX	326

AS CONSTRUCTED
REVISED DATE
Oct 26, 1978

GENERAL NOTES:

1. WATERPROOF COATING SHALL BE BE APPLIED TO ALL INTERIOR SURFACES OF THE EXISTING WATER STORAGE TANK.
2. APPLICATION THICKNESS OF THE WATERPROOF COATING SHALL BE IN ACCORDANCE WITH THE MANUFACTURER RECOMMENDATIONS.

WATERPROOF CONCRETE COATING APPLICATION SPECIFICATIONS

MATERIAL:

1. THE COATING MATERIAL SHALL BE A FLEXIBLE CONCRETE WATERPROOFING MATERIAL SUITABLE FOR DRINKING WATER APPLICATIONS.
2. FOLLOW MANUFACTURER'S APPLICATION INSTRUCTIONS FOR ALL MATERIALS USED INCLUDING BUT NOT LIMITED T0; CONCRETE REPAIR MATERIALS, FILLERS, ADMIXTURES, AND COATINGS.

APPLICATION:

1. SURFACE PREPARATION SHALL INCLUDE CLEANING OF ALL TANK SURFACES. FOLLOW ALL MANUFACTURER'S RECOMMENDATIONS FOR SURFACE PREPARATION. SURFACE PREPARATION MAY REQUIRE MECHANICAL ABRASION FOLLOWING MANUFACTURER'S RECOMMENDATIONS. THE SURFACE SHALL BE FREE OF DUST, DIRT, LAITANCE, MINERALS, PAINTS, OILS, GREASES, OR ANY OTHER CONTAMINANTS.
2. PATCH ALL HOLES AND NON-MOVING CRACKS BEFORE INSTALLATION . USE ONLY MATERIALS SUITABLE FOR USE WITH THE EXISTING SUBSTRATE AND WATERPROOF COATING.
3. STOP ALL ACTIVE WATER INGRESS INTO THE TANK PRIOR TO APPLICATION OF COATING MATERIAL.
4. FOLLOW MANUFACTURER'S RECOMMENDATION FOR APPLICATION SURFACE AND ENVIRONMENTAL REQUIREMENTS.
5. APPLY MATERIAL WITH APPROVED APPLICATION EQUIPMENT.
6. ALLOW AT LEAST 24 HOURS BEFORE APPLICATION OF SECOND COAT, IF REQUIRED.
7. CLEAN SURFACE PRIOR TO REFILLING TANK. TAKE CARE TO NOT CONTAMINATE NEW OR EXISTING PLUMBING SYSTEMS. DO NOT ALLOW CONTAMINATION OF EXISTING WATER SUPPLY SYSTEM.

STATE OF COLORADO
DIVISION OF HIGHWAYS

SCALE: NOTED	APPROVED BY:	DRAWN BY: J.A.C
DATE: 9-9-73		REVISED

WATER STORAGE TANK

STANDARD NO. OR FOLDER: G3-18

1 WEST SIDE STORAGE TANK COATING
SCALE:NTS

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

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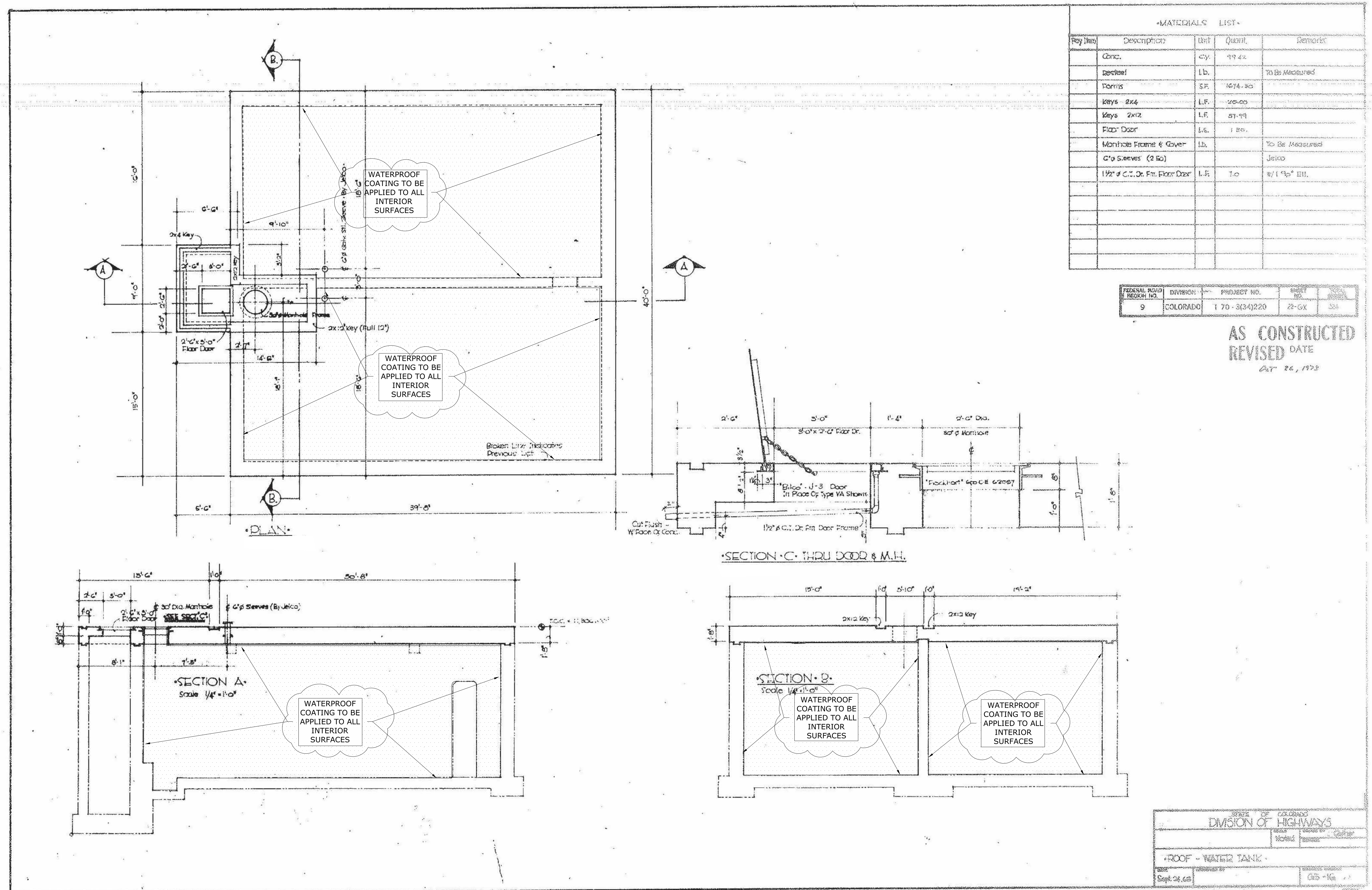
EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

Revisions				
Num	Description	Date	DRAWN BY: JBC	CHECKED BY: JM

STORAGE TANK CONCRETE LINING - DETAILS (1-2)

Drawing Number
C14.0



·MATERIALS LIST·

Key Item	Description	Unit	Quant.	Remarks
	Conc.	C.Y.	99.42	
	Resteel	Lb.		To Be Measured
	Forms	S.F.	1674.30	
	Keys 2x4	L.F.	20.00	
	Keys 2x12	L.F.	57.99	
	Floor Door	L.S.	1 Ea.	
	Manhole Frame & Cover	Lb.		To Be Measured
	6"ø Sleeves (2 Ea)			Jelco
	1½"ø C.I. Dr. Fm. Floor Door	L.F.	7.0	W/1 90° Ell.

1 WEST SIDE STORAGE TANK COATING
SCALE:NTS

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BARNARD EJMT TEAM

BARNARD · RONDINELLI life safety · BCER Engineering · Sturgeon Electric · Western States Fire Protection Co. · Consulting Engineers

EISENHOWER/JOHNSON MEMORIAL TUNNEL

FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

DRAWN BY: JBC CHECKED BY: JM

STORAGE TANK CONCRETE LINING - DETAILS (2-2)

Drawing Number
C15.0

ELECTRICAL PROJECT NARRATIVE:

OVERVIEW

THE NEW EJMT FIRE SUPPRESSION SYSTEM WILL INCLUDE ADDITIONS AND MODIFICATIONS TO THE EXISTING ELECTRICAL SYSTEMS IN BOTH THE EAST AND WEST PORTAL BUILDINGS. THE MAJOR COMPONENTS OF THE FIRE SUPPRESSION SYSTEM INCLUDE: A FIRE PUMP, DELUGE VALVES, CIRCULATING PUMPS, AND BOILERS. A NEW GENERATOR AND ASSOCIATED ELECTRICAL DISTRIBUTION SYSTEM WILL BE INSTALLED AT THE WEST PORTAL BUILDING TO PROVIDE BACKUP ELECTRICAL POWER FOR THESE MAJOR COMPONENTS IN THE EVENT OF A POWER FAILURE. THE SYSTEM ALSO INCLUDES FIRE ALARM PANELS, FIRE PROTECTION CABINETS, FIBER OPTIC LINEAR HEAT DETECTION SYSTEMS, VIDEO CAMERAS, THREE (3) WORK STATIONS, AND ASSOCIATED FLAT SCREEN DISPLAYS. ALL ELECTRONIC EQUIPMENT ASSOCIATED WITH THESE SYSTEMS WILL BE BATTERY BACKED UP. THE EXISTING EAST PORTAL BUILDING GENERATOR WILL PROVIDE BACKUP ELECTRICAL POWER FOR SYSTEM ELECTRONIC EQUIPMENT POWERED FROM THE EAST ELECTRICAL DISTRIBUTION SYSTEM.

A NEW LEVEL SENSOR WILL BE INSTALLED IN THE NEW FIRE WATER ENTRY ROOM IN THE WEST PORTAL BUILDING. THIS SENSOR WILL BE MONITORED BY THE FIRE ALARM SYSTEM. NEW FIRE PROTECTION SYSTEM CONTROLLED VALVES WILL BE INSTALLED IN THE EXISTING SEWER TREATMENT ROOM IN THE EAST PORTAL BUILDING. THESE VALVES WILL DIVERT FIRE-EVENT WATER TO NEW AND EXISTING COLLECTION TANKS. A LEVEL SENSOR WILL BE INSTALLED IN THE COLLECTION TANK SYSTEM AND WILL BE MONITORED BY THE FIRE ALARM SYSTEM.

WEST PORTAL BUILDING

THE NEW FIRE PUMP, CIRCULATING PUMPS, AND BOILER WILL BE LOCATED IN THE WEST PORTAL BUILDING AND WILL BE POWERED FROM A NEW STANDBY POWER DISTRIBUTION SYSTEM UTILIZING A SPARE CIRCUIT BREAKER LOCATED IN THE EXISTING 480Y/277V SWITCHGEAR. IN THE EVENT OF A UTILITY POWER FAILURE, A NEW NATURAL GAS POWERED GENERATOR WILL PROVIDE STANDBY POWER VIA NEW AUTOMATIC TRANSFER SWITCHES.

THE EXISTING 480Y/277V SWITCHGEAR HAS TWO SPARE 1,600A POWER CIRCUIT BREAKERS. ONE OF THESE BREAKERS WILL BE USED TO POWER THE NEW FIRE SUPPRESSION SYSTEM STANDBY POWER DISTRIBUTION SYSTEM. A NEW FEEDER WILL BE ROUTED BETWEEN THE MAIN ELECTRICAL ROOM AND NEW FIRE PUMP/MECHANICAL ROOM. ALL OF THE FIRE SUPPRESSION SYSTEM'S LARGE ELECTRICAL LOADS ARE LOCATED IN THIS PORTION OF THE BUILDING.

WHEN POWER ON THE WEST SIDE OF THE TUNNEL IS BEING FED FROM THE EXISTING 500KW GENERATOR, CDOT PERSONNEL MUST OPEN THE 12OOAMP BREAKER IN THE WEST SIDE MOTOR CONTROL CENTER LABELED "FIRE PROTECTION FIRE PUMP". THIS WILL PREVENT THE LOAD FROM THE NEWLY INSTALLED FIRE SUPPRESSION SYSTEM FROM BEING PLACED ONTO THE EXISTING 500KW TRANSFORMER. ONCE THIS BREAKER IS OPEN THE FIRE SUPPRESSION SYSTEM WILL RUN ON THE NEW 350KW GENERATOR.

A NEW 480V, 3-PHASE FIRE PUMP CONTROLLER/AUTOMATIC TRANSFER SWITCH WILL BE INSTALLED TO POWER THE FIRE PUMP FROM EITHER UTILITY POWER OR THE NEW GENERATOR. A NEW 480V, 3-PHASE AUTOMATIC TRANSFER SWITCH WILL BE INSTALLED TO POWER ALL OTHER EQUIPMENT ASSOCIATED WITH THE FIRE SUPPRESSION SYSTEM INCLUDING: FIRE PUMP, CIRCULATING PUMPS, BOILERS, BOILER ROOM LIGHTING, FIRE PROTECTION CABINETS, REMOTE CONTROL CABINETS, ZONE VALVES, AND A NEW 208Y/120V, 100A, 3-PHASE PANEL. THIS LOW VOLTAGE PANEL WILL POWER THE FIRE ALARM PANEL, FIBER OPTIC LINEAR HEAT DETECTION SYSTEM, VIDEO CAMERAS, WORK STATION, AND ASSOCIATED FLAT SCREEN DISPLAYS IN THE WEST PORTAL BUILDING. A NEW 350KW (DE-RATED TO 238KW) GENERATOR WILL BE INSTALLED TO PROVIDE STANDBY POWER TO ALL FIRE SUPPRESSION EQUIPMENT DESCRIBED ABOVE. IN ADDITION TO THE GENERATOR, ALL ELECTRONIC SYSTEM EQUIPMENT WILL ALSO BE BATTERY BACKED UP. THESE BATTERIES WILL KEEP ALL EQUIPMENT POWERED DURING AN AC POWER TRANSITION BETWEEN UTILITY AND GENERATOR SOURCES.

TWO (ONE PER TUNNEL) 480V, 30A, 3-PHASE CIRCUITS WILL BE INSTALLED FROM THE WEST PORTAL BUILDING TO POWER THE FIRE PROTECTION CABINETS, REMOTE CONTROL CABINETS, AND VALVE CABINETS LOCATED IN THE WEST HALF OF EACH PLENUM. A SMALL STEP-DOWN TRANSFORMER INSTALLED AT EACH PANEL WILL PROVIDE THE 120V POWER NEEDED TO CONTROL AND MONITOR ALL THE FIRE SUPPRESSION REMOTE MOUNTED EQUIPMENT.

A NEW LEVEL SENSOR WILL BE INSTALLED TO MONITOR THE EXISTING WATER STORAGE TANK AND WILL BE CONNECTED TO THE FIRE ALARM SYSTEM.

EAST PORTAL BUILDING

THE FIRE SUPPRESSION SYSTEM EQUIPMENT THAT WILL BE LOCATED IN THE EAST PORTAL BUILDING REQUIRES VERY LITTLE POWER. THE FIRE ALARM PANELS, FIBER OPTIC LINEAR HEAT DETECTION SYSTEM, VIDEO CAMERAS, TWO WORK STATIONS, AND FLAT SCREEN DISPLAYS WILL BE POWERED FROM THE EXISTING EMERGENCY POWER SYSTEM.

LOCATED IN THE MAIN ELECTRICAL ROOM IS A 480Y/277V, 1,200A GENERATOR BACKED UP PANEL WITH SPARE SPACE AND CAPACITY FOR ALL THE FIRE SUPPRESSION SYSTEM COMPONENTS THAT WILL BE POWERED FROM THE EAST PORTAL BUILDING. IN ADDITION TO THE GENERATOR, ALL ELECTRONIC SYSTEM EQUIPMENT WILL ALSO BE BATTERY BACKED UP. THESE BATTERIES WILL KEEP ALL EQUIPMENT POWERED DURING AN AC POWER TRANSITION BETWEEN UTILITY AND GENERATOR SOURCES.

THREE NEW CIRCUIT BREAKERS WILL BE INSTALLED IN PANEL EV TO POWER TWO (2) 480V, 3-PHASE CIRCUITS NEEDED FOR FIRE SUPPRESSION SYSTEM EQUIPMENT THAT WILL BE INSTALLED IN THE EAST HALF OF EACH PLENUM, AND A 30KVA 480V-208/120V TRANSFORMER AND 208Y/120V, 100A, 3-PHASE PANEL. THIS LOW VOLTAGE PANEL WILL POWER THE FIRE ALARM PANEL, FIBER OPTIC LINEAR HEAT DETECTION SYSTEM, VIDEO CAMERAS, WORK STATIONS, AND ASSOCIATED FLAT SCREEN DISPLAYS IN THE EAST PORTAL BUILDING. A SMALL STEP-DOWN TRANSFORMER INSTALLED AT EACH PANEL WILL PROVIDE THE 120V POWER NEEDED TO CONTROL AND MONITOR ALL THE FIRE SUPPRESSION SYSTEM REMOTE MOUNTED EQUIPMENT.

WATER RELEASED DURING A FIRE-EVENT WILL BE COLLECTED IN EXISTING AND NEW COLLECTION TANKS. NEW VALVES WILL BE INSTALLED IN THE EXISTING SEWER TREATMENT ROOM AND NEW MANHOLE 2 TO DIVERT WATER INTO THESE TANKS. THESE VALVES WILL BE CONTROLLED BY THE FIRE PROTECTION SYSTEM. FINALLY, AS PART OF THE FIRE SUPPRESSION PROJECT. A NEW LEVEL SENSORS WILL BE INSTALLED IN THE COLLECTION TANK SYSTEM AND MONITORED BY THE FIRE ALARM SYSTEM.

GENERAL NOTES:

1. ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR INSTALLING ALL CONDUIT, WIRE AND FINAL CONNECTIONS SHOWN ON THESE DRAWINGS, THE SYSTEMS GROUP DRAWINGS, AND WESTERN STATES FIRE PROTECTION DRAWINGS. SYSTEMS GROUP SHALL BE RESPONSIBLE FOR ALL PROGRAMMING, CONFIGURING AND SETUP OF FIRE ALARM SYSTEMS. ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR STARTUP SUPPORT OF SYSTEMS.

2. CONDUIT INSTALLATION INCLUDES RUNNING MULTIPLE IMC CONDUITS IN BOTH SUPPLY PLENUMS (APPROXIMATELY 9,000' PER TUNNEL). DETAILS REGARDING THE BRACKET TO SUPPORT THE CONDUIT IN BOTH PLENUMS IS SHOWN ON THE SYSTEMS GROUP DRAWINGS.

FEEDER TABLE

OVERCURRENT DEVICE SETTINGS	FEEDER IDENTIFIER	COPPER CONDUCTORS INSULATION PER SPECIFICATIONS	FEEDER IDENTIFIER	COPPER CONDUCTORS INSULATION PER SPECIFICATIONS
20	3WG20	(3#12 + 1#12G)1/2"C	4WG20	(4#12 + 1#12G)3/4"C
30	3WG30	(3#10 + 1#10G)3/4"C	4WG30	(4#10 + 1#10G)3/4"C
40	3WG40	(3#8 + 1#10G)3/4"C	4WG40	(4#8 + 1#10G)3/4"C
50	3WG50	(3#6 + 1#10G)3/4"C	4WG50	(4#6 + 1#10G)1"C
60	3WG60	(3#4 + 1#10G)1"C	4WG60	(4#4 + 1#10G)1-1/4"C
70	3WG70	(3#4 + 1#8G)1"C	4WG70	(4#4 + 1#8G)1-1/4"C
100	3WG100	(3#1 + 1#8G)1-1/4"C	4WG100	(4#2 + 1#8G)1-1/4"C
125	3WG125	(3#1/0 + 1#6G)1-1/2"C	4WG125	(4#1/0 + 1#6G)2"C
150	3WG150	(3#1/0 + 1#6G)1-1/2"C	4WG150	(4#1/0 + 1#6G)2"C
175	3WG175	(3#2/0 + 1#6G)2"C	4WG175	(4#2/0 + 1#6G)2"C
200	3WG200	(3#3/0 + 1#6G)2"C	4WG200	(4#3/0 + 1#6G)2"C
225 *	3WG225	(3#4/0 + 1#3/0G)2"C		
250 *	3WG250	(3#250KCMIL + 1#3/0G)2-1/2"C		
300	3WG300	(3#350KCMIL + 1#4G)2-1/2"C	4WG300	(4#350KCMIL + 1#4G)3-1/2"C
350	3WG350	(3#500KCMIL + 1#3G)3"C	4WG350	(4#500KCMIL + 1#3G)3-1/2"C
400	3WG400	(3#500KCMIL + 1#3G)3"C	4WG400	(4#500KCMIL + 1#3G)3-1/2"C
500	3WG500	2[(3#250KCMIL + 1#2G)2-1/2"C]	4WG500	2[(4#250KCMIL + 1#2G)3"C]
600	3WG600	2[(3#350KCMIL + 1#1G)2-1/2"C]	4WG600	2[(4#350KCMIL + 1#1G)3"C]
800	3WG800	2[(3#500KCMIL + 1#1/0G)3"C]	4WG800	2[(4#500KCMIL + 1#1/0G)3-1/2"C]
20	2WG20	(2#12 + 1#12G)3/4"C		
30	2WG30	(2#10 + 1#10G)3/4"C		

* GROUND WIRE SIZE ADJUSTED TO ACCOMMODATE 1200A OVER-CURRENT DEVICE.

ELECTRICAL DRAWING LIST

Sheet Number	Sheet Title
E1.0	ELECTRICAL GENERAL INFORMATION
E1.1	ELECTRICAL LEGEND
E1.2	ELECTRICAL SCHEDULES
E1.3	ELECTRICAL SCHEDULES
E2.1	WEST ELECTRICAL ONE-LINE DIAGRAM
E2.2	EAST ELECTRICAL ONE-LINE DIAGRAM
~~E3.1~~	~~ELECTRICAL SITE PLAN - WEST~~
E3.2	ELECTRICAL SITE PLAN - EAST
E5.0	ELECTRICAL ROADWAY LEVEL PLAN - WEST
E5.1	ELECTRICAL MEZZANINE LEVEL PLAN - WEST
E6.0	ELECTRICAL ROADWAY LEVEL PLAN - EAST
E6.1	ELECTRICAL FAN LEVEL PLAN - EAST
E7.0	ELECTRICAL SPECIFICATIONS
E7.1	ELECTRICAL SPECIFICATIONS
E7.2	ELECTRICAL SPECIFICATIONS

RECORD DRAWINGS
SSG MEP, INC.

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RONDINELLI · BARNARD · BCER engineering · Sturgeon ELECTRIC · Western States Fire Protection Co. · CONSULTING ENGINEERS

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions

Num	Description	Date

DRAWN BY: ART CHECKED BY: GEP

ELECTRICAL GENERAL INFORMATION

Drawing Number
E1.0

XREFS=(xx-tb) Layouts=(E1.0 ELECTRICAL GENERAL INFORMATION)
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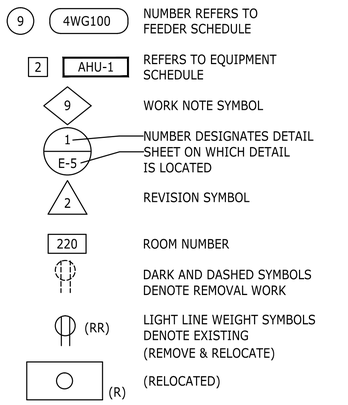
ELECTRICAL LEGEND

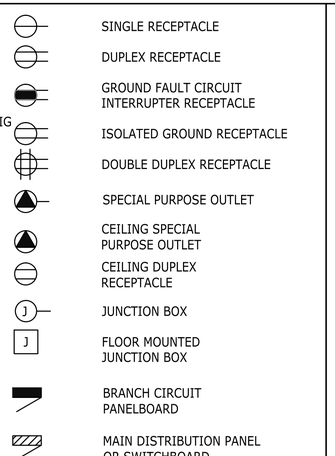
ALL SYMBOLS IN LEGEND MAY NOT NECESSARILY BE USED ON THIS PROJECT

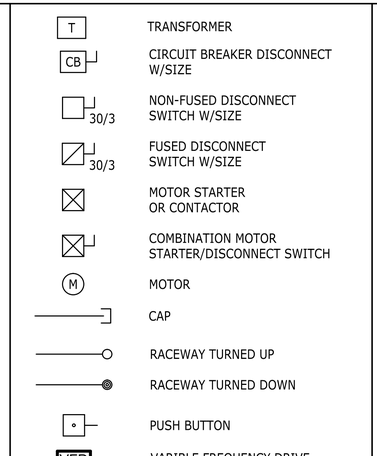
ABBREVIATIONS AND DESCRIPTIONS

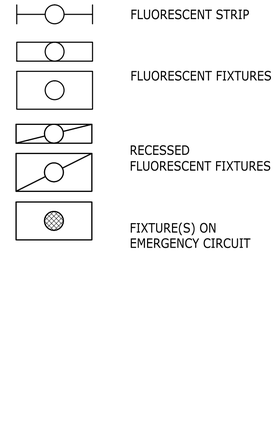
+4'-6"	MOUNTING HEIGHT AFF
A	AMPS
AC	ALTERNATING CURRENT
ac	ABOVE COUNTER
AFCI	ARC FAULT CIRCUIT INTERRUPTER
AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AHU	AIR HANDLING UNIT
AIC	AMPERE INTERRUPTING CAPACITY
AF	AMP FRAME
AT	AMP TRIP
ATS	AUTO. TRANSFER SWITCH
B	BATTERY
BKR	BREAKER
C	CONDUIT
CKT	CIRCUIT
CP	CONTROL PANEL
CT	CURRENT TRANSFORMER
(D)	DEDICATED
DP	DISTRIBUTION PANEL
(E)	EXISTING
EC	ELECTRICAL CONTRACTOR
EF	EXHAUST FAN
EOL	END OF LINE RESISTOR
EM	EMERGENCY
EMT	ELEC. METALLIC TUBING
EPO	EMERGENCY POWER OFF
EWC	ELECTRIC WATER COOLER
EX	EXPLOSION-PROOF
F	FUSE OR FIRE
FA	FIRE ALARM
FCU	FAN COIL UNIT
FDR	FEEDER
FI	FILM ILLUMINATOR
FS	FIRE SUPPRESSION
G	GROUND
GFCI	GROUND FAULT CIRCUIT INTERRUPTER
GRC	GALVANIZED RIGID CONDUIT
H	PREFIX DENOTING 277/480 PANEL
HP	HORSE POWER
IG	ISOLATED GROUND
KV	KILOVOLT
KVA	KILO VOLT-AMPERE
KVAR	KILOVAR
KW	KILOWATT
L	PREFIX DENOTING 120/208V PANEL
LV	LOW VOLTAGE
M	MONITOR
MC	MECHANICAL CONTRACTOR
MCC	MOTOR CONTROL CENTER
MDP	MAIN DISTRIBUTION PANEL
MDS	MAIN DIST. SWITCHBOARD
MG	MOTOR GENERATOR UNIT
MH	MANHOLE
MTD	MOUNTED
MTS	MANUAL TRANSFER SWITCH
N	NEUTRAL
NC	NORMALLY CLOSED
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
PA	PREACTION SYSTEM
PDU	POWER DISTRIBUTION UNIT
PF	POWER FACTOR
Ø OR PH	PHASE
PT	POTENTIAL TRANSFORMER
PVC	POLYVINYL CHLORIDE
(R)	RELOCATED
(RR)	REMOVE & RELOCATE
RM	ROOM
RT	RAINTIGHT
RTU	ROOF TOP UNIT
SCA	SHORT CIRCUIT CURRENT AVAILABLE
SRG	SIGNAL REFERENCE GRID
ST	SHUNT TRIP
SW	SWITCH
TS	TEST SWITCH
TTB	TELEPHONE TERMINAL BOARD
TTC	TELEPHONE TERMINAL CABINET
TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSER
UC	UNDERCABINET
UF	UNDERFLOOR
UG	UNDERGROUND
UON	UNLESS OTHERWISE NOTED
UPS	UNINTERRUPTIBLE POWER SUPPLY
V	VOLTS
VAC	VOLTS ALTERNATING CURRENT
VDC	VOLTS DIRECT CURRENT
VFD	VARIABLE FREQUENCY DRIVE
WHM	WATTHOUR METER
WP	WEATHERPROOF
WR	WEATHER RESISTANT

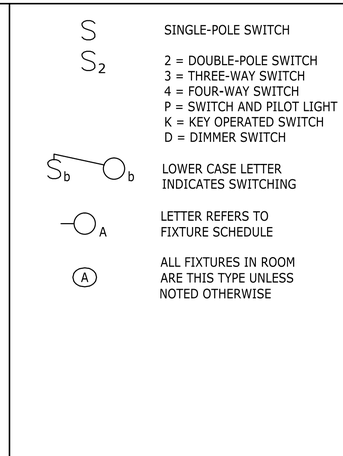


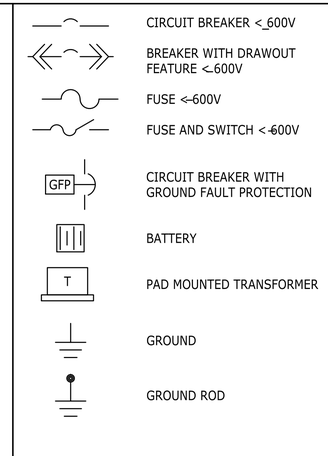
POWER / LIGHTING / ONE-LINE DIAGRAMS

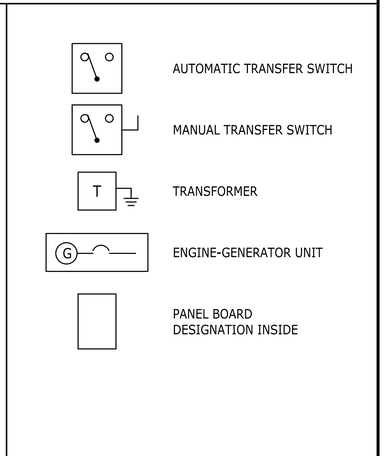












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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions
Num | Description | Date
DRAWN BY: ART | CHECKED BY: GEP

RECORD DRAWINGS
SSG MEP, INC.

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E1.1 ELECTRICAL LEGEND

Drawing Number
E1.1

GENERATOR DEMAND LOAD

DESCRIPTION	kW	COMMENT
GENERATOR SIZE	**350.0**	kW RATING UP TO 3,000'
DERATE	**-112.0**	4% DERATE PER 1,000'
RATING AT 11,000'	**238.0**	**Tunnel Elevation**
FIRE PUMP (150Hp)	148.0	RUNNING LOAD
WEST PORTAL FIRE PROTECTION SYSTEM EQUIPMENT	6.0	FIRE PROTECTION CABINETS AND REMOTE CONTROL PANELS
PANEL EMWL1	12.0	FIRE WORKS, FIBER OPTIC DETECTION, PUMP ROOM LIGHTING AND FANS
CIRCULATING PUMPS	0.0	DO NOT RUN DURING A FIRE EVENT
CALCULATED GENERATOR LOAD	**166.0**	**69.7%**

ADDITIONAL DEMAND LOAD ON DP-EV

DESCRIPTION	kW	COMMENT
EAST PORTAL FIRE PROTECTION SYSTEM EQUIPMENT	6.0	FIRE PROTECTION CABINETS AND REMOTE CONTROL PANELS
PANEL EMEL1	12.8	FIRE WORKS, FIBER OPTIC DETECTION, ETC.
DEMAND LOAD	**18.8**	23A AT 480V, 3-PHASE

EQUIPMENT SCHEDULE

MECH. DESIGNATION	EQUIPMENT DESCRIPTION	VOLTS	PH	HP	MCA	KW	KVA	PANEL DESIGNATION	CB SIZE	FEEDER SIZE	REMARKS
FP-1	FIRE PUMP	480	3	150			149.6	FIRE PUMP CONTROLLER	1200	(3#4/0 & 1#3/0G)2" IMC.	
BES-1	BOILER EQUIPMENT SKID	480	3				66.5	EMWH1	100	(3#1 & 1#6G)1-1/2" IMC.	
P-1	HEATING CIRC. PUMP	480	3	25			28.3	POWERED FROM SKID		PRE-WIRED (BY SKID MANUFACTURER)	PACKAGED WITH SKID
P-2	HEATING CIRC. PUMP	480	3	25			28.3	POWERED FROM SKID		PRE-WIRED (BY SKID MANUFACTURER)	PACKAGED WITH SKID
P-3	BOILER CIRC. PUMP	120	1	0.5			1.0	POWERED FROM SKID		PRE-WIRED (BY SKID MANUFACTURER)	PACKAGED WITH SKID
P-4	BOILER CIRC. PUMP	120	1	0.5			1.0	POWERED FROM SKID		PRE-WIRED (BY SKID MANUFACTURER)	PACKAGED WITH SKID
B-1	BOILER CONTROL PANEL	120	1			1.2	1.2	POWERED FROM SKID		PRE-WIRED (BY SKID MANUFACTURER)	PACKAGED WITH SKID
B-2	BOILER CONTROL PANEL	120	1			1.2	1.2	POWERED FROM SKID		PRE-WIRED (BY SKID MANUFACTURER)	PACKAGED WITH SKID
TCP	HOT WATER SYSTEM CONTROL PANEL	120	1			0.9	0.9	POWERED FROM SKID		PRE-WIRED (BY SKID MANUFACTURER)	PACKAGED WITH SKID
VF-1	BOILER VENT FAN 1	208	3	2			2.8	EMWL1	20	(3#12 & 1#12G)3/4" IMC.	VFD
VF-2	BOILER VENT FAN 2	208	3	1			1.7	EMWL1	15	(3#12 & 1#12G)3/4" IMC.	VFD

TYPICAL TUNNEL VOLTAGE DROP CALCULATION

DESCRIPTION	NOTES	FEEDER						
		AMPACITY	LOAD AMPS	LENGTH FEET	VOLTAGE	PF	VOLTAGE DROP	% DROP
(3#6 & 1#10G)3/4" IMC.	FPC-1	65	3.60	500	480	1.0	1.77	0.37
(3#6 & 1#10G)3/4" IMC.	FPC-2	65	3.00	1000	480	1.0	2.94	0.61
(3#6 & 1#10G)3/4" IMC.	FPC-3, RCP	65	3.00	1000	480	1.0	2.94	0.61
(3#6 & 1#10G)3/4" IMC.	FPC-4	65	1.80	1000	480	1.0	1.77	0.37
(2#6 & 1#10G)3/4" IMC.	FPC-5	65	1.04	1000	480	1.0	1.02	0.21
			TOTAL	**4500**			**10.44**	**2.18**

FIRE PUMP VOLTAGE DROP CALCULATIONS

DESCRIPTION	NOTES	FEEDER						
		AMPACITY	LOAD AMPS	LENGTH FEET	VOLTAGE	PF	VOLTAGE DROP	% DROP
FIRE PUMP OPERATING AT 115% FLA								
(3#250KCMIL & 1#4G)2-1/2" IMC.	115% FLA OF PUMP	250	207	140	480	0.8	3.59	0.75
(3#4/0 & 1#4G)2" IMC.	115% FLA OF PUMP	225	207	10	480	0.8	0.28	0.06
			TOTAL	**150**			**3.88**	**0.81**
FIRE PUMP STARTING								
(3#250KCMIL & 1#4G)2-1/2" IMC.	STARTING (ACROSS-THE-LINE)	250	1080.00	140	480	0.6	18.45	3.84
(4#4/0 & 1#4G)2-1/2" IMC.	STARTING (ACROSS-THE-LINE)	225	1080.00	10	480	0.6	1.40	0.29
			TOTAL	**150**			**19.85**	**4.14**

EJMT WEST PORTAL FAULT CURRENT SCHEDULE

NODE DESCRIPTION	NODE TYPE	LINE VOLTAGE	FROM	TO	XFRMR SIZE	FEEDER INFORMATION			CONDUCTOR TYPE	CONDUIT TYPE	SYM.RMS FAULT CURRENT	PER UNIT R VALUE	PER UNIT JX VALUE	X/R RATIO
						RUNS	SIZE	LENGTH						
XCEL ENERGY	UTILITY		151	0										
PAD MOUNTED XFMR	XFMR	480	0	1	2,000						45,219	0.00860	0.05250	6.10
480V SWITCHGEAR	PANEL	480	1	2		1	3200A Busduct	110	Cu	Mag.	42,591	0.01251	0.05508	4.40
250A BUSSED GUTTER	PANEL	480	2	3		1	#250KCMIL	140	Cu	Mag.	16,970	0.07814	0.11827	1.51
150A ATS		480	3	4		1	#1/0	10	Cu	Mag.	15,868	0.08856	0.12305	1.39
EMWH1	PANEL	480	4	5		1	#1/0	10	Cu	Mag.	14,881	0.09897	0.12782	1.29
FIRE PUMP CONTROLLER		480	3	6		1	#4/0	10	Cu	Mag.	16,202	0.08361	0.12270	1.47
EMWL1	XFMR	208	5	7	30.0						1,427	3.21231	2.19449	0.68

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RECORD DRAWINGS
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E1.2 ELECTRICAL SCHEDULES

Drawing Number
E1.2

PANEL: (N) EMWH1

FEED FROM: ATS-EMWH1 | VOLTAGE: 480 | PHASE: 3 | WIRE: 3
NEUTRAL: 100% | GROUND: STANDARD | ENCLOSURE: NEMA 1 | MOUNTING: SURFACE
MANUFACTURER: EATON | BUS AMPACITY: 250 | MAIN: 150A MLO (LIMITED BY 150A ATS) | AIC: 18,000

CKT NO	CKT DESCRIPTION	LOAD VA	LOAD TYPE	CKT BREAKER P	CKT BREAKER A	NOTE	NOTE	CKT BREAKER A	CKT BREAKER P	LOAD TYPE	LOAD VA	CKT DESCRIPTION	CKT NO
1	SPARE			3	100			100	3	M	10867	BOILER SKID	2
3	/			/	/			/	/	M	10867	/	4
5	/			/	/			/	/	M	10867	/	6
7	XFMR T-EMWL1			3	45			-	-			SPACE	8
9	/			/	/			-	-			/	10
11	/			/	/			-	-			/	12
13	EISENHOWER TUNNEL	1000	O	3	30			30	3	O	1000	JOHNSON TUNNEL	14
15	FIRE PROTECTION SYSTEM	1000	O	/	/			/	/	O	1000	FIRE PROTECTION SYSTEM	16
17	/	1000	O	/	/			/	/	O	1000	/	18
19	SPARE			3	15			15	3			SPARE	20
21	/			/	/			/	/			/	22
23	/			/	/			/	/			/	24
25	SPD			3	30	1		-	-			SPACE	26
27	/			/	/			-	-			/	28
29	/			/	/			-	-			/	30

SUBFED LOAD SUMMARY

LOAD	PHASE	KVA L	R	H	M	MLRG	CM	K	S	N	E
PANEL 'EMWL1'	A	-	-	-	1.5	0.9	-	-	-	-	5.3
	B	0.4	-	-	1.5	0.9	-	-	-	-	4.5
	C	-	-	-	1.5	0.9	-	-	-	-	4.2

LOAD TYPE	CONNECTED (KVA) A	B	C	TOTAL	DEMAND FACTOR	DEMAND (KVA) A	B	C	TOTAL
LIGHTING (L)	0.0	0.4	0.0	0.4	1.25	0.0	0.5	0.0	0.5
RECEPTACLE (R)	0.0	0.0	0.0	0.0	1.00	0.0	0.0	0.0	0.0
REC (>10000VA) (R)	0.0	0.0	0.0	0.0	0.50	0.0	0.0	0.0	0.0
HEATER (H)	0.0	0.0	0.0	0.0	1.00	0.0	0.0	0.0	0.0
LARGEST MOTOR (M)	10.9	10.9	10.9	32.6	1.25	13.6	13.6	13.6	40.8
REMAIN MOTOR (M)	1.5	1.5	1.5	4.5	1.00	1.5	1.5	1.5	4.5
CONTINUOUS LOAD (CL)	0.0	0.0	0.0	0.0	1.25	0.0	0.0	0.0	0.0
KITCHEN LOADS (K)	0.0	0.0	0.0	0.0	1.00	0.0	0.0	0.0	0.0
SPECIFIC LOADS (S)	0.0	0.0	0.0	0.0	1.00	0.0	0.0	0.0	0.0
NONCOINCIDENTAL (N)	0.0	0.0	0.0	0.0	0.00	0.0	0.0	0.0	0.0
OTHER LOAD (O)	7.3	6.5	6.2	20.0	1.00	7.3	6.5	6.2	20.0
					TOTAL DEMAND (KVA)	22.4	22.1	21.3	65.7
					SPARE (KVA)	19.2	19.5	20.3	59.0
					TOTAL (A/PH)	**80.8**	**79.7**	**76.8**	**79.1**
					SPARE (A/PH)	69.2	70.3	73.2	70.9

NOTES:
1. PROVIDE PANEL WITH INTERNALLY MOUNTED TYPE-2, 50kA SURGE PROTECTION DEVICE.

PANEL: (E) DP-EV

FEED FROM: ATS-1200A | VOLTAGE: 480/277 | PHASE: 3 | WIRE: 4
NEUTRAL: 100% | GROUND: STANDARD | ENCLOSURE: NEMA 1 | MOUNTING: SURFACE
MANUFACTURER: --- | BUS AMPACITY: 1200 | MAIN: 1200A MLO | AIC: 65,000

CKT NO	CKT DESCRIPTION	LOAD VA	LOAD TYPE	CKT BREAKER P	CKT BREAKER A	NOTE	NOTE	CKT BREAKER A	CKT BREAKER P	LOAD TYPE	LOAD VA	CKT DESCRIPTION	CKT NO
1	XFMR 'T-EMEL1' (N)			3	45			100	3	O	16667	INVERTER (BY OTHERS) (N	2
3	/			/	/			/	/	O	16667	/	4
5	/			/	/			/	/	O	16667	/	6
7	TX-EVND (300kVA) (E)	16667	O	3	400	1	1	-	-			NON-USABLE SPACE (E)	8
9	/	16667	O	/	/			-	-			/	10
11	/	16667	O	/	/			-	-			/	12
13	EVS-1 (E)	16667	O	3	150	1	1	150	3	O	16667	EVN-1 (E)	14
15	/	16667	O	/	/			/	/	O	16667	/	16
17	/	16667	O	/	/			/	/	O	16667	/	18
19	T-EVSD (E)	16667	O	3	225	1	1	-	-			NON-USABLE SPACE (E)	20
21	/	16667	O	/	/			-	-			/	22
23	/	16667	O	/	/			-	-			/	24
25	JOHNSON TUNNEL (N)	1000	O	3	30			30	3	O	1000	EISENHOWER TUNNEL (N)	26
27	FIRE PROTECTION SYSTEM	1000	O	/	/			/	/	O	1000	FIRE PROTECTION SYSTEM	28
29	/	1000	O	/	/			/	/	O	1000	/	30

SUBFED LOAD SUMMARY

LOAD	PHASE	KVA L	R	H	M	MLRG	CM	K	S	N	E
PANEL 'EMEL1"	A	-	-	-	-	-	-	-	-	-	5.6
	B	-	-	-	-	-	-	-	-	-	3.6
	C	-	-	-	-	-	-	-	-	-	3.6

LOAD TYPE	CONNECTED (KVA) A	B	C	TOTAL	DEMAND FACTOR	DEMAND (KVA) A	B	C	TOTAL
LIGHTING (L)	0.0	0.0	0.0	0.0	1.25	0.0	0.0	0.0	0.0
RECEPTACLE (R)	0.0	0.0	0.0	0.0	1.00	0.0	0.0	0.0	0.0
REC (>10000VA) (R)	0.0	0.0	0.0	0.0	0.50	0.0	0.0	0.0	0.0
HEATER (H)	0.0	0.0	0.0	0.0	1.00	0.0	0.0	0.0	0.0
LARGEST MOTOR (M)	0.0	0.0	0.0	0.0	1.25	0.0	0.0	0.0	0.0
REMAIN MOTOR (M)	0.0	0.0	0.0	0.0	1.00	0.0	0.0	0.0	0.0
CONTINUOUS LOAD (CL)	0.0	0.0	0.0	0.0	1.25	0.0	0.0	0.0	0.0
KITCHEN LOADS (K)	0.0	0.0	0.0	0.0	1.00	0.0	0.0	0.0	0.0
SPECIFIC LOADS (S)	0.0	0.0	0.0	0.0	1.00	0.0	0.0	0.0	0.0
NONCOINCIDENTAL (N)	0.0	0.0	0.0	0.0	0.00	0.0	0.0	0.0	0.0
OTHER LOAD (O)	90.9	88.9	88.9	268.8	1.00	90.9	88.9	88.9	268.8
					TOTAL DEMAND (KVA)	90.9	88.9	88.9	268.8
					SPARE (KVA)	241.5	243.5	243.5	728.8
					TOTAL (A/PH)	**328.3**	**321.1**	**321.1**	**323.3**
					SPARE (A/PH)	871.7	878.9	878.9	876.7

NOTES:
1. LOADS ON EXISTING 500kW GENERATOR IS 200kW.
NEW LOAD ADDED = 18.8kW
TOTAL LOAD = 218.8kW
SPARE = 281.2kW

PANEL: (N) EMWL1

FEED FROM: 30KVA XFMR | VOLTAGE: 208/120 | PHASE: 3 | WIRE: 4
NEUTRAL: 100% | GROUND: STANDARD | ENCLOSURE: NEMA 1 | MOUNTING: SURFACE
MANUFACTURER: EATON | BUS AMPACITY: 100 | MAIN: 100A MCB | AIC: 10,000

CKT NO	CKT DESCRIPTION	LOAD VA	LOAD TYPE	CKT BREAKER P	CKT BREAKER A	NOTE	NOTE	CKT BREAKER A	CKT BREAKER P	LOAD TYPE	LOAD VA	CKT DESCRIPTION	CKT NO
1	VF-1	933	M	3	15			20	1	O	200	TANK LVL SENSOR	2
3	/	933	M	/	/			20	1	L	384	LTG - BOILER ROOM	4
5	/	933	M	/	/			20	1			SPARE	6
7	CCTV WORKSTATION UPS	1800	O	1	20			20	1			SPARE	8
9	FA FIREWORKS UPS	1800	O	1	20			20	1			SPARE	10
11	FACP WEST CNTRL RM	1800	O	1	20			20	1			SPARE	12
13	CCTV RACKS	1800	O	1	20			20	1			SPARE	14
15	GEN. BATTERY CHARGER	1200	O	1	20			20	1			SPARE	16
17	GEN. WARMING PAD	1200	O	1	20			20	1	O	1000	GEN. JACKET HEATER	18
19	VF-2	567	M	3	15			30	2	O	1500	GEN. OIL HEATER	20
21	/	567	M	/	/			/	/	O	1500	/	22
23	/	567	M	/	/			20	1	O	200	VFD CONTROLLER	24
25	SPD			3	30	1		-	-			SPACE	26
27	/			/	/			-	-			SPACE	28
29	/			/	/			-	-			SPACE	30
31	SPACE			-	-			-	-			SPACE	32
33	SPACE			-	-			-	-			SPACE	34
35	SPACE			-	-			-	-			SPACE	36

LOAD TYPE	CONNECTED (KVA) A	B	C	TOTAL	DEMAND FACTOR	DEMAND (KVA) A	B	C	TOTAL
LIGHTING (L)	0.0	0.4	0.0	0.4	1.25	0.0	0.5	0.0	0.5
RECEPTACLE (R)	0.0	0.0	0.0	0.0	1.00	0.0	0.0	0.0	0.0
REC (>10000VA) (R)	0.0	0.0	0.0	0.0	0.50	0.0	0.0	0.0	0.0
HEATER (H)	0.0	0.0	0.0	0.0	1.00	0.0	0.0	0.0	0.0
LARGEST MOTOR (M)	0.9	0.9	0.9	2.8	1.25	1.2	1.2	1.2	3.5
REMAIN MOTOR (M)	0.6	0.6	0.6	1.7	1.00	0.6	0.6	0.6	1.7
CONTINUOUS LOAD (CL)	0.0	0.0	0.0	0.0	1.25	0.0	0.0	0.0	0.0
KITCHEN LOADS (K)	0.0	0.0	0.0	0.0	1.00	0.0	0.0	0.0	0.0
SPECIFIC LOADS (S)	0.0	0.0	0.0	0.0	1.00	0.0	0.0	0.0	0.0
NONCOINCIDENTAL (N)	0.0	0.0	0.0	0.0	0.00	0.0	0.0	0.0	0.0
OTHER LOAD (O)	5.3	4.5	4.2	14.0	1.00	5.3	4.5	4.2	14.0
					TOTAL DEMAND (KVA)	7.0	6.7	5.9	19.7
					SPARE (KVA)	3.0	3.3	4.1	10.3
					TOTAL (A/PH)	**58.6**	**55.9**	**49.4**	**54.6**
					SPARE (A/PH)	24.7	27.3	33.8	28.6

NOTES:
1. PROVIDE PANEL WITH INTERNALLY MOUNTED TYPE-2, 20kA SURGE PROTECTION DEVICE.

PANEL: (N) EMEL1

FEED FROM: 30KVA XFMR | VOLTAGE: 208/120 | PHASE: 3 | WIRE: 4
NEUTRAL: 100% | GROUND: STANDARD | ENCLOSURE: NEMA 1 | MOUNTING: SURFACE
MANUFACTURER: EATON | BUS AMPACITY: 100 | MAIN: 100A MCB | AIC: 65,000

CKT NO	CKT DESCRIPTION	LOAD VA	LOAD TYPE	CKT BREAKER P	CKT BREAKER A	NOTE	NOTE	CKT BREAKER A	CKT BREAKER P	LOAD TYPE	LOAD VA	CKT DESCRIPTION	CKT NO
1	MAIN			3	100			-	-			SPACE	2
3	/			/	/			-	-			/	4
5	/			/	/			-	-			/	6
7	FACP CONTROL RM	1800	O	1	20			20	1	O	1800	FACP FM OFFICE	8
9	CCTV RACKS	1800	O	1	20			20	1	O	1800	CCTV WKST. UPS FMO	10
11	CCTV WKST. UPS	1800	O	1	20			20	1	O	1800	FA WKST. UPS FMO	12
13	FA WKST. UPS	1800	O	1	20			20	1	O	200	CONTROL VALVES - LL EAS	14
15	SPARE			1	20			20	1			SPARE	16
17	SPARE			1	20			20	1			SPARE	18
19	SPACE			-	-			20	1			SPARE	20
21	SPACE			-	-			20	1			SPARE	22
23	SPACE			-	-			20	1			SPARE	24
25	SPACE			-	-			-	-			SPACE	26
27	SPACE			-	-			-	-			SPACE	28
29	SPACE			-	-			-	-			SPACE	30
31	SPD			3	30	1		-	-			SPACE	32
33	/			/	/			-	-			SPACE	34
35	/			/	/			-	-			SPACE	36
37	SPACE			-	-			-	-			SPACE	38
39	SPACE			-	-			-	-			SPACE	40
41	SPACE			-	-			-	-			SPACE	42

LOAD TYPE	CONNECTED (KVA) A	B	C	TOTAL	DEMAND FACTOR	DEMAND (KVA) A	B	C	TOTAL
LIGHTING (L)	0.0	0.0	0.0	0.0	1.25	0.0	0.0	0.0	0.0
RECEPTACLE (R)	0.0	0.0	0.0	0.0	1.00	0.0	0.0	0.0	0.0
REC (>10000VA) (R)	0.0	0.0	0.0	0.0	0.50	0.0	0.0	0.0	0.0
HEATER (H)	0.0	0.0	0.0	0.0	1.00	0.0	0.0	0.0	0.0
LARGEST MOTOR (M)	0.0	0.0	0.0	0.0	1.25	0.0	0.0	0.0	0.0
REMAIN MOTOR (M)	0.0	0.0	0.0	0.0	1.00	0.0	0.0	0.0	0.0
CONTINUOUS LOAD (CL)	0.0	0.0	0.0	0.0	1.25	0.0	0.0	0.0	0.0
KITCHEN LOADS (K)	0.0	0.0	0.0	0.0	1.00	0.0	0.0	0.0	0.0
SPECIFIC LOADS (S)	0.0	0.0	0.0	0.0	1.00	0.0	0.0	0.0	0.0
NONCOINCIDENTAL (N)	0.0	0.0	0.0	0.0	0.00	0.0	0.0	0.0	0.0
OTHER LOAD (O)	5.6	3.6	3.6	12.8	1.00	5.6	3.6	3.6	12.8
					TOTAL DEMAND (KVA)	5.6	3.6	3.6	12.8
					SPARE (KVA)	4.4	6.4	6.4	17.2
					TOTAL (A/PH)	**46.7**	**30.0**	**30.0**	**35.5**
					SPARE (A/PH)	36.6	53.3	53.3	47.7

NOTES:
1. PROVIDE PANEL WITH INTERNALLY MOUNTED TYPE-2, 20kA SURGE PROTECTION DEVICE.

PANEL SCHEDULE KEY PLAN

(N) EMWH1	(N) EMWL1
(E) DP-EV	(N) EMEL1

RECORD DRAWINGS
SSG MEP, INC.

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BARNARD

BCER Engineering

Sturgeon ELECTRIC

Western States Fire Protection Co.

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions

Num	Description	Date

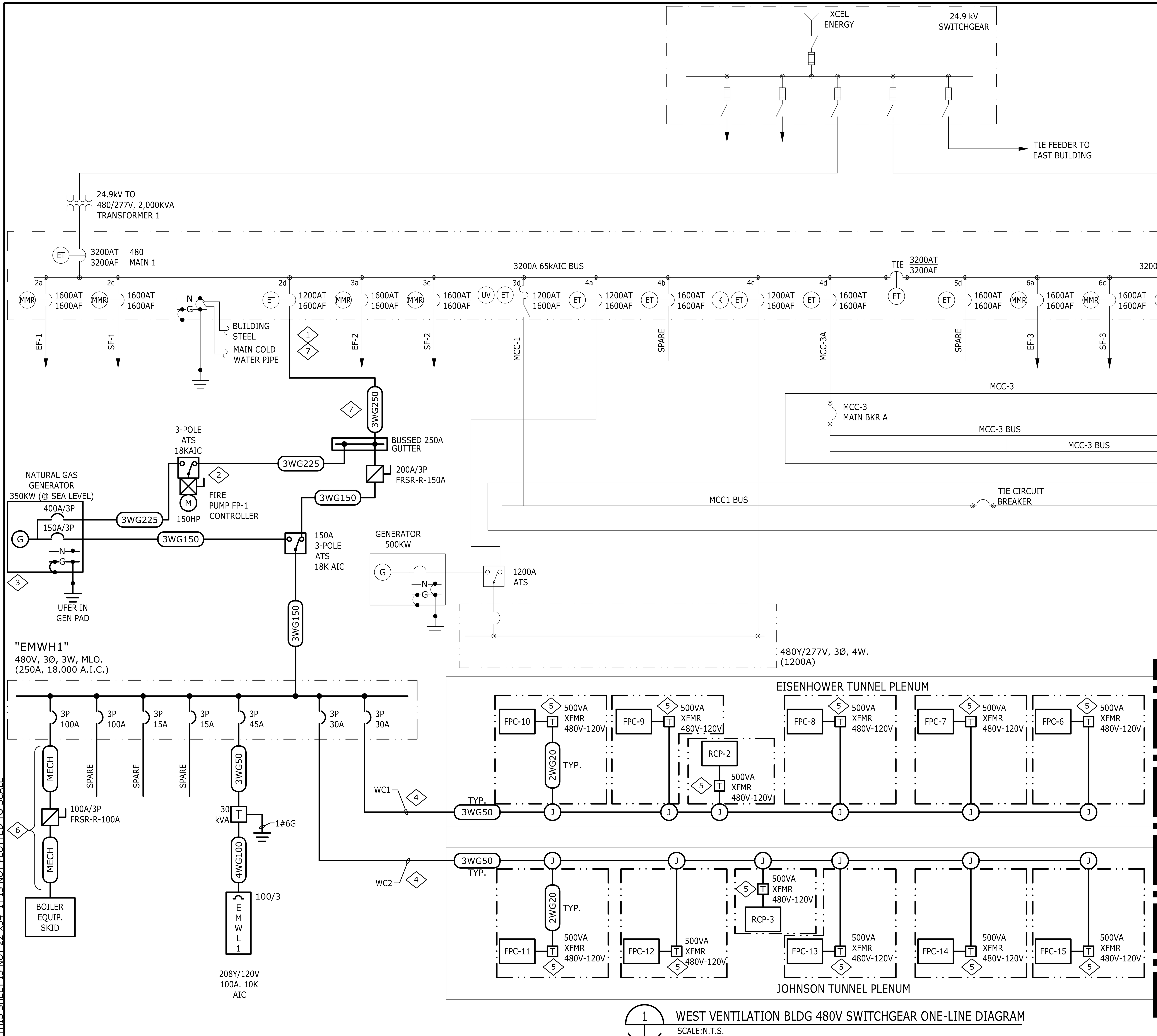
DRAWN BY: ART CHECKED BY: GEP

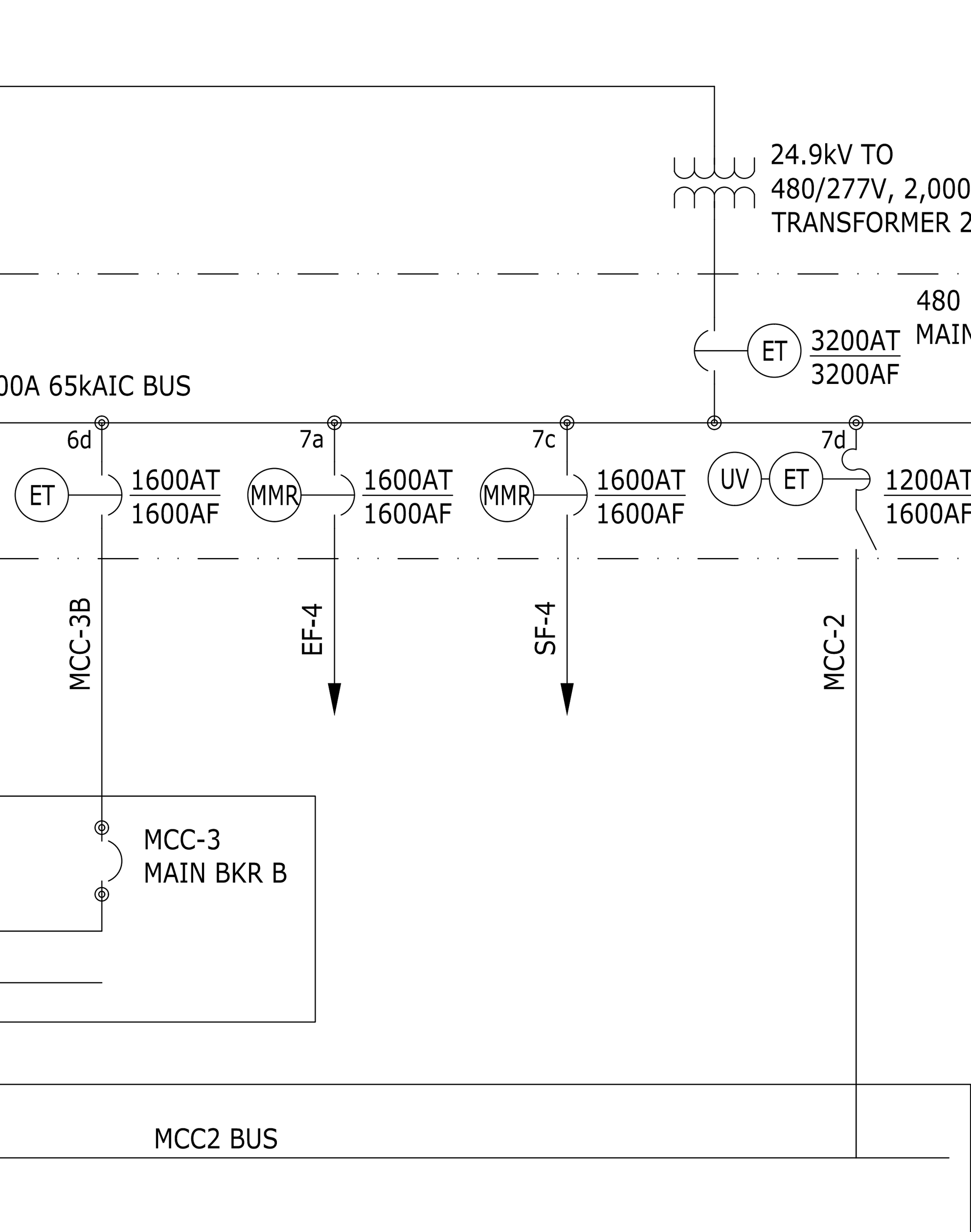
ELECTRICAL SCHEDULES

Drawing Number
E1.3

XREFS=(xx-tb) Layouts=(E1.0 ELECTRICAL GENERAL INFORMATION)
DIMSCALE=1 \\filesvr\jobs\87914002\Dwg\ejmt - fixed fire suppression system\Sheets\Electrical\E1.0 ELECTRICAL GENERAL INFORMATION.dwg FEB 3, 2015 10:32AM CHENDERSON

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE





GENERAL NOTES:

1. ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR DISCONNECTS, CONDUIT, WIRE, AND FINAL CONNECTIONS BETWEEN IDENTIFIED EQUIPMENT INCLUDING (BUT NOT LIMITED TO) FIRE PUMPS, FIRE PUMP CONTROLLER, CIRCULATING PUMPS, AND CONTROL PANELS.
2. REFER TO DRAWING E1.0 FOR FEEDER SCHEDULE.
3. REFER TO DRAWING E1.2 FOR GENERATOR, "EMWH1" AND "EMWL1" LOAD INFORMATION.

WORK NOTES:

1. UTILIZE EXISTING SPARE 1,600A CIRCUIT BREAKER IN EXISTING 480/277V SWITCHGEAR TO POWER NEW FIRE ALARM SYSTEM. COORDINATION OF THE WORK ASSOCIATED WITH THE NEW FEEDER INSTALLATION CAN BE COMPLETED WHILE THE SWITCHGEAR IS ENERGIZED. PROGRAM ENGINEER SUPPLIED CIRCUIT BREAKER SETTINGS INTO TRIP UNIT. SET TRIP TO 1,200A. PROVIDE AN ENGRAVED LABEL AT BREAKER TO STATE "FIRE PUMP DISCONNECTING MEANS".
2. INSTALL AND WIRE NEW 480/277V FIRE PUMP LISTED 3-POLE AUTOMATIC TRANSFER SWITCH AND CONTROLLER, 18K AIC RATING. PROVIDE SKID MOUNTED OR ON A HOUSEKEEPING PAD.
3. FURNISH, INSTALL AND WIRE NEW OUTDOOR CUMMINS GFBC 350KW (@ SEA LEVEL; DE-RATED TO 238 KW AT ELEVATION) NATURAL GAS GENERATOR WITH 105C ALTERNATOR, AND REMOTE ANNUNCIATOR (LOCATED IN FP/BOILER ROOM).
4. ROUTE POWER FOR TUNNEL FIRE PROTECTION SYSTEM PANELS WITH CONDUITS SHOWN ON THE SYSTEMS GROUP DRAWINGS.
5. PROVIDE SINGLE PHASE STEP DOWN TRANSFORMER WITH PRIMARY(0.8A) AND SECONDARY(4A) OVER-CURRENT PROTECTION AND DISCONNECTING MEANS. INSTALL TRANSFORMER WITHIN THE FPC/RCP PANEL IN LOCATION SHOWN IN THE SYSTEMS GROUP DRAWINGS. COORDINATE INSTALLATION WITH SYSTEMS GROUP.
6. REFER TO EQUIPMENT SCHEDULE - SHEET E1.2 FOR FEEDER SIZE TO BOILER EQUIPMENT SKID.
7. FEEDER AND BUSSED GUTTER ARE SIZED FOR FIRE PUMP AND CIRCULATION PUMPS NOT RUNNING SIMULTANEOUSLY.

RECORD DRAWINGS
SSG MEP, INC.

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Western States Fire Protection Co.
BCER Engineering
Sturgeon Electric

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

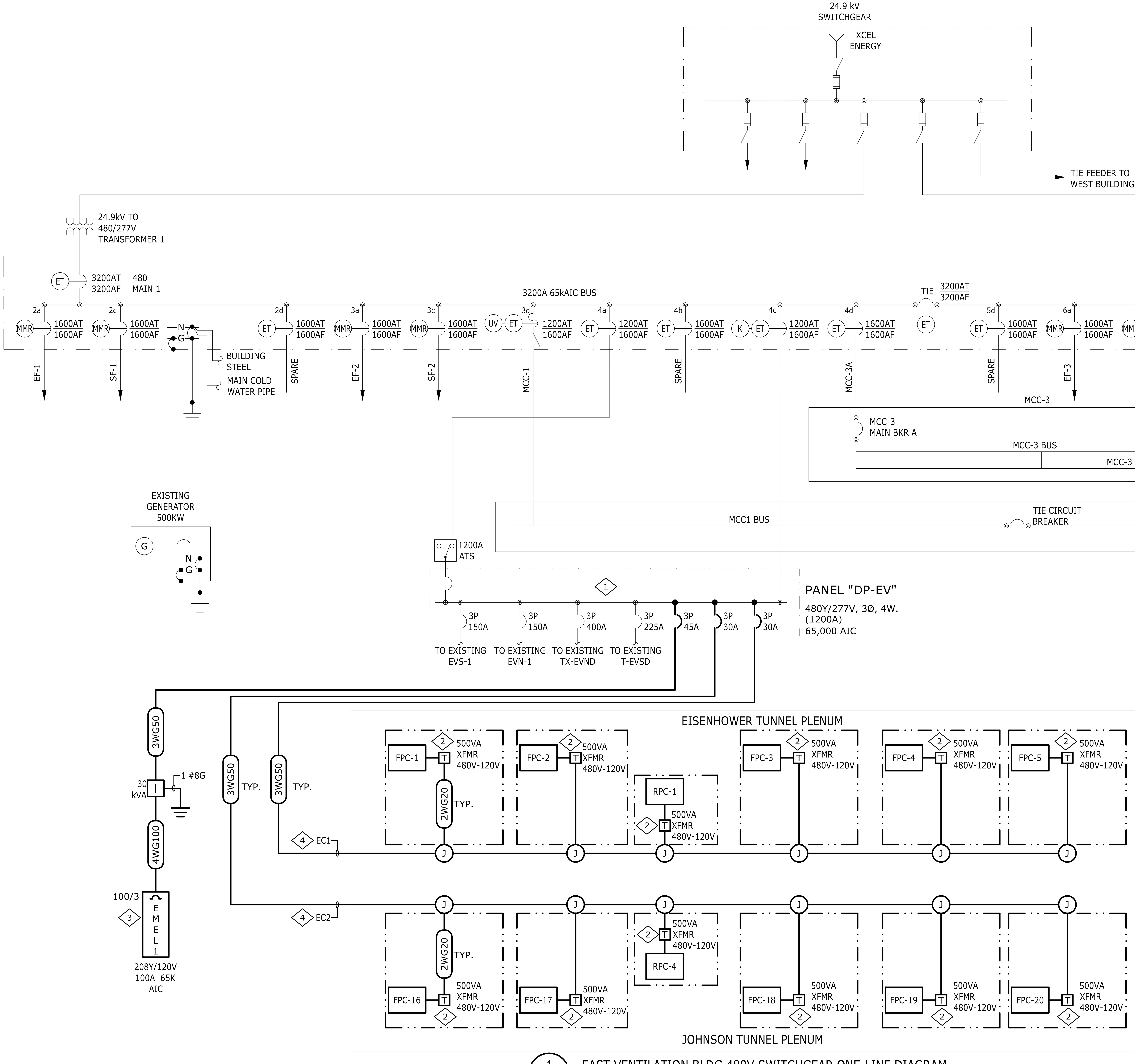
Num	Description	Date
Revisions		

DRAWN BY: ART CHECKED BY: GEP

E2.1 WEST ELECTRICAL ONE-LINE DIAGRAM
Drawing Number
E2.1

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

XREFS=(xx-tb) Layouts=(E2.1 WEST ELECTRICAL ONE-LINE DIAGRAM)
DIMSCALE=1 F:\87914002\Dwg\ejmt - fixed fire suppression system\Sheets\Electrical\E2.1 WEST ELECTRICAL ONE-LINE DIAGRAM.dwg JAN 29, 2015 10:20AM JBAKER



1 EAST VENTILATION BLDG 480V SWITCHGEAR ONE-LINE DIAGRAM

SCALE:N.T.S.

GENERAL NOTES:

1. ELECTRICAL CONTRACTOR RESPONSIBLE FOR DISCONNECTS, CONDUIT, WIRE, AND FINAL CONNECTIONS BETWEEN IDENTIFIED EQUIPMENT INCLUDING (BUT NOT LIMITED TO) FIRE PUMPS, FIRE PUMP CONTROLLER, CIRCULATING PUMPS, AND CONTROL PANELS.
2. REFER TO DRAWING E1.0 FOR FEEDER SCHEDULE.
3. REFER TO DRAWING E1.3 FOR "EMEL1" LOAD INFORMATION.
4. EXISTING 500KW GENERATOR LOAD IS LESS THAN 200KW.

WORK NOTES:

1. IN EXISTING 480/277V PANEL "DP-EV" FURNISH AND INSTALL NEW CIRCUIT BREAKERS AS SHOWN TO POWER NEW FIRE ALARM SYSTEM. RE-ARRANGE EXISTING CIRCUIT BREAKERS IN "DP-EV" AS NECESSARY TO ACCOMMODATE SPACE FOR NEW BREAKERS.
2. PROVIDE SINGLE PHASE STEP DOWN TRANSFORMER WITH PRIMARY(0.8A) AND SECONDARY(4A) OVER-CURRENT PROTECTION AND DISCONNECTING MEANS. INSTALL TRANSFORMER WITHIN THE FPC/RCP PANEL IN LOCATION SHOWN IN THE SYSTEMS GROUP DRAWINGS. COORDINATE INSTALLATION WITH SYSTEMS GROUP.
3. FURNISH, INSTALL AND WIRE NEW TRANSFORMER AND 208/120V PANEL. THIS PANEL WILL POWER THE FIRE ALARM PANELS, FIBER OPTIC LINEAR HEAT DETECTION SYSTEM, SOLENOID VALVES, VIDEO CAMERAS, WORK STATIONS, AND FLAT SCREEN DISPLAYS POWERED FROM THE EAST PORTAL.
4. ROUTE POWER FOR TUNNEL FIRE ALARM SYSTEM PANELS WITH CONDUITS SHOWN ON SYSTEMS GROUP DRAWINGS.

RECORD DRAWINGS
SSG MEP, INC.

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

DRAWN BY: ART
CHECKED BY: GEP

E2.2 EAST ELECTRICAL ONE-LINE DIAGRAM

Drawing Number
E2.2

XREFS=(xx-tb) Layouts=(E2.2 EAST ELECTRICAL ONE-LINE DIAGRAM)
DIMSCALE=1 \\filesvr\jobs\87914002\Dwg\ejmt - fixed fire suppression system\Sheets\Electrical\E2.2 EAST ELECTRICAL ONE-LINE DIAGRAM.dwg JAN 27, 2015 2:44PM CHENDERSON

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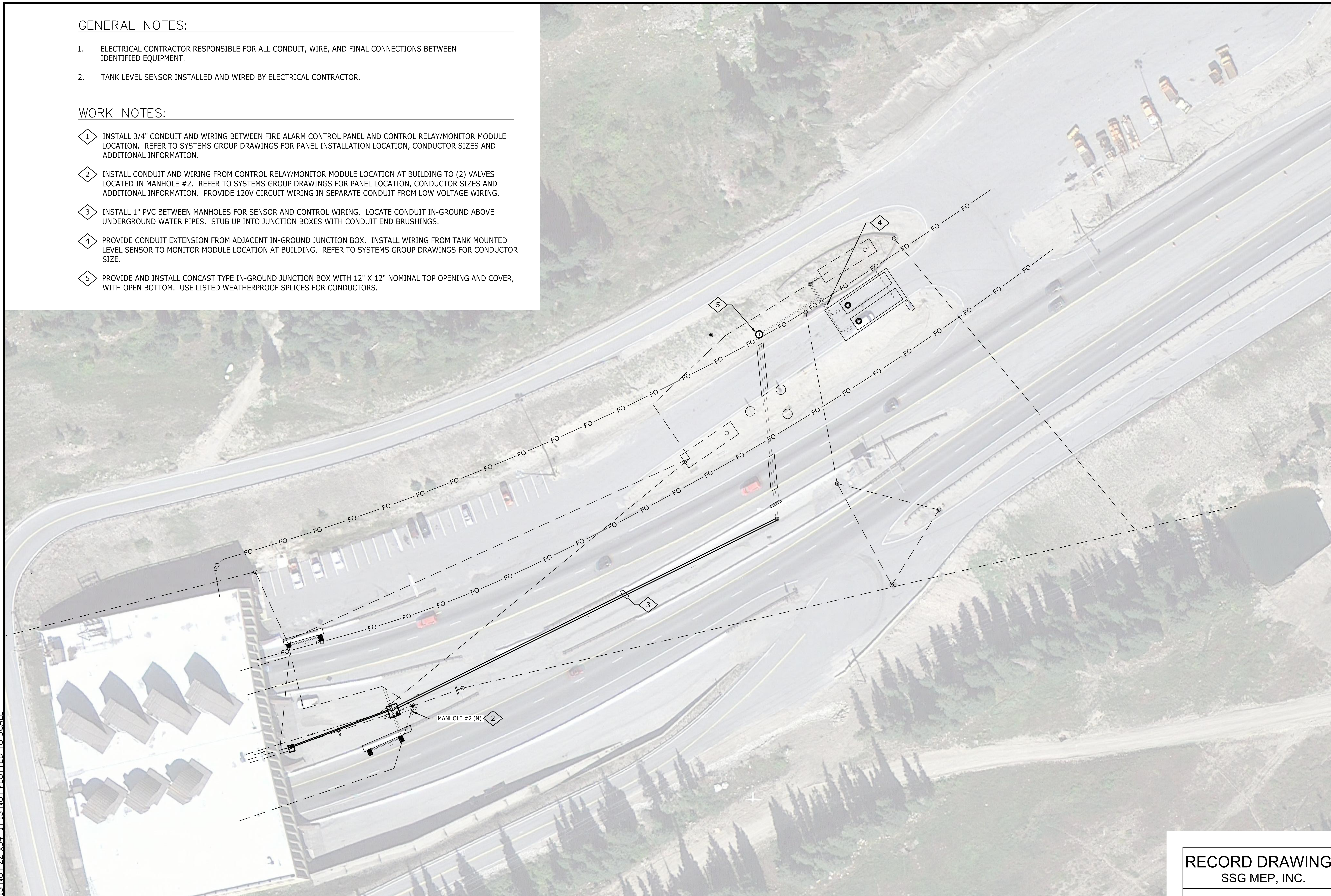
GENERAL NOTES:

1. ELECTRICAL CONTRACTOR RESPONSIBLE FOR ALL CONDUIT, WIRE, AND FINAL CONNECTIONS BETWEEN IDENTIFIED EQUIPMENT.
2. TANK LEVEL SENSOR INSTALLED AND WIRED BY ELECTRICAL CONTRACTOR.

WORK NOTES:

1. INSTALL 3/4" CONDUIT AND WIRING BETWEEN FIRE ALARM CONTROL PANEL AND CONTROL RELAY/MONITOR MODULE LOCATION. REFER TO SYSTEMS GROUP DRAWINGS FOR PANEL INSTALLATION LOCATION, CONDUCTOR SIZES AND ADDITIONAL INFORMATION.
2. INSTALL CONDUIT AND WIRING FROM CONTROL RELAY/MONITOR MODULE LOCATION AT BUILDING TO (2) VALVES LOCATED IN MANHOLE #2. REFER TO SYSTEMS GROUP DRAWINGS FOR PANEL LOCATION, CONDUCTOR SIZES AND ADDITIONAL INFORMATION. PROVIDE 120V CIRCUIT WIRING IN SEPARATE CONDUIT FROM LOW VOLTAGE WIRING.
3. INSTALL 1" PVC BETWEEN MANHOLES FOR SENSOR AND CONTROL WIRING. LOCATE CONDUIT IN-GROUND ABOVE UNDERGROUND WATER PIPES. STUB UP INTO JUNCTION BOXES WITH CONDUIT END BRUSHINGS.
4. PROVIDE CONDUIT EXTENSION FROM ADJACENT IN-GROUND JUNCTION BOX. INSTALL WIRING FROM TANK MOUNTED LEVEL SENSOR TO MONITOR MODULE LOCATION AT BUILDING. REFER TO SYSTEMS GROUP DRAWINGS FOR CONDUCTOR SIZE.
5. PROVIDE AND INSTALL CONCAST TYPE IN-GROUND JUNCTION BOX WITH 12" X 12" NOMINAL TOP OPENING AND COVER, WITH OPEN BOTTOM. USE LISTED WEATHERPROOF SPLICES FOR CONDUCTORS.



N

1 ELECTRICAL SITE PLAN - EAST
SCALE: 1" = 40'-0"

40' 20' 0 40'
SCALE: 1" = 40'-0"

RECORD DRAWINGS
SSG MEP, INC.

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

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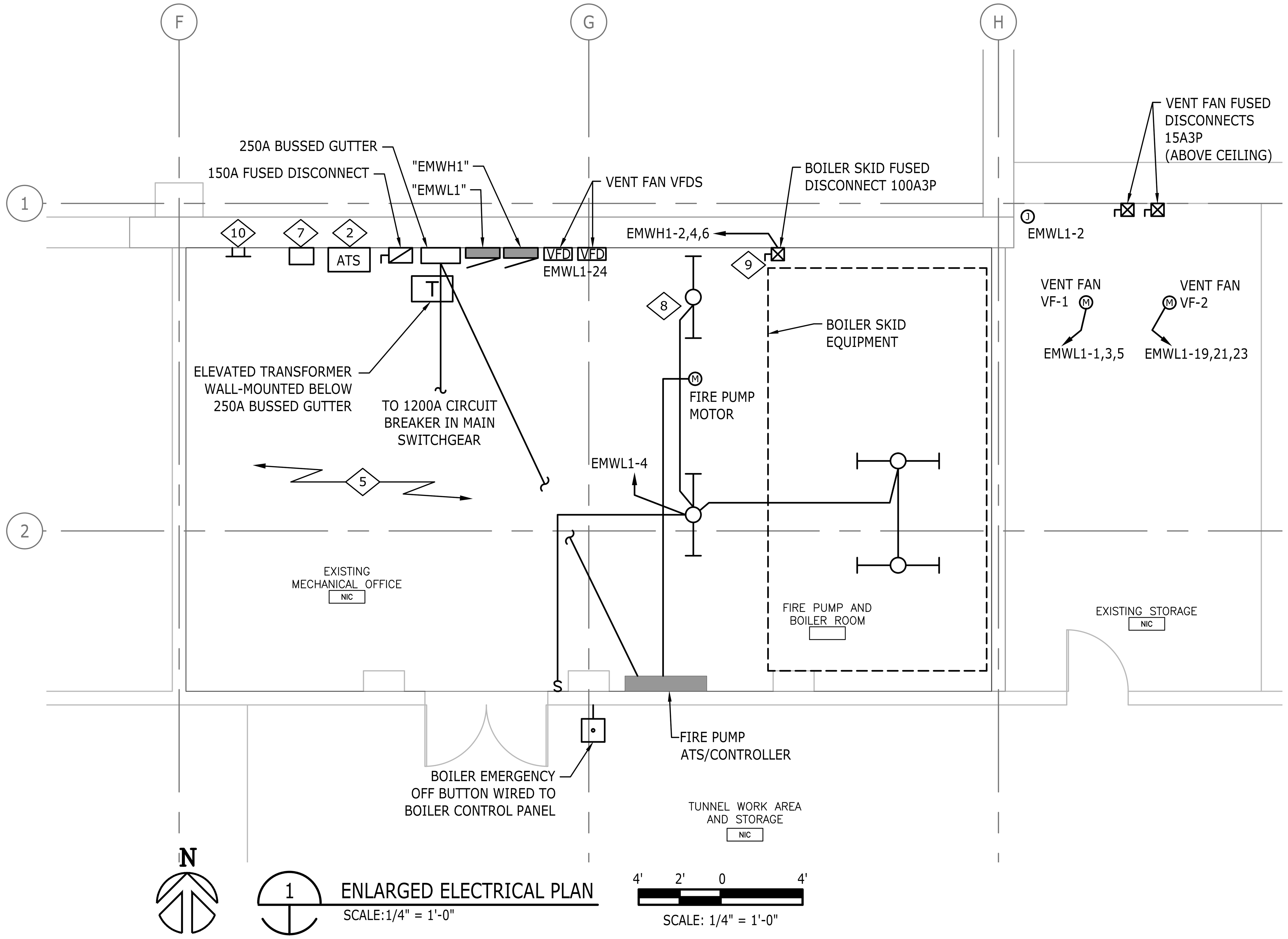
ELECTRICAL SITE PLAN - EAST

Drawing Number
E3.2



1 ENLARGED ELECTRICAL PLAN

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

4' 2' 0 4'
SCALE: 1/4" = 1'-0"

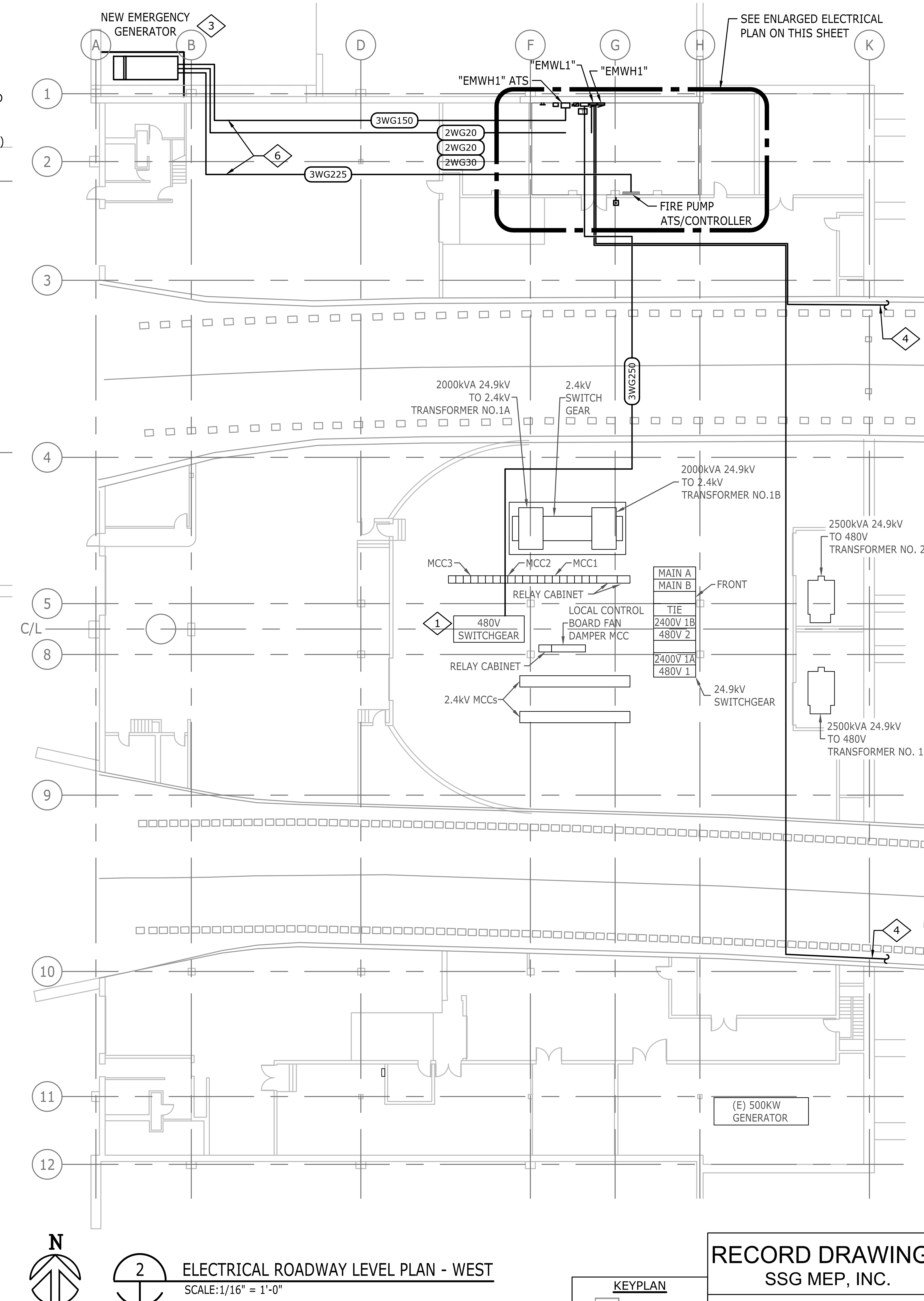
GENERAL NOTES:

1. ELECTRICAL CONTRACTOR RESPONSIBLE FOR ALL CONDUIT, WIRE, AND FINAL CONNECTIONS BETWEEN IDENTIFIED EQUIPMENT.

WORK NOTES:

1. UTILIZE SPARE 1,600A CIRCUIT BREAKER IN EXISTING 480V MAIN SWITCHGEAR TO POWER NEW FIRE PROTECTION SYSTEM. SET TO 1,200A TRIP.
2. FURNISH, INSTALL, AND WIRE NEW 480/277V, 150A ONAN OTPC 3-POLE AUTOMATIC TRANSFER SWITCH. PROVIDE WALL MOUNT.
3. FURNISH, INSTALL AND WIRE NEW CUMMINS GFBC 350KW NATURAL GAS GENERATOR WITH ONAN OUTDOOR WEATHERPROOF ENCLOSURE. LOCATE AT NORTH OF THE BUILDING. HORIZONTAL EXHAUST SHALL EXTEND 12" (MINIMUM) BEYOND THE EXTERIOR OF WEATHERPROOF ENCLOSURE. FURNISH, INSTALL AND WIRE GENERATOR REMOTE ANNUNCIATOR PANEL.
4. CONDUITS TO FIRE PROTECTION CABINETS, REMOTE CONTROL PANELS, SPRINKLER VALVE CABINETS. SEE SYSTEMS GROUP DRAWINGS FOR ADDITIONAL INFORMATION.
5. THE EXISTING MECHANICAL OFFICE IS CURRENTLY EQUIPPED WITH (6) STRIP LIGHT CEILING FIXTURES. ELECTRICAL CONTRACTOR SHALL REMOVE ANY EXISTING FIXTURES THAT FALL WITHIN THE NEW PUMP CONTROL ROOM. INSTALL (4) OF THE EXISTING FIXTURES IN THE REMAINING MECHANICAL OFFICE SPACE. RETURN UNUSED EXISTING FIXTURES TO OWNER.
6. IN ADDITION TO POWER CONDUITS, ALSO PROVIDE 3/4" CONDUITS FROM GENERATOR TO FIRE PUMP AND EMWH1 ATS FOR STATUS AND CONTROL WIRING.
7. GENERATOR ANNUNCIATOR PANEL.
8. PROVIDE (4) NEW 4' PENDANT MOUNTED STRIP LIGHT FIXTURES WITH (2) LAMPS IN CROSS SECTION AND WIRE GUARD IN FIRE PUMP AND BOILER ROOM LITHONIA MODEL # Z2-32-MVOLT-GEB10IS-SQ48-WGZ48 OR APPROVED EQUAL. CONTRACTOR TO REARRANGE FIXTURES AS NEEDED, BASED ON EQUIPMENT AND PIPING LAYOUT, TO PROVIDE EVEN LIGHT DISTRIBUTION.
9. NEW BOILER EQUIPMENT SKID WITH SINGLE-POINT ELECTRICAL CONNECTION. REFER TO WEST ELECTRICAL ONE-LINE DIAGRAM, SHEET E2.1 FOR ADDITIONAL INFORMATION.
10. PROVIDE GROUND BAR FOR NEW FIRE SUPPRESSION ELECTRICAL SYSTEM GROUNDING. CONNECT #4/0 TO NEARBY COLD WATER PIPING, #4/0 TO BUILDING MAIN GROUND SYSTEM, AND #6 FOR NEW TRANSFORMER GROUND.

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE



2 ELECTRICAL ROADWAY LEVEL PLAN - WEST

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

16' 8' 0 16'
SCALE: 1/16" = 1'-0"

KEYPLAN

WEST EAST

RECORD DRAWINGS

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EISENHOWER/JOHNSON MEMORIAL TUNNEL

FIXED FIRE SUPPRESSION SYSTEM DESIGN BUILD PROJECT

Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

Num	Description	Date

Revisions

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ELECTRICAL ROADWAY LEVEL PLAN - WEST

Drawing Number

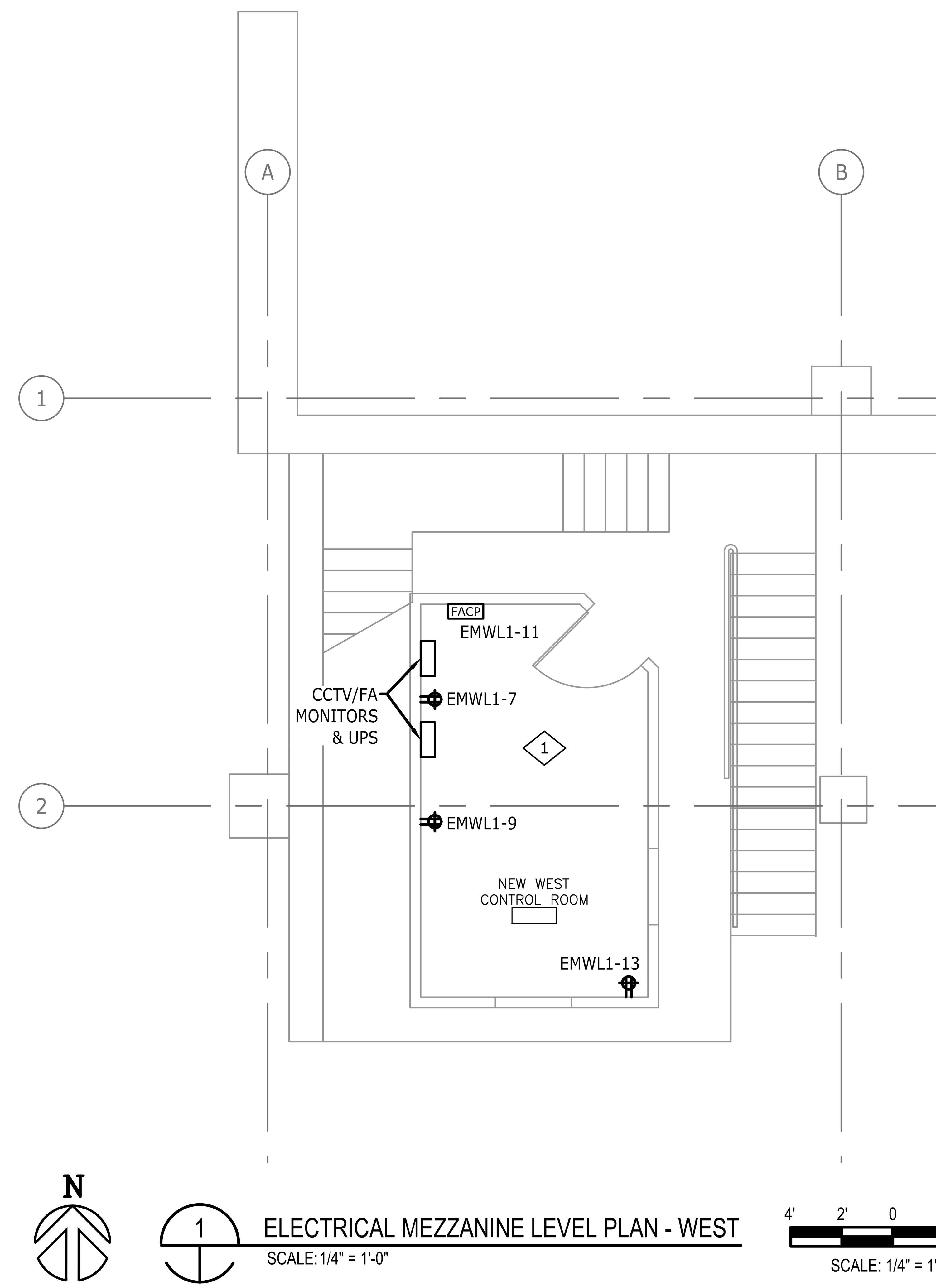
E5.0

GENERAL NOTES:

1. ELECTRICAL CONTRACTOR RESPONSIBLE FOR ALL CONDUIT, WIRE, AND FINAL CONNECTIONS BETWEEN IDENTIFIED EQUIPMENT.

WORK NOTES:

1. PROVIDE (4) 120V/20A CIRCUITS FROM PANEL "EMWL1". COORDINATE EXACT REQUIREMENTS WITH FIRE ALARM CONTRACTOR PRIOR TO INSTALLATION. REFER TO PANEL "EMWL1" SHEET E1.3 AND FIRE ALARM DRAWINGS FOR ADDITIONAL INFORMATION.



1 ELECTRICAL MEZZANINE LEVEL PLAN - WEST
SCALE: 1/4" = 1'-0"

4' 2' 0 4'
SCALE: 1/4" = 1'-0"

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ELECTRICAL MEZZANINE LEVEL PLAN - WEST

Drawing Number
E5.1

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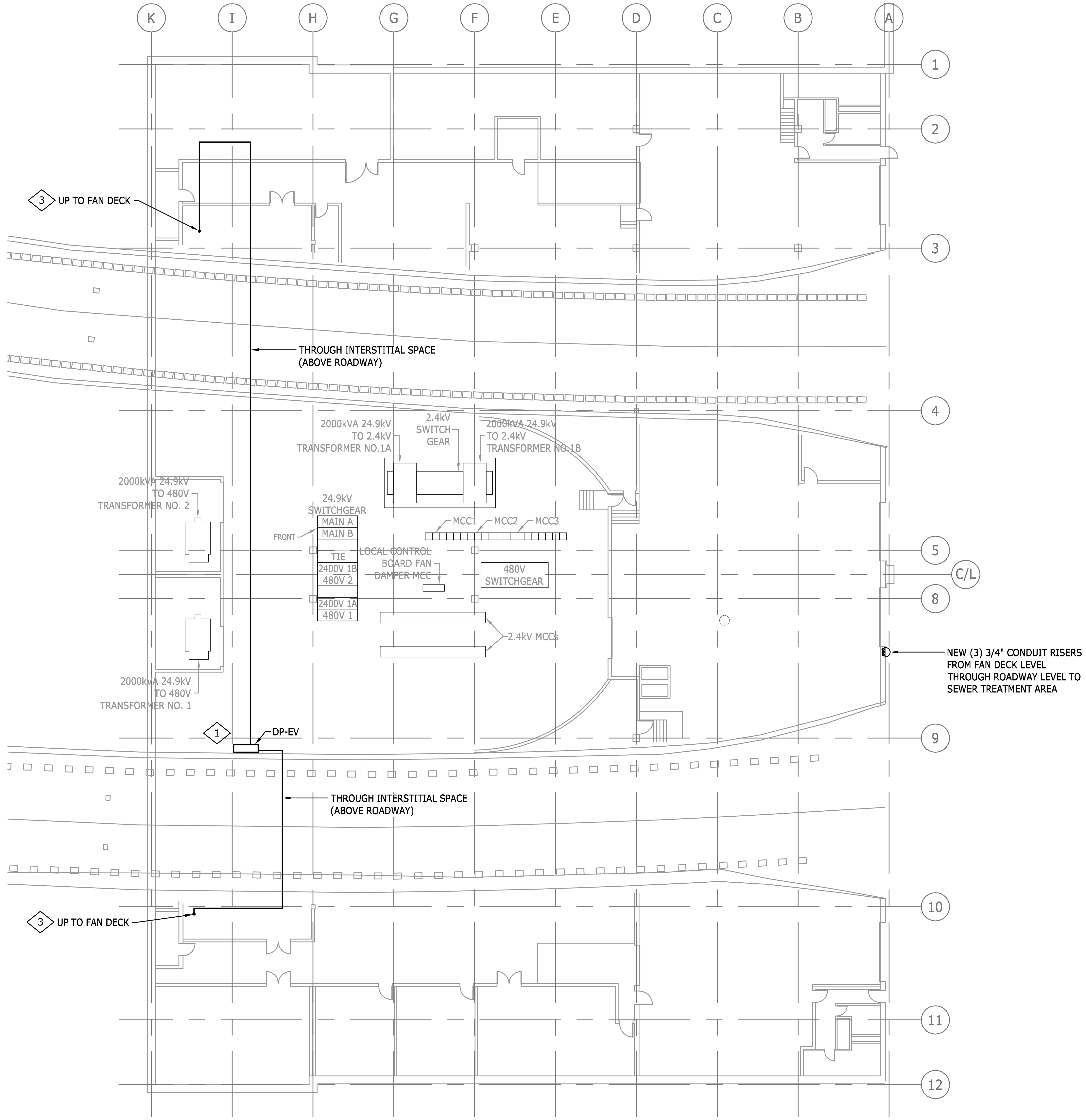
XREFS=(xx-tb, West Ventilation Building - Grid, West Ventilation Building - Mezzanine, xc-elec-WestPortal-Mezzanine) Layouts=(E5.1 ELECTRICAL MEZZANINE LEVEL PLAN - WEST)
DIMSCALE=1 \\filesvr\jobs\87914002\Dwg\ejmt - fixed fire suppression system\Sheets\Electrical\E5.1 ELECTRICAL MEZZANINE LEVEL PLAN - WEST.dwg JAN 26, 2015 12:42PM CHENDERSON

GENERAL NOTES:

1. ELECTRICAL CONTRACTOR RESPONSIBLE FOR ALL CONDUIT, WIRE, AND FINAL CONNECTIONS BETWEEN IDENTIFIED EQUIPMENT.
2. AUTOMATIC VALVES FURNISHED BY BRACONIER, WIRED BY ELECTRICAL CONTRACTOR.

WORK NOTES:

1. IN EXISTING 480/277V "DP-EV" PANEL FURNISH AND INSTALL NEW CIRCUIT BREAKERS TO POWER NEW FIRE ALARM DISTRIBUTION SYSTEM. REFER TO EAST ONE-LINE DIAGRAM SHEET E2.2 AND PANEL SCHEDULES SHEET E1.3 FOR ADDITIONAL INFORMATION.
2. PROVIDE 120V CIRCUIT FOR CONNECTION TO DRAINAGE SYSTEM CONTROL VALVES FROM PANEL EMEL1.
3. CONDUITS TO FIRE PROTECTION CABINETS, REMOTE CONTROL PANELS, INSULATED VALVE ENCLOSURES. SEE SYSTEMS GROUP DRAWINGS FOR ADDITIONAL INFORMATION.
4. INSTALL 3/4" CONDUIT AND WIRING BETWEEN FIRE ALARM CONTROL PANEL AND CONTROL-RELAY/MONITOR MODULE PANEL. REFER TO SYSTEMS GROUP DRAWINGS FOR PANEL INSTALLATION LOCATION, CONDUCTOR SIZES AND ADDITIONAL INFORMATION.
5. INSTALL 3/4" CONDUIT AND WIRING FROM VALVE TO CONTROL-RELAY/MONITOR MODULE PANEL. REFER TO SYSTEMS GROUP DRAWINGS FOR CONDUCTOR SIZES AND ADDITIONAL INFORMATION.



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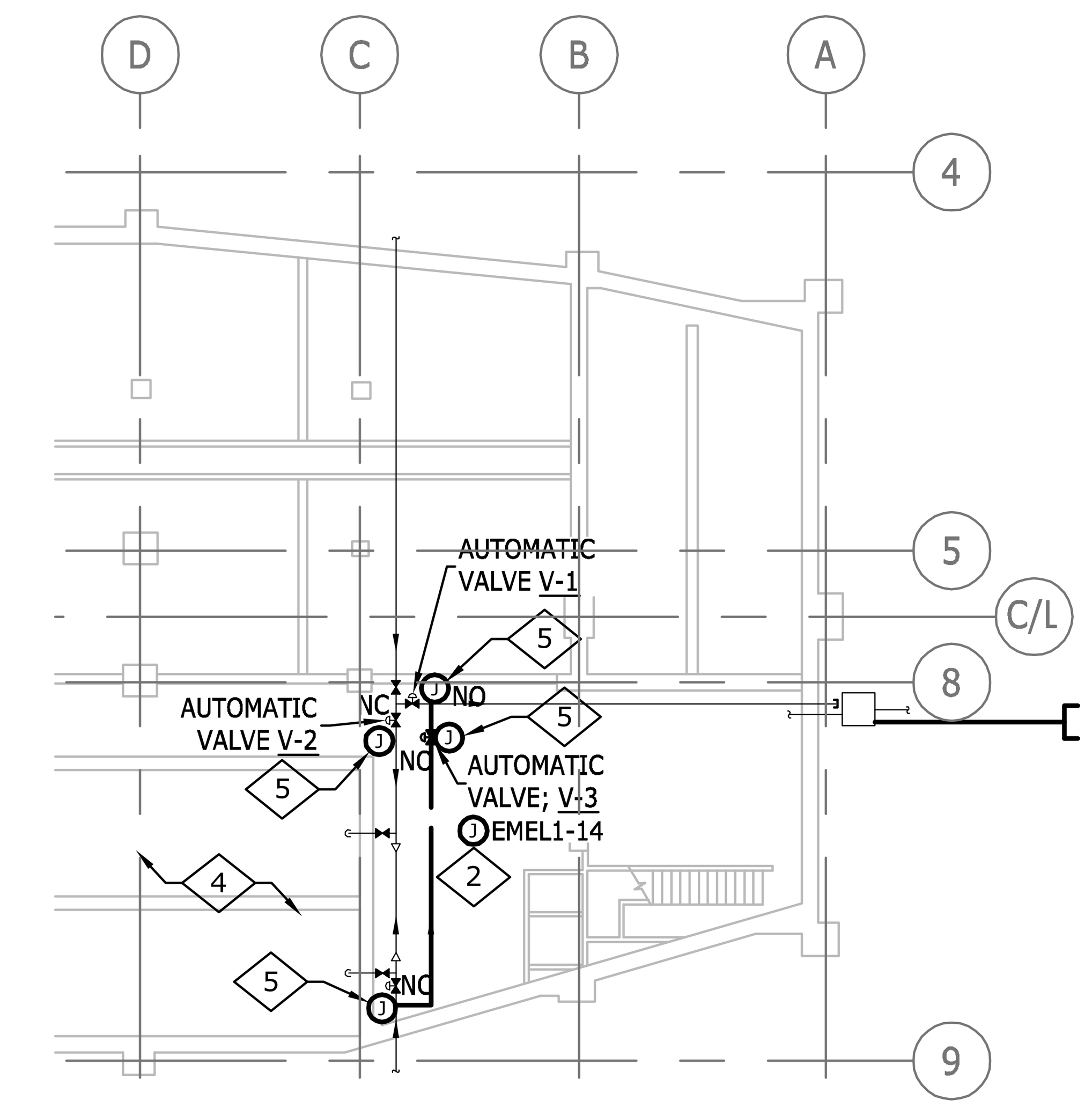
1 ELECTRICAL ROADWAY LEVEL PLAN - EAST
SCALE:1/16" = 1'-0"

16' 8' 0 16'
SCALE: 1/16" = 1'-0"



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2 ELECTRICAL SEWER TREATMENT PLAN - EAST
SCALE:1/16" = 1'-0"

16' 8' 0 16'
SCALE: 1/16" = 1'-0"

KEYPLAN
WEST EAST

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ELECTRICAL ROADWAY LEVEL PLAN - EAST

Drawing Number
E6.0

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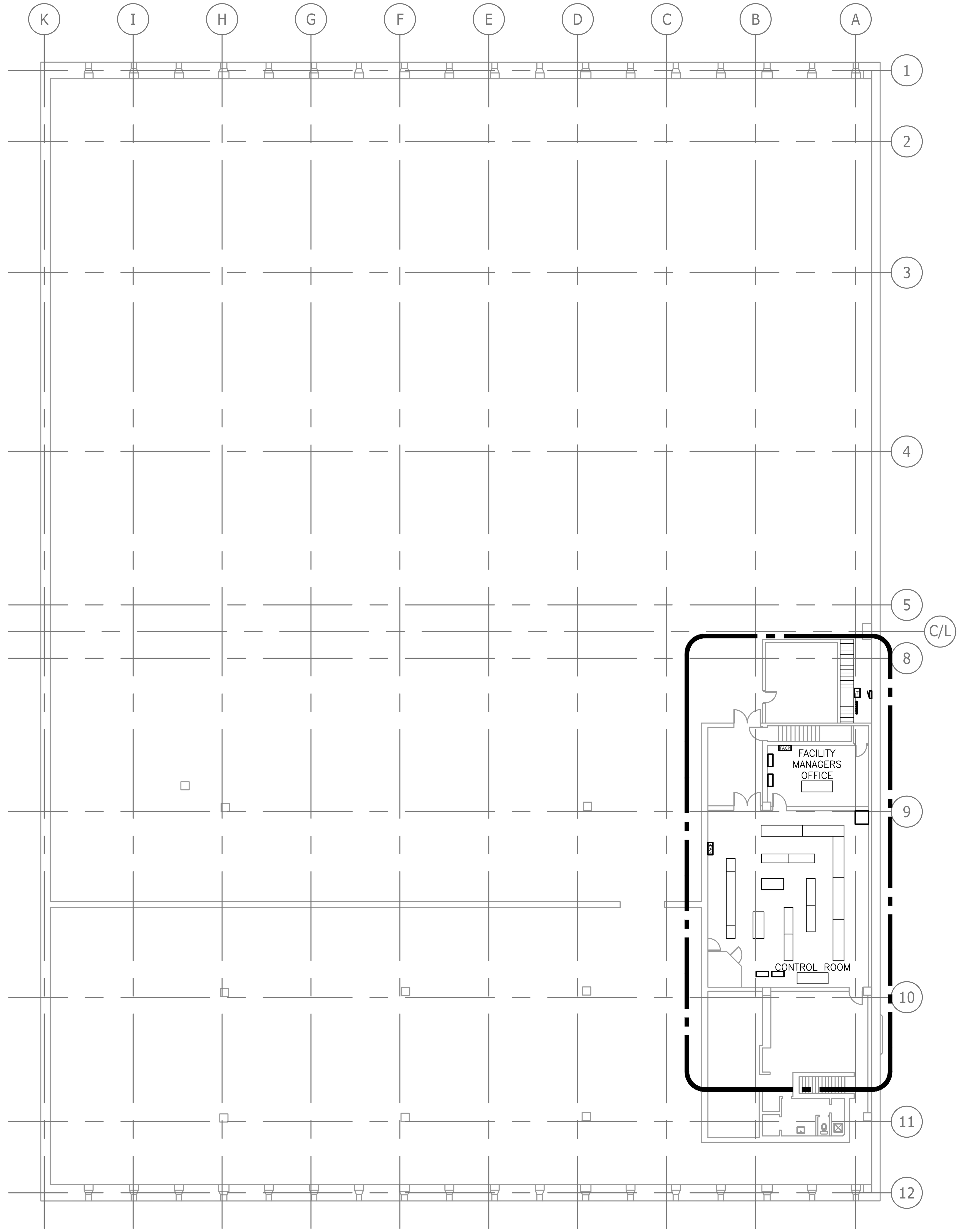
GENERAL NOTES:

1. ELECTRICAL CONTRACTOR RESPONSIBLE FOR ALL CONDUIT, WIRE, AND FINAL CONNECTIONS BETWEEN IDENTIFIED EQUIPMENT.

WORK NOTES:

1. INSTALL NEW TRANSFORMER AND PANEL. LOCATION TO BE FIELD LOCATED.
2. PROVIDE BRANCH CIRCUIT WIRING BETWEEN PANEL AND FIRE ALARM PANEL, EQUIPMENT RACK, FIREWORKS COMPUTER, FLAT SCREEN, AND FIRE ALARM PANEL LOCATED IN THIS AREA. VERIFY REQUIREMENTS WITH SYSTEMS GROUP DRAWINGS PRIOR TO ROUGH IN.
3. LHD AND CCTV EQUIPMENT CABINET IS MOVABLE. MAKE ALL POWER AND LOW VOLTAGE CONNECTIONS TO ALLOW CABINET MOVEMENT OF 24". CONFIRM LOCATION WITH CDOT BEFORE MAKING FINAL CONNECTIONS.

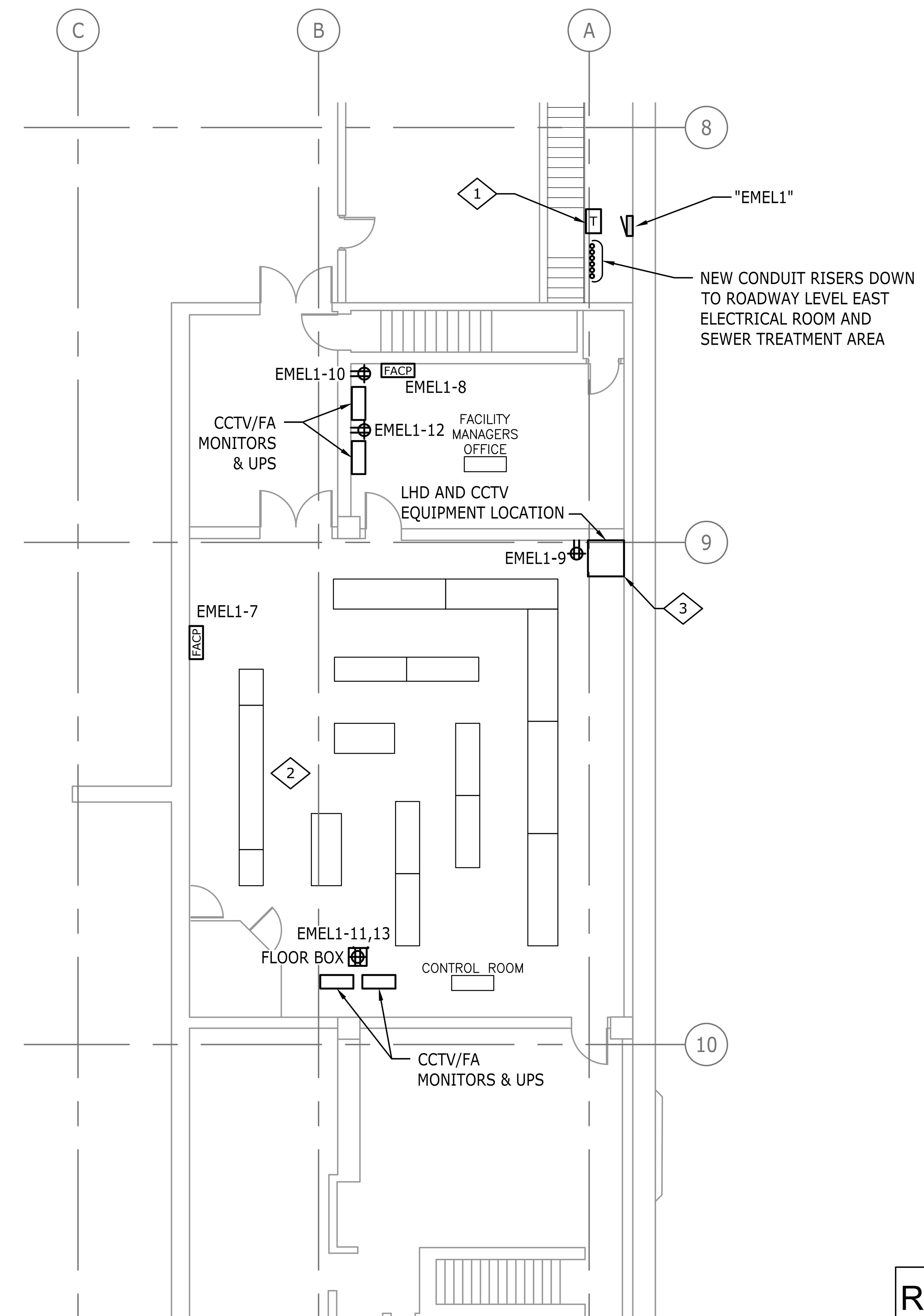


1 ELECTRICAL FAN LEVEL PLAN - EAST

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

16' 8' 0 16'

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

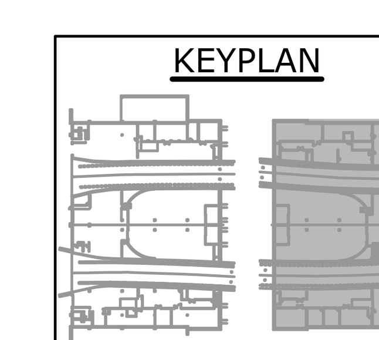


2 ENLARGED ELECTRICAL FAN LEVEL PLAN - EAST

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

8' 4' 0 8'

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



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ELECTRICAL FAN LEVEL PLAN - EAST

Drawing Number

E6.1

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SECTION 260000 - ELECTRICAL

1.1 PART 1 - GENERAL

1.2 RELATED DOCUMENTS

A. DRAWINGS AND GENERAL PROVISIONS OF THE CONTRACT, INCLUDING GENERAL AND SUPPLEMENTARY CONDITIONS AND GENERAL REQUIREMENTS BY THE ARCHITECT SHALL APPLY.

B. PROVISIONS OF THIS SECTION SHALL APPLY TO ALL OF THE ELECTRICAL WORK.

1.3 DEFINITIONS

A. THE "CONTRACTOR" AS HEREINAFTER REFERRED TO SHALL MEAN ELECTRICAL CONTRACTOR.

B. "PROVIDE" SHALL MEAN TO SUPPLY AND MAKE AVAILABLE.

C. "INSTALL" SHALL MEAN TO PUT EQUIPMENT INTO PLACE AND MAKE IT READY FOR USE.

D. "FURNISH" SHALL MEAN TO PROVIDE AND INSTALL EQUIPMENT.

1.4 MATERIAL STANDARDS

A. ALL MATERIAL SUPPLIED SHALL BE NEW AND SHALL BE EQUAL TO OR EXCEED MINIMUM REQUIREMENTS OF NEMA, IEEE, AND/OR UL.

B. ALL MATERIALS SHALL BEAR THE UNDERWRITERS' LABORATORIES, INC., LABEL PROVIDED A STANDARD HAS BEEN ESTABLISHED FOR THE MATERIAL IN QUESTION.

1.5 SCOPE OF WORK

A. FURNISH ALL MATERIALS AND EQUIPMENT AND PROVIDE ALL LABOR AND SUPPLIES NECESSARY FOR THE INSTALLATION OF THE COMPLETE ELECTRICAL SYSTEM AS SHOWN ON THE DRAWINGS AND SPECIFICATIONS HEREIN. PROVIDE ALL OTHER WORK AND MISCELLANEOUS ITEMS NOT SPECIFICALLY MENTIONED BUT REASONABLY INFERRED FOR A COMPLETE INSTALLATION INCLUDING ALL ACCESSORIES AND APPURTENANCES REQUIRED FOR TESTING THE SYSTEMS.

1.6 GENERAL REQUIREMENTS

A. THE ELECTRICAL DRAWINGS WHICH CONSTITUTE AN INTEGRAL PART OF THIS CONTRACT SHALL SERVE AS WORKING DRAWINGS. THEY INDICATE THE GENERAL LAYOUT OF THE COMPLETE ELECTRICAL SYSTEM INCLUDING ARRANGEMENT OF FEEDERS, CIRCUITS, OUTLETS, SWITCHES, CONTROLS, PANELBOARDS, SERVICE EQUIPMENT, LUMINAIRES, AND ALL OTHER WORK. THE DRAWINGS ARE DIAGRAMMATIC AND INDICATE THE GENERAL ARRANGEMENT OF ELECTRICAL WORK. LOCATIONS ARE APPROXIMATE AND SHALL BE SUBJECT TO MINOR MODIFICATIONS AS DICTATED BY FIELD CONDITIONS AND AS DIRECTED BY ARCHITECT AND/OR ENGINEER

B. FIELD VERIFICATION OF ANY SCALE DIMENSION IS DIRECTED SINCE ACTUAL LOCATIONS, DISTANCES, AND LEVELS WILL BE GOVERNED BY ACTUAL FIELD CONDITIONS. EXISTING CONDITIONS SHALL BE VERIFIED AT THE SITE PRIOR TO BEGINNING WORK.

C. THE CONTRACTOR SHALL REVIEW ALL THE DRAWINGS - ARCHITECTURAL, STRUCTURAL, MECHANICAL, ELECTRICAL, FIRE ALARM AND FIRE SPRINKLER SYSTEMS - AND REPORT ANY ERRORS OR OMISSIONS TO THE CONTRACTOR.

D. CONTRACTOR SHALL BE RESPONSIBLE FOR EXACT FITTING OF ALL MATERIALS AND EQUIPMENT IN BUILDINGS AND ON THE SITE. ALL DIMENSIONS SHALL BE VERIFIED ON JOB.

1.7 CODES, REGULATIONS, AND STANDARDS

A. THE ELECTRICAL INSTALLATION SHALL BE IN COMPLIANCE WITH THE REQUIREMENTS OF THE LATEST EDITIONS OF INTERNATIONAL BUILDING CODES (IBC), THE NATIONAL ELECTRICAL CODE (NEC), THE INTERNATIONAL ENERGY CONSERVATION CODE (IECC), AND OTHER APPLICABLE NATIONAL FIRE PROTECTION CODES (NFPA) INCLUDING AMENDMENTS AND REGULATIONS ADOPTED BY THE LOCAL JURISDICTION.

B. THE EQUIPMENT AND INSTALLATION SHALL BE IN COMPLIANCE WITH THE LATEST EDITIONS OF THE STANDARDS LISTED IN THE OTHER SECTIONS OF THESE SPECIFICATIONS.

C. THE CONTRACTOR AND ELECTRICAL INSTALLATION SHALL FULLY COMPLY WITH ALL APPLICABLE FEDERAL, STATE, CITY, AND COUNTY LAWS, ORDINANCES, AND REGULATIONS.

PART 2 - PRODUCTS

2.1 MATERIAL STANDARDS

A. THE DESIGN, MANUFACTURE, AND TESTING OF ALL ELECTRICAL EQUIPMENT AND MATERIALS SHALL CONFORM TO OR EXCEED THE LATEST APPLICABLE STANDARDS OF NEMA, IEEE, AND ANSI.

B. ALL MATERIALS UNLESS OTHERWISE NOTED SHALL BE NEW. ALL MATERIALS SHALL BE UL LISTED AND BEAR THE UL LABEL. MATERIALS THAT ARE NOT COVERED BY UL TESTING STANDARDS SHALL BE TESTED AND APPROVED BY AN INDEPENDENT TESTING LABORATORY OR GOVERNMENTAL AGENCY ACCEPTABLE TO THE OWNER, ENGINEER, AND LOCAL CODE ENFORCING AGENCY.

2.2 MANUFACTURERS

A. THE LISTING OF MANUFACTURERS IN THIS SPECIFICATION DOES NOT IMPLY ACCEPTANCE OF THEIR PRODUCTS THAT DO NOT MEET THE SPECIFIC RATINGS, FEATURES, AND FUNCTIONS CALLED OUT ON THE DRAWINGS.

B. MANUFACTURERS LISTED ARE NOT RELIEVED FROM MEETING THE REQUIREMENTS OF THESE SPECIFICATIONS IN THEIR ENTIRETY. PRODUCTS IN COMPLIANCE WITH THE SPECIFICATION AND MANUFACTURED BY OTHERS WILL ONLY BE CONSIDERED IF SUBMITTED FOR REVIEW BY THE ENGINEER AS A SUBSTITUTION FOR THE SPECIFIED MANUFACTURER(S).

2.3 MANUFACTURER'S INSTRUCTIONS

A. WHERE THE SPECIFICATIONS CALL FOR AN INSTALLATION TO BE MADE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS, A COPY OF SUCH RECOMMENDATIONS SHALL BE KEPT IN THE JOB SUPERINTENDENT'S FIELD OFFICE AT ALL TIMES AND SHALL BE AVAILABLE FOR REVIEW BY THE ENGINEER.

B. THE CONTRACTOR SHALL FOLLOW THE MANUFACTURER'S INSTRUCTION AND RECOMMENDATIONS WHERE THEY COVER POINTS NOT SPECIFICALLY INDICATED ON THE DRAWINGS, IN THE SPECIFICATIONS, OR AS REQUIRED FOR CODE COMPLIANCE. IF THE MANUFACTURER'S INSTRUCTIONS AND RECOMMENDATIONS ARE IN CONFLICT WITH THE DRAWINGS OR SPECIFICATIONS, THE CONTRACTOR SHALL OBTAIN CLARIFICATION FROM THE ENGINEER BEFORE BEGINNING WORK.

2.4 SPECIFIED ITEMS

A. EQUIPMENT OR MATERIALS SPECIFIED EXCLUSIVELY BY TRADE, NAME OF MANUFACTURER, OR BY CATALOG REFERENCE SHALL FORM BASIS OF WORK AND CONTRACT THEREFORE.

B. CONTRACTORS DESIRING TO USE ALTERNATE EQUIPMENT OR MATERIALS; MANUFACTURERS OR SUPPLIERS DESIRING TO FURNISH ALTERNATE MATERIALS OR EQUIPMENT IN LIEU OF THOSE SPECIFIED; SHALL SUBMIT REQUESTS FOR APPROVAL OF ALTERNATES TO ENGINEER.

C. REQUESTS FOR APPROVAL OF PROPOSED ALTERNATES SHALL BE MADE IN WRITING AND SHALL INCLUDE COMPLETE DATA SHEETS, CATALOG CUTS, SAMPLES, AND APPROPRIATE CALCULATIONS.

2.5 SUBMITTALS

A. FURNISH ELECTRONIC SUBMITTALS, INCLUDING SHOP DRAWINGS AND MATERIAL LISTS, AS CALLED FOR, TO THE CONTRACTOR PRIOR TO COMMENCEMENT OF WORK. MATERIAL LISTS SHALL INCLUDE CATALOG CUTS, DIAGRAMS AND OTHER DESCRIPTIVE MATERIAL. SUBMIT FOR THE FOLLOWING:

1. SWITCHBOARD
2. PANELBOARDS
3. DISCONNECT SWITCHES
4. FUSES
5. TRANSFORMERS
6. LUMINAIRES
7. LAMPS
8. WIRING DEVICES AND COVERPLATES
9. BUSSED GUTTER
10. IDENTIFICATION MATERIALS
11. WIRING/CABLING
12. GENERATOR
13. CONDUIT
14. HANGERS AND ANCHORS

B. FIELD TEST REPORTS: SUBMIT REPORTS INDICATING AND INTERPRETING RESULTS OF FIELD TESTS PERFORMED EITHER DURING INSTALLATION OF PRODUCT OR AFTER PRODUCT IS INSTALLED IN ITS FINAL LOCATION, FOR COMPLIANCE WITH REQUIREMENTS IN THE CONTRACT DOCUMENTS.

2.6 IDENTIFICATION

A. POWER RACEWAY IDENTIFICATION MATERIALS

1. IF AN EXISTING IDENTIFICATION SCHEME EXISTS FOR THIS FACILITY, MATCH THE EXISTING IDENTIFICATION SCHEME. IF AN IDENTIFICATION SCHEME DOES NOT EXIST, PROVIDE IDENTIFICATION AS FOLLOWS:

2. COLORS FOR RACEWAYS CARRYING CIRCUITS AT 600 V OR LESS:
   a. BLACK LETTERS ON A WHITE FIELD
   b. LEGEND: INDICATE VOLTAGE, SOURCE EQUIPMENT DESIGNATION, AND CIRCUIT NUMBERS AND SYSTEM OR SERVICE TYPE.

3. COLORS FOR RACEWAYS CARRYING CIRCUITS AT 600V OR LESS - EMERGENCY CIRCUITS:
   a. RED LETTERS ON A WHITE FIELD
   b. LEGEND: INDICATE VOLTAGE, SOURCE EQUIPMENT DESIGNATION, AND CIRCUIT NUMBERS

4. COLORS FOR RACEWAYS CARRYING GROUND CONDUCTORS / CABLING:
   a. WHITE LETTERS ON A GREEN FIELD
   b. LEGEND INDICATING "GROUND"

5. SELF-ADHESIVE VINYL LABELS FOR RACEWAYS CARRYING CIRCUITS AT 600 V OR LESS: PREPRINTED, FLEXIBLE LABEL LAMINATED WITH A CLEAR, WEATHER- AND CHEMICAL-RESISTANT COATING AND MATCHING WRAPAROUND ADHESIVE TAPE FOR SECURING ENDS OF LEGEND LABEL.

B. EQUIPMENT IDENTIFICATION LABELS

1. SCREW ON PLASTIC LAMICOID LABEL: MACHINE PRINTED, IN BLACK LETTERS ON A WHITE BACKGROUND, BY THERMAL TRANSFER OR EQUIVALENT PROCESS. MINIMUM LETTER HEIGHT SHALL BE 3/8 INCH.
   a. BLACK LETTERS ON A WHITE BACKGROUND - NORMAL POWER
   b. RED LETTERS ON A WHITE BACKGROUND - EMERGENCY POWER
   c. WHITE LETTERS ON A GREEN BACKGROUND - GROUNDING SYSTEMS
   d. BLACK LETTERS ON A YELLOW BACKGROUND - UPS SYSTEMS.

C. CONDUCTOR IDENTIFICATION MATERIALS

1. SELF-ADHESIVE VINYL LABELS: PREPRINTED, FLEXIBLE LABEL LAMINATED WITH A CLEAR, WEATHER- AND CHEMICAL-RESISTANT COATING AND MATCHING WRAPAROUND ADHESIVE TAPE FOR SECURING ENDS OF LEGEND LABEL.

2.7 BRANCH CIRCUIT PANELS

A. CIRCUIT BREAKER TYPE PANELBOARDS WITH MAIN LUGS OR MAIN CIRCUIT BREAKERS WHERE SHOWN, WITH NUMBER AND SIZE OF FULL WIDTH THERMAL MAGNETIC BOLTED BRANCH CIRCUIT BREAKERS WITH MINIMUM AIC RATING AS INDICATED. CIRCUIT BREAKERS SHALL BE LABELED FOR USE WITH CONDUCTORS WITH MINIMUM OF 75° INSULATION. PANELBOARDS ARE TO BE SURFACE OR FLUSH MOUNTED WITH SIZE OF BUS AS INDICATED. TWO AND THREE POLE BREAKERS SHALL HAVE COMMON TRIP AND SINGLE OPERATING HANDLE. PROVIDE SEPARATE GROUND BUS IN EACH PANELBOARD AND A FULLY RATED NEUTRAL BUS.

B. PANELBOARDS SHALL BE CONSTRUCTED OF CODE GAUGE GALVANIZED STEEL. FRONTS ARE TO BE COMPLETE WITH DOOR AND LATCH AND MASTER-KEYED LOCKS, WITH DOOR-IN-DOOR CONFIGURATION. FRONTS SHALL HAVE ADJUSTABLE TRIM CLAMPS AND DIRECTORY FRAMES. PROVIDE A TYPED CIRCUIT DIRECTORY FOR EACH NEW PANEL AND EXISTING PANELS AFFECTED BY THIS PROJECT.

C. POWER PANELS:

1. 208V, 3 PHASE, 208/120V, SINGLE OR 3 PHASE; AIC RATING PER DRAWINGS, EATON/CUTLER-HAMMER TYPE PRL1 OR EQUIVALENT BY GENERAL ELECTRIC, SQUARE D OR SIEMENS.

2. 480V OR 480/277V, 3 PHASE, AIC RATING PER DRAWINGS EATON/CUTLER-HAMMER TYPE PRL2 OR EQUIVALENT BY GENERAL ELECTRIC, SQUARE D OR SIEMENS.

2.8 DISCONNECT SWITCHES

A. PROVIDE ENCLOSED, HEAVY DUTY, FUSIBLE OR NON-FUSIBLE SAFETY SWITCHES WHERE REQUIRED.

B. EACH ENCLOSURE SHALL BE NEMA TYPE SUITABLE FOR THE SURROUNDING AREA AND CONDITIONS, AND SHALL BE LABELED FOR USE WITH CONDUCTORS HAVING MINIMUM OF 75° INSULATION. CONSULT MECHANICAL DRAWINGS AND SPECIFICATIONS OF MECHANICAL EQUIPMENT FOR ADDITIONAL DISCONNECT AND STARTER REQUIREMENTS. PROVIDE DISCONNECTS AS APPROPRIATE FOR ACTUAL EQUIPMENT PROVIDED ON THE PROJECT. ALL SWITCHES SHALL BE LABELED FOR FEEDER OR MOTOR SUPPLIED.

C. PROVIDE FUSE REJECTION KITS FOR ALL FUSIBLE SWITCHES RATED 600 AMPERES AND BELOW.

2.9 FUSES

A. FUSES SHALL BE OF THE TIME DELAY TYPE; CLASS "R" WITH REJECTION FEATURE UP TO 600 AMPERES, BOLT-IN CLASS "L" ABOVE 600 AMPERES. "FUSETRON", "LOW PEAK", OR "HI-CAP" AS MANUFACTURED BY THE BUSSMANN MANUFACTURING COMPANY OR EQUIVALENT BY GOULD, INC. (GOULD SHAWMUTT FUSES). THE CONTRACTOR SHALL FURNISH AND INSTALL ONE COMPLETE SET OF FUSES FOR ALL FUSE HOLDING DEVICES SIZED IN ACCORDANCE WITH THE ASSOCIATED MOTOR AND/OR CONDUCTORS TO BE PROTECTED. FURNISH TO OWNER A MINIMUM OF THREE SPARES FOR EACH SIZE INSTALLED.

2.10 CONDUIT AND FITTINGS

A. PROVIDE CONDUIT AND FITTINGS AS INDICATED AND AS REQUIRED PER PART 3 - EXECUTION OF THIS SPECIFICATION.

B. INTERMEDIATE METALLIC TUBING (IMC): ZINC COATED THREADED TYPE CONFORMING TO UL. PROVIDE ZINC COATING FUSED TO INSIDE AND OUTSIDE WALLS. PROVIDE CLOSED-END THREAD PROTECTORS.

C. PVC EXTERNALLY COATED RIGID STEEL CONDUIT (PVC COATED GRC): PROVIDE RIGID STEEL ZINC COATED WITH AN ADDITIONAL 40 MIL THICK COATING OF PVC AND INTERNAL GALVANIZED SURFACE. PVC COATING SHALL BE BONDED TO THE CONDUIT. EXTRUDED EXTERIOR COATING IS NOT ACCEPTABLE.

D. FLEXIBLE STEEL CONDUIT: FORMED FROM CONTINUOUS LENGTH OF SPIRALLY-WOUND, INTERLOCKED ZINC-COATED STRIP STEEL.

E. LIQUID-TIGHT, FLEXIBLE METAL CONDUIT: FORMED FROM A CONTINUOUS LENGTH OF FLEXIBLE, INTERLOCKED, AND DOUBLE-WRAPPED STEEL; GALVANIZED INSIDE AND OUTSIDE; COATED WITH LIQUID-TIGHT JACKET OF FLEXIBLE POLYVINYL CHLORIDE (PVC).

F. INTERMEDIATE METALLIC TUBING FITTINGS.

G. FLEXIBLE METALLIC CONDUIT FITTINGS: STEEL THREADLESS HINGED CLAMP TYPE.

H. FLEXIBLE NON-METALLIC CONDUIT FITTINGS: PLASTIC

I. CONDUIT BODIES: GALVANIZED STEEL CONDUIT BODIES OF TYPES, SHAPES, AND SIZES AS REQUIRED TO FULFILL JOB REQUIREMENTS AND NEC REQUIREMENTS. CONDUIT BODIES SHALL HAVE THREADED CONDUIT ENTRANCE ENDS, REMOVABLE COVERS, EITHER CAST OR GALVANIZED STEEL, AND CORROSION-RESISTANT SCREWS.

2.11 CONDUCTORS

A. UNLESS OTHERWISE INDICATED, ALL CONDUCTORS SHALL BE COPPER. CONDUCTORS SIZED #10 AWG AND SMALLER SHALL BE SOLID ANNEALED COPPER, #8 AWG AND LARGER SHALL BE STRANDED.

B. MINIMUM CONDUCTOR SIZES SHALL BE #12 AWG FOR WIRING AT 120 VOLTS AND ABOVE, AND #18 AWG FOR SIGNAL AND CONTROL CIRCUITS. FOR 120 VOLT CIRCUITS 75 FEET OR LONGER TO THE FIRST OUTLET, MINIMUM SIZE SHALL BE INCREASED TO #10 AWG (FOR 277 VOLT CIRCUITS 150 FEET).

C. COLOR CODE ALL CONDUCTORS. WIRE SIZES #8 AWG OR SMALLER SHALL HAVE INTEGRAL COLOR-CODED INSULATION. WIRE SIZES #6 AWG AND LARGER SHALL BE COLOR COED INSULATION OR MAY HAVE BLACK INSULATION BUT IDENTIFIED BY COLOR-CODED ELECTRICAL TAPE AT ALL JUNCTION, SPLICE, PULL, OR TERMINATION POINTS.

D. CONDUCTORS SHALL HAVE INSULATION RATED AT 600 VOLTS UNLESS OTHERWISE NOTED. THE FOLLOWING INSULATION STANDARDS SHALL APPLY:

1. UNDERGROUND AND WET LOCATIONS: TYPE THW OR THWN FOR #8 AWG AND LARGER; TW OR THWN FOR #10 AWG AND SMALLER.

2. INDOORS: TYPE THW, THWN, OR THHN FOR #8 AWG AND LARGER; TW, THWN, OR THHN FOR #10 AWG AND SMALLER.

3. AMPACITIES: CONDUCTOR AMPACITIES SHALL BE APPLIED PER NEC TABLE 310-16. RATINGS FOR CONDUCTORS HAVING 75°C INSULATION SHALL NOT BE EXCEEDED REGARDLESS OF WHICH INSULATION TYPE IS USED.

E. CONNECTORS SHALL BE 3-M "SCOTCHLOCK", BUCHANAN "B-CAPS", IDEAL "WING NUT", OR BUCHANAN SPLICE CAPS. ALL CONNECTORS SHALL BE RATED AT 600 VOLTS FOR GENERAL USE, OR 1000 VOLTS FOR USE WITHIN FLUORESCENT OR HIGH INTENSITY DISCHARGE (HID) LUMINAIRES.

2.12 CABINETS AND WIREWAYS

A. CODE GAUGE GALVANIZED STEEL. CABINETS TO HAVE HINGED COVERS AND MASTER KEYED LOCKS. PROVIDE CABINET SIZES AS INDICATED, AND WIREWAY SIZED FOR APPLICATION PER NEC ARTICLES 376 & 378 (WIREWAYS). PROVIDE APPROVED NEMA TYPE ENCLOSURE SUITABLE FOR LOCATION AND CONDITIONS ENCOUNTERED. FINISH SHALL BE ANSI 61 GRAY ENAMEL.

2.13 OUTLET BOXES

A. CAST METAL BOXES FOR EXPOSED CONDUIT AND IN EQUIPMENT ROOMS. ALL OUTLETS FOR EXTERIOR APPLICATION SHALL BE CAST, WEATHERPROOF TYPE, WITH GASKET AND "WP WHILE IN-USE" TYPE COVER PLATE. PROVIDE GALVANIZED OR ZINC COATED, COMPRESSED STEEL OUTLET BOXES FOR ALL OTHER APPLICATIONS. BOXES TO BE 4 INCHES SQUARE OR OCTAGONAL UNLESS OTHERWISE REQUIRED FOR SPECIFIC OUTLET OR STRUCTURAL CONDITIONS, AND OF DEPTH AS REQUIRED.

RECORD DRAWINGS
SSG MEP, INC.

THESE RECORD DRAWINGS HAVE BEEN PREPARED BASED ON INFORMATION SUBMITTED, IN PART, BY OTHERS. WHILE THIS INFORMATION IS BELIEVED TO BE RELIABLE, THE ENGINEER IS NOT RESPONSIBLE FOR ITS ACCURACY, NOR FOR ERRORS OR OMISSIONS WHICH MAY HAVE BEEN INCORPORATED INTO THIS DOCUMENT AS A RESULT.

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

DRAWN BY: ART CHECKED BY: GEP

E7.0 ELECTRICAL SPECIFICATIONS

Drawing Number
E7.0

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

XREFS=(xx-tb) Layouts=(E1.0 ELECTRICAL GENERAL INFORMATION)
DIMSCALE=1 \\filesrv\jobs\87914002\Dwg\ejmt - fixed fire suppression system\Sheets\Electrical\E1.0 ELECTRICAL GENERAL INFORMATION.dwg FEB 3, 2015 10:32AM CHENDERSON

2.14 WIRING DEVICES

A. PROVIDE SPECIFICATION GRADE RECEPTACLES AND SPECIFICATION GRADE SWITCHES AS MANUFACTURED BY, HUBBELL, LEVITON, COOPER, OR PASS AND SEYMOUR. ALL DEVICES SHALL BE OF THE SAME MANUFACTURER.

B. SWITCHES SHALL BE RATED FOR THE LOAD CONTROLLED. SWITCHES SHALL BE HEAVY-DUTY SPECIFICATION-GRADE RATED 125 VOLTS, 20A. ALL OTHER SWITCHES SHALL BE OF SIMILAR PREMIUM SPECIFICATION GRADE QUALITY.

C. THERMAL OVERLOAD SWITCHES SHALL BE PROPERLY SIZED OVERLOAD HEATER ELEMENTS.

D. RECEPTACLES SHALL BE RATED FOR THE CIRCUIT LOAD SERVED. RECEPTACLES SHALL BE RATED 125 VOLTS, 20 AMPERES NEMA 5-20R CONFIGURATION, UNLESS OTHERWISE NOTED.

E. PROVIDE STEEL COVERPLATES FOR ALL DEVICES ASSOCIATED WITH SURFACE MOUNTED RACEWAYS, IN AREAS WHERE RACEWAY IS SUBJECT TO DAMAGE OR ABUSE PROVIDE 0.140 INCH SMOOTH NYLON MATCHING COVERPLATES FOR ALL DEVICES IN FINISHED AREAS. COVERPLATES IN EXISTING ESTABLISHED BUILDINGS SHALL MATCH THE BUILDING STANDARD.

2.15 LUMINAIRES AND LAMPS

A. MANUFACTURERS

1. THE LISTING OF SPECIFIC MANUFACTURERS DOES NOT IMPLY ACCEPTANCE OF THEIR PRODUCTS THAT DO NOT MEET THE SPECIFIED RATINGS, FEATURES, AND FUNCTIONS. MANUFACTURERS LISTED ARE NOT RELIEVED FROM MEETING THESE SPECIFICATIONS IN THEIR ENTIRETY. PRODUCTS IN COMPLIANCE WITH THE SPECIFICATION AND MANUFACTURED BY OTHERS NOT NAMED WILL BE CONSIDERED ONLY IF PRE-APPROVED BY THE ENGINEER.

2. PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE ONE OF THE PRODUCTS INDICATED ON DRAWINGS.

B. ALL LUMINAIRES SHALL BEAR THE UNDERWRITERS LABORATORIES SEAL OF APPROVAL.

C. LUMINAIRES TYPES ARE INDICATED ON THE DRAWINGS BY MEANS OFLETTERS. REFER TO THE LUMINAIRE SCHEDULE FOR LUMINAIRESPECIFICATIONS. WHEN A LUMINAIRE TYPE IS INDICATED IN A ROOM ORAREA, ALL OTHER LUMINAIRES IN THE ROOM OR AREA SHALL BE OF THESAME TYPE UNLESS NOTED OTHERWISE.

D. PROVIDE CLASS P, CERTIFIED CBM, HIGH POWER FACTOR, PREMIUM LOWHEAT, HIGH FREQUENCY ELECTRONIC BALLAST WITH AUTOMATIC RESETTHERMAL PROTECTION. BALLAST SHALL OPERATE AT 10 PERCENT OR LESSTOTAL HARMONIC DISTORTION, AS MANUFACTURED BY, ADVANCE,MOTOROLA, OSRAM, SYLVANNIA, PHILLIPS OR MAGNETEK.

E. ALL LUMINAIRES SHALL BE MANUFACTURED SO THAT ALL METALLIC PARTSARE CONTINUOUSLY GROUNDED. WHERE ACRYLIC LENSES ARE SPECIFIED,THICKNESS OF SUCH LENS SHALL BE NOMINAL 0.125 INCH.

F. THE CONTRACTOR SHALL PROVIDE LAMPS TO MATCH BUILDING STANDARD LAMP TYPE IN WATTAGE AND COLOR TEMPERATURE FOR ALL FLUORESCENT AND COMPACT FLUORESCENT LAMPS USED ON THE PROJECT.

2.16 DRY TYPE TRANSFORMERS

A. DESIGNS SHALL BE IN FULL ACCORDANCE WITH THE LATEST REVISIONS OF ANSI C89.2, NEMA ST-20, NEMA TR-27, NEMA TP-1 AND LISTED BY UL.

B. TRANSFORMERS SHALL BE CAPABLE OF CONTINUOUS OPERATION AT RATED KVA, 24 HOURS A DAY, 365 DAYS A YEAR, WITH NORMAL LIFE EXPECTANCY AS DEFINED IN IEEE #65.

C. OPEN, VENTILATED, DRIP-PROOF ENCLOSURE, SELF-BRACING, WITH REMOVABLE FRONT AND REAR COVER PANELS TO PROVIDE ACCESS TO A TERMINAL COMPARTMENT LOCATED BELOW THE CORE AND COILS.

D. COILS SHALL BE INSULATED WITH A UL RATED 220°C SYSTEM HAVING AN AVERAGE RISE BY RESISTANCE OF 150°C IN A MAXIMUM AMBIENT OF 40°C, AVERAGE 30°C FOR 24 HOURS. TAPS IN THE HIGH-VOLTAGE WINDING SHALL CONSIST OF TWO 2.5 PERCENT FCAN AND FOUR 2.5 PERCENT FCBN. MINIMUM 2.8 PERCENT IMPEDANCE. THREE PHASE, 480 VOLT DELTA PRIMARY, 208/120 VOLT WYE TYPE SECONDARY UNLESS NOTED OTHERWISE. COIL SHALL BE ALUMINUM FOR TRANSFORMERS RATED 15 KVA AND ABOVE, AND COPPER FOR TRANSFORMERS RATED BELOW 15 KVA. PROVIDE VIBRATION ISOLATION PADS WITH TRANSFORMERS.

E. APPROVED MANUFACTURERS ARE: EATON/CUTLER HAMMER, SORGEL, SIEMENS, GENERAL ELECTRIC, SQUARE D, OR APPROVED EQUAL.

2.17 BUSSED GUTTER ASSEMBLIES

A. NEOPRENE GASKETED 14 GAUGE GALVANIZED STEEL HOUSING WITH CORROSION RESISTANT HARDWARE AND HIGH QUALITY WELDS WHERE REQUIRED. BUS BARS MOUNTED TO STAIR STEP BRACKETS MAXIMUM 24 INCHES ON CENTER, WITH BUS BARS SEPARATED APPROXIMATELY 2 INCHES HORIZONTAL AND 3 INCHES VERTICAL. PROVIDE APPROVED STANDOFF INSULATORS. BRACKETS SHALL BE WELDED TO THE HOUSING. WALL MOUNTING LUGS SHALL BE PROVIDED AND WELDED TO THE HOUSING. COVER SHALL BE SCREW-TYPE WITH TAPPED HOUSING AND BRASS SCREWS MAXIMUM 6 INCHES ON CENTER. COVER SHALL BE SPLIT INTO 24 INCH SEGMENTS. PROVIDE TWO ¼ INCH DEEP HOLES AT EACH END OF ASSEMBLY.

B. FINISH SHALL BE ANSI 61 GREY ENAMEL. BUS BARS SHALL BE DRILLED AND TAPPED 3/8-16 NC THREAD ON 3 INCH CENTERS FOR FUTURE SUBFEED LUGS. BUSSING SHALL BE BRACED FOR AIC RATING SHOWN ON DRAWINGS AND SHALL HAVE THE UL LABEL OF APPROVAL. ELECTRICAL RATING: 208/120 VOLT, 3 PHASE, 4 WIRE WITH AMPERE RATING AS SHOWN ON THE DRAWINGS. CUTLER HAMMER, YOUNG ELECTRIC MANUFACTURING COMPANY, OR EQUAL.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. COMPLY WITH NECA 1.

B. MEASURE INDICATED MOUNTING HEIGHTS TO BOTTOM OF UNIT FOR SUSPENDED ITEMS AND TO CENTER OF UNIT FOR WALL-MOUNTING ITEMS.

C. HEADROOM MAINTENANCE: IF MOUNTING HEIGHTS OR OTHER LOCATION CRITERIA ARE NOT INDICATED, ARRANGE AND INSTALL COMPONENTS AND EQUIPMENT TO PROVIDE MAXIMUM POSSIBLE HEADROOM CONSISTENT WITH THESE REQUIREMENTS.

D. EQUIPMENT: INSTALL TO FACILITATE SERVICE, MAINTENANCE, AND REPAIR OR REPLACEMENT OF COMPONENTS OF BOTH ELECTRICAL EQUIPMENT AND OTHER NEARBY INSTALLATIONS. CONNECT IN SUCH A WAY AS TO FACILITATE FUTURE DISCONNECTING WITH MINIMUM INTERFERENCE WITH OTHER ITEMS IN THE VICINITY.

E. GIVE RIGHT OF WAY TO PIPING SYSTEMS INSTALLED AT A REQUIRED SLOPE.

3.2 SITE EXAMINATION

A. THE CONTRACTOR SHALL EXAMINE PROJECT SITE AND ALL CONDITIONS THEREON AND SHALL TAKE INTO CONSIDERATION ALL SUCH CONDITIONS AS MAY AFFECT THE WORK HEREUNDER.

B. SPECIAL ATTENTION IS DIRECTED TO THAT PORTION OF THE WORK THAT IS IN EXISTING AREAS. THE EXISTING ELECTRICAL EQUIPMENT SHOWN ON THE PLANS ARE ONLY AS ACCURATE AS CAN BE DETERMINED FROM EXISTING ELECTRICAL PLANS, SITE OBSERVATION, ETC., AND SUCH EXISTING CONDITIONS SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO BEGINNING WORK.

3.3 SLEEVES, INSERTS, AND EMBEDDED ITEMS

A. SLEEVES, INSERTS, HANGERS, ETC., FURNISHED UNDER THIS DIVISION AND INSTALLED UNDER ANOTHER DIVISION SHALL BE SUPPLIED IN SUCH A MANNER AS WILL PERMIT ORDERLY PROGRESS OF WORK BY OTHERS.

3.4 COORDINATION

A. COORDINATE ARRANGEMENT, MOUNTING, AND SUPPORT OF ELECTRICAL EQUIPMENT WITH OTHER TRADES:

1. TO ALLOW MAXIMUM POSSIBLE HEADROOM UNLESS SPECIFIC MOUNTING HEIGHTS THAT REDUCE HEADROOM ARE INDICATED.

2. TO PROVIDE FOR EASE OF DISCONNECTING THE EQUIPMENT WITH MINIMUM INTERFERENCE TO OTHER INSTALLATIONS.

3. TO ALLOW RIGHT OF WAY FOR PIPING AND CONDUIT INSTALLED AT REQUIRED SLOPE.

4. SO CONNECTING RACEWAYS, CABLES, WIREWAYS, CABLE TRAYS, AND BUSWAYS WILL BE CLEAR OF OBSTRUCTIONS AND OF THE WORKING AND ACCESS SPACE OF OTHER EQUIPMENT.

B. COORDINATE INSTALLATION OF REQUIRED SUPPORTING DEVICES AND SET SLEEVES IN CAST-IN-PLACE CONCRETE, MASONRY WALLS, AND OTHER STRUCTURAL COMPONENTS AS THEY ARE CONSTRUCTED.

C. DETAILS OF EQUIPMENT FURNISHED BY TRADES OTHER THAN ELECTRICAL, BUT INSTALLED AS PART OF THE DIVISION 26 WORK WILL BE FOUND ON THE DRAWINGS AND SPECIFICATIONS ASSOCIATED WITH THE DIVISION SUPPLYING THE EQUIPMENT.

D. COORDINATE LOCATION OF ACCESS PANELS AND DOORS FOR ELECTRICAL ITEMS THAT ARE BEHIND FINISHED SURFACES OR OTHERWISE CONCEALED. COORDINATE ACCESS DOORS AND PANELS WITH ARCHITECT.

E. COORDINATE SLEEVE SELECTION AND APPLICATION WITH SELECTION AND APPLICATION OF FIRESTOPPING. COORDINATE FIRESTOPPING REQUIREMENTS WITH ARCHITECT.

F. COORDINATE WORK WITH OTHER TRADES TO AVOID CONFLICT AND TO PROVIDE CORRECT ROUGH-IN AND CONNECTIONS FOR EQUIPMENT FURNISHED BY OTHERS THAT REQUIRE ELECTRICAL CONNECTIONS. INFORM CONTRACTORS OF OTHER TRADES ABOUT THE REQUIRED ACCESS TO AND CLEARANCES AROUND ELECTRICAL EQUIPMENT TO COMPLY WITH CODE AND MAINTAIN SERVICEABILITY.

G. VERIFY EQUIPMENT DIMENSIONS AND REQUIREMENTS WITH PROVISIONS SPECIFIED UNDER THIS SECTION. CHECK ACTUAL JOB CONDITIONS BEFORE FABRICATING WORK. CHANGES OR ADDITIONS SUBJECT TO ADDITIONAL COMPENSATION WHICH ARE MADE WITHOUT WRITTEN AUTHORIZATION BY THE OWNER ON AN AGREED UPON PRICE SHALL BE AT THE CONTRACTOR'S RISK AND EXPENSE.

3.5 SELECTIVE DEMOLITION

A. ALL OUTLETS AND WIRING WHICH ARE TO REMAIN SHALL BE RECONNECTED TO REMAIN OPERABLE. REWORK AND EXTEND EXISTING CIRCUITS, CONDUIT, AND RELOCATE OUTLETS AS NECESSARY TO MAINTAIN FUNCTIONALITY OF ALL ITEMS TO REMAIN.

B. EXISTING ITEMS THAT CONFLICT WITH NEW CONSTRUCTION SHALL BE REWORKED AND RELOCATED TO AVOID CONFLICTS WITH THE NEW CONSTRUCTION.

C. ALL WIRING, EXCEPT WHERE INDICATED TO BE REUSED, SHALL BE DISCONNECTED FROM BOTH THE POWER SUPPLY AND UTILIZATION EQUIPMENT AND REMOVED FROM THE CONDUIT.

D. ALL EXPOSED CONDUIT, BOXES, AND OUTLETS, THAT ARE INDICATED TO BE DEMOLISHED, SHALL BE REMOVED. CONDUIT THAT IS NOT ACCESSIBLE SHALL BE CUT, CAPPED, AND ABANDONED IN PLACE.

E. ITEMS NOT WANTED BY THE OWNER SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND SHALL BE REMOVED FROM THE SITE.

F. REGULATORY REQUIREMENTS: COMPLY WITH GOVERNING EPA NOTIFICATION REGULATIONS BEFORE BEGINNING SELECTIVE DEMOLITION. COMPLY WITH HAULING AND DISPOSAL REGULATIONS OF AUTHORITIES HAVING JURISDICTION.

G. CLEANING: CLEAN ADJACENT STRUCTURES AND IMPROVEMENTS OF DUST, DIRT, AND DEBRIS CAUSED BY SELECTIVE DEMOLITION OPERATIONS. RETURN ADJACENT AREAS TO EXISTING CONDITION BEFORE SELECTIVE DEMOLITION OPERATIONS BEGAN.

3.6 CUTTING AND PATCHING

A. ALL CUTTING AND PATCHING WORK SHALL BE LAID OUT IN ADVANCE.

B. WHERE CUTTING, CHANNELING, CHASING, OR DRILLING OF FLOORS, WALLS, PARTITIONS, CEILINGS, OR OTHER SURFACES IS NECESSARY FOR PROPER INSTALLATION, SUPPORT, OR ANCHORAGE OF RACEWAYS, OUTLETS, OR OTHER ELECTRICAL EQUIPMENT THE WORK SHALL BE CAREFULLY DONE.

C. ANY DAMAGE TO WOODWORK, METALWORK, OR FINISHED SURFACE SHALL BE REPAIRED BY SKILLED MECHANICS OF THE TRADES INVOLVED AT NO ADDITIONAL COST TO THE OWNER.

D. ANY REQUIRED OPENINGS IN CONCRETE WALLS OR FLOORS SHALL BE CORE DRILLED.

E. THE CONTRACTOR SHALL NOT CUT OR DRILL ANY STRUCTURAL MEMBER WITHOUT FIRST OBTAINING WRITTEN APPROVAL OF THE ENGINEER AND GENERAL CONTRACTOR

3.7 IDENTIFICATION

A. LETTERING AND GRAPHICS: COORDINATE NAMES, ABBREVIATIONS, COLORS, AND OTHER DESIGNATIONS USED IN ELECTRICAL IDENTIFICATION WORK WITH CORRESPONDING DESIGNATIONS SPECIFIED OR INDICATED. INSTALL NUMBERS, LETTERING, AND COLORS AS SPECIFIED, AS APPROVED IN SUBMITTALS, AND AS REQUIRED BY THE NEC.

B. INSTALL IDENTIFICATION DEVICES IN ACCORDANCE WITH MANUFACTURERS WRITTEN INSTRUCTIONS AND REQUIREMENTS OF THE NEC.

C. VERIFY IDENTITY OF EACH ITEM BEFORE INSTALLING IDENTIFICATION PRODUCTS.

D. APPLY IDENTIFICATION DEVICES TO SURFACES THAT REQUIRE FINISH AFTER COMPLETING FINISH WORK.

E. ADHESIVE IDENTIFICATION PRODUCTS: CLEAN SURFACES BEFORE APPLICATION, USING MATERIALS AND METHODS RECOMMENDED BY MANUFACTURER OF IDENTIFICATION DEVICE.

F. ATTACH SIGNS AND PLASTIC LABELS THAT ARE NOT SELF-ADHESIVE TYPE WITH MECHANICAL FASTENERS.

1. EQUIPMENT TO BE LABELED:

a. PANELBOARDS.

b. CIRCUIT DIRECTORIES: TYPEWRITTEN DIRECTORY OF CIRCUITS IN THE LOCATION PROVIDED BY PANELBOARD MANUFACTURER.

c. ENCLOSURES AND ELECTRICAL CABINETS.

d. ACCESS DOORS AND PANELS FOR CONCEALED ELECTRICAL ITEMS.

e. SWITCHBOARDS.

f. TRANSFORMERS: EMERGENCY SYSTEM BOXES AND ENCLOSURES.

g. ENCLOSED SWITCHES.

h. BRANCH CIRCUIT IDENTIFICATION ON RECEPTACLES.

i. ENCLOSED CIRCUIT BREAKERS.

j. LIGHTING CONTROL EQUIPMENT.

k. DISCONNECT SWITCHES.

l. GENERATOR

3.8 INSPECTIONS AND TESTS

A. WORK SHALL BE SUBJECT TO INSPECTION BY GENERAL CONTRACTOR AND/OR ENGINEER AT ALL TIMES.

B. AFTER ELECTRICAL INSTALLATION IS COMPLETED AND AT SUCH TIME AS THE ARCHITECT OR ENGINEER MAY DIRECT, THE CONTRACTOR SHALL CONDUCT AN OPERATING TEST FOR APPROVAL. INSTALLATION SHALL BE DEMONSTRATED TO BE IN ACCORDANCE WITH REQUIREMENTS OF THE DRAWINGS AND THIS SPECIFICATION. ANY DEFECTS REVEALED SHALL BE CORRECTED PROMPTLY AND THE TESTS RECONDUCTED.

C. THE CONTRACTOR SHALL REPAIR AND/OR REPLACE ALL DEFECTIVE AND/OR FAULTY WORKMANSHIP, MATERIALS, AND/OR EQUIPMENT AND SHALL REPAIR AND/OR REPLACE ALL OTHER WORK DAMAGED AS A RESULT OF SUCH DEFECTIVE AND/OR FAULTY INSTALLATION, MATERIALS AND/OR EQUIPMENT WITHOUT CHARGE TO OWNER DURING GUARANTEE PERIOD.

D. THE FOLLOWING SYSTEMS SHALL BE TESTED:

1. POWER DISTRIBUTION.

2. GENERATOR AND TRANSFER SWITCH(ES).

3. FIRE ALARM.

3.9 DEMONSTRATION AND TRAINING

A. AT COMPLETION OF THE PROJECT AT SUCH TIME DESIGNATED BY THE OWNER, THE CONTRACTOR SHALL INSTRUCT THE OWNER AS TO THE LOCATION AND OPERATION OF ALL ELECTRICAL EQUIPMENT AND SYSTEMS INSTALLED AS PART OF THIS CONTRACT. THE CONTRACTOR SHALL ALSO BRIEF THE OWNER ON THE ROUTING OF FEEDERS TO MAJOR PIECES OF MECHANICAL EQUIPMENT AND OTHER LARGE EQUIPMENT PROVIDED BY OTHER TRADES AND CONNECTED UNDER THIS SCOPE.

B. PROVIDE DEMONSTRATION AND TRAINING AS REQUIRED AND AS FOLLOWS:

1. ELECTRICAL SERVICE AND DISTRIBUTION, INCLUDING SWITCHBOARDS PANELBOARDS.

2. PACKAGED ENGINE GENERATORS, INCLUDING TRANSFER SWITCHES.

3.10 DELIVERY AND STORAGE

A. ELECTRICAL CONTRACTOR SHALL MAKE PROVISIONS FOR DELIVERY AND SAFE STORAGE OF MATERIALS FOR THIS CONTRACT AND SHALL ASSUME FULL RESPONSIBILITY FOR CONDITION AND/OR SAFEKEEPING OF MATERIALS FURNISHED BY OTHERS ON ACCEPTANCE OF MATERIALS.

3.11 OUTAGES

A. THE ENTIRE FACILITY MUST REMAIN OPERATIONAL DURING THE WORK. ONE OR MORE OUTAGES OF THE ELECTRICAL DISTRIBUTION SYSTEM WITHIN THE BUILDING MAY BE REQUIRED TO COMPLETE INSTALLATION AND CONNECTION OF THE NEW DISTRIBUTION EQUIPMENT. THE NUMBER AND LENGTH OF THESE OUTAGES MUST BE KEPT TO A MINIMUM.

B. THE CONTRACTOR SHALL BE REQUIRED TO PREPARE A DETAILED METHOD OF PROCEDURE (MOP) FOR EACH OUTAGE. EACH MOP SHALL DETAIL THE START AND END TIMES FOR THE OUTAGE, THE STEPS TO BE PERFORMED DURING THE OUTAGE, THE APPROXIMATE TIME ALLOTTED FOR EACH STEP, AND A BACK-OUT PROCEDURE SHOULD SOMETHING UNEXPECTED OCCUR OR BE DISCOVERED DURING THE OUTAGE.

C. THE MOP SHALL BE PREPARED SUFFICIENTLY IN ADVANCE OF THE OUTAGE TO PERMIT REVIEW AND COMMENT BY THE OWNER, ENGINEER, AND ARCHITECT. THE CONTRACTOR SHALL INCORPORATE ALL COMMENTS INTO THE MOP AND SUBMIT COPIES FOR FINAL REVIEW AND SIGNOFF BY ALL PARTIES. ONCE APPROVED, THE CONTRACTOR SHALL NOTIFY THE OWNER 72 HOURS IN ADVANCE OF THE OUTAGE AND RECEIVE FINAL WRITTEN PERMISSION TO PROCEED.

RECORD DRAWINGS
SSG MEP, INC.

BARNARD EJMT TEAM

BCER Engineering — BARNARD — RONDINELLI — Sturgeon Electric — Western States Fire Protection Co. — CONSULTING ENGINEERS

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3.12 CONDUIT

A. ALL WIRING FOR SYSTEMS OPERATING OVER 50 VOLTS SHALL BE INSTALLED IN CONDUIT. CONDUIT SHALL BE OF SIZE REQUIRED BY NEC OR LARGER AS INDICATED ON DRAWINGS, AND SHALL BE INSTALLED ACCORDING TO THE NEC. BENDS SHALL BE MADE WITH AN APPROVED HICKEY OR CONDUIT BENDING MACHINE. FACTORY BENDS OVER 1-1/4 INCHES ARE APPROVED.

B. EXPOSED CONDUIT SHALL NOT BE INSTALLED IN FINISHED AREAS UNLESS PRIOR APPROVED BY ARCHITECT. EXPOSED CONDUIT MAY BE INSTALLED IN EQUIPMENT ROOMS AND AT SURFACE MOUNTED EQUIPMENT. ALL EXPOSED CONDUIT SHALL BE RUN AT RIGHT ANGLES AND PARALLEL TO THE BUILDING LINES.

C. ALL UNDERGROUND CONDUIT SHALL BE INSTALLED AT A MINIMUM OF 30 INCHES BELOW FINISHED GRADE. CONDUITS INSTALLED BELOW CONCRETE SLABS SHALL BE A MINIMUM OF 12 INCHES BELOW SLAB. ALL UNDERGROUND CONDUITS SHALL BE INSTALLED IN SELECT BACKFILL.

D. USE APPROVED TYPE COUPLINGS AND CONNECTORS IN ALL CONDUIT RUNS, AND MAKE ALL JOINTS TIGHT. PROVIDE PREMIUM QUALITY COMPRESSION TYPE COUPLINGS. PROVIDE INSULATED BUSHINGS FOR ALL TERMINATIONS IN PIPE SIZES 1-1/4 INCHES AND LARGER. PROVIDE WEATHERPROOF FITTINGS FOR RUNS EXPOSED TO WEATHER AND HIGH HUMIDITY, AND CONCRETE TIGHT FITTINGS FOR CONDUITS INSTALLED IN CONCRETE SLABS. PROVIDE SEAL-OFF FITTINGS WHERE CONDUITS ENTER OR LEAVE HAZARDOUS AREAS OR AREAS OF WIDELY DIFFERENT TEMPERATURE AND/OR HUMIDITY.

E. PRIOR TO PULLING OF CONDUCTORS, CONDUITS SHALL BE CLEANED OF ALL FOREIGN MATTER. PROVIDE 200 POUND TEST NYLON PULL-LINES IN ALL CONDUITS INTENDED FOR FUTURE USE.

F. PROVIDE CONDUIT WITH APPROPRIATE FITTINGS INSTALLED AS REQUIRED PER THE FOLLOWING CRITERIA:

1. BELOW GRADE IN EARTH: USE PVC OR PVC COATED RIGID STEEL CONDUIT. GRC IS REQUIRED WHERE UNDERGROUND OR UNDERSLAB CONDUITS PENETRATE A CONCRETE SLAB OR FOUNDATION WALL.
2. ABOVE GRADE, EXTERIOR (EXCEPT ROOFS): USE IMC WITH WEATHERPROOF FITTINGS.
3. ABOVE GRADE, INTERIOR:
   a. IN ALL LOCATIONS SUBJECT TO DAMAGE: USE IMC.

G. USE PVC COATED OR BITUMINOUS COATED GALVANIZED RIGID METAL ELBOWS FOR STUB UPS AND 90° BENDS IN UNDERGROUND CONDUITS AND FOR ALL RISERS TO GRADE AND ENTRY FROM BUILDING EXTERIOR.

3.13 WIRING

A. NO WIRE SHALL BE INSTALLED PRIOR TO COMPLETION OF WORK WHICH MIGHT CAUSE DAMAGE TO CONDUCTORS. ALL SERVICE CONDUCTORS, FEEDERS, AND BRANCH CIRCUITS SHALL BE COLOR CODED IN ACCORDANCE WITH ARTICLE 210-5 OF THE NEC. COLOR CODING SHALL BE VIA COLORED INSULATION OR TAPE AT ALL TERMINATION LOCATIONS. WIRING FOR SPECIAL SYSTEMS SUCH AS MECHANICAL EQUIPMENT, ETC., SHALL BE IN ACCORDANCE WITH MANUFACTURERS WIRING DIAGRAMS FURNISHED.

B. WIRING SHALL BE CONTINUOUS FROM OUTLET TO OUTLET OR JUNCTION BOX. SPLICES SHALL BE HELD TO A MINIMUM, AND SHALL BE MADE ONLY AT READILY ACCESSIBLE PULL BOX, JUNCTION BOX, OR OUTLET BOX. THE INSULATION VALUE OF THE JOINT SHALL EQUAL THAT OF THE CONDUCTOR. SPLICES AND CONNECTION SHALL BE MADE BY TWISTING TIGHT AND INSTALLING INSULATED PRESSURE OR WIRE NUT CONNECTORS FOR #10 AWG AND SMALLER, AND WITH STEEL CRIMP-ON SLEEVES AND OVERALL NYLON INSULATOR FOR #8 AWG AND LARGER.

C. COLOR CODE ALL CONDUCTORS. WIRE SIZES #6 AWG AND LARGER THAT HAVE BLACK INSULATION COLOR-CODED ELECTRICAL TAPE, SHALL HAVE TAPE APPLIED AT ALL JUNCTION, SPLICE, PULL, OR TERMINATION POINTS. COLOR TAPE SHALL BE APPLIED TO AT LEAST 6 INCHES OF THE CONDUCTOR.

D. COLOR CODE WIRES AS FOLLOWS:

208/120 VOLTS
PHASES: A-BLACK, B-RED, C-BLUE
NEUTRAL-WHITE, GROUND-GREEN

480/277 VOLTS
PHASES: A-BROWN, B-ORANGE, C-YELLOW
NEUTRAL-GRAY, GROUND-GREEN

E. ALL BRANCH CIRCUITS FOR 120 VOLT POWER SYSTEMS SHALL HAVE DEDICATED NEUTRAL WIRES FOR EACH CIRCUIT. NO SHARED NEUTRAL WIRES ARE ALLOWED.

3.14 GROUNDING

A. PROVIDE GROUNDING ELECTRODE CONDUCTOR AT GENERATOR PAD SIZED IN ACCORDANCE WITH THE DRAWINGS :

1. A MINIMUM OF 20 INCHES OF #2 AWG BARE SOLID COPPER CONDUCTOR LOCATED NEAR THE BOTTOM OF THE CONCRETE FOUNDATION OR FOOTING THAT IS IN DIRECT CONTACT WITH EARTH. ELECTRODE SHALL BE CADWELDED, OR EQUAL, TO ALL VERTICAL REINFORCING BARS, AND SHALL BE ENCASED BY AT LEAST 2 INCHES OF CONCRETE. (UFFER GROUND)

B. ALL ELECTRICAL NEUTRALS, RACEWAYS, AND NON-CURRENT CARRYING PARTS OF ELECTRICAL EQUIPMENT AND ASSOCIATED ENCLOSURES SHALL BE GROUNDED IN ACCORDANCE WITH NEC ARTICLE 250. AN IDENTIFIED GROUNDING CONDUCTOR SHALL BE INSTALLED IN ALL METALLIC OR PVC CONDUITS. CONNECT GROUND WIRE TO THE GROUND TERMINAL OF ALL DEVICES.

3.15 OUTLET BOXES

A. BOXES SHALL BE SUITABLE FOR REQUIREMENTS OF EACH OUTLET AND OF SUCH DIMENSIONS AS WILL FIT STRUCTURAL CONDITIONS. BOXES SHALL BE INSTALLED IN RIGID MANNER.

B. PROVIDE SINGLE GANG (OR AS REQUIRED FOR OUTLET) PLASTER OR TILE RINGS FOR ALL FLUSH OUTLETS INSTALLED AT FINISHED WALL AND CEILING SURFACES (TILE, GYPSUM BOARD, PLASTER, ETC.).

3.16 WIRING DEVICES

A. WALL SWITCH OUTLETS SHOWN AT DOOR LOCATIONS SHALL BE INSTALLED ON LATCH SIDE OF DOOR WITHIN 12" OF THE DOOR FRAME WHERE PERMISSIBLE. WALL SWITCH OUTLETS SHOWN AT DOOR LOCATIONS ON THE SWING SIDE OF THE DOOR SHALL BE MOUNTED SUCH THAT THE SWING OF THE DOOR DOES NOT OBSTRUCT THE SWITCH AND WITHIN 12" OF THE OUTSIDE SWING RADIUS. ALL DEVICES SHALL BE MOUNTED VERTICALLY

B. INSTALL COVERPLATES FOR ALL OUTLETS.

3.17 LIGHTING

A. ALL LUMINAIRES AND EQUIPMENT AS INDICATED ON THE DRAWINGS AND AS DESCRIBED HEREIN SHALL BE FURNISHED AND INSTALLED. ALL LUMINAIRES SHALL BEAR THE UL SEAL OF APPROVAL.

B. ALL LUMINAIRES SHALL BE SECURELY SUPPORTED AND ALL OUTLETS SHALL BE SECURELY ANCHORED. FURNISH ALL SUPPORTS NECESSARY FOR INSTALLATION INCLUDING STRUCTURAL MEMBERS WHERE REQUIRED.

C. FOR ALL NEW AND EXISTING FLUORESCENT LUMINARIES USING DOUBLE-ENDED LAMPS (EXCLUDING EMERGENCY LUMINAIRES), PROVIDE AND/OR INSTALL A DISCONNECT KIT, WITHIN THE LUMINAIRE, THAT BREAKS BOTH THE HOT AND NEUTRAL SUPPLY CONDUCTORS PER NEC 410.103(G).

3.18 BRANCH CIRCUIT PANELS

A. UPDATE THE PANEL DIRECTORY AT THE COMPLETION OF THE PROJECT BY PROPERLY IDENTIFYING EACH CIRCUIT. INSTALL PANELS UP 6 FOOT, 7 INCHES TO TOP OF TRIM OR AS DIRECTED BY ENGINEER. MOUNT PANELS A MINIMUM OF 24" ABOVE FINISHED FLOOR

3.19 WIRING FOR MECHANICAL EQUIPMENT

A. FURNISH AND INSTALL CIRCUITS, FEEDERS, DISCONNECT SWITCHES, OUTLETS AND MAKE ALL CONNECTIONS TO MOTORS AND/OR CONTROLS FOR HEATING, VENTILATING, AIR CONDITIONING, AND PLUMBING EQUIPMENT AS CALLED FOR IN THE DRAWINGS AND SPECIFICATIONS.

B. FLEXIBLE CONDUIT SHALL BE USED FOR CONNECTIONS TO MOTORS AND/OR OTHER EQUIPMENT WHERE VIBRATION IS ENCOUNTERED AND/OR AS CALLED FOR ON THE DRAWINGS. EVERY EFFORT SHALL BE MADE TO MAINTAIN A MAXIMUM FLEXIBLE CONDUIT LENGTH OF 3 FEET.

C. INSTALL AND CONNECT ALL MAGNETIC STARTERS AND LINE VOLTAGE CONTROLLERS, PUSHBUTTON STATIONS, THERMOSTATS, ETC., FURNISHED BY OTHERS. LOCATE AS DIRECTED BY MECHANICAL CONTRACTOR. REFER TO MECHANICAL DRAWINGS AND SPECIFICATIONS FOR ALL POWER AND CONTROL OUTLETS AND REQUIRED WIRING.

D. LINE VOLTAGE CONTROL WIRING, INCLUDING INTERLOCKS WITH OTHER MECHANICAL EQUIPMENT, SHALL BE BY CONTRACTOR, AT THE DIRECTION OF AND UNDER THE SUPERVISION OF THE MECHANICAL CONTRACTOR.

3.20 REMODEL WORK

A. ALL WIRING RUNS IN EXISTING AREAS ARE TO BE KEPT CONCEALED AS MUCH AS POSSIBLE. WHERE IMPOSSIBLE, RUN SURFACE RACEWAY AS NECESSARY ON EXISTING SURFACES AS APPROVED BY THE ARCHITECT. ALL EXPOSED RACEWAYS IN FINISHED AREAS SHALL BE PAINTED AS DIRECTED BY THE ARCHITECT.

RECORD DRAWINGS
SSG MEP, INC.

THESE RECORD DRAWINGS HAVE BEEN PREPARED BASED ON INFORMATION SUBMITTED, IN PART, BY OTHERS. WHILE THIS INFORMATION IS BELIEVED TO BE RELIABLE, THE ENGINEER IS NOT RESPONSIBLE FOR ITS ACCURACY, NOR FOR ERRORS OR OMISSIONS WHICH MAY HAVE BEEN INCORPORATED INTO THIS DOCUMENT AS A RESULT.

BARNARD EJMT TEAM

BARNARD · RONDINELLI · BCER Engineering · Sturgeon Electric · Western States Fire Protection Co. · CONSULTING ENGINEERS

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions

Num	Description	Date

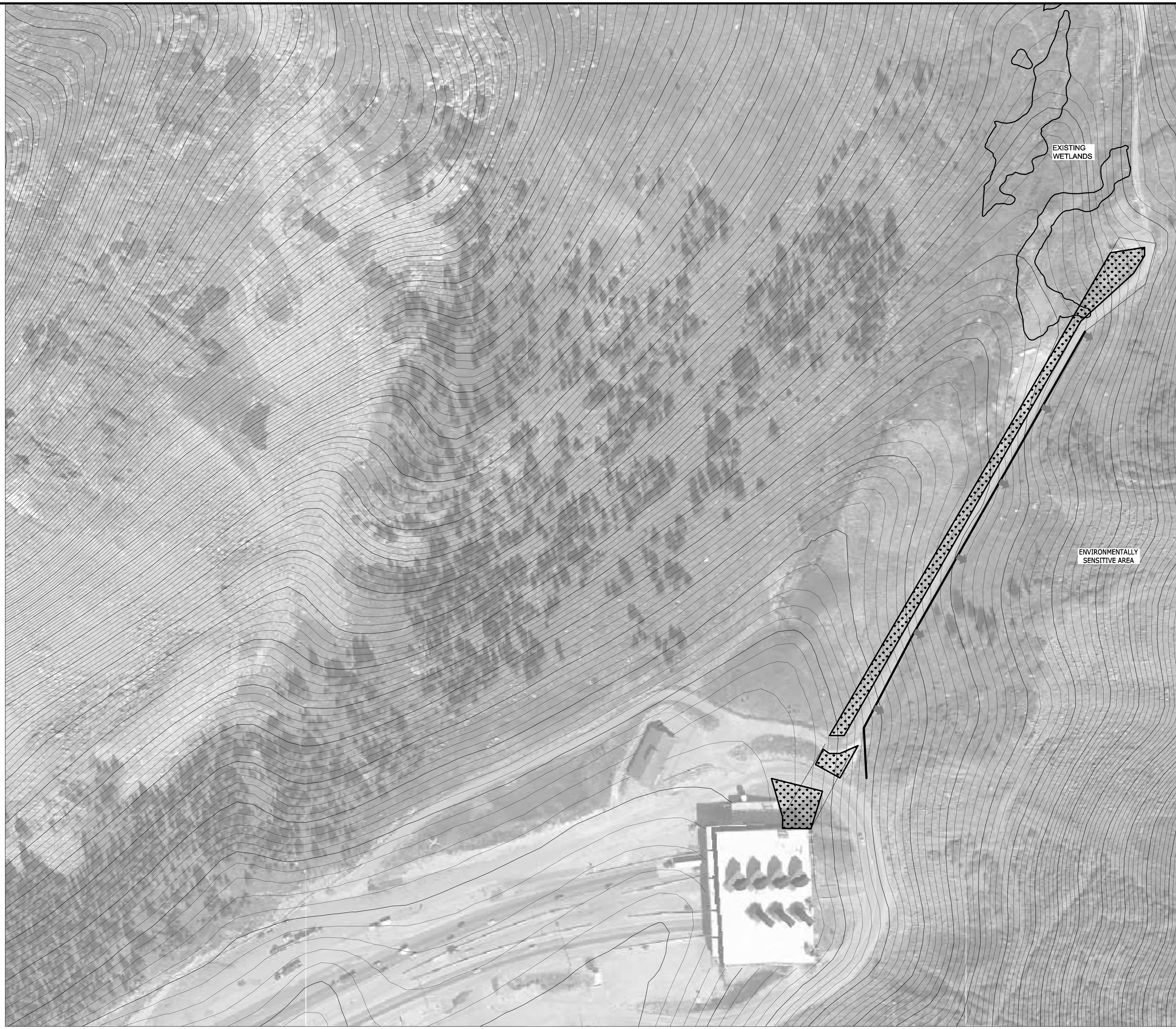
DRAWN BY: ART CHECKED BY: GEP

ELECTRICAL SPECIFICATIONS

Drawing Number
E7.2

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

XREFS=(xx-tb) Layouts=(E1.0 ELECTRICAL GENERAL INFORMATION)
DIMSCALE=1 \\filesvr\jobs\87914002\Dwg\ejmt - fixed fire suppression system\Sheets\Electrical\E1.0 ELECTRICAL GENERAL INFORMATION.dwg FEB 3, 2015 10:32AM CHENDERSON



LEGEND

RESTORED VEGETATION

THE FOLLOWING APPROVED USFS SEED MIX SHALL BE USED FOR RESEEDING:

SPECIES	PLS lbs./acre
ROCKY MOUNTAIN FESCUE (FESTUCA SAXIMONTANA)	2.00
TUFTED HAIRGRASS (DESCHAMPSIA CESPITOSA)	1.50
ALPINE BLUEGRASS (POA ALPINE)	2.00
ALPINE TIMOTHY (PHLEUM ALPINUM)	1.50
WESTERN YARROW (ACHILLEA MILLEFOLIUM VAR. OCCIDENTALIS)	0.10
BLUE MOUNTAIN PENSTEMON (PENSTEMON RYDBERGII)	0.20
MOUNTAIN PHLOX (LINANTHUS GRANDIFLORAS)	0.20
ICELAND POPPY (PAPAVER NUDICAULE)	0.20
TOTAL:	7.70

INSTALL NETLESS BLANKETS ON SLOPES GREATER THAN 4H:1V.

NOTE: USFS TO PROVIDE SEED MIX WITH A MINIMUM OF ONE MONTH'S NOTICE FROM CONTRACTOR. SEED MIX INFORMATION WILL BE UPDATED ONCE THIS IS RECEIVED FROM THE USFS.

CONTACT: PAUL SEMMER, 970-262-3448, PSEMMER@FS.FED.US

RESEEDING TO TAKE PLACE AFTER SEPTEMBER 1, 2015 AND BEFORE NOVEMBER 1, 2015.
CLEARING AND WORK LIMITS TO BE CONFINED TO WITHIN 20-FT OF THE TRENCHLINE.

N

2 WEST PORTAL LANDSCAPE PLAN
SCALE: 1" = 100'

100' 50' 0 100'
SCALE: 1" = 100'-0"

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

BARNARD EJMT TEAM

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions

Num	Description	Date

DRAWN BY: MN
CHECKED BY: JL

WEST PORTAL LANDSCAPE PLAN

Drawing Number
L1.0

LEGEND

RESTORED VEGETATION

THE FOLLOWING APPROVED USFS SEED MIX SHALL BE USED FOR RESEEDING:

SPECIES	PLS lbs./acre
ROCKY MOUNTAIN FESCUE (FESTUCA SAXIMONTANA)	2.00
TUFTED HAIRGRASS (DESCHAMPSIA CESPITOSA)	1.50
ALPINE BLUEGRASS (POA ALPINE)	2.00
ALPINE TIMOTHY (PHLEUM ALPINUM)	1.50
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TOTAL:	7.70

INSTALL NETLESS BLANKETS ON SLOPES GREATER THAN 4H:1V.

NOTE: USFS TO PROVIDE SEED MIX WITH A MINIMUM OF ONE MONTH'S NOTICE FROM CONTRACTOR. SEED MIX INFORMATION WILL BE UPDATED ONCE THIS IS RECEIVED FROM THE USFS.

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RESEEDING TO TAKE PLACE AFTER SEPTEMBER 1, 2015 AND BEFORE NOVEMBER 1, 2015.
CLEARING AND WORK LIMITS TO BE CONFINED TO WITHIN 20-FT OF THE TRENCHLINE.

N

1 EAST PORTAL LANDSCAPE PLAN
SCALE:1" = 100'

100' 50' 0 100'
SCALE: 1" = 100'-0"

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

BARNARD EJMT TEAM

BARNARD

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

DRAWN BY: MN CHECKED BY: JL

EAST PORTAL LANDSCAPE PLAN

Drawing Number
L1.1

DRAWING #	DESCRIPTION
FA0.00	FIRE ALARM: COVER PAGE
FA0.01	FIRE ALARM: LEGEND
FA0.02	FIRE ALARM: NARRATIVE
FA0.03	FIRE ALARM: SEQUENCE OF OPERATIONS PART #1
FA0.04	FIRE ALARM: SEQUENCE OF OPERATIONS PART #2
FA0.05	FIRE ALARM: SEQUENCE OF OPERATIONS DETAILS
FA0.06	FIRE ALARM: TUNNEL VENTILATION SECTOR PLAN
FA0.07	FIRE ALARM: SITE KEY PLAN
FA1.01	FIRE ALARM: SITE PLAN - EAST
FA1.02	FIRE ALARM: SITE PLAN - WEST
FA2.E01	FIRE ALARM: LOWER LEVEL EAST
FA2.E02	FIRE ALARM: ROADWAY LEVEL EAST
FA2.E03	FIRE ALARM: FAN LEVEL EAST
FA2.N01	FIRE ALARM: EISENHOWER TUNNEL FP ZONES NT-01 TO NT-05
FA2.N02	FIRE ALARM: EISENHOWER TUNNEL FP ZONES NT-06 TO NT-15
FA2.N03	FIRE ALARM: EISENHOWER TUNNEL FP ZONES NT-16 TO NT-25
FA2.N04	FIRE ALARM: EISENHOWER TUNNEL FP ZONES NT-26 TO NT-35
FA2.N05	FIRE ALARM: EISENHOWER TUNNEL FP ZONES NT-36 TO NT-45
FA2.N06	FIRE ALARM: EISENHOWER TUNNEL FP ZONES NT-46 TO NT-55
FA2.N07	FIRE ALARM: EISENHOWER TUNNEL FP ZONES NT-56 TO NT-65
FA2.N08	FIRE ALARM: EISENHOWER TUNNEL FP ZONES NT-66 TO NT-75
FA2.N09	FIRE ALARM: EISENHOWER TUNNEL FP ZONES NT-76 TO NT-85
FA2.N10	FIRE ALARM: EISENHOWER TUNNEL FP ZONES NT-86 TO NT-90
FA2.S01	FIRE ALARM: JOHNSON TUNNEL FP ZONES ST-01 TO ST-05
FA2.S02	FIRE ALARM: JOHNSON TUNNEL FP ZONES ST-06 TO ST-15
FA2.S03	FIRE ALARM: JOHNSON TUNNEL FP ZONES ST-16 TO ST-25
FA2.S04	FIRE ALARM: JOHNSON TUNNEL FP ZONES ST-26 TO ST-35
FA2.S05	FIRE ALARM: JOHNSON TUNNEL FP ZONES ST-36 TO ST-45
FA2.S06	FIRE ALARM: JOHNSON TUNNEL FP ZONES ST-46 TO ST-55
FA2.S07	FIRE ALARM: JOHNSON TUNNEL FP ZONES ST-56 TO ST-65
FA2.S08	FIRE ALARM: JOHNSON TUNNEL FP ZONES ST-66 TO ST-75
FA2.S09	FIRE ALARM: JOHNSON TUNNEL FP ZONES ST-76 TO ST-85
FA2.S10	FIRE ALARM: JOHNSON TUNNEL FP ZONES ST-86 TO ST-93
FA2.W01	FIRE ALARM: ROADWAY LEVEL WEST
FA2.W02	FIRE ALARM: ROADWAY LEVEL WEST
FA2.W03	FIRE ALARM: FAN LEVEL WEST
FA3.01	FIRE ALARM: ONE LINE DIAGRAM FIRE ALARM
FA3.02	FIRE ALARM: ONE LINE DIAGRAM CCTV
FA4.01	FIRE ALARM: E. CNTL. RM EST3 PANEL LAYOUT & CALCULATIONS
FA4.02	FIRE ALARM: W. CNTL. RM EST3 PANEL LAYOUT & CALCULATIONS
FA4.03	FIRE ALARM: MGR OFF. EST3 PANEL LAYOUT & CALCULATIONS
FA4.04	FIRE ALARM: RCP #1 EST3 PANEL LAYOUT & CALCULATIONS
FA4.05	FIRE ALARM: RCP #2 EST3 PANEL LAYOUT & CALCULATIONS
FA4.06	FIRE ALARM: RCP #3 EST3 PANEL LAYOUT & CALCULATIONS
FA4.07	FIRE ALARM: RCP #4 EST3 PANEL LAYOUT & CALCULATIONS
FA4.08	FIRE ALARM: DELUGE RELEASING & FPC HEAT LOAD CALCS
FA4.09	FIRE ALARM: FPC01 THRU FPC04 BATTERY CALCULATIONS
FA4.10	FIRE ALARM: FPC05 THRU FPC08 BATTERY CALCULATIONS
FA4.11	FIRE ALARM: FPC09 THRU FPC12 BATTERY CALCULATIONS
FA4.12	FIRE ALARM: FPC13 THRU FPC16 BATTERY CALCULATIONS
FA4.13	FIRE ALARM: FPC17 THRU FPC20 BATTERY CALCULATIONS
FA4.14	FIRE ALARM: CONDUIT FILL CALCULATIONS
FA4.15	FIRE ALARM: CONDUIT FILL CALCULATIONS
FA5.01	FIRE ALARM: FIRE PROTECTION PANEL FPC #01 WIRING DIAGRAM
FA5.02	FIRE ALARM: FIRE PROTECTION PANEL FPC #02 WIRING DIAGRAM
FA5.03	FIRE ALARM: FIRE PROTECTION PANEL FPC #03 WIRING DIAGRAM
FA5.04	FIRE ALARM: FIRE PROTECTION PANEL FPC #04 WIRING DIAGRAM
FA5.05	FIRE ALARM: FIRE PROTECTION PANEL FPC #05 WIRING DIAGRAM
FA5.06	FIRE ALARM: FIRE PROTECTION PANEL FPC #06 WIRING DIAGRAM
FA5.07	FIRE ALARM: FIRE PROTECTION PANEL FPC #07 WIRING DIAGRAM
FA5.08	FIRE ALARM: FIRE PROTECTION PANEL FPC #08 WIRING DIAGRAM
FA5.09	FIRE ALARM: FIRE PROTECTION PANEL FPC #09 WIRING DIAGRAM
FA5.10	FIRE ALARM: FIRE PROTECTION PANEL FPC #10 WIRING DIAGRAM
FA5.11	FIRE ALARM: FIRE PROTECTION PANEL FPC #11 WIRING DIAGRAM
FA5.12	FIRE ALARM: FIRE PROTECTION PANEL FPC #12 WIRING DIAGRAM
FA5.13	FIRE ALARM: FIRE PROTECTION PANEL FPC #13 WIRING DIAGRAM
FA5.14	FIRE ALARM: FIRE PROTECTION PANEL FPC #14 WIRING DIAGRAM
FA5.15	FIRE ALARM: FIRE PROTECTION PANEL FPC #15 WIRING DIAGRAM
FA5.16	FIRE ALARM: FIRE PROTECTION PANEL FPC #16 WIRING DIAGRAM
FA5.17	FIRE ALARM: FIRE PROTECTION PANEL FPC #17 WIRING DIAGRAM
FA5.18	FIRE ALARM: FIRE PROTECTION PANEL FPC #18 WIRING DIAGRAM
FA5.19	FIRE ALARM: FIRE PROTECTION PANEL FPC #19 WIRING DIAGRAM
FA5.20	FIRE ALARM: FIRE PROTECTION PANEL FPC #20 WIRING DIAGRAM
FA5.21	FIRE ALARM: IVE CABINET DETAILS
FA5.22	FIRE ALARM: FIRE PROTECTION PANEL MOUNTING DETAILS
FA6.01	FIRE ALARM: DETAILS - LINEAR HEAT HANGER
FA6.02	FIRE ALARM: DETAILS - SYSTEM SIGNAGE
FA6.03A	FIRE ALARM: DETAILS - EAST CONTROL RACK #1 - FRONT VIEW
FA6.03B	FIRE ALARM: DETAILS - EAST CONTROL RACK #1 - MID-FRONT VIEW
FA6.04A	FIRE ALARM: DETAILS - EAST CONTROL RACK #1 - REAR VIEW
FA6.04B	FIRE ALARM: DETAILS - EAST CONTROL RACK #1 - MID-REAR VIEW
FA6.05A	FIRE ALARM: DETAILS - EAST CONTROL RACK #2 - FRONT VIEW
FA6.05B	FIRE ALARM: DETAILS - EAST CONTROL RACK #2 - MID-FRONT VIEW
FA6.06A	FIRE ALARM: DETAILS - EAST CONTROL RACK #2 - REAR VIEW
FA6.06B	FIRE ALARM: DETAILS - EAST CONTROL RACK #2 - MID-REAR VIEW
FA6.07A	FIRE ALARM: DETAILS - WEST CONTROL RACK #1 - FRONT VIEW
FA6.07B	FIRE ALARM: DETAILS - WEST CONTROL RACK #1 - MID-FRONT VIEW
FA6.08A	FIRE ALARM: DETAILS - WEST CONTROL RACK #1 - REAR VIEW
FA6.08B	FIRE ALARM: DETAILS - WEST CONTROL RACK #1 - MID-REAR VIEW
FA6.09A	FIRE ALARM: DETAILS - WEST CONTROL RACK #2 - FRONT VIEW
FA6.09B	FIRE ALARM: DETAILS - WEST CONTROL RACK #2 - MID-FRONT VIEW
FA6.10A	FIRE ALARM: DETAILS - WEST CONTROL RACK #2 - REAR VIEW
FA6.10B	FIRE ALARM: DETAILS - WEST CONTROL RACK #2 - MID-REAR VIEW
FA6.11	FIRE ALARM: DEVICE WIRING DETAILS
FA6.12	FIRE ALARM: DEVICE WIRING DETAILS
FA6.13	FIRE ALARM: DEVICE WIRING DETAILS
FA6.14	FIRE ALARM: FIRE PROTECTION BRACKET HANGER DETAILS
FA6.15	FIRE ALARM: FIRE PROTECTION BRACKET HANGER DETAILS
FA6.16	FIRE ALARM: DETAILS-EAST CNTRL-RACK #1-WIRE-FRONT-TOP
FA6.17	FIRE ALARM: DETAILS-EAST CNTRL-RACK #1-WIRE-FRONT-BOTTOM
FA6.18	FIRE ALARM: DETAILS-EAST CNTRL-RACK #1-WIRE-REAR-TOP
FA6.19	FIRE ALARM: DETAILS-EAST CNTRL-RACK #1-WIRE-REAR-BOTTOM
FA6.20	FIRE ALARM: DETAILS-EAST CNTRL-RACK #2-WIRE-FRONT-TOP
FA6.21	FIRE ALARM: DETAILS-EAST CNTRL-RACK #2-WIRE-FRONT-BOTTOM
FA6.22	FIRE ALARM: DETAILS-EAST CNTRL-RACK #2-WIRE-REAR-TOP
FA6.23	FIRE ALARM: DETAILS-EAST CNTRL-RACK #2-WIRE-REAR-BOTTOM
FA6.24	FIRE ALARM: DETAILS-WEST CNTRL-RACK #1-WIRE-FRONT-TOP
FA6.25	FIRE ALARM: DETAILS-WEST CNTRL-RACK #1-WIRE-FRONT-BOTTOM
FA6.26	FIRE ALARM: DETAILS-WEST CNTRL-RACK #1-WIRE-REAR-TOP
FA6.27	FIRE ALARM: DETAILS-WEST CNTRL-RACK #1-WIRE-REAR-BOTTOM
FA6.28	FIRE ALARM: DETAILS-WEST CNTRL-RACK #2-WIRE-FRONT-TOP
FA6.29	FIRE ALARM: DETAILS-WEST CNTRL-RACK #2-WIRE-FRONT-BOTTOM
FA6.30	FIRE ALARM: DETAILS-WEST CNTRL-RACK #2-WIRE-REAR-TOP
FA6.31	FIRE ALARM: DETAILS-WEST CNTRL-RACK #2-WIRE-REAR-BOTTOM

NICET CERTIFICATION

JOHN BALLMAN
SYSTEMS GROUP
800 EAST 64TH AVENUE, UNIT #17
DENVER, COLORADO 80229
(303) 298-7900

NICET LEVEL: IV
TECHNICAL AREA: FIRE ALARM SYSTEMS
CERTIFICATE NUMBER: #101808

APPROVED BY: ____________________

DATE: ____________________

REVIEW NUMBER: 1☐ 2☐ 3☐

John Ballman
Nicet Fire Alarm systems
Level IV
Certification #101808

Date:

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

BARNARD EJMT TEAM

RONDINELLI life safety
BARNARD
BCER Engineering
Sturgeon Electric
Western States Fire Protection Co.
CONSULTING ENGINEERS

EISENHOWER/JOHNSON MEMORIAL TUNNEL

FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT

Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

Revisions

Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
COVER PAGE

Drawing Number
FA0.00

FIRE ALARM LEGEND

SYMBOL	DESCRIPTION	MODEL	BACK BOX
FACP	FIRE ALARM CONTROL PANEL	EST3	3-CAB5, OR 3-CAB7B
FPCXX	FIRE PROTECTION CABINET	31-40SF & 41-50SF	SUPPLIED
RCPXX	REMOTE CONTROL PANEL	31-40SF	SUPPLIED
CT1	MONITOR MODULE, SINGLE CIRCUIT	SIGA-CT1	4 SQUARE (2-1/8" (D) x W/ ONE GANG)
CT2	MONITOR MODULE, DUAL CIRCUIT	SIGA-CT2	4 SQUARE (2-1/8" (D) x W/ ONE GANG)
UIO6R	UNIVERSAL INPUT/OUTPUT MOTHERBOARD, 6 SLOT	SIGA-UIO6R	N/A
UIO2R	UNIVERSAL INPUT/OUTPUT MOTHERBOARD, 2 SLOT	SIGA-UIO2R	N/A
NT-01	DELUGE ZONE DESIGNATION	N/A	N/A
P	PHOTOELECTRIC SMOKE DETECTOR W/ BASE P = Photoelectric	SIGA2-PS & SIGA-SB	4" SQUARE, 2-1/8" DEEP, 3-0 RING
HCO	HEAT AND CO DETECTOR, ADDRESSABLE, FIXED AT 135 DEGREE	SIGA2-HCOS & SIGA-SB	4" SQUARE, 2-1/8" DEEP, 3-0 RING
CR	CONTROL RELAY MODULE	SIGA-CR	4" SQUARE, 2-1/8" DEEP, 1-GANG PLASTER RING
PM	MULTI-VOLTAGE RELAY	RIC-1	4" SQUARE, 2-1/8" DEEP, BLANK COVER
FB	FIBER SPLICE BOX	28024033	SUPPLIED
ZV	DELUGE ZONE VALVE	BERMAD FP400E-3DC-66	N/A
SD	DELUGE SERVICE DISCONNECT SWITCH	RELA-SRV-1	4 SQUARE (2-1/8" (D) x W/ ONE GANG)
TL	TANK LEVEL SENSOR	DON'T HAVE YET	N/A
FOLHD	FIBER OPTIC LINEAR HEAT DETECTOR	LIOS LHD3-04	PART OF CONTROL ROOM EQUIPMENT RACK
J	JUNCTION BOX	SIZE VARIES DEPENDING ON APPLICATION	N/A
	END OF LINE RESISTOR	RATING VARIES DEPENDING ON APPLICATION	N/A
	FLOW SWITCH	PART OF BERMAD DELUGE VALVE ABOVE	N/A
	TAMPER SWITCH	705W	N/A
	CCTV CAMERA	AVIGILON 2.0W-H3PTZ-DP20	1 GANG 2 1/2" DEEP BACK BOX
EOL	SUPERVISED END OF LINE DEVICE	RELA-EOL	1 GANG 2 1/2" DEEP BACK BOX
AT	AIR TEMPERATURE SWITCH	STEGO KT-011 TYPE	N/A
PS	PRESSURE SWITCH	PS-40-2	N/A
SRGX	SURGE PROTECTION DEVICE	MODEL VARIES DEPENDING ON APPLICATION	N/A
FC	FIBER CALIBRATION BOX	N/A	N/A

WIRE SPECIFICATIONS:

FIBER OPTIC LINEAR HEAT DETECTION CABLE - 2/C, 62.5/125u MULIT-MODE ARMORED CABLE. LIOS TYPE 28030504 IN TUNNEL ROADWAY AREAS. LIOS TYPE 28030606 IN NON-TUNNEL ROADWAY AREAS. E2000 APC CONNECTORS. FIBER, CONNECTORS, AND BREAK-OUT PIGTAILS PROVIDED BY SYSTEMS GROUP.

FIRE ALARM FIBER OPTIC CABLE - 4/C, 62.5/125u MULTI-MODE FIBER, 820Nm, OUTSIDE PLANT (OSP) DISTRIBUTION TYPE CABLE, KEVLAR STRENGTH MEMBER. BREAK-OUT FIBER KIT FOR "ST" TYPE CONNECTOR. "ST" CONNECTORS PROVIDED BY ELECTRICAL CONTRACTOR. FIBER TRANSCEIVER PROVIDED BY SYSTEMS GROUP.

CCTV FIBER OPTIC CABLE - 6/C, 62.5/125u SINGLE-MODE FIBER, 850nm, OUTSIDE PLANT (OSP) DISTRIBUTION TYPE CABLE, KEVLAR STRENGTH MEMBER, BREAK-OUT KIT FOR "LC" CONNECTOR. "LC" CONNECTORS PROVIDED BY ELECTRICAL CONTRACTOR. FIBER TRANSCEIVER PROVIDED BY SYSTEMS GROUP.

CAT 5e ETHERNET CABLE - 1000BASE-T, 4-PAIR UTP CAT 5e. RJ-45 CONNECTORS PROVIDED BY ELECTRICAL CONTRACTOR.

#18 TFN CONDUCTOR - STRANDED, TFN JACKET INSULATION. SEE COLOR CODES. PROVIDED BY ELECTRICAL CONTRACTOR.

#16 THHN CONDUCTOR - STRANDED, THHN JACKET INSULATION. SEE COLOR CODES. PROVIDED BY ELECTRICAL CONTRACTOR.

#14 THHN CONDUCTOR - STRANDED, THHN JACKET INSULATION. SEE COLOR CODES. PROVIDED BY ELECTRICAL CONTRACTOR.

#12 THHN CONDUCTOR - STRANDED, THHN JACKET INSULATION. SEE COLOR CODES. PROVIDED BY ELECTRICAL CONTRACTOR.

#16 TWISTED PAIR - 2/C, #16 CONDUCTORS, STRANDED, TFN JACKET INSULATION, MINIMUM 6 TWISTS PER FOOT. SEE COLOR CODES BELOW. PROVIDED BY ELECTRICAL CONTRACTOR.

#12 TWISTED PAIR - 2/C, #12 CONDUCTORS, STRANDED, THHN JACKET INSULATION, MINIMUM 6 TWISTS PER FOOT. SEE COLOR CODES. PROVIDED BY ELECTRICAL CONTRACTOR.

#10 THHN CONDUCTOR - SOLID, THHN JACKET, GREEN. PROVIDED BY ELECTRICAL CONTRACTOR.

#6 THHN CONDUCTOR - SOLID, THHN JACKET. PROVIDED BY ELECTRICAL CONTRACTOR.

COLOR CODES FOR TUNNEL PLENUMS:

WATERFLOW IDC CKT - YELLOW/BLUE

TAMPER IDC CKT - ORANGE/BROWN

DELUGE VALVE RELEASING CIRCUIT - PINK/PURPLE

SIGNALING DEVICE LOOP SLC CIRCUIT - RED/BLACK

CAMERA POWER CIRCUIT - RED/BLACK

*LIGHTER COLOR (+), DARKER COLOR (-)

1 WIRE COLOR CODE/SPECIFICATIONS
SCALE: N.T.S.

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions
Num | Description | Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM: LEGEND

Drawing Number
FA0.01

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

GENERAL

THE EISENHOWER/JOHNSON MEMORIAL TUNNEL FIXED FIRE SUPPRESSION SYSTEM (EJMT FFSS) PROJECT CONSISTS OF DELUGE TYPE SPRINKLER SYSTEM ZONES INTERFACED TO AND CONTROLLED BY THE FIRE ALARM SYSTEM. THE FIRE ALARM SYSTEM IS COMPRISED OF A FIBER OPTIC LINEAR HEAT DETECTION SYSTEM (FOLHD) THAT IS INSTALLED IN THE ROADWAY SECTION OF THE TUNNEL, WITH ASSOCIATED MONITOR AND SPRINKLER RELEASING EQUIPMENT INSTALLED THROUGHOUT THE SUPPLY PLENUMS OF THE TUNNELS, AT THE PORTAL BUILDINGS, AND ADJACENT SITE AREAS OF THE OF PROJECT. THE FIRE ALARM SYSTEM IS FURTHER INTEGRATED INTO A NEW FIRE ALARM CLOSED CIRCUIT CAMERA (FA CCTV) SYSTEM INSTALLED IN THE ROADWAY SECTION OF THE TUNNELS. THIS NEW FIRE ALARM FA CCTV SYSTEM IS INDEPENDENT OF AND IN ADDITION TO THE EXISTING TRAFFIC CONTROL CCTV CAMERA SYSTEM CURRENTLY INSTALLED IN THE TUNNEL ROADWAY AREAS. THE FIRE ALARM SYSTEM SHALL PROVIDE A GRAPHICAL USER INTERFACE (GUI) PLATFORM WITH OPERATOR WORKSTATIONS LOCATED IN THE EAST AND WEST CONTROL ROOMS, AS WELL AS THE FACILITY MANAGER'S OFFICE. THE GUI'S SHALL DISPLAY REAL-TIME FFSS SYSTEM INFORMATION TO THE SYSTEM OPERATORS DURING NORMAL AND EMERGENCY SITUATIONS, SHALL ALLOW MANUAL CONTROL OF THE SPRINKLER SYSTEMS WHEN WARRANTED, AND SHALL DISPLAY LIVE CAMERA VIDEO IMAGES OF THE AFFECTED TUNNEL AREAS.

STANDBY POWER SYSTEMS

ALL PORTIONS OF THE FIRE ALARM, FOLHD, AND FA CCTV SYSTEMS SHALL BE FURNISHED WITH BACK-UP STANDBY POWER. ALL EQUIPMENT IS FED FROM THE EMERGENCY ELECTRICAL POWER FEED THAT IS CONNECTED TO EMERGENCY GENERATORS AT EACH PORTAL; WHICH SHALL MAINTAIN A CONTINUOUS AC POWER SYSTEM TO ALL PORTIONS OF THE FIRE ALARM, FOLHD, AND FA CCTV SYSTEMS.

THE EAST AND WEST CONTROL ROOMS SHALL HAVE SMALL UNINTERRUPTIBLE POWER SUPPLY (UPS) SYSTEMS TO BACK-UP THE FIREWORKS DISPLAY SYSTEMS AND MONITORS, FA SYSTEM PRINTERS, FA CCTV WORKSTATIONS AND MONITORS, THE FA CCTV NETWORK VIDEO RECORDERS AND THE FA CCTV SYSTEM ETHERNET SWITCHES. THE FACP PANELS AT EACH CONTROL ROOM AND THE FACILITY MANAGER'S OFFICE SHALL HAVE INTERNAL BATTERY BACK-UP SYSTEMS TO PROVIDE FA POWER TO THE FIRE ALARM AND FOLHD EQUIPMENT LOCATED THERE. THE FACP PANELS AT EACH REMOTE CONTROL PANEL LOCATION SHALL HAVE INTERNAL BATTERY BACK-UP SYSTEMS TO PROVIDE FA POWER TO THE FIRE ALARM EQUIPMENT LOCATED THERE. THE FIRE ALARM POWER SUPPLIES AT EACH FIRE PROTECTION CABINET SHALL HAVE INTERNAL BATTERY BACK-UP SYSTEMS TO PROVIDE FA POWER TO THE FIRE ALARM AND FA CCTV EQUIPMENT LOCATED THERE. SINCE THE ENTIRE SYSTEM IS BACKED UP BY AN EMERGENCY GENERATOR, THE BATTERY STANDBY SYSTEMS TO THE FA EQUIPMENT SHALL BE SIZED FOR 4 HOURS OF STANDBY, FOLLOWED BY 5 MINUTES OF ALARM. THE INDIVIDUAL UPS SYSTEMS DESCRIBED ABOVE SHALL BE SIZED FOR 5 MINUTES OF STANDBY POWER, UNTIL THE EMERGENCY GENERATORS COME ON LINE.

FIBER OPTIC LINEAR HEAT DETECTION (FOLHD) SYSTEM

THE FOLHD SYSTEM SHALL BE DEPLOYED IN A REDUNDANT FASHION WITH ONE (1) LINEAR HEAT DETECTOR LOCATED IN THE EAST CONTROL ROOM AND ONE (1) LINEAR HEAT DETECTOR LOCATED IN THE WEST CONTROL ROOM. EACH LINEAR HEAT DETECTOR SHALL FEED BOTH TUNNELS SUCH THAT A BREAK IN ONE FIBER SHALL ALLOW FULL COVERAGE OF EACH TUNNEL TO REMAIN IN PLACE PROVIDING A REDUNDANT LINEAR HEAT DETECTION SYSTEM.

THE FOLHD SYSTEM SHALL BE INSTALLED IN A SINGLE 2/C ARMORED FIBER OPTIC CABLE IN EACH TUNNEL. THIS ARMORED FIBER CABLE INCLUDES A SINGLE 1/C FIBER CABLE FEED FROM EACH LINEAR HEAT DETECTOR. THIS ARMORED FIBER OPTIC CABLE SHALL BE INSTALLED ALONG THE APPROXIMATE CENTERLINE OF THE TUNNEL WITH A SLIGHT OFFSET FROM THE CENTERLINE SUCH THAT THE CABLE IS TO ONE SIDE OF THE CENTER CEILING CAP. THIS CABLE OFFSET SHALL ALLOW THE FOLHD HANGER AND FOLHD CABLE TO BE INSTALLED WITHOUT SHUTTING DOWN BOTH LANES OF TRAFFIC IN THE TUNNELS. THE FIBER OPTIC CABLE SHALL BE INSTALLED IN A HANGER SUPPORT SYSTEM THAT SHALL BE ATTACHED TO THE EXISTING CEILING TILES TO ALLOW THE FIBER OPTIC CABLE TO BE LOCATED APPROXIMATELY 2" BELOW THE EXISTING ROADWAY CEILING TO MEET THE NFPA 72 CODE REQUIRED MOUNTING DISTANCE FROM THE CEILING. THE HANGER SYSTEM SHALL BE NOTCHED ALONG THE BOTTOM OF THE CHANNEL TO ALLOW HEAT TRANSMISSION TO THE FIBER CABLE AND TO ALLOW DRAINAGE OF THE TUNNEL WASHING SYSTEM WATER.

THE FOLHD SYSTEM SHALL ALLOW FOR MULTIPLE LEVELS OF HEAT DETECTION IN THE TUNNELS; INCLUDING DELTA T ABOVE AMBIENT (SET AT 25F ABOVE AMBIENT/MINUTE) FOR PRE-POSITIONING OF THE FA CCTV CAMERAS, AND FIXED TEMPERATURE (SET AT 50F ABOVE AMBIENT/MINUTE AND/OR 160F FIXED TEMPERATURE) FOR RELEASING OF THE TUNNEL DELUGE SPRINKLER SYSTEMS. THE FOLHD SYSTEM SHALL BE "ZONED" IN EACH TUNNEL BASED ON THE DELUGE SPRINKLER ZONES; WITH THE PRIMARY AND SECONDARY ZONE FIBER CABLE HEAT RELEASING "ZONES" MATCHING THE TUNNEL DELUGE SPRINKLER ZONES (APPROXIMATELY 100' IN LENGTH). THE SECONDARY FIBER CABLE IN EACH TUNNEL IS FED FROM THE OPPOSITE CONTROL ROOM LINEAR HEAT DETECTOR, PROVIDING REDUNDANT HEAT DETECTION COVERAGE FOR RELEASING AND CAMERA PRE-POSITIONING PURPOSES.

IN THIS ZONING CONFIGURATION, THE FOLHD SYSTEM SHALL HAVE A SINGLE ZONE TYPE DELUGE SPRINKLER RELEASING MODE WHEREBY AN ALARM CONDITION IN THE ASSOCIATED TUNNEL ZONE SHALL RELEASE THE ASSOCIATED TUNNEL DELUGE SYSTEM. SEE THE FIRE ALARM SEQUENCE OF OPERATION DETAILS SHEET FOR A DEPICTION OF THE FOLHD TUNNEL ZONING.

THE FOLHD SYSTEM HAS A SINGLE ZONE RELEASING FUNCTION IN THE EVENT OF DEGRADED MODE OPERATION, CONSISTING OF A FIBER BREAK ON EITHER THE PRIMARY OR SECONDARY FIBERS IN EACH TUNNEL. IN THIS DEGRADED MODE OPERATION, THE TUNNEL DELUGE SYSTEMS ARE STILL RELEASED AND THE FA CCTV CAMERAS ARE STILL PRE-POSITIONED IN A SIMILAR FASHION TO NON-DEGRADED MODE, EXCEPT THE FOLHD SYSTEM IS LIMITED TO SINGLE ZONE ACTIVATION. THIS DEGRADED MODE RELEASING MODE IS FURTHER SHOWN ON THE FIRE ALARM SEQUENCE OF OPERATION AND SEQUENCE OF OPERATION DETAILS SHEETS.

THE FOLHD SYSTEM SHALL BE FULLY PROGRAMMABLE TO ALLOW FOR CHANGES TO ANY AND ALL "ZONES" DEFINED ON THE FIBER OPTIC CABLES; SUCH THAT "ZONES" NEAR THE PORTALS MAY HAVE A SLIGHTLY DIFFERENT DELTA T ABOVE AMBIENT SETTING TO REFLECT THE MORE EXTREME CONDITIONS CAUSED BY OUTSIDE TEMPERATURE AND/OR WIND CHILL. THE FOLHD "ZONES" SHALL ALLOW MULTIPLE ACTIVATION PARAMETERS WHERE DEEMED NECESSARY, AND SHALL ALLOW ANY OF THE "ZONE" SETTING PARAMETERS TO BE MODIFIED DURING THE INITIAL SET-UP OF THE SYSTEM, OR IN THE FUTURE, AS MAY BE WARRANTED.

WITH THE AMBIENT TEMPERATURE INSIDE THE MAJORITY OF THE TUNNEL EXPECTED TO BE APPROXIMATELY 55F AND THE CAMERA PRE-POSITIONING TEMPERATURE PARAMETER BEING 25F ABOVE AMBIENT/MINUTE, THE RESULTING 80F CAMERA PRE-POSITIONING SHOULD OCCUR WELL IN ADVANCE OF THE ZONE DELUGE RELEASING SET POINT (SET FOR 50F ABOVE AMBIENT/MINUTE AND/OR 160F FIXED TEMPERATURE). IT IS EXPECTED THAT THE NEW FIRE ALARM CLOSED CIRCUIT FA CCTV CAMERAS SHALL BE POSITIONED SIGNIFICANTLY IN ADVANCE OF AN ACTUAL DELUGE SPRINKLER RELEASING ALARM CONDITION. THE CAMERA PRE-POSITIONING TEMPERATURE SHOULD ALLOW THE SYSTEM OPERATOR TO MANUALLY ACTIVATE A SPRINKLER DELUGE ZONE IN ADVANCE OF THE ALARM ZONE PARAMETER BEING REACHED, IF DEEMED APPROPRIATE; OR MANUALLY PREVENT (ABORT) A SPRINKLER DELUGE ZONE FROM RELEASING WHERE DEEMED APPROPRIATE. THIS CAMERA PRE-POSITIONING SHOULD ALLOW THE CDOT OPERATORS THE OPPORTUNITY TO MANAGE A SMALL ENGINE FIRE OR OTHER SMALL TUNNEL HEAT CONDITION WITHOUT RELEASING THE TUNNEL DELUGE SYSTEMS UNNECESSARILY. THE FIRE ALARM CAMERA FA CCTV PRE-POSITIONING APPROACH IS FURTHER SHOWN ON THE FIRE ALARM SEQUENCE OF OPERATION AND SEQUENCE OF OPERATION DETAILS SHEETS.

THE FOLHD SYSTEM SHALL BE POWERED BY A UL LISTED FIRE ALARM POWER SUPPLY CONNECTED TO THE EMERGENCY POWER ELECTRICAL SYSTEM, SUPPLIED WITH BATTERY BACK-UP; AND LOCATED IN THE CCTV EQUIPMENT RACKS BEING INSTALLED AT THE EAST AND WEST CONTROL ROOMS.

FIRE ALARM SYSTEM

THE FIRE ALARM SYSTEM PANELS SHALL BE INTERCONNECTED BY A CLASS A FIBER OPTIC NETWORK, WITH MAIN FACP PANELS LOCATED IN THE EAST AND WEST CONTROL ROOMS. THESE FACP PANELS IN THE CONTROL ROOMS SHALL PROVIDE THE SYSTEM INTERCONNECT TO THE FIREWORKS COLOR GRAPHICS DISPLAY SYSTEMS (GUI'S) AND SYSTEM PRINTERS LOCATED IN THE EAST AND WEST CONTROL ROOMS. THESE FACP PANELS SHALL PROVIDE MONITOR AND CONTROL OF THE MISCELLANEOUS SPRINKLER DELUGE EQUIPMENT LOCATED IN THE SUPPLY PLENUMS, AT THE PORTALS, AND ADJACENT SITE AREAS; AND SHALL PROVIDE THE HARDWIRE INTERFACE FROM THE FOLHD SYSTEM AND THE HARDWIRE INTERFACE TO THE FIRE ALARM CLOSED CIRCUIT FA CCTV SYSTEMS. THERE SHALL BE AN FACP PANEL LOCATED IN THE FACILITY MANAGER'S OFFICE THAT SHALL PROVIDE THE SYSTEM INTERCONNECT TO THE FIREWORKS COLOR GRAPHICS DISPLAY SYSTEM (GUI) INSTALLED THERE.

THERE SHALL BE FOUR (4) REMOTE CONTROL PANELS LOCATED IN THE SUPPLY PLENUMS OF THE TUNNELS, WHICH SHALL PROVIDE MONITOR AND CONTROL OF ALL THE SPRINKLER SYSTEM DELUGE EQUIPMENT INSTALLED IN THE TUNNELS PROPER. THESE REMOTE CONTROL PANELS SHALL BE HOUSED IN NEMA 4X ENCLOSURES TO PROVIDE ADEQUATE ENVIRONMENTAL PROTECTION OF THE FIRE ALARM SYSTEM EQUIPMENT IN THE SUPPLY PLENUMS. TO ASSIST IN TEMPERATURE AND ENVIRONMENTAL REGULATION INSIDE THE NEMA 4X ENCLOSURES, THE FACP PANEL EQUIPMENT, POWER SUPPLIES, AND MISCELLANEOUS MODULES SHALL BE INSTALLED INSIDE THE NEMA 4X LISTED ENCLOSURE IN LIEU OF THEIR RESPECTIVE LISTED ENCLOSURES. THIS SHALL PREVENT HAVING "PANELS INSIDE OF PANELS" THROUGHOUT THE PROJECT AND PROVIDE A MORE TEMPERATE HEATING AND COOLING ENVIRONMENT FOR THE FIRE ALARM EQUIPMENT. EACH REMOTE CONTROL PANEL SHALL PROVIDE ALL MONITORING AND CONTROL FUNCTIONS FOR APPROXIMATELY 45-50 TUNNEL DELUGE SPRINKLER ZONES FROM THE EAST OR WEST PORTAL TO THE PLENUM DIVIDING WALLS IN EACH TUNNEL.

THE FIRE ALARM SYSTEM SHALL HAVE TWENTY (20) FIRE PROTECTION CABINET LOCATIONS IN THE SUPPLY PLENUMS WHERE THE DELUGE SPRINKLER RELEASING MODULES AND SPRINKLER VALVE MONITORING EQUIPMENT SHALL BE LOCATED. THE FIRE PROTECTION CABINET EQUIPMENT SHALL BE HOUSED IN NEMA 4X ENCLOSURES TO PROVIDE ADEQUATE ENVIRONMENTAL PROTECTION OF THE EQUIPMENT IN THE SUPPLY PLENUMS. THERE SHALL BE SIXTEEN (16) TEN-ZONE FIRE PROTECTION CABINET LOCATIONS, ONE (1) EIGHT-ZONE FIRE PROTECTION CABINET LOCATION, AND THREE (3) FIVE-ZONE FIRE PROTECTION CABINET LOCATIONS. THE EIGHT-ZONE AND FIVE-ZONE FIRE PROTECTION CABINET LOCATIONS ARE UTILIZED FOR THE END PORTAL SYSTEMS OF EACH TUNNEL. TYPICALLY, THERE SHALL BE ONE (1) DELUGE RELEASING CIRCUIT, ONE (1) WATERFLOW MONITOR SWITCH, AND ONE (1) VALVE TAMPER MONITOR SWITCH PER DELUGE SPRINKLER SYSTEM, WITH A FEW MISCELLANEOUS ISOLATION VALVE TAMPER MONITOR SWITCHES DISTRIBUTED THROUGHOUT THE SUPPLY PLENUMS.

THE FIRE PROTECTION CABINET LOCATIONS SHALL PROVIDE 24VDC POWER TO THE DELUGE SYSTEM RELEASING SOLENOIDS, 24VDC POWER TO THE FIRE ALARM CLOSED CIRCUIT FA CCTV CAMERAS, AND 24VDC POWER TO THE FIRE ALARM CLOSED CIRCUIT FA CCTV CAMERA NETWORK EQUIPMENT. TO ASSIST IN TEMPERATURE AND ENVIRONMENTAL REGULATION INSIDE THE NEMA 4X ENCLOSURES, THE FACP PANEL EQUIPMENT, FA CCTV SYSTEM EQUIPMENT, POWER SUPPLIES, AND MISCELLANEOUS MODULES SHALL BE INSTALLED INSIDE THE NEMA 4X LISTED ENCLOSURE IN LIEU OF THEIR RESPECTIVE LISTED ENCLOSURES. THIS SHALL PREVENT HAVING "PANELS INSIDE OF PANELS" THROUGHOUT THE PROJECT AND PROVIDE A MORE TEMPERATE HEATING AND COOLING ENVIRONMENT FOR THE FIRE ALARM AND FA CCTV SYSTEM EQUIPMENT. THE FIRE ALARM AND CCTV SYSTEM EQUIPMENT IN THE FIRE PROTECTION (FPC) CABINETS AND REMOTE CONTROL (RCP) PANELS SHALL BE POWERED BY UL LISTED FIRE ALARM POWER SUPPLIES CONNECTED TO THE EMERGENCY POWER ELECTRICAL SYSTEM, WITH BATTERY BACK-UP.

THE FIRE ALARM SYSTEM SHALL MONITOR ALL RELATED FIRE SPRINKLER EQUIPMENT (WATERFLOW SWITCHES, VALVE TAMPER SWITCHES, AND MISCELLANEOUS WATER LEVEL SWITCHES AND SYSTEM CONTROL OUTPUTS ASSOCIATED WITH THE FFSS SPRINKLER SYSTEM. IN ADDITION, THE FIRE ALARM SYSTEM SHALL REPORT THE FIRE CONDITION LOCATION IN THE ROADWAY OF THE TUNNELS FROM THE FOLHD SYSTEM, CAUSE THE ASSOCIATED FIRE SPRINKLER DELUGE ZONE TO RELEASE, AND CAUSE THE FIRE ALARM CLOSED CIRCUIT FA CCTV CAMERAS TO PRE-POSITION TO THE AFFECTED TUNNEL DELUGE ZONE.

THE FIRE ALARM SYSTEM SHALL ANNUNCIATE THE PRE-RELEASE (DELTA T ABOVE AMBIENT F) ALARM CONDITION ON THE FIREWORKS DISPLAY SYSTEMS, PRINT OUT THE AFFECTED ALARM CONDITION ON THE SYSTEM PRINTER, AND DISPLAY THE AFFECTED FACCTV CAMERA(S) ON THE FIRE ALARM FA CCTV MONITORS. ONCE THE DELTA T ABOVE AMBIENT AND/OR FIXED TEMPERATURE ALARM RELEASE CONDITION IS RECEIVED, THE TUNNEL DELUGE ZONE SHALL BE DISPLAYED ON THE FIREWORKS DISPLAYS, ALERTING THE SYSTEM OPERATOR TO THE AFFECTED TUNNEL ZONE, AND SHALL SIGNAL THE TUNNEL DELUGE SPRINKLER SYSTEM TO RELEASE WATER TO THE AFFECTED ROADWAY ZONE. THE SYSTEM OPERATOR SHALL THEN CLICK ON THE AFFECTED FLASHING ZONE(S) DISPLAYED ON THE FIREWORKS DISPLAY, WHICH DISPLAYS THE AFFECTED TUNNEL DELUGE SYSTEM AND THE MANUAL RELEASE AND MANUAL ABORT BUTTONS; WHICH ALLOWS THE SYSTEM OPERATOR TO MONITOR THE SITUATION, AND TAKE MANUAL CONTROL OF THE FIRE ALARM AND FACCTV SYSTEMS AS WARRANTED.

THE FIREWORKS DISPLAY SYSTEMS, MONITORS, AND SYSTEM PRINTERS SHALL BE POWERED FROM THE EMERGENCY POWER ELECTRICAL SYSTEM, WITH AN UNINTERRUPTIBLE POWER SOURCE (UPS) SYSTEM, CAPABLE OF PROVIDING FIVE (5) MINUTES OF STANDBY POWER, UNTIL THE EMERGENCY GENERATORS ARE STARTED AND ON-LINE.

FIRE ALARM CLOSED CIRCUIT (FA CCTV) SYSTEM

THE FIRE ALARM CLOSED CIRCUIT FA CCTV SYSTEM SHALL BE A SEPARATE CAMERA SYSTEM FROM THE EXISTING TRAFFIC CONTROL CCTV SYSTEM CURRENTLY INSTALLED THROUGHOUT THE TUNNEL. THE FA CCTV SYSTEM SHALL CONSIST OF TWELVE (12) NEW PAN-TILT-ZOOM (PTZ) CAMERAS EVENLY DISTRIBUTED THROUGHOUT EACH TUNNEL, FOR A TOTAL OF TWENTY-FOUR (24) NEW FA CCTV CAMERAS. THE FA CCTV SYSTEM SHALL HAVE AN OPERATOR WORKSTATION WITH MULTIPLE MONITORS AT EACH CONTROL ROOM LOCATION AND AT THE FACILITY MANAGERS OFFICE. THESE OPERATOR WORKSTATIONS SHALL AUTOMATICALLY DISPLAY THE AFFECTED PRE-RELEASE AND/OR DELUGE SYSTEM RELEASE CONDITION(S) AT ALL WORKSTATIONS AS THE EVENTS OCCUR, AND SHALL ALLOW MANUAL CONTROL OF THE FA CCTV CAMERAS AS CONDITIONS WARRANT. THE SYSTEM OPERATORS CAN MONITOR THE AFFECTED ZONE, ADJACENT ZONES, AND RE-POSITION (PAN-TILT-ZOOM) CAMERAS AS THE SITUATION WARRANTS.

THE FIRE ALARM SYSTEM SHALL RECEIVE HARDWARE INPUTS FROM THE FOLHD SYSTEM FOR PRE-RELEASE AND RELEASE CONDITIONS IN THE TUNNEL, AND SHALL AUTOMATICALLY TRANSMIT OUTPUTS TO THE FA CCTV SYSTEM FOR PRE-POSITIONING OF THE FA CCTV CAMERAS (ROTATE AND ZOOM) TO THE AFFECTED ZONE(S) IN THE TUNNEL. THE FA CCTV CAMERAS ARE ACTIVATED BY THE DELTA ABOVE AMBIENT F TEMPERATURE SETTING (PRE-RELEASE) AND DELTA T ABOVE AMBIENT AND/OR FIXED TEMPERATURE SETTING (RELEASE) DESCRIBED EARLIER.

THE FOLHD SYSTEM SHALL BE UTILIZED TO CONTROL THE NEW FIRE ALARM CLOSED CIRCUIT FA CCTV CAMERAS IN THE TUNNEL ROADWAYS; SUCH THAT THE NEAREST ONE (1) OR TWO (2) CAMERA(S) SHALL BE POSITIONED (ROTATED AND ZOOMED) TO THE CENTER POINT OF THE AFFECTED TUNNEL DELUGE SYSTEM. THE ONE (1) ZONE CAMERA OPERATIONS ARE FOR THE FIRST FOUR (4) TUNNEL DELUGE ZONES STARTING AT THE WEST PORTAL OF EACH TUNNEL, AND THE LAST FOUR (4) TUNNEL DELUGE ZONES ENDING AT THE EAST PORTAL OF EACH TUNNEL. ALL OTHER TUNNEL DELUGE ZONES SHALL HAVE THE TWO (2) CAMERA POSITIONING OPERATION, SINCE MORE THAN ONE (1) CAMERA COVERS THESE TUNNEL DELUGE ZONES. THIS CAMERA POSITIONING SHALL BE DONE FROM A SEPARATE LINEAR HEAT DETECTION "ZONE PARAMETER" BASED ON THE DELTA T ABOVE AMBIENT TEMPERATURE PARAMETER (INITIALLY SET FOR 25F ABOVE AMBIENT).

THE FA CCTV CAMERA TRANSMISSION EQUIPMENT SHALL BE LOCATED IN THE FIRE PROTECTION CABINET LOCATIONS DESCRIBED UNDER THE FIRE ALARM SYSTEM NARRATIVE ABOVE. THERE SHALL BE TEN (10) 1-CAMERA LOCATIONS AND FOUR (4) 2-CAMERA LOCATIONS IN EACH TUNNEL. THE FA CCTV CAMERAS ARE LOCATED APPROXIMATELY 350' FROM EACH END OF THE TUNNEL AND APPROXIMATELY 750' FROM EACH OTHER. THE FA CCTV CAMERA IMAGES SHALL BE TRANSMITTED VIA CAT 5E ETHERNET COMMUNICATIONS FROM THE FA CCTV (PTZ) CAMERA BACK TO THE FIRE PROTECTION CABINET AND THEN TO THE FA CCTV WORKSTATIONS VIA A CLASS A SELF HEALING FIBER OPTICS NETWORK. THE FA CCTV (PTZ) CAMERA SHALL RECEIVE 24VDC POWER FROM THE FIRE ALARM POWER SUPPLY LOCATED IN EACH FIRE PROTECTION CABINET. THIS FIRE ALARM POWER SUPPLY SHALL ALSO FURNISH THE 24VDC POWER REQUIRED BY THE FA CCTV FIBER SWITCH EQUIPMENT IN THE CABINETS.

THE FA CCTV SYSTEM SHALL ALLOW THE SYSTEM OPERATOR TO VIEW REAL TIME VIDEO IMAGES OF THE AFFECTED PRE-RELEASE (ALARM) TUNNEL CONDITIONS AND THE RELEASE (ALARM) TUNNEL CONDITIONS AT THE OPERATORS WORKSTATION MONITORS. THE SYSTEM OPERATOR SHALL BE CAPABLE OF RE-POSITIONING THE CAMERA TO ADJACENT AND/OR ANY OTHER TUNNEL DELUGE ZONES AS DEEMED APPROPRIATE; AND ALLOW FURTHER "MANUAL" PAN-TILT-ZOOM FUNCTIONS TO ALLOW THE OPERATOR TO BETTER VISUALIZE THE TUNNEL INCIDENT. THE FA CCTV SYSTEM SHALL HAVE REDUNDANT NETWORK VIDEO RECORDERS AT EACH CONTROL ROOM EQUIPMENT RACK LOCATION, WHICH RECEIVES THE IDENTICAL UPDATED VIDEO IMAGES CONCURRENTLY. THESE FA CCTV NETWORK RECORDERS SHALL BE INTERCONNECTED INTO THE FA CCTV FIBER OPTIC NETWORK VIA REDUNDANT INDUSTRIAL GRADE ETHERNET FIBER SWITCHES, LOCATED AT EACH CONTROL ROOM EQUIPMENT RACK LOCATION.

THE FA CCTV WORKSTATION EQUIPMENT AND MONITORS, NETWORK VIDEO RECORDERS, AND ETHERNET SWITCHES SHALL BE POWERED FROM THE EMERGENCY POWER ELECTRICAL SYSTEM, WITH AN UNINTERRUPTIBLE POWER SOURCE (UPS) SYSTEM, CAPABLE OF PROVIDING FIVE (5) MINUTES OF STANDBY POWER, UNTIL THE EMERGENCY GENERATORS ARE STARTED AND ON-LINE.

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BCER Engineering

Sturgeon Electric

Western States Fire Protection Co.

ILF CONSULTING ENGINEERS

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
NARRATIVE

Drawing Number
FA0.02

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

FIRE ALARM SEQUENCE OF OPERATIONS MATRIX FOR THE EISENHOWER/JOHNSON MEMORIAL TUNNEL

Column key (OUTPUT):
- A: ACTUATE ALARM CONDITION AT THE FACP PANELS
- B: ACTUATE SUPERVISORY CONDITION AT THE FACP PANELS
- C: ACTUATE TROUBLE CONDITION AT THE FACP PANELS
- D: DISPLAY ALARM CONDITION AT THE FIREWORKS DISPLAYS
- E: DISPLAY SPERVISORY CONDITION AT THE FIREWORKS DISPLAYS (NOTE #4)
- F: DISPLAY TROUBLE CONDITION AT THE FIREWORKS DISPLAYS
- G: PRE-POSITION THE NEAREST ONE (1) CCTV CAMERA TO THE CENTERPOINT OF THE DELUGE SYSTEM IN PRE-ALARM (ST-01 THRU ST-04, ST-91 THRU ST-93, NT-01 THRU NT-04, & NT-88 THRU NT-90)
- H: PRE-POSITION THE NEAREST TWO (2) CCTV CAMERAS TO THE CENTERPOINT OF THE DELUGE SYSTEM IN PRE-ALARM (ALL OTHER DELUGE ZONES)
- I: EVENT CONDITION TO SYSTEM PRINTER
- J: UPS TROUBLE CONDITION DISPLAYED AT ASSOCIATED FA WORKSTATION (NOTE #7)
- K: UPS TROUBLE CONDITION DISPLAYED AT ASSOCIATED CCTV WORKSTATION (NOTE #7)
- L: RELEASE DELUGE VALVE ZONE IN ALARM NOTE #12)
- M: LIGHT "PRE-ALARM" STROBE (NOTE #11)
- N: LIGHT "ALARM" STROBE (NOTE #11)
- O: CLOSE ALL DELUGE VALVES
- P: START FIRE PUMP (NOTE #10)
- Q: SHUTDOWN FIRE PUMP (NOTE #10)
- R: SHUTDOWN BOILER CIRC PUMPS #1 & #2
- S: OPEN N.C. DRAINAGE TANK ISOLATION VALVES (V-1) NOTE #13
- T: CLOSE N.O. DRAINAGE TANK ISOLATION VALVES (V-2) NOTE #13
- U: OPEN N.C. DRAINAGE TANK ISOLATION VALVES (V-3) NOTE #13
- V: CLOSE N.O. DRAINAGE TANK ISOLATION VALVES (V-4) NOTE #13
- W: CLOSE N.O. DRAINAGE TANK ISOLATION VALVES (V-5) NOTE #13
- X: OPEN N.C. DRAINAGE TANK ISOLATION VALVES (V-6) NOTE #13
- Y: MANUAL OVERRIDE DELUGE VALVE OPERATION
- Z: MANUAL OVERRIDE CCTV SYSTEM PAN/TILT OPERATION
- AA: MANUAL OVERRIDE CCTV SYSTEM ZOOM OPERATION
- BB: MANUAL OVERRIDE AUTOMATIC SYSTEM OPERATION

INPUTS		OUTPUT	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	BB
GENERAL DETECTION DEVICES	AREA SMOKE DETECTOR	1	X			X					X																			
	AREA HEAT/CO DETECTOR	2	X			X					X																			
FIRE SPRINKLER SYSTEM	DELUGE SYSTEM WATERFLOW	3	X			X					X																			
	DELUGE SYSTEM VALVE TAMPER	4		X			X				X																			
	MISC PUMP ROOM VALVE TAMPER	5		X			X				X																			
	ISOLATION VALVE TAMPER	6		X			X				X																			
	FIRE PUMP RUN STATUS	7		X			X				X									X										
	FIRE PUMP POWER LOSS	8		X			X				X																			
	FIRE PUMP PHASE REVERSAL	9		X			X				X																			
	FIRE PUMP ON EMERGENCY POWER	10		X			X				X																			
	EISENHOWER (NORTH) TUNNEL DELUGE RELEASE (NOTE #8 & #9)	11	X			X					X										X	X	NC	NC	X	X				
	JOHNSON (SOUTH) TUNNEL DELUGE RELEASE (NOTE #8 & #9)	12	X			X					X										NC	NC	X	X	X	X				
FIBER OPTIC LINEAR HEAT DETECTION	EVENT 1 PRE-ALARM	13	X			X			X	X	X				X															
REDUNDANT FIBERS OPERATION	EVENT 1 ALARM (NOTE #1)	14	X			X			X	X	X			X		X		X		X										
MISCELLANEOUS DEVICES	DRAINAGE TANK "HIGH" LEVEL	15		X			X				X																			
	BOILER "TROUBLE"	16		X			X				X																			
	WATER TANK "EMPTY" LEVEL (NOTE #10)	17	X			X					X						X		X											
	IVE LOW TEMPERATURE	18		X			X				X																			
	WATER TANK "60 MINUTE" LEVEL	19		X			X				X																			
	WATER TANK "30 MINUTE" LEVEL	20		X			X				X																			
	EMERGENCY GENERATOR "RUN"	21		X			X				X																			
	EMERGENCY GENERATOR TROUBLE"	22		X			X				X																			
	FPC CABINET POWER SUPPLY "TROUBLE" (NOTE #5)	23			X			X			X																			
	FPC CABINET CCTV SYSTEM "TROUBLE"	24			X			X			X																			
	EQUIPMENT RACK UPS "TROUBLE" (NOTE #7)	25											X																	
	EQUIPMENT RACK POWER SUPPLY "TROUBLE" (NOTE #6)	26			X			X			X																			
	CCTV WORKSTATION UPS "TROUBLE" (NOTE #7)	27											X																	
	FA WORKSTATION UPS "TROUBLE" (NOTE #7)	28										X																		
	CONTROL OUTPUT FEEDBACK STATUS (NOTE #4)	29					X																							

NOTE #1: IN REDUNDANT FIBER OPERATION, DELUGE ZONE RELEASE IS SINGLE ALARM SIGNAL FROM PRIMARY FIBER "A". ALARM SIGNALS, CCTV PRE-ALARM IS TRIGGERED BY PRE-ALARM SIGNAL ON SECONDARY FIBER "B". CCTV PRE-ALARM SIGNAL REPORTS TO SYSTEM AS AN ALARM SIGNAL, PER CDOT REQUEST.

NOTE #2: IN DEGRADED MODE FOR FIBER OPERATION (LOSS OF SECONDARY FIBER "B"), DELUGE ZONE RELEASE IS SINGLE ALARM SIGNAL FROM PRIMARY FIBER "A" ONLY. CCTV IS TRIGGERED BY ALARM SIGNAL ON PRIMARY FIBER "A".

NOTE #3: IN DEGRADED MODE FOR FIBER OPERATION (LOSS OF PRIMARY FIBER "A"), DELUGE ZONE RELEASE IS SINGLE ALARM SIGNAL FROM SECONDARY FIBER "B" ONLY.
CCTV PRE-ALARM IS TRIGGERED BY PRE-ALARM SIGNAL ON SECONDARY FIBER "B". CCTV PRE-ALARM SIGNAL REPORTS TO SYSTEM AS AN ALARM SIGNAL, PER CDOT REQUEST.

NOTE #4: CONTROL OUTPUT STATUS FEEDBACK IS REPORTED TO FIREWORKS DISPLAY UNITS AND LIGHTS THE ASSOCIATED DEVICE ICON ONLY.
THIS FEEDBACK WILL NOT REPORT TO THE FACP PANELS, NOR PRINT-OUT ON THE SYSTEM PRINTER.

NOTE #5: FPC CABINET "TROUBLE" IS A COMMON TROUBLE INDICATION FOR CIRCUITS ASSOCIATED WITH THE CABINET POWER SUPPY ONLY, INCLUDING BATTERY AND AC POWER ISSUES.

NOTE #6: EQUIPMENT RACK "TROUBLE" IS A COMMON TROUBLE INDICATION FOR CIRCUITS ASSOCIATED WITH THE CABINET POWER SUPPLY ONLY, INCLUDING BATTERY AN AC POWER ISSUES.

NOTE #7: UPS "TROUBLE" WILL ONLY REPORT TO THE ASSOCIATED WORKSTATION AS INDICATED. THE UPS TROUBLE CONDITION WILL NOT REPORT THRU THE FIRE ALARM SYSTEM,
NOR PRINT-OUT ON THE SYSTEM PRINTER.

NOTE #8: NC = NO CHANGE

NOTE #9: DRAINAGE SYSTEM WILL PRE-POSITION TO THE EISENHOWER (NORTH) TUNNEL DRAINAGE SOO IF AUTOMATIC DELUGE RELEASE ALARM OR MANUAL ACTIVATION SWITCH FOR AN EISENHOWER (NORTH) TUNNEL ZONE; OR WILL PRE-POSITION TO THE JOHNSON (SOUTH) TUNNEL
DRAINAGE SOO IF AUTOMATIC DELUGE RELEASE OR MANUAL ACTIVATION SWITCH FOR JOHNSON (SOUTH) TUNNEL ZONE. DRAINAGE VALVE POSITION LATCHES TO INITIAL POSITION (NORTH OR SOUTH) BASED ON INITIAL AUTOMATIC DELUGE RELASE ALARM OR MANUAL ACTIVATION SWITCH.

NOTE #10: FIRE PUMP CAN BE MANUALLY TURNED ON AND OFF BY THE SYSTEM OPERATOR AS WARRANTED BY THE SYSTEM EVENT. ONCE WATER TANK "EMPTY" LEVEL IS RECEIVED, THE FIRE PUMP IS LOCKED OUT AND WILL NOT RESTART UNTIL WATER TANK "EMPTY"
LEVEL ALARM IS RESTORED. ONCE WATER IS RESTORED TO THE SYSTEM AND THE WATER TANK LEVEL ALARM IS RESTORED, THE FIRE PUMP CAN BE MANUALLY RESTARTED VIA THE FIRE PUMP OVERRIDE SWITCH LOCATED AT THE ECR, WCR, OR FMO FACP PANELS.

NOTE #11: "PRE-ALARM" AND "ALARM" STROBES ARE ONLY LOCATED IN THE EAST CONTROL ROOM.

NOTE #12: THE SYSTEM DESIGN ALLOWSFOR A MAXIMUM OF TWO (2) DELUGE ZONES ACTIVATED AT ANY GIVEN TIME. IF THE SYSTEM OPERATOR ELECTS TO MANUALLY MOVE THE DELUGE RELEASE TO ANOTHER TUNNEL ZONE,THE OPERATOR MUST ACTIVATE THE NEXT
DELUGE ZONE, PRIOR TO SHUTTING OFF ANY ACTIVATED ZONE TO AVOID WATER HAMMER ISSUES IN THE FIRE SUPPRESSION PIPING. THIS APPLIES IN THE EVENT OF THE MAXIMUM TWO (2) ACTIVATED SCENARIOS, AS WELL.

NOTE #13: THE DRAINAGE VALVES ARE LATCHED INTO THE INITIAL ALARM CONDITION (NORTH OR SOUTH) POSITION UNTIL THE DRAINAGE VALVE RESET SWITCH IS OPERATED ON THE ECR, WCR, OR FMO FACP PANELS;
EVEN AFTER SYSTEM IS FULLY RESET. THE DRAINAGE VALVES CAN BE OVERRIDEN VIA DRAINAGE VALVE OVERRIDE SWITCH ON THE ECR, WCR, OR FMO FACP.

1 — FIRE ALARM/CCTV SYSTEM SEQUENCE OF OPERATIONS PART #1
SCALE: N.T.S.

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

BARNARD EJMT TEAM

BARNARD · RONDINELLI · BCER Engineering · Sturgeon Electric · Western States Fire Protection Co. · CONSULTING ENGINEERS

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions

Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM: SEQUENCE OF OPERATIONS PART #1

Drawing Number
FA0.03

FIRE ALARM SEQUENCE OF OPERATIONS MATRIX FOR THE EISENHOWER/JOHNSON MEMORIAL TUNNEL

INPUTS		*OUTPUT*	ACTUATE ALARM CONDITION AT THE FACP PANELS	ACTUATE SUPERVISORY CONDITION AT THE FACP PANELS	ACTUATE TROUBLE CONDITION AT THE FACP PANELS	DISPLAY ALARM CONDITION AT THE FIREWORKS DISPLAYS	DISPLAY SPERVISORY CONDITION AT THE FIREWORKS DISPLAYS (NOTE #4)	DISPLAY TROUBLE CONDITION AT THE FIREWORKS DISPLAYS	PRE-POSITION THE NEAREST ONE (1) CCTV CAMERA TO THE CENTERPOINT OF THE DELUGE SYSTEM IN PRE-ALARM (ST-01 THRU ST-04, ST-91 THRU ST-93, NT-01 THRU NT-04, & NT-88 THRU NT-90)	PRE-POSITION THE NEAREST TWO (2) CCTV CAMERAS TO THE CENTERPOINT OF THE DELUGE SYSTEM IN PRE-ALARM (ALL OTHER DELUGE ZONES)	EVENT CONDITION TO SYSTEM PRINTER	UPS TROUBLE CONDITION DISPLAYED AT ASSOCIATED FA WORKSTATION (NOTE #7)	UPS TROUBLE CONDITION DISPLAYED AT ASSOCIATED CCTV WORKSTATION (NOTE #7)	RELEASE DELUGE VALVE ZONE IN ALARM NOTE #12)	LIGHT "PRE-ALARM" STROBE (NOTE #11)	LIGHT "ALARM" STROBE (NOTE #11)	CLOSE ALL DELUGE VALVES	START FIRE PUMP (NOTE #10)	SHUTDOWN FIRE PUMP (NOTE #10)	SHUTDOWN BOILER CIRC PUMPS #1 & #2	OPEN N.C. DRAINAGE TANK ISOLATION VALVES (V-1) NOTE #13	CLOSE N.O. DRAINAGE TANK ISOLATION VALVES (V-2) NOTE #13	OPEN N.C. DRAINAGE TANK ISOLATION VALVES (V-3) NOTE #13	CLOSE N.O. DRAINAGE TANK ISOLATION VALVES (V-4) NOTE #13	CLOSE N.O. DRAINAGE TANK ISOLATION VALVES (V-5) NOTE #13	OPEN N.C. DRAINAGE TANK ISOLATION VALVES (V-6) NOTE #13	MANUAL OVERRIDE DELUGE VALVE OPERATION	MANUAL OVERRIDE CCTV SYSTEM PAN/TILT OPERATION	MANUAL OVERRIDE CCTV SYSTEM ZOOM OPERATION	MANUAL OVERRIDE AUTOMATIC SYSTEM OPERATION
			A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	BB
FACP/RCP/FPC PANELS	AC POWER FAILURE (NOTE #5)	30			X			X			X																			
	LOW BATTERY (NOTE #5)	31			X			X			X																			
	GROUND FAULT	32			X			X			X																			
	OPEN CIRCUIT	33			X			X			X																			
	ALARM SILENCE BUTTON	34			X			X			X																			
	MANUALLY ACTIVATED PANEL SWITCH	35			X			X			X																			X
	RCP HIGH TEMPERATURE	36		X			X				X																			
	RCP LOW TEMPERATURE	37		X			X				X																			
	FCP HIGH TEMPERATURE	38		X			X				X																			
	FCP LOW TEMPERATURE	39		X			X				X																			
MISCELLANEOUS CONTROLS	FIREWORKS MANUAL "ON" SWITCH	40									X			X	X	X		X		X	← SEE NOTE #9 →						X			X
	FIREWORKS MANUAL "OFF" SWITCH	41									X																X			X
	FACP/RCP PANEL SWITCH	42			X			X			X																			X
	CCTV MANUAL PAN/TILT CONTROL	43																										X		
	CCTV MANUAL ZOOM CONTROL	44																											X	
DEGRADED FIBER "B" OPERATION	EVENT 1 PRE-ALARM	45	← NOT AVAILABLE IN FIBER MODE "B" →																											
	EVENT 1 ALARM (NOTE #2)	46	X			X			X	X	X			X		X		X		X										
DEGRADED FIBER "A" OPERATION	EVENT 1 PRE-ALARM	47	X			X			X	X	X				X															
	EVENT 1 ALARM (NOTE #3)	48	X			X			X	X	X			X		X		X		X										
	LIOS FOLHD TROUBLE	49			X			X			X																			
	LIOS FOLHD LOSS OF PRIMARY "A" FIBER	50			X			X			X																			
	LIOS FOLHD LOSS OF SECONDARY "B" FIBER	51			X			X			X																			

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NOTE #5: FPC CABINET "TROUBLE" IS A COMMON TROUBLE INDICATION FOR CIRCUITS ASSOCIATED WITH THE CABINET POWER SUPPY ONLY, INCLUDING BATTERY AND AC POWER ISSUES.

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DRAINAGE SOO IF AUTOMATIC DELUGE RELEASE OR MANUAL ACTIVATION SWITCH FOR JOHNSON (SOUTH) TUNNEL ZONE. DRAINAGE VALVE POSITION LATCHES TO INITIAL POSITION (NORTH OR SOUTH) BASED ON INITIAL AUTOMATIC DELUGE RELASE ALARM OR MANUAL ACTIVATION SWITCH.

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EVEN AFTER SYSTEM IS FULLY RESET. THE DRAINAGE VALVES CAN BE OVERRIDEN VIA DRAINAGE VALVE OVERRIDE SWITCH ON THE ECR, WCR, OR FMO FACP.

1 FIRE ALARM/CCTV SYSTEM SEQUENCE OF OPERATIONS PART #2
SCALE: N.T.S.

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

BARNARD EJMT TEAM

RONDINELLI life safety
BARNARD
Western States Fire Protection Co.
ILF CONSULTING ENGINEERS
Sturgeon ELECTRIC
BCER Engineering

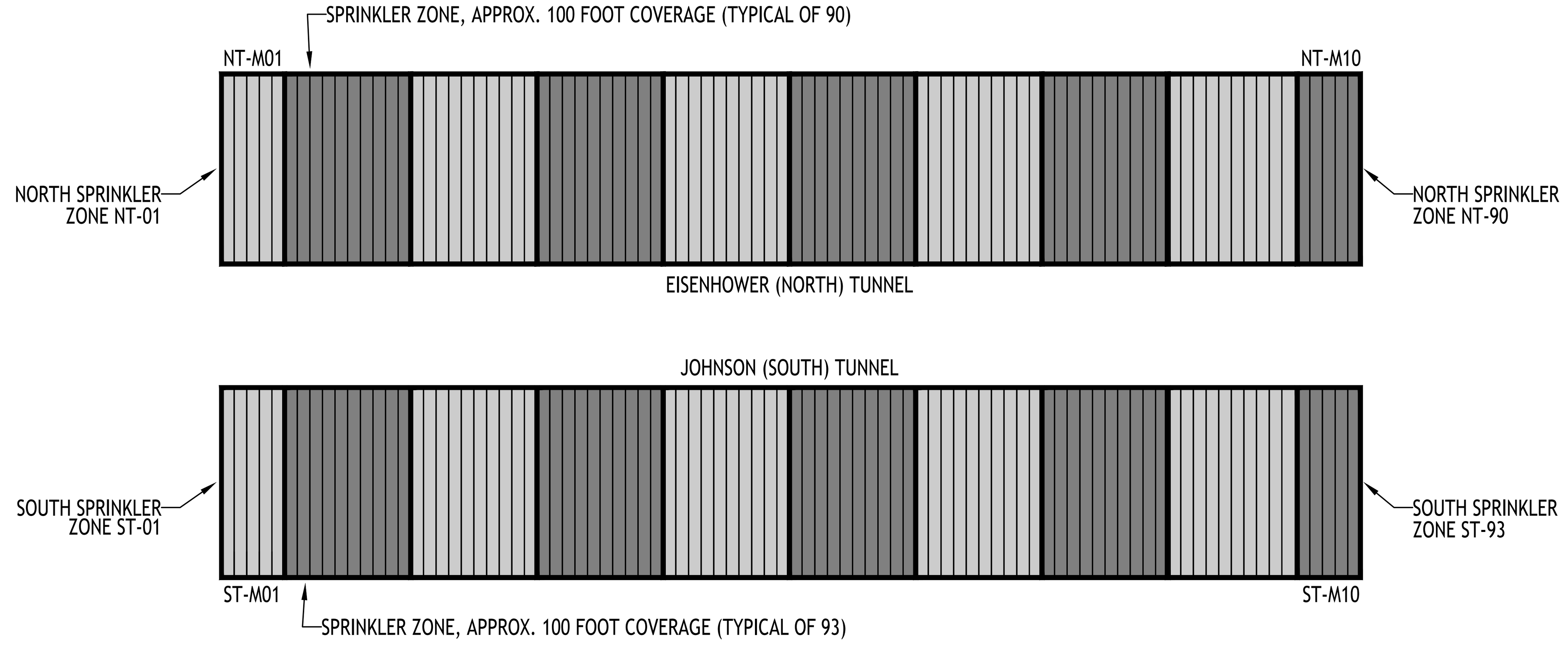
EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM: SEQUENCE OF OPERATIONS PART #2

Drawing Number
FA0.04



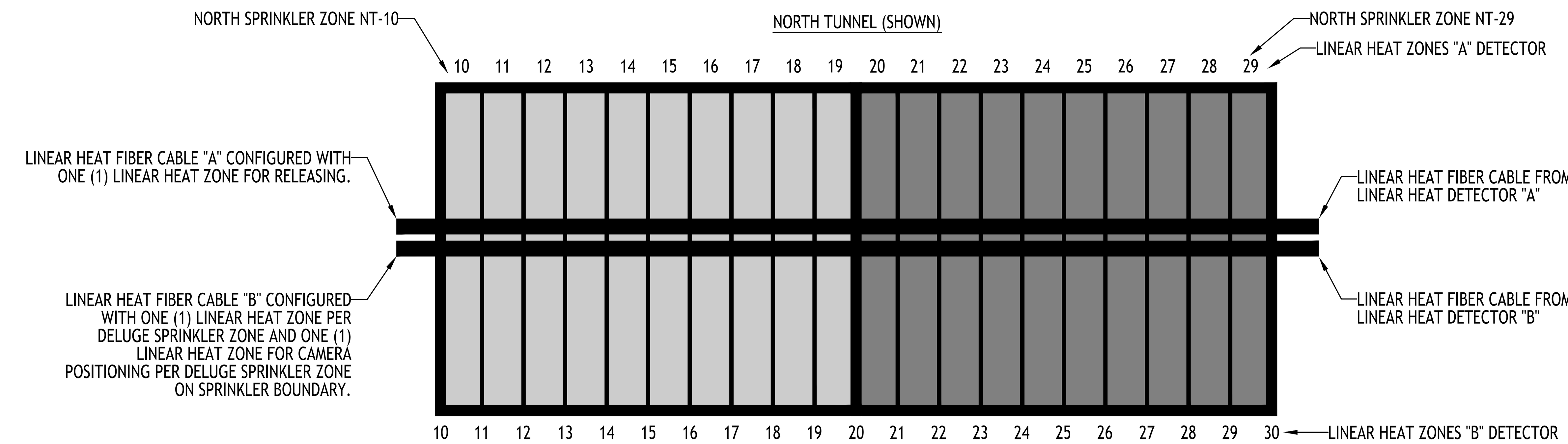
EACH TUNNEL CONTAINS (10) FIRE PROTECTION CABINETS (FPC), FOR A TOTAL OF (20) FIRE PROTECTION CABINETS.

EACH FIRE PROTECTION CABINET (FPC) CONTAINS (10), (08), OR (05) SPRINKLER ZONES FOR A TOTAL OF (183) SPRINKLER ZONES.

A SPRINKLER ZONE COVERS AN AREA APPROXIMATELY (100) FEET IN THE TUNNEL.

MAXIMUM OF (2) SPRINKLER ZONES WILL BE ALLOWED TO AUTOMATICALLY DISCHARGE AT ANY TIME.

1 TUNNEL DELUGE SPRINKLER ZONING
SCALE: N.T.S.



THE LINEAR HEAT FIBER CABLE CAN BE CONFIGURED UP TO 1000 UNIQUE ZONES. IN THIS APPLICATION THE TUNNEL CABLE WILL BE DEFINED WITH 270 UNIQUE ZONES IN THE NORTH TUNNEL, AND 279 ZONES IN THE SOUTH TUNNEL.

LINEAR HEAT FIBER CABLE ZONES WILL BE APPROXIMATELY 100 FOOT COVERAGE, TO MATCH TUNNEL DELUGE ZONES.

FIBER CABLE "A" WILL BE CONFIGURED WITH ONE (1) LINEAR HEAT CABLE ZONE FOR RELEASING.

FIBER CABLE "B" WILL BE CONFIGURED WITH ONE (1) LINEAR HEAT CABLE ZONE FOR RELEASING AND ONE (1) LINEAR HEAT CABLE ZONE FOR CAMERA POSITIONING PER SPRINKLER ZONE ON SPRINKLER ZONE BOUNDARIES.

2 TYPICAL TUNNEL DELUGE/FIRE ALARM/CCTV ZONING
SCALE: N.T.S.

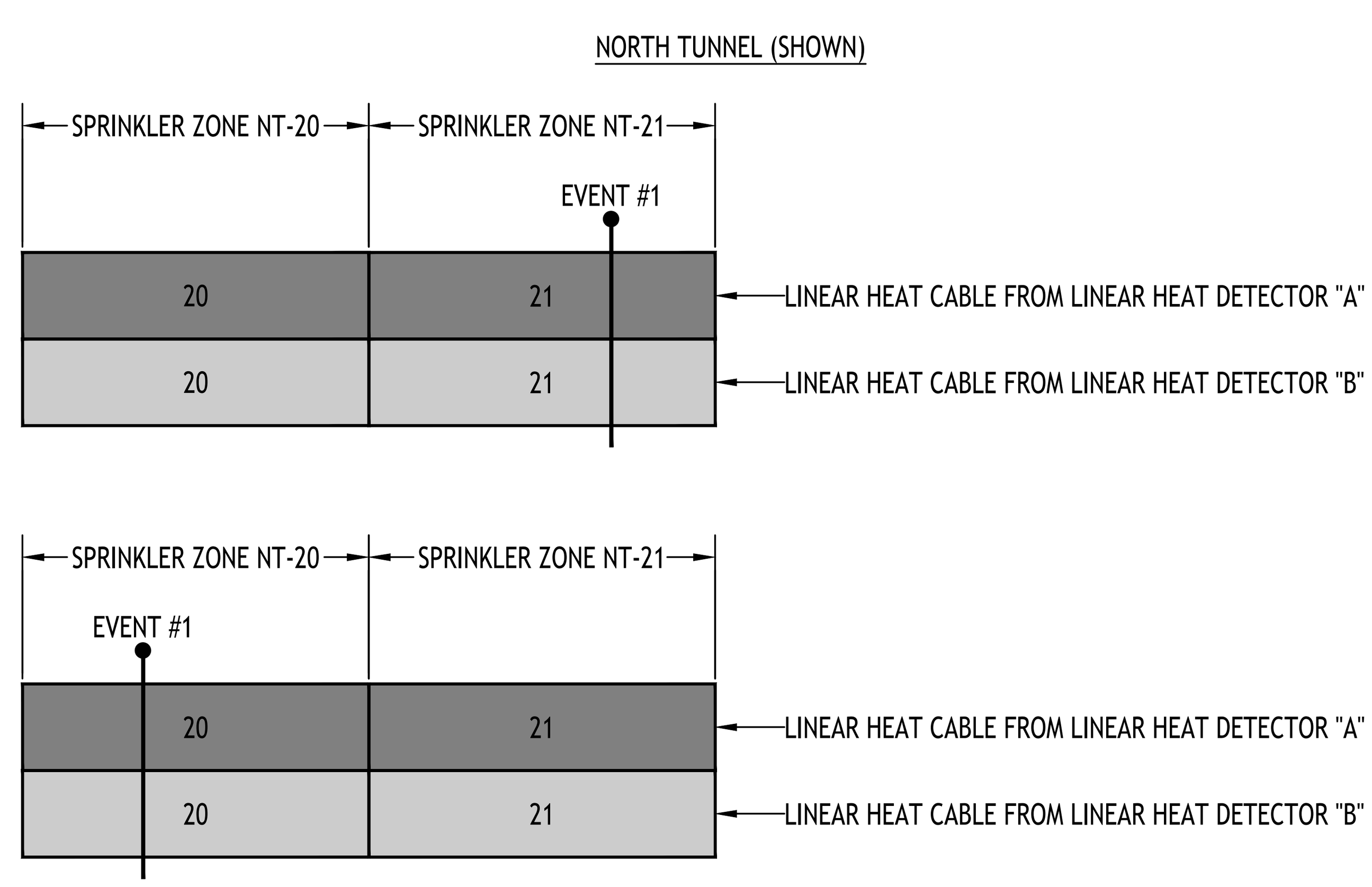
EISENHOWER - JOHNSON MEMORIAL TUNNEL
FIBER OPTICS BUDGET CALCULATION

FOLHD (LINEAR HEAT DETECTION) FIBER NETWORK

LONGEST TUNNEL FIBER OPTIC SEGMENT – FIBER SPLICE POINT AT INTERSTITIAL SPACE SPLICE BOX TRANSISTION FROM THE TUNNEL FIBER TO THE CONTROL ROOM FIBER = 8,950 FEET APPROX.
LONGEST CONTROL ROOM FIBER OPTIC SEGEMENT – SOUTH WEST (JOHNSON TUNNEL) INTERSTITIAL FIBER SPLICE BOX TO WEST CONTROL ROOM EQUIPMENT RACK = 300 FEET APPROX.
MAXIMUM ATTENUATION LOSS OF LDH-03-4 (4 kM) DETECTOR @ 0.75dB/kM = 3.00dB
ATTENUATION LOSS OF LIOS TUNNEL FIBER = 0.75dB/kM = 0.00023dB/Ft
ATTENUATION LOSS OF LIOS CONTROL ROOM FIBER = 0.75dB/kM = 0.00023dB/Ft
FUSION SPLICE LOSS = 0.05dB
APC CONNECTOR LOSS = 0.3dB
TERMINATION POINT ATTENTUATION LOSS = 0.1dB

MAXIMUM ALLOWABLE ATTENTUATION LOSS OF LHD-03-4 DETECTOR =	3.000 dB
NUMBER OF APC CONNECTORS/RUN @ 1 =	0.300 dB
NUMBER OF TERMINATION POINTS/RUN @ 1 =	0.100 dB
NUMBER OF FUSION SPLICES/RUN @ 4 =	0.200 dB
ATTENUATION LOSS OF CONTROL ROOM FIBER @300 FT =	0.069 dB
ATTENUATION LOSS OF TUNNEL FIBER @8,950 FT =	2.058 dB
SPARE ATTENTUATION LOSS dB AVAILABLE =	0.273 dB

4 FOLHD FIBER OPTIC BUDGET CALCULATION
SCALE: NOT TO SCALE



3 FOLHD SEQUENCE OF OPERATIONS EVENT DETAILS
SCALE: N.T.S.

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BARNARD EJMT TEAM

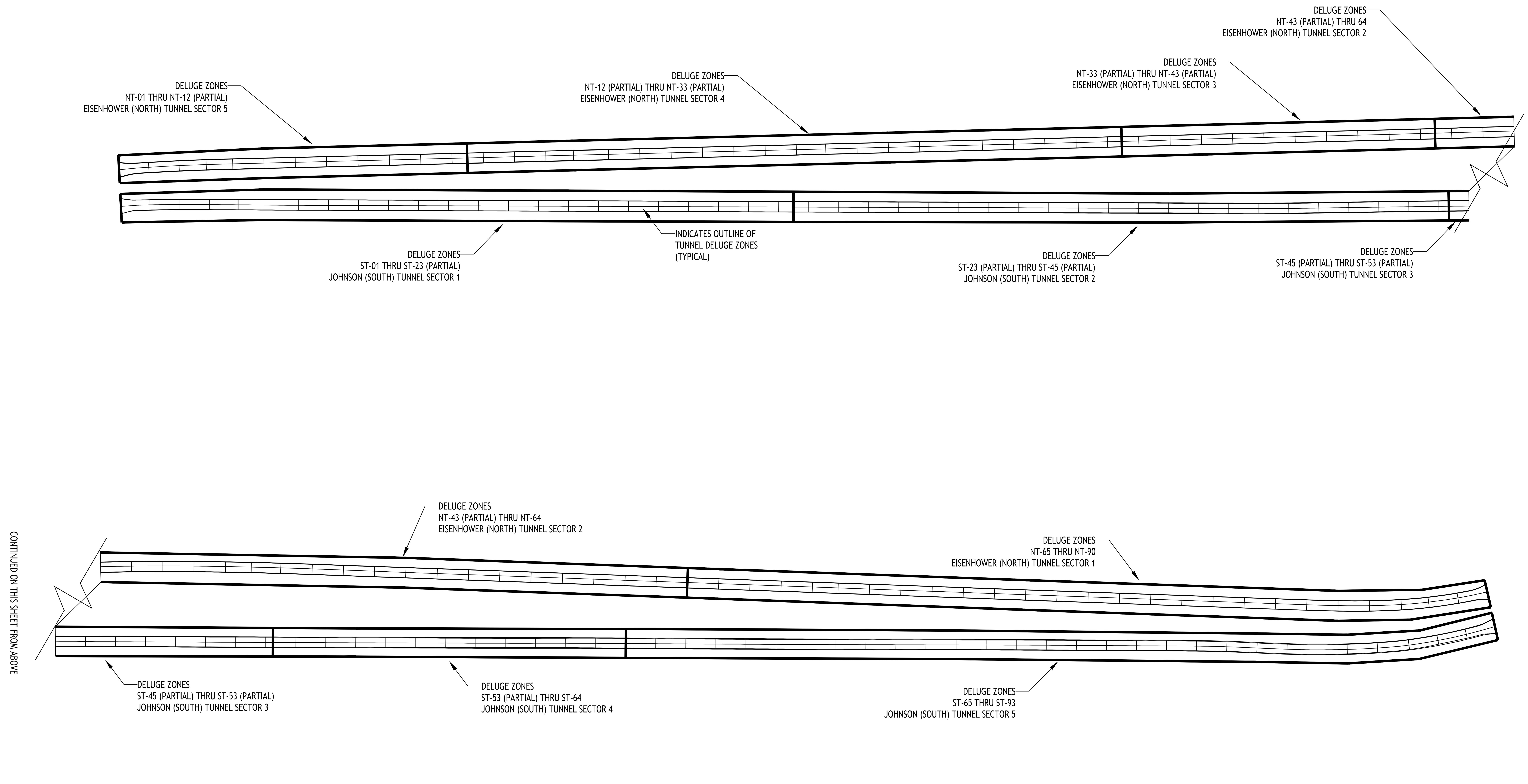
EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM: SEQUENCE OF OPERATIONS DETAILS

Drawing Number
FA0.05



1 FIRE ALARM TUNNEL VENTILATION SECTOR PLAN
SCALE: N.T.S.

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BARNARD EJMT TEAM

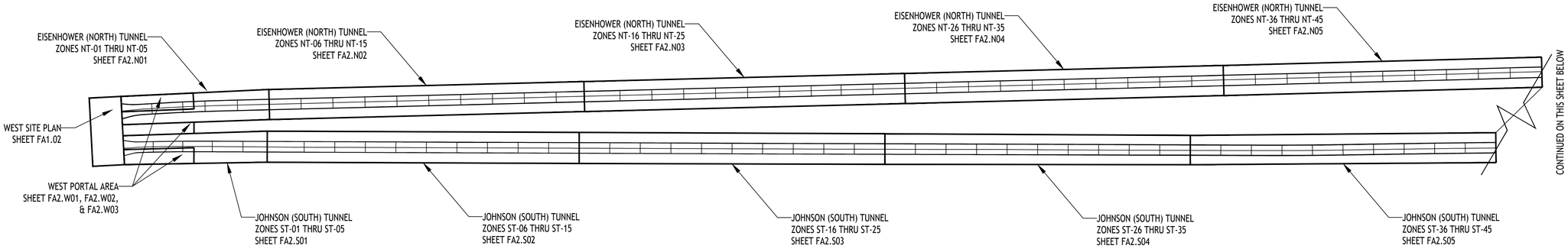
EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

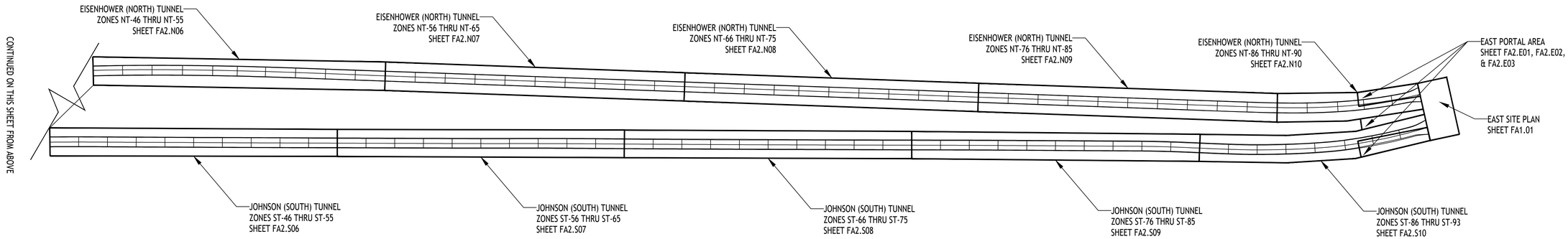
Revisions		
Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
TUNNEL VENTILATION
SECTOR PLAN

Drawing Number
FA0.06





1 FIRE ALARM SITE KEY PLAN
SCALE: N.T.S.

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

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RONDINELLI A PEER GROUP life safety

BARNARD

Western States Fire Protection Co.

BCER engineering

Sturgeon ELECTRIC

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
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RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

DRAWN BY: B.T.L. | CHECKED BY: AEE,Jr

FIRE ALARM:
SITE KEY PLAN

Drawing Number

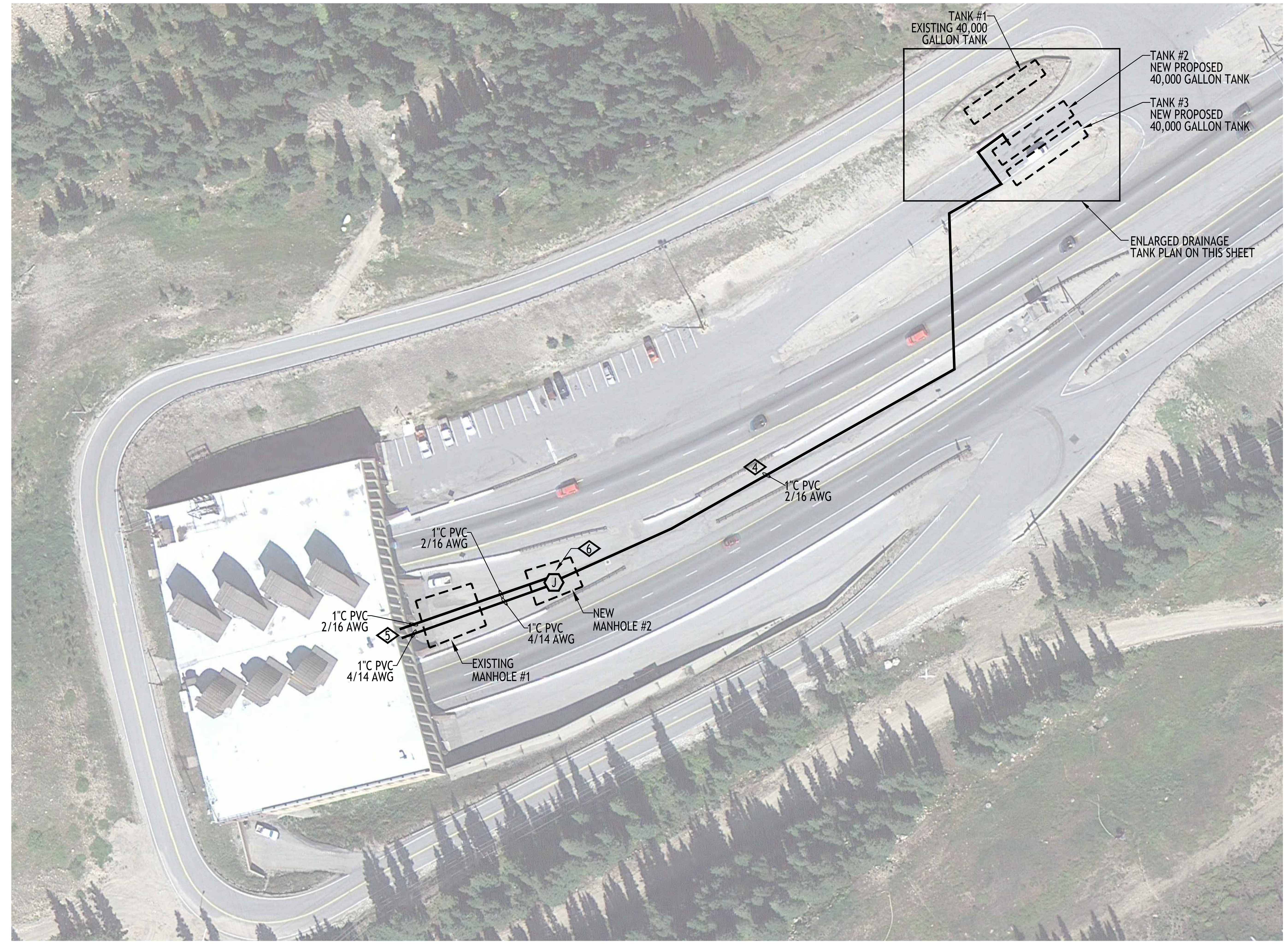
FA0.07

GENERAL NOTES:

1. IF FIELD CONDITIONS RESULT IN A CHANGE TO THE SHOP DRAWING INSTALLATION IN ANY WAY, CONTACT FAS SYSTEMS GROUP TO VERIFY PROPOSED CHANGES ARE COMPLIANT WITH NFPA 72 AND PROJECT REQUIREMENTS.
2. EACH CONTROL CABINET AND ADDRESSABLE DEVICE SHALL BEAR A TYPED LABEL INDICATING ITS ADDRESS OR DESIGNATION, WHICH CAN BE SEEN WITHOUT A LADDER OR LIFT. SMOKE AND HEAT DETECTORS SHALL HAVE THEIR LABEL ON ITS BASE.

DETAIL NOTES:

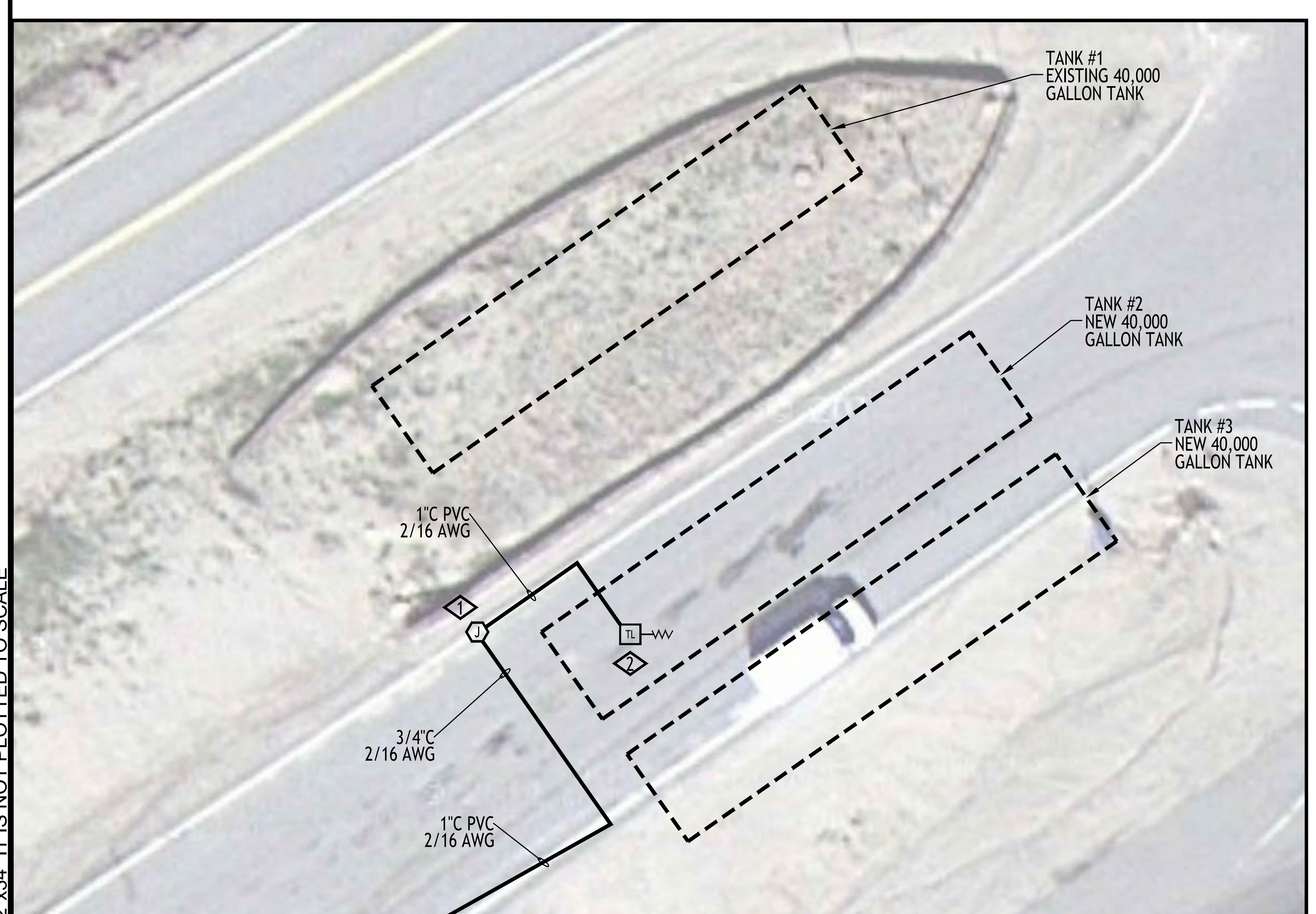
1. WEATHERPROOF BACK BOX PROVIDED BY ELECTRICAL CONTRACTOR.
2. ELECTRICAL CONTRACTOR TO CONNECT TANK HIGH LEVEL SWITCH TO THE TANK HIGH LEVEL IDC CIRCUIT. LEVEL SWITCH ACCESSED BY WEST MANHOLE.
3. NOTE NOT USED.
4. PVC RACEWAY TO UTILIZE THE SAME TRENCH AS THE NEW 12" DISCHARGE LINE.
5. FOR CONTINUATION, SEE JUNCTION BOXES ON SHEET FA2.E01.
6. ELECTRICAL CONTRACTOR TO CONNECT FIRE ALARM CONTROL CIRCUITRY TO DRAINAGE SYSTEM CONTROL VALVES (V-5 AND V-6) IN MANHOLE #2. SEE CIVIL SHEET C6.0.



N

1 FIRE ALARM - SITE PLAN - EAST
SCALE: 1/64" = 1'-0"

64' 32' 0 64'
SCALE : 1/64" = 1'-0"



N

2 ENLARGED DRAINAGE TANK PLAN
SCALE: 1/16" = 1'-0"

16' 8' 0 16'
SCALE : 1/16" = 1'-0"

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions

Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
SITE PLAN - EAST

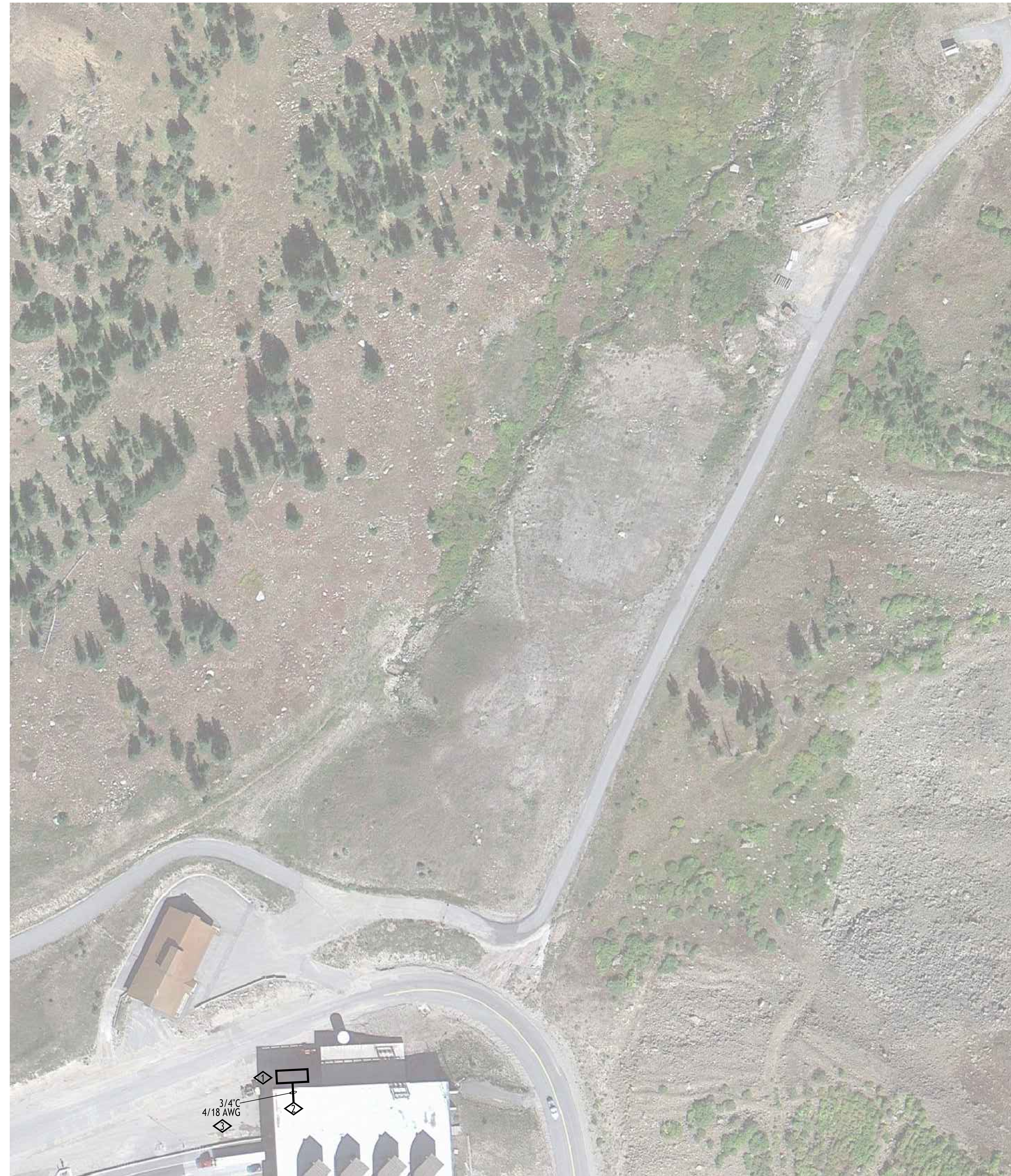
Drawing Number
FA1.01

GENERAL NOTES:

1. IF FIELD CONDITIONS RESULT IN A CHANGE TO THE SHOP DRAWING INSTALLATION IN ANY WAY, CONTACT FAS SYSTEMS GROUP TO VERIFY PROPOSED CHANGES ARE COMPLIANT WITH NFPA 72 AND PROJECT REQUIREMENTS.
2. EACH CONTROL CABINET AND ADDRESSABLE DEVICE SHALL BEAR A TYPED LABEL INDICATING ITS ADDRESS OR DESIGNATION, WHICH CAN BE SEEN WITHOUT A LADDER OR LIFT. SMOKE AND HEAT DETECTORS SHALL HAVE THEIR LABEL ON ITS BASE.

DETAIL NOTES:

1. LOCATION OF EMERGENCY GENERATOR.
2. FOR CONTINUATION, SEE JUNCTION BOX ON SHEET FA2.W01.
3. BLU/YEL WIRE PAIR - GEN RUN STATUS
ORG/BRN WIRE PAIR - GEN TROUBLE



N

1 FIRE ALARM - SITE PLAN - WEST
SCALE: 1/64" = 1'-0"

64' 32' 0 64'
SCALE : 1/64" = 1'-0"

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

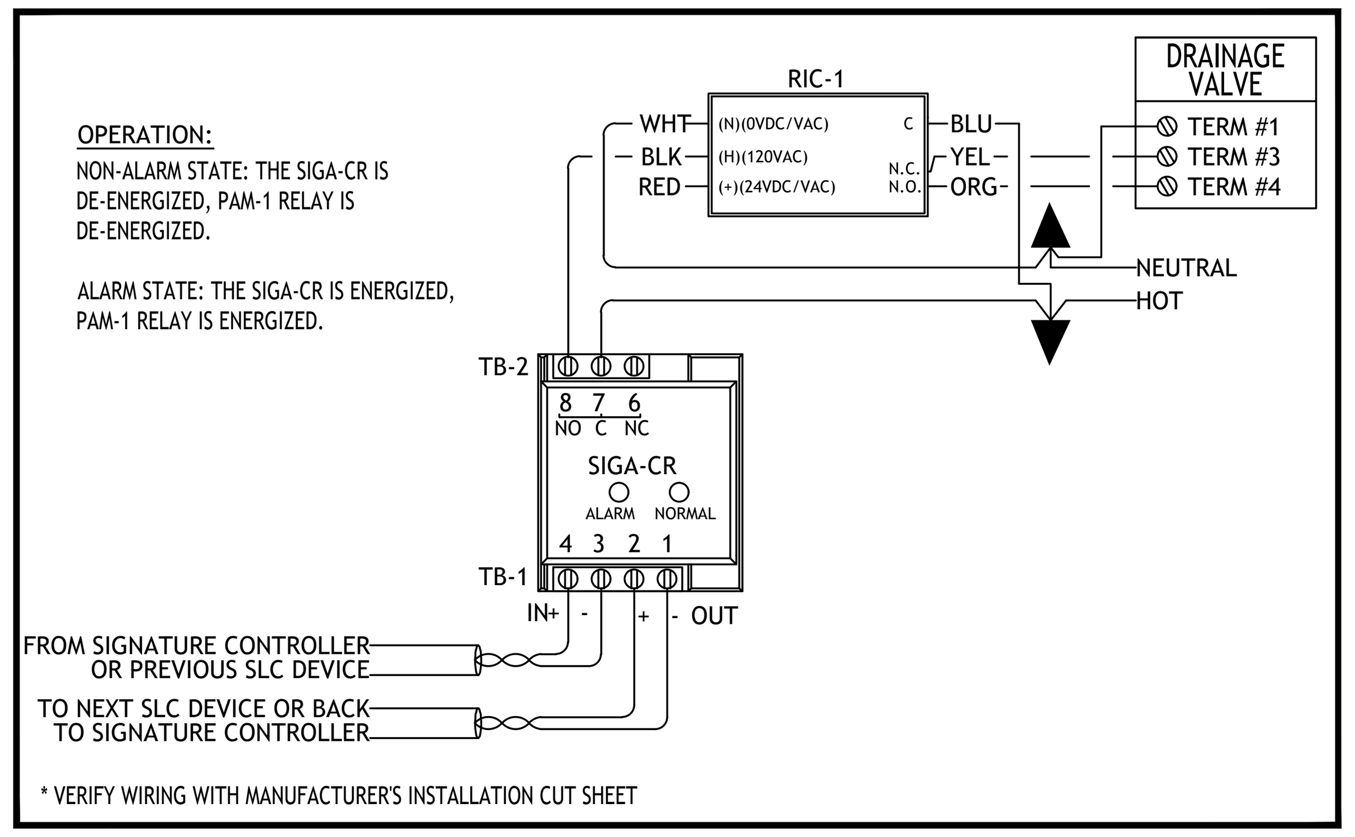
DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
SITE PLAN - WEST

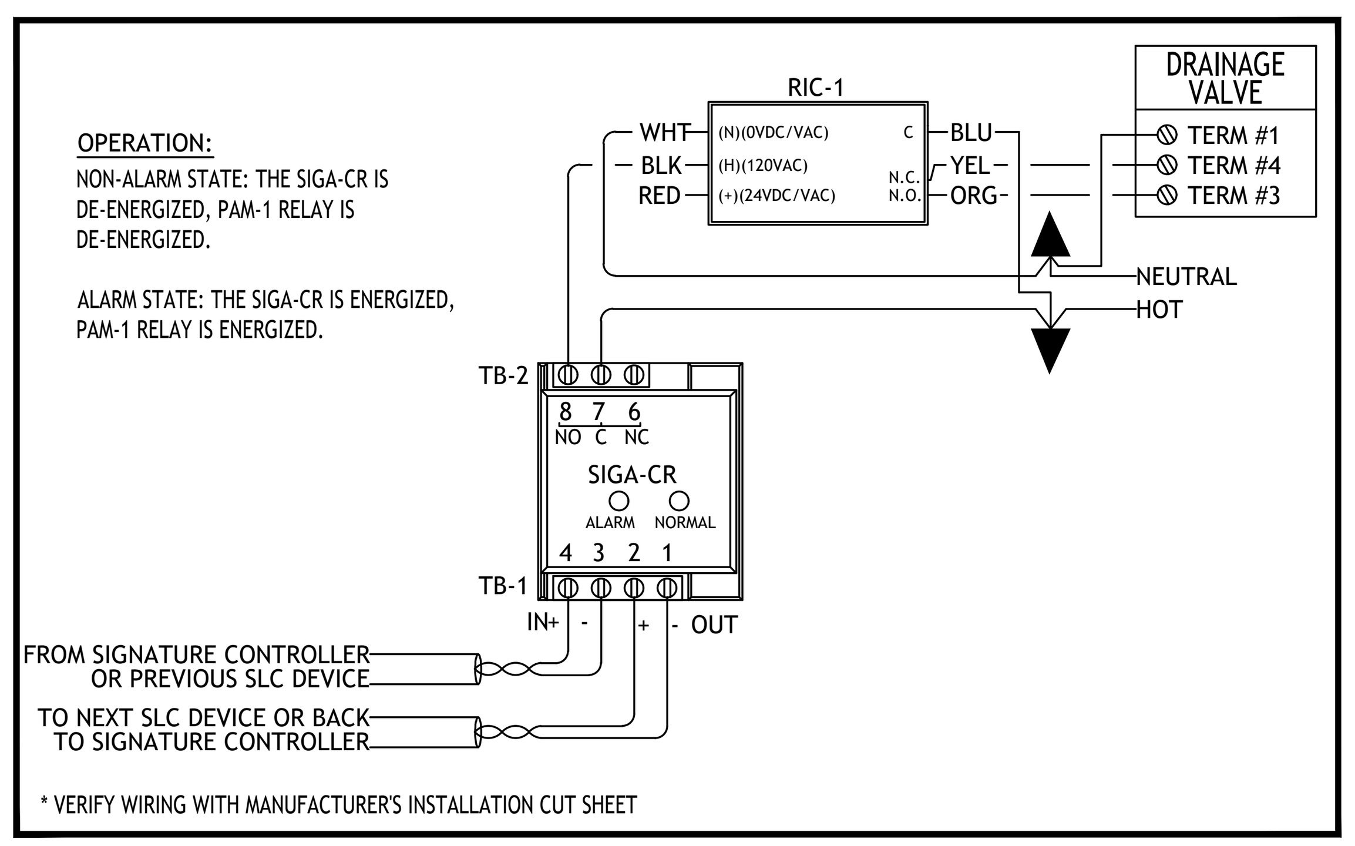
Drawing Number
FA1.02

GENERAL NOTES:

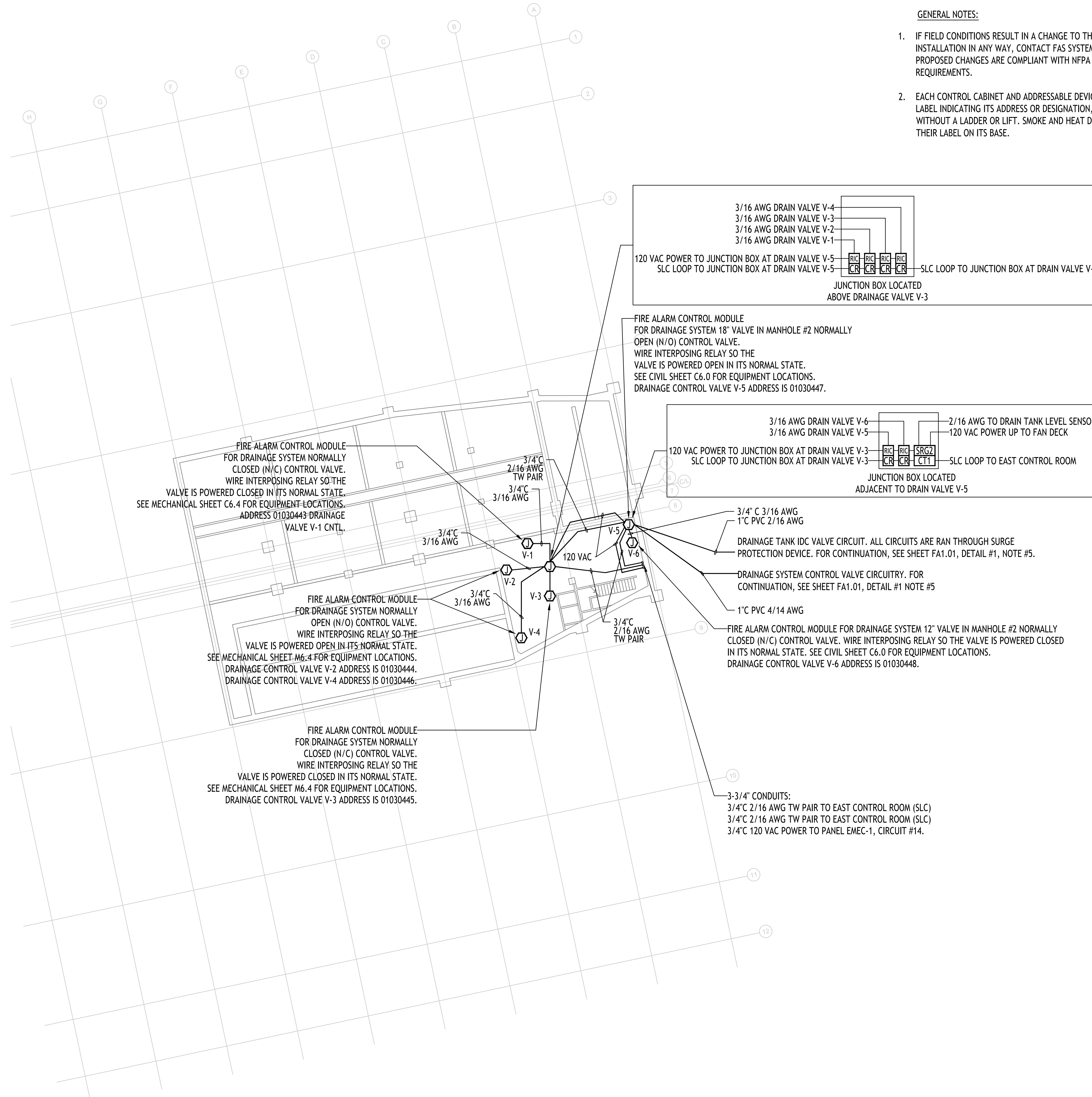
1. IF FIELD CONDITIONS RESULT IN A CHANGE TO THE SHOP DRAWING INSTALLATION IN ANY WAY, CONTACT FAS SYSTEMS GROUP TO VERIFY PROPOSED CHANGES ARE COMPLIANT WITH NFPA 72 AND PROJECT REQUIREMENTS.
2. EACH CONTROL CABINET AND ADDRESSABLE DEVICE SHALL BEAR A TYPED LABEL INDICATING ITS ADDRESS OR DESIGNATION, WHICH CAN BE SEEN WITHOUT A LADDER OR LIFT. SMOKE AND HEAT DETECTORS SHALL HAVE THEIR LABEL ON ITS BASE.



1 TYPICAL NORMALLY OPEN DRAINAGE CONTROL VALVE WIRING
SCALE: NOT TO SCALE



2 TYPICAL NORMALLY CLOSED DRAINAGE CONTROL VALVE WIRING
SCALE: NOT TO SCALE



1 LOWER LEVEL EAST
SCALE: 1/16" = 1'-0"

16' 8' 0 16'
SCALE:1/16"=1'-0"

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FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions

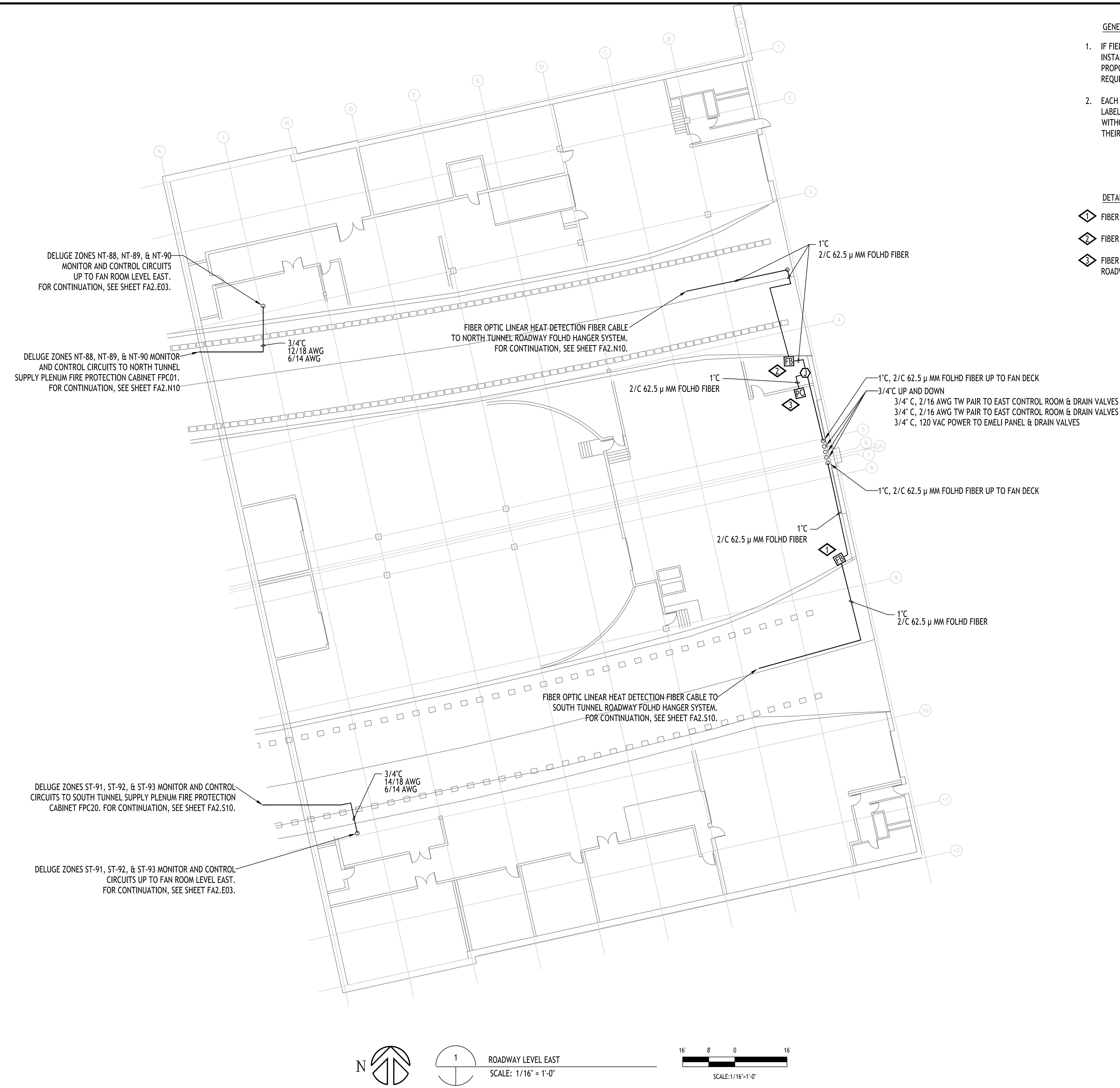
Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
LOWER LEVEL EAST

Drawing Number
FA2.E01

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE



GENERAL NOTES:

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2. EACH CONTROL CABINET AND ADDRESSABLE DEVICE SHALL BEAR A TYPED LABEL INDICATING ITS ADDRESS OR DESIGNATION, WHICH CAN BE SEEN WITHOUT A LADDER OR LIFT. SMOKE AND HEAT DETECTORS SHALL HAVE THEIR LABEL ON ITS BASE.

DETAIL NOTES:

1. FIBER SPLICE BOX LOCATED AT MEZZANINE LEVEL OF CENTER STAIR.
2. FIBER SPLICE BOX LOCATED ABOVE LOCKER ROOMS.
3. FIBER CALIBRATION BOX LOCATED BY LOCKER ROOM ENTRY DOOR AT ROADWAY LEVEL.

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
ROADWAY LEVEL EAST

Drawing Number
FA2.E02

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

GENERAL NOTES:

1. IF FIELD CONDITIONS RESULT IN A CHANGE TO THE SHOP DRAWING INSTALLATION IN ANY WAY, CONTACT FAS SYSTEMS GROUP TO VERIFY PROPOSED CHANGES ARE COMPLIANT WITH NFPA 72 AND PROJECT REQUIREMENTS.
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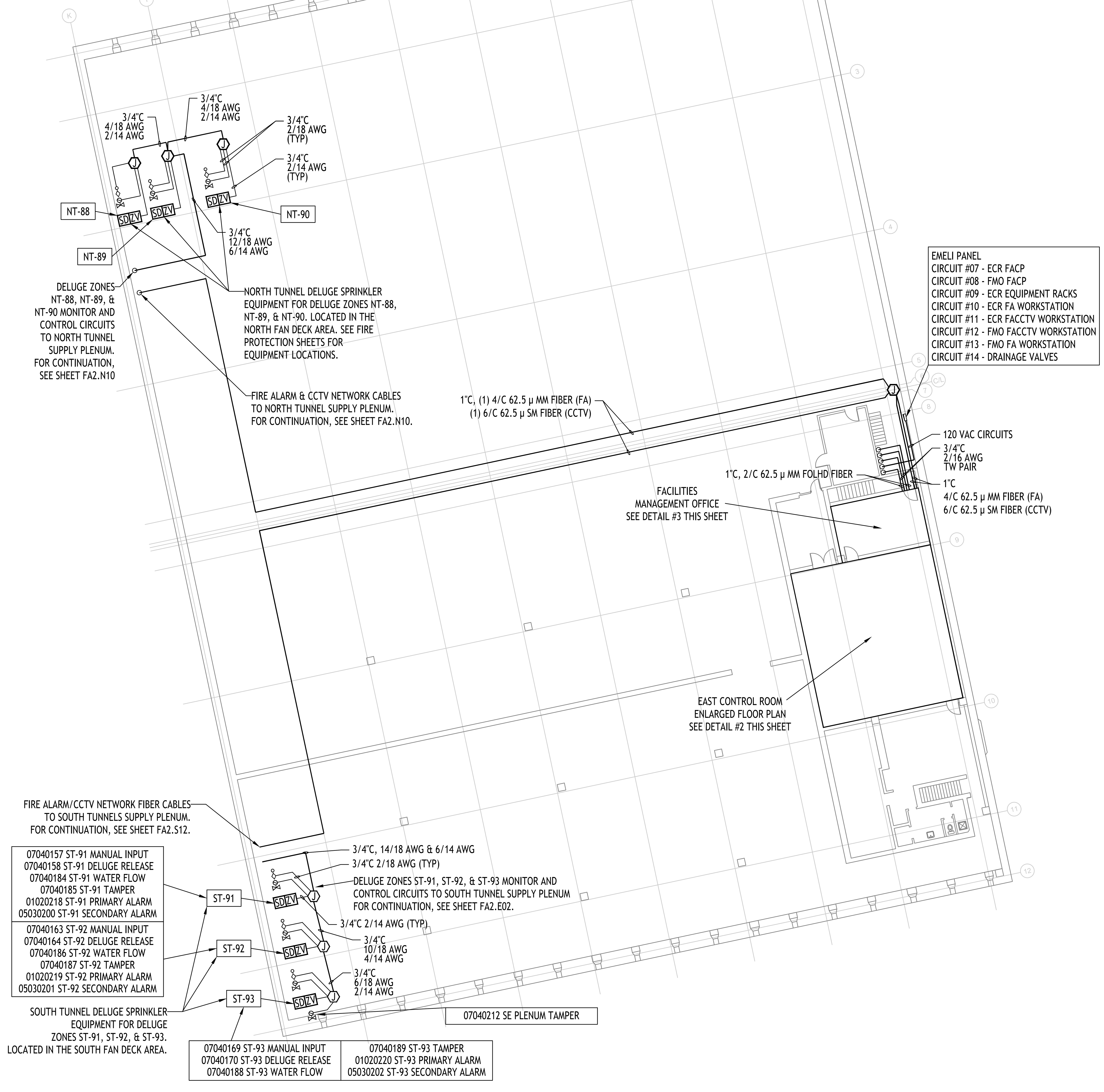
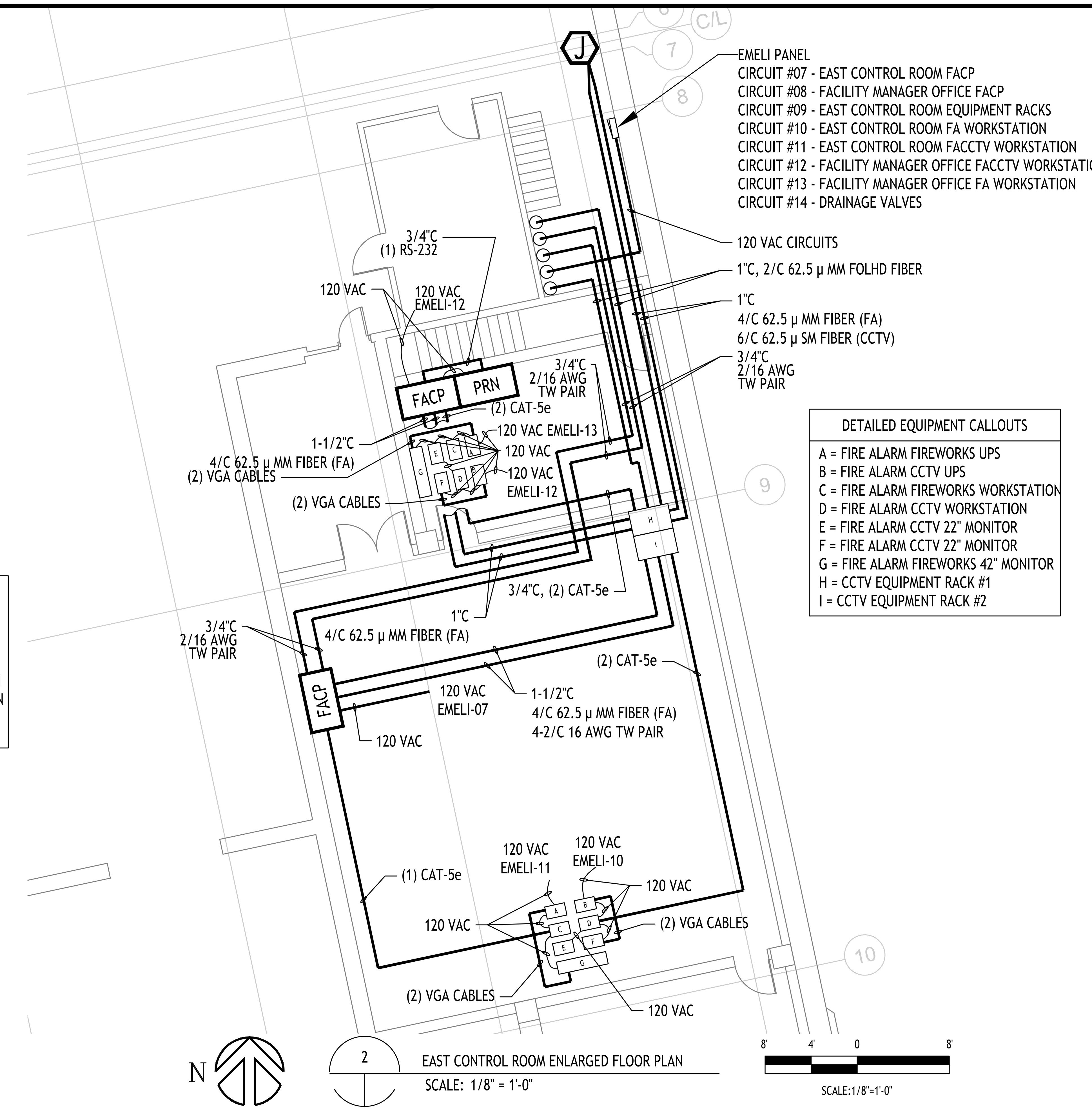
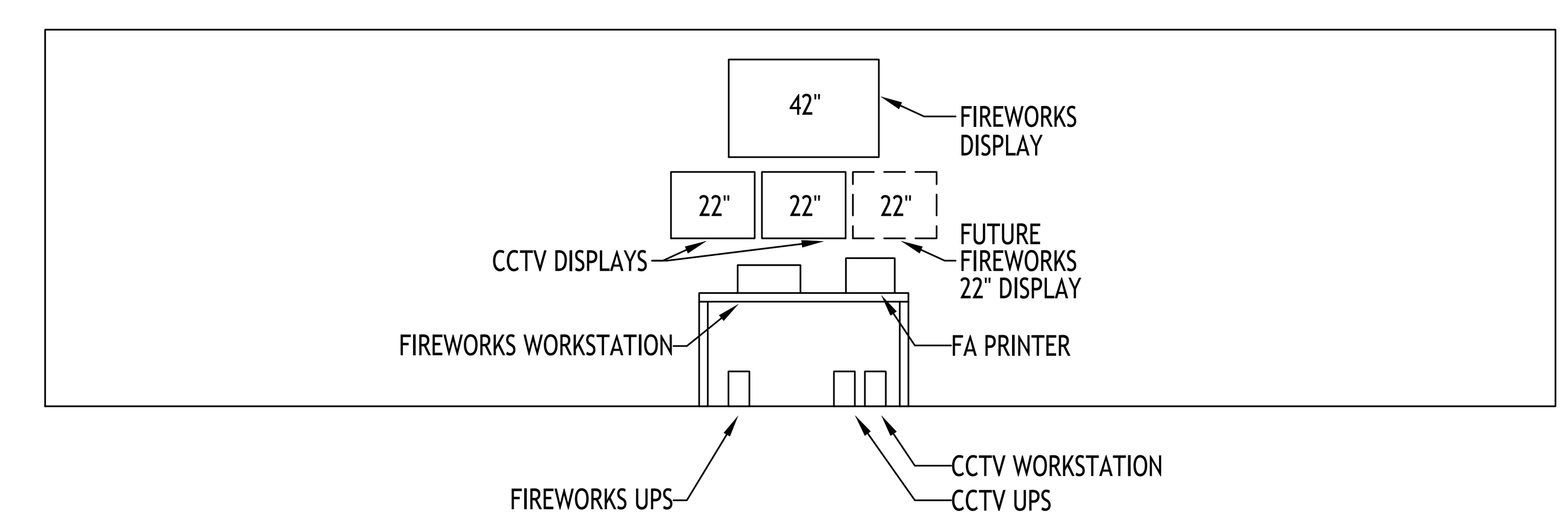


1 FAN ROOM LEVEL EAST
SCALE: 1/16" = 1'-0"

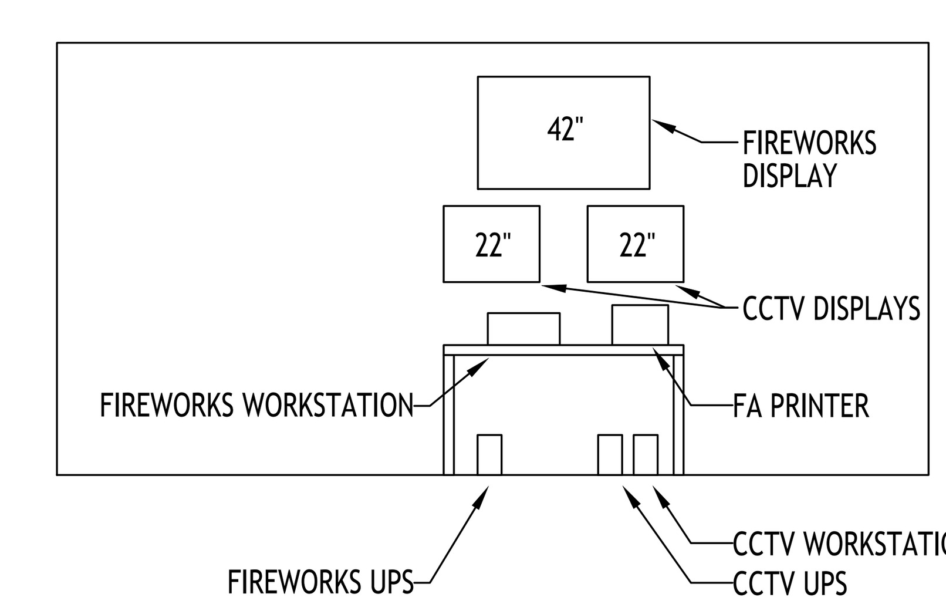


DETAILED EQUIPMENT CALLOUTS
A = FIRE ALARM FIREWORKS UPS
B = FIRE ALARM CCTV UPS
C = FIRE ALARM FIREWORKS WORKSTATION
D = FIRE ALARM CCTV WORKSTATION
E = FIRE ALARM CCTV 22" MONITOR
F = FIRE ALARM CCTV 22" MONITOR
G = FIRE ALARM FIREWORKS 42" MONITOR
H = CCTV EQUIPMENT RACK #1
I = CCTV EQUIPMENT RACK #2

2 EAST CONTROL ROOM ENLARGED FLOOR PLAN
SCALE: 1/8" = 1'-0"



3 EAST CONTROL ROOM ELEVATION VIEW
SCALE: 1/4" = 1'-0"



4 FACILITY MANAGER OFFICE ELEVATION VIEW
SCALE: 1/4" = 1'-0"

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions

Num	Description	Date
1	RELOCATED EQUIPMENT	2015-7-24

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM: FAN LEVEL EAST

Drawing Number
FA2.E03

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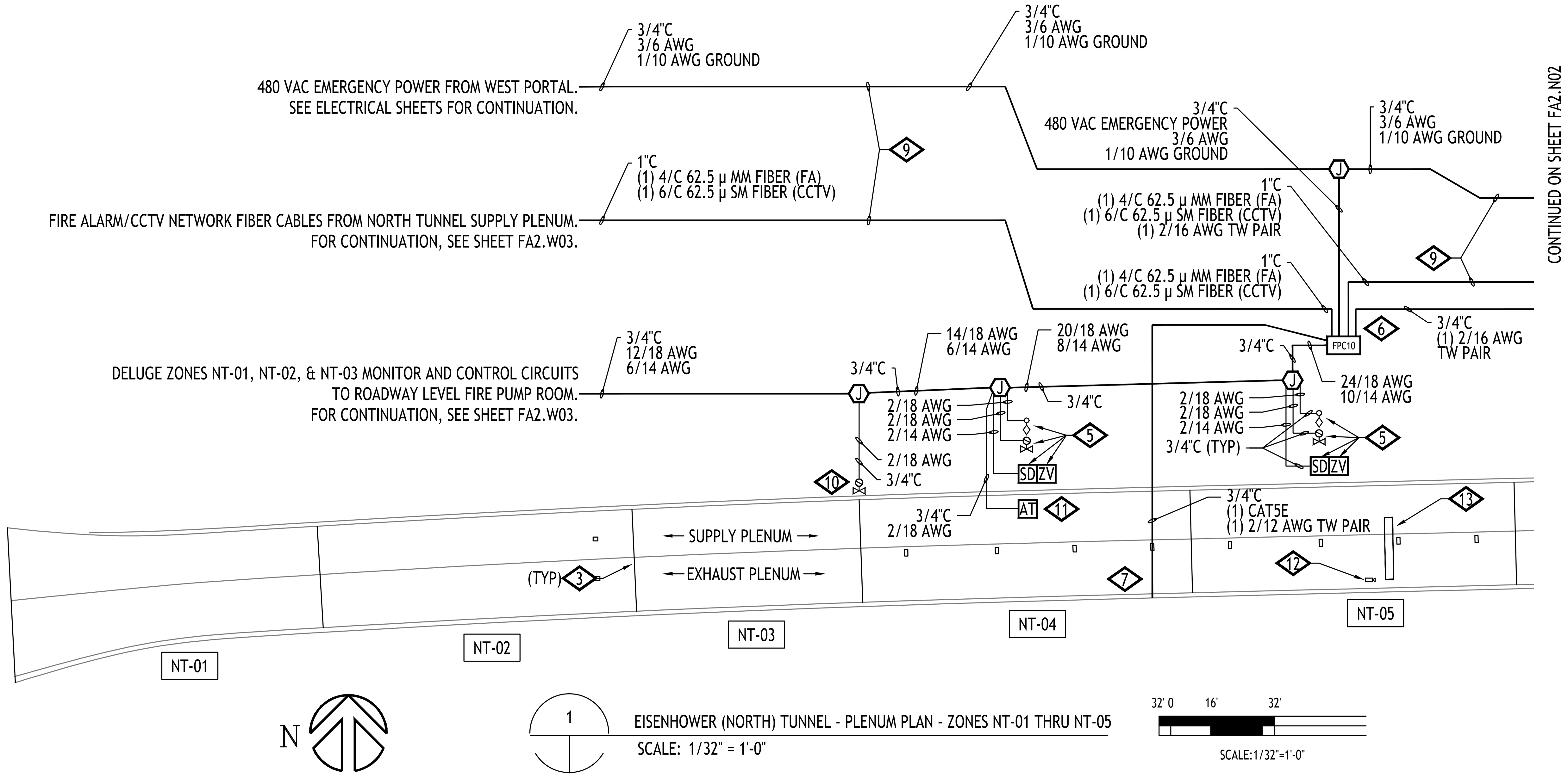

1 EISENHOWER (NORTH) TUNNEL - PLENUM PLAN - ZONES NT-01 THRU NT-05

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

GENERAL NOTES:

1. IF FIELD CONDITIONS RESULT IN A CHANGE TO THE SHOP DRAWING INSTALLATION IN ANY WAY, CONTACT FAS SYSTEMS GROUP TO VERIFY PROPOSED CHANGES ARE COMPLIANT WITH NFPA 72 AND PROJECT REQUIREMENTS.
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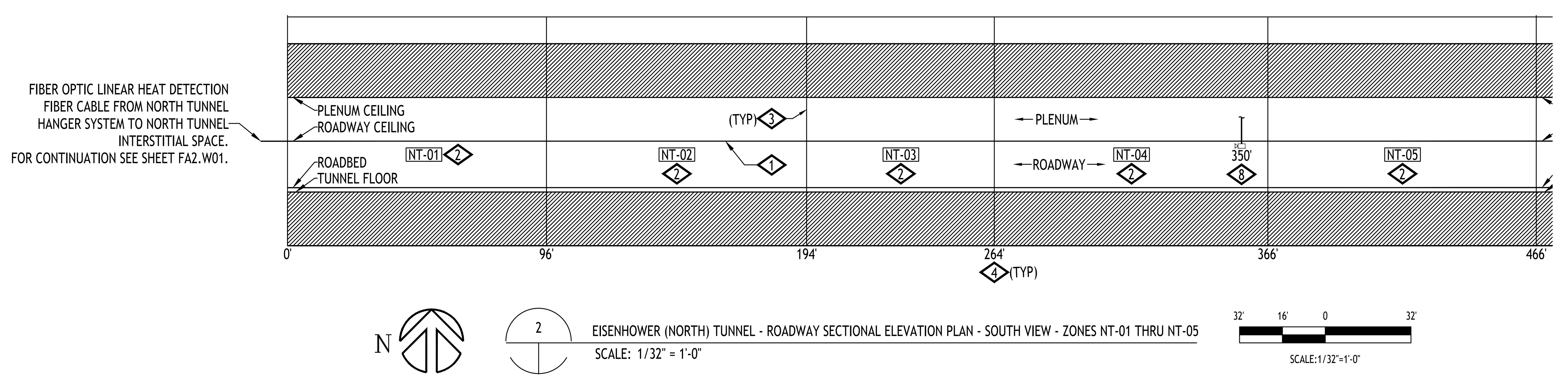
DETAIL NOTES:

1. FIBER OPTIC LINEAR HEAT DETECTION (FOLHD) FIBER CABLE IN FOLHD HANGER. CABLE TO BE MOUNTED APPROXIMATELY 2 INCHES BELOW ROADWAY CEILING TILE. SEE SHEETS FA6.01, FA6.14 AND FA6.15.
2. DELUGE ZONE SIGNS MOUNTED AT MOST CENTER-POINT OF DELUGE ZONE AND +84" FROM WALKWAY FLOOR. SEE SHEET FA6.02.
3. DELUGE ZONE BOUNDARY.
4. DIMENSION INDICATED APPROXIMATE DISTANCE OF DELUGE ZONE BOUNDARY TO WEST END PORTAL.
5. DELUGE SPRINKLER SYSTEM EQUIPMENT LOCATED IN SUPPLY PLENUM. SEE FIRE PROTECTION SHEETS FOR EQUIPMENT LOCATIONS.
6. EQUIPMENT LOCATED IN SUPPLY PLENUM.
7. ROUTE CAMERA ETHERNET AND POWER RACEWAY AND CIRCUITRY IN A CONCEALED FASHION THRU EXISTING EXHAUST PLENUM OPENING TO BACKSIDE OF ROADWAY WALL TO WALL MOUNTED LOCATION.
8. MOUNT CCTV CAMERA TO ROADWAY WALL TILE ABOVE EXIT PATHWAY. SEE SHEET FA6.02. DIMENSION INDICATES APPROXIMATE DISTANCE OF CAMERA TO WEST PORTAL END.
9. MAINTAIN MAXIMUM SEPARATION POSSIBLE BETWEEN 480 VAC POWER AND FIRE ALARM RACEWAYS. SEE SHEETS FA6.14 AND FA6.15.
10. FIRE LOOP ISOLATION VALVE TAMPER. SEE FIRE PROTECTION SHEETS FOR EQUIPMENT LOCATIONS.
11. MOUNT AIR TEMPERATURE SENSOR INSIDE INSULATED VALVE ENCLOSURE (IVE), OF ASSOCIATED TUNNEL DELUGE ZONE.
12. EXISTING CCTV TRAFFIC CAMERA, SHOWN FOR REFERENCE PURPOSES, TO REMAIN.
13. EXISTING TRAFFIC CONTROL MESSAGE BOARD, SHOWN FOR REFERENCE PURPOSES, TO REMAIN. ROUTE FOLHD FIBER AND HANGER ABOVE THE MESSAGE BOARD. IT IS ACCEPTABLE TO RUN THE FOLHD CABLE WITHOUT THE HANGER WHERE THERE IS INSUFFICIENT CLEARANCE BETWEEN THE EXISTING MESSAGE BOARD AND THE EXISTING CEILING TILE, WHERE APPLICABLE. LIMIT THE FOLHD CABLE RUNS WITHOUT THE HANGER TO THE MINIMUM DISTANCE POSSIBLE TO CLEAR THE OBSTRUCTION.



2 EISENHOWER (NORTH) TUNNEL - ROADWAY SECTIONAL ELEVATION PLAN - SOUTH VIEW - ZONES NT-01 THRU NT-05

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

ADDRESSING		
04020166	FPC10	CCTV TROUBLE
04020167	FPC10	BPS TROUBLE
04020168	FPC10	HI TEMP
04020169	FPC10	LO TEMP

ADDRESSING		
04020127	NT-01	MANUAL INPUT
04020128	NT-01	DELUGE RELEASE
04020156	NT-01	WATER FLOW
04020157	NT-01	TAMPER
05020126	NT-01	PRIMARY ALARM
01020221	NT-01	SECONDARY ALARM

ADDRESSING		
04020133	NT-02	MANUAL INPUT
04020134	NT-02	DELUGE RELEASE
04020158	NT-02	WATER FLOW
04020159	NT-02	TAMPER
05020127	NT-02	PRIMARY ALARM
01020222	NT-02	SECONDARY ALARM

ADDRESSING		
04020139	NT-03	MANUAL INPUT
04020140	NT-03	DELUGE RELEASE
04020160	NT-03	WATER FLOW
04020161	NT-03	TAMPER
05020128	NT-03	PRIMARY ALARM
01020223	NT-03	SECONDARY ALARM

ADDRESSING		
04020145	NT-04	MANUAL INPUT
04020146	NT-04	DELUGE RELEASE
04020162	NT-04	WATER FLOW
04020163	NT-04	TAMPER
04020170	NT-04	ISO VALVE TAMPER
04020171	NT-04	IVE LO TEMP
05020129	NT-04	PRIMARY ALARM
01020224	NT-04	SECONDARY ALARM

ADDRESSING		
04020151	NT-05	MANUAL INPUT
04020152	NT-05	DELUGE RELEASE
04020164	NT-05	WATER FLOW
04020165	NT-05	TAMPER
05020130	NT-05	PRIMARY ALARM
01020225	NT-05	SECONDARY ALARM

BARNARD EJMT TEAM

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions: Num | Description | Date

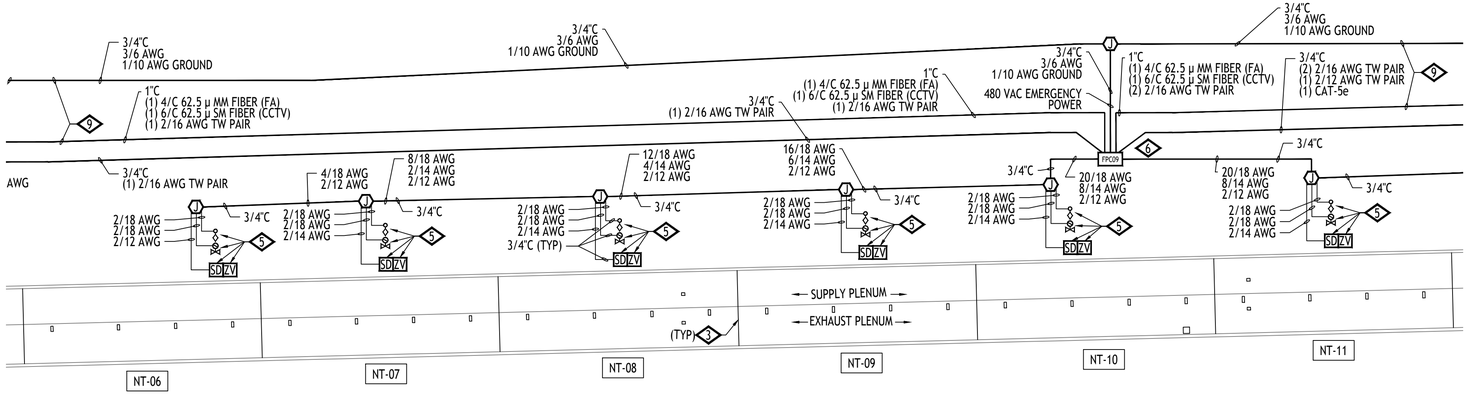
DRAWN BY: B.T.L. | CHECKED BY: AEE,Jr

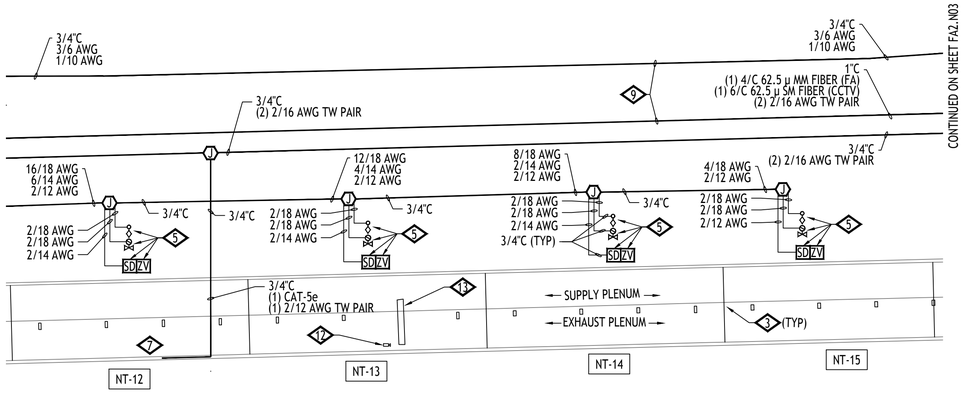
FIRE ALARM:
EISENHOWER TUNNEL
FP ZONES NT-01 TO NT-05

Drawing Number

FA2.N01

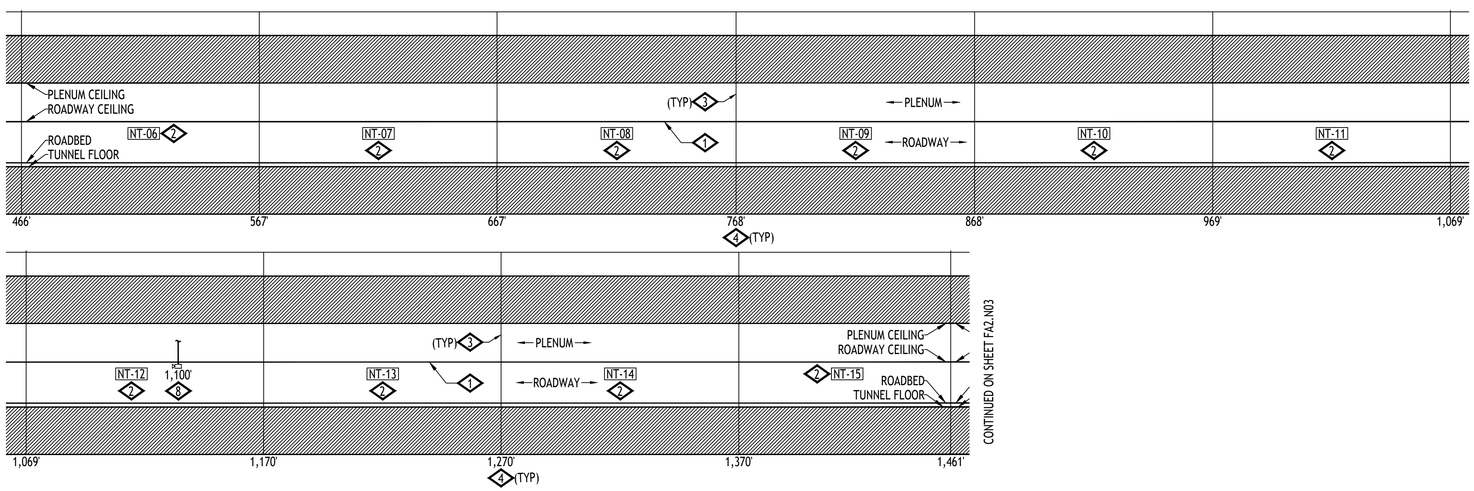
IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE





1 EISENHOWER (NORTH) TUNNEL - PLENUM PLAN - ZONES NT-06 THRU NT-15
SCALE: 1/32" = 1'-0"

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



2 EISENHOWER (NORTH) TUNNEL - ROADWAY SECTIONAL ELEVATION PLAN - SOUTH VIEW - ZONES NT-06 THRU NT-15
SCALE: 1/32" = 1'-0"

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

GENERAL NOTES:

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DETAIL NOTES:

1. FIBER OPTIC LINEAR HEAT DETECTION (FOLHD) FIBER CABLE IN FOLHD HANGER. CABLE TO BE MOUNTED APPROXIMATELY 2 INCHES BELOW ROADWAY CEILING TILE. SEE SHEETS FA6.01, FA6.14 AND FA6.15.
2. DELUGE ZONE SIGNS MOUNTED AT MOST CENTER-POINT OF DELUGE ZONE AND +84" FROM WALKWAY FLOOR. SEE SHEET FA6.02.
3. DELUGE ZONE BOUNDARY.
4. DIMENSION INDICATED APPROXIMATE DISTANCE OF DELUGE ZONE BOUNDARY TO WEST END PORTAL.
5. DELUGE SPRINKLER SYSTEM EQUIPMENT LOCATED IN SUPPLY PLENUM. SEE FIRE PROTECTION SHEETS FOR EQUIPMENT LOCATIONS.
6. EQUIPMENT LOCATED IN SUPPLY PLENUM.
7. ROUTE CAMERA ETHERNET AND POWER RACEWAY AND CIRCUITRY IN A CONCEALED FASHION THRU EXISTING EXHAUST PLENUM OPENING TO BACKSIDE OF ROADWAY WALL TO WALL MOUNTED LOCATION.
8. MOUNT CCTV CAMERA TO ROADWAY WALL TILE ABOVE EXIT PATHWAY. SEE SHEET FA6.02. DIMENSION INDICATES APPROXIMATE DISTANCE OF CAMERA TO WEST PORTAL END.
9. MAINTAIN MAXIMUM SEPARATION POSSIBLE BETWEEN 480 VAC POWER AND FIRE ALARM RACEWAYS. SEE SHEETS FA6.14 AND FA6.15.
10. FIRE LOOP ISOLATION VALVE TAMPER. SEE FIRE PROTECTION SHEETS FOR EQUIPMENT LOCATIONS.
11. MOUNT AIR TEMPERATURE SENSOR INSIDE INSULATED VALVE ENCLOSURE (IVE), OF ASSOCIATED TUNNEL DELUGE ZONE.
12. EXISTING CCTV TRAFFIC CAMERA, SHOWN FOR REFERENCE PURPOSES, TO REMAIN.
13. EXISTING TRAFFIC CONTROL MESSAGE BOARD, SHOWN FOR REFERENCE PURPOSES, TO REMAIN. ROUTE FOLHD FIBER AND HANGER ABOVE THE MESSAGE BOARD. IT IS ACCEPTABLE TO RUN THE FOLHD CABLE WITHOUT THE HANGER WHERE THERE IS INSUFFICIENT CLEARANCE BETWEEN THE EXISTING MESSAGE BOARD AND THE EXISTING CEILING TILE, WHERE APPLICABLE. LIMIT THE FOLHD CABLE RUNS WITHOUT THE HANGER TO THE MINIMUM DISTANCE POSSIBLE TO CLEAR THE OBSTRUCTION.

ADDRESSING		
04020456	FPC09	HI TEMP
04020457	FPC09	LO TEMP
04020458	FPC09	CCTV TROUBLE
04020459	FPC09	BPS TROUBLE

ADDRESSING		
04020377	NT-06	MANUAL INPUT
04020378	NT-06	DELUGE RELEASE
04020436	NT-06	WATER FLOW
04020437	NT-06	TAMPER
05020131	NT-06	PRIMARY ALARM
01020226	NT-06	SECONDARY ALARM

ADDRESSING		
04020383	NT-07	MANUAL INPUT
04020384	NT-07	DELUGE RELEASE
04020438	NT-07	WATER FLOW
04020439	NT-07	TAMPER
05020132	NT-07	PRIMARY ALARM
01020227	NT-07	SECONDARY ALARM

ADDRESSING		
04020389	NT-08	MANUAL INPUT
04020390	NT-08	DELUGE RELEASE
04020440	NT-08	WATER FLOW
04020441	NT-08	TAMPER
05020133	NT-08	PRIMARY ALARM
01020228	NT-08	SECONDARY ALARM

ADDRESSING		
04020395	NT-09	MANUAL INPUT
04020396	NT-09	DELUGE RELEASE
04020442	NT-09	WATER FLOW
04020443	NT-09	TAMPER
05020134	NT-09	PRIMARY ALARM
01020229	NT-09	SECONDARY ALARM

ADDRESSING		
04020401	NT-10	MANUAL INPUT
04020402	NT-10	DELUGE RELEASE
04020444	NT-10	WATER FLOW
04020445	NT-10	TAMPER
05020135	NT-10	PRIMARY ALARM
01020230	NT-10	SECONDARY ALARM

ADDRESSING		
04020407	NT-11	MANUAL INPUT
04020408	NT-11	DELUGE RELEASE
04020446	NT-11	WATER FLOW
04020447	NT-11	TAMPER
05020138	NT-11	PRIMARY ALARM
01020231	NT-11	SECONDARY ALARM

ADDRESSING		
04020413	NT-12	MANUAL INPUT
04020414	NT-12	DELUGE RELEASE
04020448	NT-12	WATER FLOW
04020449	NT-12	TAMPER
05020139	NT-12	PRIMARY ALARM
01020232	NT-12	SECONDARY ALARM

ADDRESSING		
04020419	NT-13	MANUAL INPUT
04020420	NT-13	DELUGE RELEASE
04020450	NT-13	WATER FLOW
04020451	NT-13	TAMPER
05020140	NT-13	PRIMARY ALARM
01020233	NT-13	SECONDARY ALARM

ADDRESSING		
04020425	NT-14	MANUAL INPUT
04020426	NT-14	DELUGE RELEASE
04020452	NT-14	WATER FLOW
04020453	NT-14	TAMPER
05020141	NT-14	PRIMARY ALARM
01030126	NT-14	SECONDARY ALARM

ADDRESSING		
04020431	NT-15	MANUAL INPUT
04020432	NT-15	DELUGE RELEASE
04020454	NT-15	WATER FLOW
04020455	NT-15	TAMPER
05020142	NT-15	PRIMARY ALARM
01030127	NT-15	SECONDARY ALARM

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EYP CONSULTING ENGINEERS

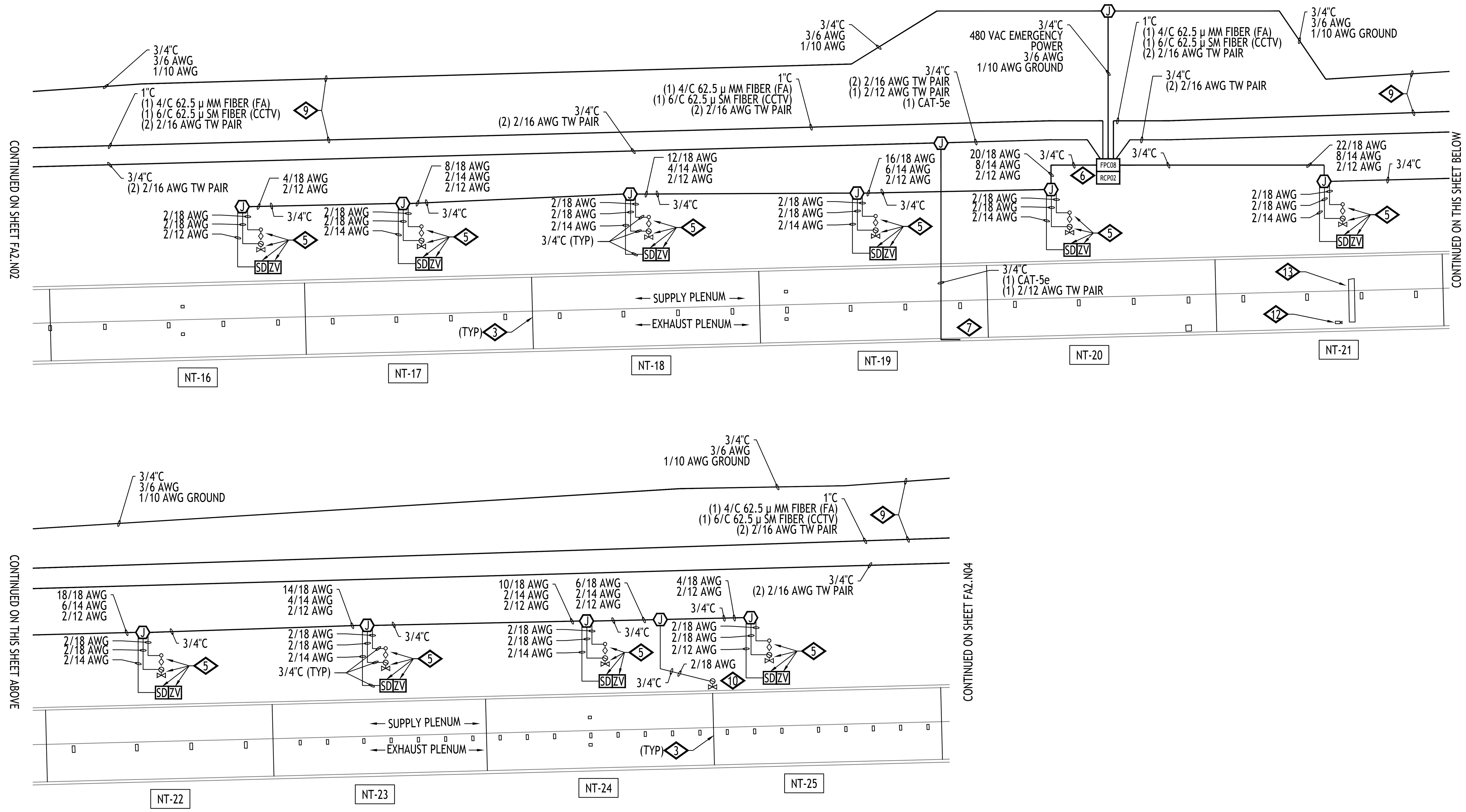
EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions			
Num	Description	Date	
			DRAWN BY: B.T.L.
			CHECKED BY: AEE,Jr

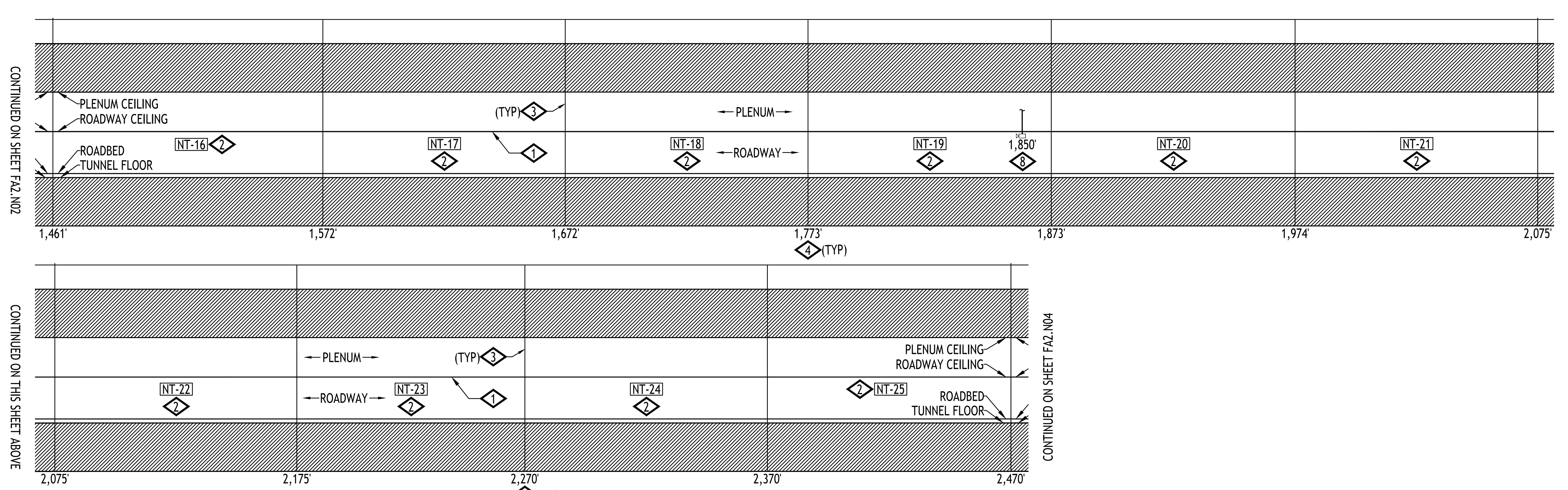
FIRE ALARM:
EISENHOWER TUNNEL
FP ZONES NT-06 TO NT-15

Drawing Number
FA2.N02

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE



1 EISENHOWER (NORTH) TUNNEL - PLENUM PLAN - ZONES NT-16 THRU NT-25
SCALE: 1/32" = 1'-0"



2 EISENHOWER (NORTH) TUNNEL - ROADWAY SECTIONAL ELEVATION PLAN - SOUTH VIEW - ZONES NT-16 THRU NT-25
SCALE: 1/32" = 1'-0"

GENERAL NOTES:

1. IF FIELD CONDITIONS RESULT IN A CHANGE TO THE SHOP DRAWING INSTALLATION IN ANY WAY, CONTACT FAS SYSTEMS GROUP TO VERIFY PROPOSED CHANGES ARE COMPLIANT WITH NFPA 72 AND PROJECT REQUIREMENTS.
2. EACH CONTROL CABINET AND ADDRESSABLE DEVICE SHALL BEAR A TYPED LABEL INDICATING ITS ADDRESS OR DESIGNATION, WHICH CAN BE SEEN WITHOUT A LADDER OR LIFT. SMOKE AND HEAT DETECTORS SHALL HAVE THEIR LABEL ON ITS BASE.

DETAIL NOTES:

1. FIBER OPTIC LINEAR HEAT DETECTION (FOLHD) FIBER CABLE IN FOLHD HANGER. CABLE TO BE MOUNTED APPROXIMATELY 2 INCHES BELOW ROADWAY CEILING TILE. SEE SHEETS FA6.01, FA6.14 AND FA6.15.
2. DELUGE ZONE SIGNS MOUNTED AT MOST CENTER-POINT OF DELUGE ZONE AND +84" FROM WALKWAY FLOOR. SEE SHEET FA6.02.
3. DELUGE ZONE BOUNDARY.
4. DIMENSION INDICATED APPROXIMATE DISTANCE OF DELUGE ZONE BOUNDARY TO WEST END PORTAL.
5. DELUGE SPRINKLER SYSTEM EQUIPMENT LOCATED IN SUPPLY PLENUM. SEE FIRE PROTECTION SHEETS FOR EQUIPMENT LOCATIONS.
6. EQUIPMENT LOCATED IN SUPPLY PLENUM.
7. ROUTE CAMERA ETHERNET AND POWER RACEWAY AND CIRCUITRY IN A CONCEALED FASHION THRU EXISTING EXHAUST PLENUM OPENING TO BACKSIDE OF ROADWAY WALL TO WALL MOUNTED LOCATION.
8. MOUNT CCTV CAMERA TO ROADWAY WALL TILE ABOVE EXIT PATHWAY. SEE SHEET FA6.02. DIMENSION INDICATES APPROXIMATE DISTANCE OF CAMERA TO WEST PORTAL END.
9. MAINTAIN MAXIMUM SEPARATION POSSIBLE BETWEEN 480 VAC POWER AND FIRE ALARM RACEWAYS. SEE SHEETS FA6.14 AND FA6.15.
10. FIRE LOOP ISOLATION VALVE TAMPER. SEE FIRE PROTECTION SHEETS FOR EQUIPMENT LOCATIONS.
11. MOUNT AIR TEMPERATURE SENSOR INSIDE INSULATED VALVE ENCLOSURE (IVE), OF ASSOCIATED TUNNEL DELUGE ZONE.
12. EXISTING CCTV TRAFFIC CAMERA, SHOWN FOR REFERENCE PURPOSES, TO REMAIN.
13. EXISTING TRAFFIC CONTROL MESSAGE BOARD, SHOWN FOR REFERENCE PURPOSES, TO REMAIN. ROUTE FOLHD FIBER AND HANGER ABOVE THE MESSAGE BOARD. IT IS ACCEPTABLE TO RUN THE FOLHD CABLE WITHOUT THE HANGER WHERE THERE IS INSUFFICIENT CLEARANCE BETWEEN THE EXISTING MESSAGE BOARD AND THE EXISTING CEILING TILE, WHERE APPLICABLE. LIMIT THE FOLHD CABLE RUNS WITHOUT THE HANGER TO THE MINIMUM DISTANCE POSSIBLE TO CLEAR THE OBSTRUCTION.

ADDRESSING		
04030231	RCP02	LO TEMP
04030232	RCP02	HI TEMP
04030206	FPC08	HI TEMP
04030207	FPC08	LO TEMP
04030208	FPC08	CCTV TROUBLE
04030209	FPC08	BPS TROUBLE

ADDRESSING		
04030127	NT-16	MANUAL INPUT
04030128	NT-16	DELUGE RELEASE
04030186	NT-16	WATER FLOW
04030187	NT-16	TAMPER
05020143	NT-16	PRIMARY ALARM
01030128	NT-16	SECONDARY ALARM

ADDRESSING		
04030133	NT-17	MANUAL INPUT
04030134	NT-17	DELUGE RELEASE
04030188	NT-17	WATER FLOW
04030189	NT-17	TAMPER
05020144	NT-17	PRIMARY ALARM
01030129	NT-17	SECONDARY ALARM

ADDRESSING		
04030139	NT-18	MANUAL INPUT
04030140	NT-18	DELUGE RELEASE
04030190	NT-18	WATER FLOW
04030191	NT-18	TAMPER
05020145	NT-18	PRIMARY ALARM
01030130	NT-18	SECONDARY ALARM

ADDRESSING		
04030145	NT-19	MANUAL INPUT
04030146	NT-19	DELUGE RELEASE
04030192	NT-19	WATER FLOW
04030193	NT-19	TAMPER
05020146	NT-19	PRIMARY ALARM
01030131	NT-19	SECONDARY ALARM

ADDRESSING		
04030151	NT-20	MANUAL INPUT
04030152	NT-20	DELUGE RELEASE
04030194	NT-20	WATER FLOW
04030195	NT-20	TAMPER
05020147	NT-20	PRIMARY ALARM
01030132	NT-20	SECONDARY ALARM

ADDRESSING		
04030157	NT-21	MANUAL INPUT
04030158	NT-21	DELUGE RELEASE
04030196	NT-21	WATER FLOW
04030197	NT-21	TAMPER
05020148	NT-21	PRIMARY ALARM
01030133	NT-21	SECONDARY ALARM

ADDRESSING		
04030163	NT-22	MANUAL INPUT
04030164	NT-22	DELUGE RELEASE
04030198	NT-22	WATER FLOW
04030199	NT-22	TAMPER
05020149	NT-22	PRIMARY ALARM
01030134	NT-22	SECONDARY ALARM

ADDRESSING		
04030169	NT-23	MANUAL INPUT
04030170	NT-23	DELUGE RELEASE
04030200	NT-23	WATER FLOW
04030201	NT-23	TAMPER
05020150	NT-23	PRIMARY ALARM
01030135	NT-23	SECONDARY ALARM

ADDRESSING		
04030175	NT-24	MANUAL INPUT
04030176	NT-24	DELUGE RELEASE
04030202	NT-24	WATER FLOW
04030203	NT-24	TAMPER
05020151	NT-24	PRIMARY ALARM
01030136	NT-24	SECONDARY ALARM
04030210	NT-24	ISO VALVE TAMPER

ADDRESSING		
04030181	NT-25	MANUAL INPUT
04030182	NT-25	DELUGE RELEASE
04030204	NT-25	WATER FLOW
04030205	NT-25	TAMPER
05020152	NT-25	PRIMARY ALARM
01030137	NT-25	SECONDARY ALARM

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EISENHOWER/JOHNSON MEMORIAL TUNNEL

FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810

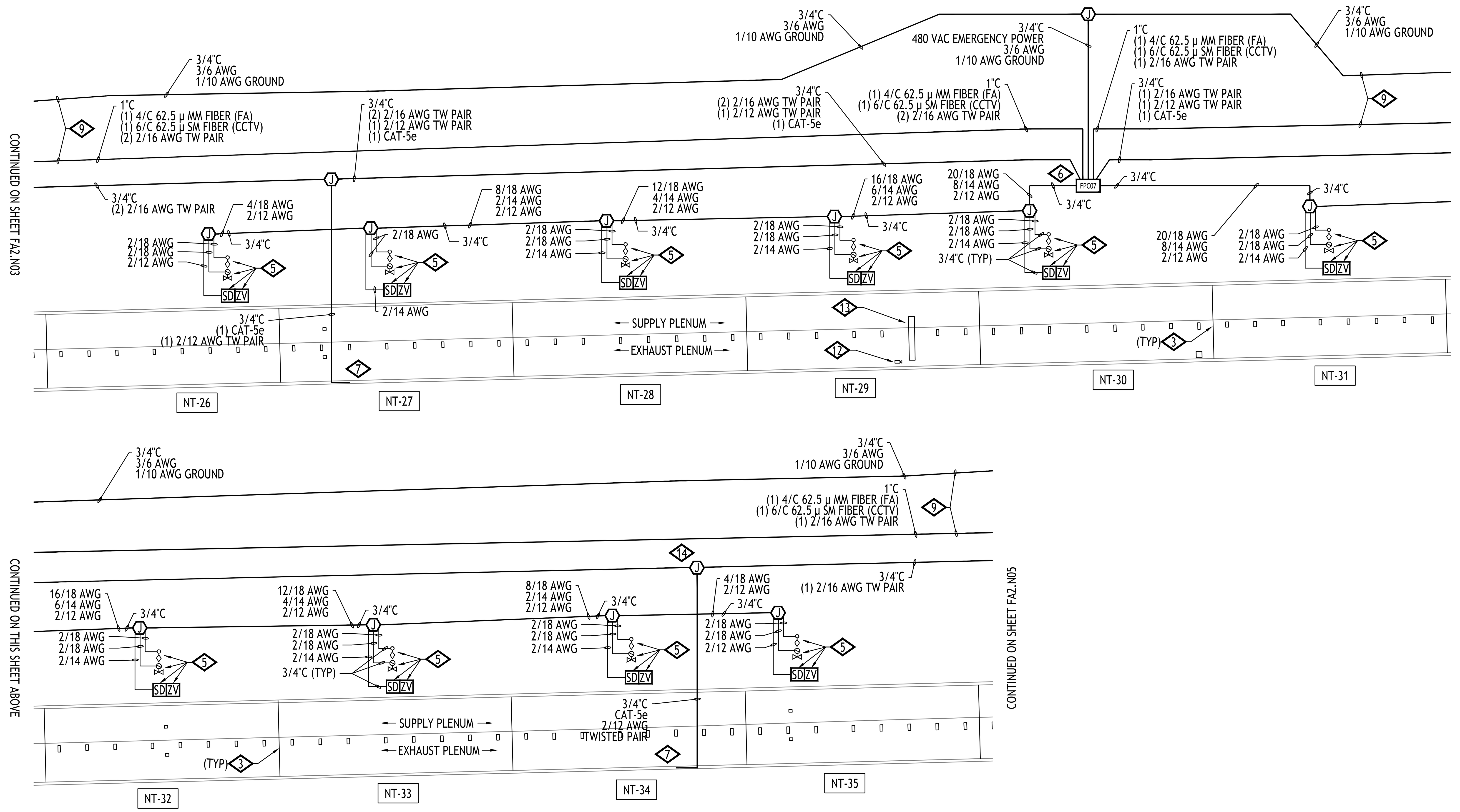
RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE.Jr

FIRE ALARM:
EISENHOWER TUNNEL
FP ZONES NT-16 TO NT-25

Drawing Number
FA2.N03



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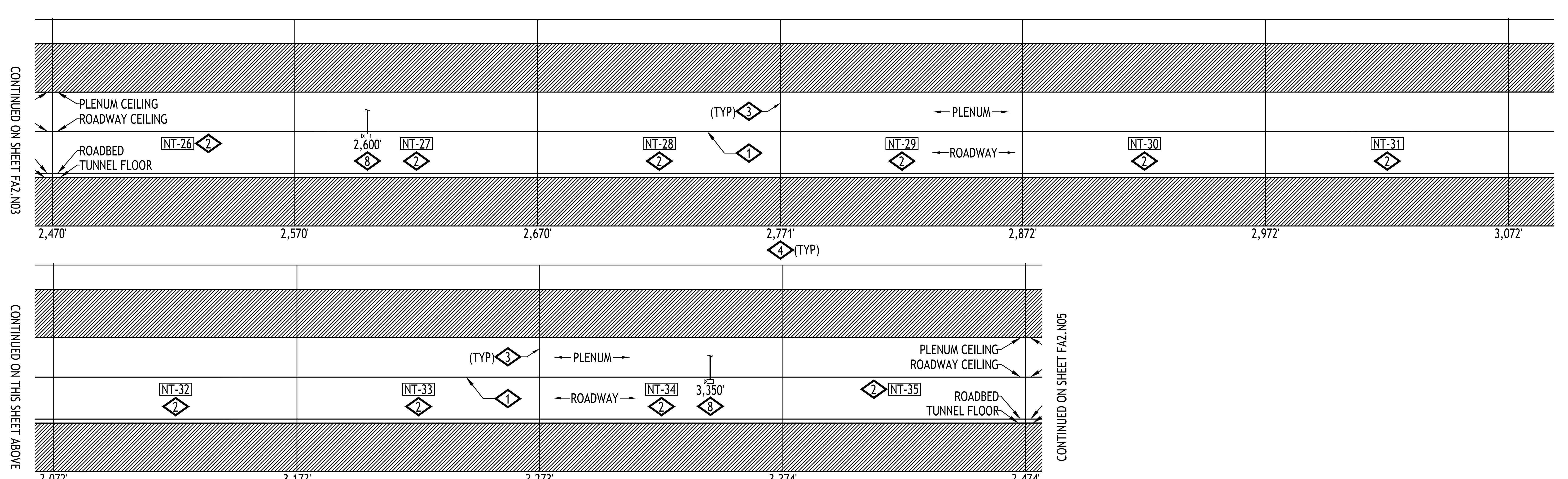
1 EISENHOWER (NORTH) TUNNEL - PLENUM PLAN - ZONES NT-26 THRU NT-35

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



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2 EISENHOWER (NORTH) TUNNEL - ROADWAY SECTIONAL ELEVATION PLAN - SOUTH VIEW - ZONES NT-26 THRU NT-35

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

GENERAL NOTES:

1. IF FIELD CONDITIONS RESULT IN A CHANGE TO THE SHOP DRAWING INSTALLATION IN ANY WAY, CONTACT FAS SYSTEMS GROUP TO VERIFY PROPOSED CHANGES ARE COMPLIANT WITH NFPA 72 AND PROJECT REQUIREMENTS.
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DETAIL NOTES:

1. FIBER OPTIC LINEAR HEAT DETECTION (FOLHD) FIBER CABLE IN FOLHD HANGER. CABLE TO BE MOUNTED APPROXIMATELY 2 INCHES BELOW ROADWAY CEILING TILE. SEE SHEETS FA6.01, FA6.14 AND FA6.15.
2. DELUGE ZONE SIGNS MOUNTED AT MOST CENTER-POINT OF DELUGE ZONE AND +84" FROM WALKWAY FLOOR. SEE SHEET FA6.02.
3. DELUGE ZONE BOUNDARY.
4. DIMENSION INDICATED APPROXIMATE DISTANCE OF DELUGE ZONE BOUNDARY TO WEST END PORTAL.
5. DELUGE SPRINKLER SYSTEM EQUIPMENT LOCATED IN SUPPLY PLENUM. SEE FIRE PROTECTION SHEETS FOR EQUIPMENT LOCATIONS.
6. EQUIPMENT LOCATED IN SUPPLY PLENUM.
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14. LONGSPAN VLS-1N-L CAT5e EXTENDER LOCATED IN JUNCTION BOX AS SHOWN.

ADDRESSING		
04030456	FPC07	HI TEMP
04030457	FPC07	LO TEMP
04030458	FPC07	CCTV TROUBLE
04030459	FPC07	BPS TROUBLE

ADDRESSING		
04030377	NT-26	MANUAL INPUT
04030378	NT-26	DELUGE RELEASE
04030436	NT-26	WATER FLOW
04030437	NT-26	TAMPER
05020153	NT-26	PRIMARY ALARM
01030138	NT-26	SECONDARY ALARM

ADDRESSING		
04030383	NT-27	MANUAL INPUT
04030384	NT-27	DELUGE RELEASE
04030438	NT-27	WATER FLOW
04030439	NT-27	TAMPER
05020154	NT-27	PRIMARY ALARM
01030139	NT-27	SECONDARY ALARM

ADDRESSING		
04030389	NT-28	MANUAL INPUT
04030390	NT-28	DELUGE RELEASE
04030440	NT-28	WATER FLOW
04030441	NT-28	TAMPER
05020155	NT-28	PRIMARY ALARM
01030140	NT-28	SECONDARY ALARM

ADDRESSING		
04030395	NT-29	MANUAL INPUT
04030396	NT-29	DELUGE RELEASE
04030442	NT-29	WATER FLOW
04030443	NT-29	TAMPER
05020156	NT-29	PRIMARY ALARM
01030141	NT-29	SECONDARY ALARM

ADDRESSING		
04030401	NT-30	MANUAL INPUT
04030402	NT-30	DELUGE RELEASE
04030444	NT-30	WATER FLOW
04030445	NT-30	TAMPER
05020157	NT-30	PRIMARY ALARM
01030142	NT-30	SECONDARY ALARM

ADDRESSING		
04030407	NT-31	MANUAL INPUT
04030408	NT-31	DELUGE RELEASE
04030446	NT-31	WATER FLOW
04030447	NT-31	TAMPER
05020158	NT-31	PRIMARY ALARM
01030143	NT-31	SECONDARY ALARM

ADDRESSING		
04030413	NT-32	MANUAL INPUT
04030414	NT-32	DELUGE RELEASE
04030448	NT-32	WATER FLOW
04030449	NT-32	TAMPER
05020159	NT-32	PRIMARY ALARM
01030144	NT-32	SECONDARY ALARM

ADDRESSING		
04030419	NT-33	MANUAL INPUT
04030420	NT-33	DELUGE RELEASE
04030450	NT-33	WATER FLOW
04030451	NT-33	TAMPER
05020160	NT-33	PRIMARY ALARM
01030145	NT-33	SECONDARY ALARM

ADDRESSING		
04030425	NT-34	MANUAL INPUT
04030426	NT-34	DELUGE RELEASE
04030452	NT-34	WATER FLOW
04030453	NT-34	TAMPER
05020161	NT-34	PRIMARY ALARM
01030146	NT-34	SECONDARY ALARM

ADDRESSING		
04030431	NT-35	MANUAL INPUT
04030432	NT-35	DELUGE RELEASE
04030454	NT-35	WATER FLOW
04030455	NT-35	TAMPER
05020162	NT-35	PRIMARY ALARM
01030147	NT-35	SECONDARY ALARM

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Western States Fire Protection Co.

Sturgeon Electric

BCER Engineering

EISENHOWER/JOHNSON MEMORIAL TUNNEL

FIXED FIRE SUPPRESSION SYSTEM

DESIGN BUILD PROJECT

Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

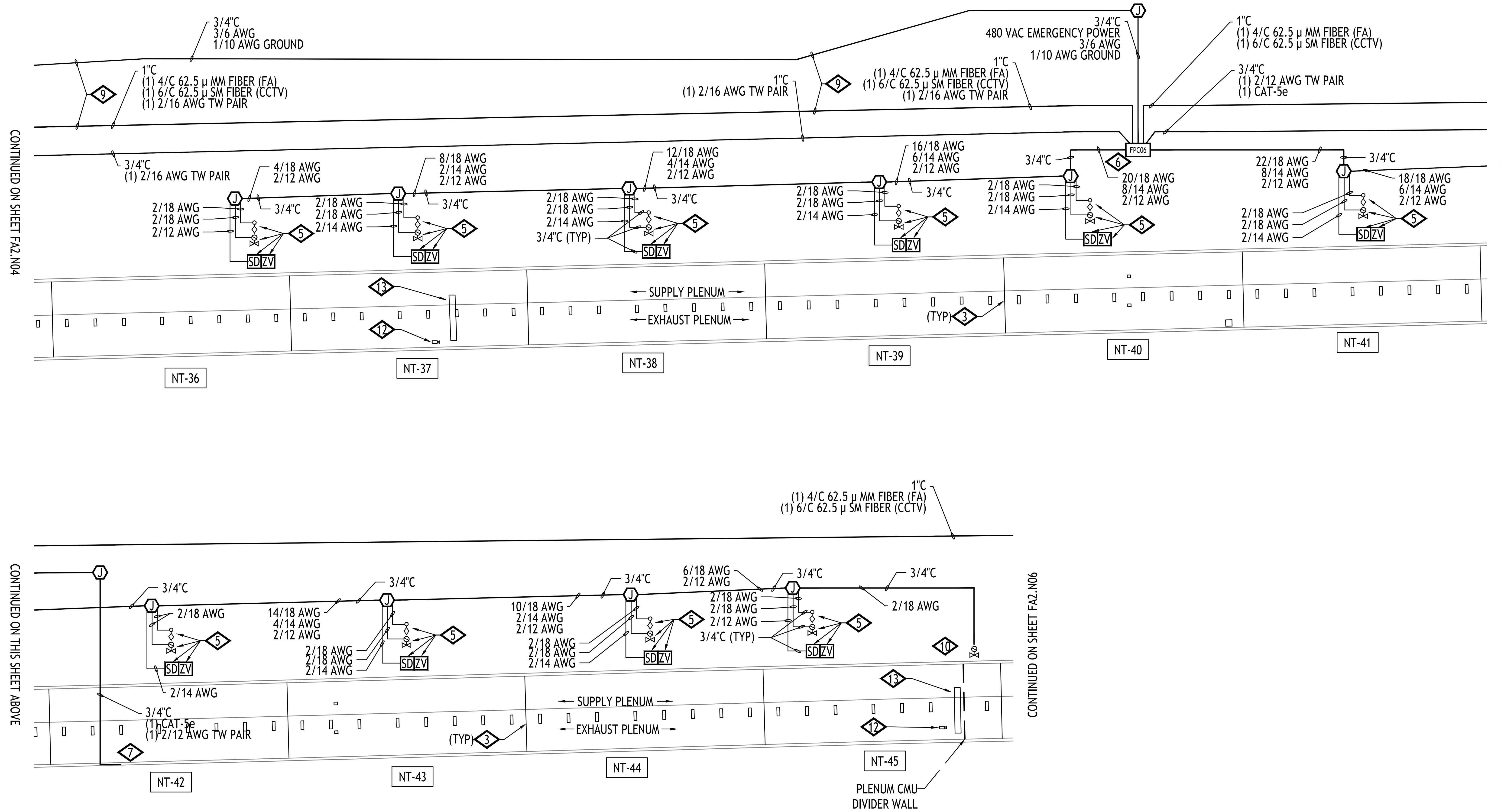
DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
EISENHOWER TUNNEL
FP ZONES NT-26 TO NT-35

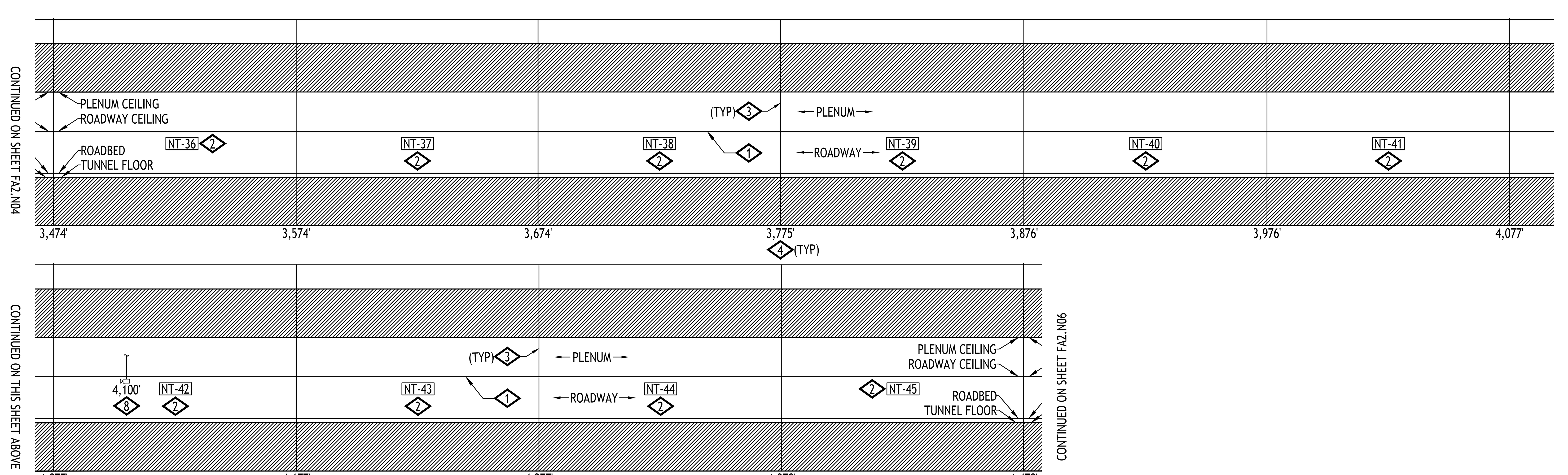
Drawing Number

FA2.N04

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE



EISENHOWER (NORTH) TUNNEL - PLENUM PLAN - ZONES NT-36 THRU NT-45
SCALE: 1/32" = 1'-0"



EISENHOWER (NORTH) TUNNEL - ROADWAY SECTIONAL ELEVATION PLAN - SOUTH VIEW - ZONES NT-36 THRU NT-45
SCALE: 1/32" = 1'-0"

GENERAL NOTES:

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DETAIL NOTES:

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2. DELUGE ZONE SIGNS MOUNTED AT MOST CENTER-POINT OF DELUGE ZONE AND +84" FROM WALKWAY FLOOR. SEE SHEET FA6.02.
3. DELUGE ZONE BOUNDARY.
4. DIMENSION INDICATED APPROXIMATE DISTANCE OF DELUGE ZONE BOUNDARY TO WEST END PORTAL.
5. DELUGE SPRINKLER SYSTEM EQUIPMENT LOCATED IN SUPPLY PLENUM. SEE FIRE PROTECTION SHEETS FOR EQUIPMENT LOCATIONS.
6. EQUIPMENT LOCATED IN SUPPLY PLENUM.
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8. MOUNT CCTV CAMERA TO ROADWAY WALL TILE ABOVE EXIT PATHWAY. SEE SHEET FA6.02. DIMENSION INDICATES APPROXIMATE DISTANCE OF CAMERA TO WEST PORTAL END.
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11. MOUNT AIR TEMPERATURE SENSOR INSIDE INSULATED VALVE ENCLOSURE (IVE), OF ASSOCIATED TUNNEL DELUGE ZONE.
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ADDRESSING		
04040206	FPC06	HI TEMP
04040207	FPC06	LO TEMP
04040208	FPC06	CCTV TROUBLE
04040209	FPC06	BPS TROUBLE

ADDRESSING		
04040127	NT-36	MANUAL INPUT
04040128	NT-36	DELUGE RELEASE
04040186	NT-36	WATER FLOW
04040187	NT-36	TAMPER
05020163	NT-36	PRIMARY ALARM
01030148	NT-36	SECONDARY ALARM

ADDRESSING		
04040133	NT-37	MANUAL INPUT
04040134	NT-37	DELUGE RELEASE
04040188	NT-37	WATER FLOW
04040189	NT-37	TAMPER
05020164	NT-37	PRIMARY ALARM
01030149	NT-37	SECONDARY ALARM

ADDRESSING		
04040139	NT-38	MANUAL INPUT
04040140	NT-38	DELUGE RELEASE
04040190	NT-38	WATER FLOW
04040191	NT-38	TAMPER
05020165	NT-38	PRIMARY ALARM
01030150	NT-38	SECONDARY ALARM

ADDRESSING		
04040145	NT-39	MANUAL INPUT
04040146	NT-39	DELUGE RELEASE
04040192	NT-39	WATER FLOW
04040193	NT-39	TAMPER
05020166	NT-39	PRIMARY ALARM
01030151	NT-39	SECONDARY ALARM

ADDRESSING		
04040151	NT-40	MANUAL INPUT
04040152	NT-40	DELUGE RELEASE
04040194	NT-40	WATER FLOW
04040195	NT-40	TAMPER
05020167	NT-40	PRIMARY ALARM
01030152	NT-40	SECONDARY ALARM

ADDRESSING		
04040157	NT-41	MANUAL INPUT
04040158	NT-41	DELUGE RELEASE
04040196	NT-41	WATER FLOW
04040197	NT-41	TAMPER
05020168	NT-41	PRIMARY ALARM
01030153	NT-41	SECONDARY ALARM

ADDRESSING		
04040163	NT-42	MANUAL INPUT
04040164	NT-42	DELUGE RELEASE
04040198	NT-42	WATER FLOW
04040199	NT-42	TAMPER
05020169	NT-42	PRIMARY ALARM
01030154	NT-42	SECONDARY ALARM

ADDRESSING		
04040169	NT-43	MANUAL INPUT
04040170	NT-43	DELUGE RELEASE
04040200	NT-43	WATER FLOW
04040201	NT-43	TAMPER
05020170	NT-43	PRIMARY ALARM
01030155	NT-43	SECONDARY ALARM

ADDRESSING		
04040175	NT-44	MANUAL INPUT
04040176	NT-44	DELUGE RELEASE
04040202	NT-44	WATER FLOW
04040203	NT-44	TAMPER
05020171	NT-44	PRIMARY ALARM
01030156	NT-44	SECONDARY ALARM

ADDRESSING		
04040181	NT-45	MANUAL INPUT
04040182	NT-45	DELUGE RELEASE
04040204	NT-45	WATER FLOW
04040205	NT-45	TAMPER
05020172	NT-45	PRIMARY ALARM
01030157	NT-45	SECONDARY ALARM
04040230	NT-45	ISO VALVE TAMPER

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

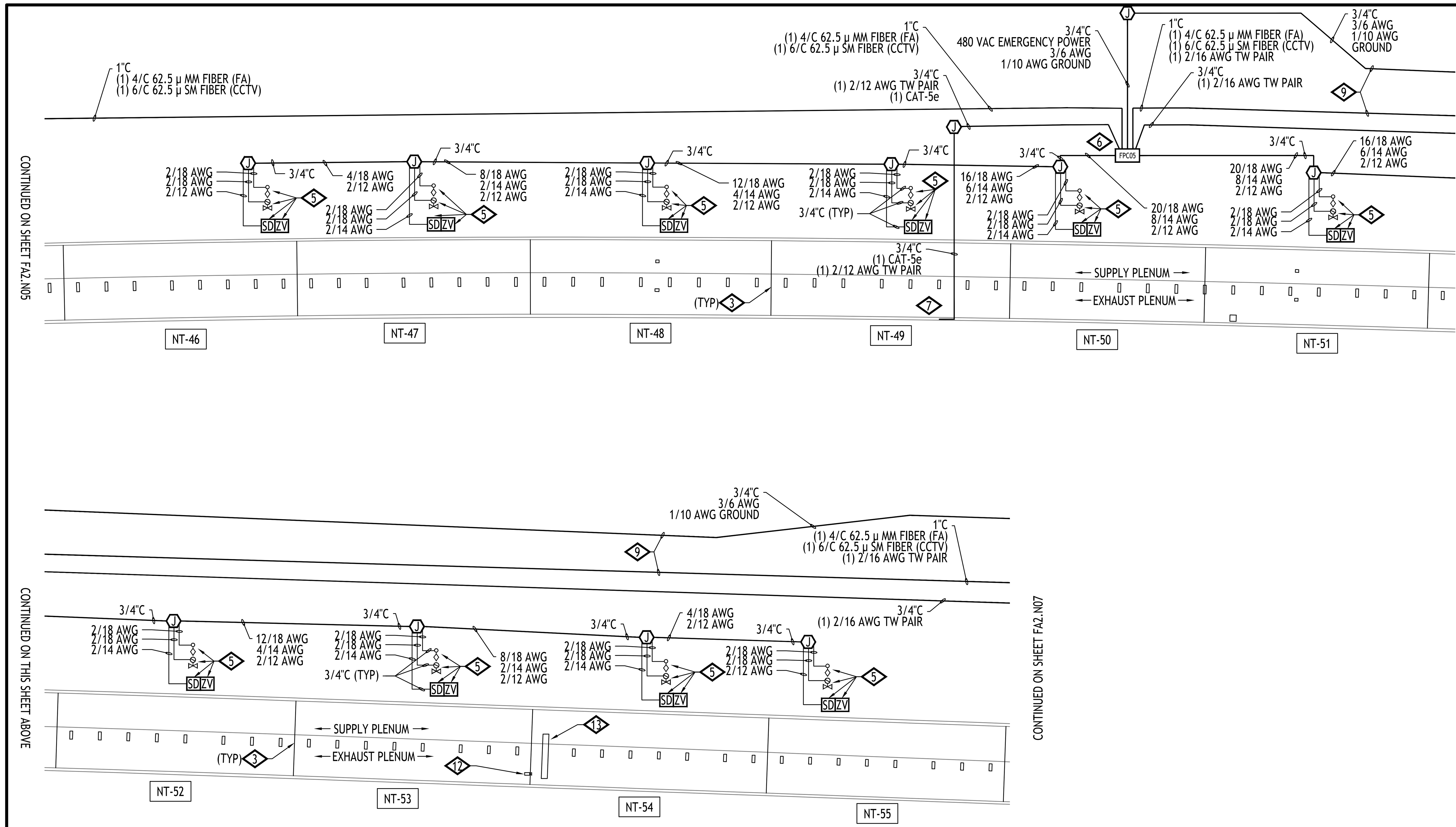
DRAWN BY: B.T.L. CHECKED BY: AEE.Jr

FIRE ALARM:
EISENHOWER TUNNEL
FP ZONES NT-36 TO NT-45

Drawing Number
FA2.N05

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE



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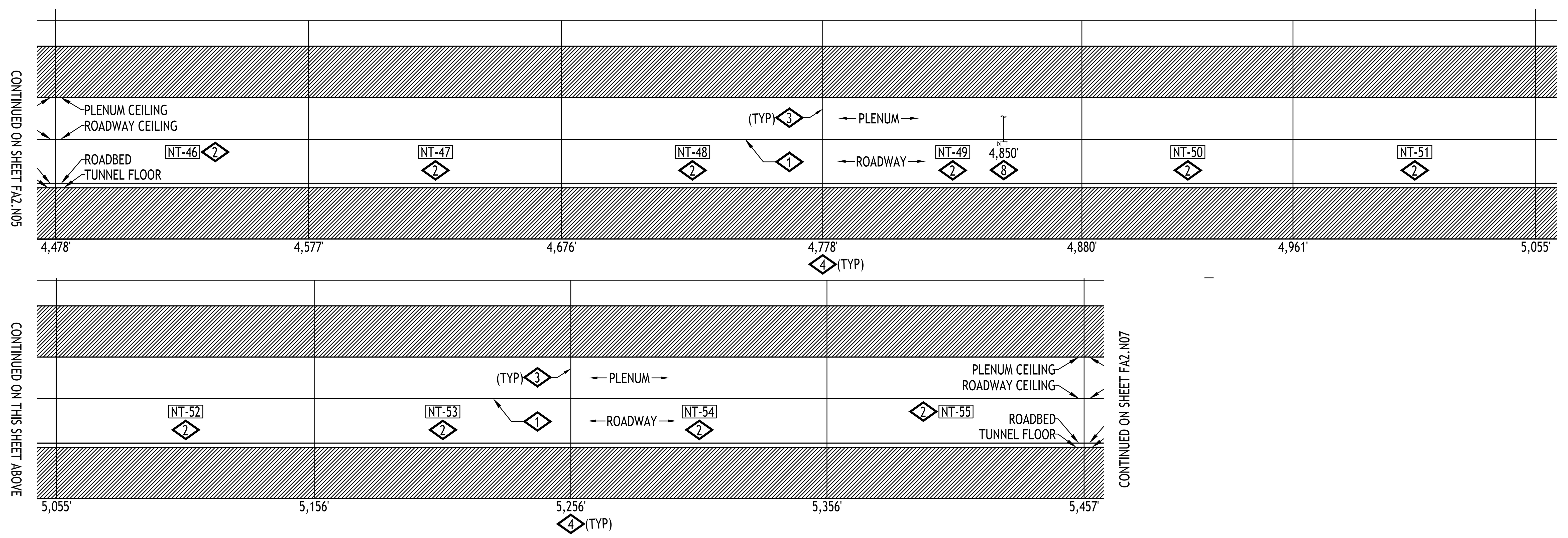
1 EISENHOWER (NORTH) TUNNEL - PLENUM PLAN - ZONES NT-46 THRU NT-55
SCALE: 1/32" = 1'-0"

32' 16' 0 32'
SCALE:1/32"=1'-0"



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2 EISENHOWER (NORTH) TUNNEL - ROADWAY SECTIONAL ELEVATION PLAN - SOUTH VIEW - ZONES NT-46 THRU NT-55
SCALE: 1/32" = 1'-0"

32' 16' 0 32'
SCALE:1/32"=1'-0"

GENERAL NOTES:

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DETAIL NOTES:

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2. DELUGE ZONE SIGNS MOUNTED AT MOST CENTER-POINT OF DELUGE ZONE AND +84" FROM WALKWAY FLOOR. SEE SHEET FA6.02.
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ADDRESSING		
03020206	FPC05	HI TEMP
03020207	FPC05	LO TEMP
03020208	FPC05	CCTV TROUBLE
03020209	FPC05	BPS TROUBLE

ADDRESSING		
03020127	NT-46	MANUAL INPUT
03020128	NT-46	DELUGE RELEASE
03020186	NT-46	WATER FLOW
03020187	NT-46	TAMPER
05020173	NT-46	PRIMARY ALARM
01030158	NT-46	SECONDARY ALARM

ADDRESSING		
03020133	NT-47	MANUAL INPUT
03020134	NT-47	DELUGE RELEASE
03020188	NT-47	WATER FLOW
03020189	NT-47	TAMPER
05020174	NT-47	PRIMARY ALARM
01030159	NT-47	SECONDARY ALARM

ADDRESSING		
03020139	NT-48	MANUAL INPUT
03020140	NT-48	DELUGE RELEASE
03020190	NT-48	WATER FLOW
03020191	NT-48	TAMPER
05020175	NT-48	PRIMARY ALARM
01030160	NT-48	SECONDARY ALARM

ADDRESSING		
03020145	NT-49	MANUAL INPUT
03020146	NT-49	DELUGE RELEASE
03020192	NT-49	WATER FLOW
03020193	NT-49	TAMPER
05020176	NT-49	PRIMARY ALARM
01030161	NT-49	SECONDARY ALARM

ADDRESSING		
03020151	NT-50	MANUAL INPUT
03020152	NT-50	DELUGE RELEASE
03020194	NT-50	WATER FLOW
03020195	NT-50	TAMPER
05020177	NT-50	PRIMARY ALARM
01030162	NT-50	SECONDARY ALARM

ADDRESSING		
03020157	NT-51	MANUAL INPUT
03020158	NT-51	DELUGE RELEASE
03020196	NT-51	WATER FLOW
03020197	NT-51	TAMPER
05020178	NT-51	PRIMARY ALARM
01030163	NT-51	SECONDARY ALARM

ADDRESSING		
03020163	NT-52	MANUAL INPUT
03020164	NT-52	DELUGE RELEASE
03020198	NT-52	WATER FLOW
03020199	NT-52	TAMPER
05020179	NT-52	PRIMARY ALARM
01030164	NT-52	SECONDARY ALARM

ADDRESSING		
03020169	NT-53	MANUAL INPUT
03020170	NT-53	DELUGE RELEASE
03020200	NT-53	WATER FLOW
03020201	NT-53	TAMPER
05020180	NT-53	PRIMARY ALARM
01030165	NT-53	SECONDARY ALARM

ADDRESSING		
03020175	NT-54	MANUAL INPUT
03020176	NT-54	DELUGE RELEASE
03020202	NT-54	WATER FLOW
03020203	NT-54	TAMPER
05020181	NT-54	PRIMARY ALARM
01030166	NT-54	SECONDARY ALARM

ADDRESSING		
03020181	NT-55	MANUAL INPUT
03020182	NT-55	DELUGE RELEASE
03020204	NT-55	WATER FLOW
03020205	NT-55	TAMPER
05020182	NT-55	PRIMARY ALARM
01030167	NT-55	SECONDARY ALARM

BARNARD EJMT TEAM

RONDINELLI life safety

ILF CONSULTING ENGINEERS

Western States Fire Protection Co.

BARNARD

BCER Engineering

Sturgeon ELECTRIC

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

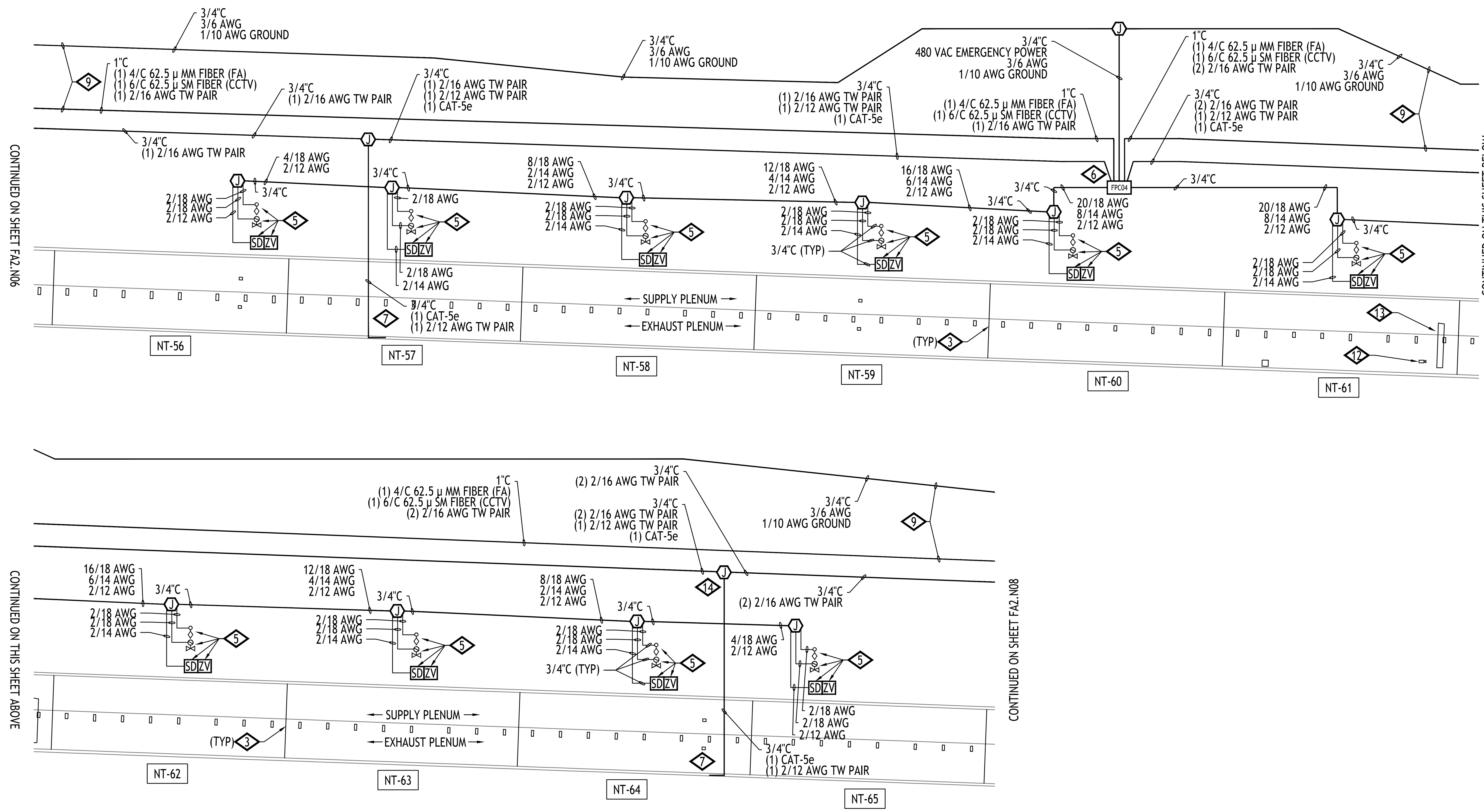
Revisions

Num	Description	Date

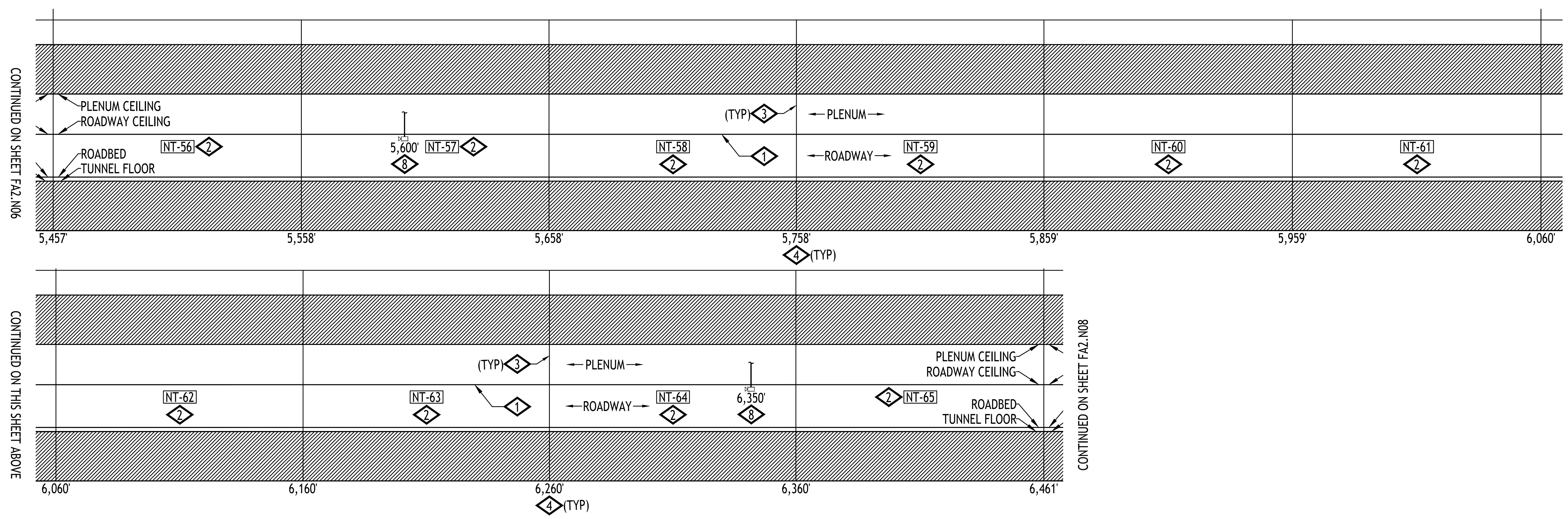
DRAWN BY: B.T.L. CHECKED BY: AEE.Jr

FIRE ALARM:
EISENHOWER TUNNEL
FP ZONES NT-46 TO NT-55

Drawing Number
FA2.N06



1 EISENHOWER (NORTH) TUNNEL - PLENUM PLAN - ZONES NT-56 THRU NT-65
SCALE: 1/32" = 1'-0"



2 EISENHOWER (NORTH) TUNNEL - ROADWAY SECTIONAL ELEVATION PLAN - SOUTH VIEW - ZONES NT-56 THRU NT-65
SCALE: 1/32" = 1'-0"

GENERAL NOTES:

1. IF FIELD CONDITIONS RESULT IN A CHANGE TO THE SHOP DRAWING INSTALLATION IN ANY WAY, CONTACT FAS SYSTEMS GROUP TO VERIFY PROPOSED CHANGES ARE COMPLIANT WITH NFPA 72 AND PROJECT REQUIREMENTS.
2. EACH CONTROL CABINET AND ADDRESSABLE DEVICE SHALL BEAR A TYPED LABEL INDICATING ITS ADDRESS OR DESIGNATION, WHICH CAN BE SEEN WITHOUT A LADDER OR LIFT. SMOKE AND HEAT DETECTORS SHALL HAVE THEIR LABEL ON ITS BASE.

DETAIL NOTES:

1. FIBER OPTIC LINEAR HEAT DETECTION (FOLHD) FIBER CABLE IN FOLHD HANGER. CABLE TO BE MOUNTED APPROXIMATELY 2 INCHES BELOW ROADWAY CEILING TILE. SEE SHEETS FA6.01, FA6.14 AND FA6.15.
2. DELUGE ZONE SIGNS MOUNTED AT MOST CENTER-POINT OF DELUGE ZONE AND +84" FROM WALKWAY FLOOR. SEE SHEET FA6.02.
3. DELUGE ZONE BOUNDARY.
4. DIMENSION INDICATED APPROXIMATE DISTANCE OF DELUGE ZONE BOUNDARY TO WEST END PORTAL.
5. DELUGE SPRINKLER SYSTEM EQUIPMENT LOCATED IN SUPPLY PLENUM. SEE FIRE PROTECTION SHEETS FOR EQUIPMENT LOCATIONS.
6. EQUIPMENT LOCATED IN SUPPLY PLENUM.
7. ROUTE CAMERA ETHERNET AND POWER RACEWAY AND CIRCUITRY IN A CONCEALED FASHION THRU EXISTING EXHAUST PLENUM OPENING TO BACKSIDE OF ROADWAY WALL TO WALL MOUNTED LOCATION.
8. MOUNT CCTV CAMERA TO ROADWAY WALL TILE ABOVE EXIT PATHWAY. SEE SHEET FA6.02. DIMENSION INDICATES APPROXIMATE DISTANCE OF CAMERA TO WEST PORTAL END.
9. MAINTAIN MAXIMUM SEPARATION POSSIBLE BETWEEN 480 VAC POWER AND FIRE ALARM RACEWAYS. SEE SHEETS FA6.14 AND FA6.15.
10. FIRE LOOP ISOLATION VALVE TAMPER. SEE FIRE PROTECTION SHEETS FOR EQUIPMENT LOCATIONS.
11. MOUNT AIR TEMPERATURE SENSOR INSIDE INSULATED VALVE ENCLOSURE (IVE), OF ASSOCIATED TUNNEL DELUGE ZONE.
12. EXISTING CCTV TRAFFIC CAMERA, SHOWN FOR REFERENCE PURPOSES, TO REMAIN.
13. EXISTING TRAFFIC CONTROL MESSAGE BOARD, SHOWN FOR REFERENCE PURPOSES, TO REMAIN. ROUTE FOLHD FIBER AND HANGER ABOVE THE MESSAGE BOARD. IT IS ACCEPTABLE TO RUN THE FOLHD CABLE WITHOUT THE HANGER WHERE THERE IS INSUFFICIENT CLEARANCE BETWEEN THE EXISTING MESSAGE BOARD AND THE EXISTING CEILING TILE, WHERE APPLICABLE. LIMIT THE FOLHD CABLE RUNS WITHOUT THE HANGER TO THE MINIMUM DISTANCE POSSIBLE TO CLEAR THE OBSTRUCTION.
14. LONGSPAN VLS-1N-L CAT5e EXTENDER LOCATED IN JUNCTION BOX AS SHOWN.

ADDRESSING		
03020456	FPC04	HI TEMP
03020457	FPC04	LO TEMP
03020458	FPC04	CCTV TROUBLE
03020459	FPC04	BPS TROUBLE

ADDRESSING		
03020377	NT-56	MANUAL INPUT
03020378	NT-56	DELUGE RELEASE
03020436	NT-56	WATER FLOW
03020437	NT-56	TAMPER
05020183	NT-56	PRIMARY ALARM
01030168	NT-56	SECONDARY ALARM

ADDRESSING		
03020383	NT-57	MANUAL INPUT
03020384	NT-57	DELUGE RELEASE
03020438	NT-57	WATER FLOW
03020439	NT-57	TAMPER
05020184	NT-57	PRIMARY ALARM
01030169	NT-57	SECONDARY ALARM

ADDRESSING		
03020389	NT-58	MANUAL INPUT
03020390	NT-58	DELUGE RELEASE
03020440	NT-58	WATER FLOW
03020441	NT-58	TAMPER
05020185	NT-58	PRIMARY ALARM
01030170	NT-58	SECONDARY ALARM

ADDRESSING		
03020395	NT-59	MANUAL INPUT
03020396	NT-59	DELUGE RELEASE
03020442	NT-59	WATER FLOW
03020443	NT-59	TAMPER
05020186	NT-59	PRIMARY ALARM
01030171	NT-59	SECONDARY ALARM

ADDRESSING		
03020401	NT-60	MANUAL INPUT
03020402	NT-60	DELUGE RELEASE
03020444	NT-60	WATER FLOW
03020445	NT-60	TAMPER
05020187	NT-60	PRIMARY ALARM
01030172	NT-60	SECONDARY ALARM

ADDRESSING		
03020407	NT-61	MANUAL INPUT
03020408	NT-61	DELUGE RELEASE
03020446	NT-61	WATER FLOW
03020447	NT-61	TAMPER
05020188	NT-61	PRIMARY ALARM
01030173	NT-61	SECONDARY ALARM

ADDRESSING		
03020413	NT-62	MANUAL INPUT
03020414	NT-62	DELUGE RELEASE
03020448	NT-62	WATER FLOW
03020449	NT-62	TAMPER
05020189	NT-62	PRIMARY ALARM
01030174	NT-62	SECONDARY ALARM

ADDRESSING		
03020419	NT-63	MANUAL INPUT
03020420	NT-63	DELUGE RELEASE
03020450	NT-63	WATER FLOW
03020451	NT-63	TAMPER
05020190	NT-63	PRIMARY ALARM
01030175	NT-63	SECONDARY ALARM

ADDRESSING		
03020425	NT-64	MANUAL INPUT
03020426	NT-64	DELUGE RELEASE
03020452	NT-64	WATER FLOW
03020453	NT-64	TAMPER
05020191	NT-64	PRIMARY ALARM
01030176	NT-64	SECONDARY ALARM

ADDRESSING		
03020431	NT-65	MANUAL INPUT
03020432	NT-65	DELUGE RELEASE
03020454	NT-65	WATER FLOW
03020455	NT-65	TAMPER
05020192	NT-65	PRIMARY ALARM
01030177	NT-65	SECONDARY ALARM

BARNARD EJMT TEAM

BARNARD · RONDINELLI life safety · BCER Engineering · Sturgeon Electric · Western States Fire Protection Co. · ILF Consulting Engineers

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions

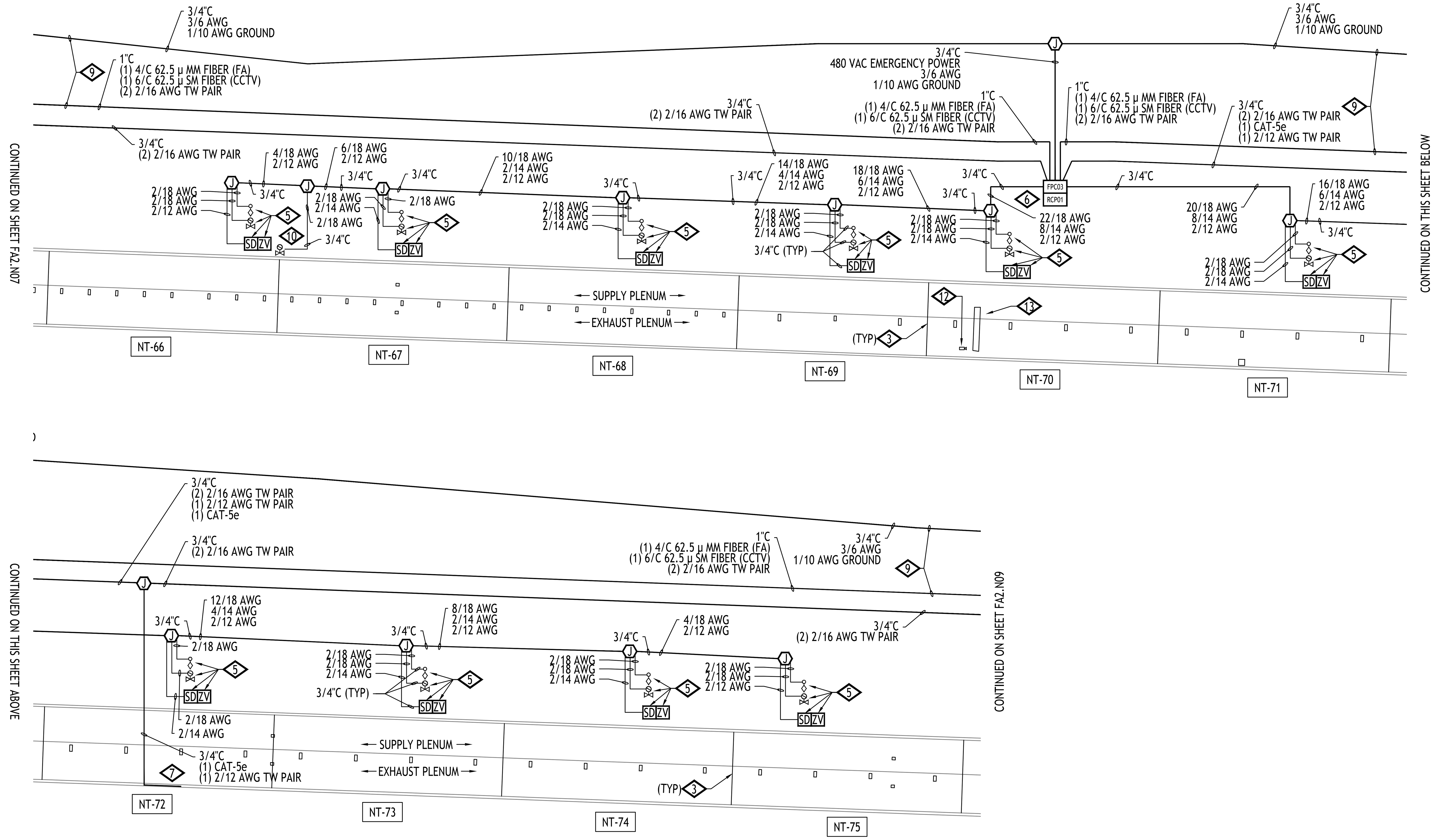
Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
EISENHOWER TUNNEL
FP ZONES NT-56 TO NT-65

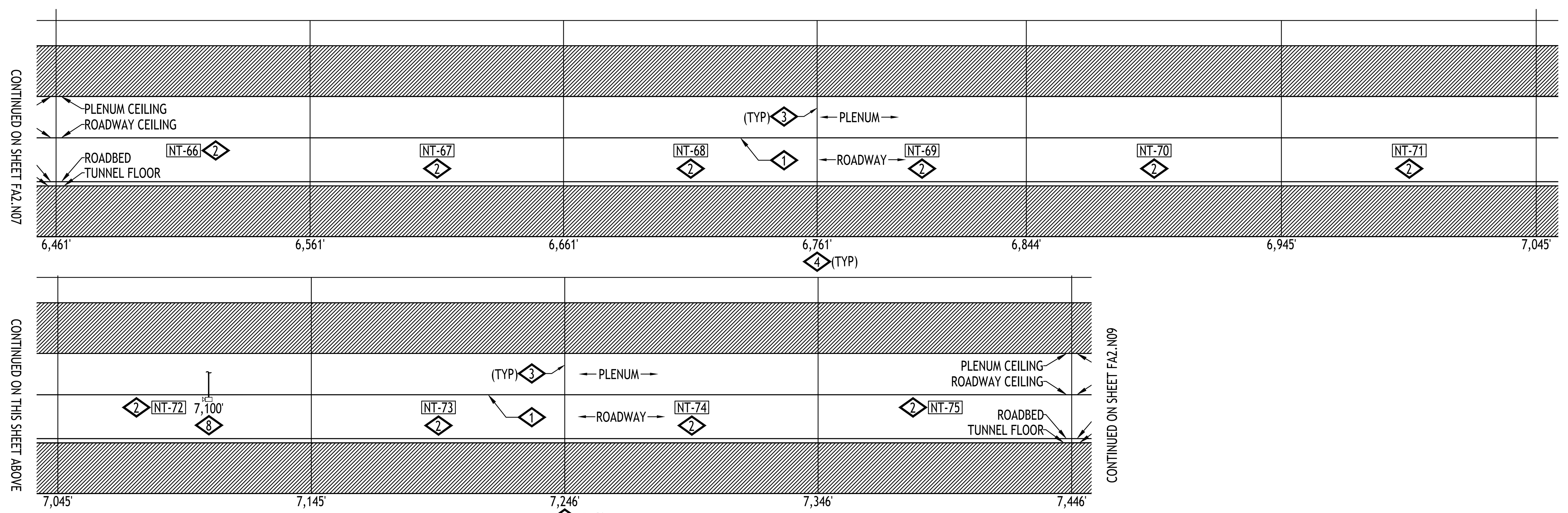
Drawing Number
FA2.N07

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE



1 EISENHOWER (NORTH) TUNNEL - PLENUM PLAN - ZONES NT-66 THRU NT-75

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



2 EISENHOWER (NORTH) TUNNEL - ROADWAY SECTIONAL ELEVATION PLAN - SOUTH VIEW - ZONES NT-66 THRU NT-75

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

GENERAL NOTES:

1. IF FIELD CONDITIONS RESULT IN A CHANGE TO THE SHOP DRAWING INSTALLATION IN ANY WAY, CONTACT FAS SYSTEMS GROUP TO VERIFY PROPOSED CHANGES ARE COMPLIANT WITH NFPA 72 AND PROJECT REQUIREMENTS.

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DETAIL NOTES:

1. FIBER OPTIC LINEAR HEAT DETECTION (FOLHD) FIBER CABLE IN FOLHD HANGER. CABLE TO BE MOUNTED APPROXIMATELY 2 INCHES BELOW ROADWAY CEILING TILE. SEE SHEETS FA6.01, FA6.14 AND FA6.15.
2. DELUGE ZONE SIGNS MOUNTED AT MOST CENTER-POINT OF DELUGE ZONE AND +84" FROM WALKWAY FLOOR. SEE SHEET FA6.02.
3. DELUGE ZONE BOUNDARY.
4. DIMENSION INDICATED APPROXIMATE DISTANCE OF DELUGE ZONE BOUNDARY TO WEST END PORTAL.
5. DELUGE SPRINKLER SYSTEM EQUIPMENT LOCATED IN SUPPLY PLENUM. SEE FIRE PROTECTION SHEETS FOR EQUIPMENT LOCATIONS.
6. EQUIPMENT LOCATED IN SUPPLY PLENUM.
7. ROUTE CAMERA ETHERNET AND POWER RACEWAY AND CIRCUITRY IN A CONCEALED FASHION THRU EXISTING EXHAUST PLENUM OPENING TO BACKSIDE OF ROADWAY WALL TO WALL MOUNTED LOCATION.
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9. MAINTAIN MAXIMUM SEPARATION POSSIBLE BETWEEN 480 VAC POWER AND FIRE ALARM RACEWAYS. SEE SHEETS FA6.14 AND FA6.15.
10. FIRE LOOP ISOLATION VALVE TAMPER. SEE FIRE PROTECTION SHEETS FOR EQUIPMENT LOCATIONS.
11. MOUNT AIR TEMPERATURE SENSOR INSIDE INSULATED VALVE ENCLOSURE (IVE), OF ASSOCIATED TUNNEL DELUGE ZONE.
12. EXISTING CCTV TRAFFIC CAMERA, SHOWN FOR REFERENCE PURPOSES, TO REMAIN.
13. EXISTING TRAFFIC CONTROL MESSAGE BOARD, SHOWN FOR REFERENCE PURPOSES, TO REMAIN. ROUTE FOLHD FIBER AND HANGER ABOVE THE MESSAGE BOARD. IT IS ACCEPTABLE TO RUN THE FOLHD CABLE WITHOUT THE HANGER WHERE THERE IS INSUFFICIENT CLEARANCE BETWEEN THE EXISTING MESSAGE BOARD AND THE EXISTING CEILING TILE, WHERE APPLICABLE. LIMIT THE FOLHD CABLE RUNS WITHOUT THE HANGER TO THE MINIMUM DISTANCE POSSIBLE TO CLEAR THE OBSTRUCTION.

ADDRESSING		
03030231	RCP01	HI TEMP
03030232	RCP01	LO TEMP
03030206	FPC03	HI TEMP
03030207	FPC03	LO TEMP
03030208	FPC03	CCTV TROUBLE
03030209	FPC03	BPS TROUBLE

ADDRESSING		
03030127	NT-66	MANUAL INPUT
03030128	NT-66	DELUGE RELEASE
03030186	NT-66	WATER FLOW
03030187	NT-66	TAMPER
05020193	NT-66	PRIMARY ALARM
01030178	NT-66	SECONDARY ALARM
03030210	NT-66	ISO VALVE TAMPER

ADDRESSING		
03030133	NT-67	MANUAL INPUT
03030134	NT-67	DELUGE RELEASE
03030188	NT-67	WATER FLOW
03030189	NT-67	TAMPER
05020194	NT-67	PRIMARY ALARM
01030179	NT-67	SECONDARY ALARM

ADDRESSING		
03030139	NT-68	MANUAL INPUT
03030140	NT-68	DELUGE RELEASE
03030190	NT-68	WATER FLOW
03030191	NT-68	TAMPER
05020195	NT-68	PRIMARY ALARM
01030180	NT-68	SECONDARY ALARM

ADDRESSING		
03030145	NT-69	MANUAL INPUT
03030146	NT-69	DELUGE RELEASE
03030192	NT-69	WATER FLOW
03030193	NT-69	TAMPER
05020196	NT-69	PRIMARY ALARM
01030181	NT-69	SECONDARY ALARM

ADDRESSING		
03030151	NT-70	MANUAL INPUT
03030152	NT-70	DELUGE RELEASE
03030194	NT-70	WATER FLOW
03030195	NT-70	TAMPER
05020197	NT-70	PRIMARY ALARM
01030182	NT-70	SECONDARY ALARM

ADDRESSING		
03030157	NT-71	MANUAL INPUT
03030158	NT-71	DELUGE RELEASE
03030196	NT-71	WATER FLOW
03030197	NT-71	TAMPER
05020198	NT-71	PRIMARY ALARM
01030183	NT-71	SECONDARY ALARM

ADDRESSING		
03030163	NT-72	MANUAL INPUT
03030164	NT-72	DELUGE RELEASE
03030198	NT-72	WATER FLOW
03030199	NT-72	TAMPER
05020199	NT-72	PRIMARY ALARM
01030184	NT-72	SECONDARY ALARM

ADDRESSING		
03030169	NT-73	MANUAL INPUT
03030170	NT-73	DELUGE RELEASE
03030200	NT-73	WATER FLOW
03030201	NT-73	TAMPER
05020200	NT-73	PRIMARY ALARM
01030185	NT-73	SECONDARY ALARM

ADDRESSING		
03030175	NT-74	MANUAL INPUT
03030176	NT-74	DELUGE RELEASE
03030202	NT-74	WATER FLOW
03030203	NT-74	TAMPER
05020201	NT-74	PRIMARY ALARM
01030186	NT-74	SECONDARY ALARM

ADDRESSING		
03030181	NT-75	MANUAL INPUT
03030182	NT-75	DELUGE RELEASE
03030204	NT-75	WATER FLOW
03030205	NT-75	TAMPER
05020202	NT-75	PRIMARY ALARM
01030187	NT-75	SECONDARY ALARM

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

BARNARD EJMT TEAM

EISENHOWER/JOHNSON MEMORIAL TUNNEL

FIXED FIRE SUPPRESSION SYSTEM

DESIGN BUILD PROJECT

Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

Revisions

Num	Description	Date

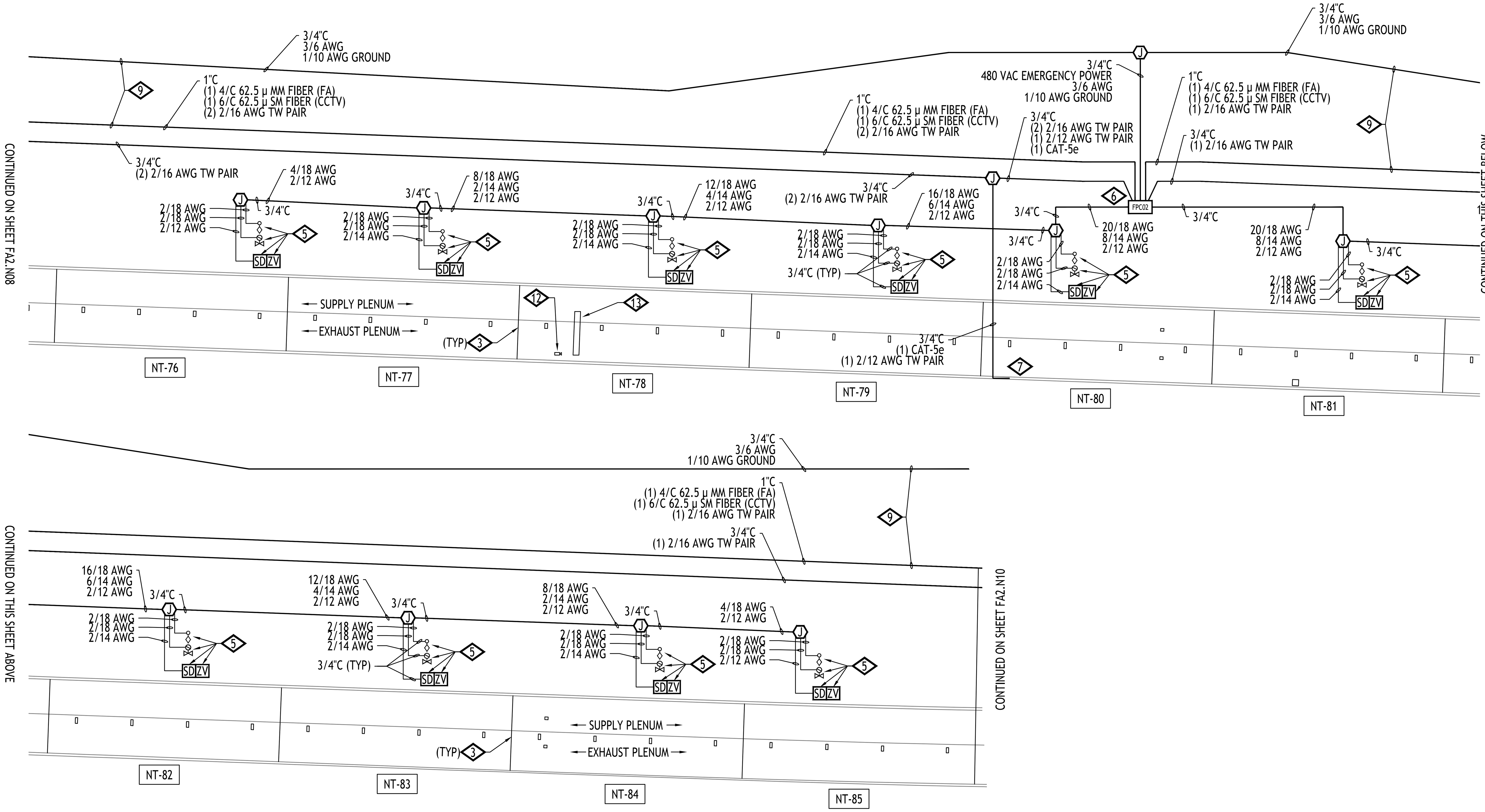
DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
EISENHOWER TUNNEL
FP ZONES NT-66 TO NT-75

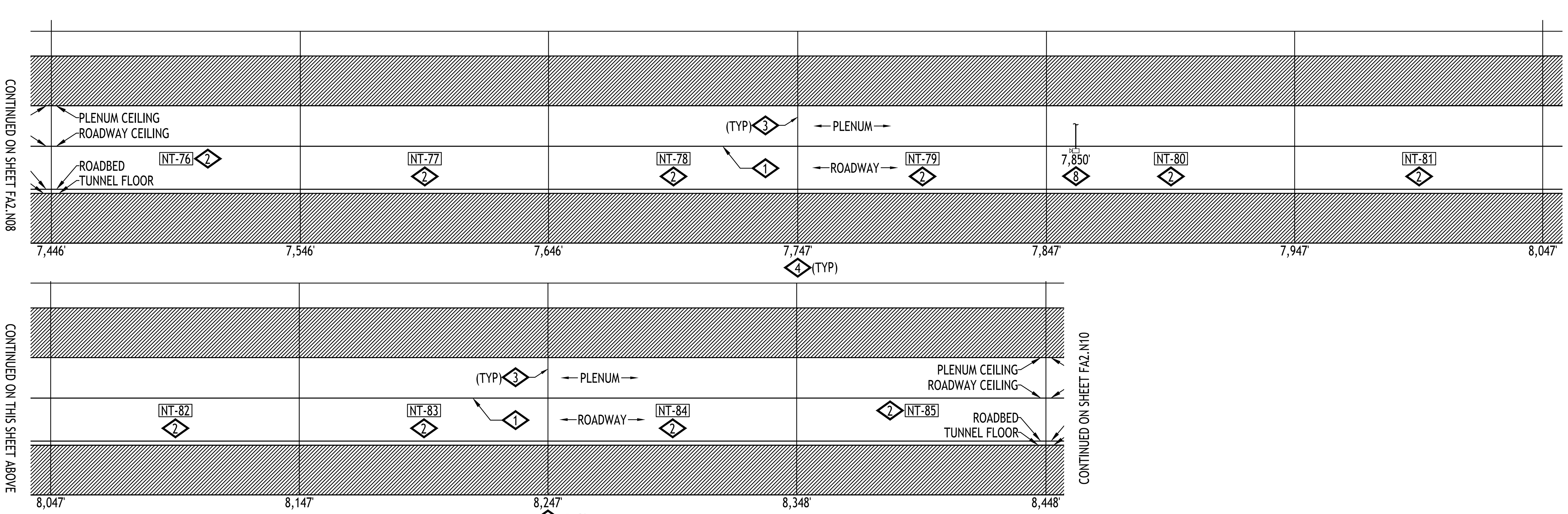
Drawing Number

FA2.N08

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE



1 EISENHOWER (NORTH) TUNNEL - PLENUM PLAN - ZONES NT-76 THRU NT-85
SCALE: 1/32" = 1'-0"



2 EISENHOWER (NORTH) TUNNEL - ROADWAY SECTIONAL ELEVATION PLAN - SOUTH VIEW - ZONES NT-76 THRU NT-85
SCALE: 1/32" = 1'-0"

GENERAL NOTES:

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DETAIL NOTES:

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2. DELUGE ZONE SIGNS MOUNTED AT MOST CENTER-POINT OF DELUGE ZONE AND +84" FROM WALKWAY FLOOR. SEE SHEET FA6.02.
3. DELUGE ZONE BOUNDARY.
4. DIMENSION INDICATED APPROXIMATE DISTANCE OF DELUGE ZONE BOUNDARY TO WEST END PORTAL.
5. DELUGE SPRINKLER SYSTEM EQUIPMENT LOCATED IN SUPPLY PLENUM. SEE FIRE PROTECTION SHEETS FOR EQUIPMENT LOCATIONS.
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9. MAINTAIN MAXIMUM SEPARATION POSSIBLE BETWEEN 480 VAC POWER AND FIRE ALARM RACEWAYS. SEE SHEETS FA6.14 AND FA6.15.
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13. EXISTING TRAFFIC CONTROL MESSAGE BOARD, SHOWN FOR REFERENCE PURPOSES, TO REMAIN. ROUTE FOLHD FIBER AND HANGER ABOVE THE MESSAGE BOARD. IT IS ACCEPTABLE TO RUN THE FOLHD CABLE WITHOUT THE HANGER WHERE THERE IS INSUFFICIENT CLEARANCE BETWEEN THE EXISTING MESSAGE BOARD AND THE EXISTING CEILING TILE, WHERE APPLICABLE. LIMIT THE FOLHD CABLE RUNS WITHOUT THE HANGER TO THE MINIMUM DISTANCE POSSIBLE TO CLEAR THE OBSTRUCTION.

ADDRESSING		
03030456	FPC02	HI TEMP
03030457	FPC02	LO TEMP
03030458	FPC02	CCTV TROUBLE
03030459	FPC02	BPS TROUBLE

ADDRESSING		
03030377	NT-76	MANUAL INPUT
03030378	NT-76	DELUGE RELEASE
03030436	NT-76	WATER FLOW
03030437	NT-76	TAMPER
05020203	NT-76	PRIMARY ALARM
01030188	NT-76	SECONDARY ALARM

ADDRESSING		
03030383	NT-77	MANUAL INPUT
03030384	NT-77	DELUGE RELEASE
03030438	NT-77	WATER FLOW
03030439	NT-77	TAMPER
05020204	NT-77	PRIMARY ALARM
01030189	NT-77	SECONDARY ALARM

ADDRESSING		
03030389	NT-78	MANUAL INPUT
03030390	NT-78	DELUGE RELEASE
03030440	NT-78	WATER FLOW
03030441	NT-78	TAMPER
05020205	NT-78	PRIMARY ALARM
01030190	NT-78	SECONDARY ALARM

ADDRESSING		
03030395	NT-79	MANUAL INPUT
03030396	NT-79	DELUGE RELEASE
03030442	NT-79	WATER FLOW
03030443	NT-79	TAMPER
05020206	NT-79	PRIMARY ALARM
01030191	NT-79	SECONDARY ALARM

ADDRESSING		
03030401	NT-80	MANUAL INPUT
03030402	NT-80	DELUGE RELEASE
03030444	NT-80	WATER FLOW
03030445	NT-80	TAMPER
05020207	NT-80	PRIMARY ALARM
01030192	NT-80	SECONDARY ALARM

ADDRESSING		
03030407	NT-81	MANUAL INPUT
03030408	NT-81	DELUGE RELEASE
03030446	NT-81	WATER FLOW
03030447	NT-81	TAMPER
05020208	NT-81	PRIMARY ALARM
01030193	NT-81	SECONDARY ALARM

ADDRESSING		
03030413	NT-82	MANUAL INPUT
03030414	NT-82	DELUGE RELEASE
03030448	NT-82	WATER FLOW
03030449	NT-82	TAMPER
05020209	NT-82	PRIMARY ALARM
01030194	NT-82	SECONDARY ALARM

ADDRESSING		
03030419	NT-83	MANUAL INPUT
03030420	NT-83	DELUGE RELEASE
03030450	NT-83	WATER FLOW
03030451	NT-83	TAMPER
05020210	NT-83	PRIMARY ALARM
01030195	NT-83	SECONDARY ALARM

ADDRESSING		
03030425	NT-84	MANUAL INPUT
03030426	NT-84	DELUGE RELEASE
03030452	NT-84	WATER FLOW
03030453	NT-84	TAMPER
05020211	NT-84	PRIMARY ALARM
01030196	NT-84	SECONDARY ALARM

ADDRESSING		
03030431	NT-85	MANUAL INPUT
03030432	NT-85	DELUGE RELEASE
03030454	NT-85	WATER FLOW
03030455	NT-85	TAMPER
05020212	NT-85	PRIMARY ALARM
01030197	NT-85	SECONDARY ALARM

BARNARD EJMT TEAM

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions
Num | Description | Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
EISENHOWER TUNNEL
FP ZONES NT-76 TO NT-85

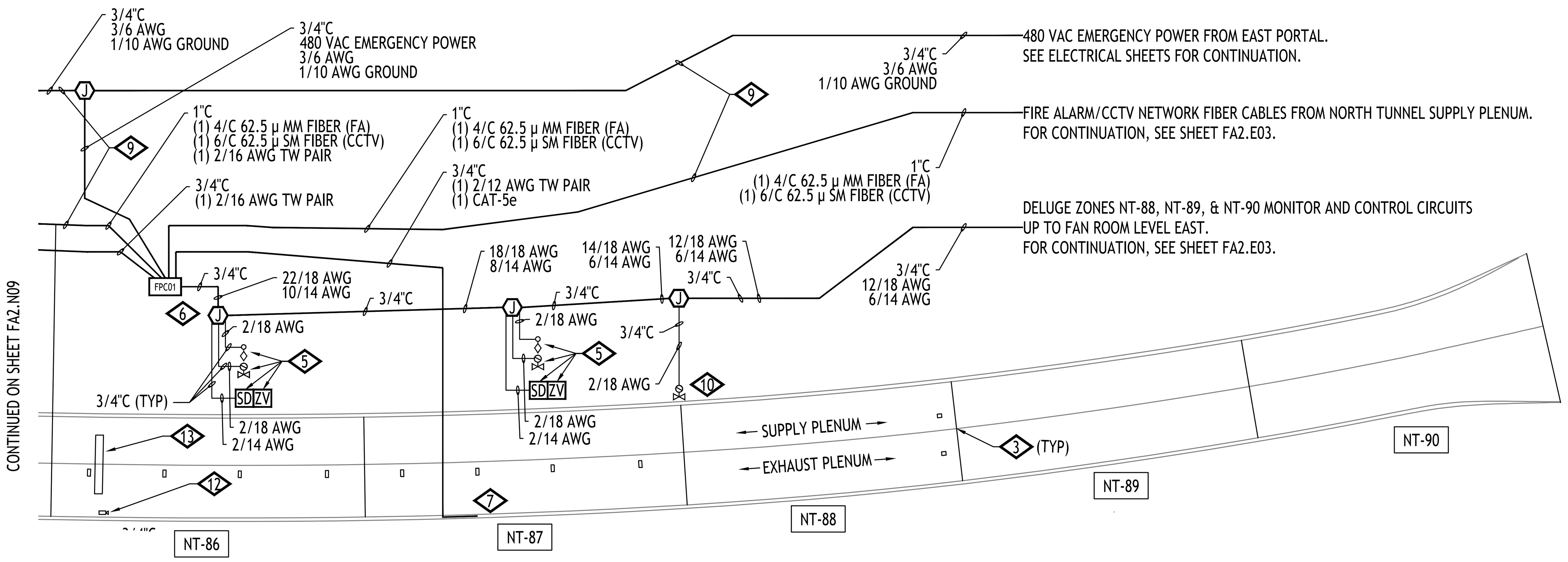
Drawing Number
FA2.N09

GENERAL NOTES:

1. IF FIELD CONDITIONS RESULT IN A CHANGE TO THE SHOP DRAWING INSTALLATION IN ANY WAY, CONTACT FAS SYSTEMS GROUP TO VERIFY PROPOSED CHANGES ARE COMPLIANT WITH NFPA 72 AND PROJECT REQUIREMENTS.
2. EACH CONTROL CABINET AND ADDRESSABLE DEVICE SHALL BEAR A TYPED LABEL INDICATING ITS ADDRESS OR DESIGNATION, WHICH CAN BE SEEN WITHOUT A LADDER OR LIFT. SMOKE AND HEAT DETECTORS SHALL HAVE THEIR LABEL ON ITS BASE.

DETAIL NOTES:

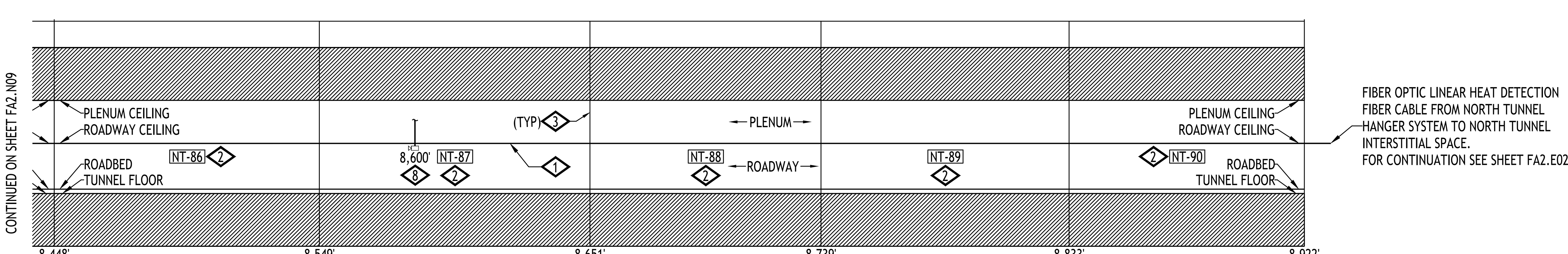
1. FIBER OPTIC LINEAR HEAT DETECTION (FOLHD) FIBER CABLE IN FOLHD HANGER. CABLE TO BE MOUNTED APPROXIMATELY 2 INCHES BELOW ROADWAY CEILING TILE. SEE SHEETS FA6.01, FA6.14 AND FA6.15.
2. DELUGE ZONE SIGNS MOUNTED AT MOST CENTER-POINT OF DELUGE ZONE AND +84" FROM WALKWAY FLOOR. SEE SHEET FA6.02.
3. DELUGE ZONE BOUNDARY.
4. DIMENSION INDICATED APPROXIMATE DISTANCE OF DELUGE ZONE BOUNDARY TO WEST END PORTAL.
5. DELUGE SPRINKLER SYSTEM EQUIPMENT LOCATED IN SUPPLY PLENUM. SEE FIRE PROTECTION SHEETS FOR EQUIPMENT LOCATIONS.
6. EQUIPMENT LOCATED IN SUPPLY PLENUM.
7. ROUTE CAMERA ETHERNET AND POWER RACEWAY AND CIRCUITRY IN A CONCEALED FASHION THRU EXISTING EXHAUST PLENUM OPENING TO BACKSIDE OF ROADWAY WALL TO WALL MOUNTED LOCATION.
8. MOUNT CCTV CAMERA TO ROADWAY WALL TILE ABOVE EXIT PATHWAY. SEE SHEET FA6.02. DIMENSION INDICATES APPROXIMATE DISTANCE OF CAMERA TO WEST PORTAL END.
9. MAINTAIN MAXIMUM SEPARATION POSSIBLE BETWEEN 480 VAC POWER AND FIRE ALARM RACEWAYS. SEE SHEETS FA6.14 AND FA6.15.
10. FIRE LOOP ISOLATION VALVE TAMPER. SEE FIRE PROTECTION SHEETS FOR EQUIPMENT LOCATIONS.
11. MOUNT AIR TEMPERATURE SENSOR INSIDE INSULATED VALVE ENCLOSURE (IVE), OF ASSOCIATED TUNNEL DELUGE ZONE.
12. EXISTING CCTV TRAFFIC CAMERA, SHOWN FOR REFERENCE PURPOSES, TO REMAIN.
13. EXISTING TRAFFIC CONTROL MESSAGE BOARD, SHOWN FOR REFERENCE PURPOSES, TO REMAIN. ROUTE FOLHD FIBER AND HANGER ABOVE THE MESSAGE BOARD. IT IS ACCEPTABLE TO RUN THE FOLHD CABLE WITHOUT THE HANGER WHERE THERE IS INSUFFICIENT CLEARANCE BETWEEN THE EXISTING MESSAGE BOARD AND THE EXISTING CEILING TILE, WHERE APPLICABLE. LIMIT THE FOLHD CABLE RUNS WITHOUT THE HANGER TO THE MINIMUM DISTANCE POSSIBLE TO CLEAR THE OBSTRUCTION.



N

1 EISENHOWER (NORTH) TUNNEL - PLENUM PLAN - ZONES NT-86 THRU NT-90
SCALE: 1/32" = 1'-0"

32' 16' 0 32'
SCALE:1/32"=1'-0"



FIBER OPTIC LINEAR HEAT DETECTION FIBER CABLE FROM NORTH TUNNEL HANGER SYSTEM TO NORTH TUNNEL INTERSTITIAL SPACE.
FOR CONTINUATION SEE SHEET FA2.E02.

N

2 EISENHOWER (NORTH) TUNNEL - ROADWAY SECTIONAL ELEVATION PLAN - SOUTH VIEW - ZONES NT-86 THRU NT-90
SCALE: 1/32" = 1'-0"

32' 16' 0 32'
SCALE:1/32"=1'-0"

ADDRESSING		
03040166	FPC01	HI TEMP
03040167	FPC01	LO TEMP
03040168	FPC01	CCTV TROUBLE
03040169	FPC01	BPS TROUBLE

ADDRESSING		
03040127	NT-86	MANUAL INPUT
03040128	NT-86	DELUGE RELEASE
03040156	NT-86	WATER FLOW
03040157	NT-86	TAMPER
05020213	NT-86	PRIMARY ALARM
01030198	NT-86	SECONDARY ALARM

ADDRESSING		
03040133	NT-87	MANUAL INPUT
03040134	NT-87	DELUGE RELEASE
03040158	NT-87	WATER FLOW
03040159	NT-87	TAMPER
05020214	NT-87	PRIMARY ALARM
01030199	NT-87	SECONDARY ALARM
03040170	NT-87	ISO VALVE TAMPER

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

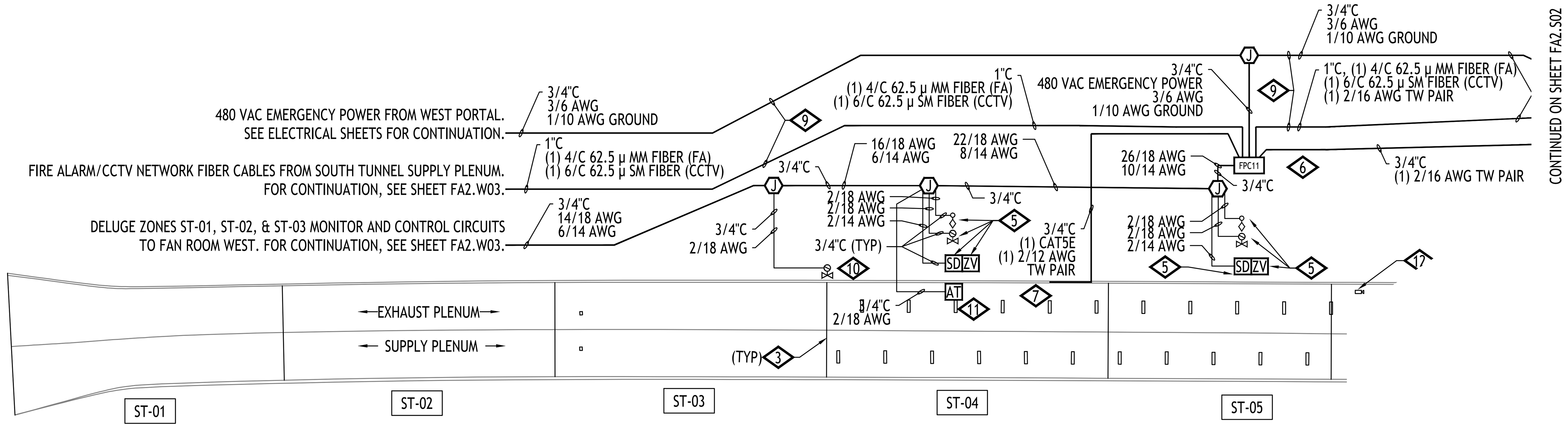
Revisions		
Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
EISENHOWER TUNNEL
FP ZONES NT-86 TO NT-90

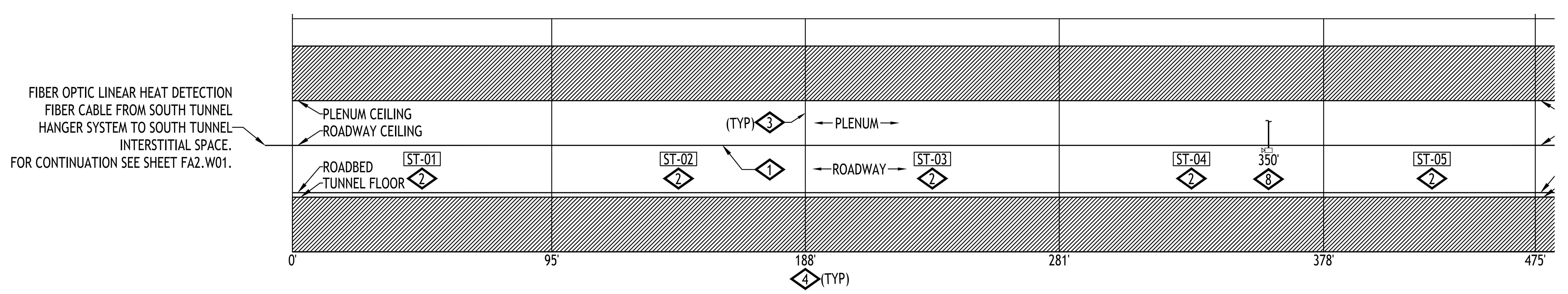
Drawing Number
FA2.N10

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE



JOHNSON (SOUTH) TUNNEL - PLENUM PLAN - ZONES ST-01 THRU ST-05

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



JOHNSON (SOUTH) TUNNEL - ROADWAY SECTIONAL ELEVATION PLAN - NORTH VIEW - ZONES ST-01 THRU ST-05

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

GENERAL NOTES:

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DETAIL NOTES:

1. FIBER OPTIC LINEAR HEAT DETECTION (FOLHD) FIBER CABLE IN FOLHD HANGER. CABLE TO BE MOUNTED APPROXIMATELY 2 INCHES BELOW ROADWAY CEILING TILE. SEE SHEETS FA6.01, FA6.14 AND FA6.15.
2. DELUGE ZONE SIGNS MOUNTED AT MOST CENTER-POINT OF DELUGE ZONE AND +84" FROM WALKWAY FLOOR. SEE SHEET FA6.02.
3. DELUGE ZONE BOUNDARY.
4. DIMENSION INDICATED APPROXIMATE DISTANCE OF DELUGE ZONE BOUNDARY TO WEST END PORTAL.
5. DELUGE SPRINKLER SYSTEM EQUIPMENT LOCATED IN SUPPLY PLENUM. SEE FIRE PROTECTION SHEETS FOR EQUIPMENT LOCATIONS.
6. EQUIPMENT LOCATED IN SUPPLY PLENUM.
7. ROUTE CAMERA ETHERNET AND POWER RACEWAY AND CIRCUITRY IN A CONCEALED FASHION THRU EXISTING EXHAUST PLENUM OPENING TO BACKSIDE OF ROADWAY WALL TO WALL MOUNTED LOCATION.
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9. MAINTAIN MAXIMUM SEPARATION POSSIBLE BETWEEN 480 VAC POWER AND FIRE ALARM RACEWAYS. SEE SHEETS FA6.14 AND FA6.15.
10. FIRE LOOP ISOLATION VALVE TAMPER. SEE FIRE PROTECTION SHEETS FOR EQUIPMENT LOCATIONS.
11. MOUNT AIR TEMPERATURE SENSOR INSIDE INSULATED VALVE ENCLOSURE (IVE), OF ASSOCIATED TUNNEL DELUGE ZONE.
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ADDRESSING		
06020166	FPC11	HI TEMP
06020167	FPC11	LO TEMP
06020168	FPC11	CCTV TROUBLE
06020169	FPC11	BPS TROUBLE

ADDRESSING		
06020145	ST-04	MANUAL INPUT
06020146	ST-04	DELUGE RELEASE
06020162	ST-04	WATER FLOW
06020163	ST-04	TAMPER
01020129	ST-04	PRIMARY ALARM
05020221	ST-04	SECONDARY ALARM
06020170	ST-04	IVE LOW TEMP
06020172	ST-04	ISO VALVE TAMPER

ADDRESSING		
06020151	ST-05	MANUAL INPUT
06020152	ST-05	DELUGE RELEASE
06020164	ST-05	WATER FLOW
06020165	ST-05	TAMPER
01020130	ST-05	PRIMARY ALARM
05020222	ST-05	SECONDARY ALARM

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EISENHOWER/JOHNSON MEMORIAL TUNNEL

FIXED FIRE SUPPRESSION SYSTEM DESIGN BUILD PROJECT

Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

Revisions: Num | Description | Date

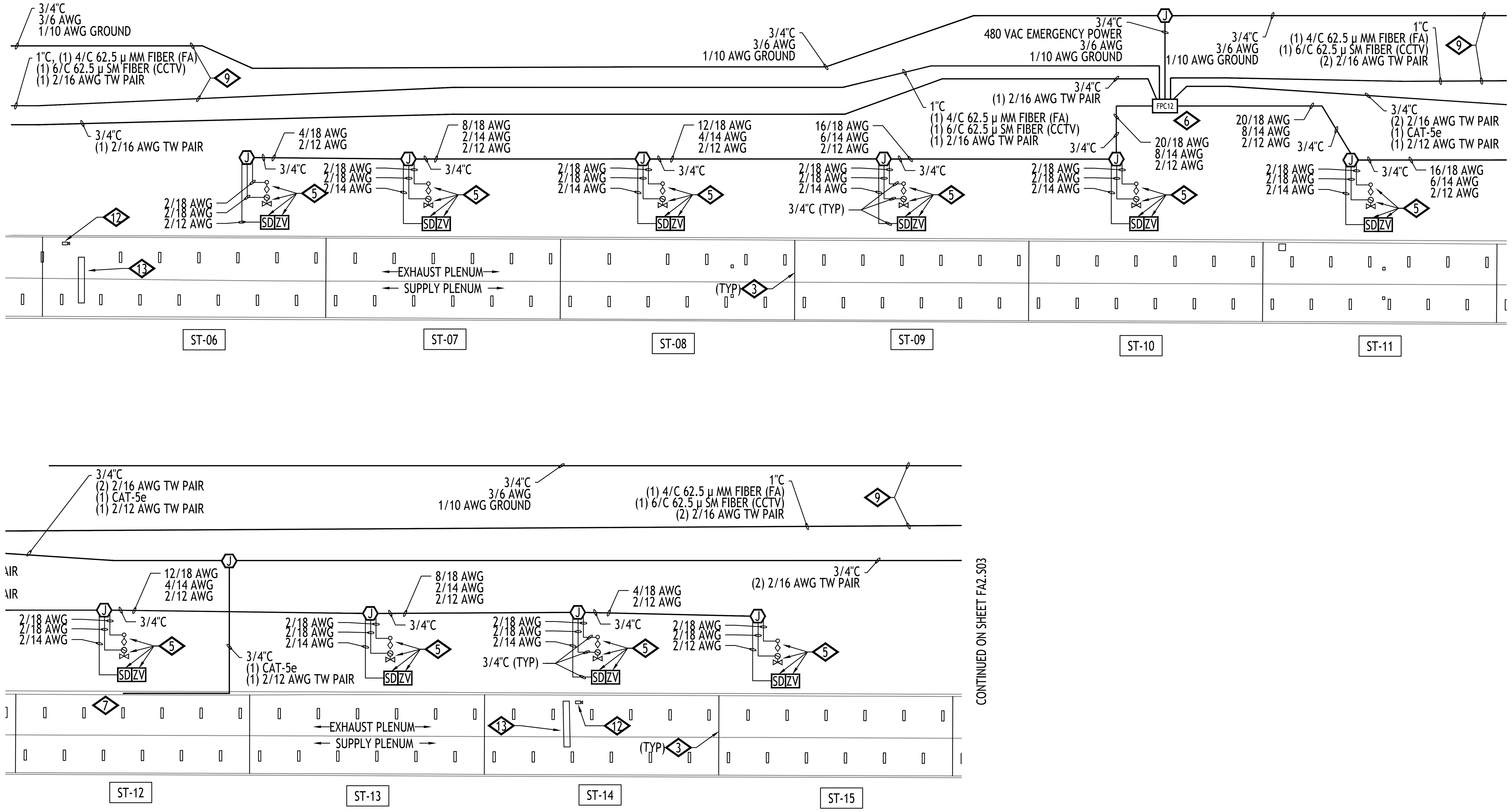
DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM: JOHNSON TUNNEL FP ZONES ST-01 TO ST-05

Drawing Number

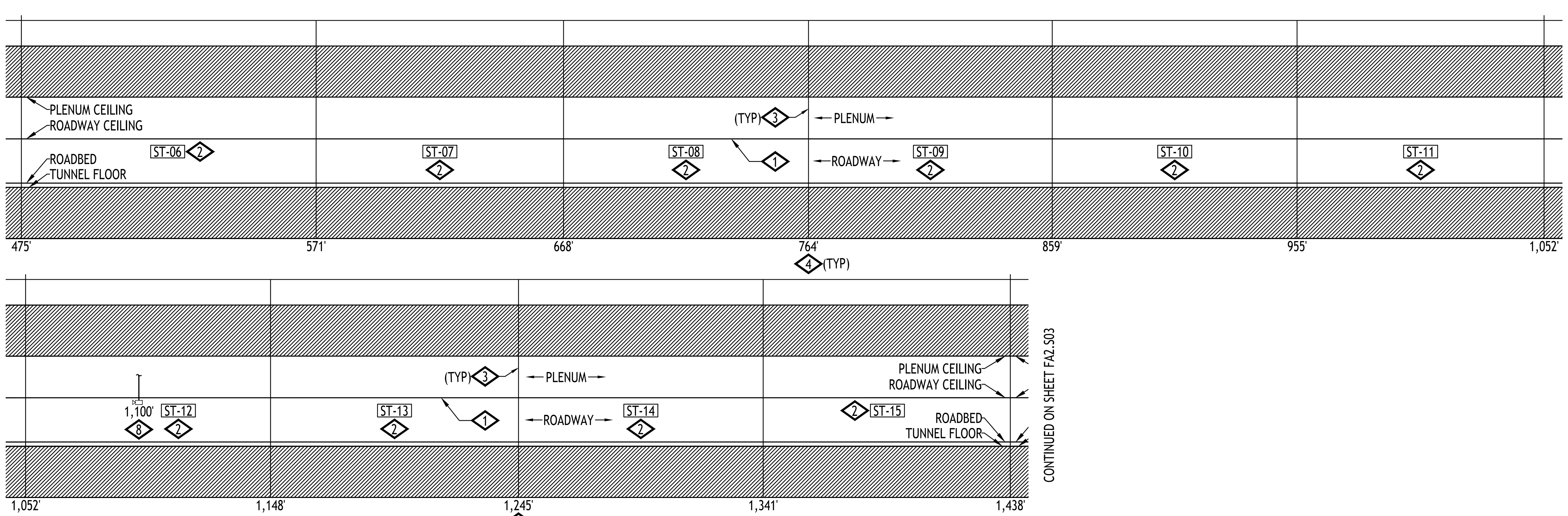
FA2.S01

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE



1 JOHNSON (SOUTH) TUNNEL - PLENUM PLAN - ZONES ST-06 THRU ST-15

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



2 JOHNSON (SOUTH) TUNNEL - ROADWAY SECTIONAL ELEVATION PLAN - NORTH VIEW - ZONES ST-06 THRU ST-15

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

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2. DELUGE ZONE SIGNS MOUNTED AT MOST CENTER-POINT OF DELUGE ZONE AND +84" FROM WALKWAY FLOOR. SEE SHEET FA6.02.
3. DELUGE ZONE BOUNDARY.
4. DIMENSION INDICATED APPROXIMATE DISTANCE OF DELUGE ZONE BOUNDARY TO WEST END PORTAL.
5. DELUGE SPRINKLER SYSTEM EQUIPMENT LOCATED IN SUPPLY PLENUM. SEE FIRE PROTECTION SHEETS FOR EQUIPMENT LOCATIONS.
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ADDRESSING		
06020456	FPC12	HI TEMP
06020457	FPC12	LO TEMP
06020458	FPC12	CCTV TROUBLE
06020459	FPC12	BPS TROUBLE

ADDRESSING		
06020377	ST-06	MANUAL INPUT
06020378	ST-06	DELUGE RELEASE
06020436	ST-06	WATER FLOW
06020437	ST-06	TAMPER
01020131	ST-06	PRIMARY ALARM
05020223	ST-06	SECONDARY ALARM

ADDRESSING		
06020383	ST-07	MANUAL INPUT
06020384	ST-07	DELUGE RELEASE
06020438	ST-07	WATER FLOW
06020439	ST-07	TAMPER
01020132	ST-07	PRIMARY ALARM
05020224	ST-07	SECONDARY ALARM

ADDRESSING		
06020389	ST-08	MANUAL INPUT
06020390	ST-08	DELUGE RELEASE
06020440	ST-08	WATER FLOW
06020441	ST-08	TAMPER
01030133	ST-08	PRIMARY ALARM
05020225	ST-08	SECONDARY ALARM

ADDRESSING		
06020395	ST-09	MANUAL INPUT
06020396	ST-09	DELUGE RELEASE
06020442	ST-09	WATER FLOW
06020443	ST-09	TAMPER
01030134	ST-09	PRIMARY ALARM
05020226	ST-09	SECONDARY ALARM

ADDRESSING		
06020401	ST-10	MANUAL INPUT
06020402	ST-10	DELUGE RELEASE
06020444	ST-10	WATER FLOW
06020445	ST-10	TAMPER
01030135	ST-10	PRIMARY ALARM
05020227	ST-10	SECONDARY ALARM

ADDRESSING		
06020407	ST-11	MANUAL INPUT
06020408	ST-11	DELUGE RELEASE
06020446	ST-11	WATER FLOW
06020447	ST-11	TAMPER
01030138	ST-11	PRIMARY ALARM
05020228	ST-11	SECONDARY ALARM

ADDRESSING		
06020413	ST-12	MANUAL INPUT
06020414	ST-12	DELUGE RELEASE
06020448	ST-12	WATER FLOW
06020449	ST-12	TAMPER
01030139	ST-12	PRIMARY ALARM
05020229	ST-12	SECONDARY ALARM

ADDRESSING		
06020419	ST-13	MANUAL INPUT
06020420	ST-13	DELUGE RELEASE
06020450	ST-13	WATER FLOW
06020451	ST-13	TAMPER
01030140	ST-13	PRIMARY ALARM
05020230	ST-13	SECONDARY ALARM

ADDRESSING		
06020425	ST-14	MANUAL INPUT
06020426	ST-14	DELUGE RELEASE
06020452	ST-14	WATER FLOW
06020453	ST-14	TAMPER
01030141	ST-14	PRIMARY ALARM
05020231	ST-14	SECONDARY ALARM

ADDRESSING		
06020431	ST-15	MANUAL INPUT
06020432	ST-15	DELUGE RELEASE
06020454	ST-15	WATER FLOW
06020455	ST-15	TAMPER
01030142	ST-15	PRIMARY ALARM
05020232	ST-15	SECONDARY ALARM

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EISENHOWER/JOHNSON MEMORIAL TUNNEL

FIXED FIRE SUPPRESSION SYSTEM DESIGN BUILD PROJECT

Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

Revisions

Num	Description	Date

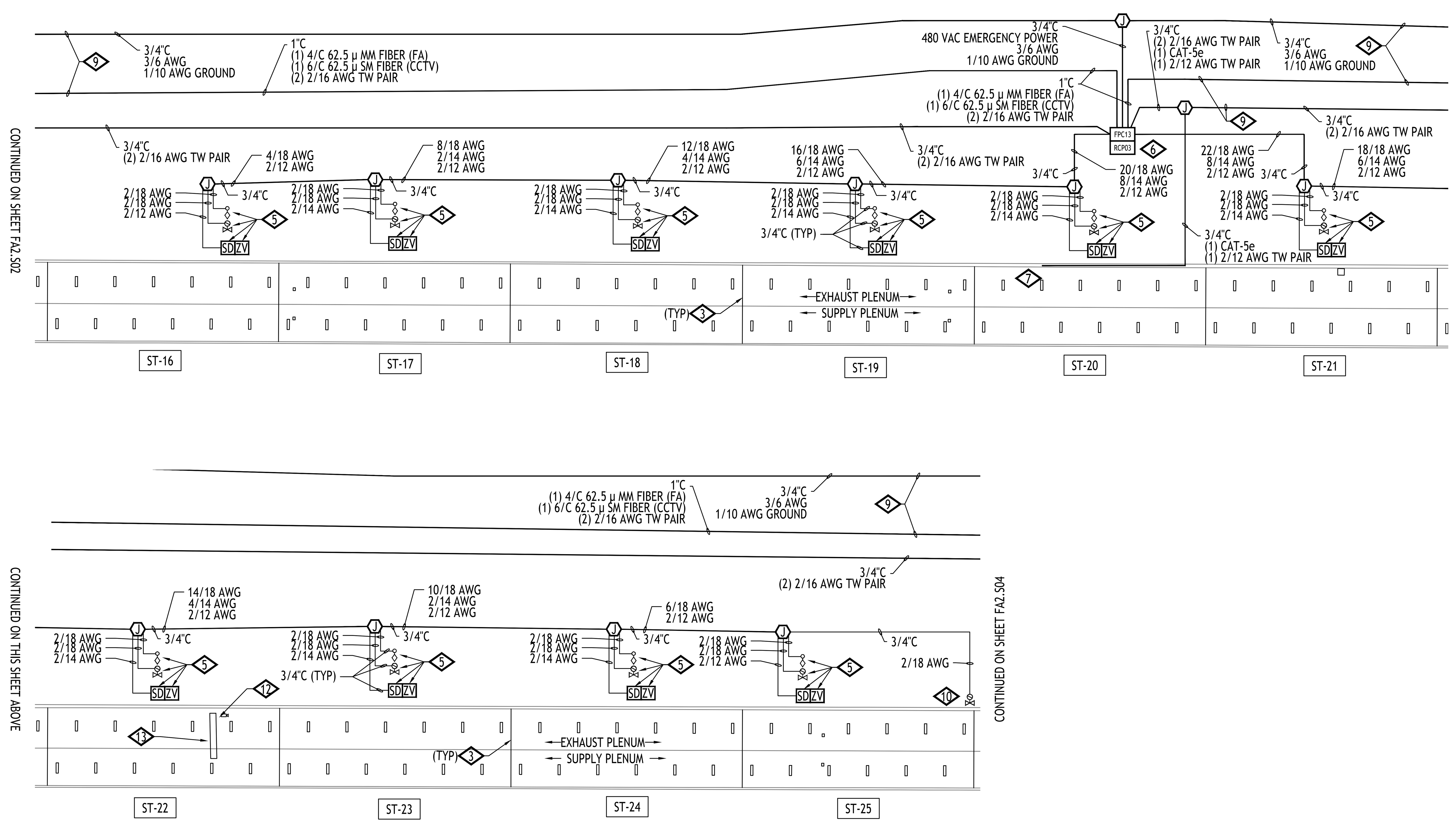
DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM: JOHNSON TUNNEL FP ZONES ST-06 TO ST-15

Drawing Number

FA2.S02

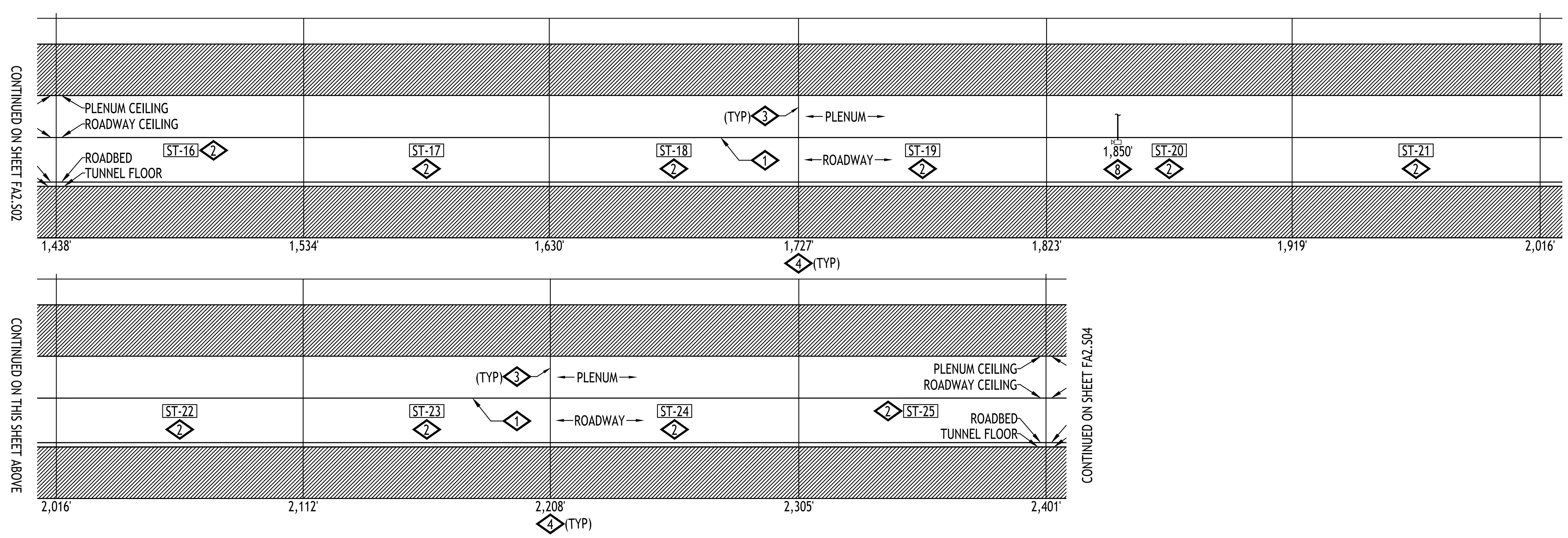
IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE



JOHNSON (SOUTH) TUNNEL - PLENUM PLAN - ZONES ST-16 THRU ST-25

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

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



JOHNSON (SOUTH) TUNNEL - ROADWAY SECTIONAL ELEVATION PLAN - NORTH VIEW - ZONES ST-16 THRU ST-25

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

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

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2. DELUGE ZONE SIGNS MOUNTED AT MOST CENTER-POINT OF DELUGE ZONE AND +84" FROM WALKWAY FLOOR. SEE SHEET FA6.02.
3. DELUGE ZONE BOUNDARY.
4. DIMENSION INDICATED APPROXIMATE DISTANCE OF DELUGE ZONE BOUNDARY TO WEST END PORTAL.
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ADDRESSING		
06030230	RCP03	HI TEMP
06030231	RCP03	LO TEMP
06030206	FPC13	HI TEMP
06030207	FPC13	LO TEMP
06030208	FPC13	CCTV TROUBLE
06030209	FPC13	BPS TROUBLE

ADDRESSING		
06030127	ST-16	MANUAL INPUT
06030128	ST-16	DELUGE RELEASE
06030186	ST-16	WATER FLOW
06030187	ST-16	TAMPER
01020143	ST-16	PRIMARY ALARM
05020233	ST-16	SECONDARY ALARM

ADDRESSING		
06030133	ST-17	MANUAL INPUT
06030134	ST-17	DELUGE RELEASE
06030188	ST-17	WATER FLOW
06030189	ST-17	TAMPER
01020144	ST-17	PRIMARY ALARM
05030126	ST-17	SECONDARY ALARM

ADDRESSING		
06030139	ST-18	MANUAL INPUT
06030140	ST-18	DELUGE RELEASE
06030190	ST-18	WATER FLOW
06030191	ST-18	TAMPER
01020145	ST-18	PRIMARY ALARM
05030127	ST-18	SECONDARY ALARM

ADDRESSING		
06030145	ST-19	MANUAL INPUT
06030146	ST-19	DELUGE RELEASE
06030192	ST-19	WATER FLOW
06030193	ST-19	TAMPER
01020146	ST-19	PRIMARY ALARM
05030128	ST-19	SECONDARY ALARM

ADDRESSING		
06030151	ST-20	MANUAL INPUT
06030152	ST-20	DELUGE RELEASE
06030194	ST-20	WATER FLOW
06030195	ST-20	TAMPER
01020147	ST-20	PRIMARY ALARM
05030129	ST-20	SECONDARY ALARM

ADDRESSING		
06030157	ST-21	MANUAL INPUT
06030158	ST-21	DELUGE RELEASE
06030196	ST-21	WATER FLOW
06030197	ST-21	TAMPER
01020148	ST-21	PRIMARY ALARM
05030130	ST-21	SECONDARY ALARM

ADDRESSING		
06030163	ST-22	MANUAL INPUT
06030164	ST-22	DELUGE RELEASE
06030198	ST-22	WATER FLOW
06030199	ST-22	TAMPER
01020149	ST-22	PRIMARY ALARM
05020131	ST-22	SECONDARY ALARM

ADDRESSING		
06030169	ST-23	MANUAL INPUT
06030170	ST-23	DELUGE RELEASE
06030200	ST-23	WATER FLOW
06030201	ST-23	TAMPER
01020150	ST-23	PRIMARY ALARM
05030132	ST-23	SECONDARY ALARM

ADDRESSING		
06030175	ST-24	MANUAL INPUT
06030176	ST-24	DELUGE RELEASE
06030202	ST-24	WATER FLOW
06030203	ST-24	TAMPER
01020151	ST-24	PRIMARY ALARM
05030133	ST-24	SECONDARY ALARM

ADDRESSING		
06030181	ST-25	MANUAL INPUT
06030182	ST-25	DELUGE RELEASE
06030204	ST-25	WATER FLOW
06030205	ST-25	TAMPER
01020152	ST-25	PRIMARY ALARM
05030134	ST-25	SECONDARY ALARM
06030232	ST-25	ISO VALVE TAMPER

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

BARNARD EJMT TEAM

BARNARD · RONDINELLI · BCER Engineering · Sturgeon Electric · Western States Fire Protection Co. · ILF CONSULTING ENGINEERS

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

Revisions

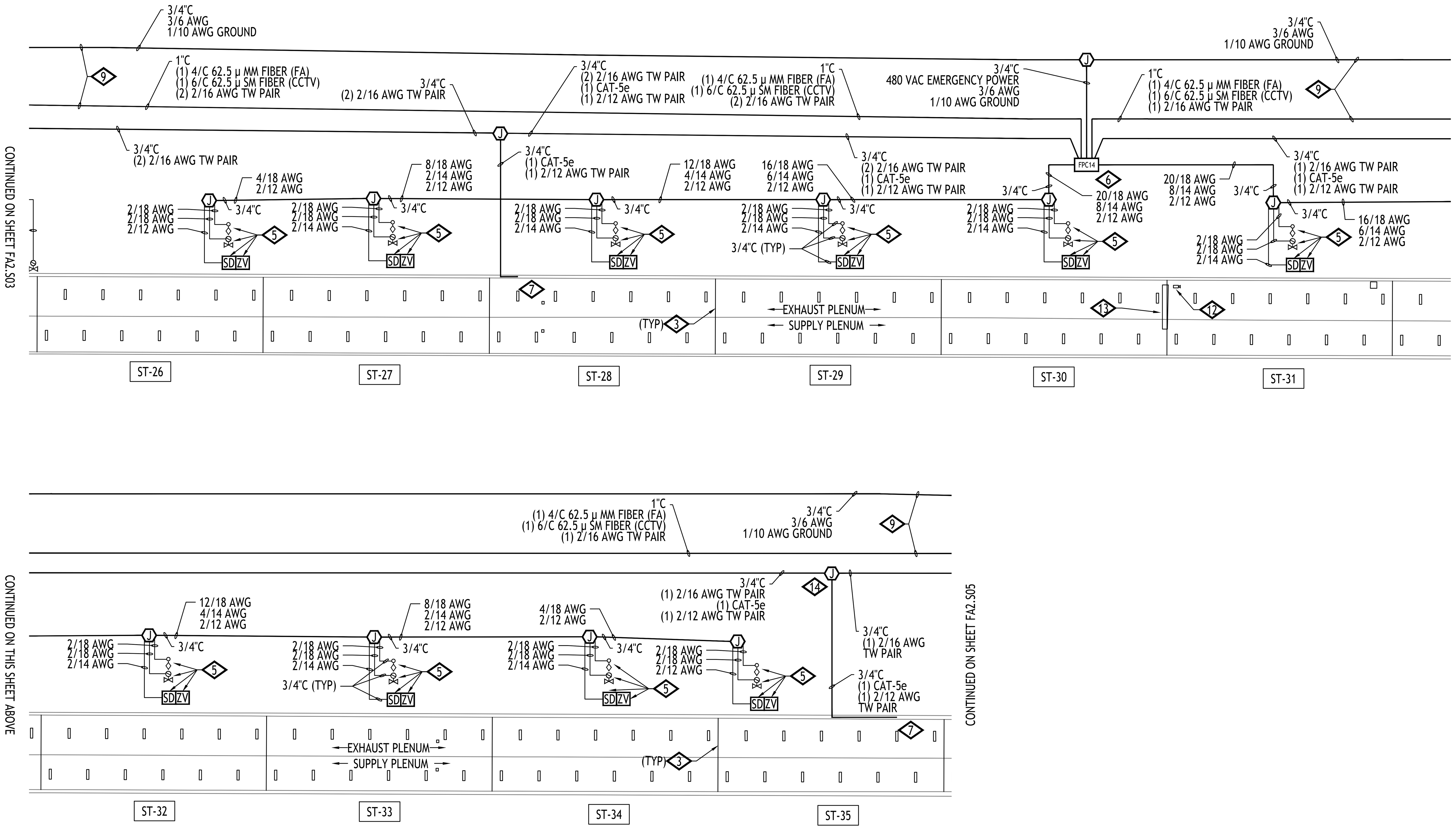
Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
JOHNSON TUNNEL
FP ZONES ST-16 TO ST-25

Drawing Number

FA2.S03

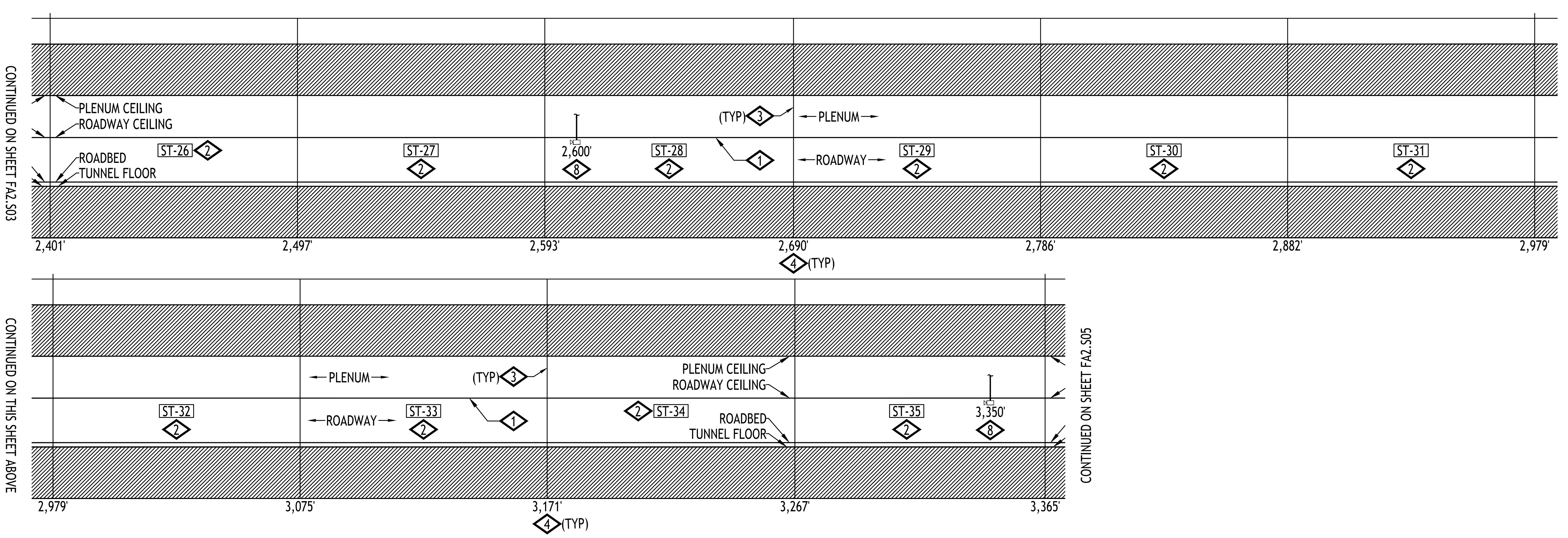


N

1 JOHNSON (SOUTH) TUNNEL - PLENUM PLAN - ZONES ST-26 THRU ST-35

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

32' 16' 0 32'
SCALE:1/32"=1'-0"



N

2 JOHNSON (SOUTH) TUNNEL - ROADWAY SECTIONAL ELEVATION PLAN - NORTH VIEW - ZONES ST-26 THRU ST-35

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

32' 16' 0 32'
SCALE:1/32"=1'-0"

GENERAL NOTES:

1. IF FIELD CONDITIONS RESULT IN A CHANGE TO THE SHOP DRAWING INSTALLATION IN ANY WAY, CONTACT FAS SYSTEMS GROUP TO VERIFY PROPOSED CHANGES ARE COMPLIANT WITH NFPA 72 AND PROJECT REQUIREMENTS.
2. EACH CONTROL CABINET AND ADDRESSABLE DEVICE SHALL BEAR A TYPED LABEL INDICATING ITS ADDRESS OR DESIGNATION, WHICH CAN BE SEEN WITHOUT A LADDER OR LIFT. SMOKE AND HEAT DETECTORS SHALL HAVE THEIR LABEL ON ITS BASE.

DETAIL NOTES:

1. FIBER OPTIC LINEAR HEAT DETECTION (FOLHD) FIBER CABLE IN FOLHD HANGER. CABLE TO BE MOUNTED APPROXIMATELY 2 INCHES BELOW ROADWAY CEILING TILE. SEE SHEETS FA6.01, FA6.14 AND FA6.15.
2. DELUGE ZONE SIGNS MOUNTED AT MOST CENTER-POINT OF DELUGE ZONE AND +84" FROM WALKWAY FLOOR. SEE SHEET FA6.02.
3. DELUGE ZONE BOUNDARY.
4. DIMENSION INDICATED APPROXIMATE DISTANCE OF DELUGE ZONE BOUNDARY TO WEST END PORTAL.
5. DELUGE SPRINKLER SYSTEM EQUIPMENT LOCATED IN SUPPLY PLENUM. SEE FIRE PROTECTION SHEETS FOR EQUIPMENT LOCATIONS.
6. EQUIPMENT LOCATED IN SUPPLY PLENUM.
7. ROUTE CAMERA ETHERNET AND POWER RACEWAY AND CIRCUITRY IN A CONCEALED FASHION THRU EXISTING EXHAUST PLENUM OPENING TO BACKSIDE OF ROADWAY WALL TO WALL MOUNTED LOCATION.
8. MOUNT CCTV CAMERA TO ROADWAY WALL TILE ABOVE EXIT PATHWAY. SEE SHEET FA6.02. DIMENSION INDICATES APPROXIMATE DISTANCE OF CAMERA TO WEST PORTAL END.
9. MAINTAIN MAXIMUM SEPARATION POSSIBLE BETWEEN 480 VAC POWER AND FIRE ALARM RACEWAYS. SEE SHEETS FA6.14 AND FA6.15.
10. FIRE LOOP ISOLATION VALVE TAMPER. SEE FIRE PROTECTION SHEETS FOR EQUIPMENT LOCATIONS.
11. MOUNT AIR TEMPERATURE SENSOR INSIDE INSULATED VALVE ENCLOSURE (IVE), OF ASSOCIATED TUNNEL DELUGE ZONE.
12. EXISTING CCTV TRAFFIC CAMERA, SHOWN FOR REFERENCE PURPOSES, TO REMAIN.
13. EXISTING TRAFFIC CONTROL MESSAGE BOARD, SHOWN FOR REFERENCE PURPOSES, TO REMAIN. ROUTE FOLHD FIBER AND HANGER ABOVE THE MESSAGE BOARD. IT IS ACCEPTABLE TO RUN THE FOLHD CABLE WITHOUT THE HANGER WHERE THERE IS INSUFFICIENT CLEARANCE BETWEEN THE EXISTING MESSAGE BOARD AND THE EXISTING CEILING TILE, WHERE APPLICABLE. LIMIT THE FOLHD CABLE RUNS WITHOUT THE HANGER TO THE MINIMUM DISTANCE POSSIBLE TO CLEAR THE OBSTRUCTION.
14. LONGSPAN VLS-1N-L CAT5e EXTENDER LOCATED IN JUNCTION BOX AS SHOWN.

ADDRESSING		
06030456	FPC14	HI TEMP
06030457	FPC14	LO TEMP
06030458	FPC14	CCTV TROUBLE
06030459	FPC14	BPS TROUBLE

ADDRESSING		
06030377	ST-26	MANUAL INPUT
06030378	ST-26	DELUGE RELEASE
06030436	ST-26	WATER FLOW
06030437	ST-26	TAMPER
01020153	ST-26	PRIMARY ALARM
05030135	ST-26	SECONDARY ALARM

ADDRESSING		
06030383	ST-27	MANUAL INPUT
06030384	ST-27	DELUGE RELEASE
06030438	ST-27	WATER FLOW
06030439	ST-27	TAMPER
01020154	ST-27	PRIMARY ALARM
05030136	ST-27	SECONDARY ALARM

ADDRESSING		
06030389	ST-28	MANUAL INPUT
06030390	ST-28	DELUGE RELEASE
06030440	ST-28	WATER FLOW
06030441	ST-28	TAMPER
01020155	ST-28	PRIMARY ALARM
05030137	ST-28	SECONDARY ALARM

ADDRESSING		
06030395	ST-29	MANUAL INPUT
06030396	ST-29	DELUGE RELEASE
06030442	ST-29	WATER FLOW
06030443	ST-29	TAMPER
01020156	ST-29	PRIMARY ALARM
05030138	ST-29	SECONDARY ALARM

ADDRESSING		
06030401	ST-30	MANUAL INPUT
06030402	ST-30	DELUGE RELEASE
06030444	ST-30	WATER FLOW
06030445	ST-30	TAMPER
01020157	ST-30	PRIMARY ALARM
05030139	ST-30	SECONDARY ALARM

ADDRESSING		
06030407	ST-31	MANUAL INPUT
06030408	ST-31	DELUGE RELEASE
06030446	ST-31	WATER FLOW
06030447	ST-31	TAMPER
01020158	ST-31	PRIMARY ALARM
05030140	ST-31	SECONDARY ALARM

ADDRESSING		
06030413	ST-32	MANUAL INPUT
06030414	ST-32	DELUGE RELEASE
06030448	ST-32	WATER FLOW
06030449	ST-32	TAMPER
01020159	ST-32	PRIMARY ALARM
05030141	ST-32	SECONDARY ALARM

ADDRESSING		
06030419	ST-33	MANUAL INPUT
06030420	ST-33	DELUGE RELEASE
06030450	ST-33	WATER FLOW
06030451	ST-33	TAMPER
01020160	ST-33	PRIMARY ALARM
05030142	ST-33	SECONDARY ALARM

ADDRESSING		
06030425	ST-34	MANUAL INPUT
06030426	ST-34	DELUGE RELEASE
06030452	ST-34	WATER FLOW
06030453	ST-34	TAMPER
01020161	ST-34	PRIMARY ALARM
05030143	ST-34	SECONDARY ALARM

ADDRESSING		
06030431	ST-35	MANUAL INPUT
06030432	ST-35	DELUGE RELEASE
06030454	ST-35	WATER FLOW
06030455	ST-35	TAMPER
01020162	ST-35	PRIMARY ALARM
05030144	ST-35	SECONDARY ALARM

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BARNARD

RONDINELLI

Western States Fire Protection Co.

BCER Engineering

Sturgeon Electric

EISENHOWER/JOHNSON MEMORIAL TUNNEL

FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT

Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

Num	Revisions Description	Date

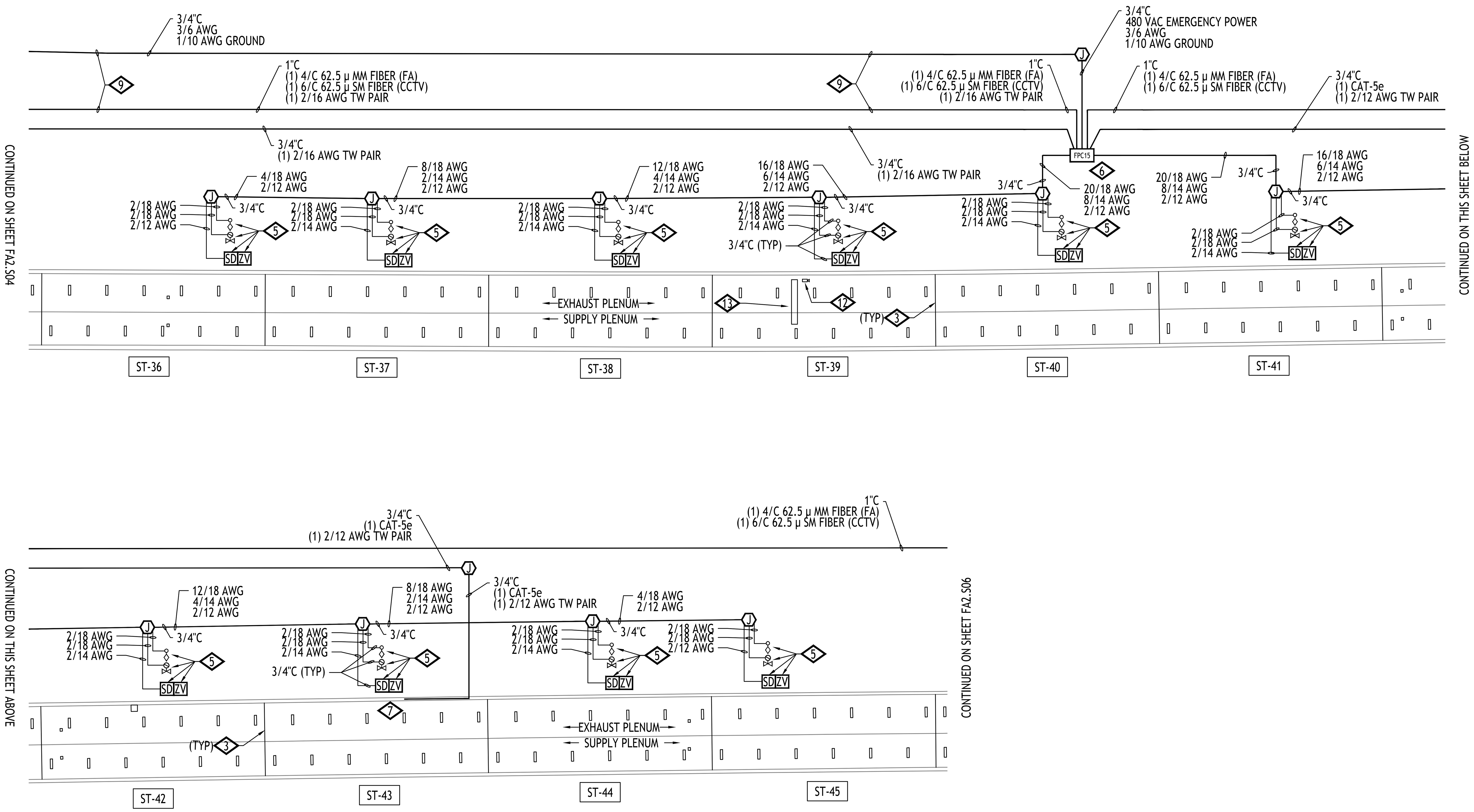
DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
JOHNSON TUNNEL
FP ZONES ST-26 TO ST-35

Drawing Number

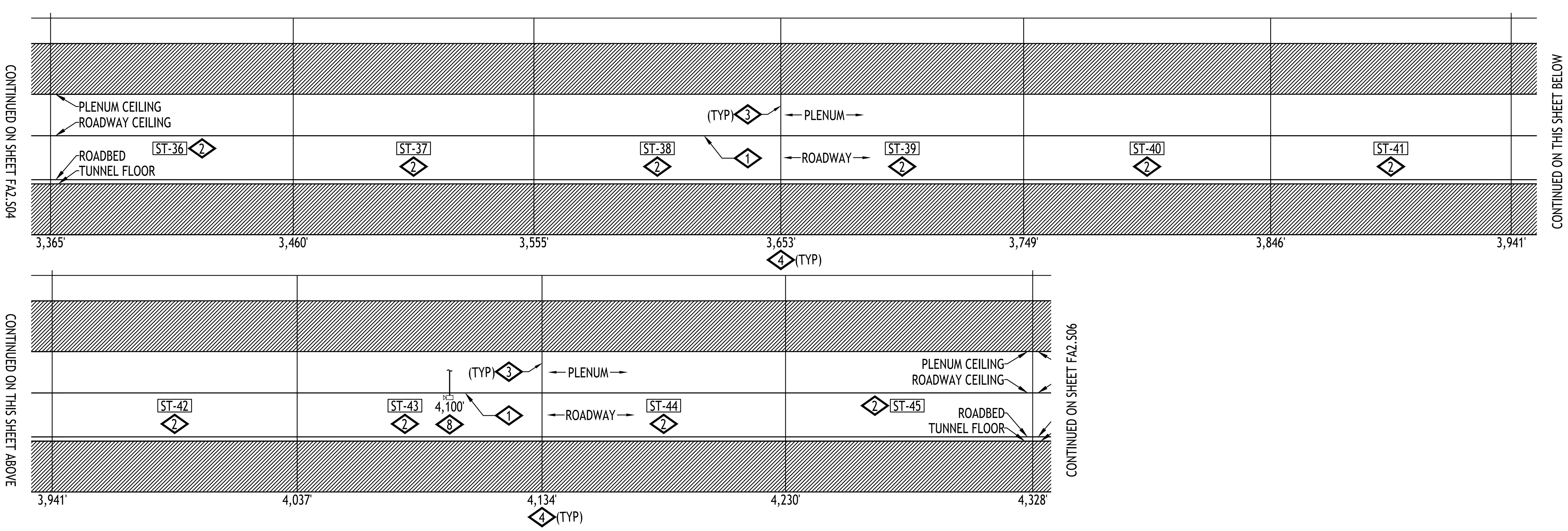
FA2.S04

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE



1 JOHNSON (SOUTH) TUNNEL - PLENUM PLAN - ZONES ST-36 THRU ST-45
SCALE: 1/32" = 1'-0"

32' 16' 0 32'
SCALE:1/32"=1'-0"



2 JOHNSON (SOUTH) TUNNEL - ROADWAY SECTIONAL ELEVATION PLAN - NORTH VIEW - ZONES ST-36 THRU ST-45
SCALE: 1/32" = 1'-0"

32' 16' 0 32'
SCALE:1/32"=1'-0"

GENERAL NOTES:

1. IF FIELD CONDITIONS RESULT IN A CHANGE TO THE SHOP DRAWING INSTALLATION IN ANY WAY, CONTACT FAS SYSTEMS GROUP TO VERIFY PROPOSED CHANGES ARE COMPLIANT WITH NFPA 72 AND PROJECT REQUIREMENTS.
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DETAIL NOTES:

1. FIBER OPTIC LINEAR HEAT DETECTION (FOLHD) FIBER CABLE IN FOLHD HANGER. CABLE TO BE MOUNTED APPROXIMATELY 2 INCHES BELOW ROADWAY CEILING TILE. SEE SHEETS FA6.01, FA6.14 AND FA6.15.
2. DELUGE ZONE SIGNS MOUNTED AT MOST CENTER-POINT OF DELUGE ZONE AND +84" FROM WALKWAY FLOOR. SEE SHEET FA6.02.
3. DELUGE ZONE BOUNDARY.
4. DIMENSION INDICATED APPROXIMATE DISTANCE OF DELUGE ZONE BOUNDARY TO WEST END PORTAL.
5. DELUGE SPRINKLER SYSTEM EQUIPMENT LOCATED IN SUPPLY PLENUM. SEE FIRE PROTECTION SHEETS FOR EQUIPMENT LOCATIONS.
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ADDRESSING		
06040206	FPC15	HI TEMP
06040207	FPC15	LO TEMP
06040208	FPC15	CCTV TROUBLE
06040209	FPC15	BPS TROUBLE

ADDRESSING		
06040127	ST-36	MANUAL INPUT
06040128	ST-36	DELUGE RELEASE
06040186	ST-36	WATER FLOW
06040187	ST-36	TAMPER
01020163	ST-36	PRIMARY ALARM
05030145	ST-36	SECONDARY ALARM

ADDRESSING		
06040133	ST-37	MANUAL INPUT
06040134	ST-37	DELUGE RELEASE
06040188	ST-37	WATER FLOW
06040189	ST-37	TAMPER
01020164	ST-37	PRIMARY ALARM
05030146	ST-37	SECONDARY ALARM

ADDRESSING		
06040139	ST-38	MANUAL INPUT
06040140	ST-38	DELUGE RELEASE
06040190	ST-38	WATER FLOW
06040191	ST-38	TAMPER
01020165	ST-38	PRIMARY ALARM
05030147	ST-38	SECONDARY ALARM

ADDRESSING		
06040145	ST-39	MANUAL INPUT
06040146	ST-39	DELUGE RELEASE
06040192	ST-39	WATER FLOW
06040193	ST-39	TAMPER
01020166	ST-39	PRIMARY ALARM
05030148	ST-39	SECONDARY ALARM

ADDRESSING		
06040151	ST-40	MANUAL INPUT
06040152	ST-40	DELUGE RELEASE
06040194	ST-40	WATER FLOW
06040195	ST-40	TAMPER
01020167	ST-40	PRIMARY ALARM
05030149	ST-40	SECONDARY ALARM

ADDRESSING		
06040157	ST-41	MANUAL INPUT
06040158	ST-41	DELUGE RELEASE
06040196	ST-41	WATER FLOW
06040197	ST-41	TAMPER
01020168	ST-41	PRIMARY ALARM
05030150	ST-41	SECONDARY ALARM

ADDRESSING		
06040163	ST-42	MANUAL INPUT
06040164	ST-42	DELUGE RELEASE
06040198	ST-42	WATER FLOW
06040199	ST-42	TAMPER
01020169	ST-42	PRIMARY ALARM
05030151	ST-42	SECONDARY ALARM

ADDRESSING		
06040169	ST-43	MANUAL INPUT
06040170	ST-43	DELUGE RELEASE
06040200	ST-43	WATER FLOW
06040201	ST-43	TAMPER
01020170	ST-43	PRIMARY ALARM
05030152	ST-43	SECONDARY ALARM

ADDRESSING		
06040175	ST-44	MANUAL INPUT
06040176	ST-44	DELUGE RELEASE
06040202	ST-44	WATER FLOW
06040203	ST-44	TAMPER
01020171	ST-44	PRIMARY ALARM
05030153	ST-44	SECONDARY ALARM

ADDRESSING		
06040181	ST-45	MANUAL INPUT
06040182	ST-45	DELUGE RELEASE
06040204	ST-45	WATER FLOW
06040205	ST-45	TAMPER
01020172	ST-45	PRIMARY ALARM
05030154	ST-45	SECONDARY ALARM

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

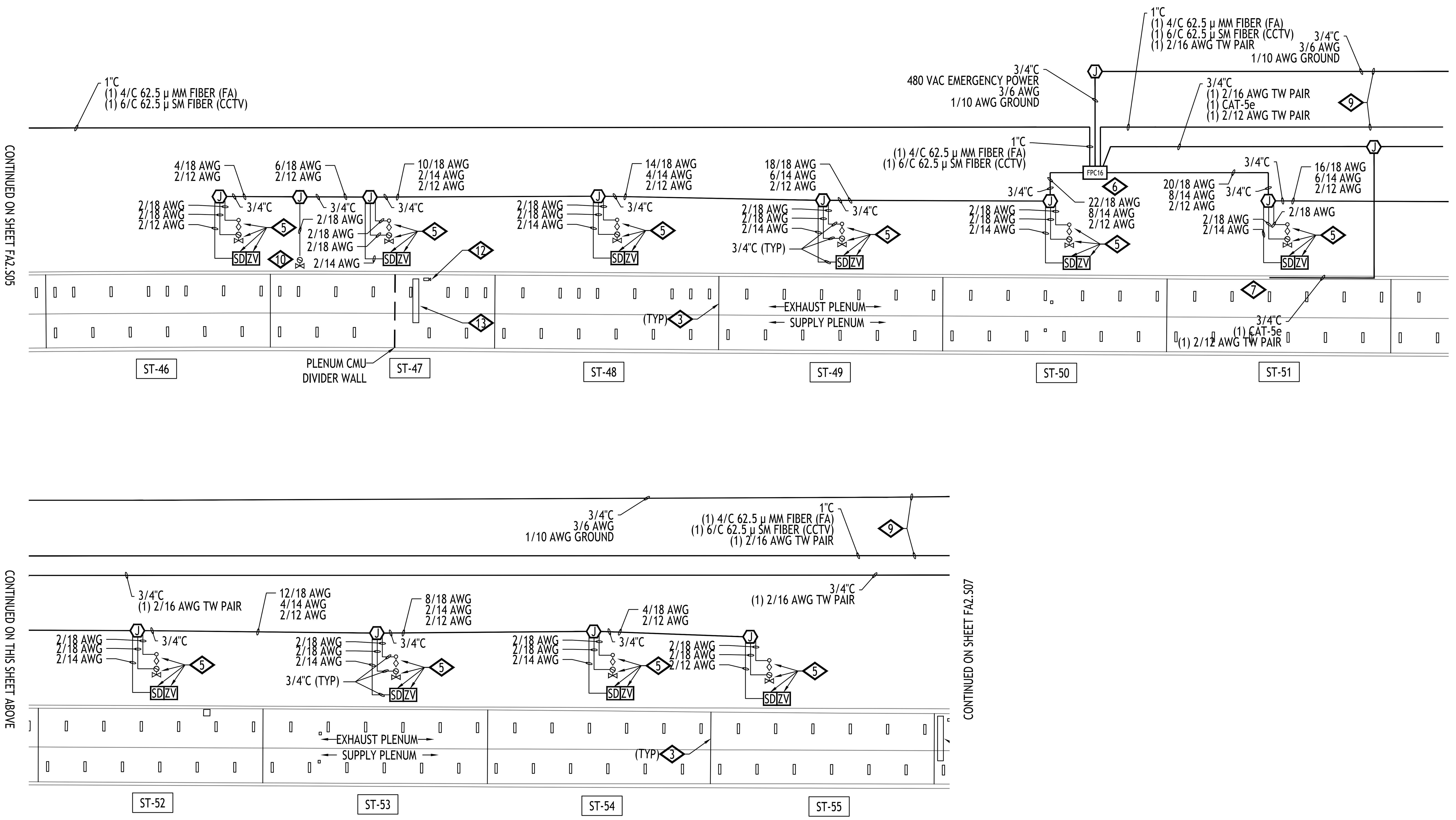
Revisions		
Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE.Jr

FIRE ALARM:
JOHNSON TUNNEL
FP ZONES ST-36 TO ST-45

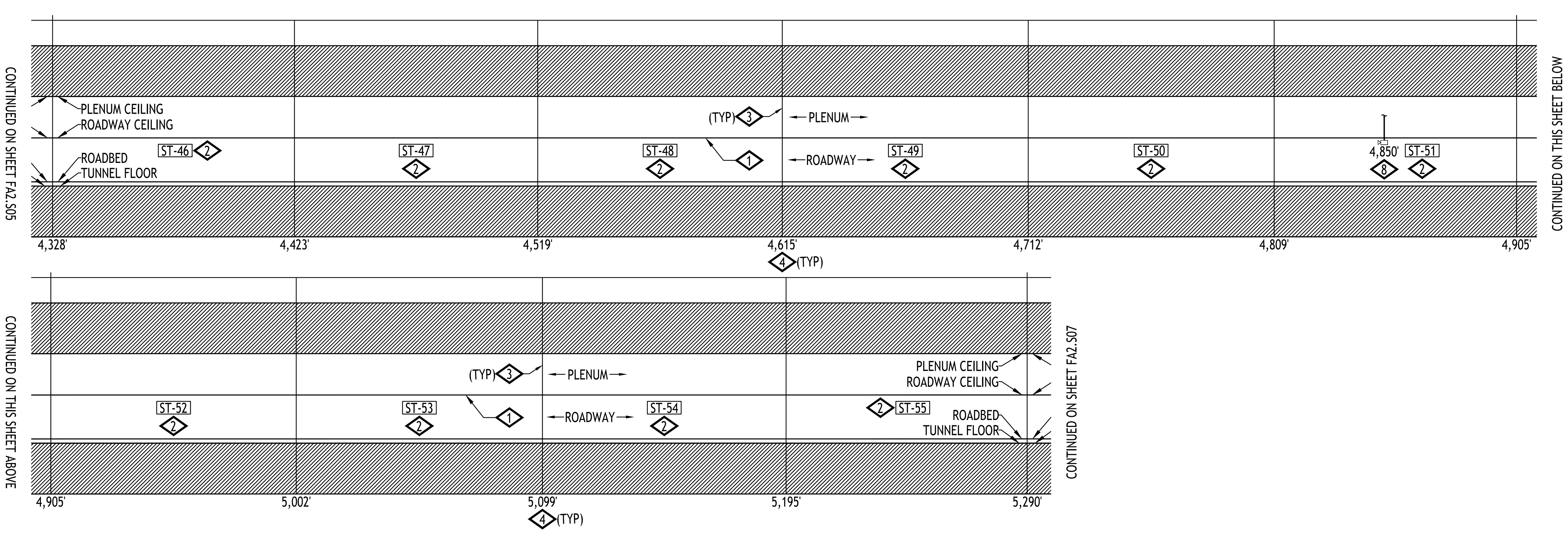
Drawing Number
FA2.S05

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE



JOHNSON (SOUTH) TUNNEL - PLENUM PLAN - ZONES ST-46 THRU ST-55

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



JOHNSON (SOUTH) TUNNEL - ROADWAY SECTIONAL ELEVATION PLAN - NORTH VIEW - ZONES ST-46 THRU ST-55

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

GENERAL NOTES:

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2. DELUGE ZONE SIGNS MOUNTED AT MOST CENTER-POINT OF DELUGE ZONE AND +84" FROM WALKWAY FLOOR. SEE SHEET FA6.02.
3. DELUGE ZONE BOUNDARY.
4. DIMENSION INDICATED APPROXIMATE DISTANCE OF DELUGE ZONE BOUNDARY TO WEST END PORTAL.
5. DELUGE SPRINKLER SYSTEM EQUIPMENT LOCATED IN SUPPLY PLENUM. SEE FIRE PROTECTION SHEETS FOR EQUIPMENT LOCATIONS.
6. EQUIPMENT LOCATED IN SUPPLY PLENUM.
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11. MOUNT AIR TEMPERATURE SENSOR INSIDE INSULATED VALVE ENCLOSURE (IVE), OF ASSOCIATED TUNNEL DELUGE ZONE.
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ADDRESSING		
07020206	FPC16	HI TEMP
07020207	FPC16	LO TEMP
07020208	FPC16	CCTV TROUBLE
07020209	FPC16	BPS TROUBLE

ADDRESSING		
07020127	ST-46	MANUAL INPUT
07020128	ST-46	DELUGE RELEASE
07020186	ST-46	WATER FLOW
07020187	ST-46	TAMPER
01020173	ST-46	PRIMARY ALARM
05030155	ST-46	SECONDARY ALARM

ADDRESSING		
07020133	ST-47	MANUAL INPUT
07020134	ST-47	DELUGE RELEASE
07020188	ST-47	WATER FLOW
07020189	ST-47	TAMPER
01020174	ST-47	PRIMARY ALARM
05030156	ST-47	SECONDARY ALARM
07020210	ST-47	ISO VALVE TAMPER

ADDRESSING		
07020139	ST-48	MANUAL INPUT
07020140	ST-48	DELUGE RELEASE
07020190	ST-48	WATER FLOW
07020191	ST-48	TAMPER
01020175	ST-48	PRIMARY ALARM
05030157	ST-48	SECONDARY ALARM

ADDRESSING		
07020145	ST-49	MANUAL INPUT
07020146	ST-49	DELUGE RELEASE
07020192	ST-49	WATER FLOW
07020193	ST-49	TAMPER
01020176	ST-49	PRIMARY ALARM
05030158	ST-49	SECONDARY ALARM

ADDRESSING		
07020151	ST-50	MANUAL INPUT
07020152	ST-50	DELUGE RELEASE
07020194	ST-50	WATER FLOW
07020195	ST-50	TAMPER
01020177	ST-50	PRIMARY ALARM
05030159	ST-50	SECONDARY ALARM

ADDRESSING		
07020157	ST-51	MANUAL INPUT
07020158	ST-51	DELUGE RELEASE
07020196	ST-51	WATER FLOW
07020197	ST-51	TAMPER
01020178	ST-51	PRIMARY ALARM
05030160	ST-51	SECONDARY ALARM

ADDRESSING		
07020163	ST-52	MANUAL INPUT
07020164	ST-52	DELUGE RELEASE
07020198	ST-52	WATER FLOW
07020199	ST-52	TAMPER
01020179	ST-52	PRIMARY ALARM
05030161	ST-52	SECONDARY ALARM

ADDRESSING		
07020169	ST-53	MANUAL INPUT
07020170	ST-53	DELUGE RELEASE
07020200	ST-53	WATER FLOW
07020201	ST-53	TAMPER
01020180	ST-53	PRIMARY ALARM
05030162	ST-53	SECONDARY ALARM

ADDRESSING		
07020175	ST-54	MANUAL INPUT
07020176	ST-54	DELUGE RELEASE
07020202	ST-54	WATER FLOW
07020203	ST-54	TAMPER
01020181	ST-54	PRIMARY ALARM
05030163	ST-54	SECONDARY ALARM

ADDRESSING		
07020181	ST-55	MANUAL INPUT
07020182	ST-55	DELUGE RELEASE
07020204	ST-55	WATER FLOW
07020205	ST-55	TAMPER
01020182	ST-55	PRIMARY ALARM
05030164	ST-55	SECONDARY ALARM

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EISENHOWER/JOHNSON MEMORIAL TUNNEL

FIXED FIRE SUPPRESSION SYSTEM

DESIGN BUILD PROJECT

Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

Revisions: Num | Description | Date

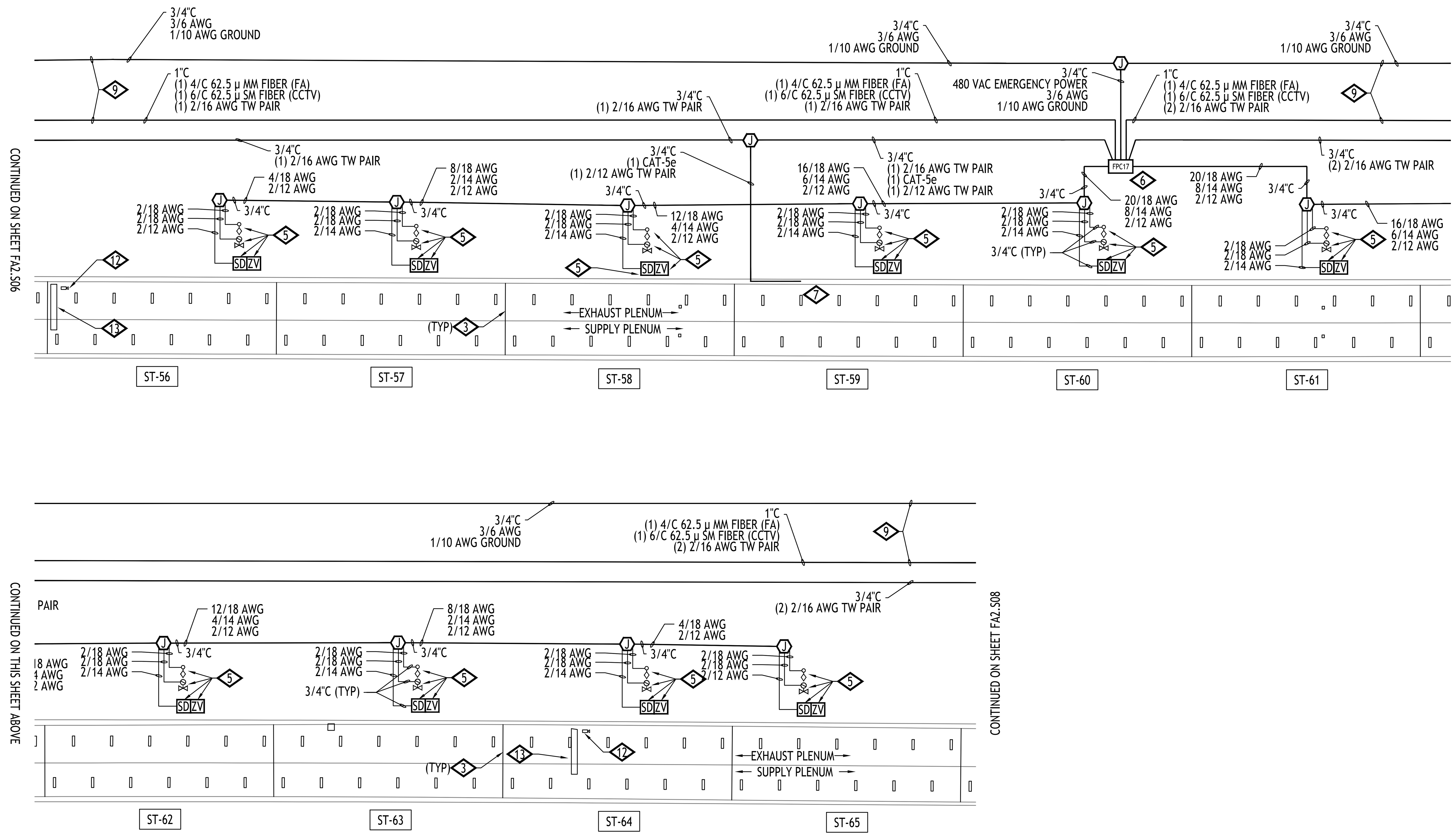
DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM: JOHNSON TUNNEL FP ZONES ST-46 TO ST-55

Drawing Number

FA2.S06

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE



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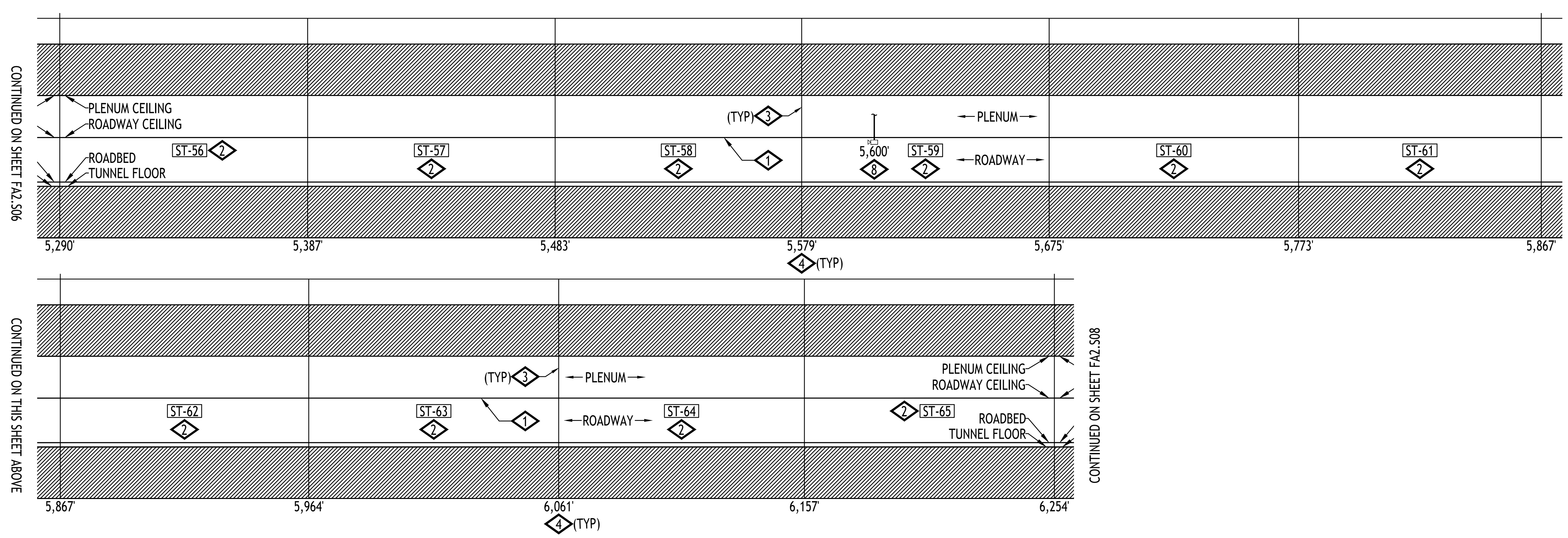
1 JOHNSON (SOUTH) TUNNEL - PLENUM PLAN - ZONES ST-56 THRU ST-65
SCALE: 1/32" = 1'-0"



N

2 JOHNSON (SOUTH) TUNNEL - ROADWAY SECTIONAL ELEVATION PLAN - NORTH VIEW - ZONES ST-56 THRU ST-65
SCALE: 1/32" = 1'-0"

GENERAL NOTES:

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4. DIMENSION INDICATED APPROXIMATE DISTANCE OF DELUGE ZONE BOUNDARY TO WEST END PORTAL.
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ADDRESSING		
07020456	FPC17	HI TEMP
07020457	FPC17	LO TEMP
07020458	FPC17	CCTV TROUBLE
07020459	FPC17	BPS TROUBLE

ADDRESSING		
07020377	ST-56	MANUAL INPUT
07020378	ST-56	DELUGE RELEASE
07020436	ST-56	WATER FLOW
07020437	ST-56	TAMPER
01020183	ST-56	PRIMARY ALARM
05030165	ST-56	SECONDARY ALARM

ADDRESSING		
07020383	ST-57	MANUAL INPUT
07020384	ST-57	DELUGE RELEASE
07020438	ST-57	WATER FLOW
07020439	ST-57	TAMPER
01020184	ST-57	PRIMARY ALARM
05030166	ST-57	SECONDARY ALARM

ADDRESSING		
07020389	ST-58	MANUAL INPUT
07020290	ST-58	DELUGE RELEASE
07020440	ST-58	WATER FLOW
07020441	ST-58	TAMPER
01020185	ST-58	PRIMARY ALARM
05030167	ST-58	SECONDARY ALARM

ADDRESSING		
07020395	ST-59	MANUAL INPUT
07020396	ST-59	DELUGE RELEASE
07020442	ST-59	WATER FLOW
07020443	ST-59	TAMPER
01020186	ST-59	PRIMARY ALARM
05030168	ST-59	SECONDARY ALARM

ADDRESSING		
07020401	ST-60	MANUAL INPUT
07020402	ST-60	DELUGE RELEASE
07020444	ST-60	WATER FLOW
07020445	ST-60	TAMPER
01020187	ST-60	PRIMARY ALARM
05030169	ST-60	SECONDARY ALARM

ADDRESSING		
07020407	ST-61	MANUAL INPUT
07020408	ST-61	DELUGE RELEASE
07020446	ST-61	WATER FLOW
07020447	ST-61	TAMPER
01020188	ST-61	PRIMARY ALARM
05030170	ST-61	SECONDARY ALARM

ADDRESSING		
07020413	ST-62	MANUAL INPUT
07020414	ST-62	DELUGE RELEASE
07020448	ST-62	WATER FLOW
07020449	ST-62	TAMPER
01020189	ST-62	PRIMARY ALARM
05030171	ST-62	SECONDARY ALARM

ADDRESSING		
07020419	ST-63	MANUAL INPUT
07020420	ST-63	DELUGE RELEASE
07020450	ST-63	WATER FLOW
07020451	ST-63	TAMPER
01020190	ST-63	PRIMARY ALARM
05030172	ST-63	SECONDARY ALARM

ADDRESSING		
07020425	ST-64	MANUAL INPUT
07020426	ST-64	DELUGE RELEASE
07020452	ST-64	WATER FLOW
07020453	ST-64	TAMPER
01020191	ST-64	PRIMARY ALARM
05030173	ST-64	SECONDARY ALARM

ADDRESSING		
07020431	ST-65	MANUAL INPUT
07020432	ST-65	DELUGE RELEASE
07020454	ST-65	WATER FLOW
07020455	ST-65	TAMPER
01020192	ST-65	PRIMARY ALARM
05030174	ST-65	SECONDARY ALARM

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

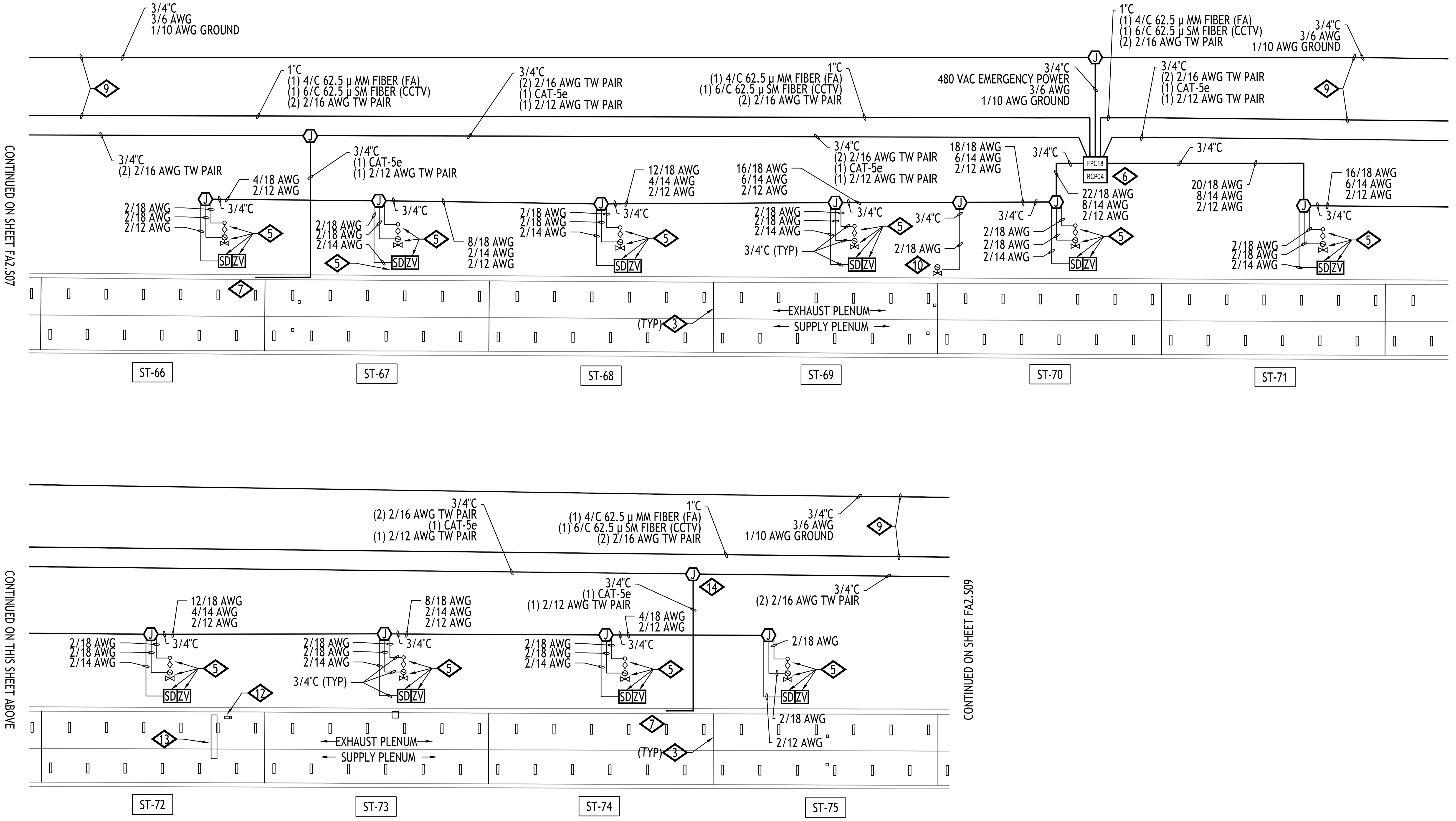
Revisions: Num | Description | Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

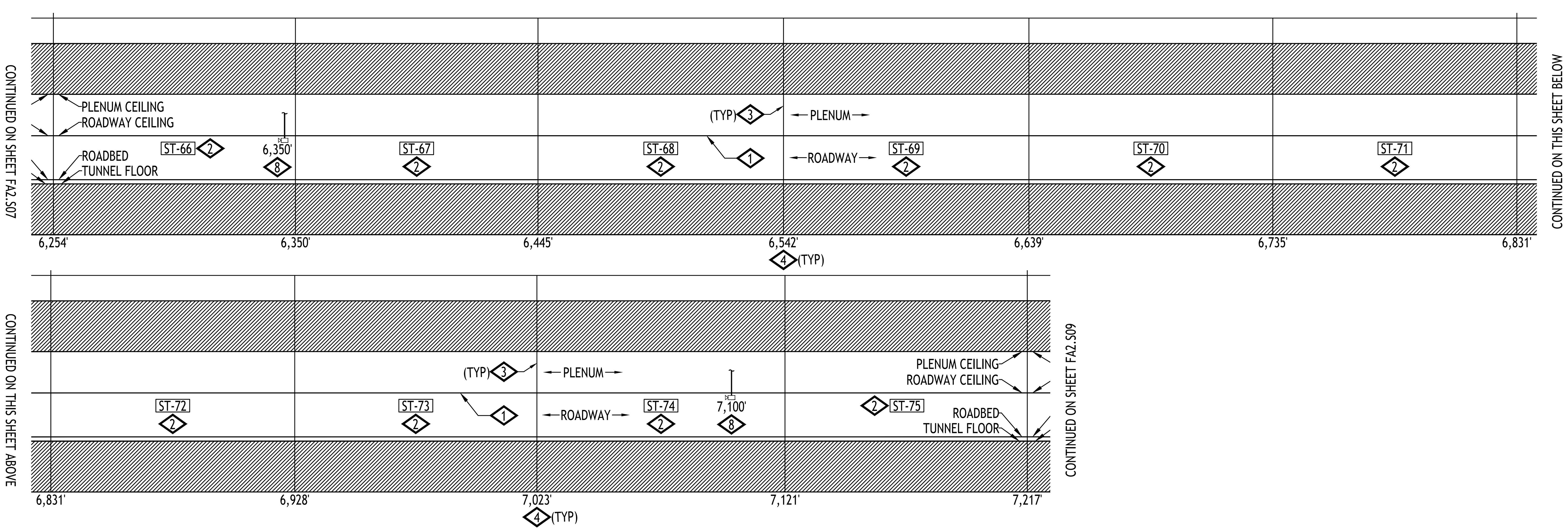
FIRE ALARM:
JOHNSON TUNNEL
FP ZONES ST-56 TO ST-65

Drawing Number
FA2.S07

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE



1 JOHNSON (SOUTH) TUNNEL - PLENUM PLAN - ZONES ST-66 THRU ST-75
SCALE: 1/32" = 1'-0"



2 JOHNSON (SOUTH) TUNNEL - ROADWAY SECTIONAL ELEVATION PLAN - NORTH VIEW - ZONES ST-66 THRU ST-75
SCALE: 1/32" = 1'-0"

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

GENERAL NOTES:

1. IF FIELD CONDITIONS RESULT IN A CHANGE TO THE SHOP DRAWING INSTALLATION IN ANY WAY, CONTACT FAS SYSTEMS GROUP TO VERIFY PROPOSED CHANGES ARE COMPLIANT WITH NFPA 72 AND PROJECT REQUIREMENTS.
2. EACH CONTROL CABINET AND ADDRESSABLE DEVICE SHALL BEAR A TYPED LABEL INDICATING ITS ADDRESS OR DESIGNATION, WHICH CAN BE SEEN WITHOUT A LADDER OR LIFT. SMOKE AND HEAT DETECTORS SHALL HAVE THEIR LABEL ON ITS BASE.

DETAIL NOTES:

1. FIBER OPTIC LINEAR HEAT DETECTION (FOLHD) FIBER CABLE IN FOLHD HANGER. CABLE TO BE MOUNTED APPROXIMATELY 2 INCHES BELOW ROADWAY CEILING TILE. SEE SHEETS FA6.01, FA6.14 AND FA6.15.
2. DELUGE ZONE SIGNS MOUNTED AT MOST CENTER-POINT OF DELUGE ZONE AND +84" FROM WALKWAY FLOOR. SEE SHEET FA6.02.
3. DELUGE ZONE BOUNDARY.
4. DIMENSION INDICATED APPROXIMATE DISTANCE OF DELUGE ZONE BOUNDARY TO WEST END PORTAL.
5. DELUGE SPRINKLER SYSTEM EQUIPMENT LOCATED IN SUPPLY PLENUM. SEE FIRE PROTECTION SHEETS FOR EQUIPMENT LOCATIONS.
6. EQUIPMENT LOCATED IN SUPPLY PLENUM.
7. ROUTE CAMERA ETHERNET AND POWER RACEWAY AND CIRCUITRY IN A CONCEALED FASHION THRU EXISTING EXHAUST PLENUM OPENING TO BACKSIDE OF ROADWAY WALL TO WALL MOUNTED LOCATION.
8. MOUNT CCTV CAMERA TO ROADWAY WALL TILE ABOVE EXIT PATHWAY. SEE SHEET FA6.02. DIMENSION INDICATES APPROXIMATE DISTANCE OF CAMERA TO WEST PORTAL END.
9. MAINTAIN MAXIMUM SEPARATION POSSIBLE BETWEEN 480 VAC POWER AND FIRE ALARM RACEWAYS. SEE SHEETS FA6.14 AND FA6.15.
10. FIRE LOOP ISOLATION VALVE TAMPER. SEE FIRE PROTECTION SHEETS FOR EQUIPMENT LOCATIONS.
11. MOUNT AIR TEMPERATURE SENSOR INSIDE INSULATED VALVE ENCLOSURE (IVE), OF ASSOCIATED TUNNEL DELUGE ZONE.
12. EXISTING CCTV TRAFFIC CAMERA, SHOWN FOR REFERENCE PURPOSES, TO REMAIN.
13. EXISTING TRAFFIC CONTROL MESSAGE BOARD, SHOWN FOR REFERENCE PURPOSES, TO REMAIN. ROUTE FOLHD FIBER AND HANGER ABOVE THE MESSAGE BOARD. IT IS ACCEPTABLE TO RUN THE FOLHD CABLE WITHOUT THE HANGER WHERE THERE IS INSUFFICIENT CLEARANCE BETWEEN THE EXISTING MESSAGE BOARD AND THE EXISTING CEILING TILE, WHERE APPLICABLE. LIMIT THE FOLHD CABLE RUNS WITHOUT THE HANGER TO THE MINIMUM DISTANCE POSSIBLE TO CLEAR THE OBSTRUCTION.
14. LONGSPAN VLS-1N-L CAT5e EXTENDER LOCATED IN JUNCTION BOX AS SHOWN.

ADDRESSING		
07030231	RCP04	HI TEMP
07030232	RCP04	LO TEMP
07030206	FPC18	HI TEMP
07030207	FPC18	LO TEMP
07030208	FPC18	CCTV TROUBLE
07030209	FPC18	BPS TROUBLE

ADDRESSING		
07030127	ST-66	MANUAL INPUT
07030128	ST-66	DELUGE RELEASE
07030186	ST-66	WATER FLOW
07030187	ST-66	TAMPER
01020193	ST-66	PRIMARY ALARM
05030175	ST-66	SECONDARY ALARM

ADDRESSING		
07030133	ST-67	MANUAL INPUT
07030134	ST-67	DELUGE RELEASE
07030188	ST-67	WATER FLOW
07030189	ST-67	TAMPER
01020194	ST-67	PRIMARY ALARM
05030176	ST-67	SECONDARY ALARM

ADDRESSING		
07030139	ST-68	MANUAL INPUT
07030140	ST-68	DELUGE RELEASE
07030190	ST-68	WATER FLOW
07030191	ST-68	TAMPER
01020195	ST-68	PRIMARY ALARM
05030177	ST-68	SECONDARY ALARM

ADDRESSING		
07030145	ST-69	MANUAL INPUT
07030146	ST-69	DELUGE RELEASE
07030192	ST-69	WATER FLOW
07030193	ST-69	TAMPER
01020196	ST-69	PRIMARY ALARM
05030178	ST-69	SECONDARY ALARM
07020210	ST-69	ISO VALVE TAMPER

ADDRESSING		
07030151	ST-70	MANUAL INPUT
07030152	ST-70	DELUGE RELEASE
07030194	ST-70	WATER FLOW
07030195	ST-70	TAMPER
01020197	ST-70	PRIMARY ALARM
05030179	ST-70	SECONDARY ALARM

ADDRESSING		
07030157	ST-71	MANUAL INPUT
07030158	ST-71	DELUGE RELEASE
07030196	ST-71	WATER FLOW
07030197	ST-71	TAMPER
01020198	ST-71	PRIMARY ALARM
05030180	ST-71	SECONDARY ALARM

ADDRESSING		
07030163	ST-72	MANUAL INPUT
07030164	ST-72	DELUGE RELEASE
07030198	ST-72	WATER FLOW
07030199	ST-72	TAMPER
01020199	ST-72	PRIMARY ALARM
05030181	ST-72	SECONDARY ALARM

ADDRESSING		
07030169	ST-73	MANUAL INPUT
07030170	ST-73	DELUGE RELEASE
07030200	ST-73	WATER FLOW
07030201	ST-73	TAMPER
01020200	ST-73	PRIMARY ALARM
05030182	ST-73	SECONDARY ALARM

ADDRESSING		
07030175	ST-74	MANUAL INPUT
07030176	ST-74	DELUGE RELEASE
07030202	ST-74	WATER FLOW
07030203	ST-74	TAMPER
01020201	ST-74	PRIMARY ALARM
05030183	ST-74	SECONDARY ALARM

ADDRESSING		
07030181	ST-75	MANUAL INPUT
07030182	ST-75	DELUGE RELEASE
07030204	ST-75	WATER FLOW
07030205	ST-75	TAMPER
01020202	ST-75	PRIMARY ALARM
05030184	ST-75	SECONDARY ALARM

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CONSULTING ENGINEERS

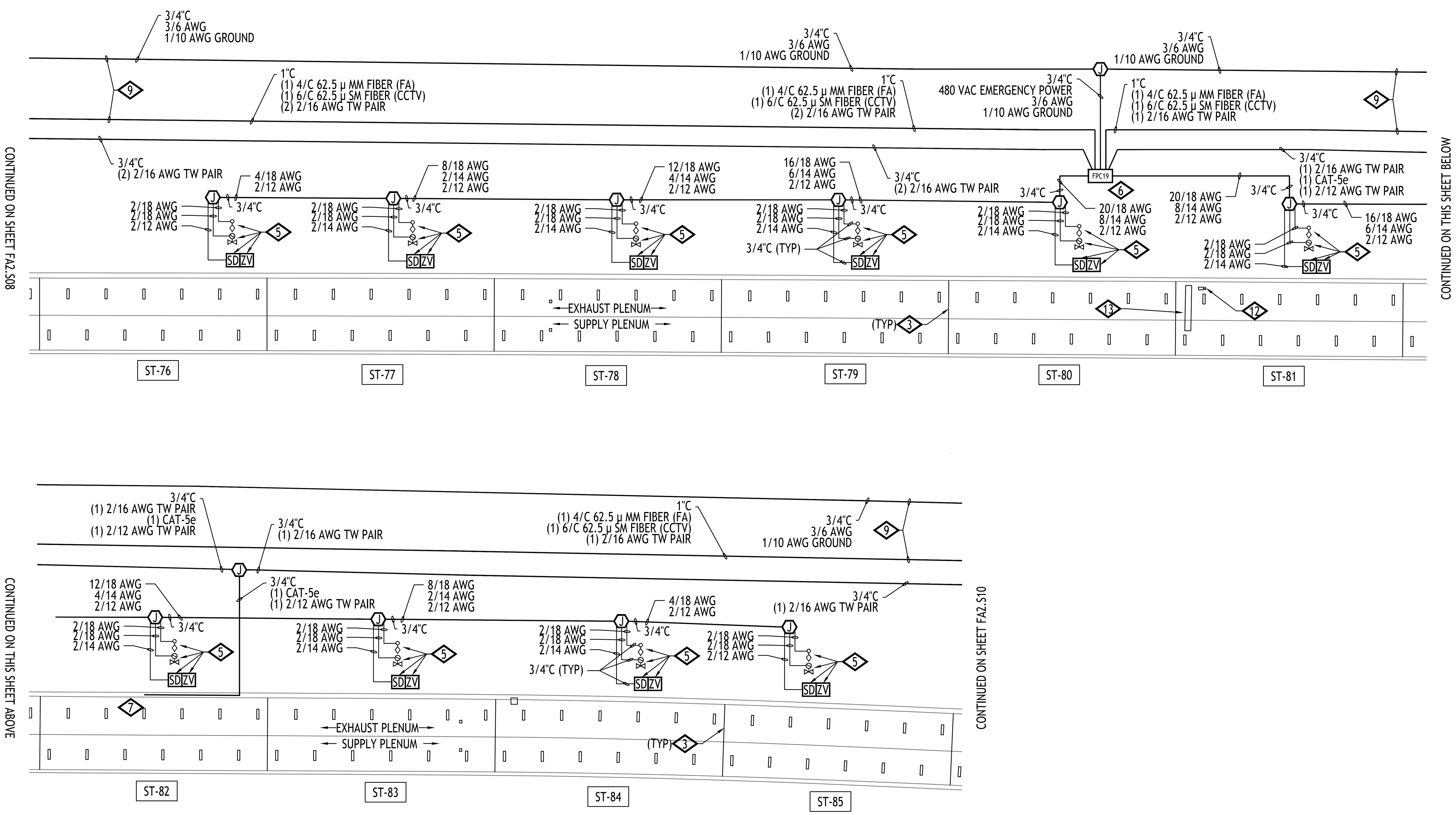
EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

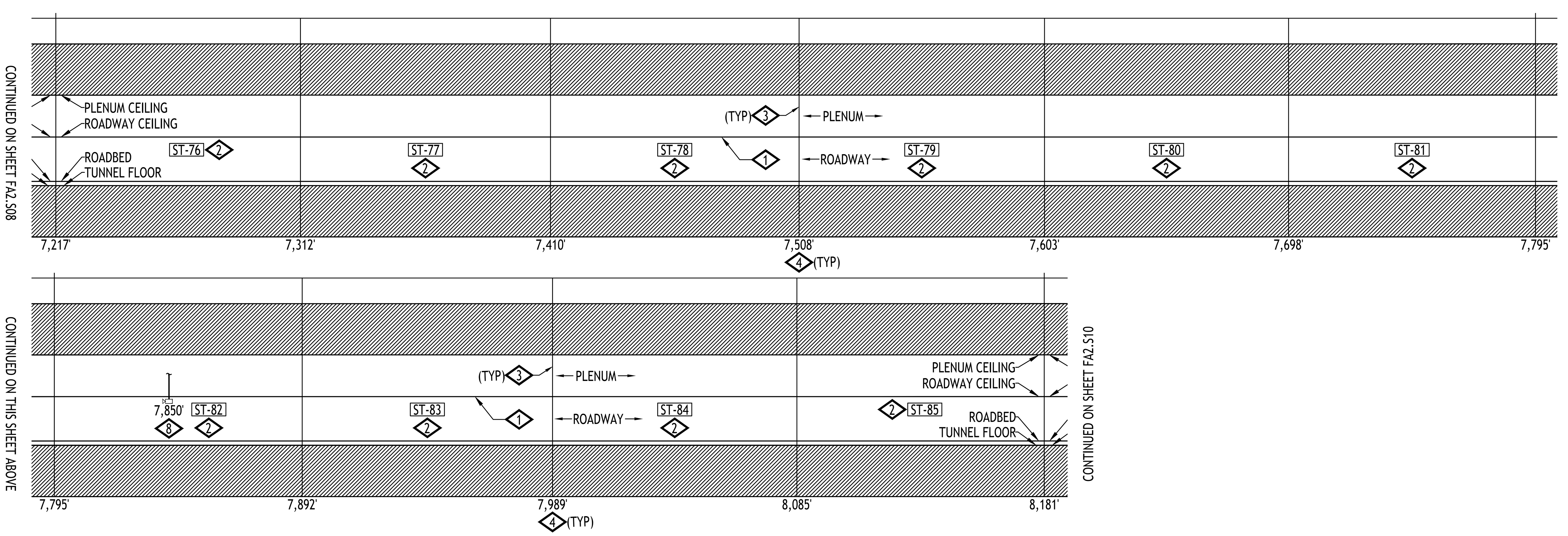
DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
JOHNSON TUNNEL
FP ZONES ST-66 TO ST-75

Drawing Number
FA2.S08



JOHNSON (SOUTH) TUNNEL - PLENUM PLAN - ZONES ST-76 THRU ST-85
SCALE: 1/32" = 1'-0"



JOHNSON (SOUTH) TUNNEL - ROADWAY SECTIONAL ELEVATION PLAN - NORTH VIEW - ZONES ST-76 THRU ST-85
SCALE: 1/32" = 1'-0"

GENERAL NOTES:

1. IF FIELD CONDITIONS RESULT IN A CHANGE TO THE SHOP DRAWING INSTALLATION IN ANY WAY, CONTACT FAS SYSTEMS GROUP TO VERIFY PROPOSED CHANGES ARE COMPLIANT WITH NFPA 72 AND PROJECT REQUIREMENTS.
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DETAIL NOTES:

1. FIBER OPTIC LINEAR HEAT DETECTION (FOLHD) FIBER CABLE IN FOLHD HANGER. CABLE TO BE MOUNTED APPROXIMATELY 2 INCHES BELOW ROADWAY CEILING TILE. SEE SHEETS FA6.01, FA6.14 AND FA6.15.
2. DELUGE ZONE SIGNS MOUNTED AT MOST CENTER-POINT OF DELUGE ZONE AND +84" FROM WALKWAY FLOOR. SEE SHEET FA6.02.
3. DELUGE ZONE BOUNDARY.
4. DIMENSION INDICATED APPROXIMATE DISTANCE OF DELUGE ZONE BOUNDARY TO WEST END PORTAL.
5. DELUGE SPRINKLER SYSTEM EQUIPMENT LOCATED IN SUPPLY PLENUM. SEE FIRE PROTECTION SHEETS FOR EQUIPMENT LOCATIONS.
6. EQUIPMENT LOCATED IN SUPPLY PLENUM.
7. ROUTE CAMERA ETHERNET AND POWER RACEWAY AND CIRCUITRY IN A CONCEALED FASHION THRU EXISTING EXHAUST PLENUM OPENING TO BACKSIDE OF ROADWAY WALL TO WALL MOUNTED LOCATION.
8. MOUNT CCTV CAMERA TO ROADWAY WALL TILE ABOVE EXIT PATHWAY. SEE SHEET FA6.02. DIMENSION INDICATES APPROXIMATE DISTANCE OF CAMERA TO WEST PORTAL END.
9. MAINTAIN MAXIMUM SEPARATION POSSIBLE BETWEEN 480 VAC POWER AND FIRE ALARM RACEWAYS. SEE SHEETS FA6.14 AND FA6.15.
10. FIRE LOOP ISOLATION VALVE TAMPER. SEE FIRE PROTECTION SHEETS FOR EQUIPMENT LOCATIONS.
11. MOUNT AIR TEMPERATURE SENSOR INSIDE INSULATED VALVE ENCLOSURE (IVE), OF ASSOCIATED TUNNEL DELUGE ZONE.
12. EXISTING CCTV TRAFFIC CAMERA, SHOWN FOR REFERENCE PURPOSES, TO REMAIN.
13. EXISTING TRAFFIC CONTROL MESSAGE BOARD, SHOWN FOR REFERENCE PURPOSES, TO REMAIN. ROUTE FOLHD FIBER AND HANGER ABOVE THE MESSAGE BOARD. IT IS ACCEPTABLE TO RUN THE FOLHD CABLE WITHOUT THE HANGER WHERE THERE IS INSUFFICIENT CLEARANCE BETWEEN THE EXISTING MESSAGE BOARD AND THE EXISTING CEILING TILE, WHERE APPLICABLE. LIMIT THE FOLHD CABLE RUNS WITHOUT THE HANGER TO THE MINIMUM DISTANCE POSSIBLE TO CLEAR THE OBSTRUCTION.

ADDRESSING		
07030456	FPC19	HI TEMP
07030457	FPC19	LO TEMP
07030458	FPC19	CCTV TROUBLE
07030459	FPC19	BPS TROUBLE

ADDRESSING		
07030377	ST-76	MANUAL INPUT
07030378	ST-76	DELUGE RELEASE
07030436	ST-76	WATER FLOW
07030437	ST-76	TAMPER
01020203	ST-76	PRIMARY ALARM
05030185	ST-76	SECONDARY ALARM

ADDRESSING		
07030383	ST-77	MANUAL INPUT
07030384	ST-77	DELUGE RELEASE
07030438	ST-77	WATER FLOW
07030439	ST-77	TAMPER
01020204	ST-77	PRIMARY ALARM
05030186	ST-77	SECONDARY ALARM

ADDRESSING		
07030389	ST-78	MANUAL INPUT
07030390	ST-78	DELUGE RELEASE
07030440	ST-78	WATER FLOW
07030441	ST-78	TAMPER
01020205	ST-78	PRIMARY ALARM
05030187	ST-78	SECONDARY ALARM

ADDRESSING		
07030395	ST-79	MANUAL INPUT
07030396	ST-79	DELUGE RELEASE
07030442	ST-79	WATER FLOW
07030443	ST-79	TAMPER
01020206	ST-79	PRIMARY ALARM
05030188	ST-79	SECONDARY ALARM

ADDRESSING		
07030401	ST-80	MANUAL INPUT
07030402	ST-80	DELUGE RELEASE
07030444	ST-80	WATER FLOW
07030445	ST-80	TAMPER
01020207	ST-80	PRIMARY ALARM
05030189	ST-80	SECONDARY ALARM

ADDRESSING		
07030407	ST-81	MANUAL INPUT
07030408	ST-81	DELUGE RELEASE
07030446	ST-81	WATER FLOW
07030447	ST-81	TAMPER
01020208	ST-81	PRIMARY ALARM
05030180	ST-81	SECONDARY ALARM

ADDRESSING		
07030413	ST-82	MANUAL INPUT
07030414	ST-82	DELUGE RELEASE
07030448	ST-82	WATER FLOW
07030449	ST-82	TAMPER
01020209	ST-82	PRIMARY ALARM
05030191	ST-82	SECONDARY ALARM

ADDRESSING		
07030419	ST-83	MANUAL INPUT
07030420	ST-83	DELUGE RELEASE
07030450	ST-83	WATER FLOW
07030451	ST-83	TAMPER
01020210	ST-83	PRIMARY ALARM
05030192	ST-83	SECONDARY ALARM

ADDRESSING		
07030425	ST-84	MANUAL INPUT
07030426	ST-84	DELUGE RELEASE
07030452	ST-84	WATER FLOW
07030453	ST-84	TAMPER
01020211	ST-84	PRIMARY ALARM
05030193	ST-84	SECONDARY ALARM

ADDRESSING		
07030431	ST-85	MANUAL INPUT
07030432	ST-85	DELUGE RELEASE
07030454	ST-85	WATER FLOW
07030455	ST-85	TAMPER
01020212	ST-85	PRIMARY ALARM
05030194	ST-85	SECONDARY ALARM

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

BARNARD EJMT TEAM

BARNARD | RONDINELLI | BCER Engineering | Sturgeon Electric | Western States Fire Protection Co. | CONSULTING ENGINEERS

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

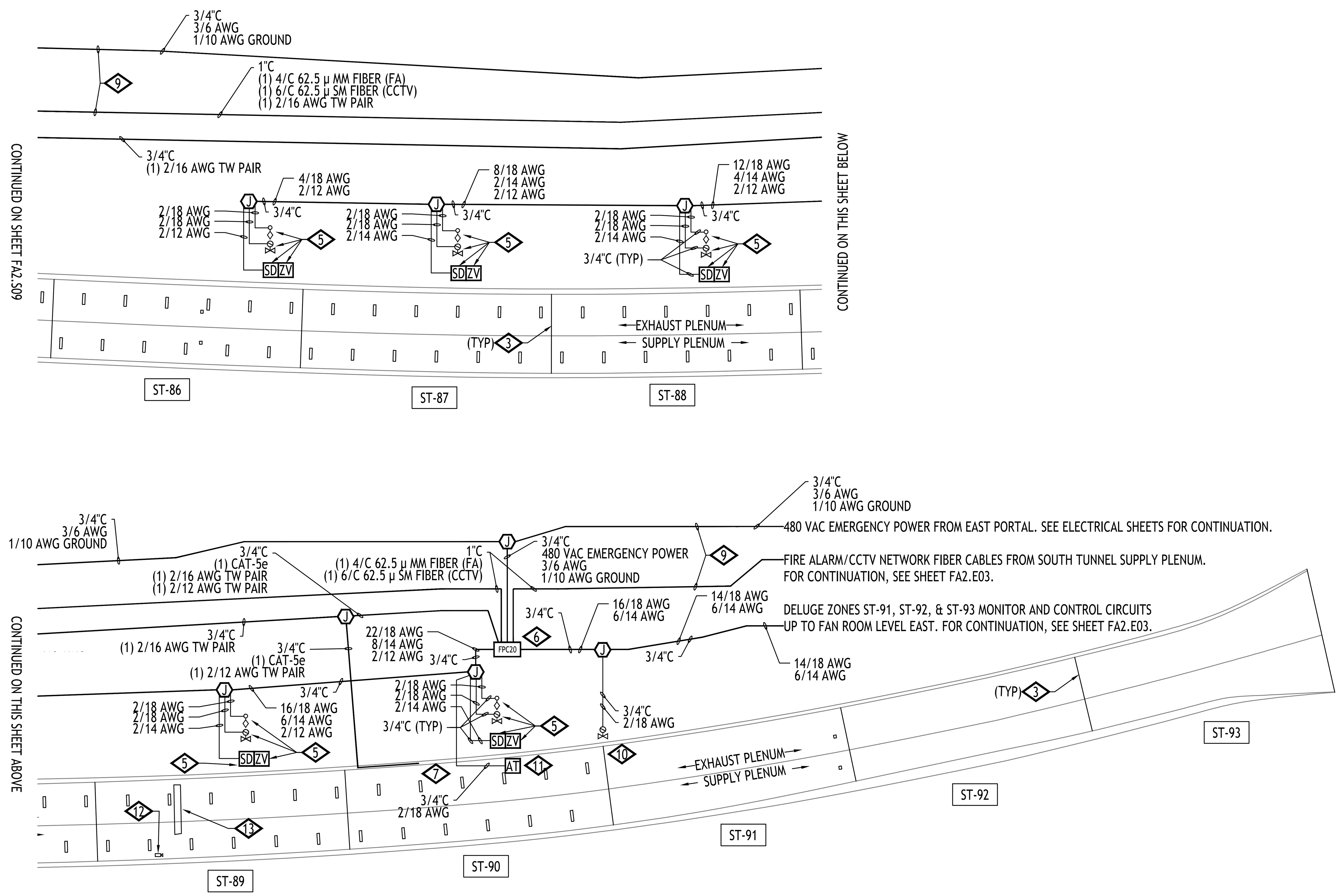
Revisions

Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

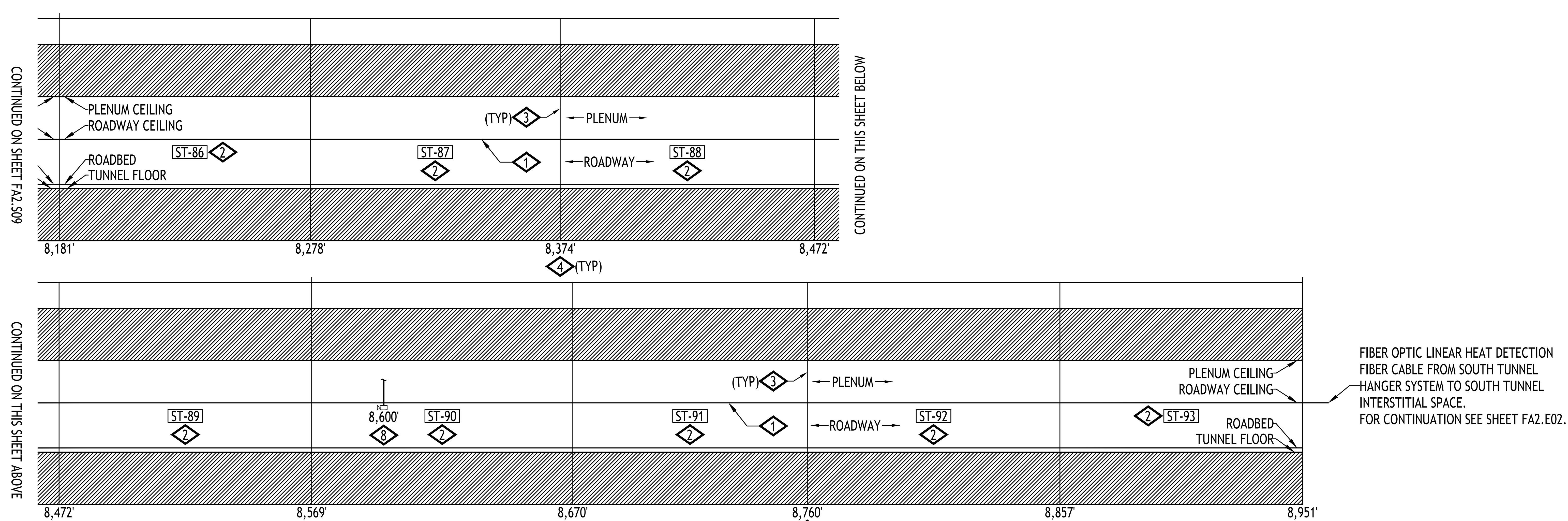
FIRE ALARM:
JOHNSON TUNNEL
FP ZONES ST-76 TO ST-85

Drawing Number
FA2.S09



1 JOHNSON (SOUTH) TUNNEL - PLENUM PLAN - ZONES ST-86 THRU ST-93

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



2 JOHNSON (SOUTH) TUNNEL - ROADWAY SECTIONAL ELEVATION PLAN - NORTH VIEW - ZONES ST-86 THRU ST-93

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

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GENERAL NOTES:

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DETAIL NOTES:

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2. DELUGE ZONE SIGNS MOUNTED AT MOST CENTER-POINT OF DELUGE ZONE AND +84" FROM WALKWAY FLOOR. SEE SHEET FA6.02.
3. DELUGE ZONE BOUNDARY.
4. DIMENSION INDICATED APPROXIMATE DISTANCE OF DELUGE ZONE BOUNDARY TO WEST END PORTAL.
5. DELUGE SPRINKLER SYSTEM EQUIPMENT LOCATED IN SUPPLY PLENUM. SEE FIRE PROTECTION SHEETS FOR EQUIPMENT LOCATIONS.
6. EQUIPMENT LOCATED IN SUPPLY PLENUM.
7. ROUTE CAMERA ETHERNET AND POWER RACEWAY AND CIRCUITRY IN A CONCEALED FASHION THRU EXISTING EXHAUST PLENUM OPENING TO BACKSIDE OF ROADWAY WALL TO WALL MOUNTED LOCATION.
8. MOUNT CCTV CAMERA TO ROADWAY WALL TILE ABOVE EXIT PATHWAY. SEE SHEET FA6.02. DIMENSION INDICATES APPROXIMATE DISTANCE OF CAMERA TO WEST PORTAL END.
9. MAINTAIN MAXIMUM SEPARATION POSSIBLE BETWEEN 480 VAC POWER AND FIRE ALARM RACEWAYS. SEE SHEETS FA6.14 AND FA6.15.
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11. MOUNT AIR TEMPERATURE SENSOR INSIDE INSULATED VALVE ENCLOSURE (IVE), OF ASSOCIATED TUNNEL DELUGE ZONE.
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ADDRESSING		
07040190	FPC20	HI TEMP
07040191	FPC20	LO TEMP
07040192	FPC20	CCTV TROUBLE
07040193	FPC20	BPS TROUBLE

ADDRESSING		
07040127	ST-86	MANUAL INPUT
07040128	ST-86	DELUGE RELEASE
07040174	ST-86	WATER FLOW
07040175	ST-86	TAMPER
01020213	ST-86	PRIMARY ALARM
05030195	ST-86	SECONDARY ALARM

ADDRESSING		
07040133	ST-87	MANUAL INPUT
07040134	ST-87	DELUGE RELEASE
07040176	ST-87	WATER FLOW
07040177	ST-87	TAMPER
01020214	ST-87	PRIMARY ALARM
05030196	ST-87	SECONDARY ALARM

ADDRESSING		
07040139	ST-88	MANUAL INPUT
07040140	ST-88	DELUGE RELEASE
07040178	ST-88	WATER FLOW
07040179	ST-88	TAMPER
01020215	ST-88	PRIMARY ALARM
05030197	ST-88	SECONDARY ALARM

ADDRESSING		
07040145	ST-89	MANUAL INPUT
07040146	ST-89	DELUGE RELEASE
07040180	ST-89	WATER FLOW
07040181	ST-89	TAMPER
01020216	ST-89	PRIMARY ALARM
05030198	ST-89	SECONDARY ALARM

ADDRESSING		
07040151	ST-90	MANUAL INPUT
07040152	ST-90	DELUGE RELEASE
07040182	ST-90	WATER FLOW
07040183	ST-90	TAMPER
01020217	ST-90	PRIMARY ALARM
05030199	ST-90	SECONDARY ALARM
07040194	ST-90	ISO VALVE TAMPER
07040195	ST-90	IVE LOW TEMP

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EISENHOWER/JOHNSON MEMORIAL TUNNEL

FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT

Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

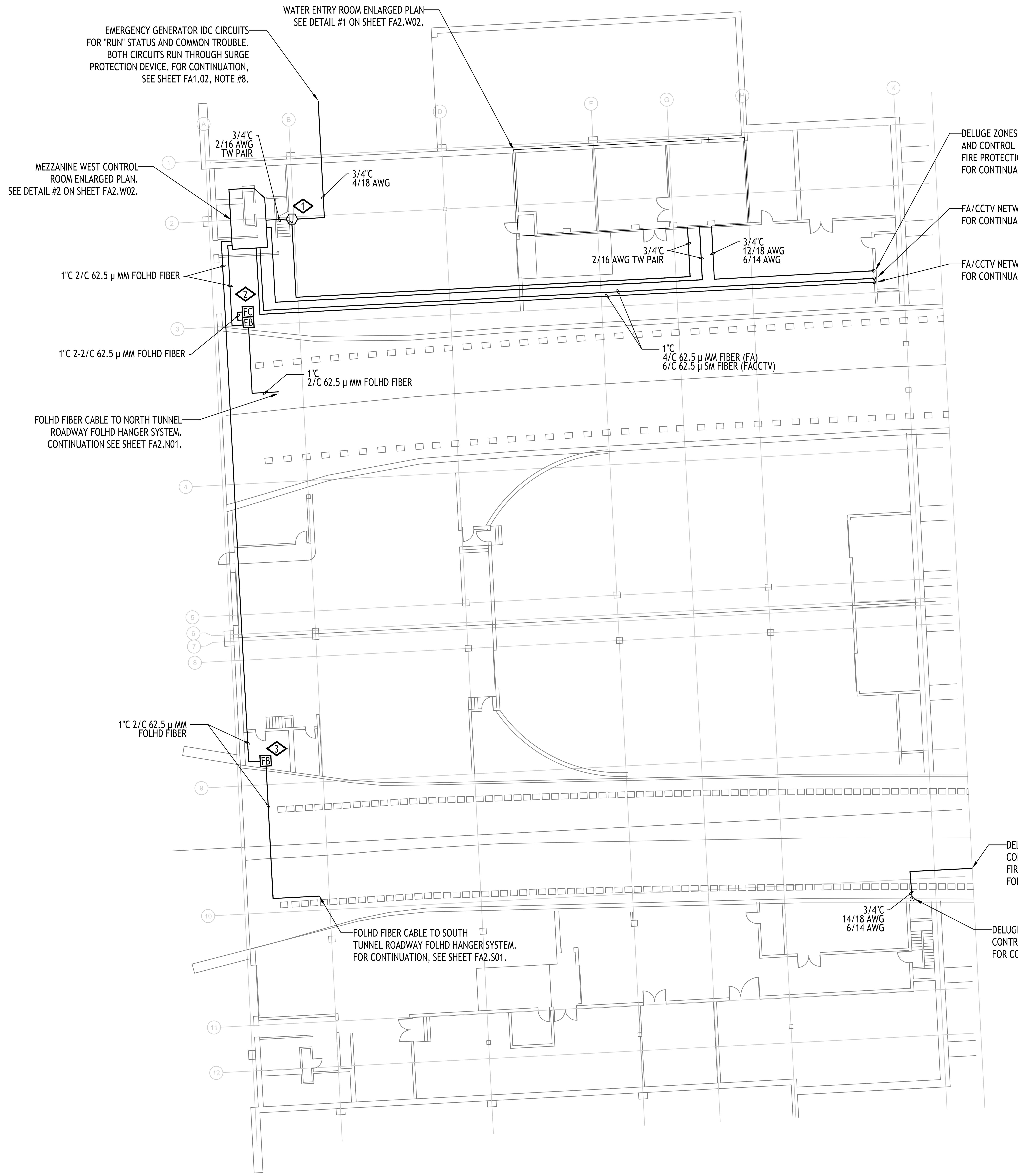
DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
JOHNSON TUNNEL
FP ZONES ST-86 TO ST-93

Drawing Number

FA2.S10

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE



GENERAL NOTES:

1. IF FIELD CONDITIONS RESULT IN A CHANGE TO THE SHOP DRAWING INSTALLATION IN ANY WAY, CONTACT FAS SYSTEMS GROUP TO VERIFY PROPOSED CHANGES ARE COMPLIANT WITH NFPA 72 AND PROJECT REQUIREMENTS.
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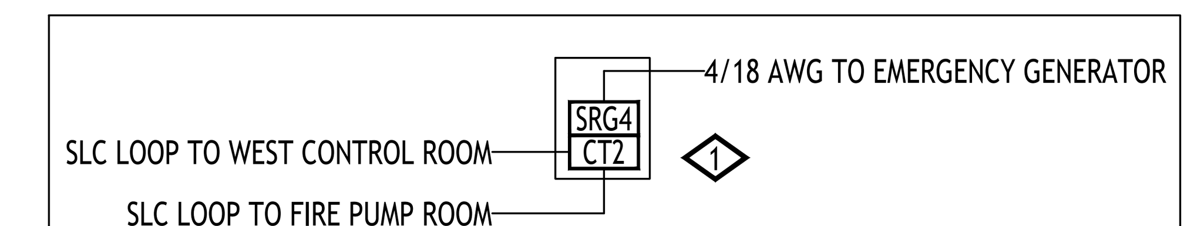
DETAIL NOTES:

1. JUNCTION BOX OUTSIDE WEST CONTROL ROOM.
2. FIBER OPTIC SPLICE BOX LOCATED AT APPROXIMATELY 12' A.F.F. FIBER OPTIC CALIBRATION BOX LOCATED AT APPROXIMATELY 5' A.F.F.
3. FIBER OPTIC SPLICE BOX LOCATED AT MEZZANINE LEVEL STAIR LANDING.



JUNCTION BOX LOCATED OUTSIDE WEST CONTROL ROOM

N

1 ROADWAY LEVEL WEST
SCALE: 1/16" = 1'-0"

16' 8' 0 16'
SCALE:1/16"=1'-0"

BARNARD EJMT TEAM

BARNARD · RONDINELLI life safety · ILF CONSULTING ENGINEERS · Western States Fire Protection Co. · BCER Engineering · Sturgeon Electric

EISENHOWER/JOHNSON MEMORIAL TUNNEL

FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT

Project No. C0703-360 Subaccount 17810

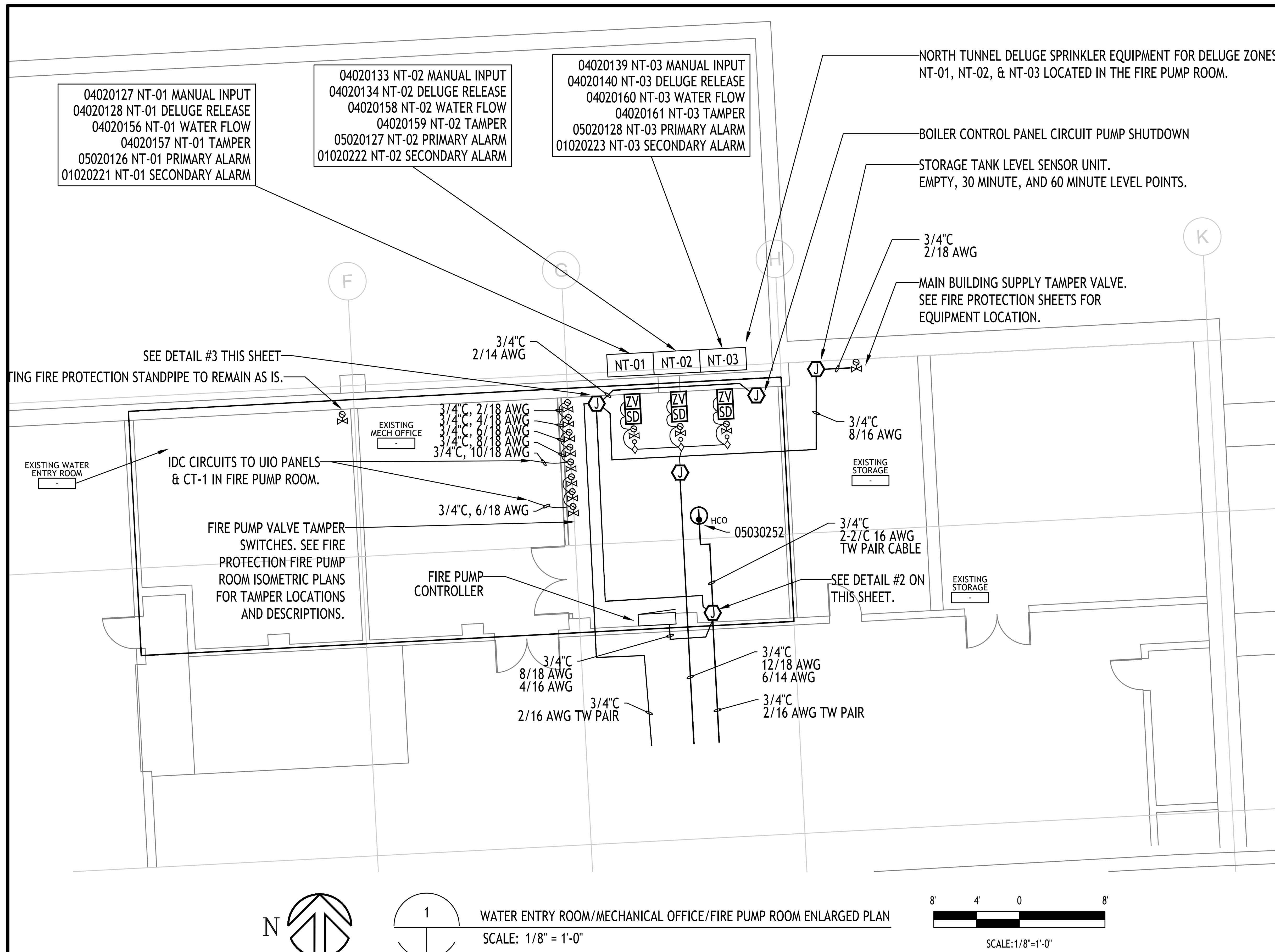
RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
ROADWAY LEVEL WEST

Drawing Number
FA2.W01

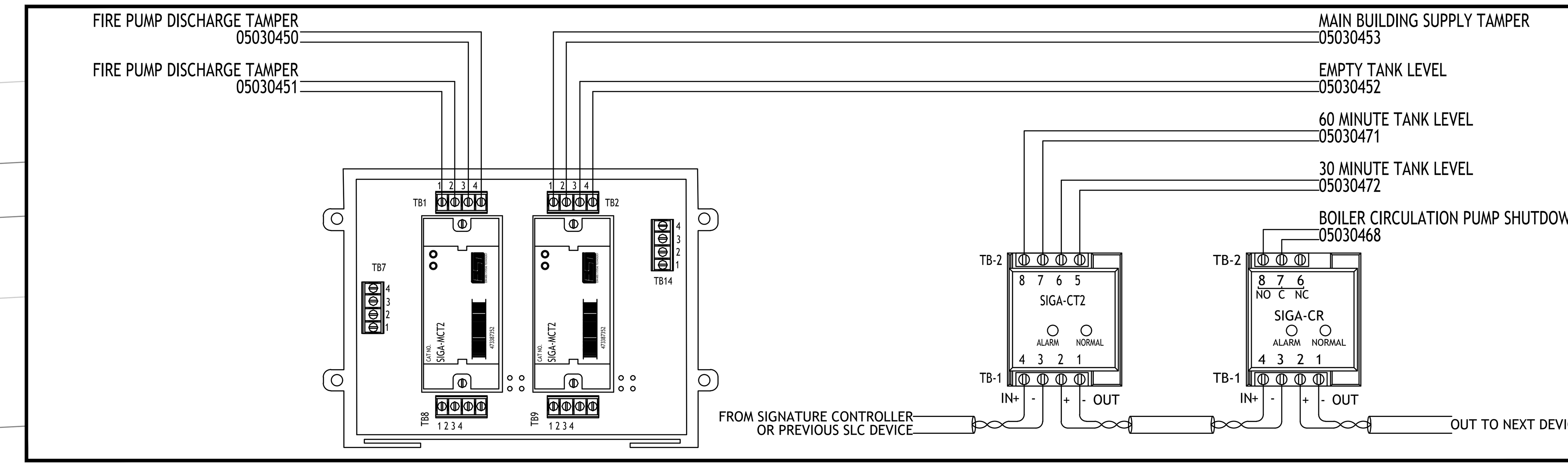


1 WATER ENTRY ROOM/MECHANICAL OFFICE/FIRE PUMP ROOM ENLARGED PLAN
SCALE: 1/8" = 1'-0"

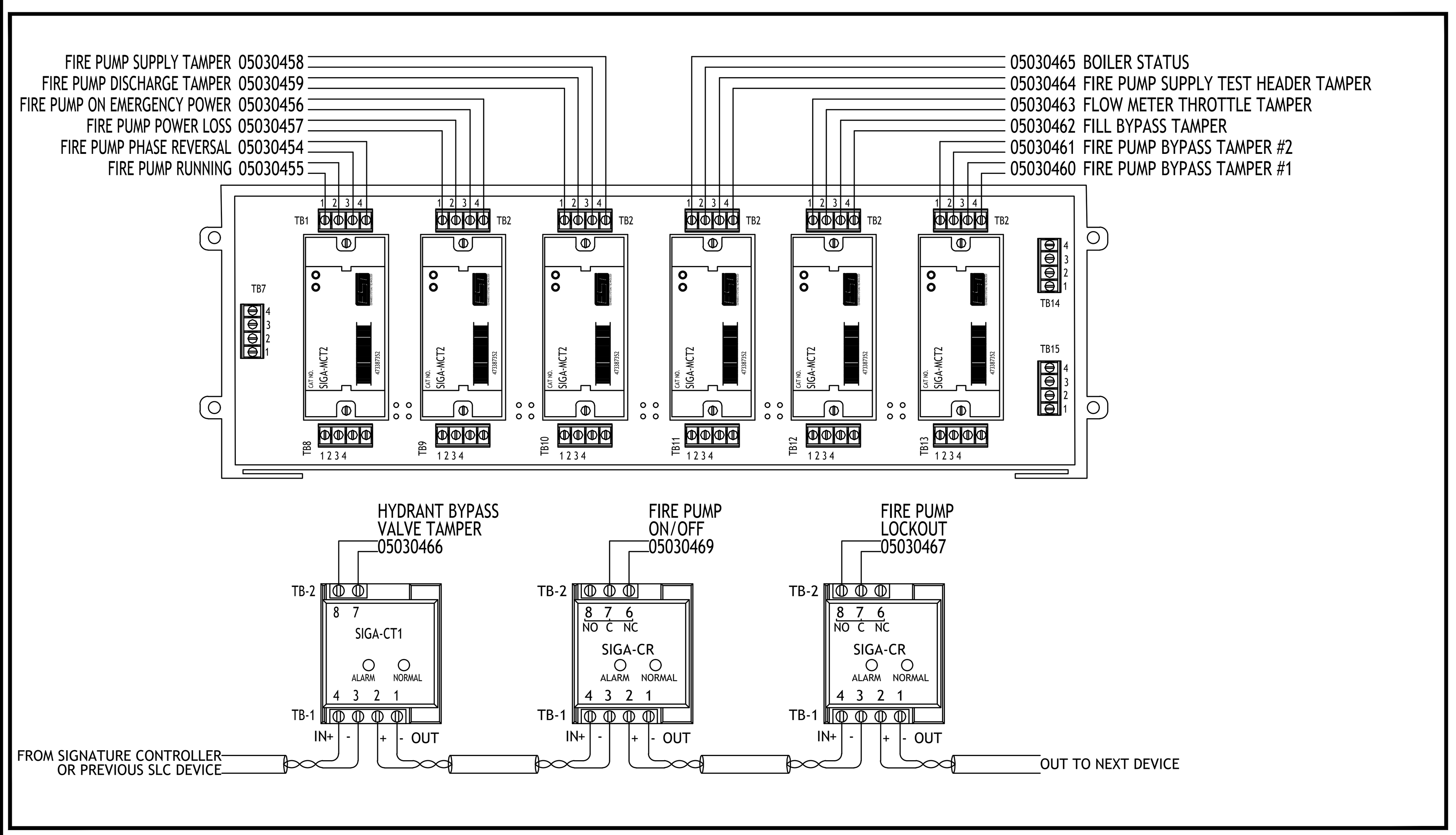
SCALE:1/8"=1'-0"

GENERAL NOTES:

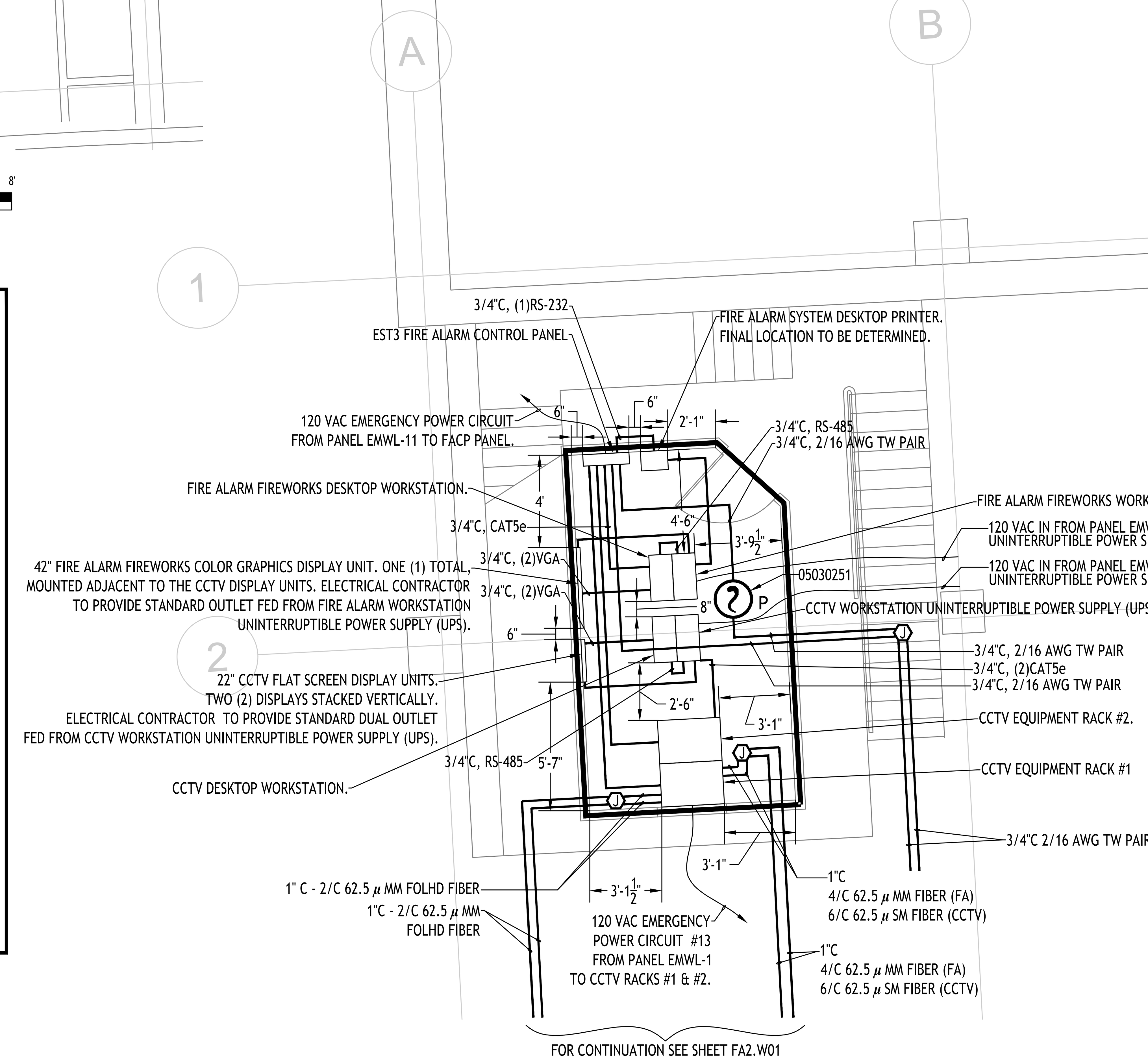
1. IF FIELD CONDITIONS RESULT IN A CHANGE TO THE SHOP DRAWING INSTALLATION IN ANY WAY, CONTACT FAS SYSTEMS GROUP TO VERIFY PROPOSED CHANGES ARE COMPLIANT WITH NFPA 72 AND PROJECT REQUIREMENTS.
2. EACH CONTROL CABINET AND ADDRESSABLE DEVICE SHALL BEAR A TYPED LABEL INDICATING ITS ADDRESS OR DESIGNATION, WHICH CAN BE SEEN WITHOUT A LADDER OR LIFT. SMOKE AND HEAT DETECTORS SHALL HAVE THEIR LABEL ON ITS BASE.
3. SIGNATURE SERIES PHOTO-ELECTRIC DETECTORS SHOULD BE MOUNTED NO CLOSER THAN 26" TO AN ELECTRONIC BALLAST OR THE WIRING FROM BALLAST FIXTURE RECEPTACLES, WHERE POSSIBLE.



3 SIGA-UIO2 DETAIL
SCALE: N.T.S.



2 SIGA-UIO6R DETAIL
SCALE: N.T.S.



4 MEZZANINE WEST CONTROL ROOM ENLARGED PLAN
SCALE: 1/4" = 1'-0"

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

BARNARD EJMT TEAM

RONDINELLI Life Safety · ILF CONSULTING ENGINEERS · BARNARD · Western States Fire Protection Co. · Systems Group · BCER Engineering · Sturgeon Electric

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

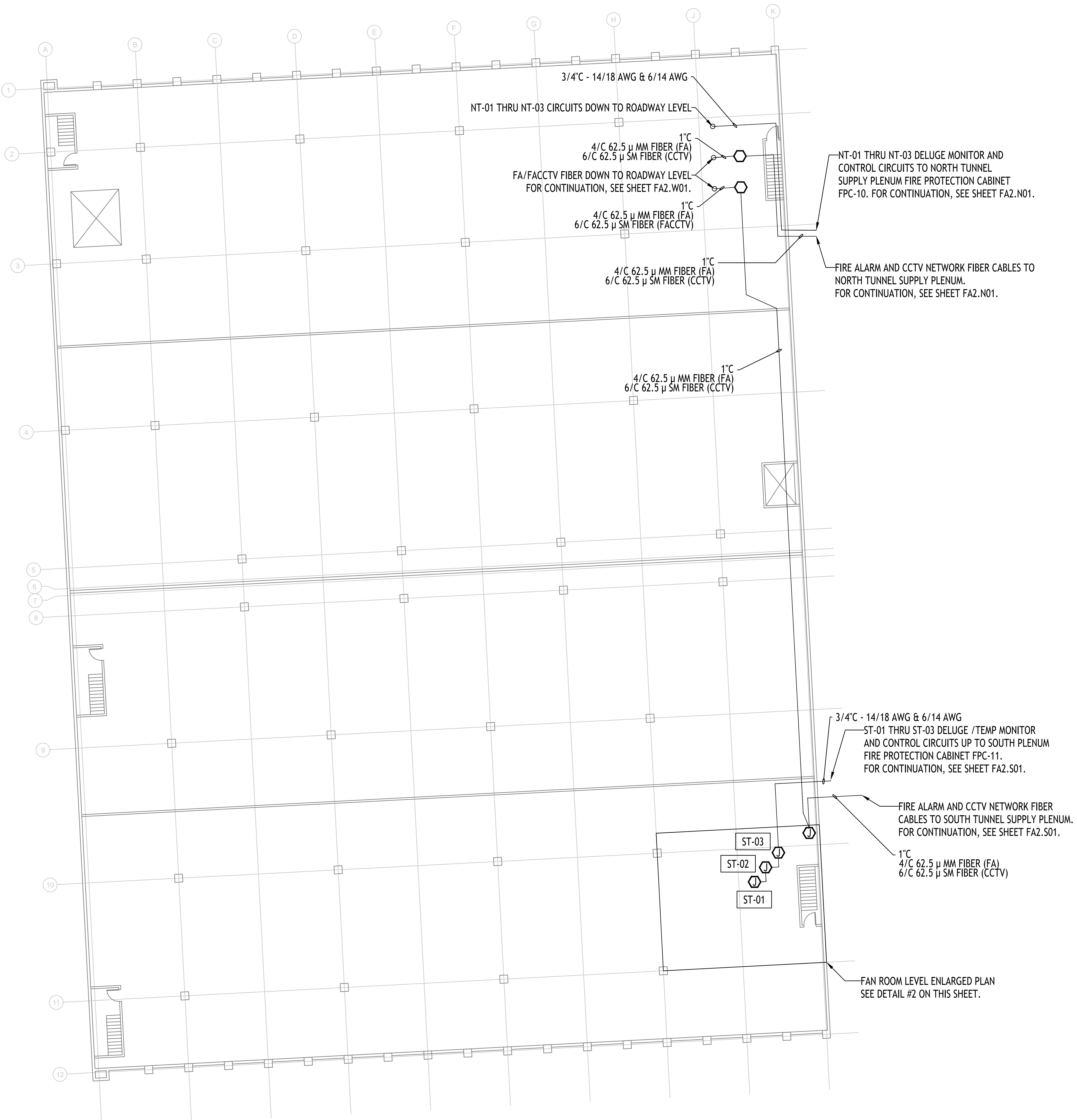
FIRE ALARM:
ROADWAY LEVEL WEST

Drawing Number
FA2.W02

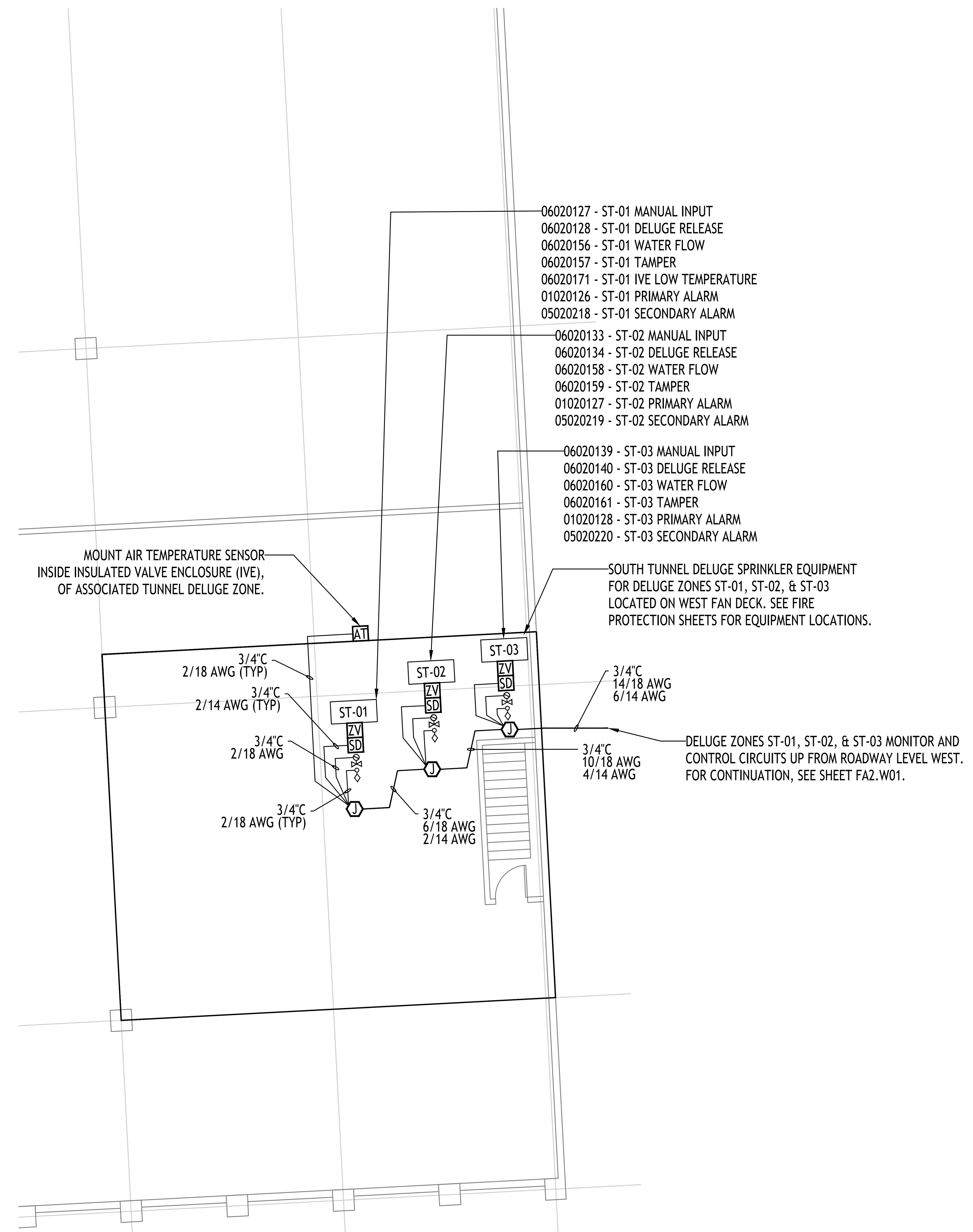
IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

GENERAL NOTES:

1. IF FIELD CONDITIONS RESULT IN A CHANGE TO THE SHOP DRAWING INSTALLATION IN ANY WAY, CONTACT FAS SYSTEMS GROUP TO VERIFY PROPOSED CHANGES ARE COMPLIANT WITH NFPA 72 AND PROJECT REQUIREMENTS.
2. EACH CONTROL CABINET AND ADDRESSABLE DEVICE SHALL BEAR A TYPED LABEL INDICATING ITS ADDRESS OR DESIGNATION, WHICH CAN BE SEEN WITHOUT A LADDER OR LIFT. SMOKE AND HEAT DETECTORS SHALL HAVE THEIR LABEL ON ITS BASE.



N — 1 FAN ROOM LEVEL WEST
SCALE: 1/16" = 1'-0"
SCALE:1/16"=1'-0"



N — 2 FAN ROOM LEVEL ENLARGED PLAN
SCALE: 1/8" = 1'-0"
SCALE:1/8"=1'-0"

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

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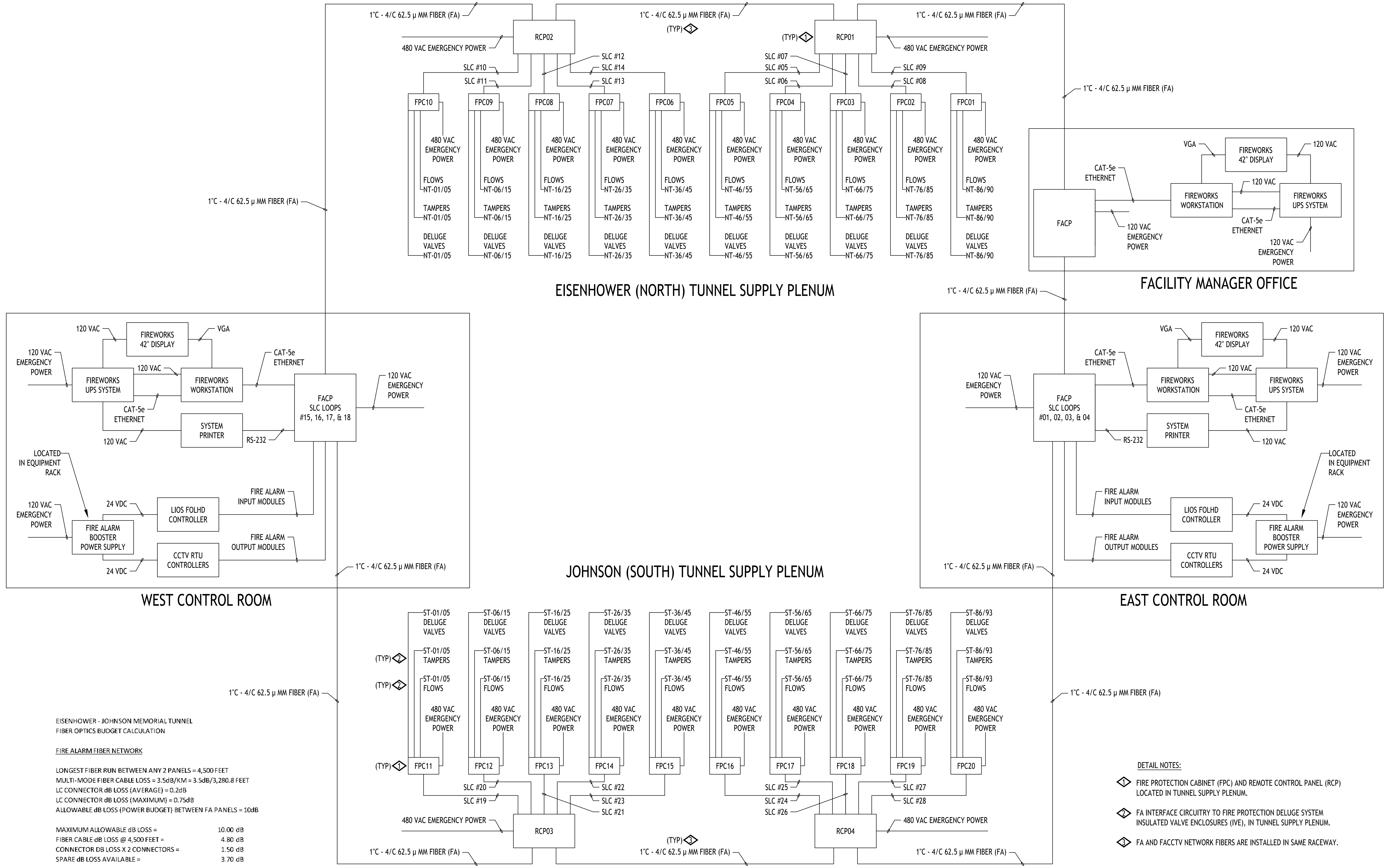
EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
FAN LEVEL WEST

Drawing Number
FA2.W03



EISENHOWER - JOHNSON MEMORIAL TUNNEL
FIBER OPTICS BUDGET CALCULATION

FIRE ALARM FIBER NETWORK

LONGEST FIBER RUN BETWEEN ANY 2 PANELS = 4,500 FEET
MULTI-MODE FIBER CABLE LOSS = 3.5dB/KM = 3.5dB/3,280.8 FEET
LC CONNECTOR dB LOSS (AVERAGE) = 0.2dB
LC CONNECTOR dB LOSS (MAXIMUM) = 0.75dB
ALLOWABLE dB LOSS (POWER BUDGET) BETWEEN FA PANELS = 10dB

MAXIMUM ALLOWABLE dB LOSS =	10.00 dB
FIBER CABLE dB LOSS @ 4,500 FEET =	4.80 dB
CONNECTOR DB LOSS X 2 CONNECTORS =	1.50 dB
SPARE dB LOSS AVAILABLE =	3.70 dB

DETAIL NOTES:

1. FIRE PROTECTION CABINET (FPC) AND REMOTE CONTROL PANEL (RCP) LOCATED IN TUNNEL SUPPLY PLENUM.
2. FA INTERFACE CIRCUITRY TO FIRE PROTECTION DELUGE SYSTEM INSULATED VALVE ENCLOSURES (IVE), IN TUNNEL SUPPLY PLENUM.
3. FA AND FACCTV NETWORK FIBERS ARE INSTALLED IN SAME RACEWAY.

2 FIRE ALARM SYSTEM FIBER OPTIC BUDGET CALCULATION
SCALE: NOT TO SCALE

1 FIRE ALARM SYSTEM ONE-LINE RISER DIAGRAM
SCALE: NOT TO SCALE

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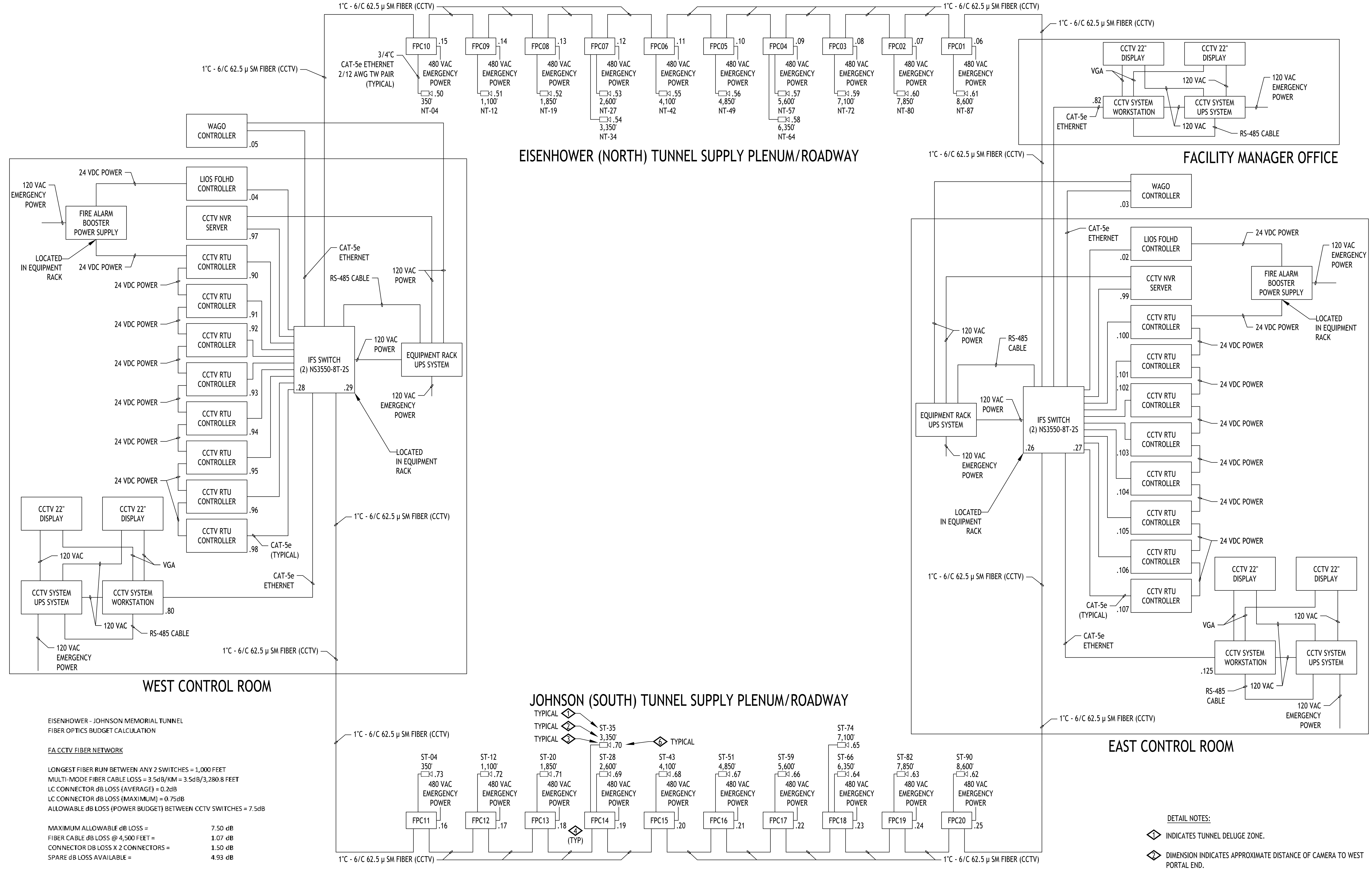
EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
ONE LINE DIAGRAM
FIRE ALARM

Drawing Number
FA3.01



EISENHOWER - JOHNSON MEMORIAL TUNNEL
FIBER OPTICS BUDGET CALCULATION

FA CCTV FIBER NETWORK

LONGEST FIBER RUN BETWEEN ANY 2 SWITCHES = 1,000 FEET
MULTI-MODE FIBER CABLE LOSS = 3.5dB/KM = 3.5dB/3,280.8 FEET
LC CONNECTOR dB LOSS (AVERAGE) = 0.2dB
LC CONNECTOR dB LOSS (MAXIMUM) = 0.75dB
ALLOWABLE dB LOSS (POWER BUDGET) BETWEEN CCTV SWITCHES = 7.5dB

MAXIMUM ALLOWABLE dB LOSS =	7.50 dB
FIBER CABLE dB LOSS @ 4,500 FEET =	1.07 dB
CONNECTOR DB LOSS X 2 CONNECTORS =	1.50 dB
SPARE dB LOSS AVAILABLE =	4.93 dB

2 CCTV SYSTEM FIBER OPTIC BUDGET CALCULATION
SCALE: NOT TO SCALE

1 CCTV SYSTEM ONE-LINE RISER DIAGRAM
SCALE: NOT TO SCALE

DETAIL NOTES:

1. INDICATES TUNNEL DELUGE ZONE.
2. DIMENSION INDICATES APPROXIMATE DISTANCE OF CAMERA TO WEST PORTAL END.
3. CCTV CAMERA LOCATED ON TUNNEL ROADWAY WALL TILE ABOVE ROADWAY EXIT.
4. FIRE PROTECTION CABINET (FPC) LOCATED IN TUNNEL SUPPLY PLENUM.
5. FIRE ALARM AND FACCTV NETWORK FIBERS ARE INSTALLED IN SAME RACEWAY.
6. ADDRESSING SCHEME 223.223.223.XX

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
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RECORD DRAWINGS - 2015-11-16

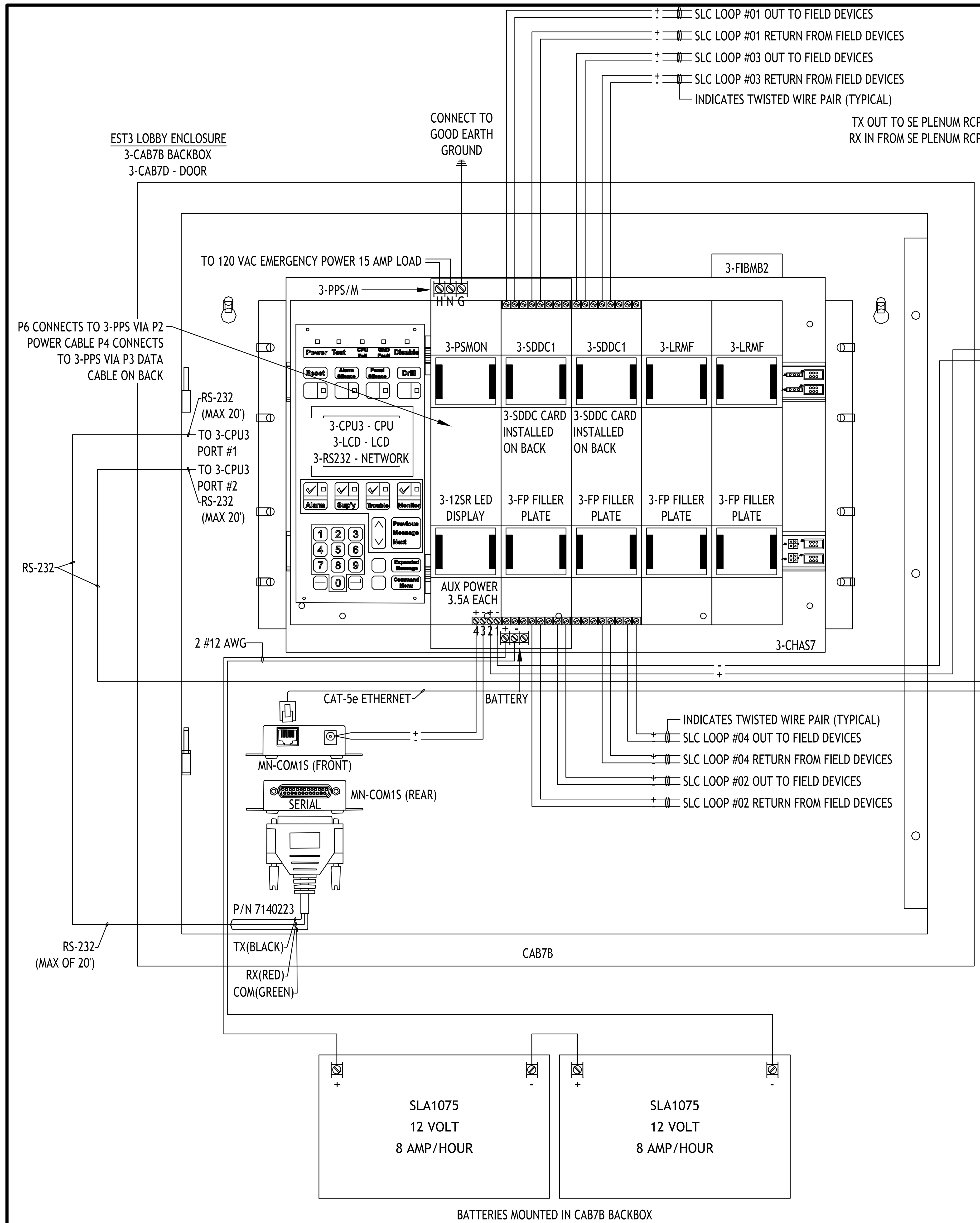
Revisions

Num	Description	Date

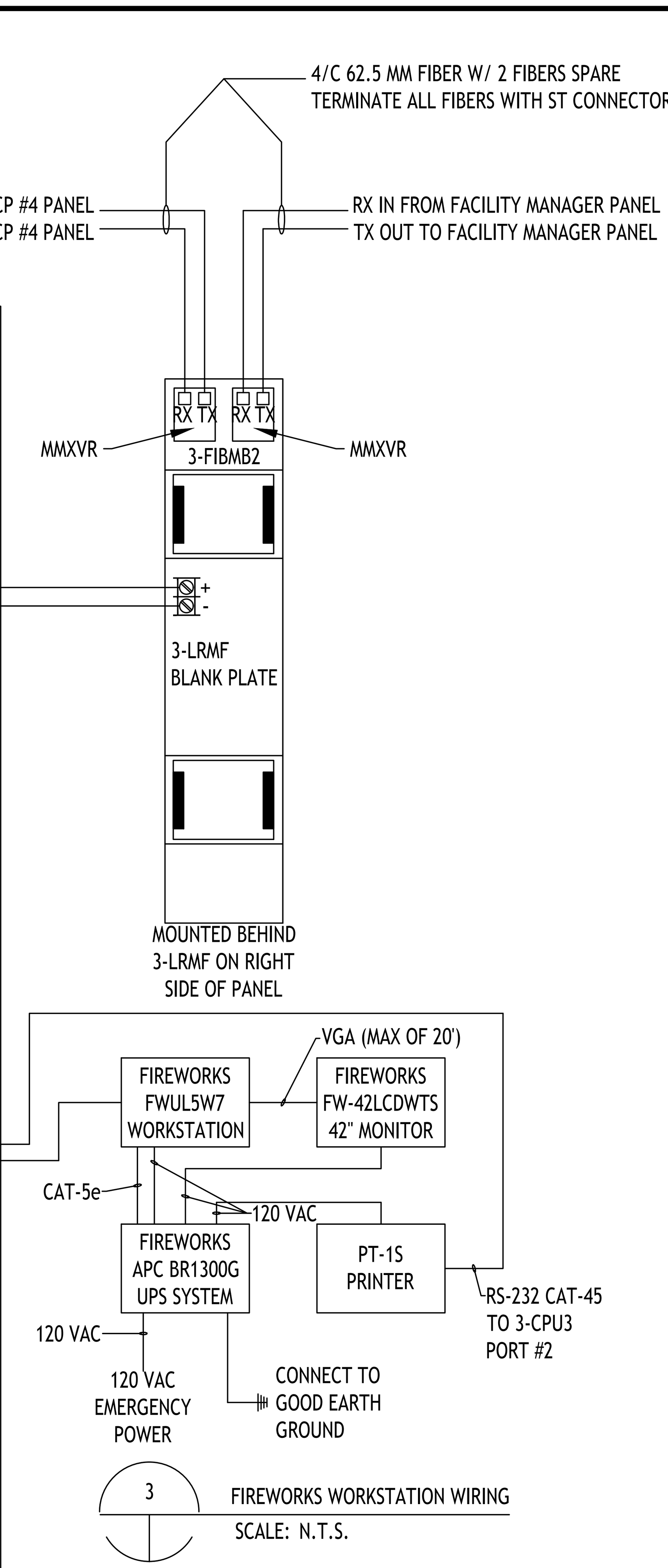
DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
ONE LINE DIAGRAM
CCTV

Drawing Number
FA3.02



1 EAST CONTROL ROOM - FACP PANEL LAYOUT & WIRING
SCALE: N.T.S.



3 FIREWORKS WORKSTATION WIRING
SCALE: N.T.S.

Supply Voltage & Battery Periods
120 VAC Supply Voltage
EJMT - EAST CONTROL ROOM - EST3

QTY.	Model	Description	Stby mA	Alm mA
4	Standby Hours			
5	Alarm Minutes			
1	3-CPU3	Central Processor Module	155	165
1	3-RS232	RS232 Communication Card	58	58
2	3-SDDC1	Signature Dual Driver Controller (LRM)	528	672
1	3-LCD	Liquid Crystal Display Module	40	42
2	3-PPS/M	Primary Power Supply (Included in 3-CPU3 Current)	0	0
1	3-12SR	Control Display Module, 12 Switches, 12 Led's (Red)	20	20
1	MN-COM1S	MN/EC Serial Communications/LAN Interface	60	60
1	3-FIBM2	Fiber Optic Communications Interface	105	105
2	MMXVR	Plug-In Standard Output Multi Mode Transceiver	40	40
		TOTAL LOAD	1006	1162
		Total Stand-By and Alarm Current	1006	1162
		Standby Hours * Total Standby Current	4024	
		(Alarm Minutes/60) * Total Alarm Current		96.833
		Total Standby/Alarm Current	4120.833	
		Battery De-Rating Factor +20%	4945.000	
4.95	Calculated Battery Ampere Hours			
Quantity	Model	Description		
2	SLA1075	8.0 AH Battery		

4 EAST CONTROL ROOM - EST3 FACP PANEL CALCULATION
SCALE: N.T.S.

Supply Voltage & Battery Periods
120 VAC Supply Voltage
EJMT - East Control Room Equipment Rack - BPS10A

Qty	Description	Stby mA	Alm mA	Total Stby mA	Total Alm mA
4	Standby Hours				
5	Alarm Minutes				
8	IoLogik E2210 CCTV Controller	203	350	1624	2800
1	LIOS LHD3-02 Controller	1875	1875	1875	1875
0	TOTAL load for the 200mA Auxiliary Power Source			0	0
1	Aux STANDBY load delivered during a power fail	12		12	0
1	Aux ALARM current delivered during a power fail		12	0	12
	Total NAC & AUX Load			3511	4687
1	BPS10A Remote Booster Power Supply, 10A, 120Vac, Red			70	270
	TOTAL LOAD			3581	4957
	Total Stand-By and Alarm Current			3581	4957
	Standby Hours * Total Standby Current			14324	
	(Alarm Minutes/60) * Total Alarm Current				413.083
	Total Standby + Alarm Current			14737.083	
	Battery De-Rating Factor +20%			17684.500	
17.68	Calculated Battery Ampere Hours				
Quantity	Model	Description			
2	SLA1116	SLA1116 18.0 AH Battery			

2 EAST CONTROL ROOM - CCTV RACK BPS10A CALCULATION
SCALE: N.T.S.

UPS System Calculations
EJMT - EAST CONTROL ROOM - FA WORK STATION

Standby: 5 min. Description	Qty	Load (W)	Total Load (W)
Fireworks Workstation	1	350	350
42" Monitor	1	180	180
PT-1S Printer	1	48	48
Total Load			578
20% Spare Capacity			115.6
UPS Capacity			693.6

UPS System Calculations
EJMT - EAST CONTROL ROOM - CCTV WORK STATION

Standby: 5 min. Description	Qty	Load (W)	Total Load (W)
CCTV Workstation	1	635	635
22" Monitor	2	25	50
Total Load			685
20% Spare Capacity			137
UPS Capacity			822

UPS System Calculations
EJMT - EAST CONTROL ROOM - CCTV RACK EQUIPMENT

Standby: 5 min. Description	Qty	Load (W)	Total Load (W)
SG300-20 Switch	1	16.05	16.05
System 750 WAGO	3	102	306
DVR Server	1	495	495
Total Load			817.05
20% Spare Capacity			163.41
UPS Capacity			980.46

5 EAST CONTROL ROOM - UPS CALCULATIONS
SCALE: N.T.S.

BARNARD EJMT TEAM

BARNARD

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

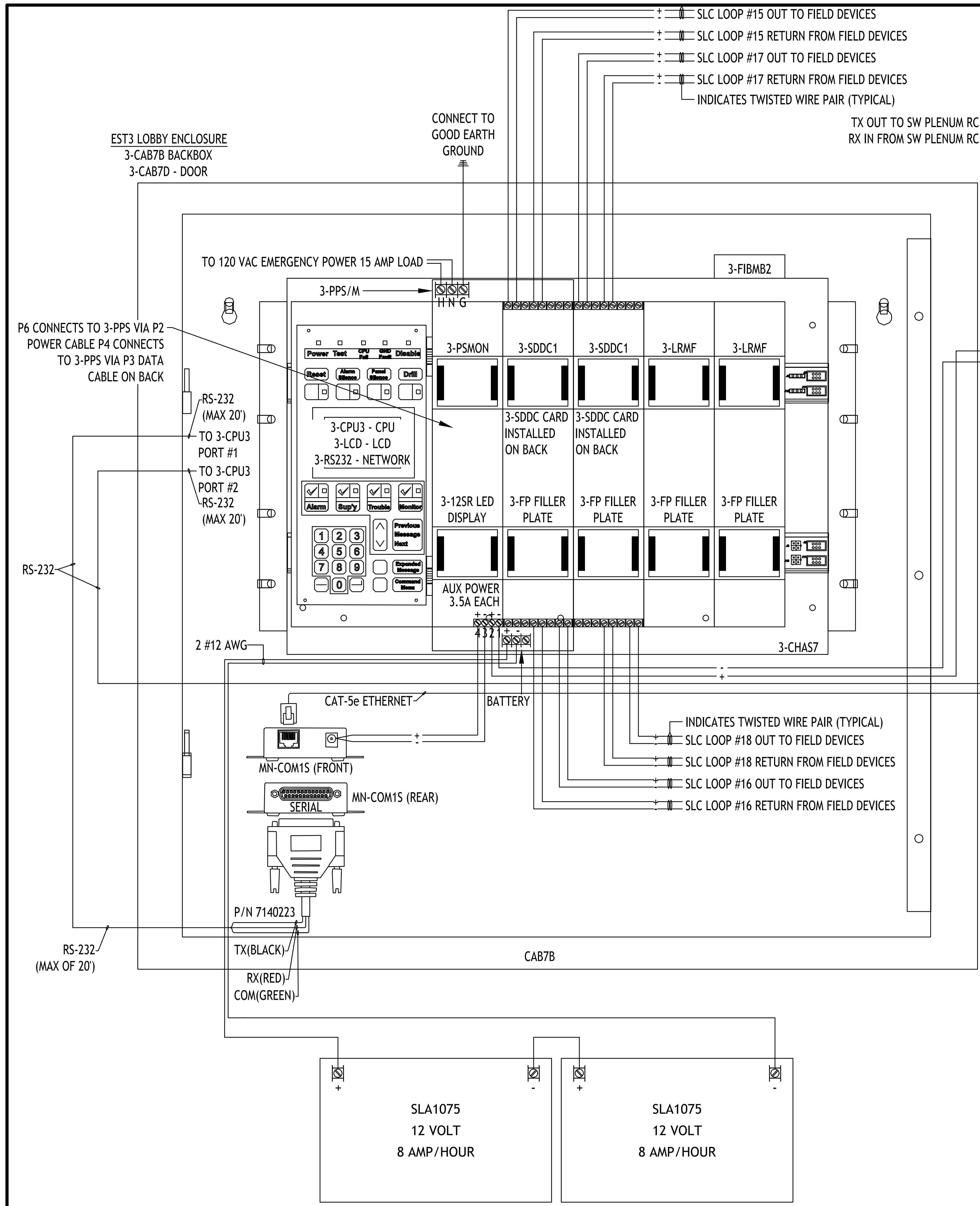
Revisions		
Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

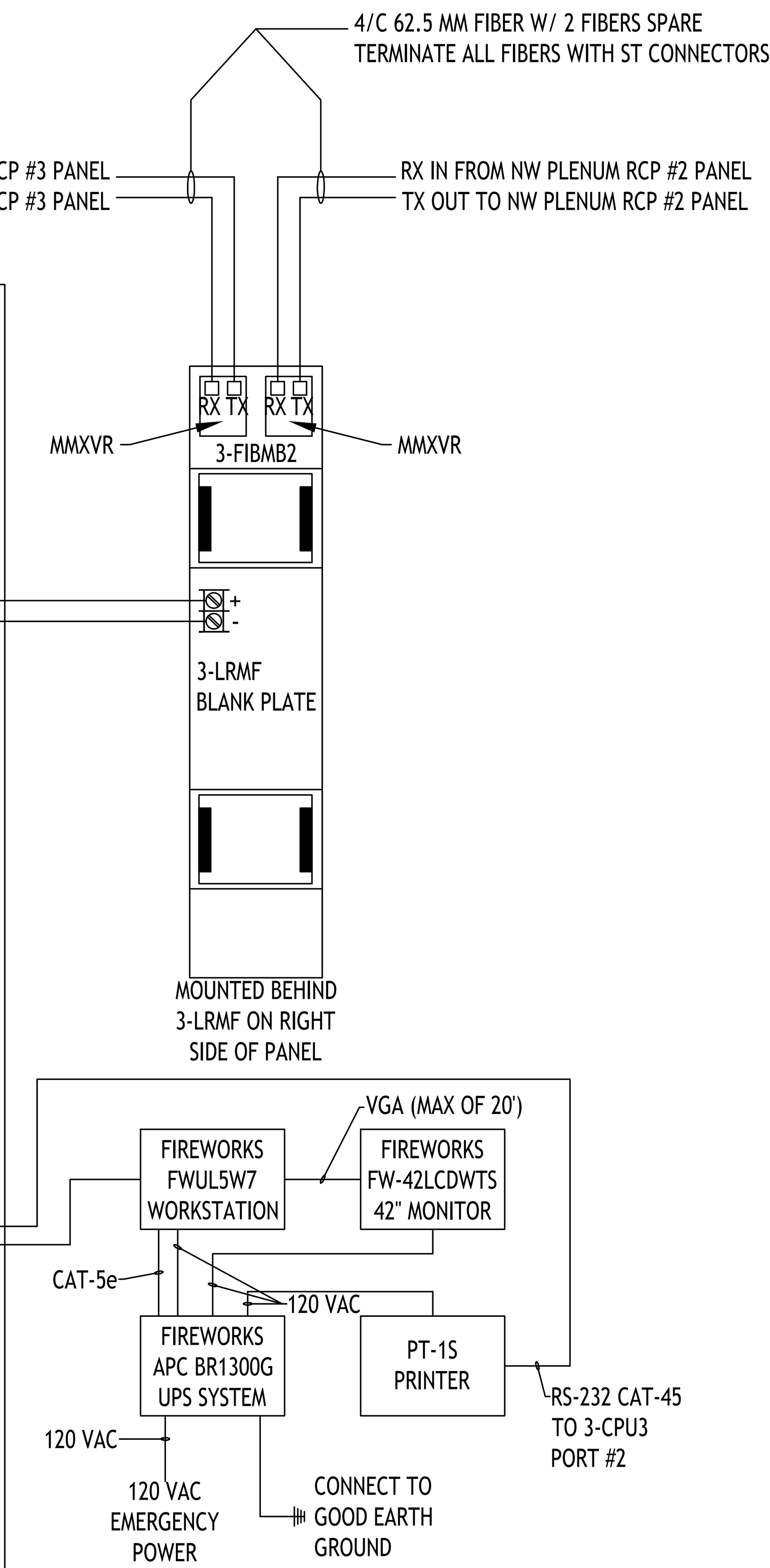
FIRE ALARM:
E. CNTR. RM EST3 PANEL LAYOUT & CALCULATIONS

Drawing Number
FA4.01

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE



1 WEST CONTROL ROOM - FACP PANEL LAYOUT & WIRING
SCALE: N.T.S.



3 FIREWORKS WORKSTATION WIRING
SCALE: N.T.S.

Supply Voltage & Battery Periods				
120	VAC Supply Voltage			
EJMT - WEST CONTROL ROOM - EST3				
4	Standby Hours			
5	Alarm Minutes			
QTY.	Model	Description	Stby mA	Alm mA
1	3-CPU3	Central Processor Module	155	165
1	3-RS232	RS232 Communication Card	58	58
2	3-SDDC1	Signature Dual Driver Controller (LRM)	528	672
1	3-LCD	Liquid Crystal Display Module	40	42
2	3-PPS/M	Primary Power Supply (Included in 3-CPU3 Current)	0	0
1	3-12SR	Control Display Module, 12 Switches, 12 Led's (Red)	20	20
1	MN-COM1S	MN/EC Serial Communications/LAN Interface	60	60
1	3-FIBM2	Fiber Optic Communications Interface	105	105
2	MMXVR	Plug-In Standard Output Multi Mode Transceiver	40	40
		TOTAL LOAD	1006	1162
		Total Stand-By and Alarm Current	1006	1162
		Standby Hours * Total Standby Current	4024	
		(Alarm Minutes/60) * Total Alarm Current		96.833
		Total Standby/Alarm Current	4120.833	
		Battery De-Rating Factor +20%	4945.000	
4.95	Calculated Battery Ampere Hours			
Quantity	Model	Description		
2	SLA1075	8.0 AH Battery		

4 WEST CONTROL ROOM - EST3 FACP PANEL CALCULATION
SCALE: N.T.S.

Supply Voltage & Battery Periods					
120	VAC Supply Voltage				
EJMT - West Control Room Equipment Rack - BPS10A					
4	Standby Hours	Stby mA	Alm mA	Total Stby mA	Total Alm mA
5	Alarm Minutes				
8	IoLogik E2210 CCTV Controller	203	350	1624	2800
1	LIOS LHD3-02 Controller	1875	1875	1875	1875
0	TOTAL load for the 200mA Auxiliary Power Source			0	0
1	Aux STANDBY load delivered during a power fail	12		12	0
1	Aux ALARM current delivered during a power fail		12	0	12
	Total NAC & AUX Load			3511	4687
1	BPS10A Remote Booster Power Supply, 10A, 120Vac, Red			70	270
			TOTAL LOAD	3581	4957
			Total Stand-By and Alarm Current	3581	4957
			Standby Hours * Total Standby Current	14324	
			(Alarm Minutes/60) * Total Alarm Current		413.083
			Total Standby + Alarm Current	14737.083	
			Battery De-Rating Factor +20%	17684.500	
17.68	Calculated Battery Ampere Hours				
Quantity	Model	Description			
2	SLA1116	SLA1116 18.0 AH Battery			

2 WEST CONTROL ROOM - CCTV RACK BPS10A CALCULATION
SCALE: N.T.S.

UPS System Calculations			
EJMT - WEST CONTROL ROOM - FA WORK STATION			
Standby: 5 min. Description	Qty	Load (W)	Total Load (W)
Fireworks Workstation	1	350	350
42" Monitor	1	180	180
PT-1S Printer	1	48	48
Total Load			578
20% Spare Capacity			115.6
UPS Capacity			693.6

UPS System Calculations			
EJMT - WEST CONTROL ROOM - CCTV WORK STATION			
Standby: 5 min. Description	Qty	Load (W)	Total Load (W)
CCTV Workstation	1	635	635
22" Monitor	2	25	50
Total Load			685
20% Spare Capacity			137
UPS Capacity			822

UPS System Calculations			
EJMT - WEST CONTROL ROOM - CCTV RACK EQUIPMENT			
Standby: 5 min. Description	Qty	Load (W)	Total Load (W)
SG300-20 Switch	1	16.05	16.05
System 750 WAGO	3	102	306
DVR Server	1	495	495
Total Load			817.05
20% Spare Capacity			163.41
UPS Capacity			980.46

5 WEST CONTROL ROOM - UPS CALCULATIONS
SCALE: N.T.S.

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BARNARD EJMT TEAM

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DESIGN BUILD PROJECT
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RECORD DRAWINGS - 2015-11-16

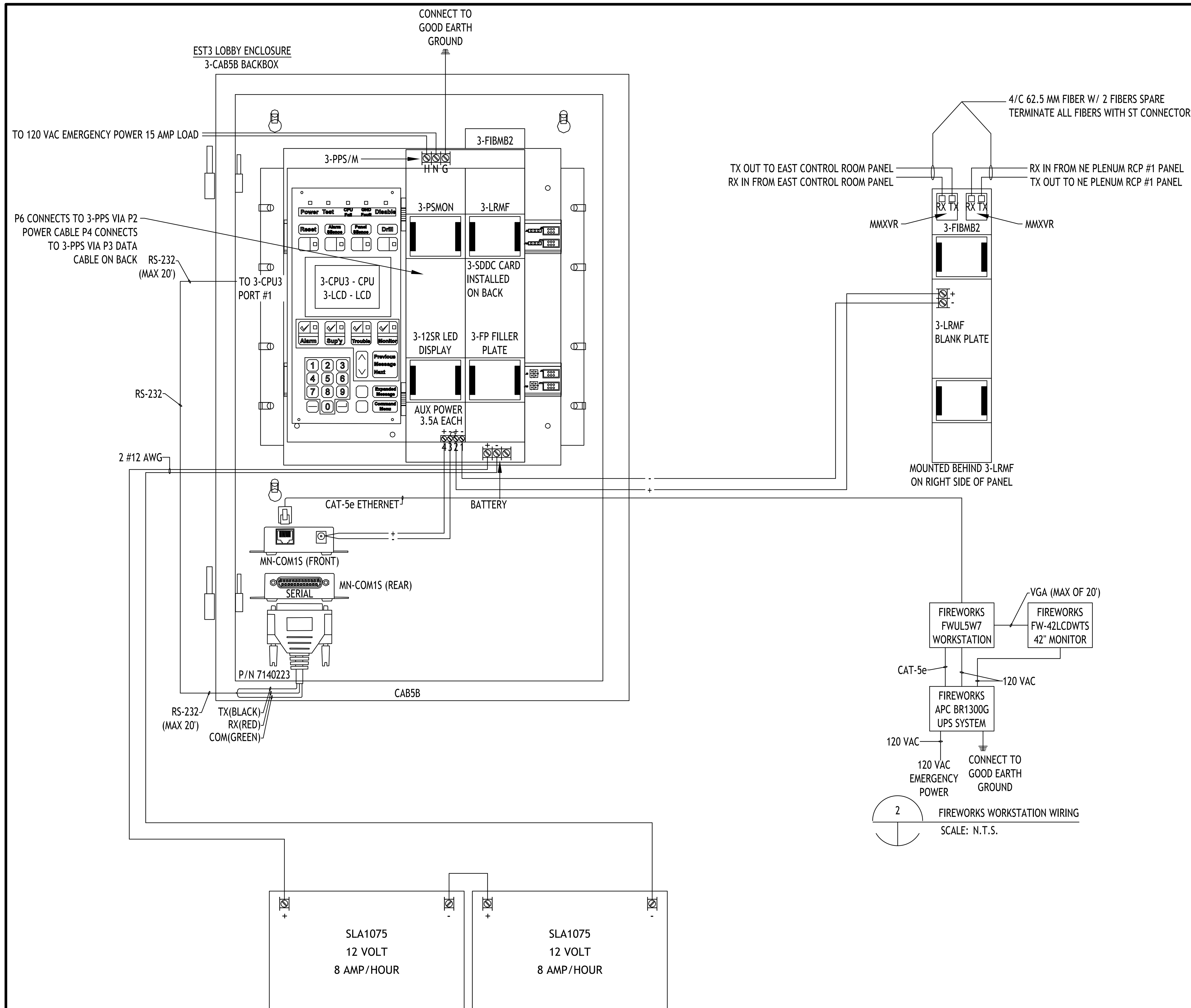
Revisions

Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
W. CONT. RM EST3 PANEL
LAYOUT & CALCULATIONS

Drawing Number
FA4.02



2 FIREWORKS WORKSTATION WIRING
SCALE: N.T.S.

1 FACILITY MANAGER OFFICE - FACP PANEL LAYOUT & WIRING
SCALE: N.T.S.

Supply Voltage & Battery Periods				
120	VAC Supply Voltage			
EJMT - FACILITY MANAGER OFFICE - EST3				
4	Standby Hours			
5	Alarm Minutes			
QTY.	Model	Description	Stby mA	Alm mA
1	3-CPU3	Central Processor Module	155	165
1	3-RS232	RS232 Communication Card	58	58
1	3-LCD	Liquid Crystal Display Module	40	42
1	3-PPS/M	Primary Power Supply (Included in 3-CPU3 Current)	0	0
1	3-12SR	Control Display Module, 12 Switches, 12 Led's (Red)	20	20
1	MN-COM1S	MN/EC Serial Communications/LAN Interface	60	60
1	3-FIBM2	Fiber Optic Communications Interface	105	105
2	MMXVR	Plug-In Standard Output Multi Mode Transceiver	40	40
		TOTAL LOAD	478	490
		Total Stand-By and Alarm Current	478	490
		Standby Hours * Total Standby Current	1912	
		(Alarm Minutes/60) * Total Alarm Current		40.833
		Total Standby/Alarm Current	1952.833	
		Battery De-Rating Factor +20%	2343.400	
2.34	Calculated Battery Ampere Hours			
Quantity	Model	Description		
2	SLA1075	8.0 AH Battery		

3 FACILITY MANAGER OFFICE - EST3 FACP PANEL CALCULATION
SCALE: N.T.S.

UPS System Calculations			
EJMT - FACILITY MANAGER OFFICE - FA WORK STATION			
Standby: 5 min. Description	Qty	Load (W)	Total Load (W)
Fireworks Workstation	1	350	350
42" Monitor	1	180	180
Total Load			530
20% Spare Capacity			106
UPS Capacity			636

UPS System Calculations			
EJMT - FACILITY MANAGER OFFICE - CCTV WORK STATION			
Standby: 5 min. Description	Qty	Load (W)	Total Load (W)
CCTV Workstation	1	635	635
22" Monitor	2	25	50
Total Load			685
20% Spare Capacity			137
UPS Capacity			822

4 FACILITY MANAGER OFFICE - UPS CALCULATIONS
SCALE: N.T.S.

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Revisions		
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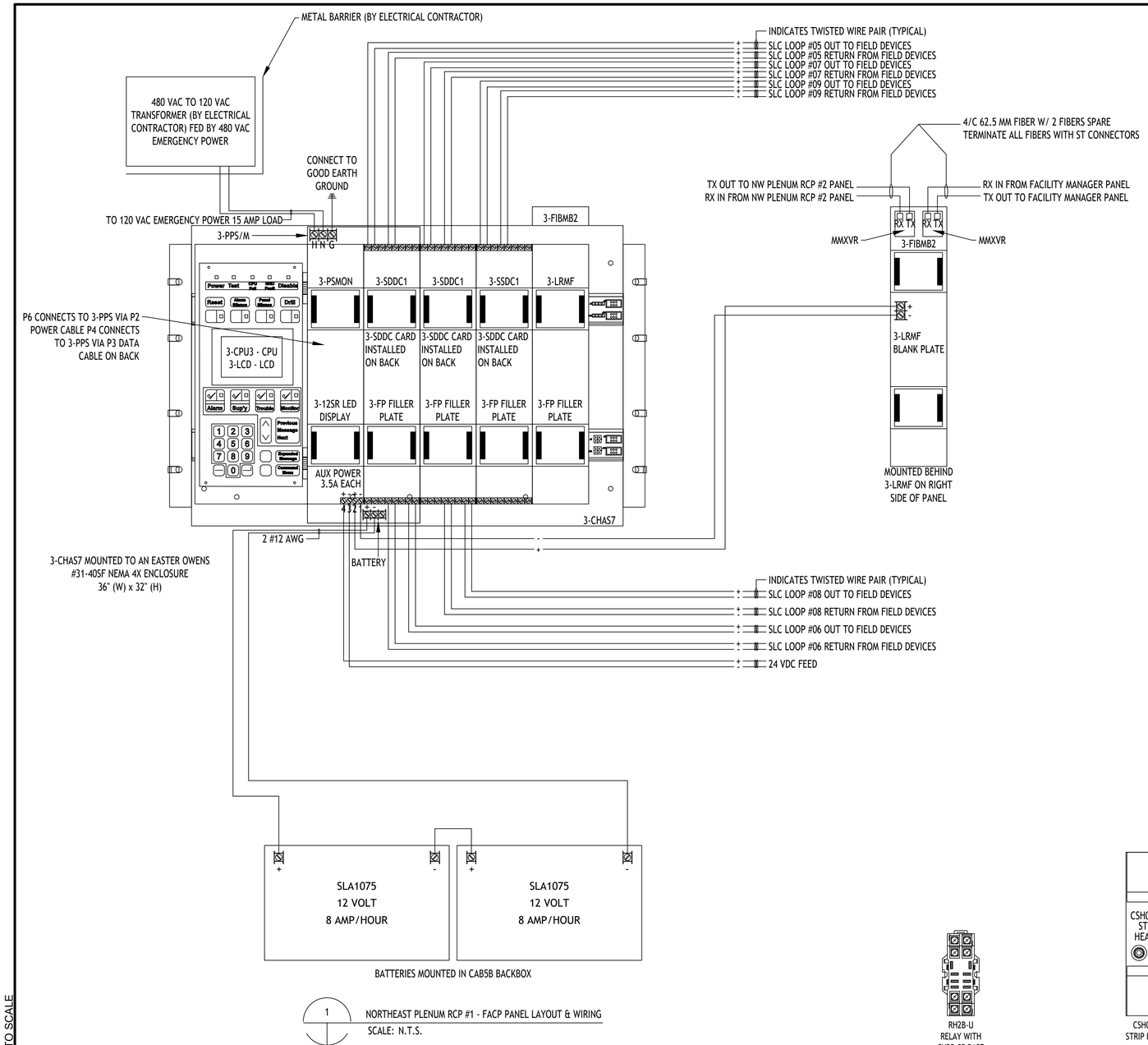
DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
MGR OFF. EST3 PANEL
LAYOUT & CALCULATIONS

Drawing Number
FA4.03



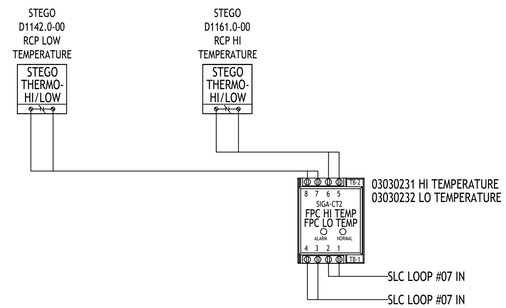
Supply Voltage & Battery Periods				
120	VAC Supply Voltage			
EJMT - RCP #1 - NORTHEAST PLENUM - EST3				
4	Standby Hours			
5	Alarm Minutes			
QTY.	Model	Description	Stby mA	Alm mA
1	3-CPU3	Central Processor Module	155	165
1	3-RS232	RS232 Communication Card	58	58
1	3-SSDC1	Signature Driver Controller (LRM)	144	204
2	3-SDDC1	Signature Dual Driver Controller (LRM)	528	672
1	3-LCD	Liquid Crystal Display Module	40	42
1	3-PPS/M	Primary Power Supply (Included in 3-CPU3 Current)	0	0
1	3-12SR	Control Display Module, 12 Switches, 12 Led's (Red)	20	20
1	MN-COM1S	MN/EC Serial Communications/LAN Interface	60	60
1	3-FIBM2	Fiber Optic Communications Interface	105	105
2	MMXVR	Plug-In Standard Output Multi Mode Transceiver	40	40
		TOTAL LOAD	1150	1366
		Total Stand-By and Alarm Current	1150	1366
		Standby Hours * Total Standby Current	4600	
		(Alarm Minutes/60) * Total Alarm Current		113.833
		Total Standby/Alarm Current	4713.833	
		Battery De-Rating Factor +20%	5656.600	
5.66	Calculated Battery Ampere Hours			
Quantity	Model	Description		
2	SLA1075	8.0 AH Battery		

2 NORTHEAST PLENUM - RCP #1 PANEL CALCULATION
SCALE: N.T.S.

1 NORTHEAST PLENUM RCP #1 - FACP PANEL LAYOUT & WIRING
SCALE: N.T.S.

RH2B-U
RELAY WITH
SH2B-05 BASE
24VDC
DPDT
RELAY

CSH00338
STRIP HEATER



IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

BARNARD EJMT TEAM
RONDINELLI
BARNARD
Western States Fire Protection Co.
BCER engineering
Sturgeon ELECTRIC

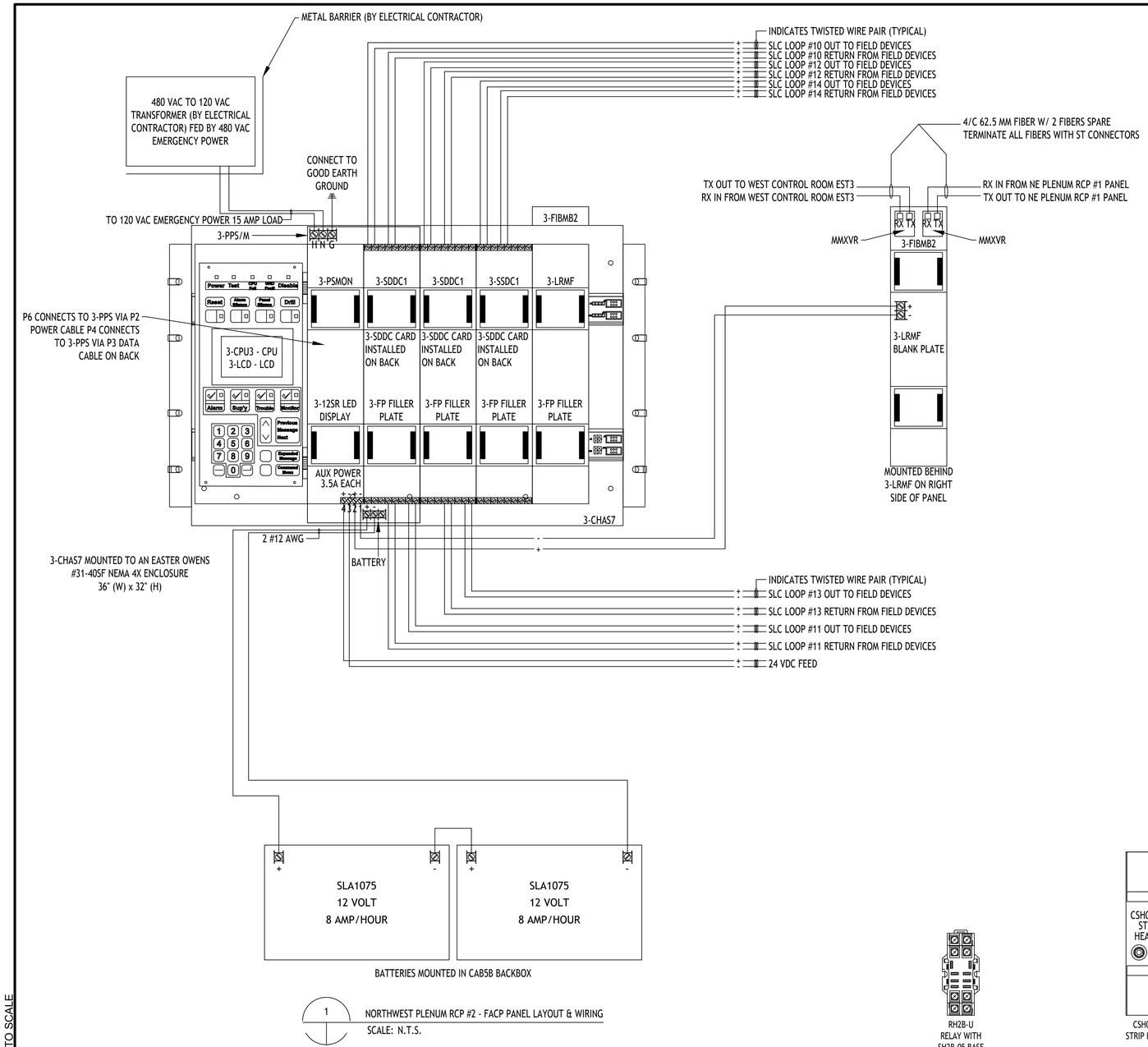
EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions			
Num	Description	Date	

DRAWN BY: B.T.L. CHECKED BY: AEE.Jr

FIRE ALARM:
RCP #1 EST3 PANEL
LAYOUT & CALCULATIONS

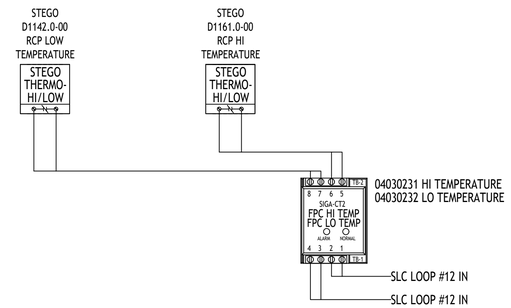
Drawing Number
FA4.04



Supply Voltage & Battery Periods				
120	VAC Supply Voltage			
EJMT - RCP #2 - NORTHWEST PLENUM - EST3				
4	Standby Hours			
5	Alarm Minutes			
QTY.	Model	Description	Stby mA	Alm mA
1	3-CPU3	Central Processor Module	155	165
1	3-RS232	RS232 Communication Card	58	58
1	3-SSDC1	Signature Driver Controller (LRM)	144	204
2	3-SDDC1	Signature Dual Driver Controller (LRM)	528	672
1	3-LCD	Liquid Crystal Display Module	40	42
1	3-PPS/M	Primary Power Supply (Included in 3-CPU3 Current)	0	0
1	3-12SR	Control Display Module, 12 Switches, 12 Led's (Red)	20	20
1	MN-COM1S	MN/EC Serial Communications/LAN Interface	60	60
1	3-FIBM2	Fiber Optic Communications Interface	105	105
2	MMXVR	Plug-In Standard Output Multi Mode Transceiver	40	40
		TOTAL LOAD	1150	1366
		Total Stand-By and Alarm Current	1150	1366
		Standby Hours * Total Standby Current	4600	
		(Alarm Minutes/60) * Total Alarm Current		113.833
		Total Standby/Alarm Current	4713.833	
		Battery De-Rating Factor +20%	5656.600	
5.66	Calculated Battery Ampere Hours			
Quantity	Model	Description		
2	SLA1075	8.0 AH Battery		

2 NORTHWEST PLENUM - RCP #2 PANEL CALCULATION
SCALE: N.T.S.

1 NORTHWEST PLENUM RCP #2 - FACP PANEL LAYOUT & WIRING
SCALE: N.T.S.



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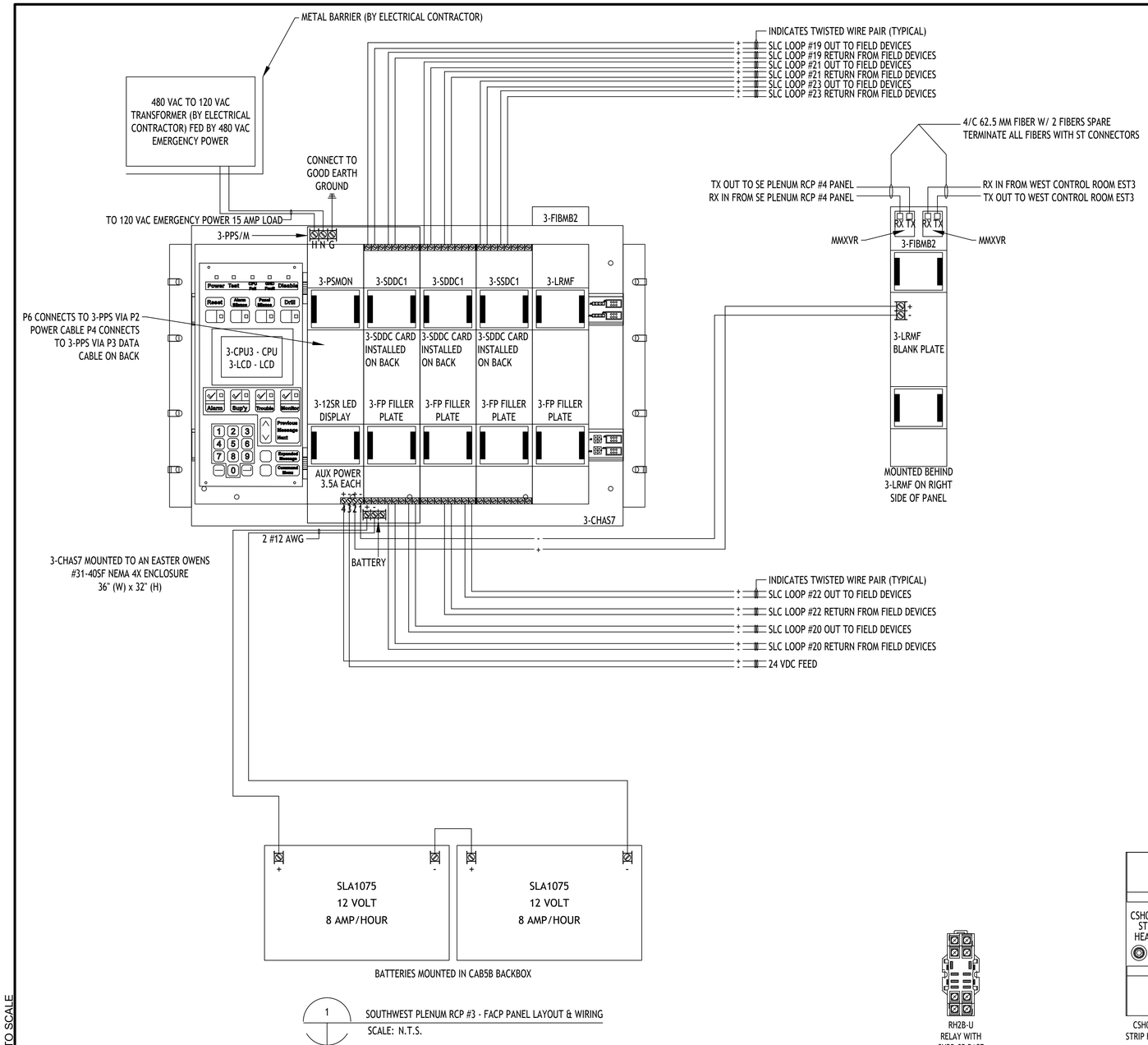
Revisions			
Num	Description	Date	

DRAWN BY: B.T.L. CHECKED BY: AEE.Jr

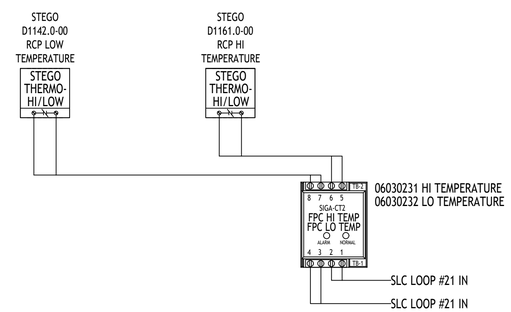
FIRE ALARM:
RCP #2 EST3 PANEL
LAYOUT & CALCULATIONS

Drawing Number
FA4.05



Supply Voltage & Battery Periods				
120	VAC Supply Voltage			
EJMT - RCP #3 - SOUTHWEST PLENUM - EST3				
4	Standby Hours			
5	Alarm Minutes			
QTY.	Model	Description	Stby mA	Alm mA
1	3-CPU3	Central Processor Module	155	165
1	3-RS232	RS232 Communication Card	58	58
1	3-SSDC1	Signature Driver Controller (LRM)	144	204
2	3-SDDC1	Signature Dual Driver Controller (LRM)	528	672
1	3-LCD	Liquid Crystal Display Module	40	42
1	3-PPS/M	Primary Power Supply (Included in 3-CPU3 Current)	0	0
1	3-12SR	Control Display Module, 12 Switches, 12 Led's (Red)	20	20
1	MN-COM1S	MN/EC Serial Communications/LAN Interface	60	60
1	3-FIBM2	Fiber Optic Communications Interface	105	105
2	MMXVR	Plug-In Standard Output Multi Mode Transceiver	40	40
		TOTAL LOAD	1150	1366
		Total Stand-By and Alarm Current	1150	1366
		Standby Hours * Total Standby Current	4600	
		(Alarm Minutes/60) * Total Alarm Current		113.833
		Total Standby/Alarm Current	4713.833	
		Battery De-Rating Factor +20%	5656.600	
5.66	Calculated Battery Ampere Hours			
Quantity	Model	Description		
2	SLA1075	8.0 AH Battery		

2 SOUTHWEST PLENUM - RCP #3 PANEL CALCULATION
SCALE: N.T.S.



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DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
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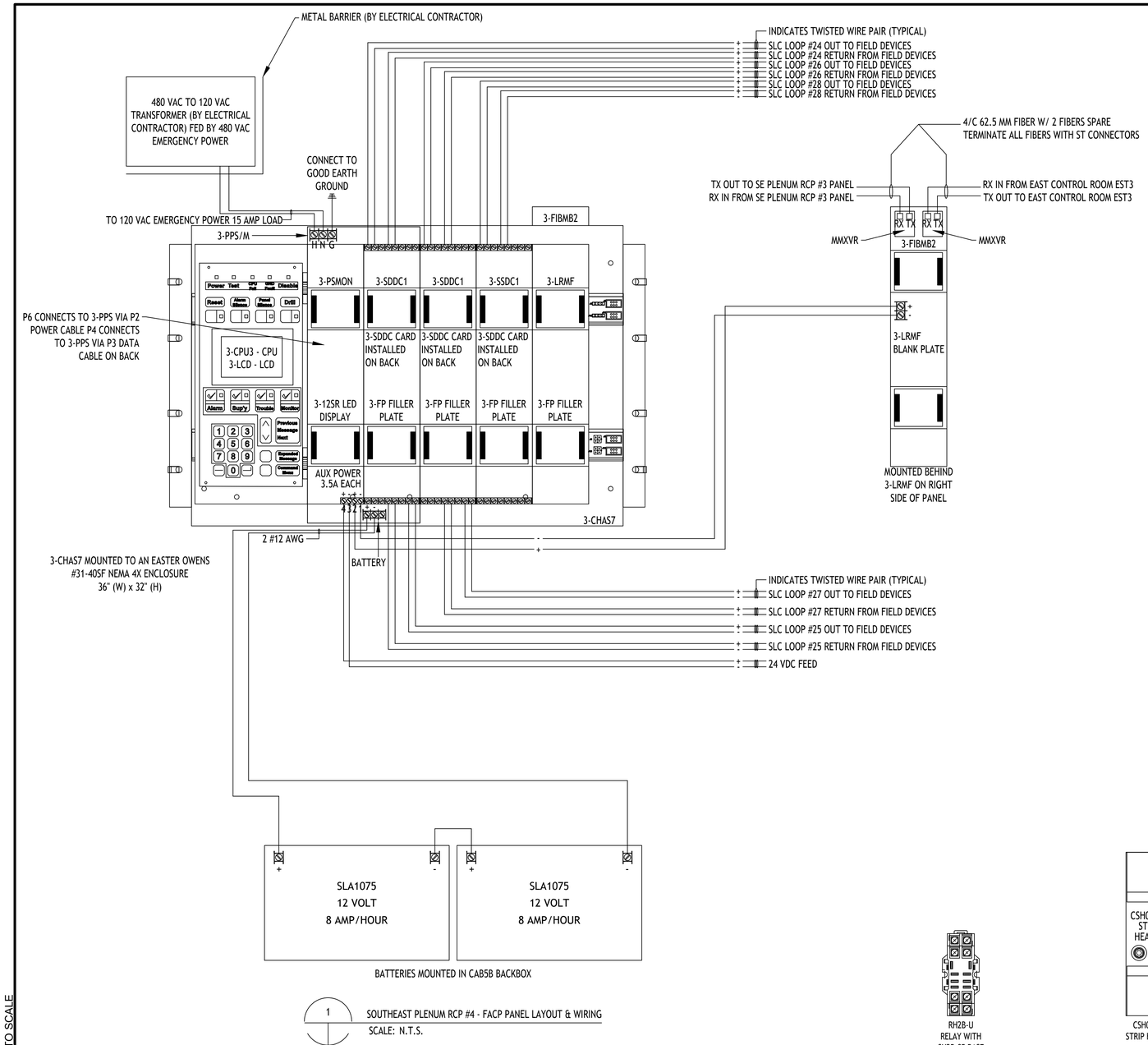
Revisions			
Num	Description	Date	

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

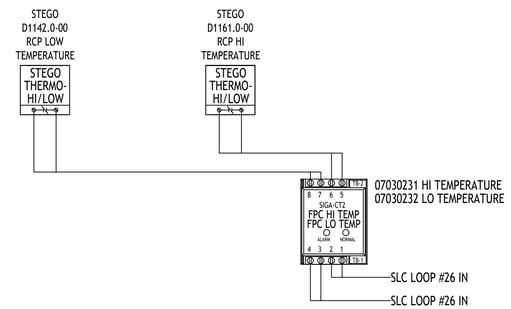
FIRE ALARM:
RCP #3 EST3 PANEL
LAYOUT & CALCULATIONS

Drawing Number
FA4.06



Supply Voltage & Battery Periods				
120	VAC Supply Voltage			
EJMT - RCP #4 - SOUTHEAST PLENUM - EST3				
4	Standby Hours			
5	Alarm Minutes			
QTY.	Model	Description	Stby mA	Alm mA
1	3-CPU3	Central Processor Module	155	165
1	3-RS232	RS232 Communication Card	58	58
1	3-SSDC1	Signature Driver Controller (LRM)	144	204
2	3-SDDC1	Signature Dual Driver Controller (LRM)	528	672
1	3-LCD	Liquid Crystal Display Module	40	42
1	3-PPS/M	Primary Power Supply (Included in 3-CPU3 Current)	0	0
1	3-12SR	Control Display Module, 12 Switches, 12 Led's (Red)	20	20
1	MN-COM1S	MN/EC Serial Communications/LAN Interface	60	60
1	3-FIBM2	Fiber Optic Communications Interface	105	105
2	MMXVR	Plug-In Standard Output Multi Mode Transceiver	40	40
		TOTAL LOAD	1150	1366
		Total Stand-By and Alarm Current	1150	1366
		Standby Hours * Total Standby Current	4600	
		(Alarm Minutes/60) * Total Alarm Current		113.833
		Total Standby/Alarm Current	4713.833	
		Battery De-Rating Factor +20%	5656.600	
5.66	Calculated Battery Ampere Hours			
Quantity	Model	Description		
2	SLA1075	8.0 AH Battery		

2 SOUTHEAST PLENUM - RCP #4 PANEL CALCULATION
SCALE: N.T.S.



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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions
Num | Description | Date

DRAWN BY: B.T.L. | CHECKED BY: AEE Jr

FIRE ALARM:
RCP #4 EST3 PANEL
LAYOUT & CALCULATIONS

Drawing Number
FA4.07

INCREMENTAL VOLTAGE DROP CALCULATIONS FOR DELUGE VALVE RELEASING CIRCUITS
MINIMUM UL RATED VOLTAGE: 16 VOLTS
Current shown in calculations is RMS current at 16 volts.

Resistance	12 Gauge	2.01
	14 Gauge	3.19
	16 Gauge	5.08

Circuit Number:
Location: 500 ft Solenoid Release Ckt w/12 AWG — INPUT VOLTAGE = 20.4 VOLTS

Notification Circuit	Current (in amps)	Wire Distance (in feet)	Total Distance (in feet)	Wire Size (AWG)	Resistance (Ohms)	Voltage Drop	From Baseline Voltage
ASCO HT8210G027	0.442	525	525	12	2.1105	0.9328	19.4672
Totals:	0.442	525			2.1105	0.9328	19.4672
Total Devices:							

Circuit Number:
Location: 400 ft Solenoid Release Ckt w/14 AWG — INPUT VOLTAGE = 20.4 VOLTS

Notification Circuit	Current (in amps)	Wire Distance (in feet)	Total Distance (in feet)	Wire Size (AWG)	Resistance (Ohms)	Voltage Drop	From Baseline Voltage
ASCO HT8210G027	0.422	425	425	14	2.7115	1.1443	19.2557
Totals:	0.422	425			2.7115	1.1443	19.2557
Total Devices:							

Circuit Number:
Location: 300 ft Solenoid Release Ckt w/14 AWG — INPUT VOLTAGE = 20.4 VOLTS

Notification Circuit	Current (in amps)	Wire Distance (in feet)	Total Distance (in feet)	Wire Size (AWG)	Resistance (Ohms)	Voltage Drop	From Baseline Voltage
ASCO HT8210G027	0.422	325	325	14	2.0735	0.8750	19.5250
Totals:	0.422	325			2.0735	0.8750	19.5250
Total Devices:							

Circuit Number:
Location: 200 ft Solenoid Release Ckt w/14 AWG — INPUT VOLTAGE = 20.4 VOLTS

Notification Circuit	Current (in amps)	Wire Distance (in feet)	Total Distance (in feet)	Wire Size (AWG)	Resistance (Ohms)	Voltage Drop	From Baseline Voltage
ASCO HT8210G027	0.422	225	225	14	1.4355	0.6058	19.7942
Totals:	0.422	225			1.4355	0.6058	19.7942
Total Devices:							

Circuit Number:
Location: 100 ft Solenoid Release Ckt w/14 AWG — INPUT VOLTAGE = 20.4 VOLTS

Notification Circuit	Current (in amps)	Wire Distance (in feet)	Total Distance (in feet)	Wire Size (AWG)	Resistance (Ohms)	Voltage Drop	From Baseline Voltage
ASCO HT8210G027	0.442	125	125	14	0.7975	0.3525	20.0475
Totals:	0.442	125			0.7975	0.3525	20.0475
Total Devices:							

1 DELUGE SOLENOID RELEASING CIRCUIT VOLTAGE DROP CALCULATIONS 500' MAXIMUM
SCALE: N.T.S.

NOTE: CIRCUIT WIRE LENGTHS INCLUDE AN ADDITIONAL 25 FEET OF WIRE TO ACCOUNT FOR RACEWAY AND CIRCUIT ROUTING IN EQUIPMENT.

FPC/RCP HEAT LOSS CALCULATION

INSULATED ENCLOSURE AREA

$$Asf = \frac{(2x8"x32") + (2x8"x36") + (2x36"x32")}{144 \text{ SQ IN/SQ FT}}$$

Asf = 23.56 S.F.

CLIMATE CONDITIONS
-30°F AMBIENT
40°F INTERIOR

INSULATION
R=6.0

BOX ASSEMBLY U-VALUE

IA FILM COEFFICIENT:	0.68
INSULATION:	6.00
METAL CABINET:	0.0
OA FILM COEFFICIENT:	0.17
	6.85

U = 1/R = 0.146 BTU/SQ FT • °F

CABINET HEAT LOSS

Qcab = A • U • ΔT
= (23.56 SQ FT) (0.146 BTU/SQ FT • °F) (40°F - (-30°F))
Qcab = 240 BTU/HR
= (70 WATTS)

2 TYPICAL FPC CABINET HEAT LOAD CALCULATIONS
SCALE: N.T.S.

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

Revisions
Num | Description | Date

DRAWN BY: B.T.L. | CHECKED BY: AEE.Jr

FIRE ALARM:
DELUGE RELEASING & FPC HEAT LOAD CALCS

Drawing Number
FA4.08

Supply Voltage & Battery Periods
120 VAC Supply Voltage
Fire Protection Cabinet #1

Qty	Item	Stby mA	Alm mA	Total Stby mA	Total Alm mA
4	Standby Hours				
5	Alarm Minutes				
5	SIGA-REL	25	170	125	850
1	NS3550-8T-2S Managed Switch	417	417	417	417
2	S35-2MLC SFP Transceiver	7.5	7.5	15	15
1	PTZ Camera	44	44	44	44
2	ASCO HT8210G027 Solenoids	442	442	884	884
0	TOTAL load for the 200mA Auxiliary Power Source			0	0
1	Aux STANDBY load delivered during a power fail	12		12	0
1	Aux ALARM current delivered during a power fail		12	0	12
	Total NAC & AUX Load			1497	2222
1	BPS10A Remote Booster Power Supply, 10A, 120Vac, Red			70	270
			TOTAL LOAD	1567	2492
			Total Stand-By and Alarm Current	1567	2492
			Standby Hours * Total Standby Current	6268	
			(Alarm Minutes/60) * Total Alarm Current		207.667
			Total Standby + Alarm Current	6475.667	
			Battery De-Rating Factor +20%	7770.800	
7.77	Calculated Battery Ampere Hours				

Quantity	Model	Description
2	SLA1097	SLA1097 10.0 AH Battery

1 FPC01 BATTERY CALCULATIONS
SCALE: N.T.S.

Supply Voltage & Battery Periods
120 VAC Supply Voltage
Fire Protection Cabinet #2

Qty	Item	Stby mA	Alm mA	Total Stby mA	Total Alm mA
4	Standby Hours				
5	Alarm Minutes				
10	SIGA-REL	25	170	250	1700
1	NS3550-8T-2S Managed Switch	417	417	417	417
2	S35-2MLC SFP Transceiver	7.5	7.5	15	15
1	PTZ Camera	44	44	44	44
2	ASCO HT8210G027 Solenoids	442	442	884	884
0	TOTAL load for the 200mA Auxiliary Power Source			0	0
1	Aux STANDBY load delivered during a power fail	12		12	0
1	Aux ALARM current delivered during a power fail		12	0	12
	Total NAC & AUX Load			1622	3072
1	BPS10A Remote Booster Power Supply, 10A, 120Vac, Red			70	270
			TOTAL LOAD	1692	3342
			Total Stand-By and Alarm Current	1692	3342
			Standby Hours * Total Standby Current	6768	
			(Alarm Minutes/60) * Total Alarm Current		278.500
			Total Standby + Alarm Current	7046.500	
			Battery De-Rating Factor +20%	8455.800	
8.46	Calculated Battery Ampere Hours				

Quantity	Model	Description
2	SLA1097	SLA1097 10.0 AH Battery

2 FPC02 BATTERY CALCULATIONS
SCALE: N.T.S.

Supply Voltage & Battery Periods
120 VAC Supply Voltage
Fire Protection Cabinet #3

Qty	Item	Stby mA	Alm mA	Total Stby mA	Total Alm mA
4	Standby Hours				
5	Alarm Minutes				
10	SIGA-REL	25	170	250	1700
1	NS3550-8T-2S Managed Switch	417	417	417	417
2	S35-2MLC SFP Transceiver	7.5	7.5	15	15
2	PTZ Camera	44	44	88	88
2	ASCO HT8210G027 Solenoids	442	442	884	884
0	TOTAL load for the 200mA Auxiliary Power Source			0	0
1	Aux STANDBY load delivered during a power fail	12		12	0
1	Aux ALARM current delivered during a power fail		12	0	12
	Total NAC & AUX Load			1666	3116
1	BPS10A Remote Booster Power Supply, 10A, 120Vac, Red			70	270
			TOTAL LOAD	1736	3386
			Total Stand-By and Alarm Current	1736	3386
			Standby Hours * Total Standby Current	6944	
			(Alarm Minutes/60) * Total Alarm Current		282.167
			Total Standby + Alarm Current	7226.167	
			Battery De-Rating Factor +20%	8671.400	
8.67	Calculated Battery Ampere Hours				

Quantity	Model	Description
2	SLA1097	SLA1097 10.0 AH Battery

3 FPC03 BATTERY CALCULATIONS
SCALE: N.T.S.

Supply Voltage & Battery Periods
120 VAC Supply Voltage
Fire Protection Cabinet #4

Qty	Item	Stby mA	Alm mA	Total Stby mA	Total Alm mA
4	Standby Hours				
5	Alarm Minutes				
10	SIGA-REL	25	170	250	1700
1	NS3550-8T-2S Managed Switch	417	417	417	417
2	S35-2MLC SFP Transceiver	7.5	7.5	15	15
1	PTZ Camera	44	44	44	44
2	ASCO HT8210G027 Solenoids	442	442	884	884
0	TOTAL load for the 200mA Auxiliary Power Source			0	0
1	Aux STANDBY load delivered during a power fail	12		12	0
1	Aux ALARM current delivered during a power fail		12	0	12
	Total NAC & AUX Load			1622	3072
1	BPS10A Remote Booster Power Supply, 10A, 120Vac, Red			70	270
			TOTAL LOAD	1692	3342
			Total Stand-By and Alarm Current	1692	3342
			Standby Hours * Total Standby Current	6768	
			(Alarm Minutes/60) * Total Alarm Current		278.500
			Total Standby + Alarm Current	7046.500	
			Battery De-Rating Factor +20%	8455.800	
8.46	Calculated Battery Ampere Hours				

Quantity	Model	Description
2	SLA1097	SLA1097 10.0 AH Battery

4 FPC04 BATTERY CALCULATIONS
SCALE: N.T.S.

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FIXED FIRE SUPPRESSION SYSTEM
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Revisions

Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr.

FIRE ALARM:
FPC01 THRU FPC04
BATTERY CALCULATIONS

Drawing Number
FA4.09

Supply Voltage & Battery Periods					
120	VAC Supply Voltage				
Fire Protection Cabinet #5					
4	Standby Hours	Stby mA	Alm mA	Total	Total
5	Alarm Minutes			Stby mA	Alm mA
10	SIGA-REL	25	170	250	1700
1	NS3550-8T-2S Managed Switch	417	417	417	417
2	S35-2MLC SFP Transceiver	7.5	7.5	15	15
1	PTZ Camera	44	44	44	44
2	ASCO HT8210G027 Solenoids	442	442	884	884
0	TOTAL load for the 200mA Auxiliary Power Source			0	0
1	Aux STANDBY load delivered during a power fail	12		12	0
1	Aux ALARM current delivered during a power fail		12	0	12
	Total NAC & AUX Load			1622	3072
1	BPS10A Remote Booster Power Supply, 10A, 120Vac, Red			70	270
			TOTAL LOAD	1692	3342
			Total Stand-By and Alarm Current	1692	3342
			Standby Hours * Total Standby Current	6768	
			(Alarm Minutes/60) * Total Alarm Current		278.500
			Total Standby + Alarm Current	7046.500	
			Battery De-Rating Factor +20%	8455.800	
8.46	Calculated Battery Ampere Hours				
Quantity	Model	Description			
2	SLA1097	SLA1097 10.0 AH Battery			

1 FPC05 BATTERY CALCULATIONS
SCALE: N.T.S.

Supply Voltage & Battery Periods					
120	VAC Supply Voltage				
Fire Protection Cabinet #6					
4	Standby Hours	Stby mA	Alm mA	Total	Total
5	Alarm Minutes			Stby mA	Alm mA
10	SIGA-REL	25	170	250	1700
1	NS3550-8T-2S Managed Switch	417	417	417	417
2	S35-2MLC SFP Transceiver	7.5	7.5	15	15
1	PTZ Camera	44	44	44	44
2	ASCO HT8210G027 Solenoids	442	442	884	884
0	TOTAL load for the 200mA Auxiliary Power Source			0	0
1	Aux STANDBY load delivered during a power fail	12		12	0
1	Aux ALARM current delivered during a power fail		12	0	12
	Total NAC & AUX Load			1622	3072
1	BPS10A Remote Booster Power Supply, 10A, 120Vac, Red			70	270
			TOTAL LOAD	1692	3342
			Total Stand-By and Alarm Current	1692	3342
			Standby Hours * Total Standby Current	6768	
			(Alarm Minutes/60) * Total Alarm Current		278.500
			Total Standby + Alarm Current	7046.500	
			Battery De-Rating Factor +20%	8455.800	
8.46	Calculated Battery Ampere Hours				
Quantity	Model	Description			
2	SLA1097	SLA1097 10.0 AH Battery			

2 FPC06 BATTERY CALCULATIONS
SCALE: N.T.S.

Supply Voltage & Battery Periods					
120	VAC Supply Voltage				
Fire Protection Cabinet #7					
4	Standby Hours	Stby mA	Alm mA	Total	Total
5	Alarm Minutes			Stby mA	Alm mA
10	SIGA-REL	25	170	250	1700
1	NS3550-8T-2S Managed Switch	417	417	417	417
2	S35-2MLC SFP Transceiver	7.5	7.5	15	15
2	PTZ Camera	44	44	88	88
2	ASCO HT8210G027 Solenoids	442	442	884	884
0	TOTAL load for the 200mA Auxiliary Power Source			0	0
1	Aux STANDBY load delivered during a power fail	12		12	0
1	Aux ALARM current delivered during a power fail		12	0	12
	Total NAC & AUX Load			1666	3116
1	BPS10A Remote Booster Power Supply, 10A, 120Vac, Red			70	270
			TOTAL LOAD	1736	3386
			Total Stand-By and Alarm Current	1736	3386
			Standby Hours * Total Standby Current	6944	
			(Alarm Minutes/60) * Total Alarm Current		282.167
			Total Standby + Alarm Current	7226.167	
			Battery De-Rating Factor +20%	8671.400	
8.67	Calculated Battery Ampere Hours				
Quantity	Model	Description			
2	SLA1097	SLA1097 10.0 AH Battery			

3 FPC07 BATTERY CALCULATIONS
SCALE: N.T.S.

Supply Voltage & Battery Periods					
120	VAC Supply Voltage				
Fire Protection Cabinet #8					
4	Standby Hours	Stby mA	Alm mA	Total	Total
5	Alarm Minutes			Stby mA	Alm mA
10	SIGA-REL	25	170	250	1700
1	NS3550-8T-2S Managed Switch	350	350	350	350
2	S35-2MLC SFP Transceiver	7.5	7.5	15	15
1	PTZ Camera	44	44	44	44
2	ASCO HT8210G027 Solenoids	442	442	884	884
0	TOTAL load for the 200mA Auxiliary Power Source			0	0
1	Aux STANDBY load delivered during a power fail	12		12	0
1	Aux ALARM current delivered during a power fail		12	0	12
	Total NAC & AUX Load			1555	3005
1	BPS10A Remote Booster Power Supply, 10A, 120Vac, Red			70	270
			TOTAL LOAD	1625	3275
			Total Stand-By and Alarm Current	1625	3275
			Standby Hours * Total Standby Current	6500	
			(Alarm Minutes/60) * Total Alarm Current		272.917
			Total Standby + Alarm Current	6772.917	
			Battery De-Rating Factor +20%	8127.500	
8.13	Calculated Battery Ampere Hours				
Quantity	Model	Description			
2	SLA1097	SLA1097 10.0 AH Battery			

4 FPC08 BATTERY CALCULATIONS
SCALE: N.T.S.

BARNARD EJMT TEAM

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions
Num | Description | Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
FPC05 THRU FPC08
BATTERY CALCULATIONS

Drawing Number
FA4.10

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

Supply Voltage & Battery Periods
120 VAC Supply Voltage
Fire Protection Cabinet #9

4	Standby Hours	Stby mA	Alm mA	Total Stby mA	Total Alm mA
5	Alarm Minutes				
10	SIGA-REL	25	170	250	1700
1	NS3550-8T-2S Managed Switch	417	417	417	417
2	S35-2MLC SFP Transceiver	7.5	7.5	15	15
1	PTZ Camera	44	44	44	44
2	ASCO HT8210G027 Solenoids	442	442	884	884
0	TOTAL load for the 200mA Auxiliary Power Source			0	0
1	Aux STANDBY load delivered during a power fail	12		12	0
1	Aux ALARM current delivered during a power fail		12	0	12
	Total NAC & AUX Load			1622	3072
1	BPS10A Remote Booster Power Supply, 10A, 120Vac, Red			70	270
			TOTAL LOAD	1692	3342
			Total Stand-By and Alarm Current	1692	3342
			Standby Hours * Total Standby Current	6768	
			(Alarm Minutes/60) * Total Alarm Current		278.500
			Total Standby + Alarm Current	7046.500	
			Battery De-Rating Factor +20%	8455.800	

8.46 Calculated Battery Ampere Hours

Quantity	Model	Description
2	SLA1097	SLA1097 10.0 AH Battery

1 FPC09 BATTERY CALCULATIONS
SCALE: N.T.S.

Supply Voltage & Battery Periods
120 VAC Supply Voltage
Fire Protection Cabinet #10

4	Standby Hours	Stby mA	Alm mA	Total Stby mA	Total Alm mA
5	Alarm Minutes				
5	SIGA-REL	25	170	125	850
1	NS3550-8T-2S Managed Switch	417	417	417	417
2	S35-2MLC SFP Transceiver	7.5	7.5	15	15
1	PTZ Camera	44	44	44	44
2	ASCO HT8210G027 Solenoids	442	442	884	884
0	TOTAL load for the 200mA Auxiliary Power Source			0	0
1	Aux STANDBY load delivered during a power fail	12		12	0
1	Aux ALARM current delivered during a power fail		12	0	12
	Total NAC & AUX Load			1497	2222
1	BPS10A Remote Booster Power Supply, 10A, 120Vac, Red			70	270
			TOTAL LOAD	1567	2492
			Total Stand-By and Alarm Current	1567	2492
			Standby Hours * Total Standby Current	6268	
			(Alarm Minutes/60) * Total Alarm Current		207.667
			Total Standby + Alarm Current	6475.667	
			Battery De-Rating Factor +20%	7770.800	

7.77 Calculated Battery Ampere Hours

Quantity	Model	Description
2	SLA1097	SLA1097 10.0 AH Battery

2 FPC10 BATTERY CALCULATIONS
SCALE: N.T.S.

Supply Voltage & Battery Periods
120 VAC Supply Voltage
Fire Protection Cabinet #11

4	Standby Hours	Stby mA	Alm mA	Total Stby mA	Total Alm mA
5	Alarm Minutes				
5	SIGA-REL	25	170	125	850
1	NS3550-8T-2S Managed Switch	417	417	417	417
2	S35-2MLC SFP Transceiver	7.5	7.5	15	15
1	PTZ Camera	44	44	44	44
2	ASCO HT8210G027 Solenoids	442	442	884	884
0	TOTAL load for the 200mA Auxiliary Power Source			0	0
1	Aux STANDBY load delivered during a power fail	12		12	0
1	Aux ALARM current delivered during a power fail		12	0	12
	Total NAC & AUX Load			1497	2222
1	BPS10A Remote Booster Power Supply, 10A, 120Vac, Red			70	270
			TOTAL LOAD	1567	2492
			Total Stand-By and Alarm Current	1567	2492
			Standby Hours * Total Standby Current	6268	
			(Alarm Minutes/60) * Total Alarm Current		207.667
			Total Standby + Alarm Current	6475.667	
			Battery De-Rating Factor +20%	7770.800	

7.77 Calculated Battery Ampere Hours

Quantity	Model	Description
2	SLA1097	SLA1097 10.0 AH Battery

3 FPC11 BATTERY CALCULATIONS
SCALE: N.T.S.

Supply Voltage & Battery Periods
120 VAC Supply Voltage
Fire Protection Cabinet #12

4	Standby Hours	Stby mA	Alm mA	Total Stby mA	Total Alm mA
5	Alarm Minutes				
10	SIGA-REL	25	170	250	1700
1	NS3550-8T-2S Managed Switch	417	417	417	417
2	S35-2MLC SFP Transceiver	7.5	7.5	15	15
1	PTZ Camera	44	44	44	44
2	ASCO HT8210G027 Solenoids	442	442	884	884
0	TOTAL load for the 200mA Auxiliary Power Source			0	0
1	Aux STANDBY load delivered during a power fail	12		12	0
1	Aux ALARM current delivered during a power fail		12	0	12
	Total NAC & AUX Load			1622	3072
1	BPS10A Remote Booster Power Supply, 10A, 120Vac, Red			70	270
			TOTAL LOAD	1692	3342
			Total Stand-By and Alarm Current	1692	3342
			Standby Hours * Total Standby Current	6768	
			(Alarm Minutes/60) * Total Alarm Current		278.500
			Total Standby + Alarm Current	7046.500	
			Battery De-Rating Factor +20%	8455.800	

8.46 Calculated Battery Ampere Hours

Quantity	Model	Description
2	SLA1097	SLA1097 10.0 AH Battery

4 FPC12 BATTERY CALCULATIONS
SCALE: N.T.S.

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

BARNARD EJMT TEAM
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Western States Fire Protection Co.
BCER engineering
Sturgeon ELECTRIC
CONSULTING ENGINEERS

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

Revisions
Num | Description | Date

DRAWN BY: B.T.L. | CHECKED BY: AEE,Jr

FIRE ALARM:
FPC09 THRU FPC12
BATTERY CALCULATIONS

Drawing Number
FA4.11

Supply Voltage & Battery Periods					
120	VAC Supply Voltage				
Fire Protection Cabinet #13					
4	Standby Hours	Stby mA	Alm mA	Total Stby mA	Total Alm mA
5	Alarm Minutes				
10	SIGA-REL	25	170	250	1700
1	NS3550-8T-2S Managed Switch	417	417	417	417
2	S35-2MLC SFP Transceiver	7.5	7.5	15	15
1	PTZ Camera	44	44	44	44
2	ASCO HT8210G027 Solenoids	442	442	884	884
0	TOTAL load for the 200mA Auxiliary Power Source			0	0
1	Aux STANDBY load delivered during a power fail	12		12	0
1	Aux ALARM current delivered during a power fail		12	0	12
	Total NAC & AUX Load			1622	3072
1	BPS10A Remote Booster Power Supply, 10A, 120Vac, Red			70	270
			TOTAL LOAD	1692	3342
			Total Stand-By and Alarm Current	1692	3342
			Standby Hours * Total Standby Current	6768	
			(Alarm Minutes/60) * Total Alarm Current		278.500
			Total Standby + Alarm Current	7046.500	
			Battery De-Rating Factor +20%	8455.800	
8.46	Calculated Battery Ampere Hours				
Quantity	Model	Description			
2	SLA1097	SLA1097 10.0 AH Battery			

1 FPC13 BATTERY CALCULATIONS
SCALE: N.T.S.

Supply Voltage & Battery Periods					
120	VAC Supply Voltage				
Fire Protection Cabinet #14					
4	Standby Hours	Stby mA	Alm mA	Total Stby mA	Total Alm mA
5	Alarm Minutes				
10	SIGA-REL	25	170	250	1700
1	NS3550-8T-2S Managed Switch	417	417	417	417
2	S35-2MLC SFP Transceiver	7.5	7.5	15	15
2	PTZ Camera	44	44	88	88
2	ASCO HT8210G027 Solenoids	442	442	884	884
0	TOTAL load for the 200mA Auxiliary Power Source			0	0
1	Aux STANDBY load delivered during a power fail	12		12	0
1	Aux ALARM current delivered during a power fail		12	0	12
	Total NAC & AUX Load			1666	3116
1	BPS10A Remote Booster Power Supply, 10A, 120Vac, Red			70	270
			TOTAL LOAD	1736	3386
			Total Stand-By and Alarm Current	1736	3386
			Standby Hours * Total Standby Current	6944	
			(Alarm Minutes/60) * Total Alarm Current		282.167
			Total Standby + Alarm Current	7226.167	
			Battery De-Rating Factor +20%	8671.400	
8.67	Calculated Battery Ampere Hours				
Quantity	Model	Description			
2	SLA1097	SLA1097 10.0 AH Battery			

2 FPC14 BATTERY CALCULATIONS
SCALE: N.T.S.

Supply Voltage & Battery Periods					
120	VAC Supply Voltage				
Fire Protection Cabinet #15					
4	Standby Hours	Stby mA	Alm mA	Total Stby mA	Total Alm mA
5	Alarm Minutes				
10	SIGA-REL	25	170	250	1700
1	NS3550-8T-2S Managed Switch	417	417	417	417
2	S35-2MLC SFP Transceiver	7.5	7.5	15	15
1	PTZ Camera	44	44	44	44
2	ASCO HT8210G027 Solenoids	442	442	884	884
0	TOTAL load for the 200mA Auxiliary Power Source			0	0
1	Aux STANDBY load delivered during a power fail	12		12	0
1	Aux ALARM current delivered during a power fail		12	0	12
	Total NAC & AUX Load			1622	3072
1	BPS10A Remote Booster Power Supply, 10A, 120Vac, Red			70	270
			TOTAL LOAD	1692	3342
			Total Stand-By and Alarm Current	1692	3342
			Standby Hours * Total Standby Current	6768	
			(Alarm Minutes/60) * Total Alarm Current		278.500
			Total Standby + Alarm Current	7046.500	
			Battery De-Rating Factor +20%	8455.800	
8.46	Calculated Battery Ampere Hours				
Quantity	Model	Description			
2	SLA1097	SLA1097 10.0 AH Battery			

3 FPC15 BATTERY CALCULATIONS
SCALE: N.T.S.

Supply Voltage & Battery Periods					
120	VAC Supply Voltage				
Fire Protection Cabinet #16					
4	Standby Hours	Stby mA	Alm mA	Total Stby mA	Total Alm mA
5	Alarm Minutes				
10	SIGA-REL	25	170	250	1700
1	NS3550-8T-2S Managed Switch	417	417	417	417
2	S35-2MLC SFP Transceiver	7.5	7.5	15	15
1	PTZ Camera	44	44	44	44
2	ASCO HT8210G027 Solenoids	442	442	884	884
0	TOTAL load for the 200mA Auxiliary Power Source			0	0
1	Aux STANDBY load delivered during a power fail	12		12	0
1	Aux ALARM current delivered during a power fail		12	0	12
	Total NAC & AUX Load			1622	3072
1	BPS10A Remote Booster Power Supply, 10A, 120Vac, Red			70	270
			TOTAL LOAD	1692	3342
			Total Stand-By and Alarm Current	1692	3342
			Standby Hours * Total Standby Current	6768	
			(Alarm Minutes/60) * Total Alarm Current		278.500
			Total Standby + Alarm Current	7046.500	
			Battery De-Rating Factor +20%	8455.800	
8.46	Calculated Battery Ampere Hours				
Quantity	Model	Description			
2	SLA1097	SLA1097 10.0 AH Battery			

4 FPC16 BATTERY CALCULATIONS
SCALE: N.T.S.

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

BARNARD EJMT TEAM

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions

Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
FPC13 THRU FPC16
BATTERY CALCULATIONS

Drawing Number
FA4.12

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

Supply Voltage & Battery Periods					
120	VAC Supply Voltage				
Fire Protection Cabinet #17					
4	Standby Hours	Stby mA	Alm mA	Total	Total
5	Alarm Minutes			Stby mA	Alm mA
10	SIGA-REL	25	170	250	1700
1	NS3550-8T-2S Managed Switch	417	417	417	417
2	S35-2MLC SFP Transceiver	7.5	7.5	15	15
1	PTZ Camera	44	44	44	44
2	ASCO HT8210G027 Solenoids	442	442	884	884
0	TOTAL load for the 200mA Auxiliary Power Source			0	0
1	Aux STANDBY load delivered during a power fail	12		12	0
1	Aux ALARM current delivered during a power fail		12	0	12
	Total NAC & AUX Load			1622	3072
1	BPS10A Remote Booster Power Supply, 10A, 120Vac, Red			70	270
			TOTAL LOAD	1692	3342
			Total Stand-By and Alarm Current	1692	3342
			Standby Hours * Total Standby Current	6768	
			(Alarm Minutes/60) * Total Alarm Current		278.500
			Total Standby + Alarm Current	7046.500	
			Battery De-Rating Factor +20%	8455.800	
8.46	Calculated Battery Ampere Hours				
Quantity	Model	Description			
2	SLA1097	SLA1097 10.0 AH Battery			

1 FPC17 BATTERY CALCULATIONS
SCALE: N.T.S.

Supply Voltage & Battery Periods					
120	VAC Supply Voltage				
Fire Protection Cabinet #18					
4	Standby Hours	Stby mA	Alm mA	Total	Total
5	Alarm Minutes			Stby mA	Alm mA
10	SIGA-REL	25	170	250	1700
1	NS3550-8T-2S Managed Switch	417	417	417	417
2	S35-2MLC SFP Transceiver	7.5	7.5	15	15
2	PTZ Camera	44	44	88	88
2	ASCO HT8210G027 Solenoids	442	442	884	884
0	TOTAL load for the 200mA Auxiliary Power Source			0	0
1	Aux STANDBY load delivered during a power fail	12		12	0
1	Aux ALARM current delivered during a power fail		12	0	12
	Total NAC & AUX Load			1666	3116
1	BPS10A Remote Booster Power Supply, 10A, 120Vac, Red			70	270
			TOTAL LOAD	1736	3386
			Total Stand-By and Alarm Current	1736	3386
			Standby Hours * Total Standby Current	6944	
			(Alarm Minutes/60) * Total Alarm Current		282.167
			Total Standby + Alarm Current	7226.167	
			Battery De-Rating Factor +20%	8671.400	
8.67	Calculated Battery Ampere Hours				
Quantity	Model	Description			
2	SLA1097	SLA1097 10.0 AH Battery			

2 FPC18 BATTERY CALCULATIONS
SCALE: N.T.S.

Supply Voltage & Battery Periods					
120	VAC Supply Voltage				
Fire Protection Cabinet #19					
4	Standby Hours	Stby mA	Alm mA	Total	Total
5	Alarm Minutes			Stby mA	Alm mA
10	SIGA-REL	25	170	250	1700
1	NS3550-8T-2S Managed Switch	417	417	417	417
2	S35-2MLC SFP Transceiver	7.5	7.5	15	15
1	PTZ Camera	44	44	44	44
2	ASCO HT8210G027 Solenoids	442	442	884	884
0	TOTAL load for the 200mA Auxiliary Power Source			0	0
1	Aux STANDBY load delivered during a power fail	12		12	0
1	Aux ALARM current delivered during a power fail		12	0	12
	Total NAC & AUX Load			1622	3072
1	BPS10A Remote Booster Power Supply, 10A, 120Vac, Red			70	270
			TOTAL LOAD	1692	3342
			Total Stand-By and Alarm Current	1692	3342
			Standby Hours * Total Standby Current	6768	
			(Alarm Minutes/60) * Total Alarm Current		278.500
			Total Standby + Alarm Current	7046.500	
			Battery De-Rating Factor +20%	8455.800	
8.46	Calculated Battery Ampere Hours				
Quantity	Model	Description			
2	SLA1097	SLA1097 10.0 AH Battery			

3 FPC19 BATTERY CALCULATIONS
SCALE: N.T.S.

Supply Voltage & Battery Periods					
120	VAC Supply Voltage				
Fire Protection Cabinet #20					
4	Standby Hours	Stby mA	Alm mA	Total	Total
5	Alarm Minutes			Stby mA	Alm mA
8	SIGA-REL	25	170	200	1360
1	NS3550-8T-2S Managed Switch	417	417	417	417
2	S35-2MLC SFP Transceiver	7.5	7.5	15	15
1	PTZ Camera	44	44	44	44
2	ASCO HT8210G027 Solenoids	442	442	884	884
0	TOTAL load for the 200mA Auxiliary Power Source			0	0
1	Aux STANDBY load delivered during a power fail	12		12	0
1	Aux ALARM current delivered during a power fail		12	0	12
	Total NAC & AUX Load			1572	2732
1	BPS10A Remote Booster Power Supply, 10A, 120Vac, Red			70	270
			TOTAL LOAD	1642	3002
			Total Stand-By and Alarm Current	1642	3002
			Standby Hours * Total Standby Current	6568	
			(Alarm Minutes/60) * Total Alarm Current		250.167
			Total Standby + Alarm Current	6818.167	
			Battery De-Rating Factor +20%	8181.800	
8.18	Calculated Battery Ampere Hours				
Quantity	Model	Description			
2	SLA1097	SLA1097 10.0 AH Battery			

4 FPC20 BATTERY CALCULATIONS
SCALE: N.T.S.

BARNARD EJMT TEAM

RONDINELLI life safety

BARNARD

BCER Engineering

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Western States Fire Protection Co.

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions

Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr.

FIRE ALARM:
FPC17 THRU FPC20
BATTERY CALCULATIONS

Drawing Number
FA4.13

Cable Information	OD (in)	Area	Quantity	Total Area
18 awg TFN	0.0783	0.00482		0
16 awg TFN	0.0888	0.00619		0
14 awg THHN	0.102	0.00817		0
12 awg THHN	0.119	0.01112		0
16/2 Tw awg TFN	0.155	0.01887	1	0.01887
4/c MM Fiber (FA)	0.41	0.13203	1	0.13203
4/c MM Fiber (CC)	0.41	0.13203	1	0.13203
Cable Eight		0		0
Cable Nine		0		0
Cable Ten		0		0
Total			3	0.28292

Intermediate Metal Conduit (IMC)				
Trade Size	ID (in)	Area	Permissible Area	Fill (%)
1/2	0.660	0.3421	0.1368	n/a
3/4	0.864	0.5863	0.2345	n/a
1	1.105	0.9590	0.3836	29.50
1 1/4	1.448	1.6467	0.6587	17.18
1 1/2	1.683	2.2246	0.8899	12.72
2	2.150	3.6305	1.4522	7.79
2 1/2	2.557	5.1351	2.0541	5.51
3	3.176	7.9223	3.1689	3.57
3 1/2	3.671	10.5842	4.2337	2.67
4	4.166	13.6310	5.4524	2.08

1 CONDUIT FILL CALCULATIONS - FA/CCTV FIBERS & (1) SLC LOOP
SCALE: N.T.S.

Cable Information	OD (in)	Area	Quantity	Total Area
18 awg TFN	0.0783	0.00482		0
16 awg TFN	0.0888	0.00619		0
14 awg THHN	0.102	0.00817		0
12 awg THHN	0.119	0.01112		0
16/2 Tw awg TFN	0.155	0.01887	2	0.03774
4/c MM Fiber (FA)	0.41	0.13203	1	0.13203
4/c MM Fiber (CC)	0.41	0.13203	1	0.13203
Cable Eight		0		0
Cable Nine		0		0
Cable Ten		0		0
Total			4	0.30179

Intermediate Metal Conduit (IMC)				
Trade Size	ID (in)	Area	Permissible Area	Fill (%)
1/2	0.660	0.3421	0.1368	n/a
3/4	0.864	0.5863	0.2345	n/a
1	1.105	0.9590	0.3836	31.47
1 1/4	1.448	1.6467	0.6587	18.33
1 1/2	1.683	2.2246	0.8899	13.57
2	2.150	3.6305	1.4522	8.31
2 1/2	2.557	5.1351	2.0541	5.88
3	3.176	7.9223	3.1689	3.81
3 1/2	3.671	10.5842	4.2337	2.85
4	4.166	13.6310	5.4524	2.21

2 CONDUIT FILL CALCULATIONS - FA/CCTV FIBERS & (2) SLC LOOPS
SCALE: N.T.S.

Cable Information	OD (in)	Area	Quantity	Total Area
18 awg TFN	0.07830	0.00482		0.00000
16 awg TFN	0.08880	0.00619		0.00000
14 awg THHN	0.10200	0.00817		0.00000
12 awg THHN	0.11900	0.01112		0.00000
16/2 Tw awg TFN	0.15500	0.01887	2	0.03774
4/c MM Fiber (FA)	0.19000	0.02835		0.00000
4/c MM Fiber (CC)	0.19000	0.02835		0.00000
Cat 5e Ethernet	0.24500	0.04714	1	0.04714
12/2 Tw awg THHN	0.41000	0.13203	1	0.13203
Cable Ten		0.00000		0.00000
Total			4	0.21691

Intermediate Metal Conduit (IMC)				
Trade Size	ID (in)	Area	Permissible Area	Fill (%)
1/2	0.660	0.3421	0.1368	n/a
3/4	0.864	0.5863	0.2345	37.00
1	1.105	0.9590	0.3836	22.62
1 1/4	1.448	1.6467	0.6587	13.17
1 1/2	1.683	2.2246	0.8899	9.75
2	2.150	3.6305	1.4522	5.97
2 1/2	2.557	5.1351	2.0541	4.22
3	3.176	7.9223	3.1689	2.74
3 1/2	3.671	10.5842	4.2337	2.05
4	4.166	13.6310	5.4524	1.59

3 CONDUIT FILL CALCULATIONS - (2) SLC LOOPS, (1) CAT-5e ETHERNET, & (1) 2/12 AWG CAMERA POWER
SCALE: N.T.S.

Cable Information	OD (in)	Area	Quantity	Total Area
18 awg TFN	0.07830	0.00482	4	0.01926
16 awg TFN	0.08880	0.00619		0.00000
14 awg THHN	0.10200	0.00817		0.00000
12 awg THHN	0.11900	0.01112	2	0.02224
16/2 Tw awg TFN	0.15500	0.01887		0.00000
4/c MM Fiber (FA)	0.19000	0.02835		0.00000
4/c MM Fiber (CC)	0.19000	0.02835		0.00000
Cable Eight		0.00000		0.00000
Cable Nine		0.00000		0.00000
Cable Ten		0.00000		0.00000
Total			6	0.04150

Intermediate Metal Conduit (IMC)				
Trade Size	ID (in)	Area	Permissible Area	Fill (%)
1/2	0.660	0.3421	0.1368	12.13
3/4	0.864	0.5863	0.2345	7.08
1	1.105	0.9590	0.3836	4.33
1 1/4	1.448	1.6467	0.6587	2.52
1 1/2	1.683	2.2246	0.8899	1.87
2	2.150	3.6305	1.4522	1.14
2 1/2	2.557	5.1351	2.0541	0.81
3	3.176	7.9223	3.1689	0.52
3 1/2	3.671	10.5842	4.2337	0.39
4	4.166	13.6310	5.4524	0.30

4 CONDUIT FILL CALCULATIONS - (1) DELUGE ZONE
SCALE: N.T.S.

Cable Information	OD (in)	Area	Quantity	Total Area
18 awg TFN	0.07830	0.00482	8	0.03852
16 awg TFN	0.08880	0.00619		0.00000
14 awg THHN	0.10200	0.00817	2	0.01634
12 awg THHN	0.11900	0.01112	2	0.02224
16/2 Tw awg TFN	0.15500	0.01887		0.00000
4/c MM Fiber (FA)	0.19000	0.02835		0.00000
4/c MM Fiber (CC)	0.19000	0.02835		0.00000
Cable Eight		0.00000		0.00000
Cable Nine		0.00000		0.00000
Cable Ten		0.00000		0.00000
Total			12	0.07711

Intermediate Metal Conduit (IMC)				
Trade Size	ID (in)	Area	Permissible Area	Fill (%)
1/2	0.660	0.3421	0.1368	22.54
3/4	0.864	0.5863	0.2345	13.15
1	1.105	0.9590	0.3836	8.04
1 1/4	1.448	1.6467	0.6587	4.68
1 1/2	1.683	2.2246	0.8899	3.47
2	2.150	3.6305	1.4522	2.12
2 1/2	2.557	5.1351	2.0541	1.50
3	3.176	7.9223	3.1689	0.97
3 1/2	3.671	10.5842	4.2337	0.73
4	4.166	13.6310	5.4524	0.57

5 CONDUIT FILL CALCULATIONS - (2) DELUGE ZONES
SCALE: N.T.S.

Cable Information	OD (in)	Area	Quantity	Total Area
18 awg TFN	0.07830	0.00482	12	0.05778
16 awg TFN	0.08880	0.00619		0.00000
14 awg THHN	0.10200	0.00817	4	0.03269
12 awg THHN	0.11900	0.01112	2	0.02224
16/2 Tw awg TFN	0.15500	0.01887		0.00000
4/c MM Fiber (FA)	0.19000	0.02835		0.00000
4/c MM Fiber (CC)	0.19000	0.02835		0.00000
Cable Eight		0.00000		0.00000
Cable Nine		0.00000		0.00000
Cable Ten		0.00000		0.00000
Total			18	0.11271

Intermediate Metal Conduit (IMC)				
Trade Size	ID (in)	Area	Permissible Area	Fill (%)
1/2	0.660	0.3421	0.1368	32.95
3/4	0.864	0.5863	0.2345	19.22
1	1.105	0.9590	0.3836	11.75
1 1/4	1.448	1.6467	0.6587	6.84
1 1/2	1.683	2.2246	0.8899	5.07
2	2.150	3.6305	1.4522	3.10
2 1/2	2.557	5.1351	2.0541	2.19
3	3.176	7.9223	3.1689	1.42
3 1/2	3.671	10.5842	4.2337	1.06
4	4.166	13.6310	5.4524	0.83

6 CONDUIT FILL CALCULATIONS - (3) DELUGE ZONES
SCALE: N.T.S.

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

Revisions
Num | Description | Date
DRAWN BY: B.T.L. | CHECKED BY: AEE,Jr

FIRE ALARM:
CONDUIT FILL
CALCULATIONS

Drawing Number
FA4.14

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Cable Information	OD (in)	Area	Quantity	Total Area
18 awg TFN	0.07830	0.00482	16	0.07704
16 awg TFN	0.08880	0.00619		0.00000
14 awg THHN	0.10200	0.00817	6	0.04903
12 awg THHN	0.11900	0.01112	2	0.02224
16/2 Tw awg TFN	0.15500	0.01887		0.00000
4/c MM Fiber (FA)	0.19000	0.02835		0.00000
4/c MM Fiber (CC)	0.19000	0.02835		0.00000
Cable Eight		0.00000		0.00000
Cable Nine		0.00000		0.00000
Cable Ten		0.00000		0.00000
Total			24	0.14831

Intermediate Metal Conduit (IMC)				
Trade Size	ID (in)	Area	Permissible Area	Fill (%)
1/2	0.660	0.3421	0.1368	n/a
3/4	0.864	0.5863	0.2345	25.30
1	1.105	0.9590	0.3836	15.47
1 1/4	1.448	1.6467	0.6587	9.01
1 1/2	1.683	2.2246	0.8899	6.67
2	2.150	3.6305	1.4522	4.09
2 1/2	2.557	5.1351	2.0541	2.89
3	3.176	7.9223	3.1689	1.87
3 1/2	3.671	10.5842	4.2337	1.40
4	4.166	13.6310	5.4524	1.09

1 CONDUIT FILL CALCULATIONS - (4) DELUGE ZONES
SCALE: N.T.S.

Cable Information	OD (in)	Area	Quantity	Total Area
18 awg TFN	0.07830	0.00482	20	0.09630
16 awg TFN	0.08880	0.00619		0.00000
14 awg THHN	0.10200	0.00817	8	0.06537
12 awg THHN	0.11900	0.01112	2	0.02224
16/2 Tw awg TFN	0.15500	0.01887		0.00000
4/c MM Fiber (FA)	0.19000	0.02835		0.00000
4/c MM Fiber (CC)	0.19000	0.02835		0.00000
Cable Eight		0.00000		0.00000
Cable Nine		0.00000		0.00000
Cable Ten		0.00000		0.00000
Total			30	0.18392

Intermediate Metal Conduit (IMC)				
Trade Size	ID (in)	Area	Permissible Area	Fill (%)
1/2	0.660	0.3421	0.1368	n/a
3/4	0.864	0.5863	0.2345	31.37
1	1.105	0.9590	0.3836	19.18
1 1/4	1.448	1.6467	0.6587	11.17
1 1/2	1.683	2.2246	0.8899	8.27
2	2.150	3.6305	1.4522	5.07
2 1/2	2.557	5.1351	2.0541	3.58
3	3.176	7.9223	3.1689	2.32
3 1/2	3.671	10.5842	4.2337	1.74
4	4.166	13.6310	5.4524	1.35

2 CONDUIT FILL CALCULATIONS - (5) DELUGE ZONES
SCALE: N.T.S.

Cable Information	OD (in)	Area	Quantity	Total Area
18 awg TFN	0.0783	0.00482	24	0.11556
16 awg TFN	0.0888	0.00619		0
14 awg THHN	0.102	0.00817	10	0.08171
12 awg THHN	0.119	0.01112		0
16/2 Tw awg TFN	0.155	0.01887		0
4/c MM Fiber (FA)	0.19	0.02835		0
4/c MM Fiber (CC)	0.19	0.02835		0
Cable Eight		0		0
Cable Nine		0		0
Cable Ten		0		0
Total			34	0.19728

Intermediate Metal Conduit (IMC)				
Trade Size	ID (in)	Area	Permissible Area	Fill (%)
1/2	0.660	0.3421	0.1368	n/a
3/4	0.864	0.5863	0.2345	33.65
1	1.105	0.9590	0.3836	20.57
1 1/4	1.448	1.6467	0.6587	11.98
1 1/2	1.683	2.2246	0.8899	8.87
2	2.150	3.6305	1.4522	5.43
2 1/2	2.557	5.1351	2.0541	3.84
3	3.176	7.9223	3.1689	2.49
3 1/2	3.671	10.5842	4.2337	1.86
4	4.166	13.6310	5.4524	1.45

3 CONDUIT FILL CALCULATIONS - (5) DELUGE ZONES, ISOVALVE, AND AIR TEMP
SCALE: N.T.S.

Cable Information	OD (in)	Area	Quantity	Total Area
6 awg THHN	0.162	0.02061	3	0.06184
8 awg THHN	0.15	0.01767	1	0.01767
Cable Three		0		0
Cable Four		0		0
Cable Five		0		0
Cable Six		0		0
Cable Seven		0		0
Cable Eight		0		0
Cable Nine		0		0
Cable Ten		0		0
Total			4	0.07951

Intermediate Metal Conduit (IMC)				
Trade Size	ID (in)	Area	Permissible Area	Fill (%)
1/2	0.660	0.3421	0.1368	23.24
3/4	0.864	0.5863	0.2345	13.56
1	1.105	0.9590	0.3836	8.29
1 1/4	1.448	1.6467	0.6587	4.83
1 1/2	1.683	2.2246	0.8899	3.57
2	2.150	3.6305	1.4522	2.19
2 1/2	2.557	5.1351	2.0541	1.55
3	3.176	7.9223	3.1689	1.00
3 1/2	3.671	10.5842	4.2337	0.75
4	4.166	13.6310	5.4524	0.58

4 CONDUIT FILL CALCULATIONS - 480 VAC POWER
SCALE: N.T.S.

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FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions

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FIRE ALARM: CONDUIT FILL CALCULATIONS

Drawing Number
FA4.15

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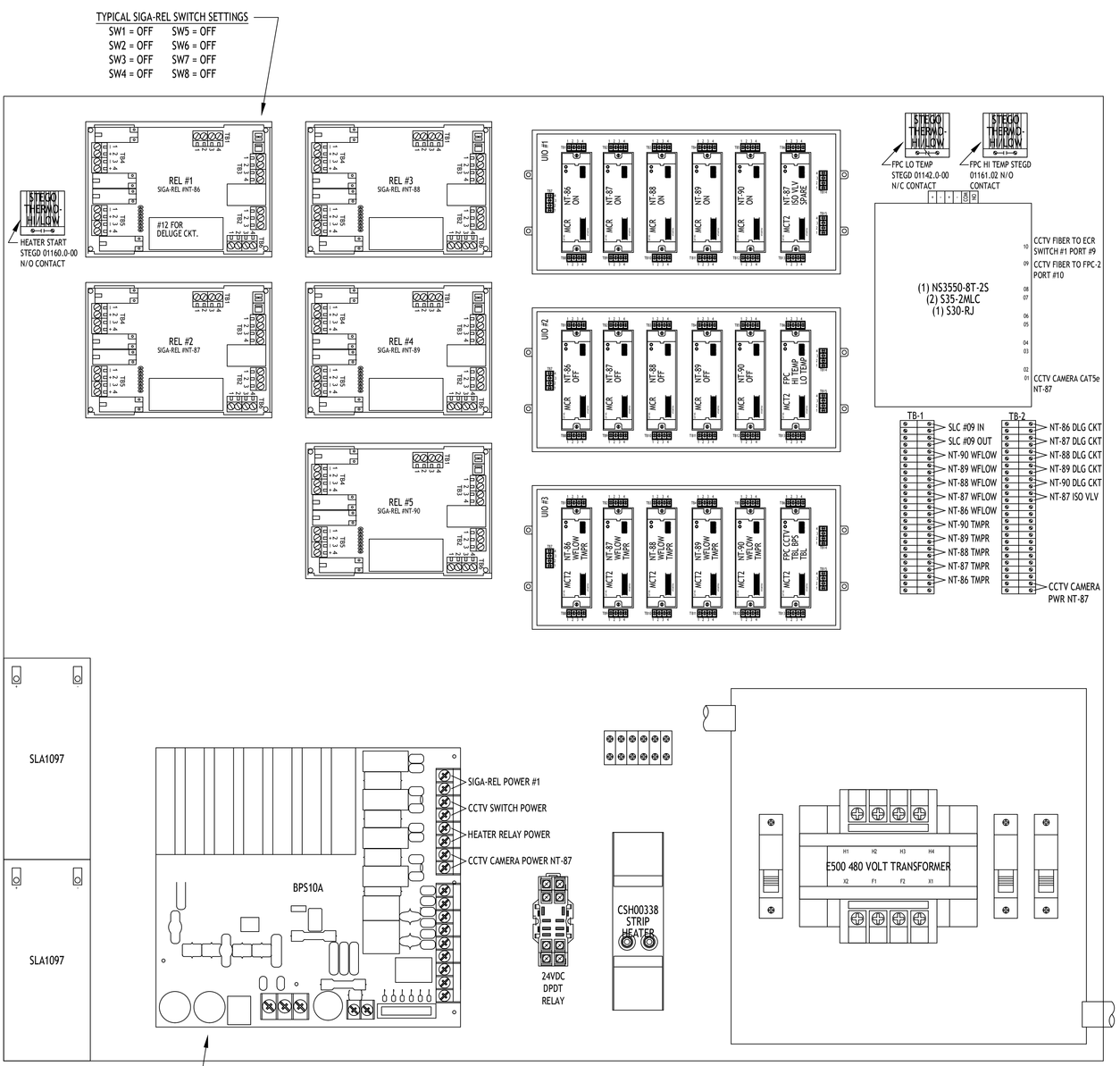

1

FPC #01 PANEL LAYOUT

SCALE: 1/2" SCALE

PANEL LAYOUT FOR FPC #01

EASTER OWENS NEMA 4X ENCLOSURE #31-405F

SHOWN AT HALF SCALE (ACTUAL SIZE: 36" W x 32" H)

Revisions		
Num	Description	Date

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FIRE ALARM:
FIRE PROTECTION PANEL
FPC #01 WIRING DIAGRAM

Drawing Number
FA5.01

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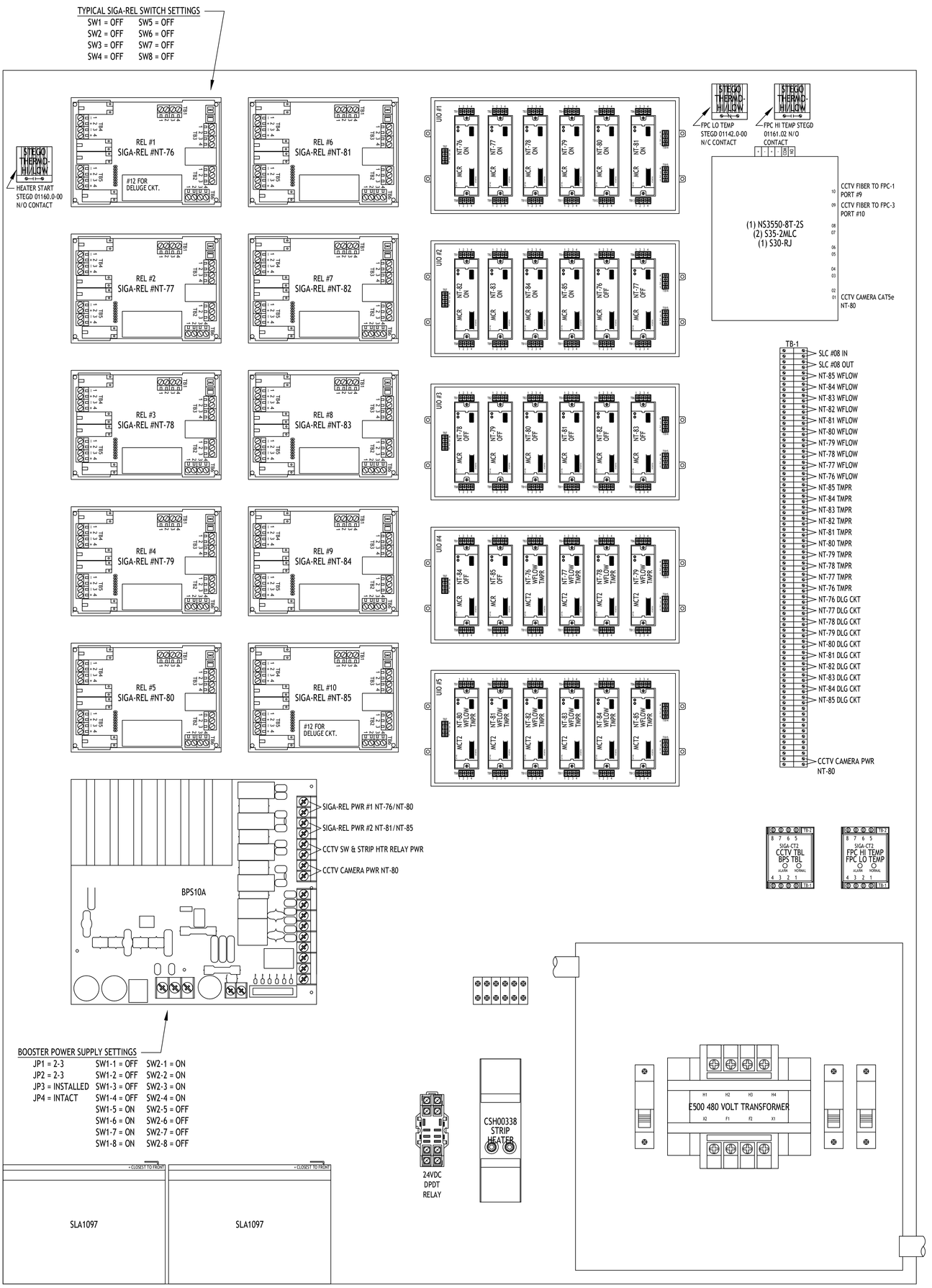

1

FPC #02 PANEL LAYOUT
SCALE: 1/2" SCALE

PANEL LAYOUT FOR FPC #02
EASTER OWENS NEMA 4X ENCLOSURE #41-505F
SHOWN AT HALF SCALE (ACTUAL SIZE: 36" W x 48" H)

FA5.02

Drawing Number

FIRE ALARM:
FIRE PROTECTION PANEL
FPC #02 WIRING DIAGRAM

Revisions		
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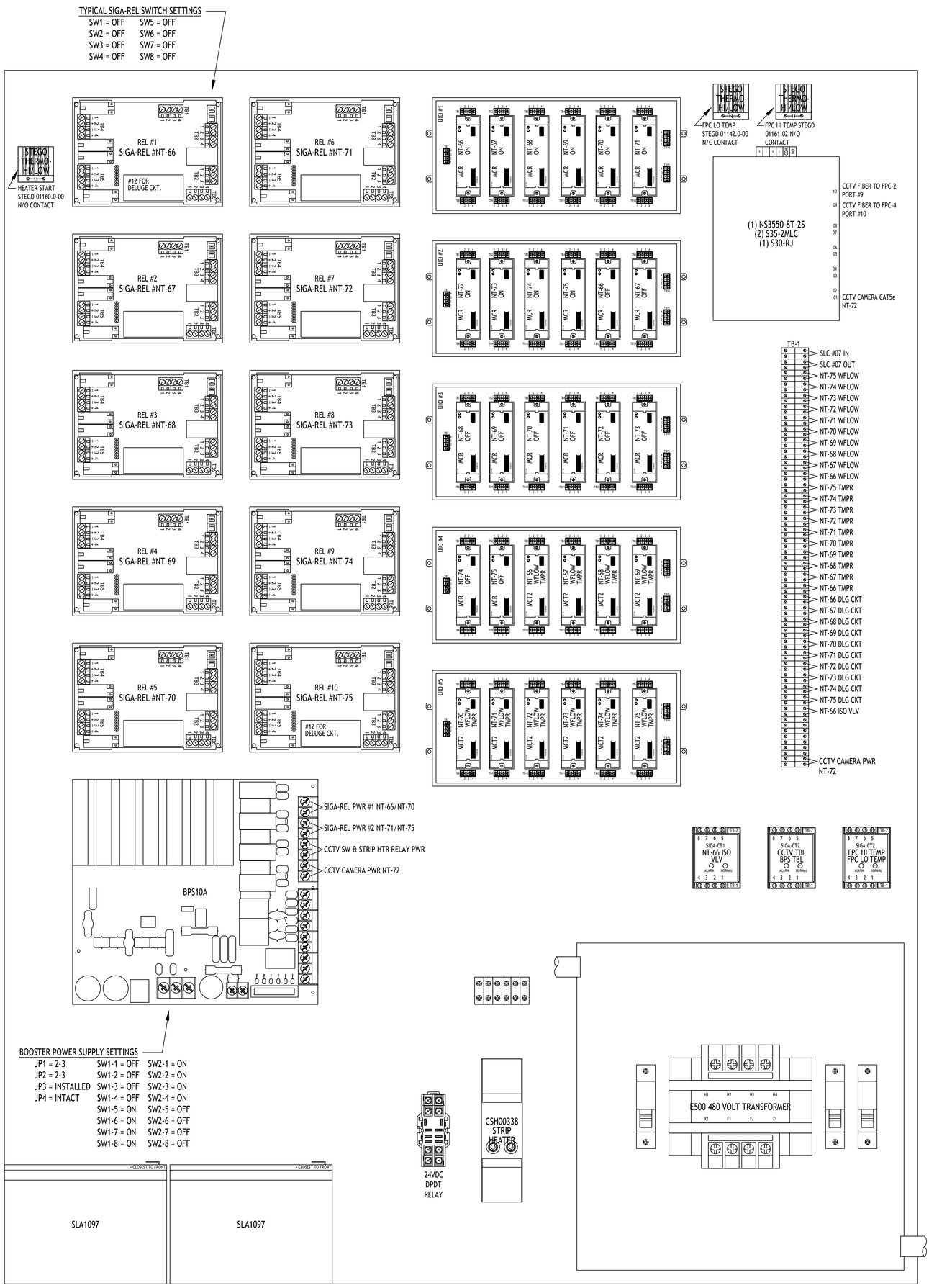

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FPC #03 PANEL LAYOUT
SCALE: 1/2" SCALE

PANEL LAYOUT FOR FPC #03
EASTER OWENS NEMA 4X ENCLOSURE #41-505F
SHOWN AT HALF SCALE (ACTUAL SIZE: 36" W x 48" H)

Revisions		
Num	Description	Date

FIRE ALARM:
FIRE PROTECTION PANEL
FPC #03 WIRING DIAGRAM

Drawing Number
FA5.03

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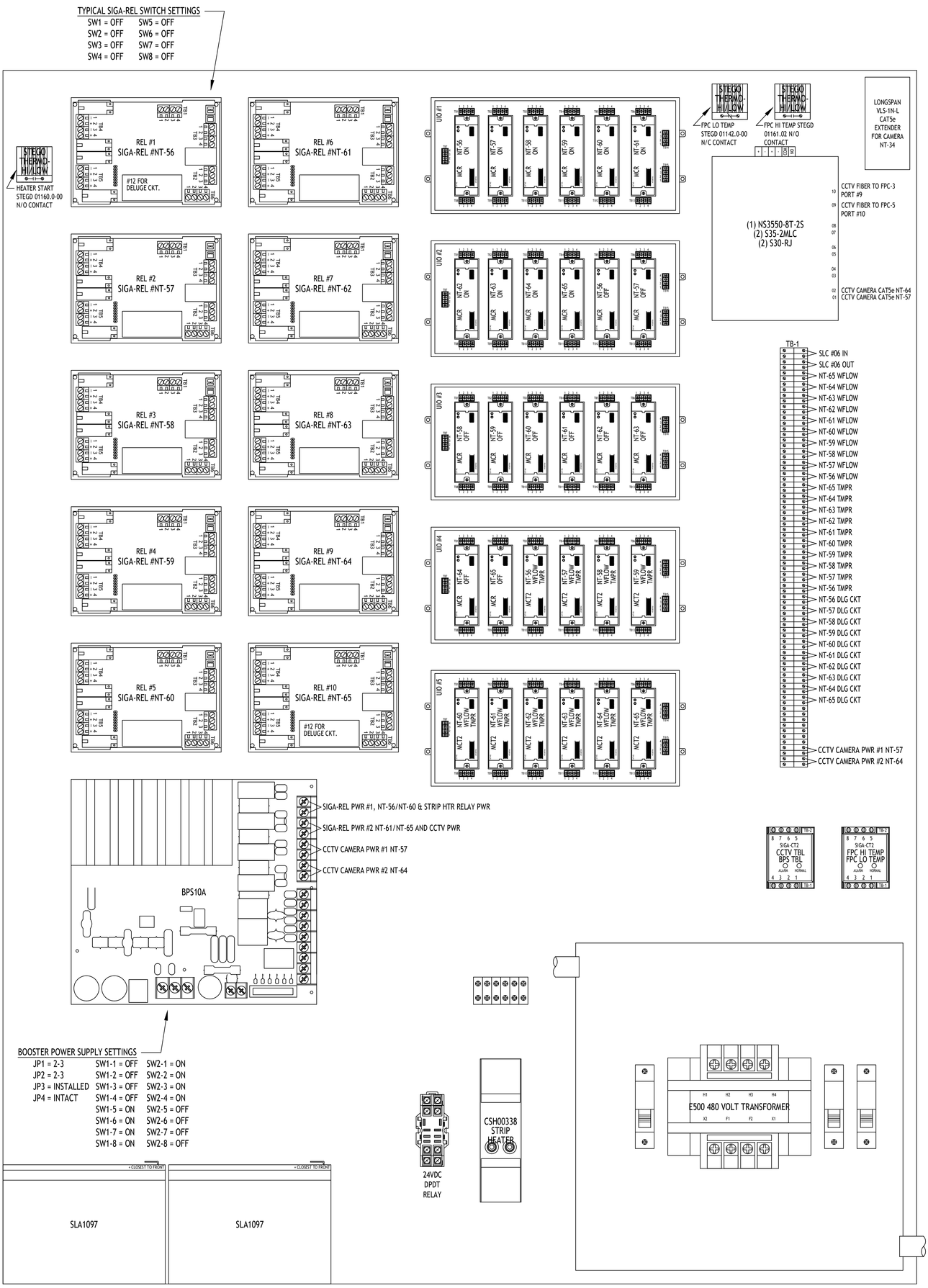

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FPC #04 PANEL LAYOUT
SCALE: 1/2" SCALE

PANEL LAYOUT FOR FPC #04
EASTER OWENS NEMA 4X ENCLOSURE #41-505F
SHOWN AT HALF SCALE (ACTUAL SIZE: 36" W x 48" H)

FA5.04

Drawing Number

FIRE ALARM:
FIRE PROTECTION PANEL
FPC #04 WIRING DIAGRAM

Revisions		
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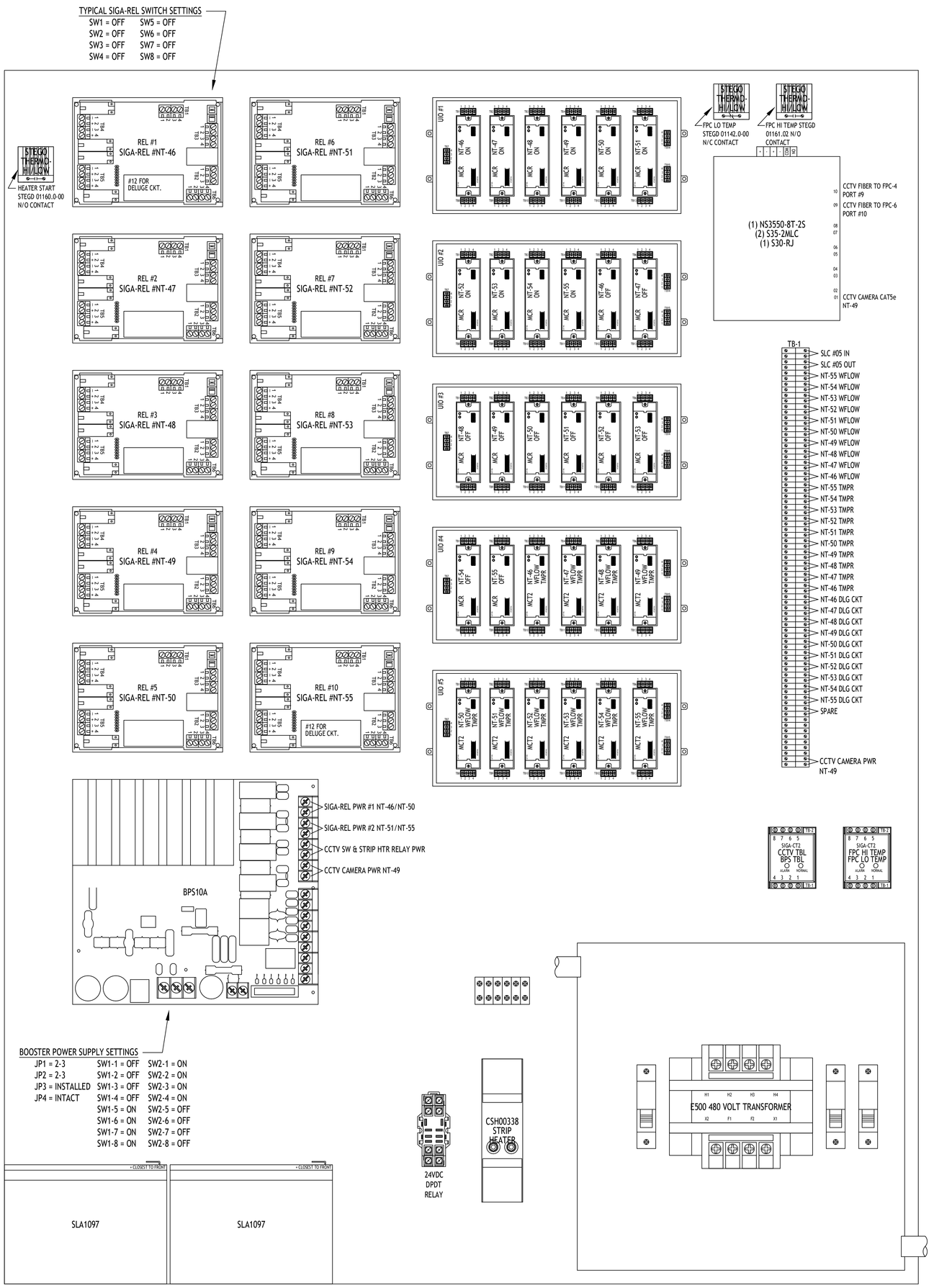

1

FPC #05 PANEL LAYOUT
SCALE: 1/2" SCALE

PANEL LAYOUT FOR FPC #05
EASTER OWENS NEMA 4X ENCLOSURE #41-505F
SHOWN AT HALF SCALE (ACTUAL SIZE: 36" W x 48" H)

FA5.05

Drawing Number

FIRE ALARM:
FIRE PROTECTION PANEL
FPC #05 WIRING DIAGRAM

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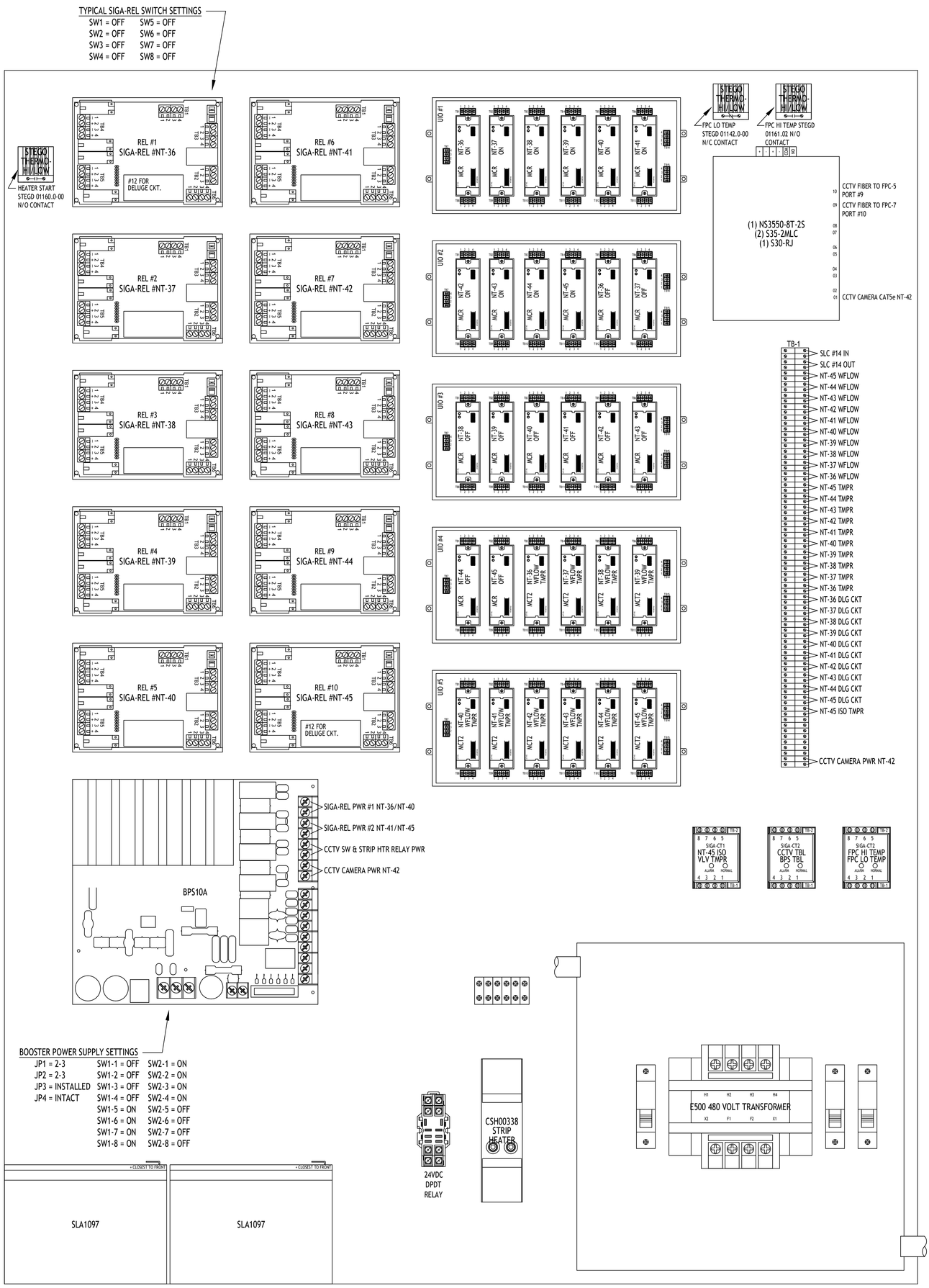

1

FPC #06 PANEL LAYOUT
SCALE: 1/2" SCALE

PANEL LAYOUT FOR FPC #06
EASTER OWENS NEMA 4X ENCLOSURE #41-505F
SHOWN AT HALF SCALE (ACTUAL SIZE: 36" W x 48" H)

Revisions		
Num	Description	Date

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FIRE ALARM:
FIRE PROTECTION PANEL
FPC #06 WIRING DIAGRAM

Drawing Number
FA5.06

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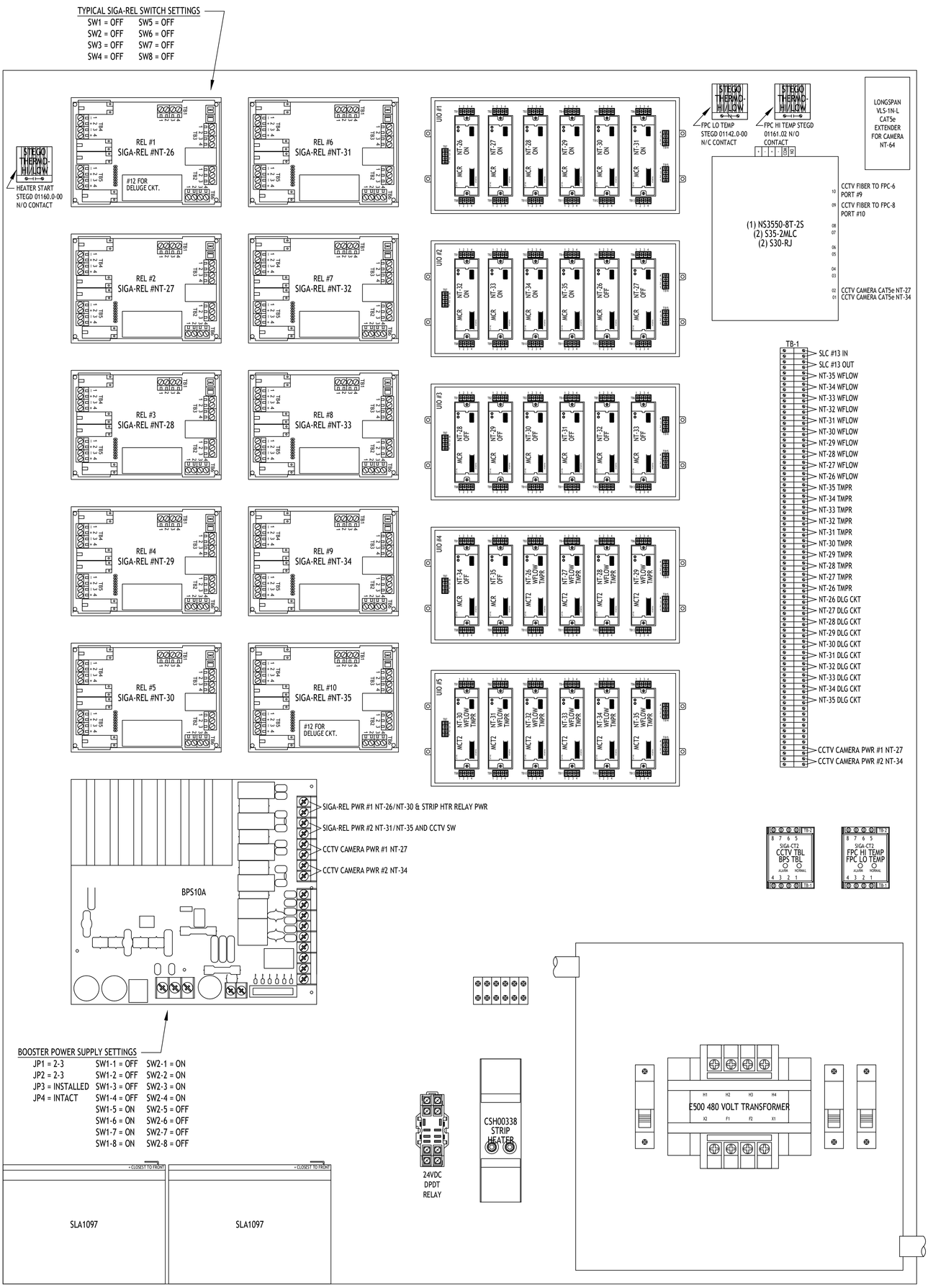

1

FPC #07 PANEL LAYOUT
SCALE: 1/2" SCALE

PANEL LAYOUT FOR FPC #07
EASTER OWENS NEMA 4X ENCLOSURE #41-505F
SHOWN AT HALF SCALE (ACTUAL SIZE: 36" W x 48" H)

Revisions		
Num	Description	Date

FIRE ALARM:
FIRE PROTECTION PANEL
FPC #07 WIRING DIAGRAM

Drawing Number
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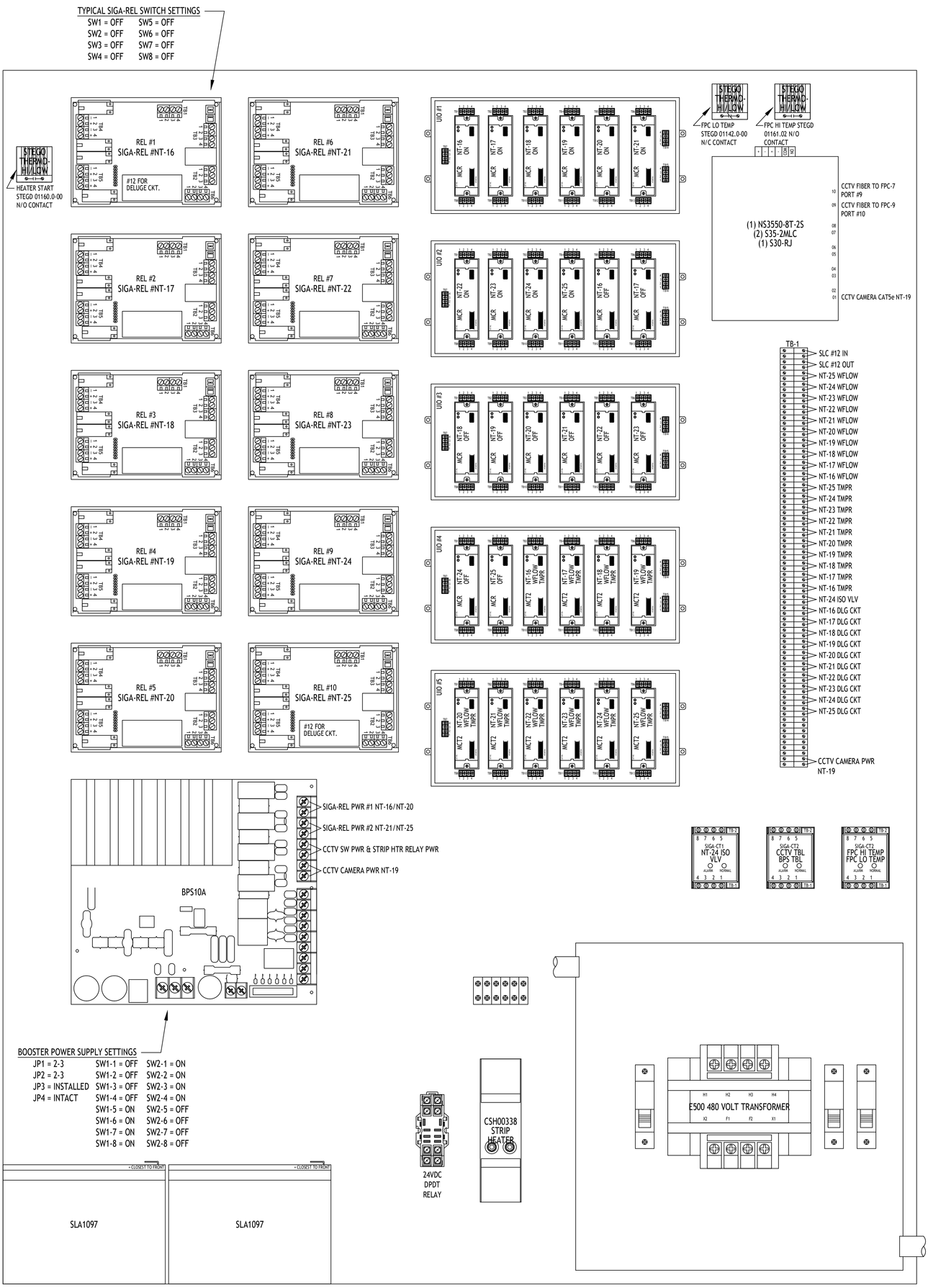

1

FPC #08 PANEL LAYOUT
SCALE: 1/2" SCALE

PANEL LAYOUT FOR FPC #08
EASTER OWENS NEMA 4X ENCLOSURE #41-505F
SHOWN AT HALF SCALE (ACTUAL SIZE: 36" W x 48" H)

FA5.08

Drawing Number

FIRE ALARM:
FIRE PROTECTION PANEL
FPC #08 WIRING DIAGRAM

Revisions		
Num	Description	Date

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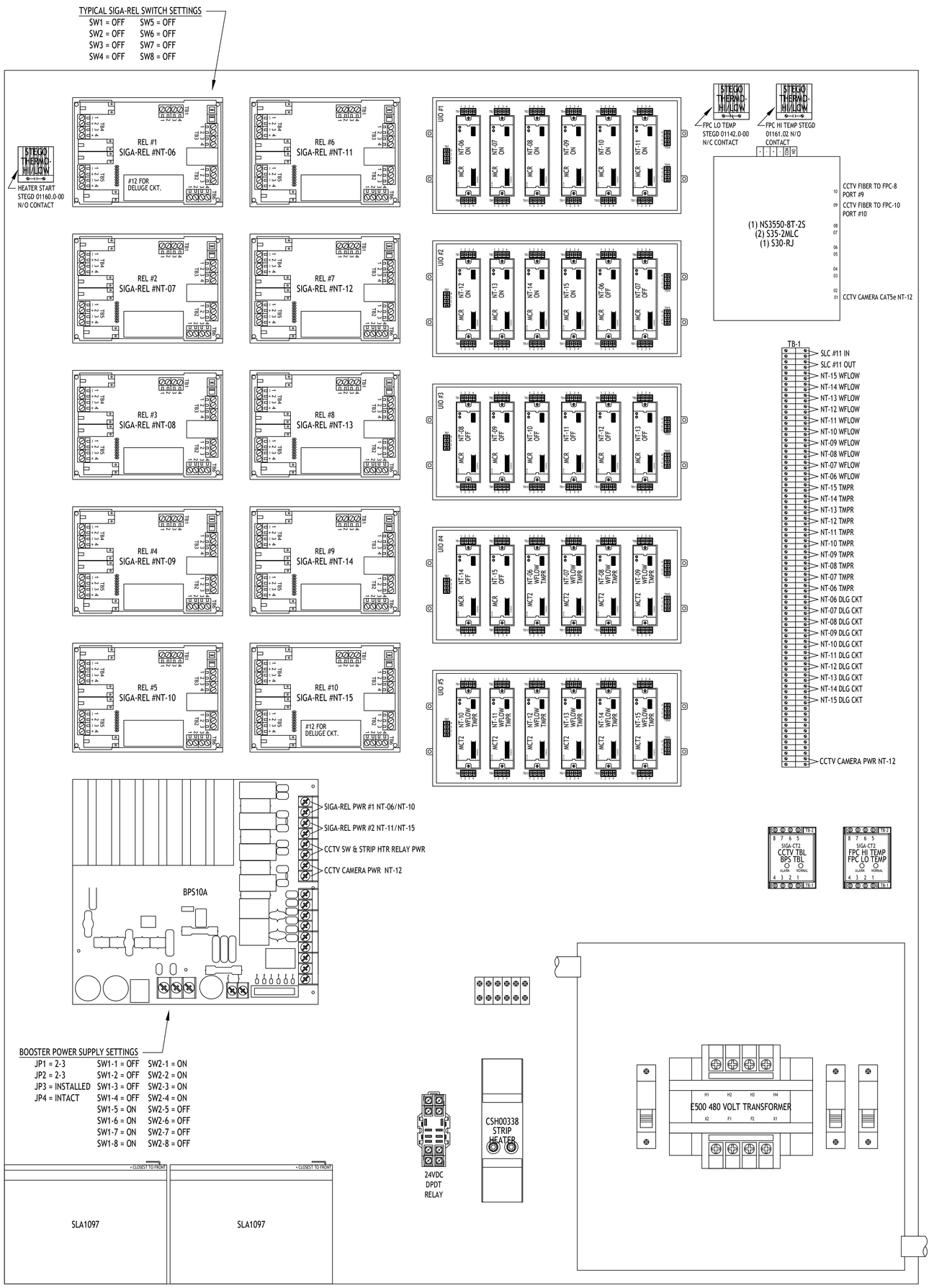

1

FPC #09 PANEL LAYOUT
SCALE: 1/2" SCALE

PANEL LAYOUT FOR FPC #09
EASTER OWENS NEMA 4X ENCLOSURE #41-505F
SHOWN AT HALF SCALE (ACTUAL SIZE: 36" W x 48" H)

Revisions		
Num	Description	Date

FIRE ALARM:
FIRE PROTECTION PANEL
FPC #09 WIRING DIAGRAM

Drawing Number
FA5.09

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

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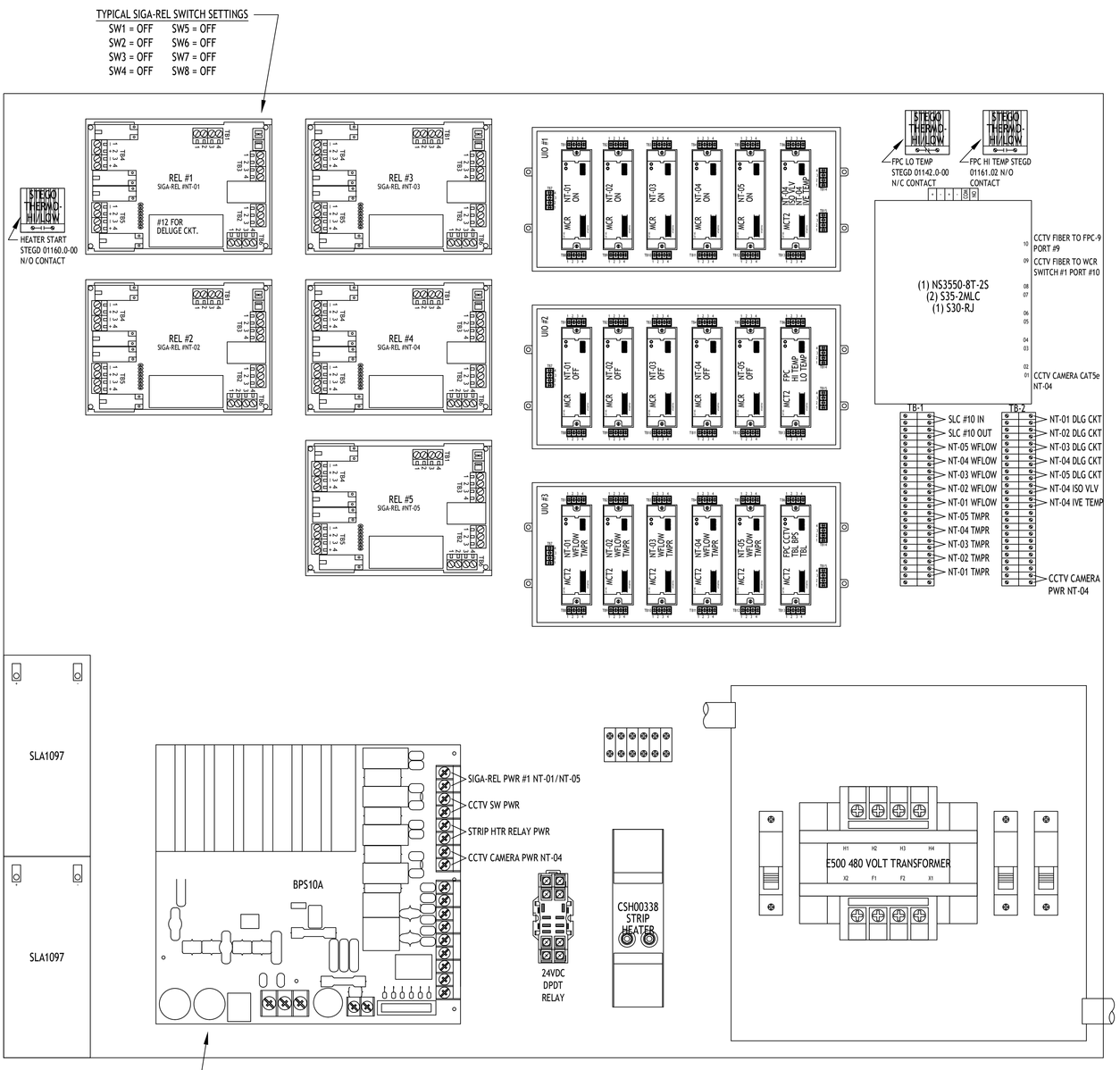

1

FPC #10 PANEL LAYOUT
SCALE: 1/2" SCALE

PANEL LAYOUT FOR FPC #10
EASTER OWENS NEMA 4X ENCLOSURE #31-405F
SHOWN AT HALF SCALE (ACTUAL SIZE: 36" W x 32" H)

Revisions		
Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
FIRE PROTECTION PANEL
FPC #10 WIRING DIAGRAM

Drawing Number
FA5.10

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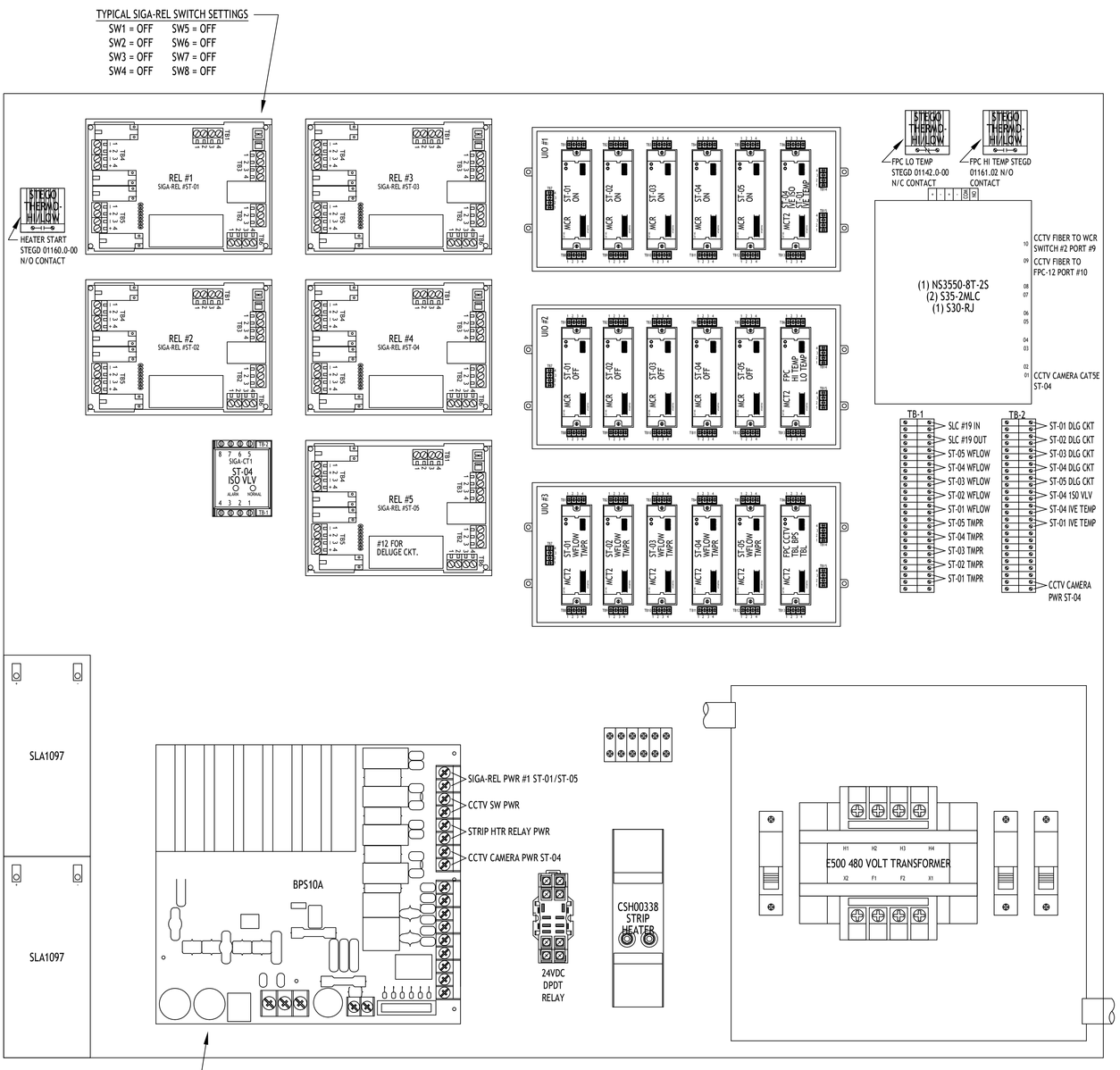

1
FPC #11 PANEL LAYOUT
SCALE: 1/2" SCALE

PANEL LAYOUT FOR FPC #11
EASTER OWENS NEMA 4X ENCLOSURE #31-405F
SHOWN AT HALF SCALE (ACTUAL SIZE: 36" W x 32" H)

Revisions		
Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
FIRE PROTECTION PANEL
FPC #11 WIRING DIAGRAM

Drawing Number
FA5.11

EISENHOWER/JOHNSON MEMORIAL TUNNEL

FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT

Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

BARNARD EJMT TEAM

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Sturgeon ELECTRIC · Systems West · Western States Fire Protection Co. · CONSULTING ENGINEERS

ASBUILT - 114

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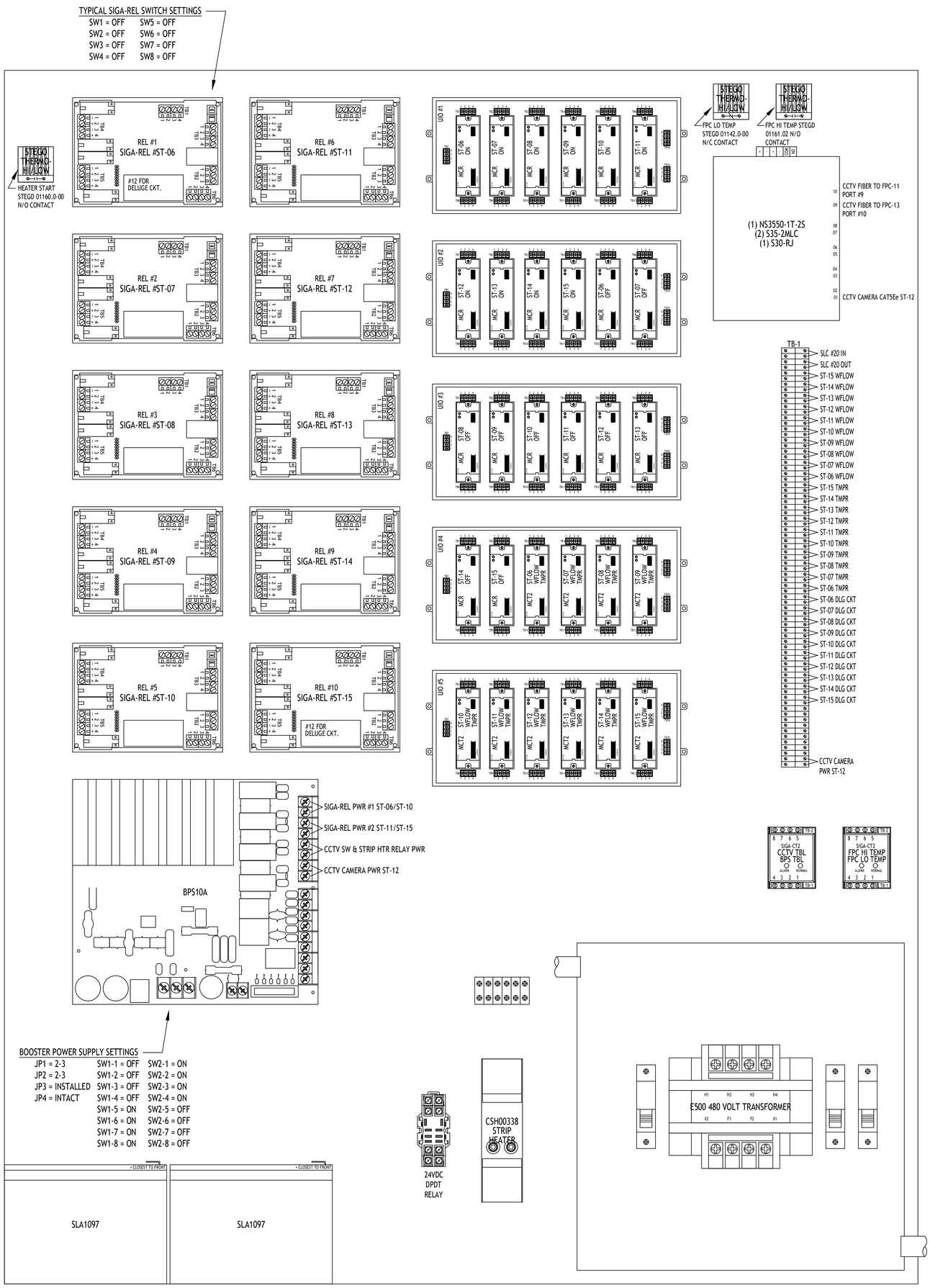

1

FPC #12 PANEL LAYOUT
SCALE: 1/2" SCALE

PANEL LAYOUT FOR FPC #12
EASTER OWENS NEMA 4X ENCLOSURE #41-505F
SHOWN AT HALF SCALE (ACTUAL SIZE: 36" W x 48" H)

FA5.12

Drawing Number

FIRE ALARM:
FIRE PROTECTION PANEL
FPC #12 WIRING DIAGRAM

Revisions		
Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

EISENHOWER/JOHNSON MEMORIAL TUNNEL

FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT

Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

BARNARD EJMT TEAM

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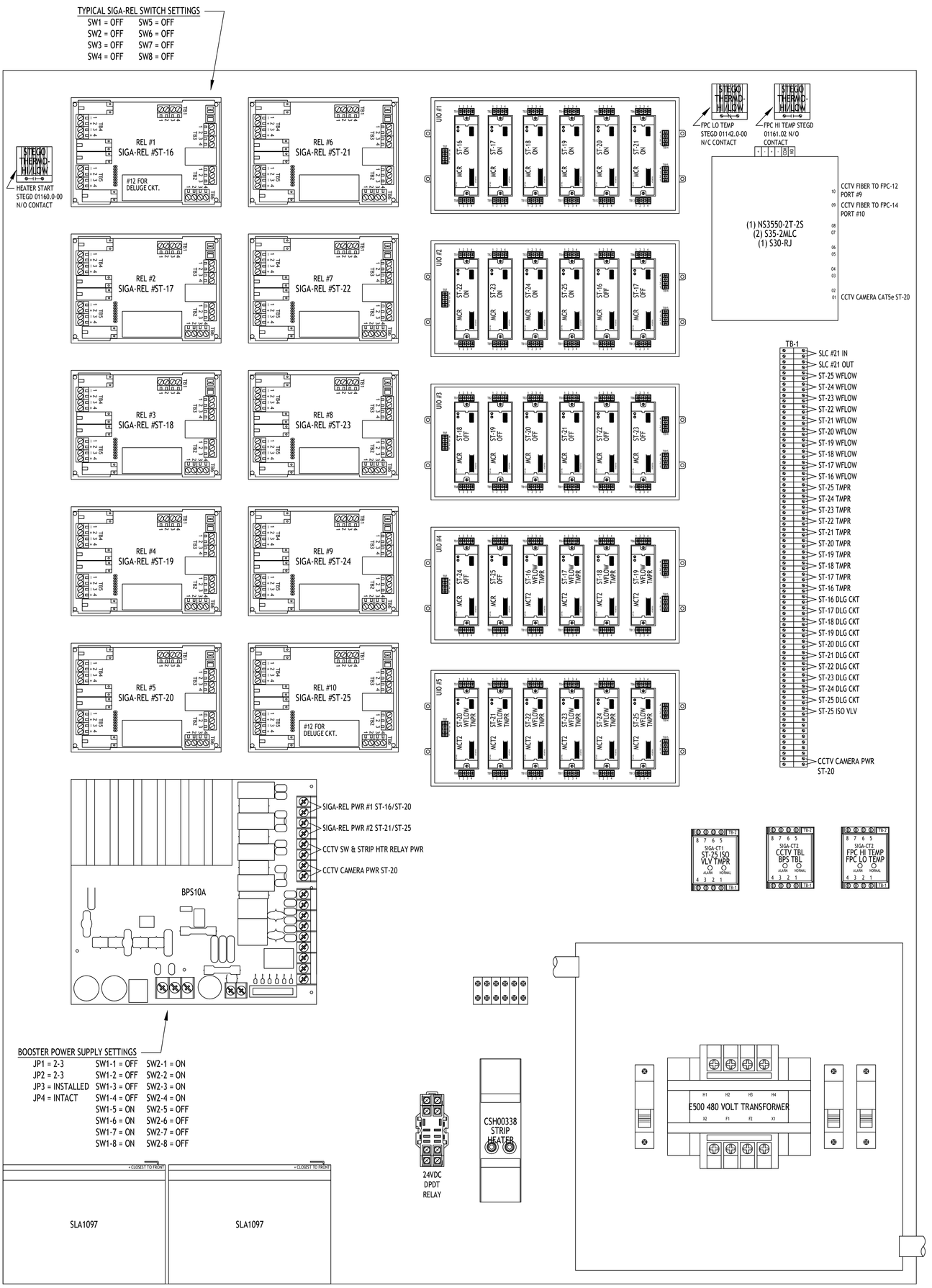

1

FPC #13 PANEL LAYOUT
SCALE: 1/2" SCALE

PANEL LAYOUT FOR FPC #13
EASTER OWENS NEMA 4X ENCLOSURE #41-505F
SHOWN AT HALF SCALE (ACTUAL SIZE: 36" W x 48" H)

Revisions		
Num	Description	Date

FIRE ALARM:
FIRE PROTECTION PANEL
FPC #13 WIRING DIAGRAM

Drawing Number
FA5.13

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

EISENHOWER/JOHNSON MEMORIAL TUNNEL

FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT

Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

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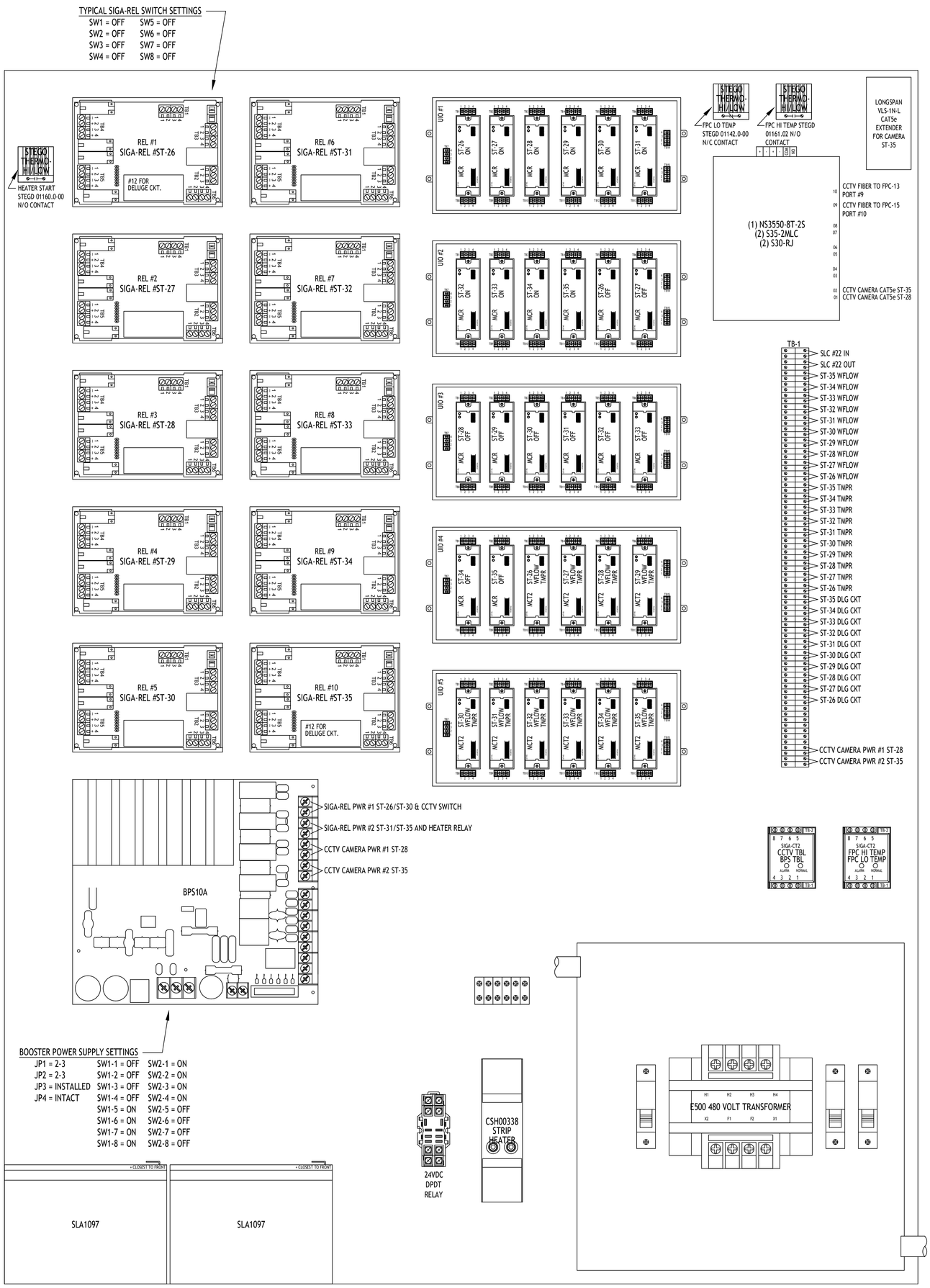

1

FPC #14 PANEL LAYOUT
SCALE: 1/2" SCALE

PANEL LAYOUT FOR FPC #14
EASTER OWENS NEMA 4X ENCLOSURE #41-505F
SHOWN AT HALF SCALE (ACTUAL SIZE: 36" W x 48" H)

FA5.14

Drawing Number

FIRE ALARM:
FIRE PROTECTION PANEL
FPC #14 WIRING DIAGRAM

Revisions		
Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

EISENHOWER/JOHNSON MEMORIAL TUNNEL

FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT

Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

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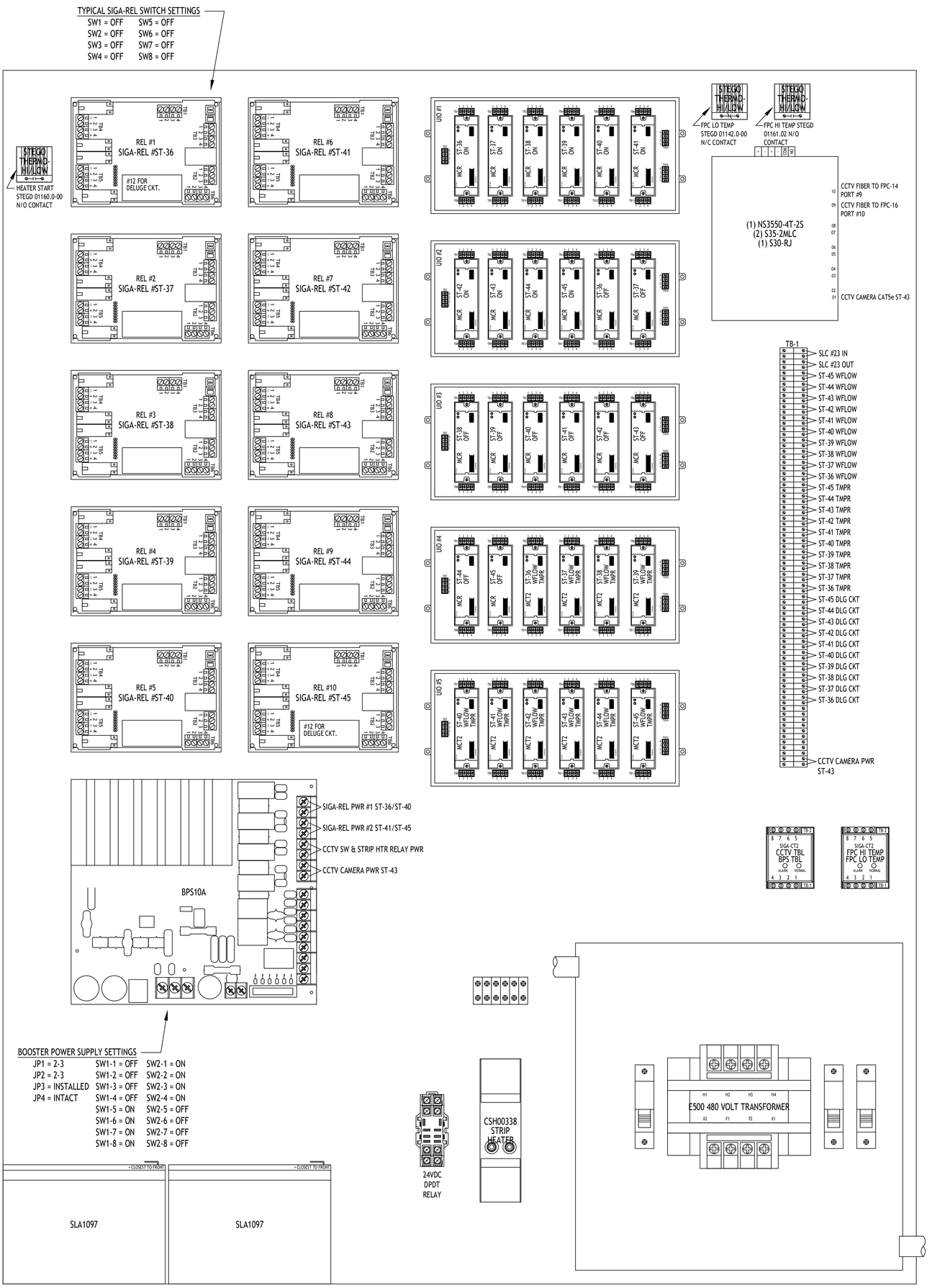

1

FPC #15 PANEL LAYOUT
SCALE: 1/2" SCALE

ADDRESSES = 0604XXXX

PANEL LAYOUT FOR FPC #15
EASTER OWENS NEMA 4X ENCLOSURE #41-505F
SHOWN AT HALF SCALE (ACTUAL SIZE: 36" W x 48" H)

Revisions		
Num	Description	Date

FIRE ALARM:
FIRE PROTECTION PANEL
FPC #15 WIRING DIAGRAM

Drawing Number
FA5.15

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

EISENHOWER/JOHNSON MEMORIAL TUNNEL

FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT

Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

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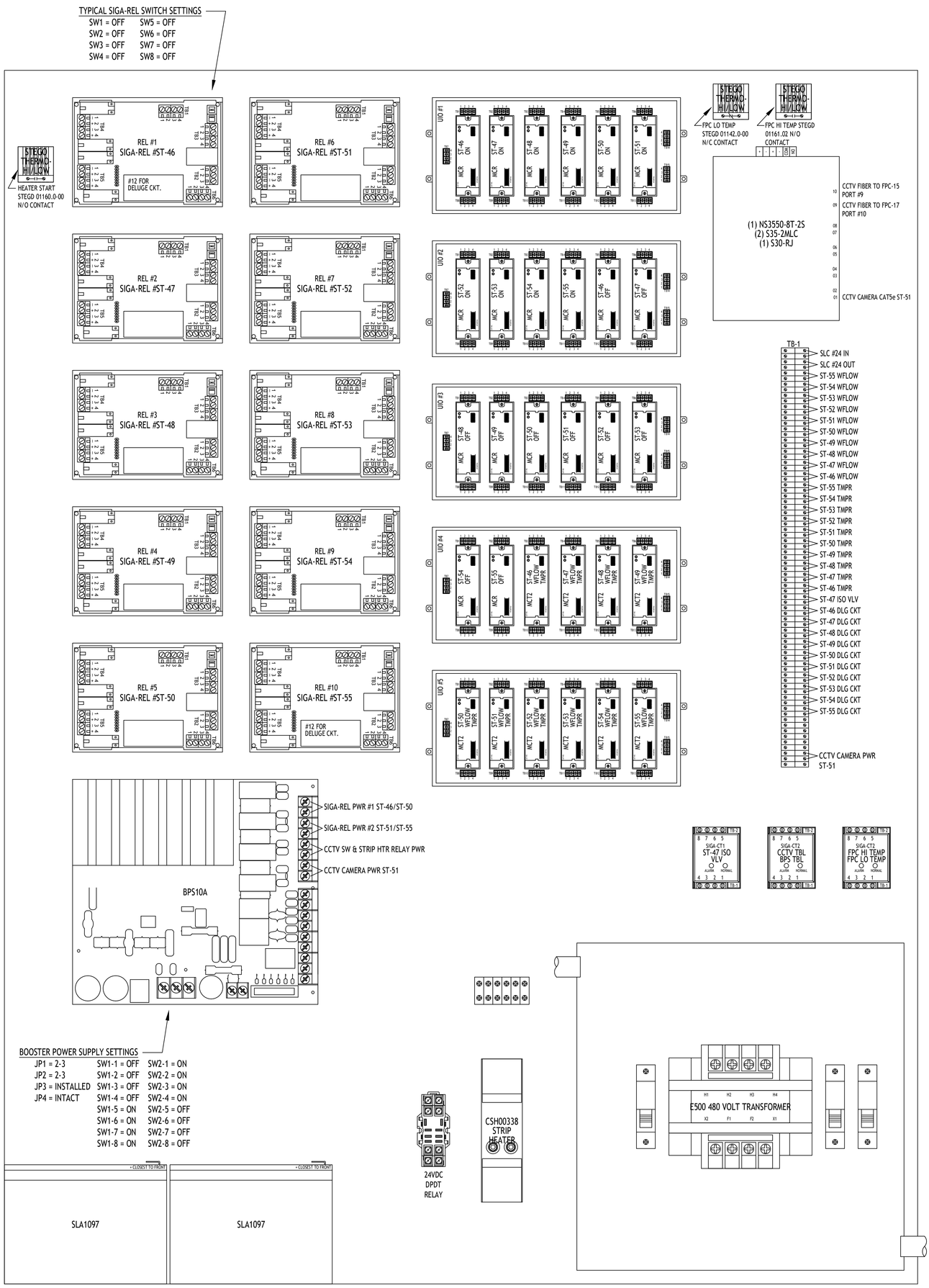

1

FPC #16 PANEL LAYOUT
SCALE: 1/2" SCALE

ADDRESSES = 0702XXXX

PANEL LAYOUT FOR FPC #16
EASTER OWENS NEMA 4X ENCLOSURE #41-505F
SHOWN AT HALF SCALE (ACTUAL SIZE: 36" W x 48" H)

Revisions		
Num	Description	Date

FIRE ALARM:
FIRE PROTECTION PANEL
FPC #16 WIRING DIAGRAM

Drawing Number
FA5.16

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

EISENHOWER/JOHNSON MEMORIAL TUNNEL

FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT

Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

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ASBUILT - 119

O & M Manual

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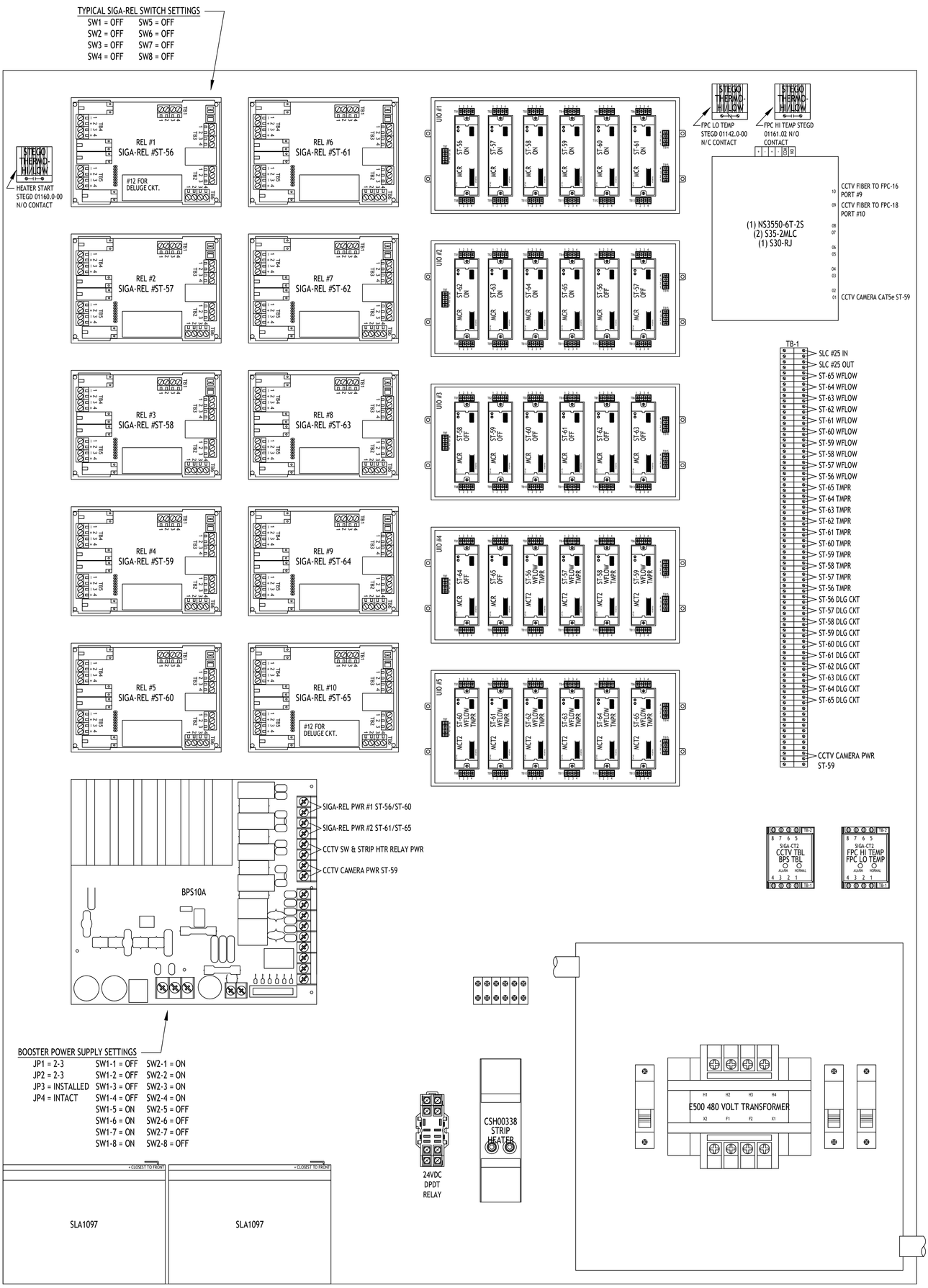

1

FPC #17 PANEL LAYOUT
SCALE: 1/2" SCALE

PANEL LAYOUT FOR FPC #17
EASTER OWENS NEMA 4X ENCLOSURE #41-505F
SHOWN AT HALF SCALE (ACTUAL SIZE: 36" W x 48" H)

Revisions		
Num	Description	Date

FIRE ALARM:
FIRE PROTECTION PANEL
FPC #17 WIRING DIAGRAM

Drawing Number
FA5.17

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

EISENHOWER/JOHNSON MEMORIAL TUNNEL

FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT

Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

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ASBUILT - 120

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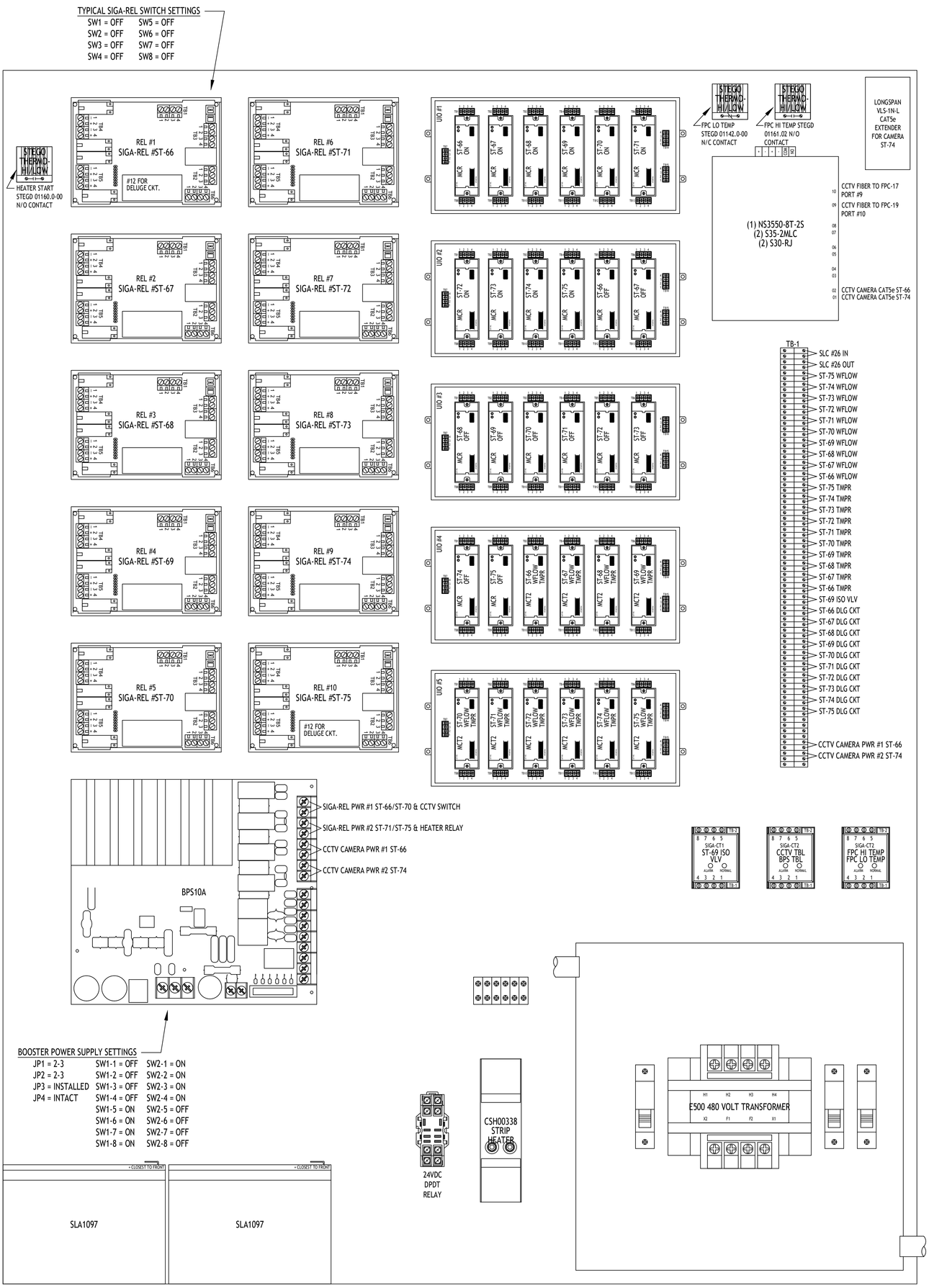

1

FPC #18 PANEL LAYOUT
SCALE: 1/2" SCALE

PANEL LAYOUT FOR FPC #18
EASTER OWENS NEMA 4X ENCLOSURE #41-505F
SHOWN AT HALF SCALE (ACTUAL SIZE: 36" W x 48" H)

Revisions		
Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
FIRE PROTECTION PANEL
FPC #18 WIRING DIAGRAM

Drawing Number
FA5.18

EISENHOWER/JOHNSON MEMORIAL TUNNEL

FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT

Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

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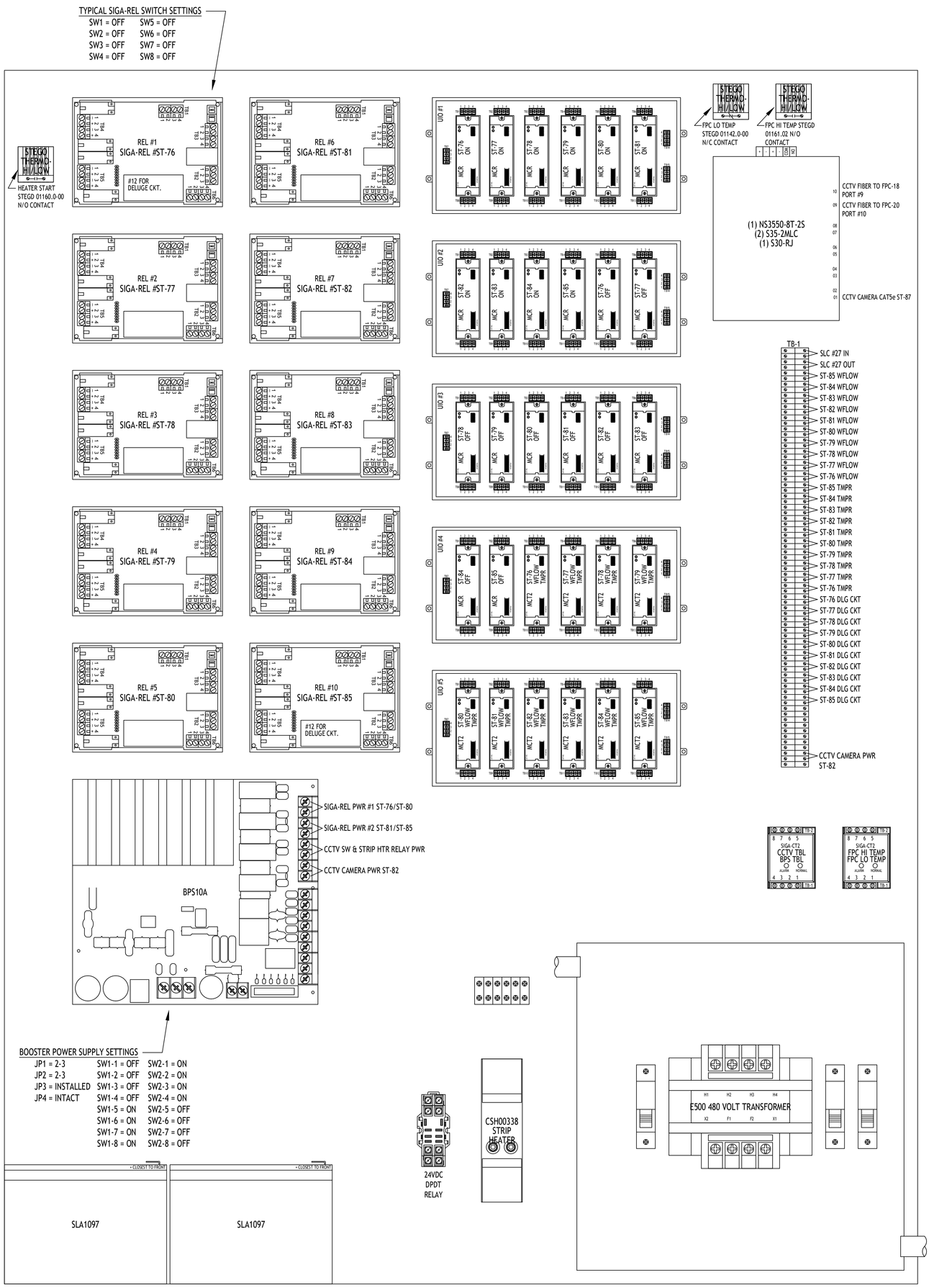

1

FPC #19 PANEL LAYOUT
SCALE: 1/2" SCALE

ADDRESSES = 0703XXXX

PANEL LAYOUT FOR FPC #19
EASTER OWENS NEMA 4X ENCLOSURE #41-505F
SHOWN AT HALF SCALE (ACTUAL SIZE: 36" W x 48" H)

Revisions		
Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
FIRE PROTECTION PANEL
FPC #19 WIRING DIAGRAM

Drawing Number
FA5.19

EISENHOWER/JOHNSON MEMORIAL TUNNEL

FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT

Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-15

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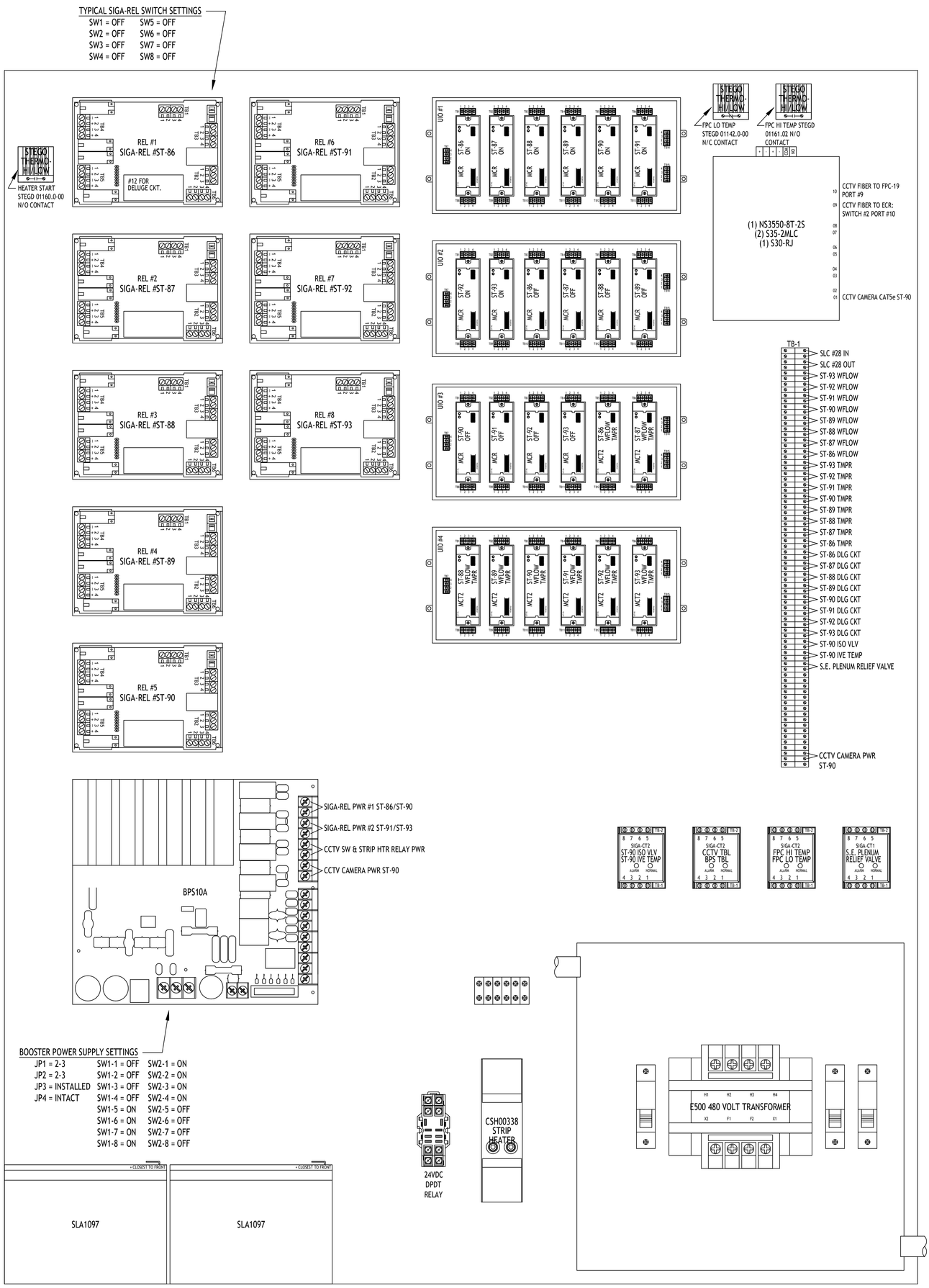

1

FPC #20 PANEL LAYOUT
SCALE: 1/2" SCALE

ADDRESSES = 0704XXXX

PANEL LAYOUT FOR FPC #20
EASTER OWENS NEMA 4X ENCLOSURE #41-505F
SHOWN AT HALF SCALE (ACTUAL SIZE: 36" W x 48" H)

Revisions		
Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
FIRE PROTECTION PANEL
FPC #20 WIRING DIAGRAM

Drawing Number
FA5.20

EISENHOWER/JOHNSON MEMORIAL TUNNEL

FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT

Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

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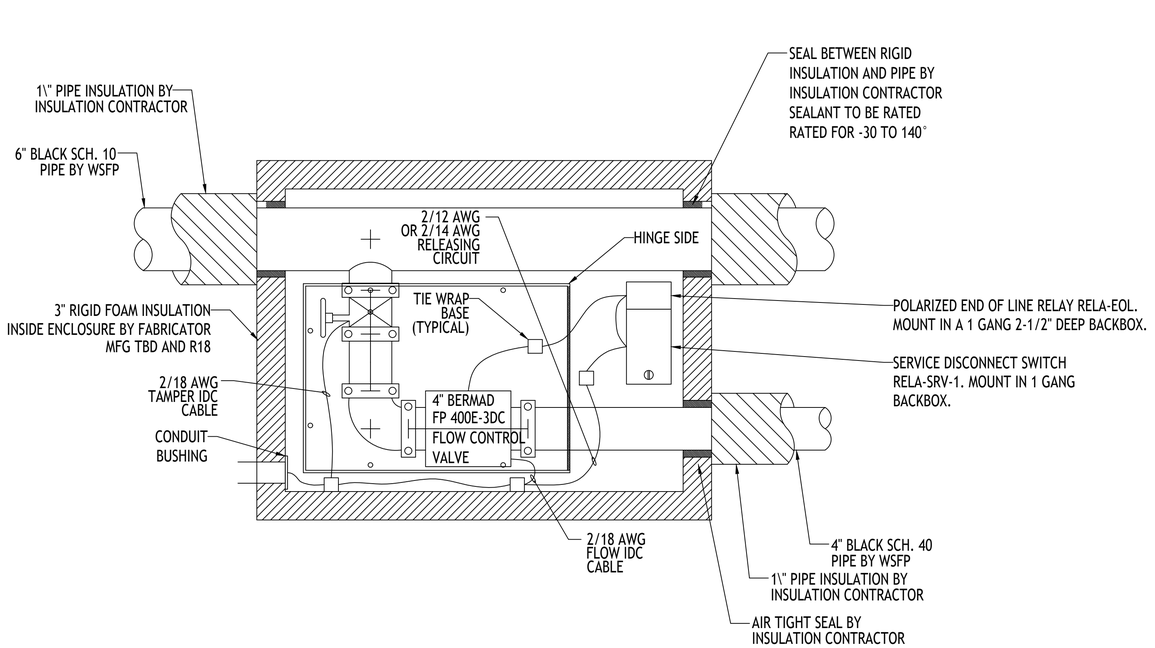
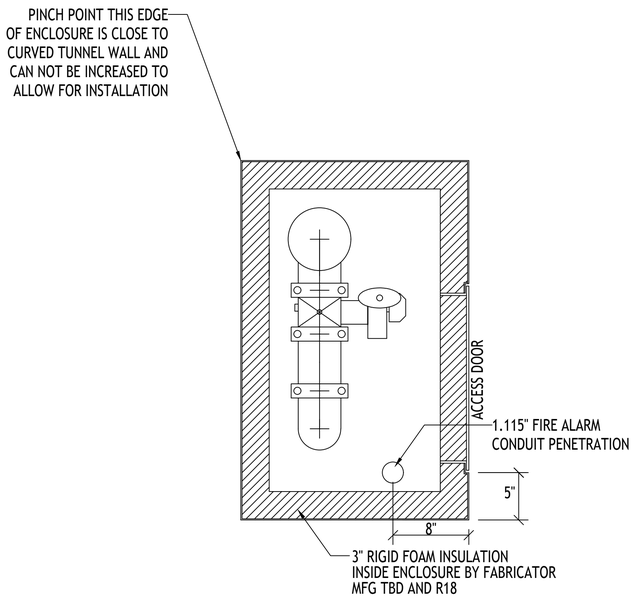


1 IVE CABINET - FRONT VIEW
SCALE: N.T.S.



2 IVE CABINET - SIDE VIEW
SCALE: N.T.S.

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

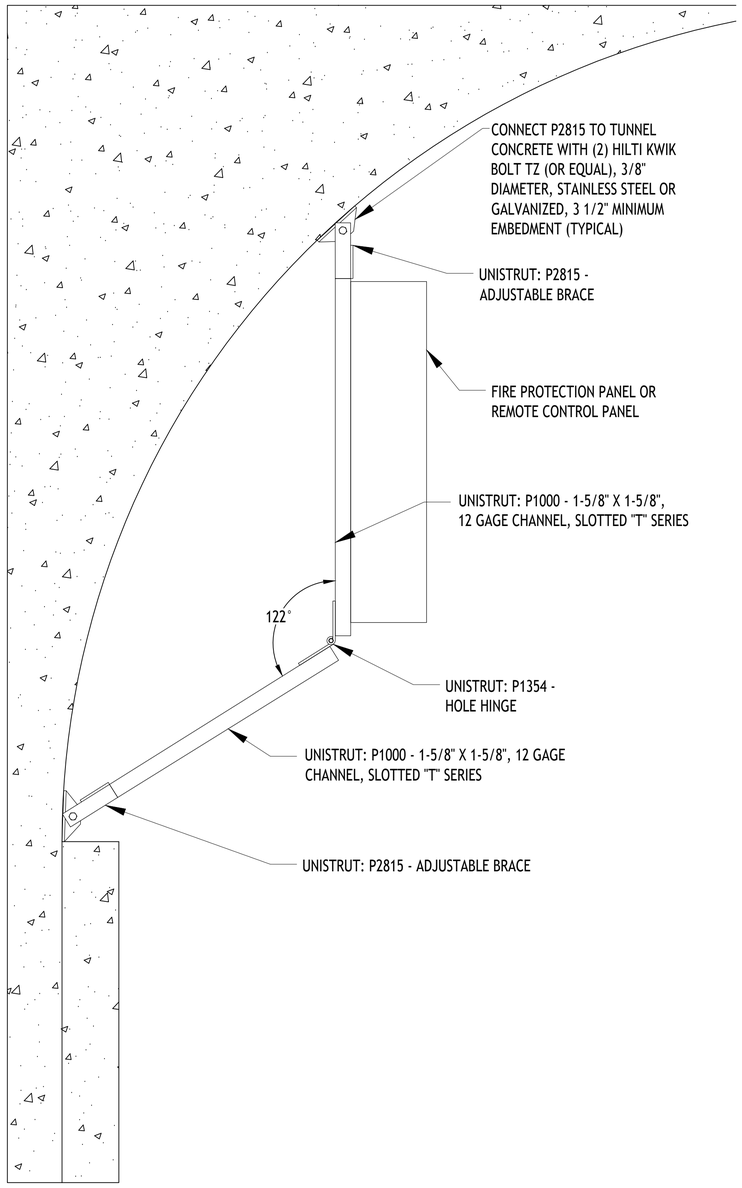
Revisions		
Num	Description	Date

DRAWN BY: B.T.L. | CHECKED BY: AEE,Jr

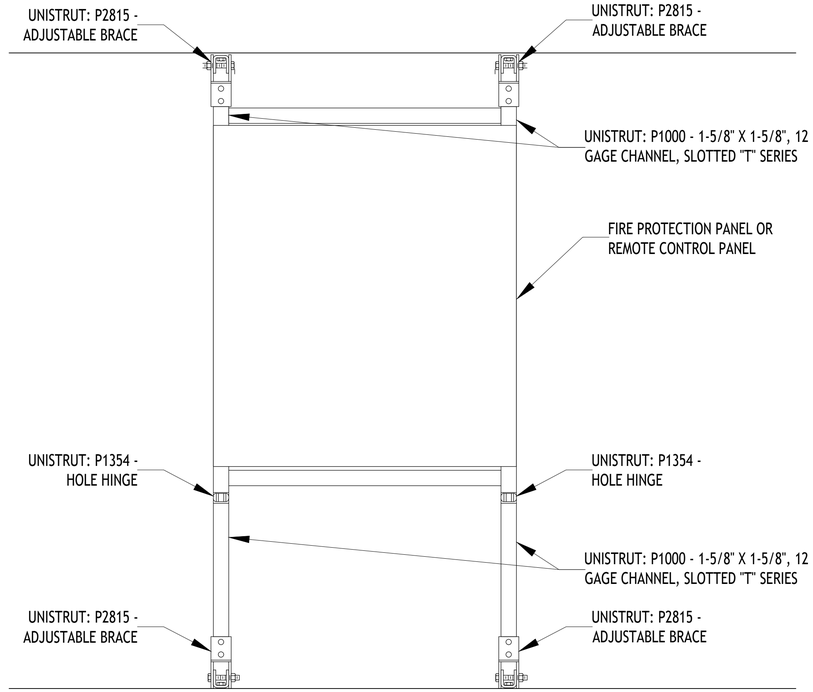
FIRE ALARM:
IVE CABINET DETAILS

Drawing Number

FA5.21



1 TYPICAL FIRE PROTECTION CABINET/REMOTE CONTROL PANEL (FPC/RCP) MOUNTING DETAIL - SIDE VIEW
SCALE: N.T.S.



2 TYPICAL FIRE PROTECTION CABINET/REMOTE CONTROL PANEL (FPC/RCP) MOUNTING DETAIL - FRONT VIEW
SCALE: N.T.S.

Description	Qty	Weight	Total Weight
Fire Protection Cabinet			
41-505F Back Box & Back Plane	1	265	265
VR1TM5 5V Pwr Module	1	0.15	0.15
24DC12 12V Pwr Module	1	0.45	0.45
MC350-1T/1S CCTV Switch	1	1.2	1.2
MCR300-1T/2S Media Converter	1	0.5	0.5
MCR300-1T/1S Media Converter	2	0.5	1
S35-2MLC SFP Transceivers	2	0.6	1.2
BPS10A Power Supply	1	13	13
SLA-1097 Battery	2	7.1	14.2
SIGA-REL Releasing Module	10	0.52	5.2
SIGA-MCR Relay Module	20	0.18	3.6
SIGA-MCT2 Input Module	10	0.1	1
SIGA-UIO6 Motherboard	5	0.56	2.8
SIGA-CT2 Input Module	1	0.4	0.4
SIGA-CT1 Input Module	1	0.4	0.4
480v-120v Transformer	1	10	10
Transformer Barrier	1	3	3
Wire	1	20	20
Total			343.1

3 FIRE PROTECTION CABINET MAX WEIGHT CALCULATIONS
SCALE: NONE

Description	Qty	Weight	Total Weight
Remote Control Panel			
31-405F Back Box & Back Plane	1	265	265
3-CHAS7 Chassis	1	8.4	8.4
3-LCD Display Module	1	0.8	0.8
3-CPU3 CPU Module	1	0.7	0.7
3-PPS/M Power Supply	1	5	5
3-SSDC1 SLC Module	1	0.5	0.5
3-SDDC1 SLC Module	2	0.5	1
3-12SR Control Module	1	0.1	0.1
3-LRMF Rail Module	1	0.35	0.35
3-FP Filler Plate	4	0.1	0.4
3-FIBM2 Fiber Comm Interface	1	1	1
MMXVR Transceiver	2	0.5	1
SLA-1075 Battery	2	5.6	11.2
480v-120v Transformer	1	10	10
Transformer Barrier	1	3	3
Wire	1	5	5
Total			313.45

4 REMOTE CONTROL PANEL MAX WEIGHT CALCULATIONS
SCALE: NONE

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810

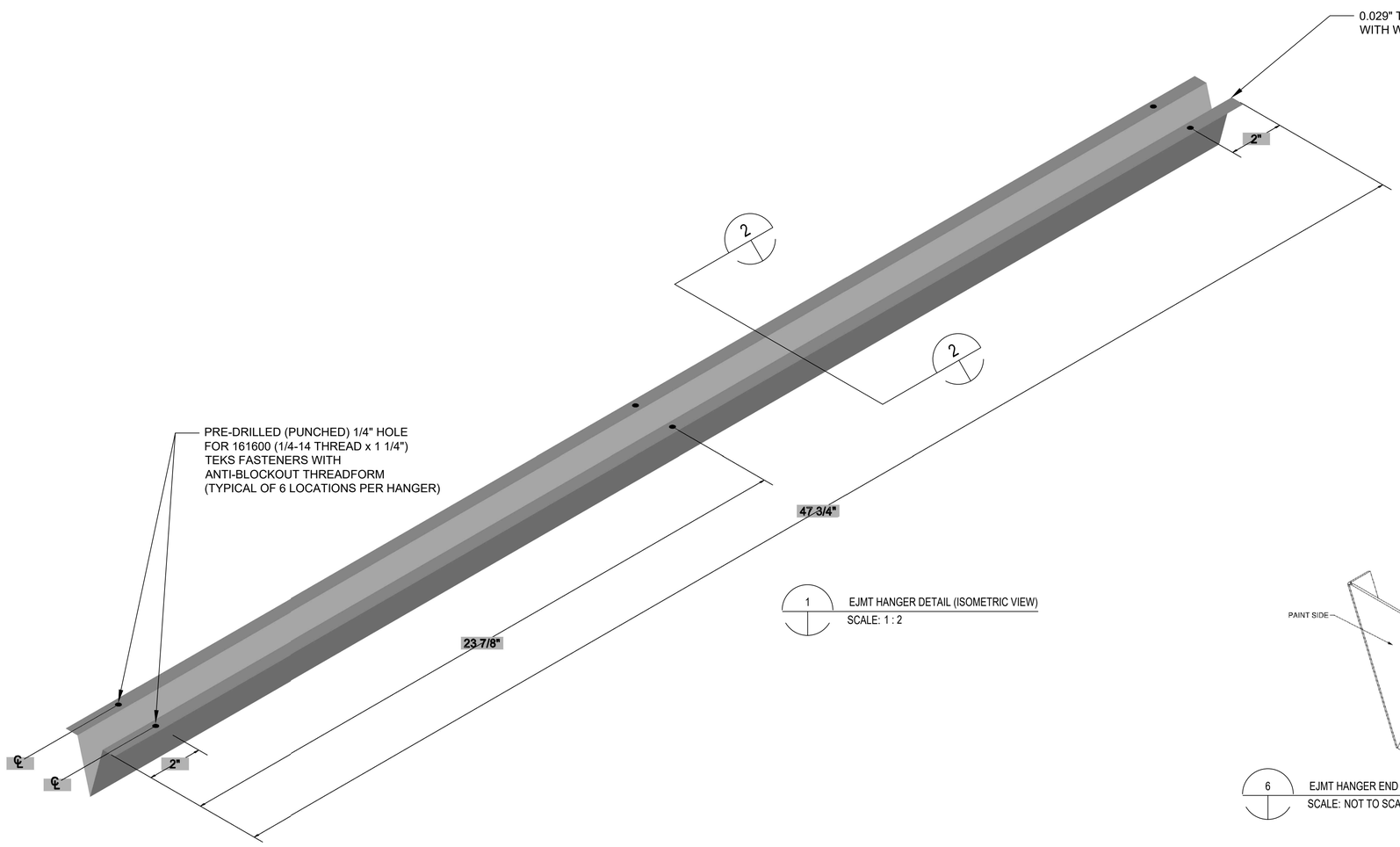
RECORD DRAWINGS - 2015-11-16

Revisions
Num | Description | Date

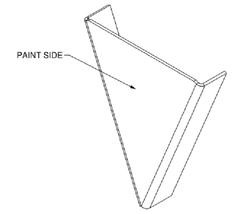
DRAWN BY: B.T.L. | CHECKED BY: AEE Jr

FIRE ALARM:
FIRE PROTECTION PANEL MOUNTING DETAILS

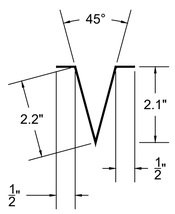
Drawing Number
FA5.22



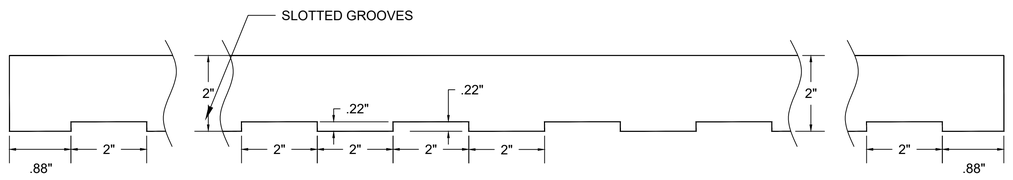
1 EJMT HANGER DETAIL (ISOMETRIC VIEW)
SCALE: 1 : 2



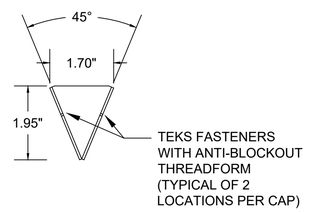
6 EJMT HANGER END CAP DETAIL (ISO VIEW)
SCALE: NOT TO SCALE



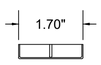
2 EJMT HANGER DETAIL (FRONT VIEW)
SCALE: 1 : 2



3 EJMT HANGER DETAIL (SIDE VIEW)
SCALE: 1 : 2



4 EJMT HANGER END CAP DETAIL (FRONT VIEW)
SCALE: 1 : 2



5 EJMT HANGER END CAP DETAIL (TOP VIEW)
SCALE: 1 : 2

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EISENHOWER/JOHNSON MEMORIAL TUNNEL

FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

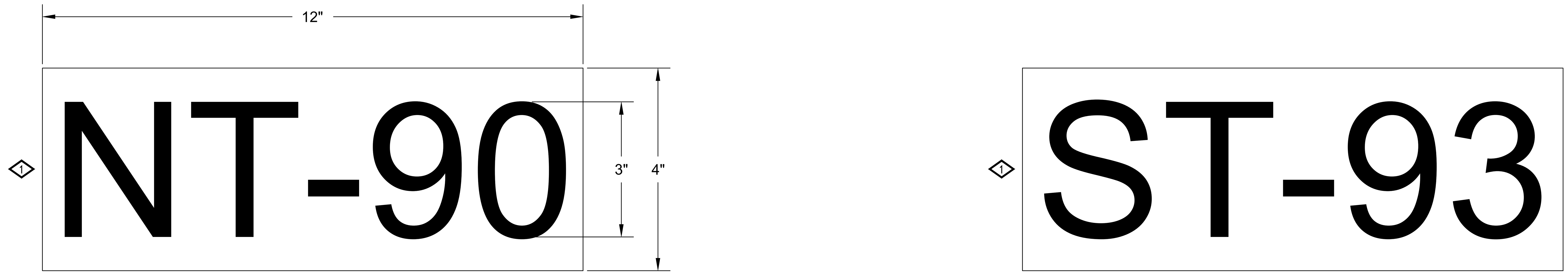
Revisions			
Num	Description	Date	

DRAWN BY: B.T.L. | CHECKED BY: AEE,Jr

FIRE ALARM:
DETAILS - LINEAR HEAT HANGER

Drawing Number

FA6.01



EISENHOWER (NORTH) TUNNEL

NORTH TUNNEL = NT-1 THRU NT-90
WEST PORTAL = NT-1, NT-2, & NT-3
INTERNAL NORTH TUNNEL = NT-4 THRU NT-87
EAST PORTAL = NT-88, NT-89, & NT-90

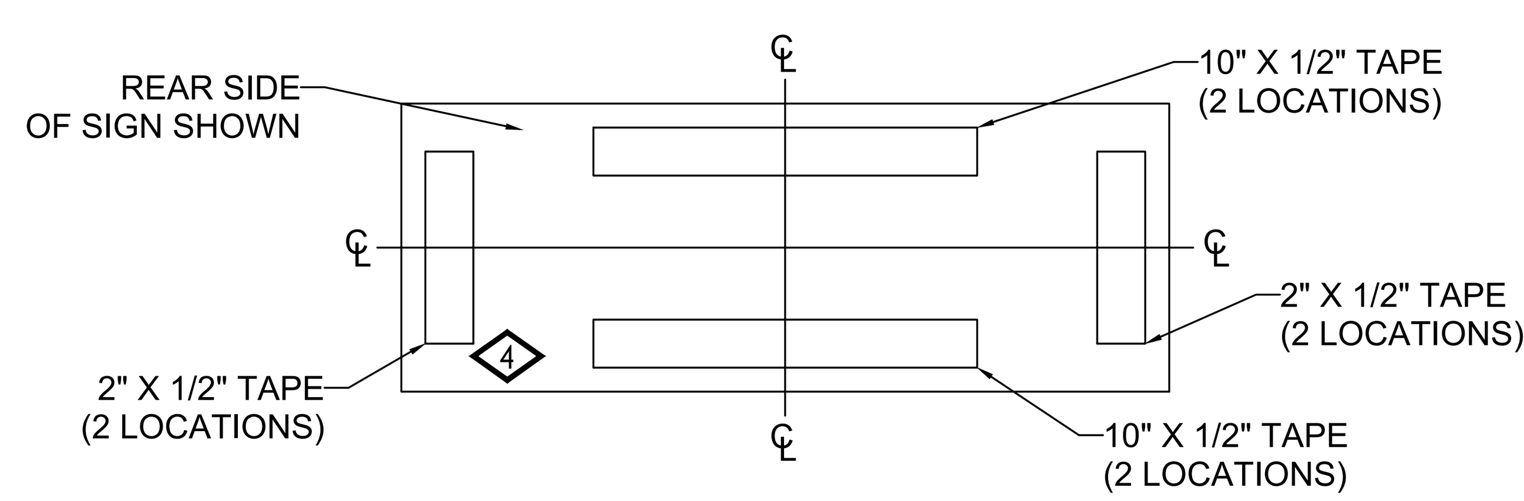
TUNNEL ZONING DELUGE SYSTEM IS FROM WEST TO EAST NUMERICALLY IN BOTH TUNNELS.
ARIAL FONT SHALL BE UTILIZED.

JOHNSON (SOUTH) TUNNEL

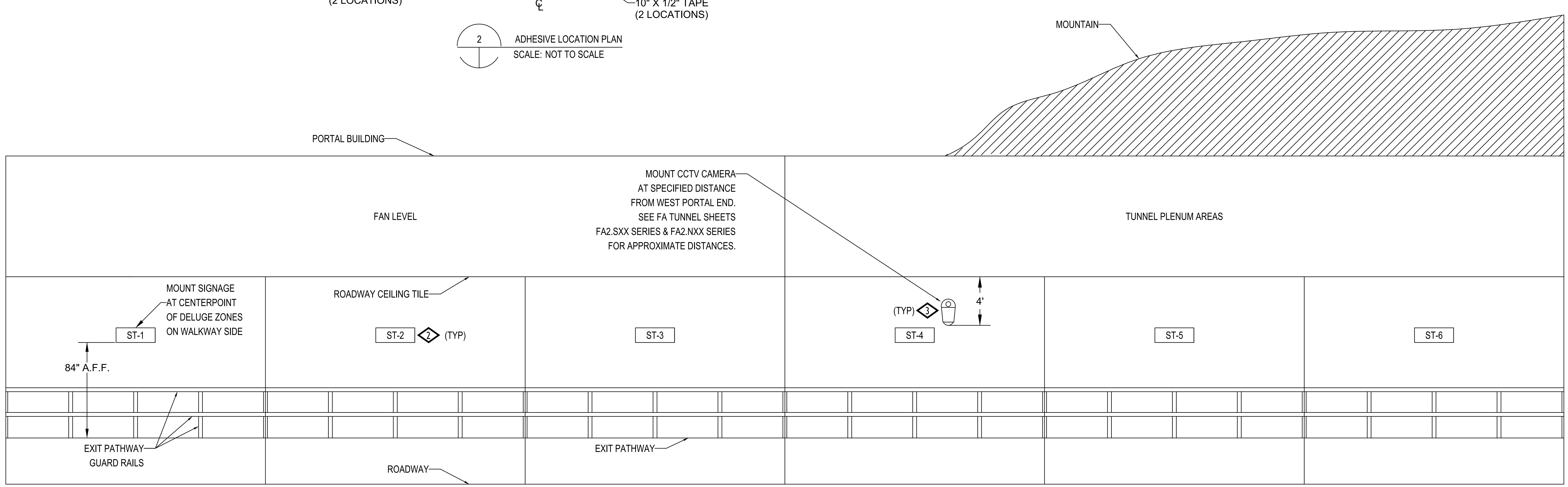
SOUTH TUNNEL = ST-1 THRU ST-93
WEST PORTAL = ST-1, ST-2, & ST-3
INTERNAL SOUTH TUNNEL = ST-4 THRU ST-90
EAST PORTAL = ST-91, ST-92, & ST-93

TUNNEL ZONING DELUGE SYSTEM IS FROM WEST TO EAST NUMERICALLY IN BOTH TUNNELS.
ARIAL FONT SHALL BE UTILIZED.

1 SIGNAGE LAYOUT
SCALE: 1 : 1 (IF SHEET IS 34" X 22")



2 ADHESIVE LOCATION PLAN
SCALE: NOT TO SCALE



3 TYPICAL TUNNEL - DELUGE SYSTEM ZONES (SOUTH TUNNEL SHOWN)
SCALE: NOT TO SCALE

DETAIL NOTES:

1. SIGN MATERIAL IS 3M REFLECTIVE 280i VINYL, WHITE, WITH BLACK ADHESIVE LETTERING. SIGN BACKER MATERIAL IS 0.032" THICK ALUMINUM.
2. THE BOTTOM OF THE DELUGE ZONE SIGN WILL BE LOCATED APPROXIMATELY 3" ABOVE THE EXISTING TUNNEL SEGMENT SIGN.
3. FIRE ALARM CCTV CAMERAS WILL BE MOUNTED WITH BOTTOM OF LENS AT 4' BELOW THE CEILING TILE. EXISTING TRAFFIC CONTROL CAMERAS ARE MOUNTED WITH THE BOTTOM OF THE LENS AT APPROXIMATELY 7' 6" BELOW THE CEILING TILE.
4. SIGN ADHESIVE IS 3M VHB TAPE. TYPE 4941F X 1/2" WIDE.

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

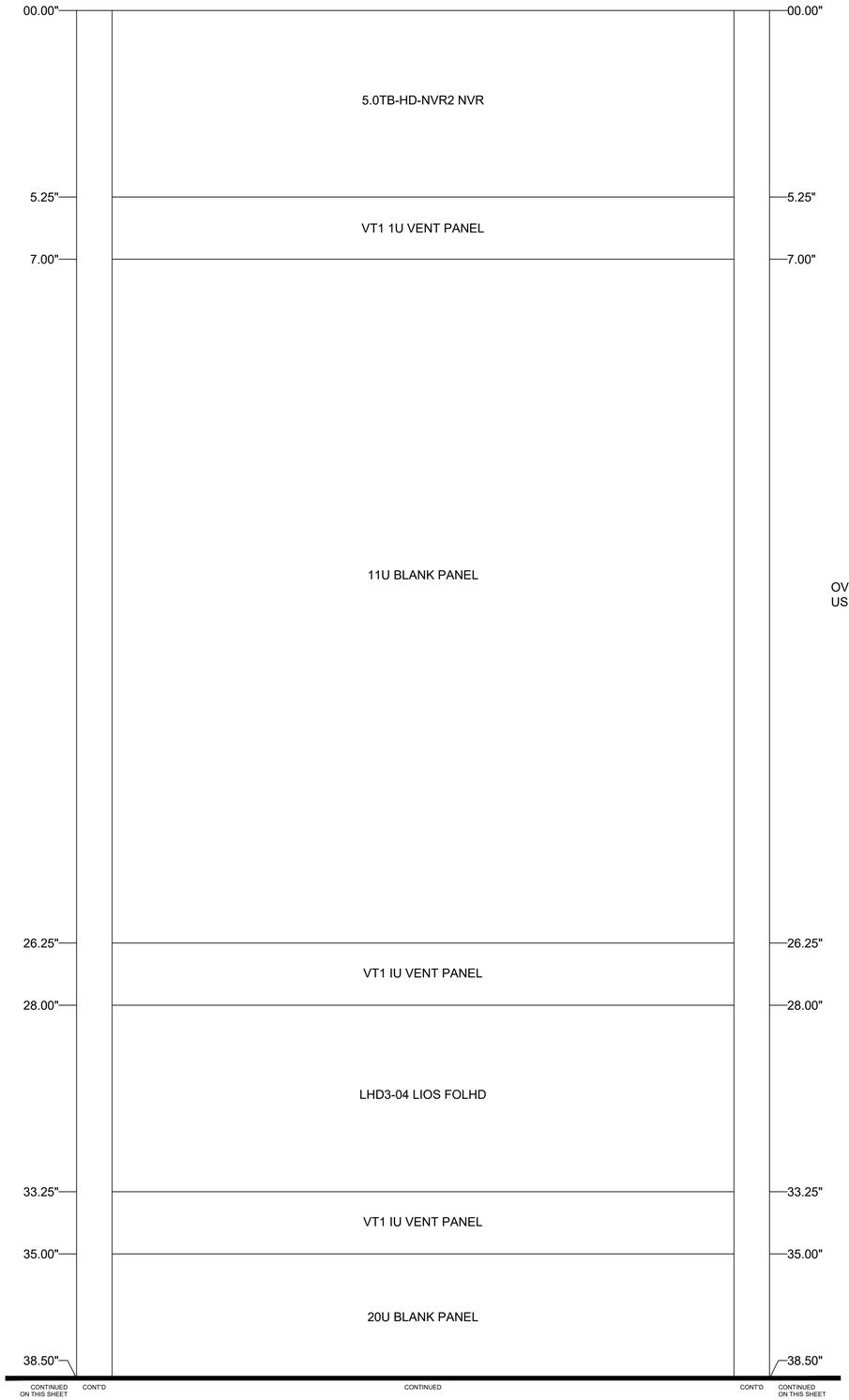
Revisions

Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr.

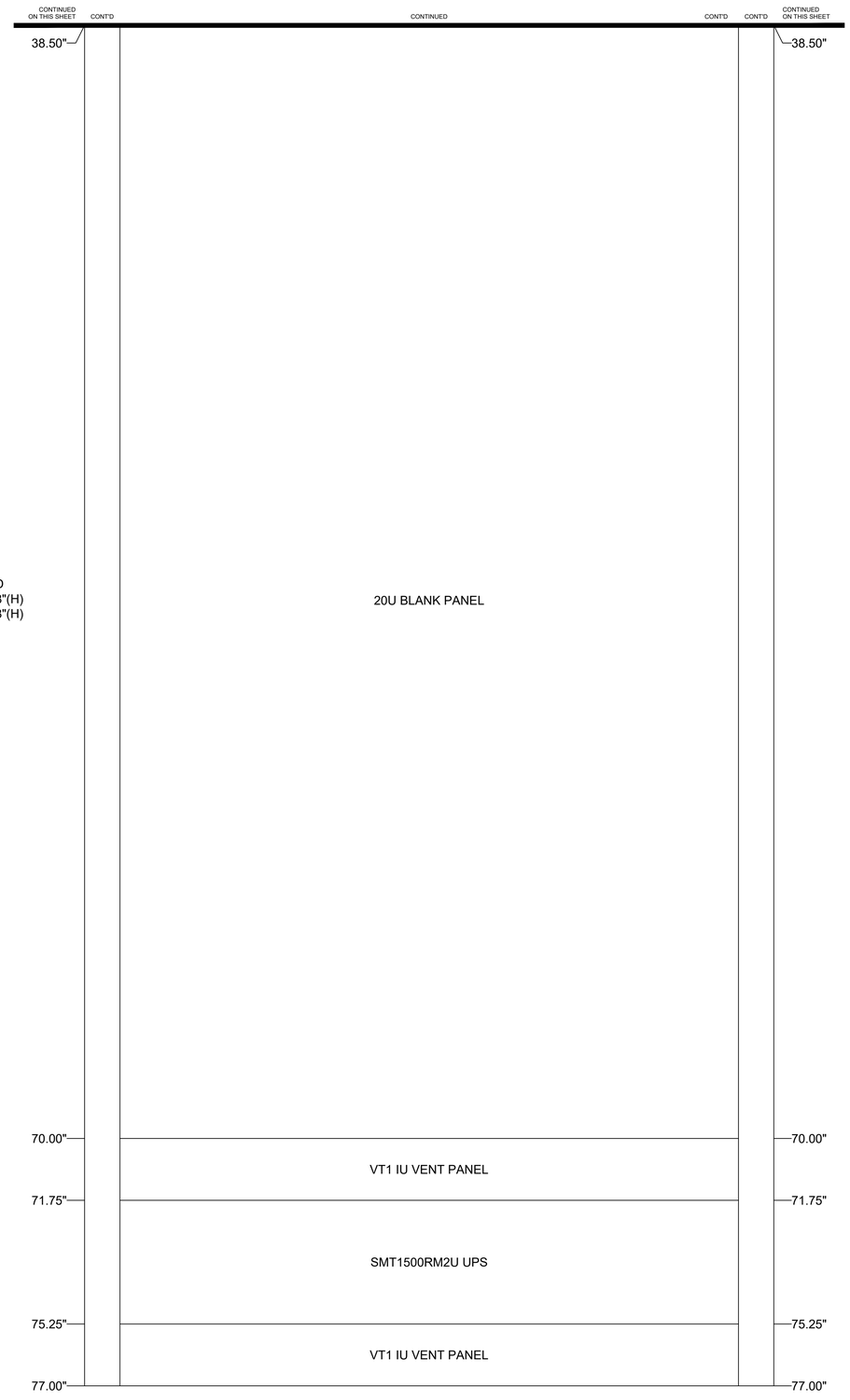
FIRE ALARM:
DETAILS - SYSTEM SIGNAGE

Drawing Number
FA6.02



MIDDLE ATLANTIC EQUIPMENT RACK WRK-44SA-32LRD
OVERALL DIMENSIONS ARE: 22-3/8"(W) x 32-5/8"(D) x 83-1/8"(H)
USEABLE DIMENSIONS ARE: 19-1/2"(W) x 30-3/4"(D) x 77-1/8"(H)
EAST CONTROL ROOM - RACK #1
FRONT VIEW

1 EAST CONTROL ROOM - RACK #1 - FRONT VIEW
SCALE: 1/2



IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

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CONSULTING ENGINEERS

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810

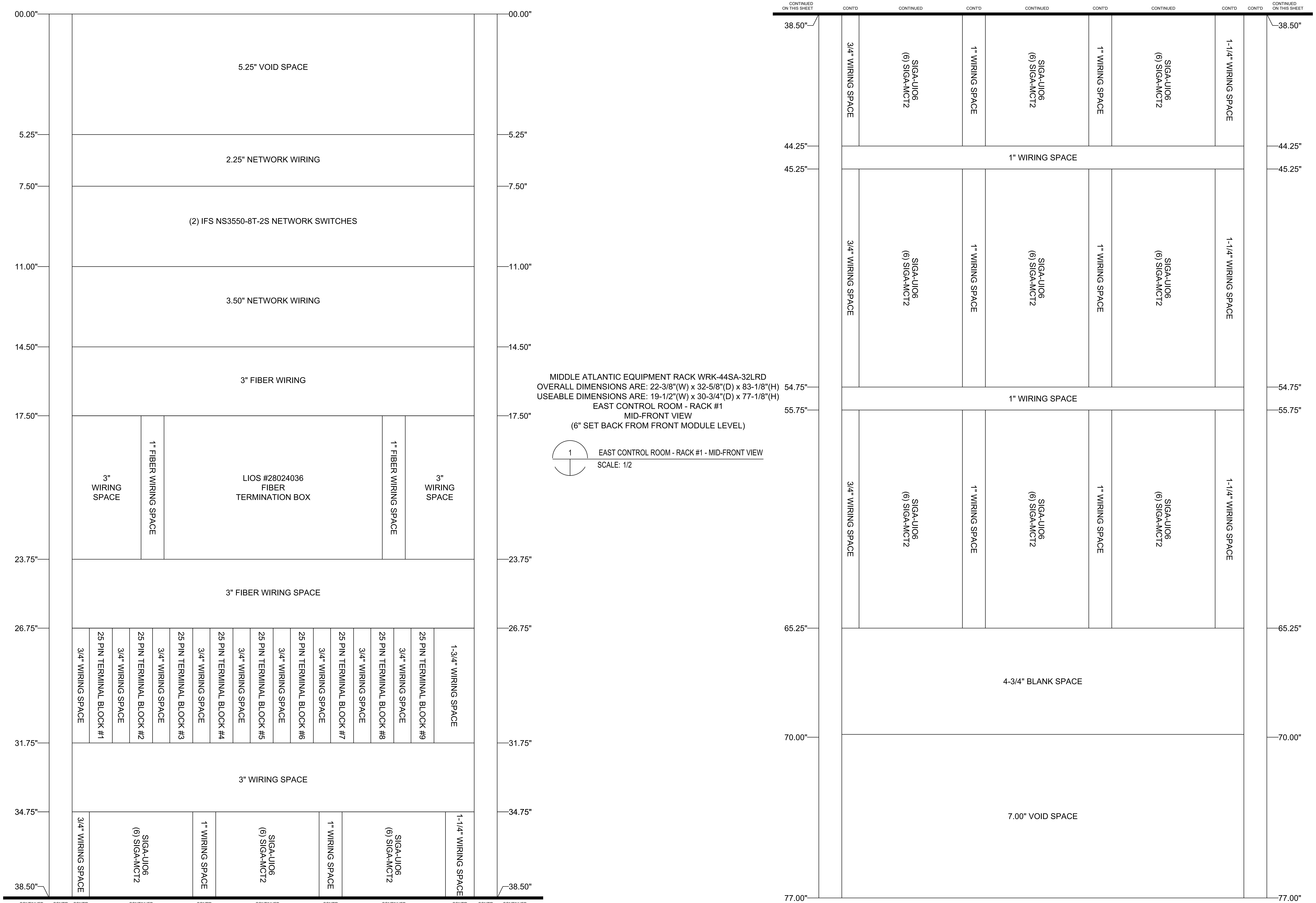
RECORD DRAWINGS - 2015-11-16

Revisions
Num | Description | Date

DRAWN BY: B.T.L. | CHECKED BY: AEE,Jr

FIRE ALARM:
DETAILS - EAST CONTROL RACK #1 - FRONT VIEW

Drawing Number
FA6.03A



MIDDLE ATLANTIC EQUIPMENT RACK WRK-44SA-32LRD
OVERALL DIMENSIONS ARE: 22-3/8"(W) x 32-5/8"(D) x 83-1/8"(H)
USEABLE DIMENSIONS ARE: 19-1/2"(W) x 30-3/4"(D) x 77-1/8"(H)
EAST CONTROL ROOM - RACK #1
MID-FRONT VIEW
(6" SET BACK FROM FRONT MODULE LEVEL)

1 EAST CONTROL ROOM - RACK #1 - MID-FRONT VIEW
SCALE: 1/2

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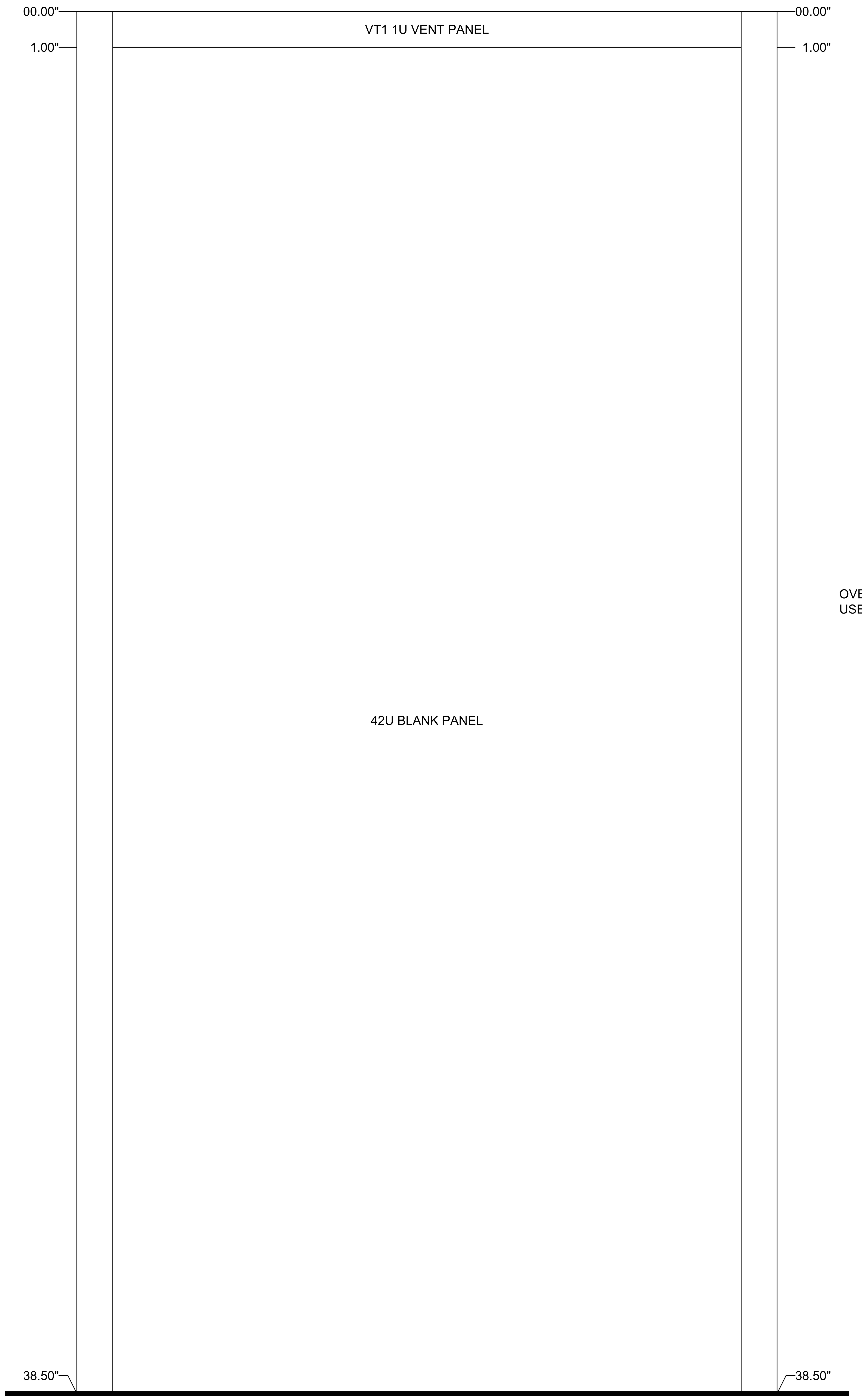
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

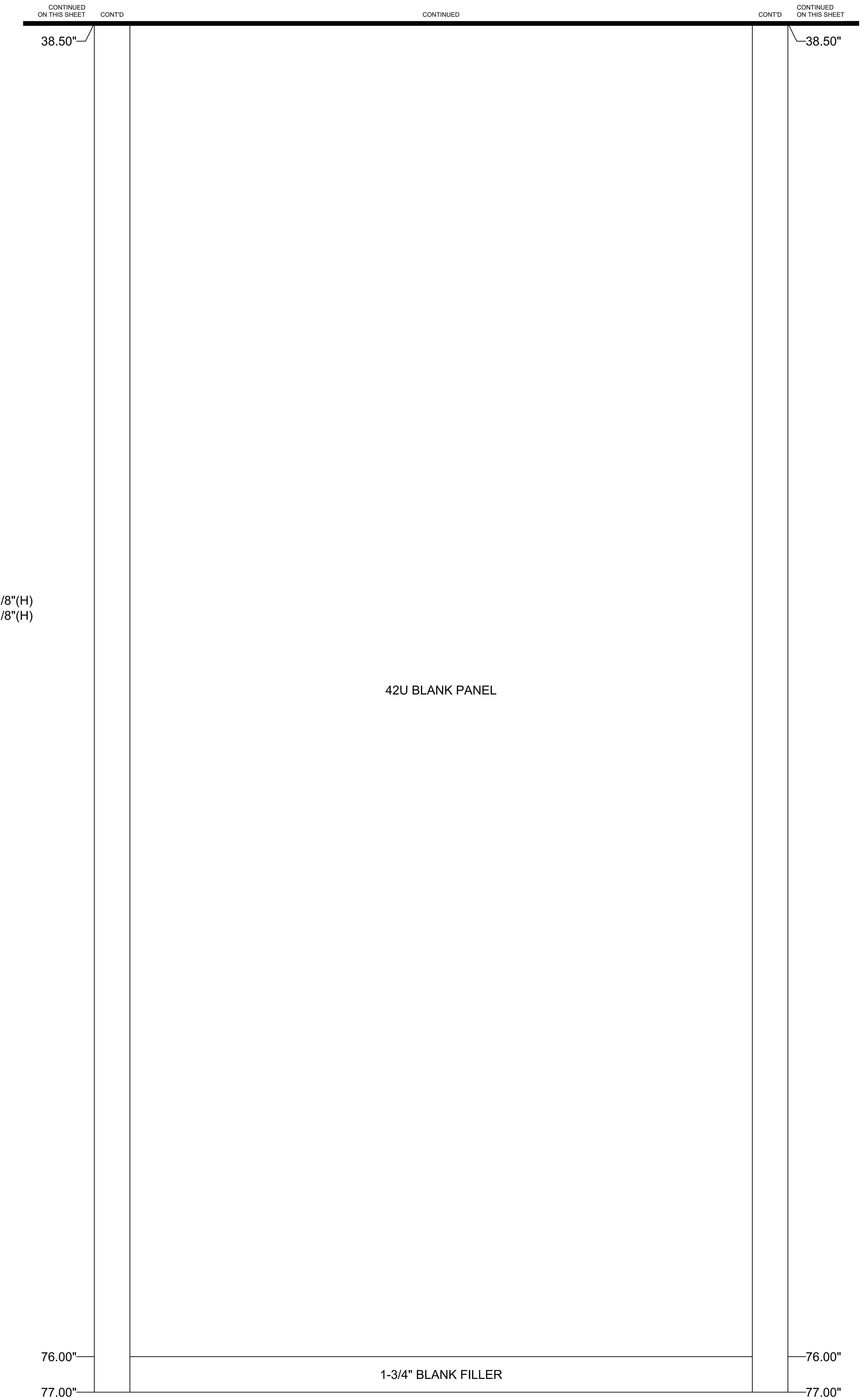
FIRE ALARM:
DETAILS - EAST CONTROL
RACK #1 - MID-FRONT VIEW

Drawing Number
FA6.03B



MIDDLE ATLANTIC EQUIPMENT RACK WRK-44SA-32
OVERALL DIMENSIONS ARE: 22-3/8"(W) x 32-5/8"(D) x 83-1/8"(H)
USEABLE DIMENSIONS ARE: 19-1/2"(W) x 30-3/4"(D) x 77-1/8"(H)
EAST CONTROL ROOM - RACK #1
REAR VIEW

1 EAST CONTROL ROOM - RACK #1 - REAR VIEW
SCALE: 1/2



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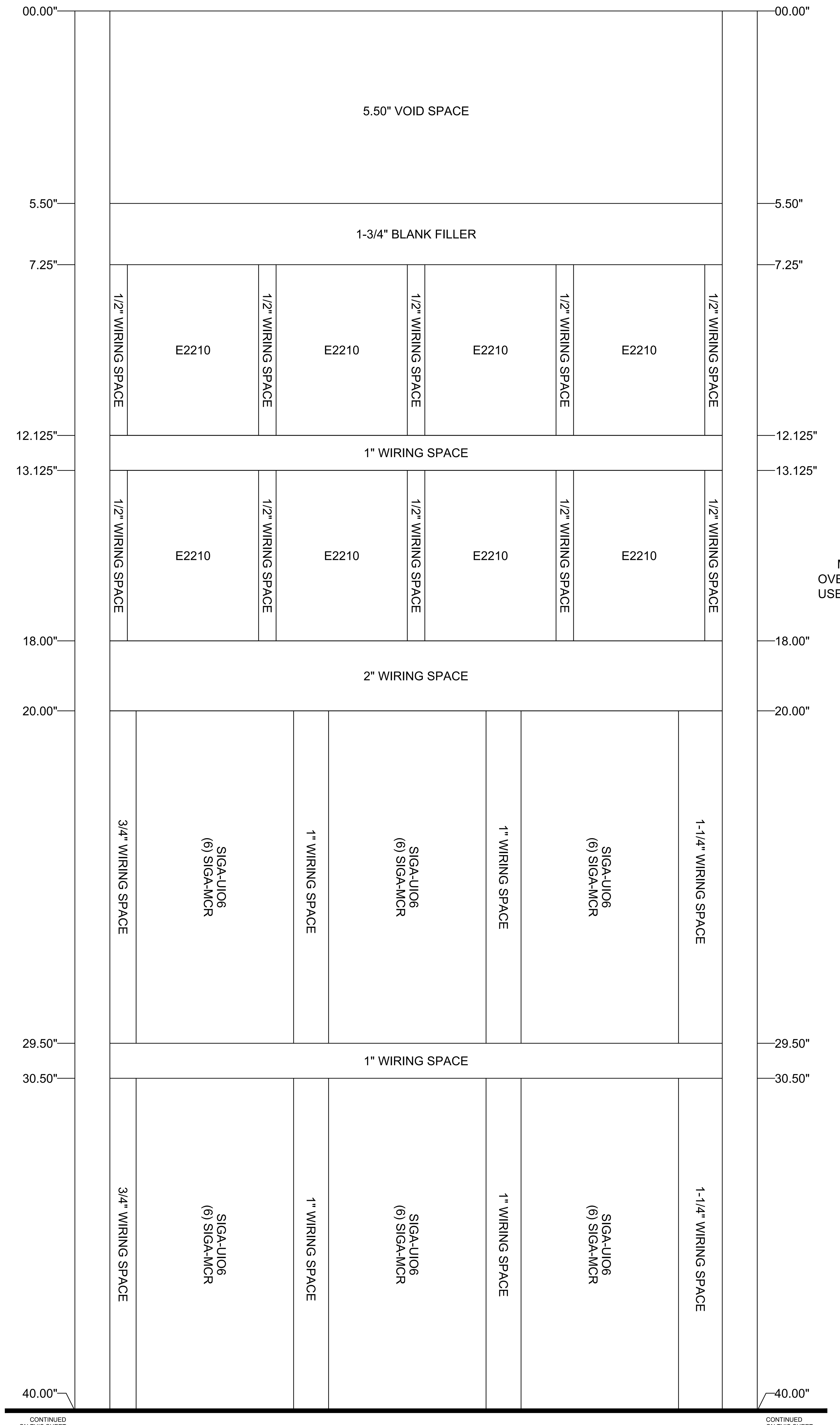
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

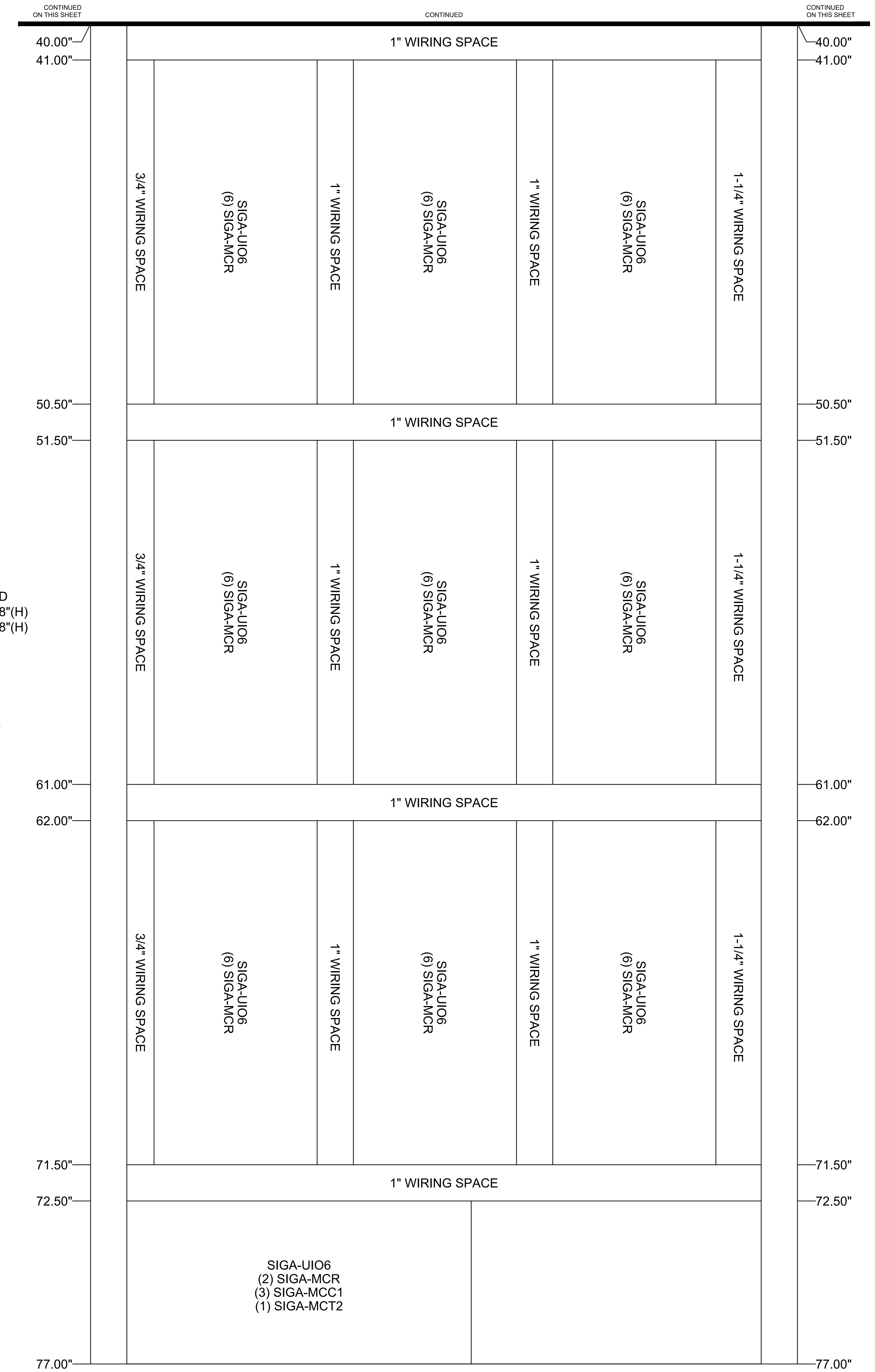
FIRE ALARM:
DETAILS - EAST CONTROL
RACK #1 - REAR VIEW

Drawing Number
FA6.04A



MIDDLE ATLANTIC EQUIPMENT RACK WRK-44SA-32LRD
OVERALL DIMENSIONS ARE: 22-3/8"(W) x 32-5/8"(D) x 83-1/8"(H)
USEABLE DIMENSIONS ARE: 19-1/2"(W) x 30-3/4"(D) x 77-1/8"(H)
EAST CONTROL ROOM - RACK #1
MID-REAR VIEW
(6" SET BACK FROM FRONT MODULE LEVEL)

1 EAST CONTROL ROOM - RACK #1 - MID-REAR VIEW
SCALE: 1/2



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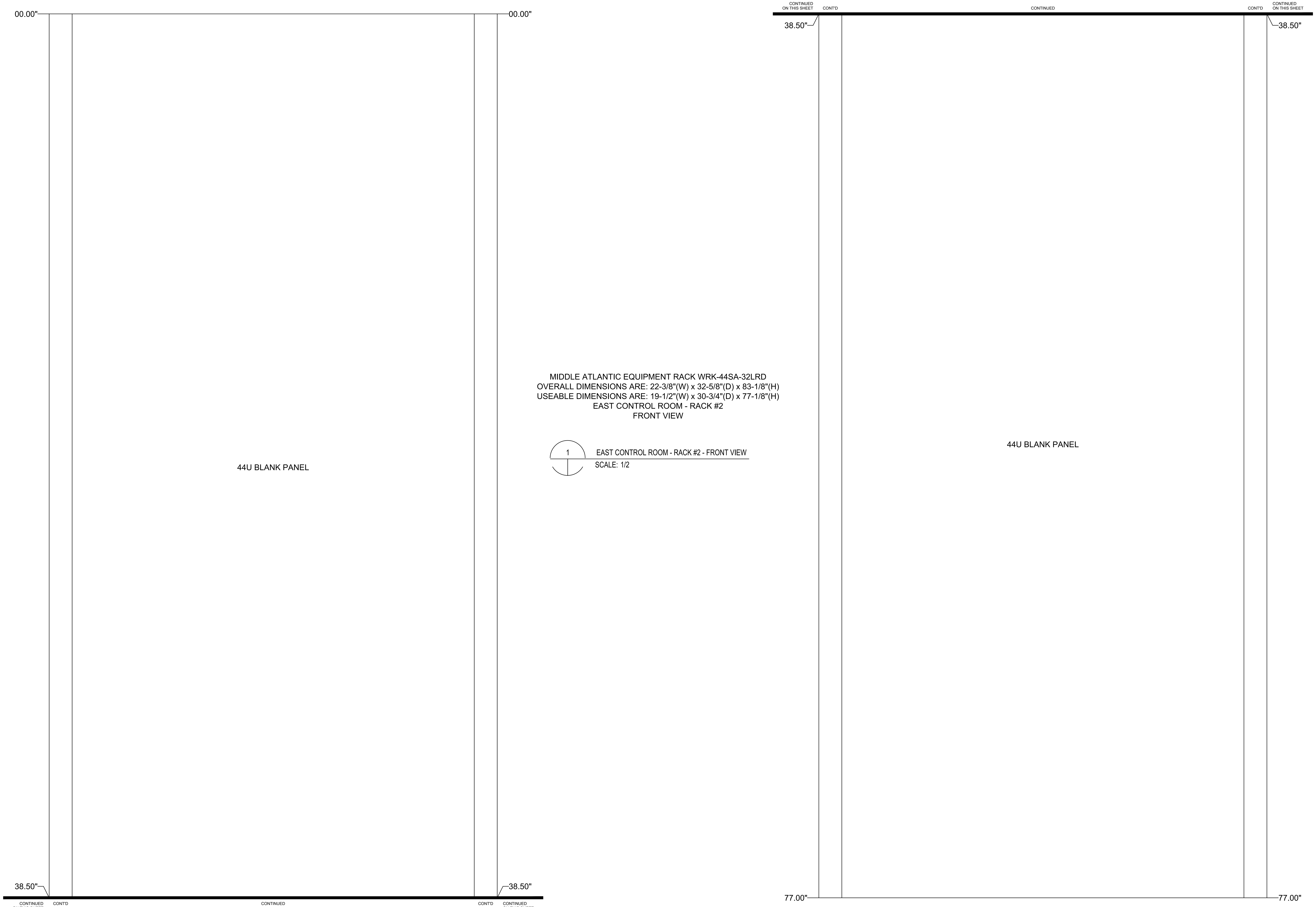
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
DETAILS - EAST CONTROL RACK #1 - MID-REAR VIEW

Drawing Number
FA6.04B



MIDDLE ATLANTIC EQUIPMENT RACK WRK-44SA-32LRD
OVERALL DIMENSIONS ARE: 22-3/8"(W) x 32-5/8"(D) x 83-1/8"(H)
USEABLE DIMENSIONS ARE: 19-1/2"(W) x 30-3/4"(D) x 77-1/8"(H)
EAST CONTROL ROOM - RACK #2
FRONT VIEW

1 EAST CONTROL ROOM - RACK #2 - FRONT VIEW
SCALE: 1/2

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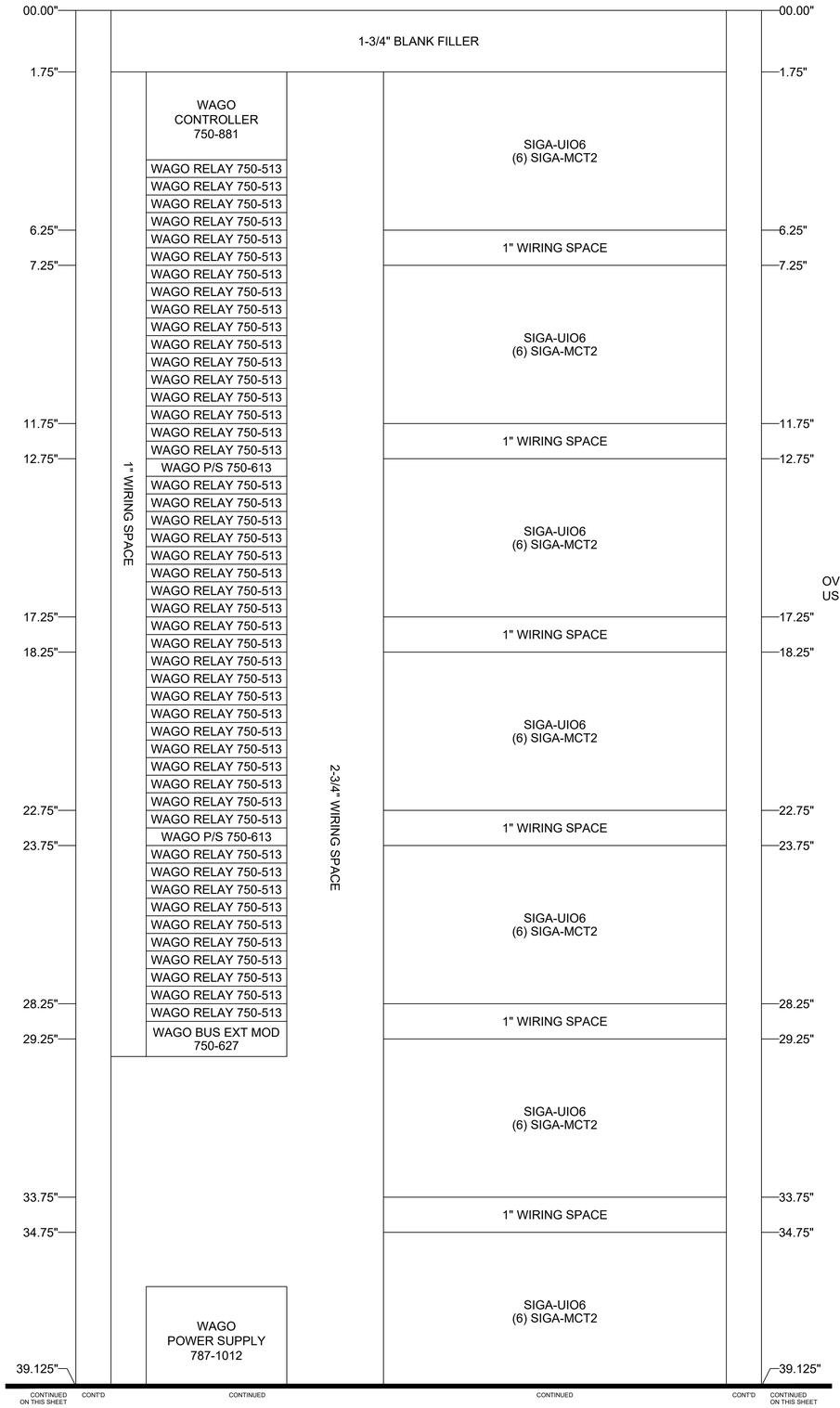
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
DETAILS - EAST CONTROL
RACK #2 - FRONT VIEW

Drawing Number
FA6.05A



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MIDDLE ATLANTIC EQUIPMENT RACK WRK-44SA-32LRD
OVERALL DIMENSIONS ARE: 22-3/8"(W) x 32-5/8"(D) x 83-1/8"(H)
USEABLE DIMENSIONS ARE: 19-1/2"(W) x 30-3/4"(D) x 77-1/8"(H)
EAST CONTROL ROOM - RACK #2
MID-FRONT VIEW
(6" SET BACK FROM FRONT MODULE LEVEL)

1 EAST CONTROL ROOM - RACK #2 - MID-FRONT VIEW
SCALE: 1/2

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Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions		
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FIRE ALARM:
DETAILS - EAST CONTROL
RACK #2 - MID-FRONT VIEW

Drawing Number
FA6.05B

00.00"

00.00"

44U BLANK PANEL

38.50"

38.50"

CONTINUED ON THIS SHEET CONT'D CONTINUED CONT'D CONTINUED ON THIS SHEET

MIDDLE ATLANTIC EQUIPMENT RACK WRK-44SA-32LRD
OVERALL DIMENSIONS ARE: 22-3/8"(W) x 32-5/8"(D) x 83-1/8"(H)
USEABLE DIMENSIONS ARE: 19-1/2"(W) x 30-3/4"(D) x 77-1/8"(H)
EAST CONTROL ROOM - RACK #2
REAR VIEW

1 EAST CONTROL ROOM - RACK #2 - REAR VIEW
SCALE: 1/2

CONTINUED ON THIS SHEET CONT'D CONTINUED CONT'D CONTINUED ON THIS SHEET

38.50"

38.50"

44U BLANK PANEL

77.00"

77.00"

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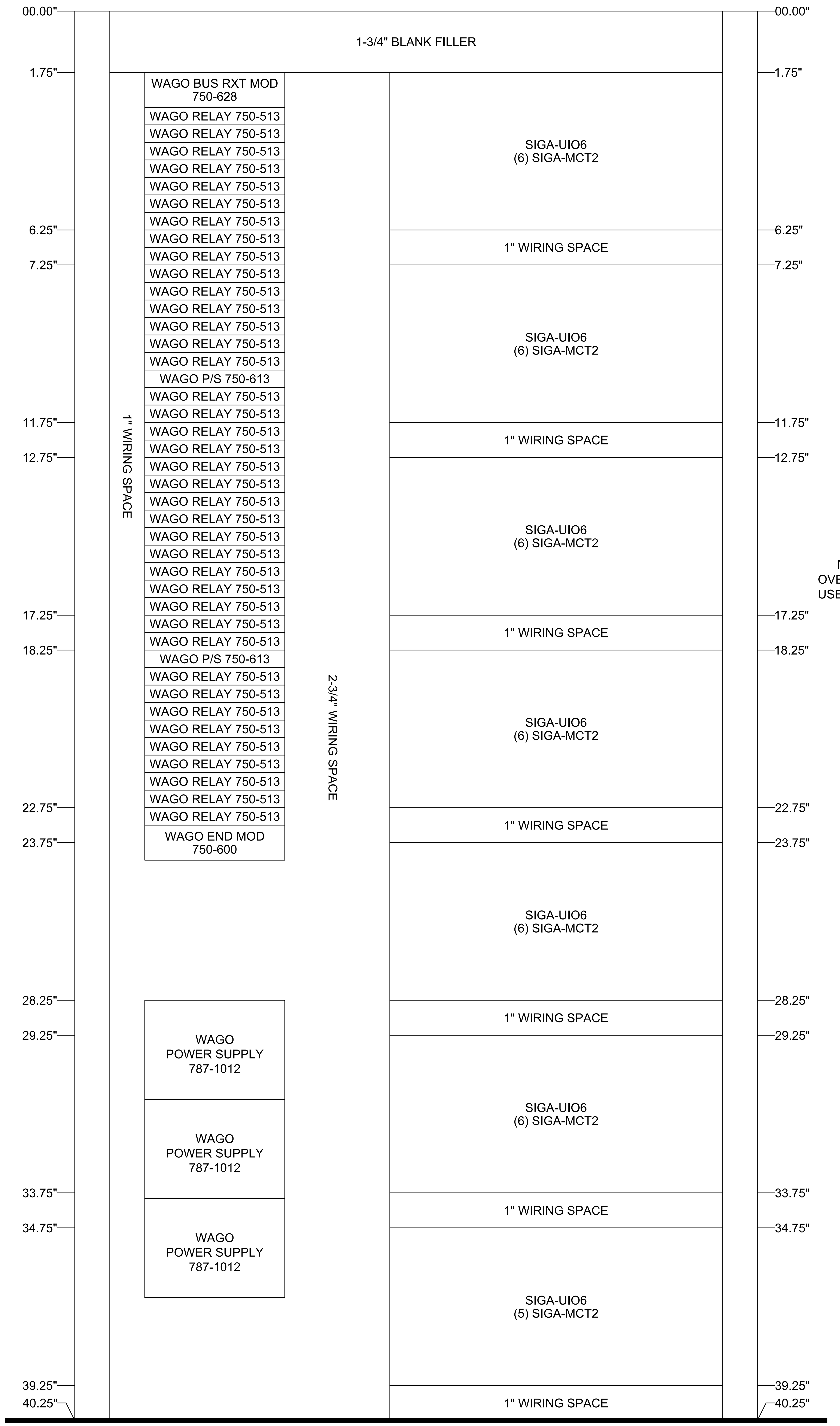
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

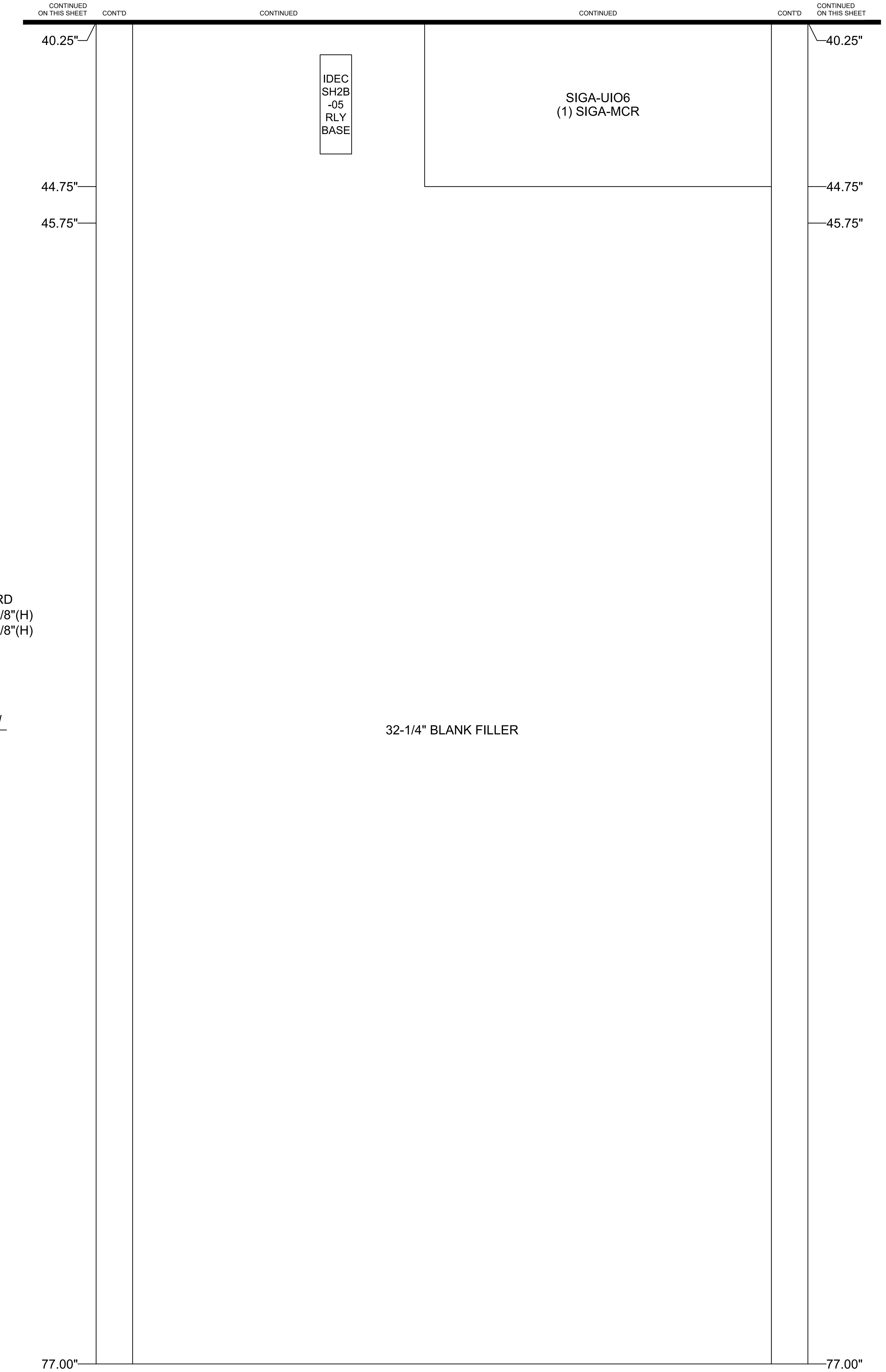
FIRE ALARM:
DETAILS - EAST CONTROL
RACK #2 - REAR VIEW

Drawing Number
FA6.06A



MIDDLE ATLANTIC EQUIPMENT RACK WRK-44SA-32LRD
OVERALL DIMENSIONS ARE: 22-3/8"(W) x 32-5/8"(D) x 83-1/8"(H)
USEABLE DIMENSIONS ARE: 19-1/2"(W) x 30-3/4"(D) x 77-1/8"(H)
EAST CONTROL ROOM - RACK #2
MID-REAR VIEW
(6" SET BACK FROM FRONT MODULE LEVEL)

1 EAST CONTROL ROOM - RACK #2 - MID-REAR VIEW
SCALE: 1/2



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RECORD DRAWINGS - 2015-11-16

Revisions		
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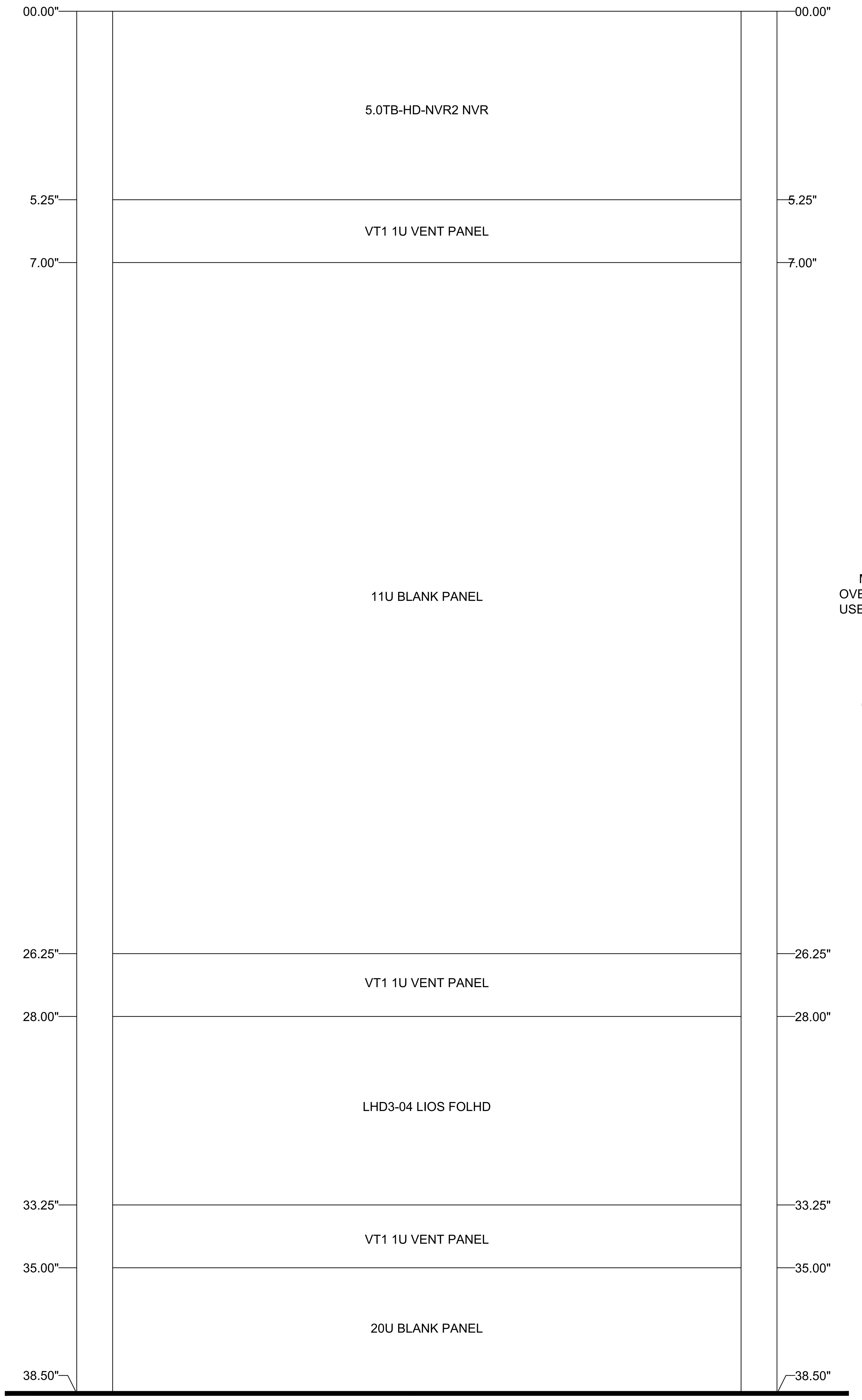
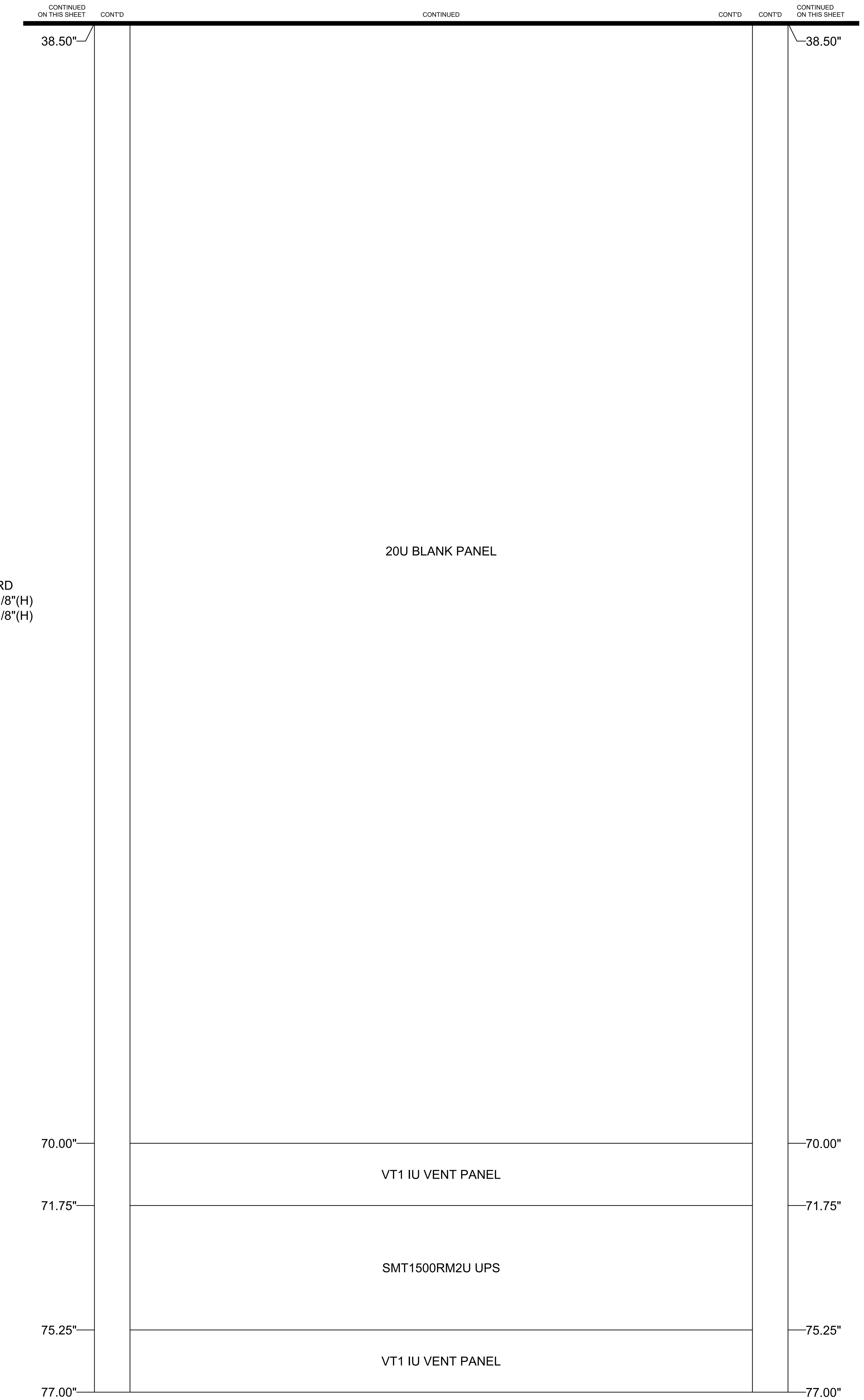
FIRE ALARM:
DETAILS - EAST CONTROL
RACK #2 - MID-REAR VIEW

Drawing Number
FA6.06B



MIDDLE ATLANTIC EQUIPMENT RACK WRK-44SA-32LRD
OVERALL DIMENSIONS ARE: 22-3/8"(W) x 32-5/8"(D) x 83-1/8"(H)
USEABLE DIMENSIONS ARE: 19-1/2"(W) x 30-3/4"(D) x 77-1/8"(H)
WEST CONTROL ROOM - RACK #1
FRONT VIEW

1 WEST CONTROL ROOM - RACK #1 - FRONT VIEW
SCALE: 1/2



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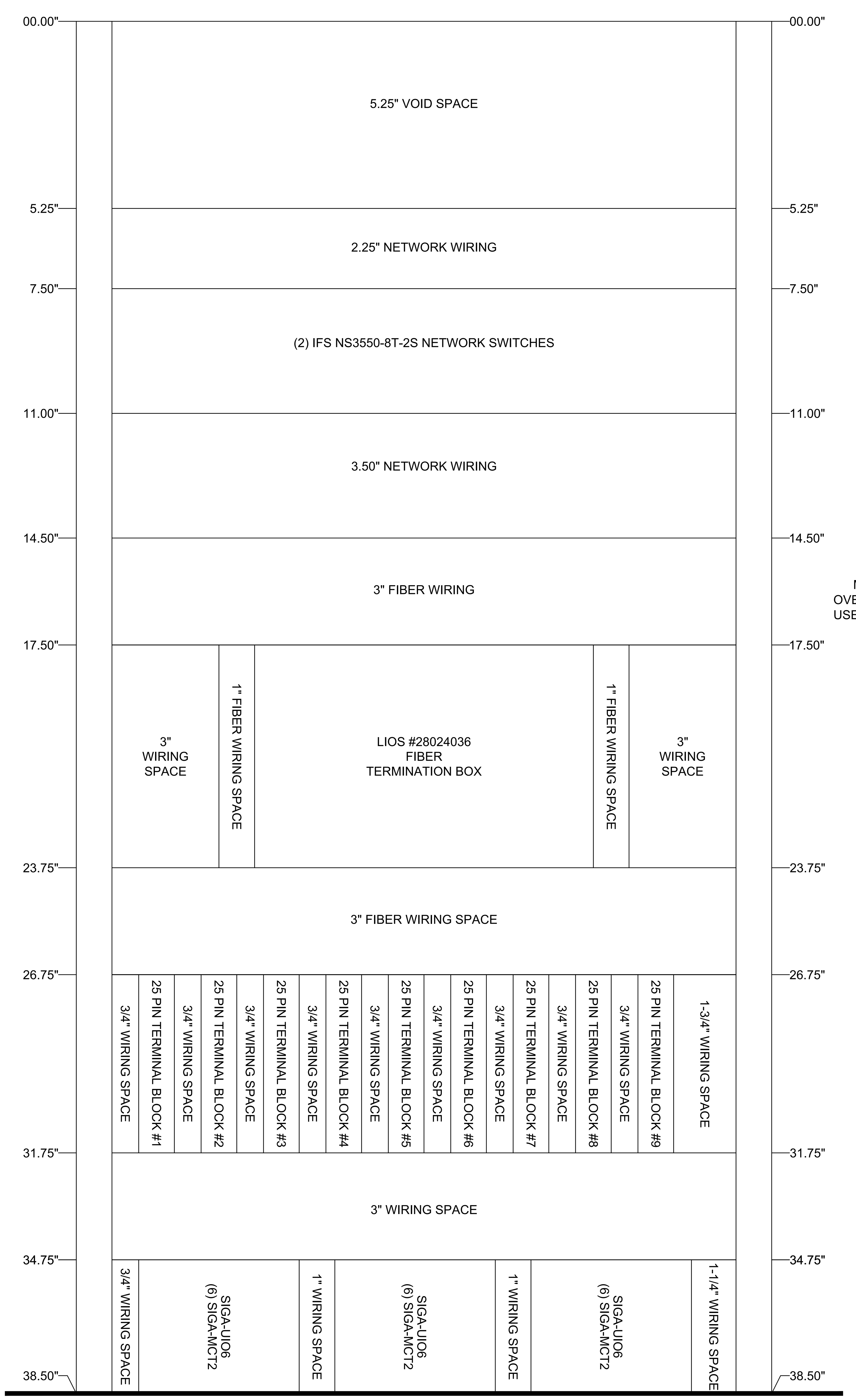
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

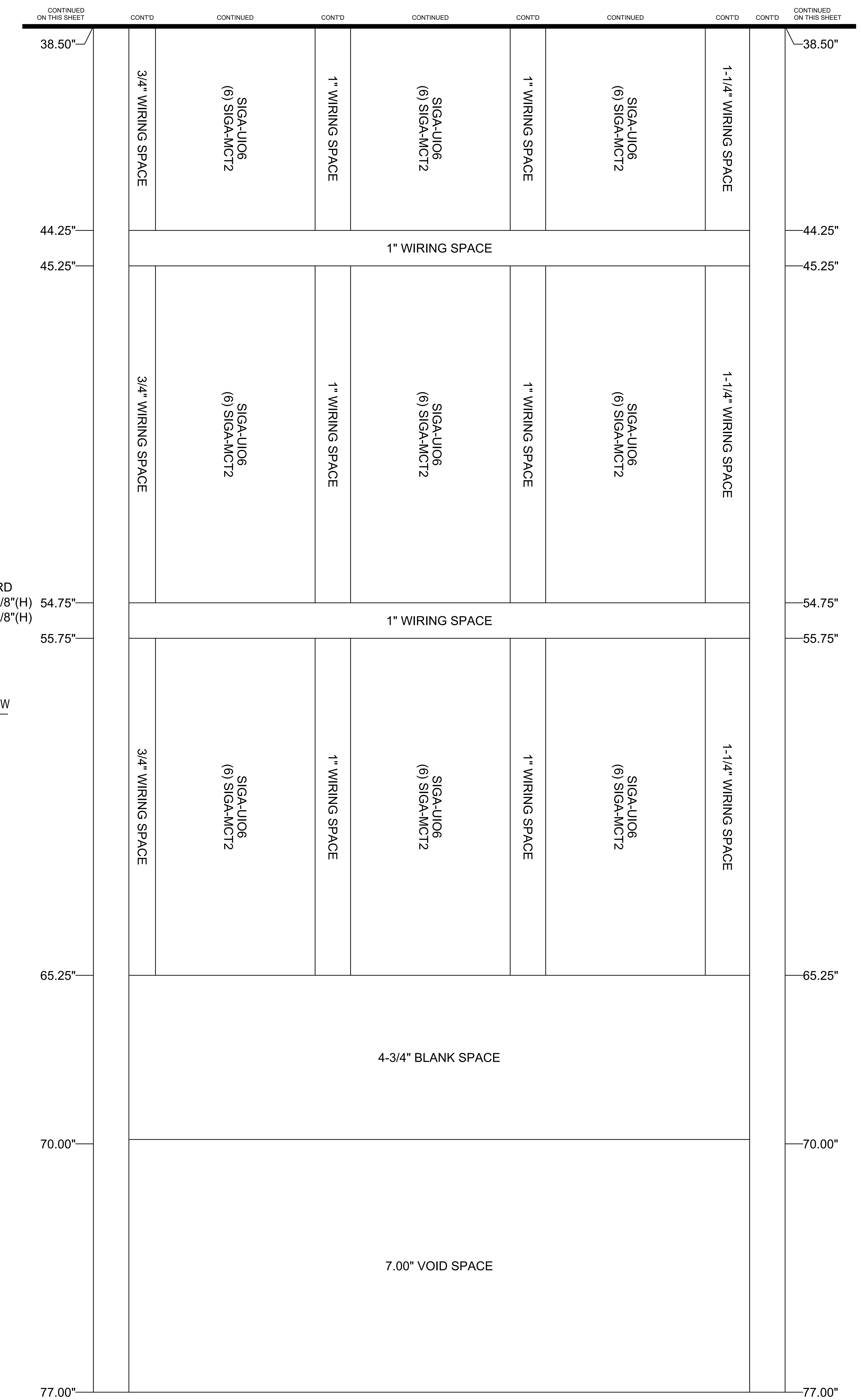
FIRE ALARM:
DETAILS - WEST CONTROL RACK #1 - FRONT VIEW

Drawing Number
FA6.07A



MIDDLE ATLANTIC EQUIPMENT RACK WRK-44SA-32LRD
OVERALL DIMENSIONS ARE: 22-3/8"(W) x 32-5/8"(D) x 83-1/8"(H)
USEABLE DIMENSIONS ARE: 19-1/2"(W) x 30-3/4"(D) x 77-1/8"(H)
WEST CONTROL ROOM - RACK #1
MID-FRONT VIEW
(6" SET BACK FROM FRONT MODULE LEVEL)

1 WEST CONTROL ROOM - RACK #1 - MID-FRONT VIEW
SCALE: 1/2



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FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Num	Revisions Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
DETAILS - WEST CONTROL RACK #1 - MID-FRONT VIEW

Drawing Number
FA6.07B

00.00"
1.00"
VT1 1U VENT PANEL
00.00"
1.00"

42U BLANK PANEL

38.50"
CONTINUED ON THIS SHEET
CONT'D
CONTINUED
CONT'D
CONTINUED ON THIS SHEET
38.50"

MIDDLE ATLANTIC EQUIPMENT RACK WRK-44SA-32
OVERALL DIMENSIONS ARE: 22-3/8"(W) x 32-5/8"(D) x 83-1/8"(H)
USEABLE DIMENSIONS ARE: 19-1/2"(W) x 30-3/4"(D) x 77-1/8"(H)
WEST CONTROL ROOM - RACK #1
REAR VIEW

1 WEST CONTROL ROOM - RACK #1 - REAR VIEW
SCALE: 1/2

CONTINUED ON THIS SHEET
CONT'D
CONTINUED
CONT'D
CONTINUED ON THIS SHEET
38.50"
38.50"

42U BLANK PANEL

76.00"
77.00"
1-3/4" BLANK FILLER
76.00"
77.00"

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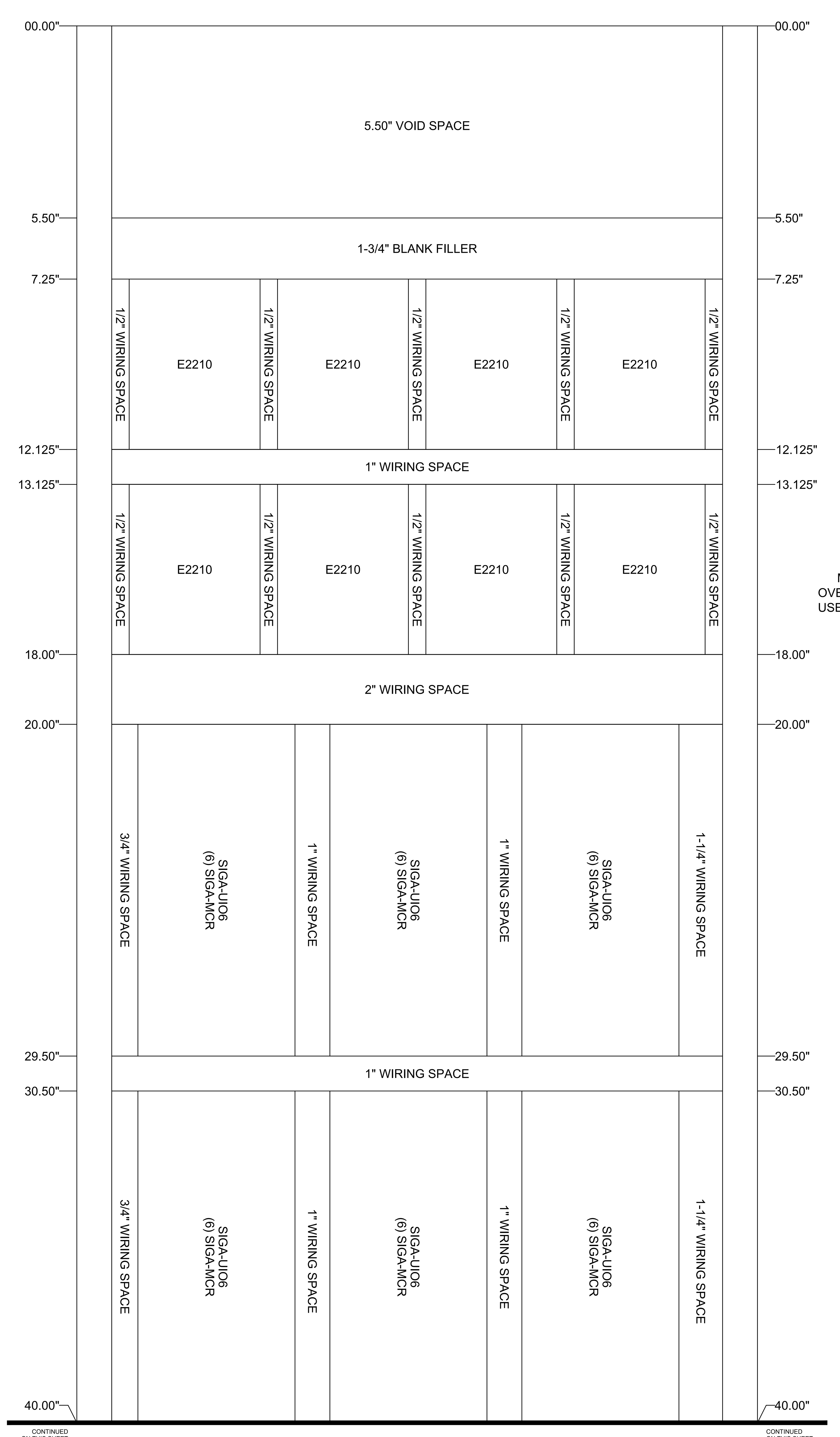
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions
Num | Description | Date

DRAWN BY: B.T.L. | CHECKED BY: AEE,Jr

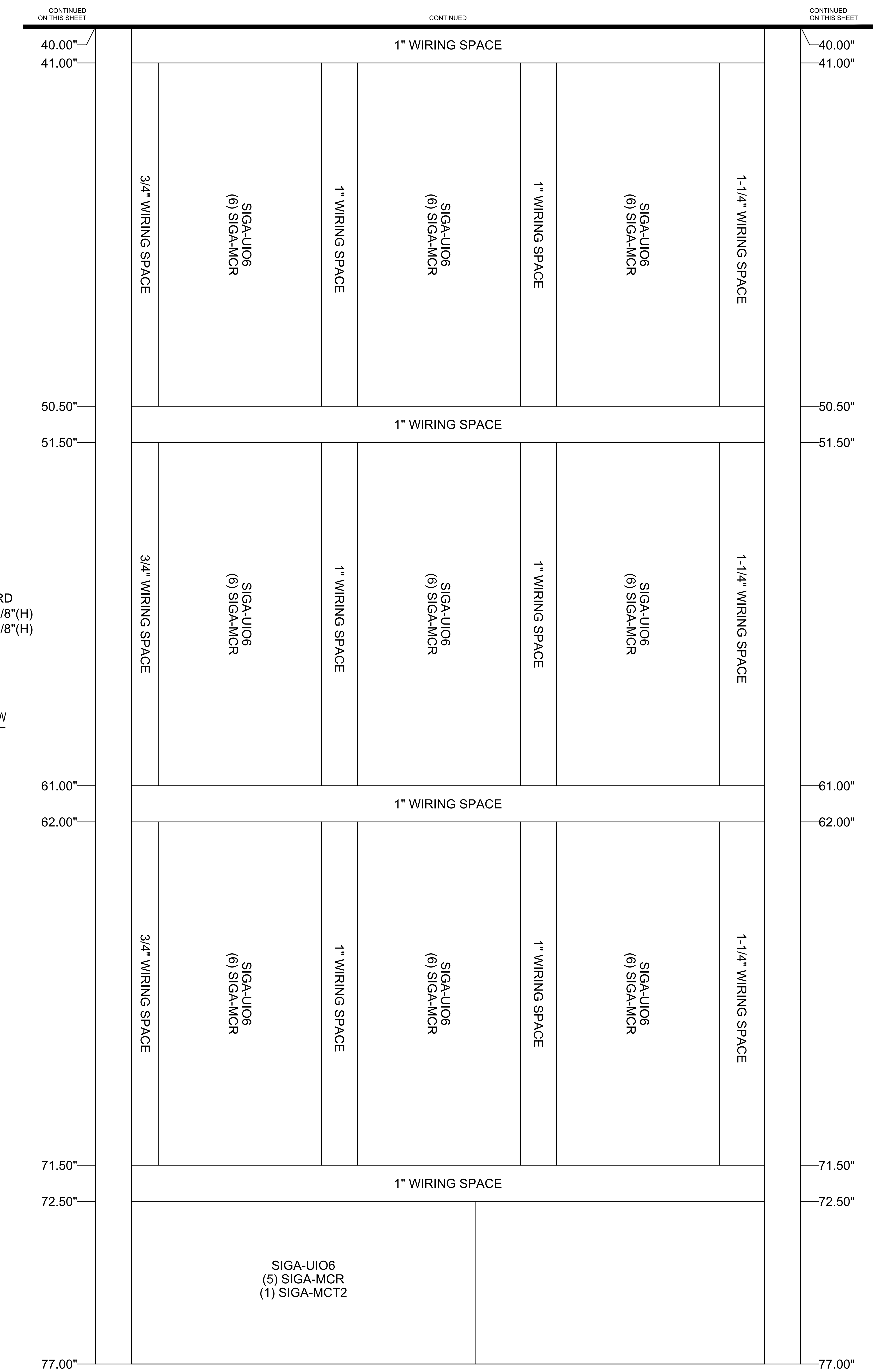
FIRE ALARM:
DETAILS - WEST CONTROL RACK #1 - REAR VIEW

Drawing Number
FA6.08A



MIDDLE ATLANTIC EQUIPMENT RACK WRK-44SA-32LRD
OVERALL DIMENSIONS ARE: 22-3/8"(W) x 32-5/8"(D) x 83-1/8"(H)
USEABLE DIMENSIONS ARE: 19-1/2"(W) x 30-3/4"(D) x 77-1/8"(H)
WEST CONTROL ROOM - RACK #1
MID-REAR VIEW
(6" SET BACK FROM FRONT MODULE LEVEL)

1 WEST CONTROL ROOM - RACK #1 - MID-REAR VIEW
SCALE: 1/2



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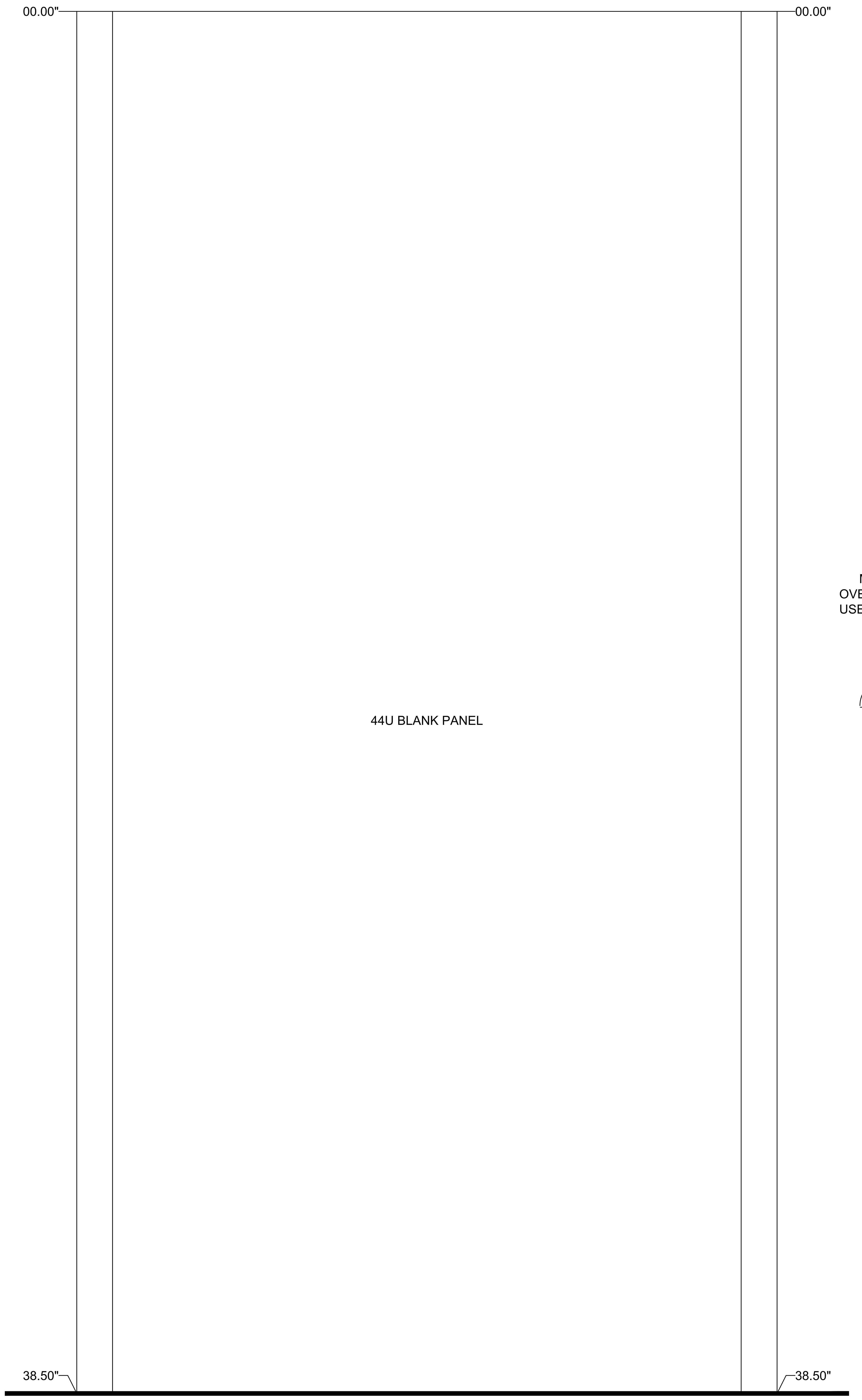
DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

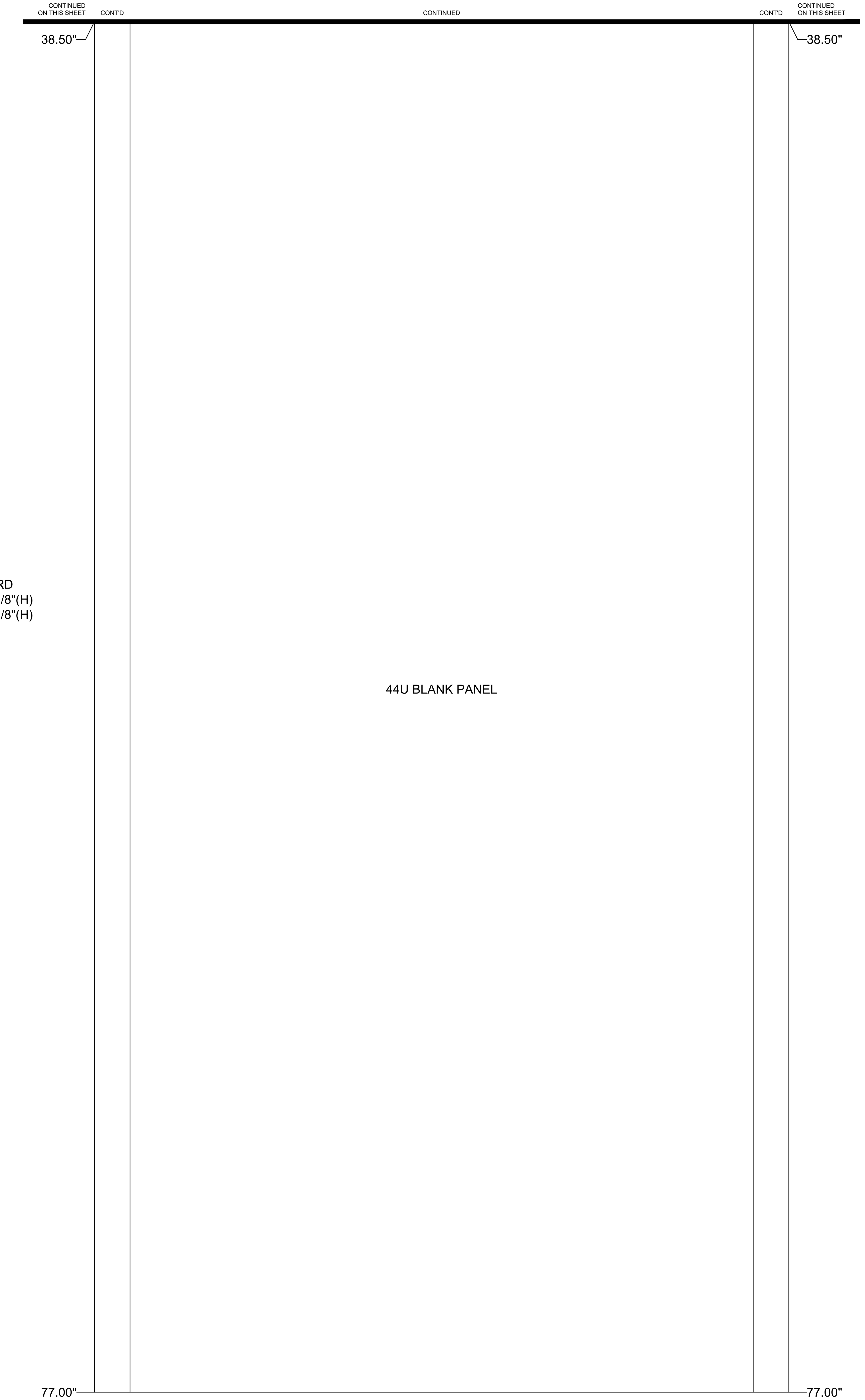
FIRE ALARM:
DETAILS - WEST CONTROL
RACK #1 - MID-REAR VIEW

Drawing Number
FA6.08B



MIDDLE ATLANTIC EQUIPMENT RACK WRK-44SA-32LRD
OVERALL DIMENSIONS ARE: 22-3/8"(W) x 32-5/8"(D) x 83-1/8"(H)
USEABLE DIMENSIONS ARE: 19-1/2"(W) x 30-3/4"(D) x 77-1/8"(H)
WEST CONTROL ROOM - RACK #2
FRONT VIEW

1 WEST CONTROL ROOM - RACK #2 - FRONT VIEW
SCALE: 1/2



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Revisions		
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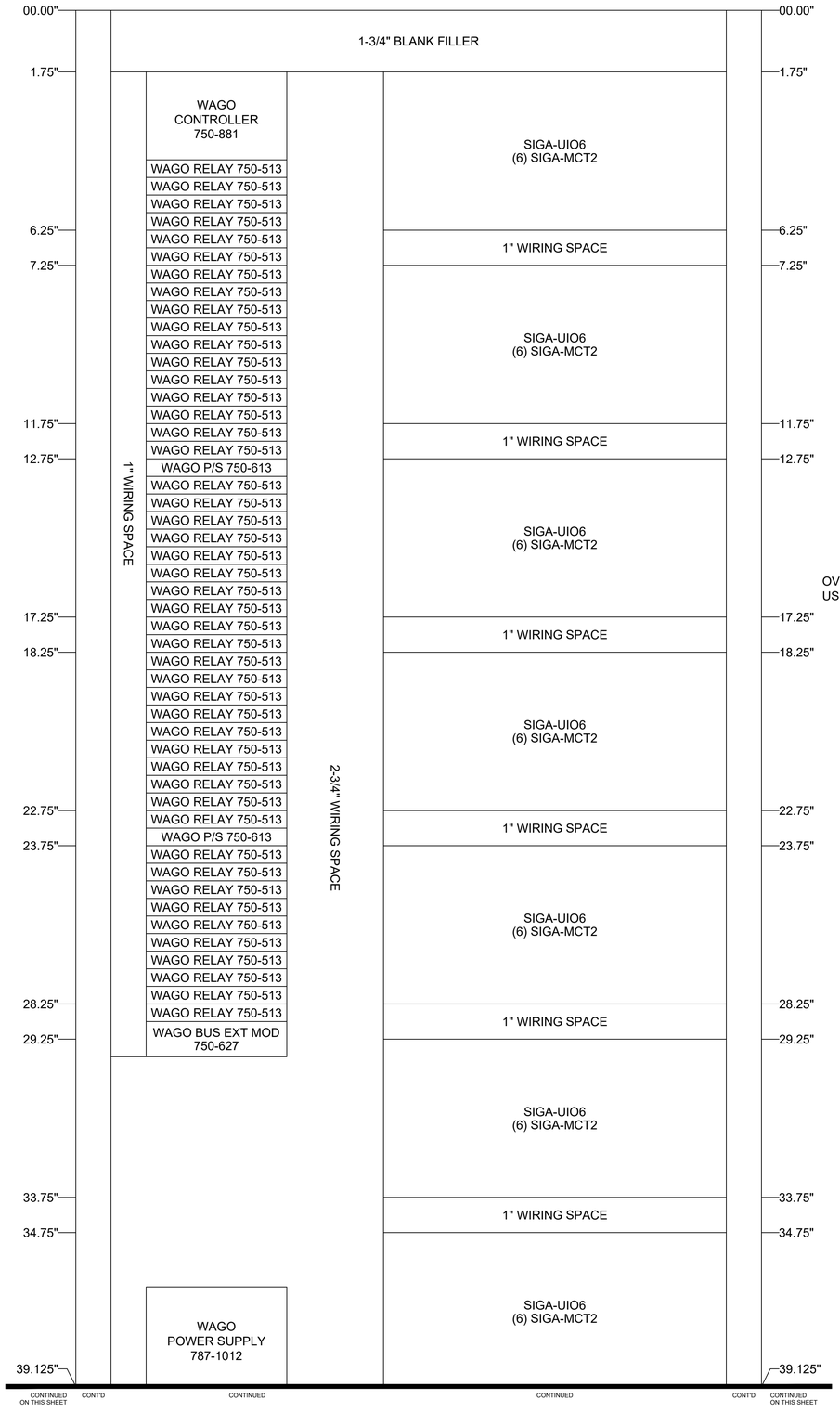
DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
DETAILS - WEST CONTROL
RACK #2 - FRONT VIEW

Drawing Number
FA6.09A



MIDDLE ATLANTIC EQUIPMENT RACK WRK-44SA-32LRD
OVERALL DIMENSIONS ARE: 22-3/8"(W) x 32-5/8"(D) x 83-1/8"(H)
USEABLE DIMENSIONS ARE: 19-1/2"(W) x 30-3/4"(D) x 77-1/8"(H)
WEST CONTROL ROOM - RACK #2
MID-FRONT VIEW
(6" SET BACK FROM FRONT MODULE LEVEL)

1 WEST CONTROL ROOM - RACK #2 - MID-FRONT VIEW
SCALE: 1/2

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FIXED FIRE SUPPRESSION SYSTEM
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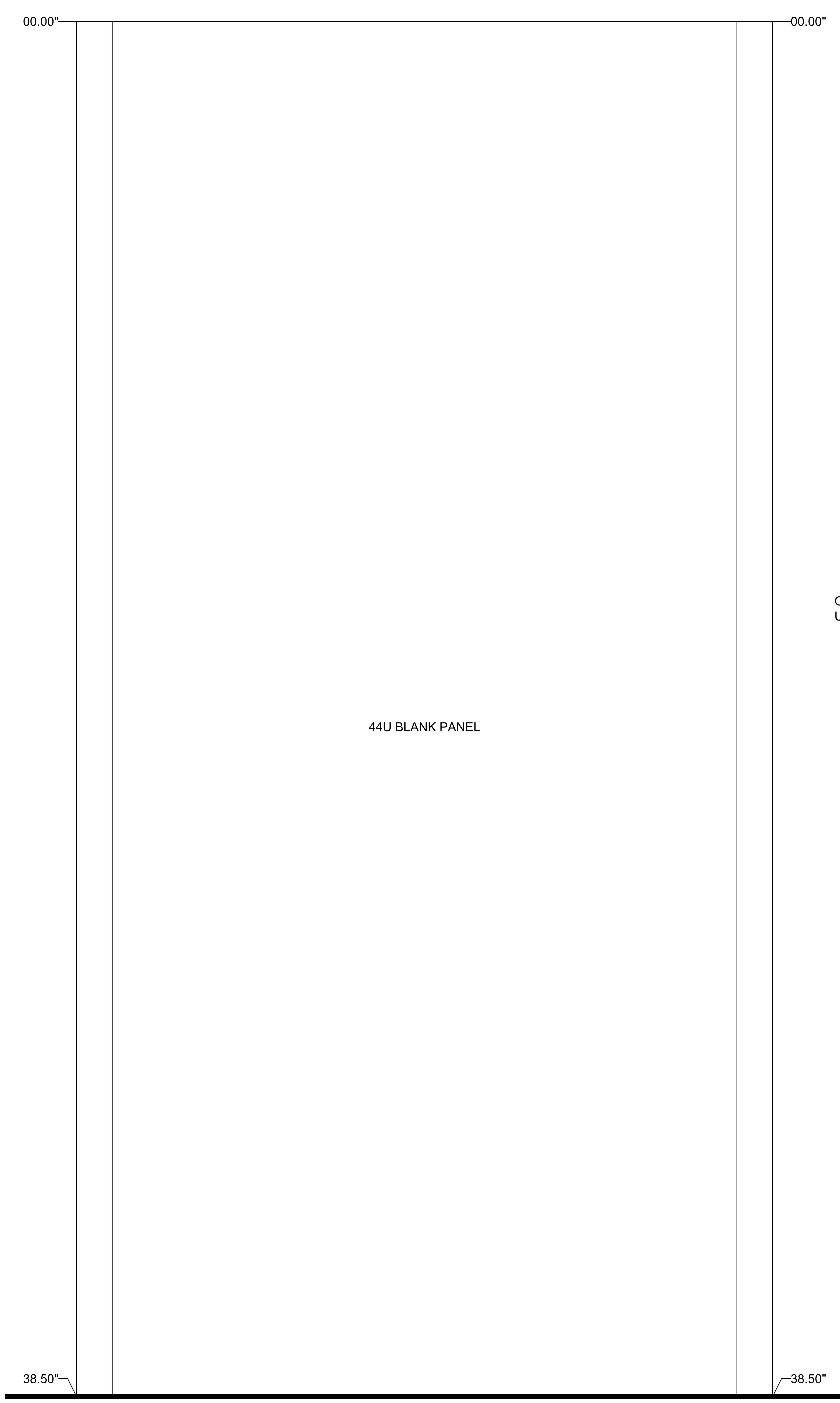
DRAWN BY: B.T.L. CHECKED BY: AEE.Jr

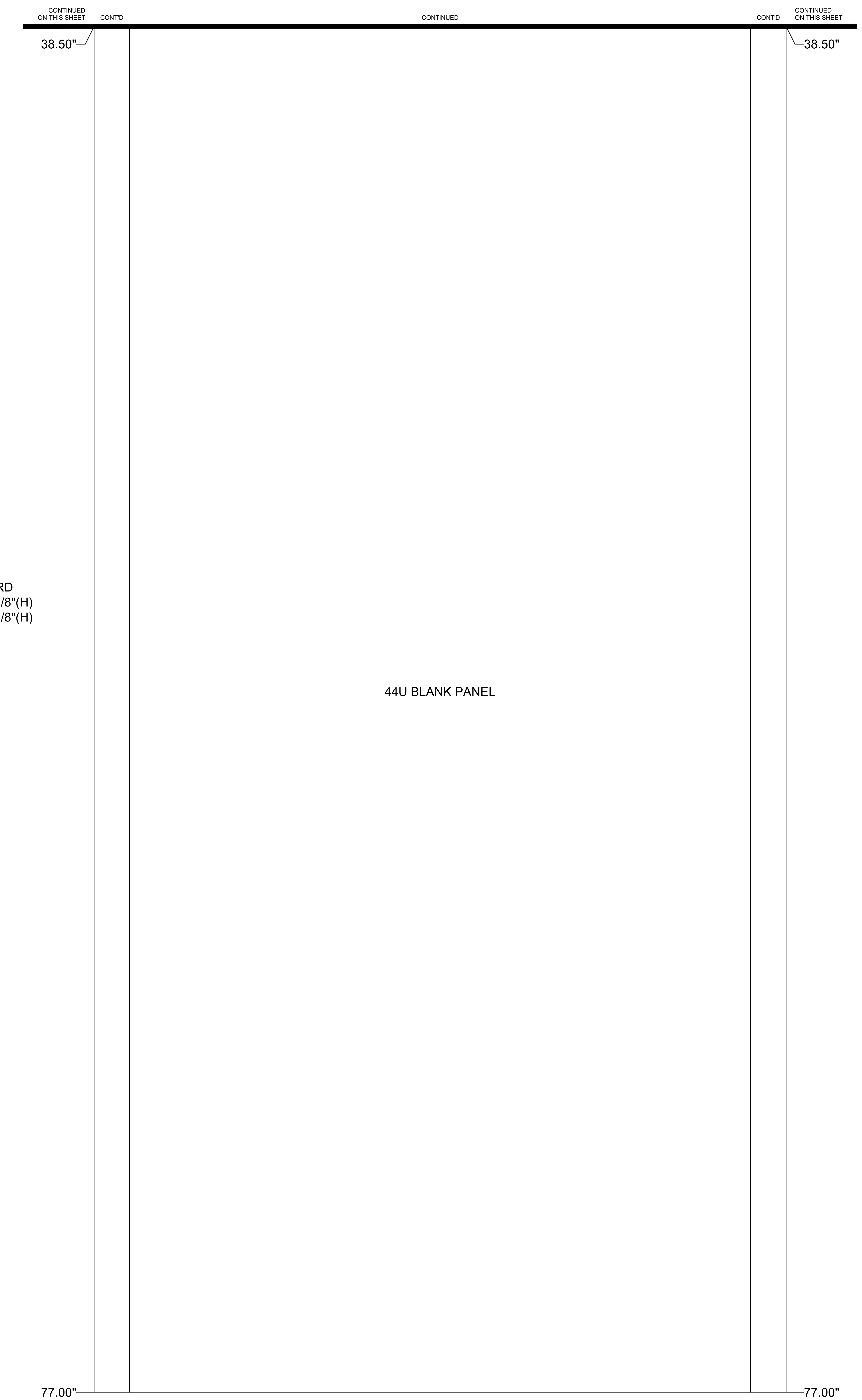
FIRE ALARM:
DETAILS - WEST CONTROL
RACK #2 - MID-FRONT VIEW

Drawing Number
FA6.09B



MIDDLE ATLANTIC EQUIPMENT RACK WRK-44SA-32LRD
OVERALL DIMENSIONS ARE: 22-3/8"(W) x 32-5/8"(D) x 83-1/8"(H)
USEABLE DIMENSIONS ARE: 19-1/2"(W) x 30-3/4"(D) x 77-1/8"(H)
WEST CONTROL ROOM - RACK #2
REAR VIEW

1 WEST CONTROL ROOM - RACK #2 - REAR VIEW
SCALE: 1/2



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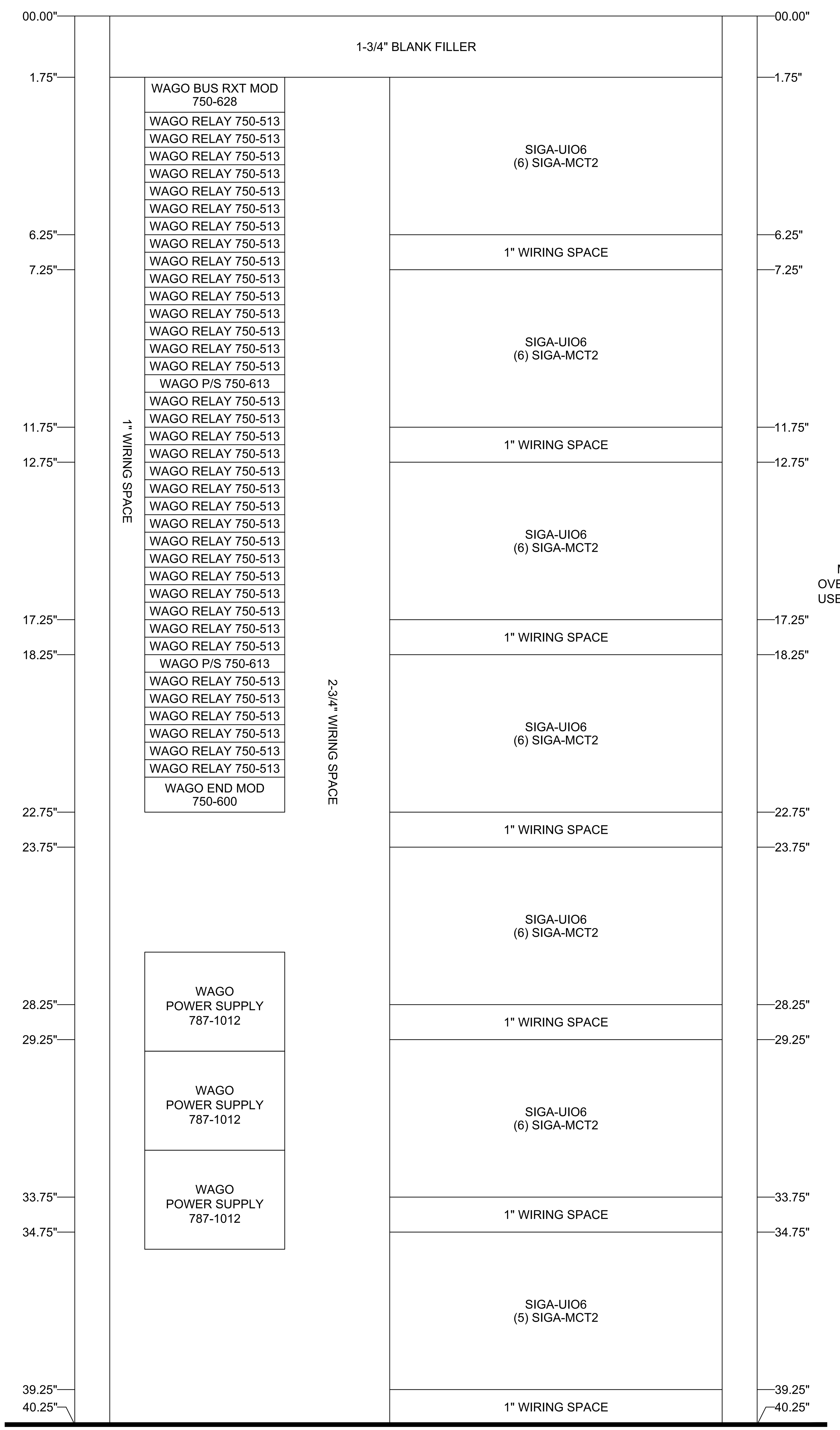
DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

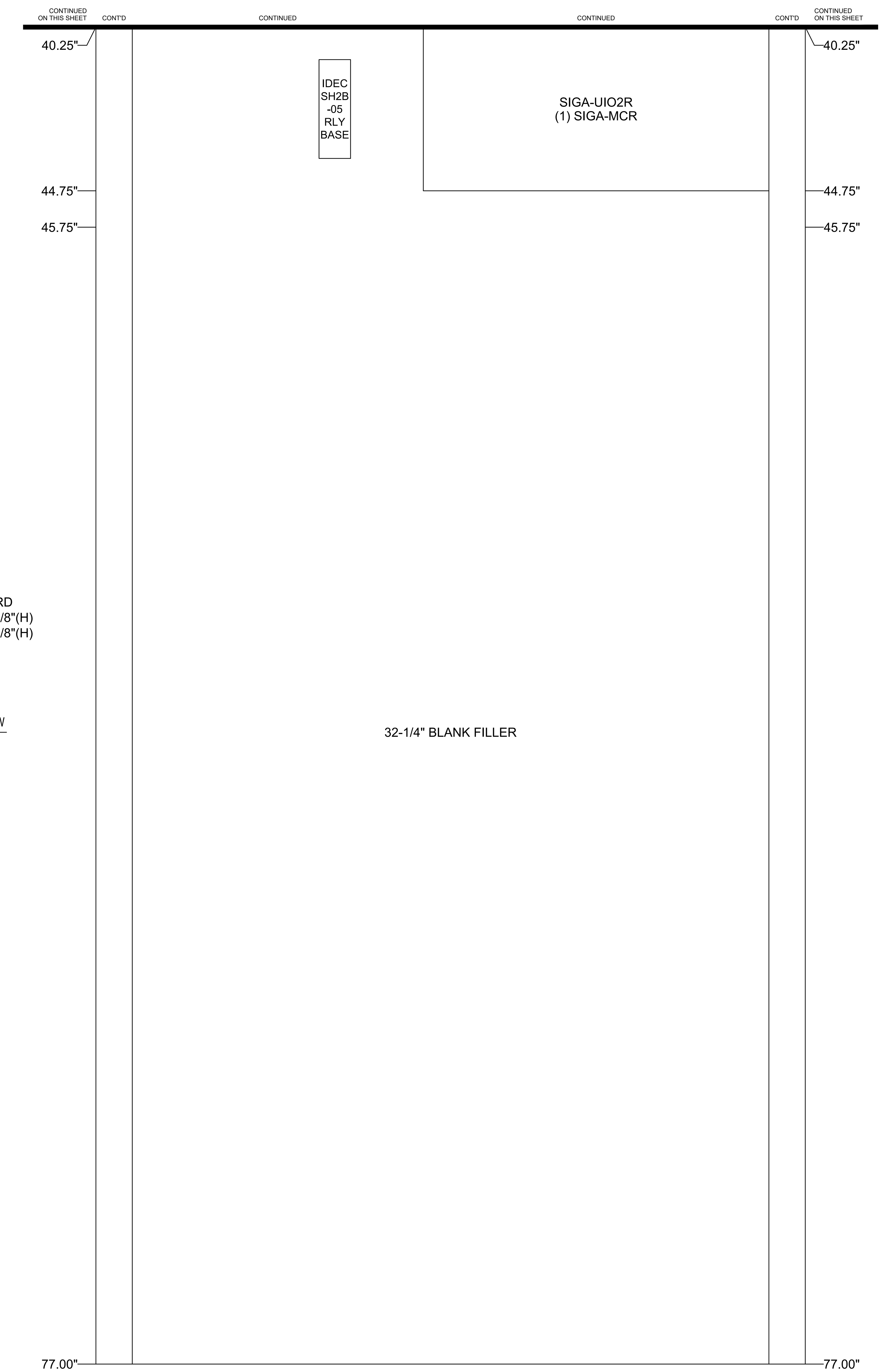
FIRE ALARM:
DETAILS - WEST CONTROL
RACK #2 - REAR VIEW

Drawing Number
FA6.10A



MIDDLE ATLANTIC EQUIPMENT RACK WRK-44SA-32LRD
OVERALL DIMENSIONS ARE: 22-3/8"(W) x 32-5/8"(D) x 83-1/8"(H)
USEABLE DIMENSIONS ARE: 19-1/2"(W) x 30-3/4"(D) x 77-1/8"(H)
WEST CONTROL ROOM - RACK #2
MID-REAR VIEW
(6" SET BACK FROM FRONT MODULE LEVEL)

1 WEST CONTROL ROOM - RACK #2 - MID-REAR VIEW
SCALE: 1/2



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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

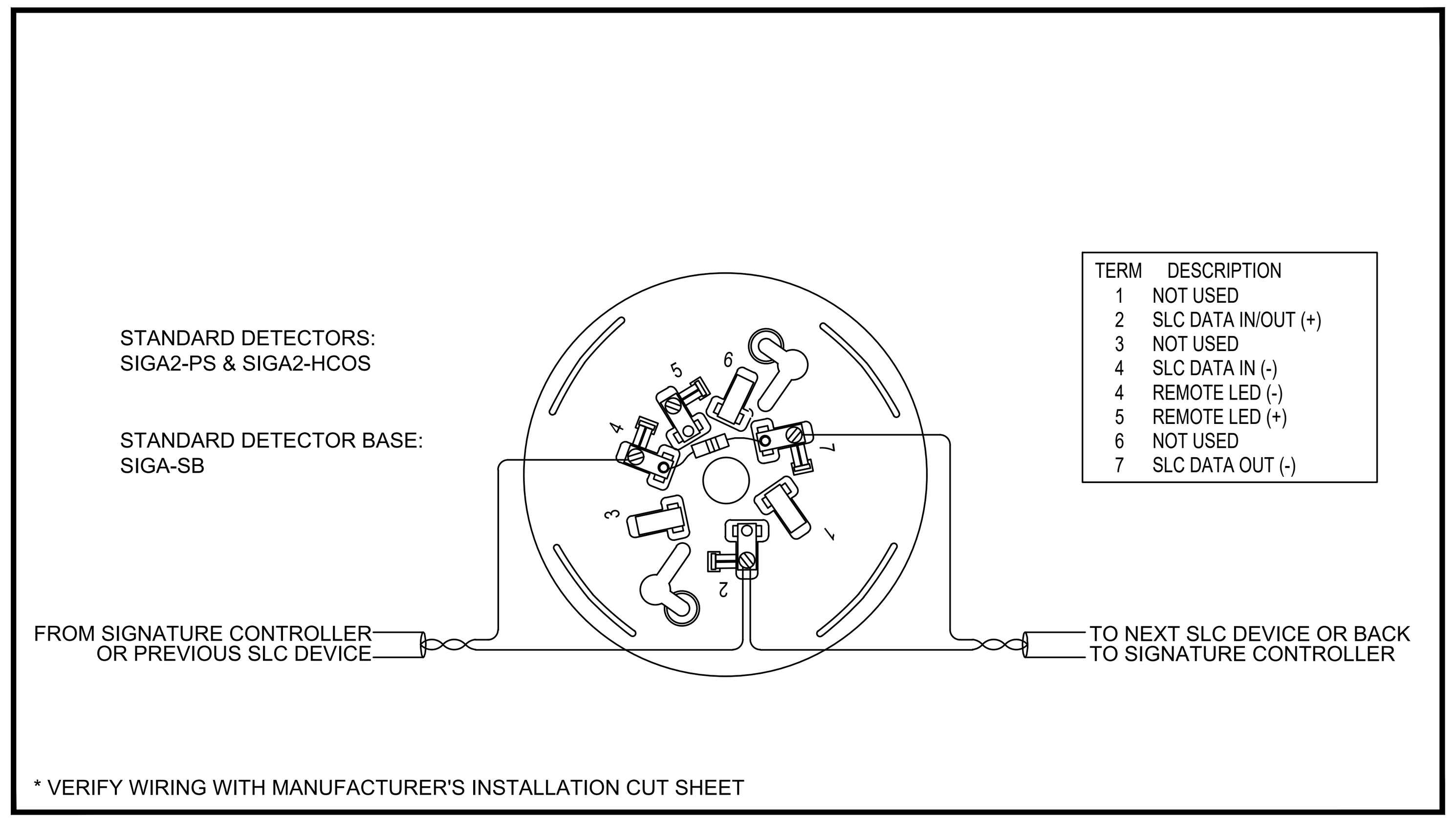
Revisions		
Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

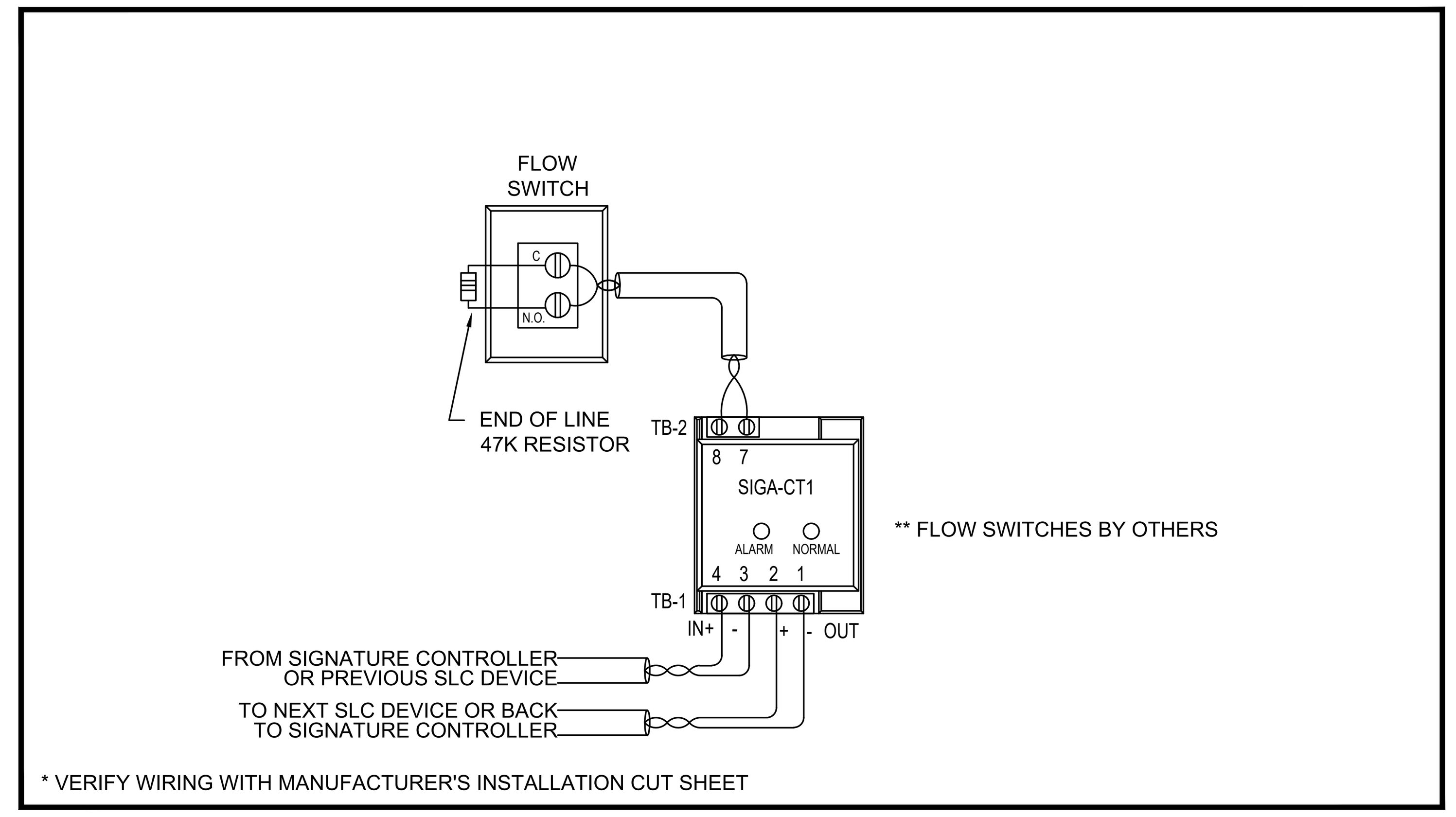
FIRE ALARM:
DETAILS - WEST CONTROL RACK #2 - MID-REAR VIEW

Drawing Number
FA6.10B

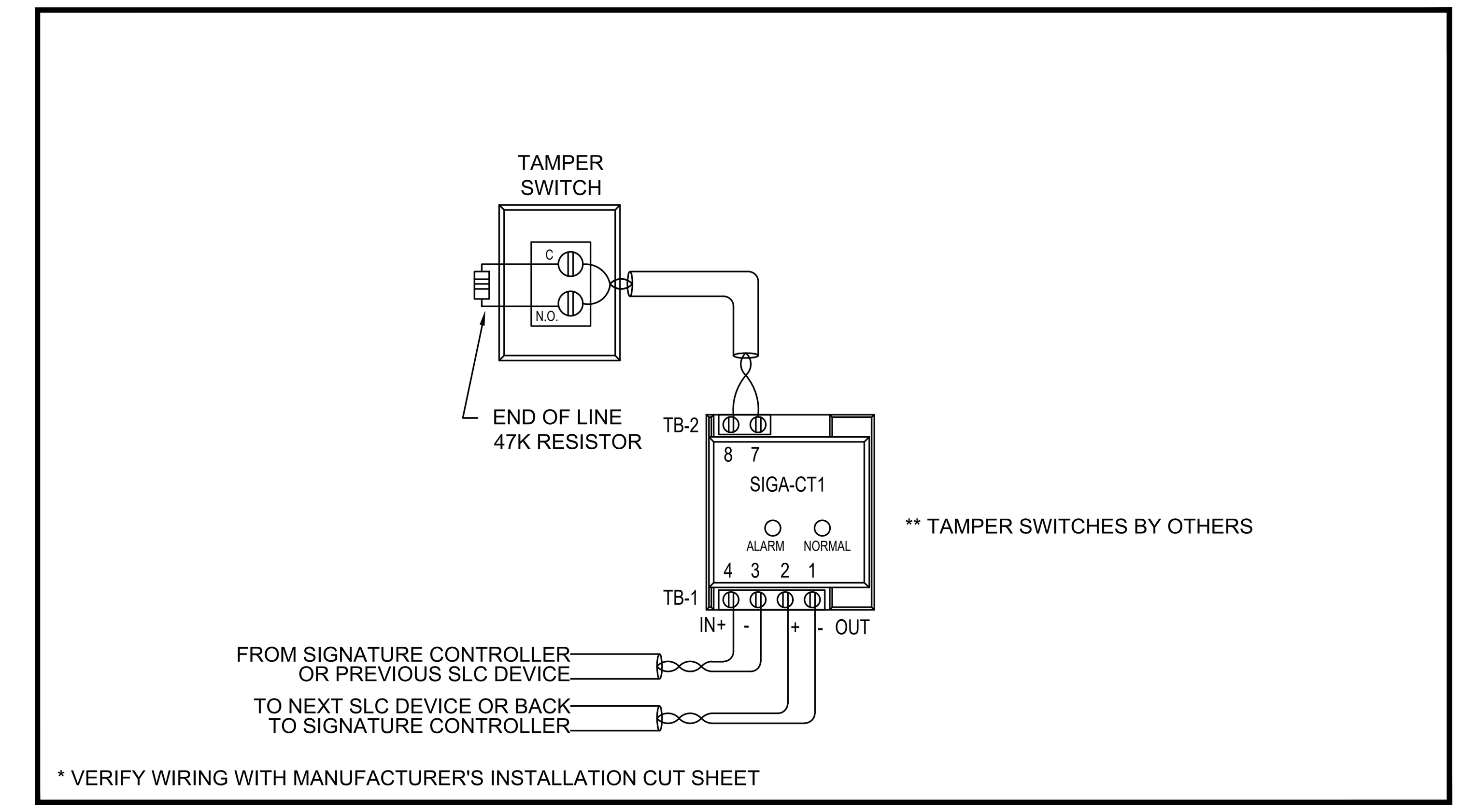
IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE



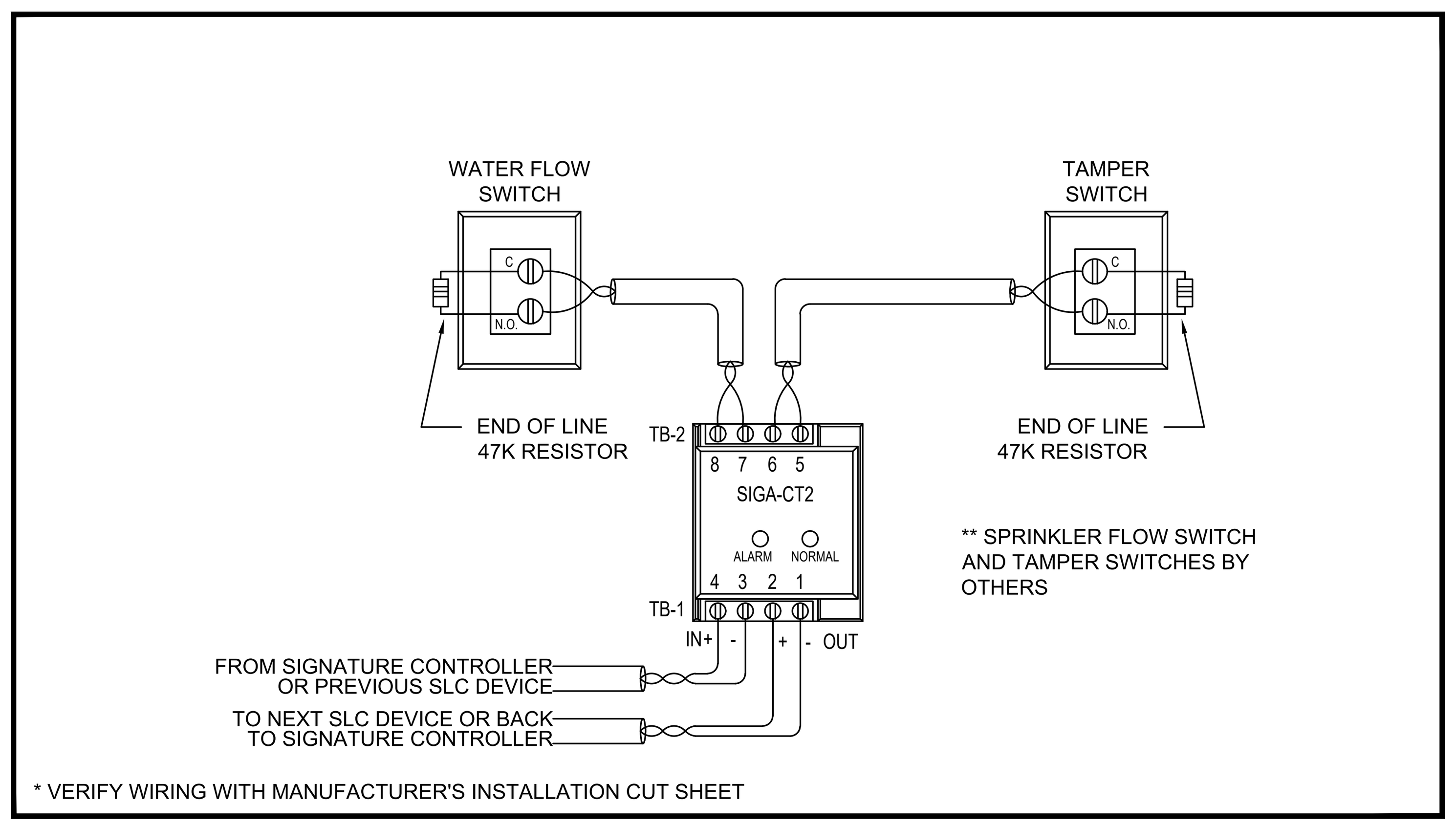
1 SMOKE OR HEAT/CO COMBO DETECTOR WIRING
SCALE: NOT TO SCALE



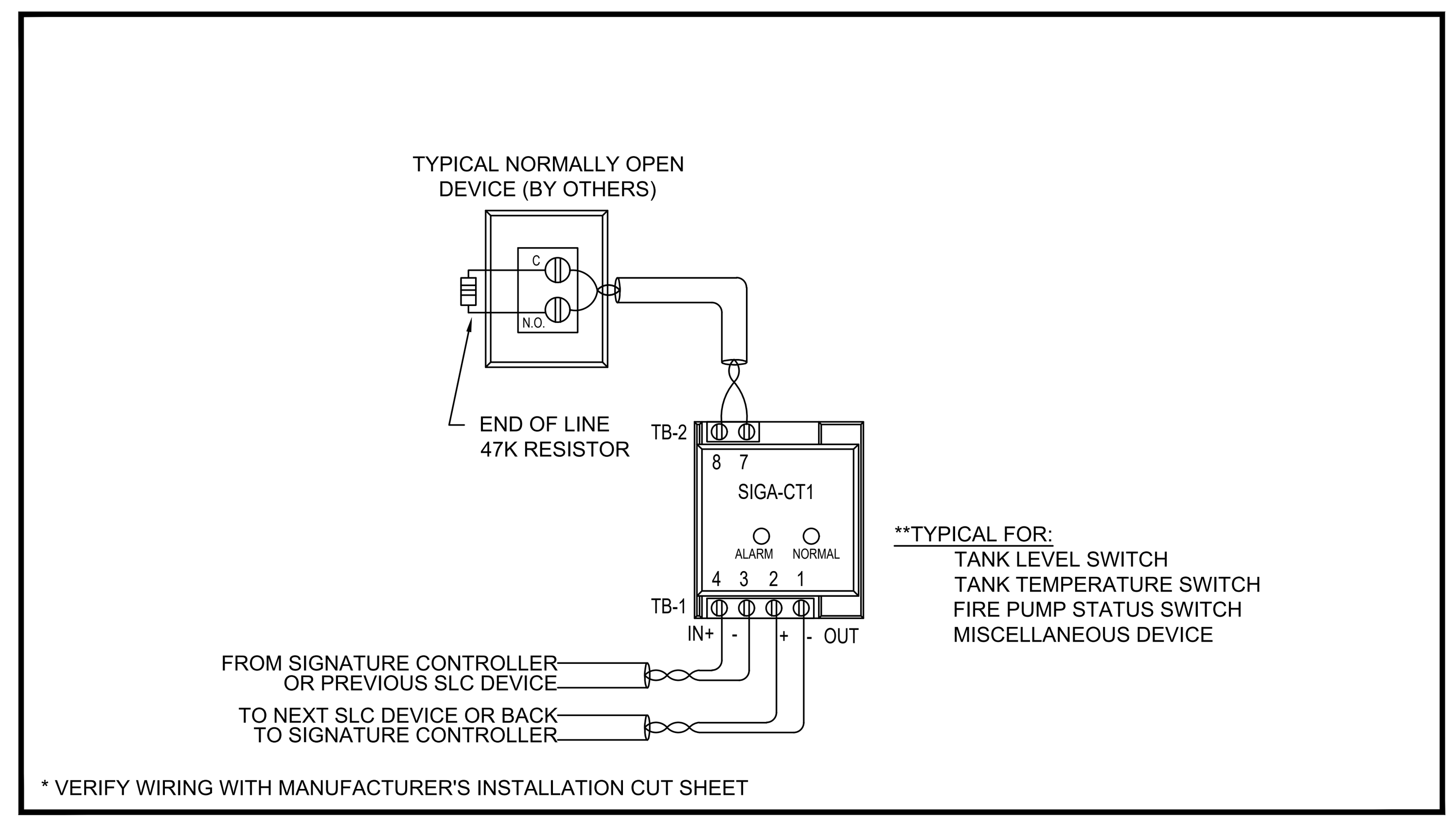
2 FLOWSWITCH MONITOR WIRING
SCALE: NOT TO SCALE



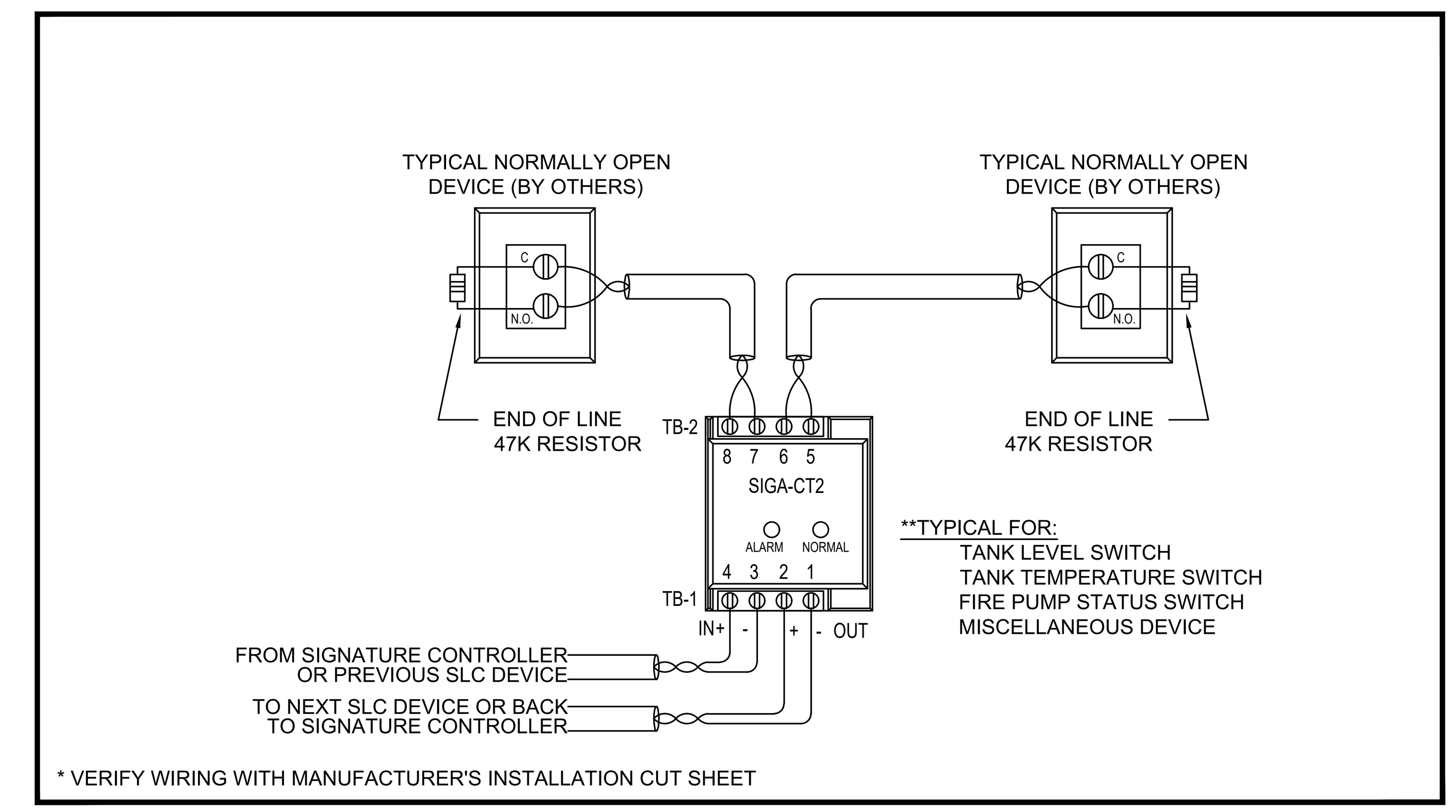
3 TAMPER SWITCH MONITOR WIRING
SCALE: NOT TO SCALE



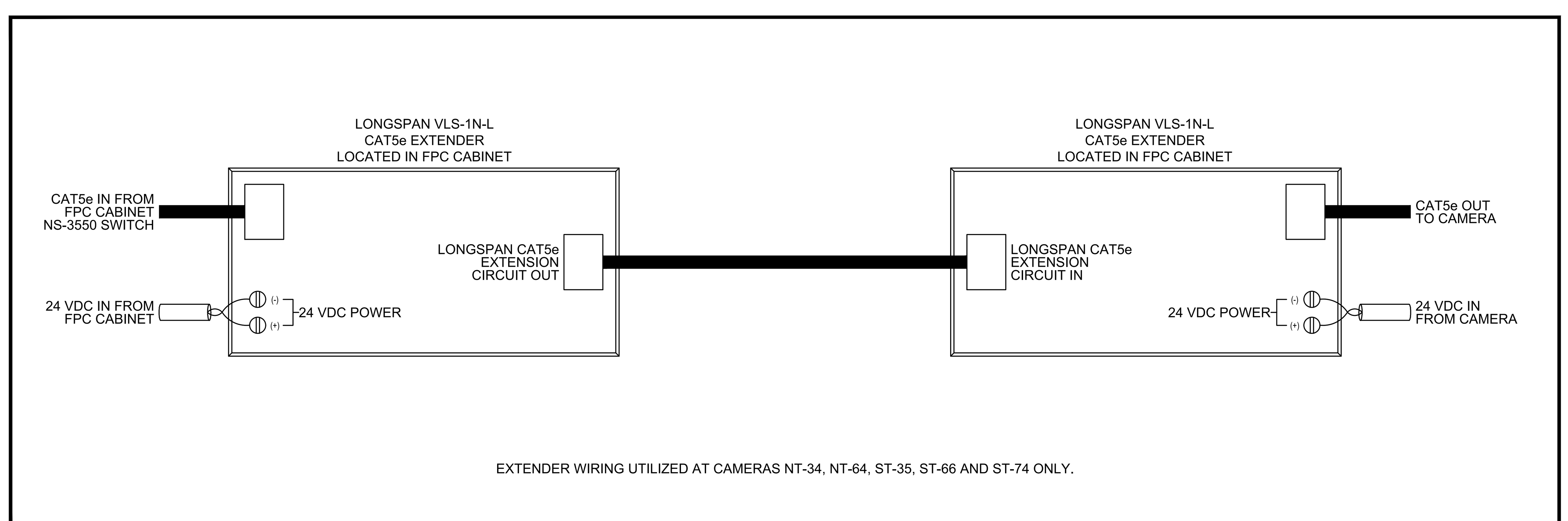
4 FLOW AND TAMPER SWITCH MONITOR WIRING
SCALE: NOT TO SCALE



5 TYPICAL SINGLE NORMALLY OPEN DEVICE MONITOR WIRING
SCALE: NOT TO SCALE



6 TYPICAL DUAL NORMALLY OPEN DEVICE MONITOR WIRING
SCALE: NOT TO SCALE



7 TYPICAL CAT5e CAMERA EXTENSION WIRING
SCALE: NOT TO SCALE

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DESIGN BUILD PROJECT
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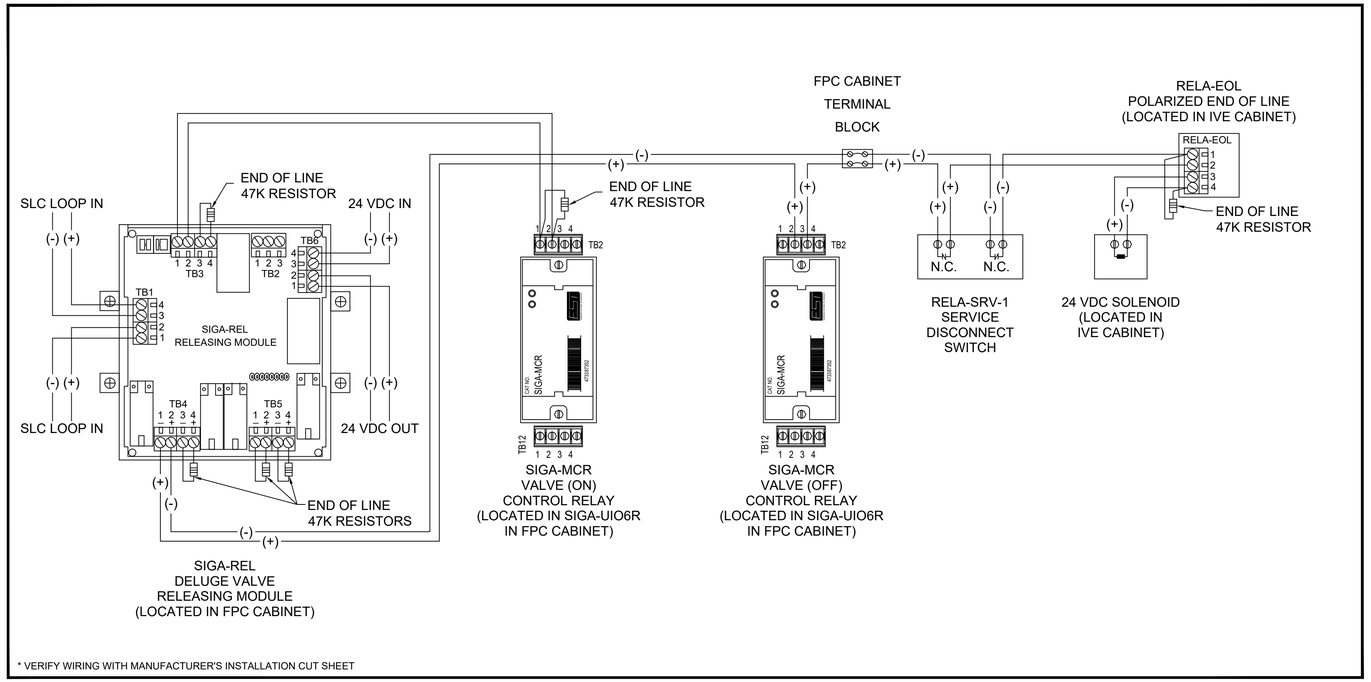
Revisions

Num	Description	Date

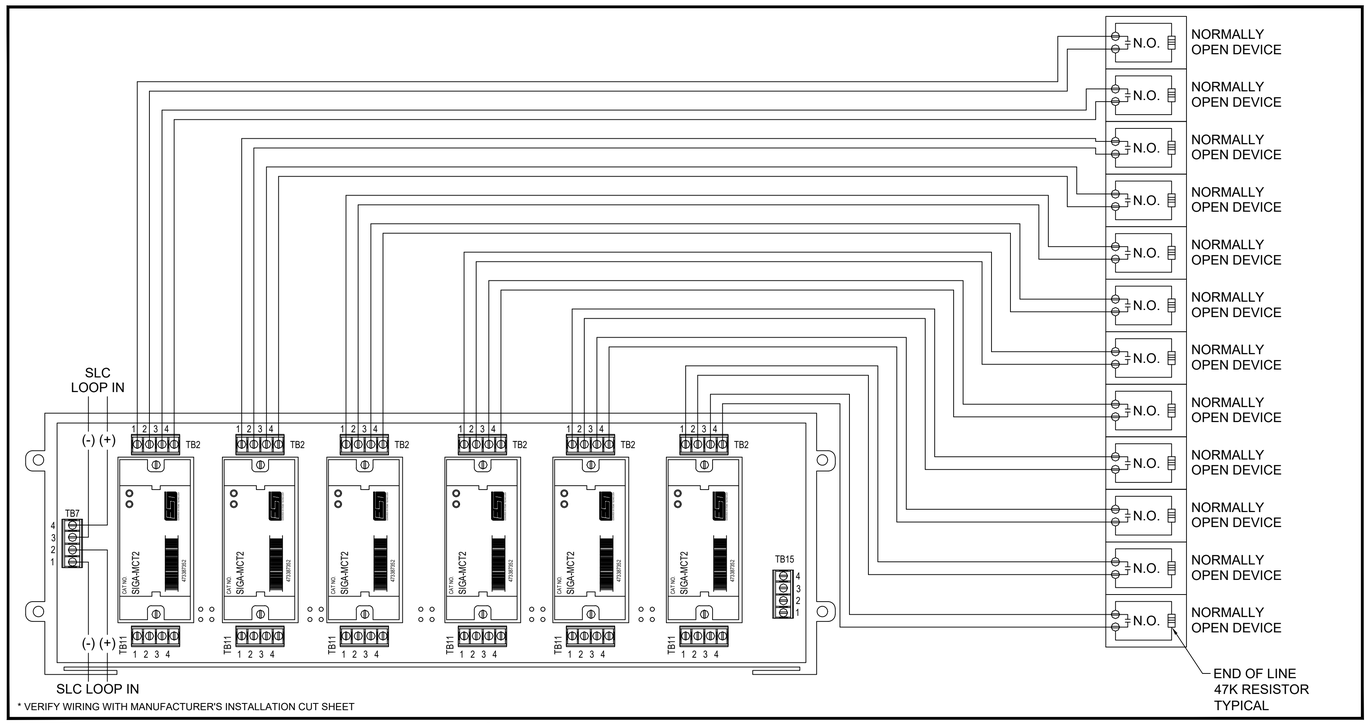
DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
DEVICE WIRING DETAILS

Drawing Number
FA6.11



1 TYPICAL DELUGE VALVE RELEASING CIRCUIT WIRING
SCALE: NOT TO SCALE



2 TYPICAL SIGA-UIO6 WITH (6) SIGA-MCT2 WIRING
SCALE: NOT TO SCALE

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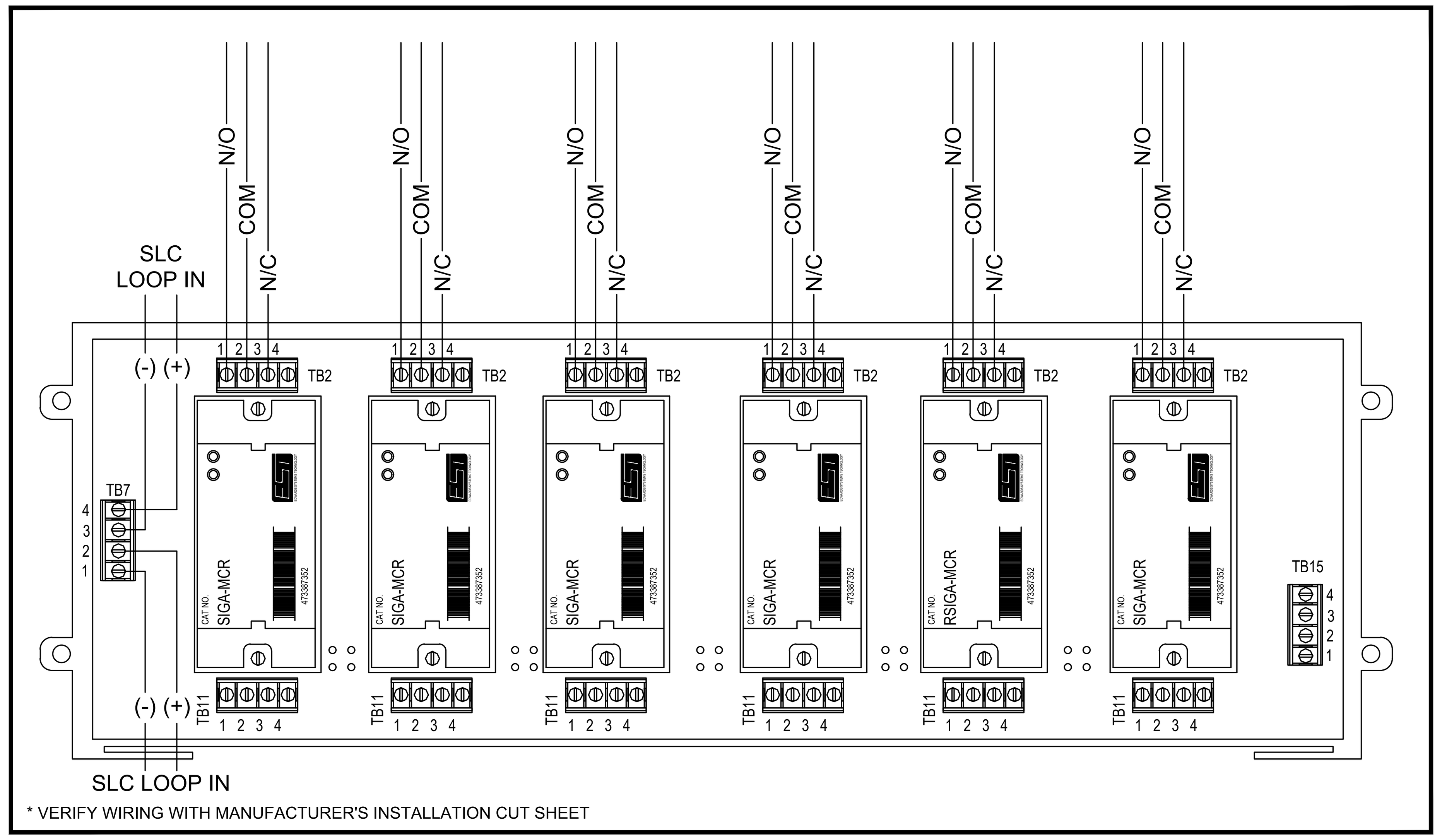
Revisions		
Num	Description	Date

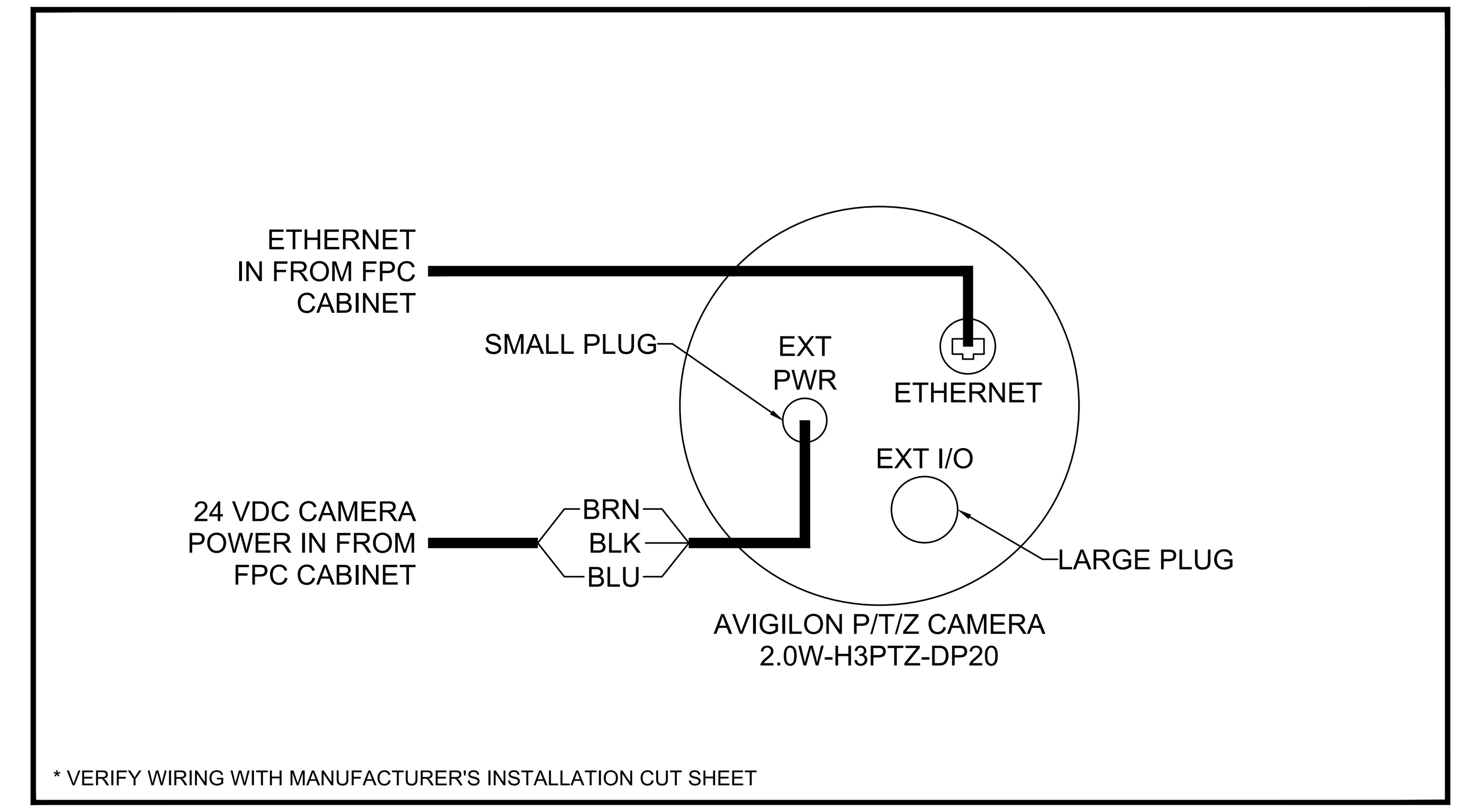
DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
DEVICE WIRING DETAILS

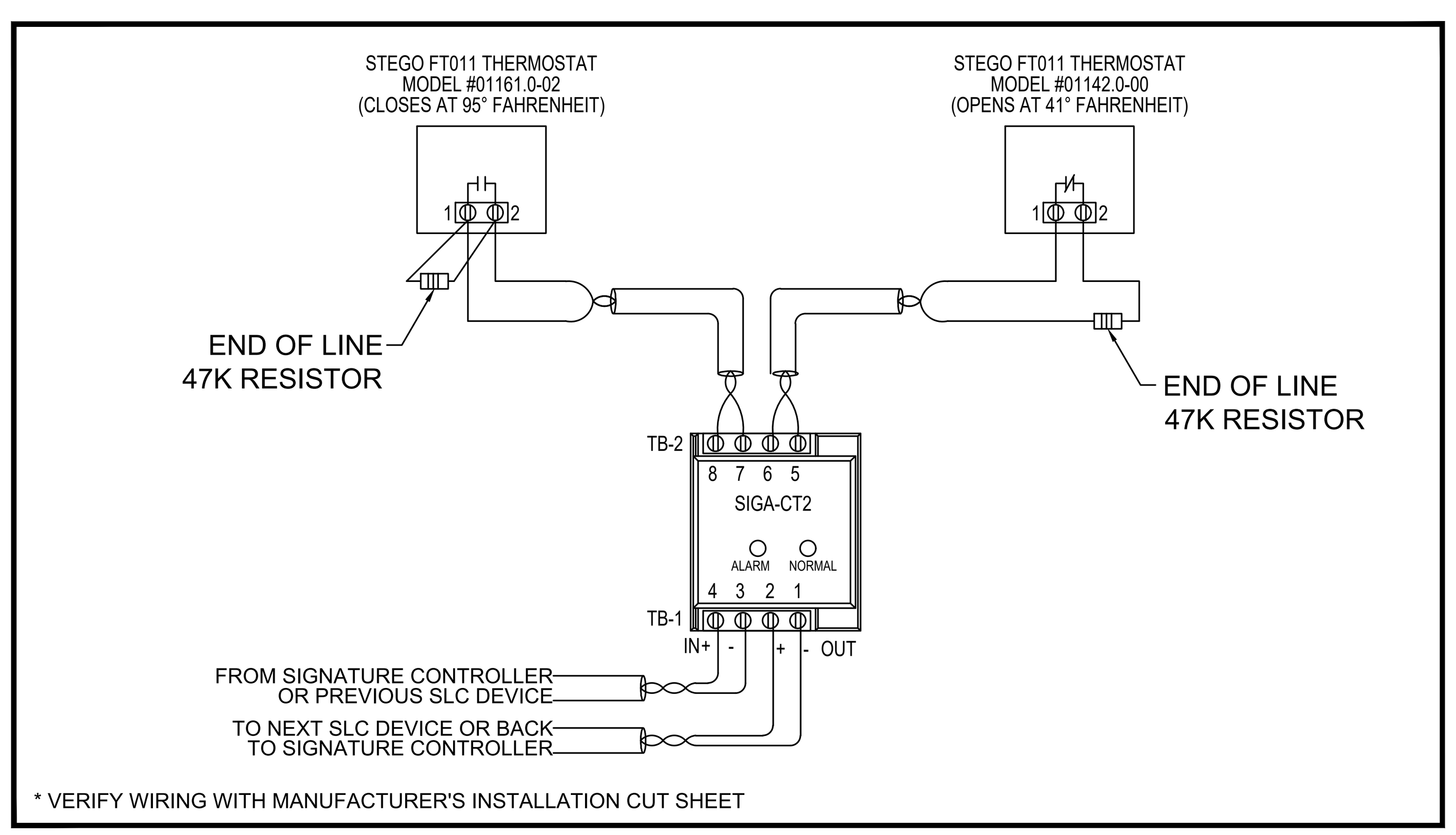
Drawing Number
FA6.12



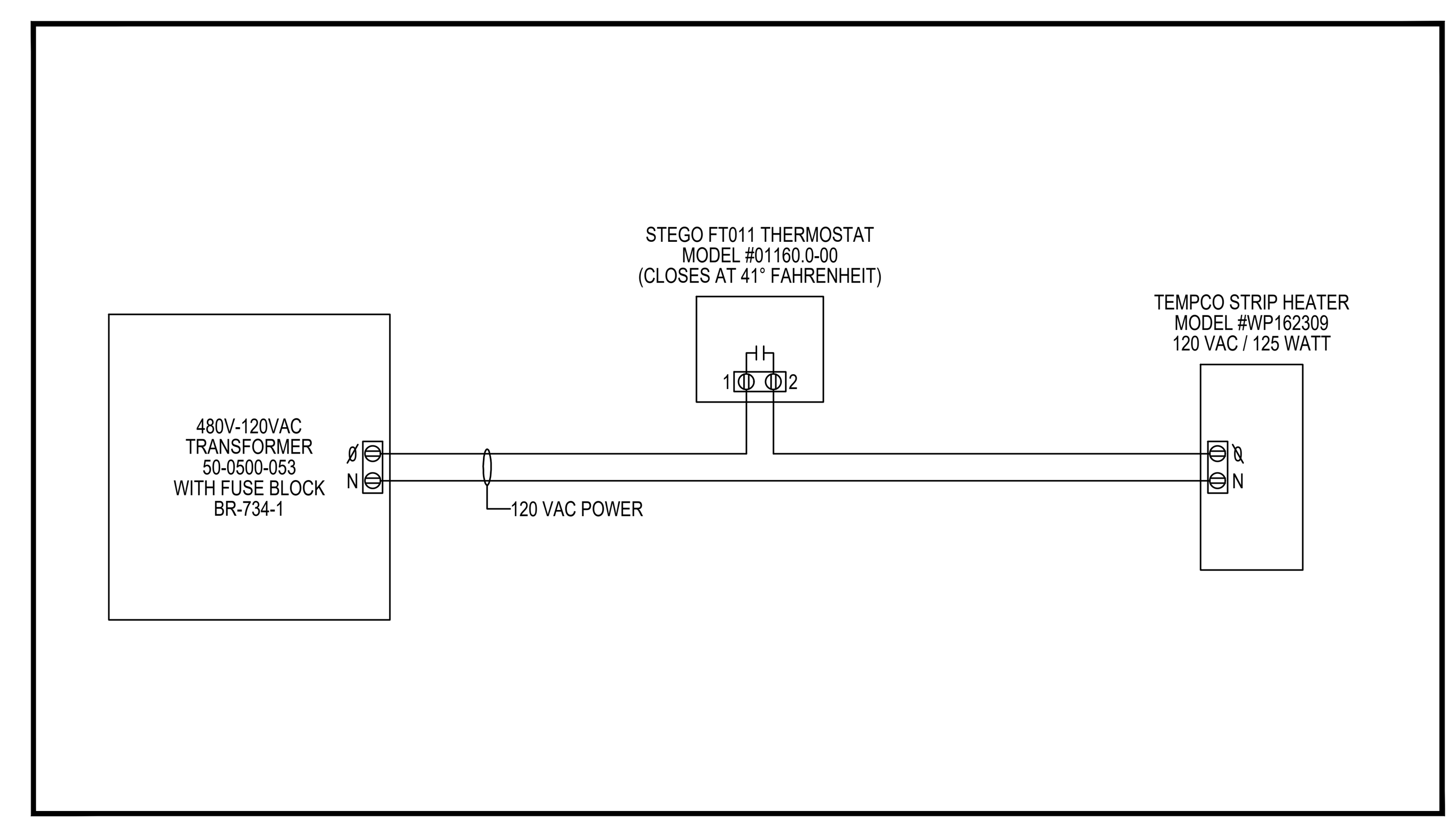
1 TYPICAL SIGA-UIO WITH (6) SIGA-MCR WIRING
SCALE: NOT TO SCALE



2 TYPICAL PAN/TILT/ZOOM CAMERA WIRING
SCALE: NOT TO SCALE



3 CABINET TEMPERATURE THERMOSTAT MONITOR WIRING
SCALE: NOT TO SCALE



4 CABINET TEMPERATURE CONTROL WIRING
SCALE: NOT TO SCALE

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Revisions

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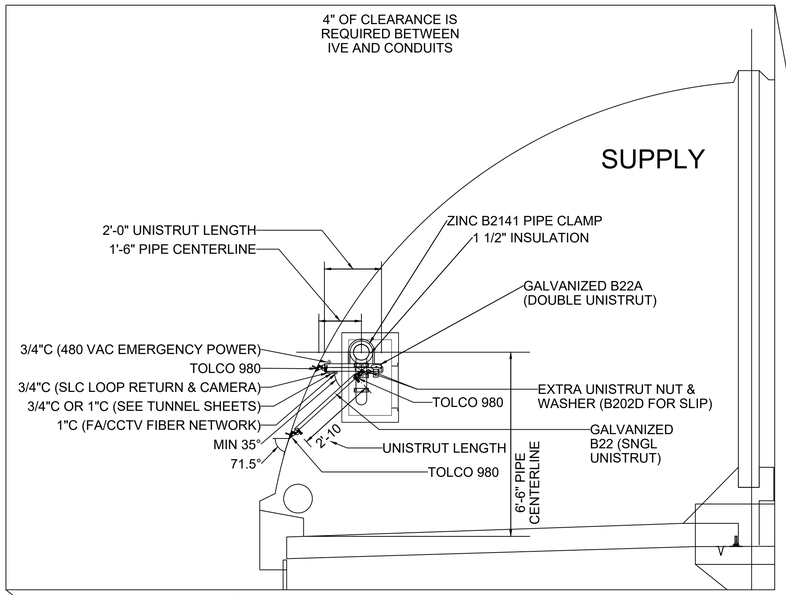
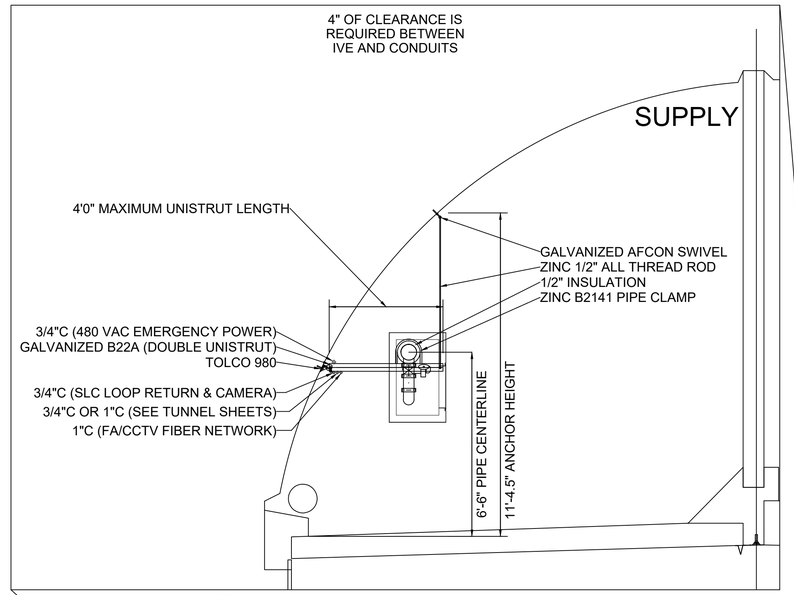
FIRE ALARM:
DEVICE WIRING DETAILS

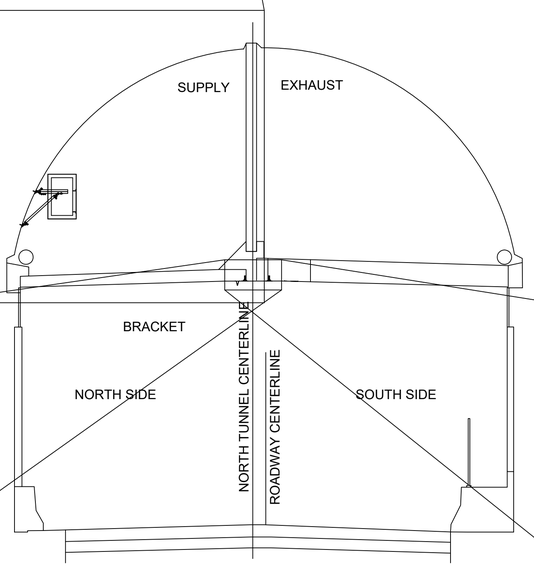
Drawing Number
FA6.13



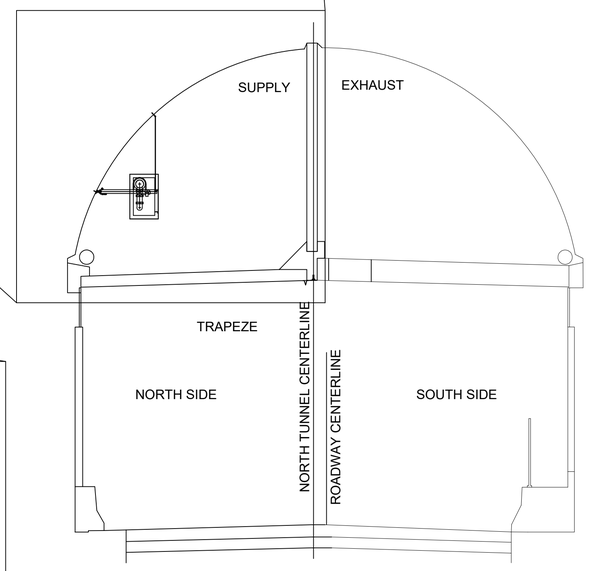
3 SECTION ENLARGEMENT #1 - TYPICAL LOCATION
SCALE: 1/32" = 1'-0"



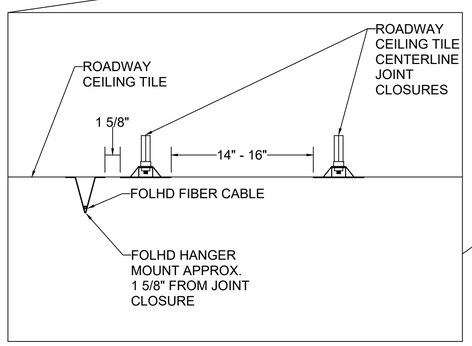
4 SECTION ENLARGEMENT #2 - OBSTRUCTED LOCATION
SCALE: 1/32" = 1'-0"



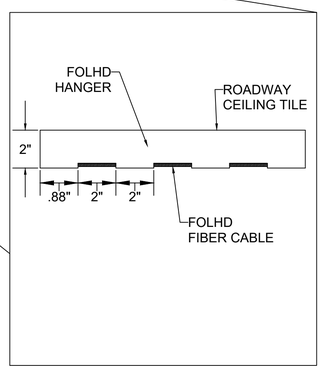
1 EISENHOWER (NORTH) TUNNEL IVE BRACKET - TYPICAL LOCATION
SCALE: 1/64" = 1'-0"



2 EISENHOWER (NORTH) TUNNEL IVE BRACKET - OBSTRUCTED LOCATION
SCALE: 1/64" = 1'-0"



5 FOLHD HANGER - FRONT VIEW
SCALE: 1/8" = 1'-0"



6 FOLHD HANGER - SIDE VIEW
SCALE: 1/8" = 1'-0"

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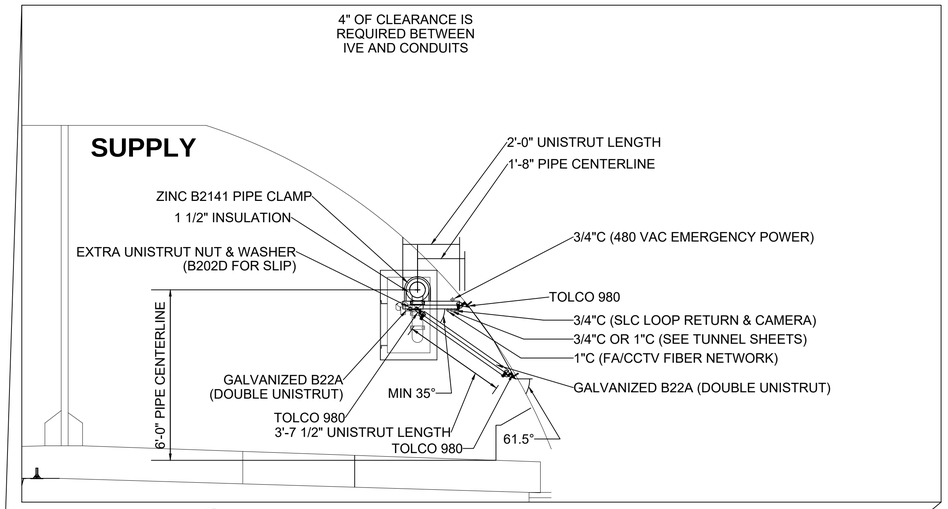
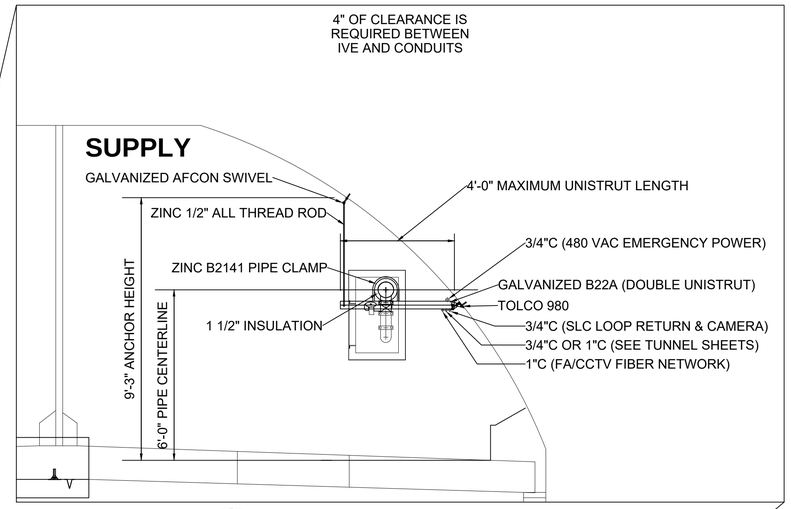
DRAWN BY: B.T.L. | CHECKED BY: AEE,Jr

FIRE ALARM:
FIRE PROTECTION
BRACKET HANGER DETAILS

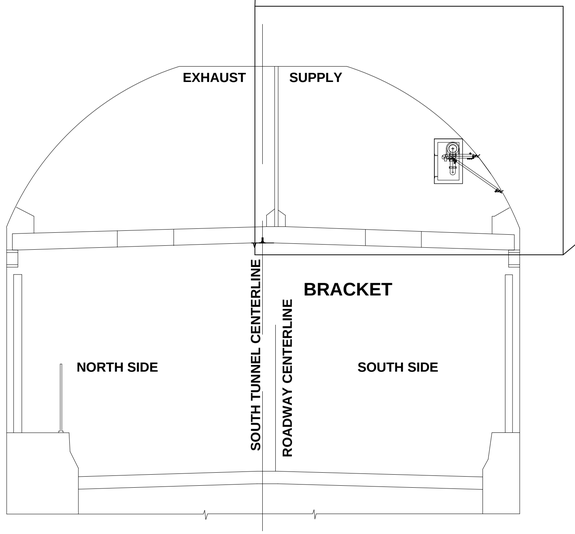
Drawing Number
FA6.14



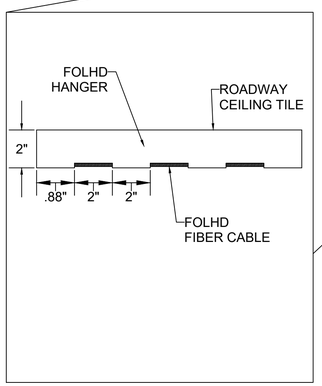
3 SECTION ENLARGEMENT #1 - TYPICAL LOCATION
SCALE: 1/32" = 1'-0"



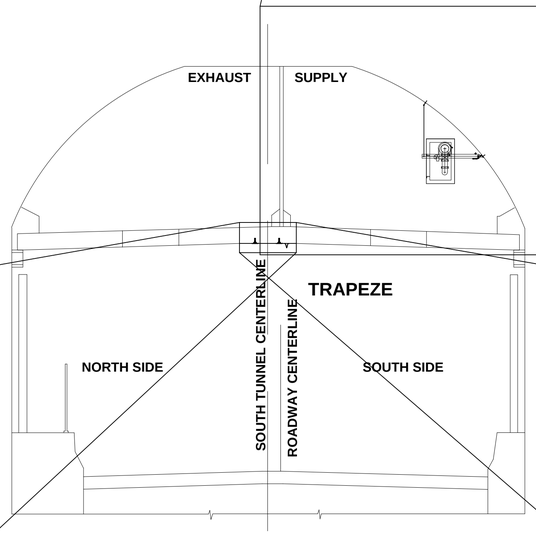
4 SECTION ENLARGEMENT #2 - OBSTRUCTED LOCATION
SCALE: 1/32" = 1'-0"



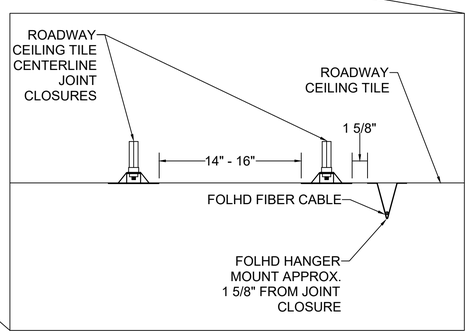
1 JOHNSON (SOUTH) TUNNEL IVE BRACKET - TYPICAL LOCATION
SCALE: 1/64" = 1'-0"



6 FOLHD HANGER - SIDE VIEW
SCALE: 1/8" = 1'-0"



2 JOHNSON (SOUTH) TUNNEL IVE BRACKET - OBSTRUCTED LOCATION
SCALE: 1/64" = 1'-0"



5 FOLHD HANGER - FRONT VIEW
SCALE: 1/16" = 1'-0"

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FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
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Revisions
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DRAWN BY: B.T.L. | CHECKED BY: AEE,Jr

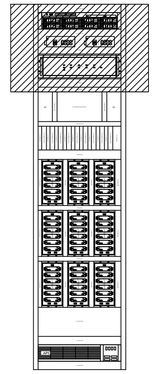
FIRE ALARM:
FIRE PROTECTION
BRACKET HANGER DETAILS

Drawing Number
FA6.15

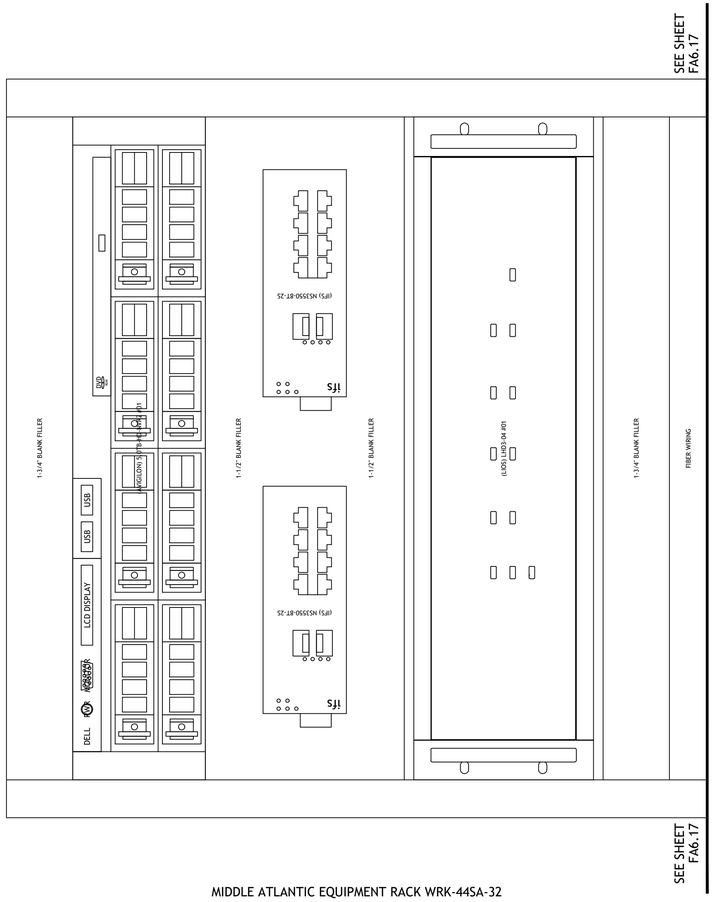
EJMT Tunnel Project
East Control Room
RACK #1 Wiring Spreadsheet
Mid-Front Level

LIOS Outputs	Cable #	Cable Color	TB #-#	UIO #	MCT2 #	Term #	Notes
+24vDC Power	Pwr	Brown	TB1-1				From BPS10 (+)
-24vDC Power	Pwr	Blue	TB1-2				From BPS10 (-)
Earth Grnd	Pwr	Green/Yellow	TB1-3				From Earth Ground
Output 1	Output 0	White	TB1-4	1	1	3	ST-01 Primary Rlse Alm
Output 2	Output 0	Green	TB1-6	1	1	1	ST-02 Primary Rlse Alm
Output 3	Output 0	Grey	TB1-8	1	2	3	ST-03 Primary Rlse Alm
Output 4	Output 0	Blue	TB1-10	1	2	1	ST-04 Primary Rlse Alm
Output 5	Output 0	Black	TB1-12	1	3	3	ST-05 Primary Rlse Alm
Output 6	Output 0	Grey/Pink	TB1-14	1	3	1	ST-06 Primary Rlse Alm
Output 7	Output 0	White/Green	TB1-16	1	4	3	ST-07 Primary Rlse Alm
Output 8	Output 0	White/Yellow	TB1-18	1	4	1	ST-08 Primary Rlse Alm
Output 9	Output 0	White/Grey	TB1-20	1	5	3	ST-09 Primary Rlse Alm
Output 10	Output 0	White/Pink	TB1-22	1	5	1	ST-10 Primary Rlse Alm
Collective Fault	Output 0	White/Blue	TB1-24	1	6	3	East LIOS Detector Comm Tbl
Collective Alarm	Output 0	White/Red	TB1-26	1	6	1	East LIOS Detector Comm Alm
Output 11	Output 1	White	TB2-1	2	1	3	ST-11 Primary Rlse Alm
Output 12	Output 1	Green	TB2-3	2	1	1	ST-12 Primary Rlse Alm
Output 13	Output 1	Grey	TB2-5	2	2	3	ST-13 Primary Rlse Alm
Output 14	Output 1	Blue	TB2-7	2	2	1	ST-14 Primary Rlse Alm
Output 15	Output 1	Black	TB2-9	2	3	3	ST-15 Primary Rlse Alm
Output 16	Output 1	Grey/Pink	TB2-11	2	3	1	ST-16 Primary Rlse Alm
Output 17	Output 1	White/Green	TB2-13	2	4	3	ST-17 Primary Rlse Alm
Output 18	Output 1	White/Yellow	TB2-15	2	4	1	ST-18 Primary Rlse Alm
Output 19	Output 1	White/Grey	TB2-17	2	5	3	ST-19 Primary Rlse Alm
Output 20	Output 1	White/Pink	TB2-19	2	5	1	ST-20 Primary Rlse Alm
Output 21	Output 1	White/Blue	TB2-21	2	6	3	ST-21Primary Rlse Alm
Output 22	Output 1	White/Red	TB2-23	2	6	1	ST-22 Primary Rlse Alm
Output 23	Output 2	White	TB3-1	3	1	3	ST-23 Primary Rlse Alm
Output 24	Output 2	Green	TB3-3	3	1	1	ST-24 Primary Rlse Alm
Output 25	Output 2	Grey	TB3-5	3	2	3	ST-25 Primary Rlse Alm
Output 26	Output 2	Blue	TB3-7	3	2	1	ST-26 Primary Rlse Alm
Output 27	Output 2	Black	TB3-9	3	3	3	ST-27 Primary Rlse Alm
Output 28	Output 2	Grey/Pink	TB3-11	3	3	1	ST-28 Primary Rlse Alm
Output 29	Output 2	White/Green	TB3-13	3	4	3	ST-29 Primary Rlse Alm
Output 30	Output 2	White/Yellow	TB3-15	3	4	1	ST-30 Primary Rlse Alm
Output 31	Output 2	White/Grey	TB3-17	3	5	3	ST-31 Primary Rlse Alm
Output 32	Output 2	White/Pink	TB3-19	3	5	1	ST-32 Primary Rlse Alm
Output 33	Output 2	White/Blue	TB3-21	3	6	3	ST-33 Primary Rlse Alm
Output 34	Output 2	White/Red	TB3-23	3	6	1	ST-34 Primary Rlse Alm
Output 35	Output 3	White	TB4-1	4	1	3	ST-35 Primary Rlse Alm
Output 36	Output 3	Green	TB4-3	4	1	1	ST-36 Primary Rlse Alm
Output 37	Output 3	Grey	TB4-5	4	2	3	ST-37 Primary Rlse Alm
Output 38	Output 3	Red	TB4-8	4	2	2	ST-38 Primary Rlse Alm
Output 39	Output 3	Violet	TB4-10	4	3	4	ST-39 Primary Rlse Alm
Output 40	Output 3	Red/Blue	TB4-12	4	3	2	ST-40 Primary Rlse Alm
Output 41	Output 3	Brown/Green	TB4-14	4	4	4	ST-41 Primary Rlse Alm
Output 42	Output 3	Yellow/Brown	TB4-16	4	4	2	ST-42 Primary Rlse Alm
Output 43	Output 3	Grey/Brown	TB4-18	4	5	4	ST-43 Primary Rlse Alm
Output 44	Output 3	Pink/Brown	TB4-20	4	5	2	ST-44 Primary Rlse Alm
Output 45	Output 3	Brown/Blue	TB4-22	4	6	4	ST-45 Primary Rlse Alm
Output 46	Output 3	Brown/Red	TB4-24	4	6	2	ST-46 Primary Rlse Alm
Output 47	Output 4	White	TB5-1	5	1	3	ST-47 Primary Rlse Alm
Output 48	Output 4	Green	TB5-3	5	1	1	ST-48 Primary Rlse Alm
Output 49	Output 4	Grey	TB5-5	5	2	3	ST-49 Primary Rlse Alm
Output 50	Output 4	Blue	TB5-7	5	2	1	ST-50 Primary Rlse Alm
Output 51	Output 4	Black	TB5-9	5	3	3	ST-51 Primary Rlse Alm
Output 52	Output 4	Grey/Pink	TB5-11	5	3	1	ST-52 Primary Rlse Alm
Output 53	Output 4	White/Green	TB5-13	5	4	3	ST-53 Primary Rlse Alm
Output 54	Output 4	White/Yellow	TB5-15	5	4	1	ST-54 Primary Rlse Alm
Output 55	Output 4	White/Grey	TB5-17	5	5	3	ST-55 Primary Rlse Alm
Output 56	Output 4	White/Pink	TB5-19	5	5	1	ST-56 Primary Rlse Alm
Output 57	Output 4	White/Blue	TB5-21	5	6	3	ST-57 Primary Rlse Alm
Output 58	Output 4	White/Red	TB5-23	5	6	1	ST-58 Primary Rlse Alm
Output 59	Output 5	White	TB6-1	6	1	3	ST-59 Primary Rlse Alm
Output 60	Output 5	Green	TB6-3	6	1	1	ST-60 Primary Rlse Alm
Output 61	Output 5	Grey	TB6-5	6	2	3	ST-61 Primary Rlse Alm
Output 62	Output 5	Blue	TB6-7	6	2	1	ST-62 Primary Rlse Alm
Output 63	Output 5	Black	TB6-9	6	3	3	ST-63 Primary Rlse Alm
Output 64	Output 5	Grey/Pink	TB6-11	6	3	1	ST-64 Primary Rlse Alm
Output 65	Output 5	White/Green	TB6-13	6	4	3	ST-65 Primary Rlse Alm
Output 66	Output 5	White/Yellow	TB6-15	6	4	1	ST-66 Primary Rlse Alm
Output 67	Output 5	White/Grey	TB6-17	6	5	3	ST-67 Primary Rlse Alm
Output 68	Output 5	White/Pink	TB6-19	6	5	1	ST-68 Primary Rlse Alm
Output 69	Output 5	White/Blue	TB6-21	6	6	3	ST-69 Primary Rlse Alm
Output 70	Output 5	White/Red	TB6-23	6	6	1	ST-70 Primary Rlse Alm
Output 71	Output 6	White	TB7-1	7	1	3	ST-71 Primary Rlse Alm
Output 72	Output 6	Green	TB7-3	7	1	1	ST-72 Primary Rlse Alm
Output 73	Output 6	Grey	TB7-5	7	2	3	ST-73 Primary Rlse Alm
Output 74	Output 6	Blue	TB7-7	7	2	1	ST-74 Primary Rlse Alm
Output 75	Output 6	Black	TB7-9	7	3	3	ST-75 Primary Rlse Alm
Output 76	Output 6	Grey/Pink	TB7-11	7	3	1	ST-76 Primary Rlse Alm
Output 77	Output 6	White/Green	TB7-13	7	4	3	ST-77 Primary Rlse Alm
Output 78	Output 6	White/Yellow	TB7-15	7	4	1	ST-78 Primary Rlse Alm
Output 79	Output 6	White/Grey	TB7-17	7	5	3	ST-79 Primary Rlse Alm
Output 80	Output 6	White/Pink	TB7-19	7	5	1	ST-80 Primary Rlse Alm
Output 81	Output 6	White/Blue	TB7-21	7	6	3	ST-81 Primary Rlse Alm
Output 82	Output 6	White/Red	TB7-23	7	6	1	ST-82 Primary Rlse Alm
Output 83	Output 7	White	TB8-1	8	1	3	ST-83 Primary Rlse Alm
Output 84	Output 7	Green	TB8-3	8	1	1	ST-84 Primary Rlse Alm
Output 85	Output 7	Grey	TB8-5	8	2	3	ST-85 Primary Rlse Alm
Output 86	Output 7	Blue	TB8-7	8	2	1	ST-86 Primary Rlse Alm
Output 87	Output 7	Black	TB8-9	8	3	3	ST-87 Primary Rlse Alm
Output 88	Output 7	Grey/Pink	TB8-11	8	3	1	ST-88 Primary Rlse Alm
Output 89	Output 7	White/Green	TB8-13	8	4	3	ST-89 Primary Rlse Alm
Output 90	Output 7	White/Yellow	TB8-15	8	4	1	ST-90 Primary Rlse Alm
Output 91	Output 7	White/Grey	TB8-17	8	5	3	ST-91 Primary Rlse Alm
Output 92	Output 7	White/Pink	TB8-19	8	5	1	ST-92 Primary Rlse Alm
Output 93	Output 7	White/Blue	TB8-21	8	6	3	ST-93 Primary Rlse Alm
Output 94	Output 7	White/Red	TB8-23	8	6	1	NT-01 Secondary Rlse Alm
Output 95	Output 8	White	TB9-1	9	1	3	NT-02 Secondary Rlse Alm
Output 96	Output 8	Green	TB9-3	9	1	1	NT-03 Secondary Rlse Alm
Output 97	Output 8	Grey	TB9-5	9	2	3	NT-04 Secondary Rlse Alm
Output 98	Output 8	Blue	TB9-7	9	2	1	NT-05 Secondary Rlse Alm
Output 99	Output 8	Black	TB9-9	9	3	3	NT-06 Secondary Rlse Alm
Output 100	Output 8	Grey/Pink	TB9-11	9	3	1	NT-07 Secondary Rlse Alm
Output 101	Output 8	White/Green	TB9-13	9	4	3	NT-08 Secondary Rlse Alm
Output 102	Output 8	White/Yellow	TB9-15	9	4	1	NT-09 Secondary Rlse Alm
Output 103	Output 8	White/Grey	TB9-17	9	5	3	NT-10 Secondary Rlse Alm
Output 104	Output 8	White/Pink	TB9-19	9	5	1	NT-11 Secondary Rlse Alm
Output 105	Output 8	White/Blue	TB9-21	9	6	3	NT-12 Secondary Rlse Alm
Output 106	Output 8	White/Red	TB9-23	9	6	1	NT-13 Secondary Rlse Alm

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE



1 EAST CONTROL ROOM - RACK #1 - FRONT VIEW - KEY PLAN
SCALE: 1 : 16



MIDDLE ATLANTIC EQUIPMENT RACK WRK-44SA-32
OVERALL DIMENSIONS ARE: 22-3/8"(W) x 32-5/8"(D) x 83-1/8"(H)
USEABLE DIMENSIONS ARE: 19-1/2"(W) x 30-3/4"(D) x 77-1/8"(H)
EAST CONTROL ROOM - RACK #1
FRONT VIEW - TOP SECTION

2 EAST CONTROL ROOM - RACK #1 - FRONT VIEW - TOP SECTION
SCALE: 1 : 2

BARNARD EJMT TEAM
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BCER engineering
Sturgeon ELECTRIC
Western States Fire Protection Co.
CONSULTING ENGINEERS

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810

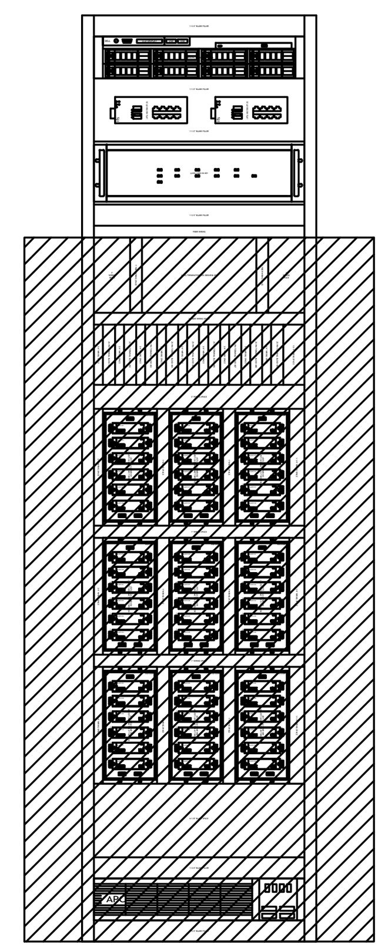
RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

DRAWN BY: B.T.L. | CHECKED BY: AEE,Jr

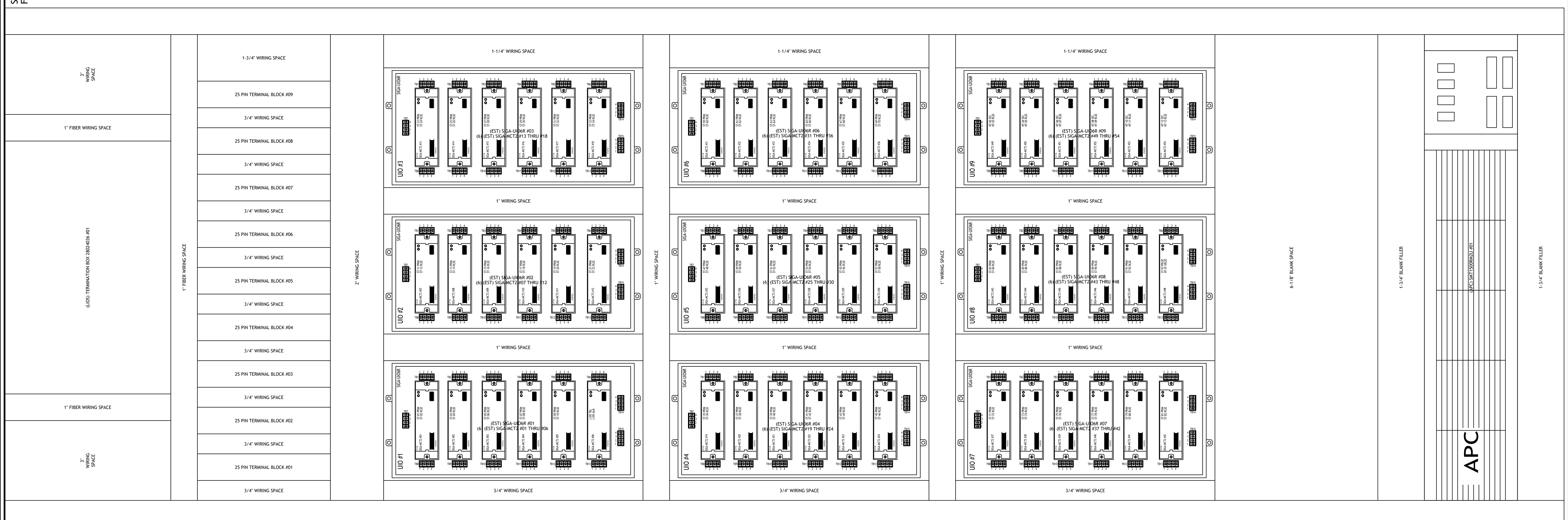
FIRE ALARM:
DETAILS-EAST CNTRL-RACK #1-WIRE-FRONT-TOP

Drawing Number
FA6.16



1 EAST CONTROL ROOM - RACK #1 - FRONT VIEW - KEY PLAN
SCALE: 1 : 16

SEE SHEET FA6.16



SEE SHEET FA6.16

MIDDLE ATLANTIC EQUIPMENT RACK WRK-44SA-32
OVERALL DIMENSIONS ARE: 22-3/8"(W) x 32-5/8"(D) x 83-1/8"(H)
USEABLE DIMENSIONS ARE: 19-1/2"(W) x 30-3/4"(D) x 77-1/8"(H)
EAST CONTROL ROOM - RACK #1
FRONT VIEW - BOTTOM SECTION

1 EAST CONTROL ROOM - RACK #1 - FRONT VIEW - BOTTOM SECTION
SCALE: 1 : 2

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

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Western States Fire Protection Co.
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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
DETAILS-EAST CNTRL-RACK #1-WIRE-FRONT-BOTTOM

Drawing Number
FA6.17

EJMT Tunnel Project
East Control Room
RACK #1 Wiring Spreadsheet
Mid-Rear Level

Ckt Description	RTU Input	RTU Module	UIO #	MCR #	Term #	Notes
Common	DI Gnd	1				Connect DI Gnd to all UIO MCR term 2's
CCTV Input 1	DI 0	1	1	1	1	NT-01 Primary CCTV Pre-Alm
CCTV Input 2	DI 1	1	1	2	1	NT-02 Primary CCTV Pre-Alm
CCTV Input 3	DI 2	1	1	3	1	NT-03 Primary CCTV Pre-Alm
CCTV Input 4	DI 3	1	1	4	1	NT-04 Primary CCTV Pre-Alm
CCTV Input 5	DI 4	1	1	5	1	NT-05 Primary CCTV Pre-Alm
CCTV Input 6	DI 5	1	1	6	1	NT-06 Primary CCTV Pre-Alm
CCTV Input 7	DI 6	1	2	1	1	NT-07 Primary CCTV Pre-Alm
CCTV Input 8	DI 7	1	2	2	1	NT-08 Primary CCTV Pre-Alm
CCTV Input 9	DI 8	1	2	3	1	NT-09 Primary CCTV Pre-Alm
CCTV Input 10	DI 9	1	2	4	1	NT-10 Primary CCTV Pre-Alm
CCTV Input 11	DI 10	1	2	5	1	NT-11 Primary CCTV Pre-Alm
CCTV Input 12	DI 11	1	2	6	1	NT-12 Primary CCTV Pre-Alm
Common	DI Gnd	2				Connect DI Gnd to all UIO MCR term 2's
CCTV Input 13	DI 0	2	3	1	1	NT-13 Primary CCTV Pre-Alm
CCTV Input 14	DI 1	2	3	2	1	NT-14 Primary CCTV Pre-Alm
CCTV Input 15	DI 2	2	3	3	1	NT-15 Primary CCTV Pre-Alm
CCTV Input 16	DI 3	2	3	4	1	NT-16 Primary CCTV Pre-Alm
CCTV Input 17	DI 4	2	3	5	1	NT-17 Primary CCTV Pre-Alm
CCTV Input 18	DI 5	2	3	6	1	NT-18 Primary CCTV Pre-Alm
CCTV Input 19	DI 6	2	4	1	1	NT-19 Primary CCTV Pre-Alm
CCTV Input 20	DI 7	2	4	2	1	NT-20 Primary CCTV Pre-Alm
CCTV Input 21	DI 8	2	4	3	1	NT-21 Primary CCTV Pre-Alm
CCTV Input 22	DI 9	2	4	4	1	NT-22 Primary CCTV Pre-Alm
CCTV Input 23	DI 10	2	4	5	1	NT-23 Primary CCTV Pre-Alm
CCTV Input 24	DI 11	2	4	6	1	NT-24 Primary CCTV Pre-Alm
Common	DI Gnd	3				Connect DI Gnd to all UIO MCR term 2's
CCTV Input 25	DI 0	3	5	1	1	NT-25 Primary CCTV Pre-Alm
CCTV Input 26	DI 1	3	5	2	1	NT-26 Primary CCTV Pre-Alm
CCTV Input 27	DI 2	3	5	3	1	NT-27 Primary CCTV Pre-Alm
CCTV Input 28	DI 3	3	5	4	1	NT-28 Primary CCTV Pre-Alm
CCTV Input 29	DI 4	3	5	5	1	NT-29 Primary CCTV Pre-Alm
CCTV Input 30	DI 5	3	5	6	1	NT-30 Primary CCTV Pre-Alm
CCTV Input 31	DI 6	3	6	1	1	NT-31 Primary CCTV Pre-Alm
CCTV Input 32	DI 7	3	6	2	1	NT-32 Primary CCTV Pre-Alm
CCTV Input 33	DI 8	3	6	3	1	NT-33 Primary CCTV Pre-Alm
CCTV Input 34	DI 9	3	6	4	1	NT-34 Primary CCTV Pre-Alm
CCTV Input 35	DI 10	3	6	5	1	NT-35 Primary CCTV Pre-Alm
CCTV Input 36	DI 11	3	6	6	1	NT-36 Primary CCTV Pre-Alm
Common	DI Gnd	4				Connect DI Gnd to all UIO MCR term 2's
CCTV Input 37	DI 0	4	7	1	1	NT-37 Primary CCTV Pre-Alm
CCTV Input 38	DI 1	4	7	2	1	NT-38 Primary CCTV Pre-Alm
CCTV Input 39	DI 2	4	7	3	1	NT-39 Primary CCTV Pre-Alm
CCTV Input 40	DI 3	4	7	4	1	NT-40 Primary CCTV Pre-Alm
CCTV Input 41	DI 4	4	7	5	1	NT-41 Primary CCTV Pre-Alm
CCTV Input 42	DI 5	4	7	6	1	NT-42 Primary CCTV Pre-Alm
CCTV Input 43	DI 6	4	8	1	1	NT-43 Primary CCTV Pre-Alm
CCTV Input 44	DI 7	4	8	2	1	NT-44 Primary CCTV Pre-Alm
CCTV Input 45	DI 8	4	8	3	1	NT-45 Primary CCTV Pre-Alm
CCTV Input 46	DI 9	4	8	4	1	NT-46 Primary CCTV Pre-Alm
CCTV Input 47	DI 10	4	8	5	1	NT-47 Primary CCTV Pre-Alm
CCTV Input 48	DI 11	4	8	6	1	NT-48 Primary CCTV Pre-Alm
Common	DI Gnd	5				Connect DI Gnd to all UIO MCR term 2's
CCTV Input 49	DI 0	5	9	1	1	NT-49 Primary CCTV Pre-Alm
CCTV Input 50	DI 1	5	9	2	1	NT-50 Primary CCTV Pre-Alm
CCTV Input 51	DI 2	5	9	3	1	NT-51 Primary CCTV Pre-Alm
CCTV Input 52	DI 3	5	9	4	1	NT-52 Primary CCTV Pre-Alm
CCTV Input 53	DI 4	5	9	5	1	NT-53 Primary CCTV Pre-Alm
CCTV Input 54	DI 5	5	9	6	1	NT-54 Primary CCTV Pre-Alm
CCTV Input 55	DI 6	5	10	1	1	NT-55 Primary CCTV Pre-Alm
CCTV Input 56	DI 7	5	10	2	1	NT-56 Primary CCTV Pre-Alm
CCTV Input 57	DI 8	5	10	3	1	NT-57 Primary CCTV Pre-Alm
CCTV Input 58	DI 9	5	10	4	1	NT-58 Primary CCTV Pre-Alm
CCTV Input 59	DI 10	5	10	5	1	NT-59 Primary CCTV Pre-Alm
CCTV Input 60	DI 11	5	10	6	1	NT-60 Primary CCTV Pre-Alm
Common	DI Gnd	6				Connect DI Gnd to all UIO MCR term 2's
CCTV Input 61	DI 0	6	11	1	1	NT-61 Primary CCTV Pre-Alm
CCTV Input 62	DI 1	6	11	2	1	NT-62 Primary CCTV Pre-Alm
CCTV Input 63	DI 2	6	11	3	1	NT-63 Primary CCTV Pre-Alm
CCTV Input 64	DI 3	6	11	4	1	NT-64 Primary CCTV Pre-Alm
CCTV Input 65	DI 4	6	11	5	1	NT-65 Primary CCTV Pre-Alm
CCTV Input 66	DI 5	6	11	6	1	NT-66 Primary CCTV Pre-Alm
CCTV Input 67	DI 6	6	12	1	1	NT-67 Primary CCTV Pre-Alm
CCTV Input 68	DI 7	6	12	2	1	NT-68 Primary CCTV Pre-Alm
CCTV Input 69	DI 8	6	12	3	1	NT-69 Primary CCTV Pre-Alm
CCTV Input 70	DI 9	6	12	4	1	NT-70 Primary CCTV Pre-Alm
CCTV Input 71	DI 10	6	12	5	1	NT-71 Primary CCTV Pre-Alm
CCTV Input 72	DI 11	6	12	6	1	NT-72 Primary CCTV Pre-Alm
Common	DI Gnd	7				Connect DI Gnd to all UIO MCR term 2's
CCTV Input 73	DI 0	7	13	1	1	NT-73 Primary CCTV Pre-Alm
CCTV Input 74	DI 1	7	13	2	1	NT-74 Primary CCTV Pre-Alm
CCTV Input 75	DI 2	7	13	3	1	NT-75 Primary CCTV Pre-Alm
CCTV Input 76	DI 3	7	13	4	1	NT-76 Primary CCTV Pre-Alm
CCTV Input 77	DI 4	7	13	5	1	NT-77 Primary CCTV Pre-Alm
CCTV Input 78	DI 5	7	13	6	1	NT-78 Primary CCTV Pre-Alm
CCTV Input 79	DI 6	7	14	1	1	NT-79 Primary CCTV Pre-Alm
CCTV Input 80	DI 7	7	14	2	1	NT-80 Primary CCTV Pre-Alm
CCTV Input 81	DI 8	7	14	3	1	NT-81 Primary CCTV Pre-Alm
CCTV Input 82	DI 9	7	14	4	1	NT-82 Primary CCTV Pre-Alm
CCTV Input 83	DI 10	7	14	5	1	NT-83 Primary CCTV Pre-Alm
CCTV Input 84	DI 11	7	14	6	1	NT-84 Primary CCTV Pre-Alm
Common	DI Gnd	8				Connect DI Gnd to all UIO MCR term 2's
CCTV Input 85	DI 0	8	15	1	1	NT-85 Primary CCTV Pre-Alm
CCTV Input 86	DI 1	8	15	2	1	NT-86 Primary CCTV Pre-Alm
CCTV Input 87	DI 2	8	15	3	1	NT-87 Primary CCTV Pre-Alm
CCTV Input 88	DI 3	8	15	4	1	NT-88 Primary CCTV Pre-Alm
CCTV Input 89	DI 4	8	15	5	1	NT-89 Primary CCTV Pre-Alm
CCTV Input 90	DI 5	8	15	6	1	NT-90 Primary CCTV Pre-Alm
			16	1	1	LIOS Reset
			16	2	1	LIOS acknowledge
			16	3	1	ECR Pre-Alm Visual
			16	4	1	ECR Alm Visual
			16	5	1	ECR Audible
			16	6	3	CCTV Sw #1 TBL
			16	6	4	CCTV Sw #1 TBL
			16	6	1	CCTV Sw #2 TBL
			16	6	2	CCTV Sw #2 TBL

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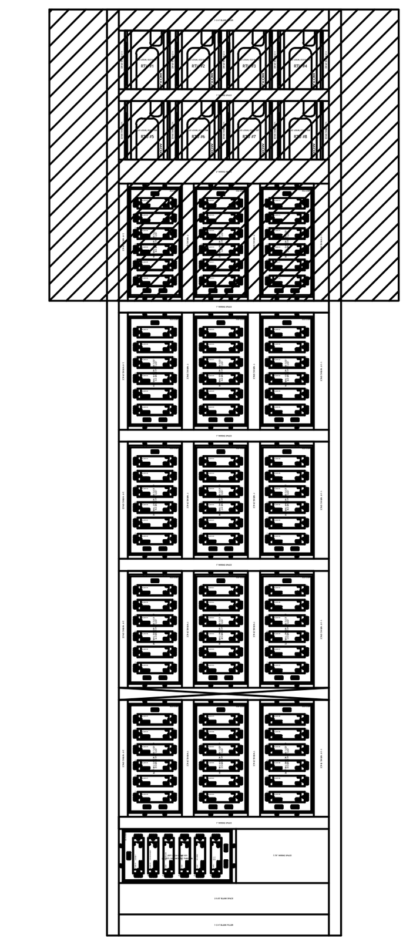
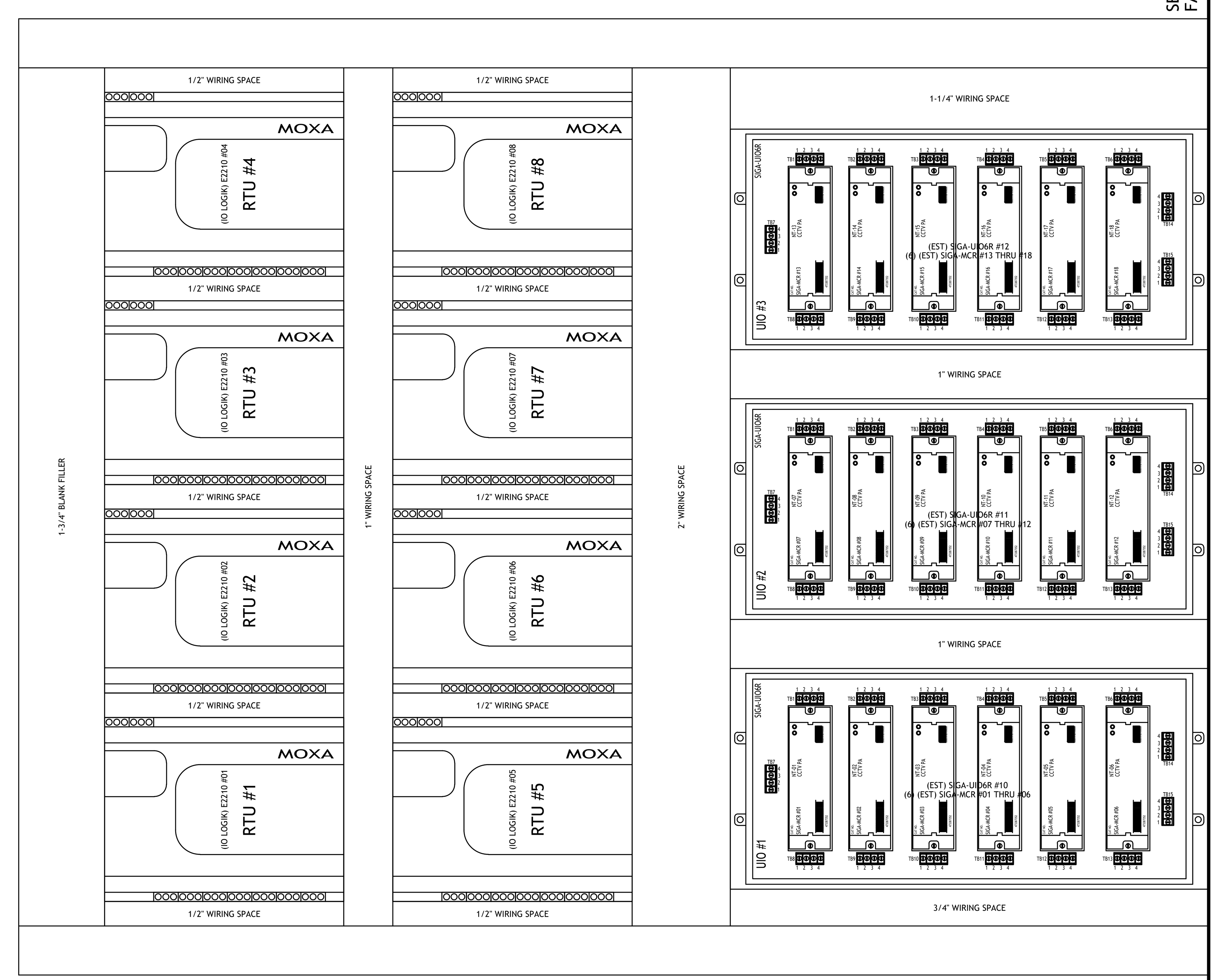


1 EAST CONTROL ROOM - RACK #1 - REAR VIEW - KEY PLAN
SCALE: 1 : 16

SEE SHEET FA6.19



SEE SHEET FA6.19

MIDDLE ATLANTIC EQUIPMENT RACK WRK-44SA-32
OVERALL DIMENSIONS ARE: 22-3/8"(W) x 32-5/8"(D) x 83-1/8"(H)
USEABLE DIMENSIONS ARE: 19-1/2"(W) x 30-3/4"(D) x 77-1/8"(H)
EAST CONTROL ROOM - RACK #1
REAR VIEW - TOP SECTION

2 EAST CONTROL ROOM - RACK #1 - REAR VIEW - TOP SECTION
SCALE: 1 : 2

BARNARD EJMT TEAM

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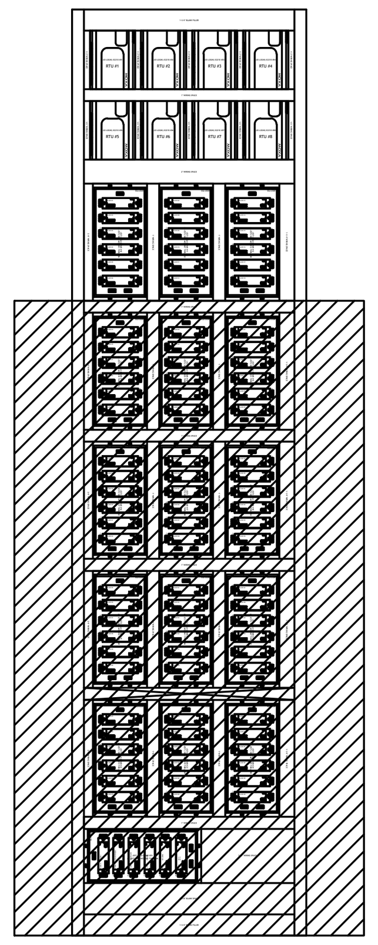
EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

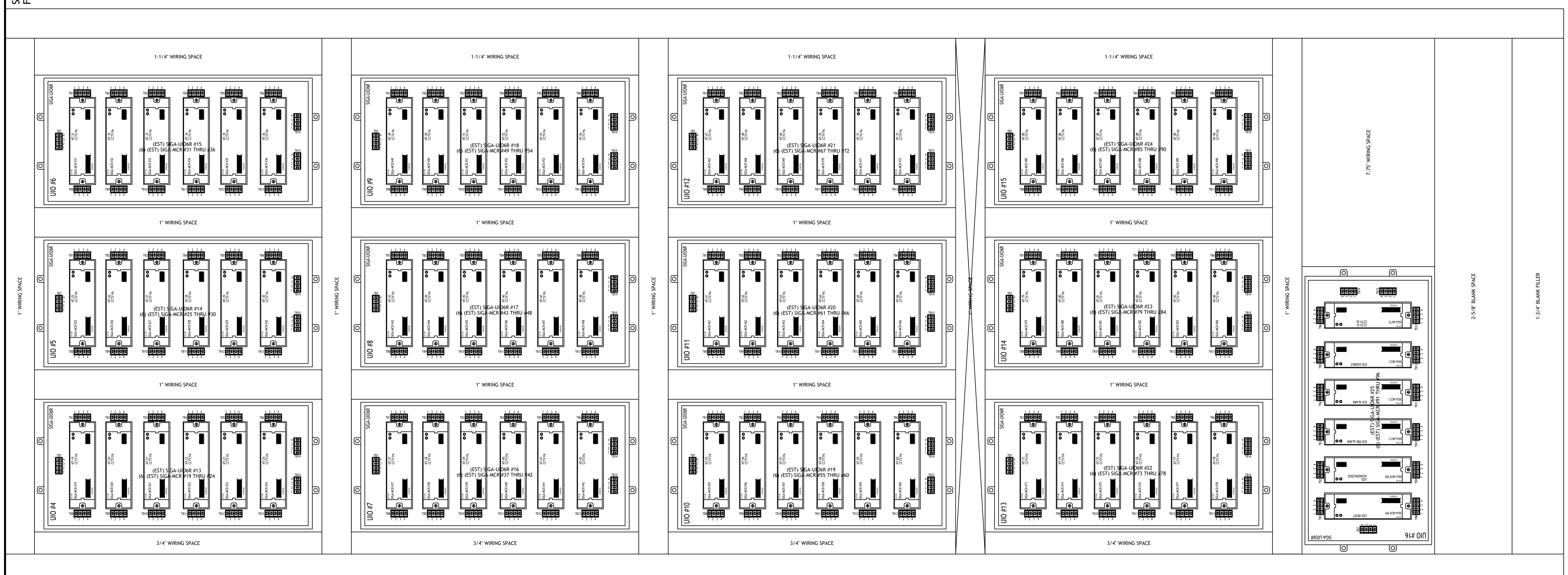
FIRE ALARM:
DETAILS-EAST CNTRL-RACK
#1-WIRE-REAR-TOP

Drawing Number
FA6.18



1 EAST CONTROL ROOM - RACK #1 - REAR VIEW - KEY PLAN
SCALE: 1 : 16

SEE SHEET FA6.18



SEE SHEET FA6.18

MIDDLE ATLANTIC EQUIPMENT RACK WRK-44SA-32
OVERALL DIMENSIONS ARE: 22-3/8"(W) x 32-5/8"(D) x 83-1/8"(H)
USEABLE DIMENSIONS ARE: 19-1/2"(W) x 30-3/4"(D) x 77-1/8"(H)
EAST CONTROL ROOM - RACK #1
REAR VIEW - BOTTOM SECTION

1 EAST CONTROL ROOM - RACK #1 - REAR VIEW - BOTTOM SECTION
SCALE: 1 : 2

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

BARNARD EJMT TEAM

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
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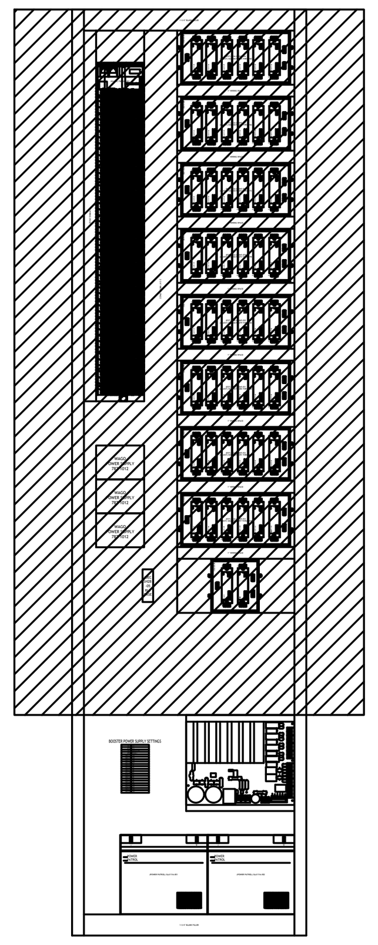
RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr.

FIRE ALARM:
DETAILS-EAST CNTRL-RACK #1-WIRE-REAR-BOTTOM

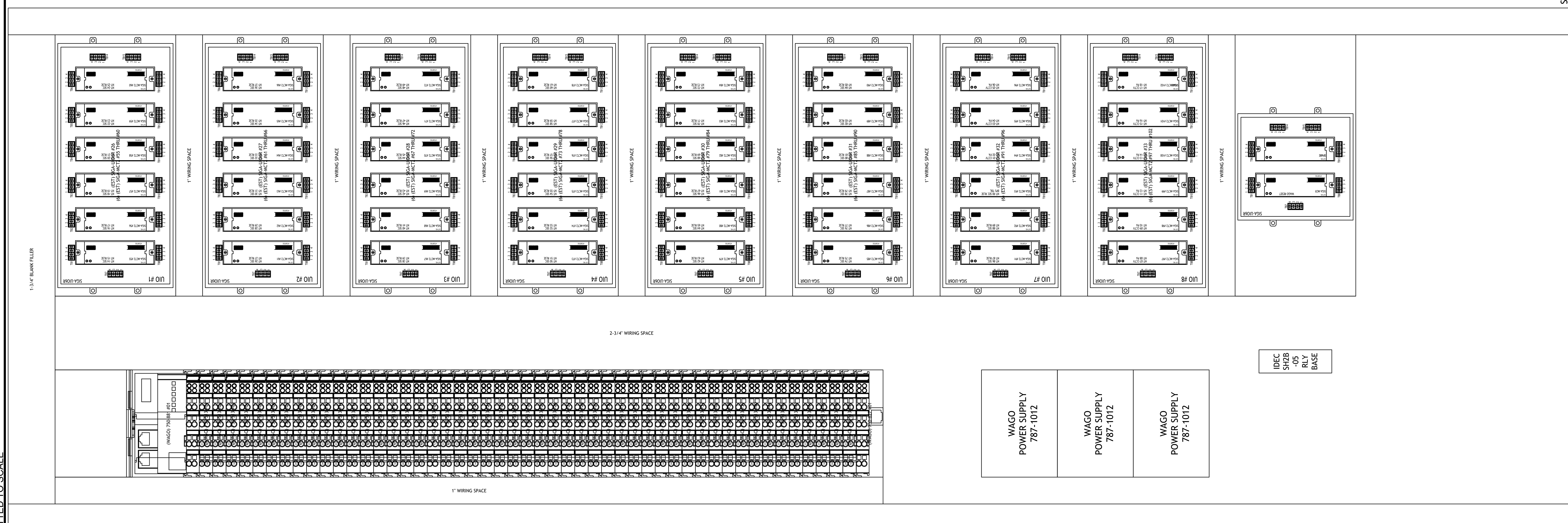
Drawing Number
FA6.19



1 EAST CONTROL ROOM - RACK #2 - FRONT VIEW - KEY PLAN

SCALE: 1 : 16

SEE SHEET FA6.21



SEE SHEET FA6.21

MIDDLE ATLANTIC EQUIPMENT RACK WRK-44SA-32
OVERALL DIMENSIONS ARE: 22-3/8"(W) x 32-5/8"(D) x 83-1/8"(H)
USEABLE DIMENSIONS ARE: 19-1/2"(W) x 30-3/4"(D) x 77-1/8"(H)
EAST CONTROL ROOM - RACK #2
FRONT VIEW - TOP SECTION

2 EAST CONTROL ROOM - RACK #2 - FRONT VIEW - TOP SECTION

SCALE: 1 : 2

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BARNARD EJMT TEAM

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM: DETAILS-EAST CNTRL-RACK #2-WIRE-FRONT-TOP

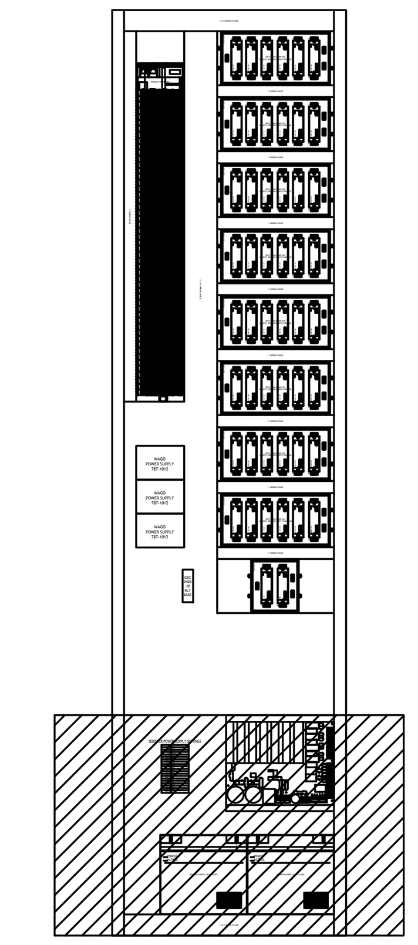
Drawing Number

FA6.20

EJMT Tunnel Project
East Control Room
RACK #2 Wiring Spreadsheet
Mid-Front Level

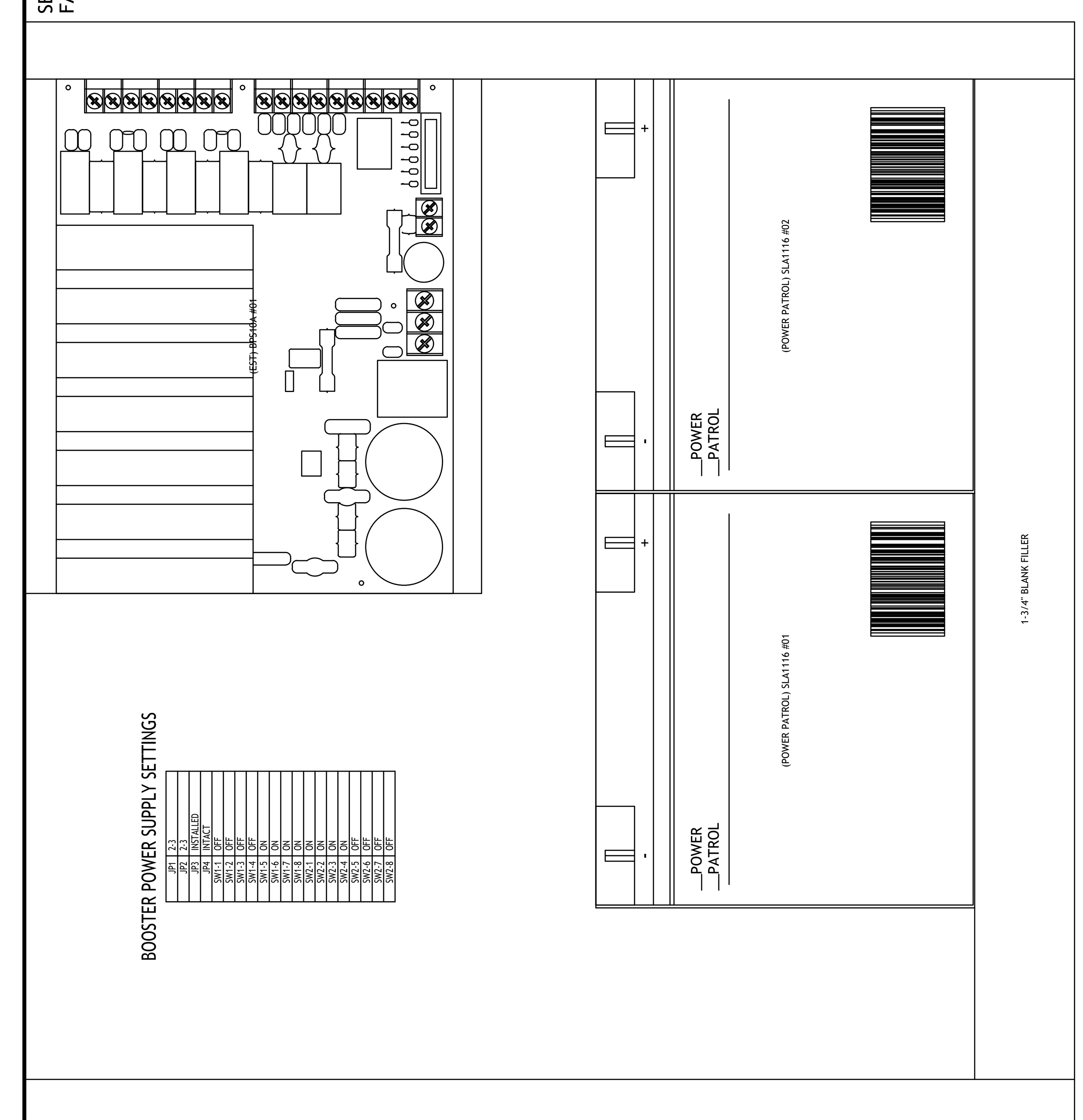
ModBus Outputs	WAGO 513 Rly Mod #	WAGO 513 Rly #	UIO #	MCT2 #	Term #	Notes
Output 107	1	1	1	1	3	NT-14 Secondary Rlse Alm
Output 108	1	2	1	1	1	NT-15 Secondary Rlse Alm
Output 109	2	3	1	2	3	NT-16 Secondary Rlse Alm
Output 110	2	4	1	2	1	NT-17 Secondary Rlse Alm
Output 111	3	5	1	3	3	NT-18 Secondary Rlse Alm
Output 112	3	6	1	3	1	NT-19 Secondary Rlse Alm
Output 113	4	7	1	4	3	NT-20 Secondary Rlse Alm
Output 114	4	8	1	4	1	NT-21 Secondary Rlse Alm
Output 115	5	9	1	5	3	NT-22 Secondary Rlse Alm
Output 116	5	10	1	5	1	NT-23 Secondary Rlse Alm
Output 117	6	11	1	6	3	NT-24 Secondary Rlse Alm
Output 118	6	12	1	6	1	NT-25 Secondary Rlse Alm
Output 119	7	13	2	1	3	NT-26 Secondary Rlse Alm
Output 120	7	14	2	1	1	NT-27 Secondary Rlse Alm
Output 121	8	15	2	2	3	NT-28 Secondary Rlse Alm
Output 122	8	16	2	2	1	NT-29 Secondary Rlse Alm
Output 123	9	17	2	3	3	NT-30 Secondary Rlse Alm
Output 124	9	18	2	3	1	NT-31 Secondary Rlse Alm
Output 125	10	19	2	4	3	NT-32 Secondary Rlse Alm
Output 126	10	20	2	4	1	NT-33 Secondary Rlse Alm
Output 127	11	21	2	5	3	NT-34 Secondary Rlse Alm
Output 128	11	22	2	5	1	NT-35 Secondary Rlse Alm
Output 129	12	23	2	6	3	NT-36 Secondary Rlse Alm
Output 130	12	24	2	6	1	NT-37 Secondary Rlse Alm
Output 131	13	25	3	1	3	NT-38 Secondary Rlse Alm
Output 132	13	26	3	1	1	NT-39 Secondary Rlse Alm
Output 133	14	27	3	2	3	NT-40 Secondary Rlse Alm
Output 134	14	28	3	2	1	NT-41 Secondary Rlse Alm
Output 135	15	29	3	3	3	NT-42 Secondary Rlse Alm
Output 136	15	30	3	3	1	NT-43 Secondary Rlse Alm
Output 137	16	31	3	4	3	NT-44 Secondary Rlse Alm
Output 138	16	32	3	4	1	NT-45 Secondary Rlse Alm
Output 139	17	33	3	5	3	NT-46 Secondary Rlse Alm
Output 140	17	34	3	5	1	NT-47 Secondary Rlse Alm
Output 141	18	35	3	6	3	NT-48 Secondary Rlse Alm
Output 142	18	36	3	6	1	NT-49 Secondary Rlse Alm
Output 143	19	37	4	1	3	NT-50 Secondary Rlse Alm
Output 144	19	38	4	1	1	NT-51 Secondary Rlse Alm
Output 145	20	39	4	2	3	NT-52 Secondary Rlse Alm
Output 146	20	40	4	2	1	NT-53 Secondary Rlse Alm
Output 147	21	41	4	3	3	NT-54 Secondary Rlse Alm
Output 148	21	42	4	3	1	NT-55 Secondary Rlse Alm
Output 149	22	43	4	4	3	NT-56 Secondary Rlse Alm
Output 150	22	44	4	4	1	NT-57 Secondary Rlse Alm
Output 151	23	45	4	5	3	NT-58 Secondary Rlse Alm
Output 152	23	46	4	5	1	NT-59 Secondary Rlse Alm
Output 153	24	47	4	6	3	NT-60 Secondary Rlse Alm
Output 154	24	48	4	6	1	NT-61 Secondary Rlse Alm
Output 155	25	49	5	1	3	NT-62 Secondary Rlse Alm
Output 156	25	50	5	1	1	NT-63 Secondary Rlse Alm
Output 157	26	51	5	2	3	NT-64 Secondary Rlse Alm
Output 158	26	52	5	2	1	NT-65 Secondary Rlse Alm
Output 159	27	53	5	3	3	NT-66 Secondary Rlse Alm
Output 160	27	54	5	3	1	NT-67 Secondary Rlse Alm
Output 161	28	55	5	4	3	NT-68 Secondary Rlse Alm
Output 162	28	56	5	4	1	NT-69 Secondary Rlse Alm
Output 163	29	57	5	5	3	NT-70 Secondary Rlse Alm
Output 164	29	58	5	5	1	NT-71 Secondary Rlse Alm
Output 165	30	59	5	6	3	NT-72 Secondary Rlse Alm
Output 166	30	60	5	6	1	NT-73 Secondary Rlse Alm
Output 167	31	61	6	1	3	NT-74 Secondary Rlse Alm
Output 168	31	62	6	1	1	NT-75 Secondary Rlse Alm
Output 169	32	63	6	2	3	NT-76 Secondary Rlse Alm
Output 170	32	64	6	2	1	NT-77 Secondary Rlse Alm
Output 171	33	65	6	3	3	NT-78 Secondary Rlse Alm
Output 172	33	66	6	3	1	NT-79 Secondary Rlse Alm
Output 173	34	67	6	4	3	NT-80 Secondary Rlse Alm
Output 174	34	68	6	4	1	NT-81 Secondary Rlse Alm
Output 175	35	69	6	5	3	NT-82 Secondary Rlse Alm
Output 176	35	70	6	5	1	NT-83 Secondary Rlse Alm
Output 177	36	71	6	6	3	NT-84 Secondary Rlse Alm
Output 178	36	72	6	6	1	NT-85 Secondary Rlse Alm
Output 179	37	73	7	1	3	NT-86 Secondary Rlse Alm
Output 180	37	74	7	1	1	NT-87 Secondary Rlse Alm
Output 181	38	75	7	2	3	NT-88 Secondary Rlse Alm
Output 182	38	76	7	2	1	NT-89 Secondary Rlse Alm
Output 183	39	77	7	3	3	NT-90 Secondary Rlse Alm
			7	3	4	BPS Trouble
Output 184	39	78	7	3	1	NT-01 CCTV Pre-Alm
Output 185	40	79	7	4	3	NT-02 CCTV Pre-Alm
Output 186	40	80	7	4	1	NT-03 CCTV Pre-Alm
Output 187	41	81	7	5	3	NT-04 CCTV Pre-Alm
Output 188	41	82	7	5	1	NT-05 CCTV Pre-Alm
Output 189	42	83	7	6	3	NT-06 CCTV Pre-Alm
Output 190	42	84	7	6	1	NT-07 CCTV Pre-Alm
Output 191	43	85	8	1	3	NT-08 CCTV Pre-Alm
Output 192	43	86	8	1	2	NT-09 CCTV Pre-Alm
Output 193	44	87	8	2	4	NT-10 CCTV Pre-Alm
Output 194	44	88	8	2	1	NT-11 CCTV Pre-Alm
Output 195	45	89	8	3	3	NT-12 CCTV Pre-Alm
Output 196	45	90	8	3	1	NT-13 CCTV Pre-Alm
Output 197	46	91	8	4	3	NT-14 CCTV Pre-Alm
Output 198	46	92	8	4	1	NT-15 CCTV Pre-Alm
Output 199	47	93	8	5	3	NT-16 CCTV Pre-Alm
Output 200	47	94	8	5	1	NT-17 CCTV Pre-Alm
Output 201	48	95	8	6	3	NT-18 CCTV Pre-Alm
Output 202	48	96				Spare Relay

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE



1 EAST CONTROL ROOM - RACK #2 - FRONT VIEW - KEY PLAN
SCALE: 1 : 16

SEE SHEET FA6.20



SEE SHEET FA6.20

MIDDLE ATLANTIC EQUIPMENT RACK WRK-44SA-32
OVERALL DIMENSIONS ARE: 22-3/8"(W) x 32-5/8"(D) x 83-1/8"(H)
USEABLE DIMENSIONS ARE: 19-1/2"(W) x 30-3/4"(D) x 77-1/8"(H)
EAST CONTROL ROOM - RACK #2
FRONT VIEW - BOTTOM SECTION

1 EAST CONTROL ROOM - RACK #2 - FRONT VIEW - BOTTOM SECTION
SCALE: 1 : 2

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CONSULTING ENGINEERS

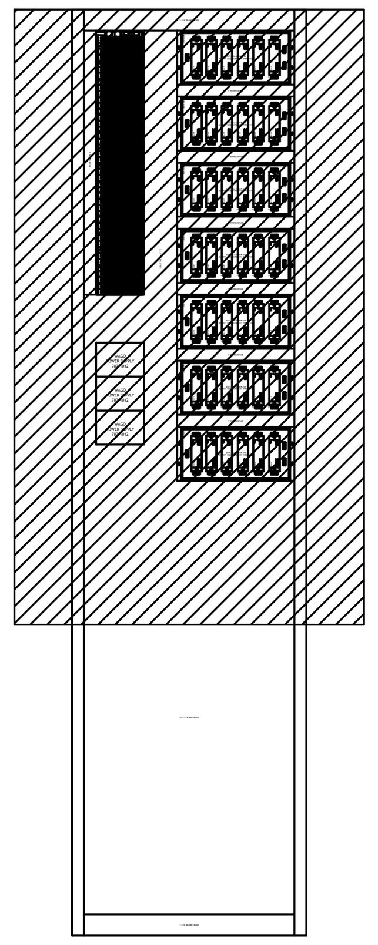
EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

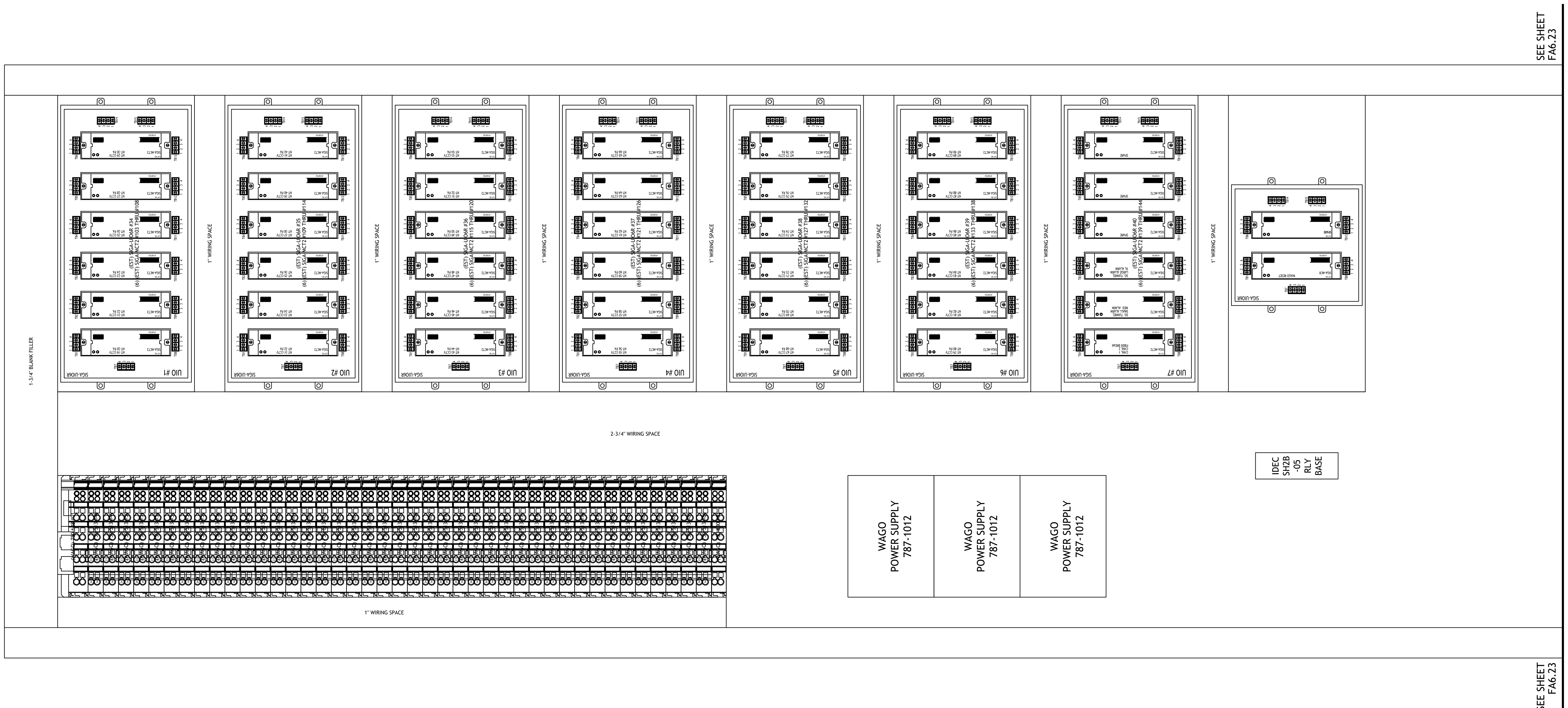
DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
DETAILS-EAST CNTRL-RACK #2-WIRE-FRONT-BOTTOM

Drawing Number
FA6.21



1 EAST CONTROL ROOM - RACK #2 - REAR VIEW - KEY PLAN
SCALE: 1 : 16



MIDDLE ATLANTIC EQUIPMENT RACK WRK-44SA-32
OVERALL DIMENSIONS ARE: 22-3/8"(W) x 32-5/8"(D) x 83-1/8"(H)
USEABLE DIMENSIONS ARE: 19-1/2"(W) x 30-3/4"(D) x 77-1/8"(H)
EAST CONTROL ROOM - RACK #2
REAR VIEW - TOP SECTION

2 EAST CONTROL ROOM - RACK #2 - REAR VIEW - TOP SECTION
SCALE: 1 : 2

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Western States Fire Protection Co.
CONSULTING ENGINEERS

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-15

Revisions		
Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
DETAILS-EAST CNTRL-RACK #2-WIRE-REAR-TOP

Drawing Number
FA6.22

EJMT Tunnel Project
East Control Room
RACK #2 Wiring Spreadsheet
Mid-Rear Level

ModBus Outputs	WAGO 513 Rly Mod #	WAGO 513 Rly #	UIO #	MCT2 #	Term #	Notes
Output 203	49	97	1	1	3	NT-19 CCTV Pre-Alm
Output 204	49	98	1	1	1	NT-20 CCTV Pre-Alm
Output 205	50	99	1	2	3	NT-21 CCTV Pre-Alm
Output 206	50	100	1	2	1	NT-22 CCTV Pre-Alm
Output 207	51	101	1	3	3	NT-23 CCTV Pre-Alm
Output 208	51	102	1	3	1	NT-24 CCTV Pre-Alm
Output 209	52	103	1	4	3	NT-25 CCTV Pre-Alm
Output 210	52	104	1	4	1	NT-26 CCTV Pre-Alm
Output 211	53	105	1	5	3	NT-27 CCTV Pre-Alm
Output 212	53	106	1	5	1	NT-28 CCTV Pre-Alm
Output 213	54	107	1	6	3	NT-29 CCTV Pre-Alm
Output 214	54	108	1	6	1	NT-30 CCTV Pre-Alm
Output 215	55	109	2	1	3	NT-31 CCTV Pre-Alm
Output 216	55	110	2	1	1	NT-32 CCTV Pre-Alm
Output 217	56	111	2	2	3	NT-33 CCTV Pre-Alm
Output 218	56	112	2	2	1	NT-34 CCTV Pre-Alm
Output 219	57	113	2	3	3	NT-35 CCTV Pre-Alm
Output 220	57	114	2	3	1	NT-36 CCTV Pre-Alm
Output 221	58	115	2	4	3	NT-37 CCTV Pre-Alm
Output 222	58	116	2	4	1	NT-38 CCTV Pre-Alm
Output 223	59	117	2	5	3	NT-39 CCTV Pre-Alm
Output 224	59	118	2	5	1	NT-40 CCTV Pre-Alm
Output 225	60	119	2	6	3	NT-41 CCTV Pre-Alm
Output 226	60	120	2	6	1	NT-42 CCTV Pre-Alm
Output 227	61	121	3	1	3	NT-43 CCTV Pre-Alm
Output 228	61	122	3	1	1	NT-44 CCTV Pre-Alm
Output 229	62	123	3	2	3	NT-45 CCTV Pre-Alm
Output 230	62	124	3	2	1	NT-46 CCTV Pre-Alm
Output 231	63	125	3	3	3	NT-47 CCTV Pre-Alm
Output 232	63	126	3	3	1	NT-48 CCTV Pre-Alm
Output 233	64	127	3	4	3	NT-49 CCTV Pre-Alm
Output 234	64	128	3	4	1	NT-50 CCTV Pre-Alm
Output 235	65	129	3	5	3	NT-51 CCTV Pre-Alm
Output 236	65	130	3	5	1	NT-52 CCTV Pre-Alm
Output 237	66	131	3	6	3	NT-53 CCTV Pre-Alm
Output 238	66	132	3	6	1	NT-54 CCTV Pre-Alm
Output 239	67	133	4	1	3	NT-55 CCTV Pre-Alm
Output 240	67	134	4	1	1	NT-56 CCTV Pre-Alm
Output 241	68	135	4	2	3	NT-57 CCTV Pre-Alm
Output 242	68	136	4	2	1	NT-58 CCTV Pre-Alm
Output 243	69	137	4	3	3	NT-59 CCTV Pre-Alm
Output 244	69	138	4	3	1	NT-60 CCTV Pre-Alm
Output 245	70	139	4	4	3	NT-61 CCTV Pre-Alm
Output 246	70	140	4	4	1	NT-62 CCTV Pre-Alm
Output 247	71	141	4	5	3	NT-63 CCTV Pre-Alm
Output 248	71	142	4	5	1	NT-64 CCTV Pre-Alm
Output 249	72	143	4	6	3	NT-65 CCTV Pre-Alm
Output 250	72	144	4	6	1	NT-66 CCTV Pre-Alm
Output 251	73	145	5	1	3	NT-67 CCTV Pre-Alm
Output 252	73	146	5	1	1	NT-68 CCTV Pre-Alm
Output 253	74	147	5	2	3	NT-69 CCTV Pre-Alm
Output 254	74	148	5	2	1	NT-70 CCTV Pre-Alm
Output 255	75	149	5	3	3	NT-71 CCTV Pre-Alm
Output 256	75	150	5	3	1	NT-72 CCTV Pre-Alm
Output 257	76	151	5	4	3	NT-73 CCTV Pre-Alm
Output 258	76	152	5	4	1	NT-74 CCTV Pre-Alm
Output 259	77	153	5	5	3	NT-75 CCTV Pre-Alm
Output 260	77	154	5	5	1	NT-76 CCTV Pre-Alm
Output 261	78	155	5	6	3	NT-77 CCTV Pre-Alm
Output 262	78	156	5	6	1	NT-78 CCTV Pre-Alm
Output 263	79	157	6	1	3	NT-79 CCTV Pre-Alm
Output 264	79	158	6	1	1	NT-80 CCTV Pre-Alm
Output 265	80	159	6	2	3	NT-81 CCTV Pre-Alm
Output 266	80	160	6	2	1	NT-82 CCTV Pre-Alm
Output 267	81	161	6	3	3	NT-83 CCTV Pre-Alm
Output 268	81	162	6	3	1	NT-84 CCTV Pre-Alm
Output 269	82	163	6	4	3	NT-85 CCTV Pre-Alm
Output 270	82	164	6	4	1	NT-86 CCTV Pre-Alm
Output 271	83	165	6	5	3	NT-87 CCTV Pre-Alm
Output 272	83	166	6	5	1	NT-88 CCTV Pre-Alm
Output 273	84	167	6	6	3	NT-89 CCTV Pre-Alm
Output 274	84	168	6	6	1	NT-90 CCTV Pre-Alm
Output 275	85	169	7	1	3	South Tunnel (Channel 1) Fiber Break
Output 276	85	170	7	1	1	North Tunnel (Channel 2) Fiber Break
Output 277	86	171	7	2	3	South Tunnel "Small" Fire
Output 278	86	172	7	2	1	South Tunnel "Medium" Fire
Output 279	87	173	7	3	3	South Tunnel "Large" Fire
Output 280	87	174	7	3	1	South Tunnel "X Large" Fire

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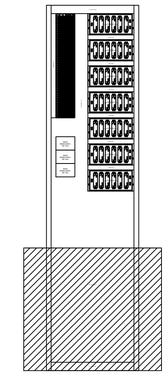

1 EAST CONTROL ROOM - RACK #2 - REAR VIEW - KEY PLAN
SCALE: 1 : 16

SEE SHEET FA6.22

32-1/2" BLANK SPACE

1-3/4" BLANK FILLER

SEE SHEET FA6.22

MIDDLE ATLANTIC EQUIPMENT RACK WRK-44SA-32
OVERALL DIMENSIONS ARE: 22-3/8"(W) x 32-5/8"(D) x 83-1/8"(H)
USEABLE DIMENSIONS ARE: 19-1/2"(W) x 30-3/4"(D) x 77-1/8"(H)
EAST CONTROL ROOM - RACK #2
REAR VIEW - BOTTOM SECTION

1 EAST CONTROL ROOM - RACK #2 - REAR VIEW - BOTTOM SECTION
SCALE: 1 : 2

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

Revisions
Num | Description | Date

DRAWN BY: B.T.L. | CHECKED BY: AEE,Jr

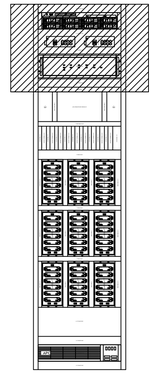
FIRE ALARM:
DETAILS-EAST CNTRL-RACK #2-WIRE-REAR-BOTTOM

Drawing Number
FA6.23

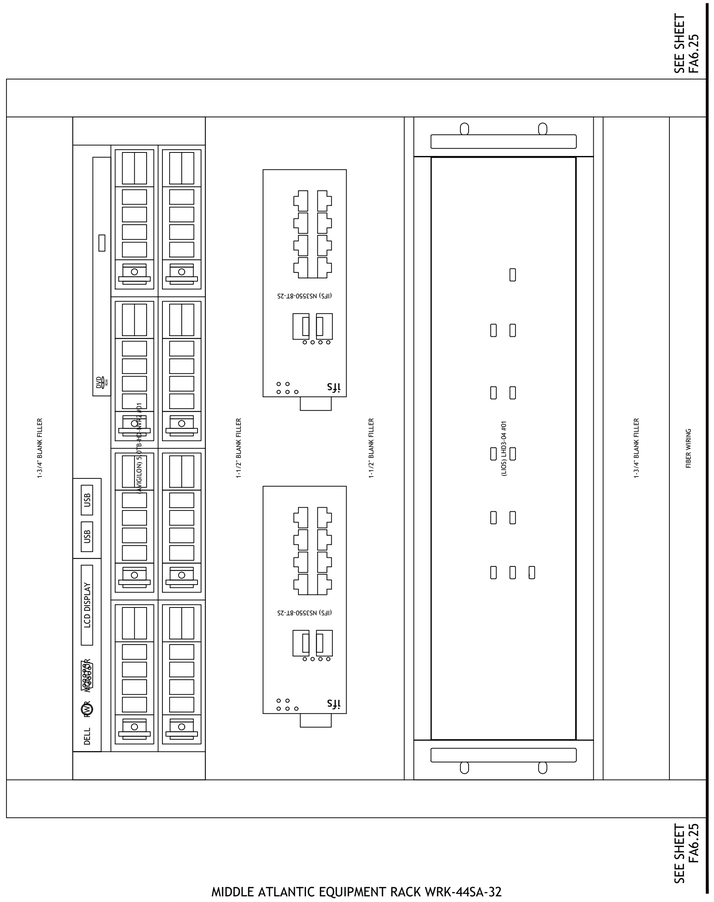
EJMT Tunnel Project
West Control Room
RACK #1 Wiring Spreadsheet
Mid-Front Level

LIOS Outputs	Cable #	Cable Color	TB #-#	UIO #	MCT2 #	Term #	Notes
+24vDC Power	Pwr	Brown	TB1-1				From BPS10 (+)
-24vDC Power	Pwr	Blue	TB1-2				From BPS10 (-)
Earth Grnd	Pwr	Green/Yellow	TB1-3				From Earth Ground
Output 1	Output 0	White	TB1-4	1	1	3	NT-01 Primary Rlse Alm
Output 2	Output 0	Green	TB1-6	1	1	1	NT-02 Primary Rlse Alm
Output 3	Output 0	Grey	TB1-8	1	2	3	NT-03 Primary Rlse Alm
Output 4	Output 0	Blue	TB1-10	1	2	1	NT-04 Primary Rlse Alm
Output 5	Output 0	Black	TB1-12	1	3	3	NT-05 Primary Rlse Alm
Output 6	Output 0	Grey/Pink	TB1-14	1	3	1	NT-06 Primary Rlse Alm
Output 7	Output 0	White/Green	TB1-16	1	4	3	NT-07 Primary Rlse Alm
Output 8	Output 0	White/Yellow	TB1-18	1	4	1	NT-08 Primary Rlse Alm
Output 9	Output 0	White/Grey	TB1-20	1	5	3	NT-09 Primary Rlse Alm
Output 10	Output 0	White/Pink	TB1-22	1	5	1	NT-10 Primary Rlse Alm
Collective Fault	Output 0	White/Blue	TB1-24	1	6	3	East LIOS Detector Comm Tbl
Collective Alarm	Output 0	White/Red	TB1-26	1	6	1	East LIOS Detector Comm Alm
Output 11	Output 1	White	TB2-1	2	1	3	NT-11 Primary Rlse Alm
Output 12	Output 1	Green	TB2-3	2	1	1	NT-12 Primary Rlse Alm
Output 13	Output 1	Grey	TB2-5	2	2	3	NT-13 Primary Rlse Alm
Output 14	Output 1	Blue	TB2-7	2	2	1	NT-14 Primary Rlse Alm
Output 15	Output 1	Black	TB2-9	2	3	3	NT-15 Primary Rlse Alm
Output 16	Output 1	Grey/Pink	TB2-11	2	3	1	NT-16 Primary Rlse Alm
Output 17	Output 1	White/Green	TB2-13	2	4	3	NT-17 Primary Rlse Alm
Output 18	Output 1	White/Yellow	TB2-15	2	4	1	NT-18 Primary Rlse Alm
Output 19	Output 1	White/Grey	TB2-17	2	5	3	NT-19 Primary Rlse Alm
Output 20	Output 1	White/Pink	TB2-19	2	5	1	NT-20 Primary Rlse Alm
Output 21	Output 1	White/Blue	TB2-21	2	6	3	NT-21Primary Rlse Alm
Output 22	Output 1	White/Red	TB2-23	2	6	1	NT-22 Primary Rlse Alm
Output 23	Output 2	White	TB3-1	3	1	3	NT-23 Primary Rlse Alm
Output 24	Output 2	Green	TB3-3	3	1	1	NT-24 Primary Rlse Alm
Output 25	Output 2	Grey	TB3-5	3	2	3	NT-25 Primary Rlse Alm
Output 26	Output 2	Blue	TB3-7	3	2	1	NT-26 Primary Rlse Alm
Output 27	Output 2	Black	TB3-9	3	3	3	NT-27 Primary Rlse Alm
Output 28	Output 2	Grey/Pink	TB3-11	3	3	1	NT-28 Primary Rlse Alm
Output 29	Output 2	White/Green	TB3-13	3	4	3	NT-29 Primary Rlse Alm
Output 30	Output 2	White/Yellow	TB3-15	3	4	1	NT-30 Primary Rlse Alm
Output 31	Output 2	White/Grey	TB3-17	3	5	3	NT-31 Primary Rlse Alm
Output 32	Output 2	White/Pink	TB3-19	3	5	1	NT-32 Primary Rlse Alm
Output 33	Output 2	White/Blue	TB3-21	3	6	3	NT-33 Primary Rlse Alm
Output 34	Output 2	White/Red	TB3-23	3	6	1	NT-34 Primary Rlse Alm
Output 35	Output 3	White	TB4-1	4	1	3	NT-35 Primary Rlse Alm
Output 36	Output 3	Green	TB4-3	4	1	1	NT-36 Primary Rlse Alm
Output 37	Output 3	Grey	TB4-5	4	2	3	NT-37 Primary Rlse Alm
Output 38	Output 3	Red	TB4-8	4	2	2	NT-38 Primary Rlse Alm
Output 39	Output 3	Violet	TB4-10	4	3	4	NT-39 Primary Rlse Alm
Output 40	Output 3	Red/Blue	TB4-12	4	3	2	NT-40 Primary Rlse Alm
Output 41	Output 3	Brown/Green	TB4-14	4	4	4	NT-41 Primary Rlse Alm
Output 42	Output 3	Yellow/Brown	TB4-16	4	4	2	NT-42 Primary Rlse Alm
Output 43	Output 3	Grey/Brown	TB4-18	4	5	4	NT-43 Primary Rlse Alm
Output 44	Output 3	Pink/Brown	TB4-20	4	5	2	NT-44 Primary Rlse Alm
Output 45	Output 3	Brown/Blue	TB4-22	4	6	4	NT-45 Primary Rlse Alm
Output 46	Output 3	Brown/Red	TB4-24	4	6	2	NT-46 Primary Rlse Alm
Output 47	Output 4	White	TB5-1	5	1	3	NT-47 Primary Rlse Alm
Output 48	Output 4	Green	TB5-3	5	1	1	NT-48 Primary Rlse Alm
Output 49	Output 4	Grey	TB5-5	5	2	3	NT-49 Primary Rlse Alm
Output 50	Output 4	Blue	TB5-7	5	2	1	NT-50 Primary Rlse Alm
Output 51	Output 4	Black	TB5-9	5	3	3	NT-51 Primary Rlse Alm
Output 52	Output 4	Grey/Pink	TB5-11	5	3	1	NT-52 Primary Rlse Alm
Output 53	Output 4	White/Green	TB5-13	5	4	3	NT-53 Primary Rlse Alm
Output 54	Output 4	White/Yellow	TB5-15	5	4	1	NT-54 Primary Rlse Alm
Output 55	Output 4	White/Grey	TB5-17	5	5	3	NT-55 Primary Rlse Alm
Output 56	Output 4	White/Pink	TB5-19	5	5	1	NT-56 Primary Rlse Alm
Output 57	Output 4	White/Blue	TB5-21	5	6	3	NT-57 Primary Rlse Alm
Output 58	Output 4	White/Red	TB5-23	5	6	1	NT-58 Primary Rlse Alm
Output 59	Output 5	White	TB6-1	6	1	3	NT-59 Primary Rlse Alm
Output 60	Output 5	Green	TB6-3	6	1	1	NT-60 Primary Rlse Alm
Output 61	Output 5	Grey	TB6-5	6	2	3	NT-61 Primary Rlse Alm
Output 62	Output 5	Blue	TB6-7	6	2	1	NT-62 Primary Rlse Alm
Output 63	Output 5	Black	TB6-9	6	3	3	NT-63 Primary Rlse Alm
Output 64	Output 5	Grey/Pink	TB6-11	6	3	1	NT-64 Primary Rlse Alm
Output 65	Output 5	White/Green	TB6-13	6	4	3	NT-65 Primary Rlse Alm
Output 66	Output 5	White/Yellow	TB6-15	6	4	1	NT-66 Primary Rlse Alm
Output 67	Output 5	White/Grey	TB6-17	6	5	3	NT-67 Primary Rlse Alm
Output 68	Output 5	White/Pink	TB6-19	6	5	1	NT-68 Primary Rlse Alm
Output 69	Output 5	White/Blue	TB6-21	6	6	3	NT-69 Primary Rlse Alm
Output 70	Output 5	White/Red	TB6-23	6	6	1	NT-70 Primary Rlse Alm
Output 71	Output 6	White	TB7-1	7	1	3	NT-71 Primary Rlse Alm
Output 72	Output 6	Green	TB7-3	7	1	1	NT-72 Primary Rlse Alm
Output 73	Output 6	Grey	TB7-5	7	2	3	NT-73 Primary Rlse Alm
Output 74	Output 6	Blue	TB7-7	7	2	1	NT-74 Primary Rlse Alm
Output 75	Output 6	Black	TB7-9	7	3	3	NT-75 Primary Rlse Alm
Output 76	Output 6	Grey/Pink	TB7-11	7	3	1	NT-76 Primary Rlse Alm
Output 77	Output 6	White/Green	TB7-13	7	4	3	NT-77 Primary Rlse Alm
Output 78	Output 6	White/Yellow	TB7-15	7	4	1	NT-78 Primary Rlse Alm
Output 79	Output 6	White/Grey	TB7-17	7	5	3	NT-79 Primary Rlse Alm
Output 80	Output 6	White/Pink	TB7-19	7	5	1	NT-80 Primary Rlse Alm
Output 81	Output 6	White/Blue	TB7-21	7	6	3	NT-81 Primary Rlse Alm
Output 82	Output 6	White/Red	TB7-23	7	6	1	NT-82 Primary Rlse Alm
Output 83	Output 7	White	TB8-1	8	1	3	NT-83 Primary Rlse Alm
Output 84	Output 7	Green	TB8-3	8	1	1	NT-84 Primary Rlse Alm
Output 85	Output 7	Grey	TB8-5	8	2	3	NT-85 Primary Rlse Alm
Output 86	Output 7	Blue	TB8-7	8	2	1	NT-86 Primary Rlse Alm
Output 87	Output 7	Black	TB8-9	8	3	3	NT-87 Primary Rlse Alm
Output 88	Output 7	Grey/Pink	TB8-11	8	3	1	NT-88 Primary Rlse Alm
Output 89	Output 7	White/Green	TB8-13	8	4	3	NT-89 Primary Rlse Alm
Output 90	Output 7	White/Yellow	TB8-15	8	4	1	NT-90 Primary Rlse Alm
Output 91	Output 7	White/Grey	TB8-17	8	5	3	ST-01 Secondary Rlse Alm
Output 92	Output 7	White/Pink	TB8-19	8	5	1	ST-02 Secondary Rlse Alm
Output 93	Output 7	White/Blue	TB8-21	8	6	3	ST-03 Secondary Rlse Alm
Output 94	Output 7	White/Red	TB8-23	8	6	1	ST-04 Secondary Rlse Alm
Output 95	Output 8	White	TB9-1	9	1	3	ST-05 Secondary Rlse Alm
Output 96	Output 8	Green	TB9-3	9	1	1	ST-06 Secondary Rlse Alm
Output 97	Output 8	Grey	TB9-5	9	2	3	ST-07 Secondary Rlse Alm
Output 98	Output 8	Blue	TB9-7	9	2	1	ST-08 Secondary Rlse Alm
Output 99	Output 8	Black	TB9-9	9	3	3	ST-09 Secondary Rlse Alm
Output 100	Output 8	Grey/Pink	TB9-11	9	3	1	ST-10 Secondary Rlse Alm
Output 101	Output 8	White/Green	TB9-13	9	4	3	ST-11 Secondary Rlse Alm
Output 102	Output 8	White/Yellow	TB9-15	9	4	1	ST-12 Secondary Rlse Alm
Output 103	Output 8	White/Grey	TB9-17	9	5	3	ST-13 Secondary Rlse Alm
Output 104	Output 8	White/Pink	TB9-19	9	5	1	ST-14 Secondary Rlse Alm
Output 105	Output 8	White/Blue	TB9-21	9	6	3	ST-15 Secondary Rlse Alm
Output 106	Output 8	White/Red	TB9-23	9	6	1	ST-16 Secondary Rlse Alm

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE



1 WEST CONTROL ROOM - RACK #1 - FRONT VIEW - KEY PLAN
SCALE: 1 : 16



MIDDLE ATLANTIC EQUIPMENT RACK WRK-44SA-32
OVERALL DIMENSIONS ARE: 22-3/8"(W) x 32-5/8"(D) x 83-1/8"(H)
USEABLE DIMENSIONS ARE: 19-1/2"(W) x 30-3/4"(D) x 77-1/8"(H)
WEST CONTROL ROOM - RACK #1
FRONT VIEW - TOP SECTION

2 WEST CONTROL ROOM - RACK #1 - FRONT VIEW - TOP SECTION
SCALE: 1 : 2

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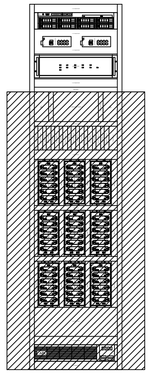
EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions			
Num	Description	Date	

DRAWN BY: B.T.L. | CHECKED BY: AEE,Jr

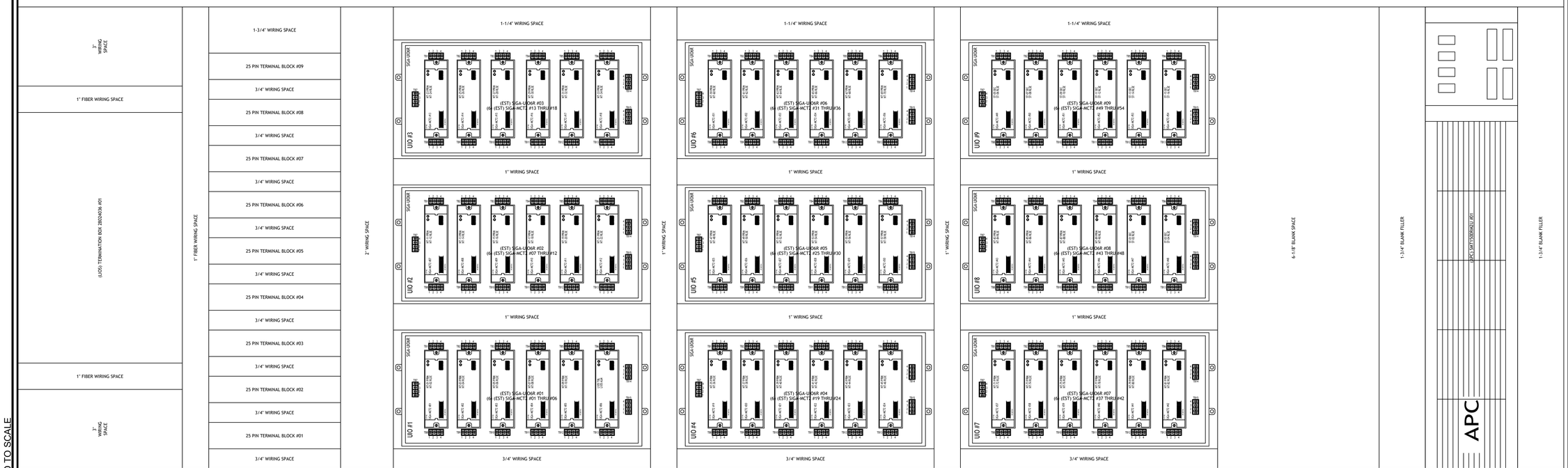
FIRE ALARM:
DETAILS-WEST CNTRL-RACK #1-WIRE-FRONT-TOP

Drawing Number
FA6.24



1 WEST CONTROL ROOM - RACK #1 - FRONT VIEW - KEY PLAN
SCALE: 1 : 16

SEE SHEET FA6.24



SEE SHEET FA6.24

MIDDLE ATLANTIC EQUIPMENT RACK WRK-44SA-32
OVERALL DIMENSIONS ARE: 22-3/8"(W) x 32-5/8"(D) x 83-1/8"(H)
USEABLE DIMENSIONS ARE: 19-1/2"(W) x 30-3/4"(D) x 77-1/8"(H)
WEST CONTROL ROOM - RACK #1
FRONT VIEW - BOTTOM SECTION

1 WEST CONTROL ROOM - RACK #1 - FRONT VIEW - BOTTOM SECTION
SCALE: 1 : 2

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions
Num | Description | Date

DRAWN BY: B.T.L. | CHECKED BY: AEE,Jr

FIRE ALARM:
DETAILS-WEST CNTRL-RACK #1-WIRE-FRONT-BOTTOM

Drawing Number
FA6.25

EJMT Tunnel Project
West Control Room
RACK #1 Wiring Spreadsheet
Mid-Rear Level

Ckt Description	RTU Input	RTU MOXA Module	UIO #	MCR #	Term #	Notes
Common	DI Gnd	1				Connect DI Gnd to all UIO MCR term 2's
CCTV Input 1	DI 0	1	1	1	1	ST-01 Primary CCTV Pre-Alm
CCTV Input 2	DI 1	1	1	2	1	ST-02 Primary CCTV Pre-Alm
CCTV Input 3	DI 2	1	1	3	1	ST-03 Primary CCTV Pre-Alm
CCTV Input 4	DI 3	1	1	4	1	ST-04 Primary CCTV Pre-Alm
CCTV Input 5	DI 4	1	1	5	1	ST-05 Primary CCTV Pre-Alm
CCTV Input 6	DI 5	1	1	6	1	ST-06 Primary CCTV Pre-Alm
CCTV Input 7	DI 6	1	2	1	1	ST-07 Primary CCTV Pre-Alm
CCTV Input 8	DI 7	1	2	2	1	ST-08 Primary CCTV Pre-Alm
CCTV Input 9	DI 8	1	2	3	1	ST-09 Primary CCTV Pre-Alm
CCTV Input 10	DI 9	1	2	4	1	ST-10 Primary CCTV Pre-Alm
CCTV Input 11	DI 10	1	2	5	1	ST-11 Primary CCTV Pre-Alm
CCTV Input 12	DI 11	1	2	6	1	ST-12 Primary CCTV Pre-Alm
Common	DI Gnd	2				Connect DI Gnd to all UIO MCR term 2's
CCTV Input 13	DI 0	2	3	1	1	ST-13 Primary CCTV Pre-Alm
CCTV Input 14	DI 1	2	3	2	1	ST-14 Primary CCTV Pre-Alm
CCTV Input 15	DI 2	2	3	3	1	ST-15 Primary CCTV Pre-Alm
CCTV Input 16	DI 3	2	3	4	1	ST-16 Primary CCTV Pre-Alm
CCTV Input 17	DI 4	2	3	5	1	ST-17 Primary CCTV Pre-Alm
CCTV Input 18	DI 5	2	3	6	1	ST-18 Primary CCTV Pre-Alm
CCTV Input 19	DI 6	2	4	1	1	ST-19 Primary CCTV Pre-Alm
CCTV Input 20	DI 7	2	4	2	1	ST-20 Primary CCTV Pre-Alm
CCTV Input 21	DI 8	2	4	3	1	ST-21 Primary CCTV Pre-Alm
CCTV Input 22	DI 9	2	4	4	1	ST-22 Primary CCTV Pre-Alm
CCTV Input 23	DI 10	2	4	5	1	ST-23 Primary CCTV Pre-Alm
CCTV Input 24	DI 11	2	4	6	1	ST-24 Primary CCTV Pre-Alm
Common	DI Gnd	3				Connect DI Gnd to all UIO MCR term 2's
CCTV Input 25	DI 0	3	5	1	1	ST-25 Primary CCTV Pre-Alm
CCTV Input 26	DI 1	3	5	2	1	ST-26 Primary CCTV Pre-Alm
CCTV Input 27	DI 2	3	5	3	1	ST-27 Primary CCTV Pre-Alm
CCTV Input 28	DI 3	3	5	4	1	ST-28 Primary CCTV Pre-Alm
CCTV Input 29	DI 4	3	5	5	1	ST-29 Primary CCTV Pre-Alm
CCTV Input 30	DI 5	3	5	6	1	ST-30 Primary CCTV Pre-Alm
CCTV Input 31	DI 6	3	6	1	1	ST-31 Primary CCTV Pre-Alm
CCTV Input 32	DI 7	3	6	2	1	ST-32 Primary CCTV Pre-Alm
CCTV Input 33	DI 8	3	6	3	1	ST-33 Primary CCTV Pre-Alm
CCTV Input 34	DI 9	3	6	4	1	ST-34 Primary CCTV Pre-Alm
CCTV Input 35	DI 10	3	6	5	1	ST-35 Primary CCTV Pre-Alm
CCTV Input 36	DI 11	3	6	6	1	ST-36 Primary CCTV Pre-Alm
Common	DI Gnd	4				Connect DI Gnd to all UIO MCR term 2's
CCTV Input 37	DI 0	4	7	1	1	ST-37 Primary CCTV Pre-Alm
CCTV Input 38	DI 1	4	7	2	1	ST-38 Primary CCTV Pre-Alm
CCTV Input 39	DI 2	4	7	3	1	ST-39 Primary CCTV Pre-Alm
CCTV Input 40	DI 3	4	7	4	1	ST-40 Primary CCTV Pre-Alm
CCTV Input 41	DI 4	4	7	5	1	ST-41 Primary CCTV Pre-Alm
CCTV Input 42	DI 5	4	7	6	1	ST-42 Primary CCTV Pre-Alm
CCTV Input 43	DI 6	4	8	1	1	ST-43 Primary CCTV Pre-Alm
CCTV Input 44	DI 7	4	8	2	1	ST-44 Primary CCTV Pre-Alm
CCTV Input 45	DI 8	4	8	3	1	ST-45 Primary CCTV Pre-Alm
CCTV Input 46	DI 9	4	8	4	1	ST-46 Primary CCTV Pre-Alm
CCTV Input 47	DI 10	4	8	5	1	ST-47 Primary CCTV Pre-Alm
CCTV Input 48	DI 11	4	8	6	1	ST-48 Primary CCTV Pre-Alm
Common	DI Gnd	5				Connect DI Gnd to all UIO MCR term 2's
CCTV Input 49	DI 0	5	9	1	1	ST-49 Primary CCTV Pre-Alm
CCTV Input 50	DI 1	5	9	2	1	ST-50 Primary CCTV Pre-Alm
CCTV Input 51	DI 2	5	9	3	1	ST-51 Primary CCTV Pre-Alm
CCTV Input 52	DI 3	5	9	4	1	ST-52 Primary CCTV Pre-Alm
CCTV Input 53	DI 4	5	9	5	1	ST-53 Primary CCTV Pre-Alm
CCTV Input 54	DI 5	5	9	6	1	ST-54 Primary CCTV Pre-Alm
CCTV Input 55	DI 6	5	10	1	1	ST-55 Primary CCTV Pre-Alm
CCTV Input 56	DI 7	5	10	2	1	ST-56 Primary CCTV Pre-Alm
CCTV Input 57	DI 8	5	10	3	1	ST-57 Primary CCTV Pre-Alm
CCTV Input 58	DI 9	5	10	4	1	ST-58 Primary CCTV Pre-Alm
CCTV Input 59	DI 10	5	10	5	1	ST-59 Primary CCTV Pre-Alm
CCTV Input 60	DI 11	5	10	6	1	ST-60 Primary CCTV Pre-Alm
Common	DI Gnd	6				Connect DI Gnd to all UIO MCR term 2's
CCTV Input 61	DI 0	6	11	1	1	ST-61 Primary CCTV Pre-Alm
CCTV Input 62	DI 1	6	11	2	1	ST-62 Primary CCTV Pre-Alm
CCTV Input 63	DI 2	6	11	3	1	ST-63 Primary CCTV Pre-Alm
CCTV Input 64	DI 3	6	11	4	1	ST-64 Primary CCTV Pre-Alm
CCTV Input 65	DI 4	6	11	5	1	ST-65 Primary CCTV Pre-Alm
CCTV Input 66	DI 5	6	11	6	1	ST-66 Primary CCTV Pre-Alm
CCTV Input 67	DI 6	6	12	1	1	ST-67 Primary CCTV Pre-Alm
CCTV Input 68	DI 7	6	12	2	1	ST-68 Primary CCTV Pre-Alm
CCTV Input 69	DI 8	6	12	3	1	ST-69 Primary CCTV Pre-Alm
CCTV Input 70	DI 9	6	12	4	1	ST-70 Primary CCTV Pre-Alm
CCTV Input 71	DI 10	6	12	5	1	ST-71 Primary CCTV Pre-Alm
CCTV Input 72	DI 11	6	12	6	1	ST-72 Primary CCTV Pre-Alm
Common	DI Gnd	7				Connect DI Gnd to all UIO MCR term 2's
CCTV Input 73	DI 0	7	13	1	1	ST-73 Primary CCTV Pre-Alm
CCTV Input 74	DI 1	7	13	2	1	ST-74 Primary CCTV Pre-Alm
CCTV Input 75	DI 2	7	13	3	1	ST-75 Primary CCTV Pre-Alm
CCTV Input 76	DI 3	7	13	4	1	ST-76 Primary CCTV Pre-Alm
CCTV Input 77	DI 4	7	13	5	1	ST-77 Primary CCTV Pre-Alm
CCTV Input 78	DI 5	7	13	6	1	ST-78 Primary CCTV Pre-Alm
CCTV Input 79	DI 6	7	14	1	1	ST-79 Primary CCTV Pre-Alm
CCTV Input 80	DI 7	7	14	2	1	ST-80 Primary CCTV Pre-Alm
CCTV Input 81	DI 8	7	14	3	1	ST-81 Primary CCTV Pre-Alm
CCTV Input 82	DI 9	7	14	4	1	ST-82 Primary CCTV Pre-Alm
CCTV Input 83	DI 10	7	14	5	1	ST-83 Primary CCTV Pre-Alm
CCTV Input 84	DI 11	7	14	6	1	ST-84 Primary CCTV Pre-Alm
Common	DI Gnd	8				Connect DI Gnd to all UIO MCR term 2's
CCTV Input 85	DI 0	8	15	1	1	ST-85 Primary CCTV Pre-Alm
CCTV Input 86	DI 1	8	15	2	1	ST-86 Primary CCTV Pre-Alm
CCTV Input 87	DI 2	8	15	3	1	ST-87 Primary CCTV Pre-Alm
CCTV Input 88	DI 3	8	15	4	1	ST-88 Primary CCTV Pre-Alm
CCTV Input 89	DI 4	8	15	5	1	ST-89 Primary CCTV Pre-Alm
CCTV Input 90	DI 5	8	15	6	1	ST-90 Primary CCTV Pre-Alm
CCTV Input 91	DI 6	8	16	1	1	ST-91 Primary CCTV Pre-Alm
CCTV Input 92	DI 7	8	16	2	1	ST-92 Primary CCTV Pre-Alm
CCTV Input 93	DI 8	8	16	3	1	ST-93 Primary CCTV Pre-Alm
			16	4	1	LIOS Reset
			16	5	1	LIOS Acknowledge
CCTV Sw #1 TBL			16	6	3	CCTV Sw #1 TBL
CCTV Sw #1 TBL			16	6	4	CCTV Sw #1 TBL
CCTV Sw #2 TBL			16	6	1	CCTV Sw #2 TBL
CCTV Sw #2 TBL			16	6	2	CCTV Sw #2 TBL

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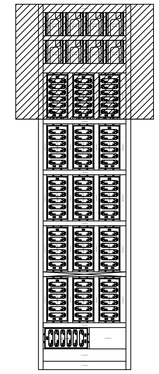
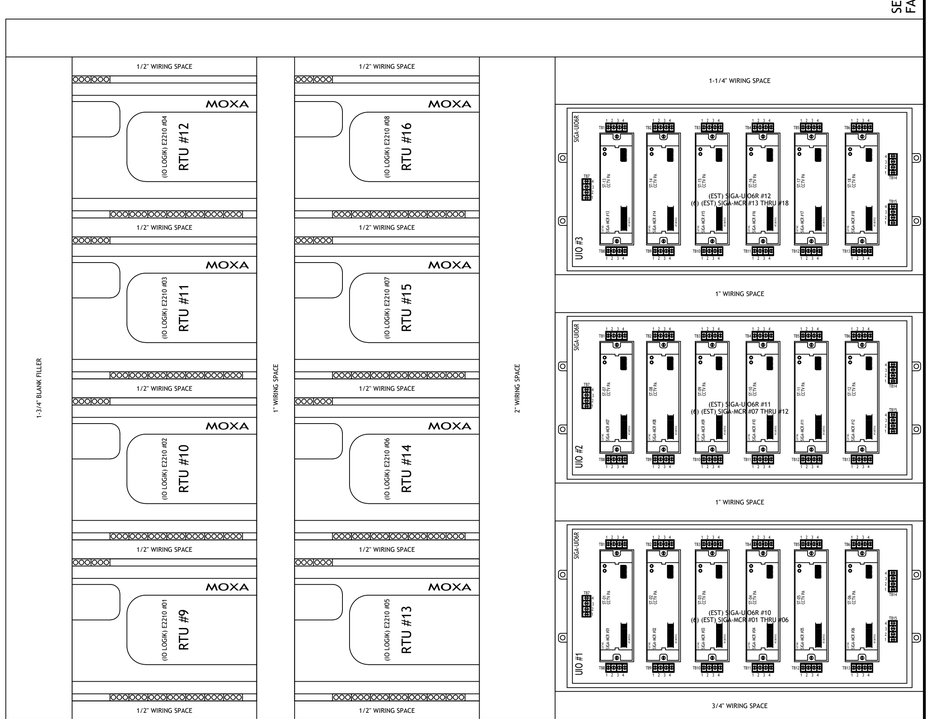


1 WEST CONTROL ROOM - RACK #1 - REAR VIEW - KEY PLAN
SCALE: 1 : 16

SEE SHEET FA6.27



SEE SHEET FA6.27

MIDDLE ATLANTIC EQUIPMENT RACK WRK-44SA-32
OVERALL DIMENSIONS ARE: 22-3/8"(W) x 32-5/8"(D) x 83-1/8"(H)
USEABLE DIMENSIONS ARE: 19-1/2"(W) x 30-3/4"(D) x 77-1/8"(H)
WEST CONTROL ROOM - RACK #1
REAR VIEW - TOP SECTION

2 WEST CONTROL ROOM - RACK #1 - REAR VIEW - TOP SECTION
SCALE: 1 : 2

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

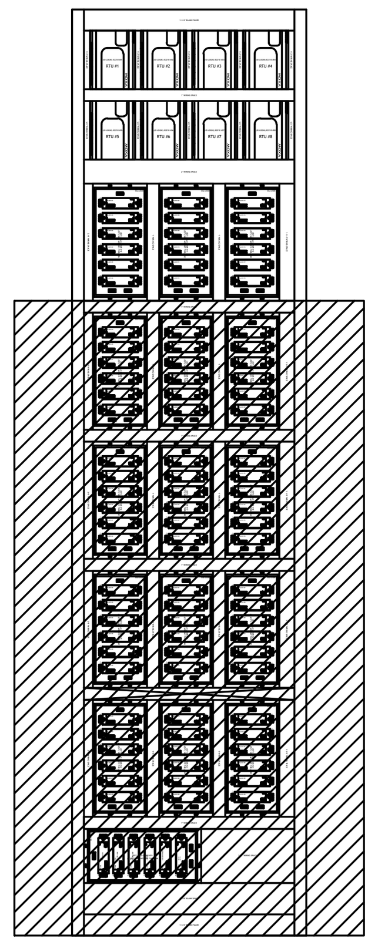
Revisions

Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
DETAILS-WEST CNTRL-RACK #1-WIRE-REAR-TOP

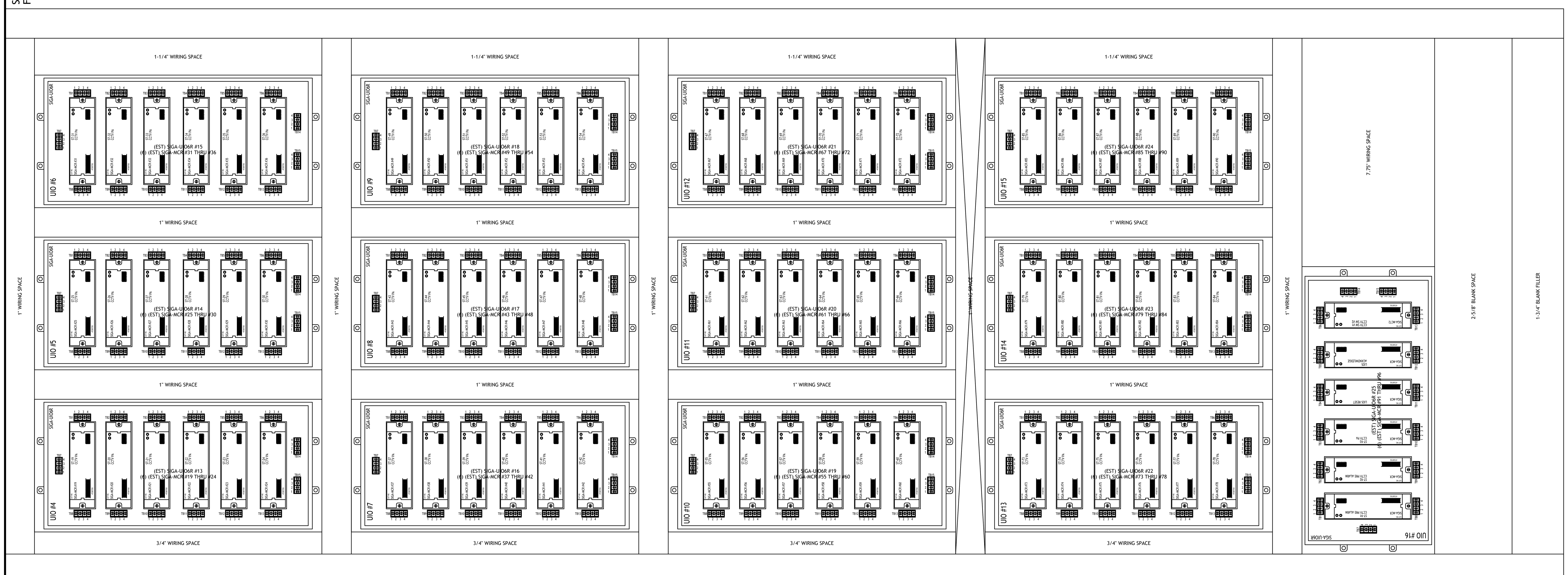
Drawing Number
FA6.26



1 WEST CONTROL ROOM - RACK #1 - REAR VIEW - KEY PLAN

SCALE: 1 : 16

SEE SHEET FA6.26



SEE SHEET FA6.26

MIDDLE ATLANTIC EQUIPMENT RACK WRK-44SA-32
OVERALL DIMENSIONS ARE: 22-3/8"(W) x 32-5/8"(D) x 83-1/8"(H)
USEABLE DIMENSIONS ARE: 19-1/2"(W) x 30-3/4"(D) x 77-1/8"(H)
WEST CONTROL ROOM - RACK #1
REAR VIEW - BOTTOM SECTION

1 WEST CONTROL ROOM - RACK #1 - REAR VIEW - BOTTOM SECTION

SCALE: 1 : 2

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FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
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RECORD DRAWINGS - 2015-11-16

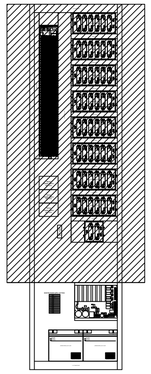
Revisions		
Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
DETAILS-WEST CNTRL-RACK #1-WIRE-REAR-BOTTOM

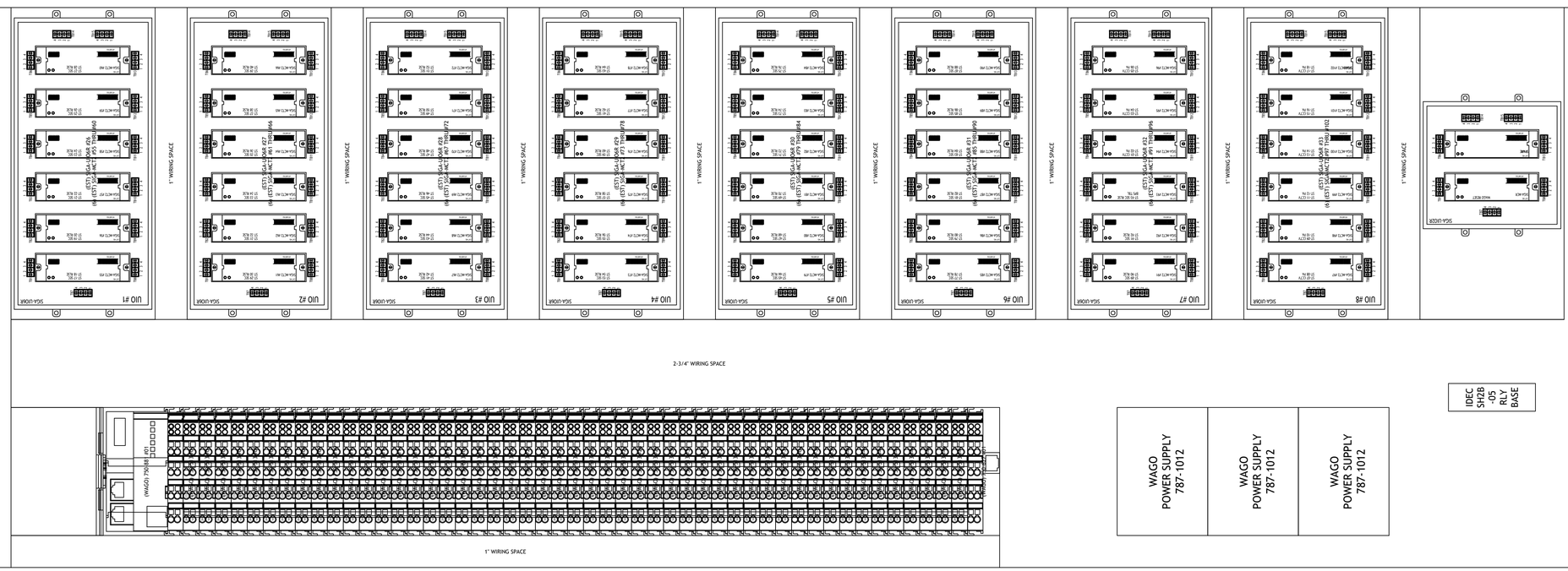
Drawing Number

FA6.27



1 WEST CONTROL ROOM - RACK #2 - FRONT VIEW - KEY PLAN
SCALE: 1 : 16

SEE SHEET FA6.29



MIDDLE ATLANTIC EQUIPMENT RACK WRK-44SA-32
OVERALL DIMENSIONS ARE: 22-3/8"(W) x 32-5/8"(D) x 83-1/8"(H)
USEABLE DIMENSIONS ARE: 19-1/2"(W) x 30-3/4"(D) x 77-1/8"(H)
WEST CONTROL ROOM - RACK #2
FRONT VIEW - TOP SECTION

2 WEST CONTROL ROOM - RACK #2 - FRONT VIEW - TOP SECTION
SCALE: 1 : 2

SEE SHEET FA6.29

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Revisions
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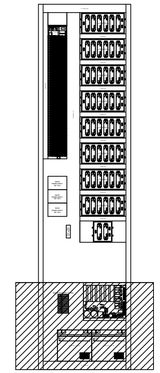
FIRE ALARM:
DETAILS-WEST CNTRL-RACK #2-WIRE-FRONT-TOP

Drawing Number
FA6.28

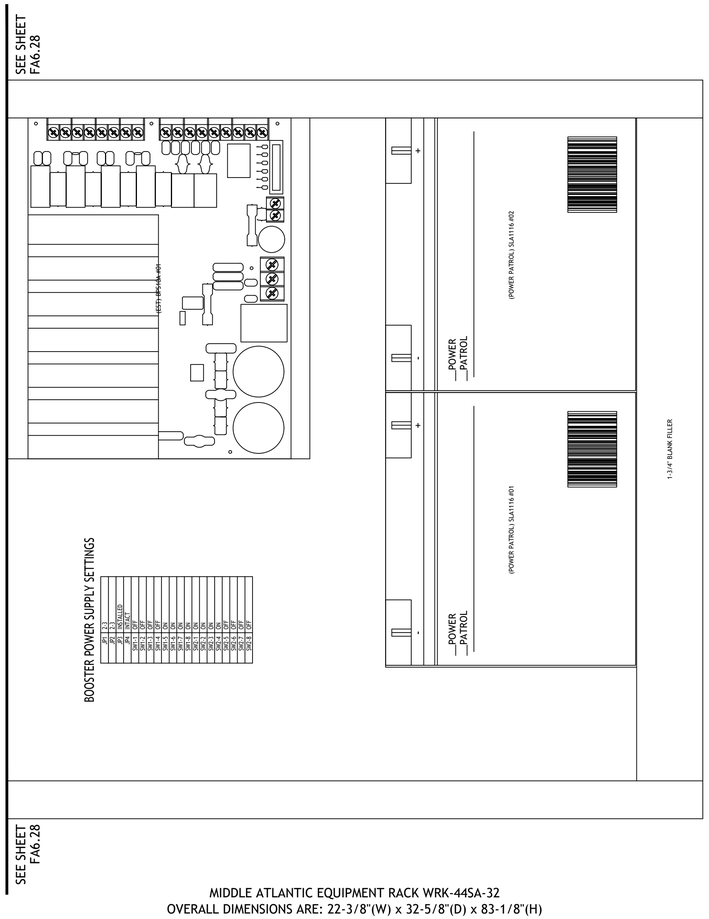
EJMT Tunnel Project
West Control Room
RACK #2 Wiring Spreadsheet
Mid-Front Level

ModBus Outputs	WAGO 513 Rly Mod #	WAGO 513 Rly #	UIO #	MCT2 #	Notes
Output 107	1	1	1	1	ST-17 Secondary Rlse Alm
Output 108	1	2	1	1	ST-18 Secondary Rlse Alm
Output 109	2	3	1	2	ST-19 Secondary Rlse Alm
Output 110	2	4	1	2	ST-20 Secondary Rlse Alm
Output 111	3	5	1	3	ST-21 Secondary Rlse Alm
Output 112	3	6	1	3	ST-22 Secondary Rlse Alm
Output 113	4	7	1	4	ST-23 Secondary Rlse Alm
Output 114	4	8	1	4	ST-24 Secondary Rlse Alm
Output 115	5	9	1	5	ST-25 Secondary Rlse Alm
Output 116	5	10	1	5	ST-26 Secondary Rlse Alm
Output 117	6	11	1	6	ST-27 Secondary Rlse Alm
Output 118	6	12	1	6	ST-28 Secondary Rlse Alm
Output 119	7	13	2	1	ST-29 Secondary Rlse Alm
Output 120	7	14	2	1	ST-30 Secondary Rlse Alm
Output 121	8	15	2	2	ST-31 Secondary Rlse Alm
Output 122	8	16	2	2	ST-32 Secondary Rlse Alm
Output 123	9	17	2	3	ST-33 Secondary Rlse Alm
Output 124	9	18	2	3	ST-34 Secondary Rlse Alm
Output 125	10	19	2	4	ST-35 Secondary Rlse Alm
Output 126	10	20	2	4	ST-36 Secondary Rlse Alm
Output 127	11	21	2	5	ST-37 Secondary Rlse Alm
Output 128	11	22	2	5	ST-38 Secondary Rlse Alm
Output 129	12	23	2	6	ST-39 Secondary Rlse Alm
Output 130	12	24	2	6	ST-40 Secondary Rlse Alm
Output 131	13	25	3	1	ST-41 Secondary Rlse Alm
Output 132	13	26	3	1	ST-42 Secondary Rlse Alm
Output 133	14	27	3	2	ST-43 Secondary Rlse Alm
Output 134	14	28	3	2	ST-44 Secondary Rlse Alm
Output 135	15	29	3	3	ST-45 Secondary Rlse Alm
Output 136	15	30	3	3	ST-46 Secondary Rlse Alm
Output 137	16	31	3	4	ST-47 Secondary Rlse Alm
Output 138	16	32	3	4	ST-48 Secondary Rlse Alm
Output 139	17	33	3	5	ST-49 Secondary Rlse Alm
Output 140	17	34	3	5	ST-50 Secondary Rlse Alm
Output 141	18	35	3	6	ST-51 Secondary Rlse Alm
Output 142	18	36	3	6	ST-52 Secondary Rlse Alm
Output 143	19	37	4	1	ST-53 Secondary Rlse Alm
Output 144	19	38	4	1	ST-54 Secondary Rlse Alm
Output 145	20	39	4	2	ST-55 Secondary Rlse Alm
Output 146	20	40	4	2	ST-56 Secondary Rlse Alm
Output 147	21	41	4	3	ST-57 Secondary Rlse Alm
Output 148	21	42	4	3	ST-58 Secondary Rlse Alm
Output 149	22	43	4	4	ST-59 Secondary Rlse Alm
Output 150	22	44	4	4	ST-60 Secondary Rlse Alm
Output 151	23	45	4	5	ST-61 Secondary Rlse Alm
Output 152	23	46	4	5	ST-62 Secondary Rlse Alm
Output 153	24	47	4	6	ST-63 Secondary Rlse Alm
Output 154	24	48	4	6	ST-64 Secondary Rlse Alm
Output 155	25	49	5	1	ST-65 Secondary Rlse Alm
Output 156	25	50	5	1	ST-66 Secondary Rlse Alm
Output 157	26	51	5	2	ST-67 Secondary Rlse Alm
Output 158	26	52	5	2	ST-68 Secondary Rlse Alm
Output 159	27	53	5	3	ST-69 Secondary Rlse Alm
Output 160	27	54	5	3	ST-70 Secondary Rlse Alm
Output 161	28	55	5	4	ST-71 Secondary Rlse Alm
Output 162	28	56	5	4	ST-72 Secondary Rlse Alm
Output 163	29	57	5	5	ST-73 Secondary Rlse Alm
Output 164	29	58	5	5	ST-74 Secondary Rlse Alm
Output 165	30	59	5	6	ST-75 Secondary Rlse Alm
Output 166	30	60	5	6	ST-76 Secondary Rlse Alm
Output 167	31	61	6	1	ST-77 Secondary Rlse Alm
Output 168	31	62	6	1	ST-78 Secondary Rlse Alm
Output 169	32	63	6	2	ST-79 Secondary Rlse Alm
Output 170	32	64	6	2	ST-80 Secondary Rlse Alm
Output 171	33	65	6	3	ST-81 Secondary Rlse Alm
Output 172	33	66	6	3	ST-82 Secondary Rlse Alm
Output 173	34	67	6	4	ST-83 Secondary Rlse Alm
Output 174	34	68	6	4	ST-84 Secondary Rlse Alm
Output 175	35	69	6	5	ST-85 Secondary Rlse Alm
Output 176	35	70	6	5	ST-86 Secondary Rlse Alm
Output 177	36	71	6	6	ST-87 Secondary Rlse Alm
Output 178	36	72	6	6	ST-88 Secondary Rlse Alm
Output 179	37	73	7	1	ST-89 Secondary Rlse Alm
Output 180	37	74	7	1	ST-90 Secondary Rlse Alm
Output 181	38	75	7	2	ST-91 Secondary Rlse Alm
Output 182	38	76	7	2	ST-92 Secondary Rlse Alm
Output 183	39	77	7	3	ST-93 Secondary Rlse Alm
			7	3	BPS Trouble
Output 184	39	78	7	3	ST-01 CCTV Pre-Alm
Output 185	40	79	7	4	ST-02 CCTV Pre-Alm
Output 186	40	80	7	4	ST-03 CCTV Pre-Alm
Output 187	41	81	7	5	ST-04 CCTV Pre-Alm
Output 188	41	82	7	5	ST-05 CCTV Pre-Alm
Output 189	42	83	7	6	ST-06 CCTV Pre-Alm
Output 190	42	84	7	6	ST-07 CCTV Pre-Alm
Output 191	43	85	8	1	ST-08 CCTV Pre-Alm
Output 192	43	86	8	1	ST-09 CCTV Pre-Alm
Output 193	44	87	8	2	ST-10 CCTV Pre-Alm
Output 194	44	88	8	2	ST-11 CCTV Pre-Alm
Output 195	45	89	8	3	ST-12 CCTV Pre-Alm
Output 196	45	90	8	3	ST-13 CCTV Pre-Alm
Output 197	46	91	8	4	ST-14 CCTV Pre-Alm
Output 198	46	92	8	4	ST-15 CCTV Pre-Alm
Output 199	47	93	8	5	ST-16 CCTV Pre-Alm
Output 200	47	94	8	5	ST-17 CCTV Pre-Alm
Output 201	48	95	8	6	ST-18 CCTV Pre-Alm
Output 202	48	96	8	6	Spare Relay

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE



1 WEST CONTROL ROOM - RACK #2 - FRONT VIEW - KEY PLAN
SCALE: 1 : 16



MIDDLE ATLANTIC EQUIPMENT RACK WRK-44SA-32
OVERALL DIMENSIONS ARE: 22-3/8"(W) x 32-5/8"(D) x 83-1/8"(H)
USEABLE DIMENSIONS ARE: 19-1/2"(W) x 30-3/4"(D) x 77-1/8"(H)
WEST CONTROL ROOM - RACK #2
FRONT VIEW - BOTTOM SECTION

1 WEST CONTROL ROOM - RACK #2 - FRONT VIEW - BOTTOM SECTION
SCALE: 1 : 2

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Sturgeon Electric

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810

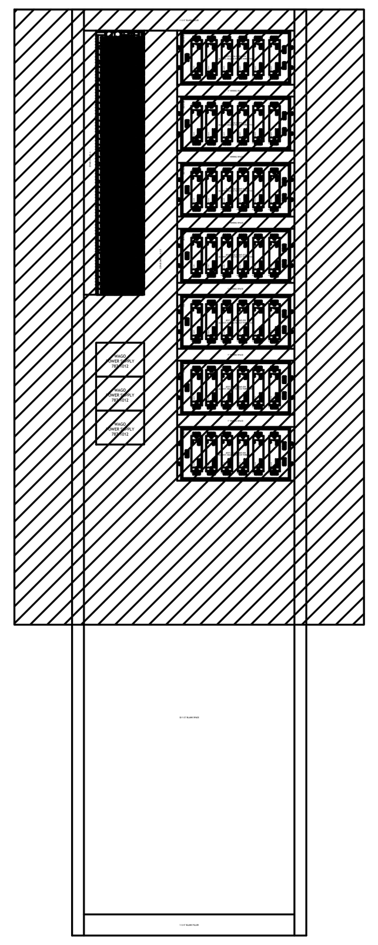
RECORD DRAWINGS - 2015-11-16

Revisions
Num | Description | Date

DRAWN BY: B.T.L. | CHECKED BY: AEE, Jr

FIRE ALARM:
DETAILS-WEST CNTRL-RACK #2-WIRE-FRONT-BOTTOM

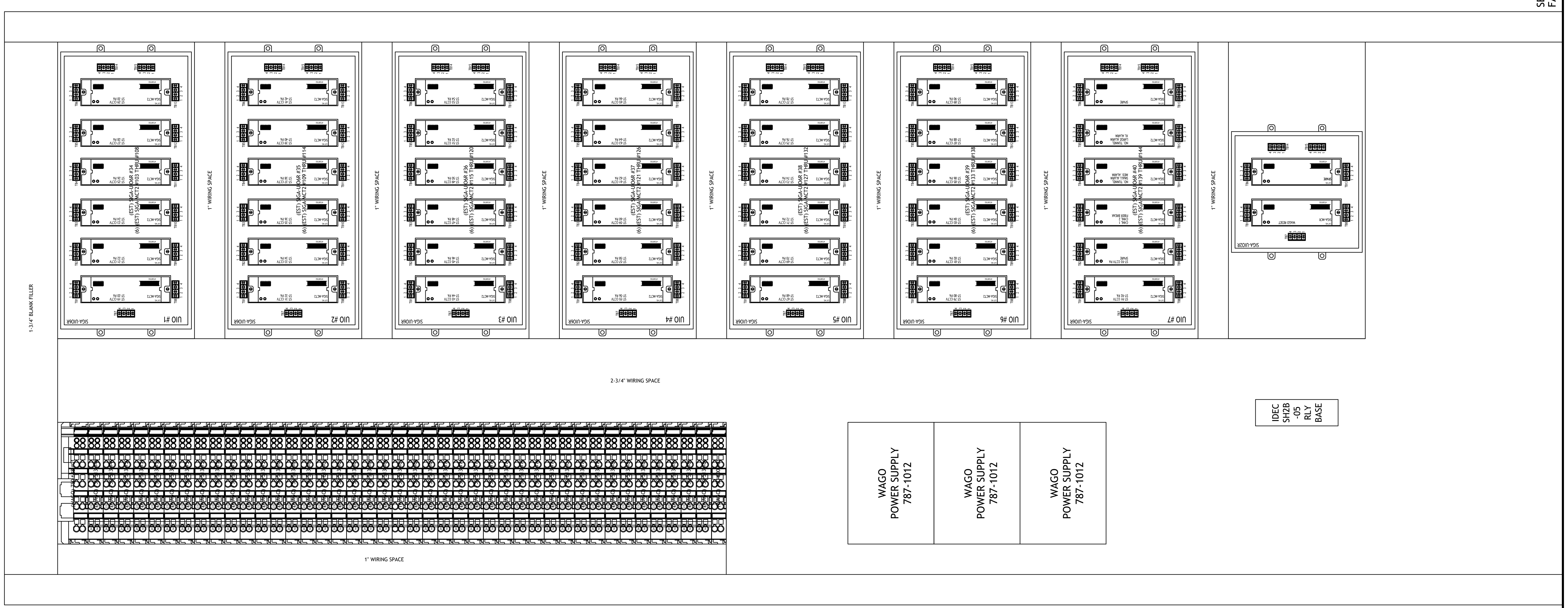
Drawing Number
FA6.29



1 WEST CONTROL ROOM - RACK #2 - REAR VIEW - KEY PLAN

SCALE: 1 : 16

SEE SHEET FA6.31



SEE SHEET FA6.31

MIDDLE ATLANTIC EQUIPMENT RACK WRK-44SA-32
OVERALL DIMENSIONS ARE: 22-3/8"(W) x 32-5/8"(D) x 83-1/8"(H)
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WEST CONTROL ROOM - RACK #2
REAR VIEW - TOP SECTION

2 WEST CONTROL ROOM - RACK #2 - REAR VIEW - TOP SECTION

SCALE: 1 : 2

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
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Revisions		
Num	Description	Date

DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

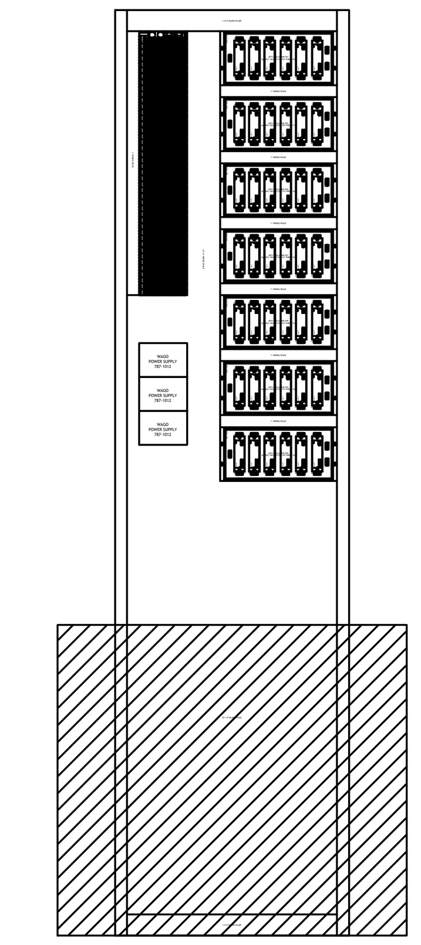
FIRE ALARM:
DETAILS-WEST CNTRL-RACK #2-WIRE-REAR-TOP

Drawing Number
FA6.30

EJMT Tunnel Project
West Control Room
RACK #2 Wiring Spreadsheet
Mid-Rear Level

ModBus Outputs	WAGO 513 Rly Mod #	WAGO 513 Rly #	UIO #	MCT2 #	Notes
Output 203	49	97	1	1	ST-19 CCTV Pre-Alm
Output 204	49	98	1	1	ST-20 CCTV Pre-Alm
Output 205	50	99	1	2	ST-21 CCTV Pre-Alm
Output 206	50	100	1	2	ST-22 CCTV Pre-Alm
Output 207	51	101	1	3	ST-23 CCTV Pre-Alm
Output 208	51	102	1	3	ST-24 CCTV Pre-Alm
Output 209	52	103	1	4	ST-25 CCTV Pre-Alm
Output 210	52	104	1	4	ST-26 CCTV Pre-Alm
Output 211	53	105	1	5	ST-27 CCTV Pre-Alm
Output 212	53	106	1	5	ST-28 CCTV Pre-Alm
Output 213	54	107	1	6	ST-29 CCTV Pre-Alm
Output 214	54	108	1	6	ST-30 CCTV Pre-Alm
Output 215	55	109	2	1	ST-31 CCTV Pre-Alm
Output 216	55	110	2	1	ST-32 CCTV Pre-Alm
Output 217	56	111	2	2	ST-33 CCTV Pre-Alm
Output 218	56	112	2	2	ST-34 CCTV Pre-Alm
Output 219	57	113	2	3	ST-35 CCTV Pre-Alm
Output 220	57	114	2	3	ST-36 CCTV Pre-Alm
Output 221	58	115	2	4	ST-37 CCTV Pre-Alm
Output 222	58	116	2	4	ST-38 CCTV Pre-Alm
Output 223	59	117	2	5	ST-39 CCTV Pre-Alm
Output 224	59	118	2	5	ST-40 CCTV Pre-Alm
Output 225	60	119	2	6	ST-41 CCTV Pre-Alm
Output 226	60	120	2	6	ST-42 CCTV Pre-Alm
Output 227	61	121	3	1	ST-43 CCTV Pre-Alm
Output 228	61	122	3	1	ST-44 CCTV Pre-Alm
Output 229	62	123	3	2	ST-45 CCTV Pre-Alm
Output 230	62	124	3	2	ST-46 CCTV Pre-Alm
Output 231	63	125	3	3	ST-47 CCTV Pre-Alm
Output 232	63	126	3	3	ST-48 CCTV Pre-Alm
Output 233	64	127	3	4	ST-49 CCTV Pre-Alm
Output 234	64	128	3	4	ST-50 CCTV Pre-Alm
Output 235	65	129	3	5	ST-51 CCTV Pre-Alm
Output 236	65	130	3	5	ST-52 CCTV Pre-Alm
Output 237	66	131	3	6	ST-53 CCTV Pre-Alm
Output 238	66	132	3	6	ST-54 CCTV Pre-Alm
Output 239	67	133	4	1	ST-55 CCTV Pre-Alm
Output 240	67	134	4	1	ST-56 CCTV Pre-Alm
Output 241	68	135	4	2	ST-57 CCTV Pre-Alm
Output 242	68	136	4	2	ST-58 CCTV Pre-Alm
Output 243	69	137	4	3	ST-59 CCTV Pre-Alm
Output 244	69	138	4	3	ST-60 CCTV Pre-Alm
Output 245	70	139	4	4	ST-61 CCTV Pre-Alm
Output 246	70	140	4	4	ST-62 CCTV Pre-Alm
Output 247	71	141	4	5	ST-63 CCTV Pre-Alm
Output 248	71	142	4	5	ST-64 CCTV Pre-Alm
Output 249	72	143	4	6	ST-65 CCTV Pre-Alm
Output 250	72	144	4	6	ST-66 CCTV Pre-Alm
Output 251	73	145	5	1	ST-67 CCTV Pre-Alm
Output 252	73	146	5	1	ST-68 CCTV Pre-Alm
Output 253	74	147	5	2	ST-69 CCTV Pre-Alm
Output 254	74	148	5	2	ST-70 CCTV Pre-Alm
Output 255	75	149	5	3	ST-71 CCTV Pre-Alm
Output 256	75	150	5	3	ST-72 CCTV Pre-Alm
Output 257	76	151	5	4	ST-73 CCTV Pre-Alm
Output 258	76	152	5	4	ST-74 CCTV Pre-Alm
Output 259	77	153	5	5	ST-75 CCTV Pre-Alm
Output 260	77	154	5	5	ST-76 CCTV Pre-Alm
Output 261	78	155	5	6	ST-77 CCTV Pre-Alm
Output 262	78	156	5	6	ST-78 CCTV Pre-Alm
Output 263	79	157	6	1	ST-79 CCTV Pre-Alm
Output 264	79	158	6	1	ST-80 CCTV Pre-Alm
Output 265	80	159	6	2	ST-81 CCTV Pre-Alm
Output 266	80	160	6	2	ST-82 CCTV Pre-Alm
Output 267	81	161	6	3	ST-83 CCTV Pre-Alm
Output 268	81	162	6	3	ST-84 CCTV Pre-Alm
Output 269	82	163	6	4	ST-85 CCTV Pre-Alm
Output 270	82	164	6	4	ST-86 CCTV Pre-Alm
Output 271	83	165	6	5	ST-87 CCTV Pre-Alm
Output 272	83	166	6	5	ST-88 CCTV Pre-Alm
Output 273	84	167	6	6	ST-89 CCTV Pre-Alm
Output 274	84	168	6	6	ST-90 CCTV Pre-Alm
Output 275	85	169	7	1	ST-91 CCTV Pre-Alm
Output 276	85	170	7	1	ST-92 CCTV Pre-Alm
Output 277	86	171	7	2	ST-93 CCTV Pre-Alm
Output 278	86	172	7	2	Spare Relay (Wired to CT2)
Output 279	87	173	7	3	North Tunnel (Channel 1) Fiber Break
Output 280	87	174	7	3	South Tunnel (Channel 2) Fiber Break
Output 281	88	175	7	4	North Tunnel "Small" Fire
Output 282	88	176	7	4	North Tunnel "Medium" Fire
Output 283	89	177	7	5	North Tunnel "Large" Fire
Output 284	89	178	7	5	North Tunnel "Large" Fire

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE



1 WEST CONTROL ROOM - RACK #2 - REAR VIEW - KEY PLAN
SCALE: 1 : 16

MIDDLE ATLANTIC EQUIPMENT RACK WRK-44SA-32
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WEST CONTROL ROOM - RACK #2
REAR VIEW - BOTTOM SECTION

1 WEST CONTROL ROOM - RACK #2 - REAR VIEW - BOTTOM SECTION
SCALE: 1 : 2

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FIXED FIRE SUPPRESSION SYSTEM
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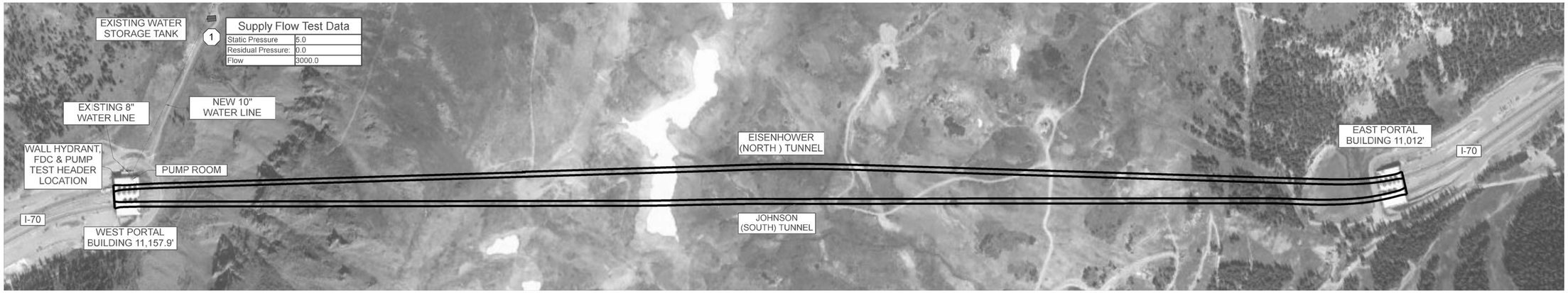
DRAWN BY: B.T.L. CHECKED BY: AEE,Jr

FIRE ALARM:
DETAILS-WEST CNTRL-RACK #2-WIRE-REAR-BOTTOM

Drawing Number
FA6.31



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1 VICINITY MAP

NOT TO SCALE

GENERAL NOTE

1. ALL MATERIALS INSTALLED SHALL MEET THE BUY AMERICA REQUIREMENTS.

2. ALL MATERIALS INSTALLED SHALL BE UL LISTED AND/OR FM APPROVED FOR FIRE SUPPRESSION USE WITH THE EXCEPTION OF:
- BERMAD FP-400E-3DC-66 FLOW CONTROL VALVE WITH NO MANUAL RELEASE VALVE
- BERMAD FP-430-UF PRESSURE RELIEF VALVE
- BETE TF72FC NOZZLE
- VIKING EC HSW FOR LIGHT HAZARD OCCUPANCY

3. ALL DELUGE SYSTEM PIPING 1-IN TO 4-IN SHALL BE BLACK SCH.40, ASTM A795 STEEL PIPE, U.S. MANUFACTURED WITH GROOVED OR THREADED ENDS FOR GROOVED FIRELOCK COUPLINGS OR THREADED CAST IRON #125 FITTINGS. ALL 6-IN AND 8-IN SUPPLY MAIN PIPE SHALL BE BLACK SCH.10, ASTM A795 STEEL PIPE, U.S. MANUFACTURED WITH GROOVED ENDS FOR GROOVED FLEXIBLE COUPLINGS. ALL PORTAL SYSTEM PIPING THAT IS EXPOSED TO THE ROADWAYS SHALL BE GALVANIZED.

4. BRACKET SUPPORTS IN TUNNEL PLENUMS SHALL BE DESIGNED TO SUPPORT 1,000 LBS (SEE FP1.2). ALL HANGERS AND SUPPORTS IN PORTAL BUILDINGS SHALL BE DESIGNED AND INSTALLED AS PER NFPA-13, CHAPTER-9 (SEE FP1.1).

5. 6-IN SUPPLY LOOP AUXILIARY DRAINS AND LOW POINT DRAINS SHALL BE INSTALLED PER NFPA-13, CHAPTER 8.

6. SEISMIC BRACING SHALL BE INSTALLED ON ALL 6-IN SUPPLY MAINS AND PUMP ROOM PIPING (SEE FP1.4). DELUGE SYSTEM PIPING 1-IN TO 4-IN SHALL BE MOUNTED DIRECTLY TO THE PLENUM FLOOR AND DOES NOT REQUIRE SEISMIC BRACING (SEE FP1.1).

7. ALL PIPE PENETRATIONS THOUGH WALLS AND FLOORS SHALL BE CAULKED AND SEALED.

8. HYDRAULIC PLACARDS SHALL BE POSTED IN FIRE PUMP MECHANICAL ROOM. VALVE LABELS AND PRESSURE SETTINGS SHALL BE PROVIDED AT EVERY FLOW CONTROL VALVE.

9. SPARE NOZZLE CABINET SHALL BE LOCATED IN FIRE PUMP MECHANICAL ROOM AND STOCKED PER NFPA-13, 6.2.9.

10. 6-IN SUPPLY LOOP SHALL BE INSULATED ON FAN DECK AND SUPPLY AIR PLENUMS. HEATED WATER SHALL BE CIRCULATED THROUGH 6-IN SUPPLY LOOP TO PREVENT PIPE FROM FREEZING.

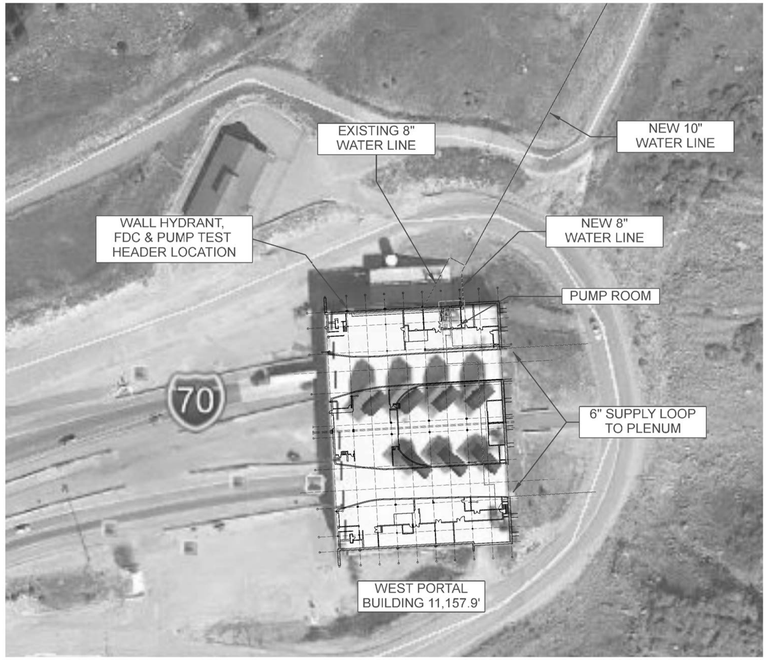
11. ALL 6-IN SUPPLY LOOP SYSTEM PIPING SHALL BE HYDROSTATICALLY TESTED AT 200 PSI OR AT 50 PSI ABOVE THE SYSTEM WORKING PRESSURE FOR TWO HOURS.

SYSTEM TYPE

3 NOZZLES SYSTEMS: QTY. 47 (EISENHOWER-NORTH)
4 NOZZLES SYSTEMS: QTY. 37 (EISENHOWER-NORTH)
12 NOZZLES SYSTEMS: QTY. 87 (JOHNSON-SOUTH)
SIDEWALL SYSTEMS: QTY. 12 (PORTAL BUILDINGS)

SYSTEM COUNT

EISENHOWER (NORTH) SYSTEMS: QTY. 90
JOHNSON (SOUTH) SYSTEMS: QTY. 93
TOTAL SYSTEMS: QTY. 183



N

2 SITE MAP

NOT TO SCALE

INDEX

NICET CERTIFICATION

JOHN HULETT
WESTERN STATES FIRE PROTECTION CO.
7026 S. TUCSON WAY
CENTENNIAL, COLORADO 80112
(303) 792-0022

NICET LEVEL: IV
TECHNICAL AREA: WATER-BASED FIRE PROTECTION SYSTEMS
CERTIFICATE NUMBER: #95682
VALID THROUGH: 01-01-2016

APPROVED BY: John Hulett
DATE: 11-16-2015

REVIEW NUMBER: 1 ☐ 2 ☐ 3 ☐

John Hulett
Water-Based Fire Protection Systems
Nicet Level IV
Certification #95682
Date: 11-16-2015
John Hulett

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Sturgeon ELECTRIC
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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
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RECORD DRAWINGS - 2015-11-16

Revisions
Num | Description | Date
- | - | -

DRAWN BY: AMB | CHECKED BY: JLH

COVER PAGE

Drawing Number
FP0.0

FIXED FIRE SUPPRESSION SYSTEM NARRATIVE

THE FIXED FIRE SUPPRESSION SYSTEM (FFSS) IS SUPPLIED BY THE EXISTING WATER STORAGE TANK FED FROM STRAIGHT CREEK, NORTH OF THE WEST PORTAL. A NEW 10-IN UNDERGROUND PIPE WILL BE INSTALLED FROM THE EXISTING TANK TO WITHIN CLOSE PROXIMITY OF THE PORTAL WHERE THE EXISTING 8-IN DOMESTIC AND STANDPIPE IS SUPPLIED. THE LINE WILL TEE INTO THE EXISTING AT THIS POINT AND REDUCE DOWN TO 8-IN TO SUPPLY THE NEW 1,250 GPM ELECTRIC FIRE PUMP LOCATED IN THE WEST VENTILATION BUILDING.

THE WATER SUPPLY TO THE FIRE PUMP WAS HYDRAULICALLY CALCULATED. THIS CALCULATION ASSUMES THE WORST CASE SCENARIO WITH THE TANK EMPTY. THE ADDITIONAL 5 PSI STATIC PRESSURE AVAILABLE WHEN THE TANK IS FULL WAS NOT UTILIZED. THE ADJUSTED WATER SUPPLY TO THE FIRE PUMP SUCTION FLANGE IS 56.9 PSI STATIC PRESSURE WITH 49.6 PSI AT 1,250 GPM. THIS ADJUSTMENT INCLUDES THE ADDITIONAL 500 GPM HOSE ALLOWANCE FOR THE EXISTING STANDPIPE SYSTEM. THE TOTAL FLOW FOR THIS CALCULATION IS 1,750 GPM.

THE 115 PSI @ 1,250 GPM FIRE PUMP IS SIZED TO PROVIDE THE REQUIRED PRESSURE AND FLOW FOR ANY TWO DELUGE SYSTEMS FLOWING AT THE SAME TIME. THE MOST DEMANDING SYSTEM IS THE EISENHOWER 3 NOZZLE SYSTEM WITH A FLOW OF 1,264.7 GPM. ALL DELUGE SYSTEM HYDRAULIC CALCULATIONS PROVIDE AT LEAST A 10% PRESSURE SAFETY FACTOR TO ALLOW FOR MINOR INSTALLATION CHANGES.

THE FIRE PUMP ASSEMBLY WILL BE PROVIDED WITH BOTH A FLOW METER AND A TEST HEADER. THE FLOW METER ALLOWS TESTING THE PERFORMANCE OF THE FIRE PUMP BY FLOWING WATER BACK TO THE PUMP SUCTION. THE TEST HEADER IS REQUIRED FOR THE ACCEPTANCE TEST AND TO VERIFY THE WATER SUPPLY FROM THE TANK EVERY 5 YEARS. THE FLOW METER CAN BE USED 4 OUT OF 5 YEARS WITH THE BENEFIT OF NOT FLOWING AND WASTING WATER OUTSIDE THE BUILDING FROM THE TEST HEADER.

A NEW WALL HYDRANT WILL BE PROVIDED CLOSE TO A NEW FIRE DEPARTMENT CONNECTION (FDC) AT THE NORTHWEST CORNER OF THE WEST VENTILATION BUILDING. THE WALL HYDRANT CAN SUPPLY A FIRE PUMPER TRUCK THAT CAN SUPPLEMENT THE WATER PRESSURE WITHIN THE FFSS THROUGH THE FDC. THE WALL HYDRANT WILL ALSO SERVE AS THE PUMP TEST HEADER WHEN REQUIRED. AN FDC WILL NOT BE PROVIDED AT THE EAST VENTILATION BUILDING BECAUSE THERE IS NO WATER SUPPLY FROM WHICH A PUMP TRUCK COULD DRAW TO SUPPLY ADDITIONAL WATER TO THE FFSS. JUST TO CLARIFY, A FIRE PUMPER TRUCK IS NOT REQUIRED FOR THE OPERATION OF THE SYSTEM BUT A RESPONDING FIRE DEPARTMENT COULD ASSIST IN THE EVENT OF A FIRE BY SUPPLEMENTING OR REPLACING THE FIRE PUMP.

DURING WINTER MONTHS A WATER TRUCK MAY NOT BE ABLE TO ACCESS THE WATER TANK FOR RE-SUPPLY. AN ARRANGEMENT OF VALVES WITH A BYPASS THAT IS NORMALLY CLOSED WILL BE PROVIDED TO ALLOW A WATER TRUCK LOCATED BELOW AT THE NORTHWEST VENTILATION BUILDING TO FILL THE WATER SUPPLY TANK UTILIZING THE FIRE PUMP.

IN THE EVENT OF A POWER OUTAGE, THE FIRE PUMP CONTROLLER IS EQUIPPED WITH AN AUTOMATIC TRANSFER SWITCH TO ALLOW OPERATION FROM THE EMERGENCY GENERATOR. ADDITIONALLY THE FIRE PUMP CONTROLLER IS OF THE SOFT START TYPE TO REDUCE THE INRUSH DEMAND ON THE EMERGENCY GENERATOR.

THERE ARE 183 DELUGE SYSTEMS PROVIDING COVERAGE OVER THE TUNNEL ROADWAY. THERE ARE 90 SYSTEMS IN THE EISENHOWER TUNNEL AND 93 SYSTEMS IN THE JOHNSON TUNNEL. THREE (3) OF THE DELUGE VALVES ARE LOCATED WITHIN THE FIRE PUMP ROOM. THE REMAINDERS OF THE DELUGE VALVES ARE LOCATED ON THE 6-IN. X 18,100 FT. LOOP LOCATED WITHIN THE SUPPLY PLENUMS AND THE FAN DECK OF THE VENTILATION BUILDINGS. THE CAPACITY OF THE 6-IN. LOOP IS APPROXIMATELY 30,000 GALLONS.

TEN (10) 6-IN. ISOLATION VALVES WILL BE PROVIDED ON THE 6-IN X 18,100 FT. LOOP. THESE VALVES WILL ALLOW SYSTEM REPAIRS IF REQUIRED TO OCCUR WITHOUT DRAINING THE ENTIRE SYSTEM. EACH OF THESE VALVES WILL HAVE A TAMPERS SWITCH. IN THE EVENT A VALVE IS CLOSED, A TROUBLE SIGNAL WILL BE DISPLAYED AT THE FIRE CONTROL PANEL (FCP).

BOILERS, EXPANSION TANKS, AND CIRCULATION PUMPS WILL BE PROVIDED WITHIN THE FIRE PUMP ROOM TO HEAT THE 6-IN. LOOP PIPING. THE SYSTEM HEAT WILL PROVIDE PROTECTION OF THE ZONE DELUGE VALVES LOCATED WITHIN INSULATED VALVE ENCLOSURE (IVE) CABINETS INSTALLED AROUND EACH ZONE VALVE IN THE PLENUM. THE VALVE ENCLOSURE WILL BE HEATED BY CONVECTIVE HEAT TRANSFER FROM THE CIRCULATING HOT WATER IN THE 6-IN. WET SUPPLY LOOP. THE HEATED WATER WILL BE DIRECTED EAST THRU THE SUPPLY PLENUM OF THE EISENHOWER TUNNEL WHERE IT WILL CROSS THROUGH THE EAST VENTILATION BUILDING ON THE FAN DECK AND RETURN WEST WITHIN THE SUPPLY PLENUM OF THE JOHNSON TUNNEL.

IN THE EVENT OF A FIRE, THE WATER SUPPLY TO THE DELUGE SYSTEMS CAN THEN TRAVEL EAST THRU BOTH SUPPLY PLENUMS TO THE ACTIVATED DELUGE SYSTEM ALLOWING WATER TO DISCHARGE FROM THE NOZZLES.

THERE ARE FOUR DIFFERENT TYPES OF DELUGE SYSTEMS WITHIN THE PROJECT. EACH SYSTEM IS DESIGNED TO PROVIDE AT LEAST 0.16 GALLONS PER SQUARE FOOT OVER THE ROADWAY WHILE TWO SYSTEMS ARE FLOWING. THE HYDRAULIC CALCULATIONS PROVIDED ARE FOR THE MOST DEMANDING AREA FOR EACH SYSTEM TYPE. THE LOCATION WAS DETERMINED BY CHANGING THE HYDRAULIC LOCATION UNTIL THE MOST DEMANDING CONDITION WAS FOUND.

THE DIFFERENCES BETWEEN EACH OF THE SYSTEM TYPES INCLUDE THE SIZE, NOZZLE TYPE, SPACING, PRESSURE, AND FLOW. EACH SYSTEM IS SIMILAR IN THAT IT PROVIDES THE DENSITY OF 0.16 GALLONS PER SQUARE FOOT. ALL OF THE DELUGE SYSTEMS WILL HAVE A MANUAL ISOLATION VALVE WITH A TAMPER SWITCH. IN THE EVENT A VALVE IS CLOSED, A TROUBLE SIGNAL WILL BE DISPLAYED AT THE FIRE CONTROL PANEL (FCP). IN THE EVENT A DELUGE SYSTEM IS ACTUATED, A PRESSURE SWITCH WILL INDICATE AN ALARM AT THE FCP.

THE DELUGE VALVE ASSEMBLIES ARE LOCATED APPROXIMATELY EVERY 100 FEET IN THE EISENHOWER SUPPLY PLENUM AND 96 FEET IN THE JOHNSON SUPPLY PLENUM. EACH DELUGE SYSTEM IS CONTROLLED BY A 4-IN. FLOW CONTROL VALVE. THIS VALVE IS HELD IN THE CLOSED POSITION BY A SMALL PRIME LINE. THE UPSTREAM SYSTEM WATER PRESSURE HOLDS THE VALVE CLOSED AND WHEN A SOLENOID VALVE IS OPENED BY A 24 VOLT CURRENT FROM THE FCP. THE FLOW CONTROL VALVE WILL OPEN. WHEN THE SOLENOID VALVE IS CLOSED, THE VALVE WILL CLOSE. ADDITIONALLY, THE FLOW CONTROL VALVE CAN OPERATE LIKE A PRESSURE REDUCING VALVE ALLOWING FOR ADJUSTMENT OF THE DOWNSTREAM PRESSURE. WITH THIS FEATURE, A HIGHER UPSTREAM PRESSURE WILL NOT OVER FLOW WHICH WOULD EFFECTIVELY REDUCE THE MINIMUM WATER SUPPLY DURATION OF ONE HOUR.

A 4-IN. CROSS MAIN WILL SUPPLY THE BRANCH LINES THAT SUPPLY THE ASSORTED NOZZLES. THE 4-IN. CROSS MAIN WILL NEED TO PENETRATE THE PLENUM WALL FOR EACH TUNNEL SYSTEM TO ALLOW ACCESS TO THE EXHAUST PLENUM VENTS. WITH EACH DELUGE SYSTEM LOCATED BELOW THE VALVE ASSEMBLY ALL CROSS MAINS AND BRANCH LINES WILL BE REQUIRED TO DRAIN AUTOMATICALLY TO AVOID TRAPPED WATER THAT COULD FREEZE WITHIN THE PIPE. THE BRANCH LINE PIPE WILL AUTOMATICALLY DRAIN FROM NOZZLES. THE CROSS MAIN WILL REQUIRE A ½-IN BALL DRIP THAT WILL AUTOMATICALLY DRAIN TO THE PLENUM FLOOR. THE BALL DRIP WILL AUTOMATICALLY OPEN AFTER THE SYSTEM IS SHUT DOWN AND THE PIPE IS NO LONGER PRESSURIZED.

THE EISENHOWER TUNNEL HAS TWO TYPES OF DELUGE SYSTEMS. BOTH SYSTEMS HAVE THE SAME LARGE BETE NOZZLES WITH THE DIFFERENCE BEING THREE (3) NOZZLES VERSES FOUR (4) NOZZLES. THE THREE NOZZLE SYSTEM REQUIRES MORE PRESSURE AT EACH NOZZLE TO PROVIDE THE 0.16 GALLONS PER SQUARE FOOT TO THE ROADWAY BELOW. THE LOCATION OF THE NOZZLES IS DETERMINED BY THE EXISTING PLENUM VENTS WITHIN THE EXHAUST PLENUM.

THE JOHNSON TUNNEL DELUGE SYSTEMS UTILIZE TWELVE (12) SMALLER BETE NOZZLES TO PROVIDE THE 0.16 GALLONS PER SQUARE FOOT TO THE ROADWAY BELOW. THE LOCATION OF THE NOZZLES IS DETERMINED BY THE EXISTING VENTS WITHIN THE SUPPLY AND EXHAUST PLENUM.

THE VENTILATION BUILDING DELUGE SYSTEMS UTILIZE TWELVE (12) HORIZONTAL SIDEWALL SPRINKLERS AS NOZZLES TO PROVIDE THE 0.16 GALLONS PER SQUARE FOOT TO THE ROADWAY BELOW. THE BRANCH LINES SUPPLYING THE NOZZLES AT THE PORTALS WILL BE EXPOSED ON THE WALL JUST BELOW THE LIGHTS. TO ADDRESS CONCERNS REGARDING CORROSION FROM ANTI-ICE SPRAY THAT CAN BECOME AIRBORNE FROM THE ROADWAY AT THE VENTILATION BUILDINGS, WE ARE PROVIDING GALVANIZED PIPE FOR THE BRANCH LINES AND NOZZLES WITH A CORROSION RESISTANT COATING.

CUSTOM BRACKETS AND TRAPEZE SUPPORTS WILL BE PROVIDED WITHIN THE SUPPLY PLENUM TO SUPPORT THE 6-IN. LOOP PIPING. THESE SUPPORTS WILL BE LOCATED AT A MAXIMUM OF 12.5 FT. ON CENTER. THE ENTIRE 6-IN. LOOP PIPING WILL BE PROVIDED WITH 1-½-IN FIBERGLASS INSULATION WITH A K-VALUE OF 0.23. ADDITIONALLY, RIGID 1-½-IN INSULATED PIPE SUPPORTS WILL BE PROVIDED FOR ALL HANGERS AND SUPPORTS.

THE VALVE ASSEMBLY FOR EACH DELUGE SYSTEM WILL BE INSIDE AN AIR TIGHT IVE. THE IVE'S ARE PROVIDED WITH 3-IN RIGID INSULATION WITH AN R-VALUE OF 18. THE IVE'S WILL HAVE AN ACCESS DOOR ALLOWING FOR EASE OF INSPECTION, TESTING, AND MAINTENANCE.

THE 6-IN. LOOP PIPING AND ITS SUPPLY WILL BE SEISMICALLY BRACED. CALCULATIONS ARE PROVIDED WITHIN THE DRAWINGS FOR THE MOST DEMANDING LONGITUDINAL AND LATERAL BRACE REQUIREMENTS. LONGITUDINAL BRACES WILL BE PROVIDED AT 100 FT. MAXIMUM DISTANCES WITHIN THE SUPPLY PLENUM AND WILL BE LOCATED AS CLOSE AS POSSIBLE TO THE VALVE ASSEMBLIES. EACH OF THE CUSTOM BRACKETS AND TRAPEZE SUPPORTS WITHIN THE PLENUM SERVE AS LATERAL BRACES AT 12.5 FT. MAXIMUM ON CENTER. THE LOOP AND SUPPLY PIPING WITHIN THE PORTALS WILL BE BRACED BY STANDARD METHODS WITH LONGITUDINAL BRACES AT 80 FT. MAXIMUM AND LATERAL BRACES AT 40 FT. MAXIMUM AND LOCATED WITHIN 1 FT. IN A CHANGE OF DIRECTION. ALL RISERS OR VERTICAL PIPING WILL BE PROVIDED WITH FOUR-WAY BRACING IN ACCORDANCE WITH NFPA-13.

A 4-IN. PRESSURE RELIEF VALVE WILL BE PROVIDED AT THE SOUTHEAST VENTILATION BUILDING TO PROVIDE PROTECTION OF SYSTEM COMPONENTS FROM THE POTENTIAL OF WATER HAMMERS THAT MAY OCCUR. WATER HAMMER IS USED TO DESCRIBE A PRESSURE SURGE THAT IS CAUSED WHEN A FLUID IS FORCED TO STOP OR CHANGE DIRECTION SUDDENLY. THE POTENTIAL FOR WATER HAMMER EXIST WHEN A DELUGE VALVE IS CLOSED.

EACH TUNNEL, AND THEIR RESPECTIVE AIR PLENUMS, CURVE NORTH AND SOUTH THROUGH THE MOUNTAIN AND CHANGE IN ELEVATION INCREASING FROM EAST TO WEST. THE CURVATURE OF THE TUNNELS OCCURS SLIGHTLY OVER A LARGE DISTANCE MAKING THE INSTALLATION OF ADDITIONAL FITTINGS AND SWING JOINTS UNNECESSARY. THE DEFLECTION IS MINIMAL BUT MUST BE ADDRESSED.

IN ADDITION, THE AIR PLENUMS ARE SUBJECT TO FREEZING TEMPERATURES IN THE WINTER MONTHS. TO PREVENT THE WATER IN THE PIPE FROM FREEZING, HOT WATER STARTING AT 100°F WITH A MAXIMUM DESIGN BOILER TEMPERATURE OF 130°F, WILL BE CIRCULATED THROUGH THE 6-IN. MAIN SUPPLY LOOP. MAIN PIPING WILL BE INSTALLED WHEN TEMPERATURES HAVE THE POTENTIAL TO BE -30°F. THE WORST CASE TEMPERATURE CHANGE WAS CALCULATED TO BE FROM -30°F TO 130°F. DUE TO DRASTIC CHANGES IN TEMPERATURE, THE 6-IN. PIPE WILL EXPAND AND CONTRACT. WHEN THE PIPE IS TO BE INSTALLED DURING THE COLD WEATHER SEASONS OR WHEN COLD WATER FROM THE STORAGE TANK IS INTRODUCED INTO THE PIPE DURING A FIRE OR TESTING SITUATION, THE STEEL PIPE WILL SHRINK. WHEN THE HOT WATER IS CIRCULATED THROUGH THE PIPE, THE STEEL PIPE WILL EXPAND. THE EXPANSION FROM THE CHANGE IN TEMPERATURE WILL CAUSE A PARALLEL DEFLECTION THAT IS ADDRESSED IN THIS DESIGN.

TO ACCOMMODATE CHANGES IN THE PIPE LENGTH AND DIRECTION, EXPANSION AND DEFLECTION WILL BE ADDRESSED CONTINUALLY FOR EVERY STICK OF PIPE ALONG THE ENTIRE LENGTH OF THE TUNNEL BY USING VICTAULIC STYLE 75 FLEXIBLE COUPLINGS AND VICTAULIC STYLE 155 EXPANSION JOINT 6-IN. NIPPLES. THROUGH PRODUCT DATA AS WELL AS EXPANSION AND DEFLECTION CALCULATIONS FOR A 25 FT. SECTION OF PIPE, A SOLUTION WAS DETERMINED TO PROVIDE EXPANSION JOINTS TO ACCOMMODATE THE EXPANSION AND DEFLECTION WITHIN EACH 25 FT. SECTION OF PIPE.

EXPANSION JOINTS SHALL BE INSTALLED AT EACH END OF PIPE APPROXIMATELY EVERY 25 FT. AN EXPANSION JOINT WILL CONSIST OF (2) STYLE 75 COUPLINGS WITH (1) STYLE 155 6-IN. SCHEDULE 40 NIPPLE, 4 INCHES IN LENGTH BETWEEN THE COUPLINGS. EACH EXPANSION JOINT WILL BE INSTALLED IN COLD WEATHER CONDITIONS, THUS EACH COUPLING SHALL BE INSTALLED TO SEPARATE THE TWO ENDS OF THE PIPE TO ALLOW FOR MAXIMUM POSSIBLE SEPARATION. WHEN THE PIPE EXPANDS DUE TO HOT WATER, THERE WILL BE ZERO DEFLECTION BETWEEN EACH PIECE OF PIPE. THE EXPANSION JOINT WILL PROVIDE 0.346-IN. OF EXPANSION WHICH EXCEEDS THE REQUIRED THERMAL EXPANSION LENGTH OF 0.3216-IN.

WHEN ANGULAR DEFLECTION IS REQUIRED, AN ADDITIONAL COUPLING AND NIPPLE SHALL BE ADDED TO ACCOMMODATE THE ANGULAR DEFLECTION BETWEEN THE COUPLINGS THAT ARE PROVIDED FOR THE EXPANSION JOINT. THIS COUPLING WILL NOT BE ABLE TO DEFLECT IN THE PARALLEL DIRECTION AND WILL NOT BE USED AS AN EXPANSION COUPLING.

IN ADDITION, TWO BRACKETS SHALL BE PROVIDED FOR EACH 25 FT. LENGTH OF PIPE. BOTH BRACKETS SHALL BE BRACED TO ALLOW MINIMAL DEFLECTION BETWEEN EACH 25 FT. STICK OF PIPE. A LONGITUDINAL BRACE SHALL BE INSTALLED EVERY 100 FT. WITH THE BRACED SUPPORT CLOSEST TO THE INSULATED VALVE ENCLOSURE TO LIMIT MOVEMENT AT THE DELUGE VALVE ASSEMBLIES AND TO PROVIDE THE REQUIRED SEISMIC BRACING.

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

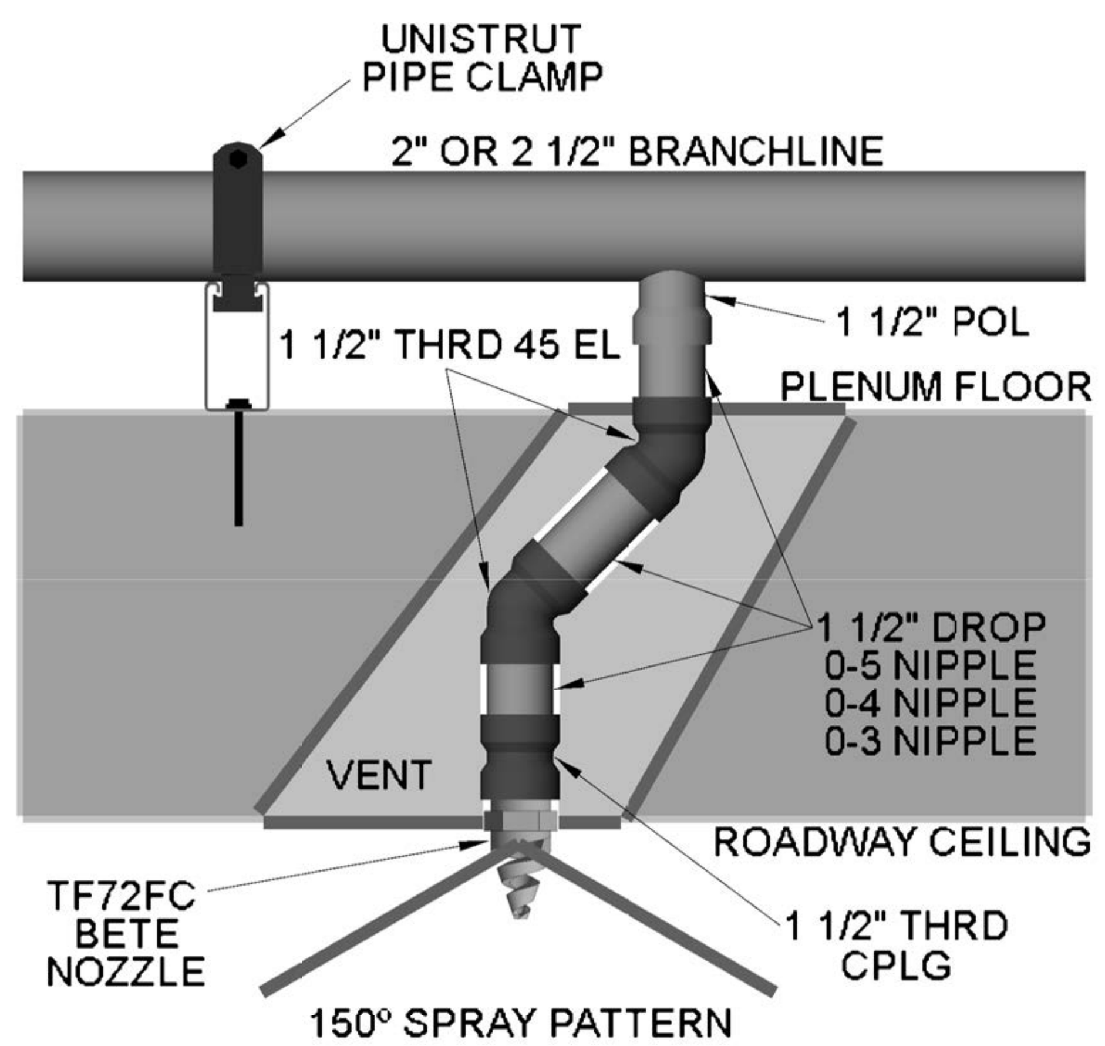
Revisions

Num	Description	Date
-	-	-

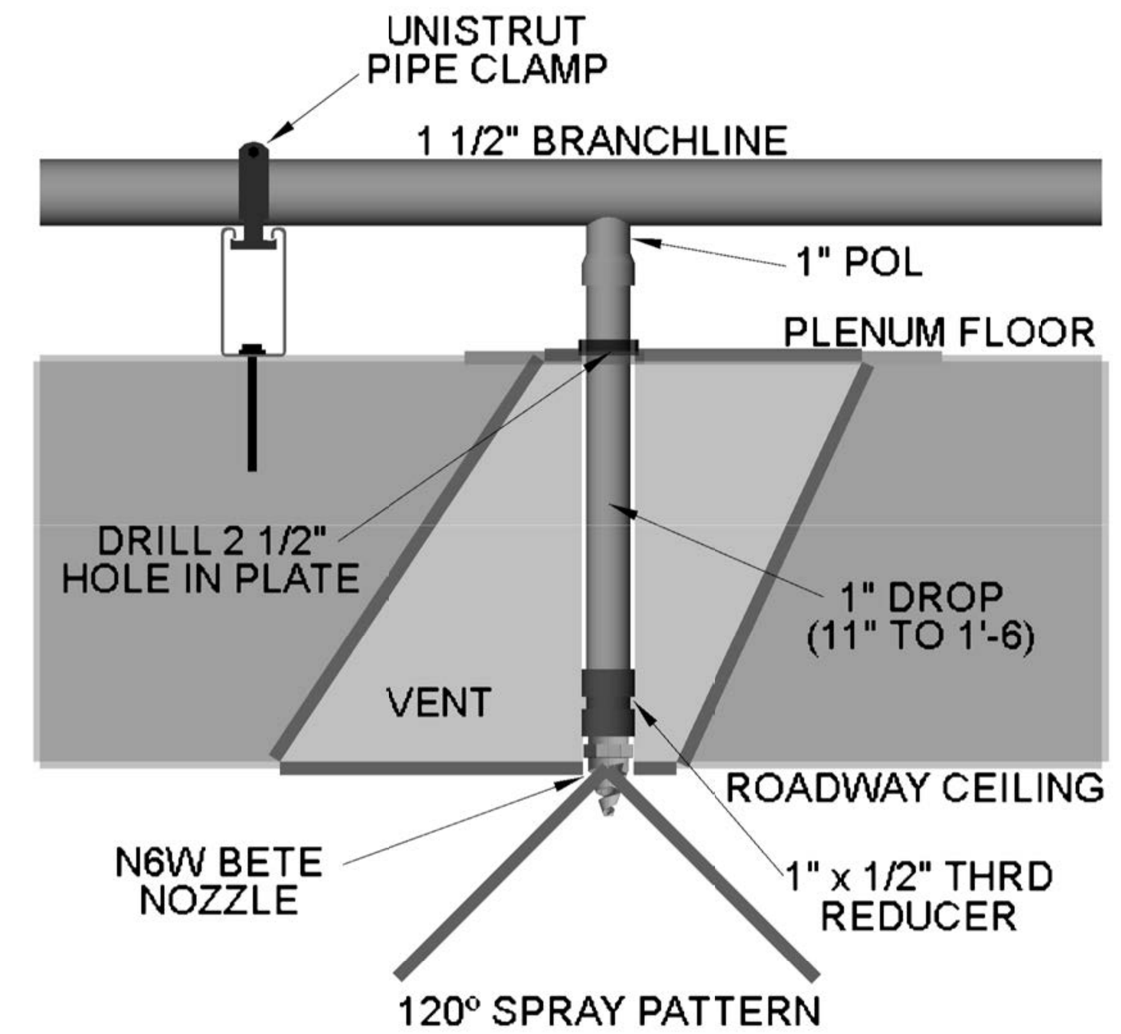
DRAWN BY: AMB
CHECKED BY: JLH

FFSS NARRATIVE

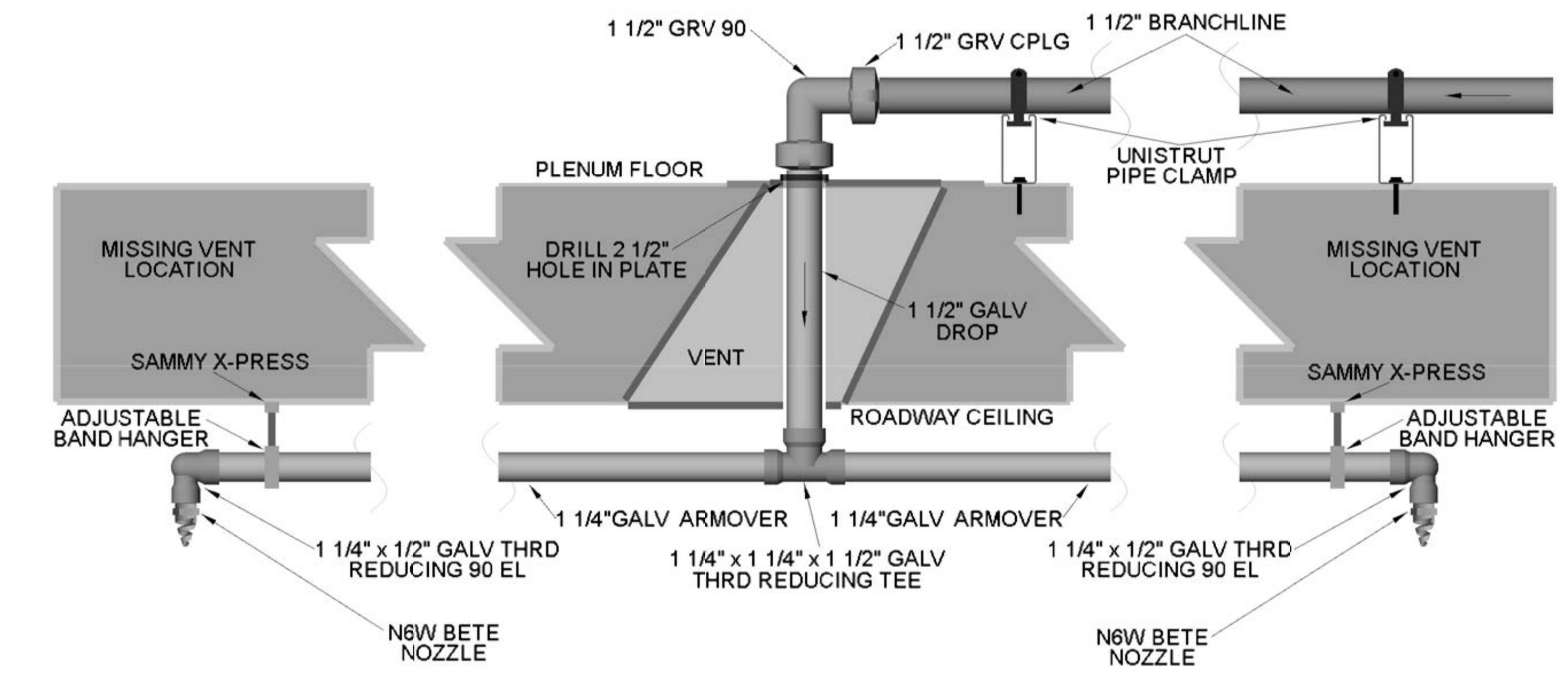
Drawing Number
FP0.1



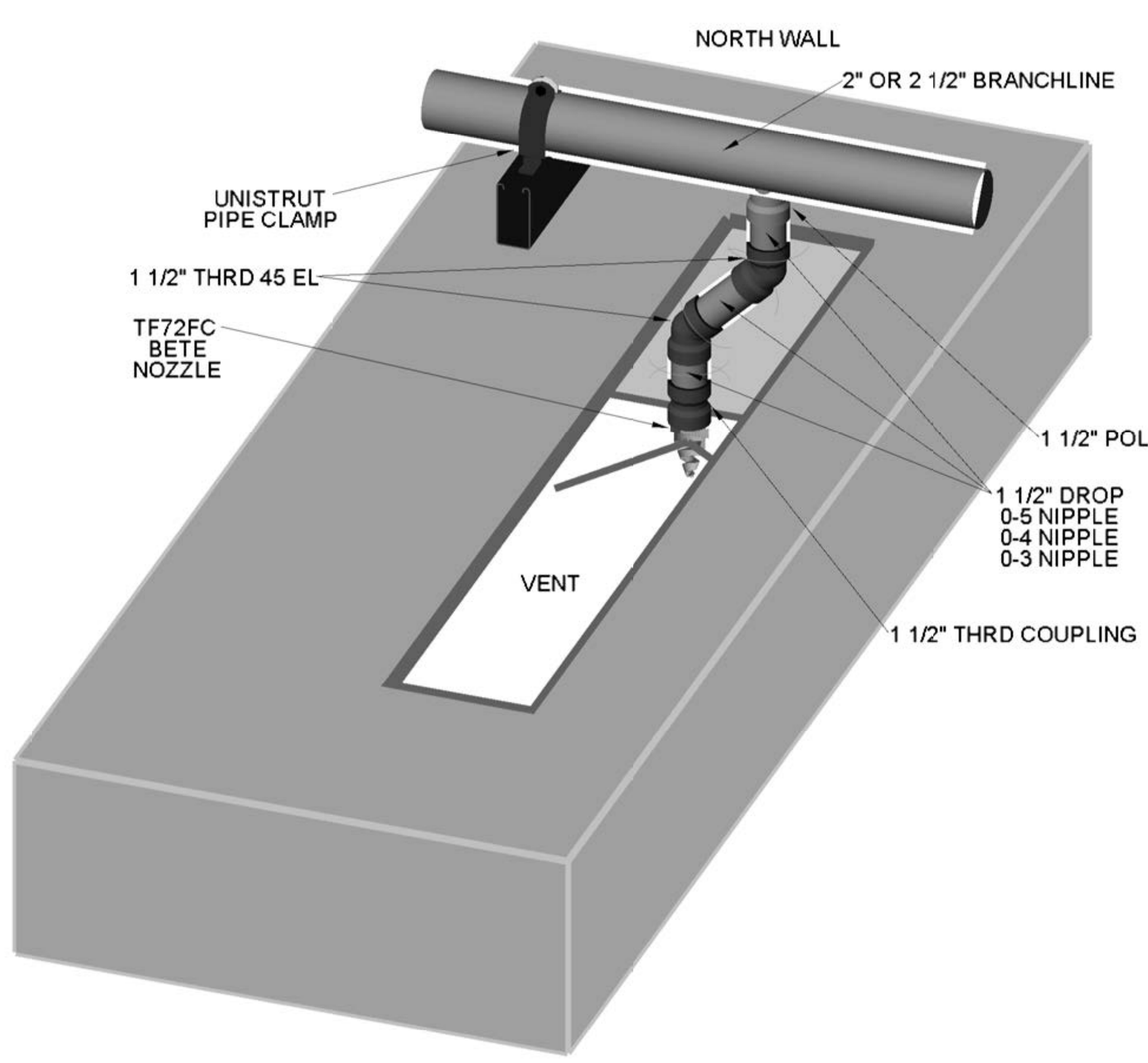
1 DROP TO NOZZLE - EISENHOWER (NORTH) TUNNEL
NOT TO SCALE



3 DROP TO NOZZLE - JOHNSON (SOUTH) TUNNEL
NOT TO SCALE



5 EXPOSED DROP TO NOZZLE - (SYSTEM ST-08 - ROADWAY)
NOT TO SCALE



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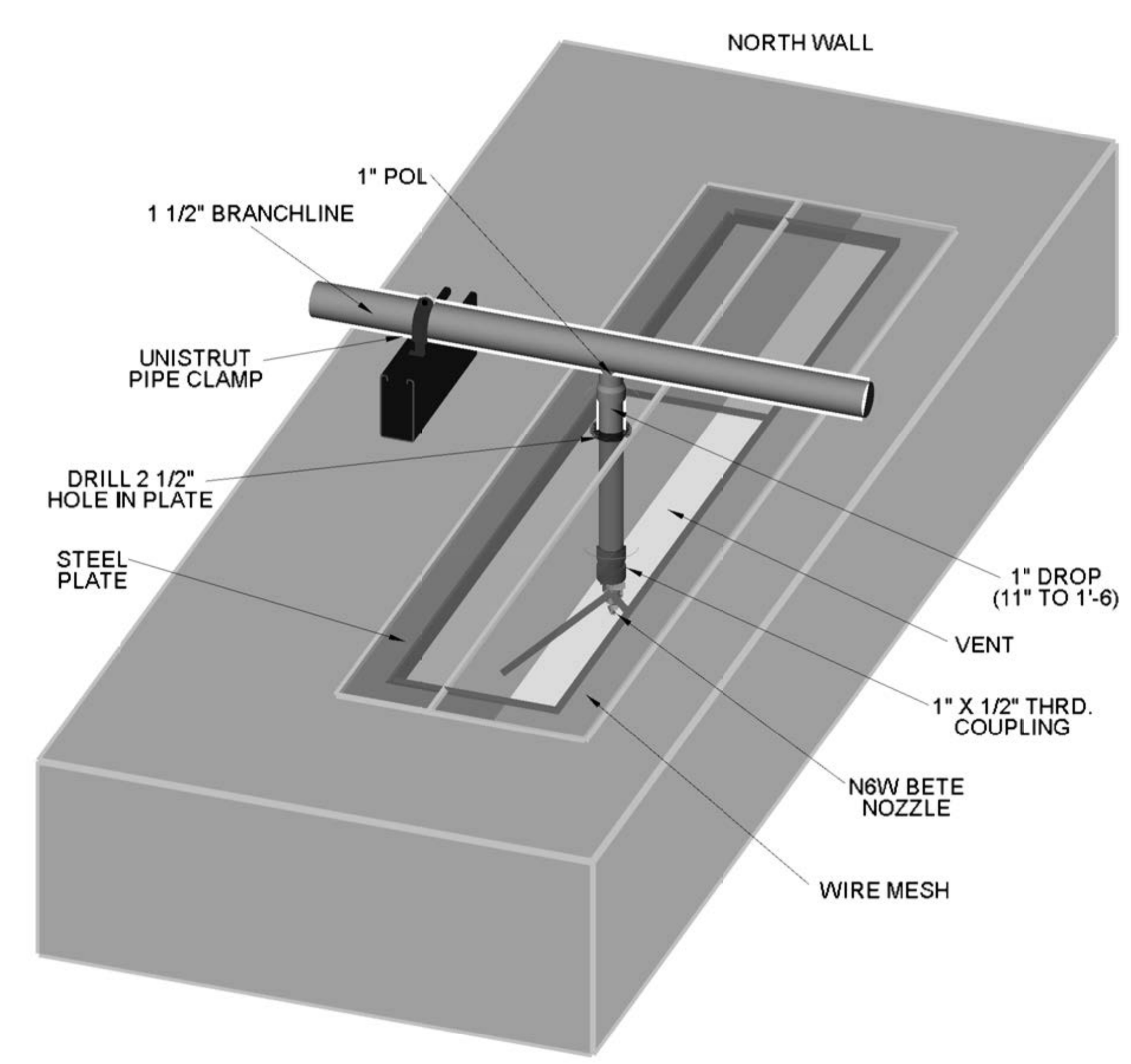
NOT TO SCALE



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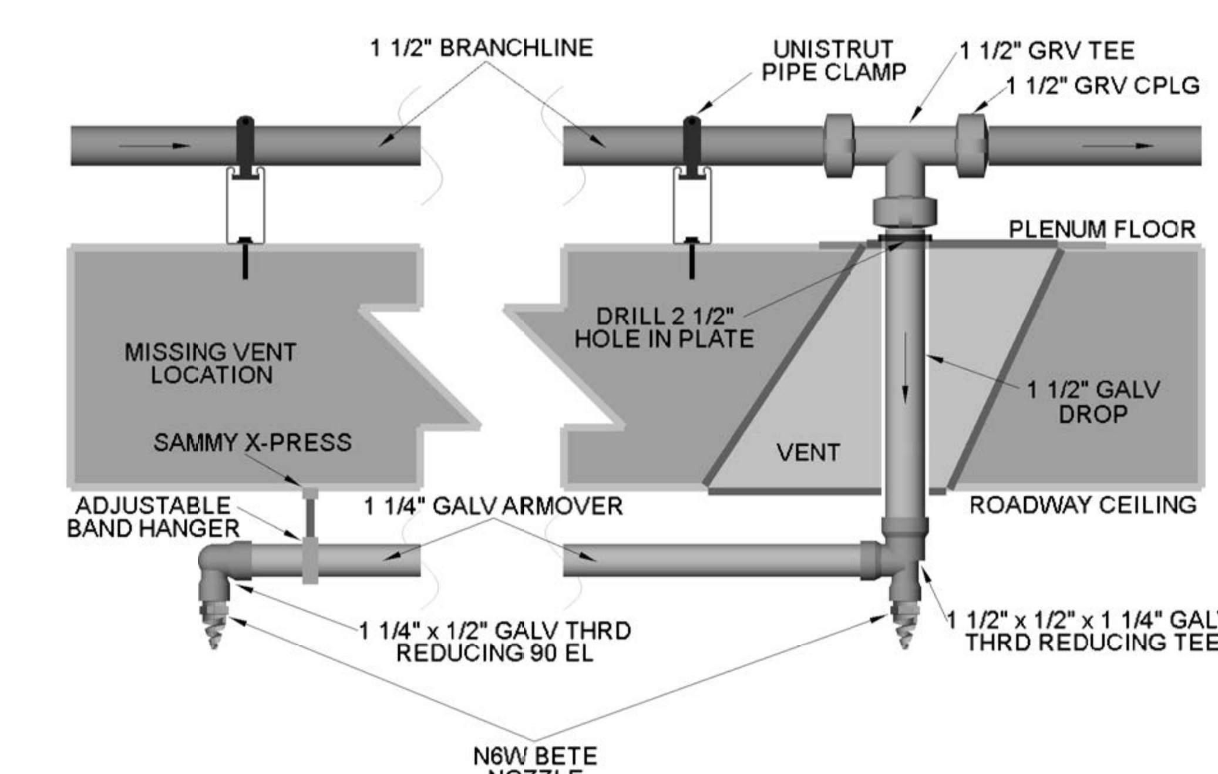
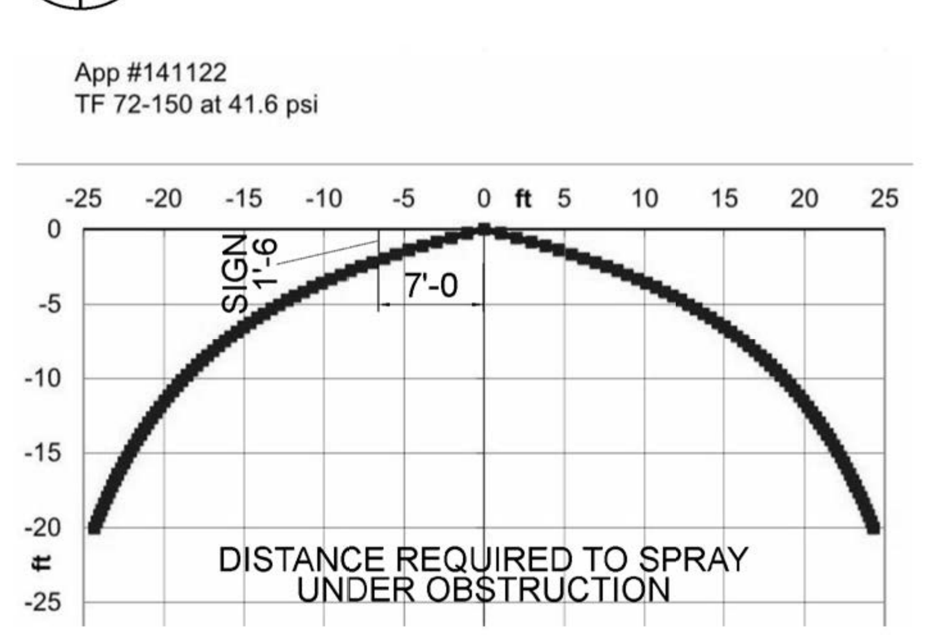
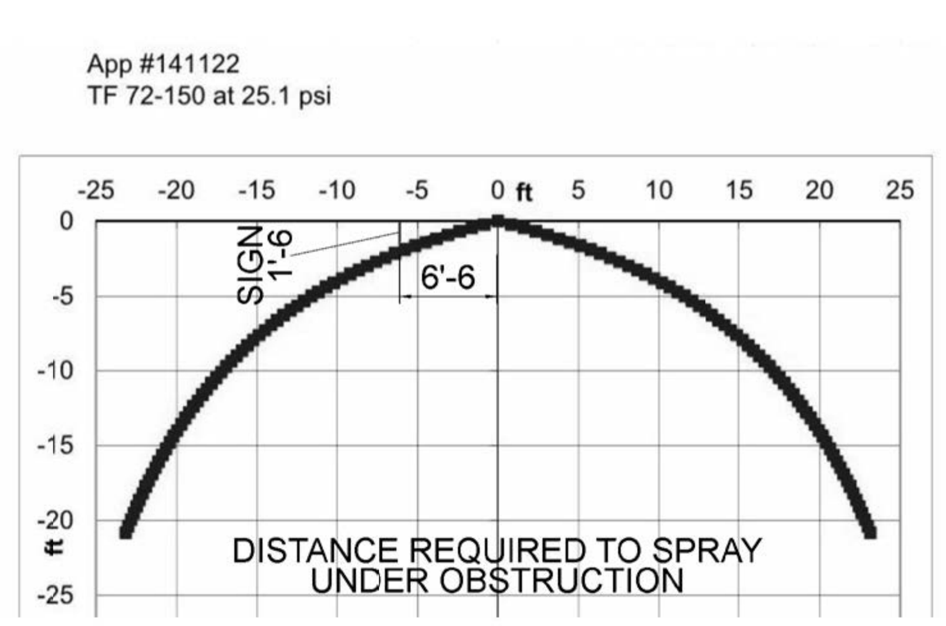
NOT TO SCALE



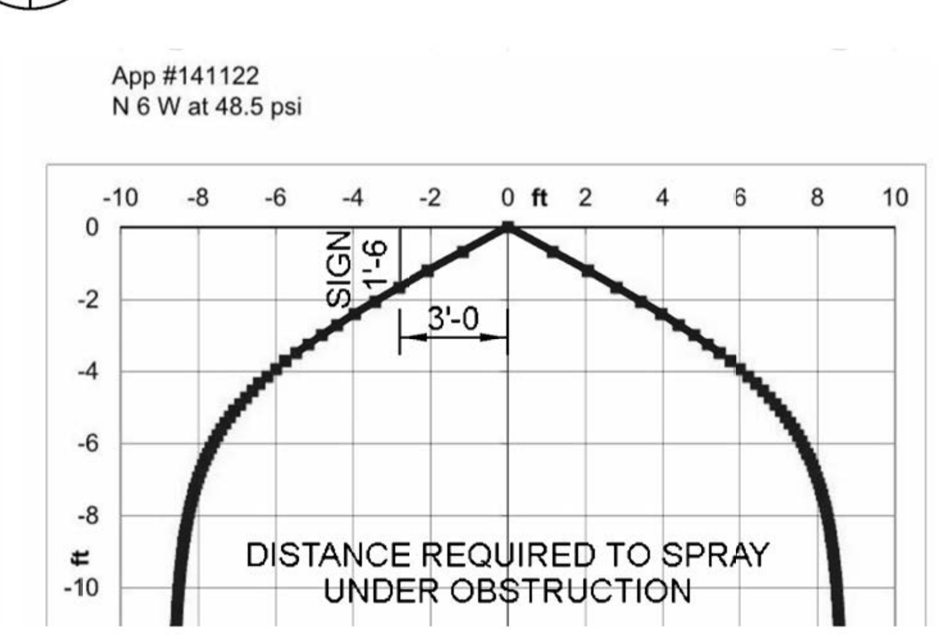
6 EXPOSED DROP TO NOZZLE - (SYSTEM ST-47 - ROADWAY)
NOT TO SCALE



7 EISENHOWER (NORTH) TUNNEL
3 NOZZLE - SPRAY OBSTRUCTION
NOT TO SCALE



8 EISENHOWER (NORTH) TUNNEL
4 NOZZLE - SPRAY OBSTRUCTION
NOT TO SCALE



9 JOHNSON (SOUTH) TUNNEL
NOZZLE - OBSTRUCTION GRAPH
NOT TO SCALE

SPRINKLER HEAD LEGEND

DESCRIPTION	SYMBOL	P/N	ORIFICE	NPT	"K"	SPRAY PATTERN	FINISH	QUANT.
BETE NOZZLE (EISENHOWER-NORTH)		TF72FC	1.13"	1 1/2"	30.4	150º	BRASS	289
BETE NOZZLE (JOHNSON-SOUTH)		N6W	1/2"	1/2"	6.64	120º	BRASS	1044
VIKING EXTENDED COVERAG EXTENDED COVERAGE HORIZONTAL SIDEWALL (PORTAL-BUILDINGS)		VK630	3/4"	3/4"	8.0	90º	WHITE	142
PROJECT TOTAL								1477

ABBREVIATION LIST

- THRD - THREADED
- GRV - GROOVE
- POL - PIPE OUTLET
- EL - ELBOW
- ATR - ALL THREAD ROD
- CPLG - COUPLING
- GALV - GALVANIZED

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BCER engineering

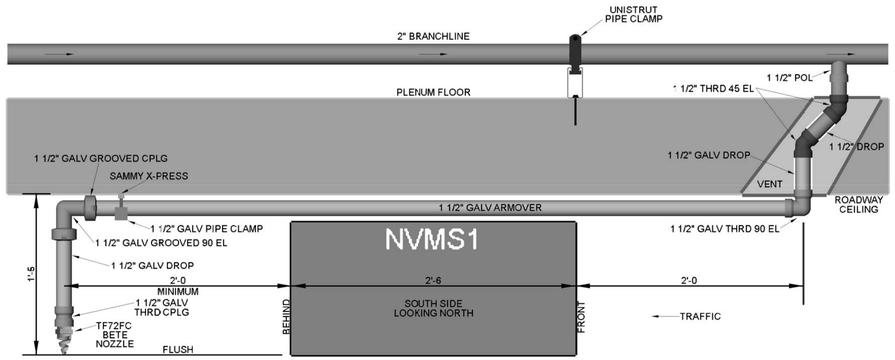
EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

DRAWN BY: AMB CHECKED BY: JLH

NOZZLES AND MISSING VENTS

Drawing Number
FP1.0



1 EXPOSED DROP TO NOZZLE - (SYSTEM NT-05 - ROADWAY)
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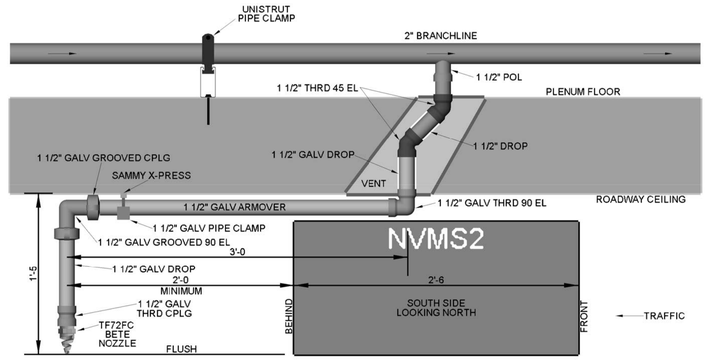
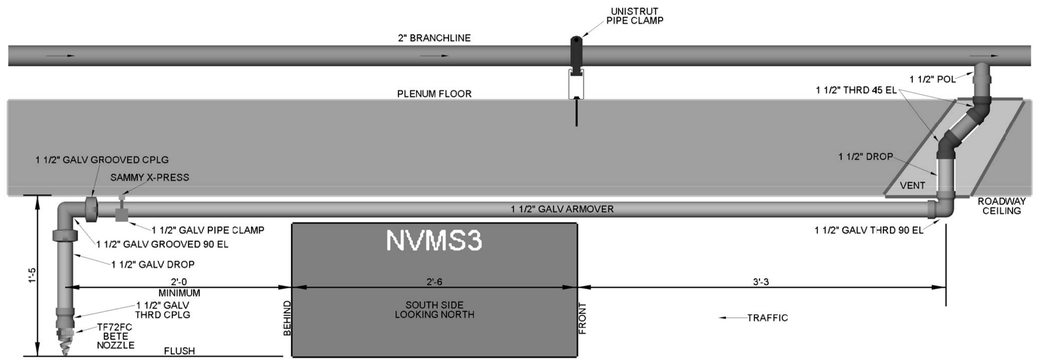
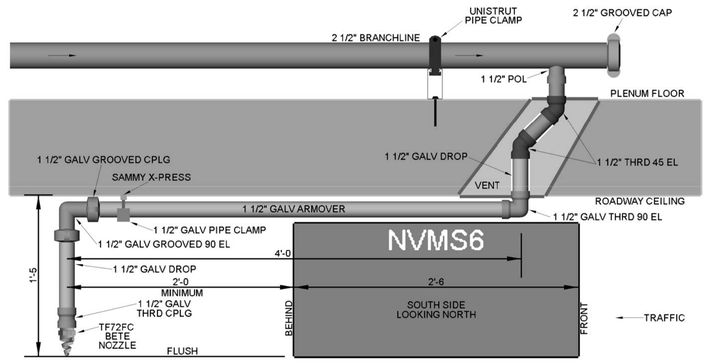


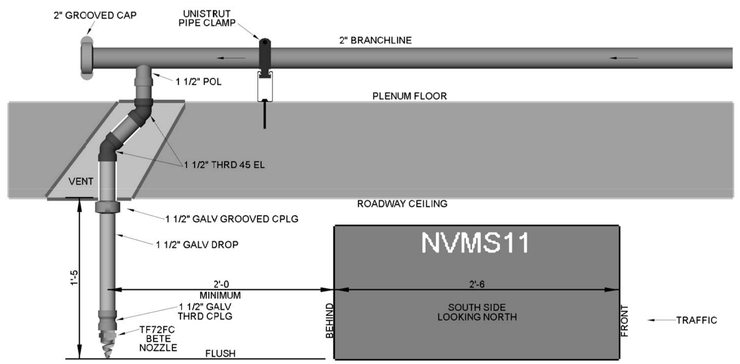
2 EXPOSED DROP TO NOZZLE - (SYSTEM NT-13 - ROADWAY)
NOT TO SCALE



3 EXPOSED DROP TO NOZZLE - (SYSTEM NT-21 - ROADWAY)
NOT TO SCALE



4 EXPOSED DROP TO NOZZLE - (SYSTEM NT-45 - ROADWAY)
NOT TO SCALE



5 EXPOSED DROP TO NOZZLE - (SYSTEM NT-86 - ROADWAY)
NOT TO SCALE

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810

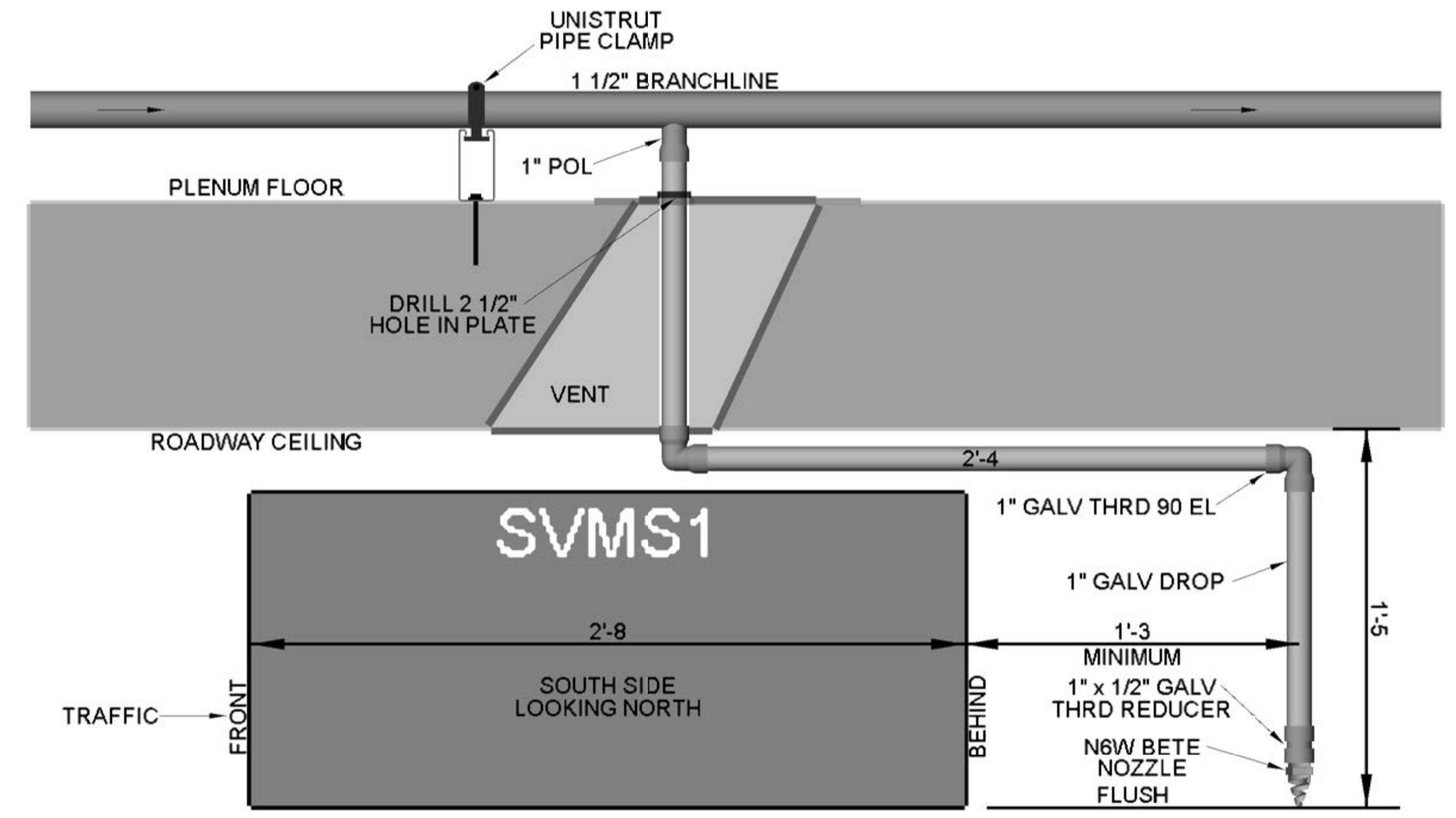
RECORD DRAWINGS - 2015-11-16

Revisions
Num | Description | Date
- | - | -

DRAWN BY: AMB
CHECKED BY: JLH

EISENHOWER (NORTH)
VARIABLE MESSAGE
SIGN OBSTRUCTION

Drawing Number
FP1.0N



1 EXPOSED DROP TO NOZZLE - (SYSTEM ST-05 - ROADWAY)
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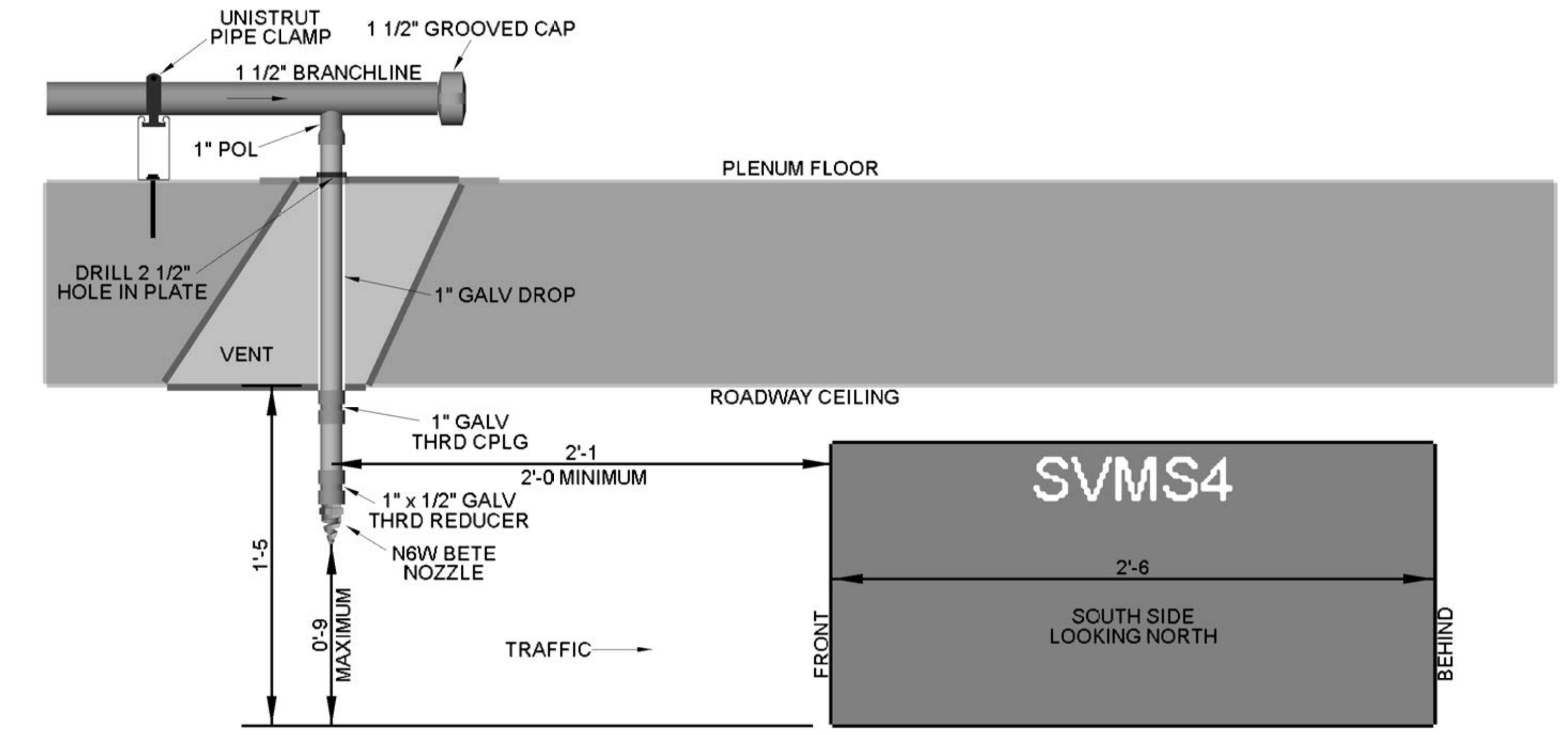

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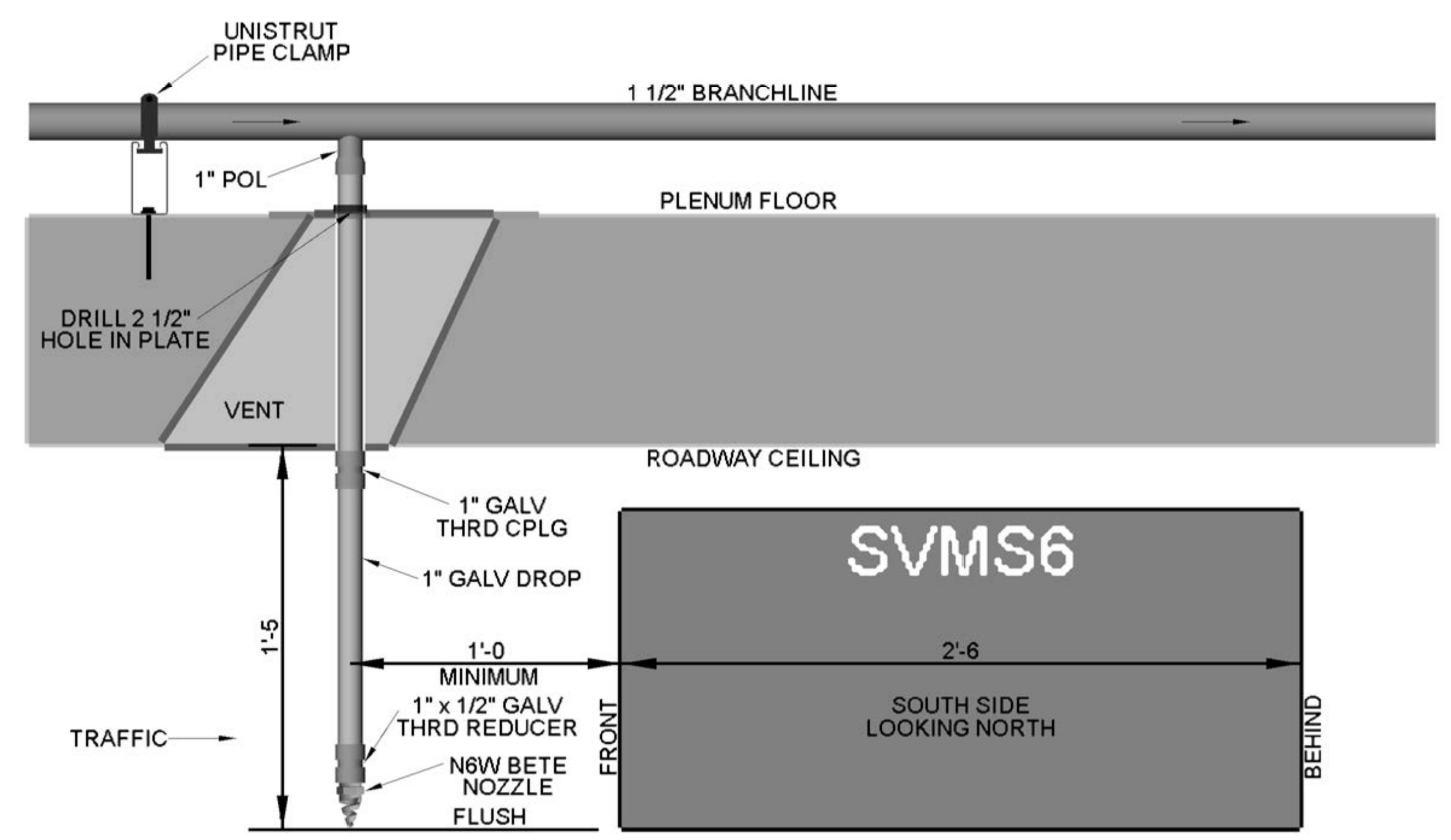
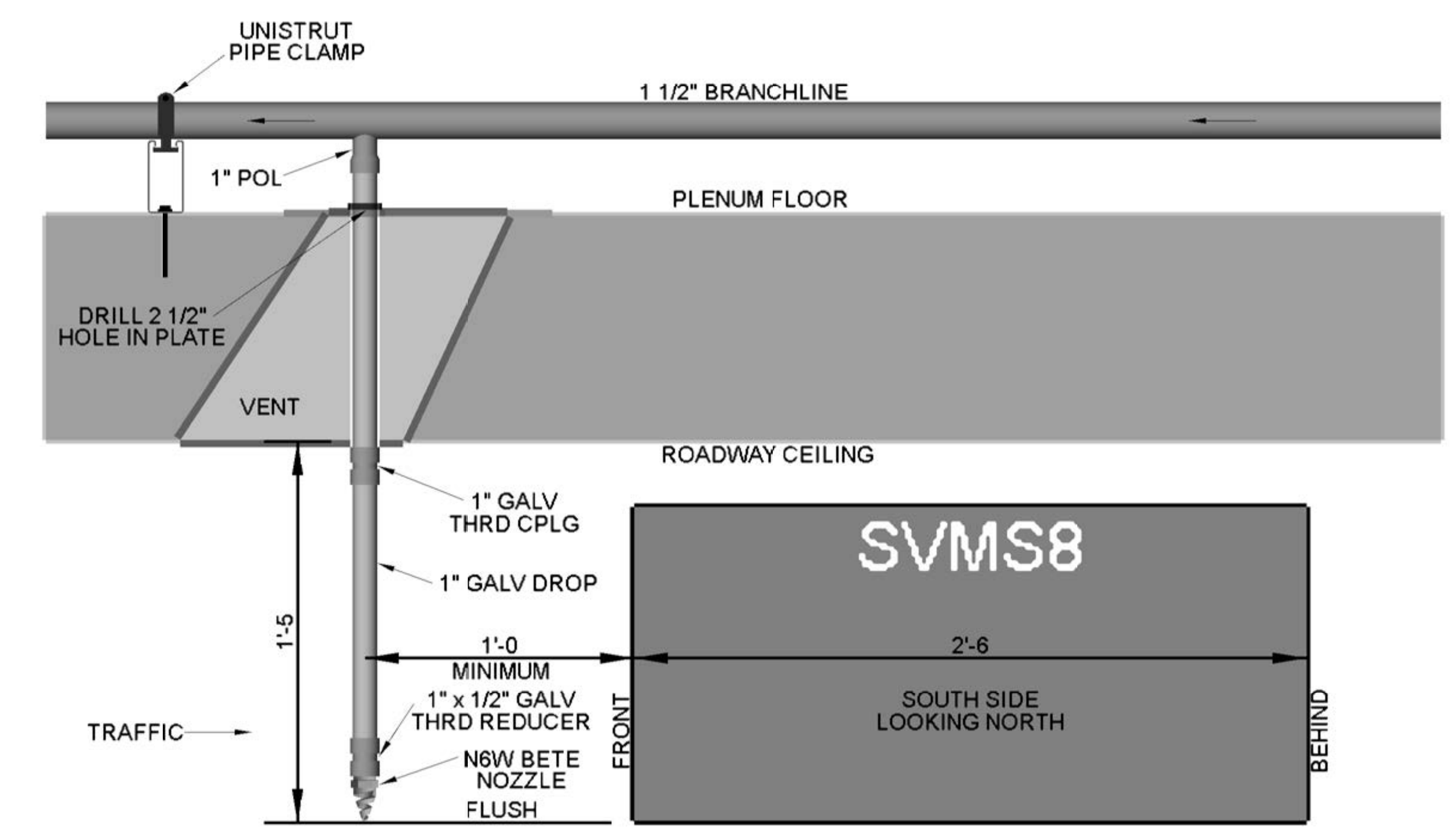


3 EXPOSED DROP TO NOZZLE - (SYSTEM ST-47 - ROADWAY)
NOT TO SCALE



4 EXPOSED DROP TO NOZZLE - (SYSTEM ST-64 - ROADWAY)
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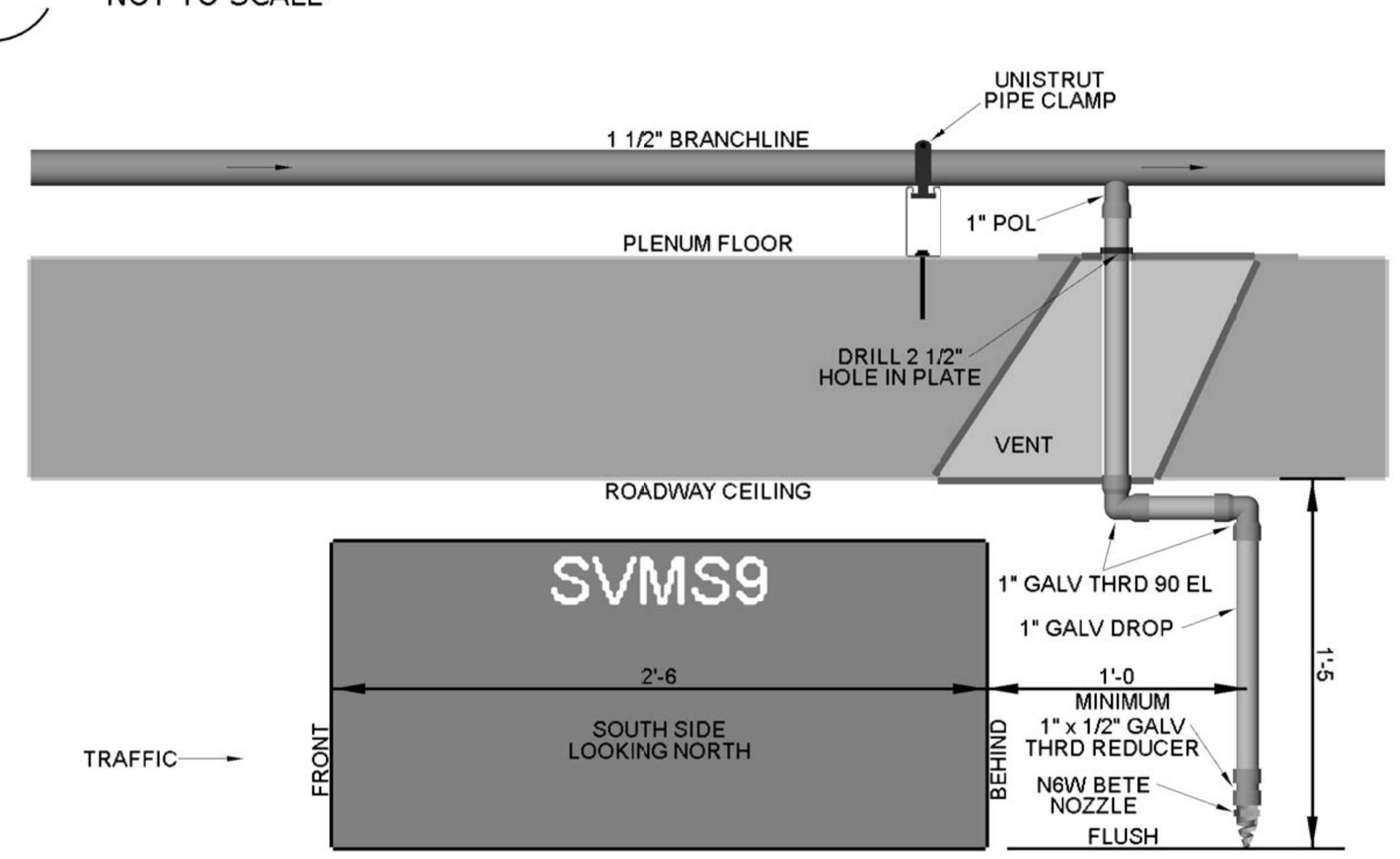

5 EXPOSED DROP TO NOZZLE - (SYSTEM ST-72 - ROADWAY)
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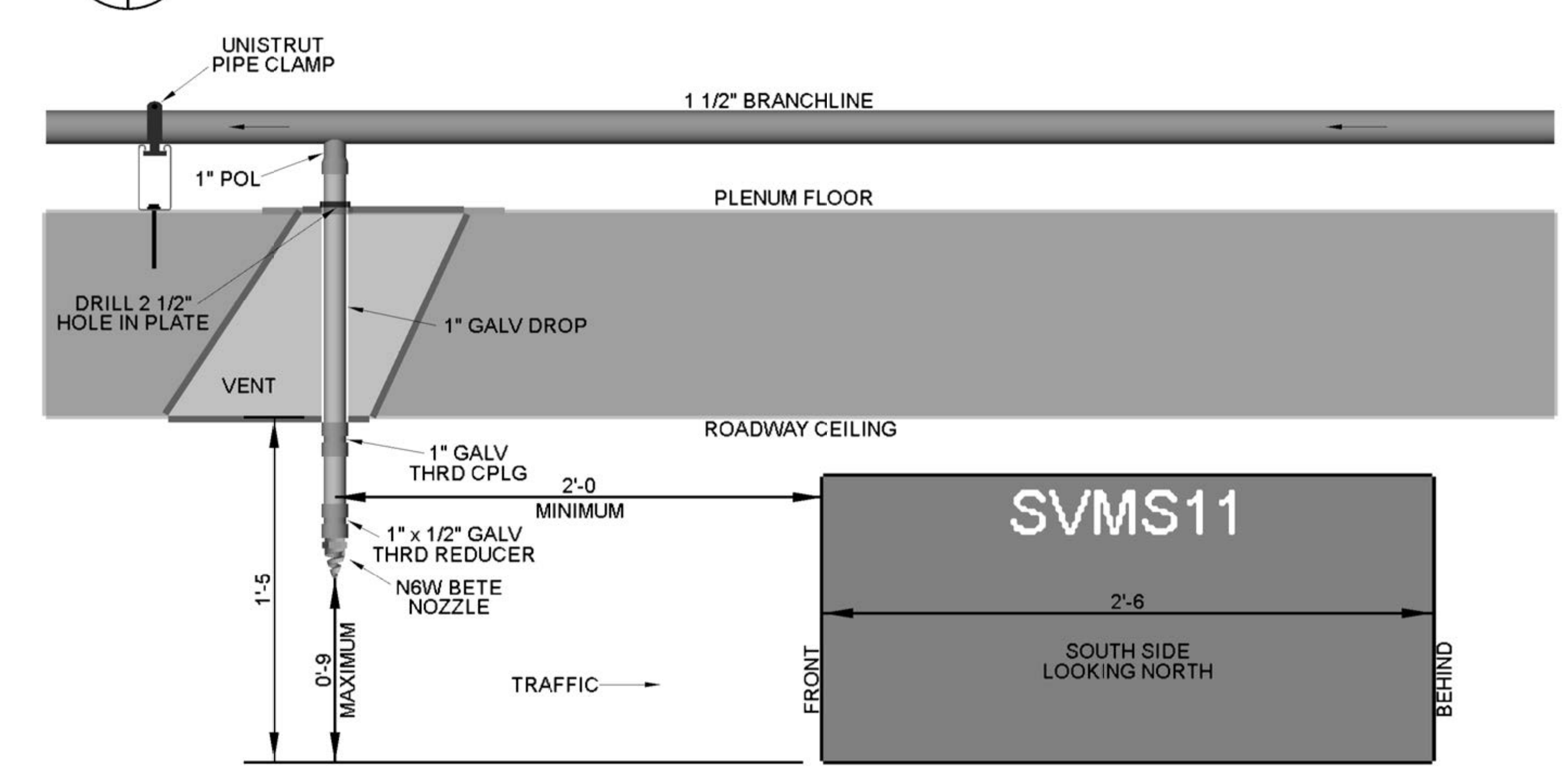

6 EXPOSED DROP TO NOZZLE - (SYSTEM ST-89 - ROADWAY)
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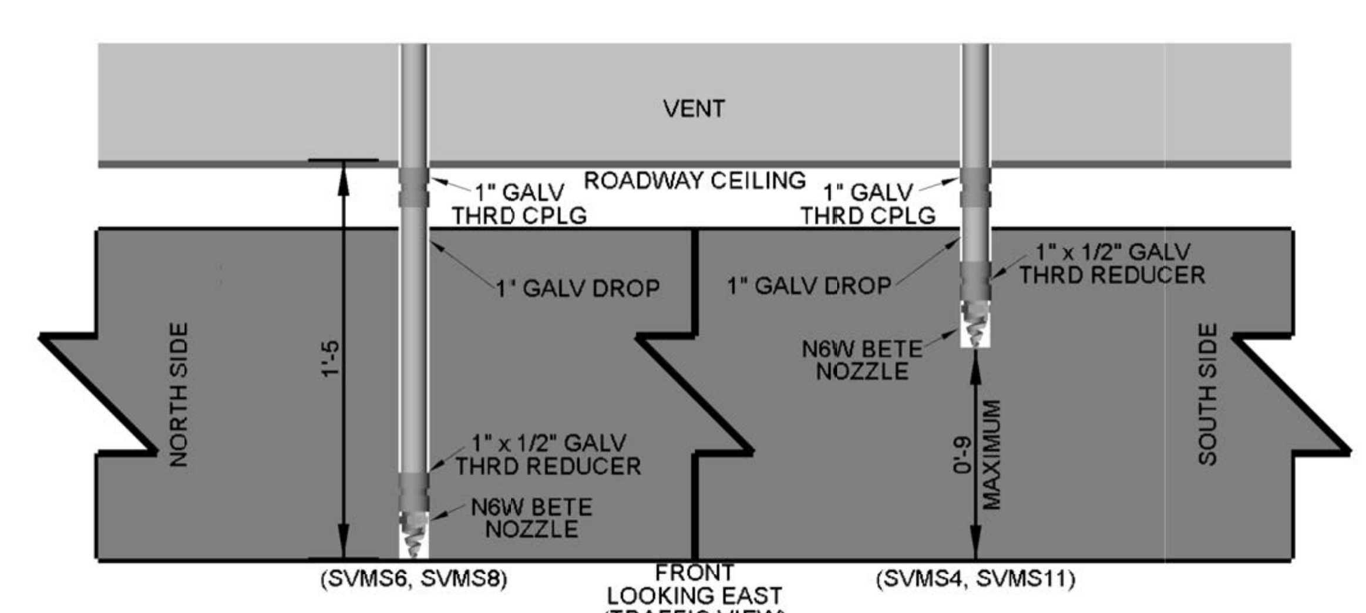

7 EXPOSED DROP TO NOZZLE - (SOUTH SYSTEMS - ROADWAY)
NOT TO SCALE

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Revisions		
Num	Description	Date
-	-	-

DRAWN BY: AMB
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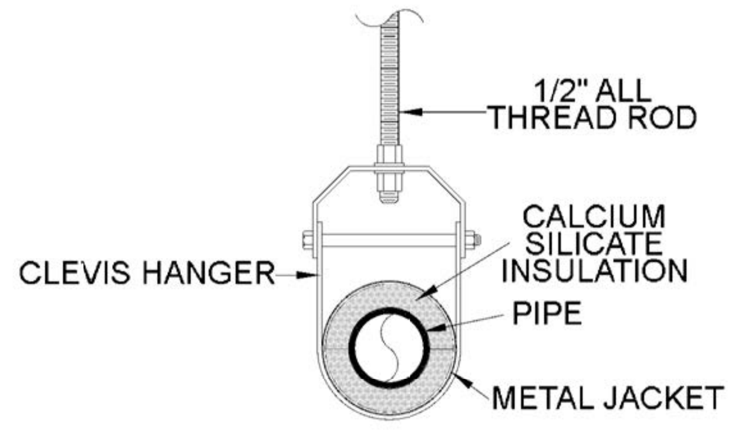
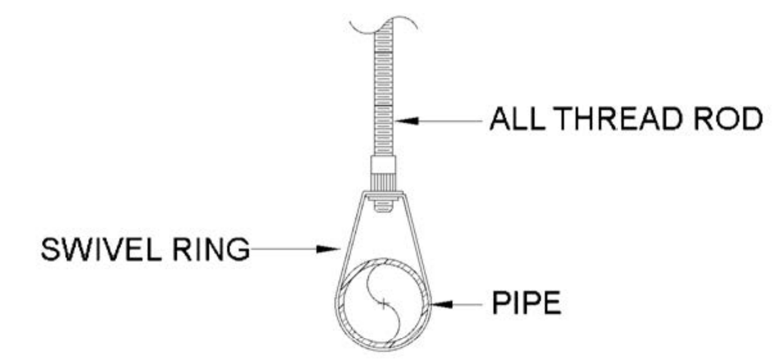
JOHNSON (SOUTH) VARIABLE MESSAGE SIGN OBSTRUCTION

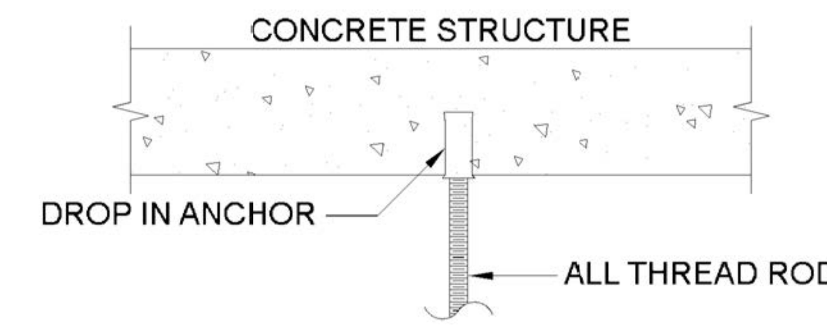
Drawing Number
FP1.0S



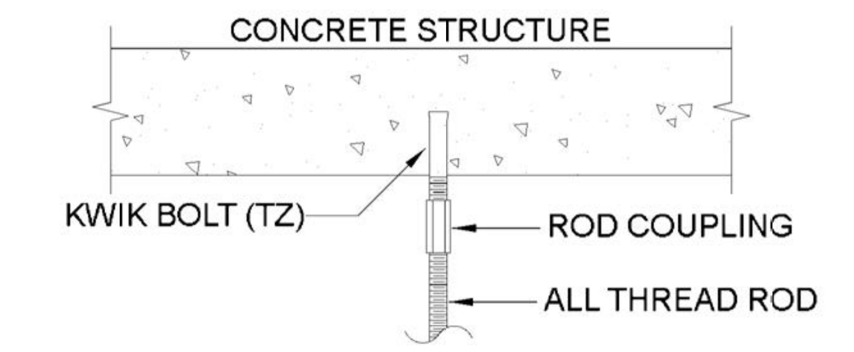
1 CLEVIS HANGER (PORTAL BUILDING - FREEZING AREAS)
NOT TO SCALE



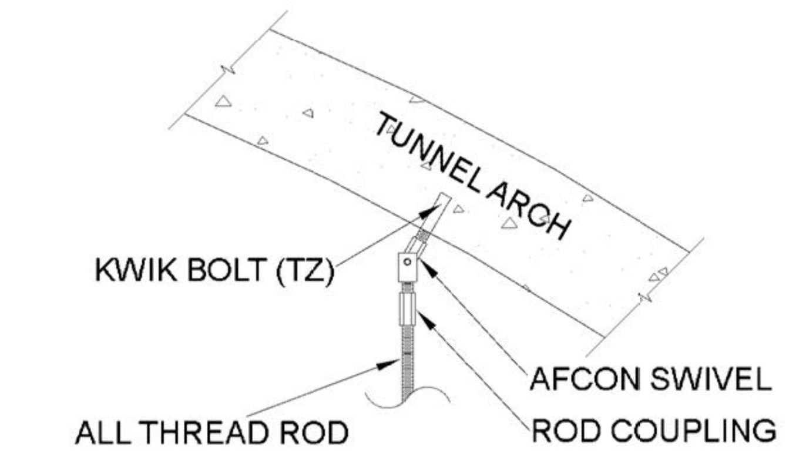
2 ADJUSTIBLE BAND HANGER (PORTAL DELUGE SYSTEM PIPING)
NOT TO SCALE



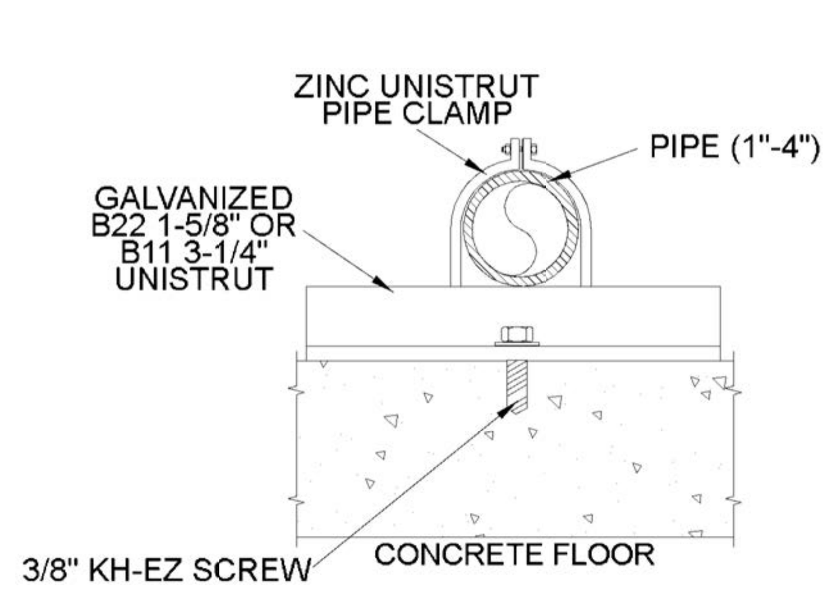
3 HILTI DROP IN ANCHOR (VERTICAL & HORIZONTAL ANCHOR)
NOT TO SCALE



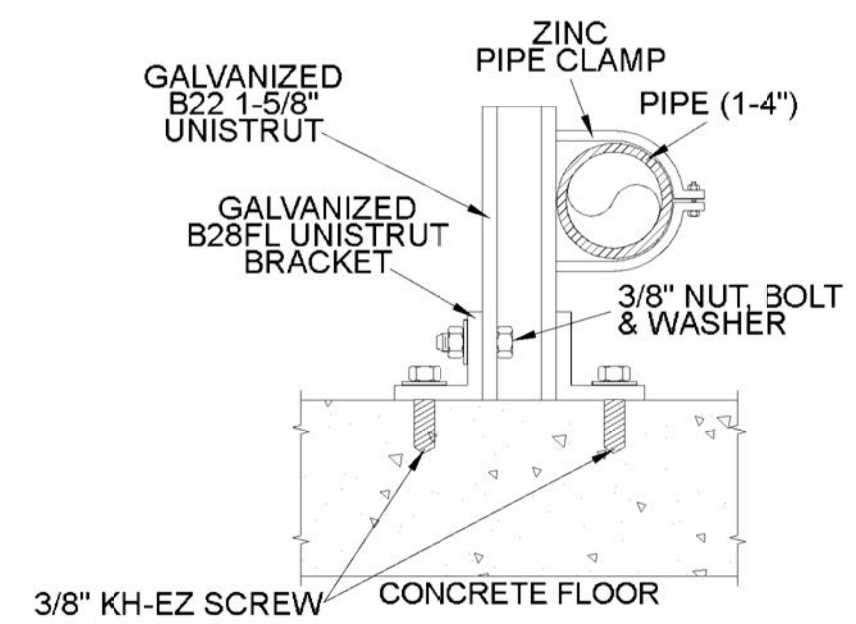
4 HILTI KWIK BOLTS (VERTICAL & HORIZONTAL ANCHOR)
NOT TO SCALE



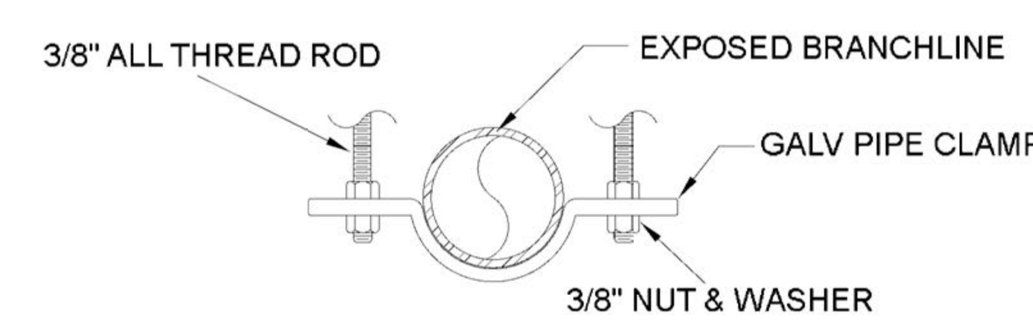
5 AFCON 615 SWIVEL (PLENUM TUNNEL ARCH ANCHOR)
NOT TO SCALE



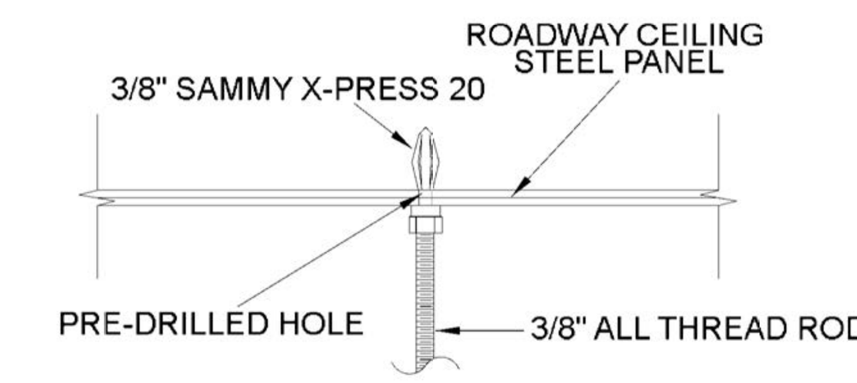
6 PIPE CLAMP DETAIL (PLENUMS - FLUSH MOUNTED)
NOT TO SCALE



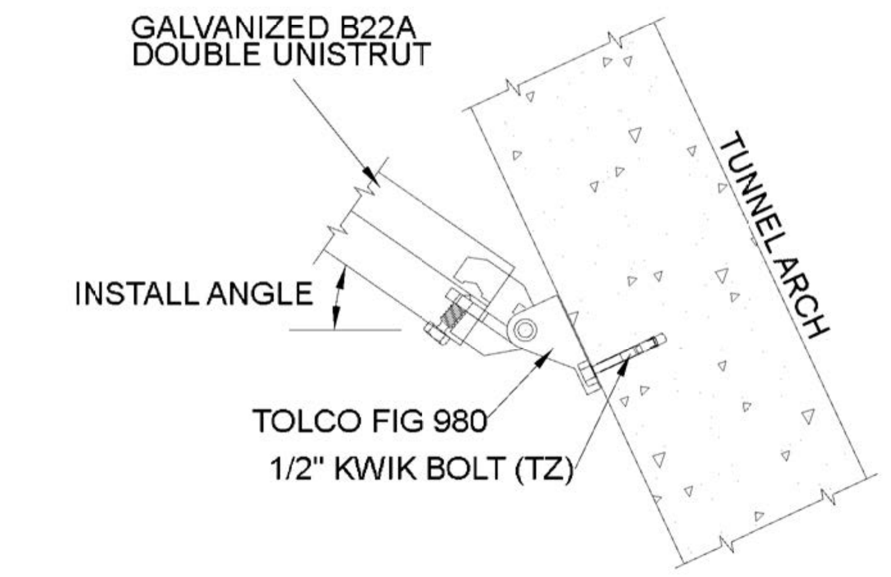
7 UNISTRUT PIPE CLAMP (PLENUMS - OFFSET MOUNTED)
NOT TO SCALE



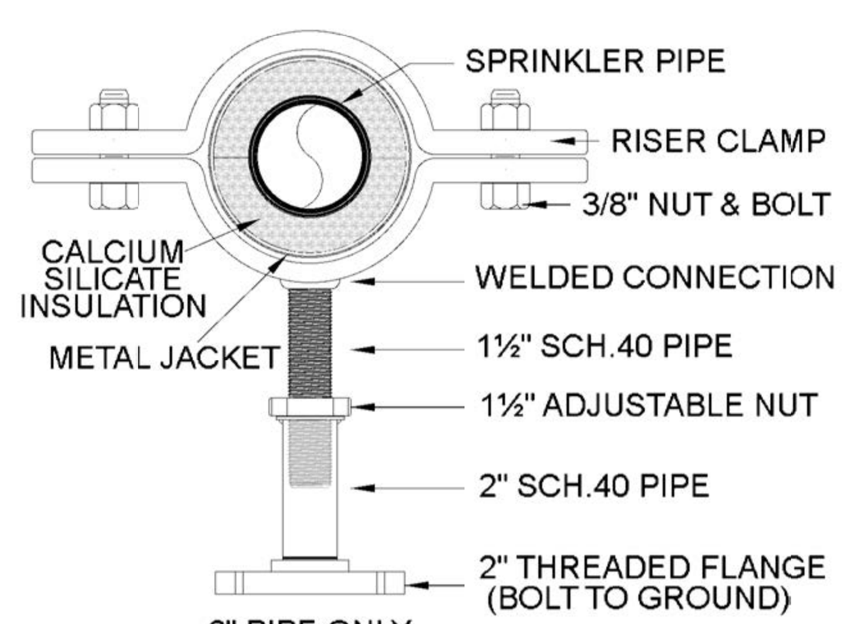
8 PIPE CLAMP (EXPOSED PIPE - ROADWAY)
NOT TO SCALE



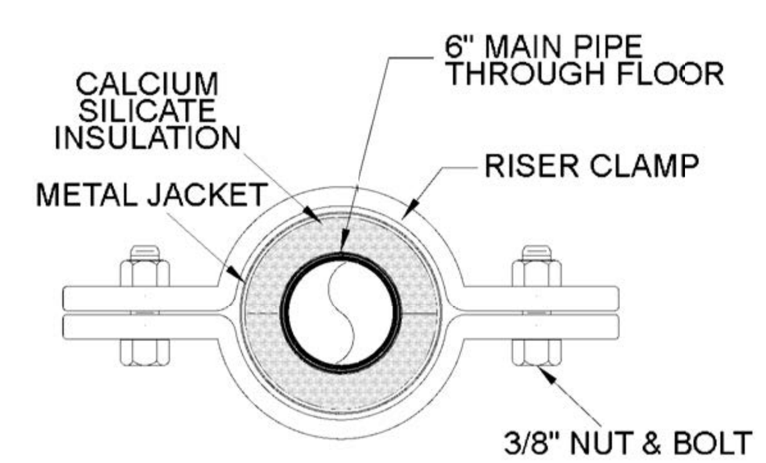
9 SAMMY X-PRESS (EXPOSED PIPE - ROADWAY)
NOT TO SCALE



10 TOLCO FIG. 980 (PLENUM BRACKET TUNNEL ARCH ANCHOR)
NOT TO SCALE



11 ADJUSTABLE PIPE STAND (PORTAL BUILDING 6" MAIN PIPING)
NOT TO SCALE



12 FLOOR CLAMP (PORTAL BUILDING 6" MAIN PIPING)
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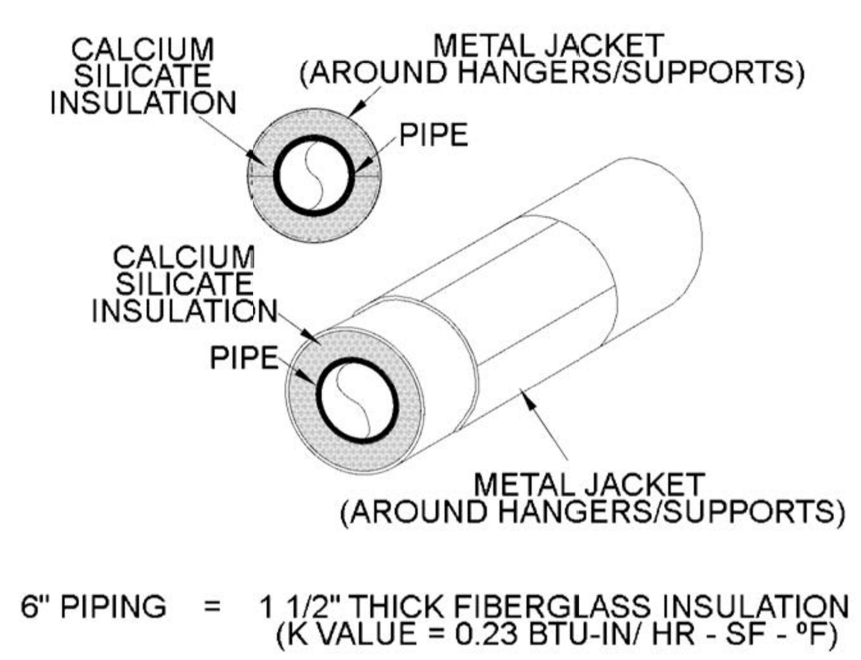
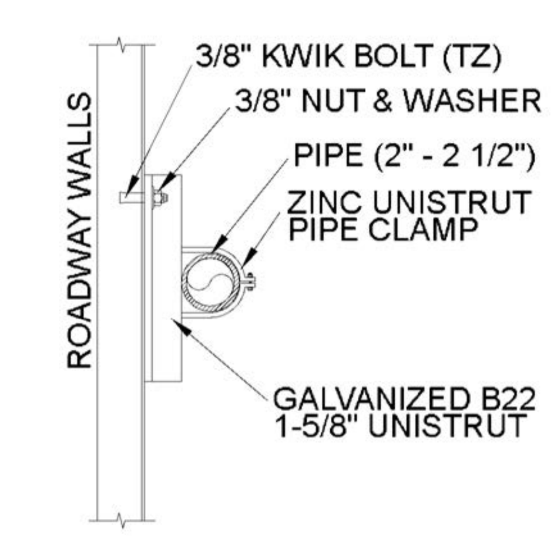
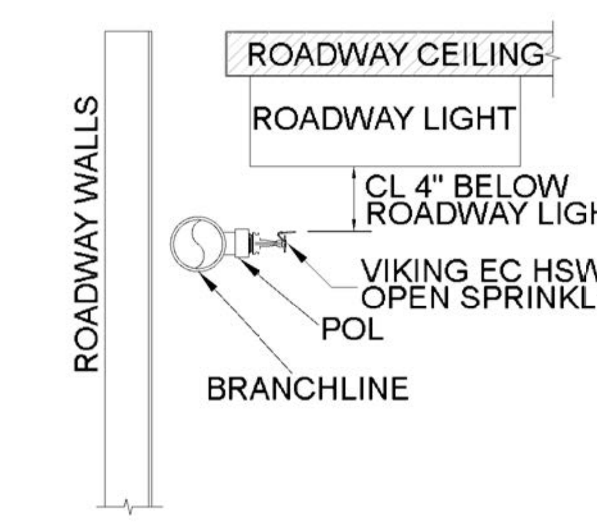


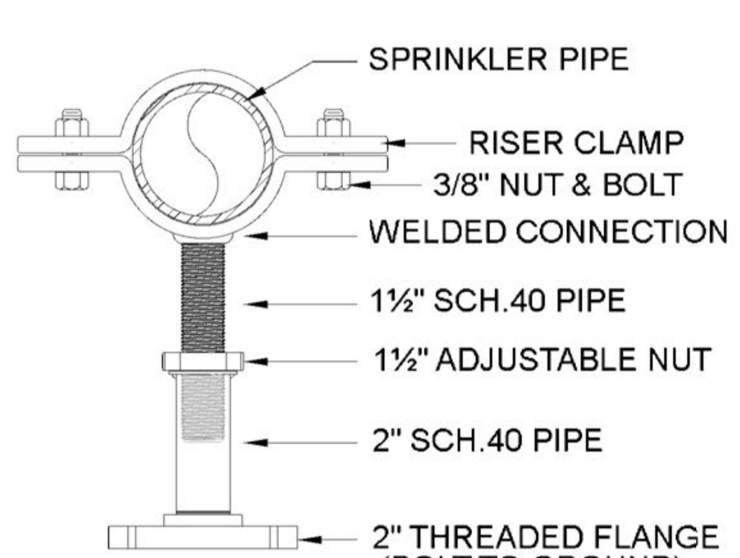
13 6" INSULATED PIPE (PLENUMS / PORTALS - FREEZING AREAS)
NOT TO SCALE



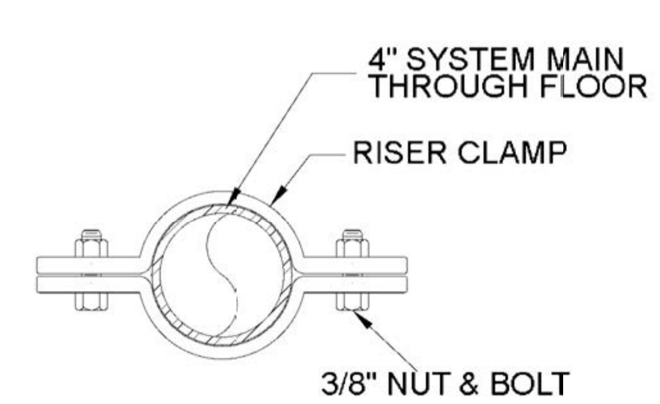
14 WALL BRACE (PORTAL DELUGE SYSTEMS ROADWAYS)
NOT TO SCALE



15 HORIZONTAL SIDEWALL NOZZLES (PORTAL DELUGE SYSTEMS ROADWAYS)
NOT TO SCALE



16 ADJUSTABLE PIPE STAND (PUMP ROOM)
NOT TO SCALE



17 RISER CLAMP (4" PORTAL DELUGE SYSTEM PIPING)
NOT TO SCALE

MAXIMUM HANGER SPACING

PIPE SIZE	*BETWEEN HANGERS	UNSUPPORTED PIPE LENGHT
1"	12'-0	3'-0
1 1/4"	12'-0	4'-0
1 1/2"	15'-0	5'-0
2"	15'-0	5'-0
2 1/2"	15'-0	5'-0
3"	15'-0	5'-0
4"	15'-0	5'-0
6"	15'-0	5'-0
8"	15'-0	5'-0

*10'-0 MAX FOR HANGERS SUSPENDED FROM CONCRETE

HANGER LEGEND

DESCRIPTION	SYMBOL	P/N
PLENUM BRACKET		ASSEMBLY
CLEVIS		FIG. 1
ADJUSTABLE BAND HANGER		FIG. 200
UNISTRUT PIPE CLAMP		2004-2013

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions

Num	Description	Date
-	-	-

DRAWN BY: AMB
CHECKED BY: JLH

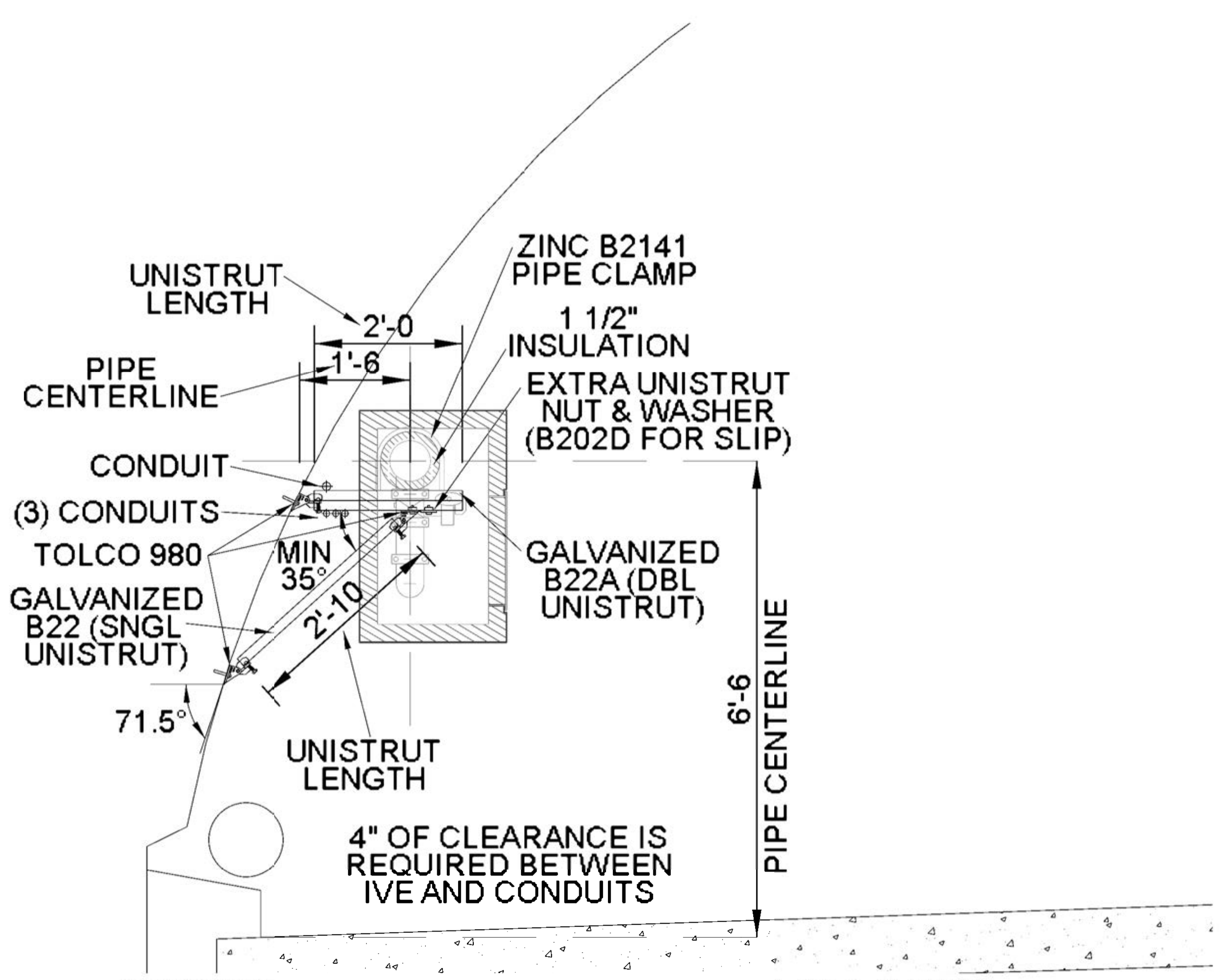
HANGERS AND SUPPORTS

Drawing Number
FP1.1

TUNNEL ARCH PLENUM BRACKET NARRATIVE

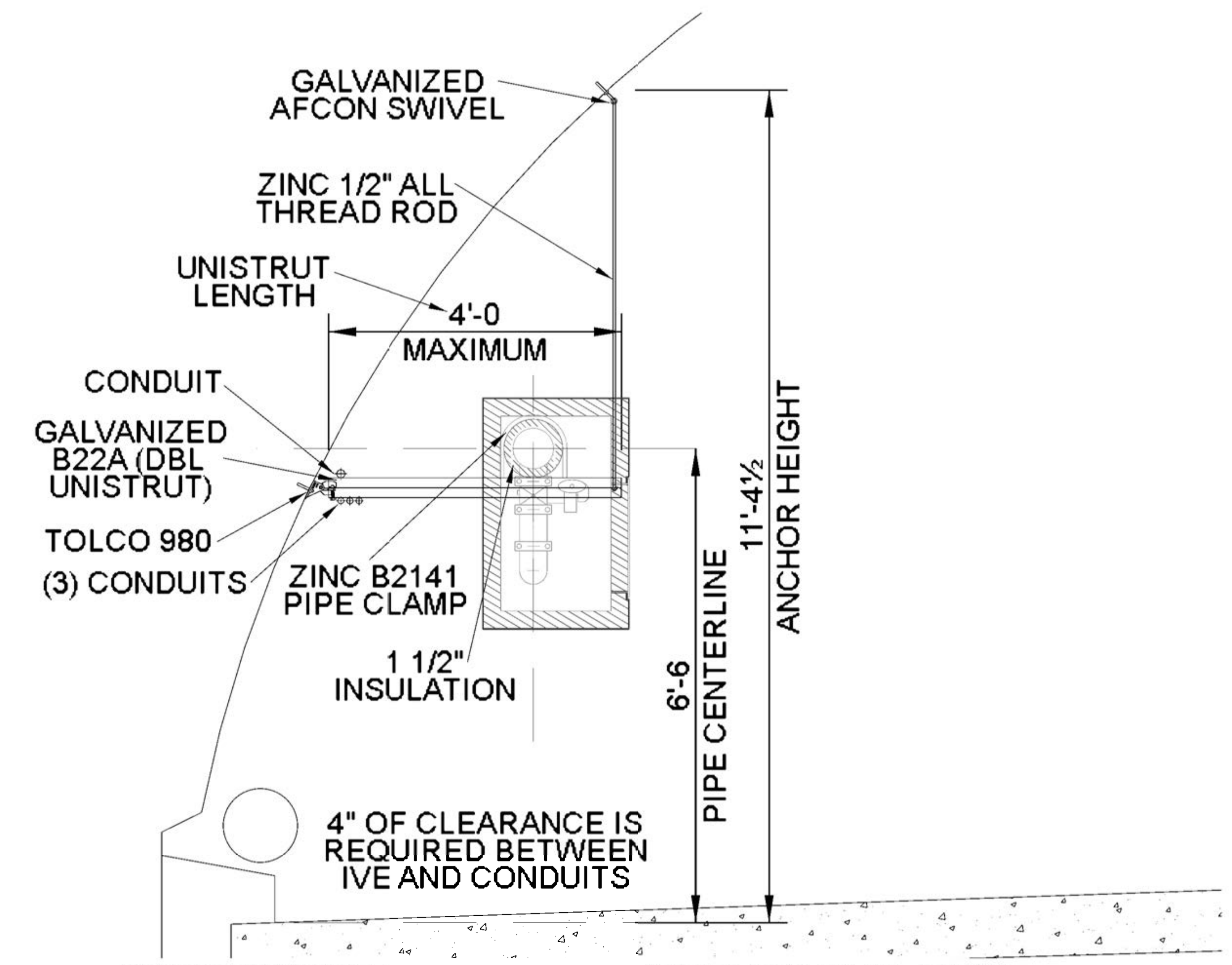
THE TUNNEL ARCH PLENUM BRACKETS ARE TO BE INSTALLED IN THE EISENHOWER (NORTH) SUPPLY AIR PLENUM ON THE NORTH TUNNEL ARCH WALL AND IN THE JOHNSON (SOUTH) SUPPLY AIR PLENUM ON THE SOUTH TUNNEL ARCH WALL. EACH BRACKET SHALL BE SPACED AT A MAXIMUM OF 12'-6 APART. THE BRACKETS ARE TO SUPPORT THE 6 INCH SUPPLY LOOP FOR THE FFSS. EVERY 25 FEET TWO BRACKETS SHALL SUPPORT ONE STICK OF 6 INCH BY 24 FEET OF SCHEDULE 10 PIPE WITH THE REQUIRED EXPANSION AND DEFLECTION JOINTS REQUIRED FOR EACH SECTION OF PIPE AND 25 FEET OF 4 SEPARATE CONDUITS. IN ADDITION, EVERY 100 FEET THE PIPE SHALL ALSO SUPPORT THE IVE ASSEMBLY FOR A SINGLE DELUGE SYSTEM. THE LOCATION FOR THE CONDUITS HAS BEEN DETERMINED TO ALLOW FOR INSTALLATION OF THE IVE AFTER THE IVE VALVES AND CONDUITS HAVE BEEN INSTALLED.

EACH BRACKET SHALL BE DESIGNED TO HOLD 12 FEET OF 6 INCH SCHEDULE 10 PIPE, 6 INCHES OF 6 INCH SCHEDULE 40 EXPANSION AND DEFLECTION JOINTS , THE WEIGHT OF THE IVE ASSEMBLY AND 4 SECTIONS OF CONDUIT 12'-6 IN LENGTH. ALL PIPE WEIGHTS, THE WEIGHTS FOR THE IVE ASSEMBLY, THE WEIGHTS FOR THE CONDUITS AND THE DESIGN LOADS FOR EACH BRACKET COMPONENT CAN BE FOUND IN TABLES LOCATED ON THIS SHEET. THE BRACKETS ARE DESIGNED TO HOLD 1000 LBS. IT HAS BEEN DETERMINED THAT THE JOHNSON (SOUTH) TUNNEL BRACKET - OPTION 1 IN DETAIL 3, HAS THE WORST CASE LOADING DUE TO THE LOCATION OF THE LOAD AND THE LARGER LENGTHS OF THE UNISTRUT THUS CALCULATIONS WERE PROVIDED FOR THIS ASSEMBLY. FOR DETAILS 2 AND 4 EACH BRACKET IS DESIGNED FOR A TRAPEZE HANGER PER NFPA-13, CH. 9, 2010 EDITION.



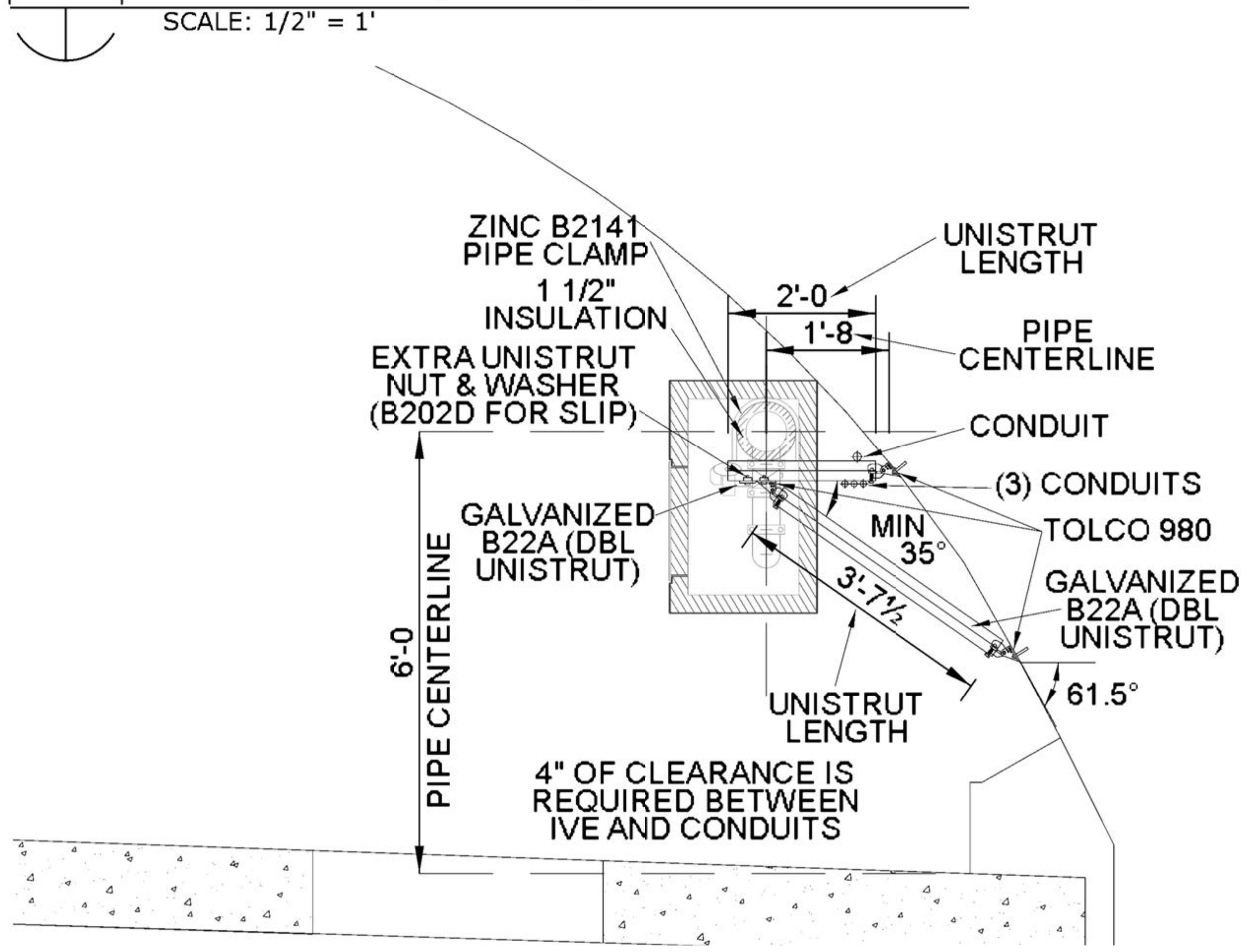
BRACKET DESIGNED IN ACCORDANCE WITH NFPA-13, CH.9, SECTION 9.1.1.2 AND THE CODES AND STANDARDS ANALYSIS FOR THIS PROJECT. SEE WORST CASE LOAD CALCULATION FOR SOUTH BRACKET LOCATED IN TUNNEL HANGER SYSTEM SUBMITTAL

1 EISENHOWER (NORTH) TUNNEL BRACKET
SCALE: 1/2" = 1'



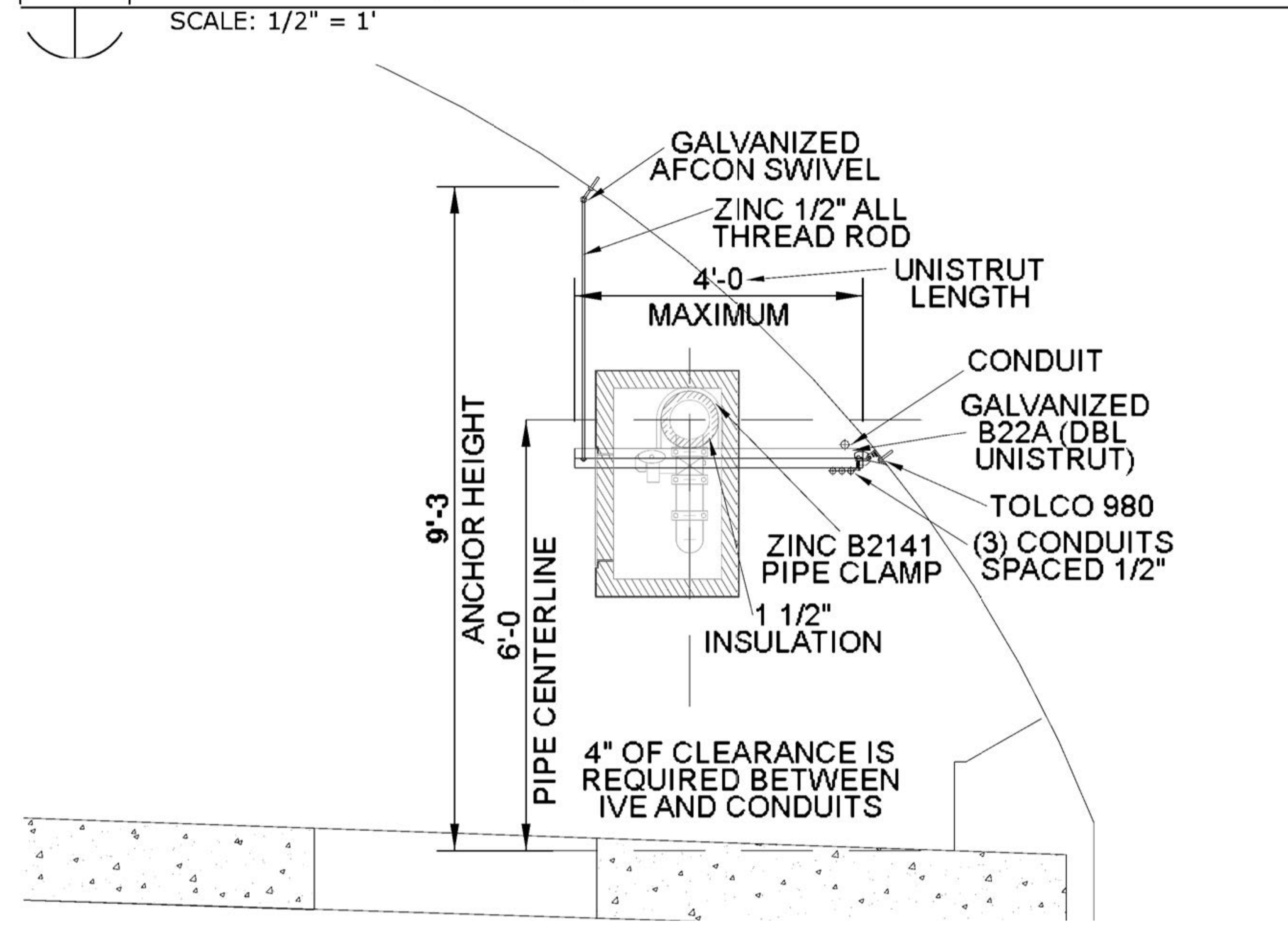
BRACKET DESIGNED FOR TRAPEZE HANGERS PER NFPA-13, CH. 9 WITH A MINIMUM SECTION MODULUS OF 0.48 FOR A MAXIMUM SPAN OF 4'-0 LOCATED ON THIS SHEET IN THE MATERIAL LOAD LIMIT TABLE

2 EISENHOWER (NORTH) TUNNEL BRACKET - WALL OBSTRUCTION
SCALE: 1/2" = 1'



BRACKET DESIGNED IN ACCORDANCE WITH NFPA-13, CH.9, SECTION 9.1.1.2 AND THE CODES AND STANDARDS ANALYSIS FOR THIS PROJECT. WORST CASE LOAD, SEE SOUTH BRACKET LOAD CALCULATION LOCATED IN TUNNEL HANGER SYSTEM SUBMITTAL

3 JOHNSON (SOUTH) TUNNEL BRACKET - OPTION 1
SCALE: 1/2" = 1'



BRACKET DESIGNED FOR TRAPEZE HANGERS PER NFPA-13, CH. 9 WITH A MINIMUM SECTION MODULUS OF 0.48 FOR A MAXIMUM SPAN OF 4'-0 LOCATED ON THIS SHEET IN THE MATERIAL LOAD LIMIT TABLE

4 JOHNSON (SOUTH) TUNNEL BRACKET - OPTION 2
SCALE: 1/2" = 1'

SCALE: 1/2" = 1'
.5 0 1 2 4

EJMT PIPE AND INSULATED VALVE ENCLOSURE WEIGHTS (LBS)
(FOR MAXIMUM BRACKET SPAN OF 12'-6)

ITEM	QTY.	WEIGHT	TOTAL
6" SCHDEDULE 10 PIPE WITH WATER (BY FOOT)	12.0	23.052	276.62
6" SCH. 40 PIPE WITH WATER (BY FOOT)	0.5	31.502	15.75
4" SCH. 40 PIPE WITH WATER (BY FOOT)	5.0	16.311	81.56
6" VIC 705W (BUTTERFLY VALVE)	1.0	28.7	28.70
4" VIC 705W (BUTTERFLY VALVE)	1.0	14.0	14.00
6" GROOVED COUPLING #75	2.0	7.0	14.00
4" GROOVED COUPLING #75	7.0	4.1	28.70
4" VIC FLK GROOVED 90 #001	2.0	6.7	13.40
4" GROOVED OUTLET	1.0	1.4	1.40
BERMAD VALVE	1.0	75.0	75.00
3/8" ATR FIG. 100	1.0	0.29	0.29
6" TOLCO FIG. 200 HANGER	1.0	1.0	1.00
4" TOLCO FIG. 200 HANGER	1.0	1.0	1.00
1.5" INSULATION	12.0	0.5	6.00
CABINET	1.0	104.0	104.00
4 CONDUITS @ 12'-6 LENGTHS	1.0	100.0	100.00
		ACTUAL WEIGHT	761.42

PRODUCT	MAXIMUM LOAD (cULus)	UNIT
FIG. 980	2,015	LBS

PRODUCT	FRACTURE LOAD	Fc (PSI)-CONCRETE TENSION 3000	UNIT
1/2" KWIK BOLT TZ (3.25" EMBED)	11,240	3,500	LBS

PRODUCT	FRACTURE LOAD	Fc (PSI)-CONCRETE SHEAR 3000	UNIT
1/2" KWIK BOLT TZ (3.25" EMBED)	7,419	7,640	LBS

PRODUCT	SHEAR MOMENT	UNIFORM LOAD 24"	30"	36"	42"	UNIT
B22 (SINGLE UNISTRUT)	0.5989	1,702	1,361	1,135	972	LBS
B22A (DOUBLE UNISTRUT)	1.7019	2,610	2,610	2,610	2,610	LBS

PRODUCT	COLUMN LOADING 24"	30"	36"	42"	48"	UNIT
B22 (SINGLE UNISTRUT)	3,993	3,802	3,589	3,360	3,118	LBS
B22A (DOUBLE UNISTRUT)	6,898	6,821	6,728	6,620	6,496	LBS

PRODUCT	RESISTANCE TO SLIP	PULL OUT	TENSION	SHEAR	UNIT
1/2" BOLT	-	-	18,000	14,000	LBS
1/2" N225 UNISTRUT NUT	1,500	2,000	-	-	LBS

PRODUCT	MAXIMUM PIPE SIZE	UNIT
1/2" AFCON 615 SWIVEL	8	IN

PRODUCT	MAXIMUM LOAD	UNIT
1/2" FIG. 70 ROD COUPLING	1,130	LBS

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Revisions

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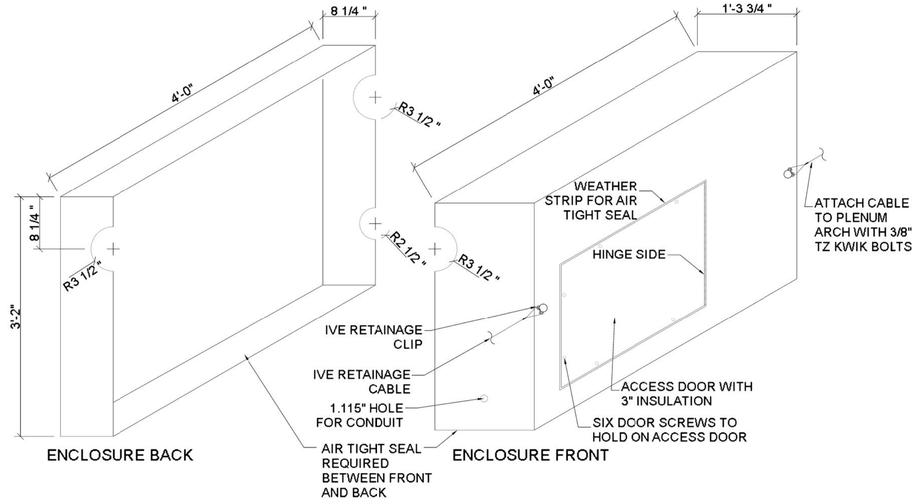
DRAWN BY: AMB CHECKED BY: JLH

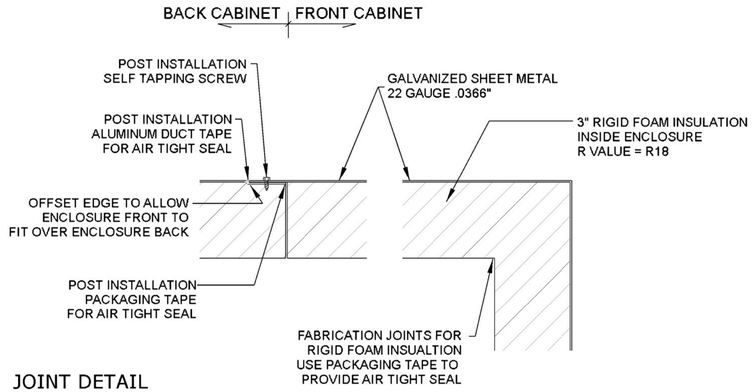
TUNNEL ARCH PLENUM BRACKET

Drawing Number
FP1.2

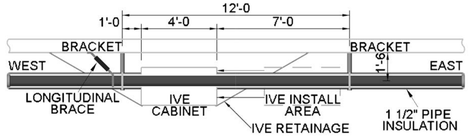


1 ENCLOSURE ISOMETRIC
NOT TO SCALE

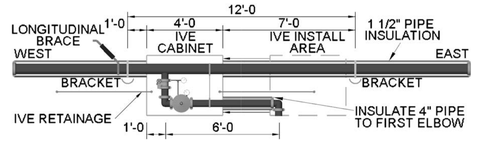
ABLE
M
H 3/8"
OLTS



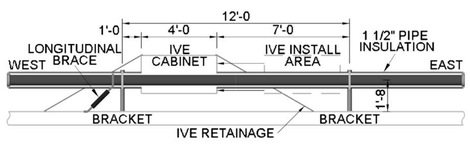
3 JOINT DETAIL
NOT TO SCALE



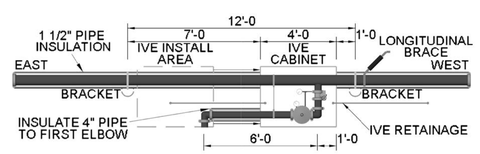
4 EISENHOWER (NORTH) TUNNEL - PLAN VIEW
NOT TO SCALE



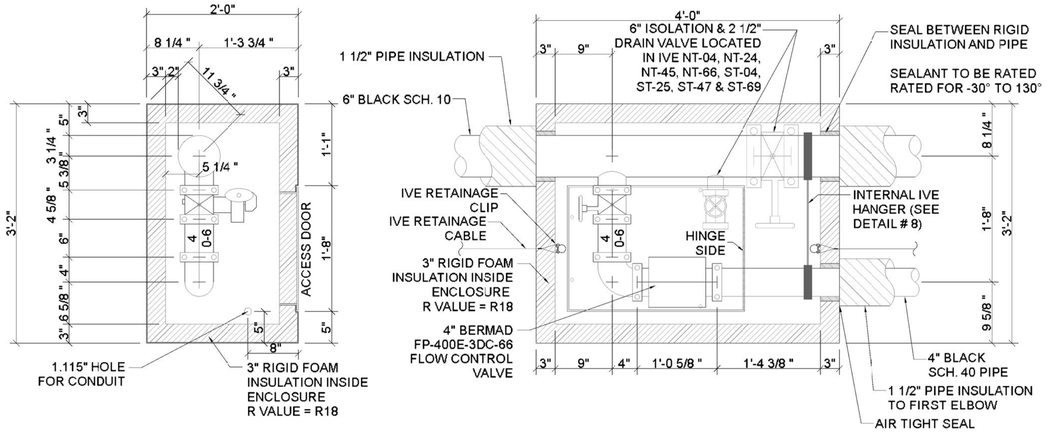
5 EISENHOWER (NORTH) TUNNEL - FRONT VIEW
NOT TO SCALE



6 JOHNSON (SOUTH) TUNNEL - PLAN VIEW
NOT TO SCALE

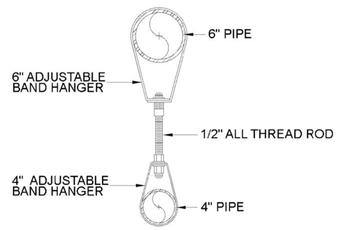


7 JOHNSON (SOUTH) TUNNEL - FRONT VIEW
NOT TO SCALE



2 ENCLOSURE FRONT AND END SECTIONS
SCALE: 1" = 1'-0

SCALE: 1" = 1'-0
.25 0 .5 1 2



8 INTERNAL IVE HANGER
NOT TO SCALE

SITE CONDITIONS

1. THE VALVE ENCLOSURES ARE TO BE INSTALLED IN THE SUPPLY PLENUMS.
2. TEMPERATURE RANGE FOR CABINETS LOCATION IS -30° TO 140° FAHRENHEIT.
3. WIND LOADS UP TO 137 MPH.

GENERAL NOTE

1. THIS DRAWING IS FOR THE EISENHOWER TUNNEL VALVE ENCLOSURES AND THE JOHNSON ENCLOSURES ARE MIRRORED.
2. ONE HUNDRED EIGHTY FOUR (184) INSULATED VALVE ENCLOSURES ARE REQUIRED WHICH INCLUDES TWO EXTRA ENCLOSURES FOR EACH TUNNEL.
3. THE 6" PIPE SUPPORTS THE VALVE ENCLOSURES AND NOT THE WALLS, FLOORS, OR CEILINGS.
4. THE SEAL BETWEEN THE FRONT AND BACK, AND AT THE DOOR MUST BE AIR TIGHT TO PREVENT HEAT LOSS. A WEATHER TIGHT GASKET SHALL BE PROVIDED. CAULKING OF GASKET IS NOT ALLOWED.
5. THE ACCESS DOOR IS MADE TO BE OPENED FOR INSPECTIONS, TESTING, AND MAINTENANCE.
6. 3" RIGID FOAM INSULATION SHALLED BE PROVIDE INSIDE ENCLOSURE AND ON ACCESS DOOR WITH AN R VALUE = R18.
7. SYSTEM IDENTIFICATION NUMBERS AND LOOP ISOLATION VALVE LOCATIONS SHALL BE PROVIDED ON THE EXTERIOR FACE OF EACH INSULATED VALVE ENCLOSURE.
8. PROVIDE IVE RETAINAGE FOR PLENUM WIND LOADS.

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
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DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
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INSULATED VALVE ENCLOSURE

Drawing Number
FP1.3

SEISMIC REQUIREMENTS

NFPA REQUIRES SEISMIC CALCULATIONS FOR THE WORST CASE SEISMIC LOAD. 6-IN LARGEST SPAN (WORST CASE LOAD) = 100 FT. 8-IN LARGEST SPAN = 20 FT. CALCULATIONS ARE PROVIDED FOR WORST CASE LOAD FOR 6-IN PIPE THUS 8-IN PIPE SEISMIC BRACING SHALL FOLLOW WORST CASE LOAD SEISMIC BRACING.

SEISMIC COEFFICIENT, C_p = 0.35
(SEE SEISMIC REPORT FOR C_p VALUES)

WHERE REQUIRED:
- SEISMIC BRACING ON ALL 6-IN SUPPLY LOOP MAINS AND 8-IN PUMP ROOM PIPING

WHERE NOT REQUIRED:
- NO SEISMIC BRACING ON CROSS MAINS AND BRANCHLINES OF DELUGE SYSTEMS

SEISMIC CLEARANCE

PROVIDE CLEARANCE AT ALL PIPING EXTENDING THROUGH WALLS, FLOORS, FOUNDATIONS. NO CLEARANCE REQUIRED AT GYPSUM BOARD OR EQUALLY FRANGIBLE CONSTRUCTION THAT IS NOT REQUIRED TO HAVE A FIRE RESISTANCE RATING.

NOMINAL PIPE SIZE	CORE DRILL HOLE OR PIPE SLEEVE SIZE
INCH	INCH
6	10
8	14

NOTE

ADDITIONAL LATERAL BRACING SHALL NOT BE REQUIRED FOR THE 6-IN SUPPLY LOOP MAIN THAT IS SUPPORTED BY A TUNNEL ARCH PLENUM BRACKET IN THE PLENUMS.

EARTHQUAKE PROTECTION NOTES:

1. ALL EARTHQUAKE BRACING TO BE IN ACCORDANCE WITH NFPA-13, 2010 EDITION.
2. FLEXIBLE COUPLINGS SHALL BE INSTALLED WHERE REQUIRED BY NFPA-13.
3. FLEXIBLE COUPLINGS SHALL BE LOCATED IN ACCORDANCE WITH NFPA-13 AS FOLLOWS:
   - 3.1. WITHIN 24-IN FROM THE TOP AND BOTTOM OF ALL RISERS.
   - 3.2. WITHIN 12-IN ABOVE AND 24-IN BELOW FLOORS IN MULTISTORY BUILDINGS.
   - 3.3. WITHIN 1 FT. OF ALL CONCRETE AND MASONRY WALL PENETRATIONS UNLESS CLEARANCE IS PROVIDED PER SECTION 9.3.4.
   - 3.4. WITHIN 24-IN OF BUILDING EXPANSION JOINTS.
   - 3.5. ABOVE AND BELOW ANY INTERMEDIATE POINTS OF SUPPORT FOR A RISER OR OTHER VERTICAL PIPE.
4. CLEARANCE SHALL BE PROVIDED AROUND ALL PIPING EXTENDED THROUGH WALLS AND FLOORS PER SECTION 9.3.4 OR FLEXIBLE COUPLINGS SHALL BE PROVIDED.
5. LONGITUDINAL SWAY BRACING SPACED AT A MAXIMUM OF 100 FT. SHALL BE PROVIDED FOR THE 6-IN SUPPLY MAIN.
6. TOPS OF RISERS OVER 3 FT. SHALL BE SECURED AGAINST DRIFTING IN ANY DIRECTION USING A 4-WAY BRACE.
7. LATERAL SWAY BRACING SPACED AT A MAXIMUM OF 40 FT. SHALL BE BE PROVIDED FOR THE 6-IN SUPPLY MAIN.
8. LONGITUDINAL BRACING SHALL BE ATTACHED DIRECTLY TO FEED AND CROSS MAINS.
9. LATERAL BRACING IN PORTALS SHALL BE ATTACHED DIRECTLY TO THE CLEVIS HANGER. LATERAL BRACING IN PLENUMS SHALL BE ATTACHED AROUND THE INSULATION.

SEISMIC CALCULATIONS

Project Address:

Eisenhower–Johnson Memorial Tunnel
Interstate 70 at the Continental Divide
Colorado, USA

Western States Fire Protection Co.
Protecting Lives and Property
a subsidiary of API Group, Inc.

Brace Information

Maximum Spacing	40'-0
Maximum Brace Length	7'-0
Bracing Material	1" sch. 40 pipe
Angle From Vertical	45 deg Minimum
Least Rad. of Gyration	0.421"
L/R Value	200
Max Horizontal Load	1310 lbs.
Force Factor (Cp)	0.5

Components Summary

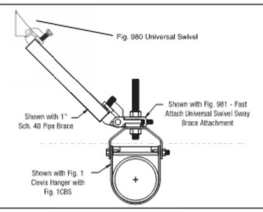
Component Description	Adjusted Load
Tolco Fig. 1 Clevis Hanger With Fig. 1CBS	1940 lbs / 1.414 = 1371 lbs.
Tolco Fig. 980 Universal Swivel	2015 lbs / 1.141 = 1425 lbs.
Tolco Fig. 981 Universal Swivel	2015 lbs / 1.141 = 1425 lbs.

*Adjusted load based on NPFA 13 Table 9.3.5.10.3
** Calculation Based on CONCENTRIC Loading

Fastener Information

Fastener Orientaion	NFPA Type E
Type	Concrete Wedge Anchor (4000 psi Cracked Concrete)
Diameter	1/2"
Length	3-1/4 in. Minimum
Maximum Load	797 lbs.

Assembly Detail



Orientation of Brace Lateral

Load Information

Braced Pipe: 6" Sch. 10 Pipe

Size and Type of Pipe	Total Length	Total Calculated Load
6" Sch. 10 Steel Pipe	40'-0	460.60
Percentage added for Fittings and Sprinkler Components	**15%**	69.10 **lbs.**
Total Adjusted Load of All pipe within Zone of Influence		529.70 **lbs.**

SEISMIC CALCULATIONS

Project Address:

Eisenhower–Johnson Memorial Tunnel
Interstate 70 at the Continental Divide
Colorado, USA

Western States Fire Protection Co.
Protecting Lives and Property
a subsidiary of API Group, Inc.

Brace Information

Maximum Spacing	100'-0
Maximum Brace Length	7'-0
Bracing Material	1" sch. 40 pipe
Angle From Vertical	45 deg Minimum
Least Rad. of Gyration	0.421"
L/R Value	200
Max Horizontal Load	1310 lbs.
Force Factor (Cp)	0.5

Components Summary

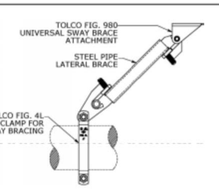
Component Description	Adjusted Load
Tolco Fig. 4L Pipe Clamp	2015 lbs / 1.414 = 1425 lbs.
Tolco Fig. 980 Universal Swivel	2015 lbs / 1.141 = 1425 lbs.

*Adjusted load based on NPFA 13 Table 9.3.5.10.3
** Calculation Based on CONCENTRIC Loading

Fastener Information

Fastener Orientaion	NFPA Type B
Type	Concrete Wedge Anchor (4000 psi Cracked Concrete)
Diameter	3/4"
Length	4-3/4 in. Minimum
Maximum Load	1498 lbs.

Assembly Detail



Orientation of Brace Longitudinal

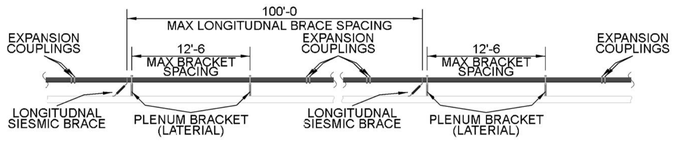
Load Information

Braced Pipe: 6" Sch. 10 Pipe

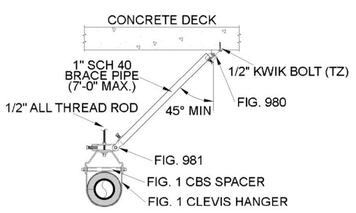
Size and Type of Pipe	Total Length	Total Calculated Load
6" Sch. 10 Steel Pipe	100'-0	1151.50
Percentage added for Fittings and Sprinkler Components	**15%**	173 **lbs.**
Total Adjusted Load of All pipe within Zone of Influence		1324.50 **lbs.**

SEISMIC BRACING LEGEND

- LATERAL BRACE
  40' SPACING, 6' MAX FROM END OF PIPE
- LONGITUDINAL BRACE
  100' SPACING, 40' MAX FROM END OF PIPE
- 4-WAY BRACE
  1-LATERAL BRACE
  1-LONGITUDINAL BRACE

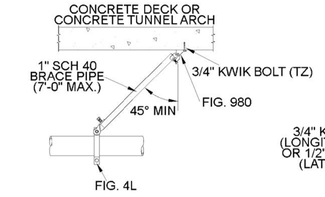


1 SEISMIC BRACING PER 100 FOOT SECTION
NOT TO SCALE



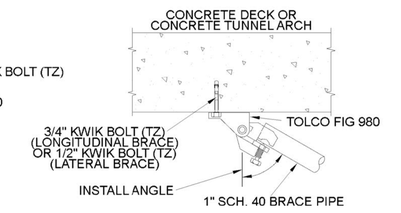
SEISMIC BRACING ONLY

2 LATERAL BRACE (PORTALS)
NOT TO SCALE



SEISMIC BRACING ONLY

3 LONGITUDINAL BRACE (PLENUMS & PORTALS)
NOT TO SCALE



SEISMIC BRACING ONLY

4 TOLCO FIG. 980 UNIVERSAL SWIVEL SWAY BRACE ATTACHMENT
NOT TO SCALE

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Revisions		
Num	Description	Date
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DRAWN BY: AMB
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SEISMIC BRACING

Drawing Number
FP1.4

THE 6-IN MAIN SUPPLY LOOP IS TO BE INSTALLED IN THE SUPPLY AIR PLENUMS LOCATED ABOVE THE ROADWAY TUNNELS AND ON THE FAN DECK IN EACH EAST AND WEST PORTAL. EACH TUNNEL AND ITS RESPECTIVE AIR PLENUMS CURVE NORTH AND SOUTH THROUGH THE MOUNTAIN AND CHANGE IN ELEVATION, INCREASING FROM EAST TO WEST. THE CURVATURE OF THE TUNNELS OCCURS SLIGHTLY OVER A LARGE DISTANCE MAKING THE INSTALLATION OF FITTINGS AND SWING JOINTS UNNECESSARY. THE DEFLECTION IS VERY MINIMAL BUT MUST BE ADDRESSED.

IN ADDITION THE AIR PLENUMS ARE SUBJECT TO FREEZING TEMPERATURES IN THE WINTER MONTHS. TO PREVENT THE WATER IN THE PIPE FROM FREEZING, HOT WATER STARTING AT 100°F WITH A MAXIMUM DESIGN BOILER TEMPERATURE OF 130°F, WILL BE CIRCULATED THROUGH THE 6-IN MAIN SUPPLY LOOP. MAIN PIPING WILL BE INSTALLED WHEN TEMPERATURES HAVE THE POTENTIAL TO BE -30°F. THE WORST CASE TEMPERATURE CHANGE WAS CALCULATED TO BE FROM -30 TO 130°F. DUE TO DRASTIC CHANGES IN TEMPERATURE, THE 6-IN PIPE WILL EXPAND AND CONTRACT. WHEN THE PIPE IS TO BE INSTALLED DURING THE COLD WEATHER SEASONS OR WHEN COLD WATER FROM THE STORAGE TANK IS INTRODUCED INTO THE PIPE DURING A FIRE OR TESTING SITUATION, THE STEEL PIPE WILL SHRINK. WHEN THE HOT WATER IS CIRCULATED THROUGH THE PIPE, THE STEEL PIPE WILL EXPAND. THE EXPANSION FROM THE CHANGE IN TEMPERATURE WILL CAUSE A PARALLEL DEFLECTION THAT MUST BE ADDRESSED.

TO ACCOMMODATE CHANGES IN THE PIPE LENGTH AND DIRECTION, EXPANSION AND DEFLECTION WILL BE ADDRESSED CONTINUALLY FOR EVERY STICK OF PIPE ALONG THE ENTIRE LENGTH OF THE TUNNEL BY USING VICTAULIC STYLE 75 FLEXIBLE COUPLINGS AND VICTAULIC STYLE 155 EXPANSION JOINT 6-IN NIPPLES. THROUGH PRODUCT DATA AND EXPANSION & DEFLECTION CALCULATIONS FOR A 25'-0 SECTION OF PIPE, A SOLUTION WAS DETERMINED TO PROVIDE EXPANSION JOINTS TO ACCOMMODATE THE EXPANSION AND DEFLECTION WITHIN EACH 25'-0 OF PIPE.

EXPANSION JOINTS SHALL BE INSTALLED AT EACH END OF PIPE APPROXIMATELY EVERY 25'-0. AN EXPANSION JOINT WILL CONSIST OF (2) STYLE 75 COUPLINGS WITH (1) STYLE 155 6-IN SCHEDULE 40 NIPPLE, 4 INCHES IN LENGTH BETWEEN THE COUPLINGS. EACH EXPANSION JOINT WILL BE INSTALLED IN COLD WEATHER CONDITIONS THUS EACH COUPLING SHALL BE INSTALLED TO SEPARATE THE TWO ENDS OF THE PIPE TO ALLOW FOR MAXIMUM POSSIBLE SEPARATION. WHEN THE PIPE EXPANDS DUE TO HOT WATER, THERE WILL BE ZERO DEFLECTION BETWEEN EACH PIECE OF PIPE. PER 25'-0, THE EXPANSION JOINT WILL PROVIDE 0.346-IN WHICH EXCEEDS THE REQUIRED THERMAL EXPANSION LENGTH OF 0.3216-IN

WHEN ANGULAR DEFLECTION IS REQUIRED, AN ADDITIONAL COUPLING AND NIPPLE SHALL BE ADDED TO ACCOMMODATE THE ANGULAR DEFLECTION BETWEEN THE COUPLINGS THAT ARE PROVIDED FOR THE EXPANSION JOINT. THIS COUPLING WILL NOT BE ABLE TO DEFLECT IN THE PARALLEL DIRECTION AND WILL NOT BE USED AS AN EXPANSION COUPLING. MAXIMUM ALLOWABLE DEFLECTION AND EXPANSION OF EACH COUPLING CAN BE FOUND ON THIS SHEET.

IN ADDITION, TWO BRACKETS SHALL BE PROVIDED FOR EACH 25 FT. LENGTH OF PIPE. BOTH BRACKETS SHALL BE BRACED TO ALLOW MINIMAL DEFLECTION BETWEEN EACH 25 FT. STICK OF PIPE. A LONGITUDINAL BRACE SHALL BE INSTALLED EVERY 100 FT. WITH THE BRACED SUPPORT CLOSEST TO THE INSULATED VALVE ENCLOSURE TO LIMIT MOVEMENT AT THE DELUGE VALVE ASSEMBLIES AND TO PROVIDE THE REQUIRED SEISMIC BRACING. SEISMIC INFORMATION CAN BE FOUND ON DRAWING FP1.4.

VICTAULIC STYLE 75 COUPLING (DATA SHEET 6.05)

NOMINAL SIZE (INCHES)	ACTUAL OUTSIDE DIAMETER (INCHES)	MAX. WORK PRESSURE (PSI) *	MAX. END LOAD (LBS.) *	ALLOWED END SEP. (INCHES) †	DEFLECTION †		BOLT/NUT NO - SIZE (INCHES) @	DIMENSIONS			APPROX. WEIGHT (KG)
					PER COUPLING (DEG.)	PIPE (IN./FT.)		X (INCHES)	Y (INCHES)	Z (INCHES)	
6	6.625	450	15,525	0 - 0.13	1˚ - 5'	0.23	2 - 5/8 X 3 1/4	8.00	11.07	2.13	7.0

* WORKING PRESSURE AND END LOAD ARE TOTAL, FROM ALL INTERNAL AND EXTERNAL LOADS, BASED ON STANDARD WEIGHT (ANSI) STEEL PIPE, STANDARD ROLL OR CUT GROOVED IN ACCORDANCE WITH VICTAULIC SPECIFICATIONS.

† ALLOWABLE PIPE END SEPARATION AND DEFLECTION FIGURES SHOW THE MAXIMUM NOMINAL RANGE OF MOVEMENT AVAILABLE AT EACH JOINT FOR STANDARD ROLL GROOVED PIPE. FIGURES FOR STANDARD CUT GROOVED PIPE MAY BE DOUBLED. THESE FIGURES ARE MAXIMUMS; FOR DESIGN AND INSTALLATION PURPOSES THESE FIGURES SHOULD BE REDUCED BY: 25% FOR 4" AND LARGER.

@ NUMBER OF BOLTS REQUIRED EQUALS NUMBER OF HOUSING SEGMENTS.

JOINT END SEPARATION / LONGITUDNAL EXPANSION

EXPANSION JOINT (GROOVE + GROOVE)	# OF COUPLINGS	ALLOWED DEFLECT. PER CPLG. (INCHES)	25.0% SAFTEY FACTOR (INCHES)
ROLL GROOVE EXPANSION JOINT (ROLL + ROLL)	1	0.13 *	0.0975
CUT GROOVE EXPANSION JOINT (CUT + CUT)	1	0.26	0.195
ROLL GROOVE TO CUT GROOVE EXPANSION JOINT (ROLL + CUT)	1	0.065 + 0.13	0.146
VICTUALIC STYLE 155 EXPANSION JOINT 6" CUT GROOVE SCH. 40 NIPPLE (ROLL + CUT + ROLL)	2	0.461	0.346

* INFORMATION PROVIDED FROM VICTAULIC STYLE 75 (DATA SHEET 6.05)
- COMBINATIONS OF EACH JOINT CAN BE USED OBTAIN THE REQUIRED EXPANSION

JOINT END ANGULAR DEFLECTION (LATERAL DIRECTION CHANGE)

DEFLECTION JOINT (GROOVE + GROOVE)	ALLOWED DEFLECT. PER CPLG. (DEG)	25.0% SAFTEY FACTOR (DEG)	ALLOWED CPLGS. PER 100FT (QTY.)	ALLOWED DEFLECT. PER 100FT (DEG)	ALLOWED DEFLECT. PER CPLG. (IN/FT)	25.0% SAFTEY FACTOR (INCHES)	ALLOWED DEFLECT. PER 25FT (INCHES)	ALLOWED DEFLECT. PER 100FT (INCHES)
ROLL GROOVE DEFLECTION JOINT (ROLL + ROLL)	1˚ - 5' *	0˚ - 48.75'	4	3˚ - 15'	0.23 *	0.173	4.313	17.25
CUT GROOVE DEFLECTION JOINT (CUT + CUT)	2˚ - 10'	1˚ - 37.5'	4	6˚ - 30'	0.46	0.345	8.625	34.50
ROLL GROOVE TO CUT GROOVE DEFLECTION JOINT (ROLL + CUT)	0˚ - 32.5' + 1˚ - 5'	1˚ - 13.13'	4	4˚ - 52'	0.115 + 0.230	0.259	6.469	25.875

* INFORMATION PROVIDED FROM VICTAULIC STYLE 75 (DATA SHEET 6.05)
- COMBINATIONS OF EACH JOINT CAN BE USED TO OBTAIN THE REQUIRED DEFLECTION

THERMAL EXPANSION OF STEEL PIPE

dl = Lo α (t1 - to)

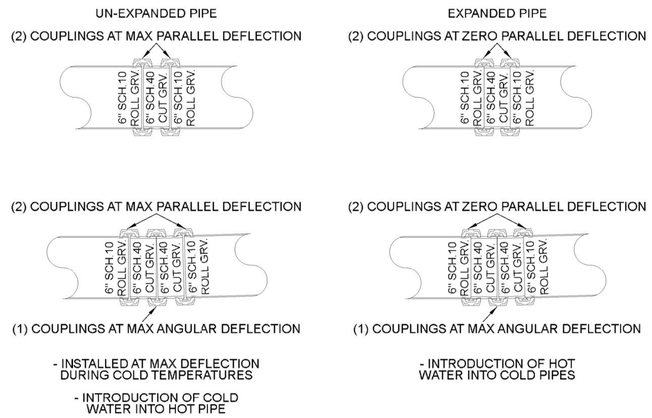
Lo = INITIAL LENGTH (inches)
Lo = 300 inches (PER 25 ft)

α = LINEAR EXPANSION COEFFICIENT (in/in°F)
αSteel = 0.0000067 (in/in°F)

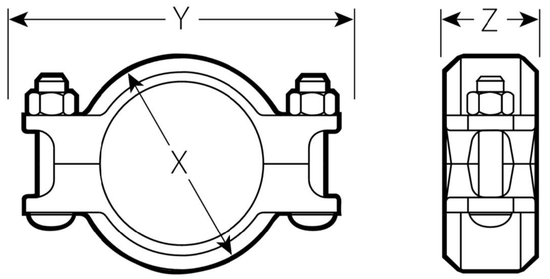
to = INITIAL TEMPERATURE (°F)
t0 = -30.00 °F

t1 = FINAL TEMPERATURE (°F)
t1 = 130.00 °F

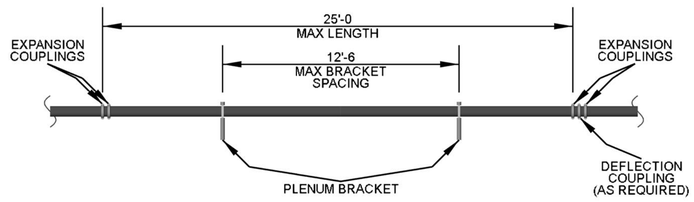
dl = CHANGE IN LENGTH (inches)
dl = 0.3216 inches



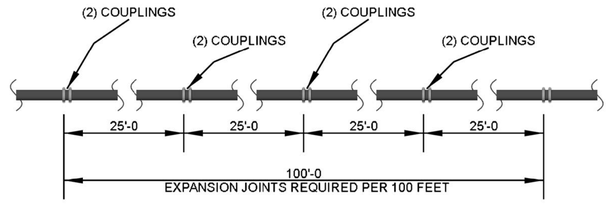
1 JOINT END SEPARATION AND DEFLECTION
NOT TO SCALE



2 VICTAULIC STYLE 75 DIMENSIONS
NOT TO SCALE



3 BRACING PER 25 FOOT SECTION
NOT TO SCALE



4 EXPANSION JOINTS PER 100 FOOT SECTION
NOT TO SCALE

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions
Num | Description | Date
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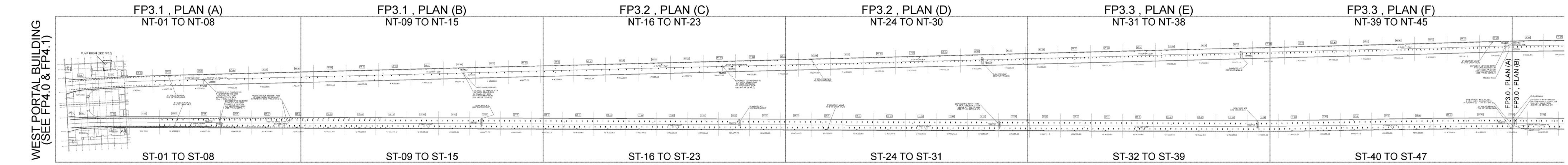
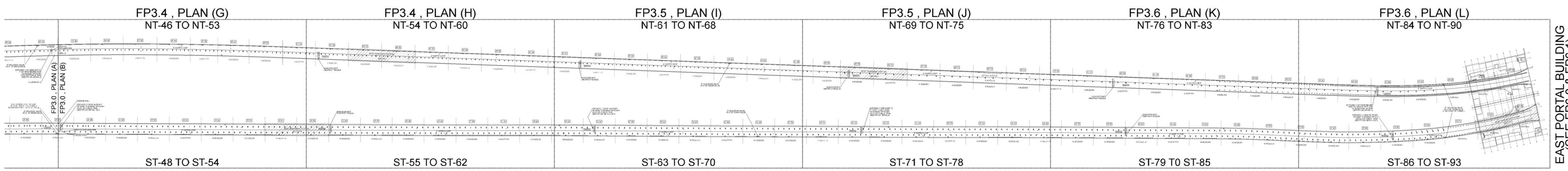
PIPE EXPANSION AND DEFLECTION

Drawing Number
FP2.0



N

1 PLAN (A) - DELUGE SYSTEMS , NT-01 TO NT-45 , ST-01 TO ST-47
NOT TO SCALE



N

2 PLAN (B) - DELUGE SYSTEMS , NT-46 TO NT-90 , ST-48 TO ST-93
NOT TO SCALE

LEGEND - SHEETS FP-3.0 TO FP-3.6

LINE TYPE

- 25'-0 — SYSTEM LENGTH
- SYSTEM BOUNDARY LINES
- MOST DEMANDING SYSTEMS
- MATCHLINES

VALVE COUNTS

- IVE CABINET: QTY. 180
- DELUGE VALVE: QTY. 183
- ISOLATION / DRAIN VALVE: QTY. 10

ABBREVIATION LIST

NT-## = NORTH TUNNEL - ID NUMBER
ST-## = SOUTH TUNNEL - ID NUMBER
NVMS# = NORTH VARIABLE MESSAGE SIGN ID NUMBER
SVMS# = SOUTH VARIABLE MESSAGE SIGN ID NUMBER

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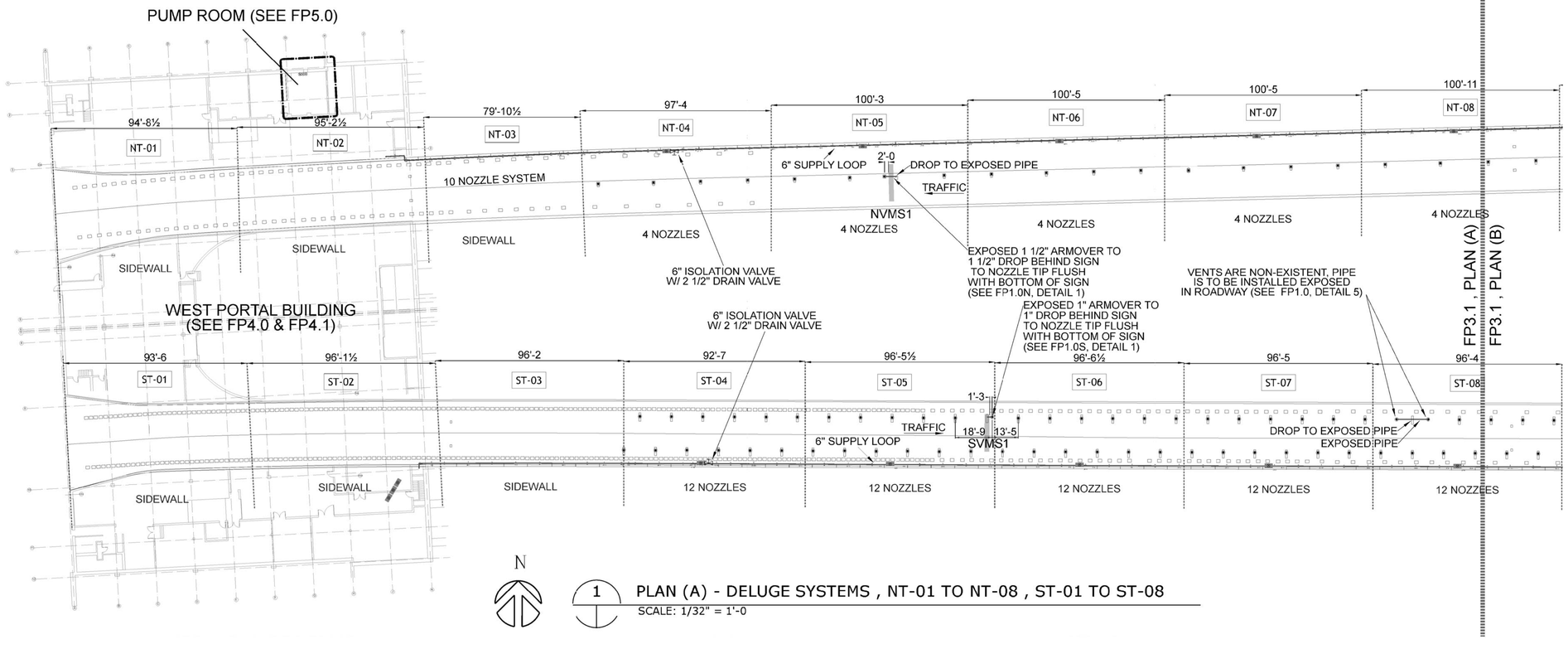
DELUGE SYSTEM LOCATION KEY

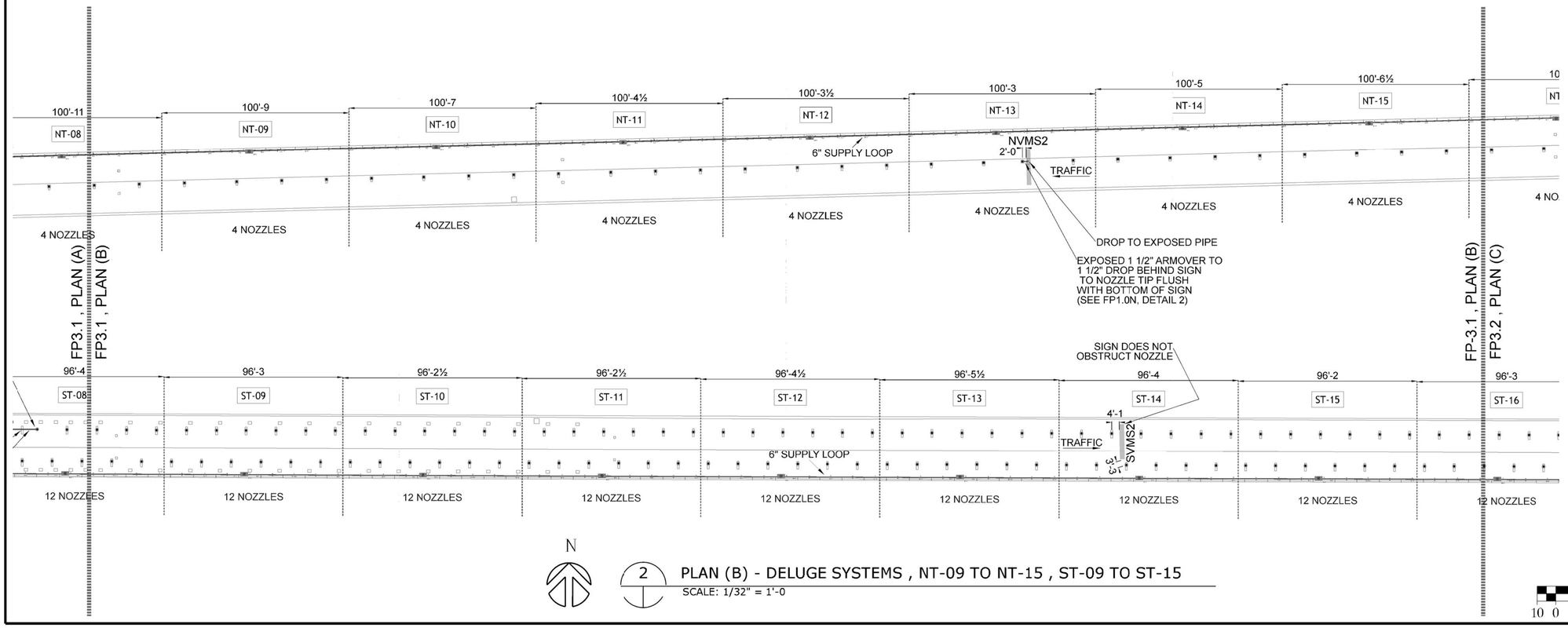
Drawing Number
FP3.0



N

1 PLAN (A) - DELUGE SYSTEMS , NT-01 TO NT-08 , ST-01 TO ST-08

SCALE: 1/32" = 1'-0



N

2 PLAN (B) - DELUGE SYSTEMS , NT-09 TO NT-15 , ST-09 TO ST-15

SCALE: 1/32" = 1'-0

SCALE: 1/32" = 1'-0

10 0 25 50 100

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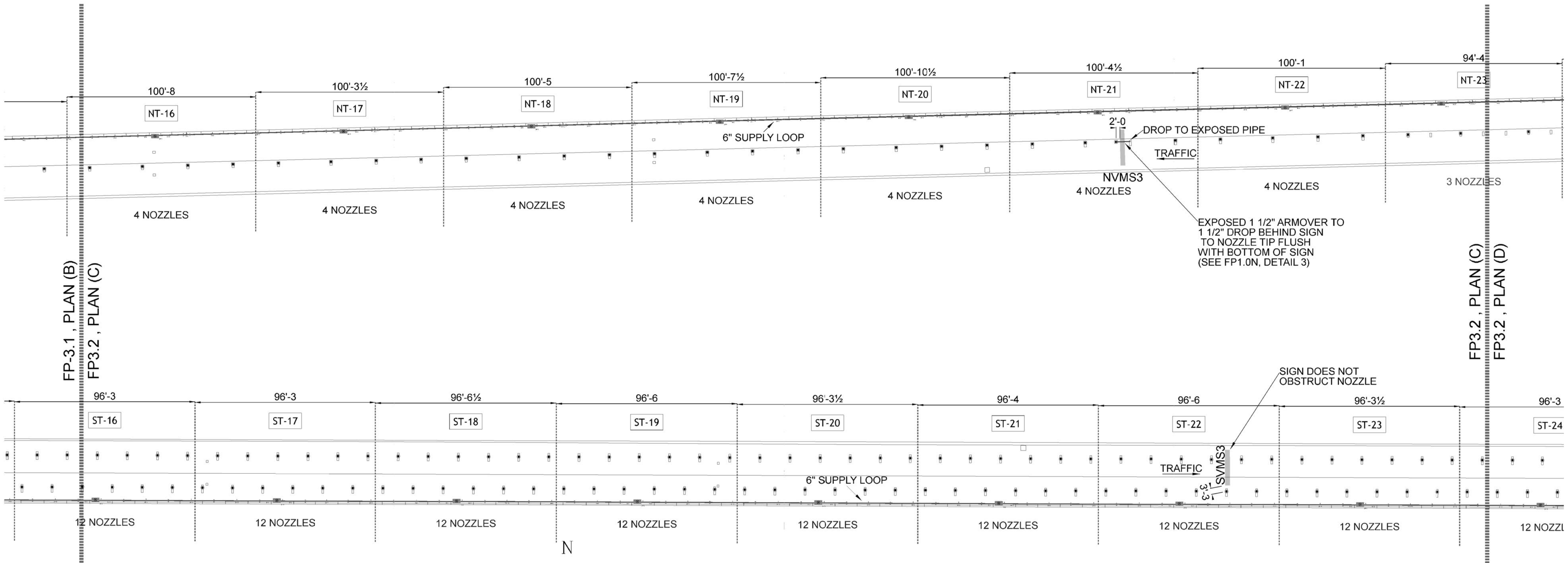
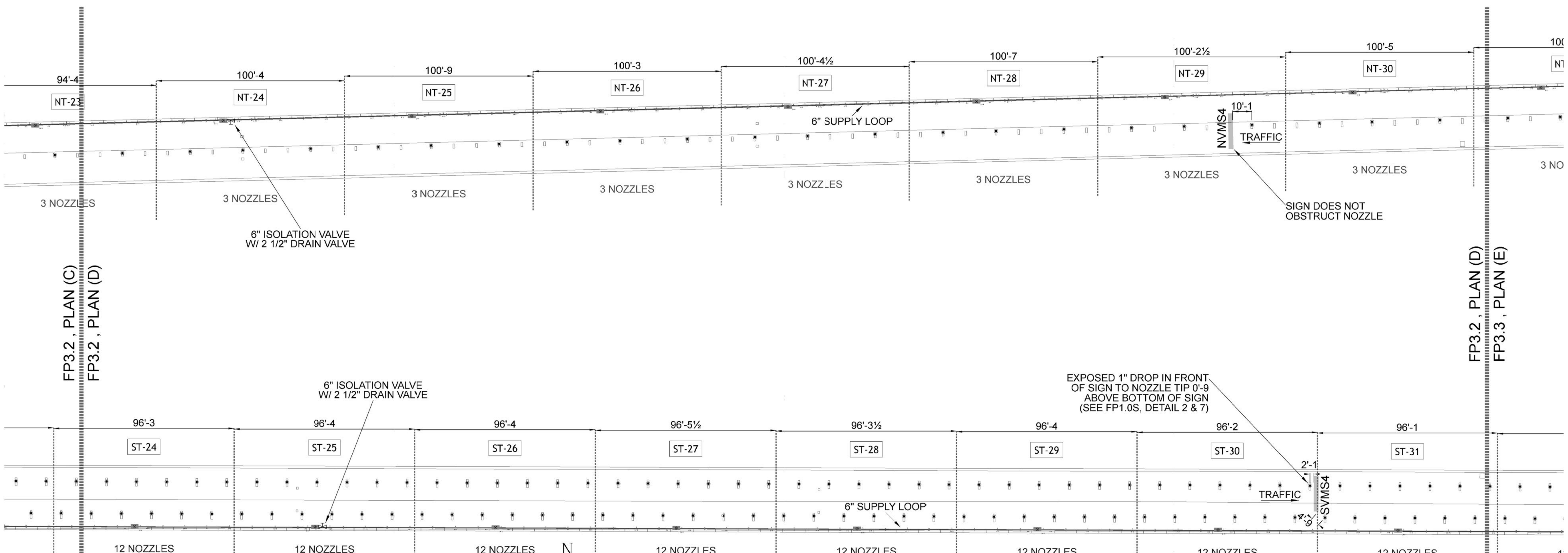
DELUGE SYSTEM LOCATION
WEST, NT-01 TO NT-15
WEST, ST-01 TO ST-15

Drawing Number

FP3.1



1 PLAN (C) - DELUGE SYSTEMS , NT-16 TO NT-23 , ST-16 TO ST-23
SCALE: 1/32" = 1'-0



2 PLAN (D) - DELUGE SYSTEMS , NT-24 TO NT-30 , ST-24 TO ST-31
SCALE: 1/32" = 1'-0

SCALE: 1/32" = 1'-0
10 0 25 50 100

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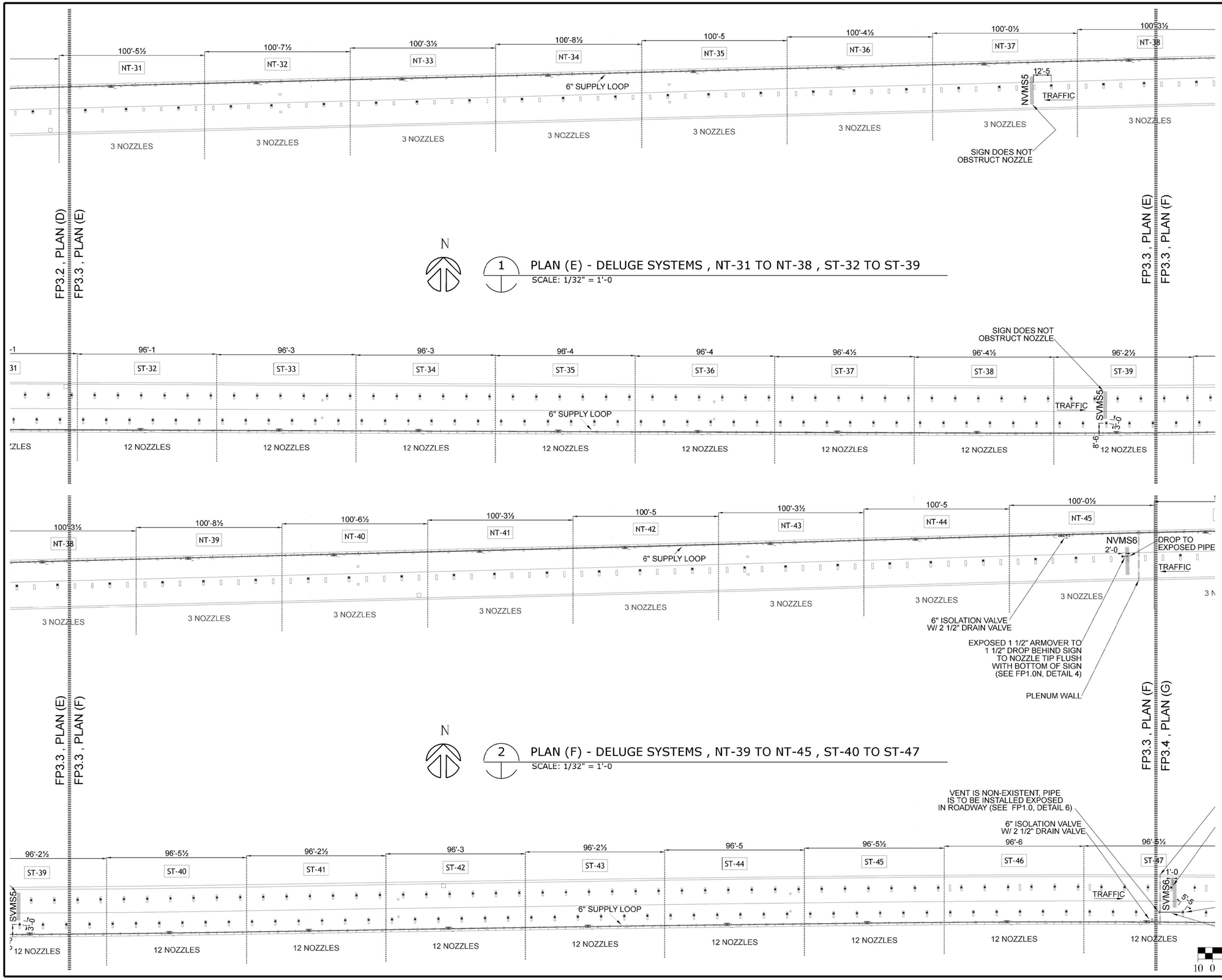
DELUGE SYSTEM LOCATION
WEST, NT-16 TO NT-30
WEST, ST-16 TO ST-31

Drawing Number
FP3.2



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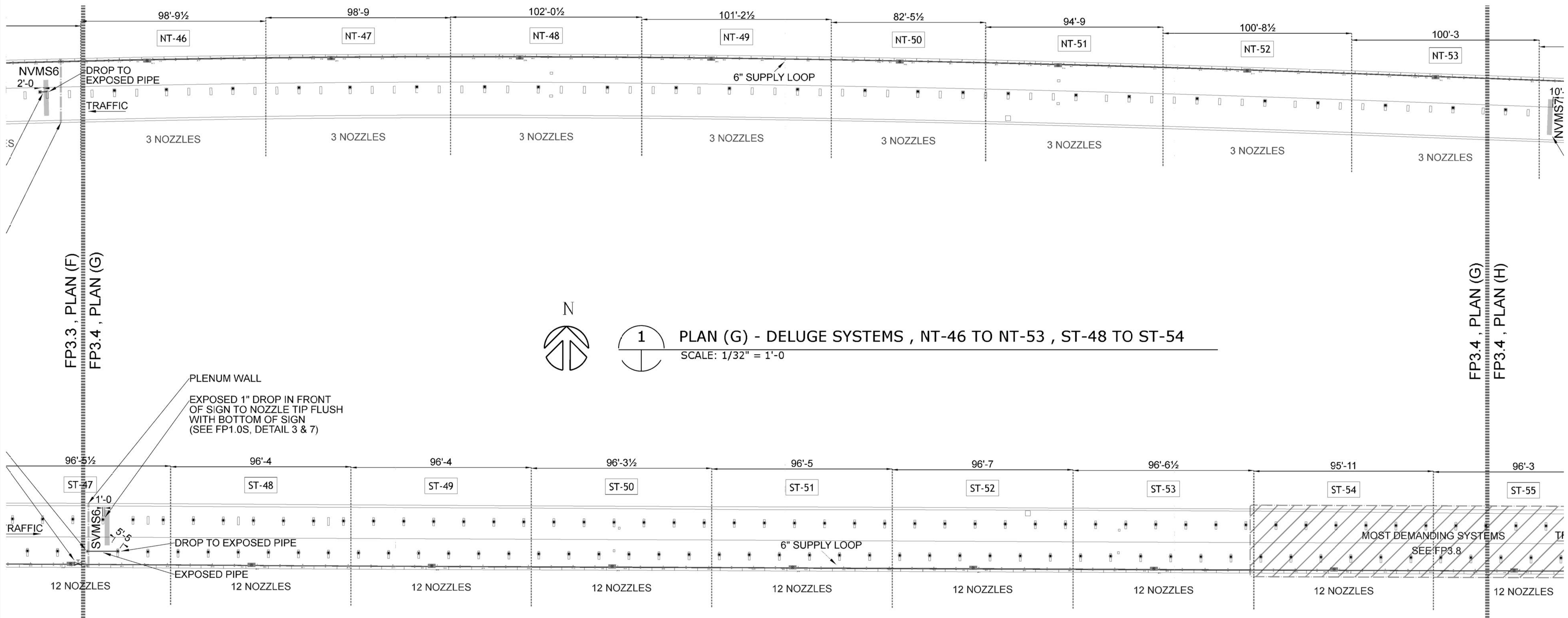
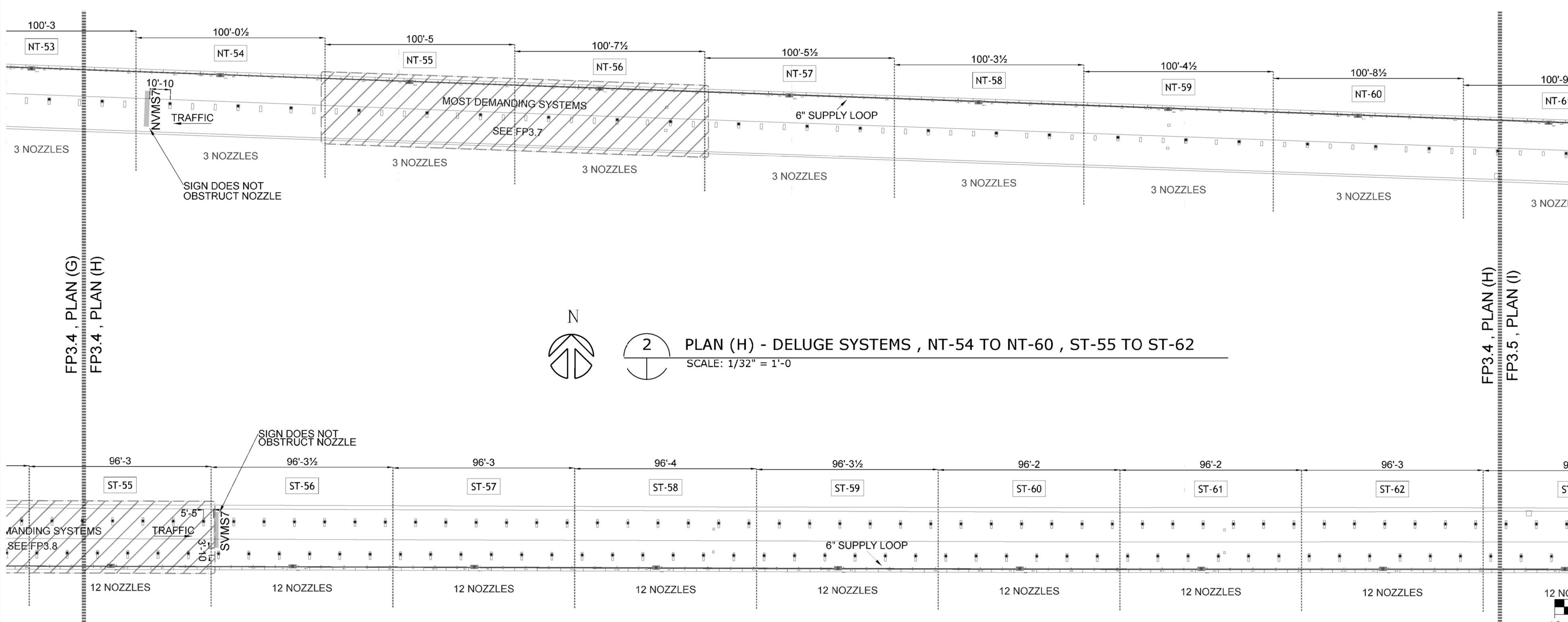
DELUGE SYSTEM LOCATION
WEST, NT-31 TO NT-45
WEST, ST-32 TO ST-47

Drawing Number
FP3.3



1 PLAN (G) - DELUGE SYSTEMS , NT-46 TO NT-53 , ST-48 TO ST-54
SCALE: 1/32" = 1'-0



2 PLAN (H) - DELUGE SYSTEMS , NT-54 TO NT-60 , ST-55 TO ST-62
SCALE: 1/32" = 1'-0

SCALE: 1/32" = 1'-0

10 0 25 50 100

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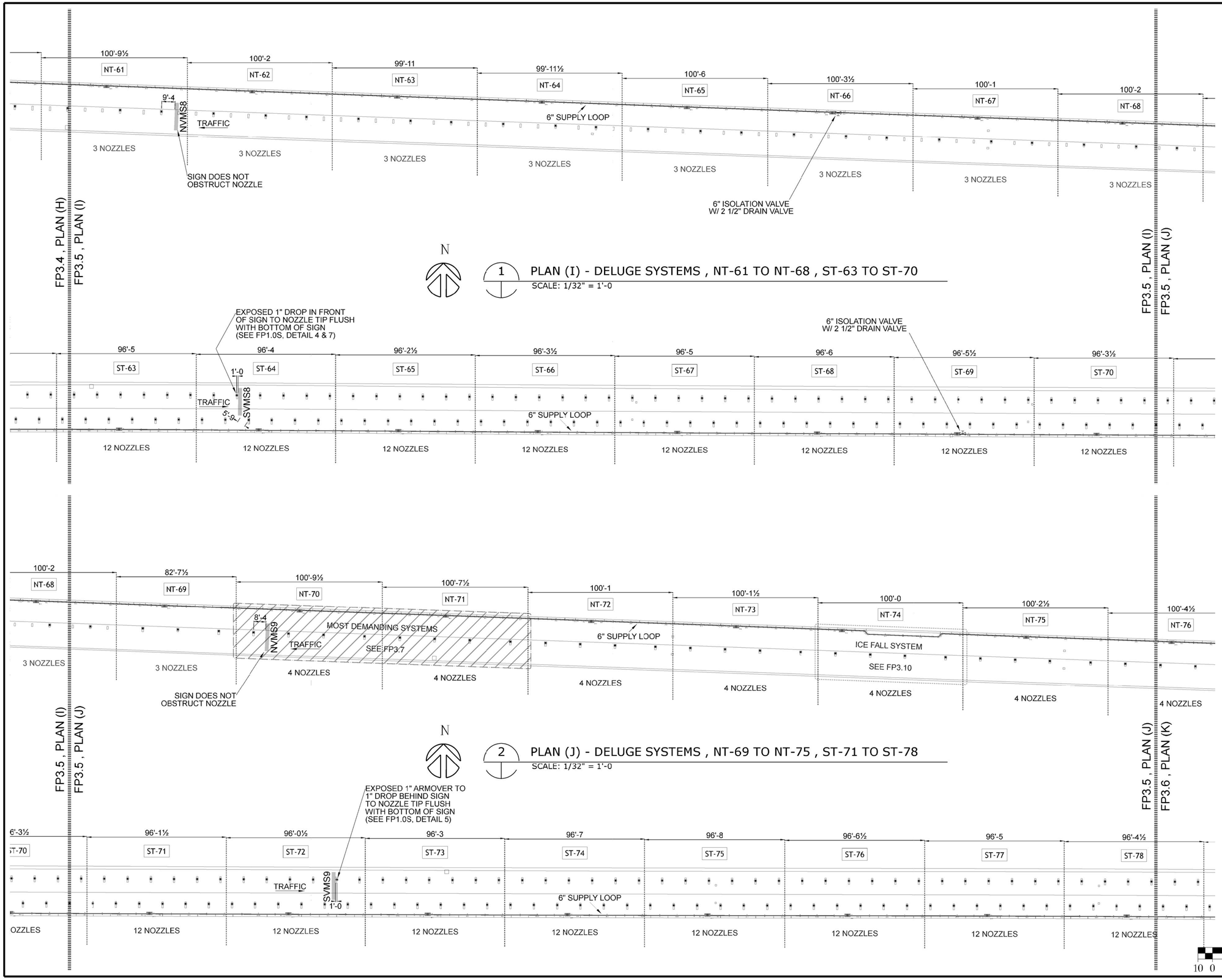
DELUGE SYSTEM LOCATION
EAST, NT-46 TO NT-60
EAST, ST-48 TO ST-62

Drawing Number
FP3.4



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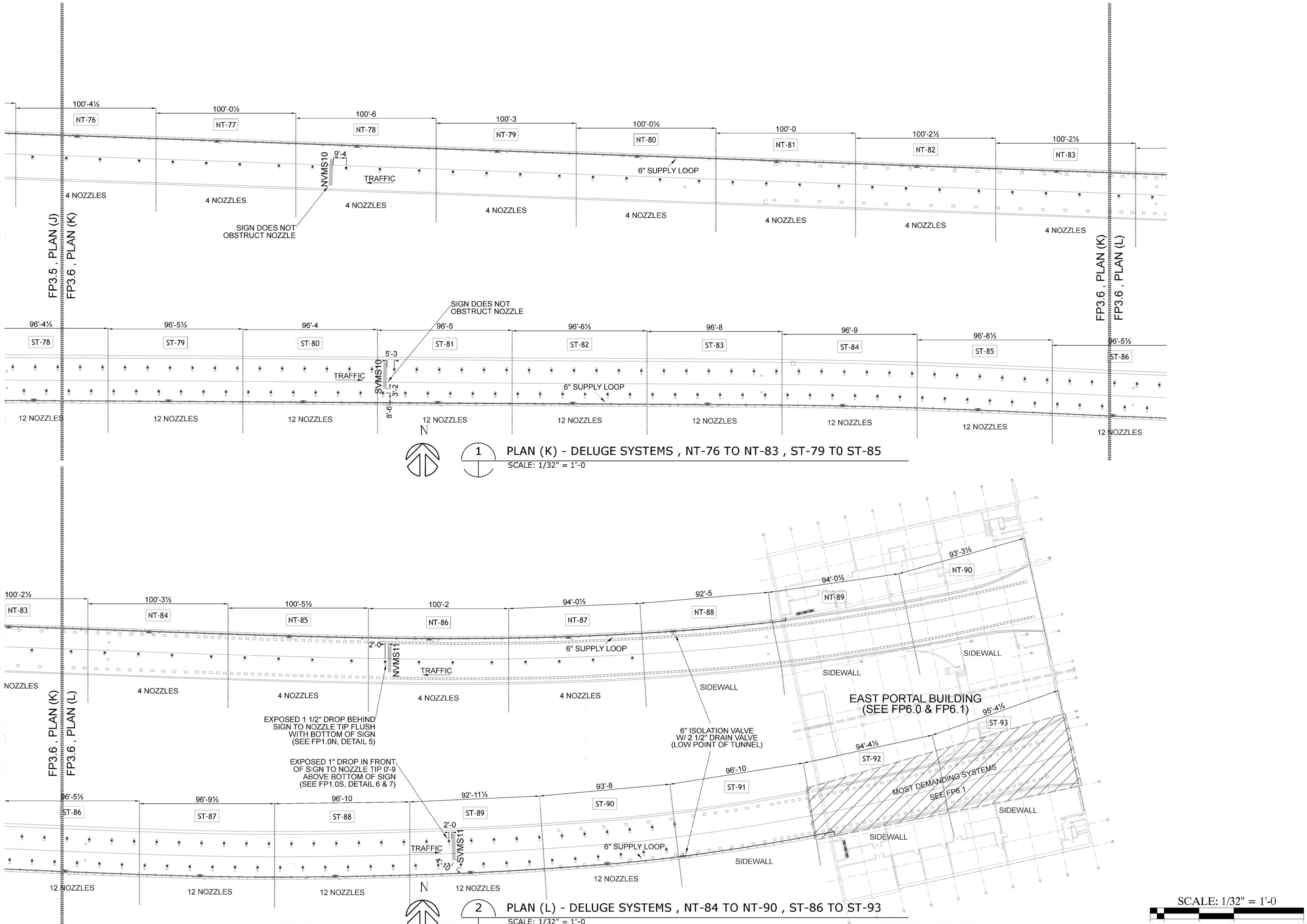
DELUGE SYSTEM LOCATION
EAST, NT-61 TO NT-75
EAST, ST-63 TO ST-78

Drawing Number

FP3.5



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DELUGE SYSTEM LOCATION
EAST, NT-76 TO NT-90
EAST, ST-79 TO ST-93

Drawing Number

FP3.6

Deluge System Testing

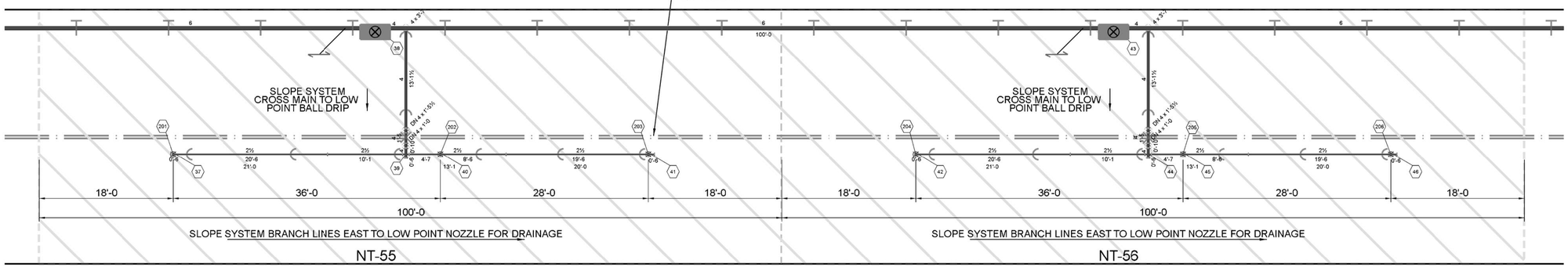
North Tunnel Test Date: 11/15/2015

Zone	Required Outlet (Factory Set) Pressure (psi)	Flow Control Valve Inlet Static (psi)	Flow Control Valve Inlet Residual (psi)	Flow Control Valve Outlet Residual (psi)	Fire Pump Supply Residual (psi)	Fire Pump Outlet Residual (psi)	Interpolated Flow from Fire Pump (gpm)	Flow Meter Reading (gpm)	Time for Flow Control Valve to Shut (sec)	Nozzle Spray Pattern	Notes:
NT-03	84	60	175	74	59	182.5	759	-	3 to 4	OK	Portal System - 10 Nozzle
NT-09	66	157	175	62	59	184	671	-	3 to 4	OK	4 Nozzle
NT-21	66	170	170	65	59	185	607	-	3 to 4	OK	4 Nozzle
NT-31	79	170	175	75	59	185	607	-	3 to 4	OK	3 Nozzle
NT-40	79	175	180	70	59	184	671	-	3 to 4	OK	3 Nozzle
NT-46	79	185	175	70	59	184	671	-	3 to 4	OK	3 Nozzle
NT-54	79	190	185	70	59	184	671	675	3 to 4	OK	3 Nozzle
NT-72	66	200	190	61	59	184	671	715	3 to 4	OK	4 Nozzle
NT-74	66	210	195	58	59	184	671	675	3 to 4	OK	4 Nozzle - ICE FALL AREA
NT-84	66	215	205	54	59	184	671	-	3 to 4	OK	4 Nozzle

FACTORY SET
EISENHOWER 3 NOZZLE
FLOW CONTROL VALVE
SYSTEM DEMAND
75.2 PSI @ 609 GPM
75.2X1.05 = 78.96 PSI
SET AT 79 PSI

Hydraulic Information	
Remote Area NORTH - 3 NOZZLES	
OCCUPANCY CLASSIFICATION	NORTH TUNNEL
DENSITY	0.16gpm/ft² for 6865.00ft² (Actual 6866.67ft²)
TOTAL HEADS FLOWING	6
K-FACTOR	30.4
TOTAL WATER REQUIRED	1218.1
TOTAL PRESSURE REQUIRED	146.1
BASE of RISER (gpm)	1218.1
BASE of RISER (psi)	146.1
SAFETY MARGIN (psi)	+19.3 (11.7%)

BETE NOZZLE TF72FC
150 DEGREE SPRAY BRASS
34' X 36' = 1224 SF
1224 X 0.16 DENSITY = 196 GPM
P = 41.6 PSI
K = 30.4
Q = 196 GPM



N

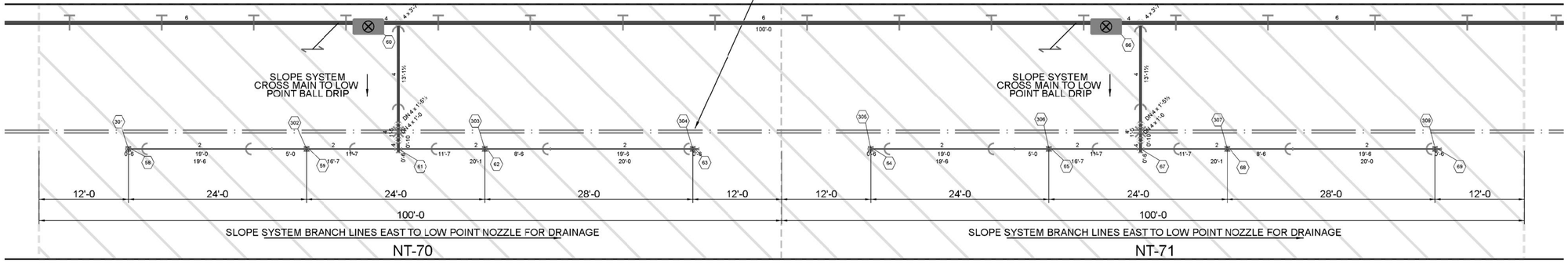
1 NT-55 & NT-56 - EISENHOWER (NORTH) TUNNEL - 3 NOZZLE SYSTEM
SCALE: 1/8" = 1'-0"

60 MINUTE WATER SUPPLY
MOST DEMANDING: 1,264.7 GPM
(4 NOZZLE SYSTEM - 2 ZONES)
SAFETY FACTOR: 5%
1,264.7 GPM X 1.05 = 1,327.9 GPM
1,327.9 GPM X 60 MIN. = 79.676 GAL

FACTORY SET
EISENHOWER 4 NOZZLE
FLOW CONTROL VALVE
SYSTEM DEMAND
62.7 PSI @ 630.8 GPM
62.7X1.05 = 65.83 PSI
SET AT 66 PSI

Hydraulic Information	
Remote Area NORTH - 4 NOZZLES	
OCCUPANCY CLASSIFICATION	NORTH TUNNEL
DENSITY	0.16gpm/ft² for 6865.00ft² (Actual 6866.21ft²)
TOTAL HEADS FLOWING	8
K-FACTOR	30.4
TOTAL WATER REQUIRED	1264.7
TOTAL PRESSURE REQUIRED	140.1
BASE of RISER (gpm)	1264.7
BASE of RISER (psi)	140.1
SAFETY MARGIN (psi)	+24.1 (14.7%)

BETE NOZZLE TF72FC
150 DEGREE SPRAY BRASS
34' X 28' = 925 SF
925 X 0.16 DENSITY = 152.32 GPM
P = 25.1 PSI
K = 30.4
Q = 152.32 GPM



N

2 NT-70 & NT-71 - EISENHOWER (NORTH) TUNNEL - 4 NOZZLE SYSTEM
SCALE: 1/8" = 1'-0"

SCALE: 1/8" = 1'-0
2 0 4 8 16

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DELUGE SYSTEMS
EISENHOWER
(NORTH) TUNNEL

Drawing Number
FP3.7

FACTORY SET
JOHNSON
FLOW CONTROL VALVE
SYSTEM DEMAND
71.9 PSI @ 578.6 GPM
71.9X1.05 = 75.50 PSI
SET AT 76 PSI

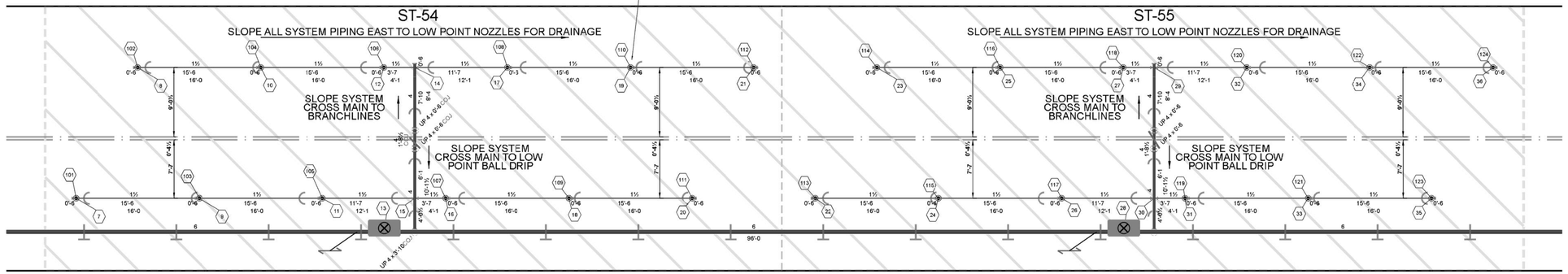
Hydraulic Information	
Remote Area SOUTH	
OCCUPANCY CLASSIFICATION	SOUTH TUNNEL
DENSITY	0.16gpm/ft² for 6590.00ft² (Actual 6590.70ft²)
TOTAL HEADS FLOWING	24
K-FACTOR	6.6
TOTAL WATER REQUIRED	1159.5
TOTAL PRESSURE REQUIRED	136.0
BASE of RISER (gpm)	1159.5
BASE of RISER (psi)	136.0
SAFETY MARGIN (psi)	+30.8 (18.5%)

BETE NOZZLE N6W
120 DEGREE SPRAY BRASS
17' X 17' = 289 SF
289 X 0.16 DENSITY = 46.24 GPM
P = 48.5 PSI
K = 6.64
Q = 46.24 GPM

Deluge System Testing

South Tunnel Test Date: 11/9/2015

Zone	Required Outlet (Factory Set) Pressure (psi)	Flow Control Valve Inlet Static (psi)	Flow Control Valve Inlet Residual (psi)	Flow Control Valve Outlet Residual (psi)	Fire Pump Supply Residual (psi)	Fire Pump Outlet Residual (psi)	Interpolated Flow from Fire Pump (gpm)	Flow Meter Reading (gpm)	Time for Flow Control Valve to Shut (sec)	Nozzle Spray Pattern	Notes:
ST-03	66	145	160	70	61	190	0	-	3 to 4	OK	Portal System - 12 Nozzle
ST-08	76	150	170	81	59	185	607	-	3 to 4	OK	12 Nozzle
ST-19	76	160	170	70	59	185	607	625	3 to 4	OK	12 Nozzle
ST-30	76	205	170	65	59	184	671	-	3 to 4	OK	12 Nozzle
ST-38	76	152	170	76	58	184	671	-	3 to 4	OK	12 Nozzle
ST-48	76	160	180	65	59	185	607	-	3 to 4	OK	12 Nozzle
ST-56	76	190	190	70	59	185	607	600	3 to 4	OK	12 Nozzle
ST-84	76	215	200	65	58	185	607	-	3 to 4	OK	12 Nozzle
ST-93	66	147	200	60	58	184	671	600	3 to 4	OK	Portal System - 12 Nozzle



N

1 ST-54 & ST-55 - JOHNSON (SOUTH) TUNNEL - 12 NOZZLE SYSTEM
SCALE: 1/8" = 1'-0"

SCALE: 1/8" = 1'-0
2 0 4 8 16

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BCER engineering
Sturgeon ELECTRIC
CONSULTING ENGINEERS

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions
Num | Description | Date
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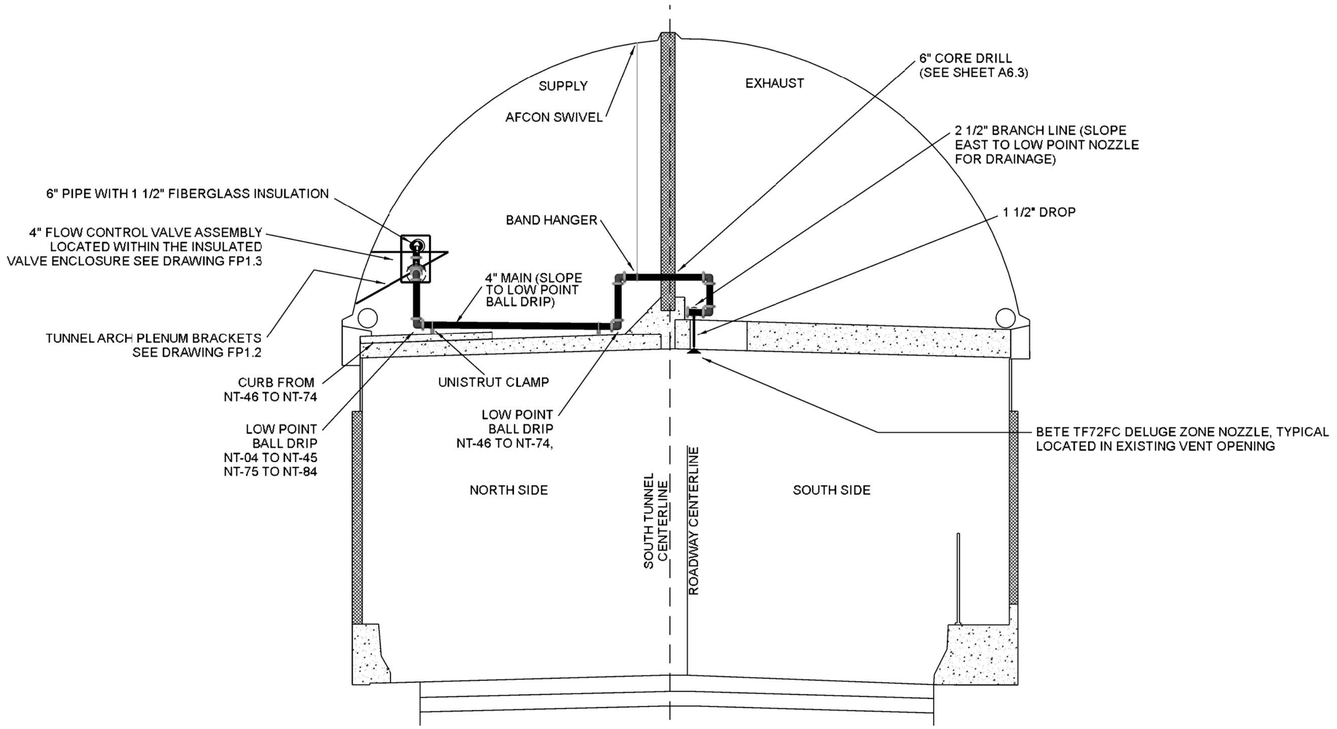
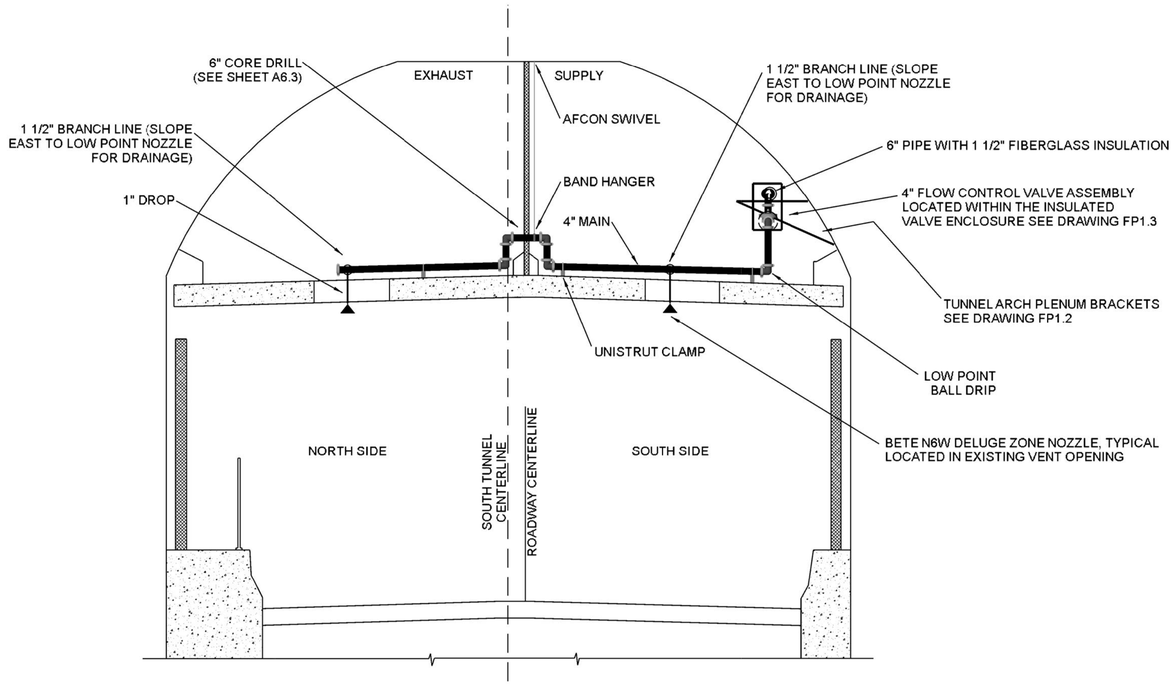
DELUGE SYSTEMS
JOHNSON
(SOUTH) TUNNEL

Drawing Number
FP3.8



1 EISENHOWER (NORTH) TUNNEL - TYPICAL SECTION (LOOKING EAST)

NOT TO SCALE



2 JOHNSON (SOUTH) TUNNEL - TYPICAL SECTION (LOOKING EAST)

NOT TO SCALE

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EISENHOWER/JOHNSON MEMORIAL TUNNEL

FIXED FIRE SUPPRESSION SYSTEM DESIGN BUILD PROJECT

Project No. C0703-360 Subaccount 17810

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Revisions

Num	Description	Date

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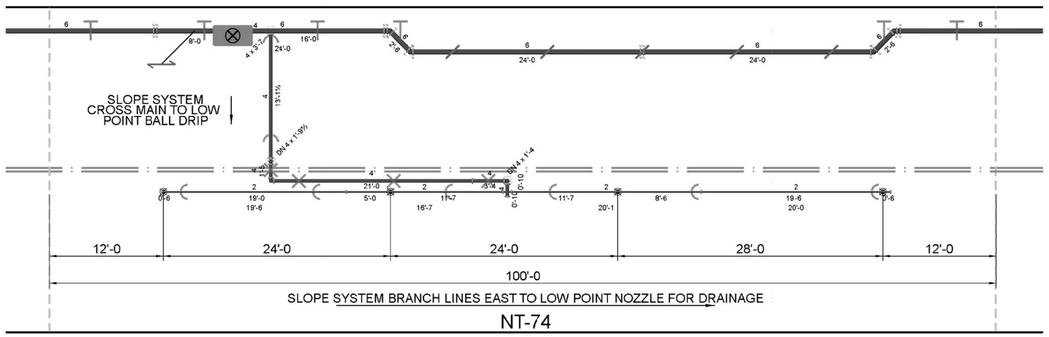
DELUGE SYSTEMS SECTIONS

Drawing Number

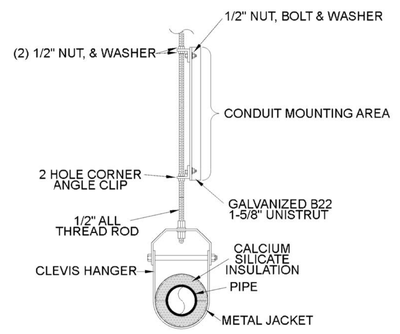
FP3.9



N

1 NT-74 - EISENHOWER (NORTH) TUNNEL - ICE FALL SYSTEM

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



2 CLEVIS HANGER - ICE FALL
EISENHOWER (NORTH) TUNNEL - NT-74

NOT TO SCALE

SCALE: 1/8" = 1'-0

2 0 4 8 16

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
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Revisions

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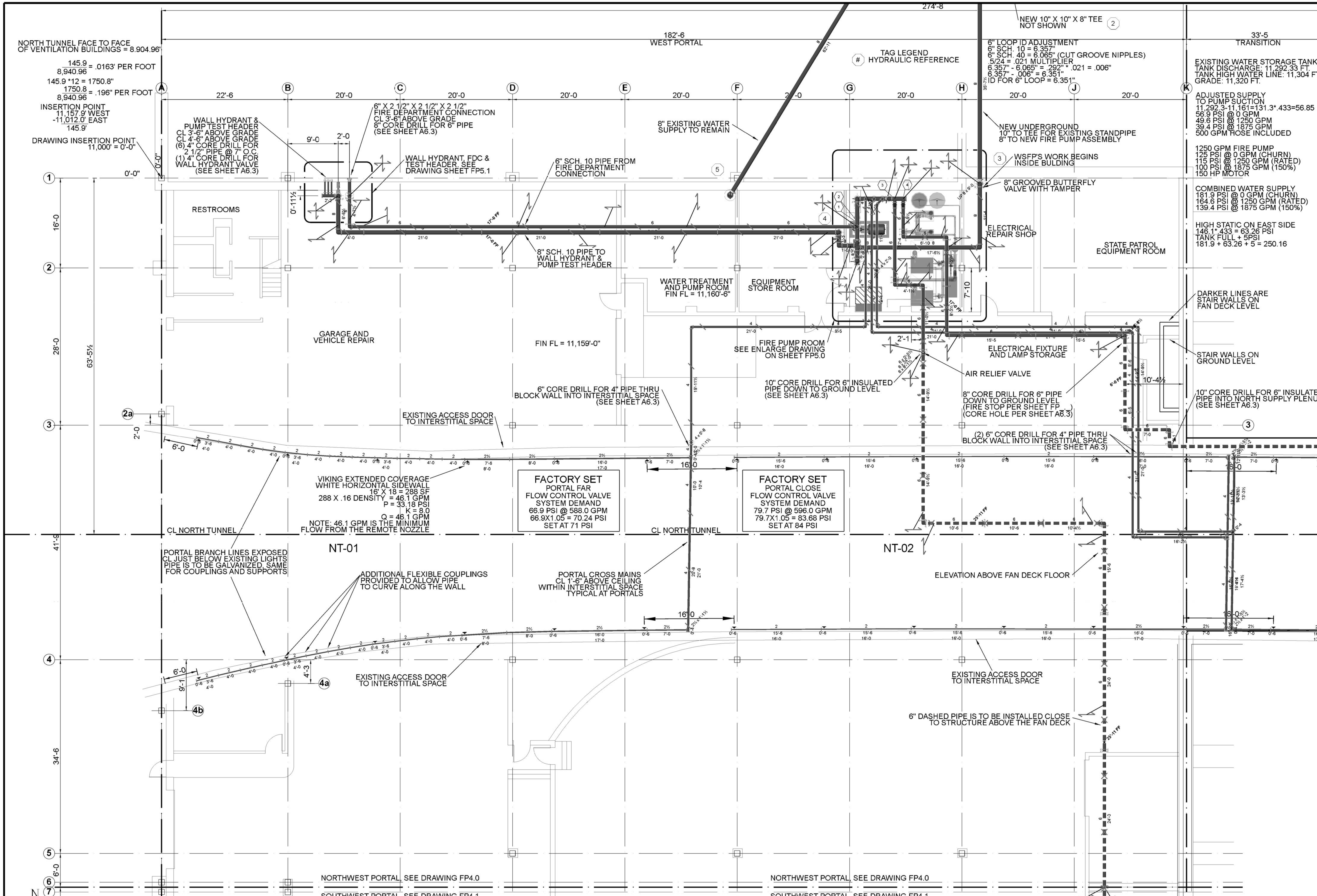
DELUGE SYSTEMS
EISENHOWER (NORTH)
TUNNEL - ICE FALL

Drawing Number

FP3.10


NORTH TUNNEL FACE TO FACE OF VENTILATION BUILDINGS = 8,904.96'
145.9 / 8,940.96 = .0163' PER FOOT
145.9 *12 = 1750.8"
1750.8 / 8,940.96 = .196" PER FOOT
INSERTION POINT 11,157.9' WEST -11,012.0' EAST 145.9'
DRAWING INSERTION POINT 11,000' = 0'-0"
274'-8
182'-6 WEST PORTAL
33'-5 TRANSITION
NEW 10" X 10" X 8" TEE NOT SHOWN
6" LOOP ID ADJUSTMENT
6" SCH. 10 = 6.357"
6" SCH. 40 = 6.065" (CUT GROOVE NIPPLES)
.5/24 = .021 MULTIPLIER
6.357" - 6.065" = .292" * .021 = .006"
6.357" - .006" = 6.351"
ID FOR 6" LOOP = 6.351"
TAG LEGEND
HYDRAULIC REFERENCE
EXISTING WATER STORAGE TANK
TANK DISCHARGE: 11,292.33 FT.
TANK HIGH WATER LINE: 11,304 FT.
GRADE: 11,320 FT.
ADJUSTED SUPPLY TO PUMP SUCTION
11,292.3-11,161=131.3*.433=56.85
56.9 PSI @ 0 GPM
49.6 PSI @ 1250 GPM
39.4 PSI @ 1875 GPM
500 GPM HOSE INCLUDED
1250 GPM FIRE PUMP
125 PSI @ 0 GPM (CHURN)
115 PSI @ 1250 GPM (RATED)
100 PSI @ 1875 GPM (150%)
150 HP MOTOR
COMBINED WATER SUPPLY
181.9 PSI @ 0 GPM (CHURN)
164.6 PSI @ 1250 GPM (RATED)
139.4 PSI @ 1875 GPM (150%)
HIGH STATIC ON EAST SIDE
146.1*.433 = 63.26 PSI
TANK FULL + 5PSI
181.9 + 63.26 + 5 = 250.16
WALL HYDRANT & PUMP TEST HEADER
CL 3'-6" ABOVE GRADE
CL 4'-6" ABOVE GRADE
(6) 4" CORE DRILL FOR 2 1/2" PIPE @ 7" O.C.
(1) 4" CORE DRILL FOR WALL HYDRANT VALVE (SEE SHEET A6.3)
6" X 2 1/2" X 2 1/2" X 2 1/2" FIRE DEPARTMENT CONNECTION CL 3'-6" ABOVE GRADE 8" CORE DRILL FOR 6" PIPE (SEE SHEET A6.3)
WALL HYDRANT, FDC & TEST HEADER, SEE DRAWING SHEET FP5.1
8" EXISTING WATER SUPPLY TO REMAIN
NEW UNDERGROUND 10" TO TEE FOR EXISTING STANDPIPE 8" TO NEW FIRE PUMP ASSEMBLY
WSFP'S WORK BEGINS INSIDE BULDING
8" GROOVED BUTTERFLY VALVE WITH TAMPER
6" SCH. 10 PIPE FROM FIRE DEPARTMENT CONNECTION
8" SCH. 10 PIPE TO WALL HYDRANT & PUMP TEST HEADER
RESTROOMS
GARAGE AND VEHICLE REPAIR
FIN FL = 11,159'-0"
WATER TREATMENT AND PUMP ROOM FIN FL = 11,160'-6"
EQUIPMENT STORE ROOM
ELECTRICAL REPAIR SHOP
STATE PATROL EQUIPMENT ROOM
FIRE PUMP ROOM SEE ENLARGE DRAWING ON SHEET FP5.0
ELECTRICAL FIXTURE AND LAMP STORAGE
AIR RELIEF VALVE
DARKER LINES ARE STAIR WALLS ON FAN DECK LEVEL
STAIR WALLS ON GROUND LEVEL
10" CORE DRILL FOR 6" INSULATED PIPE DOWN TO GROUND LEVEL (SEE SHEET A6.3)
8" CORE DRILL FOR 6" PIPE DOWN TO GROUND LEVEL (FIRE STOP PER SHEET FP_._) (CORE HOLE PER SHEET A6.3)
10" CORE DRILL FOR 6" INSULATED PIPE INTO NORTH SUPPLY PLENUM (SEE SHEET A6.3)
6" CORE DRILL FOR 4" PIPE THRU BLOCK WALL INTO INTERSTITIAL SPACE (SEE SHEET A6.3)
(2) 6" CORE DRILL FOR 4" PIPE THRU BLOCK WALL INTO INTERSTITIAL SPACE (SEE SHEET A6.3)
EXISTING ACCESS DOOR TO INTERSTITIAL SPACE
VIKING EXTENDED COVERAGE WHITE HORIZONTAL SIDEWALL
16' X 18 = 288 SF
288 X .16 DENSITY = 46.1 GPM
P = 33.18 PSI
K = 8.0
Q = 46.1 GPM
NOTE: 46.1 GPM IS THE MINIMUM FLOW FROM THE REMOTE NOZZLE
FACTORY SET
PORTAL FAR
FLOW CONTROL VALVE SYSTEM DEMAND
66.9 PSI @ 588.0 GPM
66.9X1.05 = 70.24 PSI
SET AT 71 PSI
FACTORY SET
PORTAL CLOSE
FLOW CONTROL VALVE SYSTEM DEMAND
79.7 PSI @ 596.0 GPM
79.7X1.05 = 83.68 PSI
SET AT 84 PSI
CL NORTH TUNNEL
NT-01
NT-02
PORTAL BRANCH LINES EXPOSED CL JUST BELOW EXISTING LIGHTS PIPE IS TO BE GALVANIZED, SAME FOR COUPLINGS AND SUPPORTS
ADDITIONAL FLEXIBLE COUPLINGS PROVIDED TO ALLOW PIPE TO CURVE ALONG THE WALL
PORTAL CROSS MAINS CL 1'-6" ABOVE CEILING WITHIN INTERSTITIAL SPACE TYPICAL AT PORTALS
ELEVATION ABOVE FAN DECK FLOOR
6" DASHED PIPE IS TO BE INSTALLED CLOSE TO STRUCTURE ABOVE THE FAN DECK
NORTHWEST PORTAL, SEE DRAWING FP4.0
SOUTHWEST PORTAL, SEE DRAWING FP4.1
SCALE: 1/8" = 1'-0
N

1 WEST PORTAL - EISENHOWER (NORTH) TUNNEL - ROADWAY LEVEL (NT-01 & NT-02 - SIDEWALL SYSTEMS)
SCALE: 1/8" = 1'-0

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
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WEST PORTAL
EISENHOWER (NORTH)
ROADWAY LEVEL

Drawing Number
FP4.0

NORTHWEST PORTAL, SEE DRAWING FP4.0

SOUTHWEST PORTAL, SEE DRAWING FP4.1

NORTHWEST PORTAL, SEE DRAWING FP4.0

SOUTHWEST PORTAL, SEE DRAWING FP4.1

6" DASHED PIPE IS TO BE INSTALLED CLOSE TO STRUCTURE ABOVE THE FAN DECK

EXISTING ACCESS DOOR TO INTERSTITIAL SPACE

ADDITIONAL FLEXIBLE COUPLINGS PROVIDED TO ALLOW PIPE TO CURVE ALONG THE WALL

PORTAL CROSS MAINS CL 1'-6" ABOVE CEILING WITHIN INTERSTITIAL SPACE TYPICAL AT PORTALS

VIKING EXTENDED COVERAGE WHITE HORIZONTAL SIDEWALL 16' X 18 = 288 SF 288 X .16 DENSITY = 46.1 GPM P = 33.18 PSI K = 8.0 Q = 46.1 GPM NOTE: 46.1 GPM IS THE MINIMUM FLOW FROM THE REMOTE NOZZLE

ELEVATION ABOVE FAN DECK FLOOR

ST-01

ST-02

CL SOUTH TUNNEL

CL SOUTH TUNNEL

PORTAL BRANCH LINES EXPOSED CL JUST BELOW EXISTING LIGHTS PIPE IS TO BE GALVANIZED, SAME FOR COUPLINGS AND SUPPORTS

6" CORE DRILL FOR 4" PIPE THRU BLOCK WALL TO INTERSTITIAL SPACE (SEE SHEET A6.3)

FACTORY SET
PORTAL FAR
FLOW CONTROL VALVE
SYSTEM DEMAND
63.1 PSI @ 583.2 GPM
63.1X1.05 = 66.25 PSI
SET AT 67 PSI

FACTORY SET
PORTAL CLOSE
FLOW CONTROL VALVE
SYSTEM DEMAND
62.8 PSI @ 595.2 GPM
62.8X1.05 = 65.94 PSI
SET AT 66 PSI

10" CORE DRILL FOR 6" INSULATED PIPE INTO SOUTH SUPPLY PLENUM (SEE SHEET A6.3)

(2) 6" CORE DRILL FOR 4" PIPE THRU BLOCK WALL INTO INTERSTITIAL SPACE (SEE SHEET A6.3)

(3) IVE'S LOCATED ON FAN DECK (SEE FP4.2)

(3) 6" CORE DRILL FOR 4" PIPE DOWN TO GROUND LEVEL (SEE SHEET A6.3)

STAIR WALLS ON GROUND LEVEL

DARKER LINES ARE STAIR WALLS ON FAN DECK LEVEL

63'-5½

39'-5

22'-6 | 20'-0 | 20'-0 | 20'-0 | 20'-0 | 20'-0 | 20'-0 | 20'-0 | 20'-0 | 20'-0

A B C D E F G H J K

N

1 WEST PORTAL - JOHNSON (SOUTH) TUNNEL - ROADWAY LEVEL (ST-01 & ST-02 - SIDEWALL SYSTEMS)

SCALE: 1/8" = 1'-0

SCALE: 1/8" = 1'-0

2 0 4 8 16

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EISENHOWER/JOHNSON MEMORIAL TUNNEL

FIXED FIRE SUPPRESSION SYSTEM

DESIGN BUILD PROJECT

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Revisions

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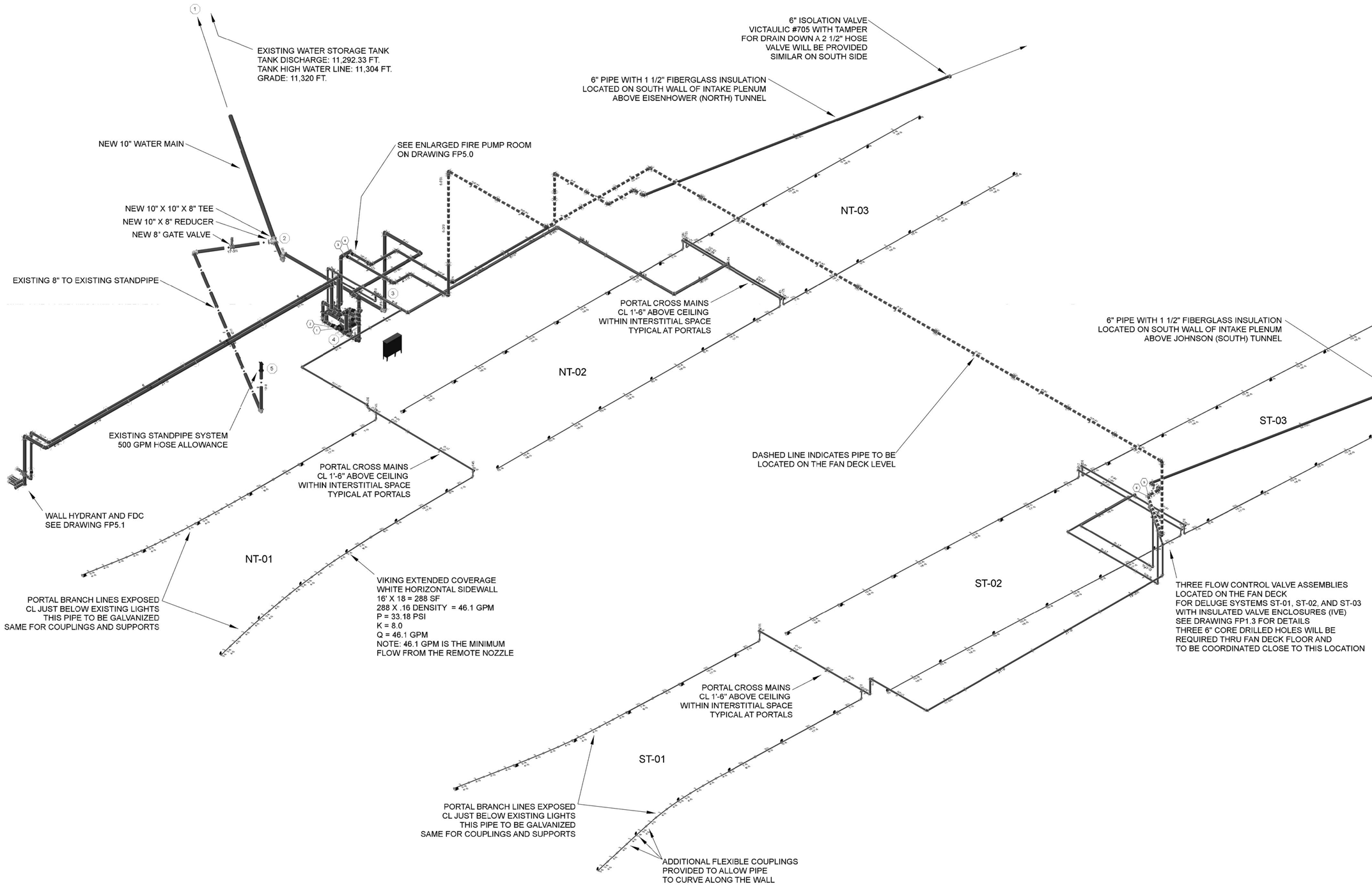
WEST PORTAL JOHNSON (SOUTH) ROADWAY LEVEL

Drawing Number

FP4.1



N

1 WEST PORTAL - ISOMETRIC

NOT TO SCALE

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EISENHOWER/JOHNSON MEMORIAL TUNNEL

FIXED FIRE SUPPRESSION SYSTEM

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-	-	-

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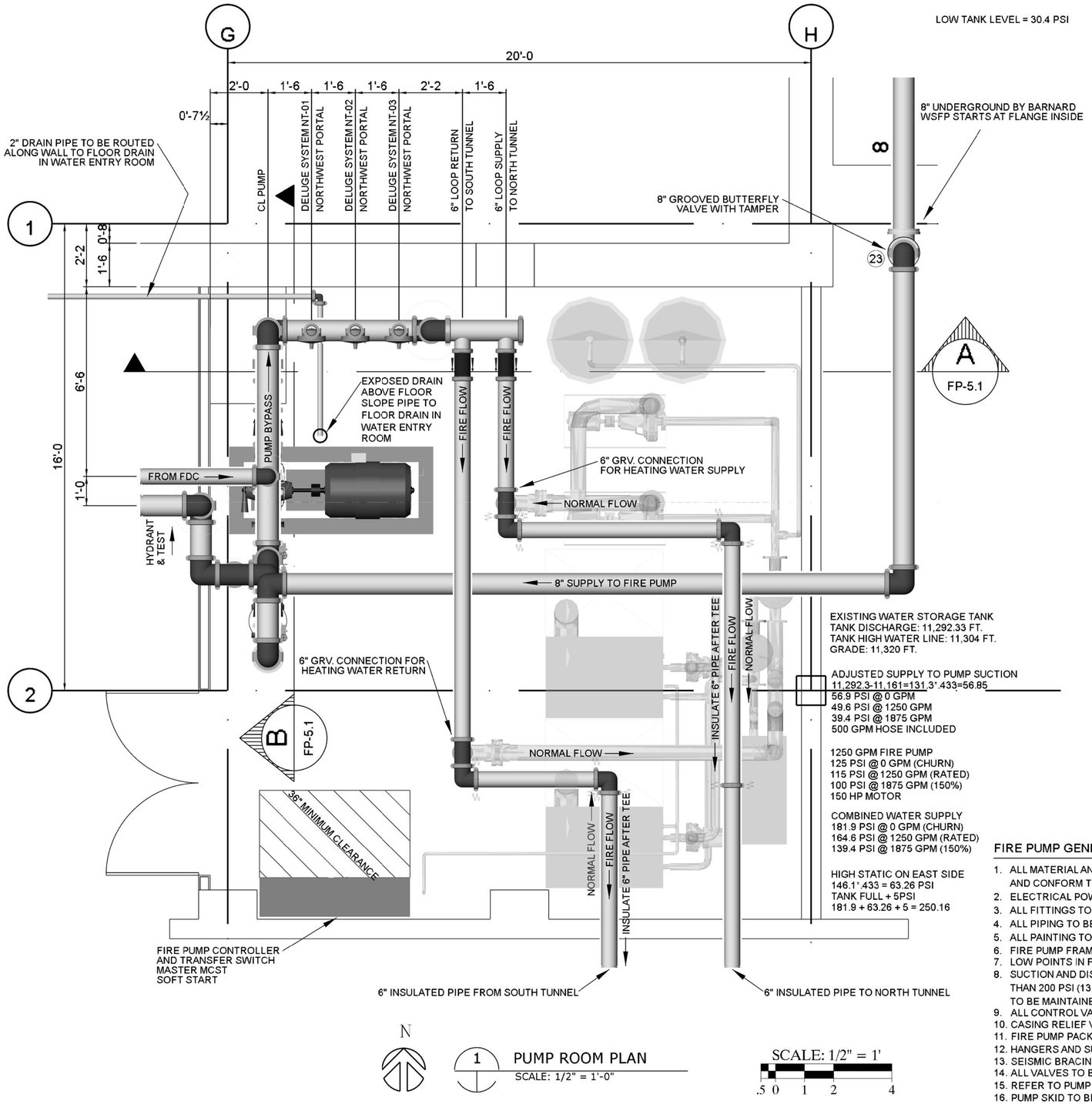
WEST PORTAL ISOMETRIC

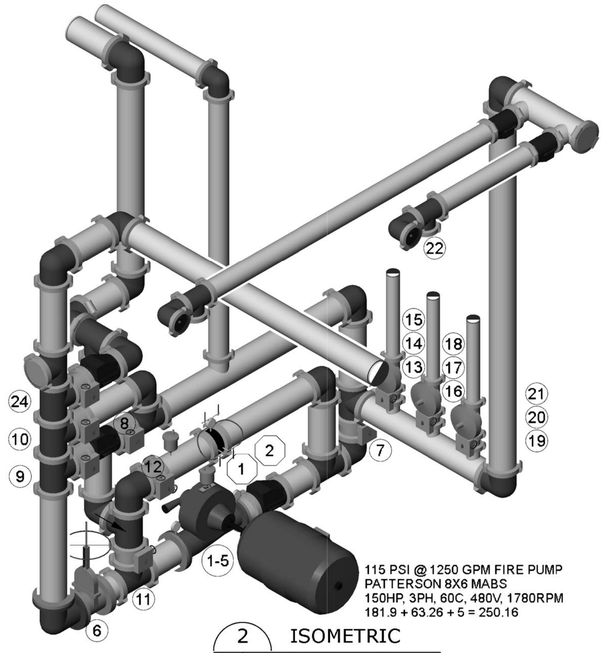
Drawing Number

FP4.2



TANK LEVEL READINGS
60 MINUTES REMAINING = 60.2 PSI
30 MINUTES REMAINING = 43.7 PSI
0 MINUTES REMAINING = 5.0 PSI

LOW TANK LEVEL = 30.4 PSI



115 PSI @ 1250 GPM FIRE PUMP
PATTERSON 8X6 MABS
150HP, 3PH, 60C, 480V, 1780RPM
181.9 + 63.26 + 5 = 250.16

2 ISOMETRIC
NOT TO SCALE

FIRE PUMP TAG LEGEND

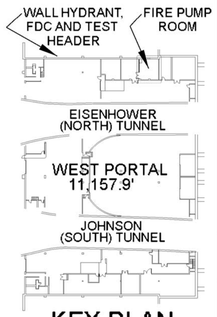
(#) WIRED DEVICE (#) HYDRAULIC REFERENCE

DEVICES IN PUMP ROOM SUPERVISED AND ACTUATED BY FIRE ALARM PANEL

#	DEVICE	VALVE POSITION PER FLOW CONDITION NORMAL FLOW	FIRE/FDC FLOW	STORAGE TANK RE-FILL
1	PUMP START	-	-	-
2	PUMP RUNNING	-	-	-
3	PUMP PHASE REVERSAL	-	-	-
4	PUMP LOSS OF PHASE	-	-	-
5	PUMP EMERGENCY POWER	-	-	-
6	PUMP SUPPLY - TAMPER SWITCH	N/O	OPEN	CLOSED
7	PUMP DISCHARGE - TAMPER SWITCH	N/O	OPEN	OPEN
8	PUMP BYPASS - TAMPER SWITCH	N/O	OPEN	CLOSED
9	PUMP BYPASS - TAMPER SWITCH	N/O	OPEN	CLOSED
10	RE-FILL BYPASS - TAMPER SWITCH	N/C	CLOSED	OPEN
11	RE-FILL - TAMPER SWITCH	N/C	CLOSED	OPEN
12	PUMP TEST - TAMPER SWITCH	N/C	CLOSED	CLOSED
13	NT-01 TAMPER SWITCH	N/O	OPEN	OPEN
14	NT-01 PRESSURE SWITCH	-	-	-
15	NT-01 SOLENOID VALVE	N/C	OPEN (FIRE IN ZONE)	CLOSED
16	NT-02 TAMPER SWITCH	N/O	OPEN	OPEN
17	NT-02 PRESSURE SWITCH	-	-	-
18	NT-02 SOLENOID VALVE	N/C	OPEN (FIRE IN ZONE)	CLOSED
19	NT-03 TAMPER SWITCH	N/O	OPEN	OPEN
20	NT-03 PRESSURE SWITCH	-	-	-
21	NT-03 SOLENOID VALVE	N/C	OPEN (FIRE IN ZONE)	CLOSED
22	6" LOOP PRESSURE SWITCH	-	-	-
23	UNDERGROUND LEAD-IN - TAMPER	N/O	OPEN	OPEN
24	WALL HYDRANT SUPPLY - TAMPER	N/O	OPEN	CLOSED

FIRE PUMP GENERAL NOTES

1. ALL MATERIAL AND INSTALLATIONS OF THIS FIRE PUMP SHALL BE UL LISTED FOR FIRE PROTECTION USE AND CONFORM TO NFPA 20, 2010 EDITION.
2. ELECTRICAL POWER WIRING AND ALARM WIRING IS BY ELECTRICAL CONTRACTOR.
3. ALL FITTINGS TO BE GROOVED FIRELOCK OR GROOVED STANDARD BY VICTAULIC.
4. ALL PIPING TO BE SCHEDULE 10 BLACK ASTM A-795 WITH GROOVED ENDS UNLESS NOTED OTHERWISE.
5. ALL PAINTING TO BE IN ACCORDANCE WITH NFPA AND MANUFACTURERS DATA.
6. FIRE PUMP FRAME TO BE ANCHORED TO CONCRETE PUMP ROOM FLOOR.
7. LOW POINTS IN FIRE PUMP PIPING TO HAVE PROVISIONS FOR DRAINING.
8. SUCTION AND DISCHARGE PIPING SHALL BE HYDROSTATICALLY TESTED AT NOT LESS THAN 200 PSI (13.8 BAR) PRESSURE, OR AT 50 PSI (3.4 BAR) IN EXCESS OF THE MAXIMUM PRESSURE TO BE MAINTAINED IN THE SYSTEM, WHICHEVER IS GREATER, FOR 2 HOURS.
9. ALL CONTROL VALVES ARE TO HAVE TAMPER SWITCHES.
10. CASING RELIEF VALVE TO BE PIPED TO FLOOR DRAIN SEPARATELY.
11. FIRE PUMP PACKING GLAND TO BE PIPED TO THE FLOOR DRAIN SEPARATELY.
12. HANGERS AND SUPPORTS TO BE PROVIDED IN ACCORDANCE WITH NFPA-13.
13. SEISMIC BRACING TO BE PROVIDED IN ACCORDANCE WITH NFPA-13.
14. ALL VALVES TO BE LABELED IN ACCORDANCE WITH NFPA-13.
15. REFER TO PUMP SUBMITTAL FOR DETAILED INFORMATION ON PUMP AND CONTROLLER.
16. PUMP SKID TO BE MOUNTED TO GROUT PAD.



KEY PLAN

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
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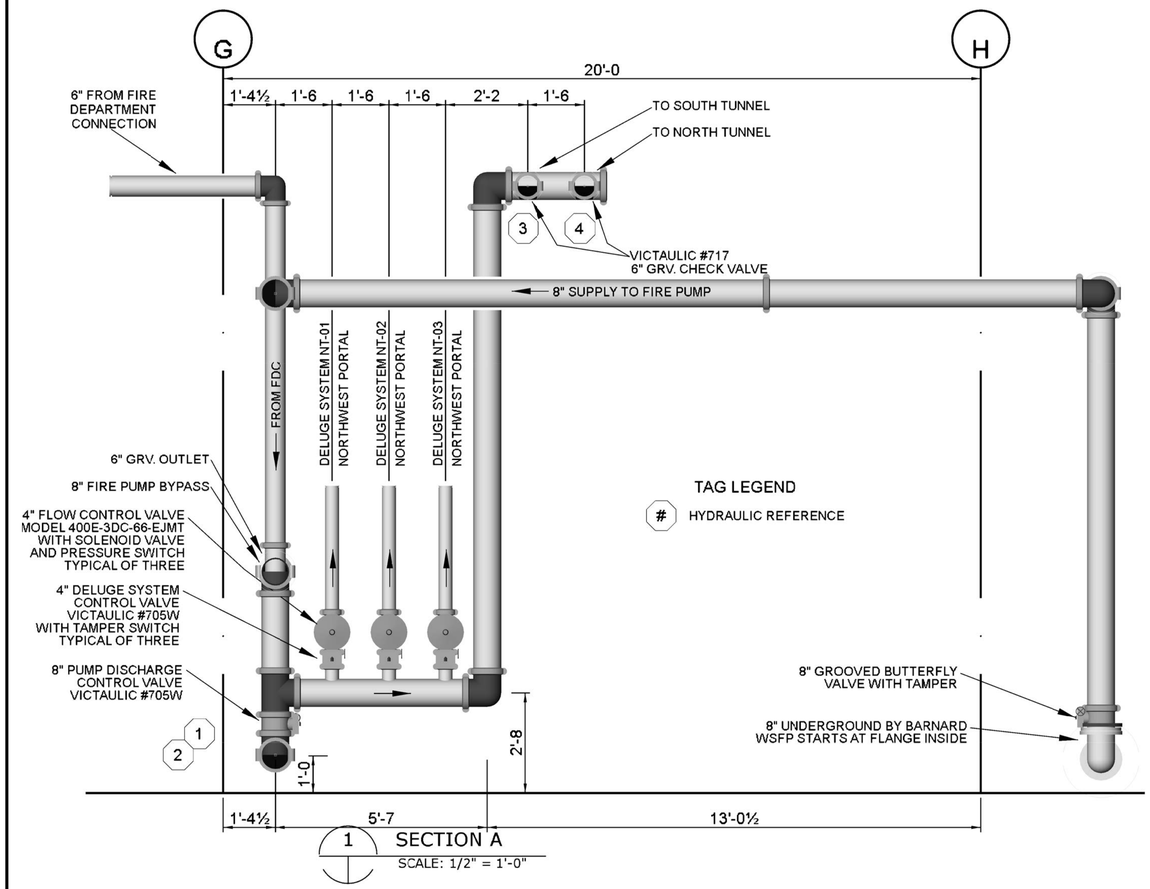
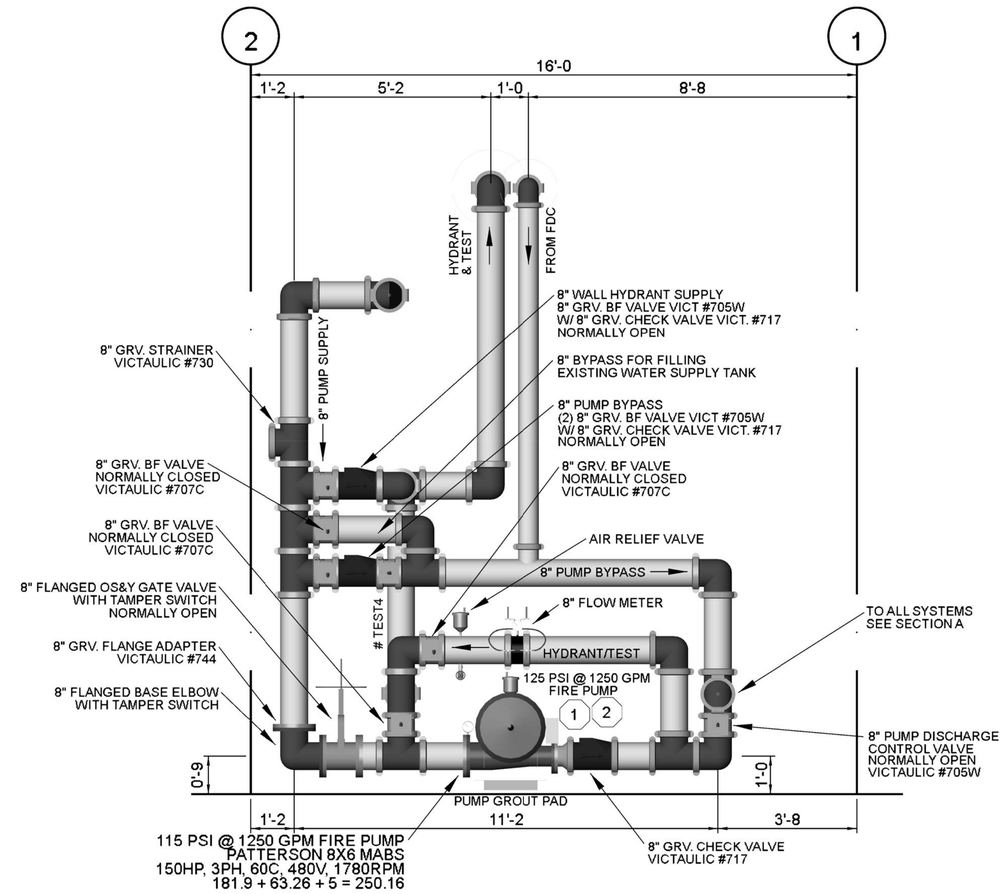
FIRE PUMP ROOM PLAN AND ISOMETRIC

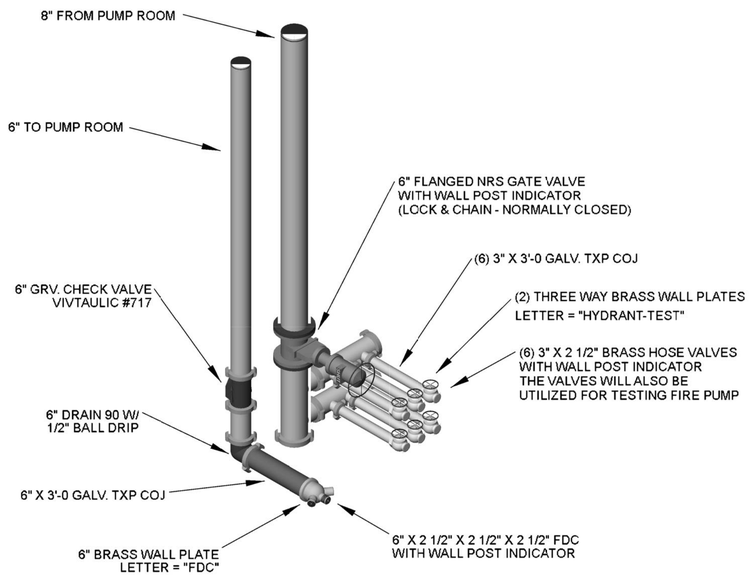
Drawing Number
FP5.0



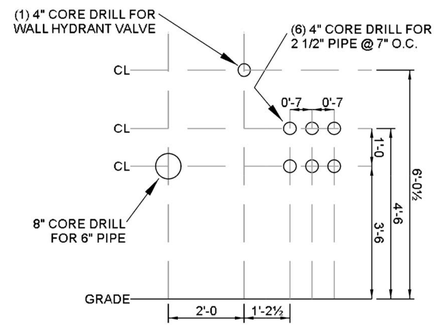
1 SECTION A
SCALE: 1/2" = 1'-0"



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

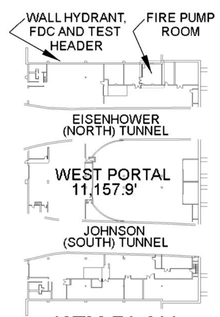


3 WALL HYDRANT, FDC AND TEST HEADER
NOT TO SCALE



(FOR CORE HOLE DETAILS, SEE SHEET A6.3)

4 WALL HYDRANT, FDC AND TEST HEADER - ELEVATION
NOT TO SCALE



KEY PLAN

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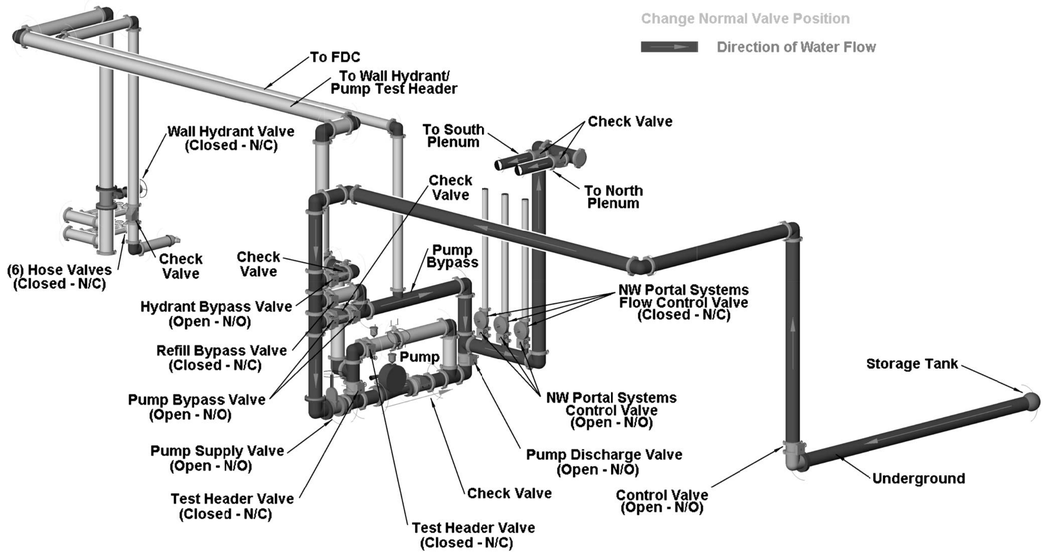
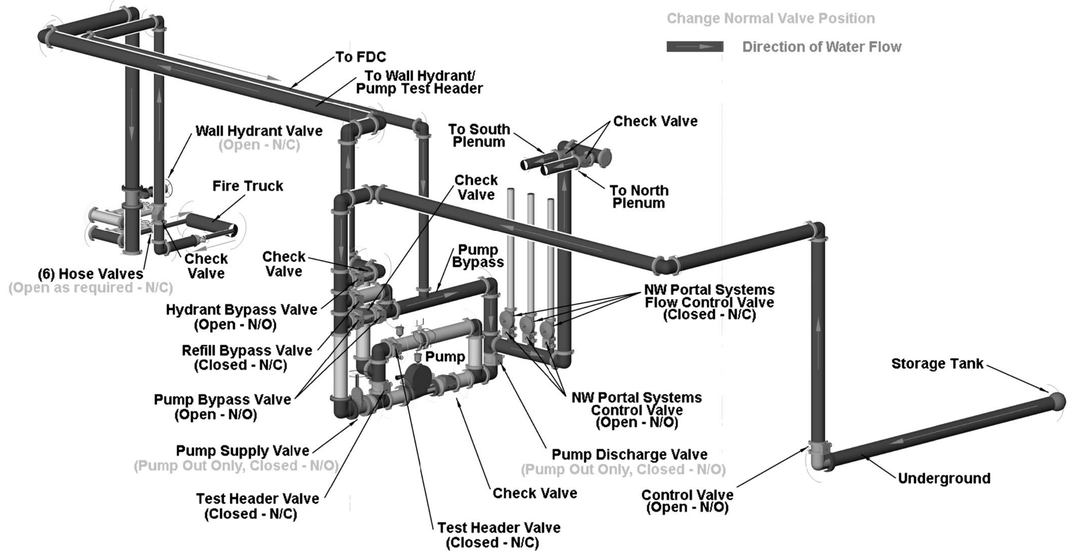
FIRE PUMP ROOM SECTIONS, WALL HYDRANT, FDC & TEST HEADER

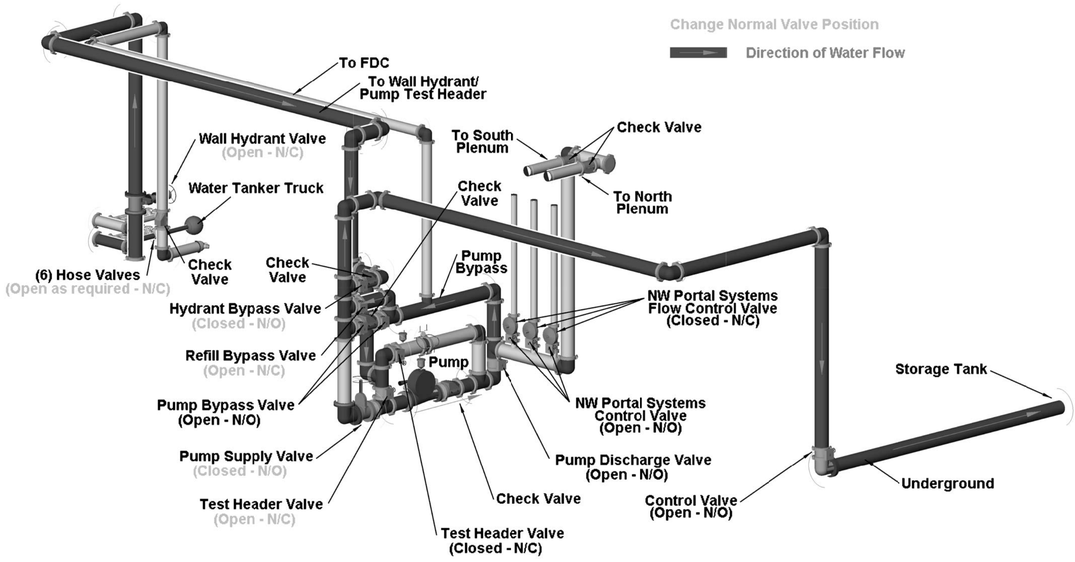
Drawing Number
FP5.1



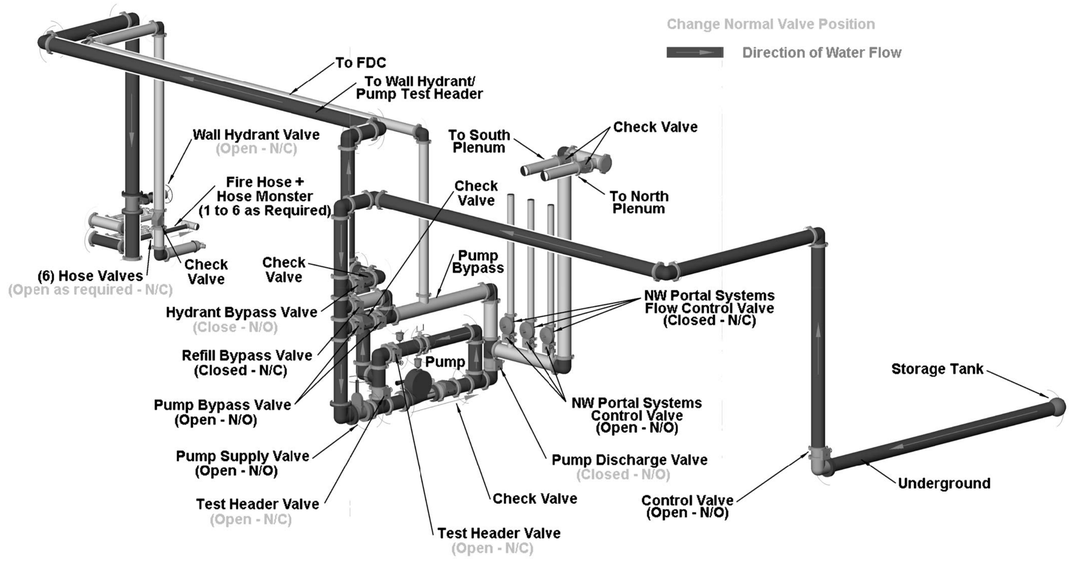
1 FIRE FLOW
NOT TO SCALE



2 WALL HYDRANT AND FDC FLOW
NOT TO SCALE



3 STORAGE TANK REFILL FLOW
NOT TO SCALE



4 PUMP TEST FLOW
NOT TO SCALE

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Western States Fire Protection Co.

BCER engineering

Sturgeon ELECTRIC

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

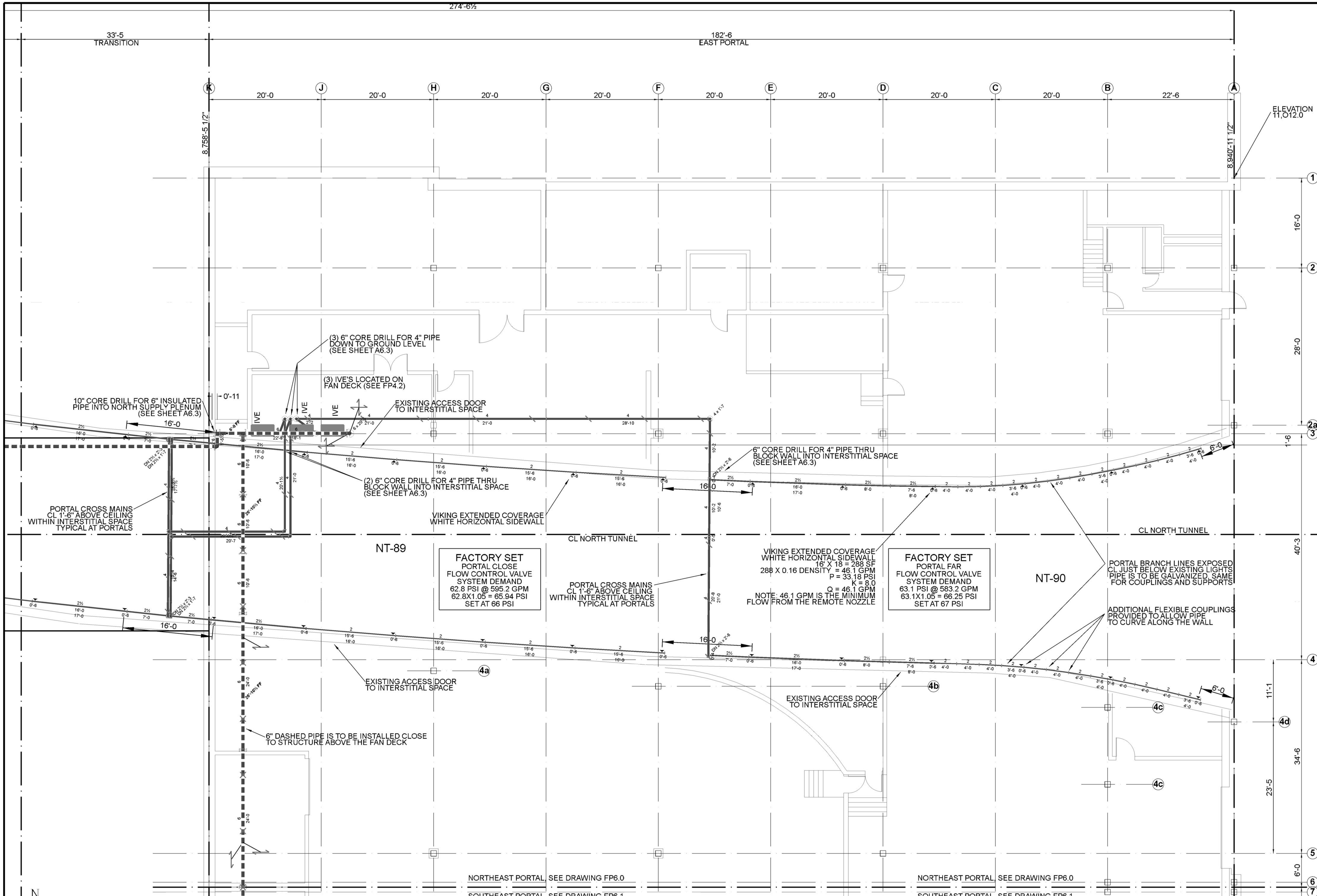
Revisions

Num	Description	Date
-	-	-

DRAWN BY: AMB
CHECKED BY: JLH

PUMP ROOM
FLOW CONDITIONS

Drawing Number
FP5.2



274'-6½
33'-5
TRANSITION
182'-6
EAST PORTAL
K
J
H
G
F
E
D
C
B
A
20'-0
22'-6
8,758'-5 1/2"
8,940'-11 1/2"
ELEVATION
11,012.0
(3) 6" CORE DRILL FOR 4" PIPE
DOWN TO GROUND LEVEL
(SEE SHEET A6.3)
(3) IVE'S LOCATED ON
FAN DECK (SEE FP4.2)
10" CORE DRILL FOR 6" INSULATED
PIPE INTO NORTH SUPPLY PLENUM
(SEE SHEET A6.3)
0'-11
IVE
EXISTING ACCESS DOOR
TO INTERSTITIAL SPACE
16'-0
6" CORE DRILL FOR 4" PIPE THRU
BLOCK WALL INTO INTERSTITIAL SPACE
(SEE SHEET A6.3)
(2) 6" CORE DRILL FOR 4" PIPE THRU
BLOCK WALL INTO INTERSTITIAL SPACE
(SEE SHEET A6.3)
PORTAL CROSS MAINS
CL 1'-6" ABOVE CEILING
WITHIN INTERSTITIAL SPACE
TYPICAL AT PORTALS
VIKING EXTENDED COVERAGE
WHITE HORIZONTAL SIDEWALL
NT-89
CL NORTH TUNNEL
FACTORY SET
PORTAL CLOSE
FLOW CONTROL VALVE
SYSTEM DEMAND
62.8 PSI @ 595.2 GPM
62.8X1.05 = 65.94 PSI
SET AT 66 PSI
PORTAL CROSS MAINS
CL 1'-6" ABOVE CEILING
WITHIN INTERSTITIAL SPACE
TYPICAL AT PORTALS
VIKING EXTENDED COVERAGE
WHITE HORIZONTAL SIDEWALL
16' X 18 = 288 SF
288 X 0.16 DENSITY = 46.1 GPM
P = 33.18 PSI
K = 8.0
Q = 46.1 GPM
NOTE: 46.1 GPM IS THE MINIMUM
FLOW FROM THE REMOTE NOZZLE
FACTORY SET
PORTAL FAR
FLOW CONTROL VALVE
SYSTEM DEMAND
63.1 PSI @ 583.2 GPM
63.1X1.05 = 66.25 PSI
SET AT 67 PSI
NT-90
CL NORTH TUNNEL
PORTAL BRANCH LINES EXPOSED
CL JUST BELOW EXISTING LIGHTS
PIPE IS TO BE GALVANIZED, SAME
FOR COUPLINGS AND SUPPORTS
ADDITIONAL FLEXIBLE COUPLINGS
PROVIDED TO ALLOW PIPE
TO CURVE ALONG THE WALL
6'-0
EXISTING ACCESS DOOR
TO INTERSTITIAL SPACE
EXISTING ACCESS DOOR
TO INTERSTITIAL SPACE
6" DASHED PIPE IS TO BE INSTALLED CLOSE
TO STRUCTURE ABOVE THE FAN DECK
1
2
2a
3
4
4a
4b
4c
4d
5
6
7
16'-0
28'-0
1'-6
40'-3
11'-1
34'-6
23'-5
6'-0
NORTHEAST PORTAL, SEE DRAWING FP6.0
SOUTHEAST PORTAL, SEE DRAWING FP6.1
NORTHEAST PORTAL, SEE DRAWING FP6.0
SOUTHEAST PORTAL, SEE DRAWING FP6.1
N

1 EAST PORTAL - EISENHOWER (NORTH) TUNNEL - ROADWAY LEVEL (NT-89 & NT-90 - SIDEWALL SYSTEMS)

SCALE: 1/8" = 1'-0

SCALE: 1/8" = 1'-0

2 0 4 8 16

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EISENHOWER/JOHNSON MEMORIAL TUNNEL

FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT

Project No. C0703-360 Subaccount 17810

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Num	Description	Date
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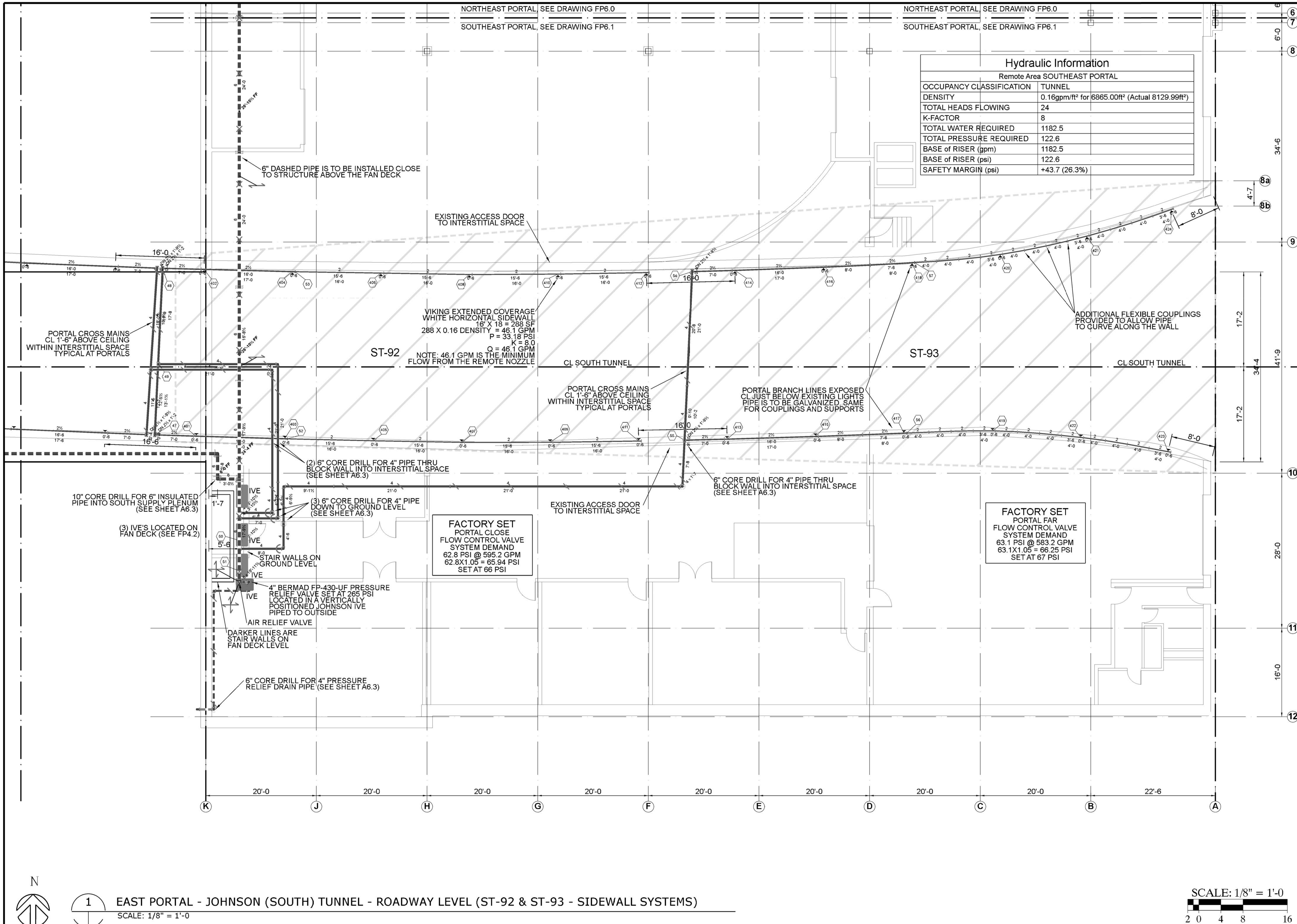
DRAWN BY: AMB CHECKED BY: JLH

EAST PORTAL
EISENHOWER (NORTH)
ROADWAY LEVEL

Drawing Number

FP6.0


NORTHEAST PORTAL, SEE DRAWING FP6.0
SOUTHEAST PORTAL, SEE DRAWING FP6.1
6" DASHED PIPE IS TO BE INSTALLED CLOSE TO STRUCTURE ABOVE THE FAN DECK
EXISTING ACCESS DOOR TO INTERSTITIAL SPACE
PORTAL CROSS MAINS CL 1'-6" ABOVE CEILING WITHIN INTERSTITIAL SPACE TYPICAL AT PORTALS
VIKING EXTENDED COVERAGE WHITE HORIZONTAL SIDEWALL
16' X 18 = 288 SF
288 X 0.16 DENSITY = 46.1 GPM
P = 33.18 PSI
K = 8.0
Q = 46.1 GPM
NOTE: 46.1 GPM IS THE MINIMUM FLOW FROM THE REMOTE NOZZLE
ST-92
ST-93
CL SOUTH TUNNEL
ADDITIONAL FLEXIBLE COUPLINGS PROVIDED TO ALLOW PIPE TO CURVE ALONG THE WALL
PORTAL BRANCH LINES EXPOSED CL JUST BELOW EXISTING LIGHTS PIPE IS TO BE GALVANIZED, SAME FOR COUPLINGS AND SUPPORTS
(2) 6" CORE DRILL FOR 4" PIPE THRU BLOCK WALL INTO INTERSTITIAL SPACE (SEE SHEET A6.3)
6" CORE DRILL FOR 4" PIPE THRU BLOCK WALL INTO INTERSTITIAL SPACE (SEE SHEET A6.3)
10" CORE DRILL FOR 6" INSULATED PIPE INTO SOUTH SUPPLY PLENUM (SEE SHEET A6.3)
(3) 6" CORE DRILL FOR 4" PIPE DOWN TO GROUND LEVEL (SEE SHEET A6.3)
(3) IVE'S LOCATED ON FAN DECK (SEE FP4.2)
STAIR WALLS ON GROUND LEVEL
4" BERMAD FP-430-UF PRESSURE RELIEF VALVE SET AT 265 PSI LOCATED IN A VERTICALLY POSITIONED JOHNSON IVE PIPED TO OUTSIDE
AIR RELIEF VALVE
DARKER LINES ARE STAIR WALLS ON FAN DECK LEVEL
6" CORE DRILL FOR 4" PRESSURE RELIEF DRAIN PIPE (SEE SHEET A6.3)
IVE
FACTORY SET
PORTAL CLOSE
FLOW CONTROL VALVE
SYSTEM DEMAND
62.8 PSI @ 595.2 GPM
62.8X1.05 = 65.94 PSI
SET AT 66 PSI
FACTORY SET
PORTAL FAR
FLOW CONTROL VALVE
SYSTEM DEMAND
63.1 PSI @ 583.2 GPM
63.1X1.05 = 66.25 PSI
SET AT 67 PSI
K J H G F E D C B A
6 7 8 8a 8b 9 10 11 12
20'-0 20'-0 20'-0 20'-0 20'-0 20'-0 20'-0 20'-0 22'-6
N
SCALE: 1/8" = 1'-0

Hydraulic Information

Remote Area SOUTHEAST PORTAL

OCCUPANCY CLASSIFICATION	TUNNEL
DENSITY	0.16gpm/ft² for 6865.00ft² (Actual 8129.99ft²)
TOTAL HEADS FLOWING	24
K-FACTOR	8
TOTAL WATER REQUIRED	1182.5
TOTAL PRESSURE REQUIRED	122.6
BASE of RISER (gpm)	1182.5
BASE of RISER (psi)	122.6
SAFETY MARGIN (psi)	+43.7 (26.3%)

1 EAST PORTAL - JOHNSON (SOUTH) TUNNEL - ROADWAY LEVEL (ST-92 & ST-93 - SIDEWALL SYSTEMS)

SCALE: 1/8" = 1'-0

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EISENHOWER/JOHNSON MEMORIAL TUNNEL

FIXED FIRE SUPPRESSION SYSTEM
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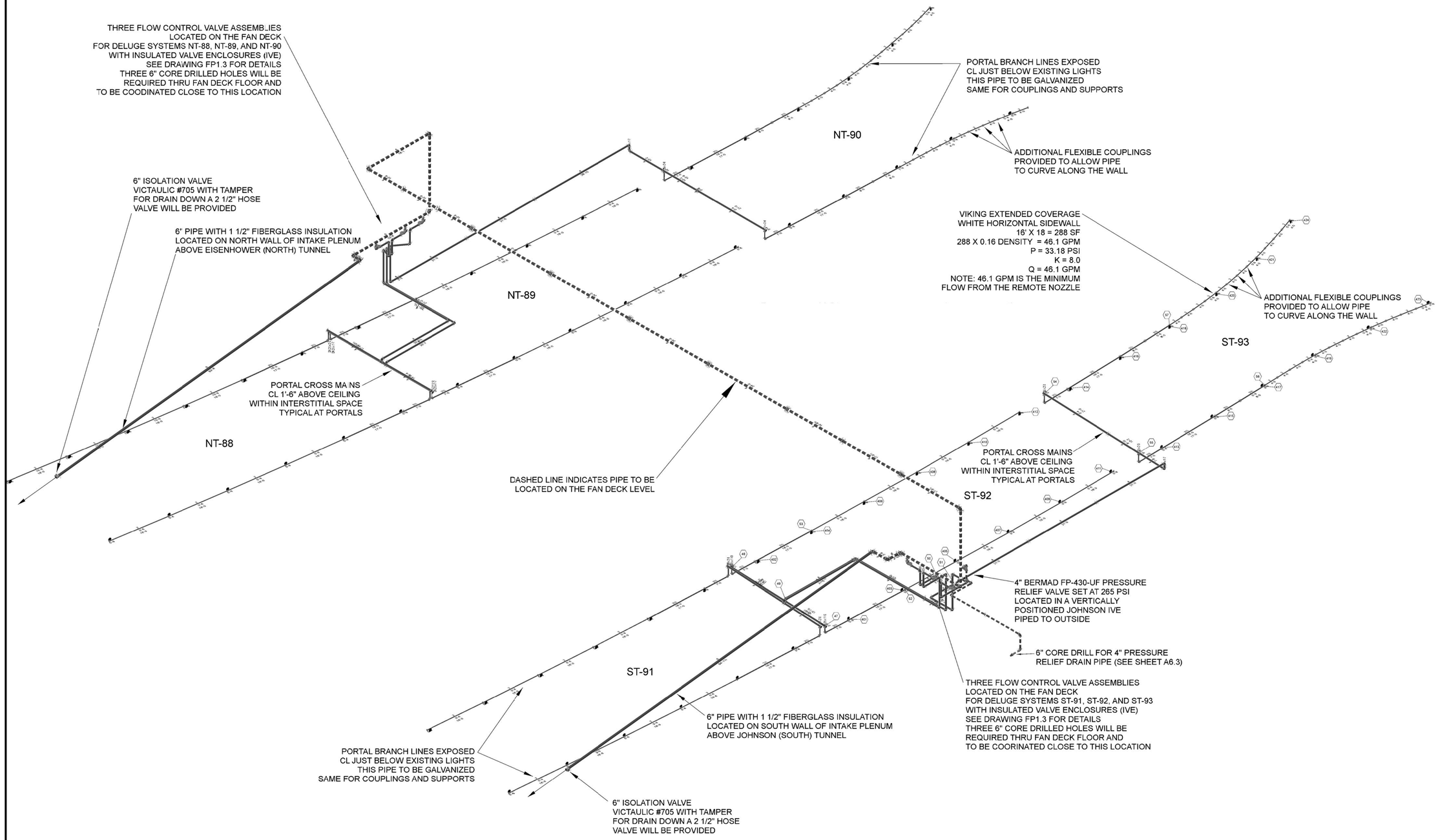
EAST PORTAL
JOHNSON (SOUTH)
ROADWAY LEVEL

Drawing Number

FP6.1



N

1 EAST PORTAL - ISOMETRIC

NOT TO SCALE

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EISENHOWER/JOHNSON MEMORIAL TUNNEL

FIXED FIRE SUPPRESSION SYSTEM

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Revisions

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DRAWN BY: AMB CHECKED BY: JLH

EAST PORTAL ISOMETRIC

Drawing Number

FP6.2

MECHANICAL LEGEND

ALL SYMBOLS IN LEGEND MAY NOT NECESSARILY BE USED ON THIS PROJECT

ABBREVIATIONS AND DESCRIPTIONS

AFF	ABOVE FINISHED FLOOR
AP	ACCESS PANEL
BOD	BOTTOM OF DUCT
BOP	BOTTOM OF PIPE
C	COMMON
CI	CAST IRON
℄ EL.	CENTER LINE ELEVATION
DIA, D	DIAMETER
EA	EXHAUST AIR
EXISTING 4" / NEW 4"	LIGHT LINE WEIGHT FOR EQUIPMENT, PIPING, SYMBOLS, TEXT, ETC. INDICATES EXISTING CONDITIONS WITH NEW WORK SHOWN AS DARK
	SCREENING INDICATES EXISTING TO BE REMOVED
FDC	FIRE DEPARTMENT CONNECTION
I.E.	INVERT ELEVATION
MA	MIXED AIR
MD	MOTORIZED DAMPER
MVD	MANUAL VOLUME DAMPER
NC	NORMALLY CLOSED
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
OA	OUTSIDE AIR
RA	RETURN AIR
REA	RETURN EXHAUST AIR
A	DIRECTION OF VIEW
	PICTURE DESIGNATION
SWT	SUPPLY WATER TEMPERATURE
RWT	RETURN WATER TEMPERATURE
SA	SUPPLY AIR
TCEAD	TEMPERATURE CONTROL EXHAUST AIR DAMPER
TCOAD	TEMPERATURE CONTROL OUTSIDE AIR DAMPER
TCRAD	TEMPERATURE CONTROL RETURN AIR DAMPER
TYP	TYPICAL
UNO	UNLESS NOTED OTHERWISE
VCP	VITRIFIED CLAY PIPE
VTR	VENT THROUGH ROOF
	POINT OF CONNECTION NEW TO EXISTING
(N)	NEW
(E)	EXISTING
(R)	RELOCATED
(F)	FUTURE
20x20	RECTANGULAR DUCTWORK
20Ø	ROUND DUCTWORK
20/20	OVAL DUCTWORK
	DIRECTION OF CUT
1	SECTION DESIGNATION
?	SECTION TAKEN ON THIS SHEET
?	DRAWN ON THIS SHEET

PIPING DESIGNATIONS, FITTINGS AND EQUIPMENT

HWS	HEATING WATER SUPPLY
HWR	HEATING WATER RETURN
HRS	HEAT RECOVERY SUPPLY
HRR	HEAT RECOVERY RETURN
CWS	CHILLED WATER SUPPLY
CWR	CHILLED WATER RETURN
	IN-LINE PUMP
	BASE MOUNTED PUMP
	PIPE CONNECTION
	ELBOW UP
	ELBOW DOWN
	TEE UP
	TEE DOWN
	RISE OR DROP
R.	BRANCH-TOP CONNECTION
D	BRANCH-BOTTOM CONNECTION
R.	PIPE CAP OR PLUG
D	UNION
	EXPANSION JOINT
	PIPE ANCHOR
	PIPE ALIGNMENT GUIDE
	FLEXIBLE CONNECTION
CDS	CONDENSER WATER SUPPLY
CDR	CONDENSER WATER RETURN
CDW	CONDENSER WATER (COMMON)
LPS	LOW PRESSURE STEAM
LPR	LOW PRESSURE STEAM (CONDENSATE) RETURN
PWS	PRE-COOLING WATER SUPPLY
PWR	PRE-COOLING WATER RETURN
	GATE VALVE
	STRAINER
	STRAINER W/BLOWOFF VALVE
	2-WAY VALVE
	STEAM TRAP
	TEMPERATURE GAUGE
	PRESSURE/TEMPERATURE TAP
	WELL
	POST INDICATING VALVE
	GAS PRESSURE REGULATOR
	GAS COCK
	VENTURI
MPS	MEDIUM PRESSURE STEAM
MPR	MEDIUM PRESSURE STEAM (CONDENSATE) RETURN
HPS	HIGH PRESSURE STEAM
HPR	HIGH PRESSURE STEAM (CONDENSATE) RETURN
RL	REFRIGERANT LIQUID
RS	REFRIGERANT SUCTION
RHG	REFRIGERANT HOT GAS
	BALL VALVE
	CALIBRATED BALANCE VALVE
	PLUG VALVE
	NEEDLE VALVE
	SOLENOID VALVE
	PRESSURE REDUCING VALVE
	2-WAY CONTROL VALVE
	3-WAY CONTROL VALVE
	CHECK VALVE
	GLOBE VALVE
	BUTTERFLY VALVE
	BALANCING VALVE
	CIRCUIT SETTER
CD	CONDENSATE DRAIN
PC	PUMPED CONDENSATE
NG	NATURAL GAS
NP	NON-POTABLE WATER
CW	POTABLE (COLD) WATER
FSP	FIRE SPRINKLER PIPE
	ARROW PARALLEL TO LINE INDICATES PITCH
	ARROW IN LINE INDICATES DIRECTION OF FLOW
	HOSE END BALL VALVE W/ CAP
	TEMPERATURE/PRESSURE RELIEF VALVE
	VACUUM BREAKER
	AUTOMATIC AIR VENT
	MANUAL AIR VENT
M	METER
	PRESSURE GAUGE W/ COCK
	GAUGE W/ PIGTAIL

CONTROLS DEVICES

H	HUMIDIFIER
	PARALLEL BLADE DAMPER
	OPPOSED BLADE DAMPER
CS	CURRENT SENSOR
DM	DAMPER ACTUATOR
MS	MOTOR STARTER
VFD	VARIABLE FREQUENCY DRIVE
H	HORN
S	DUCT SMOKE DETECTOR
FS	FLOW SWITCH
PS	PRESSURE SWITCH
PI	PRESSURE INDICATOR
T	AQUASTAT
$	MANUAL SWITCH
T N	WALL MOUNTED THERMOSTAT N - INDICATES NIGHT
T	UNIT MOUNTED THERMOSTAT
H	HUMIDISTAT
S	SENSOR (SPECIFY)
	INDICATOR LIGHT

MECHANICAL DRAWING LIST

GENERAL NOTE:

ALL MATERIAL ON THIS PROJECT SHALL MEET THE "BUY AMERICA" ACT. ALL MATERIAL SUBMITTED SHALL INCLUDE CERTIFICATION LETTER FROM MANUFACTURER.

RECORD DRAWINGS

DRAWING INCLUDES MARKUPS RECEIVED FROM THE CONTRACTOR FOR ROUTING OF PIPING, DUCTWORK, VALVE, EQUIPMENT TAG NUMBER AND EQUIPMENT LOCATION, ETC.; EQUIPMENT MODEL NUMBERS USED; RFI'S, FIELD ORDERS AND ADDENDA ITEMS. THE INFORMATION RECEIVED FROM THE CONTRACTOR'S FIELD MARKUPS HAS NOT BEEN VERIFIED BY BCER FOR ACCURACY OR COMPLETENESS. THE RESPONSIBILITY OF THESE MARKUPS ACCURACY AND COMPLETION IS THAT OF THE CONTRACTOR.

BARNARD EJMT TEAM

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
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DRAWN BY: JEB CHECKED BY: RDM

MECHANICAL GENERAL INFORMATION

Drawing Number

M1.0

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

EISENHOWER JOHNSON TUNNEL, FIRE SPRINKLER PIPE FREEZE PROTECTION MECHANICAL SYSTEM NARRATIVE

LOOP PIPING HEATING SYSTEM
THE NEW FIXED FIRE SUPPRESSION SYSTEM (FFSS) REQUIRES A MEANS TO KEEP THE 6" LOOP PIPING WATER FROM FREEZING IN THE PLENUMS. A NEW BOILER SYSTEM WILL PROVIDE A CIRCULATING HEATED WATER SYSTEM USING A PLATE AND FRAME HEAT EXCHANGER TO DECOUPLE THE HEATING WATER FROM THE "OPEN" FFSS PIPING. THE BOILERS WILL MAINTAIN A MINIMUM LOOP TEMPERATURE 80°F TEMPERATURE WHEN THE TUNNEL TEMPERATURE REACHES -30°F WHEN ONLY ONE BOILER OPERATES. THE PIPING WILL BE INSULATED COMPLETELY FROM THE BOILER/FIRE PUMP ROOM TO THE ENTIRE LOOP SERVING BOTH TUNNELS.

THE PIPING SYSTEM INCLUDES APPROXIMATELY 18,100 FEET OF 6 INCH PIPING. THE ENVIRONMENT THAT THE PIPE IS EXPOSED TO IS THE VENTILATION AIR PLENUMS ABOVE THE TRAFFIC TUNNELS. THIS AIR TEMPERATURE HAS BEEN MODELED USING -30°F AIR AND AN AVERAGE AIR VELOCITY DUE TO THE VENTILATING FANS OF 18. MPH. (NOTE: THE HEAT LOSS FROM THE INSULATED PIPE INCREASES 1.6% WHEN AIR VELOCITY REACHES 140 MPH).

THE ELEVATION OF THE TUNNEL IS 11,013 FT. (EAST) TO 11,158 FT. (WEST) ABOVE SEA LEVEL.

THE ENTIRE PIPING SYSTEM HEAT LOSS IS CALCULATED USING 1.5 INCHES OF FIBERGLASS INSULATION WITH AN "ALL-SERVICE" VAPOR BARRIER JACKETING.

THE PIPING INCLUDES A METAL JACKET TO PREVENT HIGH VELOCITY AIR DEGRADATION OF THE INSULATION.

THE PIPE HEAT LOSS MODEL USING 80°F MINIMUM WATER TEMPERATURE INDICATES 80°F WILL BE THE MINIMUM TEMPERATURE TO PROVIDE FOR VALVE CABINET HEAT LOSS.

THE SUMMARY OF HEAT LOSS (AT ALTITUDE) FROM THE SYSTEM IS AS FOLLOWS FOR 80° SWT:

18,100 FT OF 6 INCH PIPE	611,960 BTU/HR
180 VALVE CABINETS	36,360 BTU/HR
TOTAL	648,320 BTU/HR

THE NEW NON-CONDENSING TYPE BOILER SYSTEM INSTALLATION WILL BE LOCATED IN THE FIRE PUMP/MECH ROOM.

THE BOILER EFFICIENCY WILL BE 85%. THE ALTITUDE CORRECTION FOR THE BOILER INCLUDES A DERATION OF 44% (I.E. THE ALTITUDE OUTPUT WILL BE 56% OF TOTAL SEA LEVEL OUTPUT VALUE OF THE BOILER(S).

USING THIS EFFICIENCY AND ALTITUDE DERATION INDICATES A TOTAL BOILER INPUT MINIMUM OF 1,363 MBH BASED ON THE TOTAL LOAD REQUIRED. WE HAVE ELECTED TO SET THE FFSS WATER TEMPERATURE TO 100°F FOR ADDED SAFETY OF THE VALVE CABINET HEATING.

THE SYSTEM HAS BEEN SIZED WITH TWO BOILERS (LEAD-LAG CONTROL) EACH WITH 1440 MBH INPUT. EACH BOILER HAS A CIRCULATION PUMP TO PROVIDE HEAT TO THE FFSS CIRCULATION PUMPING SYSTEM THROUGH A PLATE AND FRAME HEAT EXCHANGER. THE BOILER(S) WILL OPERATE TO PROVIDE 160°F SUPPLY WATER TO THE EXCHANGER THAT HEATS THE FFSS LOOP CIRCULATING WATER TO ~100°F SWT. REFER TO CALCULATIONS ON SHEET M1.2.

THE PRIMARY PUMPING SYSTEM FOR THE LOOP PIPING WILL BE PROVIDED BY TWO PUMPS. EACH WILL BE SIZED AT FULL FLOW CAPACITY OF 320 GPM FOR NORMAL OPERATION. THESE PUMPS WILL OPERATE IN LEAD-STANDBY FUNCTION AND WILL BE PROVIDED WITH TIME FUNCTION FOR EQUALIZING THE OPERATION TIME.

THE BOILERS ARE CLOSED COMBUSTION TYPE. THE INTAKE AND VENTING WILL BE ROUTED DIRECTLY TO THE OUTSIDE OF THE BUILDING USING INLINE FANS.

THE AUTOMATIC ZONE VALVE CABINETS WILL BE HEATED USING THE LOOP PIPING AS THE SOURCE. THE CABINETS WILL BE FULLY INSULATED.

THE BOILERS WILL BE PROVIDED WITH NATURAL GAS USING THE EXISTING BRANCH PIPING THAT WAS USED TO SERVE THE TUNNEL HEATERS. THE GAS IS DISTRIBUTED FROM THE WEST END, SOUTH BOILER ROOM GAS REGULATOR. EACH BOILER WILL BE PROVIDED WITH A GAS PRESSURE REGULATOR.

THE BOILER ROOM WILL BE PROVIDED WITH AN "EMERGENCY DISCONNECTING MEANS" IN ACCORDANCE WITH ASME CSD-2009, SECTION CE-110. THIS WILL ALLOW MANUAL REMOTE SHUT DOWN LOCATED JUST OUTSIDE THE BOILER ROOM.

WASTE PIPING DRAINAGE CONTROL

THE EXISTING WASTE PIPING FROM THE TUNNELS WILL BE MODIFIED BY THE ADDITION OF CONTROL VALVES IN THE EAST SEWER TREATMENT ROOM AND THE WASTE MANHOLE OUTSIDE OF THE EAST PORTAL BUILDING.

THE CONTROL VALVES SHALL BE CONTROLLED THROUGH THE FIRE ALARM SYSTEM.

THE VALVES WILL BE PROVIDED TO ALLOW WASTE TO FLOW TO THE EXISTING INDOOR SEDIMENTATION TANKS DURING NORMAL OPERATION. IF THE VALVES LOSE POWER DURING NORMAL OPERATION THEY WILL FAIL TO ALLOW FLOW TO THE SEDIMENTATION TANKS.

THE VALVES ARE ARRANGED SUCH THAT DURING A FIRE EVENT, THE AFFECTED TUNNEL (NORTH OR SOUTH) INFLUENT LINE WILL BE DIVERTED TO THE FFSS DRAINAGE SYSTEM. A NEW 12 INCH BYPASS LINE WILL BE INSTALLED TO DIVERT ANY FIRE WATER FROM THE SOUTH ROADWAY FROM ENTERING THE SEDIMENTATION TANKS. THE EXISTING 12 INCH OBSOLETE PIPE WILL BE USED TO FLOW ANY FIRE WATER TO THE NEW FFSS DRAINAGE SYSTEM OUTSIDE THE BUILDING.

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MECHANICAL NARRATIVE

Drawing Number
M1.1

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HEATING SYSTEM CALCULATION

A. THE MINIMUM WATER TEMPERATURE THAT WILL PROVIDE ENOUGH HEAT FROM A BARE 6 INCH PIPE INSIDE THE VALVE CABINETS IS 80°F.

1. CABINET HEAT LOSS (52SF) WITH 3 INCH THICK POLYISOCYANURATE IS 202. BTU/HR USING 40°F INTERIOR CABINET AND -30°F EXTERIOR TEMP.

2. 6" BARE PIPE HEAT LOSS AT 80°F IS 108 BTU/LF. **<EXHIBIT 1>** FOUR L.F. PROVIDES 432 BTU/HR

B. USING 80°F MINIMUM CIRCULATING WATER TEMPERATURE THE 6 INCH PIPE WITH 1.5 INCH FIBERGLASS INSULATION IN 18 MPH, - 30°F AIR STREAM LOSES 33.8 BTU/HR/LF **<EXHIBIT 2>**

NOTE: THE HEAT LOSS FOR INSULATED PIPE IN A 140MPH AIR STREAM AT -30°F INCREASES BY 1.6%. THE BASIS OF DESIGN ALLOWS FOR A SAFETY FACTOR TO COVER HIGH VELOCITY. THE CFD MODEL USED TUNNEL VELOCITIES OF 135MPH.

1. TOTAL PIPE HEAT LOSS:

18,100 LF X 33.8 BTU/HR/LF = 611,960 BTU/HR

2. TOTAL CABINET HEAT LOSS:

180 CABINETS X 202 BTU/HR = 36,360 BTU/HR

3. TOTAL SYSTEM HEAT LOSS:

1+2 = 648,320 BTU/HR

C. THE BOILER INPUT RATING TO SATISFY THE SYSTEM HEAT LOSS IS:

$$\left(\frac{648{,}320 \text{ BTU/HR}}{0.85 \text{ X } 0.56}\right) = 1{,}362{,}017 \text{ BTU/HR INPUT @ S./L.}$$

WHERE 0.85 IS BOILER EFFICIENCY

WHERE 0.56 IS ALTITUDE CORRECTION @ 4%/1000FT DERATION

D. WHEN DIVIDING THIS LOAD BY 2, THE MINIMUM BOILER SIZE FOR EACH WOULD BE 681,000 BTU/HR INPUT.

E. WE HAVE ELECTED TO OPERATE THE BOILERS TO MAINTAIN APPROXIMATELY 100°F SUPPLY WATER TEMPERATURE TO THE FIRE SPRINKLER PIPING SYSTEM. THE PIPE HEAT LOSS INCREASES AS A RESULT.

PIPE H.L. = 738,480 BTU/HR **<EXHIBIT 4>**

CABINET H.L.= 36,360 BTU/HR

TOTAL H.L. = 774,840 BTU/HR OUTPUT @ ALTITUDE

THE MINIMUM REQUIRED BOILER INPUT NOW BECOMES 1,627,815 BTU/HR

THIS REQUIRES TWO 813.9 MBH INPUT BOILERS

F. WE HAVE PROVIDED 2 BOILERS WITH 1440 MBH INPUT EACH. THIS ALLOWS 100% REDUNDANCY AT 80°F EWT.

G. IF ONE BOILER IS UNAVAILABLE THE OUTPUT CAPACITY IS 685,440 BTU/HR. AFTER SUBTRACTING THE CABINET LOSS, THE AVAILABLE HEAT TO TEMPER THE 18,100 LF OF 6-INCH PIPE IS 649,080 BTU/HR. THIS EQUATES TO 35.8 BTU/LF. AT -30°F AMBIENT THE SINGLE BOILER CAN HEAT THE WATER TEMPERATURE TO 80°F.

1. THE CABINET HEAT AVAILABLE WITH 80°F BARE PIPE IS 432 BTU/HR @ 108 BTU/LF (4LF) **<EXHIBIT 3>**

2. NOTE THE CABINET H.L. IS 202 BTU/HR.

3. THE CABINET HEATING IS SATISFIED.

H. IF THE WATER FLOW STOPS AND THE WATER TEMPERATURE IS 40°F, HOW LONG WILL IT TAKE FOR THE CABINET TEMPERATURE TO DROP TO 32°F?

Q6 = 62.4 LB/CF X 0.2 CF/LF X 1 BTU/LB° F

Q6 = 12.48 BTU/°F - LF

HEAT AVAILABLE

Q2 = 3.5 LF X 12.48 BTU/°F LF X (40-32)°F

Q2 = 349 BTU

THE RATE OF HEAT LOSS

349 BTU

202 BTU/HR = 1.73 HOURS

IF THE MASS OF THE PIPE IS ADDED AT 40°F, THEN THE TIME EXTENDS TO NEARLY 2 HOURS.

I. IF THE PIPE WAS EMPTY AND 40°F, THEN THE CABINET WOULD BE AT 32°F IN LESS THAN 0.5 HOURS.

J. IF THE SYSTEM IS FILLED WITH WATER FROM THE STORAGE TANK AT 40°F HOW LONG WOULD IT TAKE FOR THE LOOP TO DROP TO 32°F WITHOUT WATER FLOW AND HEAT ADDED. THE SPACE TEMPERATURE IS ASSUMED TO BE -30°F.

1. THE PIPE HEAT LOSS IS Q40 = 20.85 BTU/HR/LF **<EXHIBIT 5>**

2. THE 6-INCH PIPE HAS HEAT STORED IN THE MASS OF THE WATER. WITHOUT CONSIDERING THE RESIDUAL HEAT OF THE PIPE, THE AVAILABLE HEAT IS:

Q = 0.2 CF/LF X 1 BTU/° F - LBW X 62.4 LBW/CF

Q = 12.48 BTU/°F LF

Q (40-32) = 12.48 BTU/° F LF X 8° F = 100 BTU/LF

3. THE TIME PERIOD TO DROP TO 32° F IS:

$$T1 = \left(\frac{100 \text{ BTU/LF}}{20.85 \text{ BTU/HR/LF}}\right) = 4.8 \text{ HOURS}$$

K. HOW LONG WILL IT TAKE FOR HEATED WATER TO REACH THE END OF THE LOOP BASED ON ONE HEATING PUMP OPERATING AT 320 GPM. THE 6 INCH PIPE FLOW RATE WILL BE 214 FPM (3.57 FPS)

$$T2 = \left(\frac{18{,}100 \text{ LF}}{214 \text{ FPM}}\right) = 84.6 \text{ MINUTES (1.4 HOURS)}$$

THEREFORE THE HEATING SYSTEM WILL REACT IN TIME.

L. THE 320 GPM NORMAL FLOW RATE IS BASED ON THE PIPE VELOCITY OF 3.6 FPS.

WITH THE SYSTEM HEAT LOSS OF 774,840 BTU/HR AT 100° F SWT

THE TEMPERATURE DROP EXPECTED FROM BEGINNING OF LOOP TO THE RETURN WILL BE:

ΔT = 774,840 BTU/HR

60 MIN/HR 8.3 LF/GAL 1 BTU/LB F 320 GAL/MIN

ΔT = 4.86 °F

EXHIBIT 1

Insulation Heat Loss Calculation - Estimates Heat Loss from an Insulated and Bare Horizontal Steel Pipe along with calculation of Surface Temperature

Input

Pipe Size (NPS)	6	inch
Operating Temperature	80	∞F
Ambient Temperature around Pipe		
Ambient Temperature	40	∞F
Wind Speed	0.00	mile/h (Inside Cabinet)
Insulation Details		
Insulation	Fiberglass	
Temperature Range (0∞F to 450∞F)		
Surface Emmisivity (ε)	0.90 - All Servi	
Thickness	1.5	inch

Solution

Insulated Pipe		
Surface Temp.	44.07	∞F
Heat Loss	12.00	BTU/h/ft
Bare Pipe		
Surface Temp.	79.96	∞F
Heat Loss	108.16	BTU/h/ft

EXHIBIT 2

Insulation Heat Loss Calculation - Estimates Heat Loss from an Insulated and Bare Horizontal Steel Pipe along with calculation of Surface Temperature

Input

Pipe Size (NPS)	6	inch
Operating Temperature	80	∞F
Ambient Temperature	-30	∞F
Wind Speed	18.00	mile/h
Insulation Details		
Insulation	Fiberglass	
Temperature Range (0∞F to 450∞F)		
Surface Emmisivity (ε)	0.90 - All Servi	
Thickness	1.5	inch

Solution

Insulated Pipe		
Surface Temp.	-27.63	∞F
Heat Loss	33.89	BTU/h/ft
Bare Pipe		
Surface Temp.	79.55	∞F
Heat Loss	1175.83	BTU/h/ft

EXHIBIT 3

Insulation Heat Loss Calculation - Estimates Heat Loss from an Insulated and Bare Horizontal Steel Pipe along with calculation of Surface Temperature

Input

Pipe Size (NPS)	6	inch
Operating Temperature	55	∞F
Ambient Temperature around Pipe		
Ambient Temperature	32	∞F
Wind Speed	0.00	mile/h (Inside Cabinet)
Insulation Details		
Insulation	Fiberglass	
Temperature Range (0∞F to 450∞F)		
Surface Emmisivity (ε)	0.90 - All Servi	
Thickness	1.5	inch

Solution

Insulated Pipe		
Surface Temp.	34.44	∞F
Heat Loss	6.65	BTU/h/ft
Bare Pipe		
Surface Temp.	54.98	∞F
Heat Loss	55.02	BTU/h/ft

EXHIBIT 4

Insulation Heat Loss Calculation - Estimates Heat Loss from an Insulated and Bare Horizontal Steel Pipe along with calculation of Surface Temperature

Input

Pipe Size (NPS)	6	inch
Horizontal Pipe Operating Temperature		
Operating Temperature	100.00	∞F
Ambient Temperature	-30.00	∞F
Wind Speed	18.00	mile/h
Insulation Details		
Insulation	Fiberglass	
Temperature Range (0∞F to 450∞F)		
Surface Emmisivity (ε)	0.90 - All Servi	
Thickness	1.5	inch

Solution

Insulated Pipe		
Surface Temp.	-27.15	∞F
Heat Loss	40.81	BTU/h/ft
Bare Pipe		
Surface Temp.	99.47	∞F
Heat Loss	1390.59	BTU/h/ft

EXHIBIT 5

Insulation Heat Loss Calculation - Estimates Heat Loss from an Insulated and Bare Horizontal Steel Pipe along with calculation of Surface Temperature

Input

Pipe Size (NPS)	6	inch
Horizontal Pipe Operating Temperature		
Operating Temperature	40	∞F
Ambient Temperature	-30	∞F
Wind Speed	18.00	mile/h
Insulation Details		
Insulation	Fiberglass	
Temperature Range (0∞F to 450∞F)		
Surface Emmisivity (ε)	0.90 - All Servi	
Thickness	1.5	inch

Solution

Insulated Pipe		
Surface Temp.	-28.54	∞F
Heat Loss	20.85	BTU/h/ft
Bare Pipe		
Surface Temp.	39.72	∞F
Heat Loss	748.60	BTU/h/ft

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FIXED FIRE SUPPRESSION SYSTEM

DESIGN BUILD PROJECT

Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

Revisions

Num	Description	Date

DRAWN BY: JEB CHECKED BY: RDM

MECHANICAL HEATING CALCULATIONS

Drawing Number

M1.2

MECHANICAL/ELECTRICAL COORDINATION (HYDRONICS)

M=Mech Contractor
E=Elec Contractor
C=Control Contractor

P – Provided
F – Furnished

REVISED DATE	PLAN CODE	EQUIPMENT DESCRIPTION	LOCATION	EQUIPMENT INPUT						STARTERS					EMERG. POWER	REMARKS
				HP	KW	AMPS	MCA	MOCP	VOLT/PH	MANUAL	MAG	COMB. MAG/ DISCONNECT	VFD	COMB. VFD/ DISCONNECT		
	B1	BOILER	BOILER/FIRE PUMP ROOM	–	–	5.0			120/1	F	–	–	–	–	YES	1,2,3
	B2	BOILER	BOILER/FIRE PUMP ROOM	–	–	5.0			120/1	F	–	–	–	–	YES	1,2,3
	P1	PUMP	BOILER/FIRE PUMP ROOM	40	–	–			480/3	–	–	–	–	P	YES	1,2,3
	P2	PUMP	BOILER/FIRE PUMP ROOM	40	–	–			480/3	–	–	–	–	P	YES	1,2,3
	P3	PUMP	BOILER/FIRE PUMP ROOM	3	–	–			480/3	–	–	P	–	–	YES	1,2,3
	P4	PUMP	BOILER/FIRE PUMP ROOM	3	–	–			480/3	–	–	P	–	–	YES	1,2,3
	VF–1	BOILER FLUE VENT FAN	LEVEL 1, STORAGE ROOM	2.0	–	–			208/3	–	–	–	–	F	YES	1,2
	VF–2	BOILER INTAKE VENT FAN	LEVEL 1, STORAGE ROOM	1.0	–	–			208/3	–	–	–	–	F	YES	1,2

1. EQUIPMENT IS INTERLOCKED WITH LIGHT OR WALL SWITCH, TIMER, CONTROLS...ETC.
2. EQUIPMENT HAS A SINGLE POINT CONNECTION.
3. SYSTEM OPERATES AS RUN/STANDBY OR IF MULTIPLE EQUIPMENT CAN OPERATE SIMULTANEOUSLY.

PUMP SCHEDULE

PLAN CODE	SERVICE	LOCATION	PUMP TYPE	MFR.	MODEL	PUMP SIZE	GPM	HEAD FT.	EFF %	APPROX. IMP. DIA.	SUCTION DIA.	DISCHARGE DIA.	% OF PROPYLENE GLYCOL	H.P.	RPM	ELEC. VOLT/PH.	REMARKS
P1	HEATING CIRCULATION	MECH ROOM	CENTR.	ARMSTRONG	SERIES 4030	3x2.5x8	320	200	74	7–1/2	3"	2–1/2	0	40	3600	480/3	PROVIDE VFD, (1)
P2	HEATING CIRCULATION	MECH ROOM	CENTR.	ARMSTRONG	SERIES 4030	3x2.5x8	320	200	74	7–1/2	3"	2–1/2	0	40	3600	480/3	PROVIDE VFD, (1)
P3	BOILER CIRCULATION	MECH ROOM	CENTR.	ARMSTRONG	SERIES 4360	3D	120	45	70	7	3"	3	0	3.0	1800	480/3	
P4	BOILER CIRCULATION	MECH ROOM	CENTR.	ARMSTRONG	SERIES 4360	3D	120	45	70	7	3"	3	0	3.0	1800	480/3	

(1) PROVIDE PUMP CONSTRUCTION TO ALLOW OPERATION UP TO 250 PSIG SYSTEM PRESSURE. (i.e. DUCTILE IRON)

HOT WATER BOILER SCHEDULE - (NATURAL GAS)

PLAN CODE	MFR.	MODEL	INSTALLED		BOILER H.P.	EWT (°F)	LWT (°F)	GPM	MBH INPUT @ S.L.	MBH GROSS OUTPUT @ S.L.	MBH OUTPUT @ ALT.	MIN. SURFACE AREA (SF)	MAX. FIRING RATE (CFH)	MIN. GAS PRESSURE (IN. W.C.)	MAX. GAS PRESSURE (IN. W.C.)	GLYCOL %	FLUE OUTLET DIAMETER	AIR INLET DIAMETER	ELEC. VOLT/PH	OPERATING WEIGHT (LBS)	REMARKS
			MFR.	MODEL																	
B1	LOCHINVAR	CHN1442			30	148.6	160	120.0	1440	1224	685	144	1735	4.5	14.0	0%	12	12	110/1	1100	ALL
B2	LOCHINVAR	CHN1442			30	148.6	160	120.0	1440	1224	685	144	1735	4.5	14.0	0%	12	12	110/1	1100	ALL

NOTES:

(1) COMBUSTION EFFICIENCY: *85%*
(2) OPERATION AT 11,000 FOOT ELEVATION. REQUIRES 44% REDUCTION IN BOILER INPUT CAPACITY TO PROVIDE OUPUT AT ALTITUDE.
(3) *125* PSIG RATED.
(4) PROVIDE NEW IRI APPROVED NATURAL GAS TRAIN FOR 2 PSI INLET GAS PRESSURE, FACTORY PIPED AND WIRED WITH UNION ENDS AND INCLUDING; GAS PRESSURE GAUGE; GAS PRESSURE REGULATOR; LOW GAS PRESSURE SWITCH; AUTO MOTORIZED OPERATING VALVE; AUTO MOTORIZED SAFETY GAS VALVE; GAS CHECKING COCK; HIGH GAS PRESSURE SWITCH; N.O. VENT VALVE.
(5) GAS/ELECTRIC IGNITION ASSEMBLY INCLUDING; GAS PRESSURE REGULATOR; GAS COCK; GAS SOLENOID VALVE, DUAL; GAS/ELECTRIC IGNITION SWITCH.
(6) PROVIDE BURNER W/ MODULATING BURNER OPERATION.
(7) PROVIDE UNIT WITH ENERGY USAGE COMPLIANCE TO ASHRAE 90.1 – *2010* REQUIREMENTS.
(8) PROVIDE GAS PRESSURE REGULATOR TO REGULATE GAS INLET PRESSURE TO 14 IN. W.C. (APPROX. 1 PSIG AVAILABLE)
(9) PROVIDE 1" PRESSURE RELIEF VALVE WITH BOILER. RELIEF VALVE RATING OF 1352 MBH, 50 PSI RELIEF PRESSURE.

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360
Subaccount 17810

RECORD DRAWINGS - 2015-11-16

Revisions
Num | Description | Date

DRAWN BY: JEB
CHECKED BY: RDM

MECHANICAL SCHEDULES

Drawing Number
M2.0

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PLATE AND FRAME HEAT EXCHANGER SCHEDULE

PLAN CODE	MFR.	MODEL	INSTALLED		HOT SIDE						COLD SIDE						MBH	HEAT TRANSFER AREA, SQ. FT.	OPERATIONAL WEIGHT	REMARKS
			MFR.	MODEL	GPM	% GLYCOL	°F EWT	°F LWT	P.D. FT. W.C.	INLET/OUTLET CONNECTION	GPM	% GLYCOL	°F EWT	°F LWT	P.D. FT. W.C.	INLET/OUTLET CONNECTION				
PF-1	ALFA-LAVAL	AQ4M-FD			120	0	160	148.6	2.0	4"	320	0	75.7	80	11.6	4"	685	75.8	965	(1) (2) (3) (4) (5) (6)
	SAME PF-1 WHEN OPERATED:				240	0	160	153.5			320		95	100			775			

(1) PROVIDE FULLY WELDED, 304 STAINLESS STEEL, RATED AT 250 PSIG. OPERATING PRESSURE.
(2) PERFORMANCE BASED ON HIGHER HEATING SYSTEM SIDE GPM; 640 GPM; 2.9° ΔT; 936 MBH., 18.4 PSIG ΔP.
(3) P/F EXCHANGER SHALL BE RATED USING THE "AHRI RATING" REQUIREMENTS.
(4) PROVIDE W/ 34 PLATES, COUNTERCURRENT FLOW, 1 - PASS HOT & COLD SIDE; EPDMP GASKET MATERIAL.
(5) TEST PRESSURE: 325 PSIG.
(6) PROVIDE FRAME FOR MINIMUM OF 44 ADDITIONAL PLATES.

EXPANSION TANK SCHEDULE

PLAN CODE	MFR.	MODEL	INSTALLED		SERVICE	CHARGE PRESSURE (PSIG)	% GLYCOL	OPERATING RANGE (°F)	CAPACITY		OPERATING WEIGHT (LBS.)	SYSTEM WATER VOLUME (GAL.) APPROX	REMARKS
			MFR.	MODEL					ACCEPT. VOLUME	TOTAL VOLUME			
ET-1	TACO	CA1400			FFSS HEATING	60	0.00	(40 - 130)	313	370	2,880	30,000	(2) (3)
ET-2	TACO	CA1400			FFSS HEATING	60	0.00	(40 - 130)	313	370	2,880	30,000	(2) (3)
ET-3	TACO	CAX42			BOILER HEATING	20	0.00	(40 - 180)	5	11	150	100	(1)

(1) SUSPENDED TYPE MOUNTING.
(2) FLOOR MOUNTED TYPE.
(3) MAXIMUM SYSTEM PRESSURE; 200 PSIG.

FAN SCHEDULE

PLAN CODE	MFR.	MODEL	INSTALLED		SYSTEM	FAN TYPE	CFM @ ALT.	S.P. IN W.C. @ S.L. (4)	WHEEL DIAMETER	FAN RPM (APPROX.)	DRIVE TYPE	H.P.	DAMPER		CURB TYPE	ELEC. VOLT/PH.	APPROX. WEIGHT (LBS.)	REMARKS
			MFR.	MODEL									TYPE	SIZE				
VF-1	ENERVEX	IPVB300			BOILER FLUE	INLINE-BI	1895	0.45	-	-	BELT	2.0	NA	NA	-	208/3		(1) (2) (3) (4) (5)
VF-2	ENERVEX	SFTA018			BOILER COMBUSTION	INLINE-BI	1008	0.49	-	-	BELT	1.0	NA	NA	-	208/3		(1) (2) (3) (4)

(1) STEEL VENT WITH B.I. WHEEL. PROVIDE COATING IN AIRSTREAM ONLY.
(2) PROVIDE BELT AND MOTOR GUARD.
(3) PROVIDE UNIT MODULATING SPEED CONTROL, FLUE PRESSURE CONTROL, ABB ACH550 DRIVE, MOTOR DISCONNECT AND INTERLOCK WITH BOILER CONTROL PANEL.
(4) STATIC PRESSURE IS BASED ON PRELIMINARY MANUFACTURER SELECTION. PROVIDE FLUE CALCULATION OF FINAL SELECTION BY MANUFACTURER.
(5) PROVIDE 12"Ø MODULATING BALANCING BAFLE.

AIR SEPARATOR SCHEDULE

PLAN CODE	MFR.	MODEL	INSTALLED		SERVICE	GPM	PRESSURE DROP (FT. OF HEAD)	PIPE SIZE	REMARKS
			MFR.	MODEL					
AS-1	B&G	RL-5			FFSS SYSTEM / HEATING	320		5"	(1)
AS-2	B&G	RL-4			HEATING	240		4"	(2)

(1) RATED AT 250 PSIG
(2) RATED AT 125PSIG/350°F

CHEMICAL BY-PASS FEEDER SCHEDULE

PLAN CODE	MFR.	MODEL	INSTALLED		SERVICE	VOLUME (GAL.)	PIPE SIZE (IN/OUT)	REMARKS
			MFR.	MODEL				
CBPF-1	NALCO	DBS-2			BOILER SYSTEM	2.0	3/4"	(1)

(1) REFER TO SPECS ON M8.3.

GAS EQUIPMENT AND GAS METER SCHEDULE

PLAN CODE	TYPE / SERVICE	MBH INPUT @S.L.	CFH @ SITE	MIN. GAS PRESSURE (IN. W.C.)	MAX. GAS PRESSURE (IN. W.C.)	FINAL CONNECTION SIZE	REMARKS
B1	BOILER	1440	2057	4.5	14	2.0	(1) (2) (3) (4) (5)
B2	BOILER	1440	2057	4.5	14	2.0	(1) (2) (3) (4) (5)
EG-1	EMERGENCY GENERATOR	4176	5966	15-20	-	2	(1) (2) (3) (4) (5)
(E) ENGR. BLDG.	ENGINEERING BUILDING	132	188	-	-	EXISTING	(1) (2) (3) (4) (5)
	TOTAL GAS LOAD	7188	10268				

(1) GAS SUPPLIED BY XCEL: 5 PSIG
(2) HEATING VALUE: *700 BTU/CF*.
(3) HARD PIPE FINAL CONNECTION.
(4) PROVIDE UNION, 6" DIRT LEG AND GAS COCK.
(5) SEE PLANS / SCHEMATIC FOR REGULATORS.

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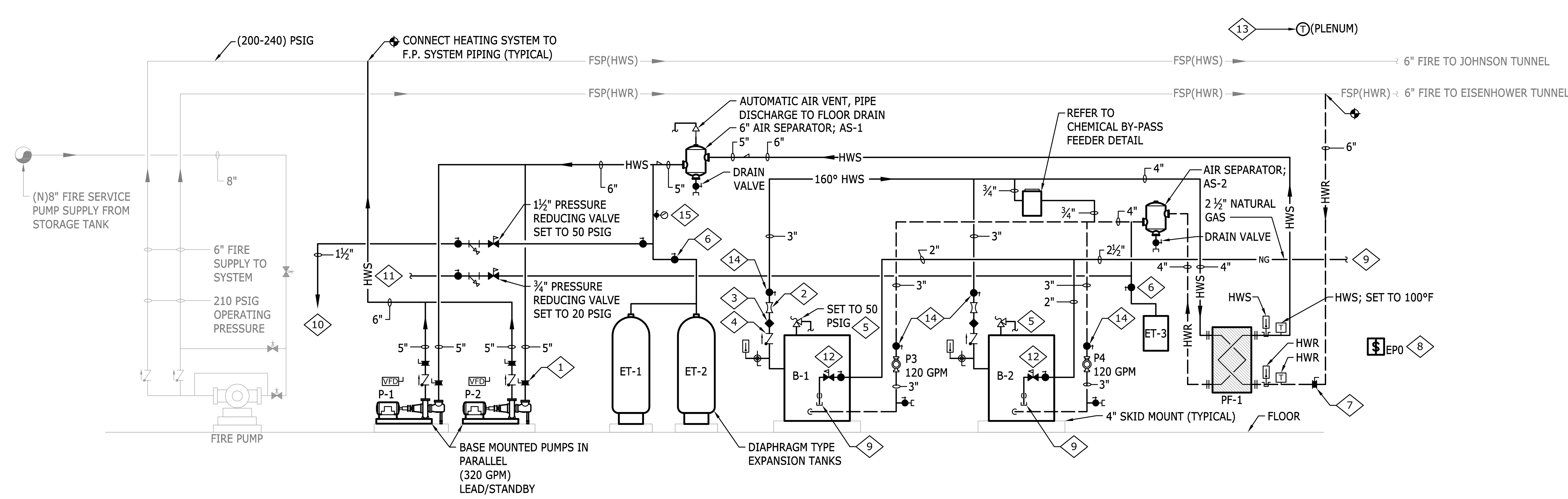
RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

DRAWN BY: JEB CHECKED BY: RDM

MECHANICAL SCHEDULES

Drawing Number
M2.1



1 BOILER SYSTEM SCHEMATIC

SCALE:NOT TO SCALE

WORK NOTES:

NOTE: THESE ITEMS ARE TO BE LOCATED IN THIS SYSTEM ARRANGEMENT AND NOT AS ADDITIONAL ITEMS TO THOSE SHOWN ON THE DETAIL ON SHEET M7.0. (applies to items 1–4)

1. BUTTERFLY VALVE (TYPICAL).
2. FLOW MEASURING STATION OR CALIBRATED BALANCING VALVE ASSEMBLY (TYPICAL).
3. BALANCING VALVE (TYPICAL).
4. CHECK VALVE (TYPICAL).
5. RELIEF VALVE; PIPE FROM OUTLET TO NEAREST DRAIN.
6. LOCKING BALL VALVE; LOCK IN THE NORMALLY OPEN POSITION.
7. HEATING SYSTEM MANUAL ISOLATION VALVE. REFER ALSO TO P/F DETAIL, USE THIS VALVE TO ISOLATE EQUIPMENT. (NOT REDUNDANT)
8. PROVIDE EMERGENCY POWER OFF (EPO) SWITCH OUTSIDE OF BOILER ROOM EXIT DOOR.
9. REFER TO GAS PIPING DETAIL ON SHEET M7.2 & M4.0.
10. CONNECT 1½" FIRE LINE "FILL LINE" FROM 8" FIRE ENTRY TO EXISTING RAW WATER DOMESTIC WATER SERVICE IN WATER ENTRY ROOM UPSTREAM OF EXISTING FILTERS.
11. CONNECT TO DOMESTIC WATER DOWNSTREAM OF FILTERS IN WATER ENTRY ROOM.
12. NATURAL GAS PRV 2 PSIG TO 12" WC
13. AMBIENT AIR TEMPERATURE SENSOR LOCATED IN TUNNEL AIR PLENUM.
14. BUTTERFLY VALVE.
15. PROVIDE SYSTEM PRESSURE SENSOR. PROVIDE ALARM TO FIRE ALARM SYSTEM IF PRESSURE DROPS TO 40PSIG (ADJUSTABLE).

BOILER SYSTEM SEQUENCE OF OPERATION

THE BOILER SYSTEM SHALL OPERATE TO MAINTAIN THE FIRE SUPPRESSION DISTRIBUTION PIPING ABOVE FREEZING.

THE BOILER SYSTEM SHALL OPERATE ANYTIME THE AMBIENT TEMPERATURE OF PLENUM IS LESS THAN 45°F.

ACTIVATE THE BOILER CONTROL SYSTEM AND START THE LEAD PRIMARY DISTRIBUTION PUMP (P1 OR P2).

PROVIDE EPO IN ACCORDANCE WITH ASME CSD-1, 2009; CE1102.

THE PRIMARY PUMPS SHALL OPERATE IN A LEAD-STANDBY CONFIGURATION. IF LEAD PUMP FAILS UPON ACTIVATION, THEN THE STANDBY PUMP SHALL AUTOMATICALLY START. ALARM SHALL BE SENT TO FAS AS A GENERAL SYSTEM FAILURE ALONG WITH BOILER, SWT SETPOINT FAILURE AND VF FAILURE.

THE PRIMARY PUMPS SHALL DISTRIBUTE A CONSTANT FLOW RATE TO THE SYSTEM THROUGH THE PUMP(S) VFD. SET CONTROLS TO EQUALIZE PUMP RUN TIME. PRIMARY PUMPS SHALL SHUT DOWN DURING FIRE MODE.

NOTE:
WHEN RESTARTING HEATING SYSTEM AFTER FIRE EVENT BOTH PRIMARY PUMPS CAN BE MANUALLY OPERATED. THE TOTAL FLOW WILL BE LESS THAN THE COMBINED TOTAL. THIS WILL ALLOW FASTER LOOP CIRCULATION THAT SHOULD NOT BE NECESSARY. SEE CALCULATIONS.

THE BOILER CONTROL SHALL OPERATE THE BOILER(S) IN LEAD-LAG MANNER TO DELIVER 160°F WATER TO THE SYSTEM P/F EXCHANGER. THE RELATED BOILER PUMP SHALL OPERATE BASED ON THE BOILER CALL FOR HEATING FROM THE FFSS SUPPLY WATER TEMPERATURE SENSOR. (100°F)

THE LAG BOILER SHALL ACTIVATE IF SUPPLY WATER TEMPERATURE DROPS 5°F BELOW PUMP SETPOINT (100°F). PROVIDE ALARM POINT.

PROVIDE ALARM POINT IF EITHER BOILER OR BOILER PUMP(S) FAIL TO OPERATE.

THE BOILER SYSTEM SHALL REMAIN DEACTIVATED WHEN THE FIRE SUPPRESSION SYSTEM IS CALLED TO BE ACTIVATED. START THE FIRE PUMP. STOP THE CIRCULATION PUMPS P1/P2.

THE BOILERS SHALL IDLE DURING FIRE MODE TO MAINTAIN 160°F SWT, BOILER CIRCULATION PUMPS(P3&P4) SHALL BE ON. BOILER SYSTEM SHALL BE OFF IF AMBIENT TEMPERATURE IS GREATER THAN 50°F.

PROVIDE INTERLOCK BETWEEN VF-1 AND VF-2 TO ASSURE FAN OPERATION WHEN EITHER BOILER IS REQUIRED TO OPERATE. FANS SHALL BE PROVEN ON BEFORE BOILERS ARE ALLOWED TO OPERATE. VENT FAN VFD'S SHALL OPERATE TO MAINTAIN FLUE PIPE NEGATIVE PRESSURE SETPOINT AND/OR POSITIVE PRESSURE ON MAKEUP COMBUSTION AIR. PRESSURES SHALL BE FIELD ADJUSTED. PROVIDE ALARM POINT.

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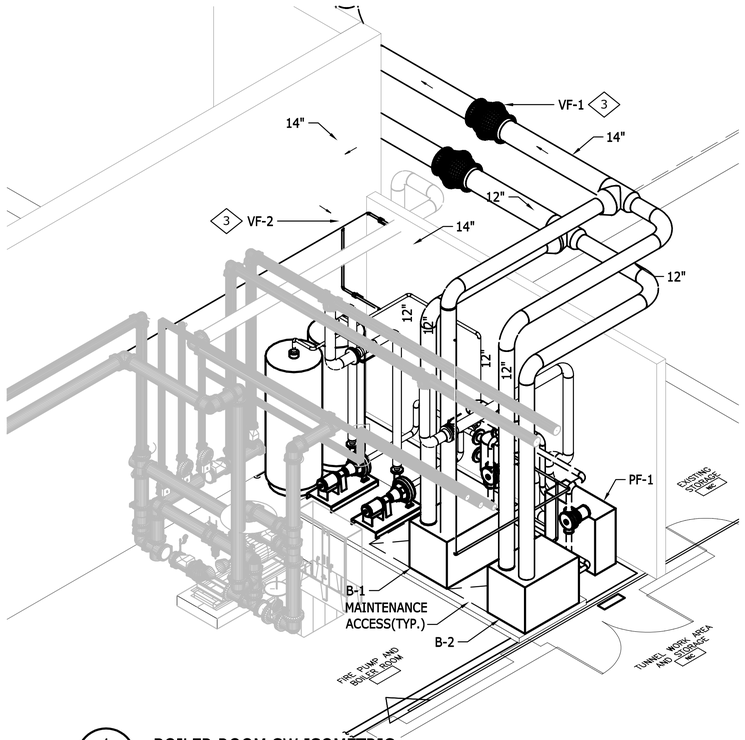
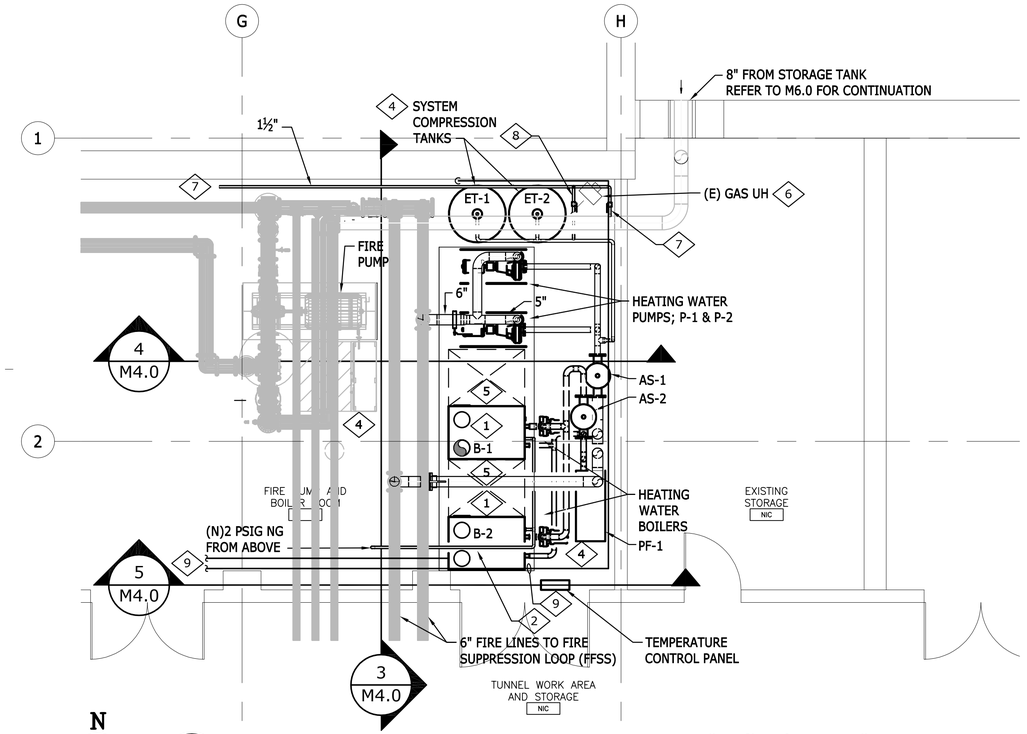
DRAWN BY: JEB | CHECKED BY: RDM

BOILER SYSTEM SCHEMATIC

Drawing Number
M3.0



1 M4.0 BOILER ROOM SW ISOMETRIC
SCALE:

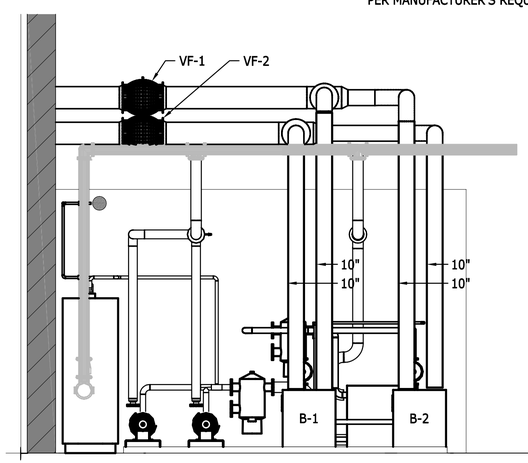


2 M4.0 M4.0 MECHANICAL BOILER ROOM
SCALE:1/4" = 1'-0"

4' 2' 0 4'
SCALE: 1/4" = 1'-0"

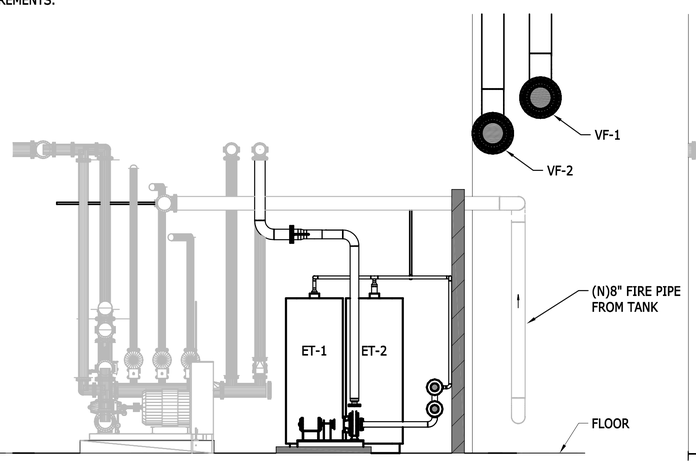
WORK NOTES (THIS DRAWING):

1. ROUTE BOILER RELIEF VALVES TO EXISTING FLOOR DRAIN IN WATER ENTRY ROOM.
2. 4" CONCRETE BASE OR I-BEAM RAILS FOR BOILER INSTALLATION.
3. PROVIDE CLEARANCE UNDER FAN TO ALLOW FOR MAINTENANCE ACCESS (MOTOR REPLACEMENT,FAN REPLACEMENT).
4. PROVIDE INSTALLATION OF EQUIPMENT & PIPING TO ALLOW FOR ALL EQUIPMENT REMOVAL AND REPLACEMENT.
5. PROVIDE INSTALLATION TO ALLOW FOR BOILER MAINTENANCE ACCESS PER MANUFACTURER'S REQUIREMENTS.
6. COORDINATE EXISTING GAS UNIT HEATER WITH MECHANICAL ROOM LAYOUT.
7. CONNECT (N)1½" PIPE BETWEEN (N)8" FIRE LINE IN MECHANICAL ROOM AND (E) WATER ENTRY PIPE IN WATER ENTRY ROOM UPSTREAM OF FILTERS.
8. CONNECT 1½" FIRE LINE "FILL LINE" FROM 8" FIRE ENTRY TO PRIMARY PUMPING SYSTEM. REFER TO BOILER PIPING SCHEMATIC ON SHEET M3.0.
9. CONNECT 1" MAKEUP TO "BOILER SYSTEM" PER SCHEMATIC.



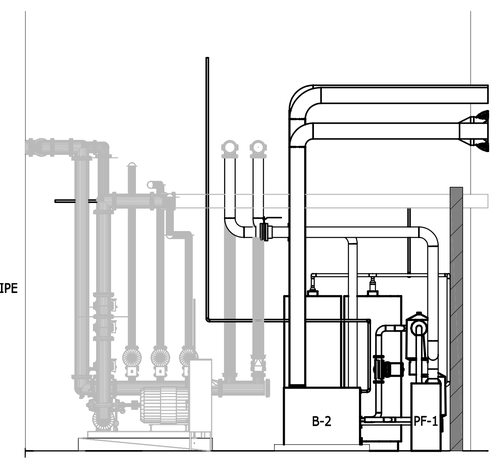
3 M4.0 M4.0 BOILER ROOM SECTION
SCALE:1/4" = 1'-0"

4' 2' 0 4'
SCALE: 1/4" = 1'-0"



4 M4.0 M4.0 BOILER ROOM SECTION
SCALE:1/4" = 1'-0"

4' 2' 0 4'
SCALE: 1/4" = 1'-0"



5 M4.0 M4.0 BOILER ROOM SECTION
SCALE:1/4" = 1'-0"

4' 2' 0 4'
SCALE: 1/4" = 1'-0"

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

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EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions
Num | Description | Date

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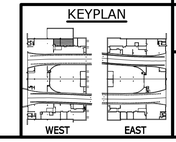
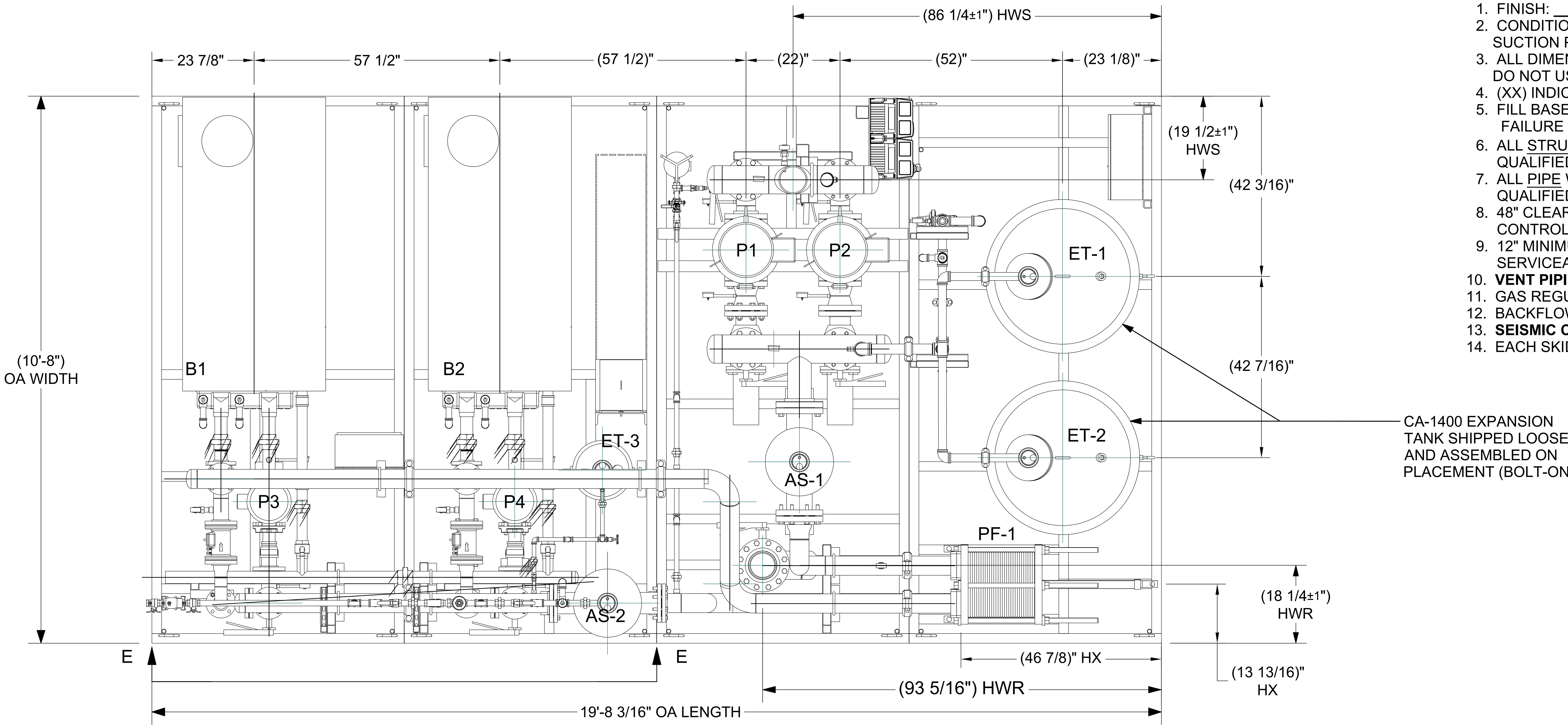
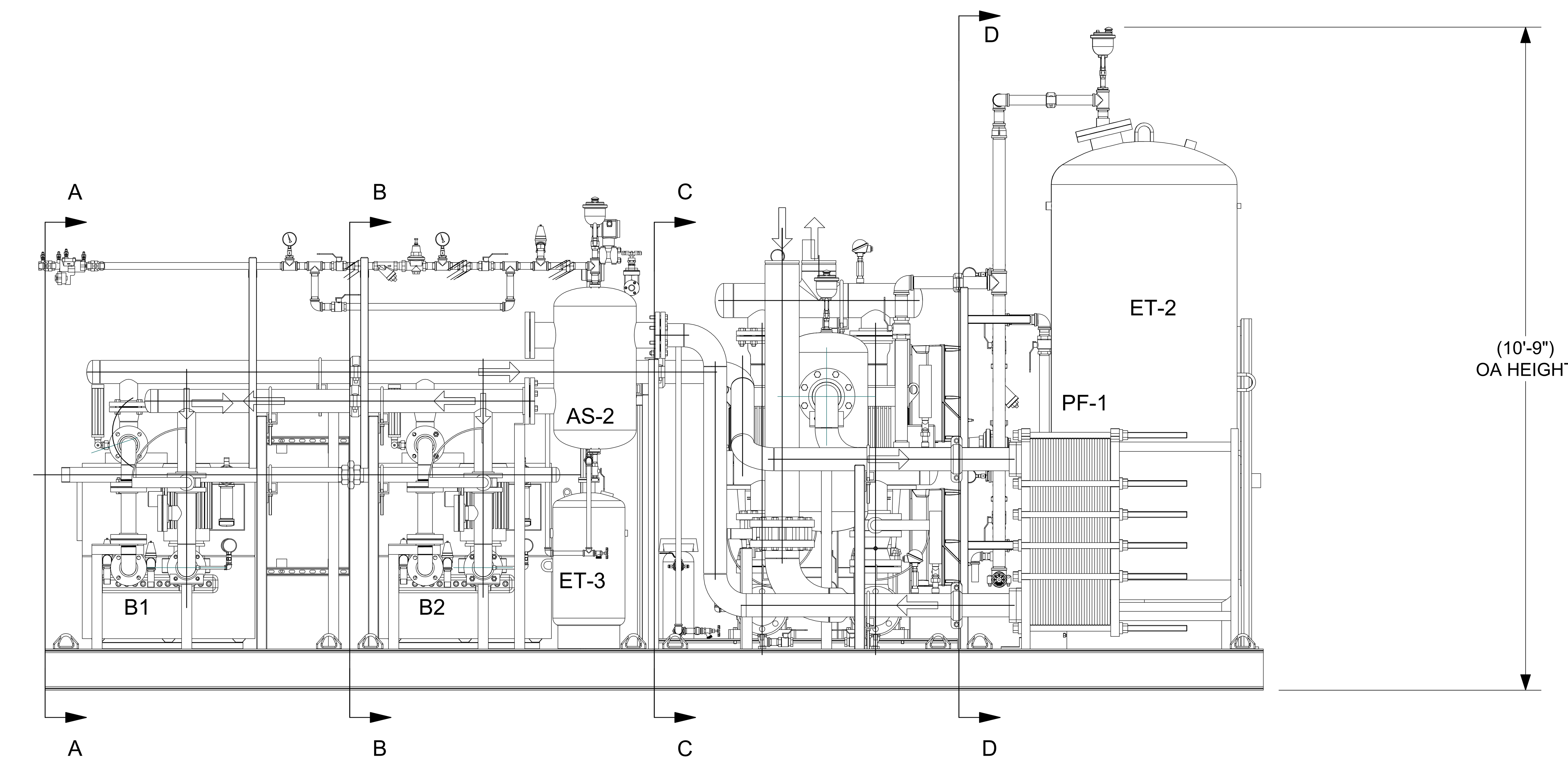
KEYPLAN


MECHANICAL BOILER ROOM

Drawing Number
M4.0



CA-1400 EXPANSION TANK SHIPPED LOOSE AND ASSEMBLED ON PLACEMENT (BOLT-ON)



NOTES:
1. FINISH: ***GRAY*** PAINT.
2. CONDITION POINT: ***320*** GPM @ ***86.7*** PSI
   SUCTION PRESSURE: ***0*** PSI MIN. / ***0*** PSI MAX
3. ALL DIMENSIONS SUBJECT TO CHANGE WITHOUT NOTICE: DO NOT USE FOR CONSTRUCTION PURPOSED UNLESS CERTIFIED.
4. (XX) INDICATE REFERENCE DIMENSIONS.
5. FILL BASE WITH NON-SHRINKING, NON-FERROUS GROUT: FAILURE TO DO SO VOIDS TIGERFLOW WARRANTY.
6. ALL STRUCTURAL WELDING SHALL BE PERFORMED BY AWS D1.1 QUALIFIED WELDERS.
7. ALL PIPE WELDING SHALL BE PERFORMED BY ASME SECTION 9 QUALIFIED WELDERS.
8. 48" CLEARANCE (CLEAR TO GROUND) REQUIRED IN FRONT OF CONTROL PANELS PER 2011 NEC TABLE 110-26 (A) (1).
9. 12" MINIMUM CLEARANCE AROUND SYSTEM FOR SYSTEM SERVICEABILITY.
10. **VENT PIPING FOR BOILERS BY OTHERS.**
11. GAS REGULATOR INTERNAL TO PACKAGED BOILER.
12. BACKFLOW PREVENTER ON BOILER MWL NOT PROVIDED.
13. **SEISMIC CALCULATIONS W/ COLORADO P.E. STAMP.**
14. EACH SKID MUST FIT THROUGH 5' X 7' DOOR.

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EISENHOWER/JOHNSON MEMORIAL TUNNEL

FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

DRAWN BY: CHECKED BY:

MECHANICAL SKID PLAN AND ELEVATION

Drawing Number
M4.1

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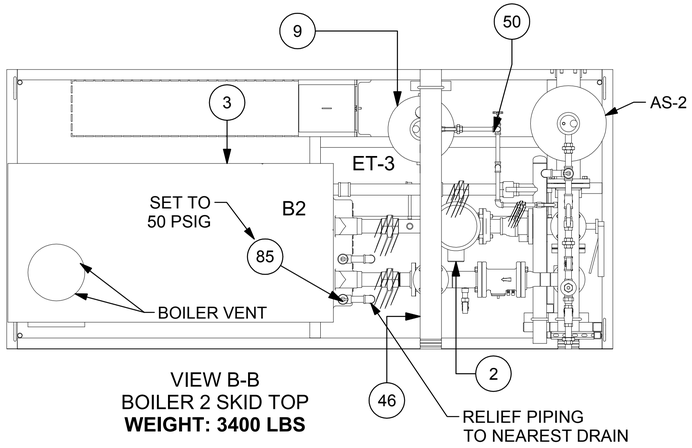
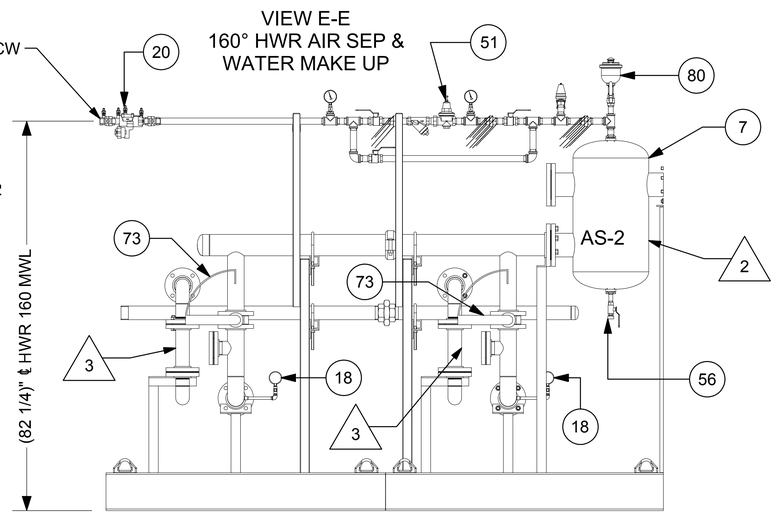
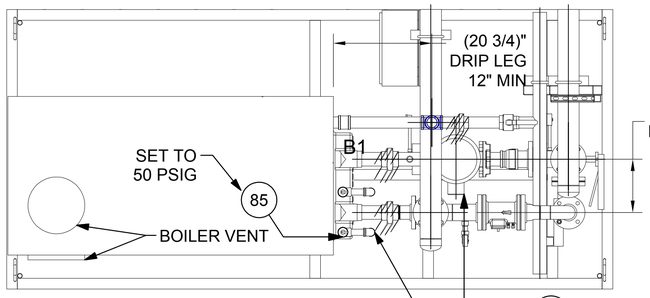
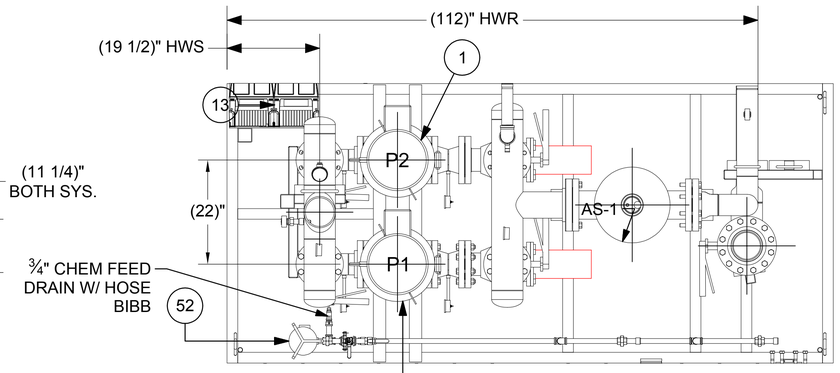


VIEW B-B
BOILER 2 SKID TOP
WEIGHT: 3400 LBS

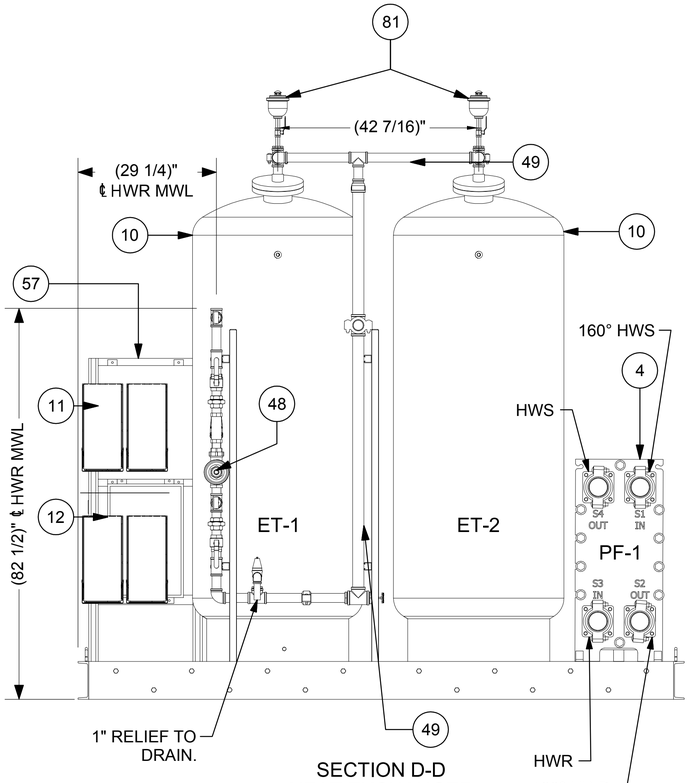




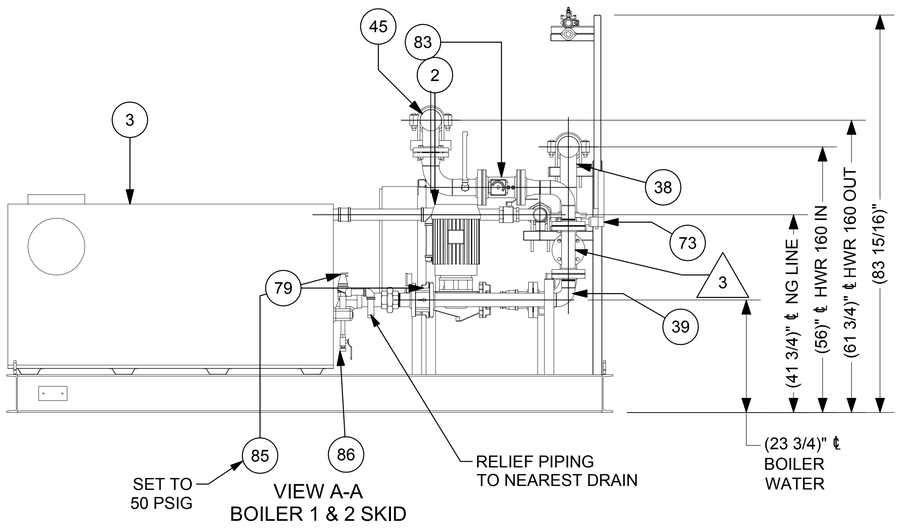
VIEW A-A
BOILER 1 SKID TOP
WEIGHT: 2700 LBS



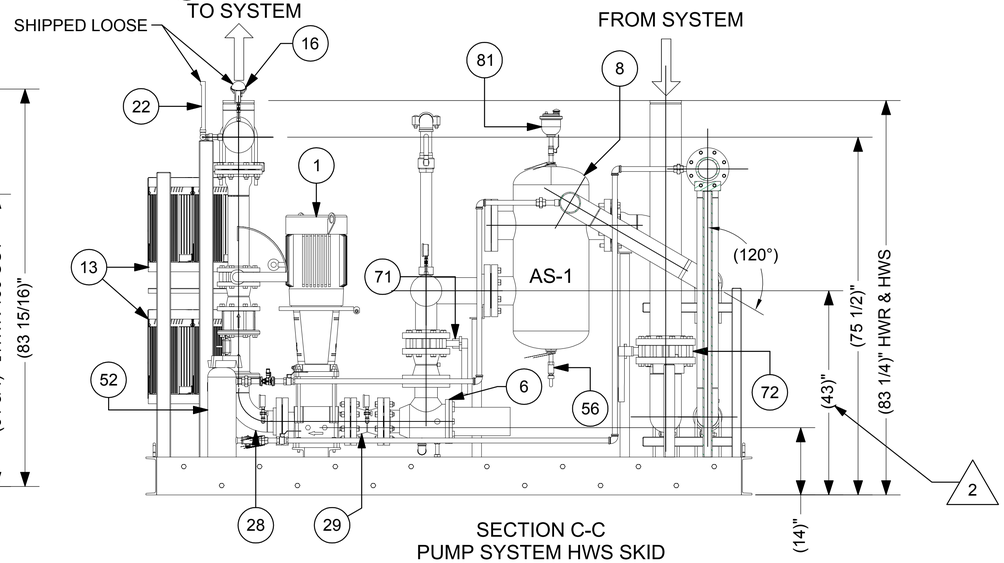
TOP VIEW
P1 & P2 SKID
TO SYSTEM



SECTION D-D
HEAT EXCHANGER
CA1400 TANK SKID
WEIGHT: 4850 LBS



VIEW A-A
BOILER 1 & 2 SKID



SECTION C-C
PUMP SYSTEM HWS SKID
WEIGHT: 4400 LBS

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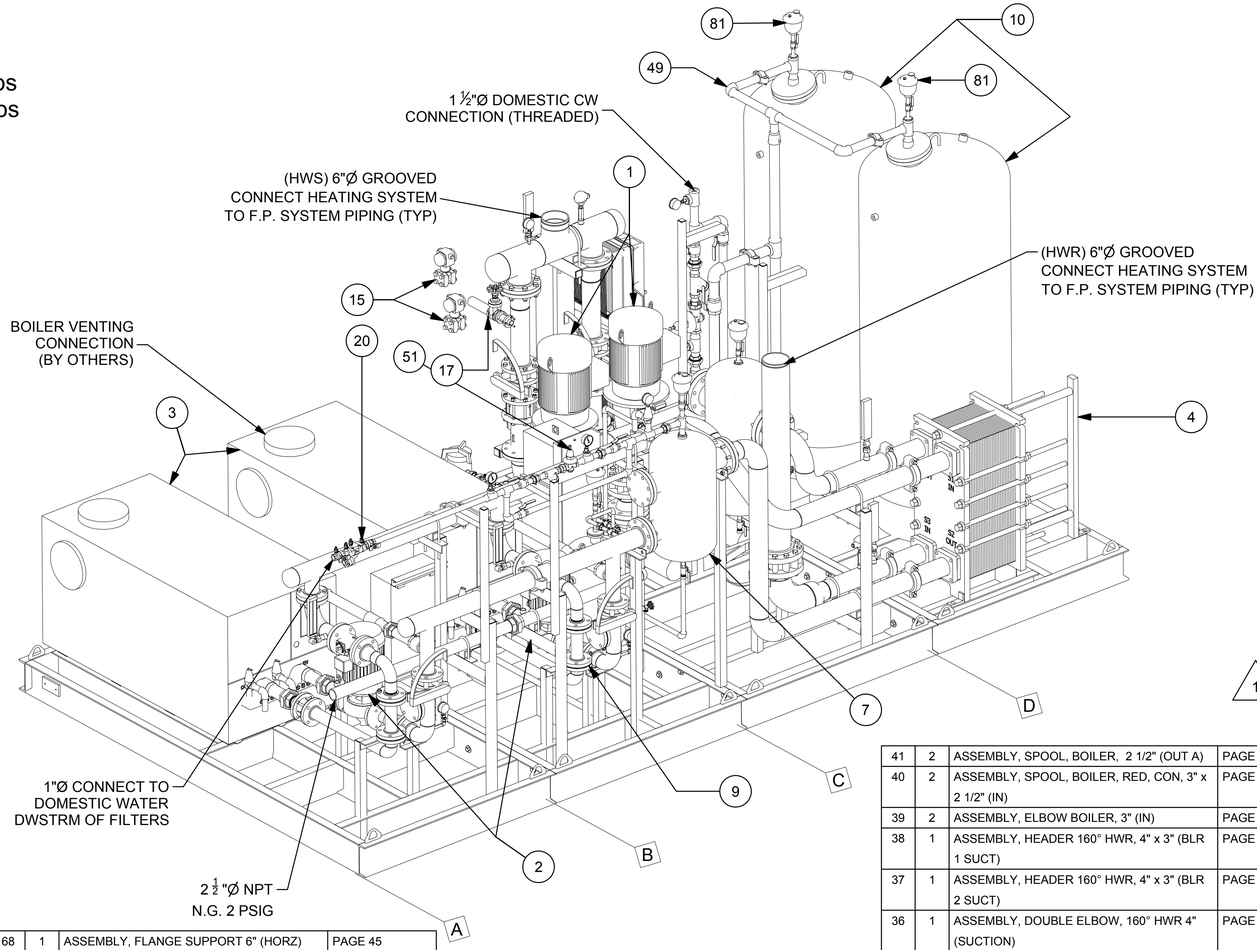
Revisions			
Num	Description	Date	
			DRAWN BY:
			CHECKED BY:

MECHANICAL SKID VIEWS

Drawing Number
M4.2

Total Ship Weight: 15,800.0 lbs
Total Operational Weight: 47,000.0 lbs



93	6	GASKET,FULLFACE,150#,NON ABS 1/8"2-1/2"	968-0250
92	8	GASKET,FULLFACE,150#,NONABS1/16"2-1/2"	969-0250
91	2	GASKET, FULL FACE, 150#, NON ABS 1/16"-4"	969-0400
90	4	GASKET, RING, 150#, NON ABS 1/16" - 4"	967-0400
89	8	GASKET, RING, 300#, NON ABS 1/16" - 4"	967-0400-1
88	4	ISOLATION KIT - 3"	961-0030000
87	7	COUPLING, ZERO-FLEX LT WGT, GRVD W/EPDM GSKT, MAX PRES 300# - 4"	926-107-PTD-4
86	2	VALVE, BALL, THRD,2-PIECE, BRONZE CAP AND CHAIN HOSE CONNECTION,1/2"xHOSE,APOLLO	842-70100HC-075
85	4	VALVE, RELIEF, B&G 1170-50, 1,710,000 BTU, 1"	973-1170050
84	2	TACO, ACCU FLO CIRCUIT SETTER BALANCING VALVE, 4"	851-ACUF-400F
83	2	TACO, ACCU FLO CIRCUIT SETTER BALANCING VALVE, 3"	851-ACUF-300F
82	10	GAUGE COCK, BRASS, FXF, 200 PSIG, 500°	905-GC865
81	3	1/2" AR VAL UL/FM/NSF 300 PSI	827-22.7
80	2	VAL, AIR RELEASE, 175 PSI MAX PRESSURE, SS TRIM - 3/4"	827-15A2
79	2	VAL, 125# / 250# WAFER SILENT CK, STAINLESS TRIM - 2-1/2"	827-1425A3
78	2	VAL, 125# / 250# WAFER SILENT CK, STAINLESS TRIM - 4"	827-1404A3
77	2	VAL, BALL, FULL PORT, BRS, FBV-3C, THD-1" - LEAD-FREE	825-0555104
76	1	VAL, BALL, FULL PORT, BRS, FBV-3C, THD-3/4" - LEAD-FREE	825-0555103
75	4	VAL, BALL, FULL PORT, BRS, FBV-3C, THD-1/2" - LEAD-FREE	825-0555102
74	2	4" BRAY, 31H, LUG STYLE, BFV, LEVER HANDLE	824-31-0400
73	2	3" BRAY, 31H, LUG STYLE, BFV, LEVER HANDLE	824-31-0300
72	1	6" BRAY, 43, LUG STYLE, BFV, LEVER HANDLE	824-436006L
71	2	4" BRAY, 43, LUG STYLE, CLASS 300, BFV, LEVER HANDLE	824-43-0400
70	2	ASSEMBLY, WML & XT PIPING SUPPORT	PAGE 45
69	1	ASSEMBLY, PIPE SUPPORT 4" (TOP)	PAGE 45
SY	QTY	DESCRIPTION	P/N

BILL OF MATERIALS

68	1	ASSEMBLY, FLANGE SUPPORT 6" (HORZ)	PAGE 45
67	1	ASSEMBLY, FLANGE SUPPORT 5" (VERT)	PAGE 45
66	1	ASSEMBLY, FLANGE SUPPORT 5" (VERT)	PAGE 45
65	1	ASSEMBLY, FLANGE SUPPORT 4" (VERT)	PAGE 45
64	1	ASSEMBLY, FLANGE SUPPORT 4" (VERT)	PAGE 45
63	2	ASSEMBLY, FLANGE SUPPORT 3" (HORZ)	PAGE 45
62	4	ASSEMBLY, FLANGE SUPPORT 3" (VERT)	PAGE 45
61	1	ASSEMBLY, SUPPORT DISC HDR SYSTEM	PAGE 44
60	1	ASSEMBLY, SUPPORT HX PIPING	PAGE 43
59	2	ASSEMBLY, SUPPORT BOILER SUCT, GAS & MWL	PAGE 42
58	1	ASSEMBLY, VFD SUPPORT	PAGE 41
57	1	ASSEMBLY, PANEL STAND	PAGE 40
56	2	ASSEMBLY, AIR SEPERATOR DRAIN	PAGE 39
55	2	ASSEMBLY, GAS LINE TRAIN	PAGE 38
54	1	ASSEMBLY, HEADER NG, 2 1/2" x 2" (BOILER 2)	PAGE 37
53	1	ASSEMBLY, HEADER NG, 2 1/2" x 2" (BOILER 1)	PAGE 36
52	1	TANK, SHOT FEEDER, HD5, NON-CODE (200# PSI)	PAGE 35
SY	QTY	DESCRIPTION	P/N

BILL OF MATERIALS

51	1	ASSEMBLY, MAKE-UP WATER LINE, PRV SET TO 20 PSIG, 1"	PAGE 34
50	1	ASSEMBLY, PIPING CAX42 TANK TO 160° HWS SUCTION	PAGE 33
49	1	ASSEMBLY, PIPING CA1440 TANK TO HWS SUCTION	PAGE 32
48	1	ASSEMBLY, MAKE-UP WATER LINE, PRV SET TO 50 PSIG, 1 1/2"	PAGE 31
47	1	ASSEMBLY, DOUBLE ELBOW, 160° HWS 4" (DISCHARGE)	PAGE 30
46	1	ASSEMBLY, HEADER 160° HWS, 4" x 3" (BLR 2 DISC)	PAGE 29
45	1	ASSEMBLY, HEADER 160° HWS, 4" x 3" (BLR 1 DISC)	PAGE 28
44	2	ASSEMBLY, ELBOW SPOOL, BOILER 3" (OUT)	PAGE 26
43	2	ASSEMBLY, SPOOL, BOILER ELB, RED, CON, 3" x 2 1/2" (OUT)	PAGE 25
42	2	ASSEMBLY, MIXING VALVE ELBOW 2 1/2" (OUT)	PAGE 48
SY	QTY	DESCRIPTION	P/N

BILL OF MATERIALS

41	2	ASSEMBLY, SPOOL, BOILER, 2 1/2" (OUT A)	PAGE 47
40	2	ASSEMBLY, SPOOL, BOILER, RED, CON, 3" x 2 1/2" (IN)	PAGE 24
39	2	ASSEMBLY, ELBOW BOILER, 3" (IN)	PAGE 23
38	1	ASSEMBLY, HEADER 160° HWR, 4" x 3" (BLR 1 SUCT)	PAGE 22
37	1	ASSEMBLY, HEADER 160° HWR, 4" x 3" (BLR 2 SUCT)	PAGE 21
36	1	ASSEMBLY, DOUBLE ELBOW, 160° HWR 4" (SUCTION)	PAGE 20
35	2	ASSEMBLY, SPECIAL FITTING SPOOL (HX 1 & 2)	PAGE 19
34	2	ASSEMBLY, SPECIAL FITTING SPOOL (HX 3 & 4)	PAGE 18
33	1	ASSEMBLY, SPOOL HWR 6" (SUCTION)	PAGE 17
32	1	ASSEMBLY, ELBOW, RED, HWR, 6"x4" (SUCTION)	PAGE 16
31	1	ASSEMBLY, ELBOW, RED, HWS 5"x4" (SUCTION)	PAGE 15
30	1	ASSEMBLY, HEADER HWS, 6" x 4" (SUCTION)	PAGE 14
29	4	ASSEMBLY, SPOOL DBL FLG 4" (SUCTION)	PAGE 13
28	2	ASSEMBLY, ELBOW, HWS 4" (DISCHARGE)	PAGE 12
27	2	ASSEMBLY, DBL FLG 4" (DISCHARGE)	PAGE 11
26	2	ASSEMBLY, SPOOL RED 5" x 4" (DISCHARGE)	PAGE 10
25	1	ASSEMBLY, HEADER, HWS 6" x 5" (DISCHARGE)	PAGE 09
24	1	ASSEMBLY, SKID (4 SKIDS 128" X 59")	PAGE 04
23	5	INDUSTRIAL, 9IT THERMOWELL, WINTERS, 3 1/2" STEM WITH LAG, 3/4" NPT	986-TIW03
SY	QTY	DESCRIPTION	P/N

BILL OF MATERIALS

1

22	3	T103-A THERMOMETER 0/160°F,9" ALUM Case, IMPACT RESIST, LIQUID FILLED, 3.5" STEM NO WELL	906-T103-A
21	2	T100-A THERMOMETER 30/240°F,9" ALUM Case, IMPACT RESIST, LIQUID FILLED, 3.5" STEM NO WELL	906-T100-A
20	1	FEBCO SERIES 860 REDUCED PRESSURE ZONE ASSEMBLY-1"	888-100-860
19	2	DIFFERENTIAL PRESSURE SWITCH P845, 1/4" NPT 35-160 PSI	240-P845-4-XR2L
18	10	GAUGE, 2 1/2", 1/4" LM, GLYCERIN FILLED - 160 PSI	905-02500160
17	1	HOT TAP FLOW SENSOR, 225BR (REMOTE MOUNT)	ELECTRICAL
16	2	TRANSMITER, RTD, 4-20mA, 0-220F	ELECTRICAL
15	2	D P TRANSMITTER, ENDRESS+HAUSER, 4-20 mA HART, SIL OPERATION INSIDE, LCD, 16 BAR / 1, 6 MPa / 240 PSI	260-PMD75
14	1	MINI POWER ZONE, SQ-D,5 kVA (MUST ORDER 8 - Q-120 WITH THIS ITEM)	986-PT061150005 LS
13	2	DANFOSS, VLT, B1 FRAME, 25HP	ELECTRICAL
12	2	LUG PANEL 16 X 24 X 8	ELECTRICAL
11	1	24 x20 x8 NEMA 4/12 E-Series Enclosure w/HMI TOUCH SCREEN PAD	ELECTRICAL
10	2	TACO, CA1400-250P, 370 GALLON ASME EXP TANK, 250 PSI W/ TANK DRAIN (ET-1&2)	854-CA1400-250
9	1	TACO, CAX-42, 11 GALLON ASME EXP TANK, 125 PSI W/ TANK DRAIN	854-CAX42-125
8	1	AIR SEPARATOR, TACO, FLANGED, MODEL AC05, 250 PSI, NO STRAINER, 5" (AS-1)	851-AC05-250
7	1	AIR SEPARATOR, TACO, FLANGED, MODEL AC4, 125 PSI, NO STRAINER, 4" (AS-2)	851-AC4-125
6	2	SUCTION DIFFUSER, TACO, SD4040, CL 250, 4"X4"	845-SD040040-5A
4	1	ALFA-LAVAL, PLATE HEAT EXCHANGER, AQ4M-FD (PF-1)	888-POHTXGR
3	2	BOILER, LOCHINVAR, COPPER FIN II, CHN1442	888-POBLR
2	2	PUMP, ARMSTRONG, MODEL 4360, 3HP@1800RPM, 460/3/60, CLASS 125, 182JM, ODP ENERGY EFFICIENT MOTOR	888-CS03
1	2	PUMP, GRUNDFOS, MODEL CR64-2 / 25HP@3600 RPM, 460/3/60, CLASS 250, ODP ENERGY EFFICIENT MOTOR	877-96418861
SYM	QTY	DESCRIPTION	P/N

BILL OF MATERIALS

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EISENHOWER/JOHNSON MEMORIAL TUNNEL

FIXED FIRE SUPPRESSION SYSTEM

DESIGN BUILD PROJECT

Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

Revisions

Num	Description	Date

DRAWN BY: CHECKED BY:

MECHANICAL SKID BILL OF MATERIAL

Drawing Number

M4.3

TRUE NORTH N

1 MECHANICAL SITE PLAN - WEST
SCALE:1" = 40'-0"

40' 20' 0 40'
SCALE: 1" = 40'-0"

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

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Revisions

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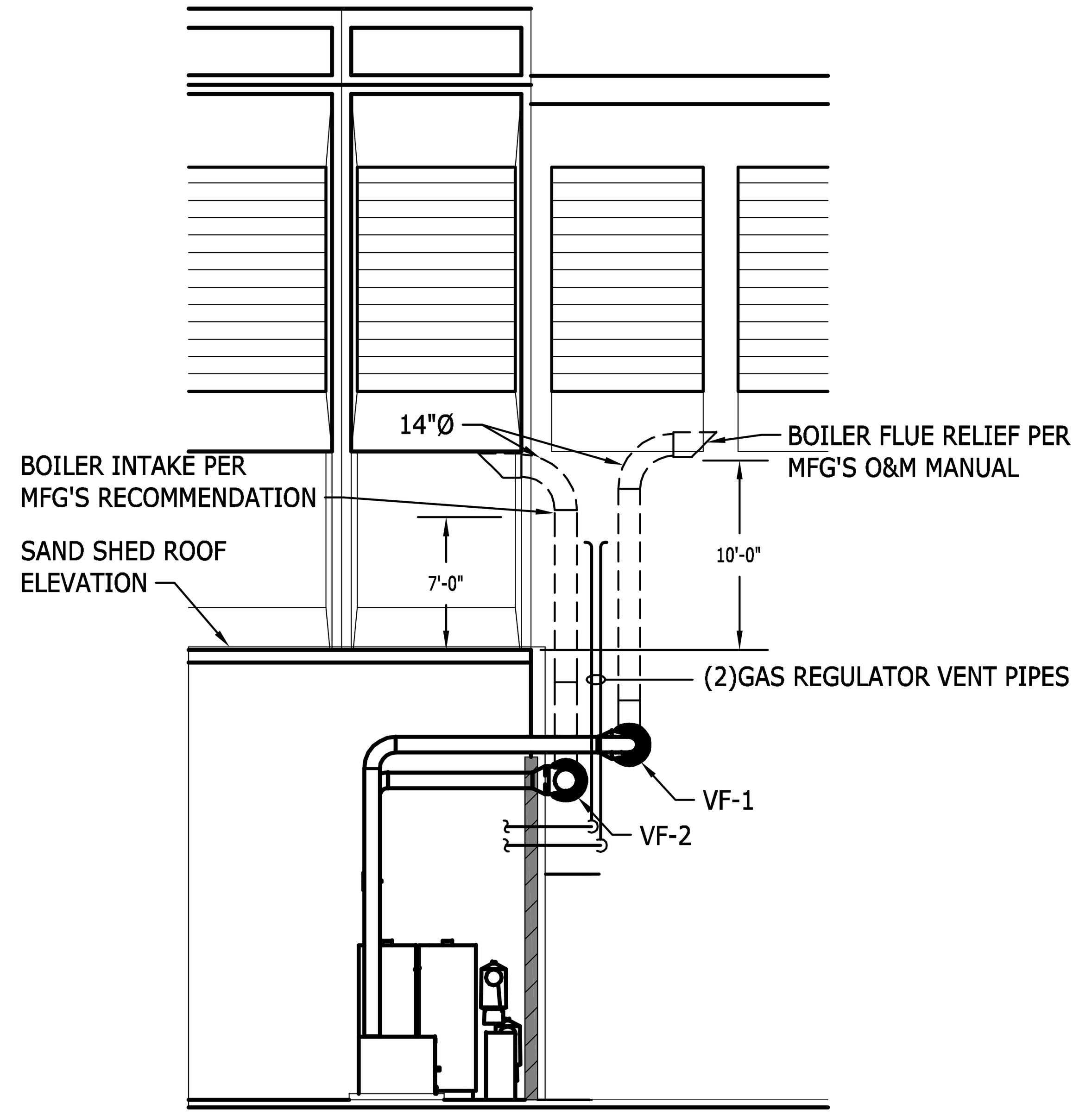
MECHANICAL SITE PLAN - WEST

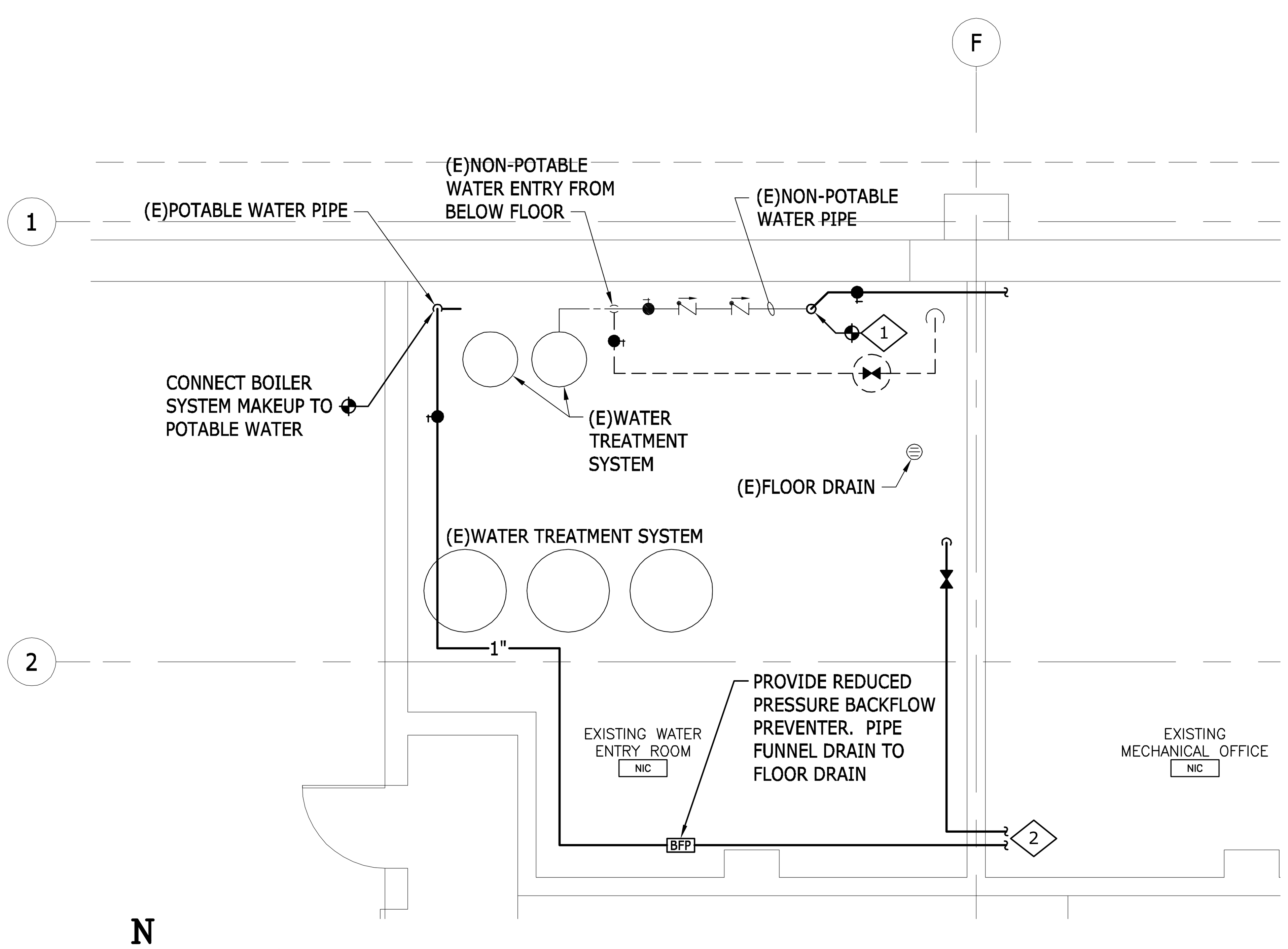
Drawing Number

M5.0



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

8' 4' 0 8'
SCALE: 1/8" = 1'-0"

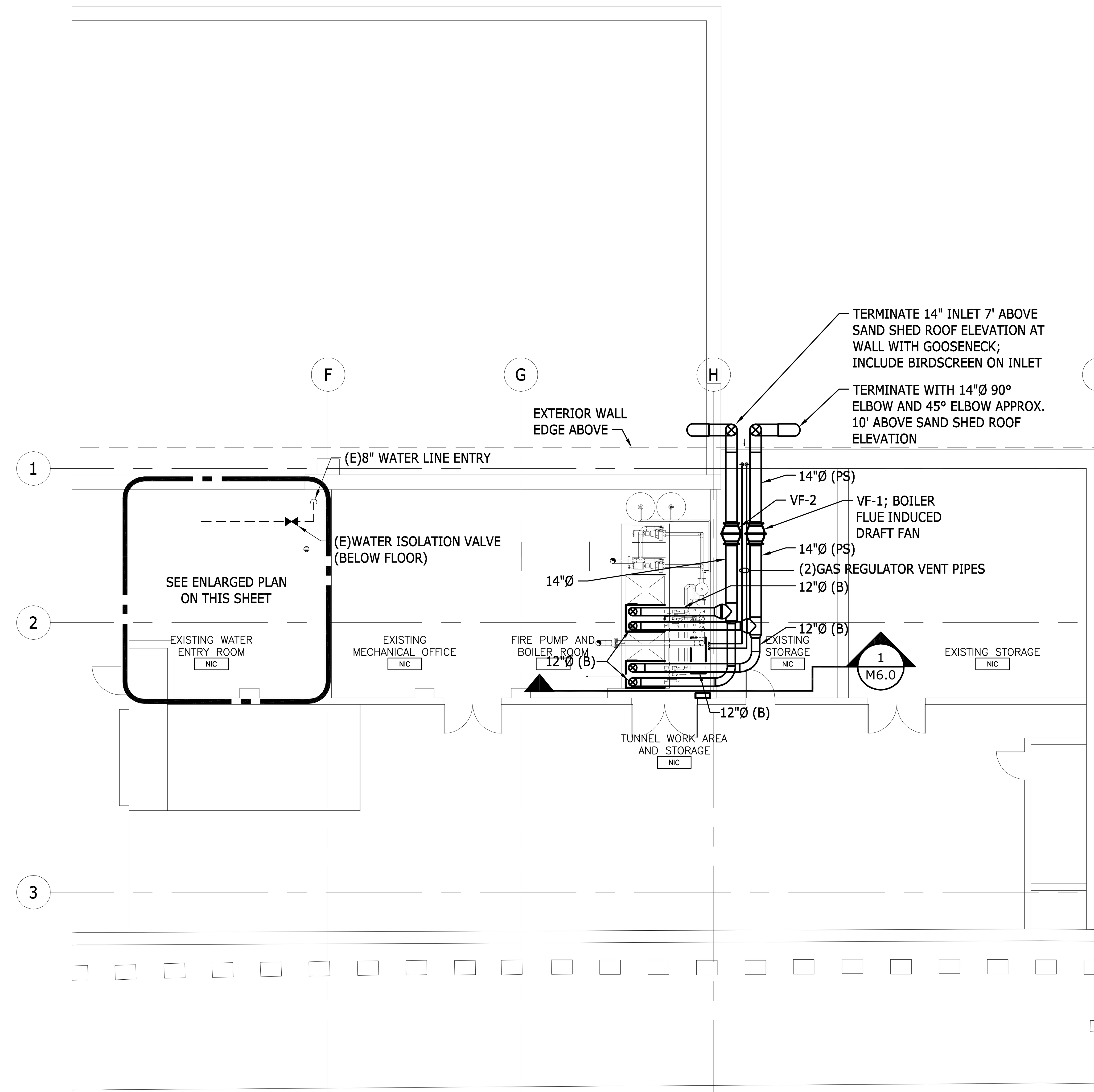


2 ENLARGED WATER ENTRY ROOM
SCALE:1/4" = 1'-0"

4' 2' 0 4'
SCALE: 1/4" = 1'-0"

WORK NOTES:

1. CONNECT (N)1½" PIPE BETWEEN (N)8" FIRE LINE IN MECHANICAL ROOM AND (E) WATER ENTRY PIPE IN WATER ENTRY ROOM UPSTREAM OF FILTERS.
2. CONNECT 1" DOMESTIC WATER TO BOILER SYSTEM. REFER TO SHEET M4.0 FOR CONTINUATION.



3 MECHANICAL ROADWAY LEVEL PLAN - WEST - NORTH
SCALE:1/8" = 1'-0"

8' 4' 0 8'
SCALE: 1/8" = 1'-0"

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

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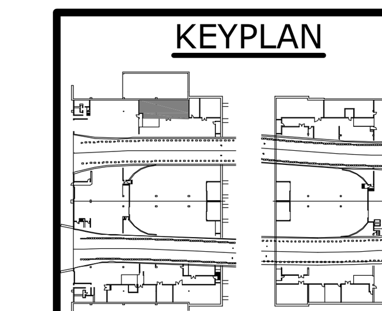
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Num	Description	Date
Revisions		

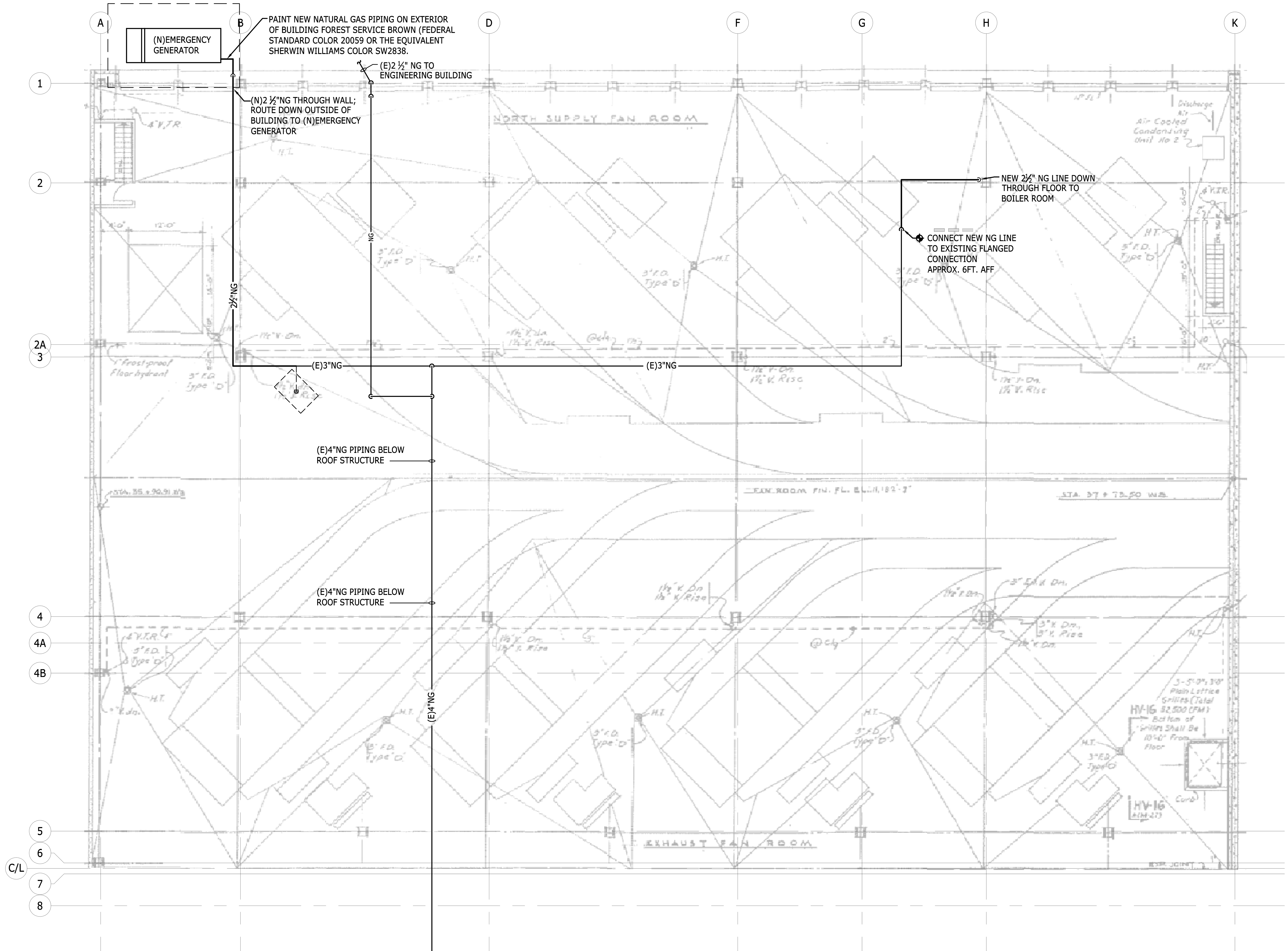
DRAWN BY: JEB CHECKED BY: RDM

KEYPLAN



MECHANICAL ROADWAY LEVEL PLAN - WEST - NORTH

Drawing Number
M6.0



1 MECHANICAL FAN LEVEL PLAN - WEST - NORTH

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

8' 4' 0 8'

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

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

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EISENHOWER/JOHNSON MEMORIAL TUNNEL

FIXED FIRE SUPPRESSION SYSTEM

DESIGN BUILD PROJECT

Project No. C0703-360 Subaccount 17810

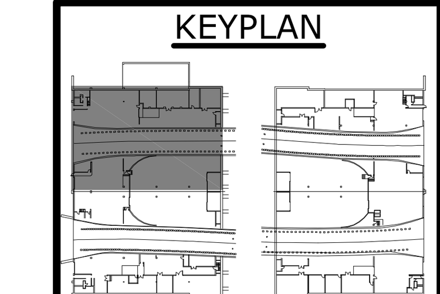
RECORD DRAWINGS - 2015-11-16

Revisions

Num	Description	Date

DRAWN BY: JEB | CHECKED BY: RDM

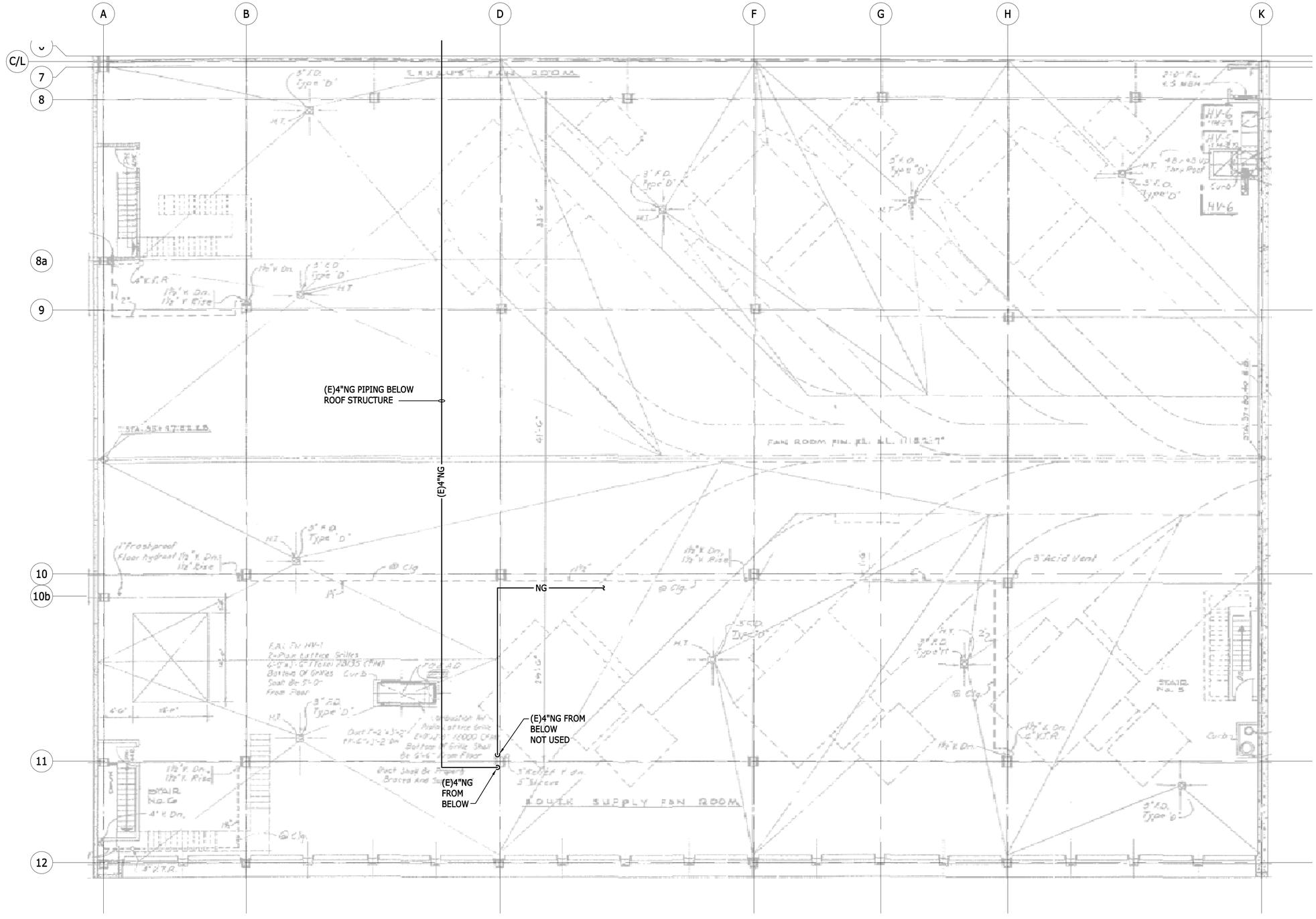
KEYPLAN



MECHANICAL FAN LEVEL PLAN - WEST - NORTH

Drawing Number

M6.1



N

1 MECHANICAL FAN LEVEL PLAN - WEST - SOUTH
SCALE:1/8" = 1'-0"

8' 4' 0 8'
SCALE: 1/8" = 1'-0"

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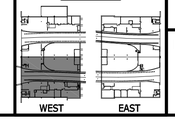

MECHANICAL FAN LEVEL PLAN - WEST - SOUTH

Drawing Number

M6.2

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A

B

D

10

11

12

VEHICLE STORAGE
NIC

REFER TO GAS PIPING SCHEMATIC ON SHEET M7.2

(E)UPS TO REMAIN & SERVE (E) VALVE THAT REMAINS

(E)NG EMERGENCY SHUT OFF VALVES (ESV)

(E)4"NG UP; NOT USED

(E)4"NG UP

(E) GAS SHUTOFF VALVE. REFER TO GAS PIPING SCHEMATIC ON SHEET M7.2

BOILER ROOM
NIC

N

1 MECHANICAL ROADWAY LEVEL PLAN - WEST - SOUTH
SCALE: 1/8" = 1'-0"

8' 4' 0 8'
SCALE: 1/8" = 1'-0"

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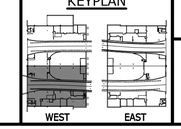
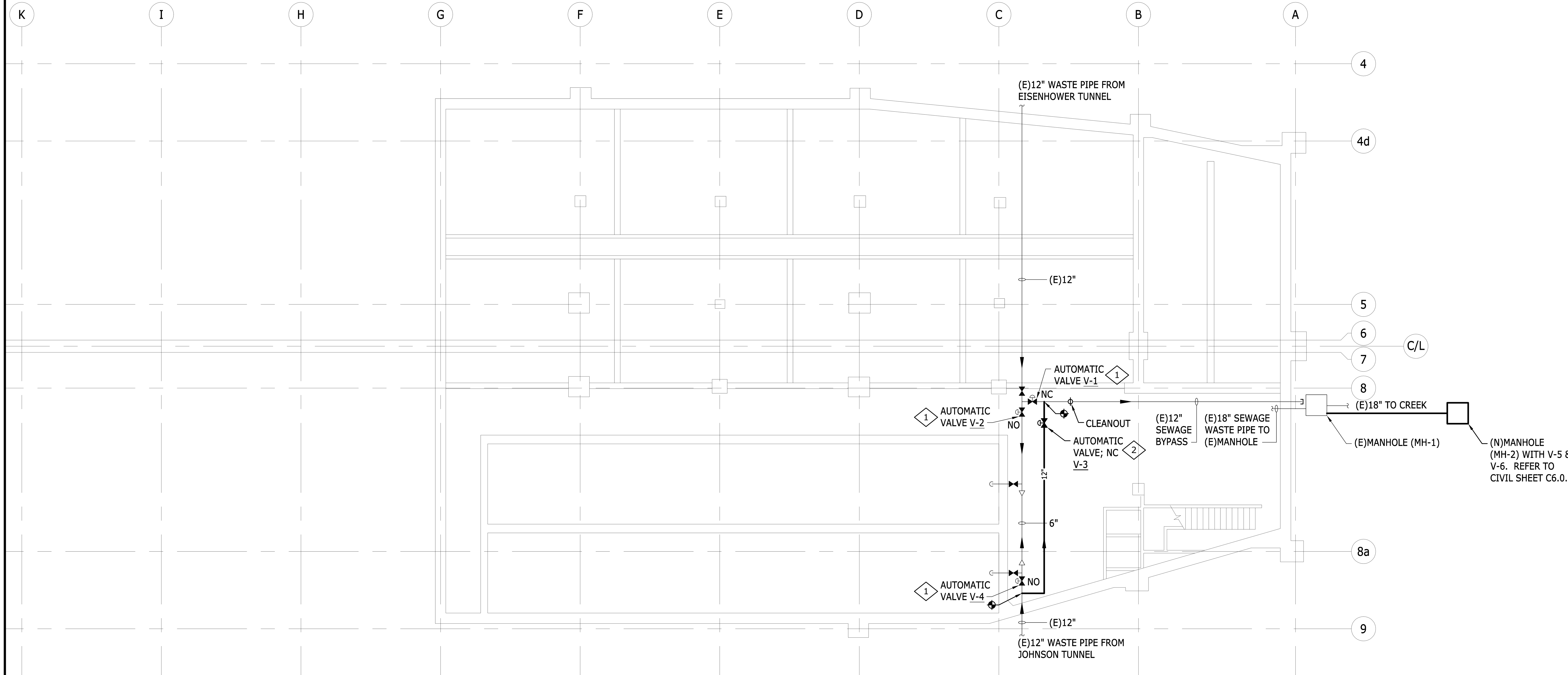


MECHANICAL ROADWAY LEVEL PLAN - WEST - SOUTH

Drawing Number

M6.3



N

1 MECHANICAL LOWER LEVEL PLAN - EAST

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

8' 4' 0 8'

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

SEQUENCE OF OPERATION:

- PROVIDE WASTE CONTROL THROUGH FIRE ALARM PANEL.
- IF FIRE EVENT OCCURS IN EISENHOWER TUNNEL, THEN V-2 & V-3 SHALL BE CLOSED; V-1 SHALL BE OPEN; V-4 SHALL REMAIN OPEN.
- IF FIRE EVENT OCCURS IN JOHNSON TUNNEL, THEN V-1 SHALL BE CLOSED; V-2 SHALL REMAIN OPEN; V-4 SHALL BE CLOSED; V-3 SHALL BE OPEN.
- IF FIRE EVENT IN EITHER TUNNEL OCCURS THE VALVES IN MH-2 (V5 & V6) SHALL POSITION TO FLOW THE WASTE TO THE RETENTION TANKS. V6 IS CLOSED & V5 IS OPEN DURING FFSS EVENT.
- SYSTEM RESET SHALL BE THROUGH FIRE ALARM SYSTEM.

WORK NOTES:

1. REMOVE EXISTING 12" GATE VALVE. PROVIDE NEW 12" AUTOMATED CONTROL VALVE WITH MANUAL CLOSURE OPTION.
2. PROVIDE NEW 12" AUTOMATED CONTROL VALVE WITH MANUAL CLOSURE OPTION.

VALVE SCHEDULE

PLAN CODE	SERVICE	MAKE-MODEL	SIZE (IN.)	CONNECTION	NORMAL POSITION
V1	WASTE PIPING	M&H - C509	12	FLANGED	NC
V2	WASTE PIPING	M&H - C509	12	FLANGED	NO
V3	WASTE PIPING	M&H - C509	12	FLANGED	NC
V4	WASTE PIPING	M&H - C509	12	FLANGED	NO
V5	WASTE PIPING	M&H - C509	12	FLANGED	NO
V6	WASTE PIPING	M&H - C509	12	FLANGED	NC

NOTES:

1) PROVIDE M&H VALVE COMPANY CAST IRON RESILIENT WEDGE VALVE; AWWA-C509, RUBBER ENCAPSULATED WEDGE; NSF61 EPOXY COATED BODY, BONNET & O-RING PLATE; OS&Y OPERATION.

2) NORMAL POSITION SHALL BE VALVE POSITION WITHOUT POWER TO ACTUATOR. VALVE SHALL BE OPEN-CLOSE OPERATION.

3) ACTUATOR SHALL BE PROVIDED WITH INTERNAL PROGRAMMABLE CONTROLS FOR EXTERNAL ACTIVATION THRU FIRE/ALARM SYSTEM. PROVIDE W/ DECOUPLE TYPE HAND WHEEL FOR MANUAL OPERATION. ACTUATOR SHALL BE ELECTRIC OPERATED, ICON-2000, MULTI-TURN.

KEYPLAN

WEST EAST

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MECHANICAL LOWER LEVEL PLAN - EAST

Drawing Number

M6.4

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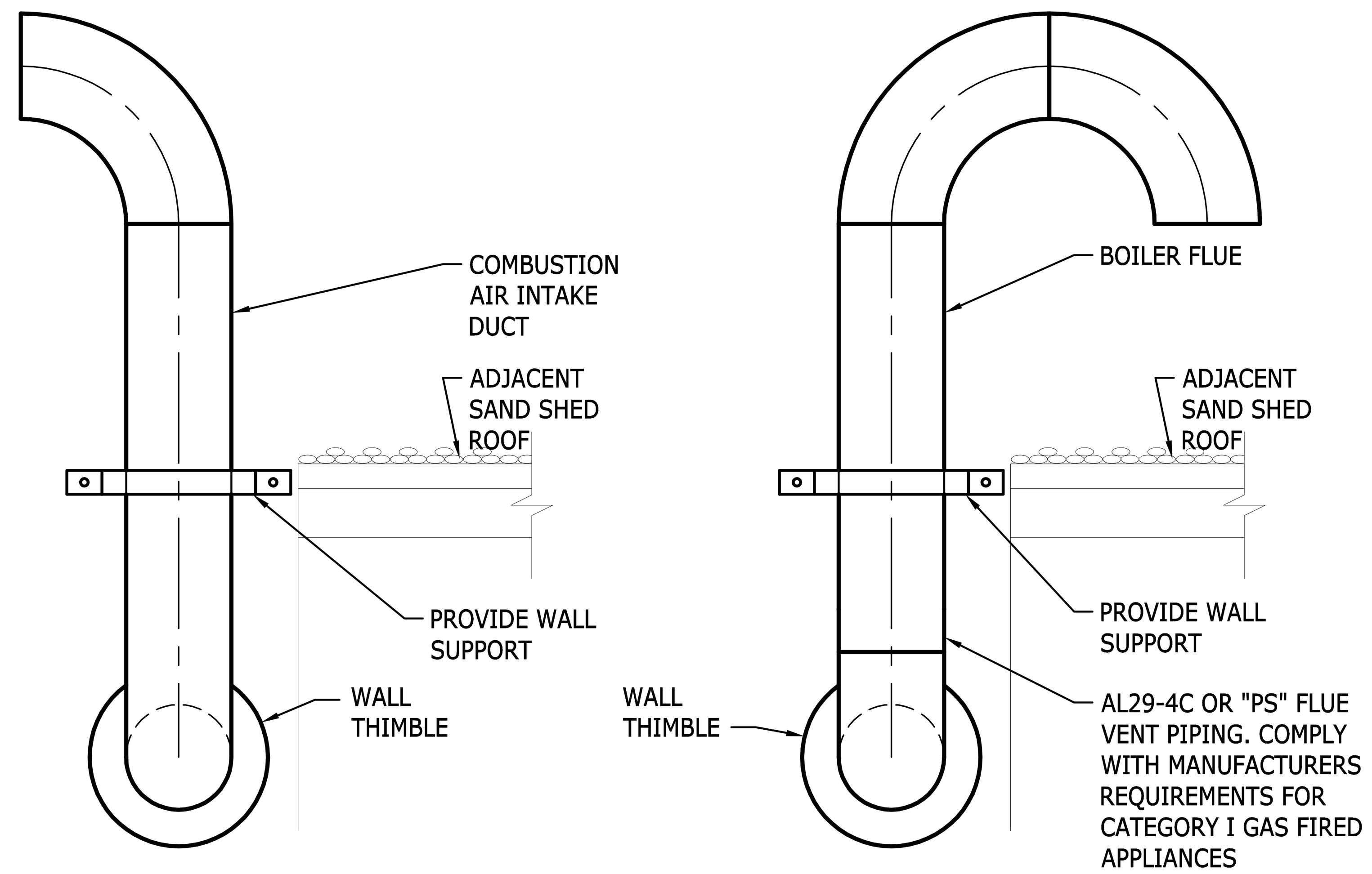
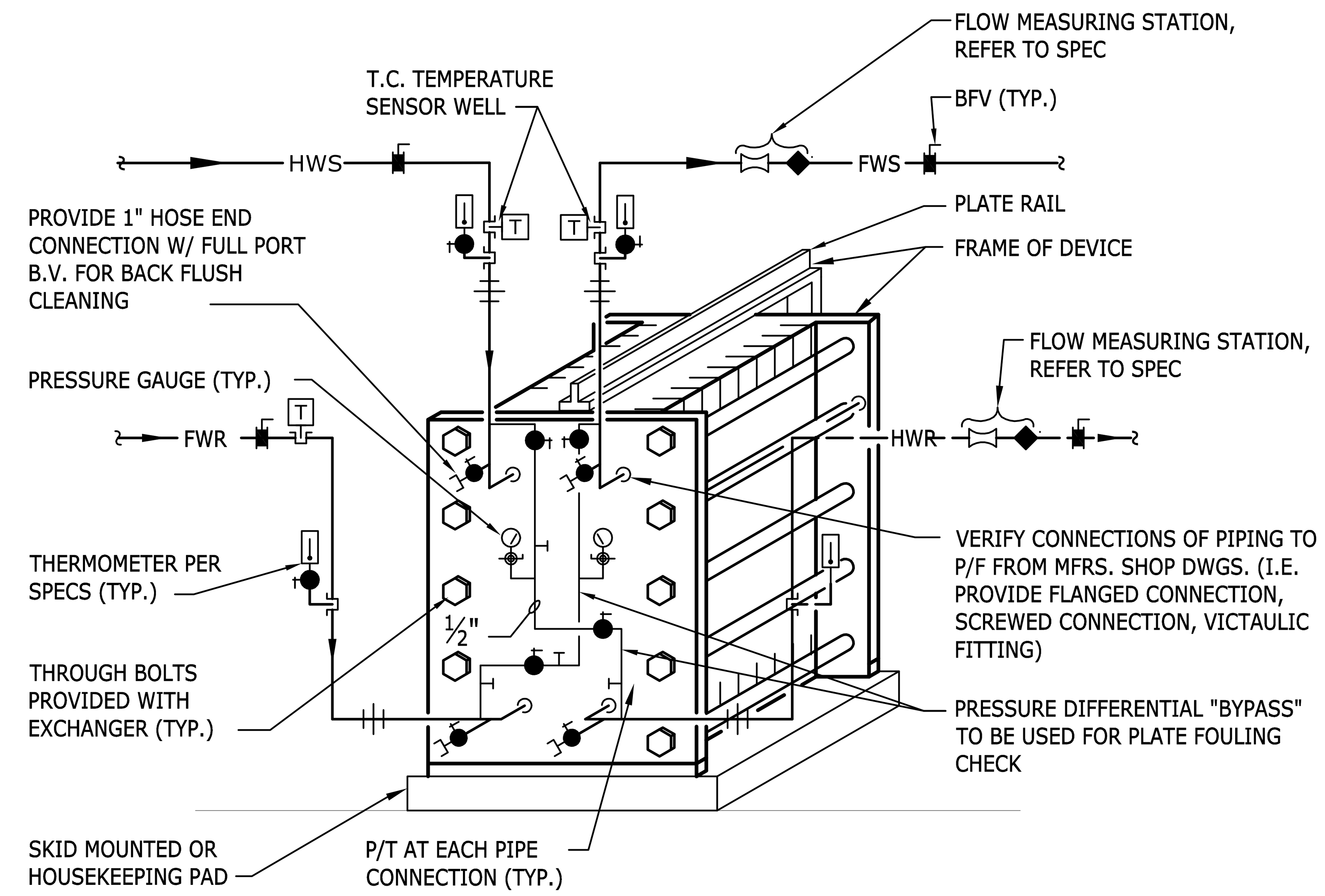
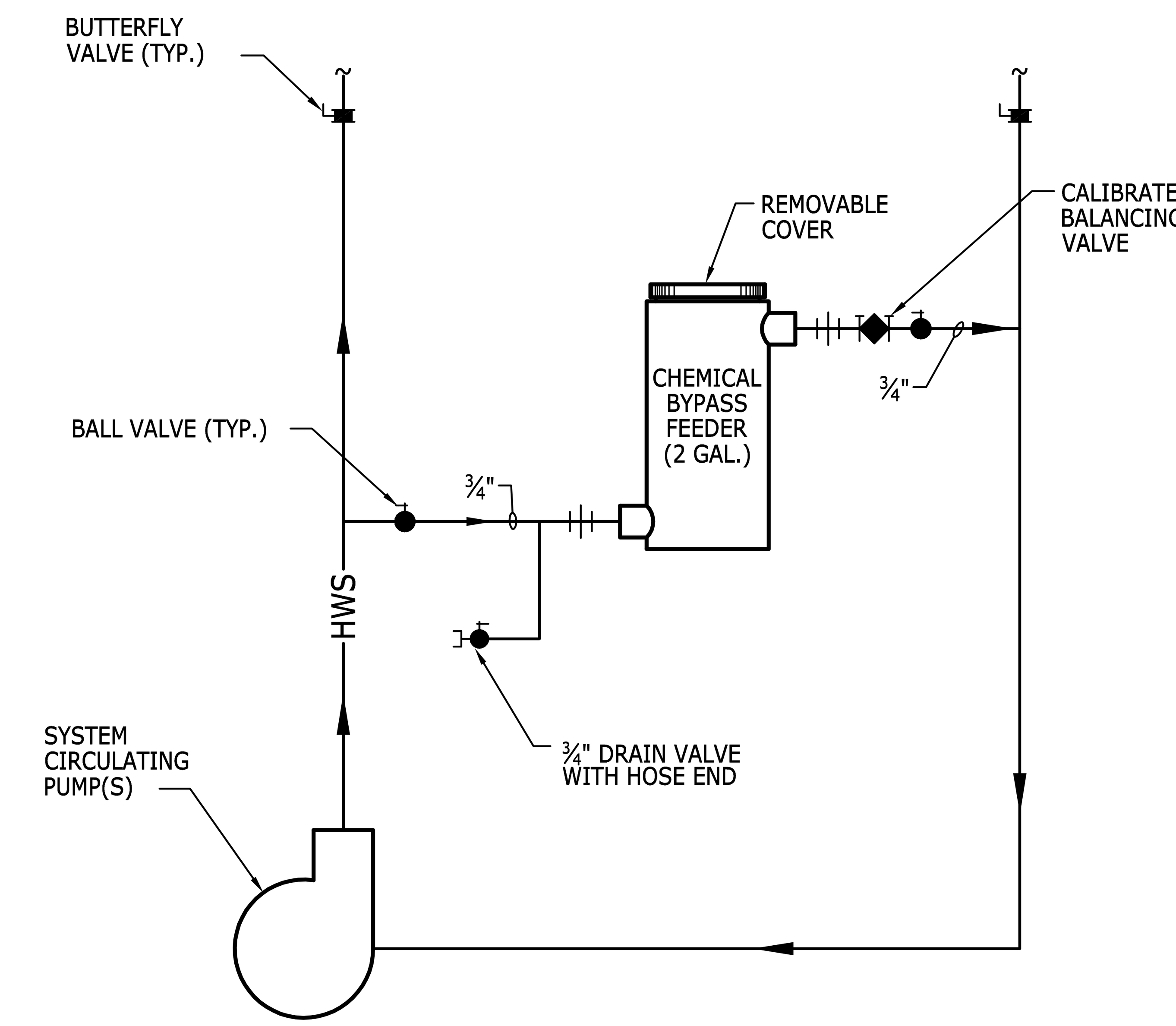


NOTE: ALL PENETRATIONS SHALL BE FLASHED AND SEALED WEATHER TIGHT.

1 BOILER FLUE AND COMBUSTION AIR INTAKE DETAIL
SCALE:NOT TO SCALE

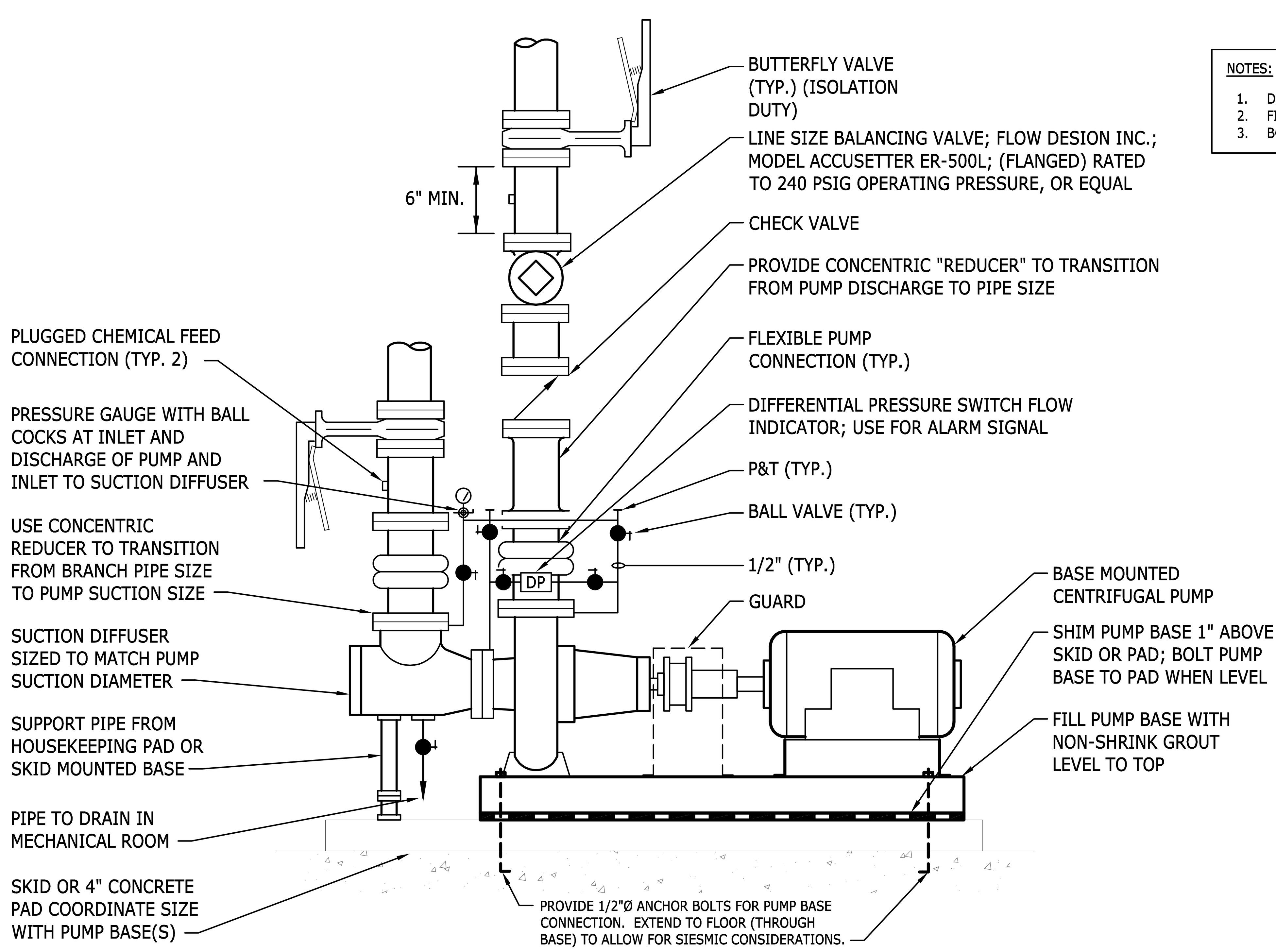


2 PLATE AND FRAME HEAT EXCHANGER PIPING DETAIL
SCALE:NOT TO SCALE

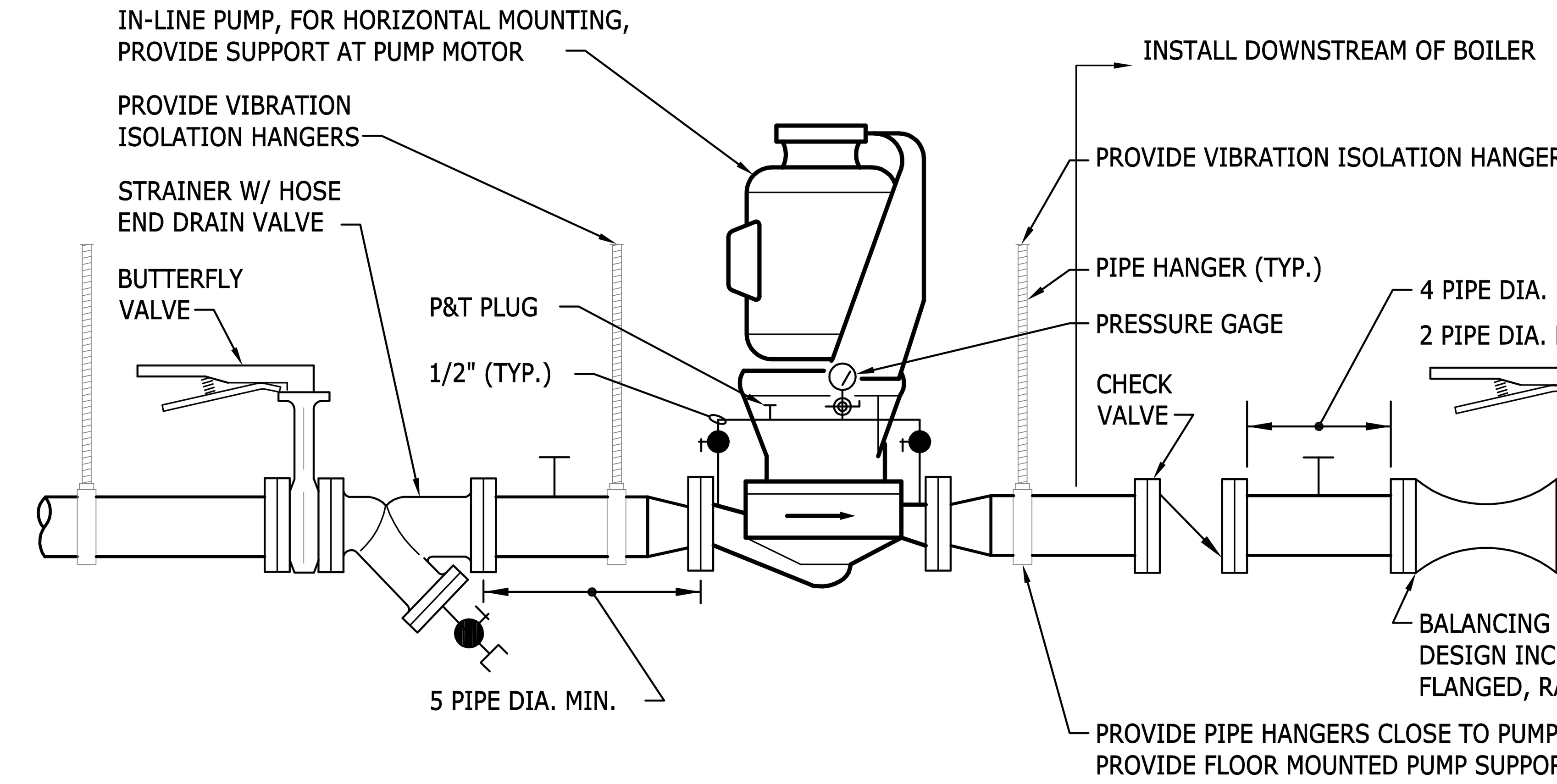


3 CHEMICAL POT FEEDER DETAIL
SCALE:NOT TO SCALE

NOTES:
1. DELETE UNIONS IF USING VICTAULIC OR FLANGED PIPE CONNECTIONS.
2. FIRE (FFSS) SIDE FLOW (FWS/FWR)
3. BOILER SIDE FLOW (HWS/HWR)



4 END SUCTION PUMP DETAIL
SCALE:NOT TO SCALE



5 INLINE PUMP ASSEMBLY
SCALE:NOT TO SCALE (2 1/2" PIPE AND SMALLER)

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MECHANICAL DETAILS

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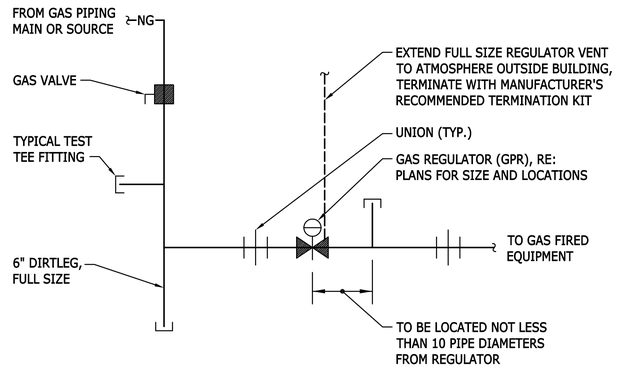
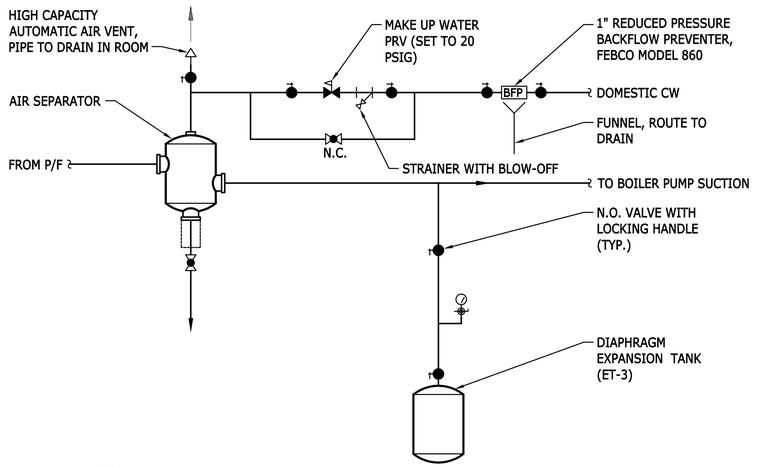
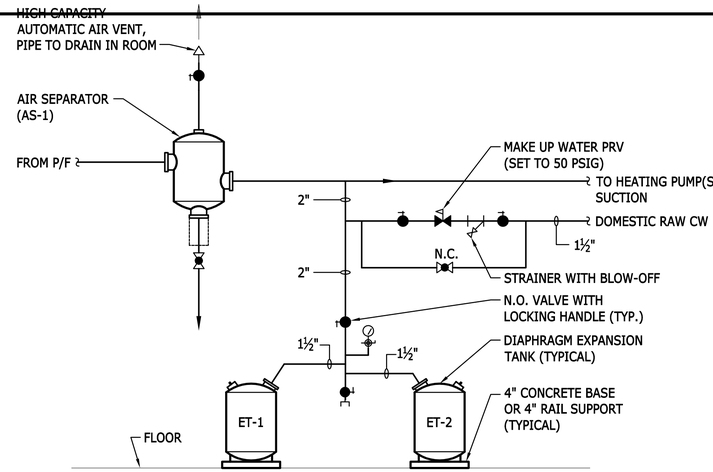


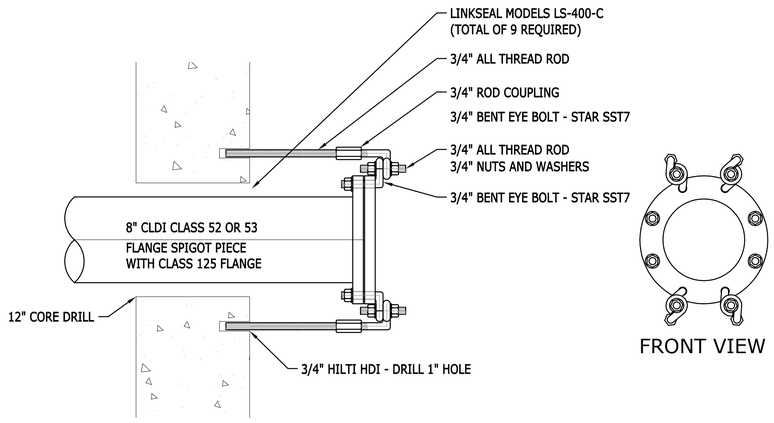
1 GAS CONNECTION DETAIL WITH GPR
SCALE:NOT TO SCALE



2 AIR SEPARATOR & EXPANSION TANK ASSEMBLY
SCALE:NOT TO SCALE (BOILER PIPING SYSTEM)

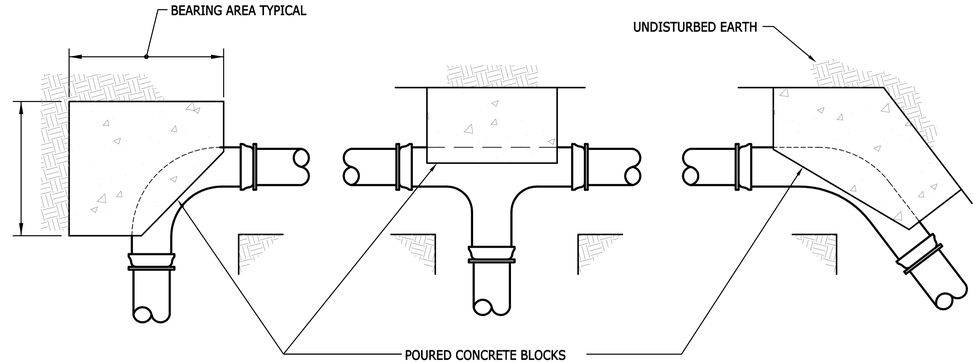


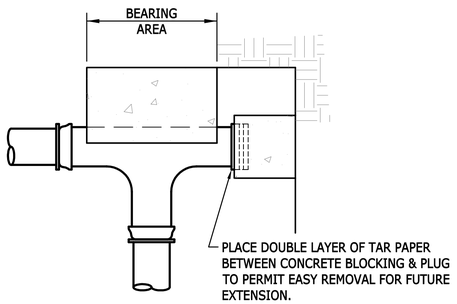
3 AIR SEPARATOR & EXPANSION TANK ASSEMBLY
SCALE:NOT TO SCALE (FIRE PIPING SYSTEM SIDE OF P/F EXCHANGER)



4 WATER ENTRY THROUGH EXTERIOR WALL
SCALE:1-1/2" = 1'-0"

1-1/2" 3/4" 0 1-1/2"
SCALE: 1-1/2" = 1'-0"





BEARING AREA OF BLOCK IN SQ. FEET					
FITTING SIZE	TEE & BEND	90° BEND	45° BEND	22-1/2° BEND	11-1/4° BEND
3"	1.0	1.33	0.67	0.4	0.25
4"	1.67	2.4	1.1	0.67	0.4
6"	3.75	5.4	2.5	1.5	0.8
8"	6.7	9.5	5.2	2.7	1.33
10"	10.5	15.0	7.0	4.1	2.0

SOIL BEARING PRESSURE	MULTIPLIER
1000	2.0
1500	1.33
2000	1.0
3000	0.67

5 TYPICAL WATER PIPE THRUST BLOCKING
SCALE:NOT TO SCALE (NOTE: SOIL BEARING PRESSURE SHALL BE FIELD TESTED)

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MECHANICAL DETAILS

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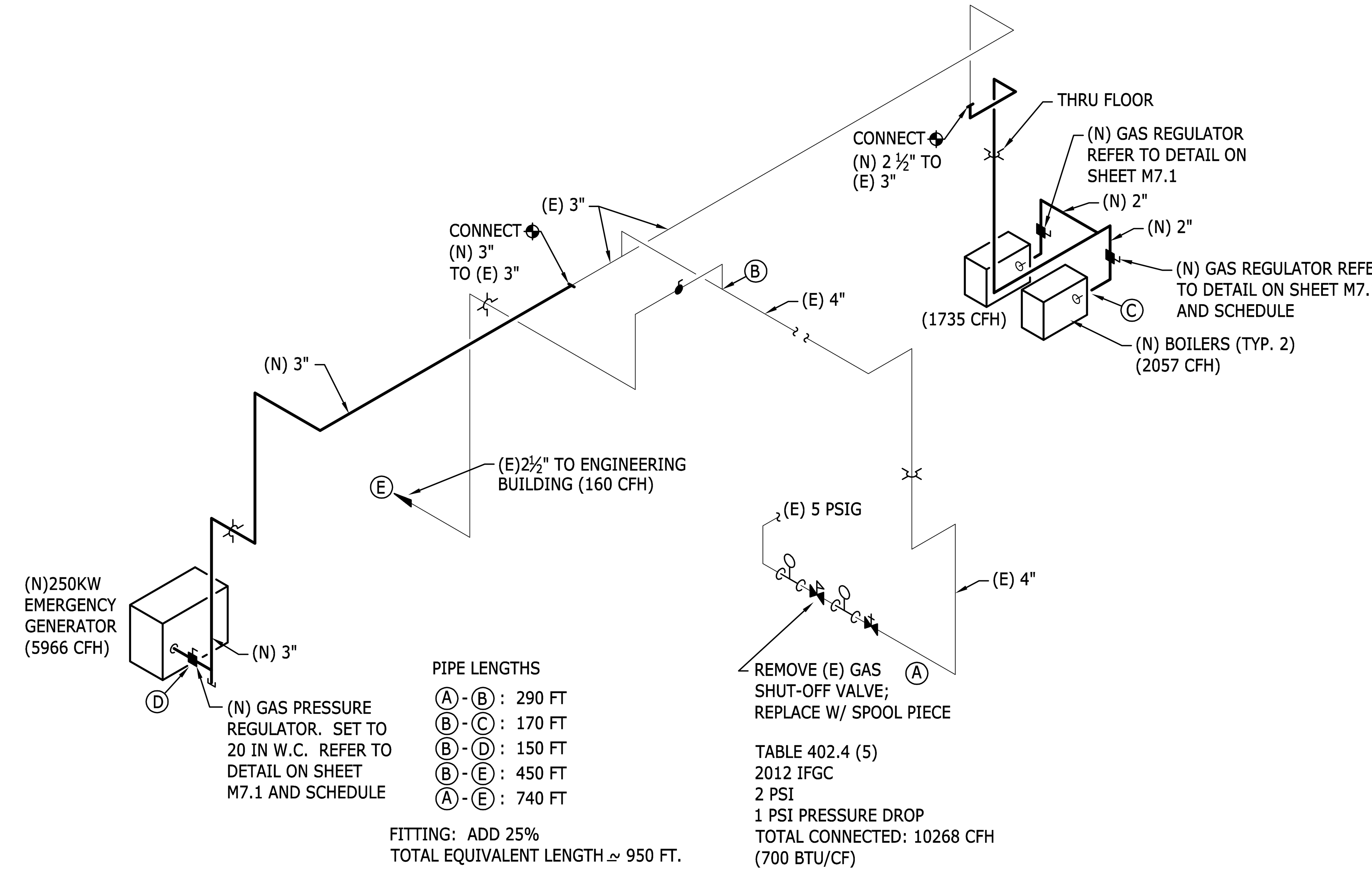
M7.1



1 EJMT GAS PIPE SIZING

SCALE:NOT TO SCALE

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MECHANICAL GAS DETAILS

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MECHANICAL SPECIFICATIONS

230000 - BASIC MECHANICAL REQUIREMENTS

GENERAL REQUIREMENTS

A. PROVIDE ALL ITEMS FOR COMPLETE AND SUCCESSFUL OPERATION OF ALL MECHANICAL SYSTEMS.

B. DRAWINGS ARE DIAGRAMMATIC ONLY. FOLLOW DRAWINGS AS CLOSELY AS ACTUAL BUILDING CONSTRUCTION AND THE WORK OF OTHER TRADES WILL PERMIT.

C. DEMONSTRATE THE OPERATION OF ALL SYSTEMS FOR THE OWNER AT A TIME AS DIRECTED BY THE OWNER.

D. LAY OUT ALL WORK IN ADVANCE. DO NOT DEFACE WORK OF OTHER TRADES. INSTALL ALL SLEEVES AND BLOCKOUTS; WATERPROOF AS REQUIRED.

E. RECORD DRAWINGS: THE CONTRACTOR SHALL MAINTAIN A MARK-UP SET OF DRAWINGS WHICH INDICATE VARIATIONS IN THE ACTUAL INSTALLATION FROM THE ORIGINAL DESIGN. TURN OVER DRAWINGS TO OWNER/ARCHITECT UPON PROJECT COMPLETION.

F. VERIFY THE ACTUAL ELECTRICAL SERVICE/VOLTAGE WITH THE ELECTRICAL DRAWINGS AND CONTRACTOR PRIOR TO ORDERING ANY MECHANICAL EQUIPMENT REQUIRING ELECTRICAL CONNECTIONS.

STANDARDS

A. ALL MECHANICAL MATERIALS SHALL BE NEW, IN FIRST CLASS CONDITION, AND U.L. LISTED WHERE APPLICABLE.

B. COMPLY WITH CURRENT INTERNATIONAL BUILDING CODE, INTERNATIONAL MECHANICAL CODE, INTERNATIONAL PLUMBING CODE, INTERNATIONAL ENERGY COMPLIANCE CODE AND NATIONAL FIRE PROTECTION ASSOCIATION IN EFFECT FOR THIS JURISDICTION.

C. PROCURE AND PAY FOR ALL PERMITS, DEVELOPMENT FEES, LICENSES, AND LIABILITY INSURANCE, ETC. FURNISH CERTIFICATE OF FINAL INSPECTION AND APPROVAL FROM STATE BOILER INSPECTOR.

D. MATERIAL SHALL BE AS SPECIFIED, AND/OR NOTED ON THE CONTRACT DRAWING.

GUARANTEE

A. REPLACE ANY WORK OR MATERIAL INSTALLED OR FURNISHED UNDER THIS CONTRACT WHICH DEVELOPS DEFECTS, EXCEPT FOR NORMAL WEAR, WITHIN FIVE (5) YEARS AFTER INTERIM ACCEPTANCE IS SECURED.

B. INCLUDE ROUTINE MAINTENANCE, INSPECTIONS AND PARTS FOR 5 YEARS FROM INTERIM ACCEPTANCE.

COORDINATION

A. PRIOR TO FABRICATION OR INSTALLATION OF ANY MECHANICAL PIPING, AND PLUMBING WORK, PARTICIPATE IN PLANNING MEETINGS TO COORDINATE ROUTING OF ALL OTHER BUILDING UTILITIES SYSTEMS, SO AS TO COMPLETELY ESTABLISH ROUTINGS, ELEVATIONS, SPACE REQUIREMENTS, AND COORDINATION OF LAYOUT AND SUSPENSION REQUIREMENTS IN RELATIONSHIP TO THE BUILDING STRUCTURE.

OPERATION AND MAINTENANCE MANUALS

A. PROVIDE O&M MANUALS FOR OWNER/ENGINEER APPROVAL AS REQUIRED BY THE CDOT CONTRACT BOOK 2 SECTION 19.16.

B. INCLUDE DESCRIPTION OF MECHANICAL EQUIPMENT, MANUFACTURER'S PRINTED OPERATING PROCEDURES, MAINTENANCE PROCEDURES, SERVICING INSTRUCTIONS AND SCHEDULES, MANUFACTURER'S SERVICE MANUALS, VALVE TAG LIST, NAME, ADDRESS AND TELEPHONE NUMBER FOR 24-HOUR SERVICE, STARTING, STOPPING, LUBRICATION, EQUIPMENT IDENTIFICATION NUMBERS, AND ADJUSTMENT CLEARLY INDICATED, PARTS LIST, MECHANICAL WARRANTIES, TEST AND BALANCE REPORT.

TRAINING

A. PROVIDE PER THE REQUIREMENTS OF CDOT CONTRACT BOOK 2 SECTION 19.15.

230500 - BASIC MATERIALS AND METHODS

GENERAL WORK INCLUDED

A. THE WORK INCLUDED UNDER THIS HEADING CONSISTS OF FURNISHING MATERIALS, SUPPLIES, EQUIPMENT, TOOLS, TRANSPORTATION AND FACILITIES, AND PERFORMING ALL LABOR AND SERVICES FOR, AS REQUIRED IN CONNECTION WITH, OR PROPERLY INCIDENTAL TO, THE HVAC & PLUMBING AND WORK, AS DESCRIBED IN THESE SECTIONS OF THE SPECIFICATIONS, SHOWN ON THE DRAWINGS, OR REASONABLY IMPLIED THEREFROM.

B. REMOVALS AND/OR RELOCATION OF EXISTING PIPING, INSULATION, FANS AND OTHER ASSOCIATED EQUIPMENT AS INDICATED ON THE PLANS OR AS REQUIRED TO COORDINATE AND ADAPT NEW AND EXISTING MECHANICAL SYSTEMS TO ALL OTHER WORK.

C. PROVIDE MECHANICAL IDENTIFICATION FOR ALL NEW PIPING. IDENTIFICATION SHALL BE BY SETON OR BRADY AND CONSIST OF THE FOLLOWING:
1. BRASS VALVE TAGS WITH STAMPED LETTERS SHALL BE PROVIDED FOR ALL VALVES. SECURE TO THE VALVE WITH CHROME PLATED BALL CHAINS.
2. IDENTIFY ALL NEW PIPING, EQUIPMENT WITH PAINTED STENCILS, PLASTIC PIPE MARKERS OR PLASTIC TAPE MARKERS. MARKERS SHALL INDICATE TYPE INCLUDING SUPPLY OR RETURN AND DIRECTION OF FLOW.
3. ALL IDENTIFICATION SHALL CONFORM WITH ANSI A13.1.

D. SKID MOUNTED, FACTORY TESTED SYSTEMS.

230593 - TESTING, ADJUSTING, AND BALANCING

REQUIREMENTS

A. SUBMIT TEST REPORTS FOR TESTING, ADJUSTING AND BALANCING.

B. AGENCY SHALL BE COMPANY SPECIALIZING IN THE ADJUSTING AND BALANCING OF SYSTEMS SPECIFIED IN THIS SECTION WITH MINIMUM THREE (3) YEARS DOCUMENTED EXPERIENCE AND NEBB CERTIFIED. PERFORM WORK UNDER SUPERVISION OF REGISTERED PROFESSIONAL ENGINEER.

C. TOTAL SYSTEM BALANCE SHALL BE PERFORMED IN ACCORDANCE WITH NEBB PROCEDURAL STANDARDS FOR TESTING, BALANCING AND ADJUSTING OF ENVIRONMENTAL SYSTEMS.

D. BEFORE COMMENCING WORK, VERIFY THAT SYSTEMS ARE COMPLETE AND OPERABLE. ENSURE THE FOLLOWING:
1. EQUIPMENT IS OPERABLE AND IN A SAFE AND NORMAL CONDITION.
2. TEMPERATURE CONTROL SYSTEMS ARE INSTALLED COMPLETE AND OPERABLE.
3. PROPER THERMAL OVERLOAD PROTECTION IS IN PLACE FOR ELECTRICAL EQUIPMENT.
4. PUMP& PIPING INSTALLATION IS COMPLETE AND OPERATIONAL.

E. PROMPTLY REPORT ABNORMAL CONDITIONS IN MECHANICAL SYSTEMS OR CONDITIONS WHICH PREVENT SYSTEM BALANCE.

F. ADJUSTING AND BALANCING:
1. ADJUST PUMPING SYSTEMS.
2. RECORDED DATA SHALL REPRESENT ACTUALLY MEASURED, OR OBSERVED, INITIAL CONDITION, AND FINAL CONDITION AFTER BALANCING.
3. PERMANENTLY MARK SETTINGS OF VALVES, AND OTHER ADJUSTMENT DEVICES ALLOWING SETTINGS TO BE RESTORED. SET AND LOCK MEMORY STOPS.
4. LEAVE SYSTEMS IN PROPER WORKING ORDER, CLOSING ACCESSORY DOORS, CLOSING DOORS TO ELECTRICAL SWITCH BOXES.
5. BALANCE SYSTEMS TO WITHIN 5% OF SCHEDULED VALUE.

G. COMPLY WITH THE REQUIREMENTS OF CDOT RFP BOOK 2 SECTION 19.14.

230700 - MECHANICAL INSULATION

A. INSULATION THICKNESS BASED ON ASHRAE 90.1 RECOMMENDATIONS.

B. MANUFACTURERS: CERTAINTEED; OWENS-CORNING; JOHNS-MANVILLE, CORP.; MANSON INSULATION CO.; ARMSTRONG; OR EQUAL.

C. GLASS FIBER: ASTM C 547, TYPE 1, RIGID MOLDED, NONCOMBUSTIBLE, 0.23 "K" VALUE AT 75 DEGREE F MEAN TEMPERATURE, MAXIMUM SERVICE TEMPERATURE 850 DEGREE F, MOISTURE SORPTION LESS THAN 0.2% BY VOLUME. COMPOSITE 25/50-FLAME SPREAD/SMOKE DEVELOPED RATING (ASTM E 84, UL 723, AND NFPA 255).
1. VAPOR RETARDER JACKET: ASTM C 1136, 45LBS/IN TENSILE STRENGTH (ASTM D 828), OR BEACH PUNCTURE 50 OZ IN/IN TEAR MINIMUM (ASTM D 781). WHITE KRAFT PAPER REINFORCED WITH GLASS FIBER YARN AND BONDED TO ALUMINUM FOIL, SECURED WITH SELF-SEALING LONGITUDINAL LAPS AND BUTT STRIPS.
2. CONNECTIONS: TACKS, PRESSURE SENSITIVE COLOR MATCHING VINYL TAPE, PERMA-WELD ADHESIVE.

D. EQUIPMENT INSULATION: RIGID FIBERGLASS BOARD (LOW TEMPERATURE): ASTM C 612, TYPE IA AND IB, 3 LB/CU FT DENSITY, 0.23 "K" VALUE AT 75 DEGREE F MEAN TEMPERATURE, MAXIMUM SERVICE TEMPERATURE 450 DEGREE F, MOISTURE SORPTION LESS THAN 5.0% BY WEIGHT, ALUMINUM FOIL FACING REINFORCED WITH FIBERGLASS SCRIM LAMINATED TO UL RATED KRAFT PAPER. COMPOSITE 25/50-FLAME SPREAD/SMOKE DEVELOPED RATING (ASTM E 84, UL 723, AND NFPA 90A).
1. SECURE WITH UL LISTED PRESSURE SENSITIVE TAPE AND/OR OUTWARD CLINCHED EXPANDED STAPLES AND VAPOR BARRIER COATING AS NEEDED.

E. EQUIPMENT INSULATION ACCESSORIES: PROVIDE STAPLES, BANDS, WIRE, WIRE NETTING, TAPE, CORNER ANGLES, ANCHORS AND STUD PINS AS RECOMMENDED BY INSULATION MANUFACTURER FOR APPLICATIONS INDICATED.

F. EQUIPMENT INSULATION COATINGS, MASTICS AND ADHESIVES.
1. VAPOR BARRIER COATING (STORE AND APPLY BETWEEN 40° F AND 100° F, PROTECT FROM FREEZING UNTIL DRY): USED ON BELOW AMBIENT PIPING/DUCT TO PREVENT MOISTURE INGRESS. PERMEANCE SHALL BE 0.013 PERMS OR LESS AT 43 MILS DRY PER ASTM E 96, PROCEDURE B.
a. FOSTER 30-80
b. CHILDERS CP-38
c. VIMASCO 749

G. HOT LOW PRESSURE PIPING (141° F TO 200° F:
1. APPLICATIONS:
a. HOT WATER SUPPLY AND RETURN.
b. DOMESTIC COLD WATER SUPPLY AND RETURN.
2. INSULATION:
a. FIBERGLASS: 1-1/2 INCH THICKNESS UP TO 1 1/2" INCH PIPE, 2-INCH THICKNESS FOR ALL OTHER PIPE SIZES.

H. HOT EQUIPMENT INSULATION (ABOVE AMBIENT TEMPERATURE):
1. APPLICATIONS:
a. HEAT EXCHANGERS.
b. HOT WATER EXPANSION TANKS.
c. AIR SEPARATORS.
2. INSULATION:
a. FIBERGLASS (HIGH TEMPERATURE): 2-INCH THICKNESS. DO NOT USE FOR EQUIPMENT ABOVE 450 DEGREE F.

I. INSTALLATION OF PIPING INSULATION
1. INSTALL INSULATION AFTER PIPING SYSTEM TESTS HAVE BEEN COMPLETED.
2. CLEAN PIPING TO REMOVE FOREIGN SUBSTANCES AND MOISTURE PRIOR TO APPLYING INSULATION.
3. INSTALL INSULATION PRODUCTS ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS, BUILDING CODES, AND RECOGNIZED INDUSTRY STANDARDS.
4. OMIT INSULATION ON UNIONS, BALANCE COCKS, FLOW REGULATORS.
5. SECURE LONGITUDINAL JACKET LAPS AND BUTT STRIPS ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.
6. FIRMLY RUB LAP AND BUTT STRIPS TO PRESSURIZE SEAM AND ENSURE POSITIVE CLOSURE.
7. INSULATE EACH CONTINUOUS RUN OF PIPING WITH FULL-LENGTH UNITS OF INSULATION, WITH SINGLE CUT PIECE TO COMPLETE RUN. DO NOT USE SCRAPS.
8. APPLY INSULATION TO PIPING WITH ALL JOINTS TIGHTLY FITTED TO ELIMINATE VOIDS.
9. EXTEND SURFACE FINISHES TO PROTECT ALL SURFACES, END, AND RAW EDGES OF INSULATION.
10. PROTECT VAPOR-BARRIER JACKETS ON PIPE INSULATION FROM PUNCTURE OR OTHER DAMAGE. AVOID THE USE OF STAPLES ON VAPOR BARRIER JACKETS. SEAL VAPOR BARRIER PENETRATIONS WITH VAPOR BARRIER COATING.
11. COVER VALVES, FITTINGS AND SIMILAR ITEMS WITH EQUIVALENT THICKNESS AND COMPOSITION OF INSULATION AS APPLIED TO ADJOINING PIPE RUN. INSTALL FACTORY MOLDED OR JOB FABRICATED COVERS (AT INSTALLER'S OPTION).
12. EXTEND PIPING INSULATION WITHOUT INTERRUPTION THROUGH WALLS, FLOORS AND SIMILAR PIPING PENETRATIONS.
13. PROVIDE THERMAL SHIELD INSERTS ON ALL PIPE.
a. MINIMUM INSULATION INSERT LENGTHS:
(1.) 1-1/2 - 2-1/2 INCH PIPE: 10-INCHES
(2.) 3 - 6-INCH PIPE: 12-INCHES
14. APPLY GALVANIZED METAL SHIELDS BETWEEN HANGERS OR SUPPORTS AND PIPE INSULATION. FORM SHIELDS TO FIT THE INSULATION AND EXTEND UP TO THE CENTERLINE OF THE PIPE. THE SHIELD LENGTH SHALL BE 4-INCHES LESS THAN THE ASSOCIATED INSULATION HANGER INSERT TO ALLOW FOR VAPOR RETARDING BUTT JOINTS ON EACH SIDE OF THE SHIELDS.
15. APPLY ADHESIVES, MASTICS AND COATINGS AT MANUFACTURER'S RECOMMENDED MINIMUM COVERAGE PER GALLON.
16. REPLACE ALL DAMAGED INSULATION IN WHOLE; REPAIR OF DAMAGED INSULATION WILL NOT BE ACCEPTED.
17. INSULATE FITTINGS AND VALVES WITH PVC INSULATED FITTING COVERS AND INSULATION INSERTS PER MANUFACTURER'S RECOMMENDATIONS.

J. INSTALLATION OF EQUIPMENT INSULATION
1. INSTALL INSULATION PRODUCTS ACCORDING TO MANUFACTURER'S INSTRUCTIONS, BUILDING CODES, AND RECOGNIZED INDUSTRY STANDARDS.
2. APPLY INSULATION AS CLOSE AS POSSIBLE TO EQUIPMENT BY GROOVING, SCORING, AND BEVELING INSULATION, IF NECESSARY. AS REQUIRED, SECURE INSULATION TO EQUIPMENT WITH STUDS, PINS, CLIPS, ADHESIVE, WIRES, OR BANDS
3. FILL JOINTS, CRACKS, SEAMS, AND DEPRESSIONS WITH BEDDING COMPOUND TO FORM SMOOTH SURFACE. ON COLD EQUIPMENT USE VAPOR RETARDANT CEMENT
4. MAINTAIN INTEGRITY OF VAPOR-BARRIER ON EQUIPMENT INSULATION AND PROTECT IT TO PREVENT PUNCTURE AND OTHER DAMAGE.
5. DO NOT APPLY INSULATION TO EQUIPMENT, MUFFLERS, BREECHINGS, OR STACKS WHILE HOT.
6. APPLY INSULATION USING STAGGERED JOINT METHOD AND DOUBLE LAYER CONSTRUCTION. APPLY EACH LAYER OF INSULATION SEPARATELY.
7. COVER INSULATED SURFACES WITH ALL-SERVICE JACKETING NEATLY FITTED AND FIRMLY SECURED. LAP SEAMS AT LEAST 2-INCH. APPLY OVER VAPOR BARRIER WHERE APPLICABLE.
8. DO NOT INSULATE MANHOLES, HANDHOLES, CLEANOUTS, ASME STAMP, OR MANUFACTURER'S NAMEPLATE. PROVIDE NEATLY BEVELED EDGE AT INTERRUPTIONS OF INSULATION.
9. PROVIDE REMOVABLE INSULATION SECTIONS WITH ALUMINUM JACKET AND STAINLESS STEEL BANDS TO COVER PARTS OF EQUIPMENT WHICH MUST BE OPENED FOR MAINTENANCE; INCLUDE METAL VESSEL COVERS, FASTENERS, FLANGES, FRAMES AND ACCESSORIES.

230900 - CONTROLS AND INSTRUMENTATION

WORK INCLUDED

A. PROVIDE ALL LABOR, EQUIPMENT, AND MATERIAL NECESSARY FOR COMPLETE AND FULLY OPERATIONAL TEMPERATURE CONTROL VALVE OPERATION AND PROVIDE INTERFACE WITH BAS/LOCAL EQUIPMENT OPERATION THROUGH COORDINATION WITH OWNER.

B. THE AUTOMATIC TEMPERATURE CONTROL VALVE SYSTEM SHALL BE ELECTRIC.

C. THE CONTROL SYSTEM SHALL INCLUDE ALL CONTROL VALVES, OPERATORS, REQUIRED TO FULFILL THE INTENT OF THE DRAWINGS AND THE SEQUENCE OF OPERATION. COORDINATE ALL WORK WITH THE EQUIPMENT SUPPLIERS/OWNER AND ELECTRICAL CONTRACTOR.

D. PROVIDE ALL COMPLETION SERVICES SPECIFIED HEREINAFTER, INCLUDING FINAL SYSTEM PERFORMANCE VERIFICATION, TO ENSURE THE SYSTEM FUNCTIONS AS SPECIFIED IN THE SEQUENCE OF OPERATION.

E. CONTROLS AND ALARMS SHALL INTERFACE WITH FIRE ALARM SYSTEM.

AUTOMATIC CONTROL VALVES

A. ALL AUTOMATIC CONTROL VALVES SHALL BE FURNISHED UNDER THIS SECTION AND INSTALLED UNDER THE MANUFACTURER'S INSTALLATION INSTRUCTIONS.

B. SIZE VALVES AND PROVIDE WITH ACTUATORS OF SUFFICIENT POWER FOR THE DUTY INTENDED. VALVE BODY AND ACTUATOR SELECTION SHALL BE SUFFICIENT TO HANDLE SYSTEM PRESSURE AND CLOSE AGAINST THE DIFFERENTIAL PRESSURES ENCOUNTERED. VALVE PRESSURE DROPS FOR WATER VALVES WILL BE 4-6 PSI FOR THE GPM SHOWN ON THE DRAWINGS.

C. VALVES AND ACTUATORS SHALL BE FOR NORMALLY-OPEN OR NORMALLY-CLOSED OPERATION AS SHOWN ON THE DRAWINGS.

CONTROL WIRING

A. ELECTRICAL WIRING: PROVIDE IN ACCORDANCE WITH DIVISION 16 AS REQUIRED FOR THE TEMPERATURE CONTROL SYSTEM, INCLUDING ELECTRICAL INTERLOCK WIRING. COMPLY WITH THE NATIONAL ELECTRICAL CODE, LOCAL CODES, AND DIVISION 16 OF THESE SPECIFICATIONS.

B. INTERNAL CONTROL WIRING FOR EQUIPMENT SHALL BE PROVIDED BY THE MANUFACTURERS OF THAT EQUIPMENT.

232112 - SEISMIC

A. PROVIDE SEISMIC BRACING ON PIPING IN MECHANICAL ROOM WHICH MATCHES THE ENTIRE FIRE SPRINKLER PIPING SYSTEM AND COMPLIES WITH THE BASE CONTRACT.

232113 - PIPING

A. HEATING WATER PIPING: SCHEDULE 40, SEAMLESS OR RESISTANCE WELDED, STANDARD STEEL, CAST IRON SCREWED FITTINGS, RATED FOR 125 PSI. TEST PIPING FOR AT LEAST SIX (6) CONSECUTIVE HOURS, DURING WHICH TIME, PRESSURE SHALL REMAIN CONSTANT WITHOUT PUMPING. SUBJECT WELDED JOINTS TO THE HAMMER TEST AND COPPER JOINTS TO SOAP SUDS WHILE UNDER HYDROSTATIC PRESSURE.

B. THE HEATING WATER PIPING SHALL BE TYPE "L" HARD DRAWN COPPER, WITH CAST BRONZE OR WROUGHT COPPER FITTINGS, SOLDER JOINTS USING 95-5 SOLDER.

C. PROVIDE DIELECTRIC ISOLATION AND/OR COUPLINGS (I.E., WATERWAY FITTINGS) AT ALL CONNECTIONS BETWEEN DISSIMILAR PIPING.

D. PROVIDE CHEMICAL TREATMENT OF BOILER HEATING SYSTEM. PROVIDE USE 'BY-PASS FEEDER' FOR SOURCE AND PROVIDE CHEMICALS BRICKETTES.

E. NATURAL GAS PIPING
1. PIPE 2-INCHES AND SMALLER: ASTM A 53, GRADE B , TYPE E, SCHEDULE 40 BLACK STEEL PIPE, ELECTRIC RESISTANCE WELDED.
2. FITTINGS:
a. MALLEABLE IRON THREADED FITTINGS: ANSI B16.3; (CLASS 125 AND 300).
b. MALLEABLE IRON THREADED UNIONS: ANSI B16.30, CLASS 150, 250 OR 300; SELECTED BY INSTALLER FOR PROPER PIPING FABRICATION AND SERVICE REQUIREMENTS, INCLUDING STYLE, END CONNECTIONS, AND METAL-TO-METAL SEATS (IRON, BRONZE OR BRASS).
c. FORGED STEEL SOCKET-WELDED AND THREADED FITTINGS: ANSI B16.11, EXCEPT MSS SP-79 FOR THREADED REDUCER INSERTS; RATED TO MATCH SCHEDULE OF CONNECTED PIPE (UP TO 4-INCH PIPE SIZE).
3. PIPE 2-1/2 INCH AND LARGER: ASTM A 53, GRADE B, TYPE S, SCHEDULE 40 SEAMLESS BLACK STEEL PIPE.
4. FITTINGS:
a. STEEL FLANGES/FITTINGS: ANSI B 16.5, INCLUDING BOLTING AND GASKETING OF THE FOLLOWING MATERIAL GROUP, END CONNECTION AND FACING, EXCEPT AS OTHERWISE INDICATED.
1) MATERIAL GROUP: GROUP 1.1
2) END CONNECTIONS: BUTT WELD
3) FACINGS: RAISED-FACE
b. FORGED STEEL SOCKET-WELDED AND THREADED FITTINGS: ANSI B16.11, EXCEPT MSS SP-79 FOR THREADED REDUCER INSERTS; RATED TO MATCH SCHEDULE OF CONNECTED PIPE (UP TO 4-INCH PIPE SIZE).
c. WROUGHT STEEL BUTT-WELDED FITTINGS: ANSI B16.9, EXCEPT ANSI B16.28 FOR SHORT-RADIUS ELBOWS AND RETURNS; RATED TO MATCH CONNECTED PIPE.

F. NATURAL GAS VALVES
1. GAS COCKS 2-INCH AND SMALLER: 150 PSI WOG, BRONZE BODY, STRAIGHTAWAY PATTERN, SQUARE HEAD, THREADED ENDS. ACCEPTABLE MANUFACTURERS: LUNKENHEIMER, NIBCO, POWELL, STOCKHAM.
2. GAS COCKS 2-1/2 INCH AND LARGER: MSS SP-78; 175 PSI, LUBRICATED PLUG TYPE, SEMI-STEEL BODY, SINGLE GLAND, WRENCH OPERATED, FLANGED ENDS. ACCEPTABLE MANUFACTURERS: LUNKENHEIMER, NIBCO, POWELL, STOCKHAM.

232114 - PIPING SPECIALTIES

VALVES

A. GENERAL: COMPLY WITH MSS-92 1980 "VALVE USERS MANUAL".

B. SIZES: PROVIDE VALVES OF SAME SIZE AS UPSTREAM PIPE SIZE. SIZE CONTROL VALVES FOR REQUIRED FLOW.

C. EXTENDED STEMS: WHERE INSULATION IS INDICATED OR SPECIFIED, PROVIDE EXTENDED STEMS TO ALLOW FULL OPERATION OF THE VALVE WITHOUT INTERFERENCE BY THE INSULATION.

D. BYPASS AND DRAIN CONNECTIONS: COMPLY WITH MSS SP-45.

E. END CONNECTIONS: AS SPECIFIED IN THE INDIVIDUAL VALVES SPECIFICATIONS.
1. THREADS: COMPLY WITH ANSI B2.1.
2. FLANGES: COMPLY WITH ANSI B16.1 FOR CAST IRON, ANSI B16.5 FOR STEEL, AND ANSI B16.24 FOR BRONZE.
3. SOLDER-JOINT: COMPLY WITH ANSI B16.18. WHERE SOLDERED END CONNECTIONS ARE USED, USE SOLDER HAVING A MELTING POINT BELOW 840 DEGREE F FOR CHECK VALVES AND BELOW 421 DEGREE F FOR BALL VALVES.

F. BALL VALVES: 3-INCH AND SMALLER: MSS-SP-110, 150 PSI SWP, 600 PSI WOG, TWO-PIECE ASTM B584 CAST BRONZE BODY, FULL PORT, CHROME PLATED BRASS/BRONZE BALL, TFE SEATS, ANTI-BLOWOUT STEM SEPARATE PACKNUT WITH ADJUSTABLE STEM PACKING, EXTENDED STEM, AND VINYL COVERED STEEL HANDLE. THREADED OR SOLDERED END CONNECTIONS. ACCEPTABLE MANUFACTURERS: NIBCO T/S 585-70; MILWAUKEE; APOLLO (CONBRACO); WATTS; GRINNELL

G. BUTTERFLY VALVES: 4-INCH AND LARGER: MSS-SP-68, ASTM A126, CLASS B FULLY LUGGED IRON BODY, ASTM B148 ALUMINUM BRONZE DISC, ASTM A582 416 STAINLESS STEEL STEM, RTFE SEAT LINER, REINFORCED NYLON BEARINGS, EPDM BUSHING AND NBR STEM SEALS. ASTM CLASS 250 WOG RATING. EPDM LINER, RATED FOR 200 PSI BI-DIRECTIONAL SHUTOFF AND 200 PSI DEAD-END SERVICE WITH DOWNSTREAM PIPING REMOVED. PROVIDE EXTENDED NECK FOR INSULATION. SIZES 4"-6" SHALL BE LEVER OPERATED WITH 10-POSITION THROTTLING PLATE. ACCEPTABLE MANUFACTURERS; KEYSTONE; NIBCO; MILWAUKEE; "ML" SERIES; STOCKHAM; CENTERLINE; WATTS; GRINNELL; VICTAULIC; APOLLO; DEZURIK

H. CHECK VALVES:
1. SWING CHECK VALVE: 2-1/2 INCH AND SMALLER: MSS SP-80; CLASS 150 SWP, ASTM B62 BRONZE BODY AND BONNET, HORIZONTAL SWING DESIGN, Y-PATTERN, WITH TFE SEAT DISC. THREADED OR SOLDERED END CONNECTIONS. ACCEPTABLE MANUFACTURERS: NIBCO T/S 433-Y; MILWAUKEE; GRINNELL; STOCKHAM.
2. 3-INCH AND LARGER: MSS SP-71; CLASS 250, ASTM A126 CLASS B DUCTILE IRON BODY WITH BRONZE TRIM, NON-ASBESTOS GASKET, HORIZONTAL SWING, AND FLANGED ENDS. VALVE SHALL BE CAPABLE OF BEING REFITTED WITHOUT REMOVING FROM PIPE. ACCEPTABLE MANUFACTURERS: NIBCO F918-B; MILWAUKEE; STOCKHAM; HAMMOND; GRINNELL.

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

BARNARD EJMT TEAM

BARNARD · RONDINELLI · BCER Engineering · Sturgeon Electric · Systems Group · Western States Fire Protection Co. · ILF Consulting Engineers

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Num	Description	Date

Revisions

DRAWN BY: JEB | CHECKED BY: RDM

MECHANICAL SPECIFICATIONS

Drawing Number
M8.0

MECHANICAL SPECIFICATIONS

I. DRAIN VALVE: BALL VALVE WITH THREADED HOSE END AND METALCAP WITH CHAIN. APOLLO FIG. 78_100/78_200 SERIES

J. SAFETY RELIEF VALVES: MANUFACTURER: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ON OF THESE MANUFACTURERS: AMTROL; BELL & GOSSETT ITT; FLUID HANDLING DIVISION; KUNKLE VALVE CO., INC.; LONERGAN; LUNKENHEIMER CO.; WATTS.
1. DIAPHRAGM OPERATED, CAST IRON OR BRASS BODY VALVE, WITH LOW INLET PRESSURE CHECK VALVE, INLET STRAINER REMOVABLE WITHOUT SYSTEM SHUTDOWN AND NON-CORROSIVE VALVE SEAT AND STEM; 125 PSIG WORKING PRESSURE AND 250 DEGREE MAXIMUM OPERATING TEMPERATURE. VALVE DESIGNED, BUILT, RATED, AND STAMPED IN ACCORDANCE WITH ASME BOILER AND PRESSURE VESSEL CODE. SELECT VALVE TO SUIT ACTUAL SYSTEM PRESSURE AND BTU CAPACITY. FACTORY SET VALVE TO RELIEVE AT 10 PSI ABOVE OPERATING PRESSURE WITH FIELD ADJUSTMENT CAPABILITIES.

K. PRESSURE REDUCING VALVE: (BOILER SYSTEM) DIAPHRAGM OPERATED, CAST IRON OR BRASS BODY, FILL VALVE DESIGNED TO MAINTAIN WATER PRESSURE IN A CLOSED WATER SYSTEM. VALVE INCLUDES CLEANABLE STRAINER, REMOVABLE SEAT ASSEMBLY, PURGE LEVER FOR QUICK FILLING, AND BUILT-IN CHECK VALVE. ADJUSTMENT RANGE OF 10 TO 25 PSIG. MAXIMUM OPERATING TEMPERATURE SHALL BE 225 DEGREES F, MAXIMUM WORKING PRESSURE OF 125 PSIG. NOTE: FFSS SYSTEM PRV SHALL BE RATED AT 250 PSIG.

L. PUMP SUCTION DIFFUSERS: CAST IRON BODY, WITH FLANGED CONNECTIONS FOR 2-1/2 INCH AND LARGER; 250 PSIG WORKING PRESSURE, 300 DEGREE F MAXIMUM OPERATING TEMPERATURE; AND COMPLETE WITH THE FOLLOWING FEATURES:
1. INLET VANES WITH LENGTH 1-1/2 TIMES PUMP SUCTION DIAMETER OR GREATER.
2. CYLINDER STRAINER WITH 3/16-INCH DIAMETER OPENINGS WITH TOTAL FREE AREA EQUAL TO OR GREATER THAN FIVE (5) TIMES CROSS-SECTIONAL AREA OF PUMP SUCTION, DESIGNED TO WITHSTAND PRESSURE DIFFERENTIAL EQUAL TO PUMP SHUTOFF HEAD.
3. DISPOSABLE FINE MESH STRAINER TO FIT OVER CYLINDER STRAINER (START-UP STRAINER).
4. PERMANENT MAGNET, LOCATED IN FLOW STREAM, REMOVABLE FOR CLEANING.
5. ADJUSTABLE FOOT SUPPORT, DESIGNED TO CARRY WEIGHT OF SUCTION PIPING.
6. BLOWDOWN TAPPING IN BOTTOM; GAUGE TAPPING IN SIDE.

PIPING ACCESSORIES

A. MANUAL AIR VENT: BRONZE BODY AND NONFERROUS INTERNAL PARTS; 150 PSIG WORKING PRESSURE, 212 DEGREE F OPERATING TEMPERATURE; MANUALLY COIN OPERATED AND HAVING DISCHARGE OUTLET CONNECTION AND 1/8-INCH NPT MALE CONNECTION.

B. AUTOMATIC AIR VENT: FLOAT TYPE VENT DESIGNED TO VENT AUTOMATICALLY; BRONZE BODY AND NONFERROUS INTERNAL PARTS. 150 PSIG WORKING PRESSURE, 240 DEGREE F OPERATING TEMPERATURE (250 PSIG ON PRIMARY PUMP SIDE). 1/4-INCH DISCHARGE CONNECTION AND 1/2-INCH INLET CONNECTION.

AIR SEPARATORS

A. CENTRIFUGAL AIR SEPARATOR: WELDED STEEL TANK, ASME CONSTRUCTED AND LABELED FOR 125 PSIG MINIMUM WORKING PRESSURE (OR 250 PSIG PER SCHEDULE) AND 350 DEGREE F MAXIMUM OPERATING TEMPERATURE. TANGENTIAL INLET AND OUTLET CONNECTIONS. THREADED BLOWDOWN CONNECTION SIZED FOR FULL SYSTEM FLOW. 1/4_INCH CONNECTION LOCATED AT TOP OF AIR SEPARATOR FOR EXPANSION TANK CONNECTION. FACTORY APPLIED ENAMEL FINISH. PROVIDE SCREWED CONNECTIONS UP TO AND INCLUDING 3-INCH NPS; FLANGED CONNECTIONS FOR 4-INCH NPS AND ABOVE.

EXPANSION TANKS

B. MANUFACTURER: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OFTHESE MANUFACTURERS: AMTROL, INC.; ARMSTRONG PUMPS, INC.; BELL & GOSSETT ITT; FLUID HANDLING DIVISION; TACO, INC.; WESSELS.

C. DIAPHRAGM COMPRESSION TANK TYPE: WELDED STEEL TANK SUITABLE FOR 125 PSIG WORKING PRESSURE, 350 DEGREES MAXIMUM OPERATING TEMPERATURE; CONSTRUCTED, TESTED, AND LABELED IN ACCORDANCE WITH ASME PRESSURE VESSEL CODE. FLEXIBLE DIAPHRAGM SEPARATES AIR CHARGE FROM SYSTEM WATER. INCLUDE TAPS FOR PRESSURE GAUGE, AIR CHARGE FITTING, AND DRAIN. DIAPHRAGM MATERIAL SHALL BE CHEMICALLY INERT TO PROPYLENE GLYCOL. SUPPORT VERTICAL TANKS WITH STEEL LEGS OR BASE; SUPPORT HORIZONTAL TANKS WITH STEEL SADDLES. TANK, WITH TAPS AND SUPPORTS, SHALL BE CONSTRUCTED, TESTED, AND LABELED IN ACCORDANCE WITH ASME PRESSURE VESSEL CODE, SECTION VIII, DIVISION 1.

PIPING INSTALLATION

A. ARRANGE PIPING IN HORIZONTAL GROUPS, EACH GROUP TO BE IN ONE PLANE. MAINTAIN INDICATED SLOPE.

B. CONCEAL PIPE INSTALLATIONS IN WALLS, PIPE CHASES, UTILITY SPACES, ABOVE CEILINGS, BELOW GRADE OR FLOORS.

C. INSTALL PIPING TIGHT TO SLABS, BEAMS, JOISTS, COLUMNS, WALLS, AND OTHER PERMANENT ELEMENTS OF THE BUILDING. INSTALL PIPING PARALLEL TO PERMANENT ELEMENTS OF BUILDING. PROVIDE SPACE TO PERMIT INSULATION APPLICATIONS, WITH 1-INCH CLEARANCE OUTSIDE INSULATION.

D. SLOPING, AIR VENTING, AND DRAINING:
1. INSTALL PIPING TRUE TO LINE AND GRADE, AND FREE OF TRAPS AND AIR POCKETS. INSTALL PIPING LEVEL EXCEPT FOR GRAVITY FLOW SYSTEMS SUCH AS CONDENSER WATER AND CONDENSATE DRAIN PIPING.
2. CONNECT BRANCH PIPING TO BOTTOM OF MAINS, EXCEPT FOR UP-FEED RISERS, WHICH SHALL HAVE TAKE-OFF ON TOP OF MAIN.
3. INSTALL MANUAL AIR VENTS AT HIGH POINTS IN HYDRONIC PIPING SYSTEMS AND AT ALL COILS. PROVIDE 1/4_INCH COPPER, 180 DEGREE BEND PIPE TO DISCHARGE VENTED WATER INTO CAN.
4. INSTALL AUTOMATIC AIR VENT ON AIR SEPARATOR AND WHERE SHOWN. PROVIDE VALVED INLET AND ROUTE DISCHARGE PIPE TO FLOOR DRAIN.
5. INSTALL DRAIN VALVES WITH HOSE ADAPTERS AT LOW POINTS IN MAINS, RISERS, AND BRANCH LINES. DRAIN CONSISTS OF A TEE FITTING, 3/4-INCH BALL VALVE, AND SHORT 3/4-INCH THREADED NIPPLE AND CAP.

E. FITTINGS: STANDARD MANUFACTURED FITTINGS. FIELD FABRICATED FITTINGS AND BUSHINGS ARE PROHIBITED ON ALL PIPING.

F. MAKE REDUCTIONS IN PIPE SIZES USING ECCENTRIC REDUCER FITTING INSTALLED WITH THE LEVEL SIDE UP.

VALVES

A. FIELD CHECK VALVES FOR PACKING AND LUBRICANT. REPLACE LEAKING PACKING. SERVICE VALVES WITH LUBRICANT FOR SMOOTH AND PROPER OPERATION BEFORE PLACING IN SERVICE.

B. INSTALL VALVES ACCESSIBLE FROM FLOOR LEVEL, LOCATED FOR EASY ACCESS.

C. INSTALL VALVES IN HORIZONTAL PIPING WITH STEM AT OR ABOVE CENTER OF PIPE. INSTALL VALVES IN POSITION TO ALLOW FULL STEM MOVEMENT. PROVIDE OPERATING HANDLES FOR VALVES AND COCKS WITHOUT INTEGRAL OPERATORS.

D. PROVIDE EXTENDED VALVE STEMS WHERE INSULATION IS SPECIFIED.

E. PROVIDE SEPARATE SUPPORT WHERE NECESSARY.

F. PROVIDE VALVES SAME SIZE AS LINE SIZE.

G. PROVIDE DRAIN VALVES AND HOSE ADAPTERS AT STRAINERS FOR BLOWOFF; SAME SIZE AS STRAINER BLOWOFF CONNECTION.

232123 - HVAC EQUIPMENT

BASE MOUNTED PUMP

A. ACCEPTABLE MANUFACTURERS SHALL BE AS FOLLOWS OR EQUAL.
1. ITT BELL & GOSSETT
2. TACO
3. ARMSTRONG
4. AURORA
5. PEERLESS

FRAME MOUNTED END SUCTION PUMPS

A. GENERAL: PROVIDE FRAME-MOUNTED BRONZE FITTED END SUCTION PUMPS WHERE INDICATED, AND OF CAPACITIES AND HAVING CHARACTERISTICS AS SCHEDULED.

B. TYPE: HORIZONTAL MOUNT, SINGLE STAGE, VERTICAL SPLIT CASE, FLEXIBLE COUPLING, BASE MOUNTED, DESIGNED FOR 250 PSI WORKING PRESSURE.

C. CASING: CAST IRON, 125 PSI ANSI FLANGES, TAPPINGS FOR GAUGE AND DRAIN CONNECTIONS.

D. SHAFT: STEEL WITH REPLACEABLE SHAFT SLEEVE.

E. BEARINGS: REGREASEABLE BALL BEARINGS.

F. SEAL: MECHANICAL, WITH CARBON SEAL RING AND CERAMIC SEAT.

G. MOTOR: PUMP MOTOR SHALL BE NON-OVERLOADING AT ANY POINT ON PUMP CURVE AND SHALL BE HIGH EFFICIENCY DESIGN. PROVIDE AS INDUCTION DUTY RATED.

H. IMPELLER: BRONZE ENCLOSED TYPE, HYDRAULICALLY AND DYNAMICALLY BALANCED, KEYED TO SHAFT AND SECURED WITH LOCKING SCREW. ASSEMBLY COMPONENTS SHALL BE 304 STAINLESS STEEL.

I. BASEPLATE: STRUCTURAL STEEL WITH WELDED CROSS MEMBERS, AND OPEN GROUTING AREA.

J. COUPLING: FLEXIBLE, CAPABLE OF ABSORBING TORSIONAL VIBRATION, EQUIPPED WITH COUPLING GUARD.

K. IN-LINE CIRCULATOR PUMPS
1. GENERAL: PROVIDE BRONZE FITTED IN-LINE CIRCULATOR PUMPS WHERE INDICATED, AND OF CAPACITIES AS SCHEDULED.
2. TYPE: HORIZONTAL MOUNT, VERTICAL SPLIT CASE, OIL-LUBRICATED, DESIGNED FOR 125 PSI WORKING PRESSURE, AND 225 DEGREE F CONTINUOUS WATER TEMPERATURE.
3. BODY: CAST IRON, WITH FLANGED SUCTION AND DISCHARGE AND GAUGE TAPPINGS.
4. SHAFT: HARDENED ALLOY STEEL.
5. BEARINGS: OIL-LUBRICATED BRONZE JOURNAL BEARINGS.
6. SEAL: MECHANICAL, WITH CARBON SEAL RING AND CERAMIC SEAT.
7. MOTOR: PUMP MOTOR SHALL BE NON-OVERLOADING AT ANY POINT ON PUMP CURVE.
8. COUPLING: SELF-ALIGNING, FLEXIBLE COUPLING.
9. IMPELLER: BRASS OR BRONZE ENCLOSED TYPE, HYDRAULICALLY AND DYNAMICALLY BALANCED, AND KEYED TO SHAFT.
10. MOTORS SHALL BE INDUCTION DUTY TYPE.
11. PROVIDE MOTORS WITH SHAFT GROUNDING KITS.

INSTALLATION OF PUMPS

A. GENERAL: INSTALL HVAC PUMPS WHERE INDICATED, IN ACCORDANCE WITH MANUFACTURER'S PUBLISHED INSTALLATION INSTRUCTIONS, COMPLYING WITH RECOGNIZED INDUSTRY PRACTICES TO ENSURE THAT HVAC PUMPS COMPLY WITH REQUIREMENTS AND SERVE INTENDED PURPOSES.

B. ACCESS: PROVIDE ACCESS SPACE AROUND HVAC PUMPS FOR SERVICE AS INDICATED, BUT IN NO CASE LESS THAN THAT RECOMMENDED BY MANUFACTURER.

C. SUPPORT: INSTALL BASE-MOUNTED PUMPS ON MINIMUM OF 4-INCH STEEL BASE EQUAL. SET AND LEVEL PUMP.

D. ELECTRICAL WIRING: INSTALL ELECTRICAL DEVICES FURNISHED BY MANUFACTURER BUT NOT SPECIFIED TO BE FACTORY-MOUNTED. FURNISH COPY OF MANUFACTURER'S WIRING DIAGRAM SUBMITTAL TO ELECTRICAL INSTALLER.

E. VERIFY THAT ELECTRICAL WIRING INSTALLATION IS IN ACCORDANCE WITH MANUFACTURER'S SUBMITTAL AND INSTALLATION REQUIREMENTS OF DIVISION 26 SECTIONS. DO NOT PROCEED WITH EQUIPMENT START-UP UNTIL WIRING INSTALLATION IS ACCEPTABLE TO EQUIPMENT INSTALLER.

F. PIPING CONNECTIONS: PROVIDE SYSTEM RETURN CONNECTION TO INLET STRAINER WITH VALVED BYPASS TO DRAIN. PROVIDE PUMP DISCHARGE CONNECTIONS WITH CHECK VALVE, SHUTOFF VALVE, AND BALANCING VALVE FOR EACH PUMP.

ADJUSTING AND CLEANING

A. ALIGNMENT: ADJUST SHAFTS OF ALL MOTORS AND PUMPS WITHIN RECOMMENDED TOLERANCES BY MANUFACTURER, AND IN PRESENCE OF MANUFACTURER'S SERVICE REPRESENTATIVE.

B. START-UP: LUBRICATE PUMPS BEFORE START-UP. START-UP IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

C. REFER TO DIVISION 23, SECTION 230593, FOR PUMP SYSTEM BALANCING; NOT WORK OF THIS SECTION.

D. CLEANING: CLEAN FACTORY-FINISHED SURFACES. REPAIR ANY MARRED OR SCRATCHED SURFACES WITH MANUFACTURER'S TOUCH-UP PAINT.

230515 - VARIABLE FREQUENCY CONTROLLERS (FOR PUMPS)

GENERAL

A. COMPLY WITH THE REQUIREMENTS OF THE REFERENCE STANDARDS NOTED HEREIN, EXCEPT WHERE MORE STRINGENT REQUIREMENTS ARE LISTED HEREIN OR OTHERWISE REQUIRED BY THE CONTRACT DOCUMENTS.

B. NFPA 70 - NATIONAL ELECTRICAL CODE.

C. ANSI/NEMA ICS 6 - ENCLOSURES FOR INDUSTRIAL CONTROLS AND SYSTEMS.

D. NEMA AB 1 - MOLDED CASE CIRCUIT BREAKERS.

E. NEMA ICS 2 - INDUSTRIAL CONTROL DEVICES, CONTROLLERS, AND ASSEMBLIES.

F. NEMA ICS 3.1 - SAFETY STANDARDS FOR CONSTRUCTION AND GUIDE FOR SELECTION, INSTALLATION AND OPERATION OF ADJUSTABLE SPEED DRIVE SYSTEMS.

G. NEMA 250 - ENCLOSURES FOR ELECTRICAL EQUIPMENT (1000 VOLTS MAXIMUM).

H. ANSI/UL STANDARD 508.

I. IEEE STANDARD 519_1992; FOR VOLTAGE AND TOTAL DEMAND DISTORTION.

J. FCC RULES AND REGULATIONS, PART 15, SUBPART J; FOR RADIATED RFI.

K. SHOP DRAWINGS: INCLUDE FRONT AND SIDE VIEWS OF ENCLOSURES WITH OVERALL DIMENSIONS AND WEIGHTS SHOWN; CONDUIT ENTRANCE LOCATIONS AND REQUIREMENTS; AND NAMEPLATE LEGENDS.

L. PRODUCT DATA: PROVIDE CATALOG SHEETS SHOWING VOLTAGE, CONTROLLER SIZE, RATINGS AND SIZE OF SWITCHING AND OVERCURRENT PROTECTIVE DEVICES, SHORT CIRCUIT RATINGS, DIMENSIONS, AND ENCLOSURE DETAILS.

M. TEST REPORTS: INDICATE FIELD TEST AND INSPECTION PROCEDURES AND TEST RESULTS.

N. MANUFACTURER'S INSTALLATION INSTRUCTIONS: INDICATE APPLICATION CONDITIONS AND LIMITATIONS OF USE STIPULATED BY PRODUCT TESTING AGENCY SPECIFIED UNDER REGULATORY REQUIREMENTS. INCLUDE INSTRUCTIONS FOR STORAGE, HANDLING, PROTECTION, EXAMINATION, PREPARATION, INSTALLATION, AND STARTING OF PRODUCT.

O. MANUFACTURER'S FIELD REPORTS: PROVIDE REPORT TO OWNER & IN SHOP DRAWINGS..

P. MANUFACTURER'S FIELD REPORTS: INDICATE START-UP INSPECTION FINDINGS.

Q. OPERATION DATA: INCLUDE INSTRUCTIONS FOR STARTING AND OPERATING CONTROLLERS, AND DESCRIBE OPERATING LIMITS THAT MAY RESULT IN HAZARDOUS OR UNSAFE CONDITIONS.

R. MAINTENANCE DATA: INCLUDE ROUTINE PREVENTIVE MAINTENANCE SCHEDULE.

S. FURNISH PRODUCTS LISTED AND CLASSIFIED BY UNDERWRITERS LABORATORIES, INC., AND CONFORMING TO REFERENCED STANDARDS AS SUITABLE FOR PURPOSE SPECIFIED AND INDICATED.

T. STORE IN A CLEAN, DRY SPACE. MAINTAIN FACTORY WRAPPING OR PROVIDE AN ADDITIONAL HEAVY CANVAS OR HEAVY PLASTIC COVER TO PROTECT UNITS FROM DIRT, WATER, CONSTRUCTION DEBRIS, AND TRAFFIC.

U. HANDLE IN ACCORDANCE WITH MANUFACTURER'S WRITTEN INSTRUCTIONS. LIFT ONLY WITH LUGS PROVIDED FOR THE PURPOSE. HANDLE CAREFULLY TO AVOID DAMAGE TO COMPONENTS, ENCLOSURE, AND FINISH.

V. PROVIDE ENOUGH AIR FILTERS FOR FULL 5 YEAR OPERATION TERM.

W. PROVIDE THREE (3) OF EACH FUSE SIZE AND TYPE FOR FULL 5 YEAR OPERATION TERM.

PRODUCTS

A. ALL VFDS PROVIDED FOR THIS PROJECT SHALL BE OF A SINGLE MANUFACTURER.

B. MANUFACTURERS: ASEA BROWN BOVERI (ABB); ROBICON; DANFOSS GRAHAM OR EQUAL.

C. THE VFD SHALL CONVERT INCOMING 3-PHASE 60 HZ AC POWER TO A VARIABLE FREQUENCY, VARIABLE VOLTAGE AC OUTPUT SUITABLE FOR CONTROL OF A STANDARD NEMA DESIGN B INDUCTION MOTOR OVER A 10:1 SPEED RANGE.

D. THE VFD SHALL CONSIST OF A 3-PHASE FULL-WAVE CONVERTER SECTION TO RECTIFY THE INCOMING AC SOURCE, A FILTERED DC BUS SECTION, AND A SINUSOIDAL PWM OUTPUT SECTION UTILIZING IGBT TYPE OUTPUT TRANSISTORS, AND UTILIZING SENSORLESS TORQUE VECTOR CONTROL LOGIC, AS SPECIFIED BELOW.

E. THE VFD SHALL MAINTAIN A NEAR UNITY POWER FACTOR REGARDLESS OF SPEED OR LOAD (0.95 OR BETTER FOR DRIVES LARGER THAN 5 HP).

F. INVERTER SECTION SHALL UTILIZE INSULATED GATE BIPOLAR TRANSISTORS (IGBTS) WITH A MINIMUM RATING OF 1200 VDC, AND HAVE AN ADJUSTABLE CARRIER FREQUENCY RANGE OF 1 TO 6 KHZ THROUGH 100 HP, AND 1 TO 3 KHZ ABOVE 100 HP.

G. THE VFD AND OPTIONS SHALL BE TESTED TO ANSI/UL STANDARD 508 AND LISTED BY EITHER UL OR ETL.

H. POWER LINE NOISE SHALL BE LIMITED TO A 5% VOLTAGE DISTORTION FACTOR AND TOTAL DEMAND DISTORTION FACTOR (TDD) AS DEFINED IN IEEE STANDARD 519-1992, GUIDE FOR HARMONIC CONTROL AND REACTIVE COMPENSATION OF STATIC POWER CONVERTERS. SUBMITTAL DATA SHALL INCLUDE CALCULATIONS TO SHOW TDD BASED ON AVAILABLE SHORT CIRCUIT CURRENT. THE POINT OF COMMON COUPLING (PCC) SHALL BEAT THE POWER WIRING IMMEDIATELY DOWNSTREAM OF THE BUILDING TRANSFORMER.

I. THE VFD TORQUE CHARACTERISTIC SHALL MATCH THE DRIVEN LOAD.

J. INPUT POWER: 480 VOLT, 3-PHASE, 60 HZ.

K. THE VFD SHALL INCLUDE AN INTEGRAL DISCONNECT TO ISOLATE THE VFD FROM INPUT POWER.

L. VOLTAGE TOLERANCE: 10%; FREQUENCY TOLERANCE 3%.

M. THE VFD OUTPUT SHALL BE RATED FOR CONTINUOUS DUTY WITH FULL LOAD AMP RATINGS THAT MEET OR EXCEED NEC TABLE 430-150. THE VFD SHALL HAVE OVERLOAD CAPABILITY OF 110 PERCENT RATED CURRENT FOR 60 SECONDS. OUTPUT VOLTAGE RANGE SHALL NOT EXCEED INPUT RATED VOLTAGE.

N. AMBIENT OPERATING CONDITIONS: TEMPERATURE, 0-40 DEGREES C; RELATIVE HUMIDITY, 0-95 PERCENT, NON-CONDENSING, 11,000 FEET ELEVATION, WITHOUT DERATION.

O. ALL PRINTED CIRCUIT BOARDS AND POWER SUBASSEMBLIES SHALL BE BURNED IN AT ELEVATED TEMPERATURE (50 DEGREES C MINIMUM) FOR FORTY-EIGHT (48) HOURS MINIMUM. THE COMPLETED, ASSEMBLED VFD SHALL BE FUNCTIONALLY TESTED UNDER MOTOR LOAD BEFORE SHIPMENT TO ENSURE PROPER OPERATION. THE MANUFACTURER SHALL PROVIDE CERTIFICATION THAT THESE TESTS HAVE BEEN COMPLETED.

BASIC FEATURES

A. CONTROL POWER TRANSFORMER WITH FUSED PRIMARY AND 24V OR 120V FUSED SECONDARY.

B. VFD AC LINE INPUT HIGH-SPEED SEMI-CONDUCTOR TYPE CURRENT-LIMITING FUSES RATED 200,000 AIC MINIMUM.

C. OPERATOR CONTROLS:
1. "HAND-OFF-AUTO" SELECTOR SWITCH. IN "AUTO' POSITION, DRIVE STARTS AND STOPS MOTOR FROM REMOTE CONTACT CLOSURE, AND MOTOR SPEED SHALL BE PROPORTIONAL TO A REMOTE SPEED CONTROL SIGNAL. IN "HAND" POSITION, MOTOR IS STARTED AND STOPPED FROM VFD KEYPAD/DISPLAY MODULE, AND THE MOTOR SPEED SHALL BE AS SET THROUGH THE VFD KEYPAD/DISPLAY MODULE.
2. PILOT LIGHTS: LED TYPE. 22.5MM IEC STYLE, RED "VFD ON", WHITE "CONTROL POWER ON", AND AMBER "VFD FAULT".

D. KEYPAD/DISPLAY MODULE:
1. A MULTI-LINE ALPHA-NUMERIC BACKLIT DISPLAY CAPABLE OF DISPLAYING AT MINIMUM MOTOR SPEED (HZ), MOTOR CURRENT (A), MOTOR VOLTAGE (V), ELAPSED TIME METER (HRS.), INVERTER LOAD (%) AND ALL DRIVE PROGRAMMING PARAMETERS.
2. KEYPAD TO ENABLE STARTING AND STOPPING, AND MANUAL SPEED ADJUSTMENT WHEN THE SELECTOR SWITCH IS IN "HAND" POSITION.

E. PROGRAMMABLE RELAY OUTPUTS (THREE MINIMUM) CAPABLE OF INDICATING THE FOLLOWING:
1. VFD IN RUN MODE
2. VFD AT ZERO SPEED
3. VFD FAULT

F. TERMINALS FOR FIELD-INSTALLED EXTERNAL SAFETIES.

G. FIELD-SELECTABLE AUTO RESTART ON POWER SOURCE FAILURE.

H. ADJUSTABLE VOLTAGE BOOST FOR STARTING HIGH TORQUE LOADS.

I. DRIVE SHALL BE CAPABLE OF STARTING INTO A SPINNING MOTOR BY MATCHING FREQUENCY AND PHASE ANGLE TO THE MOTOR BACK EMF.

J. CRITICAL SPEED AVOIDANCE: DRIVE SHALL ALLOW THE USER TO AVOID OPERATION AT RESONANT SPEEDS. SELECTED SPEEDS SHALL BE STEPPED OVER. FOUR (4) CRITICAL SPEEDS SHALL BE CAPABLE OF BEING AVOIDED, WITH AN ADJUSTABLE BANDWIDTH FOR EACH CRITICAL SPEED.

K. SIGNAL FOLLOWER: IN AUTO SPEED MODE, MOTOR SPEED SHALL BE PROPORTIONAL TO AN EXTERNAL 4_20 MA SPEED CONTROL SIGNAL. VERIFY WITH CONTROL CONTRACTOR WHETHER THE CONTROL SIGNAL IS 4-20 MA. PROVIDE CONTROL SIGNAL CONSISTENT THROUGHOUT THE FACILITY. LOSS OF REFERENCE SIGNAL SHALL CAUSE DRIVE TO GO TO PROGRAMMABLE PRESET SPEED.

INPUT POWER HARMONIC REDUCTION

A. ALL VFDS OF 3 HP AND LARGER SHALL HAVE AS A MINIMUM; POSITIVE AND NEGATIVE DC LINK REACTORS, OR AC LINE INPUT REACTORS TO REDUCE INPUT POWER HARMONICS. IF THE TOTAL HARMONICS EXCEED THAT ALLOWED AS DEFINED IN PARAGRAPH 2.2-F, ABOVE, AT THE PCC; PROVIDED ADDITIONAL AC LINE INPUT REACTORS, INPUT ISOLATION TRANSFORMERS, OR LINE INPUT FILTERS AS REQUIRED TO MEET THE PROVISIONS PARAGRAPH 2.2-F.

MOTOR PROTECTION

A. FOR ALL INSTALLATIONS WHERE THE CONDUCTORS FROM THE VFD TO THE MOTOR EXCEED 100 FEET IN LENGTH, PROVIDE A MINIMUM 3 PERCENT REACTANCE MOTOR PROTECTING DV/DT FILTER AT THE VFD OUTPUT TERMINALS.

ADJUSTMENTS

A. ACCELERATION TIME: 2 TO 20 SECOND MINIMUM RANGE.

B. DECELERATION TIME: 2 TO 20 SECOND MINIMUM RANGE.

C. VOLTS/HZ RATIO: PROGRAMMABLE.

D. VOLTAGE BOOST: PROGRAMMABLE.

E. CRITICAL SPEED LOCKOUT: FOUR (4) CRITICAL SPEEDS WITH ADJUSTABLE BANDWIDTH.

F. CURRENT LIMIT: 30 TO 110 PERCENT SINE WAVE CURRENT RATING.

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

BARNARD EJMT TEAM

BARNARD

RONDINELLI life safety

Western States Fire Protection Co.

CONSULTING ENGINEERS

BCER engineering

Sturgeon ELECTRIC

EISENHOWER/JOHNSON MEMORIAL TUNNEL

FIXED FIRE SUPPRESSION SYSTEM DESIGN BUILD PROJECT

Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

Revisions		
Num	Description	Date

DRAWN BY: JEB CHECKED BY: RDM

MECHANICAL SPECIFICATIONS

Drawing Number

M8.1

MECHANICAL SPECIFICATIONS

G. CARRIER FREQUENCY RANGE: 1 TO 6 KHZ THROUGH 100 HP AND 1 TO 3 KHZ ABOVE 100 HP.

H. OUTPUT FREQUENCY RANGE: 0 TO 80 HZ MINIMUM RANGE.

I. ALL DRIVE PARAMETERS SHALL BE STORED IN NON-VOLATILE MEMORY (EEPROM).

PROTECTIVE FEATURES

A. VFD SHALL HAVE BUILT-IN PROTECTION FOR POWER SOURCE TRANSIENTS, OVER-VOLTAGE, UNDER-VOLTAGE, AND PHASE LOSS. VFD SHALL NOT REQUIRE AN INPUT ISOLATION TRANSFORMER FOR TRANSIENT PROTECTION.

B. DC BUS OVER-VOLTAGE PROTECTION.

C. INSTANTANEOUS SHUTDOWN WHEN LOAD CURRENT EXCEEDS 150 PERCENT.

D. ADJUSTABLE ELECTRONIC CLASS 20 INVERSE TIME CHARACTERISTIC OVER-CURRENT OVERLOAD PROTECTION FOR THE MOTOR.

E. THE VFD SHALL BE CAPABLE OF WITHSTANDING RANDOMLY APPLIED SHORT CIRCUIT CURRENT APPLIED ACROSS THE OUTPUT TERMINALS WITHOUT DAMAGE.

F. PROTECTION OF VFD FOR ANY EXTERNAL DISCONNECTS BETWEEN THE DRIVE AND THE MOTOR. PROVIDE CONTROL TERMINALS FOR CONNECTION OF DISCONNECT SWITCH AUXILIARY CONTACTS, WHICH WILL IMMEDIATELY STOP THE DRIVE WHEN OPENED.

G. DC BUS DISCHARGE CIRCUIT FOR PROTECTION OF SERVICE PERSONNEL, WITH "BUS CHARGED" INDICATOR.

H. TROUBLESHOOTING DIAGNOSTIC FEATURES:
1. INDICATOR LIGHTS ON INVERTER POWER MODULE TO INDICATE CORRECT OPERATION (OR FAILURE) OF INDIVIDUAL POWER SWITCHING DEVICES.
2. INDICATOR LIGHTS TO SHOW DRIVE FAULT/READY STATES, AND REASON FOR FAULT SHUTDOWN, INCLUDING: INSTANTANEOUS OVERLOAD, MOTOR OVERLOAD, OUTPUT OR DC BUS OVER-VOLTAGE, OR SOURCE OVER-VOLTAGE, UNDER-VOLTAGE, OR PHASE LOSS. THE VFD SHALL STORE IN MEMORY AT MINIMUM THE PREVIOUS FIVE (5) ALARMS.

FABRICATION

A. WIRING TERMINATIONS: MATCH CONDUCTOR MATERIALS AND SIZES INDICATED.

B. ENCLOSURE: FOR DRY, INDOOR APPLICATIONS: NEMA 250, TYPE 12.

C. FINISH: MANUFACTURER'S STANDARD ENAMEL.

SOURCE QUALITY CONTROL

A. INSPECT AND PRODUCTION_TEST EACH PRODUCT SPECIFIED IN THIS SECTION.

EXECUTION

A. VERIFY THAT SURFACE IS SUITABLE FOR CONTROLLER INSTALLATION.

B. DO NOT INSTALL CONTROLLER UNTIL BUILDING ENVIRONMENT CAN BE MAINTAINED WITHIN THE SERVICE CONDITIONS REQUIRED BY THE MANUFACTURER.

C. INSTALL CONTROLLER WHERE INDICATED, IN ACCORDANCE WITH MANUFACTURER'S WRITTEN INSTRUCTIONS AND NEMA ICS 3.1.

D. TIGHTEN ACCESSIBLE CONNECTIONS AND MECHANICAL FASTENERS AFTER PLACING CONTROLLER.

E. INSTALL FUSES IN FUSIBLE SWITCHES.

F. PROVIDE ENGRAVED PLASTIC NAMEPLATES.

G. PROVIDE NEATLY TYPED LABEL INSIDE EACH MOTOR CONTROLLER DOOR IDENTIFYING MOTOR SERVED, NAMEPLATE HORSEPOWER, FULL LOAD AMPERES, CODE LETTER, SERVICE FACTOR, AND VOLTAGE/PHASE RATING.

H. INSPECT COMPLETED INSTALLATION FOR PHYSICAL DAMAGE, PROPER ALIGNMENT, ANCHORAGE, AND GROUNDING.

I. PROVIDE MINIMUM TWO (2) HOURS OF START-UP SERVICE FOR EACH VFD. SERVICE SHALL BE PERFORMED BY FACTORY-TRAINED SERVICE TECHNICIANS.

J. TECHNICIAN SHALL VERIFY CORRECT INSTALLATION, START-UP THE DRIVE, ADJUST ALL REQUIRED OPERATING PARAMETERS, AND VERIFY PROPER OPERATION IN ALL OPERATING MODES.

K. OWNER TRAINING: PROVIDE MINIMUM EIGHT (8) HOURS TRAINING IN OPERATION AND TROUBLE-SHOOTING PROCEDURES FOR THE INSTALLED DRIVES.

L. MAKE FINAL ADJUSTMENTS TO INSTALLED DRIVE TO ASSURE PROPER OPERATION OF FAN SYSTEM. OBTAIN PERFORMANCE REQUIREMENTS FROM INSTALLER OF DRIVEN LOADS.

M. TOUCH UP SCRATCHED OR MARRED SURFACES TO MATCH ORIGINAL FINISH.

SECTION 235200 - BOILERS

A. MANUFACTURER'S QUALIFICATIONS: FIRMS REGULARLY ENGAGED IN MANUFACTURE OF BOILERS, OF TYPES AND CAPACITIES REQUIRED, WHOSE PRODUCTS HAVE BEEN IN SATISFACTORY USE IN SIMILAR SERVICE FOR NOT LESS THAN FIVE (5) YEARS.

B. MANUFACTURER'S TEST: ALL BOILERS SHALL BE FACTORY ASSEMBLED AND TESTED. SUBMIT TEST RESULTS TO CONTRACT/ENGINEER PRIOR TO SHIPPING.

C. PRODUCT DATA: SUBMIT MANUFACTURER'S TECHNICAL PRODUCT DATA, INCLUDING RATED CAPACITIES OF SELECTED MODEL CLEARLY INDICATED, WEIGHTS (SHIPPING, INSTALLED, AND OPERATING), FURNISHED SPECIALTIES, FLUE SIZING RECOMMENDATIONS AND ACCESSORIES; AND INSTALLATION AND START-UP INSTRUCTIONS.

D. SHOP DRAWINGS: SUBMIT MANUFACTURER'S ASSEMBLY-TYPE SHOP DRAWINGS INDICATING DIMENSIONS, WEIGHTS, LOADINGS, REQUIRED CLEARANCES, AND METHOD OF FIELD ASSEMBLY, COMPONENTS AND LOCATION AND SIZE OF EACH FIELD CONNECTION.

E. WIRING DIAGRAMS: SUBMIT MANUFACTURER'S ELECTRICAL REQUIREMENTS FOR POWER SUPPLY WIRING TO CAST IRON BOILERS. SUBMIT MANUFACTURER'S LADDER-TYPE WIRING DIAGRAMS FOR INTERLOCK AND CONTROL WIRING REQUIRED FOR FINAL INSTALLATION OF CAST IRON BOILERS AND CONTROLS. CLEARLY DIFFERENTIATE BETWEEN PORTIONS OF WIRING THAT ARE FACTORY INSTALLED AND PORTIONS TO BE FIELD-INSTALLED.

F. RECORD DRAWINGS: AT PROJECT CLOSEOUT, SUBMIT RECORD DRAWINGS OF INSTALLED SYSTEMS PRODUCTS IN ACCORDANCE WITH REQUIREMENTS OF THE MAIN CONTRACT.

G. MAINTENANCE DATA: SUBMIT MAINTENANCE DATA AND PARTS LIST FOR EACH CAST IRON BOILER, CONTROL, AND ACCESSORY; INCLUDING "TROUBLE-SHOOTING" MAINTENANCE GUIDE. INCLUDE THIS DATA, PRODUCT DATA, SHOP DRAWINGS, AND WIRING DIAGRAMS IN MAINTENANCE MANUAL; IN ACCORDANCE WITH REQUIREMENTS OF THE MAIN CONTRACT.

H. FINNED WATER TUBE BOILERS:
1. LOCHINVAR WATER HEATER CO.
2. PATTERSON - KELLY CO.
3. RHEEM MANUFACTURING CO.
4. A.O. SMITH, WATER PRODUCTS CO.

I. FINNED WATER TUBE BOILERS
1. THE WATER CONTAINING SECTION SHALL CONSIST OF A HEAT EXCHANGER CONSTRUCTED OF A "FIN TUBE" DESIGN, WITH STRAIGHT COPPER TUBES HAVING EXTRUDED INTEGRAL FINS SPACED SEVEN (7) FINS PER INCH. THESE TUBES SHALL BE "ROLLED" SECURELY INTO GLASS-LINED, CAST IRON HEADERS. THERE SHALL BE NO BOLTS, GASKETS OR "O" RINGS IN THE HEAD CONFIGURATION. REMOVABLE ACCESS PLUGS SHALL BE PROVIDED ON THE HEAT EXCHANGER HEADERS FOR THE PURPOSES OF INSPECTION, CLEANING OR REPAIR. BOILER DRAINS SHALL BE PROVIDED, HAVING EXTERNAL ACCESS. THE HEAT EXCHANGER SHALL BE MOUNTED IN A STRESS FREE JACKET ASSEMBLY IN ORDER TO PROVIDE A "FREE FLOATING DESIGN" ABLE TO WITHSTAND THE EFFECTS OF THERMAL SHOCK. THE BOILER SHALL BEAR THE ASME "H" STAMP FOR 160 PSI WORKING PRESSURE AND SHALL BE NATIONAL BOARD LISTED. THE COMPLETE HEAT EXCHANGER ASSEMBLY SHALL CARRY A TEN (10) YEAR WARRANTY AGAINST FAILURE CAUSED BY DEFECTIVE WORKMANSHIP OR MATERIAL.

2. THE COMBUSTION CHAMBER SHALL BE CONSTRUCTED OF STAINLESS STEEL AND SEALED FOR COMBUSTION EMPLOYING THE POWER BURNER CONCEPT. THE BURNER SURFACE SHALL BE CONSTRUCTED OF HIGH TEMPERATURE ALUMINUM/CHROMIUM ALLOY WOVEN MESH AND FIRE IN A VERTICAL PLANE WITHIN THE COMBUSTION CHAMBER. THE BURNER SHALL EMPLOY A SPECIAL PERFORATED FLAME INJECTION TUBE EXTENDING THE ENTIRE LENGTH OF THE HEAT EXCHANGER. A COMPLETE FIVE-YEAR WARRANTY FROM THE BOILER MANUFACTURER MUST BE PROVIDED. THE BURNER MUST BE CAPABLE OF FIRING AT BOTH A COMPLETE BLUE FLAME WITH MAXIMUM GAS AND AIR INPUT AS WELL AS FIRING INFRARED WHEN GAS AND AIR ARE REDUCED. BURNER MUST BE CAPABLE OF FIRING FROM 50 PERCENT UP TO 100 PERCENT OF RATED INPUT WHEN SUPPLIED WITH 4-INCHES WATER COLUMN OF INLET GAS PRESSURE TO THE BOILER. THIS WILL INSURE AVAILABILITY OF FULL RATE FIRING UNDER HEAVY DEMAND CONDITIONS, NO EXCEPTIONS. THE BURNER SHALL FIRE IN A FULL 360 DEGREE PATTERN RESULTING IN UNIFORM HEAT TRANSFER UPON EVERY INCH OF HEATING SURFACE. A VIEWING PORT SHALL BE PROVIDED, PERMITTING VISUAL OBSERVATION OF BURNER OPERATION.

3. THE HOT WATER BOILER SHALL USE A COMBUSTION AIR BLOWER TO PRECISELY CONTROL THE FUEL/AIR MIXTURE FOR MAXIMUM EFFICIENCY. THE BLOWER HOUSING SHALL BE A FULLY SEALED, NON-SPARKING, CAST ALUMINUM ASSEMBLY. THE BLOWER ASSEMBLY SHALL BE MOUNTED ON THE BURNER AND DRAW GAS AND AIR FROM A PREMIXING CHAMBER. A MULTI SPEED OR DRIVE SHALL BE USED TO INFINITELY VARY BLOWER SPEED AND VOLUME OF AIR DELIVERED TO THE COMBUSTION PROCESS. THE COMBUSTION AIR BLOWER SHALL OPERATE FOR A PRE-PURGE PERIOD BEFORE BURNER IGNITION AND A POST-PURGE PERIOD AFTER BURNER OPERATION TO CLEAR THE COMBUSTION CHAMBER. A DIFFERENTIAL AIR PRESSURE SWITCH SHALL BE PROVIDED TO PROVE OPERATION OF THE COMBUSTION AIR BLOWER, MONITOR COMBUSTION CHAMBER PRESSURES AND MONITOR OPERATION OF THE FLUE.

4. THE GAS TRAIN SHALL CONSIST OF A RATIO GAS VALVE TO SUPPLY GAS IN A 1:1 RATIO TO COMBUSTION AIR ALLOWING BURNER INPUT TO VARY BASED ON LOAD. THE RATIO GAS VALVE SHALL PERFORM THE FUNCTIONS OF SAFETY SHUTOFF, CONSTANT PRESSURE REGULATION AND AIR/GAS RATION CONTROL. OPERATION OF THE RATIO GAS VALVE SHALL BE ACCOMPLISHED BY OPERATION OF AN ELECTRO-HYDRAULIC CYLINDER PROVIDING A SLOW OPENING AND QUICK CLOSING OF THE VALVE SEAT. FULL CLOSING OF THE VALVE SEAT SHALL OCCUR IN LESS THAN 0.8 SECONDS WHEN THE VALVE IS DE-ENERGIZED. A VISUAL STROKE POSITION INDICATOR SHALL BE PROVIDED ON THE VALVE ASSEMBLY TO INDICATE THE POSITION OF THE VALVE SEAT. AN ADDITIONAL GAS VALVE SHALL BE PROVIDED IN THE GAS TRAIN TO PROVIDE REDUNDANT VALVE SEATS IN THE BURNER GAS SUPPLY.

5. THE BOILER SHALL BE CONSTRUCTED WITH A 16 GAUGE GALVANIZED STEEL JACKET ASSEMBLY. THE INTERIOR OF THE COMBUSTION CHAMBER AND FLUE COLLECTOR SHALL BE CONSTRUCTED COMPLETELY OF STAINLESS STEEL TO ENSURE CORROSION PROTECTION. ALL INNER AND OUTER JACKET PANELS SHALL BE FULLY GASKETED AND SEALED. THE EXTERIOR OF THE JACKET ASSEMBLY SHALL BE FINISHED IN A 3-COAT ACRYLIC ENAMEL FINISH. ALL MODELS SHALL BE CERTIFIED FOR INSTALLATION ON COMBUSTIBLE FLOORS WITHOUT ADDITIONAL SAFETY PROVISIONS.

6. THE BOILER SHALL BE DESIGNED TO ALLOW FIELD INSTALLATION OF MULTIPLE VENTING OPTIONS. THE BOILER SHALL BE VENTED WITH A VERTICAL DIRECTAIRE SYSTEM USING A TWO-PIPE SYSTEM INSTALLED WITH CATEGORY I VENT PIPE.

7. A 24 VAC CONTROL CIRCUIT AND COMPONENTS SHALL BE USED. ALL COMPONENTS SHALL BE EASILY ACCESSED AND SERVICEABLE FROM THE FRONT AND TOP OF THE UNIT. STANDARD OPERATING CONTROLS SHALL UTILIZE IMMERSION THERMISTERS TO SENSE WATER TEMPERATURES, FOR THE DIGITAL TEMPERATURE CONTROL MODULE. AN ADJUSTABLE IMMERSION TYPE, MANUAL RESET SAFETY HIGH LIMIT SHALL BE PROVIDED TO LIMIT BOILER WATER TEMPERATURE. THE CONTROL PANEL SHALL CONTAIN A LIGHTED ON/OFF MAIN POWER SWITCH, DIGITAL TEMPERATURE DISPLAY AND LED'S FOR OPERATION AND ALARM FAULTS. SUPPLY VOLTAGE SHALL BE 120-1 PHASE.

8. THE BOILER SHALL BE EQUIPPED WITH AN ELECTRONIC TEMPERATURE CONTROL MODULE WITH A MICROPROCESSOR BASED PLATFORM INCORPORATING SOFTWARE CUSTOMIZED FOR OPERATION OF THE BOILER. ALL INTERNAL SAFETY, OPERATING AND IGNITION CONTROLS SHALL INTERFACE WITH THE ELECTRONIC TEMPERATURE CONTROL MODULE. THE ELECTRONIC TEMPERATURE CONTROL MODULE SHALL PROVIDE ON/OFF CONTROL OF THE GAS SUPPLY TO THE BURNER, OPERATION OF THE VFD TO CONTROL THE VARIABLE SPEED COMBUSTION AIR BLOWER, INTERFACE WITH THE IGNITION CONTROL SYSTEM, CONTROL OF WATER TEMPERATURE SET POINTS, AND MONITORING OF ALL SAFETY FUNCTIONS. LOCAL COMMUNICATION, PROGRAMMING AND A DISPLAY OF OPERATING AND ALARM STATUS CONDITIONS SHALL BE ACCESSIBLE THROUGH A DIAGNOSTIC INFORMATION CENTER WITH A DIGITAL DISPLAY. THE DIAGNOSTIC INFORMATION CENTER SHALL BE INTEGRALLY MOUNTED ON THE FRONT CONTROL PANEL OF THE BOILER. THE DIAGNOSTIC INFORMATION CENTER SHALL CONTAIN A LIGHTED ON/OFF MAIN POWER SWITCH, A DIGITAL DISPLAY OF A TEMPERATURE FUNCTIONS AND A SERIES OF LED'S TO INDICATE DATA CURRENTLY SHOWN IN THE DIGITAL DISPLAY, THE OPERATIONAL STATUS OF THE BOILER, OR AN ACTIVE ALARM FAULT. DATA POINTS VISIBLE IN THE DIGITAL DISPLAY INCLUDE INLET WATER TEMPERATURE, OUTLET WATER TEMPERATURE, WATER TEMPERATURE DIFFERENTIAL, PERCENT FIRING RATE, SETPOINT TEMPERATURES AND SETPOINT DIFFERENTIAL. OPERATIONAL STATUS LED'S SHALL BE PROVIDED FOR CALL FOR HEAT, LOW AIR, PURGE, TRIAL FOR IGNITION AND BURNER ON. FAULT STATUS LED'S SHALL BE PROVIDED FOR HIGH LIMIT, GAS PRESSURE, LOW WATER, MOTOR DRIVE AND IGNITION MODULE STATUS. THE BOILER ELECTRONIC TEMPERATURE MODULE SHALL SERVE AS AN OPERATING TEMPERATURE CONTROL TO TRACK DEMAND AND REGULATE THE AMOUNT OF HEAT ADDED TO THE WATER SYSTEM FOR HEATING BOILERS.

9. THE BOILER SHALL FEATURE THE "SMART SYSTEM" CONTROL WITH A 2-LINE, 16 CHARACTER LCD DISPLAY, PASSWORD SECURITY OUTDOOR RESET, PUMP DELAY WITH FREEZE PROTECTION, PUMP EXERCISE AND PC PORT CONNECTION. THE BOILER SHALL ALLOW 0-10 VDC INPUT CONNECTION FOR BMS CONTROL AND HAVE BUILT-IN "CASCADE" TO SEQUENCE AND ROTATE WHILE MAINTAIN STAGE FIRING OF TWO BOILERS WITHOUT UTILIZATION OF AN EXTERNAL CONTROLLER.

10. LOCAL COMMUNICATION, PROGRAMMING AND A DISPLAY OF OPERATING AND ALARM STATUS CONDITIONS SHALL BE ACCESSIBLE THROUGH THE SMART SYSTEM CONTROL PANEL. THE SMART SYSTEM CONTROL PANEL SHALL CONTAIN AN ON/OFF MAIN POWER SWITCH, A DIGITAL DISPLAY OF A TEMPERATURE FUNCTIONS, THE OPERATIONAL STAUS OF THE BOILER, OR AN ACTIVE ALARM FAULT. DATA POINTS VISIBLE IN THE DIGITAL DISPLAY INCLUDE INLET WATER TEMPERATURE, OUTLET WATER TEMPERATURE, WATER TEMPERATURE DIFFERENTIAL, PERCENT FIRING RATE, SETPOINT TEMPERATURES, SETPOINT DIFFERENTIAL, OUTDOOR AIR TEMPERATURE, MINIMUM TEMPERATURE, MAXIMUM TEMPERATURE AND MAXIMUM RESET TEMPERATURE. OPERATIONAL STATUS SHALL BE DISPLAYED FOR OFF, STANDBY, PRE-PURGE, IGNITION, SPACE HEATING, DHW HEATING, AND POST-PURGE. FAULT STAUS SHALL BE PROVIDED FOR HIGH LIMIT, GAS PRESSURE (OPTIONAL), LOW WATER, BLOCKED DRAIN, LOUVER PROVING, AND AIR PRESSURE SWITCH STATUS.

11. THE STANDARD OPERATING CONTROL SYSTEM SHALL INCLUDE REDUNDANT PROVEN PILOT HOT SURFACE IGNITION WITH FULL FLAME MONITORING CAPABILITY. THE IGNITION SYSTEM SHALL BE ABLE TO FUNCTION INDEPENDENTLY IN THE EVENT OF A FAILURE IN ONE SYSTEM. MULTIPLE MAIN GAS VALVES WITH REDUNDANT VALVE SEATS AND BUILT IN LOW GAS PRESSURE REGULATORS SHALL BE SUPPLIED AS STANDARD. GAS VALVES WILL BE REFERENCED TO THE COMBUSTION CHAMBER TO ENSURE PROPER AIR/GAS MIXTURE FOR EFFICIENT COMBUSTION.

12. ADDITIONAL STANDARD CONTROLS SHALL INCLUDE A FLOW SWITCH, LOW AIR/BLOCKED FLUE PRESSURE SWITCH FOR EACH FAN, LOW VOLTAGE TRANSFORMER FOR THE CONTROL CIRCUIT, 7 AMP CIRCUIT BREAKER AND AN ASME PRESSURE RELIEF VALVE. ALL NATURAL GAS MODELS WILL BE EQUIPPED WITH AN AUTOMATIC RESET LOW GAS PRESSURE SWITCH. THE MANUFACTURER SHALL VERIFY PROPER OPERATION OF THE BURNERS, ALL CONTROLS AND THE HEAT EXCHANGER BY CONNECTION TO WATER AND VENTING FOR A FACTORY FIRE TEST PRIOR TO SHIPPING. A QUALITY TEST REPORT SHALL BE SHIPPED WITH EACH UNIT AND SUBMITTED TO THE CONTRACTOR/ENGINEER.

13. A 24 VAC CONTROL CIRCUIT AND COMPONENTS SHALL BE USED. ALL COMPONENTS SHALL BE EASILY ACCESSED AND SERVICEABLE. ALL COMPONENTS SHALL HAVE MULTI-PIN, PLUG IN TYPE CONNECTORS TO EASE SERVICE, TROUBLESHOOTING AND LOWER REMOVAL AND REPLACEMENT COST. THE BOILER MUST BE ABLE TO MAINTAIN APPROXIMATELY 50% OPERATING CAPACITY IN THE EVENT OF A FAILURE OF ANY ONE (1) CONTROL COMPONENT, I.E. GAS VALVE, COMBUSTION AIR FAN, IGNITION CONTROL, IGNITER OR PRESSURE SWITCH.

14. THE BOILER SHALL BE APPROVED FOR INDOOR INSTALLATION. THE BOILER SHALL BE APPROVED FOR SIDEWALL, DIRECTAIRE VERTICAL, DIRECTAIRE VERTICAL WITH SIDEWALL AIR INLET, DIRECTAIRE HORIZONTAL, AIRELOCK DIRECT VENT AND CONVENTIONAL VENTING (SEE MECHANICAL DETAIL). VENTING SHALL BE CLASSIFIED CATEGORY I, NEGATIVE DRAFT, NON-CONDENSING, TO USE TYPE "B" DOUBLE WALL VENTING MATERIALS. DIRECT VENT INSTALLATIONS REQUIRE THE USE OF AL294C VENT MATERIALS.

15. THE BOILER SHALL HAVE AN INDEPENDENT LABORATORY RATING FOR OXIDES OF NITROGEN (NOx) OF LESS THAN 20 PPM CORRECTED TO 3% O2.

16. THE FIRING CONTROL SYSTEM SHALL BE M9.
c. M-9 - TWO HOT SURFACE IGNITIONS WITH ELECTRONIC SUPERVISION (STANDARD)

18. THE ELECTRONIC TEMPERATURE CONTROL MODULE SHALL BE CAPABLE OF VARYING BURNER INPUT FROM 35 PERCENT UP TO 100 PERCENT OF RATED INPUT. BURNER INPUT MAY VARY IN STEPS AS SMALL 1 PERCENT OF INPUT ALLOWING UP TO 50 ADJUSTABLE STEPS WHILE TRACKING THE HEATING LOAD. ACCESS TO THE BOILER ELECTRONIC TEMPERATURE CONTROL AND THE DIGITAL DISPLAY SHALL BE FROM A FRONT MOUNTED DIAGNOSTIC INFORMATION CENTER. THE ELECTRICAL COMPONENTS, RELAYS AND CIRCUIT BOARDS SHALL BE ACCESSIBLE FROM THE FRONT CONTROL PANEL ACCESS. ALL ELECTRICAL CONNECTIONS FROM THE SAFETY AND OPERATING CONTROLS TO THE ELECTRONIC TEMPERATURE CONTROL MODULE SHALL BE MADE BY A WIRING HARNESS WITH UNIQUE MULTIPLE PIN TERMINATIONS FOR EACH CONNECTION POINT.

19. THE IGNITION CONTROL SYSTEM SHALL INCLUDE AN ELECTRONICALLY PROVEN HOT SURFACE IGNITION SYSTEM WITH FULL FLAME MONITORING CAPABILITY. ADDITIONAL STANDARD CONTROLS SHALL INCLUDE A LOW VOLTAGE TRANSFORMER FOR THE CONTROL CIRCUIT, A FLOW SWITCH TO PROVE WATER FLOW, TEMPERATURE-PRESSURE GAUGE AND A FACTORY INSTALLED ASME PRESSURE RELIEF VALVE. ALL INTERNAL AND EXTERNAL WIRING HARNESS CONNECTIONS SHALL HAVE MULTI-PIN PLUG-IN TYPE CONNECTORS TO EASE SERVICE, TROUBLESHOOTING AND REDUCE REMOVAL AND REPLACEMENT COST. THE MANUFACTURER SHALL VERIFY PROPER OPERATION OF THE BURNERS, ALL CONTROLS AND THE HEAT EXCHANGER BY CONNECTION TO GAS, WATER AND VENTING FOR A FULL FACTORY FIRE TEST PRIOR TO SHIPPING. A QUALITY TEST REPORT SHALL BE SHIPPED WITH EACH UNIT.

20. THE BOILER SHALL BE CERTIFIED AND LISTED BY THE CSA INTERNATIONAL UNDER THE LATEST EDITION OF THE ANSI Z21.13 TEST STANDARD. THE BOILER SHALL COMPLY WITH THE ENERGY EFFICIENCY REQUIREMENTS OF THE LATEST EDITION OF THE ASHRAE 90.1 STANDARD. THE BOILER SHALL BE CERTIFIED AND LISTED IN CANADA BY THE CANADIAN GAS ASSOCIATION UNDER THE LATEST EDITION OF STANDARDS CAN1-3.1 AND CSA C22.2. THE BOILER SHALL OPERATE AT UP TO 85 PERCENT THERMAL EFFICIENCY.

21. M9 - INFINITELY PROPORTIONAL COMBUSTION: PEAK EFFICIENCY IS ACHIEVED BY ADJUSTING THE FIRING RATE BETWEEN 35 AND 100 PERCENT OF RATED OUTPUT. INCLUDES HOT SURFACE IGNITION WITH ELECTRONIC FLAME SUPERVISION TO PROVIDE MAIN BURNER SHUTDOWN UPON FLAME FAILURE. CSA/ANSI CERTIFIED SAFETY CONTROL SYSTEM. CONTROL CIRCUIT IS 24 VOLT.

J. INSTALLATION OF BOILERS
1. GENERAL: INSTALL BOILERS IN ACCORDANCE WITH MANUFACTURER'S INSTALLATION INSTRUCTIONS, IN ACCORDANCE WITH STATE AND LOCAL CODE REQUIREMENTS, AND IN ACCORDANCE WITH REQUIREMENTS OF LOCAL UTILITY COMPANY. INSTALL UNITS PLUMB AND LEVEL, TO TOLERANCE OF 1/8-INCH IN 10' - 0" IN BOTH DIRECTIONS. MAINTAIN MANUFACTURER'S RECOMMENDED CLEARANCES AROUND AND OVER BOILERS.
2. SUPPORT: INSTALL BOILERS ON 4-INCH BASE, 6-INCH LARGER ON EACH SIDE THAN BASE OF UNIT OR STEEL FRAME WITH MINIMUM OF 4" HEIGHT.

235100 - BOILER VENTING

GENERAL

A. THIS SECTION SPECIFIES THE FOLLOWING:
1. DOUBLE WALL METAL VENTS AND ACCESSORIES FOR GAS-FIRED APPLIANCES

B. CODES AND STANDARDS:
1. NFPA: COMPLY WITH NFPA 211 "STANDARD FOR CHIMNEYS, FIREPLACES, VENTS AND SOLID FUEL BURNING APPLIANCES".
2. UL: COMPLY WITH APPLICABLE PORTIONS OF UL SAFETY STANDARDS; PROVIDE PRODUCTS WHICH HAVE BEEN UL LISTED AND LABELED.
3. SMACNA: COMPLY WITH SMACNA LOW PRESSURE DUCT STANDARDS FOR FABRICATED BREECHING AND SMOKEPIPE.
4. ASHRAE: COMPLY WITH THE ASHRAE EQUIPMENT HANDBOOK, CHAPTER 27, FOR CHIMNEY, GAS VENT, AND FIREPLACE SYSTEMS, MATERIAL REQUIREMENTS AND DESIGN CRITERIA.
5. UMC: COMPLY WITH THE INTERNATIONAL MECHANICAL CODE AND INTERNATIONAL FUEL GAS CODE FOR CHIMNEY APPLICATION AND REQUIREMENTS OF STACK TYPE, HEIGHT, AND CLEARANCES.

C. SHOP DRAWINGS: SUBMIT SHOP DRAWINGS INCLUDING REQUIRED CLEARANCES, ASSEMBLY AND INSTALLATION INSTRUCTIONS, AND SUPPORT OF COMPONENTS.
1. THE SHEET METAL CONTRACTOR SHALL SUBMIT A COMPUTERIZED VENT SIZING ANALYSIS FOR THE ACTUAL BOILERS AND WATER HEATERS BEING FURNISHED. THE COMPUTER ANALYSIS SHALL LIST THE MAKE, MODEL NUMBER, FIRING RATE, AND THE ALLOWABLE BACK PRESSURE FOR EACH APPLIANCE, THE QUANTITY AND TYPE OF EACH COMPONENT, THE DRAFT CONDITIONS WITH EACH APPLIANCE FIRING INDIVIDUALLY AND WITH ALL APPLIANCES FIRING. THE CONTRACTOR SHALL ALSO PROVIDE DRAWINGS SHOWING ALL COMPONENTS AND THEIR LOCATION IN THE SYSTEM.

D. ALL PARTS EXPOSED TO OUTSIDE ATMOSPHERE SHALL BE COATED BY THE INSTALLER, WITH ONE (1) BASE COAT AND ONE (1) FINISH COAT OF GLIDDEN, METALLITE, OR EQUAL.

E. QUALITY CONTROL SUBMITTALS:
1. CERTIFICATES: SUBMIT CERTIFICATES OF MATERIALS COMPLIANCE WITH SPECIFIED ASTM, UL, AND ASHRAE REQUIREMENTS.
2. CERTIFICATES: SUBMIT WELDERS' QUALIFICATION CERTIFICATES.

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

BARNARD EJMT TEAM

BARNARD

RONDINELLI

BCER

Sturgeon ELECTRIC

Western States Fire Protection Co.

CONSULTING ENGINEERS

EISENHOWER/JOHNSON MEMORIAL TUNNEL

FIXED FIRE SUPPRESSION SYSTEM DESIGN BUILD PROJECT

Project No. C0703-360 Subaccount 17810

RECORD DRAWINGS - 2015-11-16

Revisions

Num	Description	Date

DRAWN BY: JEB CHECKED BY: RDM

MECHANICAL SPECIFICATIONS

Drawing Number

M8.2

MECHANICAL SPECIFICATIONS

3. CERTIFICATES: SUBMIT COMPLETE ENGINEERING REPORT CERTIFYING THAT STACKS MEET THE CODE WIND AND SEISMIC LOADS.

F. RECORD DRAWINGS: AT PROJECT CLOSEOUT, SUBMIT RECORD DRAWINGS OF INSTALLED SYSTEMS PRODUCTS IN ACCORDANCE WITH REQUIREMENTS OF THE MAIN CONTRACT.

G. TYPE B GAS VENTS (GAS-BURNING APPLIANCES ONLY):
1. DESCRIPTION: DOUBLE WALL GAS VENTS, UL LISTED FOR TYPE B, CONSISTING OF AN INNER PIPE OF SHEET ALUMINUM, AND OUTER PIPE OF GALVANIZED SHEET STEEL, WITH THE FOLLOWING MINIMUM THICKNESSES:

ROUND, UP TO 6 INCH GAUGE	0.012-INCH	28
ROUND, 7-INCH TO 18-INCH GAUGE	0.014-INCH	28

H. ACCESSORIES: UL-LABELED TEES, ELBOWS, INCREASERS, DRAFT HOOD CONNECTORS, METAL CAP WITH BIRD BARRIER, ADJUSTABLE ROOF FLASHING, STORM COLLAR, SUPPORT ASSEMBLY, THIMBLES, FIRE STOP SPACERS, AND FASTENERS, FABRICATED OF SIMILAR MATERIALS AND DESIGNS AS VENT PIPE STRAIGHT SECTIONS.

I. ALL STEEL, POSITIVE PRESSURE, DOUBLE AND VENTS:
1. DESCRIPTION: UL-LABELED DOUBLE AND TRIPLE WALL METAL STACKS FOR USE WITH BUILDING HEATING EQUIPMENT BURNING GAS, SOLID, OR LIQUID FUELS NOT EXCEEDING 1,000 DEGREE F CONTINUOUS AND CAPABLE OF MAINTAINING AIRTIGHT INTEGRITY AT PRESSURES UP TO 72-INCH W.C. AS DESCRIBED IN NFPA 211 AND UL 103.
2. CONSTRUCTION: ALL STACKS AND BREECHINGS WILL HAVE INNER WALLS OF 20 GAUGE (TYPE 304 STAINLESS STEEL FOR GAS AND NO. 2 OIL) OR (TYPE 316 STAINLESS STEEL FOR SOLID FUELS, OR NO. 4 THRU NO. 6 OIL). THE OUTER JACKET SHALL BE 24 GAUGE ALUMINUM COATED STEEL FOR SIZES UP TO 24-INCH I.D. AND 20 GAUGE FOR SIZES 26-INCH I.D. AND LARGER. THERE SHALL BE MINIMUM 1-INCH AIR SPACE BETWEEN THE INNER AND OUTER WALLS.

J. ACCESSORIES: UL-LABELED TEES, ELBOWS, INCREASERS, DRAFT HOOD CONNECTORS, METAL CAP WITH BIRD BARRIER, ADJUSTABLE ROOF FLASHING, STORM COLLAR, SUPPORT ASSEMBLY, THIMBLES, FIRE STOP SPACERS, AND FASTENERS FABRICATED OF SIMILAR MATERIALS AND DESIGNS AS VENT PIPE STRAIGHT SECTIONS.

K. MANUFACTURERS SHALL BE THE FOLLOWING OR EQUAL:
1. AMERICAN METAL PRODUCTS
2. GENERAL PRODUCTS
3. HART & COOLEY
4. METALBESTOS
5. SIMPSON DURA-VENT
6. VAN PACKER
7. AMPCO

235700 - HEAT EXCHANGERS

GENERAL

A. MANUFACTURER'S QUALIFICATIONS: FIRMS REGULARLY ENGAGED IN MANUFACTURE OF HEAT EXCHANGERS, OF TYPES, MATERIALS, AND SIZES REQUIRED, WHOSE PRODUCTS HAVE BEEN IN SATISFACTORY USE IN SIMILAR SERVICE FOR NOT LESS THAN FIVE (5) YEARS.

B. AHRI-400 CERTIFICATION: CONSTRUCT PLATE AND FRAME OR BRONZED PLATE HEAT EXCHANGERS IN ACCORDANCE WITH AHRI-400.

C. MANUFACTURER: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING:
1. WATER-TO-WATER PLATE AND FRAME HEAT EXCHANGERS:
   a. PAUL MUELLER CO.
   b. TRANTER, INC.
   c. ALFA-LAVAL

D. WATER-TO-WATER PLATE AND FRAME HEAT EXCHANGER
1. THIS CONTRACTOR SHALL PROVIDE PLATE AND FRAME HEAT EXCHANGER OF CAPACITY AS SCHEDULED AND WHERE SHOWN ON THE DRAWINGS WITH EMBOSSED HEAT TRANSFER PLATES, PERIMETER GASKETS, GUIDE RAILS, AND FRAMES AND COMPRESSION BOLTS.
2. UNITS SHALL BE ASME RATED FOR 250 PSIG OPERATING PRESSURE, 300 DEGREE F (149 DEGREE C) MAXIMUM TEMPERATURE, HAVE A HEAT TRANSFER AREA AS SCHEDULED ON THE DRAWING.
3. FRAME SHALL BE CARBON STEEL WITH BAKED EPOXY ENAMEL PAINT, SIDE BOLTS AND SHROUD. PLATES SHALL BE TYPE 304 STAINLESS STEEL.
4. GASKETS SHALL BE NITRILE RUBBER.
5. NOZZLES SHALL BE 250 LB. ASA RATED LOOSE FLANGE TYPE, OF THE SIZE CALLED FOR ON THE DRAWINGS.
6. HEAT EXCHANGER SHALL BE AHRI-400 CERTIFIED.

E. GENERAL: COMPLY WITH WATER-TO-WATER PLATE AND FRAME HEAT EXCHANGER MANUFACTURER'S INSTRUCTIONS FOR INSTALLATION.

F. CLEANING: CLEAN FACTORY-FINISHED SURFACES. REPAIR ANY MARRED OR SCRATCHED SURFACES WITH MANUFACTURER'S TOUCH-UP PAINT.

G. GENERAL: FURNISH TO OWNER, REPLACEMENT GASKETS FOR EACH FLANGED CONNECTION FOR EACH HEAT EXCHANGER FOR A PERIOD OF 5 YEARS.

232505 - BY-PASS FEEDER

A. PROVIDE A BY-PASS FEEDER FOR ADDING CHEMICAL TO THE CLOSED WATER SYSTEM. THE FEEDER SHALL HAVE TWO (2) 3/4-INCH NPT FEMALE PIPE CONNECTIONS, AND A 3-1/2 INCH QUICK TOP OPENING CAP, WITH 0-RING SEAT. CAPACITY OF THE FEEDER SHALL BE 2 GALLONS, CAPABLE OF OPERATING AT 250 PSIG AND AT A TEMPERATURE UP TO 212 DEGREE F. THE BY-PASS FEEDER SHALL BE MOUNTED NO HIGHER FROM THE FLOOR THAN 48-INCHES.

B. PROVIDE CHEMICALS TO THE BOILER SYSTEM. FOR START-UP AND 5 YEAR MAINTENANCE PERIOD.

END OF SPECIFICATION

IF THIS SHEET IS NOT 22"x34" IT IS NOT PLOTTED TO SCALE

BARNARD EJMT TEAM

BARNARD RONDINELLI BCER Engineering Sturgeon Electric Western States Fire Protection Co. CONSULTING ENGINEERS

EISENHOWER/JOHNSON MEMORIAL TUNNEL
FIXED FIRE SUPPRESSION SYSTEM
DESIGN BUILD PROJECT
Project No. C0703-360 Subaccount 17810
RECORD DRAWINGS - 2015-11-16

Revisions

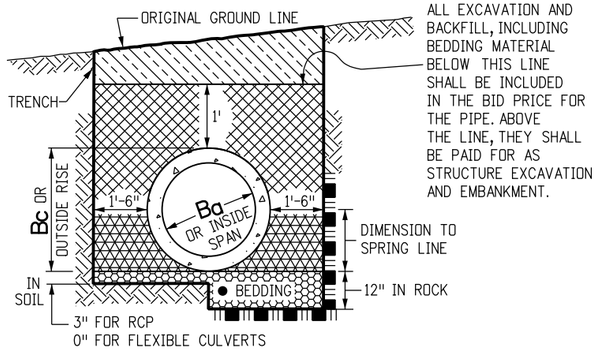
Num	Description	Date

DRAWN BY: JEB CHECKED BY: RDM

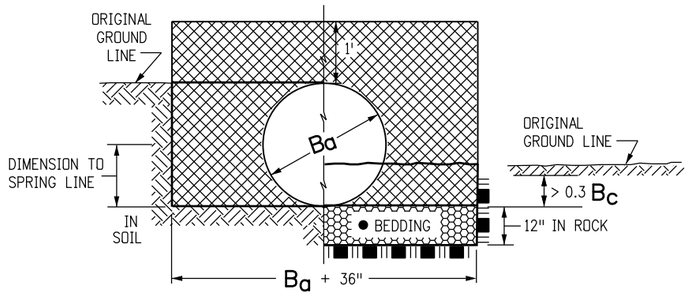
MECHANICAL SPECIFICATIONS

Drawing Number

M8.3



PIPE IN TRENCH

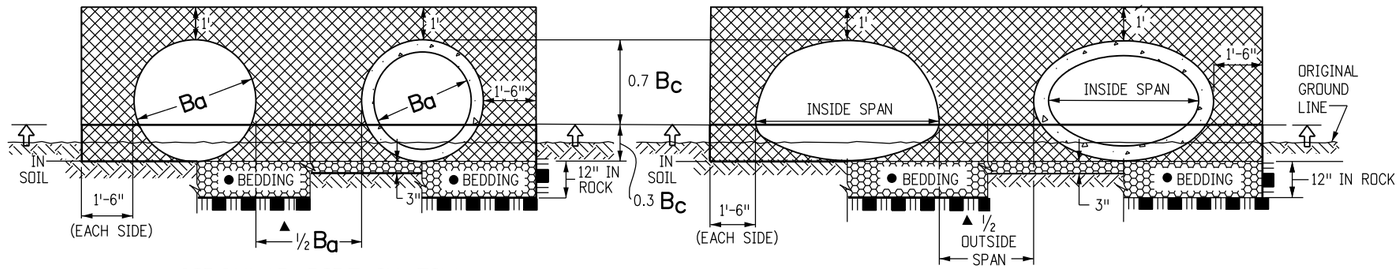


CIRCULAR PIPE

(WHERE ORIGINAL GROUND LINE IS BETWEEN 0.3 B_C AND B_C + 1 FT. ABOVE FLOWLINE)

● THE BEDDING MATERIAL FOR RIGID PIPE IN SOIL SHALL BE 3 IN. OF LOOSE STRUCTURE BACKFILL (CLASS 1 OR 2). BEDDING IS NOT REQUIRED FOR FLEXIBLE PIPE IN SOIL. BEDDING MATERIAL FOR RIGID OR FLEXIBLE PIPE IN ROCK SHALL BE 12 IN. OF LOOSE STRUCTURE BACKFILL, CLASS 1.

▲ WHEN TWO OR MORE CONDUITS ARE LAID SIDE-BY-SIDE, THEY SHALL BE PLACED SO THAT THEY ARE ½ OUTSIDE DIAMETER, OR ½ OUTSIDE SPAN, OR 3 FT. APART, WHICHEVER IS LESS. HOWEVER, IF END SECTIONS ARE USED, THE MINIMUM SPACING SHALL BE 1 FT. BETWEEN END SECTIONS.



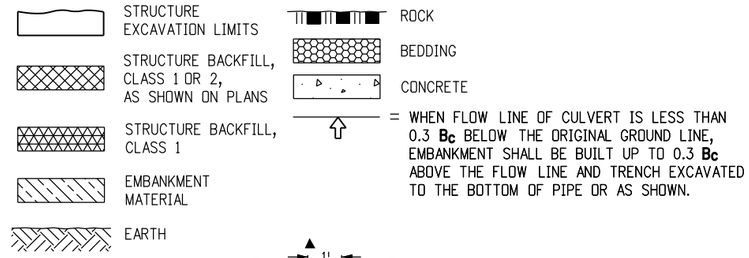
CIRCULAR PIPE IN FILL

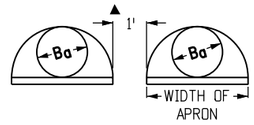
ARCH OR ELLIPTICAL PIPE IN FILL

GENERAL NOTES

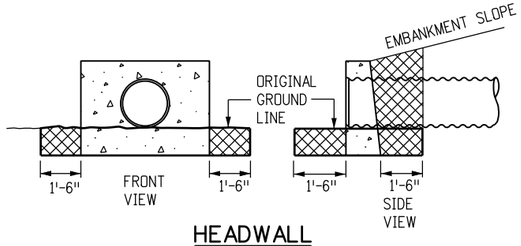
1. EXCAVATION AND BACKFILL PATTERNS DIFFERENT FROM THOSE INDICATED ON THESE SHEETS WILL BE SHOWN ELSEWHERE ON THE PLANS.
2. EXCAVATION FOR CHANNEL CHANGE OR CHANNEL IMPROVEMENT WILL BE EITHER UNCLASSIFIED EXCAVATION OR MUCK EXCAVATION AND WILL BE NOTED ON THE PLANS. EXCAVATION FROM THE CHANNEL FLOWLINE TO THE DEPTH REQUIRED FOR THE NEW STRUCTURE AND INCIDENTAL CHANNEL EXCAVATION WILL BE PAID FOR AS STRUCTURE EXCAVATION.
3. STRUCTURE FOOTINGS WHICH ARE LOCATED IN ROCK SHALL BE POURED OUT TO UNDISTURBED ROCK WITHOUT FORMING IN CONFORMANCE WITH SUBSECTION 601.09(b).
4. STRUCTURAL PLATE CULVERTS SHALL BE CONSTRUCTED AS SHOWN ON THE PLANS.
5. **B_a** EQUALS THE INSIDE DIAMETER OF A PIPE AND **B_c** EQUALS THE OUTSIDE DIAMETER OF A PIPE. FOR THIN WALLED PIPES, IT IS ASSUMED THAT **$B_a = B_c$**.
6. APPROXIMATE STRUCTURE EXCAVATION AND BACKFILL QUANTITIES, UP TO 1 FT. OVER THE PIPE WILL BE SHOWN ON THE PLANS, FOR INFORMATION ONLY.

LEGEND

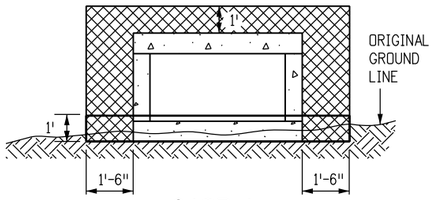




CONDUIT WITH END SECTIONS

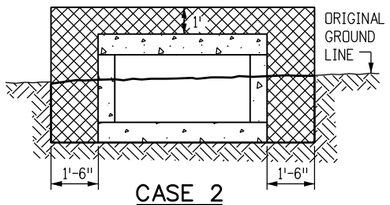


HEADWALL



CASE 1

APPLIES WHEN THE ORIGINAL GROUND LINE IS LESS THEN 1 FT. ABOVE THE BOTTOM OF THE BOX CULVERT. THE EMBANKMENT SHALL BE BUILT UP TO 1 FT. ABOVE THE BOTTOM OF THE BOX CULVERT AND THEN EXCAVATED TO THE BOTTOM OF THE BOX CULVERT. THIS EMBANKMENT AND EXCAVATION WILL NOT BE MEASURED AND PAID FOR SEPARATELY BUT SHALL BE INCLUDED IN THE COST OF THE WORK.

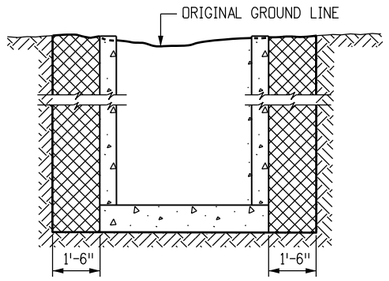


CASE 2

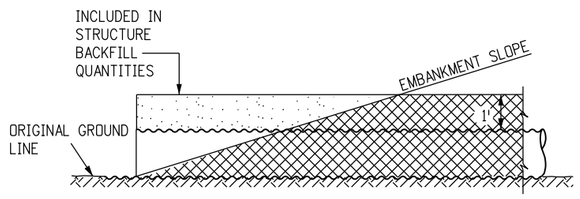
APPLIES WHEN THE ORIGINAL GROUND LINE IS MORE THAN 1 FT. ABOVE THE BOTTOM OF THE BOX CULVERT.

CONCRETE BOX CULVERT

IN BOTH CASES, THE TRENCH (OUTLINED BY THE THICK SOLID LINE) SHALL THEN BE EXCAVATED TO ACCOMMODATE CONSTRUCTION OF THE BOX CULVERT.



DROP INLETS AND DIVISION BOXES



END OF PIPE

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Last Modification Date: 07/04/12 Initials: LTA	(R-X)		
Full Path: www.coloradodot.info/business/designsupport	(R-X)		
Drawing File Name: 206010102.dgn	(R-X)		
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	(R-X)		

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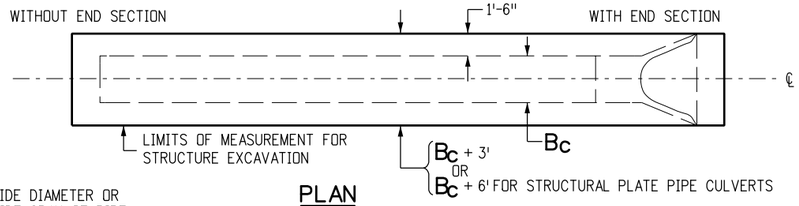
Project Development Branch DD/LTA

EXCAVATION AND BACKFILL FOR STRUCTURES

Issued By: Project Development Branch July 4, 2012

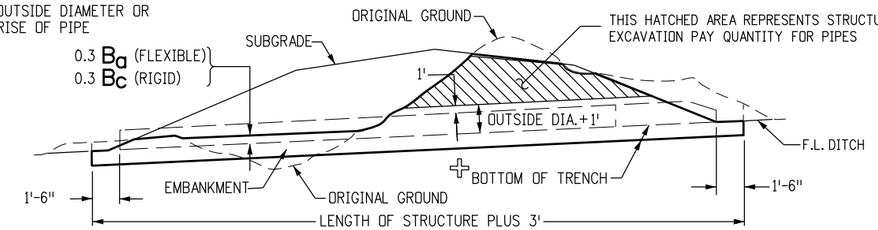
STANDARD PLAN NO.
M-206-1
Sheet No. 1 of 2



PLAN

B_a = INSIDE DIAMETER OR INSIDE SPAN OF PIPE

B_c = OUTSIDE DIAMETER OR RISE OF PIPE

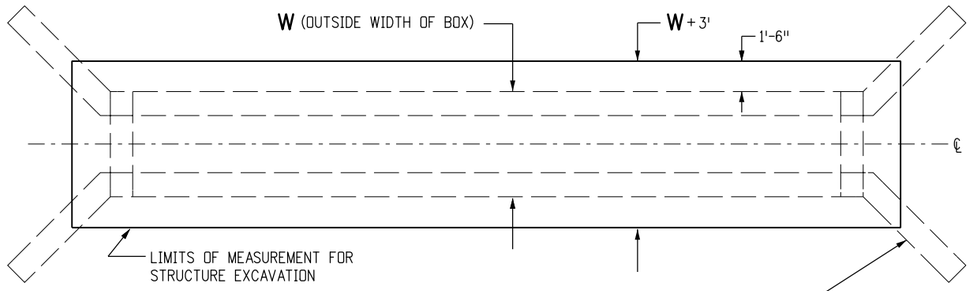


PROFILE

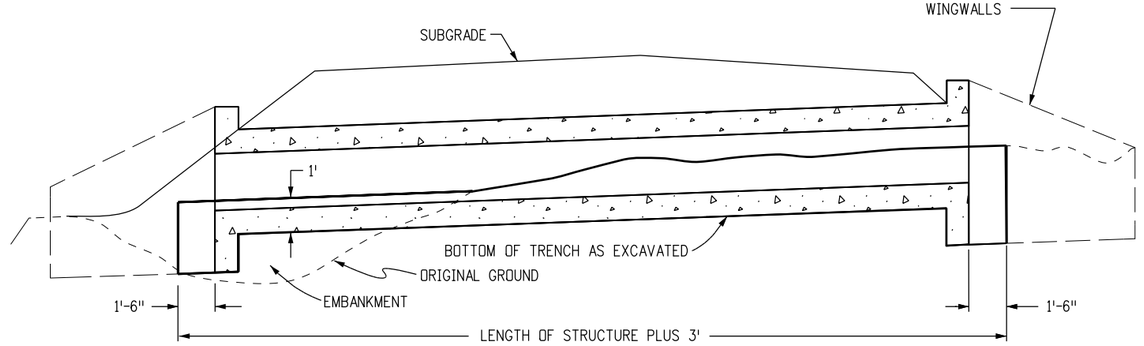
✙ FOR APPLICABLE LIMITS OF STRUCTURE EXCAVATION, SEE BEDDING DETAILS ON SHEET 1 OF THESE DETAILS.

STRUCTURE EXCAVATION UP TO 1 FT. ABOVE THE TOP OF THE PIPE SHALL BE INCLUDED IN THE BID PRICE OF THE PIPE.

STRUCTURE EXCAVATION MEASUREMENT FOR PIPE CULVERTS

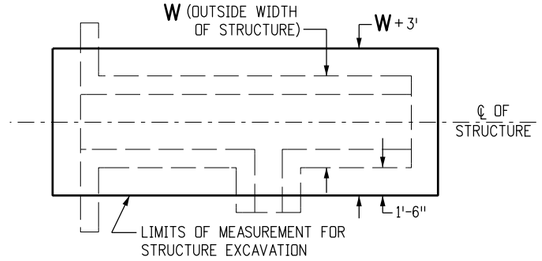


PLAN

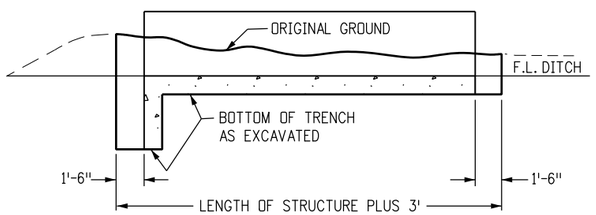


PROFILE

STRUCTURE EXCAVATION MEASUREMENT FOR CONCRETE BOX CULVERTS

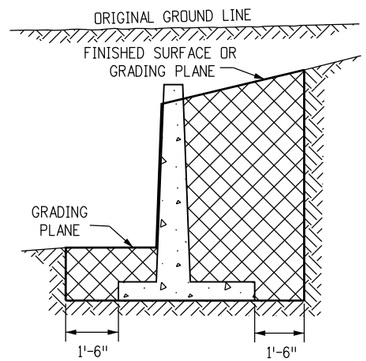


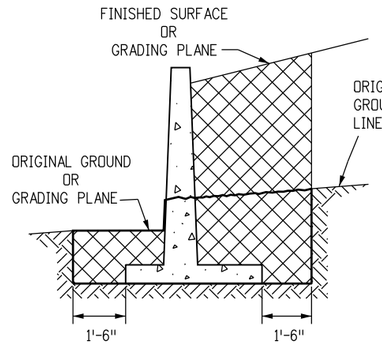
PLAN

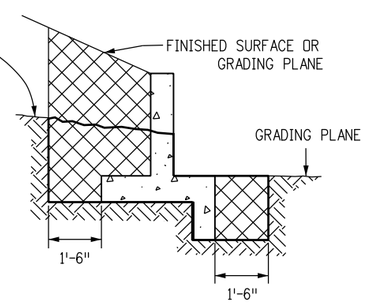


PROFILE

STRUCTURE EXCAVATION MEASUREMENT FOR DIVISION BOXES







WINGWALL

RETAINING WALL IN CUT & IN PARTIAL CUT

ANY ADDITIONAL EXCAVATION BEHIND THE LIMITS SHOWN SHALL BE FILLED WITH CLASS I BACKFILL MATERIAL. THE ADDITIONAL EXCAVATION AND BACKFILL WILL NOT BE MEASURED AND PAID FOR.

LEGEND

- STRUCTURE EXCAVATION LIMITS
- STRUCTURE BACKFILL, CLASS 1 OR 2, AS SHOWN ON PLANS
- CONCRETE

Computer File Information		Sheet Revisions	
Creation Date: 07/04/12 Initials: DD		Date:	Comments
Last Modification Date: 07/04/12 Initials: LTA	R-X		
Full Path: www.coloradodot.info/business/designsupport	R-X		
Drawing File Name: 206010202.dgn	R-X		
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	R-X		

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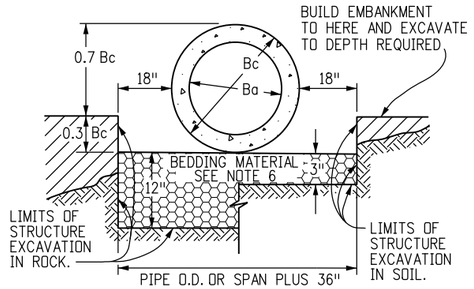
EXCAVATION AND BACKFILL FOR STRUCTURES

Issued By: Project Development Branch July 4, 2012

STANDARD PLAN NO.

M-206-1

Sheet No. 2 of 2



NOTE: Bc IS THE OUTSIDE DIMENSION FOR DIAMETER, SPAN OR RISE.

PIPE INSTALLATION

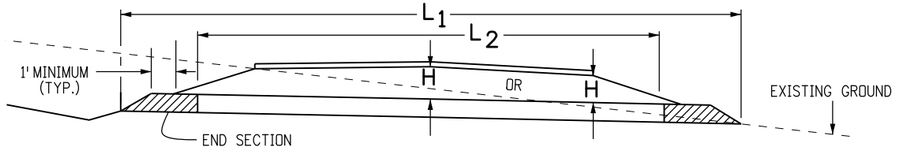
(WITH 0.7 PROJECTION RATIO)

CIRCULAR (CIR)			VERTICAL ELLIPTICAL (VE)				HORIZONTAL ELLIPTICAL (HE)			
△ PIPE SIZE= *Ba* (INSIDE DIA)	WALL THICKNESS	0.3 *Bc* (OUTSIDE DIA)	SPAN	RISE	WALL THICKNESS	0.3 OUTSIDE RISE	SPAN	RISE	WALL THICKNESS	0.3 OUTSIDE RISE
IN.		FT.	IN.			FT.	IN.			FT.
12	2	0.40								
15	2-1/4	0.49								
18	2-1/2	0.58					23	14	2-3/4	0.49
21	2-3/4	0.66								
24	3	0.75					30	19	3-1/4	0.66
27	3-1/4	0.84					34	22	3-1/2	0.73
30	3-1/2	0.92					38	24	3-3/4	0.79
33	3-3/4	1.01								
36	4	1.10	29	45	4-1/2	1.35	45	29	4-1/2	0.95
42	4-1/2	1.28	34	53	5	1.58	53	34	5	1.10
48	5	1.45	38	60	5-1/2	1.78	60	38	5-1/2	1.23
54	5-1/2	1.62	43	68	6	2.00	68	43	6	1.38
60	6	1.80	48	76	6-1/2	2.23	76	48	6-1/2	1.53
66	6-1/2	1.97	53	83	7	2.43	83	53	7	1.68
72	7	2.15	58	91	7-1/2	2.65	91	58	7-1/2	1.83
78	7-1/2	2.32	63	98	8	2.85	98	63	8	1.98
84	8	2.50	68	106	8-1/2	3.08	106	68	8-1/2	2.13
90	8-1/2	2.68	72	113	9	3.28	113	72	9	2.25
96	9	2.85	77	121	9-1/2	3.50	121	77	9-1/2	2.40
102	9-1/2	3.02	82	128	9-3/4	3.69	128	82	9-3/4	2.54
108	10	3.20	87	136	10	3.90	136	87	10	2.68

△ ALSO EQUIVALENT ROUND DIMENSION FOR ELLIPTICAL PIPE.

DIMENSIONS FOR REINFORCED CONCRETE PIPE

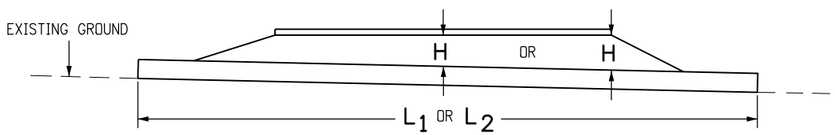
(FOR INFORMATION ONLY)



CONCRETE PIPE WITH END SECTIONS

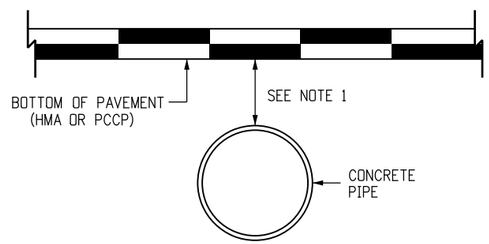
NOTE: USE THE H THAT IS GREATER FOR MAXIMUM ALLOWABLE FILL HEIGHT.

H = MAXIMUM HEIGHT OF FILL OVER TOP OF PIPE, EXCLUDING PAVEMENT THICKNESS.
L_1 = LENGTH OF PIPE TO BE MEASURED WHEN PLACED IN ACCORDANCE WITH SECTION 617 OR 624.
L_2 = LENGTH OF PIPE TO BE MEASURED WHEN PLACED IN ACCORDANCE WITH SECTION 603.



CONCRETE PIPE WITHOUT END SECTIONS

NOTE: USE THE H THAT IS GREATER FOR MAXIMUM ALLOWABLE FILL HEIGHT.



MINIMUM COVER FOR RIGID PIPE

GENERAL NOTES

REINFORCED CONCRETE PIPE

1. ADEQUATE COVER SHALL BE PROVIDED DURING CONSTRUCTION TO PROTECT THE PIPE FROM DAMAGE. THE MINIMUM COVER SHALL BE AS SHOWN ON THESE TABLES OR CONFORM TO AASHTO REQUIREMENTS, WHICHEVER IS GREATER. THE MINIMUM COVER FOR REINFORCED CONCRETE PIPE IS MEASURED FROM THE TOP OF THE PIPE TO THE BOTTOM OF THE PAVEMENT: HMA OR PCCP.
2. FILL HEIGHTS GREATER THAN MAXIMUM ALLOWED IN THE HEIGHTS OF FILL TABLE ON THIS SHEET REQUIRE SPECIAL DESIGN OF STRUCTURE.
3. PIPE DESIGN IS BASED ON SAFETY FACTOR OF 1.33 ON ULTIMATE STRENGTH.
4. THE HEIGHTS OF FILL OVER TOP OF PIPE ARE BASED ON UNIT WEIGHT OF SOIL AT 135 LBS. PER CUBIC FT.
5. PIPE CLASS IS DETERMINED FROM 0.01 IN. CRACK D-LOAD.
6. BEDDING IS CLASS B (MODIFIED) (FROM CONCRETE PIPE DESIGN MANUAL-AMERICAN CONCRETE PIPE ASSOCIATION) WITH SETTLEMENT RATIO R = 0.0 $_{sd}$ (YIELDING BED). BEDDING MATERIAL FOR RIGID PIPE IN SOIL SHALL BE 3 IN. LOOSE THICKNESS STRUCTURE BACKFILL CLASS 2. BEDDING MATERIAL FOR RIGID PIPE IN ROCK SHALL BE 12 IN. LOOSE THICKNESS STRUCTURE BACKFILL CLASS 1.
7. CHANGES IN DESIGN FACTORS REQUIRE COMPENSATING CHANGES IN PIPE DESIGN.
8. MINIMUM WALL THICKNESS DIMENSIONS ARE BASED ON AASHTO M 170 (WALL B) FOR CIRCULAR PIPE, AND AASHTO M 207 FOR ELLIPTICAL PIPE.
9. SPACING FOR MULTIPLE PIPE INSTALLATIONS SHALL CONFORM TO THE DETAILS SHOWN ON STANDARD PLAN M-206-1.
10. WHEN A PIPE IS TO BE EXTENDED, THE SAME PIPE MATERIAL AND SIZE AS IN THE ORIGINAL PIPE INSTALLATION SHALL BE USED.

NONREINFORCED CONCRETE PIPE

1. AT THE OPTION OF THE CONTRACTOR, NONREINFORCED CONCRETE PIPE CONFORMING TO AASHTO M 86 MAY BE USED IN LIEU OF REINFORCED CONCRETE PIPE FOR ALL SIZES 36 INCHES IN DIAMETER AND SMALLER. THE NONREINFORCED CONCRETE PIPE SHALL MEET THE SAME D-LOAD TO PRODUCE THE ULTIMATE LOAD UNDER THE THREE-EDGE BEARING METHOD AS SPECIFIED FOR REINFORCED CONCRETE PIPE IN CONFORMANCE WITH AASHTO M 170. THE CONTRACTOR SHALL PROVIDE WRITTEN CERTIFICATION OF CONFORMACE. THE WALL THICKNESS OF THE NONREINFORCED PIPE MAY BE INCREASED AS REQUIRED TO MEET D-LOAD REQUIREMENT.
2. ALL REQUIREMENTS FOR REINFORCED CONCRETE PIPE, EXCEPT THOSE REFERRING TO REINFORCEMENT, SHALL APPLY TO NONREINFORCED CONCRETE PIPE.

TYPE OF PIPE	HEIGHT OF FILL OVER TOP OF PIPE, H (FEET) CLASS OF PIPE (0.01 IN. CRACK D-LOAD)				
	CLASS CIR II CLASS VE II CLASS HE II 1000 D	CLASS CIR III CLASS VE III CLASS HE III 1350 D	CLASS CIR IV CLASS VE IV CLASS HE IV 2000 D	CLASS CIR V CLASS VE V ——— 3000 D	——— CLASS VE VI ——— 4000 D
CIRCULAR (CIR)	MIN. TO 18	MIN. TO 25	± 25 TO 37	± 37 TO 45	
VERTICAL ELLIPTICAL (VE)	MIN. TO 18	MIN. TO 25	± 25 TO 37	± 37 TO 45	± 45 TO 62
HORIZONTAL ELLIPTICAL (HE)	MIN. TO 18	MIN. TO 25	± 25 TO 37		

ALLOWABLE RANGE OF HEIGHTS FOR FILL OVER REINFORCED CONCRETE PIPE

(ALL SIZES)

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Last Modification Date: 07/04/12 Initials: LTA	R-X		
Full Path: www.coloradodot.info/business/designsupport	R-X		
Drawing File Name: 603020101.dgn	R-X		
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	R-X		

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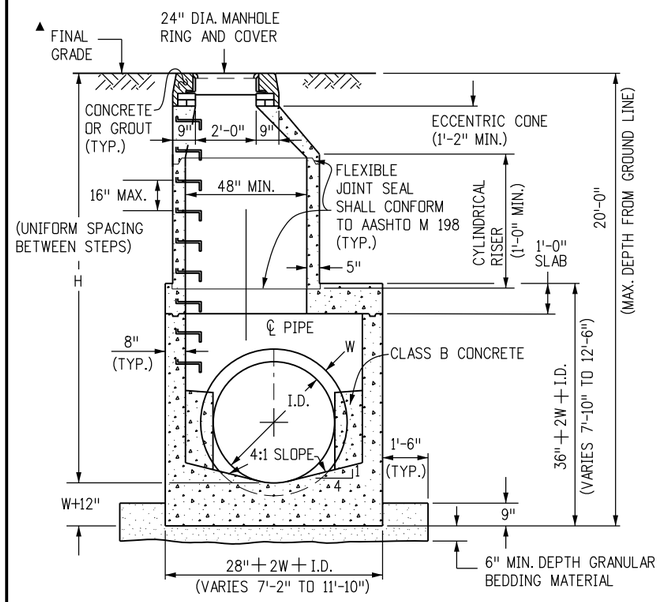
REINFORCED CONCRETE PIPE

Issued By: Project Development Branch on July 4, 2012

STANDARD PLAN NO.
M-603-2
Sheet No. 1 of 1



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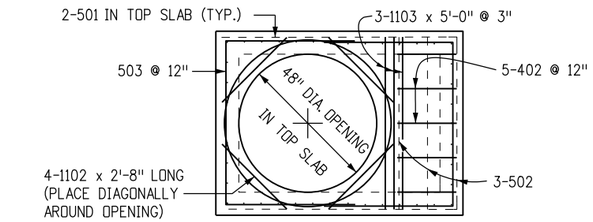
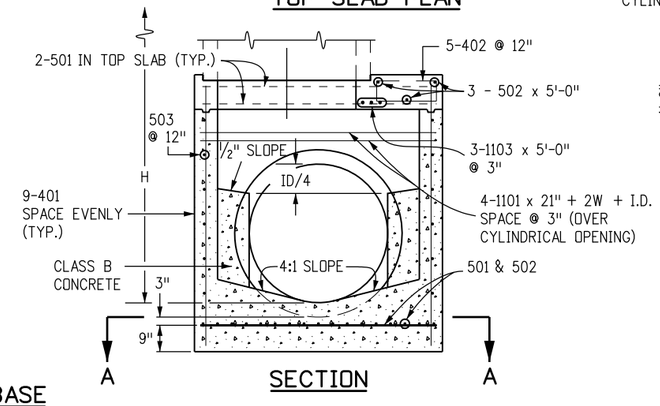


TOP SLAB PLAN



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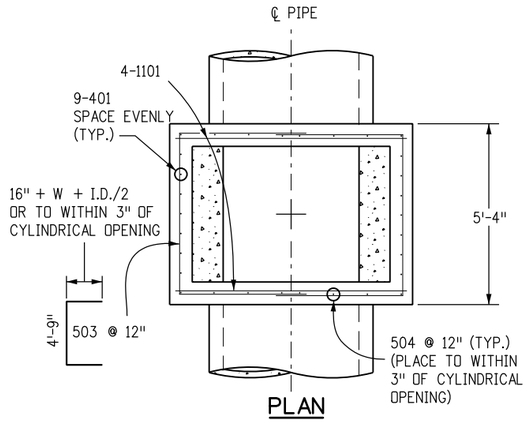
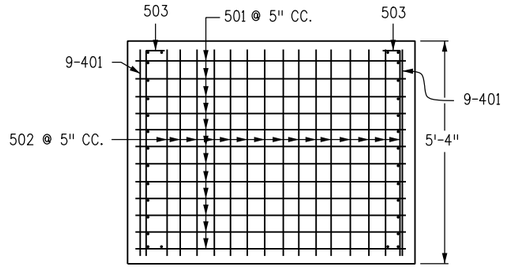


PLAN



SECTION A-A
(STEEL IN BOTTOM OF BASE)

GENERAL NOTES

1. SINCE ALL PIPE ENTRIES INTO THE BASE ARE VARIABLE, THE DIMENSIONS SHOWN ARE TYPICAL. ACTUAL DIMENSIONS AND QUANTITIES FOR CONCRETE AND REINFORCEMENT SHALL BE AS REQUIRED IN THE WORK.
2. THE PRECAST FLAT TOP MAY BE USED ON ANY MANHOLE. THE ECCENTRIC CONE MAY BE USED WHEN THE MANHOLE "H" HEIGHT IS AT LEAST 8 FT.
3. THE MANHOLE RING FRAME SHALL BE SET IN A BED OF GROUT. THE FRAME SHALL BE SURROUNDED WITH A CEMENT GROUT IN UNPAVED AREA, OR A CONCRETE COLLAR IN PAVED AREA. SEE DETAILS ON SHEETS 2 AND 3.
4. DESIGN OF BOX BASE IS BASED ON STRAIGHT RUNS OF PIPE OR CHANGE IN DIRECTION OF LESS THAN 45°. SPECIAL DESIGN IS REQUIRED FOR 45° OR GREATER.
5. PRECAST MANHOLES AND REINFORCEMENT SHALL CONFORM TO AASHTO M 199 (ASTM C 478).
6. CAST-IN-PLACE MANHOLES SHALL BE CLASS B CONCRETE.
7. STEPS SHALL BE REQUIRED WHEN THE MANHOLE DEPTH EXCEEDS 3 FT.-6 IN. AND SHALL CONFORM TO AASHTO M 199.
8. ALL REINFORCING STEEL SHALL BE GRADE 60 AND EPOXY COATED. VERTICAL STEEL SHALL BE PLACED AT CENTERLINE OF WALL. ALL BARS SHALL HAVE A 2 IN. MINIMUM CLEARANCE.
9. ALL PIPE ENTRIES INTO THE BASE OF MANHOLE SHALL BE CONNECTED BY OPEN CHANNELIZATION ADJUSTED FOR PIPE SIZE, SHAPE, SLOPE, AND DIRECTION OF FLOW. DETAILS SHOWN ARE TYPICAL FOR INSTALLATIONS WITH ALL INVERTS OF SAME RELATIVE ELEVATION. FOR EXCESSIVE ELEVATION DIFFERENCE BETWEEN INVERTS, SPECIAL BASE/CHANNEL DETAILS WILL BE SHOWN ON THE PLANS.
10. FLOW CHANNELS AND INVERTS SHALL BE FORMED BY SHAPING WITH CLASS B CONCRETE OR APPROVED GROUT.
11. STUB-OUTS SHALL EXTEND 2 FT. MINIMUM BEYOND OUTSIDE WALL SURFACE OF MANHOLE AND BE SATISFACTORILY PLUGGED.
12. THE SLOPE OF THE MANHOLE COVER SHALL MATCH THE ROADWAY PROFILE AND CROSS SLOPE.

▲ WHEN FINAL GRADE IS PAVEMENT SURFACE, RECESS MANHOLE RING AND COVER 1/4" MIN. TO 1/2" MAX.

MAHHOLE BOX BASE

MARK	SIZE	TYPE	WT. #/FT.	BARS	I.D. 54"	60"	66"	72"	84"	96"	FORMULAS
401	4	I	0.668	NO. REQ'D.	18	18	18	18	18	18	401
				LENGTH	8'-1"	8'-8"	9'-3"	9'-10"	11'-0"	12'-2"	BAR LENGTH = 32" + 2W + I.D.
				WEIGHT *	97.2	104.2	111.2	118.2	132.3	146.3	
402	4	III	0.668	NO. REQ'D.	5	5	5	5	5	5	402
				LENGTH	5'-5"	6'-0"	6'-7"	7'-2"	8'-4"	9'-6"	BAR LENGTH = I.D. + 2W
				WEIGHT *	18.1	20.0	22.0	23.9	27.8	31.7	
501	5	I	1.043	NO. REQ'D.	17	17	17	17	17	17	501
				LENGTH	7'-5"	8'-0"	8'-7"	9'-2"	10'-4"	11'-6"	BAR LENGTH = 24" + I.D. + 2W
				WEIGHT *	131.5	141.8	152.2	162.5	183.2	203.9	
502	5	I	1.043	NO. REQ'D.	22	23	25	26	29	32	502
				LENGTH	5'-0"	5'-0"	5'-0"	5'-0"	5'-0"	5'-0"	NUMBER BARS REQ'D. = 3 + $\left(\frac{24+I.D.+2W}{@\ 5"}+1\right)$
				WEIGHT *	114.7	119.9	130.4	135.6	151.2	166.9	
503	5	II	1.043	NO. REQ'D.	16	16	18	18	20	24	503
				LENGTH	12'-10"	13'-5"	14'-0"	14'-7"	15'-9"	16'-11"	NUMBER BARS REQ'D. = $2\left(\frac{13+I.D.+2W}{@\ 12"}+1\right)$
				WEIGHT *	214.2	223.9	262.8	273.8	328.5	423.5	BAR LENGTH = 4'-9"+2(16+W+I.D./2)
504	5	I	1.043	NO. REQ'D.	12	14	14	16	18	20	504
				LENGTH	8'-1"	8'-8"	9'-3"	9'-10"	11'-0"	12'-2"	NUMBER BARS REQ'D. = $2\left(\frac{2W+I.D.-4}{@\ 12"}+1\right)$
				WEIGHT *	101.2	126.6	135.1	164.1	206.5	253.8	BAR LENGTH = 32"+2W+I.D.
1101	11	I	5.313	NO. REQ'D.	4	4	4	4	4	4	1101
				LENGTH	7'-2"	7'-9"	8'-4"	8'-11"	10'-1"	11'-3"	BAR LENGTH = 21" + I.D. + 2W
				WEIGHT *	152.3	164.7	177.1	189.5	214.3	239.1	
1102	11	I	5.313	NO. REQ'D.	4	4	4	4	4	4	
				LENGTH	2'-8"	2'-8"	2'-8"	2'-8"	2'-8"	2'-8"	
				WEIGHT *	56.7	56.7	56.7	56.7	56.7	56.7	
1103	11	I	5.313	NO. REQ'D.	3	3	3	3	3	3	
				LENGTH	5'-0"	5'-0"	5'-0"	5'-0"	5'-0"	5'-0"	
				WEIGHT *	79.7	79.7	79.7	79.7	79.7	79.7	
* REINFORCING STEEL TOTAL					965.6	1,037.5	1,127.2	1,204.0	1,380.2	1,601.6	
CONCRETE - CUBIC YARDS - TOTAL					6.0	6.6	7.3	8.0	9.5	11.1	

NOTE: QUANTITIES ARE BASED ON SAME SIZE PIPE ENTRANCE TO AND EXIT FROM, BASE AND A 4 FT. MANHOLE ENTRANCE INTO TOP SLAB OF BASE.

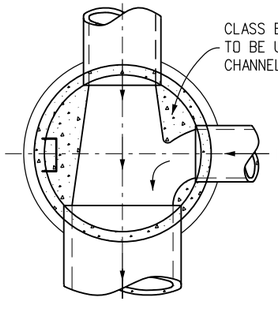
BENDING

TYPE I — STRAIGHT

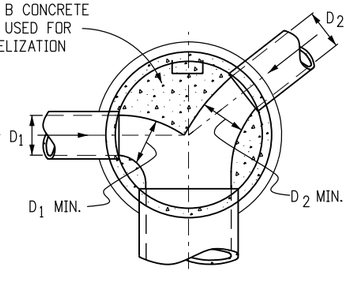
TYPE II — 4'-9", 16"+W+I.D./2

TYPE III — 12", 12", 7", I.D.+2W-38"

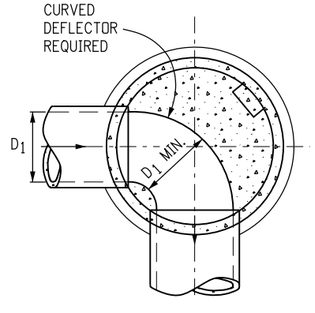
QUANTITIES FOR CONCRETE MANHOLE BOX BASE



THROUGH PIPE ONE LATERAL



ANGLED LATERALS



SHARP ANGLE

TYPICAL CHANNELIZATION DETAILS

Computer File Information		Sheet Revisions	
Creation Date: 07/04/12 Initials: DD		Date:	Comments
Last Modification Date: 07/04/12 Initials: LTA	(R-X)		
Full Path: www.coloradodot.info/business/designsupport	(R-X)		
Drawing File Name: M06040200103.dgn	(R-X)		
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MANHOLES

Issued By: Project Development Branch July 4, 2012

STANDARD PLAN NO.
M-604-20
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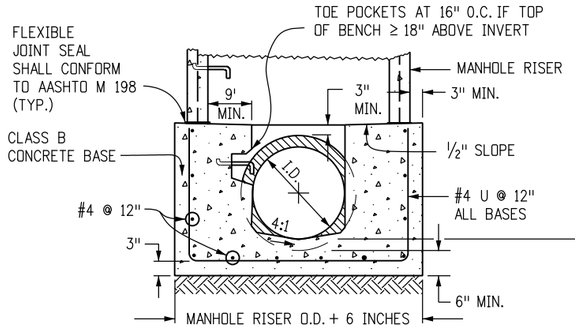
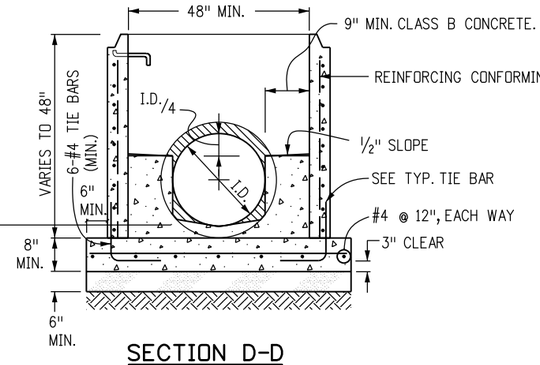
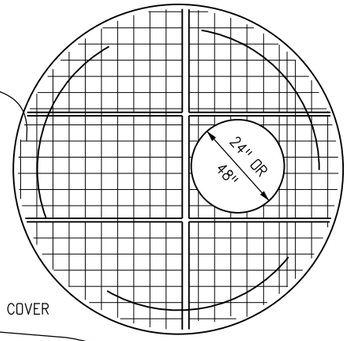
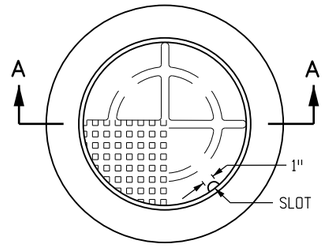


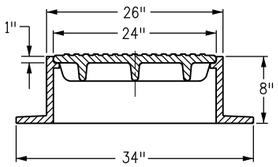
SECTION B-B



SECTION D-D

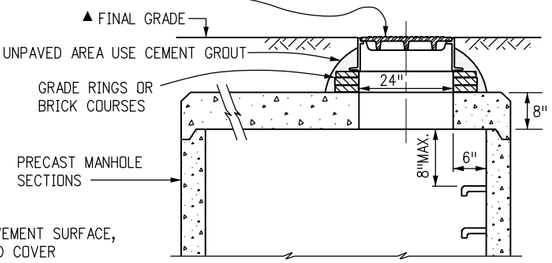






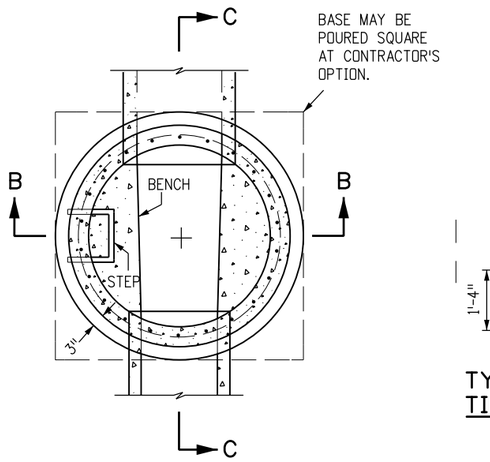
TOTAL WEIGHT: APPROXIMATELY 400 LBS. SHALL BE GRAY OR DUCTILE CAST IRON IN ACCORDANCE WITH SUBSECTION 712.06.

SECTION A-A
MANHOLE RING AND COVER

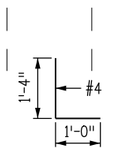


▲ WHEN FINAL GRADE IS PAVEMENT SURFACE, RECESS MANHOLE RING AND COVER ¼" MIN. TO ½" MAX.

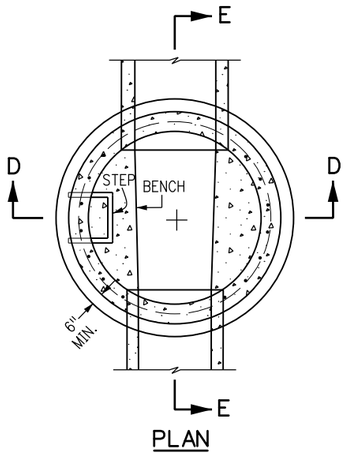
FLAT TOP SECTION DETAIL



PLAN



TYPICAL TIE BAR



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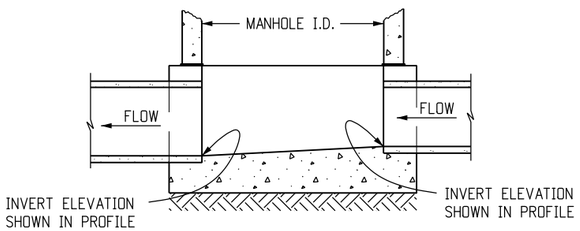
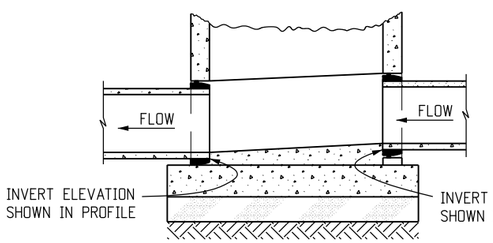
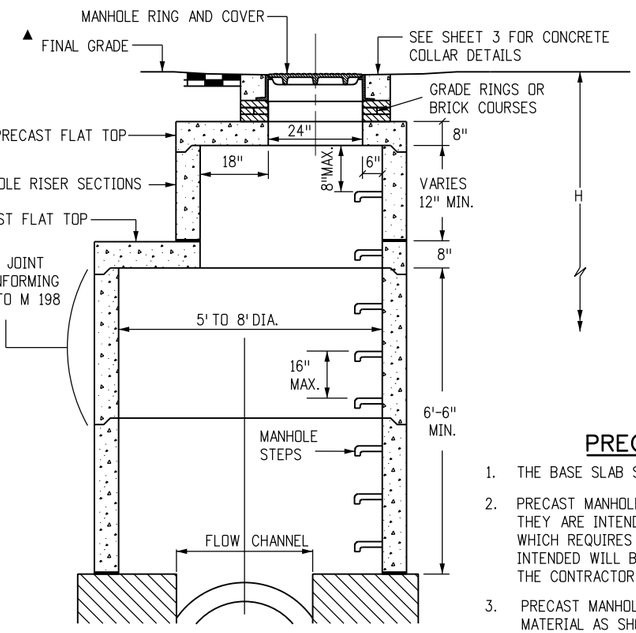


SECTION C-C
CAST-IN-PLACE SLAB BASE



SECTION E-E
PRECAST SLAB BASE



MANHOLE RISER DETAIL

LEGEND

- SUITABLE SUBGRADE
- GRANULAR BEDDING MATERIAL
- CONCRETE

PRECAST MANHOLE BASES NOTES:

1. THE BASE SLAB SHALL BE POURED MONOLITHICALLY WITH BOTTOM RISER SECTION.
2. PRECAST MANHOLE BASES SHALL FIT THE CONDITIONS AND LOCATIONS FOR WHICH THEY ARE INTENDED WITHOUT ANY FIELD MODIFICATIONS. ANY MANHOLE BASE WHICH REQUIRES FIELD CUTTING OR MODIFICATION IN ORDER TO FIT THE LOCATIONS INTENDED WILL BE REJECTED BY THE ENGINEER AND REMOVED AND REPLACED BY THE CONTRACTOR AT NO COST TO THE DEPARTMENT.
3. PRECAST MANHOLE BASES SHALL BE BEDDED ON AN APPROVED GRANULAR BEDDING MATERIAL AS SHOWN ABOVE.

Computer File Information		Sheet Revisions	
Creation Date: 07/04/12 Initials: DD		Date:	Comments
Last Modification Date: 07/04/12 Initials: LTA	R-X		
Full Path: www.coloradodot.info/business/designsupport	R-X		
Drawing File Name: M06040200203.dgn	R-X		
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MANHOLES

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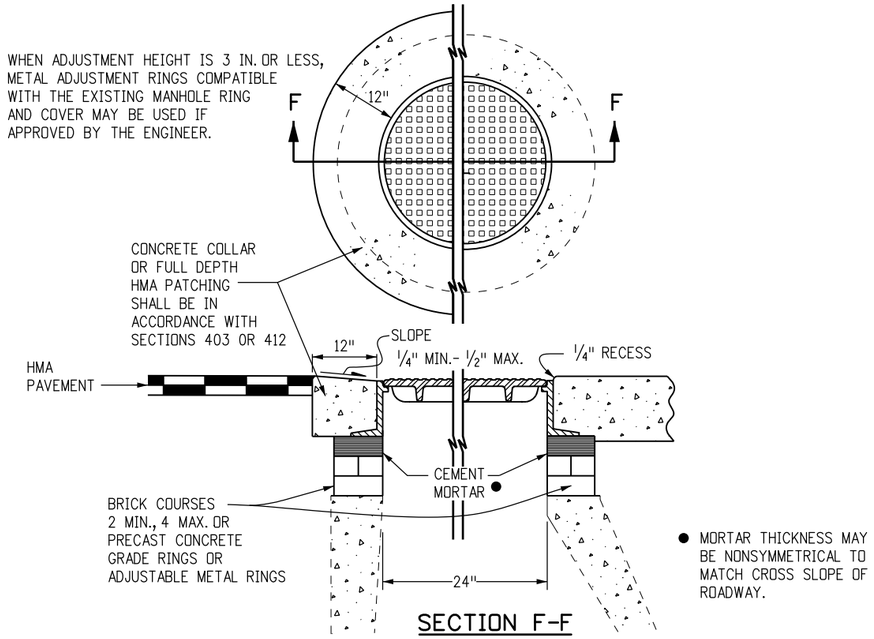
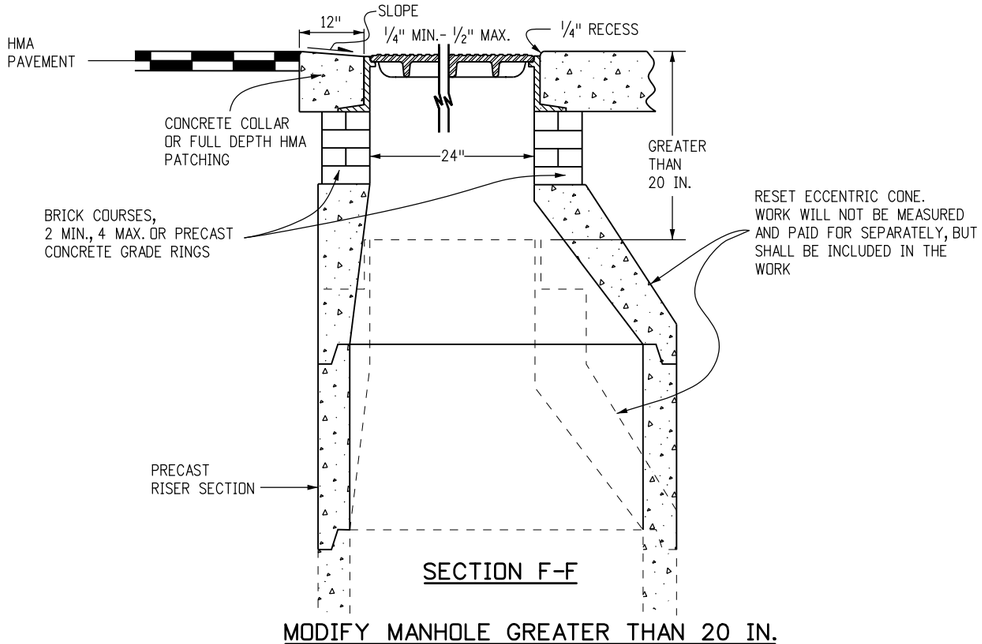


SECTION F-F

ADJUST MANHOLE 20 IN. OR LESS

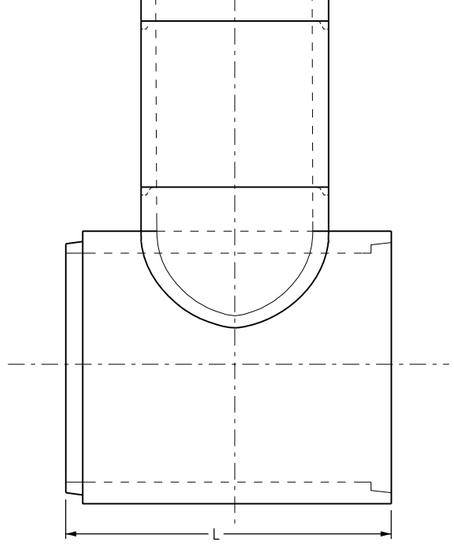


SECTION F-F

MODIFY MANHOLE GREATER THAN 20 IN.

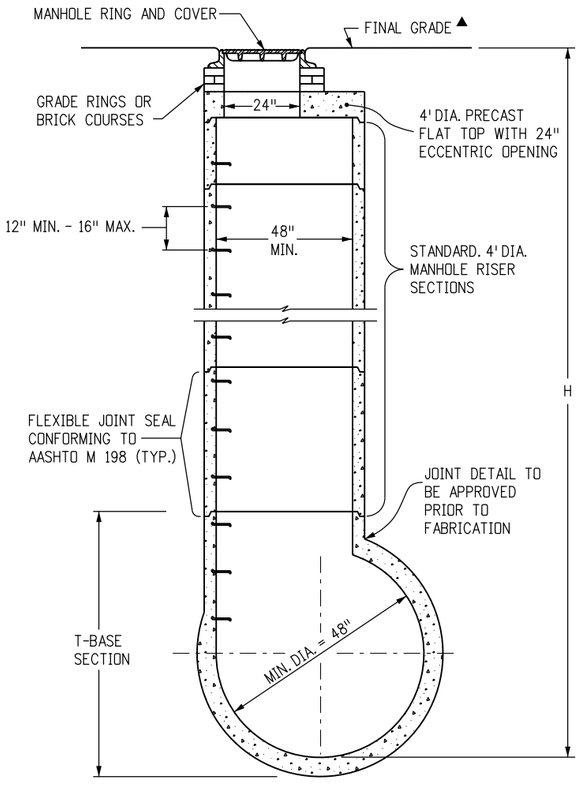
T-BASE MANHOLES NOTES

1. THE T-BASE SECTION SHALL BE SHOP-FABRICATED FOR DELIVERY TO THE CONSTRUCTION SITE AS A COMPLETE UNIT.
2. THESE DETAILS SHOW ONLY THE CONCEPTUAL AND STANDARD DIMENSIONAL REQUIREMENTS FOR TYPE T-BASE MANHOLES. THE CONTRACTOR SHALL FURNISH DETAILED SHOP DRAWINGS FOR APPROVAL PRIOR TO FABRICATION. THE DETAILS SHOWN HEREIN APPLY ONLY TO 48 IN. AND GREATER DIAMETER PIPES.
3. EXCEPT FOR CLASS OF PIPE, SPECIFICATIONS FOR THE MANHOLE SHALL BE THE SAME AS THOSE REQUIRED FOR THE ADJOINING PIPE.
4. THE T-BASE SECTION SHALL MAINTAIN ITS INTERNAL SHAPE AND FLOW AREA. GROUTING OR FILLING SHALL BE APPLIED SO AS TO NOT DISTURB THE NORMAL FLOW OR REDUCE THE AREA.



CIRCULAR RIGID PIPE (LONGITUDINAL SECTION)

▲ WHEN FINAL GRADE IS PAVEMENT SURFACE, RECESS MANHOLE RING AND COVER 1/4" MIN. TO 1/2" MAX.



CIRCULAR RIGID PIPE (TRANSVERSE SECTION)

MANHOLE T-BASE

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MANHOLES

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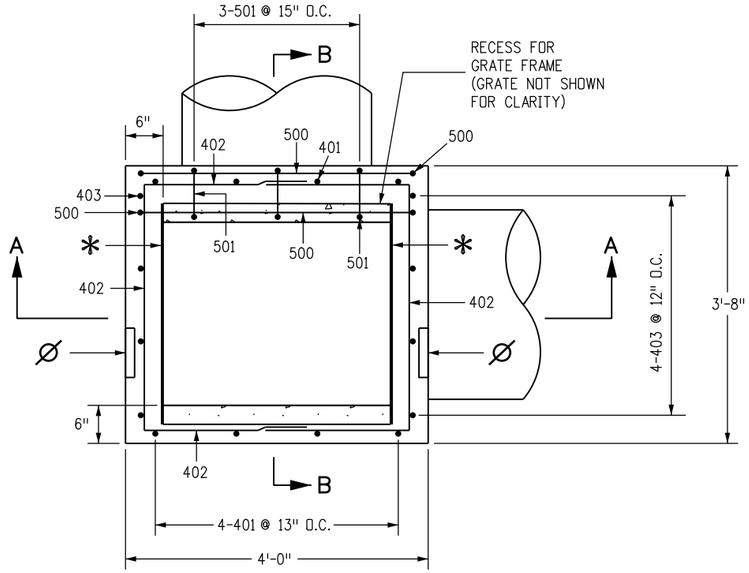
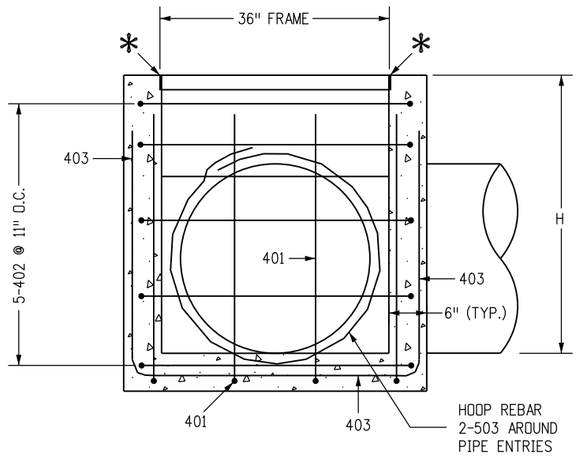


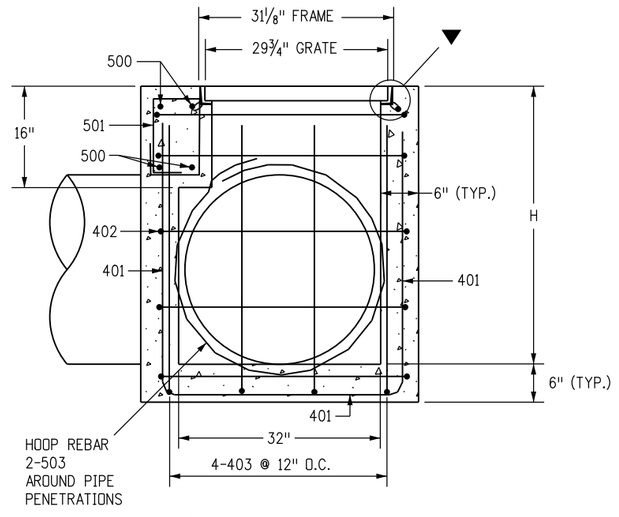
PLAN

GENERAL NOTES

1. FOR THE 32 INCH AND 36 INCH INSIDE INLET DIMENSIONS, THE ALLOWABLE PIPE I.D. IS 30 INCHES OR LESS. FOR THE 72 INCH INSIDE INLET DIMENSION, THE ALLOWABLE PIPE I.D. IS "H" MINUS 18 INCHES, OR LESS, UP TO A MAXIMUM OF 66 INCHES FOR "H" OF 7 FEET OR MORE.
2. ALL CONCRETE SHALL BE CLASS B.
3. INLET MAY BE CAST-IN-PLACE OR PRECAST.
4. REINFORCING BARS SHALL BE #4 UNLESS SHOWN OTHERWISE.
5. ALL REINFORCING BARS SHALL BE GRADE 40 AND EPOXY COATED. REINFORCING BARS SHALL HAVE A MINIMUM CLEARANCE OF 2 IN.
6. ALL EDGE DISTANCES NOT MARKED "CLEAR" ARE TO THE CENTERLINE OF THE BAR.
7. CUT OR BEND REINFORCING BARS AROUND PIPES AS REQUIRED.
8. STEPS SHALL BE REQUIRED WHEN THE INLET DEPTH "H" IS EQUAL TO OR GREATER THAN 4 FT. AND SHALL CONFORM TO AASHTO M 199.
9. THE INVERT OF THE BOX SHALL BE SLOPED TO DRAIN.
10. THE CONTRACTOR SHALL STAMP FLOW ARROWS INTO THE TOP SURFACE OF THE INLET BOX SIDEWALLS TO INDICATE THE DIRECTION OF RUNOFF. THE STAMPED ARROWS SHALL BE 6 IN. LONG, 1 IN. HIGH, AND ⅜ IN. DEEP. FOR INLETS IN SUMP CONDITIONS, THE STAMPED FLOW ARROWS SHALL INDICATE THE PREDOMINATE DIRECTION OF RUNOFF FLOW.
11. A 4 IN. DIA. STAINLESS STEEL MEDALLION WITH "NO DUMPING DRAINS TO STREAM" OR SIMILAR MESSAGE SHALL BE FIRMLY ATTACHED TO TOP OF THE INLET SURFACE WITH A PERMANENT FASTENER. THE MEDALLION WILL HAVE A FISH SYMBOL AND BLUE COLOR BACKGROUND. ALTERNATIVELY, THIS MESSAGE MAY BE CAST WITH 1 IN. HEIGHT LETTERS INTO THE TOP OF THE INLET'S CONCRETE SURFACE OR SURROUNDING CONCRETE APRON. THE NO DUMPING MESSAGE SHALL BE ELIMINATED FOR INLETS LOCATED WITHIN THE SHOULDER OF CONTROLLED ACCESS FREEWAYS WHEN SPECIFIED IN THE PLANS.



SECTION A-A



SECTION B-B

LEGEND

▼ GRATE TO BE INSTALLED DURING CONSTRUCTION OF THE BOX WITH THE VANE GRATE BOLTED IN PLACE TO THE FRAME.

* TO FACILITATE REMOVAL OF THE GRATE, PLACE PLYWOOD 3 IN. x ¼ IN. x 31-⅜ IN. ALONG EDGE OF THE GRATE AS SHOWN.

⌀ FLOW ARROW STAMP IN DIRECTION OF FLOW (TYP.). FLOW →

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Full Path: www.coloradodot.info/business/designsupport	R-X		
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VANE GRATE INLET

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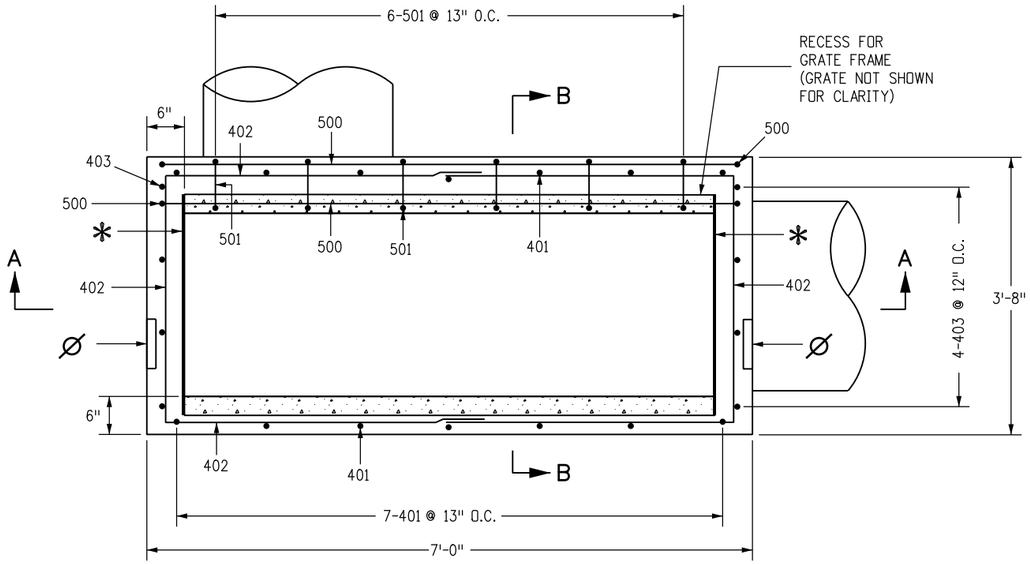
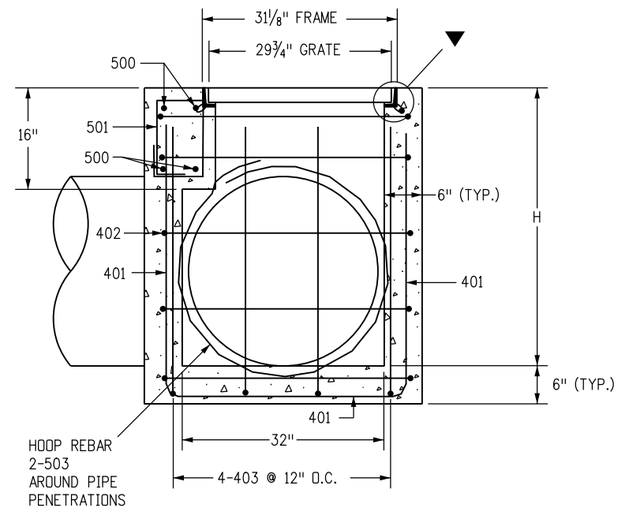
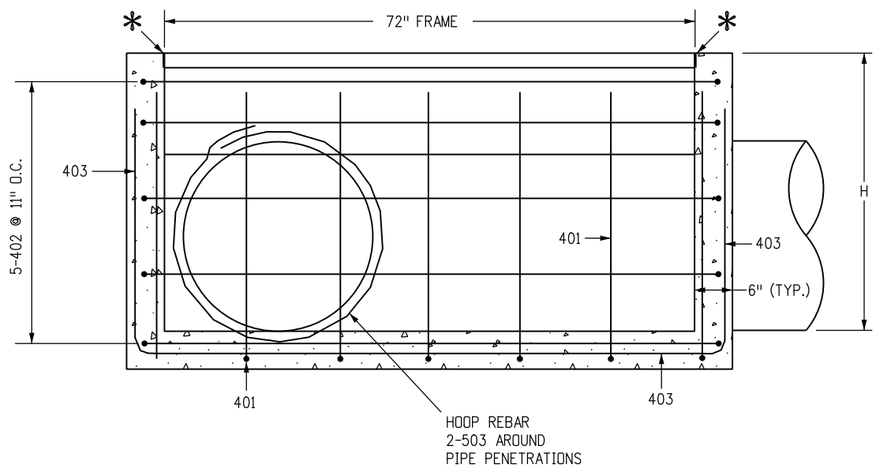


PLAN



SECTION B-B



SECTION A-A

LEGEND

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Ø FLOW ARROW STAMP IN DIRECTION OF FLOW (TYP.). FLOW →

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VANE GRATE INLET

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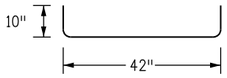

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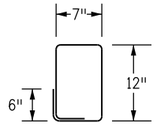

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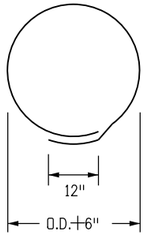

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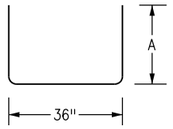
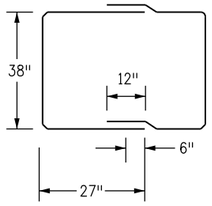


INCREASE DIMENSION "A" 1 IN. FOR EACH 1 IN. INCREASE OF "H" ABOVE 4 FT.

401

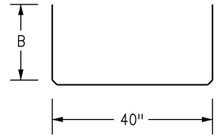


(2-402 BARS SHOWN TO INDICATE PROPER PLACEMENT)

ADD TWO BARS FOR EACH 6 IN. INCREASE OF "H" ABOVE 4 FT.

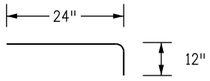
402

36 IN. INLET BOX BENDING DIAGRAM



INCREASE DIMENSION "B" 1 IN. FOR EACH 1 IN. INCREASE OF "H" ABOVE 4 FT.

403



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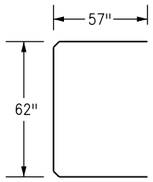

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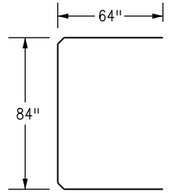


407

INLET APRON BENDING DIAGRAM FOR 36 IN. INLET

MARK	NO. REQ'D	LENGTH (EACH)
405	9	3'-0"
406	1	14'-8"
407	1	17'-8"

BAR LIST FOR CONCRETE APRON

(FOR INFORMATION ONLY)

MARK	NO. REQ'D	HEIGHT "A"	HEIGHT "B"	LENGTH (EACH)
500	4			5'-2"
501	3			4"-2"
503	4			10'-5"
401	4	3'-10"		10'-8"
402	10			7'-8"
403	4		4'-0"	11'-4"

BAR LIST FOR H = 4'-0" 36 IN. INLET

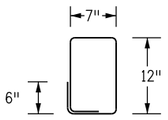
QUANTITIES FOR ONE 36 IN. INLET

H	NUMBER OF STEPS REQUIRED	CONC. CU. YD.	STEEL LBS.
4'-0"	1	1.3	180
4'-6"	2	1.5	186
5'-0"	2	1.6	201
5'-6"	2	1.7	207
6'-0"	3	1.8	222
6'-6"	3	1.9	227
7'-0"	3	2.1	243
7'-6"	4	2.2	248
8'-0"	4	2.3	263
8'-6"	4	2.4	269
9'-0"	5	2.5	285
9'-6"	5	2.7	289
10'-0"	5	2.8	306
10'-6"	6	2.9	310
11'-0"	6	3.0	326
11'-6"	6	3.1	331

NOTES

1. CONCRETE QUANTITY INCLUDES VOLUME OCCUPIED BY PIPES.
2. REINFORCING STEEL QUANTITY ASSUMES TWO 503 HOOPS FOR EACH 24 IN. PIPE.
3. BARS NUMBERED IN 400 SERIES INDICATES #4 SIZE BAR. BARS NUMBERED IN 500 SERIES INDICATES #5 SIZE BAR.
4. ALL REINFORCING BARS SHALL BE GRADE 40 AND EPOXY COATED.

500



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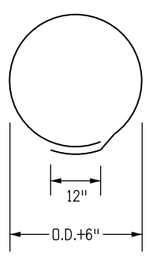

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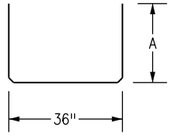
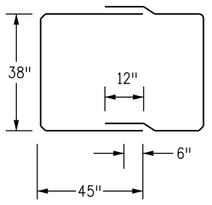


INCREASE DIMENSION "A" 1 IN. FOR EACH 1 IN. INCREASE OF "H" ABOVE 4 FT.

401

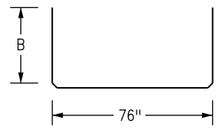


(2-402 BARS SHOWN TO INDICATE PROPER PLACEMENT)

ADD TWO BARS FOR EACH 6 IN. INCREASE OF "H" ABOVE 4 FT.

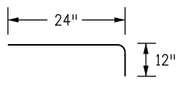
402

72 IN. INLET BOX BENDING DIAGRAM



INCREASE DIMENSION "B" 1 IN. FOR EACH 1 IN. INCREASE OF "H" ABOVE 4 FT.

403



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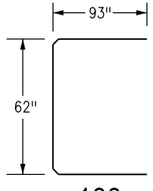

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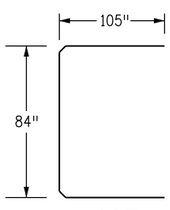

407

INLET APRON BENDING DIAGRAM FOR 72 IN. INLET

MARK	NO. REQ'D	LENGTH (EACH)
405	13	3'-0"
406	1	20'-8"
407	1	24'-6"

BAR LIST FOR CONCRETE APRON

(FOR INFORMATION ONLY)

MARK	NO. REQ'D	HEIGHT "A"	HEIGHT "B"	LENGTH (EACH)
500	4			8'-2"
501	6			4'-2"
503	4			10'-5"
401	7	3'-10"		10'-8"
402	10			10'-8"
403	4		4'-0"	14'-4"

BAR LIST FOR H = 4'-0" 72 IN. INLET

QUANTITIES FOR ONE 72 IN. INLET

H	NUMBER OF STEPS REQUIRED	CONC. CU. YD.	STEEL LBS.
4'-0"	1	2.1	253
4'-6"	2	2.3	260
5'-0"	2	2.4	282
5'-6"	2	2.6	289
6'-0"	3	2.8	310
6'-6"	3	3.0	318
7'-0"	3	3.2	339
7'-6"	4	3.3	346
8'-0"	4	3.5	369
8'-6"	4	3.7	376
9'-0"	5	3.9	397
9'-6"	5	4.1	405
10'-0"	5	4.2	426
10'-6"	6	4.4	433
11'-0"	6	4.6	455
11'-6"	6	4.8	462

Computer File Information		Sheet Revisions	
Creation Date: 07/04/12 Initials: DD		Date:	Comments
Last Modification Date: 07/04/12 Initials: LTA	R-X		
Full Path: www.coloradodot.info/business/designsupport	R-X		
Drawing File Name: 6040250305.dgn	R-X		
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VANE GRATE INLET

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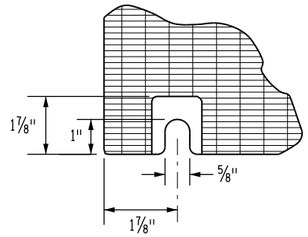
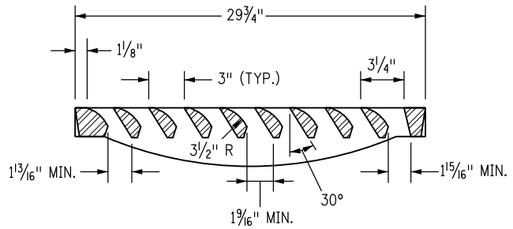
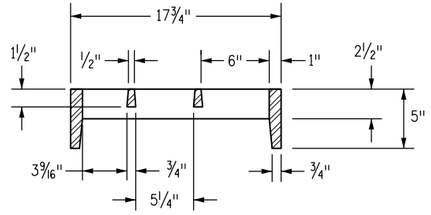


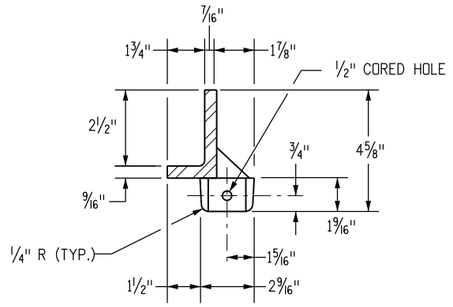
DETAIL A
BOLT SLOT AT CORNER (TYP.)



SECTION A-A



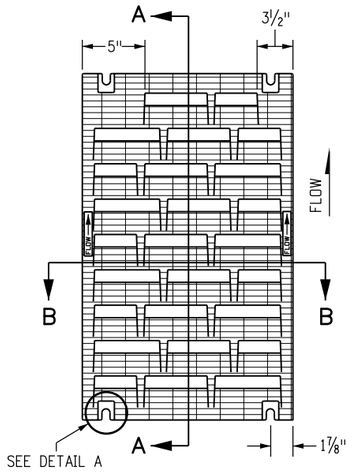
SECTION B-B



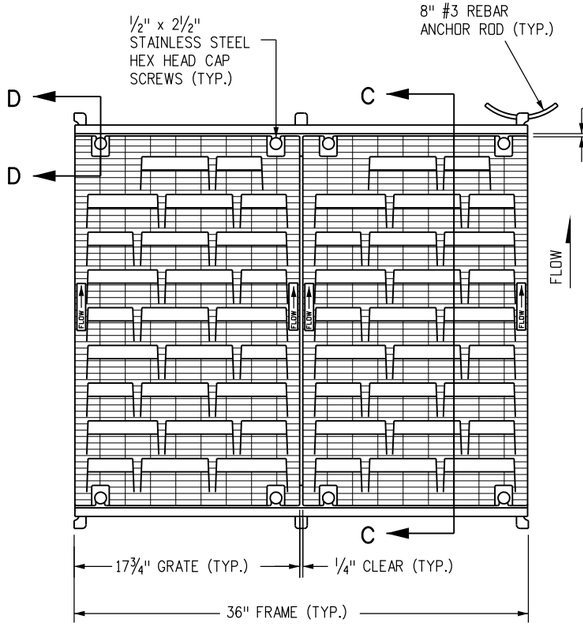
DETAIL B

NOTES

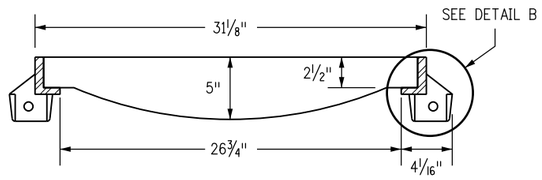
1. FREE OPEN AREA: 190 SQ. IN./GRATE.
2. MATERIAL: CAST GRAY IRON ASTM A-48 CLASS 35B.
3. FINISH: NO PAINT.
4. WEIGHT: GRATE 170 LBS. EACH; FRAME 29 LBS. EACH.
5. ALL REINFORCING BARS SHALL BE EPOXY COATED.



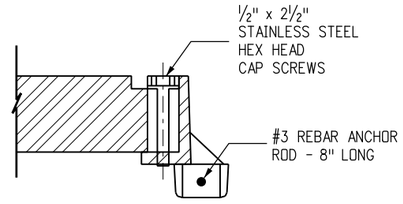
GRATE PLAN



MULTIPLE GRATE WITH FRAME PLAN



SECTION C-C



SECTION D-D

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VANE GRATE INLET

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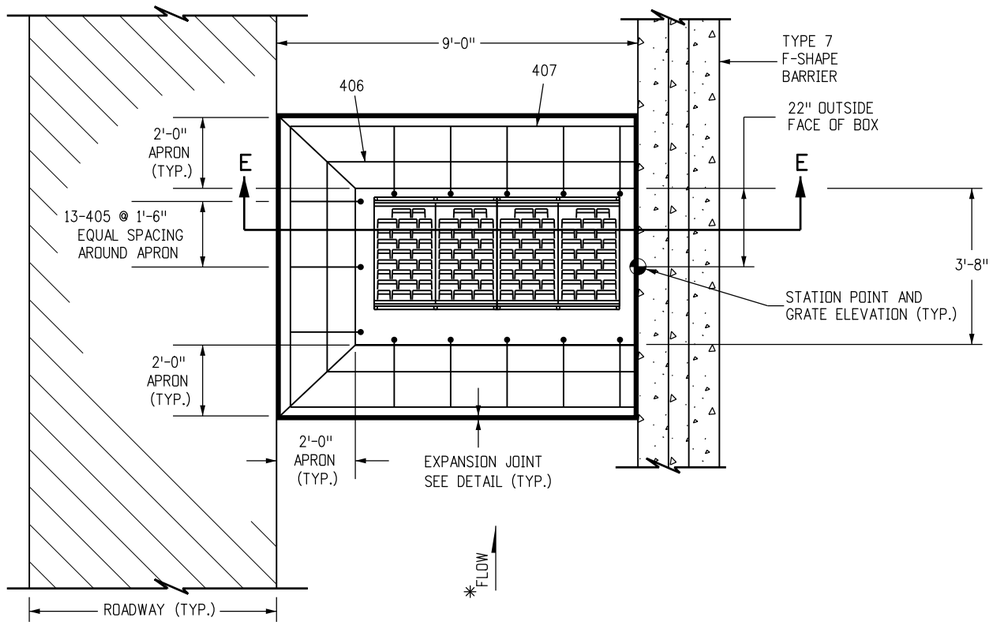
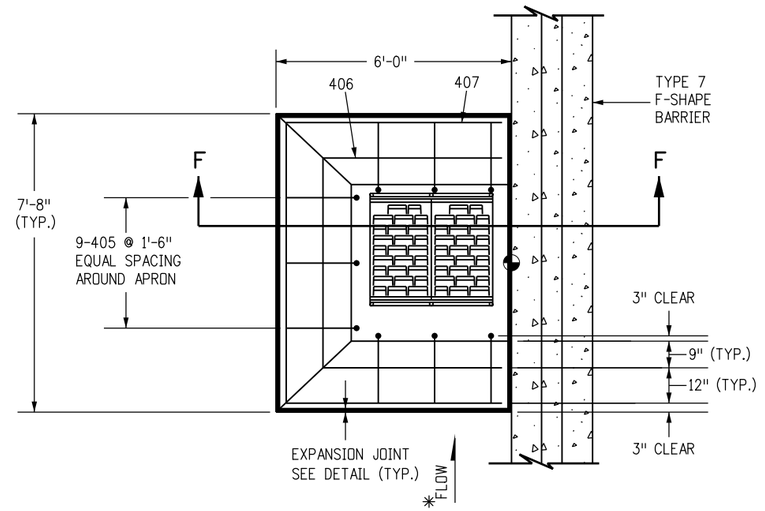
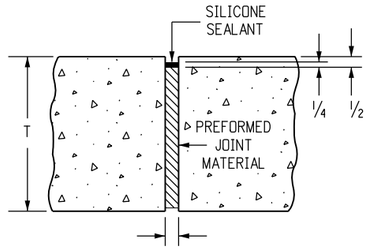


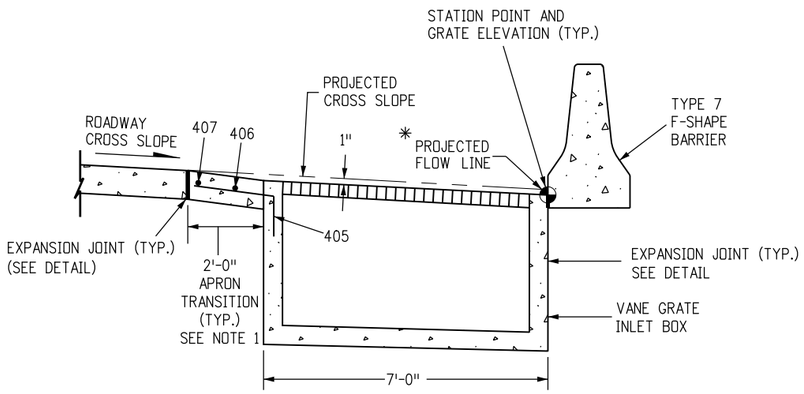
CONCRETE APRON FOR 72 IN. INLET



CONCRETE APRON FOR 36 IN. INLET



EXPANSION JOINT (TYP.)

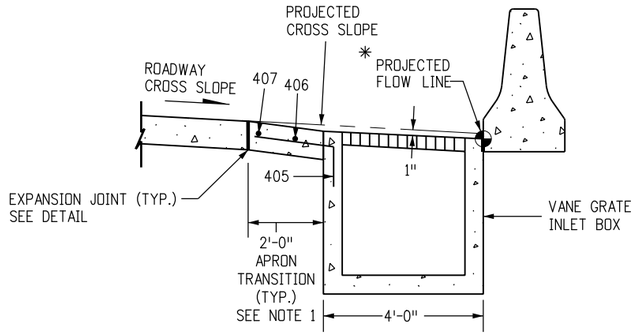


SECTION E-E

NOTES

1. A 2 FT. CONCRETE TRANSITION APRON SHALL BE CONSTRUCTED AS SHOWN AND SHALL BE KEYED INTO THE INLET.
2. CONCRETE APRON SHALL BE THE SAME THICKNESS AND TYPE AS THE SURROUNDING CONCRETE.
3. THE COST OF THE CONCRETE APRON SHALL BE INCLUDED THE COST OF THE INLET.

* IF THE INLET IS OFFSET FROM THE BARRIER, SLOPE THE APRON ADJACENT TO THE BARRIER TO DIRECT FLOW TOWARD THE GRATE.



SECTION F-F

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VANE GRATE INLET

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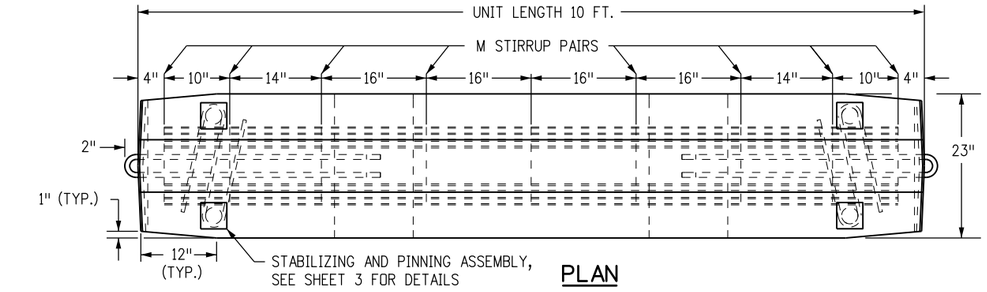
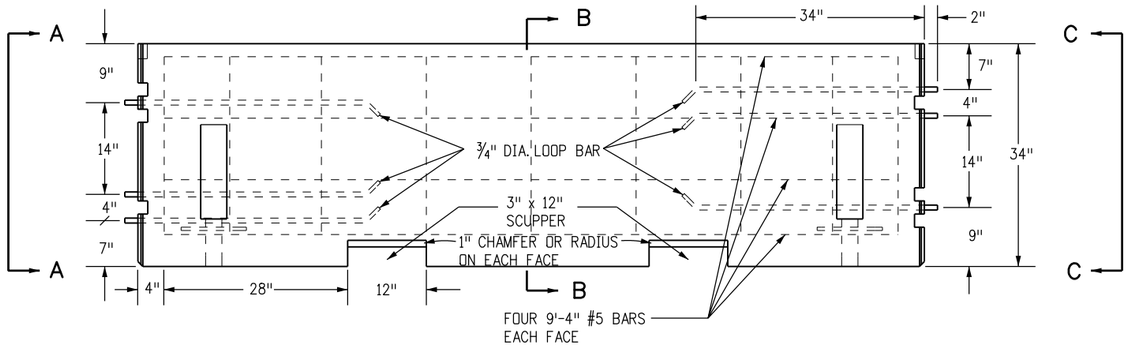
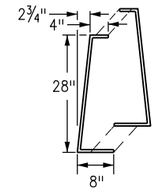


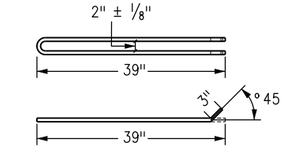
PLAN



ELEVATION BARRIER



STIRRUP "M" #5 REBAR PAIR

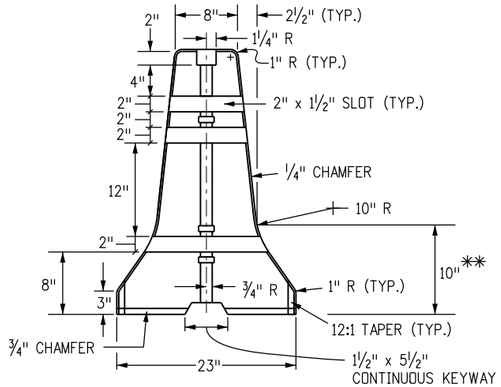


LOOP BAR BENDING DETAIL (ASTM A36)

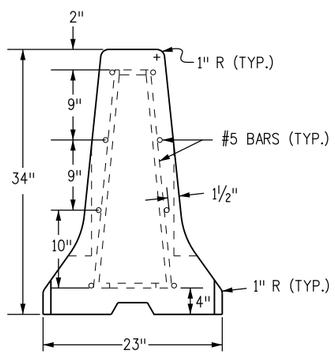
(HOT-DIP GALVANIZED AFTER FABRICATION)

GENERAL NOTES

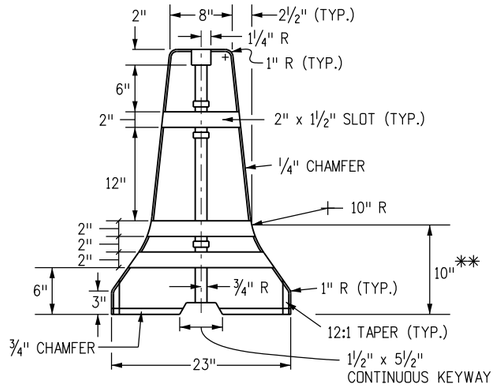
1. ALL STEEL REINFORCING SHALL BE 2 IN. CLEAR OF THE NEAREST SURFACE OF CONCRETE UNLESS OTHERWISE SHOWN. REINFORCING STEEL SHALL BE GRADE 40 MINIMUM.
2. CONCRETE SHALL BE CLASS D.
3. ALL PERMANENT PRECAST BARRIERS USED TO REPLACE OTHER CONCRETE BARRIERS, SHALL BE IN NEW CONDITION, UNDAMAGED, AND WITH NO REPAIRS.
4. FOR TEMPORARY INSTALLATIONS, INSTALL WITH A MINIMUM 4 FT. DISTANCE FROM THE CENTERLINE OF THE CONCRETE BARRIER TO ANY OBSTRUCTIONS BEHIND IT. FOR TEMPORARY INSTALLATIONS WITH LESS THAN A 4 FT. MINIMUM DISTANCE, STABILIZATION PINS SHALL BE USED ON EACH BARRIER UNIT ADJACENT TO, AND WITHIN 10 FT. OF BOTH SIDES OF THE OBSTRUCTION. SEE SHEET 3 FOR STABILIZATION PINNING DETAILS.
5. THE FLARE RATE FOR TEMPORARY INSTALLATIONS SHALL BE 10:1 OR FLATTER UNLESS OTHERWISE APPROVED BY THE ENGINEER FOR PERMANENT INSTALLATIONS. SEE THE FLARE RATES TABLE ON STANDARD M-606-13, SHEET 3.
6. STABILIZATION PINS SHALL BE USED TO ANCHOR EACH 10 FT. UNIT IN ALL PERMANENT INSTALLATIONS. SEE SHEET 3 FOR STABILIZATION PINNING DETAILS.
7. FOR ALL PERMANENT INSTALLATIONS THAT REQUIRE END ANCHORAGES. SEE STANDARD PLAN M-606-13, SHEET 1, FOR ANCHORAGE DETAILS.
8. THE MONTH AND YEAR THE PRECAST TYPE 7 CONCRETE BARRIER WAS MANUFACTURED SHALL BE MOLDED INTO ONE END OF EACH 10 FT. BARRIER UNIT.
9. APPROVED NON-SHRINK GROUT SHALL BE USED FOR GROUTING OVER ALL PINS AND GROUTING OF SCUPPERS.
10. WHEN HYDRAULIC ANALYSIS ALLOWS, SCUPPERS MAY NOT BE NEEDED ON:
    - A. MEDIAN INSTALLATION WITH INLET DRAINAGE.
    - B. SHOULDER BARRIER ON HIGH EDGE OF A SUPERELEVATED SHOULDER.
    - C. MEDIAN BARRIER ON A CREST VERTICAL CURVE.
    - D. PERMANENT BARRIER, IF SPECIFIED ON PLANS.
11. ALL INCIDENTAL WORK AND MATERIALS SUCH AS CONNECTING PINS, ANCHORS BOLTS, GROUT, AND EXCAVATION FOR END ANCHORAGE, WILL NOT BE PAID FOR SEPARATELY, BUT SHALL BE INCLUDED IN THE COST OF THE WORK.
12. ONE IN. DIAMETER THREADED INSERTS MAY BE CAST-IN-PLACE TO FACILITATE LIFTING FOR TEMPORARY BARRIER APPLICATIONS ONLY.
13. RETROREFLECTORIZATION IS REQUIRED ON BARRIERS. SEE BARRIER RETROREFLECTOR NOTES ON STANDARD PLAN S-612-1.



SECTION A-A

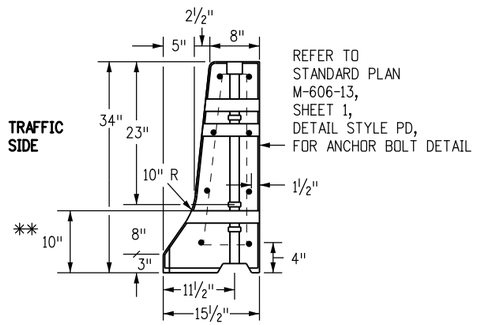


SECTION B-B

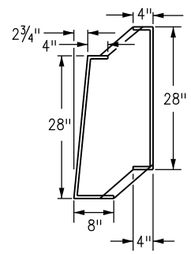


SECTION C-C

** DIMENSIONS MARKED ARE TO THE INTERSECTION POINT OF THE BARRIER SLOPES. CONSTRUCT THE 10 IN. RADIUS TO PROVIDE A SMOOTH TRANSITION BETWEEN THE SLOPES.



NARROW BASE SHOULDER BARRIER



NARROW BASE STIRRUP "M" #5 REBAR PAIR

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Last Modification Date: 07/04/12 Initials: LTA	R-X		
Full Path: www.coloradodot.info/business/designsupport	R-X		
Drawing File Name: 6060140103.dgn	R-X		
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	R-X		

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PRECAST TYPE 7 CONCRETE BARRIER

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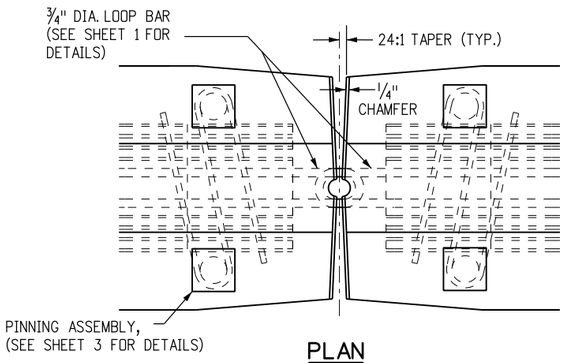
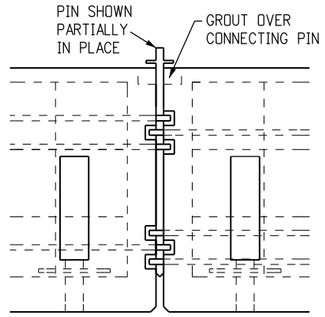


PLAN

SHOWN PRIOR TO PIN INSTALLATION.

FOR DETAILS NOT SHOWN,
SEE SECTION VIEWS A-A, B-B AND C-C
ON SHEET 1.

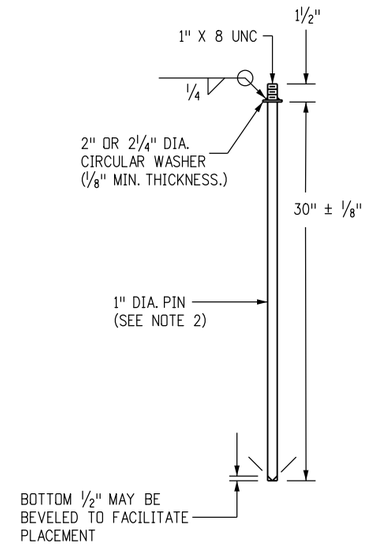


ELEVATION

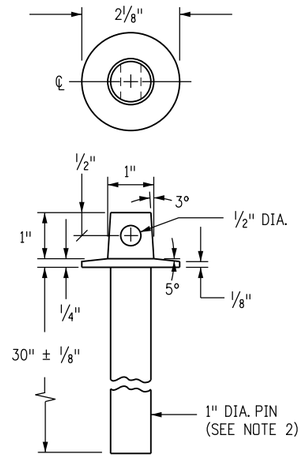
FOR DETAILS NOT SHOWN,
SEE SECTION VIEWS A-A, B-B, AND C-C
ON SHEET 1

NOTES

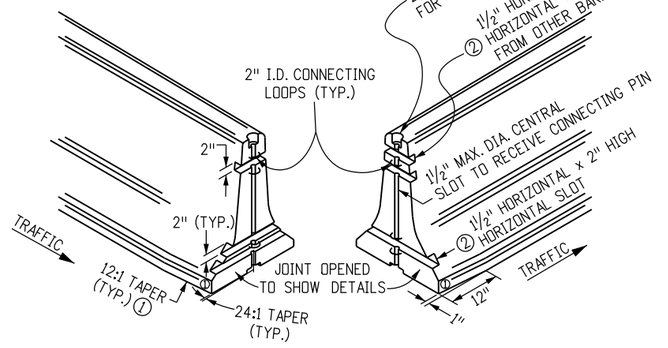
1. WASHERS SHALL BE FORGED AS AN INTEGRAL PART OF THE PIN, OR SHALL BE WELDED AS SHOWN.
2. PINS SHALL BE HOT-DIPPED GALVANIZED AFTER FABRICATION.
3. IF AN ALTERNATIVE TOP CONFIGURATION IS USED FOR LIFTING, THE LIFTING PIN SHALL BE PROVIDED. PINS SHALL CONFORM TO CRITICAL DIMENSIONS (PIN LENGTH DIAMETER).
4. PINS SHALL CONFORM TO ASTM A449.
5. APPROVED NON-SHRINK GROUT SHALL BE USED FOR GROUTING OVER ALL PINS, AND GROUTING OF SCUPPERS.
6. BOTH ENDS OF THE BARRIER SHALL HAVE A 24:1 TAPER IN EACH DIRECTION FROM THE CENTER PIN RECESS TO IT'S OUTER EDGE TO FACILITATE PLACEMENT ON CURVES.
7. JOINTS BETWEEN CAST-IN-PLACE GUARDRAIL TYPE 7 AND PERMANENT INSTALLATION PRECAST TYPE 7 CONCRETE BARRIER SHALL INCLUDE ALL REGRESSES AND LOOPS IN THE CAST-IN-PLACE END, ALONG WITH THE PIN TO COMPLETE THE TYPICAL PRECAST TYPE 7 CONCRETE BARRIER JOINT.



CONNECTING PIN DETAIL



ALTERNATIVE PIN DETAIL



JOINT STYLE

① A 1 IN. BY 12 IN. TAPER IS REQUIRED AT THE BOTTOM OF ALL FOUR CORNERS OF THE BARRIER SECTIONS TO ELIMINATE SNAGGING OF SNOW PLOW BLADES. THE TAPER IS OPTIONAL ON PERMANENT INSTALLATIONS.

② THE HORIZONTAL SLOTS SHALL BE 1½ IN. IN DEPTH AT THE CENTER OF THE BARRIER AND MAY DECREASE IN DEPTH AT THE EDGE OF THE BARRIER DUE TO THE (24:1) TAPER.

DETAILS FOR PIN AND LOOP CONNECTION

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Creation Date: 07/04/12	Initials: DD		Date:	Comments
Last Modification Date: 07/04/12	Initials: LTA	(R-X)		
Full Path: www.coloradodot.info/business/designsupport		(R-X)		
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PRECAST TYPE 7 CONCRETE BARRIER

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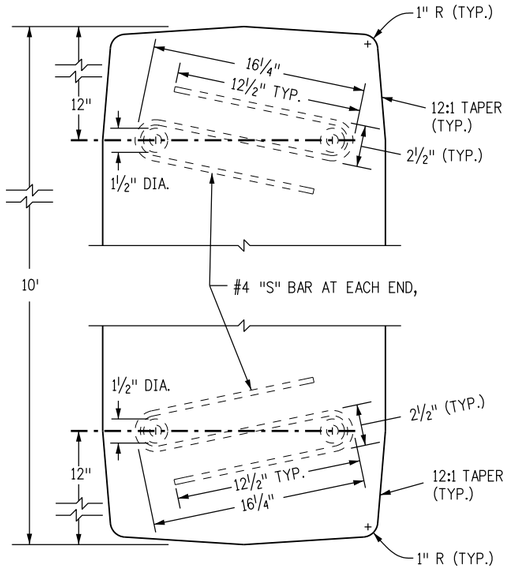
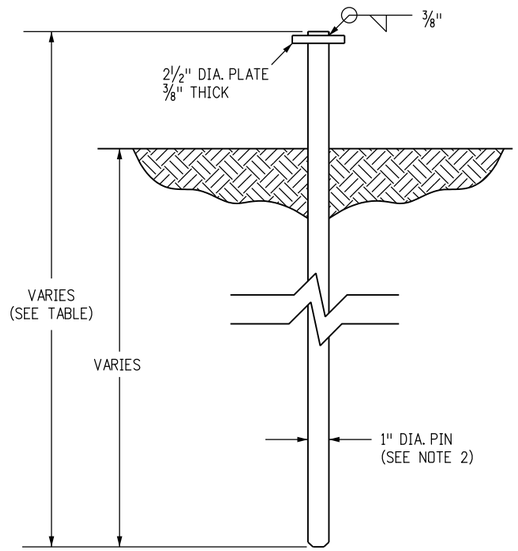
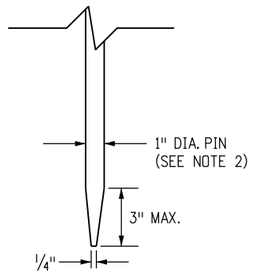


PLAN VIEW OF S BAR ENDS



STABILIZATION PIN

(ASTM A 36 STEEL)



OPTIONAL TAPERED END PIN

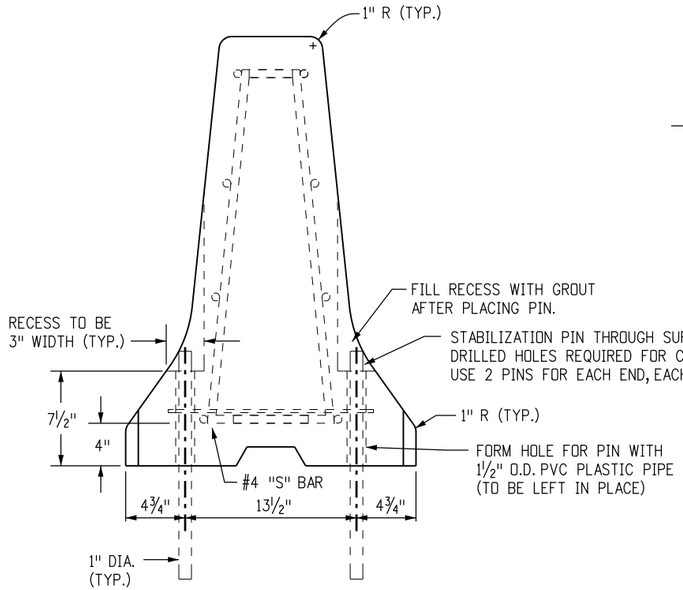
(SEE NOTE 4)

NOTES

1. SEE SHEET 1 FOR REINFORCEMENT AND OTHER DETAILS NOT SHOWN HERE.
2. PINS SHALL BE HOT-DIPPED GALVANIZED AFTER FABRICATION
3. FOR TERMINAL ANCHORING OF THE PERMANENT INSTALLATION OF PRECAST TYPE 7 CONCRETE BARRIER, SEE THE END ANCHORAGE DETAIL ON STANDARD PLAN M-606-13, SHEET 1.
4. AN OPTIONAL 3 IN. MAXIMUM TAPERED END POINT MAY BE PROVIDED ON THE STABILIZATION PIN TO FACILITATE DRIVING.

ROAD SURFACE	PIN LENGTH
CONCRETE	2 FT.-6 IN.
HMA	3 FT.
SOIL	3 FT.-6 IN.

TABLE OF STABILIZATION PIN LENGTHS



ELEVATION VIEW WITH PINS

DETAILS FOR STABILIZATION OF PERMANENT OR TEMPORARY PINNED PRECAST TYPE 7 CONCRETE BARRIER

Computer File Information		Sheet Revisions	
Creation Date: 07/04/12 Initials: DD		Date:	Comments
Last Modification Date: 07/04/12 Initials: LTA	(R-X)		
Full Path: www.coloradodot.info/business/designsupport	(R-X)		
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PRECAST TYPE 7 CONCRETE BARRIER

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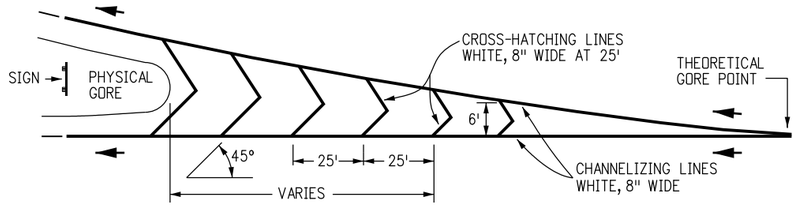
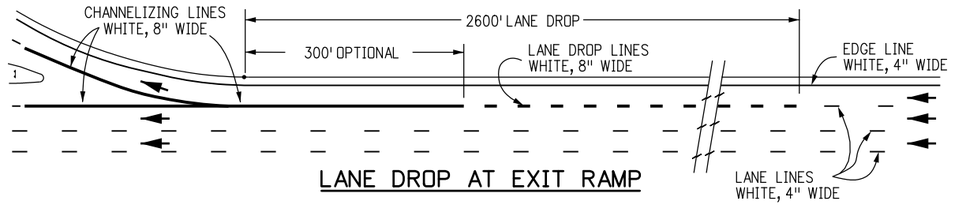


OPTIONAL DECEL LANE



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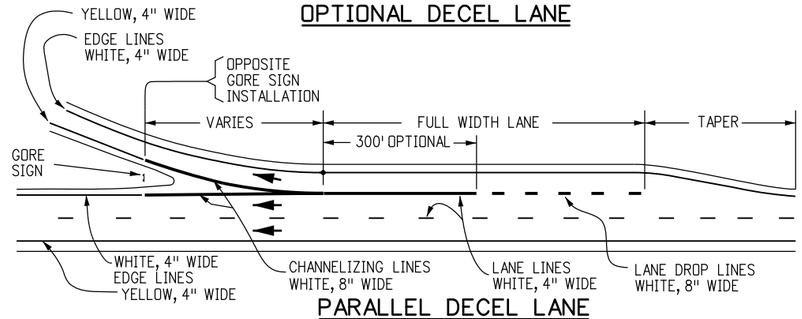
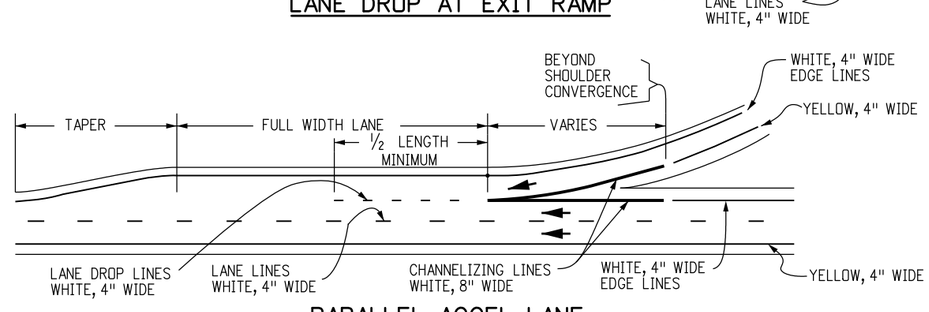
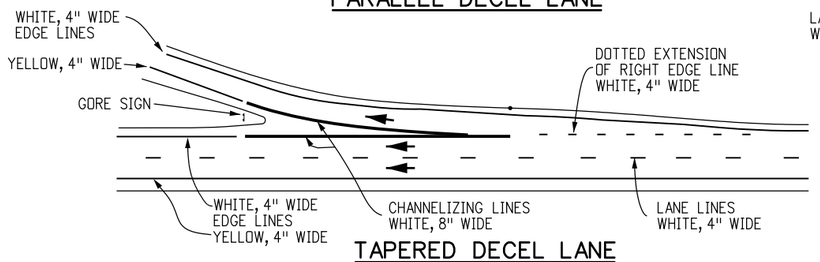


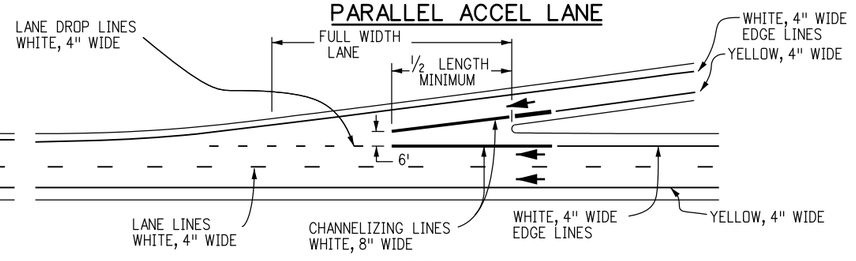
PARALLEL DECEL LANE



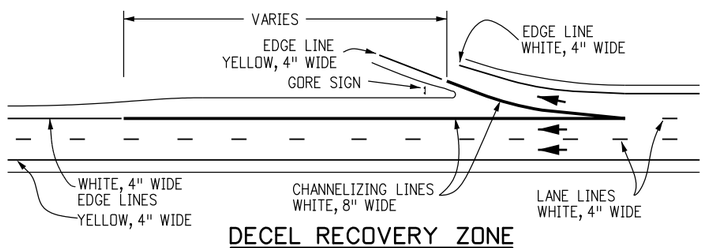
PARALLEL ACCEL LANE



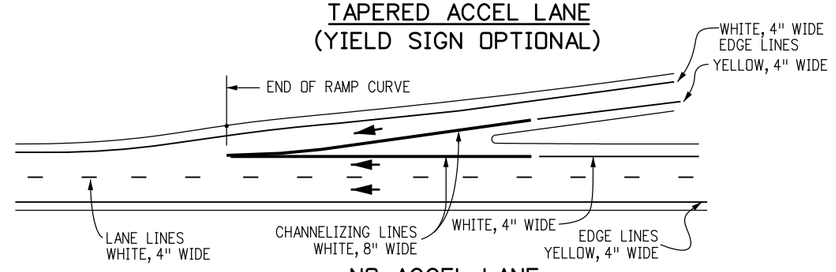
TAPERED DECEL LANE



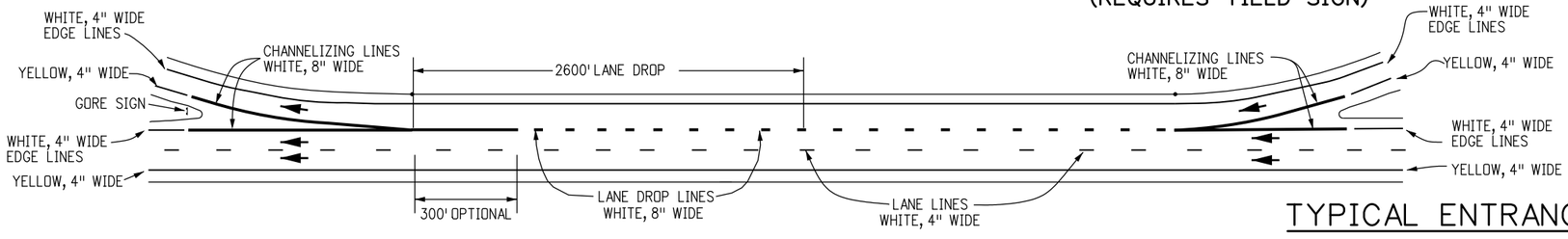
TAPERED ACCEL LANE (YIELD SIGN OPTIONAL)



DECEL RECOVERY ZONE



NO ACCEL LANE (REQUIRES YIELD SIGN)



COMBINATION ACCEL-DECEL LANE

GENERAL NOTES

1. CENTER LINES

   BROKEN YELLOW, 4 IN. WIDE - 10 FT. SEGMENTS WITH 30 FT. GAPS.

   SOLID YELLOW, 4 IN. WIDE.
   THESE LINES SEPARATE ADJACENT-OPPOSITE DIRECTION TRAFFIC LANES. DOUBLE LINES SHALL BE SPACED 4 IN. APART.

2. LANE LINES

   BROKEN WHITE, 4 IN. WIDE - 10 FT. SEGMENTS WITH 30' GAPS.

   SOLID WHITE, 4 IN. WIDE.
   THESE LINES SEPARATE ADJACENT-SAME DIRECTION TRAFFIC LANES. A SOLID LINE MAY BE USED TO DISCOURAGE LANE CHANGING, WHILE TWO PARALLEL SOLID WHITE LINES ARE REQUIRED TO PROHIBIT LANE CHANGING.

3. EDGE LINES

   SOLID WHITE OR YELLOW EDGE LINES SHALL BE 4 IN. WIDE. YELLOW EDGE LINES SHALL BE USED ONLY FOR LEFT EDGE, IN THE DIRECTION OF TRAVEL OF DIVIDED STREETS AND HIGHWAYS (SEPARATED BY OTHER THAN A PAINTED MEDIAN) AND ONE-WAY ROADWAYS (INCLUDING RAMPS).

   EDGE LINES ARE NOT CONTINUED THROUGH INTERSECTIONS AND ARE NOT BROKEN FOR DRIVEWAYS. CARE MUST BE TAKEN TO AVOID EDGE LINE APPEARING AS LANE LINE ALONG ROADWAYS WITH WIDE SHOULDERS AND/OR CLOSELY SPACED DRIVEWAYS.

4. DOTTED LINES

   BROKEN WHITE, WIDTH MATCHING THE LINE BEING EXTENDED-2 FT. SEGMENTS WITH 4 FT. GAPS. THESE LINES ARE USED TO DELINEATE THE EXTENSION OF A LINE THROUGH AN INTERSECTION OR INTERCHANGE AREA.

5. CHANNELIZING LINES

   SOLID WHITE, 8 IN. WIDE. THESE LINES ARE USED WITH ACCELERATION-DECELERATION LANES, PAVEMENT WIDTH TRANSITIONS, AND LEFT-RIGHT TURN SLOTS OR ISLANDS.

6. CROSS-HATCHING LINES

   SOLID WHITE OR YELLOW, 8 IN. WIDE-45 DEGREE DIAGONAL, SPACED AT 25 FT. INTERVALS. THESE LINES ARE OPTIONAL AND MAY BE PLACED AT LOCATIONS INDICATED ON THE PLANS OR DETERMINED BY THE ENGINEER. YELLOW SHALL BE USED FOR PAINTED MEDIANS OR PAVEMENT WIDTH TRANSITIONS ONLY.

   OPTIONAL DIAGONAL SHOULDER MARKINGS SHALL BE SOLID WHITE, 8 IN. WIDE, SPACED AT INTERVALS OF 20 FT. MINIMUM TO 100 FT. MAXIMUM.

7. PARKING LINES

   SOLID WHITE, 3 IN. WIDE-DIAGONAL OR PARALLEL AS SHOWN ON THE PLANS OR DIRECTED BY THE ENGINEER.

8. STOP LINES

   SOLID WHITE, 24 IN. WIDE-EXTEND PARALLEL TO INTERSECTED ROADWAY ACROSS ALL APPROACH LANES OR AS INDICATED AT LOCATIONS ON THE PLANS. LOCATE AT THE DESIRED STOPPING POINT, NOT MORE THAN 30 FT, NOR LESS THAN 4 FT. FROM THE NEAREST EDGE OF THE INTERSECTED TRAFFIC LANE.

9. LANE DROP MARKINGS

   BROKEN WHITE, 8 IN. WIDE - 3 FT. SEGMENTS WITH 9 FT. GAPS. THESE LINES SHOULD BEGIN 2600 FT. IN ADVANCE OF THE THEORETICAL GORE POINT TO DISTINGUISH THE LANE DROP FROM A CONTINUOUS LANE. THE CHANNELIZING LINE MAY BE EXTENDED APPROXIMATELY 300 FT. UPSTREAM.

(CONTINUED ON SHEET NO. 2)

TYPICAL ENTRANCE AND EXIT RAMP MARKINGS

Computer File Information	
Creation Date: 07/04/12	Initials: SCL
Last Modification Date: 06/10/14	Initials: KEN
Full Path: www.coloradodot.info/library/traffic/traffic-s-standard-plans	
Drawing File Name: S-627-01_1of5.dgn	
CAD Ver.: MicroStation V8 Scale: Not to Scale	Units: English

	Sheet Revisions	
	Date:	Comments
R-1	10/18/12	SHEET 2 - ADDED "D" NOTE
R-2	06/27/13	SHEET 5 - UPDATED BICYCLIST SYMBOL
R-3	09/16/13	SHEET 3 - UPDATED TYPICAL ISLAND MARKINGS DETAIL
R-4	06/16/14	SHEET 1 - CORRECTED STRIPING ERROR IN PARALLEL ACCEL LANE DETAIL

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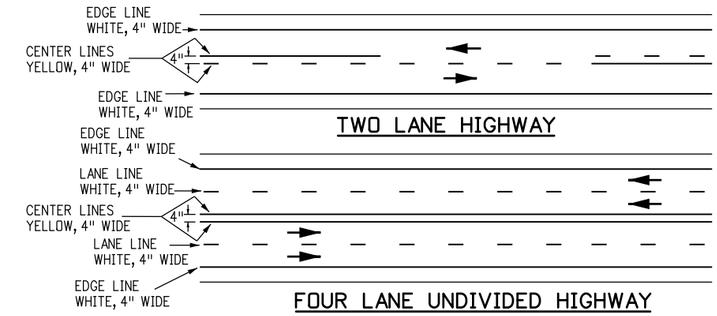
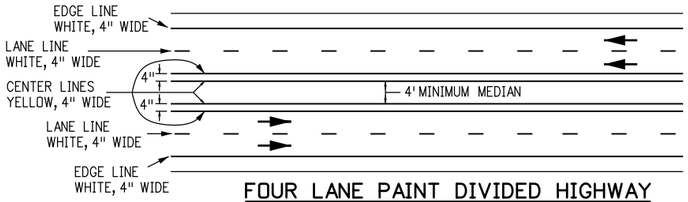
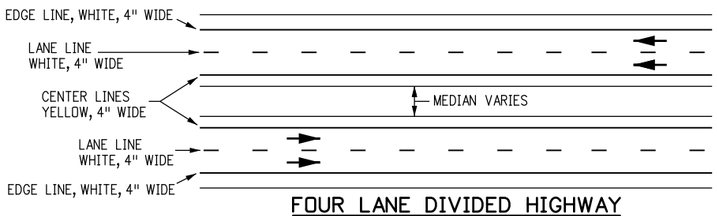


TWO LANE HIGHWAY

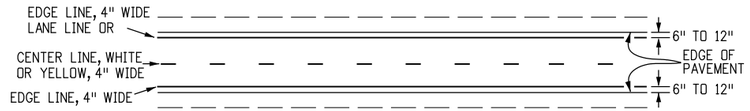
FOUR LANE UNDIVIDED HIGHWAY



FOUR LANE PAINT DIVIDED HIGHWAY

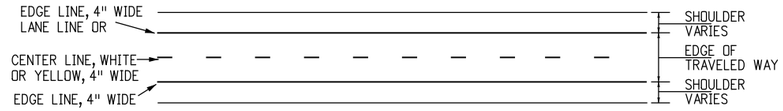


FOUR LANE DIVIDED HIGHWAY

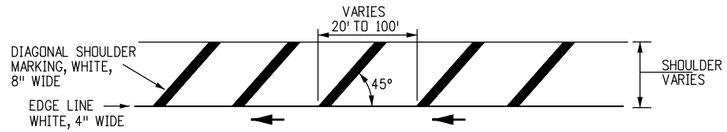


NOTE: EDGE LINES ARE NOT TO BE USED WHEN TRAVELED WAY IS LESS THAN 20 FEET.

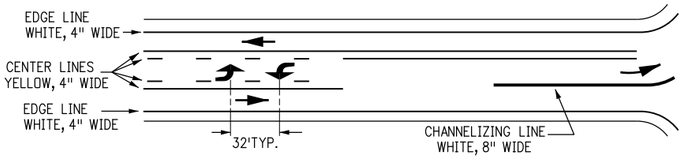
NO SHOULDER OR UNSURFACED SHOULDER



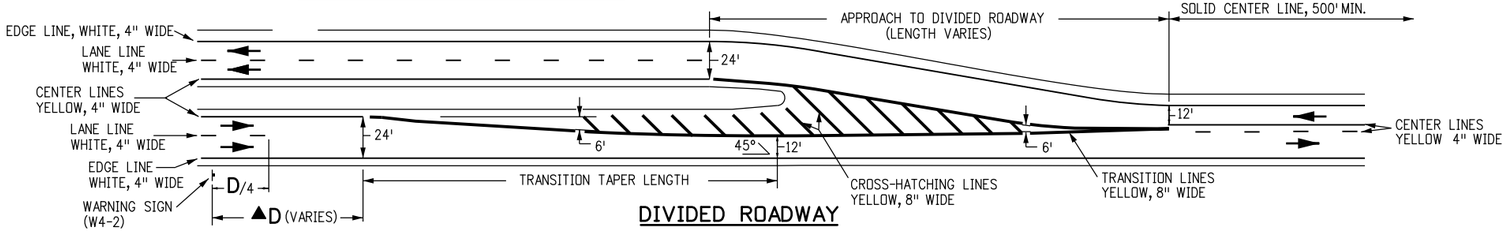
SHOULDER SURFACED



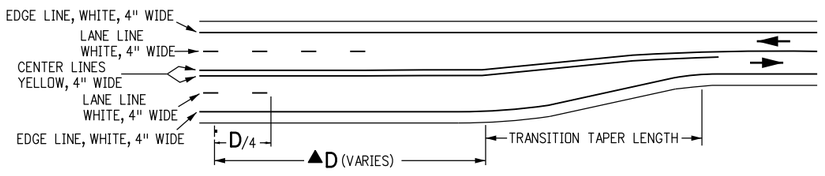
EDGE LINE WITH OPTIONAL DIAGONAL SHOULDER MARKING



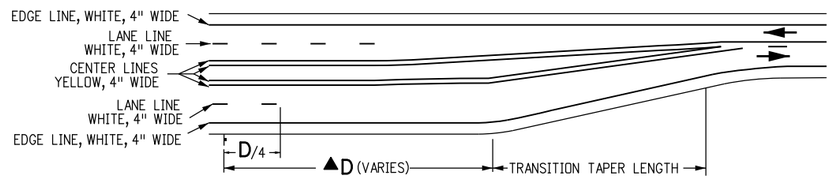
TYPICAL TWO WAY LEFT TURN LANE



DIVIDED ROADWAY



UNDIVIDED ROADWAY - CASE 1



UNDIVIDED ROADWAY - CASE 2

GENERAL NOTES

(CONTINUED FROM SHEET NO. 1)

10. CROSSWALK LINES

SOLID WHITE, 12 IN. WIDE FOR TRANSVERSE LINE TYPE - EXTEND ACROSS ENTIRE WIDTH OF PAVEMENT. IF NO ADVANCE STOP LINE IS PROVIDED, INCREASE THE WIDTH OF THE CROSSWALK LINES TO 24 IN. THE DISTANCE BETWEEN THE LINES IS USUALLY DETERMINED BY THE WIDTH OF THE SIDEWALKS SO CONNECTED, HOWEVER, IN NO CASE SHALL THIS BE LESS THAN 6 FT.

COMPLICATED AND/OR CHANNELIZED INTERSECTIONS AND MID-BLOCK CROSSWALKS SHALL BE SOLID WHITE, 12 IN. TO 24 IN. WIDE AND 8 FT. TO 10 FT. LONG FOR LONGITUDINAL LINE TYPE AS DETAILED IN THE PLANS OR AS DIRECTED BY THE ENGINEER.

11. WORD, ARROW AND SYMBOL MARKINGS

ALL LETTERS, ARROWS AND SYMBOLS SHALL BE IN CONFORMANCE WITH "THE STANDARD ALPHABETS FOR HIGHWAY SIGNS AND PAVEMENT MARKINGS" ADOPTED BY THE FEDERAL HIGHWAY ADMINISTRATION.

12. TRANSITION TAPER LENGTH

L = MINIMUM LENGTH OF TAPER.

S = DESIGN SPEED FOR NEW CONSTRUCTION OR NUMERICAL VALUE OF THE POSTED SPEED LIMIT OF THE 85TH PERCENTILE SPEED OF EXISTING TRAFFIC.

W = WIDTH TRANSITIONED

FORMULA: FOR SPEED 45 MPH OR MORE, $L = S \times W$

FOR SPEED 40 MPH OR LESS, $L = \frac{WS^2}{60}$

13. TRANSITION LINES

SOLID YELLOW, 8 IN. WIDE. THESE LINES ARE USED WHERE ADDITIONAL EMPHASIS OR VISIBILITY IS DESIRABLE AT PAVEMENT WIDTH TRANSITIONS. PLACE AT LOCATIONS INDICATED ON THE PLANS OR AS DIRECTED BY THE ENGINEER.

14. SPEED MEASURING MARKING

SOLID WHITE, 24 IN. - EXTEND 4 FT. FROM OUTSIDE OF EDGE LINES ON SHOULDERS.

▲ NOTE:

D = THE DISTANCE FROM THE PAVEMENT WIDTH TRANSITION SIGN (W4-2) TO THE BEGINNING OF THE TRANSITION TAPER. FOR MORE INFORMATION ON THE "D" VALUE REGARDING SIGN AND PAVEMENT MARKING PLACEMENT, SEE THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES", TABLE 2C-4, CONDITION A: SPEED REDUCTION AND LANE CHANGING IN HEAVY TRAFFIC AND FOOTNOTE 2 REGARDING TYPICAL CONDITIONS.

TYPICAL PAVEMENT WIDTH TRANSITION MARKINGS

Computer File Information		Sheet Revisions	
Creation Date: 07/04/12 Initials: KEN		Date:	Comments
Last Modification Date: 10/18/12 Initials: SCL	R-1	10/18/12	ADDED MORE NOTES ON "D" VALUE
Full Path: www.coloradodot.info/library/traffic/traffic-s-standard-plans	R-X		
Drawing File Name: S-627-01_2of5.dgn	R-X		
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	R-X		

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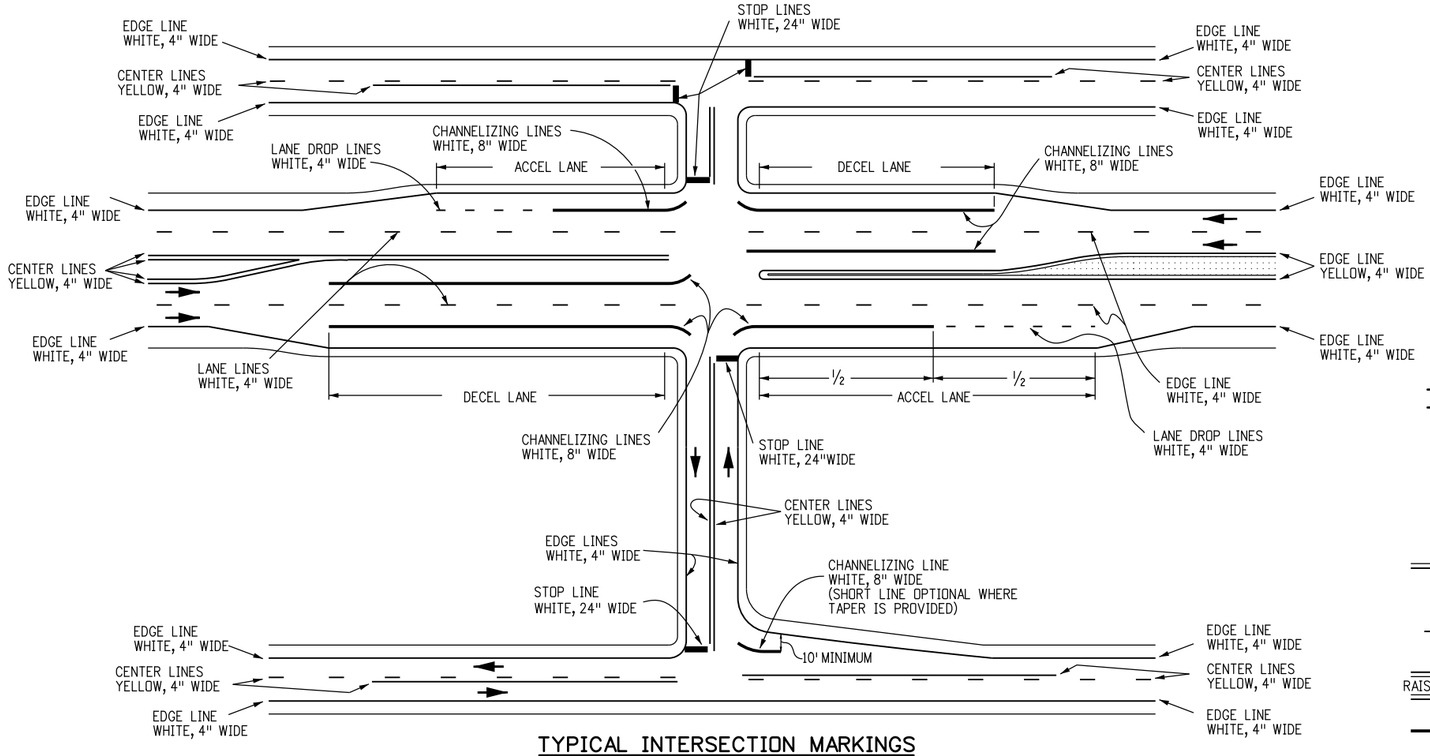
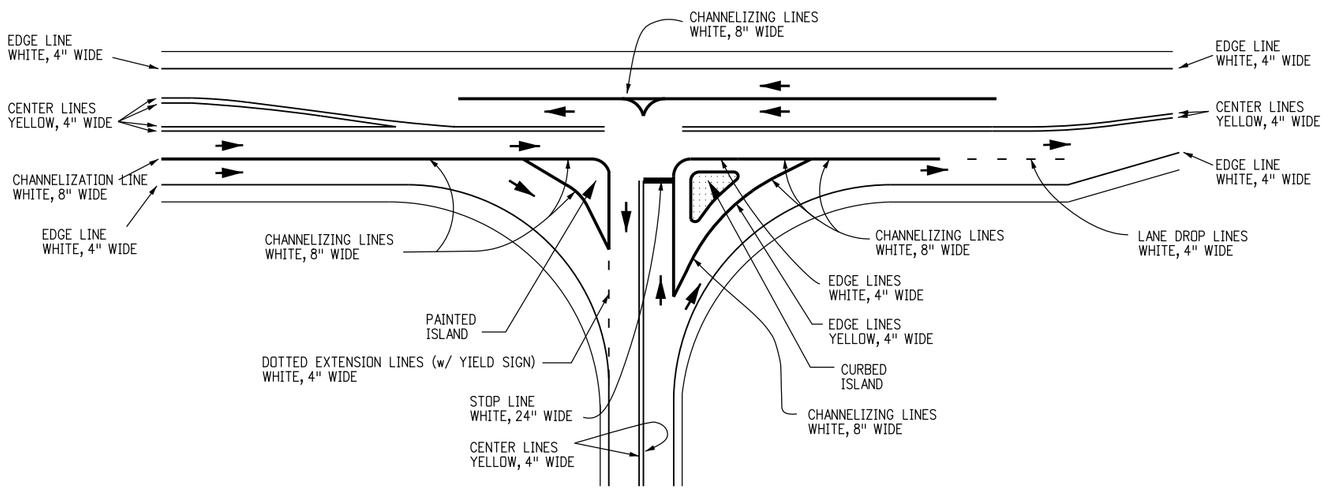
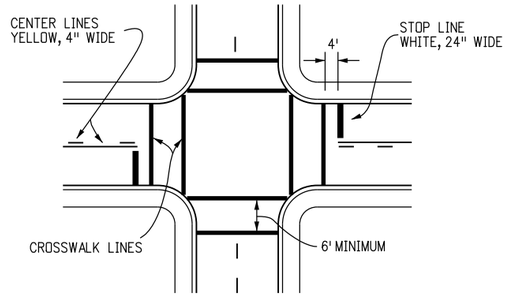


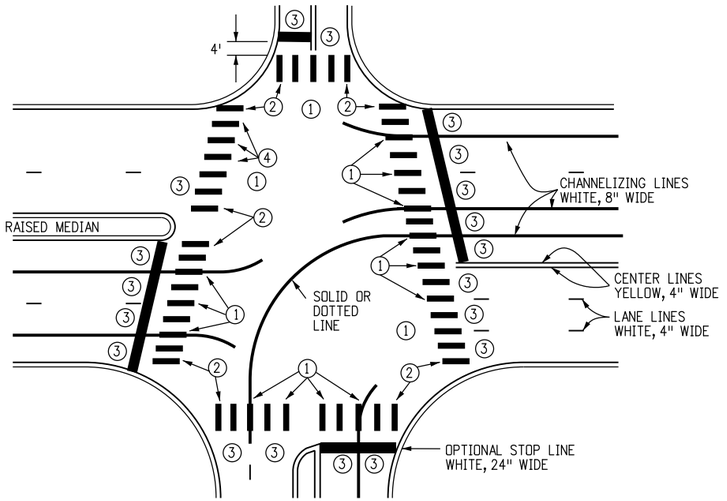
TYPICAL INTERSECTION MARKINGS



TYPICAL ISLAND MARKINGS

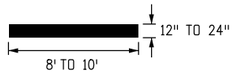


TYPICAL TRANSVERSE LINE CROSSWALK MARKINGS



TYPICAL CONTINENTAL CROSSWALK MARKINGS

LONGITUDINAL LINE DETAIL



CROSSWALK NOTES

CENTER CROSSWALKS ON CURB RAMPS. IF SUCH RAMPS ARE NOT PROVIDED CENTER ON SIGNAL POLES WHEREVER PRACTICAL.

1. CENTER ON LANE, CENTER OR CHANNELIZING LINE.
2. CENTER OR EXTENDED FLOW LINE.
3. CENTER BETWEEN ADJACENT LINES.
4. LINES AND SPACES TO APPROXIMATE ADJACENT PATTERN.

INTERSECTIONS, ISLANDS AND CROSSWALKS

Computer File Information		Sheet Revisions	
Creation Date: 07/04/12 Initials: JSW		Date:	Comments
Last Modification Date: 09/16/13 Initials: KEN	R-3	09/16/13	ADDED ACCEL LANE IN TYP. ISLAND MARKING DETAIL
Full Path: www.coloradodot.info/library/traffic/traffic-s-standard-plans	R-X		
Drawing File Name: S-627-01_3of5.dgn	R-X		
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	R-X		

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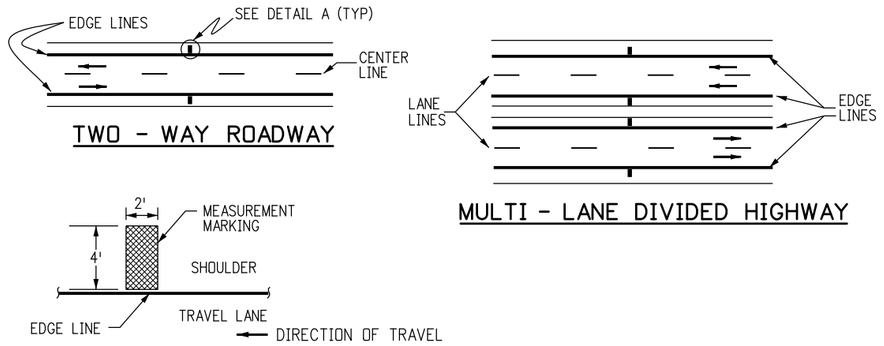
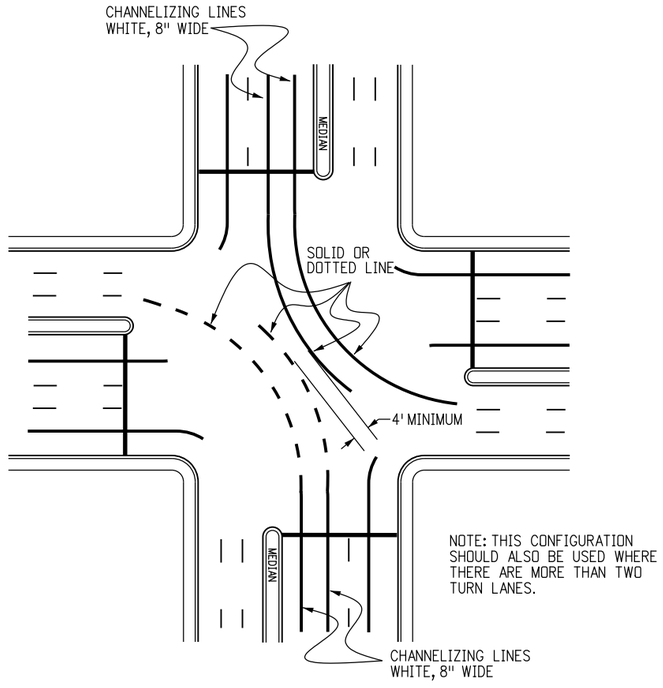
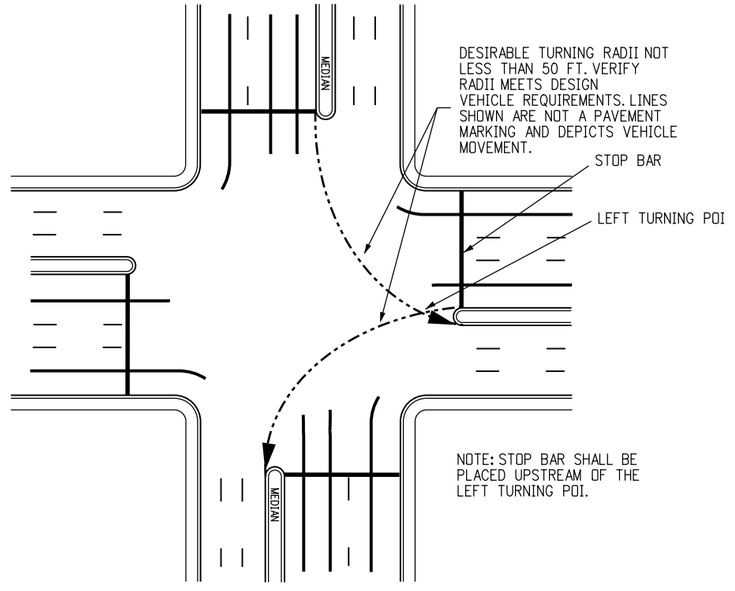


DETAIL A

TYPICAL SPEED MEASUREMENT MARKING



TYPICAL DOUBLE LEFT TURN MARKINGS



TYPICAL STOP BAR PLACEMENT

Computer File Information		Sheet Revisions	
Creation Date: 07/04/12 Initials: SCL		Date:	Comments
Last Modification Date: Initials:	R-X		
Full Path: www.coloradodot.info/library/traffic/traffic-s-standard-plans	R-X		
Drawing File Name: S-627-01_4of5.dgn	R-X		
CAD Ver.: MicroStation V8 Scale: Not to Scale Units: English	R-X		

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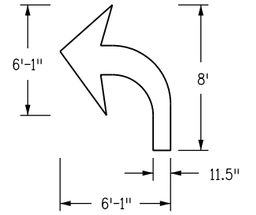
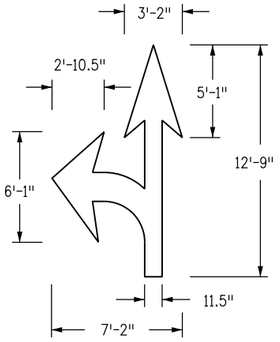


AREA = 15.5 SQ.FT.



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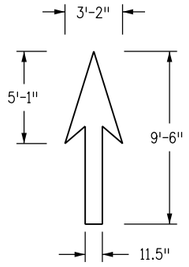

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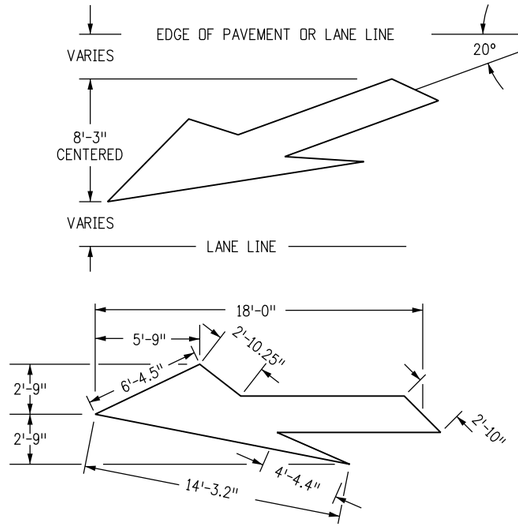

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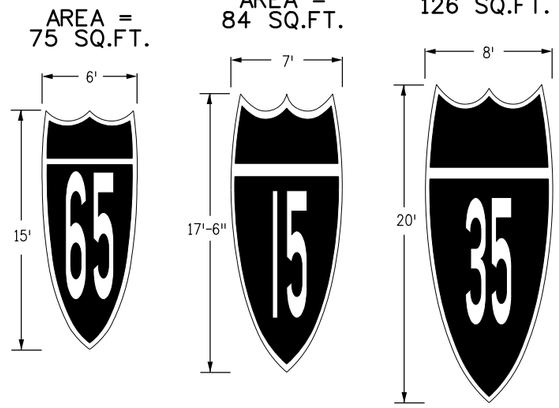


ELONGATED ROUTE SHIELDS

ELONGATED ROUTE SHIELD NOTES

ELONGATED ROUTE SHIELDS SHALL BE AT LEAST 8'x20' WHEN USED ON HIGH SPEED ROADWAYS (45 MPH OR MORE).

PER FIGURE 3B-25 OF THE 2009 MUTCD ELONGATED ROUTE SHIELD COLORS SHALL CONFORM WITH THE STANDARD HIGHWAY SIGNS AND MARKINGS BOOK.

DESIGNATED PAYMENT AREAS

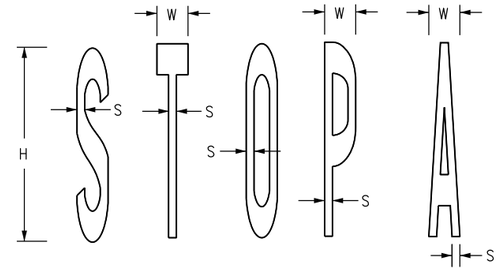
FOR THE FOLLOWING H, W, AND S DIMENSIONS PAY:

H = 4' WORDS

BIKE - 5.5 SQ.FT.
LANE - 6.0 SQ.FT.
ONLY - 6.0 SQ.FT.
XING - 5.0 SQ.FT.

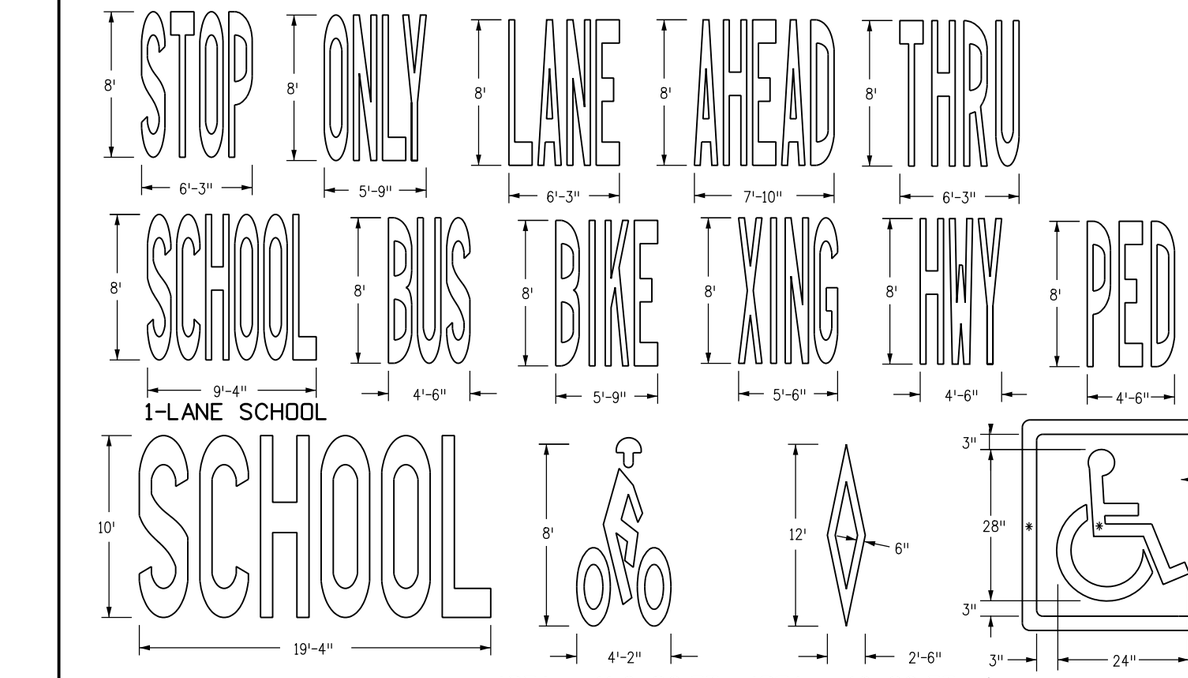
H = 8' WORDS

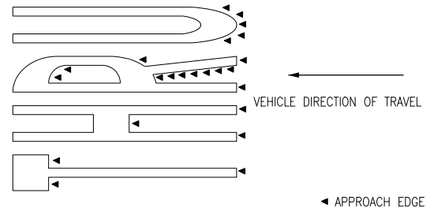
STOP - 23.0 SQ.FT.
XING - 20.0 SQ.FT.
ONLY - 22.5 SQ.FT.
LANE - 22.5 SQ.FT.
AHEAD - 29.0 SQ.FT.
BIKE - 21.0 SQ.FT.
BUS - 18.5 SQ.FT.
HWY - 16.5 SQ.FT.
THRU - 22.0 SQ.FT.
SCHOOL(1L) - 33.0 SQ.FT.
PED - 17.5 SQ.FT.
SCHOOL(2L) - 85.0 SQ.FT.



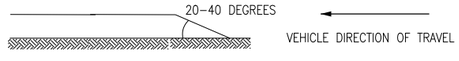
H = HEIGHT	H = 8'	H = 4'
W = WIDTH	W = 1'-3.4" TO 1'-4"	W = 7.7" TO 8"
S = STROKE	S = 3.8" TO 4"	S = 1.9" TO 2"

TYPICAL LETTER MEASUREMENTS





TYPICAL APPROACH EDGE TAPERING VIEW



TYPICAL APPROACH EDGE TAPERING PROFILE VIEW

WORD AND SYMBOL NOTES

IF HEIGHT IS INCREASED OR DECREASED THEN ALL MEASUREMENTS CHANGE PROPORTIONATELY. EXAMPLE: "H" MEASUREMENT FOR STOP IS REDUCED TO 4' FROM 8' THEN SQUARE FEET = 5.75 ($\frac{1}{4}$ OF 23.0 SQ. FT.).

PAVEMENT WORD AND SYMBOL MARKINGS, TRANSVERSE AND LONGITUDINAL (CONTINENTAL) CROSSWALK LINES, AND STOP LINES WILL BE PAID FOR IN SQUARE FEET USING THEIR SPECIFIC BID ITEMS.

TAPERING NOTES

ALL PAVEMENT MARKING APPROACH EDGES FROM THE VEHICLE DIRECTION OF TRAVEL SHALL BE TAPERED USING A PUTTY KNIFE OR SIMILAR TOOL.

PAVEMENT MARKING WORDS AND SYMBOLS

Computer File Information		Sheet Revisions	
Creation Date: 07/04/12 Initials: SCL		Date:	Comments
Last Modification Date: 06/27/13 Initials: KEN	R-2	06/27/13	UPDATED BICYCLIST SYMBOL
Full Path: www.coloradodot.info/library/traffic/traffic-s-standard-plans	R-X		
Drawing File Name: S-627-01_5of5.dgn	R-X		
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