# By eMARYLAND MARKETPLACE (eMM) ONLY

# ADDENDUM NO. 5

## TO THE CONTRACT DOCUMENTS FOR THE

## **BCDC YOUTH DETENTION CENTER**

at the Baltimore City Detention Center in the Division of Pretrial Detention and Services (DPDS)

# STATE OF MARYLAND

CONTRACT NUMBER: KT-000-150-C01

DATE OF ISSUE: MARCH 5, 2015

To All Bidders: This Addendum is intended to modify, explain, correct and/or delete the provisions of the original Contract Documents issued February 5, 2015, and previously-issued Addenda, and is hereby (unless noted otherwise) made a part of the Contract Documents on which the Construction Contract will be based.

Acknowledge receipt of the Addendum by inserting its number and date in the Construction Bid Form. Failure to do so may subject the bidder to disqualification.

Addendum No. 5 consists of a total of eleven (11) 8<sup>1</sup>/<sub>2</sub>" x 11" pages, eight (8) specification attachments containing 93 pages and thirty-eight (38) full-size drawing sheets.

- I. Addendum: eleven (11) pages.
- II. Attachments:

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## Specifications:

01 35 10 SUSTAINABLE PROJECT REQUIREMENTS, LEED Scorecard attachment only (2) pages) 07 42 13.19 INSULATED METAL WALL PANELS (11 pages) 23 09 00 HVAC INSTRUMENTATION AND CONTROLS (17 pages) 23 74 33 DEDICATED OUTDOOR-AIR UNITS (14 pages) VARIABLE REFRIGERANT FLOW SYSTEMS (8 pages) 23 81 30 23 81 30.11 VARIABLE REFRIGERANT VOLUME (VRV) HVAC SYSTEM CONTROLS (10 pages) SECONDARY UNIT SUBSTATIONS - SECONDARY LESS THAN 1000V (19 pages) 26 11 16.11 26 33 54 THREE-PHASE UNINTERRUPTIBLE POWER SYSTEM (12 pages)

Drawings: thirty-eight (38) sheets, as follows:

EY120A

Three (3) Genera G110	l sheets: G120	G130	
Two (2) Architecto AS100	ural sheets: AS200		
One (1) Plumbing PO150	sheet		
Ten (10) Mechani	ical sheets:		
MV130Á	MV140B	MO180	MO183
MO140	MO170	MO181	
MV140A	MO171	MO182	
Twenty-two (22)	Electrical sheets:		
EG000	EP110A	EY120B	E533
EL110A	EP140	E400	E534
EL110B	EY100	E500	E535
EL120A	EY110A	E531	E536

Issued by:

EL120B

for Jermin Englie

Kate Dixon, Acting Director Division of Capital Construction and Facilities Maintenance Department of Public Safety and Correctional Services State of Maryland 6776 Reisterstown Road Suite 201 Baltimore, MD 21215-2341 Telephone: 410-585-3021

E532

E538 E541

E537

Prepared by: PSA-Dewberry + Penza Bailey Architects, A Joint Venture 401 Woodbourne Avenue Baltimore, MD 21212 A. Clarifications and General Bidders' Questions (THESE ARE INTENDED ONLY TO CLARIFY PROVISIONS OF THE CONTRACT DOCUMENTS BUT DO NOT MODIFY THEM):

5.1.	Question: Request to add a manufacturer or a product to a list of acceptable manufacturers or products in a specification section.
	<b>Response:</b> Lists of products and manufacturers in the specifications are in the form of either a Restricted List or a Nonrestricted List, as defined in Section 01 60 00 PRODUCT REQUIREMENTS. In the case of a Nonrestricted List, submission of an unnamed product or manufacturer does not require a substitution or change to the Contract Documents, but must comply with requirements for "Comparable Products" as outlined in that Section.
	For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with the requirements in "Comparable Products" Article in Section 01 60 00 PRODUCT REQUIREMENTS. Such a product is not considered a substitution.
	Proposed changes to a Restricted List shall be in accordance with Section 01 25 00 SUBSTITUTION PROCEDURES.
	Per the Contract Documents, no substitutions will be entertained during the bidding period. After Contract award, alternate approaches or substitutions may be reviewed in accordance with the procedures outlined in Section 01 25 00 SUBSTITUTION PROCEDURES.
5.2.	<b>Question:</b> Details for conduit size, back box and mounting height at Door Types A, B, C, D, and O on TY-001?
	Response: Details are shown on 5/TY-502.
5.3.	Question: Are the 3 interior non-numbered cameras shown on TY-100 to be included in the camera schedule?
	Response: No, all required interior cameras are shown on Sheets TY-110A through TY-140A.
5.4.	Question: Is telecom outlet conduit to be run in cable tray or accessible ceiling space?
	Response: As indicated on Drawing EG000, provide conduit from outlet to the cable tray.
5.5.	Question: Clarify requirements for CMP-rated cabling re Sheet TY-002 and TY-001.
	<b>Response:</b> Section 28 04 12 HORIZONTAL CABLING FOR ELECTRONIC SECURITY, PART 2 – PRODUCTS, 2.1 GENERAL, Paragraph B specifies requirements for cabling types.
5.6.	<b>Question:</b> Confirm responsibility for furnishing and installation of devices shown in details 1, 2,3, & 5 on TY-501, details 4 & 5 on TY-601:
	<b>Response:</b> See Sheet TY-001 and TY-002 Legend Keyed Notes for responsibility for conduit, back boxes and cabling for these devices.
5.7.	Question: On Sheet AF800, question about tile base at toilet rooms 0.8.1, 0.8.2 and 1.7.
	<b>Response</b> : On Sheet AF800, Remark 6 addresses walls to receive tile base at toilet rooms 0.8.1, 0.8.2 and 1.7.

# B. Drawings

5.8.	Sheet G110 FIRST FLOOR CODE SYNOPSIS PLAN: Replace this sheet with revised sheet G110.
5.9.	Sheet G120 SECOND FLOOR CODE SYNOPSIS PLAN: Replace this sheet with revised sheet G120.
5.10.	Sheet G130 THIRD FLOOR CODE SYNOPSIS PLAN: Replace this sheet with revised sheet G130.
5.11.	Sheet AS100 ARCHITECTURAL SITE PLAN: Replace this sheet with revised sheet AS100.
5.12.	Sheet AS200 ARCHITECTURAL SITE DETAILS: Replace this sheet with revised sheet AS200.
5.13.	Sheet AR140A, REFLECTED SOFFIT PLANS:
	1/AR140A REFLECTED DAYROOM SOFFIT PLAN: Replace "PRE-FINISHED ALUMINUM COMPOSITE PANEL SYSTEM" WITH PRE-FINISHED INSULATED CORE METAL PANEL SYSTEM."
	2/AR140A REFLECTED GYM SOFFIT PLAN: Replace "PRE-FINISHED ALUMINUM COMPOSITE PANEL SYSTEM" WITH PRE-FINISHED INSULATED CORE METAL PANEL SYSTEM."
5.14.	Sheet A300 EXTERIOR ELEVATIONS:
	A6/A300 NORTH ELEVATION – YDC: Replace "PRE-FINISHED ALUMINUM COMPOSITE PANEL SYSTEM" WITH PRE-FINISHED INSULATED CORE METAL PANEL SYSTEM."
	D6/A300 EAST ELEVATION – YDC/SUI: Replace "PRE-FINISHED ALUMINUM COMPOSITE PANEL SYSTEM" WITH PRE-FINISHED INSULATED CORE METAL PANEL SYSTEM."
5.15.	Sheet A301 EXTERIOR ELEVATIONS:
	C6/A301 SOUTH ELEVATION – YDC: Replace "PRE-FINISHED ALUMINUM COMPOSITE PANEL SYSTEM" WITH PRE-FINISHED INSULATED CORE METAL PANEL SYSTEM."
	E6/A301 WEST ELEVATION – YDC/SUI: Replace "PRE-FINISHED ALUMINUM COMPOSITE PANEL SYSTEM" WITH PRE-FINISHED INSULATED CORE METAL PANEL SYSTEM."
5.16.	Sheet A302 EXTERIOR ELEVATIONS:
	B4/A302 – 1/AP110A: Replace "PRE-FINISHED ALUMINUM COMPOSITE PANEL SYSTEM" WITH PRE-FINISHED INSULATED CORE METAL PANEL SYSTEM."
	B6/A302 – 1/AP110A: Replace "PRE-FINISHED ALUMINUM COMPOSITE PANEL SYSTEM" WITH PRE-FINISHED INSULATED CORE METAL PANEL SYSTEM."
	D4/A302 – 1/AP110A: Replace "PRE-FINISHED ALUMINUM COMPOSITE PANEL SYSTEM" WITH PRE-FINISHED INSULATED CORE METAL PANEL SYSTEM."
	D6/A302 – 1/AP110A: Replace "PRE-FINISHED ALUMINUM COMPOSITE PANEL SYSTEM" WITH PRE-FINISHED INSULATED CORE METAL PANEL SYSTEM."

5.17.	Sheet A400 WALL SECTIONS:
0.17.	
	A/A400 WALL SECTION – YDC: Replace "PRE-FINISHED ALUMINUM COMPOSITE PANEL SYSTEM" WITH PRE-FINISHED INSULATED CORE METAL PANEL SYSTEM."
	B/A400 WALL SECTION – YDC: Replace "PRE-FINISHED ALUMINUM COMPOSITE PANEL SYSTEM" WITH PRE-FINISHED INSULATED CORE METAL PANEL SYSTEM."
	C/A400 WALL SECTION – YDC: Replace "PRE-FINISHED ALUMINUM COMPOSITE PANEL SYSTEM" WITH PRE-FINISHED INSULATED CORE METAL PANEL SYSTEM."
5.18.	Sheet A401 WALL SECTIONS:
	E/A401 WALL SECTION – YDC: Replace "PRE-FINISHED ALUMINUM COMPOSITE PANEL SYSTEM" WITH PRE-FINISHED INSULATED CORE METAL PANEL SYSTEM."
	F/A401 WALL SECTION – YDC: Replace "PRE-FINISHED ALUMINUM COMPOSITE PANEL SYSTEM" WITH PRE-FINISHED INSULATED CORE METAL PANEL SYSTEM."
5.19.	Sheet A403 WALL SECTIONS:
	Q/A403 WALL SECTION – YDC: Replace "PRE-FINISHED ALUMINUM COMPOSITE PANEL SYSTEM" WITH PRE-FINISHED INSULATED CORE METAL PANEL SYSTEM."
5.20.	Sheet A405 WALL SECTIONS:
	Y/A405 WALL SECTION: Replace "PRE-FINISHED ALUMINUM COMPOSITE PANEL SYSTEM" WITH PRE-FINISHED INSULATED CORE METAL PANEL SYSTEM."
5.21.	Sheet A500 CONSTRUCTION DETAILS:
	A1/A500 – A/A400: Replace "PRE-FINISHED ALUMINUM COMPOSITE PANEL SYSTEM" WITH PRE-FINISHED INSULATED CORE METAL PANEL SYSTEM." Replace "ALIGN STUD WITH ALUMINUM COMPOSITE PANEL ANCHOR LOCATIONS" with "ALIGN STUD WITH INSULATED METAL PANEL ANCHOR LOCATIONS."
	A3/A500 – A/A400: Replace "PRE-FINISHED ALUMINUM COMPOSITE PANEL SYSTEM" WITH PRE-FINISHED INSULATED CORE METAL PANEL SYSTEM." Replace "ALIGN STUD WITH ALUMINUM COMPOSITE PANEL ANCHOR LOCATIONS" with "ALIGN STUD WITH INSULATED METAL PANEL ANCHOR LOCATIONS."
5.22.	Sheet A501 CONSTRUCTION DETAILS:
	A1/A501 – B/A400: Replace "PRE-FINISHED ALUMINUM COMPOSITE PANEL SYSTEM" WITH PRE-FINISHED INSULATED CORE METAL PANEL SYSTEM." Replace "ALIGN STUD WITH ALUMINUM COMPOSITE PANEL ANCHOR LOCATIONS" with "ALIGN STUD WITH INSULATED METAL PANEL ANCHOR LOCATIONS."
	E4/A501 – E/A401: Replace "PRE-FINISHED ALUMINUM COMPOSITE PANEL SYSTEM" WITH PRE-FINISHED INSULATED CORE METAL PANEL SYSTEM." Replace "ALIGN STUD WITH ALUMINUM COMPOSITE PANEL ANCHOR LOCATIONS" with "ALIGN STUD WITH INSULATED METAL PANEL ANCHOR LOCATIONS."

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5.23.	Sheet A502 CONSTRUCTION DETAILS:
0.20.	Sheet ASUZ CONSTRUCTION DETAILS.
	C3/A502 – F/A401: Replace "PRE-FINISHED ALUMINUM COMPOSITE PANEL SYSTEM" WITH PRE-FINISHED INSULATED CORE METAL PANEL SYSTEM." Replace "ALIGN STUD WITH ALUMINUM COMPOSITE PANEL ANCHOR LOCATIONS" with "ALIGN STUD WITH INSULATED METAL PANEL ANCHOR LOCATIONS."
	C4/A502 – F/A401: Replace "PRE-FINISHED ALUMINUM COMPOSITE PANEL SYSTEM" WITH PRE-FINISHED INSULATED CORE METAL PANEL SYSTEM." Replace "ALIGN STUD WITH ALUMINUM COMPOSITE PANEL ANCHOR LOCATIONS" with "ALIGN STUD WITH INSULATED METAL PANEL ANCHOR LOCATIONS."
5.24.	Sheet A600 HOLLOW METAL DOOR AND FRAME SCHEDULE, change Hardware Set for 6.9 CAN WASH, Door Number 6.9, to Hardware Set 03.
5.25.	Sheet D400, DETENTION WINDOW SCHEDULE: Add the following windows:
	8.1.3, with Frame Type DF22, Glazing Type SG-12. 8.1.5, with Frame Type DF22, Glazing Type SG-12.
5.26.	Sheet P0150 PLUMVING DETAILS: Replace this sheet with revised Sheet P0150, attached.
5.27.	Sheet MV130A THIRD FLOOR AND MEZZ. PLAN - MECHANCIAL: Replace this sheet with revised Sheet MV130A, attached.
5.28.	Sheet MO140 ROOF PLAN – MECHANICAL: Replace this sheet with revised Sheet MO140, attached.
5.29.	Sheet MV140A ROOF PLAN – HVAC MECHANICAL – AREA A: Replace this sheet with revised Sheet MV140A, attached.
5.30.	Sheet MV140B ROOF PLAN – HVAC MECHANICAL – AREA B: Replace this sheet with revised Sheet MV140B, attached.
5.31.	Sheet MO170 MECHANICAL SCHEDULES: Replace this sheet with revised Sheet MO170, attached.
5.32.	Sheet MO171 MECHANICAL SCHEDULES: Replace this sheet with revised Sheet MO171, attached.
5.33.	Sheet MO180 MECHANICAL – AUTOMATIC CONTROL DIAGRAMS: Replace this sheet with revised Sheet MO180, attached.
5.34.	Sheet MO181 MECHANICAL – AUTOMATIC CONTROL DIAGRAMS: Replace this sheet with revised Sheet MO181, attached.
5.35.	Sheet MO182 MECHANICAL – AUTOMATIC CONTROL DIAGRAMS: Replace this sheet with revised Sheet MO182, attached.
5.36.	Sheet MO183 MECHANICAL - AUTOMATIC CONTROL DIAGRAMS: Add Sheet MO183, attached.
5.37.	Sheet EG000: Replace this sheet with revised sheet EG000.
5.38.	Sheet EL110A: Replace this sheet with revised sheet EL110A.
5.39.	Sheet EL110B: Replace this sheet with revised sheet EL110B.
5.40.	Sheet EL120A: Replace this sheet with revised sheet EL120A.

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Sheet EL120B: Replace this sheet with revised sheet EL120B.         Sheet EP110A: Replace this sheet with revised sheet EP110A.         Sheet EP140: Replace this sheet with revised sheet EP140.
Sheet EP140: Replace this sheet with revised sheet EP140.
Sheet EY100: Replace this sheet with revised sheet EY100.
Sheet EY110A: Replace this sheet with revised sheet EY110A.
Sheet EY120A: Replace this sheet with revised sheet EY120A.
Sheet EY120B: Replace this sheet with revised sheet EY120B.
Sheet E400: Replace this sheet with revised sheet E400.
Sheet E500: Replace this sheet with revised sheet E500.
Sheet E531: Replace this sheet with revised sheet E531.
Sheet E532: Replace this sheet with revised sheet E532.
Sheet E533: Replace this sheet with revised sheet E533.
Sheet E534: Replace this sheet with revised sheet E534.
Sheet E535: Replace this sheet with revised sheet E535.
Sheet E536: Replace this sheet with revised sheet E536.
Sheet E537: Replace this sheet with revised sheet E537.
Sheet E538: Replace this sheet with revised sheet E538.
Sheet E541: Replace this sheet with revised sheet E541.
Sheet TY-120B, SECOND FLOOR PLAN, AREA B, Classroom 1 (Room 9.1.1): add a wall-mounted Duress Button to room 9.1.1.
Sheet TY301, Drawings 4 and 8: Change note "SECURITY CABINETS BY DIV 27" to "SECURITY CABINETS BY DIV 28".

# C. Project Manual

5.61.	Volumes	1 through 6, TABLE OF CONTENTS:
	Delete	Section 07 42 43 COMPOSITE WALL PANELS.
	Add Se	ction 07 42 13.19 INSULATED METAL WALL PANELS.
		ction 23 81 30.11 VARIABLE REFRIGERANT VOLUME (VRV) HVAC SYSTEM NTROLS.
5.62.		1 35 10 SUSTAINABLE PROJECT REQUIREMENTS, PART 1 – GENERAL, 1.5 ABLE PROJECT REQUIREMENTS, A. LEED CERTIFICATION: Add paragraph 11 as
		<ol> <li>Portions of the LEED Scorecard and Design Credit submittals are not complete. The Contractor is to comply with all LEED credits marked "Yes" AND "Maybe", with final and the most current credit selections and responsibilities being recorded in the project's SmartSheet LEED Scorecard. Per item no.B.3, the contractor shall be granted access to the Smartsheet online scorecard and task list.</li> </ol>
5.63.	Section (	1 3 5 10 SUSTAINABLE PROJECT REQUIREMENTS: Add LEED Scorecard, attached.
5.64.		4 20 00 UNIT MASONRY, PART 2 – PRODUCTS, 2.5 BRICK, Paragraph B Face Brick: paragraph 3 with the following:
	3	. Face Brick: McAvoy Brick "Havertown". Match size, coursing and joint treatment of existing brick at SUI Building.
5.65.		5 51 13 METAL PAN STAIRS, PART 2 – PRODUCTS, 2.1 MANUFACTURERS: Replace h A with the following (retain existing subparagraphs 1 through 5):
		lanufacturers: Subject to compliance with requirements, manufacturers whose products may e incorporated into the Work include, but are not limited to, the following:
5.66.		5 51 13 METAL PAN STAIRS, PART 2 – PRODUCTS, 2.2 PERFORMANCE EMENTS: Add Paragraph D and subparagraph as follows:
		tructural Performance of Railings: Railings shall withstand the effects of gravity loads and the llowing loads and stresses within limits and under conditions indicated:
	1	Handrails and Top Rails of Guards:
		<ul> <li>a. Uniform load of 50 lbf/ft. (0.73 kN/m) applied in any direction.</li> <li>b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.</li> <li>c. Uniform and concentrated loads need not be assumed to act concurrently.</li> </ul>
	2	Infill of Guards:
		<ul> <li>a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).</li> <li>b. Infill load and other loads need not be assumed to act concurrently.</li> </ul>
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5.67.		05 51 13 METAL PAN STAIRS, PART 2 – PRODUCTS: Add Paragraph 2.9 and graphs as follows:
	2.9	STAIR RAILINGS
	A.	Comply with applicable requirements in Section 055213 "Pipe and Tube Railings."
		1. Rails may be bent at corners, rail returns, and wall returns, instead of using prefabricated fittings.
		2. Connect posts to stair framing by direct welding unless otherwise indicated.
	В.	Steel Tube Railings: Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand indicated loads.
		<ol> <li>Rails and Posts: 1-1/2-inch- (38-mm-) square top and bottom rails and 1-1/2-inch- (38-mm-) square posts.</li> <li>Picket Infill: 1/2-inch- (13-mm-) round pickets spaced less than 4 inches (100 mm) clear.</li> </ol>
	C.	Welded Connections: Fabricate railings with welded connections. Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
		<ol> <li>Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 2 welds: completely sanded joint, some undercutting and pinholes are okay as shown in NAAMM AMP 521.</li> </ol>
	D.	Form changes in direction of railings as follows:
		1. As detailed.
	E.	For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
	F.	Close exposed ends of railing members with prefabricated end fittings.
	G.	Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.
	Н.	Connect posts to stair framing by direct welding unless otherwise indicated.
	I.	Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
		<ol> <li>For nongalvanized railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.</li> </ol>
		<ol> <li>Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides 1-1/2-inch (38-mm) clearance from inside face of handrail to finished wall surface.</li> </ol>

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5.68.			1 13 METAL PAN STAIRS, PART 2 – PRODUCTS, 2.11 FINISHES: Delete Paragraph B graphs 1 and 2.
5.69.			1 13 METAL PAN STAIRS, PART 2 – PRODUCTS, 2.11 FINISHES: Replace Paragraph llowing:
	C.		aration for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with SSPC /NACE No. 3, "Commercial Blast Cleaning."
5.70.	Section	1 07 4	2 13.19 INSULATED METAL WALL PANELS: Add Section 07 42 13.19, attached.
5.71.	Section	4 07 נ	2 43 COMPOSITE WALL PANELS: Delete Section 07 42 43.
5.72.	Section	7 07 ו	2 00 ROOF ACCESSORIES:
	PAR <sup>-</sup> foilow		GENERAL, 1.2 SUMMARY, Paragraph A. Section Includes: Add subparagraph 6 as
		6.	Rooftop fall protection system.
	PART	Г1—0	GENERAL, 1.2 SUMMARY, Paragraph B. Related Sections: Delete subparagraph 2.
			GENERAL, 1.5 ACTION SUBMITTALS, Paragraph D. Delegated-Design Submittal: Add aph 3 as follows:
		3.	Roof fall protection system: Design and detail fabrication and attachment of complete fall protection system for roof areas as indicated, including retractable or horizontal lifeline systems and ladder protection, in compliance with ANSI/ASSE Z359.2-2007 and OSHA load requirements. Include analysis of anchorage system and applied loads to structure by qualified fall protection engineer.
5.73.			2 00 ROOF ACCESSORIES, PART 2 – PRODUCTS, 2.8 ROOF ANCHORS: Replace
	2.8	ROC	OFTOP FALL PROTECTION SYSTEM
	A.	Certi	fied active fall protection system, including horizontal lifelines and ladder protection.
		1. <b>2</b> .	Allow continuous mobility along edges indicated to receive fall protection system. Include all end-user equipment, including harnesses and lanyards, as part of system.
5.74.			2 00 ROOF ACCESSORIES, PART 3 – EXECUTION: Add Paragraph 3.4 and hs as follows:
	3.4	DEM	IONSTRATION AND TRAINING
	А.		ooftop fall protection system, provide demonstration and training of Owner's personnel stem-authorized users.

5.75.	Section 08 71 00 DOOR HARDWARE, Add the following hardware sets:
	Hardware Set No. 48 Door #(s): 11.3.11 11.3.12
	Each To Have:
	QtyDescriptionCatalog NumberFinishMfr1EACONT. HINGE112HD628IVE1EAINSTITUTIONAL W/ DEADBOLTL9482T 06N x L11-943626SCH1EAPRIMUS CORE20-740-XP626SCH1SETSEALS5050BBRNNGP1EADOOR SWEEP101VACLNGP1EATHRESHOLD513ALNGP1EADOOR POSITION SWITCHBY SECURITY CONTRACTORState
5.76.	Section 08 80 00 GLAZING, PART 2 – PRODUCTS, 2.15 FIRE-PROTECITON-RATED GLAZING TYPES, Paragraph B: Change "FRSG" to "GL-2".
5.77.	Section 23 09 00 HVAC INSTRUMENTATION AND CONTROLS: Replace entire section with revised Section 23 09 00, attached.
5.78.	Section 23 74 33 DEDICATED OUTDOOR-AIR UNITS: Replace entire section with revised Section 23 74 33, attached.
5.79.	Section 23 81 30 VARIABLE REFRIGERANT FLOW SYSTEMS: Replace entire section with revised Section 23 81 30, attached.
5.80.	Section 23 81 30.11 VARIABLE REFRIGERANT VOLUME (VRV) HVAC SYSTEM CONTROLS: Add Section 23 81 30.11, attached.
5.81.	Section 26 11 16.11: Add Section 26 11 16.11, attached.
5.82.	Section 26 12 19: Delete Section 26 12 19.
5.83.	Section 26 23 13: Delete Section 26 23 13.
5.84.	Section 26 33 54: Replace this Section with 26 33 54, attached.

## **END of ADDENDUM NO. 5**



# LEED 2009 for New Construction and Major Renovation Project Scorecard

ject Nam ject Add	ne: Youth Dete ress:		
<u> </u>	™ 5 SUSTAIN	IABLE SITES	26 Points
	Prereq 1	Construction Activity Pollution Prevention	Required
	Credit 1	Site Selection	1
	Credit 2	Development Density and Community Connectivity	5
+	Credit 3 Credit 4.1	Brownfield Redevelopment Alternative Transportation - Public Transportation Access	1 6
	Credit 4.1 Credit 4.2	Alternative Transportation - Public Transportation Access Alternative Transportation - Bicycle Storage and Changing Rooms	1
	Credit 4.3	Alternative Transportation - Low-Emitting and Fuel-Efficient Vehicles	3
	Credit 4.4	Alternative Transportation - Parking Capacity	2
· ·	1 Credit 5.1	Site Development - Protect or Restore Habitat	1
1	Credit 5.2 Credit 6.1	Site Development - Maximize Open Space Stormwater Design - Quantity Control	1
	1 Credit 6.2	Stormwater Design - Quality Control	1
	1 Credit 7.1	Heat Island Effect - Nonroof	1
	Credit 7.2	Heat Island Effect - Roof	1
: ? N	Credit 8	Light Pollution Reduction	1
	6 WATER I	EFFICIENCY	10 Points
	Prereq 1	Water Use Reduction	Required
	Credit 1	Water Efficient Landscaping	2 to 4
		2 Reduce by 50% 4 No Potable Water Use or Irrigation	2 4
	2 Credit 2	Innovative Wastewater Technologies	2
	4 Credit 3	Water Use Reduction	2 to 4
		2 Reduce by 30%	2
		3 Reduce by 35% 4 Reduce by 40%	3
			4
92	20 ENERGY	& ATMOSPHERE	35 Points
92	20 ENERGY Prereq 1		
9 2	Prereq 1 Prereq 2	& ATMOSPHERE Fundamental Commissioning of Building Energy Systems Minimum Energy Performance	35 Points Required Required
	Prereq 1 Prereq 2 Prereq 3	& ATMOSPHERE Fundamental Commissioning of Building Energy Systems Minimum Energy Performance Fundamental Refrigerant Management	35 Points Required Required Required
92	Prereq 1 Prereq 2	& ATMOSPHERE Fundamental Commissioning of Building Energy Systems Minimum Energy Performance Fundamental Refrigerant Management Optimize Energy Performance	35 Points Required Required
	Prereq 1 Prereq 2 Prereq 3	& ATMOSPHERE Fundamental Commissioning of Building Energy Systems Minimum Energy Performance Fundamental Refrigerant Management	35 Points Required Required Required 1 to 19
	Prereq 1 Prereq 2 Prereq 3	& ATMOSPHERE Fundamental Commissioning of Building Energy Systems Minimum Energy Performance Fundamental Refrigerant Management Optimize Energy Performance I Improve by 12% for New Buildings or 8% for Existing Building Renovations	35 Points Required Required Required 1 to 19 1
	Prereq 1 Prereq 2 Prereq 3	ATMOSPHERE  Fundamental Commissioning of Building Energy Systems Minimum Energy Performance Fundamental Refrigerant Management Optimize Energy Performance I Improve by 12% for New Buildings or 8% for Existing Building Renovations     Improve by 14% for New Buildings or 10% for Existing Building Renovations     Improve by 16% for New Buildings or 12% for Existing Building Renovations     Improve by 18% for New Buildings or 14% for Existing Building Renovations     Improve by 18% for New Buildings or 14% for Existing Building Renovations	35 Points Required Required 1 to 19 1 2 3 4
	Prereq 1 Prereq 2 Prereq 3	ATMOSPHERE  Fundamental Commissioning of Building Energy Systems Minimum Energy Performance Fundamental Refrigerant Management Optimize Energy Performance      Improve by 12% for New Buildings or 8% for Existing Building Renovations     Improve by 14% for New Buildings or 10% for Existing Building Renovations     Improve by 16% for New Buildings or 12% for Existing Building Renovations     Improve by 18% for New Buildings or 12% for Existing Building Renovations     Improve by 18% for New Buildings or 12% for Existing Building Renovations     Improve by 18% for New Buildings or 16% for Existing Building Renovations     Improve by 20% for New Buildings or 16% for Existing Building Renovations	35 Points Required Required Required 1 to 19 1 2 3 4 5
	Prereq 1 Prereq 2 Prereq 3	A ATMOSPHERE  Fundamental Commissioning of Building Energy Systems Minimum Energy Performance Fundamental Refrigerant Management Optimize Energy Performance      Improve by 12% for New Buildings or 8% for Existing Building Renovations     Improve by 14% for New Buildings or 10% for Existing Building Renovations     Improve by 16% for New Buildings or 12% for Existing Building Renovations     Improve by 16% for New Buildings or 12% for Existing Building Renovations     Improve by 18% for New Buildings or 12% for Existing Building Renovations     Improve by 20% for New Buildings or 16% for Existing Building Renovations     Improve by 22% for New Buildings or 16% for Existing Building Renovations     Improve by 22% for New Buildings or 18% for Existing Building Renovations	35 Points Required Required 1 to 19 1 2 3 4 5 6
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LEED 2009 for New Construction and Major Renovation Project Scorecard

ject Name: Youth Deter ject Address:	Center	3.3.2015
? No ? No		
7 MATERIA	LS & RESOURCES	14 Points
Prereq 1	Storage and Collection of Recyclables	Required
3 Credit 1.1	Building Reuse - Maintain Existing Walls, Floors and Roof	1 to 3
	Reuse 55%	1
	Reuse 75% Reuse 95%	2 3
1 Credit 1.2	Building Reuse - Maintain Interior Nonstructural Elements	5 1
Credit 2	Construction Waste Management	1 to 2
	50% Recycled or Salvaged	1
	75% Recycled or Salvaged	2
2 Credit 3	Materials Reuse	1 to 2
	Reuse 5%	1
	Reuse 10%	2
Credit 4	Recycled Content	1 to 2
	10% of Content	1
Credit 5	20% of Content Regional Materials	2 1 to 2
Credit 5	10% of Materials	1
	20% of Materials	2
1 Credit 6	Rapidly Renewable Materials	1
Credit 7	Certified Wood	1
? No		
2 3 INDOOR	ENVIRONMENTAL QUALITY	15 Points
Prereq 1	Minimum Indoor Air Quality Performance	Required
Prereq 2	Environmental Tobacco Smoke (ETS) Control	Required
Credit 1	Outdoor Air Delivery Monitoring	1
1 Credit 2	Increased Ventilation	1
Credit 3.1 Credit 3.2	Construction Indoor Air Quality Management Plan - During Construction	1
Credit 4.1	Construction Indoor Air Quality Management Plan - Before Occupancy Low-Emitting Materials - Adhesives and Sealants	1
Credit 4.1	Low-Emitting Materials - Paints and Coatings	1
Credit 4.3	Low-Emitting Materials - Flooring Systems	1
Credit 4.4	Low-Emitting Materials - Composite Wood and Agrifiber Products	1
1 Credit 5	Indoor Chemical and Pollutant Source Control	1
Credit 6.1	Controllability of Systems - Lighting	1
1 Credit 6.2	Controllability of Systems - Thermal Comfort	1
Credit 7.1	Thermal Comfort - Design	1
Credit 7.2	Thermal Comfort - Verification	1
1 Credit 8.1	Daylight and Views - Daylight	1
1 Credit 8.2 ? No	Daylight and Views - Views	1
INNOVAT	ION IN DESIGN	6 Points
Credit 1	Innovation in Design	1 to 5
	1 IDc1.1: Innovation in Design - SSc4.1 Public Transportation Access, Option 1 - Exemplary Performance	1
	1 IDc1.2: Innovation in Design - MRc7 Certified Wood - Exemplary Performance	1
	1 IDc1.3: Innovation in Design - EAc6 Green Power - Exemplary Performance	1
	1 IDc1.4: Innovation in Design - Integrated Pest Management	1
0	1 IDc1.5: Innovation in Design - Green Cleaning	1
? No	LEED <sup>®</sup> Accredited Professional	1
REGIONA	L PRIORITY	4 Points
Credit 1	Regional Priority	1 to 4
orout r	1 Rec1.1 Regional Priority - SSc4.1 Public Transportation Access	1
	Regionally Defined Credit Achieved	1
	Regionally Defined Credit Achieved	1
	Regionally Defined Credit Achieved	1
0 N		
? № 12 41 PROJECT	TOTALS (Certification Estimates)	110 Poin

Certified: 40-49 points Silver: 50-59 points Gold: 60-79 points Platinum: 80+ points

#### SECTION 07 42 13.19 - INSULATED METAL WALL PANELS

PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Foamed-insulation-core metal wall panels.

#### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of doors, windows, and louvers.
  - 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - 3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
  - 4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
  - 5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal panels.
  - 6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
  - 7. Review temporary protection requirements for metal panel assembly during and after installation.
  - 8. Review procedures for repair of metal panels damaged after installation.
  - 9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

#### 1.4 SUSTAINABLE DESIGN REQUIREMENTS

- A. Applicable LEED Credits
  - 1. MRc2
  - 2. MRc4
  - 3. MRc5
  - 4. IEQc4.1

#### B. LEED Requirements

#### 1. MRc2: CONSTRUCTION WASTE MANAGEMENT

No less than the specified portion of all construction waste from the Project shall be diverted from disposal in a landfill and/or incineration in with the Project Requirements for Construction Waste Management and Disposal. Refer to Specification Sections 017419 Construction Waste Management and Disposal and 013510 Sustainable Design Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

2. MRc4: Recycled Content Material

No less than the specified minimum proportion of the building materials shall contain post-consumer and pre-consumer waste materials in accordance with the Project Requirements for Recycled Content Materials. All materials counted towards the computations of the proportion of the Recycled Content Materials shall comply with the standard minimum percentages of post-consumer waste materials and for the minimum percentages of pre-consumer waste materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

#### 3. MRc5: REGIONALLY MANUFACTURED HARVESTED MATERIALS

No less than the specified minimum proportion of the building materials shall be extracted, processed, and manufactured within 500 miles of the Project Site in accordance with the Project Requirements for Regionally Manufactured and/or Harvested Materials. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

4. IEQc4.1: Low Emitting Materials: Sealants and Adhesives

All sealants, adhesives, and sealant primers used on the interior of the building shall comply with the Project Requirements for Low Emitting Materials – Sealants and Adhesives. Refer to Specification Section 013510 Sustainable Project Requirements. Contractor shall provide LEED verification as per Specification Section 013300 Submittal Procedures.

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
- B. Sustainable Design Submittals:
  - 1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
- C. Shop Drawings:

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- 1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
- 2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).
- D. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.
  - 1. Include similar Samples of trim and accessories involving color selection.
- E. Samples for Verification: For each type of exposed finish, prepared on Samples of size indicated below.
  - 1. Metal Panels: 12 inches (305 mm) long by actual panel width. Include fasteners, closures, and other metal panel accessories.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each product, tests performed by a qualified testing agency.
- C. Field quality-control reports.
- D. Sample Warranties: For special warranties.

#### 1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

#### 1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
  - 1. Build mockup of typical metal panel assembly, including corner, soffits, supports, attachments, and accessories.
  - 2. Water-Spray Test: Conduct water-spray test of metal panel assembly mockup, testing for water penetration according to AAMA 501.2.
  - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

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#### 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal panels during installation.

#### 1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

#### 1.11 COORDINATION

A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

#### 1.12 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including rupturing, cracking, or puncturing.
    - b. Deterioration of metals and other materials beyond normal weathering.
  - 2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

#### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 72:
  - 1. Wind Loads: As indicated on Drawings.
  - 2. Other Design Loads: As indicated on Drawings.
  - 3. Deflection Limits: For wind loads, no greater than 1/240 of the span.
- B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E 283 at the following test-pressure difference:
  - 1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).
- C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:
  - 1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- E. Fire-Test-Response Characteristics: Provide metal wall panels and system components with the following fire-test-response characteristics, as determined by testing identical panels and system components per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.
  - 1. Fire-Resistance Characteristics: Provide materials and construction tested for fire resistance per ASTM E 119.
  - Intermediate-Scale Multistory Fire Test: Tested mockup, representative of completed multistory wall assembly of which wall panel is a part, complies with NFPA 285 for test method and required fire-test-response characteristics of exterior non-load-bearing wall panel assemblies.
  - 3. Radiant Heat Exposure: No ignition when tested according to NFPA 268.
  - 4. Potential Heat: Acceptable level when tested according to NFPA 259.
  - 5. Surface-Burning Characteristics: Provide wall panels with a flame-spread index of 25 or less and a smoke-developed index of 450 or less, per ASTM E 84.

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#### 2.2 FOAMED-INSULATION-CORE METAL WALL PANELS

- A. General: Provide factory-formed and -assembled metal wall panels fabricated from two metal facing sheets and insulation core foamed in place during fabrication, and with joints between panels designed to form weathertight seals. Include accessories required for weathertight installation.
  - 1. Insulation Core: Modified isocyanurate foam using a non-CFC blowing agent, with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively.
    - a. Closed-Cell Content: 90 percent when tested according to ASTM D 6226.
    - b. Density: 2.7 lb/cu. ft. when tested according to ASTM D 1622.
    - c. Compressive Strength: Minimum 20 psi (140 kPa) when tested according to ASTM D 1621.
    - d. Shear Strength: 26 psi (179 kPa) when tested according to ASTM C 273/C 273M.
- B. Concealed-Fastener, Foamed-Insulation-Core Metal Wall Panels: Formed with tongueand-groove panel edges; designed for sequential installation by interlocking panel edges and mechanically attaching panels to supports using concealed clips or fasteners.
  - 1. <u>Basis of Design Product: Provide CENTRIA Architectural Systems "Formawall</u> <u>Dimension Series Insulated Core Metal Wall Panels", or comparable product,</u> <u>subject to compliance with requirements.</u>
  - Metallic-Coated Steel Sheet: Facings of zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
    - a. Nominal Thickness: [0.030 inch (0.76 mm)].
    - b. Surface: Smooth, flat.
    - c. Exterior Finish: Two-coat mica fluoropolymer.
      - 1) Color: Match formed metal wall panels.
    - d. Interior Finish: 0.2 mil primer with 0.6 mil acrylic color coat.
      - 1) Color: As selected by Architect from manufacturer's full range.
  - 3. Panel Coverage: Custom widths indicated.
  - 4. Panel Thickness: 2.5 inches (64 mm).
  - 5. Thermal-Resistance Value (R-Value): R-17 according to ASTM C 1363.
  - 6.

#### 2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metalliccoated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
  - 1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal panels.
  - 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
  - 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefinfoam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
- D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.
- E. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
  - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
  - 2. Joint Sealant: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
  - 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

## 2.4 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

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- D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
  - 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
  - 2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
  - 3. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
  - 4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
  - 5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.
    - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

#### 2.5 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Steel Panels and Accessories:
  - 1. Mica Fluoropolymer: AAMA 621. Two-coat fluoropolymer finish with suspended mica flakes containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
  - 2. Concealed Finish: Apply pretreatment and manufacturer's standard white or lightcolored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.8 mil.

## PART 3 - EXECUTION

#### 3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.

- 1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
- 2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.
  - a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

#### 3.3 METAL PANEL INSTALLATION

- A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
  - 1. Shim or otherwise plumb substrates receiving metal panels.
  - 2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
  - 3. Install screw fasteners in predrilled holes.
  - 4. Locate and space fastenings in uniform vertical and horizontal alignment.
  - 5. Install flashing and trim as metal panel work proceeds.
  - 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
  - 7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
  - 8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.
- B. Fasteners:
  - 1. Steel Panels: Use stainless-steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
- C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

- D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal wall panel manufacturer.
  - 1. Seal metal wall panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal wall panel manufacturer.
  - 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

#### 3.4 INSULATED METAL WALL PANEL INSTALLATION

- A. General: Apply continuous ribbon of sealant to panel joint on concealed side of insulated metal wall panels as vapor seal; apply sealant to panel joint on exposed side of panels for weather seal.
  - 1. Fasten foamed-insulation-core metal wall panels to supports with fasteners at each lapped joint at location and spacing and with fasteners recommended by manufacturer.
  - 2. Apply panels and associated items true to line for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
  - 3. Provide metal-backed washers under heads of exposed fasteners on weather side of insulated metal wall panels.
  - 4. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
  - 5. Provide sealant tape at lapped joints of insulated metal wall panels and between panels and protruding equipment, vents, and accessories.
  - 6. Apply a continuous ribbon of sealant tape to panel side laps and elsewhere as needed to make panels weathertight.
  - 7. Apply snap-on battens to exposed-fastener, insulated-core metal wall panel seams to conceal fasteners.
- B. Foamed-Insulation-Core Metal Wall Panels: Fasten metal wall panels to supports with concealed clips at each joint at location and spacing and with fasteners recommended by manufacturer. Fully engage tongue and groove of adjacent panels.
  - 1. Install clips to supports with self-tapping fasteners.
- C. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
  - 1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.
- D. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level. Install work with laps, joints, and seams that are permanently watertight.

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- 1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to achieve waterproof performance.
- 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

#### 3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Water-Spray Test: After installation, test area of assembly as directed by Architect for water penetration according to AAMA 501.2.
- C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal wall panel installation, including accessories.
- D. Metal wall panels will be considered defective if they do not pass test and inspections.
- E. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.
- F. Prepare test and inspection reports.

#### 3.6 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074213.19

#### SECTION 23 09 00 - HVAC INSTRUMENTATION AND CONTROLS

PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes control equipment for HVAC systems and components, including control components for split system units, and other HVAC units that are not supplied with factory-wired controls.
- B. The documentation contained in this section and other contract documents pertaining to HVAC controls is schematic in nature. The contractor shall coordinate and provide hardware and software necessary to implement the functions shown or as implied in these contract documents.

#### 1.3 DESCRIPTION

- A. Furnish and install a complete Automatic Temperature Control System (ATC) consisting of a Direct Digital Control Automatic Temperature Control System. The system shall be complete in all respects including labor, materials, equipment, and services necessary. HVAC system controls shall be based on Tridium Niagara AX platform and shall conform to ASHRAE standard 135 BACnet. All controllers shall be resident BACnet appliances and shall require no gateways. The control contractor shall provide all necessary controllers, relays and appurtenances etc. as required, to provide a complete HVAC system operation in accordance with the sequence of operation.
- B. The System Supplier shall assume and execute full responsibility to select, furnish, install and connect, test and calibrate, place into operation all specified components, assemblies, and accessories needed for a complete and functional system of HVAC monitoring and control in full compliance with the requirements of the contract documents.
- C. The System shall be accessed through a standard web browser (Internet Explorer or equal). A graphical (GUI) interface shall be provided to allow for monitoring, remote alarm reporting and system set point adjustments.

#### 1.4 WORK INCLUDE

- A. General Building Management System (BMS) Contractor shall provide and install:
  - 1. A fully integrated Building Automation System (BAS), incorporating direct digital control (DDC) for energy management, equipment monitoring and control, and subsystems with open communications capabilities as herein specified.
  - 2. Complete temperature control system to be DDC with electric actuation as specified herein.

- 3. All wiring, conduit, panels, and accessories for a complete operational system.
- 4. BMS Contractor shall be responsible for all electrical work associated with the BMS.
  - a. Perform all wiring in accordance with all local and national codes.
  - b. Install all line voltage wiring, concealed or exposed, in conduit in accordance with the division 16 specifications, NEC and local building code.
  - c. Provide a maximum of 50 feet extension of 120 volt, 20 amp circuits and circuit breakers from Emergency power panels for all BMS equipment power. Provide and install local UPS Power supply for all BMS system panels and equipment.
  - d. Surge transient protection shall be incorporated in design of system to protect electrical components in all DDC Controllers and operator's workstations.
  - e. All low voltage electrical control wiring throughout the building whether exposed or concealed shall be run in conduit in accordance with the division 16 specifications, local building code and the NEC.
  - f. Provide all miscellaneous field device mounting and interconnecting wiring for all mechanical systems including fuel oil system, emergency generators, chillers, water treatment, AC units, condensing units, expansion tanks, VFD, unit heaters, filtration systems, terminal units, fan coil units, electric heater's, chiller control system.
  - g. All systems requiring interlock wiring shall be hardwired interlocked and shall not rely on the BMS to operate (e.g. emergency generator to fuel oil pump interlock, emergency generator damper interlock, etc.) Interlock wiring shall be run in separate conduits from BMS associated wiring.
- 5. All wells for water monitoring devices, flow switches and alarms, as required.
  - a. All installation kits for turbine flow meters, allow service and removal under pressure.
- 6. Provide open communications system. The system shall be an open architecture with the capabilities to support a multi-vendor environment. To accomplish this effectively, system shall be capable of utilizing standard protocols as follows as well as be able to integrate third-party systems via existing vendor protocols.
  - a. System shall be capable of high speed Ethernet communication using BACnet/IP and TCP/IP protocol.
  - b. System shall be capable of BACnet communication according to ANSI/ASHRAE 135-2004.
  - c. System shall be capable of OPC server communications according to OPC Data Access 2.0 and Alarms and Events 1.0.
  - d. System shall be capable of using the LonTalk protocol.

- e. The system shall be capable of supporting both standard and vendor specific protocols to integrate a wide variety of third-party devices and legacy systems.
- f. The intent is to either use the Operator Workstation provided under this contract to communicate with control systems provided by other vendors or to allow information about the system provided in this contract to be sent to another workstation. This allows the user to have a single seat from which to perform daily operation.
- 7. Provide hardware, software, and wiring to provide communication interfaces with each of the systems listed below.
  - a. HVAC Controllers
  - b. Fire Alarm System
- 8. Provide system graphics for each controlled device and/or integrated systems as required by the owner. Origin of information shall be transparent to the operator and shall be controlled, displayed, trended, etc. as if the points were hardwired to the BMS.
- 9. One (1) Personal computer operator workstation, associated peripherals and equipment required to set up dynamic color graphic PC console as shown on drawings.
- 10. One (1) Portable Operator Terminal to be connected and communicating simultaneously with the entire BMS from any DDC Controller. The portable terminal shall be able to monitor, adjust, trend, edit, modify, add, and delete, all system information or points.
- 11. Primary DDC panels as follows:
  - a. Minimum one (1) BMS system Primary DDC panel per floor. The application specific controllers installed for the terminal units on a floor will be connected to the BMS panel on the same floor. DDC Panels serving AHU's on a floor are not to be used to meet this requirement. Separate panels will be required.
  - b. Minimum one (1) BMS system Primary DDC panel per each major mechanical system:
    - 1) Air Handling Unit
    - 2) Rooftop Units
    - 3) Heating water boiler system
    - 4) Emergency Generator
    - 5) VRV System
  - c. It shall be acceptable to combine up to three (3) of the following mechanical equipment into one (1) Primary DDC panel:
    - 1) Exhaust Fans
    - 2) Standalone Supply Fans
    - 3) Package AC Units

- d. It is acceptable to wire the following systems into any of the Primary DDC panels:
  - 1) Miscellaneous alarm monitoring (i.e. ATS, leak, temperature, light ...etc.)
  - 2) Miscellaneous equipment (i.e. Unit Heater, Domestic Water Heater, Standalone Dampers ...etc.)
- e. Main Primary DDC panel shall contain the following verification and monitoring points list:
  - 1) Hot Water Loop: Pump Status, Differential pressure between supply and return, Water flow rate, heating water supply and return temperatures.
  - 2) Rooftop Unit: Discharge air temperature, mixed air temperature, return air temperature, mixed air damper position, return air damper position, exhaust air damper position, minimum and main outside air damper position, supply and return fan VFD speed, duct static pressure, total air flow, return air flow, cooling coil entering and leaving temperature.
  - 3) Zones: Zone temperatures, zone temperature set points, zone co2 levels.
  - 4) Temperature: Outside dry bulb and wet bulb temperatures.
  - 5) Domestic water: Boiler efficiencies
  - 6) Pumps: Elevator and Water room Sump pump alarms.
- f. Motors in motor control centers shall be controlled from the DDC controller associated with HVAC system. It shall not be acceptable to control all motors in a MCC from one DDC controller dedicated to the MCC. The intent of this specification is that the loss of any one DDC controller shall not affect the operation of other HVAC systems, only for the points connected to the DDC controller.
- 12. Stand-alone Application Specific Controllers (ASCs) for terminal equipment (CAV, VRV, and VAV units, unit heaters).

#### 1.4 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
    - a. Manufacturers:

- 1) Alerton by Havtech
- 2) Honeywell International Inc.; Home & Building Control.
- 3) Invensys Building Systems.
- 4) Johnson Controls, Inc.; Controls Group.

#### 1.5 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Section 01 33 00 Submittal Procedures.
- B. Product Data for each type of product specified. Include manufacturer's technical Product Data for each control device furnished, indicating dimensions, capacities, performance characteristics, electrical characteristics, finishes of materials, installation instructions, and startup instructions.
- C. Shop Drawings from manufacturer detailing equipment assemblies and indicating dimensions, weights, loadings, required clearances, methods of field assembly, components, and location and size of each field connection. Submit damper leakage and flow characteristics, plus size schedule for controlled dampers.
- D. Shop Drawings containing the following information for each control system:
  - 1. Schematic flow diagram showing fans, coils, dampers, airflow measurement devices, and control devices.
  - 2. Each control device labeled with setting or adjustable range of control.
  - 3. Diagrams for all required electrical wiring. Clearly differentiate between factory-installed and field-installed wiring.
  - 4. Details of control panel faces, including controls, instruments, and labeling.
  - 5. Written description of sequence of operation.
  - 6. Trunk cable schematic showing programmable control unit locations and trunk data conductors.
  - 7. Listing of connected data points, including connected control unit and input and input devices.
  - 8. System graphics indicating monitoring systems, data (connected and calculated) point addresses, and operation notations.
  - 9. Software description and sequence of operation.
  - 10. System configuration showing peripheral devices, diagrams, and intercommunications.
- E. Wiring diagrams detailing wiring for power, signal, and control systems and differentiating clearly between manufacturer-installed and field-installed wiring.

- F. Maintenance data for control systems equipment to include in the operation and maintenance manual specified Section 01 78 23 Operation and Maintenance Data. Including the following:
  - 1. Maintenance instructions and spare parts lists for each type of control device.
  - 2. Intercommunication wiring diagram with identified and numbered system components and devices.
  - 3. Inspection period, cleaning methods, cleaning materials recommended, and calibrate tolerances.
  - 4. Calibration records and list of set points.
- G. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors. Revise Shop Drawings to reflect actual installation and operating sequences.

#### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is a certified installer of the automatic control system manufacturer for both installation and maintenance of units required for this project.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilation Systems."
- 1.7 DELIVERY, STORAGE AND HANDLING
  - A. Store equipment and materials inside and protected from weather.
  - B. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping control devices to unit manufacturer.

#### 1.8 RESPONSIBILITIES

- A. Electrical Subcontractor:
  - 1. All power wiring as shown on electrical drawings. Power wiring required for the ATC system and not identified on the electrical drawings shall be provided by the ATC contractor.
- B. Complying with the principle of "unit responsibility" all electrical work for automatic controls, except as otherwise specified, or shown on the electrical drawings shall be included in Division 23.
- C. Electrical work shall, in general, comply with the following:
  - 1. All low voltage wiring in finished rooms shall be concealed below working heights and exposed above.

- 2. Electrical work may include both low voltage power and control wiring, as required.
- 3. Conduit network for power systems may be used for running control voltage wiring.
- 4. All electrical work shall comply with the NEC and local electrical codes.
- 5. All safety devices shall be wired through both hand and auto positions of motor starting device to insure 100% safety shut-off.
- 6. All magnetic starters furnished by Electrical Contractor for mechanical equipment shall be furnished with integral 120 volt control transformers, sized to handle the additional VA needed for the controls pilots, EP valves, etc.
- 7. The motor starter supplier shall provide auxiliary contacts as required for interlocking by ATC Contractor, the supplier shall estimate an allowance of at least one spare auxiliary contact per starter. All interlock and control wiring shown on the electrical prints is by the electrical subcontractor.
- 8. Low voltage plenum rated wiring can be run exposed above working heights in equipment rooms and above accessible ceiling. Wiring shall be neatly tied to pipes, EMT or other devices and not laid on ceiling tile.
- 9. Power to all control devices and panels shall be by the ATC Contractor, unless otherwise indicated in the electrical drawings.

#### 1.9 DRAWINGS AND LAYOUTS

A. The ATC system manufacturer shall submit description of operation and schematic drawings of the System to the Engineer for approval before starting work. At least eight sets of submittals shall be sent through channels. At least four sets of operator and maintenance manuals with "as built" drawings, parts lists, etc., shall be provided at job completion.

PART 2 - PRODUCTS

#### 2.1 CONTROL EQUIPMENT AND DEVICES

- A. The control system shall include all necessary and specified control equipment properly installed in accordance with specifications and drawings, and shall include the automatic control of the following:
  - Control Valves: Provide factory fabricated control valves with operators as required by this specification. Provide selection as determined by manufacturer for installation requirements and pressure class, based on maximum pressure and temperature in piping system. Provide valve size in accordance with specified maximum pressure drop across control valve. Equipment control valves with heavy duty actuators, with proper shut off rating for each individual application.
    - Water Service Valves: Equal percentage characteristics for throttling service, linear characteristics for 3-way mixing or diverting service, with a range ability of 30 to 1, and maximum full flow pressure drop of 5 psig. (Not less than 3 psig; not more than 7 psig). Two-position valves shall be line size.

- b. Single Seated Valves: Cage type trim, providing seating and guiding surfaces for plug on "top and bottom" guided plugs.
- c. Valve Trim and Stems: Polished stainless steel.
- d. Packing: Spring-loaded Teflon, self-adjusting.
- e. Bodies, 2" and Smaller: Bronze with screwed end connections, replaceable brass seat. 125 psig rated, minimum.
- 2. Control Dampers: Dampers required in the temperature control functions of the automatic control system shall be AMCA-rated, factory fabricated manufactured by the ATC systems manufacturer. All dampers shall be sized as shown on drawings or as specified. All damper frames shall be constructed of 13 gauge galvanized sheet metal and shall have a flange. The blades shall be parallel or opposed, as required, and suitable for the air velocities to be encountered in the system. Replaceable Butyl rubber seals are to be provided on damper blades and installed along with the top and bottom of the frame. Seals and bearings shall be able to withstand temperatures ranging from minus 40 degrees F to plus 200 degrees F. Dampers shall be leak rated for 3 CFM/foot squared at 1" WG and 20 CFM/foot. squared at 4" WG or less in full closed position at 4" WG pressure differential across damper.
- 3. Damper blades shall not exceed 6" in width. All blades shall not exceed 6" in width. All blades are to be corrugated type construction, fabricated from two sheets of #22 gauge galvanized sheet steel, spot welded together. Blades are to be suitable for high velocity performance. Damper blades shall be a maximum of 48" long. Longer units shall be fabricated in sections. Dampers shall be Ruskin CD-60 or Johnson Controls D-1300 or approved equal.
- 4. Operators: A damper operator shall be electric and be provided for each automatic damper and shall be of sufficient capacity to operate the damper under all conditions and to guarantee tight close-off of dampers, as specified, against system pressure encountered. Each damper operator shall be provided with spring-return for normally closed or normally open position for fail safe operation to account for fire, low temperatures, or power interruption as indicated. Damper operators shall be manufactured from die-cast metal; no plastic or sheet metal bodies will be allowed.
- B. Sensors and Controllers:
  - Thermistor temperature sensors shall be Vibration and Corrosion Resistant for wall, immersion, or duct mounting a required. Accuracy shall be +/-0.36degF between the range of 32.0 deg. F - 158.0deg F.
    - a. Room Sensors
      - 1) The room sensor shall incorporate an on-board 10K thermistor for room temperature sensing.
      - The room sensor shall provide a five-position slide switch to allow the occupant to offset the programmed temperature setpoint of the unit controller by a programmable amount.
      - 3) Push-button switch located on the room sensor shall be monitored by the unit controller. The status of the switch shall be usable in a supervisory control logic

or algorithm or to override to an occupied mode for a programmable amount of time.

- 4) The room sensor shall include an override LED which shall illuminate when an override has been requested. Under normal scheduled operation, the LED shall flash periodically indicating proper operation of the unit controller.
- 5) The room sensor cover shall be provided with tamper resistant screws.
- 6) Screw terminals and pluggable RJ-11 type connectors shall be provided for wiring terminations between the controller and the room sensor.
- b. Duct Sensors
  - 1) Single point duct mounted sensors shall have a minimum 9" rigid probe and be used when the duct size is less than 24".
  - 2) Averaging duct mounted sensors shall have a minimum 12.5' long averaging element and be used when the duct size is greater than 24".
- 2. Temperature Transmitters
  - a. Transmitters shall be of 2-wire, 4-20 mA output type with a solid state or RTD type element having an accuracy of +/- 1% of span. Transmitter shall include protection against reverse polarity and supply voltage transients. A span and zero adjustment shall be provided with each transmitter to allow for recalibration as necessary.
    - 1) Room Sensors
      - a) Sensor covers shall be provided with tamper resistant screws.
    - 2) Duct Sensors
      - a) Single point duct mounted sensors shall have a minimum 9" rigid probe and be used when the duct size is less than 24".
      - b) Averaging duct mounted sensors shall have a minimum 12.5' long averaging element and be used when the duct size is greater than 24".
- 3. Humidity Transmitters
  - a. Transmitters shall be of 2-wire, 4-20 mA output type with a resistance or capacitance element having an accuracy of +/- 2% between 20-95% Rh. Transmitter shall include protection against reverse polarity and supply voltage transients. An accuracy adjustment shall be provided with each transmitter to allow for recalibration as necessary.
  - b. Duct Mounted
    - a) Sensor shall have a minimum 6" rigid probe with a pressure cast aluminum weatherproof box with gasketed cover.
  - c. Room Sensor.

- a) Set-Point Adjustment: Concealed.
- b) Set-Point Indication: Keyed.
- c) Thermometer: Spiral bimetal.
- d) Color: Standard.
- e) Orientation: Horizontal.
- f) Cover: Manufacturer's standard lockable cover.
- 4. Differential Pressure Transmitters
  - a. Differential pressure transmitters shall be of 2-wire, 4-20 mA output type having an accuracy of +/- 3% over the entire range (0-1.00" water gage). An accuracy and zero span adjustment shall be provided with each transmitter to allow for recalibration as necessary. Air Filter Differential: Dwyer Series 630or approved equal.
- 5. Freezestats
  - a. Shall be heavy duty temperature controls that incorporate a vapor charged sensing element.
  - b. The low temperature cut-out must be adjustable.
  - c. The sensor shall have a 4-wire, 2 circuit contact that is designed to close when the main contact opens.
  - d. Must be wired in series with the fan.
- 6. Smoke Detectors
  - a. Duct smoke detectors shall be furnished under the Electrical Section of these Specifications, and installed in the ductwork of air moving equipment as required.
  - b. All control connections and wiring will be done under this Section of the Specifications. Power to smoke detector and connection to fire alarm system shall be performed by the electrical contractor.
- 7. Wall Mounted Sensor Guard
  - a. This Contractor shall furnish and install on all wall mounted sensors except those furnished with packaged equipment metal thermostat guards.
  - b. The guards will be constructed so that they cannot be twisted or jimmied open and so that pencils, letter openers, etc., cannot be inserted through the cover to adjust the thermostat.
  - c. All guards shall be mounted independent of the sensor and shall be anchored to wall.
- 8. Static Pressure sensor

- a. The device shall output a 4 ~ 20 milli-amp which is linear in relation to the sensor pressure for air or water.
- b. Accuracy shall be 0.5 % of full scale.
- 9. Relay
  - a. Plug-in relay blade type. Coil voltages shall be 12VDC, 24VDC, or VAC. Relay bases shall have contract ratings of 300V, 10 amperes.
- C. Line-Voltage, On-Off Thermostats: Bimetal-actuated, open contact or bellows-actuated, enclosed, snap-switch type, or equivalent solid-state type, with heat anticipator, integral manual on-off-auto selector switch.
  - 1. Equip thermostats, which control electric heating loads directly, with off position on dial wired to break unground conductors.
  - 2. Dead Band: Maximum 2 deg F (1 deg C).
- D. Low-Voltage, On-Off Thermostats: NEMA DC 3, 24-V, bimetal-operated, mercury-switch type, with adjustable or fixed anticipation heater, concealed set-point adjustment, 55 to 85 deg F (13 to 30 deg C) set-point range, and 2 deg F (1 deg C) maximum differential.
- E. Room Thermostat Cover Construction: Manufacturer's standard locking covers.
  - 1. Set-Point Adjustment: Concealed.
  - 2. Thermometer: Concealed.
  - 3. Color: Manufacturer's standard.
  - 4. Orientation: Horizontal.
- F. Room thermostat accessories include the following:
  - 1. Insulating Bases: For thermostats located on exterior walls.
  - 2. Thermostat Guards: Locking; heavy-duty, mounted on separated base.
  - 3. Adjusting Key: As required for calibration and cover screws.
  - 4. Aspirating Boxes: For flush-mounted aspirating thermostats.
  - 5. Set-Point Adjustment: 1/2-inch- (13-mm-) diameter, adjustment knob.
- G. Electric, Low-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, manual- or automatic-reset switch that trips if temperature sensed across any 12 inches (300 mm) of bulb length is equal to or below set point.
  - 1. Bulb Length: Minimum 20 feet (6 m).
  - 2. Quantity: One thermostat for every 20 sq. ft. (2 sq. m) of coil surface.

#### **HVAC INSTRUMENTATION AND CONTROLS**

- H. Electric, High-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, manual- or automatic-]reset switch that trips if temperature sensed across any 12 inches (300 mm) of bulb length is equal to or above set point.
  - 1. Bulb Length: Minimum 20 feet (6 m).
  - 2. Quantity: One thermostat for every 20 sq. ft. (2 sq. m) of coil surface.

### 2.2 STATUS SENSORS

- B. Status Inputs for Fans: Differential-pressure switch with pilot-duty rating and with adjustable range of 0- to 5-inch wg. (0 to 1240 Pa).
- C. Status Inputs for Electric Motors: Comply with ISA 50.00.01, current-sensing fixed- or split-core transformers with self-powered transmitter, adjustable and suitable for 175 percent of rated motor current.
- D. Current Switches: Self-powered, solid-state with adjustable trip current, selected to match current and system output requirements.
- E. Electronic Valve/Damper Position Indicator: Visual scale indicating percent of travel and 2- to 10-V dc, feedback signal.

# 2.3 FLOW MEASURING STATIONS

- A. Duct Airflow Station: Combination of air straightener and multiport, self-averaging pitot tube station.
  - 1. Manufacturers:
    - a. Air Monitor Corporation.
    - b. Paragon Inc.
  - 2. Casing: Galvanized-steel frame.
  - 3. Flow Straightener: Aluminum honeycomb, 3/4-inch (20-mm) parallel cell, 3 inches (75 mm) deep.
  - 4. Sensing Manifold: Copper manifold with bullet-nosed static pressure sensors positioned on equal area basis.

# 2.4 APPLICATION SPECIFIC CONTROLLERS - HVAC APPLICATIONS

- A. Each Digital Panel shall be able to extend its monitoring and control through the use of standalone Application Specific Controllers (Application Specific Controllers).
- B. Each ASC shall operate as a standalone controller capable of performing its specified control responsibilities independently of other controllers in the network. Each ASC shall be a microprocessor-based, multi-tasking, real-time digital control processor.
- C. Each ASC shall have sufficient memory to support its own operating system and data bases including:

- 1. Control Processes
- 2. Energy Management Applications
- 3. Operator Interface
- D. The operator interface to any ASC point data or programs shall be through the Digital Panel or portable operator's terminal connected to any ASC on the network.
- E. Application Specific Controllers shall directly support the temporary use of a portable service terminal that can be connected to the ASC via zone temperature or directly at the controller. The capabilities of the portable service terminal that can be connected to the ASC via zone temperature or directly at the controller. The capabilities of the portable service terminal that can be connected to the ASC via zone temperature or directly at the controller. The capabilities of the portable service terminal that can be connected to the ASC via zone temperature or directly at the controller. The capabilities of the portable service terminal shall include, but not be limited to, the following:
  - 1. Display temperatures
  - 2. Display status
  - 3. Display set points
  - 4. Display control parameters
  - 5. Override binary output control
  - 6. Override analog set points
  - 7. Modification of gain and offset constants
- F. Powerfail Protection: All system set points, proportional bands, control algorithms, and any other programmable parameters shall be stored such that a power failure of any duration does not necessitate reprogramming the ASC.
- G. Application Descriptions:
  - 1. Unitary Controllers:
    - a. Unitary Controllers shall support, but not limited to, the following types of systems to address specific applications described in the "Execution" portion of this specification, and for future expansion:
    - b. Unitary Controllers shall support the following types of point inputs and outputs:
      - 1) Heating and Cooling Outputs
      - 2) 1 to 3 Stages
      - 3) Analog Output with two-pipe logic
      - 4) Fan Output
      - 5) On/Off Logic Control

#### 2.5 TRAINING

A. The ATC Contractor will provide a minimum of 16 hours of instructions to the Baltimore City' personnel in the operation and maintenance of the control system. Training will be provided after the system has been commissioned and demonstrated to the Architect or his representative.

### 2.6 SEQUENCE OF OPERATIONS

A. See Contract Drawings.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Verify that power supply is available to control units.
- B. Verify that duct-, pipe-, and equipment-mounted devices are installed before proceeding with installation.

#### 3.2 INSTALLATION

- A. Install software in control units. Implement all features of programs to specified requirements and as appropriate to sequence of operation.
- B. Connect and configure equipment and software to achieve sequence of operation specified.
- C. Verify location of thermostats, humidistats, and other exposed control sensors with Drawings and room details before installation. Install devices 48 inches (1220 mm) above the floor.
- D. Install averaging elements in ducts and plenums in crossing or zigzag pattern.
- E. Install guards on thermostats at all locations unless otherwise indicated.
- F. Expand list of locations below or clearly indicate on Drawings.
- G. Install automatic dampers according to Section 23 33 00 Air Duct Accessories.
  - 1. Install damper motors on outside of duct in warm areas, not in locations exposed to outdoor temperatures.
  - 2. Install labels and nameplates to identify control components according to Section 23 05 53 Identification for HVAC Piping and Equipment.
  - 3. Install refrigerant instrument wells, valves, and other accessories according to Section 23 23 00 Refrigerant Piping.
  - 4. Install duct volume-control dampers according to Section 23 33 00 Air Duct Accessories.
  - 5. Install electronic and fiber-optic cables according to 27 13 23 Fiber Optic Cables.

#### 3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
- B. Perform the following field tests and inspections and prepare test reports:
  - 1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove and replace malfunctioning units and retest.
  - 2. Test and adjust controls and safeties.
  - 3. Test calibration of electronic controllers by disconnecting input sensors and stimulating operation with compatible signal generator.
  - 4. Test each point through its full operating range to verify that safety and operating control set points are as required.
  - 5. Test each control loop to verify stable mode of operation and compliance with sequence of operation. Adjust PID actions.
  - 6. Test each system for compliance with sequence of operation.
  - 7. Test software and hardware interlocks.
    - a. DDC Verification:
      - 1) Verify that instruments are installed before calibration, testing, and loop or leak checks.
      - 2) Check instruments for proper location and accessibility.
      - 3) Check instrument installation for direction of flow, elevation, orientation, insertion depth, and other applicable considerations.
      - 4) Check temperature instruments and material and length of sensing elements.
      - 5) Check control valves. Verify that they are in correct direction.
      - 6) Check DDC system as follows:
        - a) Verify that DDC controller power supply is from emergency power supply, if applicable.
        - b) Verify that wires at control panels are tagged with their service designation and approved tagging system.
        - c) Verify that spare I/O capacity has been provided.
        - d) Verify that DDC controllers are protected from power supply surges.
    - b. Replace damaged or malfunctioning controls and equipment and repeat testing procedures.

#### 3.4 ADJUSTING

- A. Calibrating and Adjusting:
  - 1. Calibrate instruments.
  - 2. Make three-point calibration test for both linearity and accuracy for each analog instrument.
  - 3. Calibrate equipment and procedures using manufacturer's written recommendations and instruction manuals. Use test equipment with accuracy at least double that of instrument being calibrated.
  - 4. Control System Inputs and Outputs:
    - a. Check analog inputs at 0, 50, and 100 percent of span.
    - b. Check analog outputs using milliampere meter at 0, 50, and 100 percent output.
    - c. Check digital inputs using jumper wire.
    - d. Check digital outputs using ohmmeter to test for contact making or breaking.
    - e. Check resistance temperature inputs at 0, 50, and 100 percent of span using a precision-resistant source.
  - 5. Flow:
    - a. Set differential pressure flow transmitters for 0 and 100 percent values with 3-point calibration accomplished at 50, 90, and 100 percent of span.
    - b. Manually operate flow switches to verify that they make or break contact.
  - 6. Pressure:
    - a. Calibrate pressure transmitters at 0, 50, and 100 percent of span.
    - b. Calibrate pressure switches to make or break contacts, with adjustable differential set at minimum.
  - 7. Temperature:
    - a. Calibrate resistance temperature transmitters at 0, 50, and 100 percent of span using a precision-resistance source.
    - b. Calibrate temperature switches to make or break contacts.
  - 8. Stroke and adjust control valves and dampers without positioners, following the manufacturer's recommended procedure, so that valve or damper is 100 percent open and closed.
  - 9. Stroke and adjust control valves and dampers with positioners, following manufacturer's recommended procedure, so that valve and damper is 0, 50, and 100 percent closed.

- 10. Provide diagnostic and test instruments for calibration and adjustment of system.
- 11. Provide written description of procedures and equipment for calibrating each type of instrument. Submit procedures review and approval before initiating startup procedures.
- B. Adjust initial temperature and humidity set points.
- C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to three visits to Project during other than normal occupancy hours for this purpose.

#### 3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain HVAC instrumentation and controls. Refer to Division 01 Section "Demonstration and Training."
- B. Refer Division 01 for administrative and procedural requirements for demonstration and training.

### PART 4 - WARRANTY

- 4.1 Special Warranty: Manufacturer and Installer shall agree to repair or replace in part or entirety any component that fail in materials or workmanship within a specified warranty period. Verified available warranties and warranty periods for units and components shall be provided to owner.
  - 1. Warranty Period: Five years from date of Substantial Completion.

END OF SECTION 23 09 00

# SECTION 23 74 33 - DEDICATED OUTDOOR-AIR UNITS

PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

- A. Section includes factory-packaged units capable of supplying up to 100 percent outdoor air and providing cooling and heating.
- B. Related Sections include the following:
  - 1. Division 7 Section "Security Joint Sealants" for requirements for and locations to receive security joint sealants.
  - 2. Division 11 Section "Tamper-Proof Metal Fasteners" for requirements for and locations to receive security fasteners.

### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include rated capacities, operating characteristics, and furnished specialties and accessories.
- B. LEED Submittals:
  - 1. Product Data for Prerequisite EA 2: Documentation indicating that units comply with applicable requirements in ASHRAE/IESNA 90.1.
  - 2. Product Data for Prerequisite EA 3: Documentation indicating that refrigerants comply.
  - 3. Product Data for Credit EA 4: Documentation indicating that equipment and refrigerants comply.
  - 4. Product Data for Prerequisite IEQ 1: Documentation indicating that units comply with ASHRAE 62.1, Section 5 "Systems and Equipment."
  - 5. Product Data for Credit IEQ 1: Documentation indicating that units are equipped with a direct outdoor airflow-measuring device capable of measuring the minimum outdoor airflow with accuracy within 15 percent of the design minimum airflow rate, as defined by ASHRAE 62.1.
  - 6. Product Data for Credit IEQ 4.1: For solvent cements and adhesive primers, documentation including printed statement of VOC content.
  - 7. Laboratory Test Reports for Credit IEQ 4: For solvent cements and adhesive primers, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
  - 8. Product Data for Credit IEQ 5: Documentation indicating that units include MERV 13 filters rated according to ASHRAE 52.2.
- C. Shop Drawings:

- 1. Include plans, elevations, sections, and attachment details.
- 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

### 1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Roof-curb mounting details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
  - 1. Size and location of unit-mounted rails and anchor points and methods for anchoring units to roof curb.
  - 2. Required roof penetrations for ducts, pipes, and electrical raceways, including size and location of each penetration.
- B. Startup service reports.
- C. Sample Warranty: For special warranty.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For units to include in emergency, operation, and maintenance manuals.
- 1.6 MAINTENANCE SPARE PARTS
  - A. Belts: Two sets for each belt-driven unit.
  - B. Filters: Two sets for each unit.
  - C. Other spare parts: Manufacturer's recommended quantity, but not less than 10% of all replacement parts, with a minimum quantity of one each.

### 1.7 WARRANTY

- A. Special Warranty: Manufacturer agrees to replace components of units that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period for Compressors: Five years from date of Substantial Completion.
  - 2. Warranty Period for Heat Exchangers: 10 years from date of Substantial Completion.

# PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. AAON
  - 2. Carrier Corporation

### DEDICATED OUTDOOR-AIR UNITS

- 3. Trane
- 4. York

#### 2.2 PERFORMANCE REQUIREMENTS

- A. General Fabrication Requirements: Comply with requirements in ASHRAE 62.1, Section 5 "Systems and Equipment," and Section 7 "Construction and System Start-up."
- B. Cabinet Thermal Performance:
  - 1. Maximum Overall U-Value: Comply with requirements in ASHRAE/IESNA 90.1.
- C. Cabinet Surface Condensation:
  - 1. Cabinet shall have additional insulation and vapor seals if required to prevent condensation on the interior and exterior of the cabinet.
  - 2. Portions of cabinet located downstream from the cooling coil shall have a thermal break at each thermal bridge between the exterior and interior casing to prevent condensation from occurring on the interior and exterior surfaces. The thermal break shall not compromise the structural integrity of the cabinet.
- D. Maximum Cabinet Leakage: 0.5 percent of the total supply-air flow at a pressure rating equal to the fan shut-off pressure.
- E. Cabinet Deflection Performance:
  - 1. Walls and roof deflection shall be within 1/200 of the span at the design working pressure equal to the fan shut-off pressure. Deflection limits shall be measured at any point on the surface.
  - 2. Floor deflections shall be within 1/240 of the span considering the worst-case condition caused by the following:
    - a. Service personnel.
    - b. Internal components.
    - c. Design working pressure defined for the walls and roof.
- F. Electrical components, devices, and accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- G. Capacities and Characteristics: As shown on drawings.

#### 2.3 CABINET

- A. Construction: Double wall.
- B. Exterior Casing Material: Galvanized steel with paint finish.
- C. Interior Casing Material: Galvanized.
- D. Lifting and Handling Provisions: Factory-installed shipping skids and lifting lugs.
- E. Base Rails: Galvanized -steel rails for mounting on roof curb or pad as indicated.

- F. Access for Inspection, Cleaning, and Maintenance: Comply with requirements in ASHRAE 62.1.
  - 1. Service Doors: Hinged access doors with gaskets. Material and construction of doors shall match material and construction of cabinet in which doors are installed.
- G. Roof: Standing seam or membrane; sloped to drain water.
- H. Floor: Reinforced, metal surface; reinforced to limit deflection when walked on by service personnel. Insulation shall be below metal walking surface.
- I. Cabinet Insulation:
  - 1. Type: Foam insulation.
  - 2. Thickness: 1 inch.
  - 3. Insulation Adhesive: Comply with ASTM C 916, Type I.
  - 4. Mechanical Fasteners: Suitable for adhesive, mechanical, or welding attachment to casing without damaging liner and without causing air leakage when applied as recommended by manufacturer.
- J. Condensate Drain Pans:
  - 1. Shape: Rectangular, with 2 percent slope in at least two planes to direct water toward drain connection.
  - 2. Size: Large enough to collect condensate from cooling coils including coil piping connections, coil headers, and return bends.
    - a. Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1.
    - b. Depth: A minimum of 2 inches deep.
  - 3. Configuration: Double wall, with space between walls filled with foam insulation and moisture-tight seal.
  - 4. Material: Stainless-steel sheet.
  - 5. Drain Connection:
    - a. Located on both ends of pan, at lowest point of pan.
    - b. Terminated with threaded nipple.
    - c. Minimum Connection Size: NPS 1.
  - 6. Units with stacked coils shall have an intermediate drain pan to collect condensate from top coil.
- K. Surfaces in Contact with Airstream: Comply with requirements in ASHRAE 62.1 for resistance to mold and erosion.
- L. Roof Curb: Full-perimeter curb of sheet metal, minimum 12 inches high, with wood nailer, neoprene sealing strip, and welded Z-bar flashing.
  - 1. Comply with requirements in "The NRCA Roofing Manual."

# 2.4 SUPPLY FAN

A. Plenum Fan Type: Direct drive, single width, non-overloading, with backward-inclined or airfoil blades.

- 1. Fan Wheel Material: Aluminum; attached directly to motor shaft.
- 2. Fan Wheel Drive and Arrangement: Direct drive, AMCA Arrangement 4.
- 3. Fan panel and frame Material: Powder-coated steel, stainless steel, or aluminum.
- 4. Fan Enclosure: Easily removable enclosure around rotating parts.
- 5. Fan Balance: Precision balance fan below 0.08 inch/s at design speed with filter in.

### B. Motors:

- 1. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
- 2. Enclosure: Totally enclosed.
- 3. Enclosure Materials: Cast iron.
- 4. Motor Bearings: Rated for 200,000 hours with external lubrication connections.
- 5. Efficiency: Premium efficient.
- 6. Service Factor: 1.15.
- 7. Speed Control: Variable Frequency Drive
- C. Mounting: Fan wheel, motor, and drives shall be mounted to fan casing with elastomeric isolators.

### 2.5 RETURN/EXHAUST FAN

- A. Plenum Fan Type: Direct drive, single width, non-overloading, with backward-inclined or airfoil blades.
  - 1. Fan Wheel Material: Aluminum; attached directly to motor shaft.
  - 2. Fan Wheel Drive and Arrangement: Direct drive, AMCA Arrangement 4.
  - 3. Fan panel and frame Material: Powder-coated steel, stainless steel, or aluminum.
  - 4. Fan Enclosure: Easily removable enclosure around rotating parts.
  - 5. Fan Balance: Precision balance fan below 0.08 inch/s at design speed with filter in.
- B. Motors:
  - Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
  - 2. Enclosure: Totally enclosed.
  - 3. Enclosure Materials: Cast iron .
  - 4. Motor Bearings: Rated for 200,000 hours with external lubrication connections.
  - 5. Efficiency: Premium efficient.
  - 6. Service Factor: 1.15.
  - 7. Speed Control: Variable Frequency Drive
- C. Mounting: Fan wheel, motor, and drives shall be mounted to fan casing with elastomeric isolators.

### 2.6 COOLING COILS

A. Capacity Ratings: Comply with ASHRAE 33 and ARI 410 and coil bearing the ARI label.

- B. Coil Casing Material: Galvanized steel.
- C. Tube Material: Copper.
- D. Tube Header Material: Copper.
- E. Fin Material: Aluminum.
- F. Fin and Tube Joints: Mechanical bond.
- G. Leak Test: Coils shall be leak tested with air underwater.
- H. Refrigerant Coil Capacity Reduction: Circuit coils for face control.
- I. Refrigerant Coil Suction and Distributor Header Materials: Seamless copper tube with brazed joints.
- J. Coating: Phenolic epoxy corrosion-protection coating after assembly.

# 2.7 REFRIGERATION SYSTEM

- A. Comply with requirements in ASHRAE 15, "Safety Standard for Refrigeration Systems."
- B. Refrigerant Charge: Factory charged with refrigerant and filled with oil.
- C. Compressors: Variable capacity Scroll compressors with integral vibration isolators, internal overcurrent and overtemperature protection, internal pressure relief, and crankcase heater.
- D. Refrigerant: R-410A.
  - 1. Classified as Safety Group A1 according to ASHRAE 34.
  - 2. Provide unit with operating charge of refrigerant.
- E. Refrigeration System Specialties:
  - 1. Expansion valve with replaceable thermostatic element.
  - 2. Refrigerant dryer.
  - 3. High-pressure switch.
  - 4. Low-pressure switch.
  - 5. Thermostat for coil freeze-up protection during low ambient temperature operation or loss of air.
  - 6. Brass service valves installed in discharge and liquid lines.
- F. Refrigerant condenser coils:
  - 1. Capacity Ratings: Complying with ASHRAE 33 and ARI 410 and coil bearing the ARI label.
  - 2. Tube Material: Copper.
  - 3. Fin Material: Aluminum.
  - 4. Fin and Tube Joint: Mechanical bond.
  - 5. Leak Test: Coils shall be leak tested with air underwater.
  - 6. Coating: Phenolic epoxy corrosion-protection coating after assembly.
- G. Condenser Fan Assembly:

- 1. Fans: Direct-drive propeller type with statically and dynamically balanced fan blades.
- 2. Fan Motors:
  - a. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
  - b. Motor Enclosure: Totally enclosed non-ventilating (TENV) or totally enclosed air over (TEAO) enclosure.
  - c. Enclosure Materials: Cast iron .
  - d. Motor Bearings: Permanently lubricated bearings.
  - e. Built-in overcurrent and thermal-overload protection.
  - f. Efficiency: Premium efficient.
  - g. Service Factor: 1.15.
  - h. Speed control: Variable frequency drive.
- 3. Fan Safety Guards: Steel with corrosion-resistant coating.
- H. Safety Controls:
  - 1. Compressor motor and condenser coil fan motor low ambient lockout.
  - 2. Overcurrent protection for compressor motor.

# 2.8 INDIRECT-FIRED GAS FURNACE HEATING

- A. Furnace Assembly:
  - 1. Factory assembled, piped, and wired.
  - 2. Comply with requirements in NFPA 54, "National Fuel Gas Code," and ANSI Z21.47, "Gas-Fired Central Furnaces."
  - 3. AGA Approval: Designed and certified by and bearing label of AGA.
- B. Burners:
  - 1. Heat-Exchanger Material: Aluminum with a minimum thermal efficiency of 80 percent.
  - 2. Fuel: Natural gas.
  - 3. Ignition: Electronically controlled electric spark with flame sensor.
- C. Heat-Exchanger Drain Pan Material: Stainless steel.
- D. Venting: Power vent with integral, motorized centrifugal fan interlocked with gas valve.
- E. Safety Controls:
  - 1. Gas Control Valve: Multi-Staging.
  - 2. Gas Train: Single-body, regulated, redundant, 24-V ac gas valve assembly containing pilot solenoid valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff.

# 2.9 OUTDOOR-AIR INTAKE HOOD

- A. Type: Manufacturer's standard hood or louver.
- B. Materials: Match cabinet.

- C. Bird Screen: Comply with requirements in ASHRAE 62.1.
- D. Configuration: Designed to inhibit wind-driven rain and snow from entering unit.

# 2.10 FILTERS

- A. Pre Filters: 2-inch- thick, fiberglass, pleated, throw away with ASHRAE 30% efficiency.
- B. Extended-Surface, Disposable Panel Filters:
  - 1. Comply with NFPA 90A.
  - 2. Factory-fabricated, dry, extended-surface type.
  - 3. Thickness: 4 inches.
  - 4. Minimum Arrestance: 85, according to ASHRAE 52.1.
  - 5. Minimum Merv: 13, according to ASHRAE 52.2.
  - 6. Media: Fibrous material formed into deep-V-shaped pleats with antimicrobial agent
  - 7. and held by self-supporting wire grid.
- C. Mounting Frames:
  - 1. Panel filters arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or from access plenum.
  - 2. Extended surface filters arranged for flat orientation, removable from access plenum.
  - 3. Galvanized or stainless steel with gaskets and fasteners, suitable for bolting together into built-up filter banks with space for prefilter.

# 2.11 ENERGY RECOVERY WHEEL

- A. Frame: Rigid metal frame containing wheel drive motor, drive belt, wheel seals and bearings.
- B. Energy wheel: Total energy heat wheel constructed of light weight polymer with permanent bonded desiccant coating.
- C. Motor Bearings: Ball bearings with external lubrication connections.

# 2.12 ELECTRICAL POWER CONNECTIONS

- A. General Electrical Power Connection Requirements: Factory-installed and -wired switches, motor controllers, transformers, and other necessary electrical devices shall provide a single-point field power connection to unit.
- B. Enclosure: NEMA 250, mounted in unit with hinged access door in unit cabinet having a lock and key or padlock and key,
- C. Wiring: Numbered and color-coded to match wiring diagram.
- D. Wiring Location: Install factory wiring outside an enclosure in a raceway.
- E. Power Interface: Field power interface shall be to NEMA KS 1, heavy-duty, nonfused disconnect switch.

- F. Factory Wiring: Branch power circuit to each motor and to controls with one of the following disconnecting means:
  - 1. NEMA KS 1, heavy-duty, fusible switch with rejection-type fuse clips rated for fuses. Select and size fuses to provide Type 2 protection according to IEC 60947-4-1.
  - 2. NEMA KS 1, heavy-duty, nonfusible switch.
  - 3. UL 489, motor-circuit protector (circuit breaker) with field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.
- G. Factory-Mounted, Overcurrent-Protection Service: For each motor.
- H. Transformer: Factory mounted with primary and secondary fuses and sized with enough capacity to operate electrical load plus spare capacity.
- I. Controls: Factory wire unit-mounted controls where indicated.
- J. Lights: Factory wire unit-mounted lights.
- K. Receptacle: Factory wire unit-mounted, ground fault interrupt (GFI) duplex receptacle.
- L. Control Relays: Auxiliary and adjustable time-delay relays.

# 2.13 CONTROLS

- A. Control equipment are specified in Section 230923 "Direct Digital Control (DDC) System for HVAC" and sequence of operation are shown on drawings.
- B. Control Wiring: Factory wire connection for controls' power supply.
- C. Control Devices: Sensors, transmitters, relays, switches, detectors, operators, actuators, and valves shall be manufacturer's standard items to accomplish indicated control functions.
- D. Control Dampers:
  - 1. Damper Location: Factory installed inside unit for ease of blade axle and bushing service. Arrange dampers located in a mixing box to achieve convergent airflow to minimize stratification.
  - 2. Damper Leakage: Comply with requirements in AMCA 500-D. Leakage shall not exceed 6.5 cfm per sq. ft. at a static-pressure differential of 4.0 inches water column when a torque of 5 inch pounds per sq. ft is applied to the damper jackshaft.
  - 3. Damper Rating: Rated for close-off pressure equal to the fan shutoff pressure.
  - 4. Damper Label: Bear the AMCA seal for both air leakage and performance.
  - 5. Blade Configuration: Unless otherwise indicated, use parallel blade configuration for twoposition control and equipment isolation service and use modulating control when mixing two airstreams. For other applications, use an opposed-blade configuration.
  - 6. Damper Frame Material: Extruded aluminum.
  - 7. Blade Type: Single-thickness metal reinforced with multiple V-grooves.
  - 8. Blade Material: Extruded aluminum.
  - 9. Maximum Blade Width: 6 inches.
  - 10. Maximum Blade Length: 48 inches.
  - 11. Blade Seals: Replaceable, continuous perimeter vinyl seals and jambs with stainlesssteel compression-type seals.
  - 12. Bearings: Thrust bearings for vertical blade axles.
  - 13. Airflow Measurement:

- a. Monitoring System: Complete and functioning system of airflow monitoring as an integral part of the damper assembly where indicated.
- b. Remote Monitoring Signal: 0-10 volt or 4-20 mA scaled signal.
- c. Accuracy of flow measurement: Within 5 percent of the actual flow rate between the range of the scheduled minimum and maximum airflow. For units with a large range between minimum and maximum airflow, configure the damper sections and flow measurement assembly as necessary to comply with accuracy.
- d. Straightening Device: Integral to the flow measurement assembly if required to achieve the specified accuracy as installed.
- e. flow measuring device: Suitable for operation in untreated and unfiltered outdoor air. If necessary, include temperature and altitude compensation and correction to maintain the accuracy.
- E. Damper Operators:
  - 1. Factory-installed electric operator for each damper assembly with one operator for each damper assembly mounted to the damper frame.
  - 2. Operator capable of shutoff against fan pressure and able to operate the damper with sufficient reserve power to achieve smooth modulating action and proper speed of response at the velocity and pressure conditions to which the damper is subjected.
  - 3. Maximum Operating Time: Open or close damper 90 degrees in 60 seconds.
  - 4. Adjustable Stops: For both maximum and minimum positions.
  - 5. Position Indicator and Graduated Scale: Factory installed on each actuator with words "OPEN" and "CLOSED," or similar identification, at travel limits.
  - 6. Spring-return operator to fail-safe; either closed or open as required by application.
  - 7. Operator Type: Direct coupled, designed for minimum 60,000 full-stroke cycles at rated torque.
  - 8. Position feedback Signal: For remote monitoring of damper position.
  - 9. Coupling: V-bolt and V-shaped, toothed cradle.
  - 10. Circuitry: Electronic overload or digital rotation-sensing circuitry.
- F. Refrigeration System Controls:
  - 1. Unit-mounted enthalpy controller shall lock out refrigerant system when outdoor-air enthalpy is less than 28 Btu/lb of dry air or outdoor-air temperature is less than 55 deg F.
  - 2. Outdoor-air sensor de-energizes dehumidifier operation when outdoor-air temperature is less than 55 deg F.
  - 3. Relative-humidity sensor energizes dehumidifier operation when relative humidity is more than 50 percent.
- G. Furnace Controls:
  - 1. Staged Burner Control: Four steps of control.
  - 2. Electronic Burner Control: 20 to 100 percent modulation of the firing rate; 10 to 100 percent with dual-furnace units.
- H. Damper Controls: Space pressure sensor modulates outdoor- and return-air dampers to maintain a positive pressure in space at a minimum of 0.05 inch wg with respect to outdoor reference.
- I. Integral Smoke Alarm: Smoke detector installed in supply and return air.
- J. DDC Temperature Control: Standalone control module for link between unit controls and DDC temperature-control system. Control module shall be compatible with control system specified in Section 230923 "Direct Digital Control (DDC) System for HVAC." Links shall include the following:

- 1. Start/stop interface relay, and relay to notify DDC temperature-control system alarm condition.
- 2. Hardware interface or additional sensors for the following:
  - a. Room temperature.
  - b. Discharge-air temperature.
  - c. Refrigeration system operating.
  - d. Furnace operating.
  - e. Constant and variable motor loads.
  - f. Variable-frequency-controller operation.
  - g. Cooling load.
  - h. Economizer cycles.
  - i. Air-distribution static pressure and ventilation-air volumes.
- K. Interface with DDC System for HVAC: Factory-installed hardware and software to enable the DDC system for HVAC to monitor, control, and display unit status and alarms.
  - 1. Hardwired Points: As indicated on drawings.
  - 2. ASHRAE 135 (BACnet or other Industry-accepted, open-protocol communication interface with the DDC system for HVAC shall enable the DDC system for HVAC operator to remotely control and monitor the unit from an operator workstation. Control features and monitoring points displayed locally at unit control panel shall be available through the DDC system for HVAC.

### 2.14 ACCESSORIES

- A. Service Lights and Switch: Factory installed in fan and coil sections with weatherproof cover. Factory wire lights to a single-point field connection.
- B. Duplex Receptacle: Factory mounted in unit supply-fan section and refrigeration section, with 20 amp 120 V GFI duplex receptacle and weatherproof cover.

# PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for piping, ducts, and electrical systems to verify actual locations of connections before equipment installation.
- C. Examine roof curbs and equipment supports for suitable conditions where units will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

A. Comply with manufacturer's rigging and installation instructions for unloading units and moving to final locations.

### DEDICATED OUTDOOR-AIR UNITS

- B. Curb Support: Install roof curb on roof structure according to "The NRCA Roofing Manual."
  - 1. Install and secure units on curbs and coordinate roof penetrations and flashing with roof construction.
  - 2. Coordinate size, installation, and structural capacity of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 077200 "Roof Accessories."
  - 3. Coordinate size, location, and installation of unit manufacturer's roof curbs and equipment supports with roof Installer.
- C. Restrained Curb Support: Install restrained vibration isolation roof-curb rails on roof structure according to "The NRCA Roofing Manual."
- D. Install 3000-psi, compressive-strength (28-day) concrete base inside roof curb, 4 inches thick. Concrete and reinforcement are specified with concrete.
- E. Comply with requirements for gas-fired furnace installation in NFPA 54, "National Fuel Gas Code."
- F. Install separate devices furnished by manufacturer and not factory installed.
- G. Install new filters at completion of equipment installation and before testing, adjusting, and balancing.
- H. Install drain pipes from unit drain pans to sanitary drain.
  - 1. Drain Piping: Drawn-temper copper water tubing complying with ASTM B 88, Type L, with soldered joints.
  - 2. Pipe Size: Same size as condensate drain pan connection.

# 3.3 CONNECTIONS

- A. Where installing piping adjacent to units, allow space for service and maintenance.
- B. Gas Piping Connections:
  - 1. Comply with requirements in Section 231123 "Facility Natural-Gas Piping."
  - 2. Connect gas piping to furnace, full size of gas train inlet, and connect with union, pressure regulator, and shutoff valve with sufficient clearance for burner removal and service.
  - 3. Install AGA-approved flexible connectors.
- C. Duct Connections:
  - 1. Comply with requirements in Section 233113 "Metal Ducts."
  - 2. Drawings indicate the general arrangement of ducts.
  - 3. Connect ducts to units with flexible duct connectors. Comply with requirements for flexible duct connectors in Section 233300 "Air Duct Accessories."
- D. Electrical Connections: Comply with requirements for power wiring, switches, and motor controls in electrical Sections.
  - 1. Install electrical devices furnished by unit manufacturer but not factory mounted.

# 3.4 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
  - 1. Complete installation and startup checks according to manufacturer's written instructions.
  - 2. Inspect units for visible damage to furnace combustion chamber.
  - 3. Perform the following operations for both minimum and maximum firing and adjust burner for peak efficiency:
    - a. Measure gas pressure at manifold.
    - b. Measure combustion-air temperature at inlet to combustion chamber.
    - c. Measure flue-gas temperature at furnace discharge.
    - d. Perform flue-gas analysis. Measure and record flue-gas carbon dioxide and oxygen concentration.
    - e. Measure supply-air temperature and volume when burner is at maximum firing rate and when burner is off. Calculate useful heat to supply air.
  - 4. Verify operation of remote panel including pilot-light operation and failure modes. Inspect the following:
    - a. High-limit heat exchanger.
    - b. Alarms.
  - 5. Inspect units for visible damage to refrigerant compressor, condenser and evaporator coils, and fans.
  - 6. Start refrigeration system when outdoor-air temperature is within normal operating limits and measure and record the following:
    - a. Cooling coil leaving-air, dry- and wet-bulb temperatures.
    - b. Cooling coil entering-air, dry- and wet-bulb temperatures.
    - c. Condenser coil entering-air dry-bulb temperature.
    - d. Condenser coil leaving-air dry-bulb temperature.
  - 7. Simulate maximum cooling demand and inspect the following:
    - a. Compressor refrigerant suction and hot-gas pressures.
    - b. Short-circuiting of air through outside coil or from outside coil to outdoor-air intake.
  - 8. Inspect casing insulation for integrity, moisture content, and adhesion.
  - 9. Verify that clearances have been provided for servicing.
  - 10. Verify that controls are connected and operable.
  - 11. Verify that filters are installed.
  - 12. Clean coils and inspect for construction debris.
  - 13. Clean furnace flue and inspect for construction debris.
  - 14. Inspect operation of power vents.
  - 15. Purge gas line.
  - 16. Inspect and adjust vibration isolators and seismic restraints.
  - 17. Verify bearing lubrication.
  - 18. Clean fans and inspect fan-wheel rotation for movement in correct direction without vibration and binding.
  - 19. Adjust fan belts to proper alignment and tension.
  - 20. Start unit.
  - 21. Inspect and record performance of interlocks and protective devices including response to smoke detectors by fan controls and fire alarm.
  - 22. Operate unit for run-in period.

- 23. Calibrate controls.
- 24. Adjust and inspect high-temperature limits.
- 25. Inspect outdoor-air dampers for proper stroke and interlock with return-air dampers.
- 26. Verify operational sequence of controls.
- 27. Measure and record the following airflows. Plot fan volumes on fan curve.
  - a. Supply-air volume.
  - b. Return-air flow.
  - c. Outdoor-air flow.
- B. After startup, change filters, verify bearing lubrication, and adjust belt tension.
- C. Remove and replace components that do not properly operate and repeat startup procedures as specified above.
- D. Prepare written report of the results of startup services.

### 3.5 ADJUSTING

- A. Adjust initial temperature and humidity set points.
- B. Set field-adjustable switches and circuit-breaker trip ranges as indicated.
- C. Occupancy Adjustments: When requested within12 months from date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

#### 3.6 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.
- B. Refer Division 01 for administrative and procedural requirements for demonstration and training

END OF SECTION 23 74 33

# SECTION 23 81 30 – VARIABLE REFRIGERANT FLOW SYSTEMS

PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes Air Cooled Multi Zone, Variable Refrigerant Flow system consisting of inverter 3 pipe simultaneous heating and cooling. Each system/zone is based on one air cooled outdoor unit connected by a single refrigerant circuit consisting of suction, hot gas and liquid pipework. Both hot gas and liquid for cooling are apportioned through a series of refrigerant distribution controllers to multiple indoor units.
- B. Related Requirements:
  - 1. Division 7 Section "Security Joint Sealants" for requirements for and locations to receive security joint sealants.
  - 2. Division 11 Section "Tamper-Proof Metal Fasteners" for requirements for and locations to receive security fasteners

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.
- B. LEED Submittals:
  - 1. Product Data for Credit EA 4: Documentation indicating that equipment and refrigerants comply.
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
  - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 2. Wiring Diagrams: For power, signal, and control wiring.
  - 3. Refrigerant piping indicating sizes, routing and connections to indoor units, and distribution controllers, in coordination with other building structure and services.
- D. Samples for Initial Selection: For units with factory-applied color finishes.

# 1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

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B. Warranty: Sample of special warranty.

### 1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For Multi Zone, Variable Refrigerant Flow systems to include in emergency, operation, and maintenance manuals.

### 1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Filters: Two sets for each indoor unit.
- B. Other spare parts: Manufacturer's recommended quantity, but not less than 10% of all replacement parts, with a minimum quantity of one each.

### 1.7 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ASHRAE Compliance:
  - 1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."
  - ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 4 "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - " Procedures," and Section 7 -"Construction and System Start-up."
- C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, and including Certification in the current AHRI Directory per AHRI Standard 1230.

# 1.8 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

#### 1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of Multi Zone, Variable Refrigerant Flow systems that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period:
    - a. For Compressor: Manufacturer's Ten years from date of Substantial Completion.
    - b. For Parts: Manufacturer's Ten year from date of Substantial Completion.
    - c. For Labor: Two years from date of Substantial Completion.
    - d. Air Handlers: Manufacturer's 10 years from date of substantial completion

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- e. Branch Selector Boxes: Manufacturer's 10 years from date of substantial completions
- f. Zone Controllers: Manufacturer's 10 years from date of substantial completion
- g. Centralized Controller: 1 Year from date of substantial completion

# PART 2 - PRODUCTS

# 2.1 MANUFACTURERS

- A. Multi Zone, Variable Refrigerant Flow systems:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturer specified.
  - 2.
- a. Daikin.
- b. Mitsubishi Electric Cooling and Heating.
- c. Trane
- d. Or approved equal.

# 2.2 INDOOR UNITS

- A. Concealed Evaporator-Fan Components:
  - 1. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.
  - 2. Insulation: Faced, glass-fiber duct liner.
  - 3. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermalexpansion valve. Comply with ARI 206/110.
  - 4. Fan: Forward-curved, double-width wheel of galvanized steel; directly connected to motor.
  - 5. Fan Motors:
    - a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
    - b. DC ECM Motors, multitapped, multispeed with internal thermal protection and permanent lubrication.
    - c. Wiring Terminations: Connect motor to chassis wiring with plug connection.
  - 6. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
  - 7. Filters: Permanent, cleanable.
  - 8. Condensate Drain Pans:
    - a. Fabricated with one percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.
      - 1) Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1.
      - 2) Depth: A minimum of 2 inches deep.
    - b. Double-wall, galvanized-steel sheet with space between walls filled with foam insulation and moisture-tight seal.

- c. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.
  - 1) Minimum Connection Size: NPS 1.
- d. Pan-Top Surface Coating: Asphaltic waterproofing compound.
- e. Units with stacked coils shall have an intermediate drain pan to collect condensate from top coil.
- 9. Controls:
  - a. Provide air and refrigerant temperature sensors, expansion valves, controlled by microprocessor control system, and integral return air temperature sensor.
- B. Wall-Mounted, Evaporator-Fan Components:
  - 1. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.
  - 2. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermalexpansion valve. Comply with ARI 206/110.
  - 3. Fan: Direct drive, centrifugal.
  - 4. Fan Motors:
    - a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
    - b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
    - c. Enclosure Type: Totally enclosed, fan cooled.
    - d. NEMA Premium (TM) efficient motors as defined in NEMA MG 1.
    - e. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.
    - f. Mount unit-mounted disconnect switches on interior of unit.
  - 5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
  - 6. Condensate Drain Pans:
    - a. Fabricated with one percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.
      - 1) Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1.
      - 2) Depth: A minimum of 1 inch deep.
    - b. Double-wall, galvanized-steel sheet with space between walls filled with foam insulation and moisture-tight seal.
    - c. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.
      - 1) Minimum Connection Size: NPS 1.
    - d. Pan-Top Surface Coating: Asphaltic waterproofing compound.
  - 7. Air Filtration Section:
    - a. General Requirements for Air Filtration Section:

- 1) Comply with NFPA 90A.
- 2) Minimum Arrestance: According to ASHRAE 52.1 and Minimum MERV 8 according to ASHRAE 52.2.
- 3) Filter-Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lifted out from access plenum.
- b. Disposable Panel Filters:
  - 1) Factory-fabricated, viscous-coated, flat-panel type.
  - 2) Thickness: 1 inch.
  - 3) Arrestance according to ASHRAE 52.1: 80.
  - 4) MERV 8 according to ASHRAE 52.2: 5.
  - 5) Media: Interlaced glass fibers sprayed with nonflammable adhesive and antimicrobial agent.
  - 6) Frame: Galvanized steel, with metal grid on outlet side, steel rod grid on inlet side, and hinged; with pull and retaining handles.

# 2.3 OUTDOOR UNITS

- A. Air-Cooled, Outdoor unit Components:
  - 1. Casing: Steel, finished with baked enamel in standard manufacturer's color with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
  - 2. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
    - a. Compressor Type: Inverter Scroll.
    - b. Variable speed compressor motor controlled by frequency inverter, high-pressure switch, and automatic-reset low-pressure switch.
    - c. Refrigerant Charge: R-410A.
    - d. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid subcooler. Comply with ARI 206/110.
  - 3. Fan: Propeller type, directly connected to motor.
  - 4. Motor: Totally enclosed, multispeed, with integral thermal-overload protection.
  - 5. Low Ambient Kit: Permits operation down to 45 deg F.
  - 6. Mounting Base: Polyethylene.
  - 7. Accessories: Expansion valves, oil separators, suction and liquid shutoff valves, strainers, liquid receivers and accumulators.

# 2.4 REFRIGERANT DISTRIBUTION CONTROLLERS

- A. Distribution Controllers:
  - 1. The controller casing shall be constructed of galvanized steel metal panels with insulated valve cavity. The controller shall divert either hot gas or liquid refrigerant to the connected indoor unit(s) depending on the cooling or heating requirements. The controller shall have single or multiple refrigerant outlets, each outlet having simultaneous independent selection of either heating or cooling.

### 2.5 ACCESSORIES

- A. Sequence of operation are specified on drawings.
- B. Individual temperature controller: Wireless infrared to remotely control individual indoor unit or a group of units with the following features:
  - 1. 24-hour time control of system stop and start.
  - 2. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.
  - 3. Fan-speed selection including auto setting.
  - 4. Temperature selection and adjustment.
  - 5. Operation mode selection.
  - 6. Filter cleaning identification.
  - 7. Full fault diagnostics display.
  - 8. Built-in temperature sensor.
- C. Central controller: Capable of controlling network of indoor units, individually, in groups and unanimously with the following features for each series of indoor unit arrangements:
  - 1. 24-hour time control of system stop and start.
  - 2. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.
  - 3. Fan-speed selection including auto setting.
  - 4. Temperature selection and adjustment.
  - 5. Operation mode selection.
  - 6. Filter cleaning identification.
  - 7. Full fault diagnostics display, identifying either an individual indoor unit or a series of indoor units.
- D. Central controller shall have the capability to override the individual remote controller of any unit on the same network.

# PART 3 - EXECUTION

# 3.1 INSTALLATION

- A. Installing contractor shall have completed all Manufacturer's Installation and Commissioning classes (16 hours), Service & Troubleshooting Classes (16 hours) and Controls Application and Commissioning Classes (16 hours).
- B. Installing contractor shall have successfully installed a minimum of (5) five VRF projects in excess of 50 TR each and provide testimonials for submittal.
- C. Install unit's level and plumb.
- D. Install indoor units using manufacturer's standard mounting devices securely fastened to building structure.
- E. Install roof-mounted, outdoor units on equipment supports specified in Section 077200 "Roof Accessories." Anchor units to supports with removable, cadmium-plated fasteners.
- F. Equipment Mounting:
  - 1. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."

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- G. Pipework: Refer to Section 23 23 00 "Refrigerant Piping" for additional requirements.
  - 1. Size refrigerant pipework in accordance with manufacturer's written instructions. Design pipework routes to maintain shortest possible distance, in coordination with building structure and other services, and complying with the maximum allowable distance limitations. Install pipework with minimum joints and insulate with close cell elastomeric insulation. Utilize only branch pipes and branch pipe kits supplied or recommended by the manufacturer. Reducing tees are not permitted. Make all brazed joints with dry nitrogen purge to ensure the prevention of oxidization to the internal surface of the copper pipes. Prevent moisture, dirt and any other contaminants to the interior of pipes and air conditioning units during installation. Pressure test pipework with dry nitrogen as recommended by the manufacturer after installation and prior to connection of the outdoor units, sealing of insulation joints and starting the outdoor unit. Evacuate entire system to vacuum pressure as recommended by the manufacturer once the outdoor units are connected. Fill the system with refrigerant in accordance with the requirements of the manufacturer after completion of the above process.

### H. Wiring:

1. Furnish and install all control wiring, and associated accessories in accordance with manufacturer's written instructions.

### 3.2 CONNECTIONS

- A. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.
- B. Duct Connections: Duct installation requirements are specified in Section 233113 "Metal Ducts." Drawings indicate the general arrangement of ducts. Connect supply and return ducts to indoor units with flexible duct connectors. Flexible duct connectors are specified in Section 233300 "Air Duct Accessories."

# 3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a locally qualified, factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Perform tests and inspections.
  - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Tests and Inspections:
  - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  - 2. Operational Test: After electrical circuitry has been energized, start the systems to confirm proper operation.
  - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Remove and replace malfunctioning units and retest as specified above.

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E. Prepare test and inspection reports.

### 3.4 STARTUP SERVICE

- A. Manufacturer's Representative must provide start-up and commissioning along with local handson training.
  - 1. Complete installation and startup checks according to manufacturer's written instructions.
  - 2. Manufacturer's Representative to conduct complete systems re-commissioning at one year of operation.
- B. CONSTANT MONITORING SERVICE
- C. All systems shall be maintained by equipment manufacturer's continual monitoring service.
  - 1. Optimize system operation with Variable Refrigerant Temperature, in response to system loads and streaming local weather forecasting, calculating real time control strategy.
  - 2. Constantly monitor at least 80 points within the systems' operation in 24/7 real time via OEM's Cloud service and analysis.
  - 3. Provide predictive maintenance monitoring and alerts continually during operation.
  - 4. Installation with first year quarterly reporting and analysis. Owner opts to subscribe for second year forward annual, semi-annual or quarterly reporting.

# 3.5 DEMONSTRATION

- A. Manufacturer's representative shall support installing contractor by providing its own factoryauthorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units on site and in local live equipment training laboratory.
- B. Refer Division 01 for administrative and procedural requirements for demonstration and training.

END OF SECTION 238126

# SECTION 23 81 30.11 – VARIABLE REFRIGERANT VOLUME (VRV) HVAC SYSTEM CONTROLS

PART 1 – GENERAL

### 1.1. Physical characteristics

A. General:

The local remote control shall be made from plastic materials with a neutral color. Each control shall have a LCD (Liquid Crystal Display) that shows set point, room temperature, mode of operation (on/off/cool/heat), and fan speed.

#### 1.2. Electrical characteristics

A. General:

The each indoor unit control circuit board shall supply 16 volts DC to the local remote controller. The voltage may rise or fall in relation to the transmission packets that are sent and received.

B. Wiring:

The control wiring shall be terminated in a daisy chain design from outdoor unit, to branch selector, then daisy chaining to each indoor unit in the system and terminating at the farthest indoor unit. The remote control wiring shall run from the indoor unit control board terminal block to the remote controller connected with that indoor unit.

C. Wiring size:

Wiring shall be non-shielded, 2-conductor sheathed vinyl cord or cable, and 18 AWG stranded copper wire.

#### 1.3. VRV Controls Network

The VRV Controls Network shall be made up of local remote controllers, multi-zone controllers, advanced multi-zone controllers, and open protocol software devices that transmit information via the high-speed communication bus and can also be controlled via a network PC. The VRV Controls Network supports operation monitoring, scheduling, error e-mail distribution, general user software, tenant billing, maintenance support, and integration with Building Management Systems (BMS) using open protocol via BACnet<sup>®</sup> or Lonworks<sup>®</sup> interfaces; all of which blend to provide the optimal control strategy for the best HVAC comfort solution.

# PART 2 - PRODUCTS

2.1. Local Remote Controllers

VRV local remote controllers shall be compatible with all VRV indoor units. The remote controller wiring shall consist of a non-polar two-wire connection to the indoor unit. The local remote controllers may be wall-mounted and can be adjusted to maintain the optimal operation of the connected indoor unit(s). Set temperatures can be adjusted in increments of 1 °F. In the cases where a system or unit error may occur, the VRV controllers will display a two-digit error code and the unit address. The local remote controllers do not require addressing.

A. Remote Controller

The Remote Controller shall provide control for all VRV indoor units. The remote controller wiring consist of a non-polar two-wire connection to the indoor unit at terminals P1/P2. The Remote Controller is wall mounted and can be adjusted to maintain the optimal operation of the connected indoor unit(s). The Remote Controller does not require addressing.

The Remote Controller can be used in conjunction with the BRC2A71 (Simplified Remote Controller) or another NAV Remote Controller to control the same indoor unit group. No more than 2 remote controllers can be placed in the same group.

1. Mounting:

The Remote Controller shall be mounted into a standard 2" x 4" junction box.

- 2. Display Features:
  - The Remote Controller shall be approximately 4.75" x 4.75" in size with a backlit 2.75" x 1.75" LCD display.
  - Feature Backlit LCD Display with contrast adjustment and auto off after 30 seconds.
  - Display information shall be selectable from English, French, or Spanish.
  - Configurable display mode Detailed, Standard, and Simple
    - Large 11/16" room temperature displayed in Simple display
  - The controller shall display Operation Mode, Setpoint, and Fan Speed.
    - o Displayed items configurable
    - Configure "Off" to be displayed when unit is turned off (field setting required)
      - Prevents mode adjustment
    - Setpoint can be removed from display when unit is turned Off (field setting required)
      - Prevents setpoint adjustment
      - Fan speed display removable (field setting required)
        - Prevents fan speed adjustment
  - System Status icons.

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- The controller shall display temperature setpoint in one degree increments with a range of 60-90°F (16-32°C)
- Detailed and Simple display will reflect room temperature (0-176°F/-18-80°C range in one degree increment).
  - Display of temperature information shall be configurable for Expression of temperature
  - Fahrenheit or Celsius
- On/Off status shall be displayed with an LED.
- Error codes will be displayed in the event of system abnormality/error with a two digit code.
  - A blinking LED will also signal system abnormality/error
- The following system temperatures can be displayed to assist service personnel in troubleshooting:
  - Return Air Temperature
  - Liquid Line Temperature
  - Gas Line Temperature
  - Discharge Air Temperature (depending on unit),
  - Remote Controller Sensor Temperature
  - Temperature used for Indoor Unit Control
- 3. Basic Operation:
  - Capable of controlling a group of up to 16 indoor units.

- Controller shall control the following group operations:
  - On/Off, Operation Mode (Cool, Heat, Fan, Dry and Auto\* (\*with VRV Heat Recovery))
    - Configure only the essential modes to be selectable remove unnecessary mode selection(s) from display
  - o Independent Cooling and Heating setpoints in the occupied mode
    - Dual setpoints (individual Cool and Heat setpoints with minimum setpoint differential  $0 8^{\circ}F(0 4^{\circ}C)$  default  $2^{\circ}F(1^{\circ}C)$ ) or Single setpoint
  - Independent Cooling Setup and Heating Setback setpoints in the unoccupied mode
  - Fan Speed
  - Airflow direction (dependent on indoor unit type).
  - The controller shall be able to limit the user adjustable setpoint ranges individually for cooling and heating in the occupied period
  - Function button lockout (On/Off, Mode, Fan Speed, Up/Down, Left, Right Arrows)
  - Indoor Unit group assignment
  - Clock (12/24 hour) and Day display
  - Automatic adjustment for Day Light Savings Time (DST)
    - Set changeover period (second Sunday in March / first Sunday in November)
- 4. Programmability:
  - Controller shall support schedule settings with selectable weekly pattern options.
    - o 7-day
    - Weekday + Weekend
    - Weekday + Saturday + Sunday
    - o Everyday
    - The schedule shall support unit On/Off
    - Independently settable Cooling and/or Heating setpoints when unit is on (occupied)
    - Setup (Cooling) and Setback (Heating) setpoints when unit is off (unoccupied)
    - A maximum of 5 operations can be schedulable per day
    - Time setting in 1-minute increments
  - The Controller shall support auto-changeover mode for both Heat Pump and Heat Recovery systems allowing the optimal room temperature to be maintained by automatically switching the indoor unit's mode between Cool and Heat according to the room temperature and temperature setpoint.
    - Changeover to cooling mode shall occur at cooling setpoint + 1°F (0.5°C) as the primary changeover deadband and takes the guard timer into consideration
      - Configurable from 1 4°F (0.5 2°C)
    - Changeover to cooling mode shall occur at the primary changeover deadband to cooling + 1°F (0.5°C) as the secondary changeover deadband.
      - Configurable from  $1 4^{\circ}F(0.5 2^{\circ}C)$
    - Changeover to heating mode shall occur at heating setpoint 1°F (0.5°C) as the primary changeover deadband and takes the guard timer into consideration
      - Configurable from  $1 4^{\circ}F(0.5 2^{\circ}C)$

- Changeover to heating mode shall occur at the primary changeover deadband to heating - 1°F (0.5°C) as the secondary changeover deadband.
  - Configurable from 1 4°F (0.5 2°C)
- 1 hour guard timer
  - Upon changeover, guard timer will prevent another changeover during this period.
  - Guard timer is ignored by a change of setpoint manually from either the Multi-zone Controller, Remote Controller, or by schedule.
  - The Guard timer is also ignored if the space temperature reaches the secondary changeover deadband (configurable from 1 - 4°F (0.5 – 2°C)) from the primary changeover deadband, and the guard timer has been activated
  - 60 minutes as default, configurable to 15, 30, or 90 minutes
- The Controller shall support an Auto Off Timer for temporarily enabling indoor unit operation during the unoccupied period.
  - When the Off Timer is enabled and when the unit is manually turned on at the remote controller
  - o The controller shall shut off the unit after a set time period
  - The time period shall be configurable in the controller menu with a range of 30-180 minutes in 10 minute increments
- The room temperature shall be capable of being sensed at either the NAV Remote Controller, the Indoor Unit return air temperature sensor (default), or Remote Temperature Sensor (KRCS01-1B) configured through the field settings.

# B. Remote Temperature Sensor

The Remote Temperature Sensor shall provide temperature sensing for all VRV indoor units. The remote controller wiring consists of a non-polar two-wire connection to the indoor unit at terminals X13A. The Remote Temperature Sensor is wall mounted and is used to maintain the optimal operation of the connected indoor unit.

The Remote Temperature Sensor can be used in conjunction with the Navigation Remote Controller, Simplified Remote Controller, and the Wireless Remote Controller to sense space temperature outside of the indoor unit. No more than 2 remote controllers can be placed in the same group.

- 1. Mounting:
  - Sensor Box shall be 2.38" x 1.97" x 0.75" (H x W x D) in size.
  - Can be mounted on the wall in the provided sensor box.
  - Can be mounted in the Simplified Remote Controller (BRC2A71).
  - Can be mounted a button temperature sensor holder (field supplied).
- 2. Application:

The location of the temperature sensor should provide a realistic sample of the space temperature in order to provide the optimum comfort level to the occupants.

- Things that need to be considered are:
  - Indoor unit location
  - Will outside area be brought into the space and/or indoor unit
  - Ceiling heights
  - Control Scheme
  - Design and limitations due to architecture

- o Plenum air return
- Basic Operation:
   Beplac
  - Replaces indoor unit return air temperature sensor.
     Senses room temperature for only one indoor unit
- 2.2. Advanced Multi-zone Controllers

The VRV advanced multi-zone controllers shall be compatible with all VRV, SkyAir, and Daikin RA and FTXS indoor units with the use of the KRP928BB2S RA Adapter. The advanced multi-zone controller wiring consist of a non-polar two-wire connection to the outdoor unit. The advanced multi-zone controllers may be wall-mounted and can be adjusted to maintain the optimal operation of up to 64 connected indoor unit groups and 128 indoor units. Set temperatures can be adjusted in increments of 1°F. In the cases where a system or unit error may occur, the VRV controllers will display a two-digit error code and the unit address.

A. DCM601A71: intelligent Touch Manager (iTM) V. 2.0 (Basis of Design) The intelligent Touch Manager (version 2.0) shall provide control for all VRV, SkyAir, and Daikin RA and FTXS indoor units with the use of the KRP928BB2S RA Adapter. It shall be capable of controlling a maximum or 64 indoor unit groups and 128 indoor units connected to a maximum of 10 outdoor units. The intelligent Touch Manager shall support operations superseding that of the local remote controller, system configuration, daily/weekly scheduling, monitoring of operation status, and malfunction monitoring.

The controller wiring shall consist of a non-polar two-wire connection to the indoor unit at terminals F1F2 (out-out) of the outdoor unit. The intelligent Touch Manager is wall mounted and can be adjusted to maintain the optimal operation of the connected indoor unit(s).

The intelligent Touch Manager can be used in conjunction with the BRC1E71/72 (Navigation Remote Controller), the BRC2A71 (Simplified Remote Controller), or the BRC4C82/7E83/7C812/7E818 (Wireless Remote Controller), BACnet, and Lonworks interfaces to control the same indoor unit groups. The remote controller shall require daisy chain wiring for grouping multiple indoor units (up to 16) together. Manual addressing is required of each remote controller group associated with the intelligent Touch Manager. DIII-NET address can be set for one (1) indoor unit or each indoor unit in the remote controller group. No more than 2 remote controllers can be placed in the same group.

The intelligent Touch Manager shall be equipped with two RJ-45 Ethernet ports for 100 Mbps network communication to support interconnection with a network PC via the Internet, Local Area Network (LAN), or connection with a non-networked PC after completed installation.

Web access functions shall be available so that facility staff can securely log into each Intelligent Touch Manager via the PC's web browser to support monitoring, scheduling, error recognition, and general user functions. Error emais are also sent to designated email addresses. An additional optional software function Power Proportional Distribution (PPD) tenant billing shall also be available. The optional software shall require advanced purchase and can only be activated upon receipt of a license activation key from Daikin AC.

1. Mounting:

The intelligent Touch Manager shall be mounted on the wall or into the mounting fixtures included with the intelligent Touch Manager.

- 2. Display Features:
  - a. The intelligent Touch Manager shall be approximately 11.42" x 9.57" x 1.97' in size with a backlit 10.4" LCD display.
  - b. Display information shall be selectable from English, French, Italian, Korean, Dutch, Portuguese, Chinese, Japanese, German, or Spanish.
  - c. Featured backlit LCD with auto off after 30 minutes (default) is adjustable between 1 to 60 minutes, or the choice of 3 different screen savers.
  - d. Area and Group configuration
    - 1) Area contains one (1) or more Area(s) or Group(s)
    - 2) A Group may be an indoor unit, Di, Dio point that has a DIII-NET address
    - 3) A Group may be an external management point such as a Di, Do, Ai, or Ao that does not have a DIII-NET address
  - e. An Area is a tiered group where management points (indoor unit, digital input/output, and analog input/output groups) can be monitored and controlled by global settings. Up to 650 Areas can be created. Area hierarchy can have up to 10 tiered levels (ex. top level: 1<sup>st</sup> floor West, 2<sup>nd</sup> level: offices, hallways, 3<sup>rd</sup> level: Office 101, 102, and 103, etc.). Area configuration shall classify levels of monitoring and control for each management point
    - 1) Areas and Groups may be assigned names (ex. Office 101, Lobby, North Hallway, etc.)
  - f. The Controller shall display On/Off, Operation Mode, Setpoint, Space Temperature, Louver Position, Fan Speed for each Area or Group.
- g. The Controller shall display Date (mm/dd/yyyy, yyyy/mm/dd, or dd/mm/yyyy format selectable) and day of the week along with the time of day (12hr or 24hr display selectable).
  - h. The Controller shall adjust for daylight savings time (DST) automatically.
  - i. Display information shall be updated every 3 seconds to show the latest status of the indoor unit groups.
  - j. System status icons shall display On/Off (color coded), Malfunction/Error (color coded), Forced Stop, Setback, Filter, Maintenance, and Screen Lock.
  - k. The controller shall display the temperature setpoint in one degree increments with a range of 60°F 90°F, 1°F basis (16°C 32°C, 0.1°C basis).
    - 1) Display of temperature setpoint information shall be configurable for Fahrenheit or Celsius
  - I. Display shall reflect room temperature in one tenth degree increments with a range of-58°F − 248°F, 0.1°F basis (-50°C − 120°C, 0.1°C basis) with 0.1°C accuracy.
    - 1) Display of room temperature information shall be configurable for Fahrenheit or Celsius
  - m. The Menu List shall be used to configure options and display information for each Area or Group.
  - n. Error status shall be displayed in the event of system abnormality/error with one of three color coded icons placed over the indoor unit icon or lower task bar.
    - System errors are generated when the intelligent Touch Manager system with other VRV controls systems are combined incorrectly or power proportional distribution calculation errors occur. The intelligent Touch Manager shall display the error with a red triangle placed on the lower task bar.
    - 2) Unit errors occurring within the VRV system shall be displayed with a yellow triangle placed over the indoor unit icon
    - 3) Limit errors are based upon preconfigured analog input upper and lower limit settings and are generated when the limits have been met. When limit error is generated a yellow triangle will be placed over the unit icon.

- 4) Communication errors between the intelligent Touch Manager and the indoor units shall be displayed with a blue triangle placed over the indoor unit icon
- 5) Error history shall be available for viewing for up to 500,000 errors/abnormality events with operation events.
- o. Layout View
  - 1) Capable of displaying site floor plan as the background for visual navigation. Indoor unit, DIII-NET Di and Dio, and External Di, DO, Ai, and Ao icons with operational status can be placed on the floor layout
    - i) Up to 4 status points can be assigned to the indoor unit icon (room name, room temperature, setpoint, and mode)
    - ii) Digital input and output icons will display On/Off status
    - iii) Analog input icons will display analog value
  - 2) Up to 60 floor layout sections can be created
- 3. Basic Operation:
  - a. Capable of controlling by Area(s) or Group(s)
  - b. Controller shall control the following group operations:
    - 1) On/Off
    - 2) Operation Mode (Cool, Heat, Fan, Dry, and Auto)
    - 3) Independent Cool and Heat dual Setpoints or single Setpoint for current mode in the occupied period
    - 4) Controller shall be able to limit the user adjustable setpoint ranges individually for cooling and heating based upon the Area or Group configurations
    - 5) Independent Setup (Cooling) and Setback (Heating) setpoints in the unoccupied mode adjustable to 50 95°F
      - i) Setup and Setback setpoints can only be set outside of the occupied setpoint range
      - ii) The Setup and Setback setpoints will automatically maintain a 2°F fixed differential from the highest possible occupied setpoints
      - iii) The recovery differential shall be  $4^{0}\text{F}$  (default) and adjustable between  $2-10^{0}\text{F}$
      - iv) Settings shall be applied based upon the Area or Group configurations
    - 6) Fan Speed
    - i) Up to 3 speeds (dependent upon indoor unit type)
    - 7) Airflow direction (dependent upon indoor unit type)
      - i) 5 fixed positions or oscillating
    - 8) Remote controller permit/prohibit of On/Off, Mode, and Setpoint
    - 9) Lock out setting for Intelligent Touch Manager display
    - 10) Indoor unit Group/Area assignment
  - c. Capable of providing battery backup power for the clock at least 1 year when no AC power is applied.
    - 1) The battery can last at least 13 years when AC power is applied
    - 2) Settings stored in non-volatile memory
- 4. Programmability:
  - a. Controller shall support weekly schedule settings.
    - 1) 7 day weekly pattern (7)
    - 2) Weekday + Weekend (5 + 2)
    - 3) Weekday + Saturday + Sunday (5 + 1 + 1)
    - 4) Everyday (1)
    - 5) The schedule shall have the capabilities of being enabled or disabled
    - 6) 100 independent schedules configurable with up to 20 events settable for each days schedule
      - i) Each scheduled event shall specify time and target Area or Group

- ii) Each scheduled event shall include On/Off, Optimum Start, Operation Mode, Occupied Setpoints, Setback Setpoints, Remote Controller On/Off Prohibit, Remote Controller Mode Prohibit, Remote Controller Setpoint Prohibit, Timer Extension Setting, Fan Speed, and Setpoint Range Limit
  - Setpoint when unit is On (occupied)
  - Configurable Setup (Cooling) and Setback (Heating) setpoints when unit is Off (unoccupied)
- iii) Time setting in 1-minute increments
- iv) Timer Extension shall be used for a timed override (settable from 30 180 minutes) to allow indoor unit operation during the unoccupied period
- 7) A maximum of 40 exception days can be schedule on the yearly schedule (repeats yearly)
  - i) Exception days shall be used to override specified days on the weekly schedule based upon irregular occupied/unoccupied conditions
  - Exception days can be configured on a set date (Jan 1) or floating date (1<sup>st</sup> Monday in September)
- b. Controller shall support auto-changeover.
  - Auto-change shall provide Fixed (default), Individual, Averaging, and Vote changeover methods for both Heat Pump and Heat Recovery systems based upon the changeover group configuration. This will allow for the optimal room temperature to be maintained by automatically switching the indoor unit's mode between Cool and Heat in accordance with the room temperature and setpoint. The following changeover scheme shall be applicable to the Fixed, Individual, and Averaging methods.
    - i) Changeover to cooling mode shall occur at cooling setpoint + 1°F (0.5°C) as the primary changeover deadband and takes the guard timer into consideration
      - Configurable from  $1 4^{\circ}F(0.5 2^{\circ}C)$
    - ii) Changeover to cooling mode shall occur at the primary changeover deadband to cooling + 1°F (0.5°C) as the secondary changeover deadband.
      - Configurable from  $1 4^{\circ}F(0.5 2^{\circ}C)$
    - iii) Changeover to heating mode shall occur at heating setpoint 1°F (0.5°C) as the primary changeover deadband and takes the guard timer into consideration
      - Configurable from  $1 4^{\circ}F(0.5 2^{\circ}C)$
    - iv) Changeover to heating mode shall occur at the primary changeover deadband to heating 1°F (0.5°C) as the secondary changeover deadband.
      - Configurable from  $1 4^{\circ}F(0.5 2^{\circ}C)$
    - v) A weighted demand shall be configurable for the Averaging and Vote methods.
  - 2) Fixed Method
    - i) Changeover evaluated by room temperature and setpoint of the representative indoor unit (first registered indoor unit in changeover group) in the changeover group even when it is not operating (must be in Cool, Heat, or Auto mode)
    - ii) Changeover affects all indoor unit groups in the changeover group.
  - 3) Individual method (recommended for Heat Recovery Systems)
    - i) Changeover evaluated by room temperature and setpoints of the individual indoor unit group in the changeover group
    - ii) Changeover affects individual indoor unit group in the changeover group
  - 4) Average method

- i) Changeover evaluated by the average of all indoor unit group's room temperatures and setpoints operating in Cool, Heat, or Auto mode in the changeover group list
- ii) If none of the indoor units in the group meet the above requirements the Fixed method of changeover will be applied
- iii) A weighted demand (0 3) can be configured for each indoor unit in the changeover group.
- iv) Changeover affects all indoor unit groups in the changeover group.
- 5) Vote Method
  - In each indoor unit, the cooling demand is calculated based upon the difference between the room temperature and cooling setpoint. If the room temperature falls below the primary cool changeover point (cool setpoint plus the primary changeover deadband) the cooling demand is considered as 0 (zero). Then the total cooling demand is calculated as the sum of each indoor unit's cooling demand
  - ii) The opposite is true for the total heating demand
  - iii) A weight (0-3) can be added to each indoor unit's demand in the changeover group. The default setting is 1
  - iv) The weight 0 (zero) means the indoor unit's demand is not added in the total demand, so the indoor unit's demand is considered to be 0 (zero)
  - v) The weight 2 or 3 means the indoor unit's demand is added 2 or 3 times in the total demand, respectively
  - vi) Changeover to cooling mode shall occur when the total cooling demand is greater than the total heating demand.
  - vii) The opposite is true for changeover to heating
  - viii) Vote supports a Heating Override option, which prioritizes switching to the heating mode if at least one room temperature falls below the secondary heat changeover point (heat setpoint minus the secondary changeover deadband) even if the total cooling demand is greater than the total heating demand.
  - ix) Changeover affects all indoor unit groups in the changeover group.
- 6) Changeover shall change the operation mode of the indoor unit that is set as the Changeover Master. The Changeover Master indoor unit shall then change the operation mode of all indoor unit groups daisy chained to the same outdoor unit in the Heat Pump system or branch selector box in the Heat Recovery system.
- 7) Guard timer
  - i) Upon changeover, guard timer will prevent another changeover during the guard timer activation period (15, 30, 60 (default) min).
  - Guard timer is ignored by a change of setpoint manually from either intelligent Touch Manger or Remote Controller, by schedule, or the room temperature meets or exceeds the secondary changeover deadband of the mode opposite of the current mode setting
- c. Controller shall support Interlock
  - 1) Interlock feature for use with 3<sup>rd</sup> party equipment (DOAS, dampers, occupancy sensing, etc...) to automatically control Groups or Areas corresponding to the change of the operation states or the On/Off states of any Group.
  - 2) WAGO I/O unit Di, Do, Ai, Ao
    - i) On/Off based monitoring and control of equipment
    - ii) Manual or scheduled operation of equipment
    - iii) Operation based upon interlock with management points (group(s))
    - iv) Monitor equipment error/alarm status

- 3) Digital Input/Output (DEC102A51-US2) unit or Digital Input (DEC101A51-US2) unit
  - i) On/Off based monitoring and control of equipment
  - ii) Manual or scheduled operation of equipment
  - iii) Operation based upon interlock with management points (group(s)) iv) Monitor equipment error/alarm status
- d. Controller shall support force shutdown of associated indoor unit groups.
- 5. Web/Email Function
  - a. Each intelligent Touch Manager shall be capable of monitoring, operating, and scheduling a maximum of 64 indoor unit groups (up to 512 indoor unit groups with the addition of the iTM Plus Adapter) from a networked PC's web browser. It shall also be capable of creating general user access and sending detailed error emails to a customized distribution list (up to 10 email addresses).
  - b.All PCs shall be field supplied

#### PART 3 - WARRANTY

- 3.1 Special Warranty: Manufacturer and Installer shall agree to repair or replace in part or entirety any component that fail in materials or workmanship within a specified warranty period. Verified available warranties and warranty periods for units and components shall be provided to owner.
  - Warranty Period: Five years from date of Substantial Completion. 1.

#### SECTION 26 11 16.11

#### SECONDARY UNIT SUBSTATIONS – SECONDARY LESS THAN 1000 V

#### PART 1 GENERAL

#### 1.01 SCOPE

- A. The Contractor shall furnish and install the secondary unit substation(s) complete from the incoming line terminals to the outgoing line terminals as specified herein and as shown on the contract drawings.
- B. The secondary unit substation shall consist of primary equipment, transformer and secondary equipment as specified below. The manufacturer of the unit substation shall furnish and coordinate all major components of the substations, including incoming primary equipment section, transformer and low-voltage section, as well as circuit breakers, fusible switches, and metering components. Provide a single warranty covering all substation assemblies, transformers and components.
- C. Connections between the primary device and transformer shall be bus, and between the transformer and secondary shall be flexible bus braid.
- D. Outdoor primary and secondary equipment where specified shall be of weatherproof construction, rodent proof and shall contain 120-volt space heaters, receptacles and lighting as required.

#### 1.02 RELATED SECTIONS

A. Section 16322A – Substation Transformers – Liquid-Filled

Β.

- C. Section 16361B Medium Voltage Switches 5/15 kV Line-up
- D. Section 16426A Metal-Enclosed Drawout Switchgear (Magnum DS) Low Voltage

#### 1.03 REFERENCES

- A. The secondary unit substation shall be designed, assembled, tested and installed in accordance with latest applicable standards of NEMA, IEEE and ANSI, applicable to its three major sections:
  - 1. MV Load Interrupter Switchgear NEMA SG4, SG5; ANSI C37
  - 2. MV Motor Controllers ANSI/NEMA ICS-3-Part 2, UL347
  - Secondary Substation Transformers NEMA 210, IEEE 100, ANSI C57
  - 4. LV Distribution Switchboards NEMA PB-2, UL 891

### 1.04 SUBMITTALS – FOR REVIEW/APPROVAL

- A. The following information shall be submitted to the Engineer:
  - 1. Master drawing index
  - 2. Front view elevation
  - 3. Floor plan
  - 4. Single line
  - 5. Schematic diagram
  - 6. Nameplate schedule
  - 7. Component list
  - 8. Conduit entry/exit locations
  - 9. Assembly ratings including:
    - a. Short-circuit rating
    - b. Voltage
    - c. Continuous current
    - d. Basic Impulse level for equipment over 600 volts
    - e. kVA
  - 10. Major component ratings including:
    - a. Voltage
    - b. Continuous current
    - c. Interrupting ratings
  - 11. Cable terminal sizes
  - 12. Connection details between close-coupled assemblies
  - 13. Composite front view and floor plan of close-coupled assemblies
  - 14. Impedance for transformers
  - 15. Product data sheets
- B. Where applicable, the following additional information shall be submitted to the Engineer:
  - 1. Busway connection
  - 2. Key interlock scheme drawing and sequence of operation

#### 1.05 SUBMITTALS – FOR CONSTRUCTION

- A. The following information shall be submitted for record purposes:
  - 1. Final as-built drawings and information for items listed Paragraph 1.04, and shall incorporate all changes made during the manufacturing process
  - 2. Wiring diagrams
  - 3. Certified production test reports
  - 4. Installation information

5. Seismic certification as specified

#### 1.06 QUALIFICATIONS

- A. The manufacturer of the assembly shall be the manufacturer of the major components within the assembly.
- B. For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.
- C. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.
  - a. The equipment manufacturer shall certify that the equipment can withstand, that is, function following the seismic event, including both vertical and lateral required response spectra as specified in above codes.
  - b. The equipment manufacturer shall document the requirements necessary for proper seismic mounting of the equipment. Seismic qualification shall be considered achieved when the capability of the equipment, meets or exceeds the specified response spectra.

#### 1.07 REGULATORY REQUIREMENTS

A. Certified copies of production test reports shall be supplied demonstrating compliance with these standards when requested by the engineer.

#### 1.08 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One
 (1) copy of these instructions shall be included with the equipment at time of shipment.

#### 1.09 OPERATION AND MAINTENANCE MANUALS

A. Equipment operation and maintenance manuals shall be provided with each assembly shipped and shall include instruction leaflets, instruction bulletins, and renewal parts lists where applicable for the complete assembly and each major component.

#### PART 2A PRODUCTS – PRIMARY EQUIPMENT

#### 2.01 MANUFACTURERS

- A. Eaton Corporation
- B. General Electric
- C. Siemens

The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above 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 ten (10) days prior to bid date.

### 2.02 RATINGS

A. Sw	ritchgear assembly ratings shall be as follows:	
1.	Nominal System Voltage	15kV three-phase three wire
2.	System Grounding	solid
3.	Rated Maximum Voltage	15 kV
4.	Rated Lightning Impulse Withstand Voltage (BIL)	) 95
	kV for 15 k	V assemblies
5.	Arc Resistant Accessibility Type	Type 2B per IEEE C37.20.7
6.	Main Cross Bus Continuous Current	600 A
7.	Main Cross Bus Momentary Current (10 Cycle)	40 kA rms Asym/_65 kA peak
8.	Main Cross Bus 2-Second Short Circuit Current	25 kA rms Sym
9.	Enclosure Internal Arc Short Circuit Rating	40 kA rms Sym/65 kA peak
10.	Enclosure Internal Arc Short Circuit Duration	0.5 second
11.	Non-Fused Switch (Continuous and Load Break	current) 600Amperes
12.	Non-Fused Switch Fault Close and Momentary w	vithstand 40kA rms Asym
13.	Non-Fused Switch 2-Second Short-time short-cir	cuit current 25kA rms Sym
14.	Fuse Rating As s	hown on drawings
15.	Type of Fuse	RBA-400
16.	Fuse Interrupting Rating	25kA Sym RMS
17.	Fused Switch Fault close & Momentary	40kA Asym RMS

### 2.03 5 AND 15 KV CONSTRUCTION

- A. The metal-enclosed load interrupter switchgear shall consist of deadfront, completely metalenclosed vertical sections containing load interrupter switches and fuses (where shown) of the number, rating and type noted on the drawings or specified herein.
- B. The following features shall be supplied on every vertical section containing a three-pole, two-position open-closed switch:

- A minimum 5-inch x 18-inch high-impact viewing window that permits full view of the position of all three switch blades through the closed door. Open Switch Blades should provide adequate AIR (normal air) clearance to provide full dielectric insulation between Line and load per IEEE C37.30.4 without the use of insulators or insulating gasses. The window shall not be more than 58-inches above the switch pad level to allow ease of inspection
- 2. The fuse compartment door shall be interlocked with the switch so that:
  - a. The switch must be opened before the fuse compartment door can be opened.
  - b. The fuse compartment door must be closed before the switch can be closed.
- Switch compartment door shall be interlocked such that it cannot be opened until the switch has been locked open and fuse compartment door has been unlocked and opened.
- 4. Provision for padlocking the switch in the open or closed position
- 5. Green OPEN, Red CLOSED switch position indicators with the words "Open" and "Closed" in French, Spanish and English
- 6. A hinged cover with rustproof quarter turn nylon latches over the switch operating mechanism to discourage casual tampering
- 7. The switch shall be removable from the structure as a complete operational component
- C. Vertical section construction shall be of the universal frame type using die-formed and bolted parts. All enclosing covers and doors shall be fabricated from steel with thickness equal to or greater than that specified in ANSI/IEEE C37.20.3. No owner removable hardware for covers or doors shall be thread-forming type. To facilitate installation and maintenance of cables and bus in each vertical section, padlockable hinged rear covers held closed by bolts shall be provided.
- D. Each vertical section containing a switch shall have hinged, bolted upper and lower front doors for access to load interrupter switch and fuse compartments. Switch operating mechanism shall be easily accessible from the front without requiring opening of main front doors. Removable handle shall be provided for manual operation of the switch. Provide storage provision for the removable handle within the switch operating mechanism box.
- E. Each load interrupter switch shall have the following features:
  - 1. Three-pole gang-operated mechanism
  - 2. Manual quick-make, quick-break over-toggle-type mechanism that does not require the use of a chain or a cable for operation, and utilizes a heavy-duty coil spring to provide opening and closing energy
  - 3. The speed of opening and closing the switch shall be independent of the operator, and it shall be impossible to tease the switch into any intermediate position under normal operation
  - 4. Separate main and break contacts to provide maximum endurance for fault close and load interrupting duty

- 5. Insulating barriers between each phase and between the outer phases and the enclosure
- 6. A maintenance provision for slow closing the switch to check switch blade engagement and slow opening the switch to check operation of the arc interrupting contacts

#### 2.04 BUS

- A. All phase bus conductors shall be [tin-plated copper] [silver-plated copper].
- B. Ground bus shall be silver-plated copper and be directly fastened to an unplated metal surface of each vertical section, and be of a size sufficient to carry the rated (2-second) current of the switchgear assembly.
- C. A neutral bus shall be provided only when indicated on the drawings. It shall be insulated for 1000 Vac to ground. The current rating of the neutral bus shall be 600 amperes.

#### 2.05 BUS INSULATION SYSTEM

- A. All bus shall be supported utilizing a high strength and high creep support providing 10.5inch of creep distance between phases and ground. The molded fins shall be constructed of high track resistant polyester.
- B. All standoff insulators on switches and fuse mountings shall be [glass polyester] [cycloaliphatic epoxy]

#### 2.06 WIRING/TERMINATIONS

- A. One (1) terminal pad per phase shall be provided for attaching contractor-supplied cable terminal lugs for a maximum of two (2) conductors per phase of the sizes indicated on the drawings. Sufficient space shall be allowed for contractor supplied electrical stress relief termination devices.
- B. Small wiring, fuse blocks and terminal blocks within the vertical section shall be furnished as indicated on the drawings. Each control wire shall be labeled with wire markers. Terminal blocks shall be provided for owner's connections to other apparatus.

### 2.07 FUSES

A. Fault protection shall be provided by fuses with continuous ratings as shown in the contract documents. Any fuse/switch integrated momentary and fault close ratings specified shall have been verified by test and UL and CSA certified.

#### 2.08 UTILITY METERING

#### 2.09 ACCESSORIES

- A. Supply key interlocks as shown on the drawings.
- B. Furnish distribution class surge arresters with ratings in accordance with manufacture's recommendations.

#### 2.10 ENCL OSURES

- A. Enclosures shall be constructed per IEEE/ANSI C37.20.3. It shall be designed such that it can be installed indoor or outdoor.
- B. Switchgear enclosure shall provide protection against internal arcing faults at the front, sides, and rear as defined by accessibility Type 2B under ANSI test guide C37.20.2.
- C. In the event of an internal arcing fault, the resulting arc pressure and the exhaust shall be directed upward and into the plenum fitted above each section.
- The switchgear shall be installed outdoor. An enclosed arc exhaust plenum shall be furnished for installation above the switchgear. Arc exhaust shall be vented from the arc-plenum to the exit location via arc-duct as shown on the drawings. Arc duct shall be supplied by \*[the switchgear manufacturer][Purchaser]. When supplied by Purchaser, it must be made and installed in accordance with basic minimum design requirements provided by the switchgear manufacturer. Field assembly of the arc-plenum and arc-duct shall be by installing contractor. A minimum of one (1) 250-watt, 120-volt space heater shall be provided in each vertical section. Power for the space heater(s) shall be furnished □[as indicated on the drawings] [by a control power transformer mounted in the switchgear] [by a transformer mounted within the low voltage switchboard/switchgear].

#### 2.11 NAMEPLATES

A. A nameplate shall be mounted on the front door of each switch vertical section in accordance with the drawings.

#### 2.12 FINISH

A. Prior to assembly, all enclosing steel shall be thoroughly cleaned and phosphatized. A powder coating shall be applied electrostatically, then fused-on by baking in an oven. The coating is to have a thickness of not less than 1.5 mils. The finish shall have the following properties:

Impact resistance (ASTM D-2794) Pencil hardness (ASTM D-3363) Flexibility (ASTM D-522) Salt spray (ASTM B117-85 [20]) Color 60 direct/60 indirect H Pass 1/8-inch mandrel 600 hours ANSI 61 gray

#### 2.13 SPECIAL SWITCHGEAR CONFIGURATIONS

A. Duplex Switchgear Assembly

 Furnish, where shown on the drawings, a duplex switchgear assembly configuration consisting of two (2) load interrupter switches with common load side bus to feed one load circuit, which shall be fused or unfused as indicated on the drawings. Key interlocks shall be supplied to prevent paralleling the incoming sources, and to prevent opening the front door of each vertical section containing one of the two switches unless both switches are locked open

### PART 2B PRODUCTS - TRANSFORMERS

#### 2.01 MANUFACTURERS

- A. Eaton
- B. General Electric
- C. Siemens

The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above 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 ten (10) days prior to bid date.

#### 2.02 RATINGS

A. The ratings of the transformer shall be as follows or as shown on the drawings:

kVA Rating Impedance	1500/1725 ONAN/Future ON 5.75% +/- 7-1/2% Standard	JAF
Tolera	ance	
HV	15.0kV Delta	
HV BIL	95kV	
HV De-energized Taps	4	+/- 2 - 2-1/2% full capacity
LV	277/480VoltsWye	
LV BIL	95kV	

#### 2.03 CONSTRUCTION

- A. The unit shall be biodegradable electrical insulating fluid from high oleic vegetable oil sources filled and shall be in accordance with the latest edition of the NEC. High fire point fluids shall be Factory Mutual and UL listed.
- B. The transformer shall carry its continuous rating with average winding temperature rise by resistance that shall not exceed 65 degrees C, based on an average ambient of 30 degrees C over 24 hours with a maximum of 40 degrees C.

- C. The transformer shall be designed to carry short-time emergency overloads in accordance with ANSI C57.12.92 as applicable. Duration and magnitude of designed withstand capability shall be as outlined in ANSI C57.12.90 and the latest draft of the IEEE short-circuit test code.
- D. The transformer shall be designed to meet the sound level standards for liquid transformers as defined in NEMA TR1. The measurement procedure shall be as specified in ANSI C.57.12.90.
- E. High-voltage and low-voltage windings shall be copper. Insulation between layers of the windings shall be by Insuldur paper or equal.
- F. The main transformer tank and attached components shall be designed to withstand pressures 25% greater than the required operating design value without permanent deformation. Construction shall consist of carbon steel plate reinforced with external sidewall braces. All seams and joints shall be continuously welded.
- G. Each radiator assembly shall be individually weldedand receive a quality control pressurized check for leaks. The entire tank assembly shall receive a similar leak test before core and coil are tanked. A final six-hour leak test shall be performed after the transformer is tanked, welded and completed to ensure that there are no leaks before shipment.

#### 2.04 ACCESSORIES

- A. Transformer features and accessories shall include:
  - 1. De-energized tap changer with externally operated, padlockable handle
  - 2. Combination drain and filter valve and sampling device
  - 3. Manual gas pressure test connection
  - 4. Filling plug and filter press connection in cover
  - 5. Dial-type top liquid thermometer
  - 6. Magnetic liquid level gauge
  - 7. Provisions for lifting, provisions for jacking, base designed for skidding or rolling in two directions
  - 8. Ground pad stainless steel
  - 9. Instruction nameplate aluminum
  - 10. Pressure vacuum gauge
  - 11. Welded-on main tank cover and handhole in cover
  - 12. Pressure relief device

#### 2.05 FINISH

A. The paint shall be applied using an air spray with air dry acrylic topcoat system to a minimum of three mils average thickness. Outdoor liquid transformer units shall include

suitable outdoor paint finish. Units shall be painted ANSI 61 for indoor service or outdoor service and shall match the primary and secondary equipment.

#### 2.06 TERMINAL COMPARTMENTS/FLANGE CONNECTIONS

A. The transformer unit supplied shall include a HV close-coupled flange and a LV closecoupled flange. Connections between the primary device and transformer shall be cable and between the transformer and secondary shall be flexible bus braid.

#### PART 2 C PRODUCTS – SECONDARY EQUIPMENT

#### 2.01 MANUFACTURERS

- A. Eaton
- B. General Electric
- C. Siemens

The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above 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 ten (10) days prior to bid date.

#### 2.02 RATINGS

- A. Voltage rating shall be as indicated on the drawings. The entire assembly shall be suitable for 600 volts maximum ac service.
- B. The assembly shall be rated to withstand mechanical forces exerted during short-circuit conditions when connected directly to a power source having available fault current of 65,000 amperes symmetrical at rated voltage.
- C. The bus system shall have a minimum ANSI short-circuit withstand rating of 100,000 amperes symmetrical tested in accordance with ANSI C37.20.1 and UL1558.
- D. All circuit breakers shall have a minimum symmetrical interrupting capacity of 65,000 amperes. To ensure a fully selective system, all circuit breakers shall have 30 cycle short-time withstand ratings equal to their symmetrical interrupting ratings through 85,000 amperes, regardless of whether equipped with instantaneous trip protection or not.
- E. All ratings shall be tested to the requirements of ANSI C37.20.1, C37.50 and C37.51 and UL witnessed and approved.

#### 2.03 CONSTRUCTION

- A. The switchgear shall consist of the required number of vertical sections bolted together to form a rigid assembly. The sides shall be covered with removable bolt-on covers. All edges of front covers or hinged front panels shall be formed. Provide ventilators located on the top of the switchgear over the breaker and bus compartments to ensure adequate ventilation within the enclosure. Hinged rear doors, complete with provisions for padlocking, shall be provided.
- B. The assembly shall be provided with adequate lifting means and shall be capable of being moved into installation position and bolted directly to Provisions shall be made for jacking of shipping groups, for removal of skids or insertion of equipment rollers. Base of assembly shall be suitable for rolling directly on pipes without skids. The base shall be equipped with slots in the base frame members to accommodate the use of pry bars for moving the equipment to its final position.
- C. Each vertical steel unit forming part of the switchgear line-up shall be a self-contained housing having one or more individual breaker or instrument compartments, a centralized bus compartment and a rear cable compartment. Each individual circuit breaker compartment, or cell, shall be segregated from adjacent compartments and sections by means of steel barriers to the maximum extent possible. It shall be equipped with drawout rails and primary and secondary disconnecting contacts. Removable hinge pins shall be provided on the breaker compartment door hinges. Current transformers for feeder instrumentation, where shown on the plans, shall be located within the appropriate breaker cells and be front accessible and removable.
- D. The stationary part of the primary disconnecting devices for each power circuit breaker shall be breaker mounted and consist of a set of contacts extending to the rear through a glass polyester insulating support barrier; corresponding moving finger contacts, suitably spaced, shall be furnished on the power circuit breaker studs which engage in only the connected position. The assembly shall provide multiple silver-to-silver full floating high pressure point contacts with uniform pressure on each finger maintained by springs. Each circuit shall include the necessary three-phase bus connections between the section bus and the breaker line side studs. Load studs shall be equipped with insulated copper load extension buses terminating in solderless type terminals in the rear cable compartment of each structure. Bus extensions shall be silver-platedwhere outgoing terminals are attached.
- E. The circuit breaker door design shall be such that the following functions may be performed without the need to open the circuit breaker door: lever circuit breaker between positions, operate manual charging system, close and open circuit breaker, examine and adjust trip unit, and read circuit breaker rating nameplate.
- F. The secondary disconnecting devices shall consist of floating terminals mounted on the stationary unit and engaging mating contacts at the front of the breaker. The secondary disconnecting devices shall be gold-plated and engagement shall be maintained in the "connected" and "test" positions.
- G. The removable power circuit breaker element shall be equipped with disconnecting contacts and interlocks for drawout application. It shall have four positions, "connected," "test," "disconnected" and "removed." The breaker drawout element shall contain a worm gear

levering "in" and "out" mechanism with removable lever crank. Levering shall be accomplished via the use of conventional tools. Mechanical interlocking shall be provided so that the breaker is in the tripped position before levering "in" or "out" of the cell. Interlocking that trips the breaker will not be accepted. The breaker shall include an optional provision for key locking open to prevent manual or electric closing. Padlocking shall provide for securing the breaker in the connected, test, or disconnected position by preventing levering.

- H. An insulating flash shield shall be mounted above each circuit breaker to prevent flashover from the arc chutes to ground.
- I. The switchgear shall be Cutler-Hammer Magnum DS low voltage metal-enclosed switchgear, utilizing Magnum DS power circuit breakers as herein specified.
- J. The switchgear shall be suitable for use as service entrance equipment and be labeled in accordance with UL requirements.
- K. Provide a rear compartment barrier between the cable compartment and the main bus to protect against inadvertent contact with main or vertical bus bars.
- L. Provide in the cell when the circuit breaker is withdrawn, a safety shutter which automatically covers the line and load stabs and protects against incidental contact.

#### 2.04 BUS

- A. All bus bars shall be silver-plated copper. Main horizontal bus bars shall be mounted with all three phases arranged in the same vertical plane. Bus sizing shall be based on ANSI standard temperature rise criteria of 65 degrees C over a 40 degrees C ambient (outside the enclosure).
- B. Provide a full capacity neutral bus where a neutral bus is indicated on the drawings.
- C. A copper ground bus shall be furnished firmly secured to each vertical section structure and shall extend the entire length of the switchgear. The ground bus short-time withstand rating shall meet that of the largest circuit breaker within the assembly.
- D. All hardware used on conductors shall be high-tensile strength and zinc-plated. All bus joints shall be provided with Belleville-type washers.

#### 2.05 WIRING/TERMINATIONS

- A. Small wiring, necessary fuse blocks and terminal blocks within the switchgear shall be furnished as required. Control components mounted within the assembly shall be suitably marked for identification corresponding to the appropriate designations on manufacturer's wiring diagrams.
- B. Provide a front accessible, isolated vertical wireway for routing of factory and field wiring. Factory provisions shall be made for securing field wiring without the need for adhesive wire anchors.

- C. Front access to all circuit breaker secondary connection points shall be provided for ease of troubleshooting and connection to external field connections without the need of removing the circuit breaker for access.
- D. All control wire shall be type SIS. Control wiring shall be 16 ga for control circuits and 14 ga for current transformer circuits. Wire bundles shall be secured with nylon ties and anchored to the assembly with the use of pre-punched wire lances or nylon non-adhesive anchors. All current transformer secondary leads shall first be connected to conveniently accessible shorting terminal blocks before connecting to any other device. Shorting screws with provisions for storage shall be provided. All groups of control wires leaving the switchgear shall be provided with terminal blocks with suitable numbering strips and provisions for #10 AWG field connections. Each control wire shall be marked to the origin zone/wire name/destination zone over the entire length of the wire using a cured ink process. [Provide wire markers at each end of all control wiring]. Plug-in terminal blocks shall be provided for all shipping split wires. Terminal connections to remote devices or sources shall be front accessible via doors above each circuit breaker.
- E. NEMA 2-hole mechanical-type lugs shall be provided for all line and load terminations suitable for copper or aluminum cable rated for 75 degrees C of the size indicated on the drawings.
- F. Lugs shall be provided in the incoming line section for connection of the main grounding conductor. Additional lugs for connection of other grounding conductors shall be provided as indicated on the drawings.
- G. Reusable insulating boots shall be provided to cover all power cable terminations.

#### 2.06 CIRCUIT BREAKERS

- A. All protective devices shall be low voltage power circuit breakers, Cutler-Hammer type Magnum DS or approved equal. All breakers shall be UL listed for application in their intended enclosures for 100% of their continuous ampere rating.
- B. All power circuit breakers shall be constructed and tested in accordance with ANSI C37.13, C37.16, C37.17, C37.50, UL 1066 and NEMA SG-3 standard. The breaker shall carry a UL label.
- C. Breakers shall be provided in drawout configuration. The 800, 1600, 2000 and 3200 ampere frame power circuit breakers shall be provided in the same physical frame size, while 4000, 5000 and 6000 ampere frame power circuit breakers shall be provided in a second physical frame size. Both physical frame sizes shall have a common height and depth.
- D. Power circuit breakers shall utilize a two-step stored-energy mechanism to charge the closing springs. The closing of the breaker contacts shall automatically charge the opening springs to ensure quick-break operation.
- E. Breakers shall be manually operated (MO) unless electrically operated (EO) is indicated on the drawings.

- F. To facilitate lifting, the power circuit breaker shall have integral handles on the side of the breaker.
- G. The power circuit breaker shall have a closing time of not more than 3 cycles.
- H. The primary contacts shall have an easily accessible wear indicator to indicate contact erosion.
- The power circuit breaker shall have three windows in the front cover to clearly indicate any electrical accessories that are mounted in the breaker. The accessory shall have a label that will indicate its function and voltage. The accessories shall be plug and lock type and UL listed for easy field installation. They shall be modular in design and shall be common to all frame sizes and ratings.
- J. The breaker control interface shall have color-coded visual indicators to indicate contact open or closed positions, as well as mechanism charged and discharged positions. Manual control pushbuttons on the breaker face shall be provided for opening and closing the breaker. The power circuit breaker shall have a "Positive On" feature. The breaker flag will read "Closed" if the contacts are welded and the breaker is tripped or opened.
- K. The current sensors shall have a back cover window that will permit viewing the sensor rating on the back of the breaker. A rating plug will offer indication of the rating on the front of the trip unit.
- L. A position indicator shall be located on the faceplate of the breaker. This indicator shall provide color indication of the breaker position in the cell. These positions shall be Connect (Red), Test (Yellow), and Disconnect (Green). The levering door shall be interlocked so that when the breaker is in the closed position, the breaker levering-in door shall not open.
- M. Each power circuit breaker shall offer sixty (60) front-mounted dedicated secondary wiring points. Each wiring point shall have finger safe contacts, which will accommodate #10 AWG maximum field connections with ring tongue or spade terminals or bare wire.

### 2.07 TRIP UNITS

- A. Each low voltage power circuit breaker shall be equipped with a solid-state tripping system consisting of three current sensors, microprocessor-based trip device and flux-transfer shunt trip. Current sensors shall provide operation and signal function. The trip unit shall use microprocessor-based technology to provide the basic adjustable time-current protection functions. True rms sensing circuit protection shall be achieved by analyzing the secondary current signals received from the circuit breaker current sensors and initiating trip signals to the circuit breaker trip actuators when predetermined trip levels and time delay settings are reached. Interchangeable current sensors with their associated rating plug shall establish the continuous trip rating of each circuit breaker. The trip unit shall be Cutler-Hammer type Digitrip RMS 520.
- B. The trip unit shall have an information system that utilizes battery backup LEDs to indicate mode of trip following an automatic trip operation. The indication of the mode of trip shall be retained after an automatic trip. A reset button shall be provided to turn off the LED

indication after an automatic trip. A test pushbutton shall energize a LED to indicate the battery status.

- C. The trip unit shall be provided with a display panel, including a representation of the time/current curve that will indicate the protection functions. The unit shall be continuously self-checking and provide a visual indication that the internal circuitry is being monitored and is fully operational.
- D. The trip unit shall be provided with a making-current release circuit. The circuit shall be armed for approximately two cycles after breaker closing and shall operate for all peak fault levels above 25 times the ampere value of the rating plug.
- E. Trip unit shall have selectable powered and unpowered thermal memory for enhanced circuit protection.
- F. Complete system selective coordination shall be provided by the addition of the following individually adjustable time/current curve shaping solid-state elements:
  - 1. All circuit breakers shall have adjustments for long delay pickup and time
  - 2. All circuit breakers shall have individual adjustments for short delay pickup and time, and include l<sup>2</sup>t settings
  - 3. All circuit breakers shall have an adjustable instantaneous pickup
  - 4. All circuit breakers shall have individually adjustable ground fault current pickup and time, and include l<sup>2</sup>t settings or ground alarm only
- G. The trip unit shall have provisions for a single test kit to test each of the trip functions.
- H. The trip unit shall provide zone interlocking for the short-time delay and ground fault delay trip functions for improved system coordination. The zone interlocking system shall restrain the tripping of an upstream breaker and allow the breaker closest to the fault to trip with no intentional time delay. In the event that the downstream breaker does not trip, the upstream breaker shall trip after the present time delay. The trip unit shall include a voltage transformer module, suitable for operation up to 600V, 50/60 Hz. The primary of the voltage transformer module shall be connected internally to the line side of the circuit breaker through a dielectric test disconnect plug.
- I. System coordination shall be provided by the following microprocessor-based programmable time-current curve shaping adjustments. The short-time pickup adjustment shall be dependent on the long delay setting.
  - 1. Programmable long-time setting
  - 2. Programmable long-time delay with selectable I<sup>2</sup>t or I<sup>4</sup>t curve shaping
  - 3. Programmable short-time setting
  - 4. Programmable short-time delay with selectable flat or l<sup>2</sup>t curve shaping, and zone selective interlocking
  - 5. Programmable instantaneous setting
  - 6. Programmable ground fault setting trip or ground fault setting alarm

- 7. Programmable ground fault delay with selectable flat or I<sup>2</sup>t curve shaping and zone selective interlocking
- 8. Adjustable undervoltage release
- 9. Adjustable overvoltage release
- 10. Reverse load and fault current
- 11. Reverse sequence voltage alarm
- 12. Underfrequency
- 13. Overfrequency
- 14. Voltage phase unbalance and phase loss during current detection
- J. Each section of the switchgear shall be provided with a space heater thermostatically controlled. Power for the space heaters shall be obtained from a source as indicated on the drawings. Supply voltage shall be 120 volts ac.
- K. Fused control power transformers shall be provided as indicated on the drawings or as required for proper operation of the equipment. A manual disconnect shall be provided ahead of the primary fuses.

#### 2.08 ENCLOSURES

#### Α.

- B. Outdoor Non-Walk-in Enclosure
  - Switchgear shall be enclosed in an outdoor non-walk-in NEMA 3R enclosure conforming to all applicable requirements of UL and designed to withstand wind velocities of 110mph. The enclosure shall have a roof sloping toward the rear. Outer sections shall be the same widths as indoor structures except the end sections of a non-walk-in enclosure shall be wider than the inner sections to permit opening the inner door. Each end of the outdoor structure shall have an end trim
  - 2. The enclosure shall be provided with front and rear hinged padlockable doors with wind stops for each section. Steel floor plates shall be provided in the rear cable compartment. Ventilating openings shall be provided complete with replaceable fiberglass air filters which are removable from the exterior of the enclosure. Provide necessary space heaters thermostatically controlled for breaker, bus and cable compartments of adequate wattage to prevent the accumulation of moisture within the compartments
  - The construction of the enclosure shall be modular so future sections can be added without affecting NEMA 3R integrity. Provide interior fluorescent lights, switches and GFI protected receptacles
  - 4. The enclosure shall be provided with undercoating applied to all members in contact with the foundation surface to retard corrosion
  - 5. Power for the space heaters, lights and receptacles shall be obtained from a control power transformer within the switchgear. Supply voltage shall be 120 volts ac

- 6. A portable overhead circuit breaker lifter shall be provided to assist in removal of the circuit breakers from the enclosure
- 7. Each shipping section shall be shipped completely assembled

#### 2.09 NAMEPLATES

- A. Engraved nameplates, mounted on the face of the assembly, shall be furnished for all main and feeder circuits as indicated on the drawings. Nameplates shall be laminated plastic, black characters on white background, and secured with screws. Characters shall be 3/16-inch high, minimum.
- B. Furnish master nameplate giving switchgear designation, voltage ampere rating, shortcircuit rating, and manufacturer's name.
- C. Control components mounted within the assembly, such as fuse blocks, relays, pushbuttons, switches, etc., shall be suitably marked for identification corresponding to appropriate designations on manufacturer's drawings.

#### 2.10 FINISH

- A. All exterior and interior steel surfaces of the switchgear shall be properly cleaned and provided with a rust-inhibiting phosphatized coating. Color and finish of the switchgear shall be ANSI 61.
- 2.11 SURGE PROTECTIVE DEVICES
  - A. Provide surge protective devices as specified in Section 16671A.

#### 2.12 FACTORY TESTING

- A. Standard factory tests shall be performed on the primary equipment provided under this section. All tests shall be in accordance with the latest version of ANSI and NEMA standards.
- B. The following factory tests shall be made on all transformers. All tests shall be in accordance with the latest revision of ANSI and NEMA standards.
  - 1. Resistance measurements of all windings on the rated voltage connection of each unit and at the tap extremes of one unit only of a given rating on this project
  - 2. Ratio tests on the rated voltage connection and on all tap connections
  - 3. Polarity and phase-relation tests on the rated voltage connections
  - 4. No-load loss at rated voltage on the rated voltage connection
  - 5. Exciting current at rated voltage on the rated voltage connection

- 6. Impedance and load loss at rated current on the rated voltage connection of each unit and on the tap extremes of one unit only of a given rating on this project
- 7. Applied potential test
- 8. Induced potential tests
- C. The following standard factory tests shall be performed on the secondary equipment provided under this section. All tests shall be in accordance with the latest version of ANSI and NEMA standards.
  - The switchgear shall be completely assembled, wired, adjusted and tested at the factory. After assembly, the complete switchgear shall be tested to ensure the accuracy of the wiring and the functioning of all equipment. The main bus system shall be given a dielectric test of 2200 volts for one minute between live parts and ground and between opposite polarities
  - The wiring and control circuits shall be given a dielectric test of 1500 volts for one minute or 1800 volts for one second between live parts and ground, in accordance with ANSI C37.20.1
- D. The manufacturer shall provide three (3) certified copies of factory test reports.
  - 1.

#### 2.13 FIELD QUALITY CONTROL

- A. Provide the services of a qualified factory-trained manufacturer's representative to assist the Contractor in installation and startup of the equipment specified under this section for a period of 7 working days. The manufacturer's representative shall provide technical direction and assistance to the contractor in general assembly of the equipment, connections and adjustments, and testing of the assembly and components contained herein.
- B. The Contractor shall provide three (3) copies of the manufacturer's field startup report.

#### 2.14 MANUFACTURER'S CERTIFICATION

- A. A qualified factory-trained manufacturer's representative shall certify in writing that the equipment has been installed, adjusted and tested in accordance with the manufacturer's recommendations.
- B. The Contractor shall provide three (3) copies of the manufacturer's representative's certification.
- 2.15 TRAINING

- A. The Contractor shall provide a training session for up to five (5) owner's representatives for 1 normal workdays at a job site location determined by the owner.
- B. The training session shall be conducted by a manufacturer's qualified representative. The training program shall include instructions on the assembly including primary equipment, transformer, and secondary equipment. All circuit breakers, protective devices and other major components shall be included.
- 2.16 INSTALLATION
  - A. The contractor shall install all equipment per the manufacturer's recommendation and the contract drawings.
  - B. All necessary hardware to secure the assembly in place shall be provided by the contractor.
- 2.17 FIELD ADJUSTMENTS
- 2.18 FIELD TESTING

#### SECTION 26 33 54 - THREE- PHASE UNINTERRUPTIBLE POWER SYSTEM 277/480VAC SYSTEM

#### PART 1 - GENERAL

- 1.1 SUMMARY
  - A. This specification defines the electrical and mechanical characteristics and requirements for a continuous-duty three-phase, solid-state, scalable (field-upgradable) uninterruptible power system (UPS). The UPS shall provide high-quality AC power for sensitive electronic equipment.
  - B. Related Requirements:
    - 1. Division 7 Section "Security Joint Sealants" for requirements for and locations to receive security joint sealants.
    - 2. Division 11 Section "Tamper-Proof Metal Fasteners" for requirements for and locations to receive security fasteners.

#### 1.2 STANDARDS

- A. The UPS shall be designed in accordance with the applicable sections of the current revision of the following documents. Where a conflict arises between these documents and statements made herein, the statements in this specification shall govern.
  - 1. UL Standard 924.
  - 2. CSA 22.2, No. 107.1
  - 3. FCC Part 15, Class A
  - 4. IEC 61000-4-5
  - 5. National Electrical Code (NFPA-70)
  - 6. NEMA PE-1
  - 7. ISTA\_1H
- B. The UPS shall be UL and cUL listed per UL Standard 1778.

#### 1.3 SYSTEM DESCRIPTION

- A. Design Requirements UPS Module
  - 1. Voltage. Input/output voltage specifications of the UPS shall be:
  - 2. Rectifier Input: 277/480 volts, three-phase, 4-wire-plus-ground
  - 3. Bypass Input: 277/480 volts, three-phase, 4-wire-plus-ground
  - 4. Output: 277/480 volts, three-phase, 4-wire-plus-ground
- B. Output Load Capacity. Specified output load capacity of the UPS shall be 24KW.
- C. Scalable Output Capacity. UPS rated output capacity will be scalable by means of a software update which will require no hardware modifications to the UPS. Models will be available in capacity ranges of 40, 60, 80, 100, 120, 160 and 200kVA.

40kVA model will be scalable from 40k to 60kVA to 80kVA.

80kVA model will be scalable from 80kVA to 100kVA to 120kVA.

160kVA model will be scalable from 160kVA to 200kVA

- D. Parallel Operation. Up to four (4) UPS module outputs may be connected together in parallel to provide up to 3X maximum output capacity with redundancy.
- E. Current Sharing: When multiple UPS modules are connected in parallel and powering a common load, each UPS module output current will not differ by more than 5% of the rated full load current of one UPS module.
- F. Design Requirements Battery
  - 1. Battery Cells: Valve-regulated, lead acid batteries.
  - 2. Reserve Time: 90 minutes, with ambient temperature of 77°F (25°C). Unit shall provide terminal for connection of external batteries.
  - 3. Recharge Time: to 95% capacity within ten (10) times discharge time.
- G. Modes of Operation
  - 1. The UPS shall be designed to operate as an on-line, double-conversion, reverse-transfer system with the following operating modes:
    - a. Normal The critical AC load is continuously supplied by the UPS inverter. The rectifier/charger derives power from an AC source and supplies DC power to the inverter while simultaneously float-charging the reserve battery.
    - b. Emergency Upon failure of utility AC power, the critical AC load is supplied by the inverter, which obtains power from the battery. There shall be no interruption in power to the critical load upon failure or restoration of the utility AC source.
    - c. Recharge Upon restoration of utility AC power after a utility AC power outage, the rectifier/charger shall automatically restart and assume the inverter and battery recharge loads.
    - d. Bypass If the UPS must be taken out of service for maintenance or repair or if the inverter overload capacity is exceeded, the static transfer switch shall perform a reverse transfer of the load from the inverter to the bypass source with no interruption in power to the critical AC load.
    - e. Eco-Mode When this mode is enabled by service personnel the UPS will power the critical load through the UPS static bypass. If the bypass source becomes unqualified the UPS will switch to Normal mode of operation as defined above. Utility power is considered unqualified when either the input voltage varies more than +10% of rated voltage or the input frequency varies beyond +10% of 60Hz. Ten (10) minutes after the bypass source becomes qualified the UPS will automatically transfer to Eco-Mode of operation.
- H. Performance Requirements
  - 1. AC Input to UPS
    - a. Voltage Configuration for Standard Units: 480V, three-phase, three-wire plus ground
    - b. Voltage Range: +15%, -20% of nominal without derating
    - c. Frequency: 57-66 Hz
    - d. Power Factor: >0.99 at nominal input voltage and full-rated UPS output load, >0.98 at nominal input voltage and half-rated UPS output load
    - e. Inrush Current: UPS inrush current not to exceed 1.5 times rated input current. Maintenance bypass and distribution cabinet inrush current not to exceed 8 times rated input current.
    - f. Current Limit: 140% of nominal AC input current maximum

#### THREE-PHASE UNINTERRUPTIBLE POWER SYSTEM 277/480VAC SYSTEM

- g. Current Distortion: <3% reflected THD maximum at full load
- h. Surge Protection: Sustains input surges without damage per criteria listed in IEC 1000-4-5
- 2. AC Output, UPS Inverter
  - a. Voltage Configuration: three-phase, 3-wire plus ground
  - b. Voltage Regulation:
    - i. ±1% three-phase RMS average for a balanced three-phase load for the combined variation effects of input voltage, connected load, battery voltage, ambient temperature and load power factor
    - ii. ±2% three-phase RMS average for a 100% unbalanced load for the combined variation effects of input voltage, connected load, battery voltage, ambient temperature and load power factor
  - 3. Frequency: Nominal frequency ±0.05% for single unit, ±0.25% for paralleled units
  - 4. Frequency Slew Rate: Selectable from 0.1Hz/sec to 3.0Hz/sec maximum for single unit; Fixed maximum of 0.2Hz/sec for paralleled units
  - 5. Phase Displacement:
    - a. ±0.5 degree for balanced load
    - b. ±1.0 degrees for 100% unbalanced load
  - 6. Bypass Line Sync Range:
    - a. ±2.0 Hz, field-selectable ±0.5 to 5.0 Hz
  - 7. Voltage Distortion:
    - a. 1% total harmonic distortion (THD) for linear loads
    - b. <5% THD for 100% nonlinear loads (3:1 crest factor) without kVA/kW derating
  - 8. Load Power Factor Range: 0.7 lagging to 1.0 leading without derating
  - 9. Output Power Rating: Rated kVA at 0.9 lagging power factor
  - 10. Overload Capability:
    - a. 110% for 1 hour
    - b. 125% for 10 minutes
    - c. 150% for 1 minute
- 11. Voltage Transient Response:
  - 100% load step

Loss or return of AC input power ±1.0%

- 12. Transient Recovery Time: to within 2% of output voltage within one cycle
- 13. Voltage Unbalance: 100% unbalanced load, ±2%

### 1.4 ENVIRONMENTAL CONDITIONS

- A. The UPS shall be able to withstand the following environmental conditions without damage or degradation of operating characteristics:
  - 1. Operating Ambient Temperature
    - a. UPS Module: 32°F to 104°F (0°C to 40°C)
    - b. Battery: 77°F ±9°F (25°C ±5°C)
  - 2. Storage/Transport Ambient Temperature
    - a. UPS Module: -13°F to 158°F (-25°C to 70°C)

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±5.0%

- b. Battery: -4°F to 92°F (-20°C to 33°C)
- 3. Relative Humidity 0 to 95%, non-condensing
- 4. Altitude
  - a. Operating: to 6,562 ft. (2000m) above mean sea level without derating. Linearly derated from 100% load at 6,562 ft. (2000m) to 88% load at 9,843 ft. (3000m).
  - b. Storage/Transport: to 40,000 ft. (12,200m) above mean sea level.
  - 5. Audible Noise
    - a. Less than 61dB for 40-80kVA model
    - b. Less than 63dB for 100-120kVA model
    - c. Less than 69dB for 160-200kVA model

#### 1.5 SUBMITTALS

- A. Proposal Submittals
  - 1. Submittals with the proposal shall include:
    - a. System configuration with single-line diagrams
    - b. Functional relationship of equipment including weights, dimensions and heat dissipation
    - c. Descriptions of equipment to be furnished, including deviations from these specifications
    - d. Size and weight of shipping units to be handled by installing contractor
    - e. Detailed layouts of customer power and control connections
    - f. Detailed installation drawings including all terminal locations

#### B. UPS Delivery Submittals

1. Submittals upon UPS delivery shall include a complete set of submittal drawings and one (1) set of instruction manuals that shall include a functional description of the equipment with block diagrams, safety precautions, instructions, step-by-step operating procedures and routine maintenance guidelines, including illustrations.

#### 1.6 WARRANTY

- A. UPS Module
  - 1. The UPS manufacturer shall warrant the UPS module against defects in materials and workmanship for 24 months after initial startup.

#### B. Battery

1. The battery manufacturer's standard warranty shall be passed through to the end user.

#### 1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications
  - 1. A minimum of 20 years' experience in the design, manufacture and testing of solidstate UPS systems is required. The system shall be designed and manufactured according to world-class quality standards. The manufacturer shall be ISO 9001:2000 certified.

#### B. Factory Testing

1. Before shipment, the manufacturer shall fully and completely test the system to assure compliance with the specification.

#### PART 2 - PRODUCT

#### 2.1 FABRICATION

- A. Materials
  - All materials of the UPS shall be new, of current manufacture and high grade and shall not have been in prior service except as required during factory testing. All active electronic devices shall be solid-state. All power semi-conductors shall be sealed. Control logic and fuses shall be physically isolated from power train components to ensure operator safety and protection from heat. All electronic components shall be accessible from the front without removing sub-assemblies for service access.

#### B. Wiring

- 1. Wiring practices, materials and coding shall be in accordance with the requirements of the National Electrical Code, OSHA and applicable local codes and standards. All bolted connections of busbars, lugs and cables shall be in accordance with requirements of the National Electrical Code and other applicable standards. All electrical power connections shall be torqued to the required value and marked with a visual indicator.
- 2. Provisions shall be made in the cabinets to permit installation of input, output and external control cabling, using raceway or conduit. Provision shall be made for top and bottom access to input, output, bypass and DC connections. In conformance with NEC, connection cabinets shall provide for adequate wire bend radius. All copper busbars for customer power connections shall be tin plated for connection integrity.
- C. Construction and Mounting
  - 1. The UPS shall be in NEMA Type 1 enclosures, designed for floor mounting. The UPS shall be structurally adequate and have provisions for hoisting, jacking and forklift handling. Maximum cabinet height shall be 78.7 in. (2000mm).

#### D. Cooling

- 1. Cooling of the UPS shall be by forced air using a redundant fan configuration. Fan power shall be provided by the UPS.
- 2. The thermal design, along with all thermal and ambient sensors, shall be coordinated with the protective devices before excessive component or internal cabinet temperatures are exceeded. Air filters shall be located at the point of air inlet and be changeable.

#### 2.2 COMPONENTS

#### Rectifier/Charger

- A. General
  - 1. The term rectifier/charger shall denote the solid-state equipment and controls necessary to convert AC to regulated DC for input to the inverter and for charging the battery.

#### B. AC Input Current Limiting

- 1. The rectifier/charger unit shall be provided with AC input current limiting whereby the maximum input current shall be limited to 140% of the full input current rating. Input current limit will be adjustable by service personnel to allow the UPS to be used with undersized feeder breakers.
- C. DC Filter
  - The rectifier/charger shall have an output filter to minimize ripple current into the battery. The AC ripple voltage of the rectifier DC output shall not exceed 1% RMS of the float voltage. The filter shall be adequate to ensure that the DC output of the rectifier/charger will meet the input requirements of the inverter without the battery connected.
- D. Automatic Rectifier Restart
  - 1. Upon restoration of utility AC power, after a utility AC power outage and prior to a UPS automatic end-of-discharge shutdown, the rectifier/charger shall automatically restart and assume the inverter and battery recharge loads.
- E. Battery Recharge
  - 2. In addition to supplying power for the inverter load, the rectifier/charger shall be capable of producing battery charging current sufficient to replace 95% of the battery discharge power within ten (10) times the discharge time. After the battery is recharged, the rectifier/charger shall maintain the battery at full charge until the next emergency operation.
- F. Overvoltage Protection
  - 1. There shall be DC overvoltage protection so that if the DC voltage rises to the preset limit, the UPS will shut down automatically and initiate an uninterrupted load transfer to the static bypass line.

#### 2.3 INVERTER

- A. General
  - 1. The term inverter shall denote the equipment and controls to convert DC from the rectifier/charger or battery to precise AC to power the load. The inverter shall be solid-state, capable of providing rated output power, and for increased performance the inverter shall be a pulse-width-modulated design and utilize insulated gate bipolar transistors (IGBTs).

#### B. Overload Capability

- 1. The inverter shall be capable of supplying current and voltage for overloads exceeding 100%. The inverter is to provide 150% of full load for 1 minute, 125% of full load for 10 minutes and 110% of full load for 1 hour. A status indicator and audible alarm shall indicate overload operation. The UPS shall transfer the load to bypass when overload capacity is exceeded.
- C. Fault Clearing and Current Limit
  - The inverter shall be capable of supplying an overload current of 150% of its full-load rating for one minute. For greater currents or longer time duration, the inverter shall have electronic current-limiting protection to prevent damage to components. The critical load will be transferred to the static bypass automatically and uninterrupted. The inverter shall be self-protecting against any magnitude of connected output overload. Inverter control

logic shall sense and disconnect the inverter from the critical AC load without the requirement to clear protective fuses.

#### 2.4 STEP LOAD RESPONSE

- A. Voltage Distortion
  - 1. Total harmonic distortion in the output voltage will not exceed 1% for 0% to 100% linear loads.
  - 2. Total harmonic distortion in the output voltage will not exceed 4% for 0% to 100% nonlinear loads.
  - 3. Total harmonic distortion in the output voltage will not exceed 5% for 0% to 100% nonlinear, unbalanced loads.
- B. Phase Balance
  - Electronic controls shall be provided to regulate each phase so that an unbalanced loading will not cause the output voltage to go outside the specified voltage unbalance or phase displacement. With 100% load on one phase (and 0% load on the other two phases) or 100% load on two phases (and 0% load on the other phase), the voltage balance is to be within 2% and the phase displacement is to be 120 degrees within ±1.5 degrees.
- C. Inverter Shutdown
  - 1. For rapid removal of the inverter from the critical load, the inverter control electronics shall instantaneously turn off the inverter transistors. Simultaneously, the static transfer switch shall be turned on to maintain continuous power to the critical load.
- D. Inverter DC Protection
  - 1. The inverter shall be protected by the following disconnect levels:
    - a. DC Overvoltage Shutdown
    - b. DC Undervoltage Warning (Low Battery Reserve)-pre-warning time is
  - c. DC Undervoltage Shutdown (End of Discharge)
- E. Output Frequency
  - The output frequency of the inverter shall be controlled by a high-speed DSP capable of holding the inverter output frequency to within ±0.05% during steady state and transient conditions. Total deviation from the rated frequency, including short time fluctuations and drift, shall not exceed 0.05%.

#### 2.5 Display and Controls

adjustable

#### A. Monitoring and Control

- 1. The UPS shall be provided with a microprocessor-based unit status display and controls section designed for convenient and reliable user operation. A graphical liquid crystal display (LCD) shall be used to show a single-line diagram of the UPS and shall be provided as part of the monitoring and controls sections of the UPS. All operator controls and monitors shall be located on the front of the UPS cabinet. Monitoring functions such as metering, status and alarms shall be displayed on the graphical LCD. Additional features of the monitoring system shall include:
  - a. Menu-driven display with pushbutton navigation
  - b. Real-time clock (time and date)

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- c. Alarm history with time and date stamp
- d. Memory with battery backup
- B. Metering
  - 1. The following parameters shall be displayed:
    - a. Input AC voltage line-to-line
    - b. Input AC current for each phase
    - c. Input frequency
    - d. Battery voltage
    - e. Battery charge/discharge current
    - f. Output AC voltage line-to-line
    - g. Output AC current for each phase
    - h. Output frequency
    - i. Apparent power
    - j. Active power
    - k. Battery time left during battery operation
- C. Selectable Input Contacts
  - 1. The UPS shall have these available selectable input contacts:
    - a. On Generator
    - b. Fast Power Off
    - c. MBB Auxiliary Contacts
    - d. Start Battery Test
    - e. Fault Acknowledge
    - f. Bypass and Inverter Off
    - g. Stop Battery Test
- D. Alarm Messages
  - 1. The following alarm messages shall be displayed:
    - a. Mains Voltage Abnormal
    - b. Mains Undervoltage
    - c. Mains Freq. Abnormal
    - d. Charger Fault
    - e. Battery Reversed
    - f. No Battery
    - g. Control Power 1 Fail
    - h. Parallel Comm. Fail
    - i. Bypass Unable To Track
    - j. Bypass Abnormal
    - k. Inverter Asynchronous
    - I. Fan Fault
    - m. Control Power 2 Fail
    - n. Unit Over Load
    - o. System Over Load
    - p. Bypass Phase Reversed

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- q. Transfer Time-Out
- r. Load Sharing Fault
- s. Parallel Connect Fault
- t. Bypass Over Current
- u. Output Ground Fault
- E. Status Messages
  - 1. The following UPS status messages shall be displayed:
    - a. Rectifier (Off / Soft Start / Main Input On / Battery Input On)
    - b. Input Supply (Normal Mode / Battery Mode / All Off)
    - c. Battery Self Test (True / False)
    - d. Input Disconnect (Open / Closed)
    - e. EPO (True / False)
    - f. Charger (On / Off)
    - g. Output Disconnect (Open / Closed)
    - h. Maint. Disconnect (Open / Closed)
    - i. Bypass Disconnect (Open / Closed)
    - j. Inverter (Off / Soft Start / On)
    - k. Bypass (Normal / Unable To Trace / Abnormal)
    - I. Output Supply (All Off / Bypass Mode / Inverter Mode / Output Disable)
    - m. Inverter On (Enable / Disable)
- F. Controls
  - UPS startup, shutdown and maintenance bypass operations shall be accomplished through pushbutton controls on the front panel. Menu-driven user prompts shall be provided to guide the operator through system operation without the use of additional manuals. Pushbuttons shall be provided to display the status of the UPS and to test and reset visual and audible alarms. A mimic screen shall be available on the LCD to depict a single-line diagram of the UPS with switch positions and power flow.
- G. On-Line Battery Test
  - 1. The UPS shall be provided with a menu-driven On-Line Battery Test feature. The test shall ensure the capability of the battery to supply power to the inverter while the load is supplied power in the normal mode.

#### 2.6 STATIC TRANSFER SWITCH

- A. General
  - 1. A static transfer switch and bypass circuit shall be provided as an integral part of the UPS. The static switch shall be a naturally commutated high-speed static (SCR-type) device rated to conduct full load current continuously. The switch shall have an overload rating to clear a 20-ampere load branch circuit breaker.
  - 2. The static transfer switch control logic shall contain an automatic transfer control circuit that senses the status of the inverter logic signals and operating and alarm conditions. This control circuit shall provide an uninterrupted transfer of the load to an alternate bypass source without exceeding the transient limits specified herein, when an overload or malfunction occurs within the UPS or to bypass the UPS for maintenance.

- B. Uninterrupted Transfer
  - 1. The transfer control logic shall automatically turn on the static transfer switch, transferring the critical AC load to the bypass source, after the transfer logic senses any of the following conditions:
    - a. Inverter overload capacity exceeded
    - b. Critical AC load overvoltage or undervoltage
    - c. UPS fault condition
  - 2. The transfer control logic shall inhibit an automatic transfer of the critical load to the bypass source if any of the following conditions are present:
    - a. Bypass frequency out of limits
    - b. Bypass out-of-synchronization range with inverter output
- C. Uninterrupted Retransfer
  - 1. Retransfer of the critical AC load from the bypass source to the inverter output shall be automatically initiated unless inhibited by manual control. The transfer control logic shall inhibit an automatic retransfer of the critical load to the inverter if one of the following conditions exists:
    - a. Bypass out of synchronization range with inverter output
    - b. Inverter/bypass voltage difference exceeding preset limits
    - c. Overload condition exists in excess of inverter full load rating
    - d. UPS fault condition present

#### 2.7 MAINTENANCE BYPASS SWITCH

- A. General
  - 1. A manually operated maintenance bypass switch shall be incorporated into the UPS cabinet to directly connect the critical load to the bypass AC input power source, bypassing the rectifier/charger, inverter and static transfer switch.
- B. Battery Cabinet
  - 1. The battery cabinet shall include ten (10) year design life, valve-regulated, lead-acid battery cells housed in a separate cabinet that matches the UPS cabinet styling to form an integral system lineup. All battery cell inter-connects shall utilize bolted connections, and all batteries shall include copper, inserted terminal posts allowing connector torque of 110 in-lb (12.4 Nm). Battery cells shall be mounted on slide-out trays for ease of maintenance. A battery disconnect circuit breaker shall be included for isolation of the battery pack from the UPS module. Casters and leveling feet shall also be provided with the battery cabinet for ease of installation. When the application calls for the battery cabinet to be bolted to the UPS cabinet, an interconnecting cable kit will be available, precut and pre-lugged.

#### 2.8 ACCESSORIES

- A. Liebert IntelliSlot<sup>®</sup> Web Card (ISWEB-LB)
  - 1. Provides communication outputs to indicate a change of status of the UPS. Outputs are provided for:
    - a. SNMP
    - b. HTML Web page
    - c. Allow use of Liebert Nform<sup>™</sup> and or network management systems

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- B. Matching Maintenance Bypass and Distribution Cabinet
  - 1. A make-before-break maintenance bypass with Solenoid Key Release Unit (SKRU) interlock shall be available in a cabinet that matches and may be bolted up to the UPS. Installation of the cabinet shall not affect the cooling ability of the UPS. Thermal-magnetic breakers shall be provided for bypass and maintenance isolation.
- C. Remote Alarm Panel
  - 1. The remote alarm panel shall have LED alarm lights. An audible alarm shall sound upon any alarm condition. The surface- or flush-mounted NEMA 1 enclosed panel shall indicate:
    - a. Load on UPS LED
    - b. Load on Bypass LED
    - c. Battery Discharging LED
    - d. Low Battery Warning LED
    - e. UPS Alarm Condition LED
    - f. New Alarm Condition LED (For a Second UPS Alarm Condition)
    - g. Audible Alarm with Reset pushbutton
    - h. Lamp Test/Reset pushbutton

#### PART 3 - EXECUTION

- 3.1 TRAINING
  - A. The Contractor shall provide a training session for up to five (5) owner's representatives for 2 normal workdays at a job site location determined by the owner.
  - B. The training session shall be conducted by a manufacturer's qualified representative. The training program shall consist of the instruction on the operation of the assembly, circuit breakers, and major components within the assembly.

#### 3.2 FIELD QUALITY CONTROL

- A. The following inspections and test procedures shall be performed by factory-trained field service personnel during the UPS startup.
  - 1. Visual Inspection
    - a. Inspect equipment for signs of damage.
    - b. Verify installation per drawings.
    - c. Inspect cabinets for foreign objects.
    - d. Verify neutral and ground conductors are properly sized and configured.
    - e. Inspect battery cases.
    - f. Inspect battery for proper polarity.
    - g. Verify all printed circuit boards are configured properly.
  - 2. Mechanical Inspection
    - a. Check all control wiring connections for tightness.
    - b. Check all power wiring connections for tightness.
    - c. Check all terminal screws, nuts and/or spade lugs for tightness.

- 3. Electrical Inspection
  - a. Check all fuses for continuity.
  - b. Confirm input voltage and phase rotation is correct.
  - c. Assure connection and voltage of the battery string(s).

#### 3.3 MANUFACTURER'S FIELD SERVICE

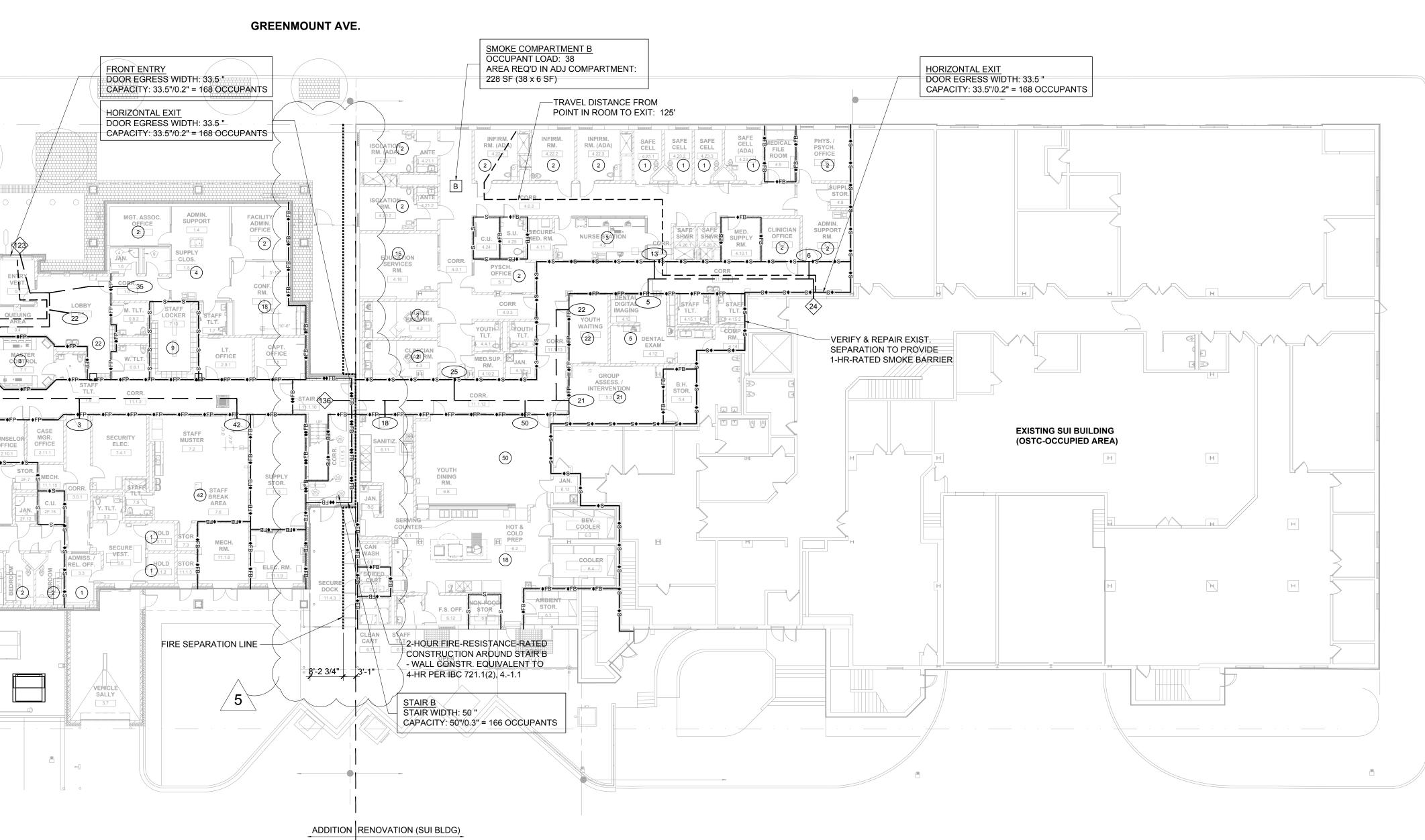
- A. Service Personnel
  - 1. The UPS manufacturer shall directly employ a nationwide service organization consisting of factory-trained field service personnel dedicated to the startup and maintenance of UPS and power equipment.
  - 2. The manufacturer shall provide a national dispatch center to coordinate field service personnel schedules. One toll-free number shall reach a qualified support person 24 hours a day, 7 days a week, 365 days a year. If emergency service is required, on-site response time shall be four hours or less within 150 miles of an Emerson Network Power Liebert Services center.
  - 3. Two local customer engineers shall be assigned to the site with a regional office as a backup. Escalation procedures shall be in place to notify Power Technical Support if a site is not functioning within 24 hours.
- B. Replacement Parts Stocking
  - 1. Parts shall be available through an extensive network to ensure round-the-clock parts availability throughout the country.
  - 2. Spare parts shall be stocked by local field service personnel with backup available from national parts center and the manufacturing location. A national parts center Customer Support Parts Coordinator shall be on call 24 hours a day, 7 days a week, 365 days a year for immediate parts availability.
- C. Maintenance Contracts
  - 1. A complete offering of preventive and full-service maintenance contracts for both the UPS system and battery system shall be available.
- D. Automated Site Monitoring
  - The UPS manufacturer shall provide as an option an automated site-monitoring service. This service shall be staffed by a qualified support person 24 hours a day, 7 days a week, 365 days a year. At the detection of an alarm within the UPS, the controls shall initiate communications with the monitoring service. The monitoring service shall be capable of interpreting the communicated alarms to allow dispatch of a service engineer.

END OF SECTION 26 33 54

F					
					TRAVEL DISTANCE FROM
E	EAST EAGER STREET				
D	EASTEAG		CAPAC CAPAC	A EGRESS WIDTH: 33.5 " CITY: 33.5 "/0.2" = 168 OC IOKE COMPARTMENT CUPANT LOAD: 26 EA REQ'D IN ADJ COM S SF (26 x 6 SF)	CCUPANTS YOUTH LAUNDRY 2F.14 FEMALE OUTDOOR REC. 10.8F 10.8F 10.8F 2F.3 A CORR. 2F.3 CORR. CORR. C
С		<b>RST FL</b> " = 1'-0"		ODE SY	NOPSIS PLAN FORREST
B	APPLICABLE CODES Building Code: Fire Code: Nechanical Code: Plumbing Code: Electrical Code: Electrical Code: Elevator Safety Code: Accessibility Code: Energy Conservation Code: ENERGY CODE DATA BUILDING ENVELOPE REQUIRE Opaque Assemblies Roofs Insulation entirely above deck Attic (below exterior slabs)	IBC (2012) IEBC (2012) NFPA 101 (2012) ( NFPA 1 (2012) (Fin IMC (2012) NSPC (2012) NED (2011) ASHRAE 90.1 (2011) ASHRAE 90.1 (2012) IBC 2012 in addition Maryland Accessib IECC (2012) MENTS PER IECC Req'd U-factor	re Code) 10) nn to DLLR Requirer	ments <u>Provided</u> R-30 min. (metal) R-25 min. (TPO) R-38	BUILDING CODE DATA         NFPA 101 LIFE SAFETY CODE, 2012 (unless noted otherwise; references to IBC a         Occupancy Classification         Chapter 22: New Detention and Correctional Occupancies Classification: Use Condition IV, Impeded Egress         Group I-3 (IBC 308.5), Condition 4 (IBC 308.5)         Mixed Occupancies (IBC 508.3): Business areas (outside the secure area) consider provisions of 508.2.1 for an accessory occupancy, no separation of occupancies         General Building Heights and Areas (IBC Chapter 5)         COMAR deletes reference to NFPA 5000 Building Construction and Safety Code an building code adopted by the Authority Having Jurisdiction (Maryland Building Per Standards adopt IBC 2012).         Allowable Buildings Heights and Areas (IBC Table 504)         Existing 2-story SUI building provides equivalent of Type IIB construction; proposed of Type IIA construction         ADDITION       EXISTING 0 Ccupancy Group         IIA Type Construction I-3       IIA Type Construction 2 stories, 65' height         1 story, 55' hei 15,000 SF       10,000 SF         Automatic Sprinkler Height Increase (IBC 504.2): Allows increase in max. ht. by 20' a of stories by 1         Building area in Table 503 may be increased to frontage and automatic sprinkler prinkler prinkler for the processed to frontage and automatic sprinkler prinkler for the prinkler
Α	Mails         Mass (new construction)         Mass (existing building)         Metal Framed         Slab on Grade         Unheated slab         Fenestration         Doors         Entrance door (glazed)         Vertical Fenestration         Fixed Fenestration         Detention windows         Aluminum storefront         SHGC:	N/A <u>Req'd U-factor</u> U-0.77 U-0.38 U-0.38 U-0.50	R-9.5ci N/A R-13+R-7.5ci R-10ci Req'd SHGC 0.40 0.40	R-36 R-12.6 ci (new) U-0.58 (exist) R-23+-R-8.4ci R-10ci <u>Provided</u> U-0.57 U-0.22 U-0.39 0.35 U-0.39 0.27	Building area in 1 able 503 may be increased to frontage and automatic sprinkler p follows: Aa + {At + [At x If} + [At x Is]} Aa = allowable building area (SF) per story At = tabular building area per story per Table 503 If = area increase factor due to frontage calculated per 506.2 Is = area increase factor due to sprinkler protection calculated per 506.3 506.2 Frontage increase: Allowed for a building has more than 25% of its perim way or open space having a width of not less than 20 feet. If = [F/P - 0.25] W/30 If = area increase factor due to frontage F = Building perimeter fronting public way or open space ≥ 20 feet wide P = Perimeter of entire building W = Width of public way or open space 506.3 Automatic sprinkler system increase: Allows building area limitation from increased by an additional 200 percent for buildings with more than one story

## KEY NOTES

- 1 INTUMESCENT FIREPROOFING AT ROOF DECK AND JOISTS OF HOUSING UNIT UPPER ROOFS (CLERESTORY AREA), & OTHER AREAS OF EXPOSED STRUCTURE ACCESSIBLE TO DETAINEES (NEW CONSTRUCTION ONLY).
- 2 INTUMESCENT FIREPROOFING AT EXPOSED COLUMNS AND ROOF BEAMS OF GYMNASIUM. (ROOF JOISTS AND DECK ARE EXEMPTED FROM THE FIRE-PROTECTION REQUIREMENT AS THEY ARE NOT LESS THAN 20' ABOVE THE FLOOR. 3 SPRAY FIRE-RESISTIVE MATERIAL AT COLUMNS AND BRACING IN CONCEALED AREAS
- OF GYMNASIUM WALLS.
- A SPRAY FIRE-RESISTIVE MATERIAL AT STRUCTURAL FRAME, ROOF FRAMING AND DECKING EXPOSED AT MECHANICAL ROOMS, ELEVATOR EQUIPMENT, & OTHER NON-DETAINEE AREAS, AND ABOVE CEILINGS OF OTHER SPACES (NEW CONSTRUCTION ONLY).



**STREET** 

C are to IBC 2012)	Allowable from	(area renovated for Y ntage increase: - 0.25] 30/30 = 0.60	DC plus area occupi	ed by OSTC program):	Fire-Resistance Rating Require (feet) for Types IIA & IIB Co					
	Allowable Are				Fire Separation Distance (X	) Туре с	of Construction	<u>1</u>	Rating R	<b>≀eq'd</b>
	Aa = {10,000	+ [10,000 x 0.60] + [1	0,000 x 2]} = 36,000		X > 5		both	-	1	
					5 ≤ X< 10		both		1	
	Existing area	of largest floor (2nd flo	oor) 33,804 SF		10 ≤X< 30		IIA		1	
	A 1 11/1				X > 00		IIB		0	
	Addition:	ntaga inaragaa			X ≥ 30		both		0	
		ntage increase: d because not needed			Fire-Resistance-Rated Constru	ction (IBC Chapte	or 7)			
de verd overde eithere	Allowable Are						<u></u>			
dered under the es required.		$+ [15,000 \times 2] = 45,0$	00 SF		Definitions (IBC 702)					
es required.		[:::;::::::::::::::::::::::::::::::::::								
	Largest floor (	(2nd floor): 25,460 SF	:		Fire Separation Distance (as one of the following:	s defined in Chap	ter 2): the dis	tance me	easured fr	rom the
and substitutes the Performance	Incidental Uses (IBC 50	99)			<ol> <li>The closest interior lot li</li> <li>The centerline of a street</li> </ol>		olic wav: or			
Fenomance	IBC Table 509 Haza	ardous Area Protection	I		<ol> <li>An imaginary line betwee anywhere between the</li> </ol>	en two buildings	on the propert			
ad O atom addition is	Room or Area Rooms w/ boilers wh	here largest equip. >1	5 nsi & 10 hn	Separation and/or Protection 1 hour or automatic sprinkler	both buildings and can					
ed 3-story addition is	Refrigerant machine Laundry rooms over	ery room		1 hour or automatic sprinkler 1 hour or automatic sprinkler	Exterior Walls (IBC 705)					
NG		pped with padded surf	aces	1 hour	Fire-resistance rating (IBC 7	(05.5): Rate exte	rior walls in ac	cordance	e with Tab	bles 60
<u>struction</u> height		lection rooms over 100		1 hour	for exposure from the ins					
SF					sides with fire separation					•
	Protection from Hazard	S			Allowable area of openings			-		protecte
0' and max. number	Table 22.3.2.1 Haza	ardous Area Protectior	1		an exterior wall shall not Automatic sprinkler system	(I <del>BC 7</del> 04.8 <del>.1):</del> W	/ith sprin <del>kler</del> s	ystem <del>, m</del>	aximum a	
	Hazardous Area Des			Separation/Protection	openings shall be the sat for fire separation distant		for protected	openings	. No limit	on are
	Boiler and fuel-fired			1 hour			0 T I I = 0 = 0			
er protection as	Central or bulk laund			1 hour	Maximum Area of Exterior V	Vall Openings (IB	C Table 705.8	5):		
	Commercial cooking Commissaries	gequipment		In accordance with 9.2.3 Smoke resistant			Fire Sepa	ration Die	stanco	
	Employee locker roc	me		Smoke resistant	Degree of Op'g Protection	X<3	•		10 <x≤15< td=""><td>15&lt;</td></x≤15<>	15<
	Hobby/handicraft sh			Smoke resistant	Protected	Not permitted		<u>25%</u>	45%	7
	Maintenance shops			Smoke resistant	Unprotected	Not permitted		25%	45%	7
	Soiled linen rooms			1 hour		•				
		SF in area but ≤100 S	F in area	Smoke resistant	Smoke Barriers (IBC 709)					
3	storing combustil									
	-	0 SF storing combustit	ole materials	1 hour 1 hour	Smoke barriers require 1-ho Openings: protect in accord					
imeter on a public	Trash collection room			1 noui	Penetrations: Comply with S	Section 714 (IBC	709.6) <sup>°</sup> .	9.5).		
	Type of Construction (II	BC Chapter 6)			Joints: Comply with Section Ducts and air transfer opening	· · · ·		IBC 700	8)	
	Fire-Resistance Rating	Requirements for Buil	ding Elements (in ho	ours) (IBC Table 601)	Shaft Enclosures	ngs. comply with		IDC 709.	0).	
	Building Element	IIA: Rating Req'd	IIB: Rating Req'd	Notes	Shalt Enclosures					
	Structural Frame	<u>1 1</u>	0		8.6.5 1 hour fire barrier whe	ere connectina 3 s	stories or fewe	er.		
	Bearing Walls		-		Fire-resistance rating: Not lo				cting less	s than 4
	Exterior	1	0	not < Table 602 req'ts.	than fire-resistance rating					
m Table 503 to be	Interior	1	0				-			
bry above grade plane.	Nonbearing Walls	_	_							
	Exterior	see Table 602	see Table 602							
		0	0	not < req'd by other code sections						
	Floor construction	1	0 0	rating not required for reaf framing						
	Roof construction	I	U	rating not required for roof framing and decking $\geq$ 20' above floor below						
				and decking $\simeq 20$ above 1001 below						

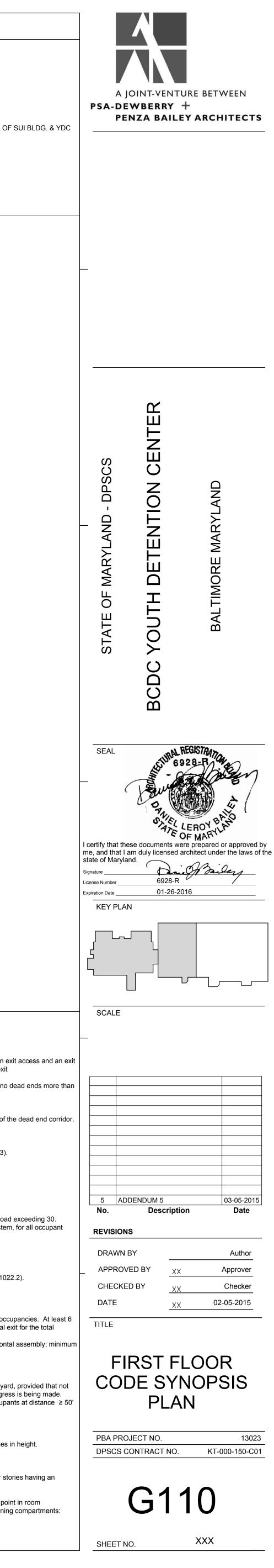
## GENERAL NOTES

- . ALL PENETRATIONS THROUGH BUILDING ELEMENTS REQUIRED TO BE RATED SHALL BE PROVIDED WITH AN APPROVED PROTECTION METHOD IN ACCORDANCE WITH SECTION 07 84 13 DESIGNED TO RESIST THE PASSAGE OF FIRE FOR A TIME PERIOD NOT LESS THAN THE REQUIRED FIRE-RESISTANCE RATING OF THE WALL, FLOOR OR ROOF IN WHICH IT IS INSTALLED.
- 2. ALL JOINTS MADE IN OR BETWEEN BUILDING ELEMENTS REQUIRED TO BE RATED SHALL BE PROTECTED BY AN APPROVED FIRE-RESISTANT JOINT SYSTEM IN ACCORDANCE WITH SECTION 07 84 46 DESIGNED TO RESIST THE PASSAGE OF FIRE FOR A TIME PERIOD NOT LESS THAN THE REQUIRED FIRE-RESISTANCE RATING OF THE WALL, FLOOR OR ROOF IN OR BETWEEN WHICH IT IS INSTALLED.
- 3. AT NEW CONSTRUCTION (NOT APPLICABLE TO SUI BUILDING): ALL STRUCTURAL STEEL FRAME MEMBERS NOT ENCASED IN FIRE-RESISTANCE-RATED CONSTRUCTION, AND ALL ROOF CONSTRUCTION AND ASSOCIATED SECONDARY MEMBERS LESS THAN 20 FEET ABOVE THE FLOOR, SHALL BE HAVE APPLIED FIREPROOFING PROVIDING 1-HOUR FIRE-RESISTANCE-RATED PROTECTION.

# LEGEND

-s-s-s-NON-RATED SMOKE-TIGHT PARTITION
+s
+FP
+FB
— ↔FB— ↔FB— 2-HR FIRE-RESISTANCE-RATED FIRE BARRIER
FIRE SEPARATION LINE (PER IBC 702)
EXIST. SEPARATION BETWEEN OSTC-OCCUPIED AREA OF SUI BL
4 ROOM OCCUPANT LOAD
24 CUMULATIVE OCCUPANT LOAD
PATH OF TRAVEL
83 EXIT OCCUPANT LOAD
– – – – TRAVEL DISTANCE

aration Distance	Opening Protectives	Arrangement
02): he building face to can be located line applies to 601 and 602. Rate kposure from both cted openings in	Fire barriers w/ 1-hour rating Shaft, exit enclosure & exit passageways11Other fire barriers13/4	<ul> <li>2.2.5.2 Dead end: 50' maximum in Condition IV.</li> <li>22.2.5.3 Common path of travel: 100' maximum</li> <li>22.2.6.2 Travel distance: 150' maximum from any room door required as an exit acc</li> <li>22.2.6.4 Travel distance: 200' maximum from any point in a room and an exit</li> <li>Dead ends (IBC 1018.4): where more than one exit or exit access is req'd, no dead of 20' in length.</li> <li>Exceptions: <ol> <li>In I-3 Occupancies, dead end shall not exceed 50'.</li> <li>Unlimited where length of dead is less than 2.5 times the least width of the dead</li> </ol> </li> <li>Exit Access (IBC 1014)</li> <li>Common path of egress travel: 100' maximum in I-3 Occupancy (IBC 1014.3).</li> <li>Exit Access Travel Distance (IBC 1016)</li> <li>200' maximum in I-3 Occupancy with sprinkler system (IBC Table 1016.1)</li> <li>Exit Access Corridors</li> <li>7.1.3.1 Exit Access Corridors: 1 hour fire rating where serving occupant load excee Corridor Fire-Resistance Rating: 1 hour in I-3 Occupancy with sprinkler system, for a loads (IBC Table 1018.1).</li> <li>Interior Exit Stairways and Ramps</li> </ul>
of unprotected rea of openings	Fire PartitionsCorridor walls11/3Other fire partitions13/4Exterior Walls13/4Smoke Barriers11/3	<ul><li>7.1.3.2.1 Exits: 1 hour fire barrier where connecting 3 stories or less. Construct as 1-hour fire barriers where connecting less than 4 stories (IBC 1022.2).</li><li>Horizontal Exits</li></ul>
5 <x≤20 20<x<br="">75% No limit 75% No limit</x≤20>	Occupant Loads         First Floor:       365         Second Floor:       354 (including occupants of upper housing tier)         Third Floor:       222         Fire Pumps (IBC 913)         Protection of fire pump rooms (IBC 913.2.1, Exception 1 for automatic sprinkler system): separate from all other areas of the building by 1-hour fire barriers or 1-hour horizontal assemblies, or both.         Means of Egress         Table 7.3.3.1 Capacity of Means of Egress Stairways:         0.3 inches per person Level components:         0.2 inches per person	<ul> <li>22.2.2.5: Horizontal exits shall be permitted.</li> <li>Horizontal exits permitted to comprise 100% of exits required for Group I-3 occupand SF of space per occupant shall be provided on each side of the horizontal exit for number of people in adjoining compartments (IBC 1025.1, Exception 2).</li> <li>Separation (IBC 1025.2) shall be provided by a fire wall, fire barrier or horizontal assi fire-resistance rating of 2 hours.</li> <li>Discharge from Exits</li> <li>22.2.7.1: Exits shall be permitted to discharge into a fenced or walled courtyard, pro more than two walls of the courtyard are the building walls form which egress is b</li> <li>22.2.7.2: Enclosed yard used for exit discharge shall accommodate all occupants at from building, with net area of 15 SF per person.</li> <li>Extinguishment Requirements</li> <li>22.3.5.5(1) Provide Class I standpipe systems for any building 3 or more stories in heig Subdivision of Building Spaces</li> <li>22.3.7.1 Smoke barriers to divide every story used for sleeping by residents or stories for occupant load of 50 or more into not less than 2 compartments.</li> <li>22.3.7.3 Maximum residents in smoke compartment: 200 Max. distance to door in smoke barrier: 150' from room door, 200' from any point in re 22.3.7.7 Area per occupant on ea. side of smoke barrier for occupants in adjoining com 6 SF</li> </ul>



					ADA ADA ADA ADA ADA ADA ADA ADA ADA ADA	
				SMOKE COMPARTME OCCUPANT LOAD: 24 AREA REQ'D IN ADJ C 144 SF (24 x 6 SF)	4	COMMON PATH OF TF TO THIS POINT: 72' SMOKE COMPARTMEN OCCUPANT LOAD: 26 AREA REQ'D IN ADJ C 156 SF (26 x 6 SF)
С					<u>A</u>	TRAVEL DISTANCE FR POINT IN ROOM TO EX
0	1 SECC G120 1/16" = 1'-0		<u>OOR C</u>	<u>ODE SY</u> N	NOPSIS PLAN	N NORTH 0' 8' 16' 32'
	APPLICABLE CODES				BUILDING CODE DATA	
	Building Code:	IBC (2012)				2012 (unless noted otherwise; references to IBC a
	-	IEBC (2012)			Occupancy Classification	
	Fire Code:	NFPA 101 (2012) ( NFPA 1 (2012) (Fir			Chapter 22: New Detention and	
	Mechanical Code:	IMC (2012)			Classification: Use Condition	
	Plumbing Code:	NSPC (2012)			Group I-3 (IBC 308.5), Condition	
	Electrical Code:	NED (2011)				Business areas (outside the secure area) consider ccessory occupancy, no separation of occupancies
	Energy Standard:	ASHRAE 90.1 (20 <sup>-</sup>	10)		General Building Heights and Are	eas (IBC Chapter 5)
В	Elevator Safety Code:	IBC 2012 in addition	n to DLLR Require	ments		PA 5000 Building Construction and Safety Code an
D	Accessibility Code:	Maryland Accessib	ility Code (2012)		building code adopted by the A Standards adopt IBC 2012).	Authority Having Jurisdiction (Maryland Building Pe
	Energy Conservation Code:	IECC (2012)			Allowable Buildings Heights and Existing 2-story SUI building prov of Type IIA construction	Areas (IBC Table 504) ides equivalent of Type IIB construction; proposed
	ENERGY CODE DATA				Occupancy Group	ADDITION EXISTING IIA Type Construction IIB Type Constru
	BUILDING ENVELOPE REQUIRE	MENTS PER IECC			I-3	2 stories, 65' height 1 story, 55' hei 15,000 SF 10,000 SF
	Opaque Assemblies	Req'd U-factor	Req'd R-Value	Provided		ase (IBC 504.2): Allows increase in max. ht. by 20' a
	Roofs Insulation entirely above deck		R-25	R-30 min. (metal)	of stories by 1	500)
	Attic (below exterior slabs)		R-38	R-25 min. (TPO) R-38	Building Area Modifications (IBC	
	Walls				follows:	/ be increased to frontage and automatic sprinkler p
	Mass (new construction) Mass (existing building)	N/A	R-9.5ci N/A	R-12.6 ci (new) U-0.58 (exist)	Aa + {At + [At x If} + [At	t x ls]}
	Metal Framed		R-13+R-7.5ci	R-23+-R-8.4ci	Aa = allowable building At = tabular building are	area (SF) per story ea per story per Table 503
	<u>Slab on Grade</u> Unheated slab		R-10ci	R-10ci	If = area increase factor	r due to frontage calculated per 506.2 or due to sprinkler protection calculated per 506.3
	<u>Fenestration</u>	Req'd U-factor	Req'd SHGC	Provided	506.2 Frontage increase: Alle	owed for a building has more than 25% of its perim
	<u>Doors</u> Entrance door (glazed)	U-0.77		U-0.57		a width of not less than 20 feet.
Α	Vertical Fenestration	0 0.11		0 0.01	If = [F/P - 0.25] W/30 If = area increase factor	r due te frentege
	Fixed Fenestration Detention windows Aluminum storefront	U-0.38 U-0.38	0.40	U-0.22 U-0.39 0.35		ronting public way or open space ≥ 20 feet wide building
	SHGC:	11.0.50	0.40	0.35		stem increase: Allows building area limitation from
	<u>Skylights</u> SHGC	U-0.50	0.40	U-0.39 0.27	increased by an additional	200 percent for buildings with more than one story

### SMOKE COMPARTMENT D OCCUPANT LOAD: 26 AREA REQ'D IN ADJ COMPARTMENT: 156 SF (26 x 6 SF) SMOKE COMPARTMENT C OCCUPANT LOAD: 24 AREA REQ'D IN ADJ COMPARTMENT: 144 SF (24 x 6 SF) 1 DAYROOM OUTDOOR REC STAFF STATION SHOWER ( 24 States States States of P STAIR A DOOR EGRESS WIDTH: 33.5 " CAPACITY: 33.5"/0.2" = 168 OCCUPANTS 🔍 24 💭 SHOWER 2D.12 OUTDOOR STATION

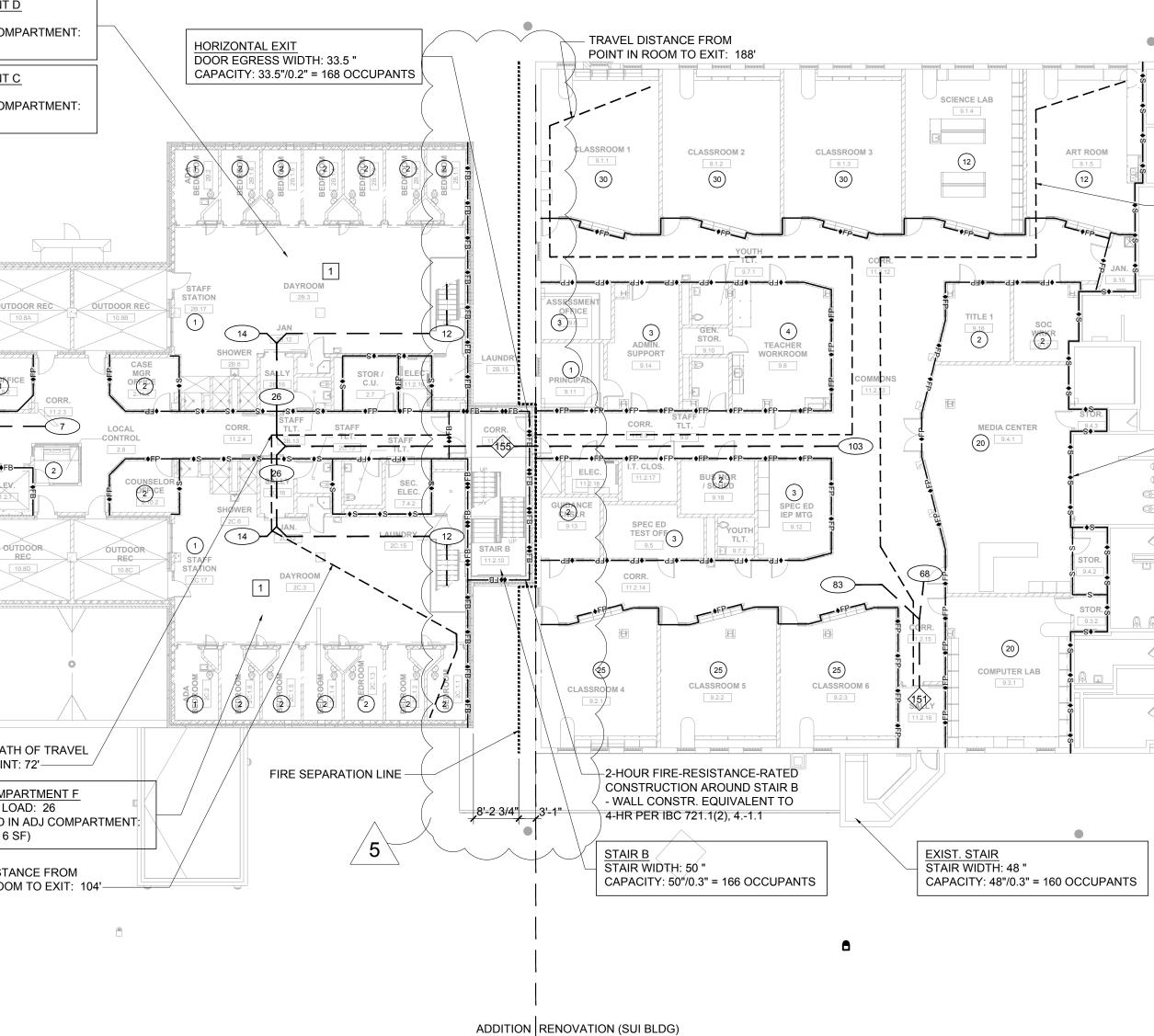
DAYROOM

2D.3

10.8D

### **KEY NOTES**

- 1 INTUMESCENT FIREPROOFING AT ROOF DECK AND JOISTS OF HOUSING UNIT UPPER <sup>¬</sup> ROOFS (CLERESTORY AREA), & OTHER AREAS OF EXPOSED STRUCTURE ACCESSIBLE TO DETAINEES (NEW CONSTRUCTION ONLY).
- 2 INTUMESCENT FIREPROOFING AT EXPOSED COLUMNS AND ROOF BEAMS OF GYMNASIUM. (ROOF JOISTS AND DECK ARE EXEMPTED FROM THE FIRE-PROTECTION REQUIREMENT AS THEY ARE NOT LESS THAN 20' ABOVE THE FLOOR.
- 3 SPRAY FIRE-RESISTIVE MATERIAL AT COLUMNS AND BRACING IN CONCEALED AREAS OF GYMNASIUM WALLS.
- 4 SPRAY FIRE-RESISTIVE MATERIAL AT STRUCTURAL FRAME, ROOF FRAMING AND DECKING EXPOSED AT MECHANICAL ROOMS, ELEVATOR EQUIPMENT, & OTHER NON-DETAINEE AREAS, AND ABOVE CEILINGS OF OTHER SPACES (NEW CONSTRUCTION ONLY).



					Fire Desistance Detine Descin	an and a first source) for East			0
		-	DC plus area occup	ied by OSTC program):	Fire-Resistance Rating Require				
		ntage increase:			(feet) for Types IIA & IIB Co	nstruction, Occupancy (	assification	I-3 (IBC Tab	ne 602):
are to IBC 2012)	Allowable Are	-0.25] 30/30 = 0.60			Fire Separation Distance (X	) Type of Cons	ruction	Rating R	oa'd
		+ [10,000 x 0.60] + [1	0 000 x 211 - 36 000		X > 5	both	TUCLION	<u>naung n</u>	equ
	Aa – {10,000	+ [10,000 X 0.00] + [1	$0,000 \times 2]$ = 30,000		5 ≤ X< 10	both		1	
	Existing area	of largest floor (2nd fl	oor) 33 804 SE		10 ≤X< 10	IIA		1	
	Existing area	or largest noor (zhu n	001) 33,004 35		10 3/ 30	IIB		1	
	Addition:				X ≥ 30	both		0	
		ntage increase:			∧ ≥ 50	DOUT		0	
		d because not needed	1		Fire-Resistance-Rated Constru	ction (IBC Chapter 7)			
	Allowable Are		A						
lered under the		+ [15,000 x 2]} = 45,0			Definitions (IBC 702)				
es required.	Aa - (10,000	· [10,000 x 2]j = 40,0							
	Largest floor (	(2nd floor): 25,460 SF	=		Fire Separation Distance (as	s defined in Chapter 2).	he distance	measured fro	om the l
					one of the following:				
	Incidental Uses (IBC 50	99)			1. The closest interior lot li	ne:			
and substitutes the		,0)			2. The centerline of a stree		or		
Performance	IBC Table 509 Haza	rdous Area Protectior	า		3. An imaginary line betwee			he imaginary	line car
			•			two buildings, but once			
	Room or Area			Separation and/or Protection	both buildings and can				
d 2 story addition is		nere largest equip. >1	5 psi & 10 hp	1 hour or automatic sprinkler					
ed 3-story addition is	Refrigerant machine	• • •		1 hour or automatic sprinkler	Exterior Walls (IBC 705)				
	Laundry rooms over			1 hour or automatic sprinkler					
G		oped with padded sur	faces	1 hour	Fire-resistance rating (IBC 7	05.5): Rate exterior wal	s in accorda	nce with Tab	les 601
truction		lection rooms over 10		1 hour	for exposure from the ins				
neight SF					sides with fire separation				
	Protection from Hazard	s			Allowable area of openings		area of un	protected or p	orotected
0' and max. number					an exterior wall shall not				
	Table 22.3.2.1 Haza	ardous Area Protection	n		Automatic sprinkler system				rea of u
					openings shall be the sa				
	Hazardous Area De	scription		Separation/Protection	for fire separation distant	-	·	5	
	Boiler and fuel-fired			1 hour	,				
r protection as	Central or bulk laund	dries >100 SF		1 hour	Maximum Area of Exterior V	Vall Openings (IBC Table	705.8):		
	Commercial cooking	g equipment		In accordance with 9.2.3					
	Commissaries			Smoke resistant		Fire	Separation	Distance	
	Employee locker roc	oms		Smoke resistant	Degree of Op'g Protection	<u>X&lt;3</u> <u>3<x≤5< u=""></x≤5<></u>	5 <x≤10< td=""><td><u>10<x≤15< u=""></x≤15<></u></td><td><u>15&lt;</u>X</td></x≤10<>	<u>10<x≤15< u=""></x≤15<></u>	<u>15&lt;</u> X
	Hobby/handicraft sh	ops		Smoke resistant	Protected	Not permitted 15%	25%	45%	75
	Maintenance shops			Smoke resistant	Unprotected	Not permitted 15%	25%	45%	75
	Soiled linen rooms			1 hour					
		SF in area but ≤100 S	SF in area	Smoke resistant	Smoke Barriers (IBC 709)				
	storing combustil	ble materials							
	Storage rooms >100	) SF storing combustil	ble materials	1 hour	Smoke barriers require 1-ho	ur fire-resistance rating	IBC 709.3).		
meter on a public	Trash collection room	ms		1 hour	Openings: protect in accord		BC 709.5).		
					Penetrations: Comply with S				
	Type of Construction (II	BC Chapter 6)			Joints: Comply with Section	· · · · · · · · · · · · · · · · · · ·			
					Ducts and air transfer openi	ngs: comply with Section	າ 717 (IBC 7	09.8).	
	Fire-Resistance Rating	Requirements for Bui	Iding Elements (in h	ours) (IBC Table 601)					
					Shaft Enclosures				
	Building Element	IIA: Rating Req'd	IIB: Rating Req'd	Notes					
	Structural Frame	1	0		8.6.5 1 hour fire barrier whe				
	Bearing Walls		_		Fire-resistance rating: Not l				than 4
	Exterior	1	0	not < Table 602 req'ts.	than fire-resistance rating	g of floor assembly pene	rated (IBC 7	′13.4).	
m Table 503 to be	Interior	1	0						
ry above grade plane.	Nonbearing Walls								
	Exterior	see Table 602	see Table 602						
		0	0	not < req'd by other code sections					
	Floor construction	1	0						
	Roof construction	1	0	rating not required for roof framing					
				and decking $\geq$ 20' above floor below					

## GENERAL NOTES

### . ALL PENETRATIONS THROUGH BUILDING ELEMENTS REQUIRED TO BE RATED SHALL BE PROVIDED WITH AN APPROVED PROTECTION METHOD IN ACCORDANCE WITH SECTION 07 84 13 DESIGNED TO RESIST THE PASSAGE OF FIRE FOR A TIME PERIOD NOT LESS THAN THE REQUIRED FIRE-RESISTANCE RATING OF THE WALL, FLOOR OR ROOF IN WHICH IT IS INSTALLED.

- 2. ALL JOINTS MADE IN OR BETWEEN BUILDING ELEMENTS REQUIRED TO BE RATED SHALL BE PROTECTED BY AN APPROVED FIRE-RESISTANT JOINT SYSTEM IN ACCORDANCE WITH SECTION 07 84 46 DESIGNED TO RESIST THE PASSAGE OF FIRE FOR A TIME PERIOD NOT LESS THAN THE REQUIRED FIRE-RESISTANCE RATING OF THE WALL, FLOOR OR ROOF IN OR BETWEEN WHICH IT IS INSTALLED.
- 3. AT NEW CONSTRUCTION (NOT APPLICABLE TO SUI BUILDING): ALL STRUCTURAL STEEL FRAME MEMBERS NOT ENCASED IN FIRE-RESISTANCE-RATED CONSTRUCTION, AND ALL ROOF CONSTRUCTION AND ASSOCIATED SECONDARY MEMBERS LESS THAN 20 FEET ABOVE THE FLOOR, SHALL BE HAVE APPLIED FIREPROOFING PROVIDING 1-HOUR FIRE-RESISTANCE-RATED PROTECTION.

# LEGEND

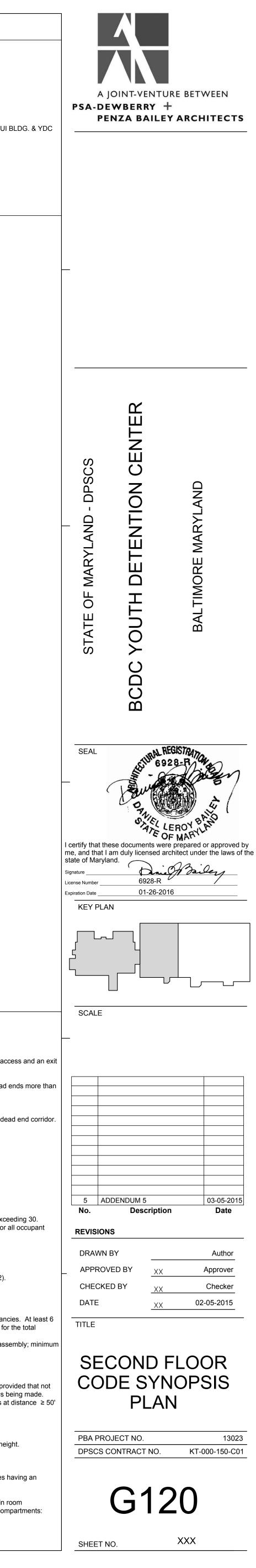
_ss_	
<b>♦</b> S	◆S
♦FP	◆FP — 1-HR FIRE-RESISTANCE-RATED FIRE PARTITION
— ♦FB——	◆FB — 1-HR FIRE-RESISTANCE-RATED FIRE BARRIER
<b>— ♦♦</b> FB- <b>—</b>	↔FB2-HR FIRE-RESISTANCE-RATED FIRE BARRIER
	FIRE SEPARATION LINE (PER IBC 702)
	EXIST. SEPARATION BETWEEN OSTC-OCCUPIED AREA OF SUI BI
	ROOM OCCUPANT LOAD
(	24 CUMULATIVE OCCUPANT LOAD
	PATH OF TRAVEL
	83 EXIT OCCUPANT LOAD
	– – TRAVEL DISTANCE

## -TRAVEL DISTANCE FROM

POINT IN ROOM TO EXIT: 151'

#### -VERIFY & REPAIR EXIST. SEPARATION TO PROVIDE 1-HR-RATED SMOKE BARRIER

ration Distance 2):	Opening Protectives				Arrangement
-)-	Table 8.3.4.2 Minimum Fire Assemblies (hours)	Protection Ratings for	r Opening Protectives in I	Fire Resistance-Rated	2.2.5.2 Dead end: 50' maximum in Condition IV. 22.2.5.3 Common path of travel: 100' maximum
	<u>Component</u> Elevator hoistways	Walls & Partitions	Fire Door Assemblies 1-1/2	NP	22.2.6.2 Travel distance: 150' maximum from any room door required as an exit acc 22.2.6.4 Travel distance: 200' maximum from any point in a room and an exit
	Vertical shafts (incl. stairways, exits,	1 2 1	1 1-1/2 1	NP NP NP	Dead ends (IBC 1018.4): where more than one exit or exit access is req'd, no dead e 20' in length. Exceptions:
	& refuse chutes) Fire barriers	2	1-1/2 3/4	NP 3/4	<ol> <li>In I-3 Occupancies, dead end shall not exceed 50'.</li> <li>Unlimited where length of dead is less than 2.5 times the least width of the dead</li> </ol>
e building face to	Horizontal exits Exit access corridors	1/2 2 1	1/3 1-1/2 1/3	1/3 NP 3/4	Exit Access (IBC 1014) Common path of egress travel: 100' maximum in I-3 Occupancy (IBC 1014.3).
	Smoke partitions	1 1 1/2	1/3 1/3	1/3 1/3	Exit Access Travel Distance (IBC 1016)
an be located ine applies to	Opening Fire Protection As	semblies, Ratings and	Markings (IBC Table 716	6.5)	200' maximum in I-3 Occupancy with sprinkler system (IBC Table 1016.1)
	Type of Assembly Fire walls & barriers w/ >	- 1-hour rating	Required Assembly M Rating (in hrs)	Min. Fire Door & Fire Shutter Assembly Ratings (in hrs) 1-1/2	Exit Access Corridors 7.1.3.1 Exit Access Corridors: 1 hour fire rating where serving occupant load exce
01 and 602. Rate bosure from both	Fire barriers w/ 1-hour ra	ating	1-1/2	1-1/2	Corridor Fire-Resistance Rating: 1 hour in I-3 Occupancy with sprinkler system, for a loads (IBC Table 1018.1).
ed openings in	Shaft, exit enclosure Other fire barriers Fire Partitions	& exit passageways	1	1 3/4	Interior Exit Stairways and Ramps
<sup>t</sup> unprotected ea of openings	Corridor walls Other fire partitions Exterior Walls		1 1 1	1/3 3/4 3/4	7.1.3.2.1 Exits: 1 hour fire barrier where connecting 3 stories or less. Construct as 1-hour fire barriers where connecting less than 4 stories (IBC 1022.2).
	Smoke Barriers		1	1/3	Horizontal Exits
< <u>X≤20</u> <u>20<x< u=""> 75% No limit 75% No limit</x<></u>	Occupant LoadsFirst Floor:365Second Floor:354 (incThird Floor:222	luding occupants of u	oper housing tier)		<ul> <li>22.2.2.5: Horizontal exits shall be permitted.</li> <li>Horizontal exits permitted to comprise 100% of exits required for Group I-3 occupance</li> <li>SF of space per occupant shall be provided on each side of the horizontal exit for number of people in adjoining compartments (IBC 1025.1, Exception 2).</li> <li>Separation (IBC 1025.2) shall be provided by a fire wall, fire barrier or horizontal asse fire-resistance rating of 2 hours.</li> </ul>
	Fire Pumps (IBC 913)			·····	Discharge from Exits
	from all other areas o both.			sprinkler system): separate norizontal assemblies, or	<ul> <li>22.2.7.1: Exits shall be permitted to discharge into a fenced or walled courtyard, provide the more than two walls of the courtyard are the building walls form which egress is be 22.2.7.2: Enclosed yard used for exit discharge shall accommodate all occupants at from building with pet area of 15.55 per percent.</li> </ul>
	Means of Egress Table 7.3.3.1 Capacity of M	leans of Egress			from building, with net area of 15 SF per person. Extinguishment Requirements
1 atorios, pat loss		inches per person			22.3.5.5(1) Provide Class I standpipe systems for any building 3 or more stories in heig
4 stories, not less	7.4.1.1(2)Single means travel limitations are		r a mezzanine or balcony	where common path of	Subdivision of Building Spaces
	22.2.3.2 Aisles, corrido	rs and ramps required	for egress shall be not le	ess than 48" in width	<ul> <li>22.3.7.1 Smoke barriers to divide every story used for sleeping by residents or stories h occupant load of 50 or more into not less than 2 compartments.</li> <li>22.3.7.3 Maximum residents in smoke compartment: 200 Max. distance to door in smoke barrier: 150' from room door, 200' from any point in ro</li> <li>22.3.7.7 Area per occupant on ea. side of smoke barrier for occupants in adjoining compart 6 SF</li> </ul>

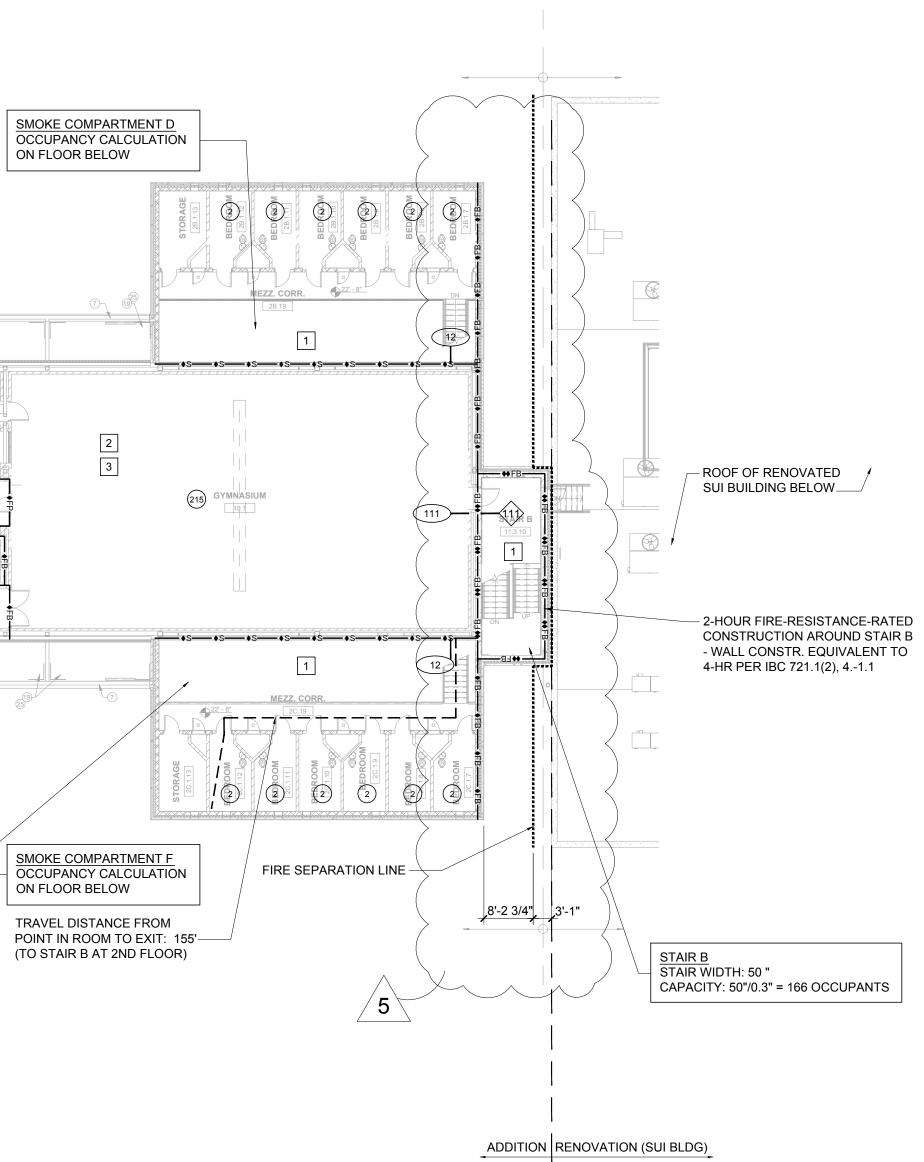


D					MEZZ. CORR 2019 22-5 000 200 200 200 200 200 200 20
С	1 G130 1/16" = 1'-0		OR COD	<u>E SYN</u> O	<b>PSIS PLAN</b> $v = 16' = 32'$
_	APPLICABLE CODES				BUILDING CODE DATA
	Building Code:	IBC (2012) IEBC (2012)			NFPA 101 LIFE SAFETY CODE, 2012 (unless noted otherwise; references to IBC
	Fire Code:	NFPA 101 (2012) (			Occupancy Classification
	Masharias Cada	NFPA 1 (2012) (Fi	re Code)		Chapter 22: New Detention and Correctional Occupancies Classification: Use Condition IV, Impeded Egress
	Mechanical Code:	IMC (2012)			Group I-3 (IBC 308.5), Condition 4 (IBC 308.5)
	Plumbing Code: Electrical Code:	NSPC (2012) NED (2011)			Mixed Occupancies (IBC 508.3): Business areas (outside the secure area) consider provisions of 508.2.1 for an accessory occupancy, no separation of occupancies of the secure area area.
	Energy Standard:	ASHRAE 90.1 (20	10)		General Building Heights and Areas (IBC Chapter 5)
В	Elevator Safety Code:		on to DLLR Requirem	ients	COMAR deletes reference to NFPA 5000 Building Construction and Safety Code
D	Accessibility Code:	Maryland Accessib			building code adopted by the Authority Having Jurisdiction (Maryland Building Standards adopt IBC 2012).
	Energy Conservation Code:	IECC (2012)			Allowable Buildings Heights and Areas (IBC Table 504) Existing 2-story SUI building provides equivalent of Type IIB construction; propose
	ENERGY CODE DATA				of Type IIA construction ADDITION EXISTIN Occupancy Group IIA Type Construction IIB Type Cons
	BUILDING ENVELOPE REQUIRE	EMENTS PER IECC			I-3 2 stories, 65' height 1 story, 55' l 15,000 SF 10,000 SF
	Opaque Assemblies	Req'd U-factor	Req'd R-Value	Provided	Automatic Sprinkler Height Increase (IBC 504.2): Allows increase in max. ht. by 2 of stories by 1
	Roofs Insulation entirely above deck		R-25	R-30 min. (metal) R-25 min. (TPO)	Building Area Modifications (IBC 506)
	Attic (below exterior slabs)		R-38	R-25 min. (TPO) R-38	Building area in Table 503 may be increased to frontage and automatic sprinkle
	<u>Walls</u> Mass (new construction)		R-9.5ci	R-12.6 ci (new)	tollows: Aa + {At + [At x If} + [At x Is]}
	Mass (existing building) Metal Framed	N/A	N/A R-13+R-7.5ci	U-0.58 (exist) R-23+-R-8.4ci	Aa = allowable building area (SF) per story
	Slab on Grade		<b>D</b> (0)	5.40.4	At = tabular building area per story per Table 503 If = area increase factor due to frontage calculated per 506.2
	Unheated slab	Req'd U-factor	R-10ci Req'd SHGC	R-10ci Provided	Is = area increase factor due to sprinkler protection calculated per 506.3
	Fenestration Doors	Req u O-laciol	Reguisnou	Flovided	506.2 Frontage increase: Allowed for a building has more than 25% of its per way or open space having a width of not less than 20 feet.
А	Entrance door (glazed)	U-0.77		U-0.57	If = [F/P - 0.25] W/30
7 \	Vertical Fenestration Fixed Fenestration	11.0.20		11.0.22	If = area increase factor due to frontage F = Building perimeter fronting public way or open space $\ge$ 20 feet wide
	Detention windows Aluminum storefront SHGC:	U-0.38 U-0.38	0.40	U-0.22 U-0.39 0.35	P = Perimeter of entire building W = Width of public way or open space
	Skylights	U-0.50	0.70	U-0.39	506.3 Automatic sprinkler system increase: Allows building area limitation fro
	SHGC		0.40	0.27	increased by an additional 200 percent for buildings with more than one sto

### SMOKE COMPARTMENT C OCCUPANCY CALCULATION ON FLOOR BELOW 2 (2)i Tolo H 22' - 8 MEZZ. CORR. 1 MECH. RM. 4 FITNESS RM. 4 10.10 4 ──◆FB────◆FB────→ ●FB────→ ╘╾╾╺╒┍┍╌╾╸┥╒┍╼╾╴┥╒┍╧┈╴╺╒┍╼┼╌┧ STAIR A DOOR EGRESS WIDTH: 33.5 " CAPACITY: 33.5"/0.2" = 168 OCCUPANTS 41.3.3 + B + + + + B + + + YOUT REMOTE CLOSET <del>──</del>♦FB<del>─</del>₽─♦FB≁ 4 EQ. STOR. I Kara ta bara ta bar MECH. RM. 4 s + ----- s 1 MEZZ. CORR.

### KEY NOTES

- 1 INTUMESCENT FIREPROOFING AT ROOF DECK AND JOISTS OF HOUSING UNIT UPPER ROOFS (CLERESTORY AREA), & OTHER AREAS OF EXPOSED STRUCTURE ACCESSIBLE TO DETAINEES (NEW CONSTRUCTION ONLY).
- 2 INTUMESCENT FIREPROOFING AT EXPOSED COLUMNS AND ROOF BEAMS OF GYMNASIUM. (ROOF JOISTS AND DECK ARE EXEMPTED FROM THE FIRE-PROTECTION REQUIREMENT AS THEY ARE NOT LESS THAN 20' ABOVE THE FLOOR.
- 3 SPRAY FIRE-RESISTIVE MATERIAL AT COLUMNS AND BRACING IN CONCEALED AREAS OF GYMNASIUM WALLS.
- 4 SPRAY FIRE-RESISTIVE MATERIAL AT STRUCTURAL FRAME, ROOF FRAMING AND DECKING EXPOSED AT MECHANICAL ROOMS, ELEVATOR EQUIPMENT, & OTHER NON-DETAINEE AREAS, AND ABOVE CEILINGS OF OTHER SPACES (NEW CONSTRUCTION ONLY).



	Existing SUI building (area renovated for YDC plus area occupie Allowable frontage increase:	ed by OSTC program):	Fire-Resistance Rating Require (feet) for Types IIA & IIB Cor				
C are to IBC 2012)	If = [713/838 - 0.25] 30/30 = 0.60						
<i>L</i> _	Allowable Area (Type IIB):		Fire Separation Distance (X)			Rating Re	eq'd
	Aa = {10,000 + [10,000 x 0.60] + [10,000 x 2]} = 36,000		X > 5	bo		1	
			5 ≤ X< 10	bo		1	
	Existing area of largest floor (2nd floor) 33,804 SF		10 ≤X< 30	II.A		1	
			X - 00	IIE		0	
	Addition:		X ≥ 30	bo	in	0	
	Allowable frontage increase: Not calculated because not needed		Fire Desistance Dated Construc	ation (IPC Chapter 7)			
	Allowable Area (Type IIA)		Fire-Resistance-Rated Construct				
dered under the	$A = \{15,000 + [15,000 \times 2]\} = 45,000 \text{ SF}$		Definitions (IBC 702)				
es required.	Aa - {13,000 · [13,000 x 2]] - 43,000 Si						
	Largest floor (2nd floor): 25,460 SF		Fire Separation Distance (as one of the following:	s defined in Chapter 2	): the distance	measured fro	om the bu
and substitutes the Performance	Incidental Uses (IBC 509)		<ol> <li>The closest interior lot lir</li> <li>The centerline of a stree</li> </ol>		av: or		
Fenomance	IBC Table 509 Hazardous Area Protection		<ol> <li>An imaginary line betwee anywhere between the</li> </ol>	en two buildings on th	ne property. (Th		
	Room or Area	Separation and/or Protection	both buildings and cann				
ed 3-story addition is	Rooms w/ boilers where largest equip. >15 psi & 10 hp	1 hour or automatic sprinkler					
	Refrigerant machinery room	1 hour or automatic sprinkler	Exterior Walls (IBC 705)				
NG	Laundry rooms over 100 SF	1 hour or automatic sprinkler					
struction	Group I-3 cells equipped with padded surfaces	1 hour	Fire-resistance rating (IBC 70				
height	Waste and linen collection rooms over 100 SF	1 hour	for exposure from the ins		n distance > 10	) feet. Rate fo	or exposi
SF	Drotaction from Llozorda		sides with fire separation		um area of upr	aratastad ar n	ratactad
	Protection from Hazards		Allowable area of openings ( an exterior wall shall not				lolecleu
20' and max. number	Table 22.3.2.1 Hazardous Area Protection		Automatic sprinkler system ( openings shall be the sar	(I <del>BC 7</del> 04.8 <del>.1):  Wit</del> h s	pri <del>nkler</del> system	<del>, m</del> aximum <del>ar</del>	
	Hazardous Area Description	Separation/Protection	for fire separation distance			.get ite inne	
	Boiler and fuel-fired heater rooms	1 hour	,				
er protection as	Central or bulk laundries >100 SF	1 hour	Maximum Area of Exterior W	/all Openings (IBC Ta	ble 705.8):		
	Commercial cooking equipment	In accordance with 9.2.3					
	Commissaries	Smoke resistant		F	Fire Separation	Distance	
	Employee locker rooms	Smoke resistant	Degree of Op'g Protection	<u>X&lt;3</u> <u>3<x< u=""></x<></u>			<u>15<x≤< u=""></x≤<></u>
	Hobby/handicraft shops	Smoke resistant	Protected	Not permitted 15		45%	75%
	Maintenance shops	Smoke resistant	Unprotected	Not permitted 15	% 25%	45%	75%
	Soiled linen rooms	1 hour					
	Storage rooms >50 SF in area but ≤100 SF in area	Smoke resistant	Smoke Barriers (IBC 709)				
3	storing combustible materials	4 have	Create harrian namina 1 har				
	Storage rooms >100 SF storing combustible materials Trash collection rooms	1 hour 1 hour	Smoke barriers require 1-ho Openings: protect in accord				
rimeter on a public	Trash collection rooms	THOU	Penetrations: Comply with S				
	Type of Construction (IBC Chapter 6)		Joints: Comply with Section	715 (IBC 709.7).			
	Fire-Resistance Rating Requirements for Building Elements (in hou	urs) (IBC Table 601)	Ducts and air transfer openir	igs: comply with Sec	uon 717 (IBC 7	ບອ.ຽ).	
	Duilding Element IIA: Define Dealth IID: Define D	Notoo	Shaft Enclosures				
		Notes	QCE 1 hour fire herrier who	re connecting 2 storie	a ar faurar		
	Structural Frame 1 0		8.6.5 1 hour fire barrier whe			an acting laga	then 1 of
	Bearing Walls Exterior 1 0	not < Table 602 reg'ts.	Fire-resistance rating: Not le				than 4 St
	Interior 1 0	101 < 1able 002 requis.	than fire-resistance rating	g of noor assembly pe		13.4).	
m Table 503 to be	Nonbearing Walls						
ory above grade plane.	Exterior see Table 602 see Table 602						
		not < req'd by other code sections					
	Floor construction 1 0						
		rating not required for roof framing					
		and decking $\ge$ 20' above floor below					

## GENERAL NOTES

- CCESSIBLE OF ROTECTION LED AREAS
- ROOF IN WHICH IT IS INSTALLED.
  2. ALL JOINTS MADE IN OR BETWEEN BUILDING ELEMENTS REQUIRED TO BE RATED SHALL BE PROTECTED BY AN APPROVED FIRE-RESISTANT JOINT SYSTEM IN ACCORDANCE WITH SECTION 07 84 46 DESIGNED TO RESIST THE PASSAGE OF FIRE FOR A TIME PERIOD NOT LESS THAN THE REQUIRED FIRE-RESISTANCE RATING OF THE WALL, FLOOR OR ROOF IN OR BETWEEN WHICH IT IS INSTALLED.

1. ALL PENETRATIONS THROUGH BUILDING ELEMENTS REQUIRED TO BE RATED SHALL

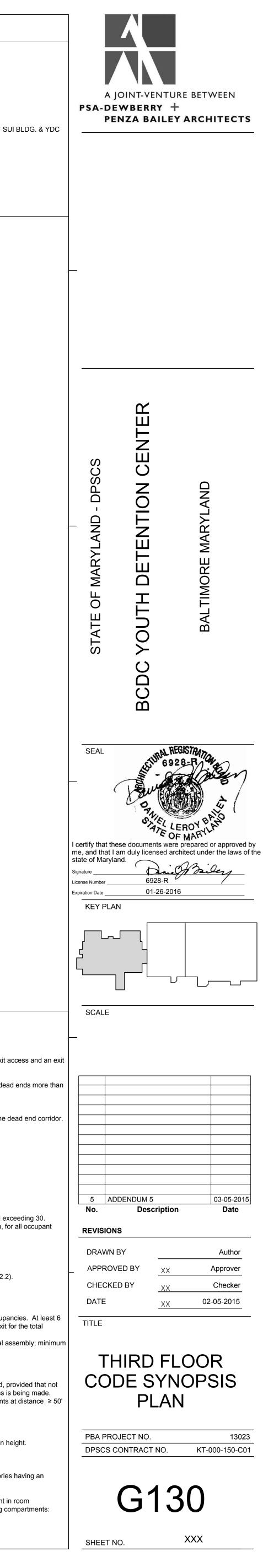
SECTION 07 84 13 DESIGNED TO RESIST THE PASSAGE OF FIRE FOR A TIME PERIOD NOT LESS THAN THE REQUIRED FIRE-RESISTANCE RATING OF THE WALL, FLOOR OR

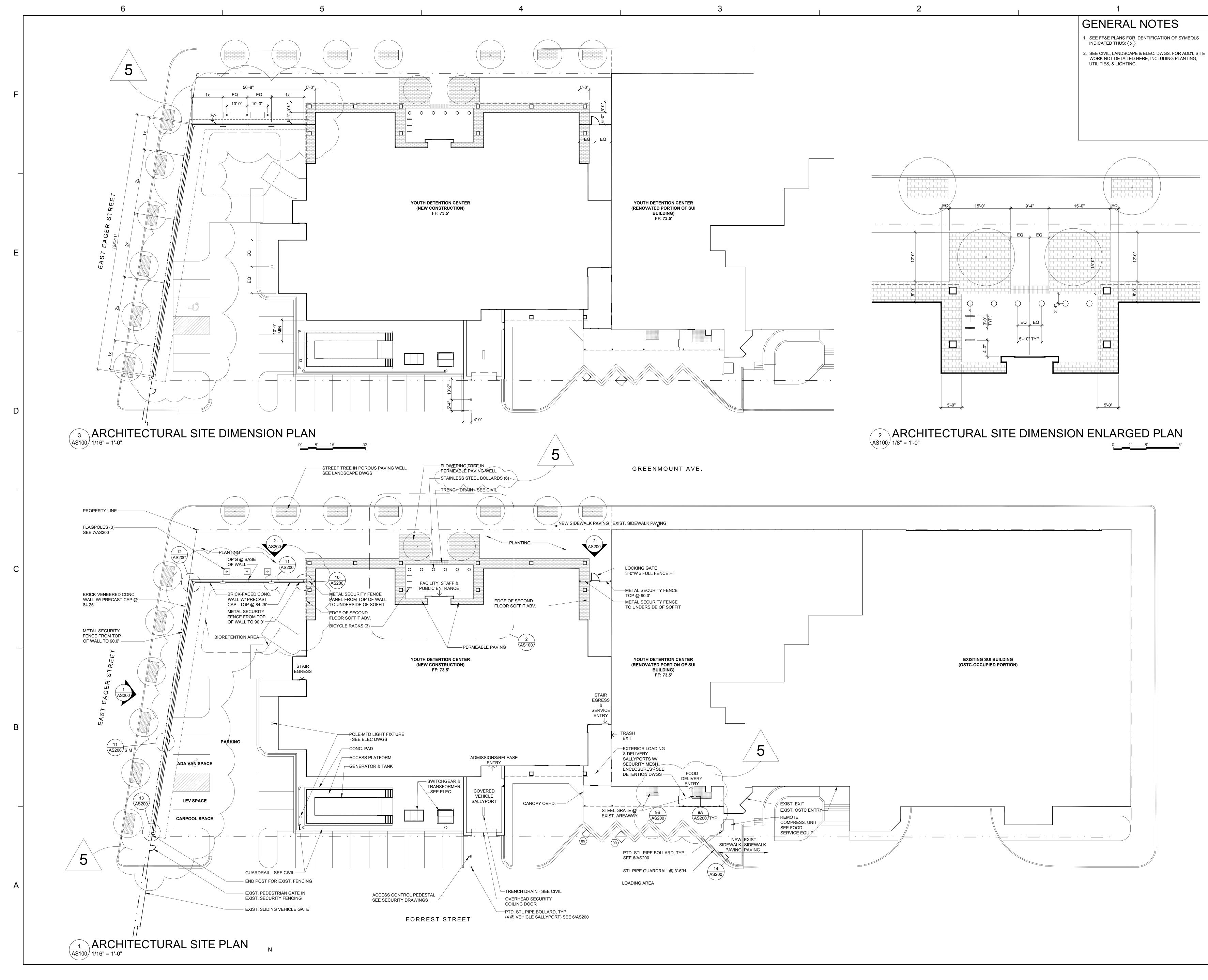
BE PROVIDED WITH AN APPROVED PROTECTION METHOD IN ACCORDANCE WITH

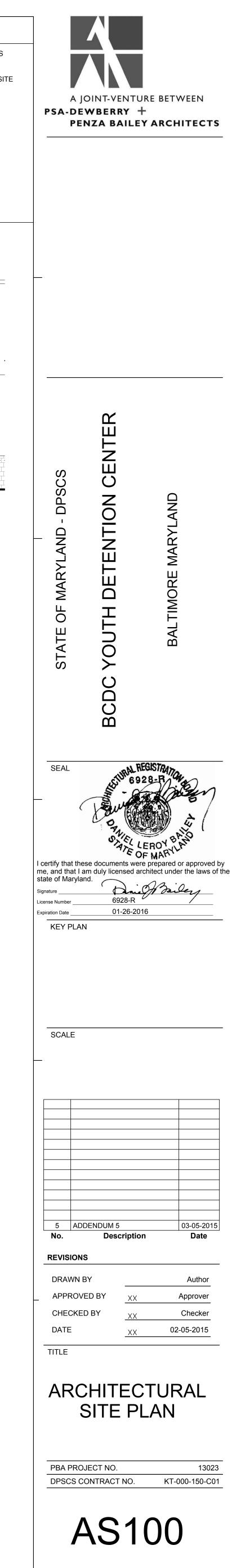
3. AT NEW CONSTRUCTION (NOT APPLICABLE TO SUI BUILDING): ALL STRUCTURAL STEEL FRAME MEMBERS NOT ENCASED IN FIRE-RESISTANCE-RATED CONSTRUCTION, AND ALL ROOF CONSTRUCTION AND ASSOCIATED SECONDARY MEMBERS LESS THAN 20 FEET ABOVE THE FLOOR, SHALL BE HAVE APPLIED FIREPROOFING PROVIDING 1-HOUR FIRE-RESISTANCE-RATED PROTECTION. LEGEND

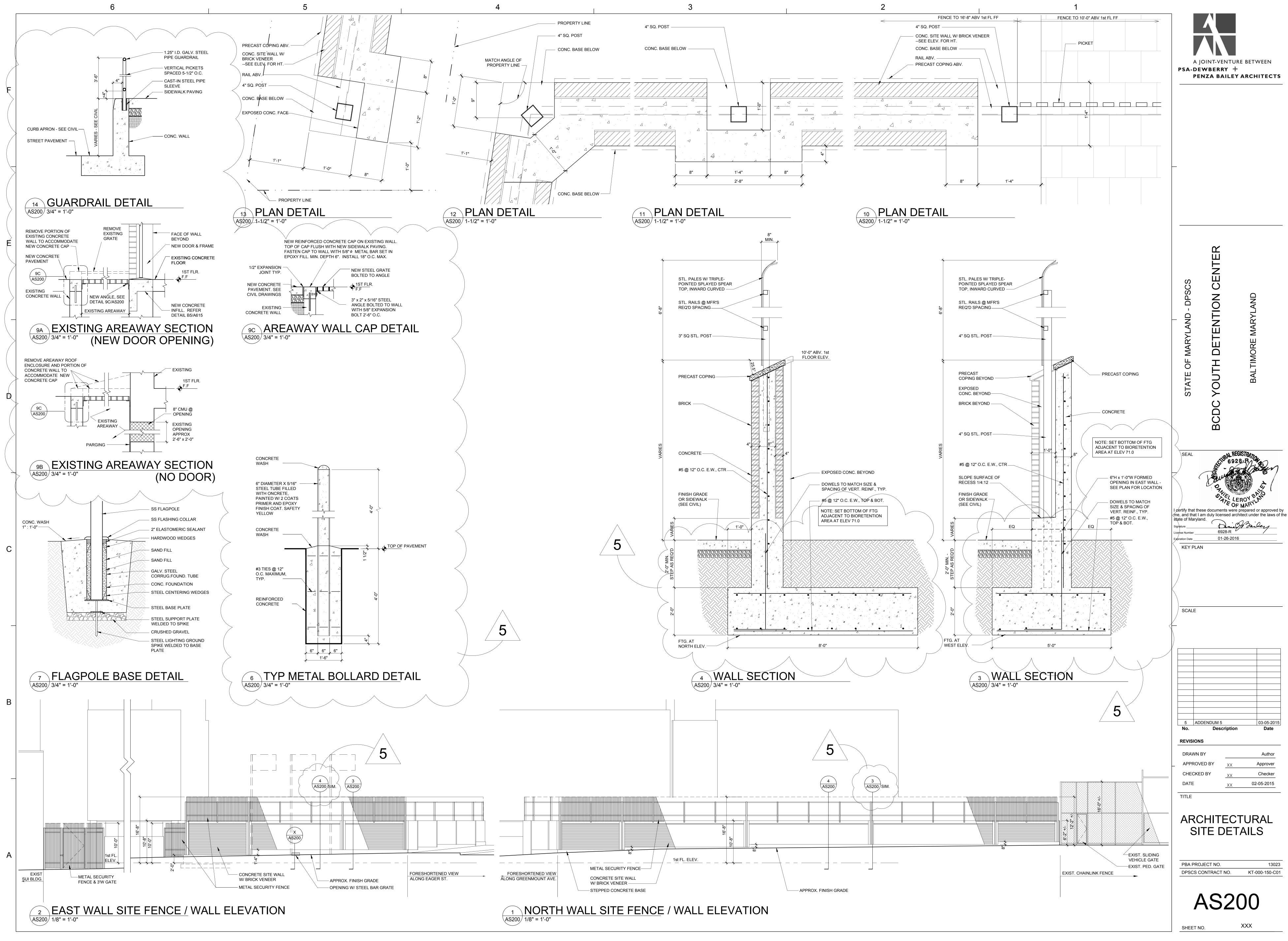
-s-s-s-NON-RATED SMOKE-TIGHT PARTITION
+s
+FP
+FB
FIRE SEPARATION LINE (PER IBC 702)
EXIST. SEPARATION BETWEEN OSTC-OCCUPIED AREA OF SUI BL
ROOM OCCUPANT LOAD
24 CUMULATIVE OCCUPANT LOAD
PATH OF TRAVEL
83 EXIT OCCUPANT LOAD
– – – – TRAVEL DISTANCE

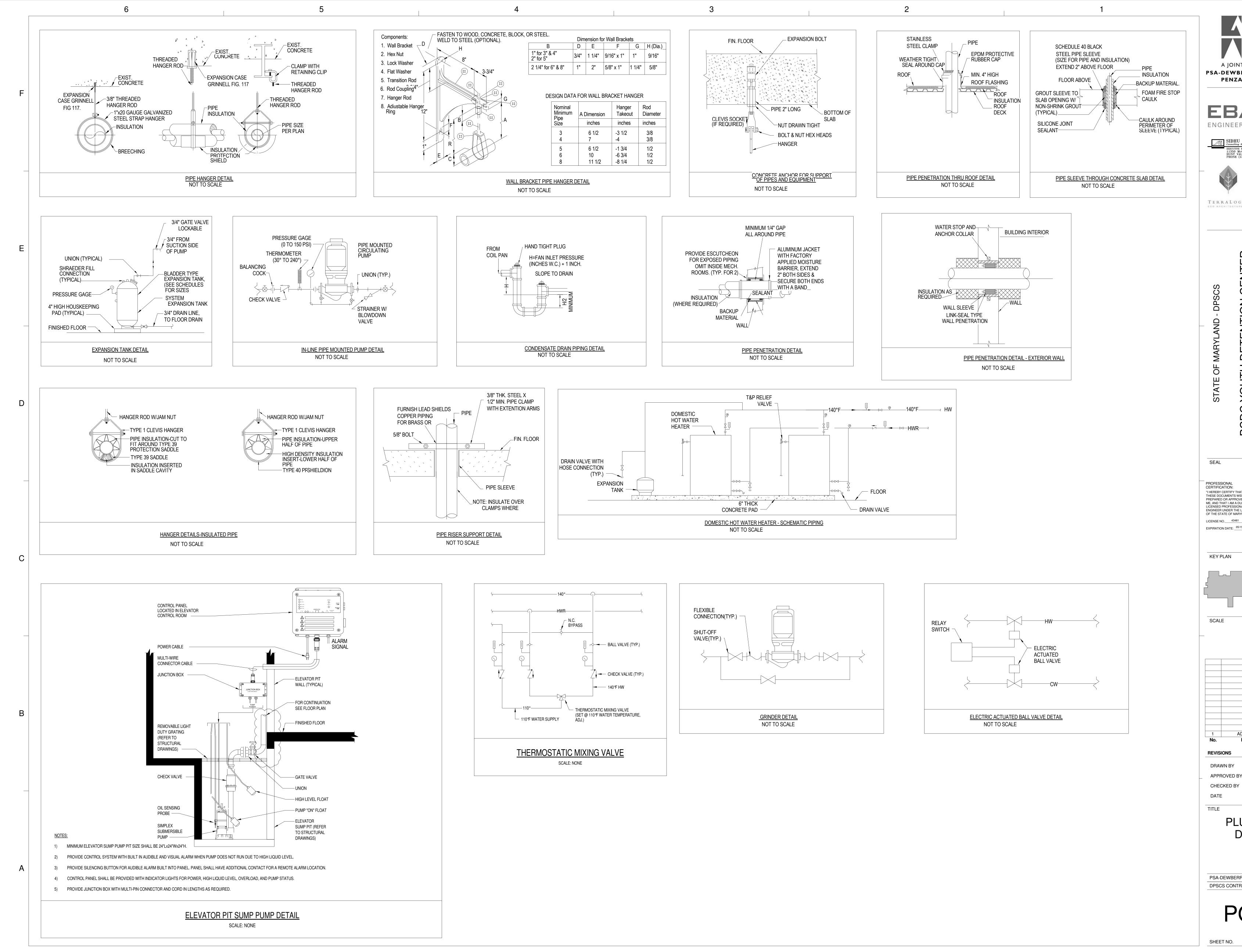
paration Distance	Opening Protectives				Arrangement
602):	Table 8.3.4.2 Minimum Fire Protection Ratings for Opening Protectives in Fire Resistance-Rated Assemblies (hours)				2.2.5.2 Dead end: 50' maximum in Condition IV.
<u>d</u>					22.2.5.3 Common path of travel: 100' maximum
	Component	Walls & Partitions	Fire Door Assemblies	Fire Window Assemblies	22.2.6.2 Travel distance: 150' maximum from any room door required as an exit ac 22.2.6.4 Travel distance: 200' maximum from any point in a room and an exit
	Elevator hoistways	2	1-1/2	NP	
	Vertical shafts	1	1	NP	Dead ends (IBC 1018.4): where more than one exit or exit access is req'd, no dead
	Vertical shafts (incl. stairways, exits,	2 1	1-1/2 1	NP NP	20' in length. Exceptions:
	& refuse chutes)				1. In I-3 Occupancies, dead end shall not exceed 50'.
	Fire barriers	2	1-1/2 3/4	NP 3/4	3. Unlimited where length of dead is less than 2.5 times the least width of the de
		1/2	1/3	1/3	Exit Access (IBC 1014)
the building face to	Horizontal exits	2	1-1/2	NP	
	Exit access corridors	1	1/3	3/4	Common path of egress travel: 100' maximum in I-3 Occupancy (IBC 1014.3).
	Smoke barriers Smoke partitions	<u> </u>	<u> </u>	<u> </u>	Exit Access Travel Distance (IBC 1016)
e can be located le line applies to	Opening Fire Protection Assemblies, Ratings and Markings (IBC Table 716.5)				200' maximum in I-3 Occupancy with sprinkler system (IBC Table 1016.1)
	Required Assembly Min. Fire Door & Fire Shutter				Exit Access Corridors
	Type of Assembly		. ,	Assembly Ratings (in hrs)	
CO1 and CO2 Data	Fire walls & barriers w/ > 1-hour rating21-1/2				7.1.3.1 Exit Access Corridors: 1 hour fire rating where serving occupant load exce
601 and 602. Rate exposure from both	1-1/2 1-1/2 Fire barriers w/ 1-hour rating				Corridor Fire-Resistance Rating: 1 hour in I-3 Occupancy with sprinkler system, for loads (IBC Table 1018.1).
	Shaft, exit enclosure & exit passageways11Other fire barriers13/4Fire Partitions3/4				
ected openings in					Interior Exit Stairways and Ramps
<b>.</b>					
a of unprotected area of openings	Corridor walls Other fire partitions		1	1/3 3/4	<ul><li>7.1.3.2.1 Exits: 1 hour fire barrier where connecting 3 stories or less.</li><li>Construct as 1-hour fire barriers where connecting less than 4 stories (IBC 1022.2).</li></ul>
area or openings	Exterior Walls		<u>1</u>	3/4	Construct as 1-hour me barriers where connecting less than 4 stories (IBC 1022.2).
	Smoke Barriers     1     1/3       Occupant Loads       First Floor:     365       Second Floor:     354 (including occupants of upper housing tier)				Horizontal Exits
					22.2.2.5: Horizontal exits shall be permitted.
15 <x≤20 20<x<="" td=""><td>Horizontal exits permitted to comprise 100% of exits required for Group I-3 occupant SF of space per occupant shall be provided on each side of the horizontal exit for</td></x≤20>					Horizontal exits permitted to comprise 100% of exits required for Group I-3 occupant SF of space per occupant shall be provided on each side of the horizontal exit for
75% No limit					number of people in adjoining compartments (IBC 1025.1, Exception 2).
75% No limit	Third Floor: 222		por frodoling dory		Separation (IBC 1025.2) shall be provided by a fire wall, fire barrier or horizontal ass
	Fire Dumpe (IDC 012)				fire-resistance rating of 2 hours.
	Fire Pumps (IBC 913)				Discharge from Exits
	Protection of fire pump rooms (IBC 913.2.1, Exception 1 for automatic sprinkler system): separate from all other areas of the building by 1-hour fire barriers or 1-hour horizontal assemblies, or				22.2.7.1. Evite shall be normitted to discharge into a fenced or welled courtward, pro
	both.	of the building by 1-hou	If fire barriers of 1-hour no	rizontal assemblies, or	22.2.7.1: Exits shall be permitted to discharge into a fenced or walled courtyard, pro more than two walls of the courtyard are the building walls form which egress is to
	Means of Egress				22.2.7.2: Enclosed yard used for exit discharge shall accommodate all occupants a
					from building, with net area of 15 SF per person.
	Table 7.3.3.1 Capacity of Means of Egress         Stairways:       0.3 inches per person         Level components:       0.2 inches per person         ss       7.4.1.1(2)Single means of egress permitted for a mezzanine or balcony where common path of travel limitations are met.				Extinguishment Requirements
					22.3.5.5(1) Provide Class I standpipe systems for any building 3 or more stories in hei
an 4 stories, not less					Subdivision of Building Spaces
					22.3.7.1 Smoke barriers to divide every story used for sleeping by residents or stories
	22232 Aisles corrido	ors and ramos required	for earess shall be not les	s than 48" in width	occupant load of 50 or more into not less than 2 compartments.
	,,,,,	22.2.3.2 Aisles, corridors and ramps required for egress shall be not less than 48" in width			22.3.7.3 Maximum residents in smoke compartment: 200
					Max. distance to door in smoke barrier: 150' from room door, 200' from any point in i
				22.3.7.7 Area per occupant on ea. side of smoke barrier for occupants in adjoining con	
					6 SF
					1







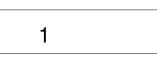






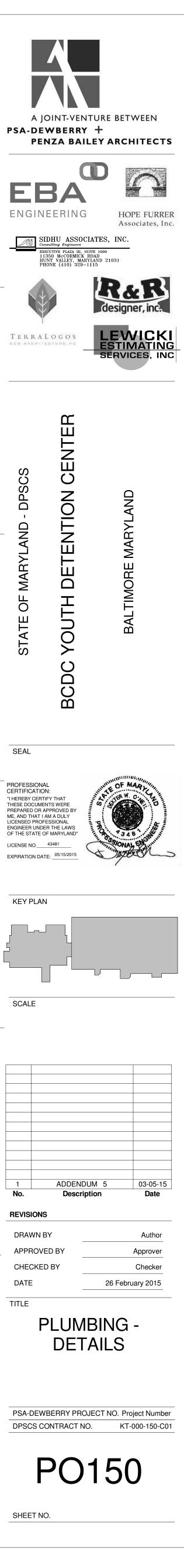


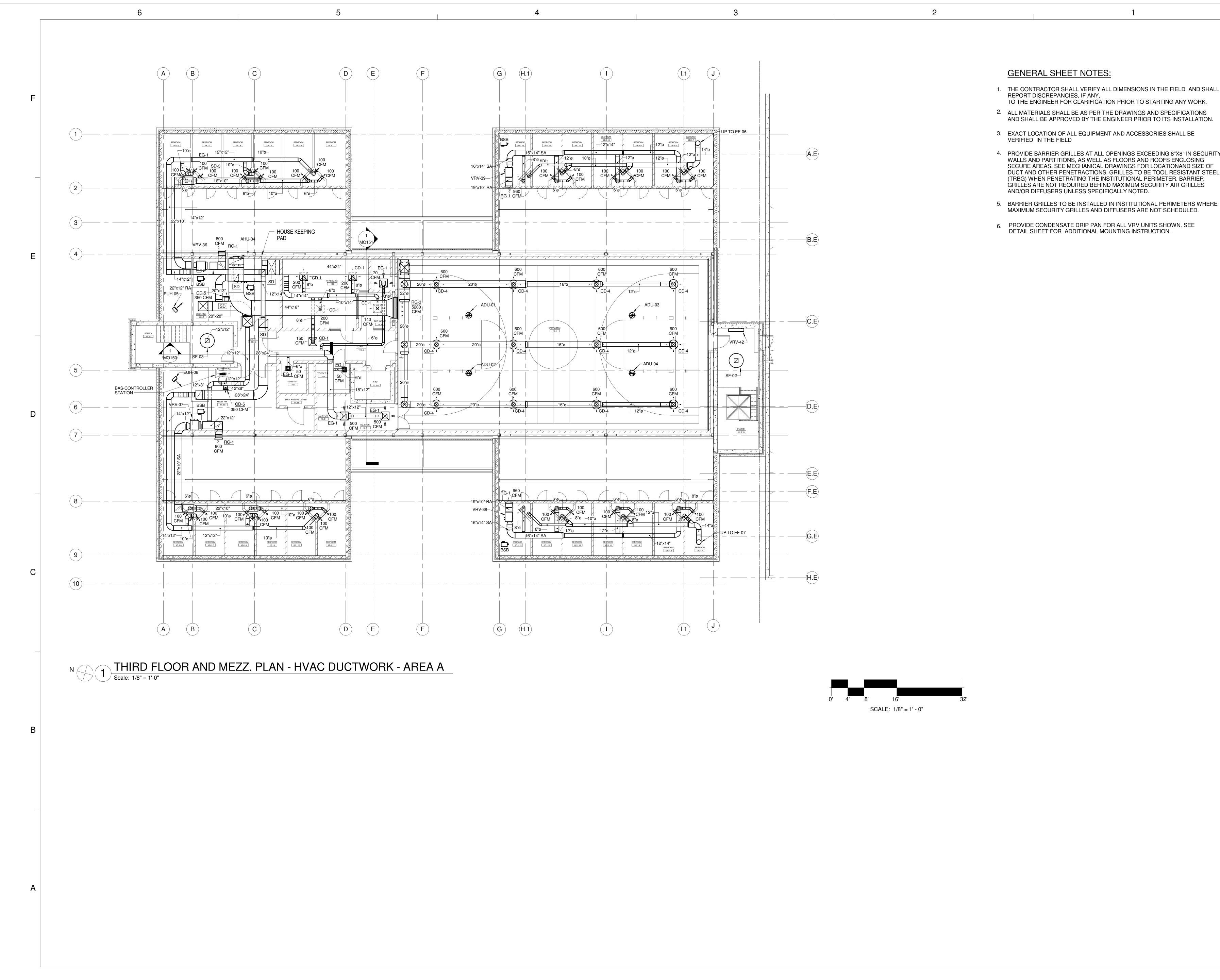




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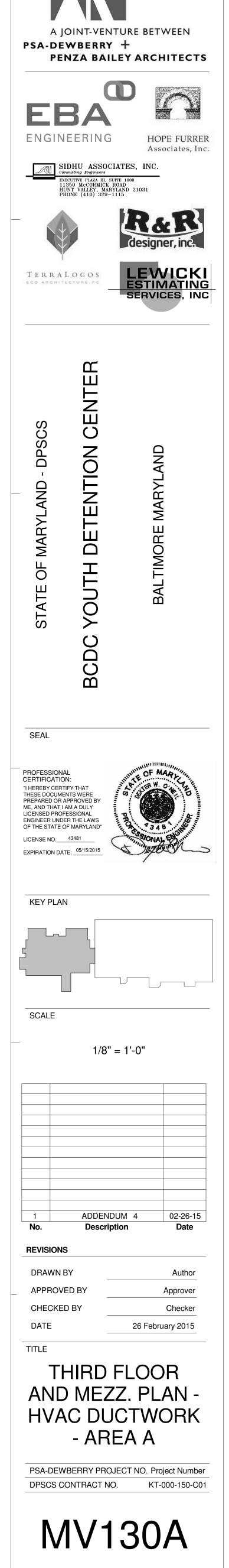




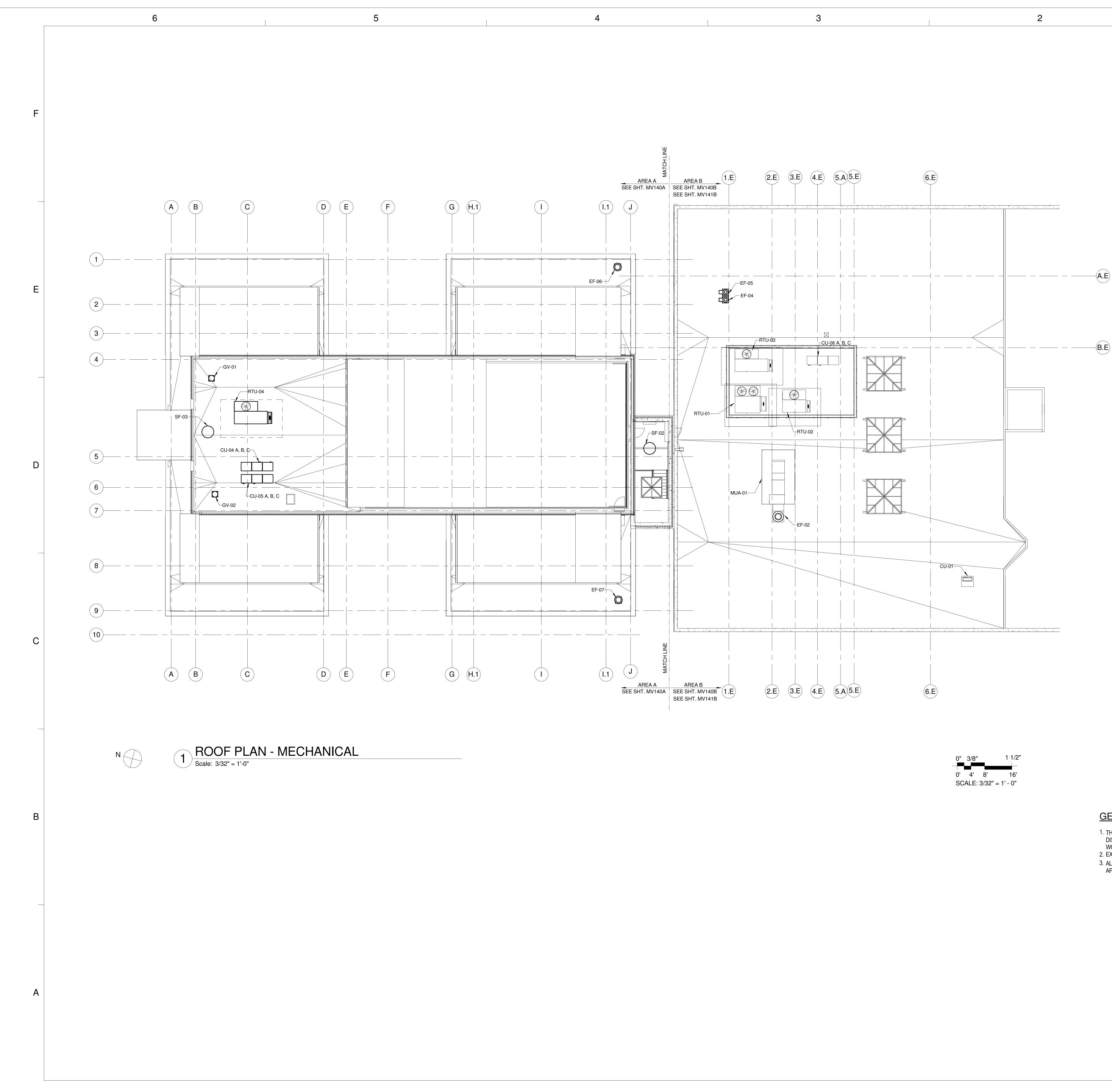
TO THE ENGINEER FOR CLARIFICATION PRIOR TO STARTING ANY WORK. 2. ALL MATERIALS SHALL BE AS PER THE DRAWINGS AND SPECIFICATIONS AND SHALL BE APPROVED BY THE ENGINEER PRIOR TO ITS INSTALLATION.

4. PROVIDE BARRIER GRILLES AT ALL OPENINGS EXCEEDING 8"X8" IN SECURITY WALLS AND PARTITIONS, AS WELL AS FLOORS AND ROOFS ENCLOSING SECURE AREAS. SEE MECHANICAL DRAWINGS FOR LOCATIONAND SIZE OF DUCT AND OTHER PENETRACTIONS. GRILLES TO BE TOOL RESISTANT STEEL (TRBG) WHEN PENETRATING THE INSTITUTIONAL PERIMETER. BARRIER GRILLES ARE NOT REQUIRED BEHIND MAXIMUM SECURITY AIR GRILLES

5. BARRIER GRILLES TO BE INSTALLED IN INSTITUTIONAL PERIMETERS WHERE MAXIMUM SECURITY GRILLES AND DIFFUSERS ARE NOT SCHEDULED.



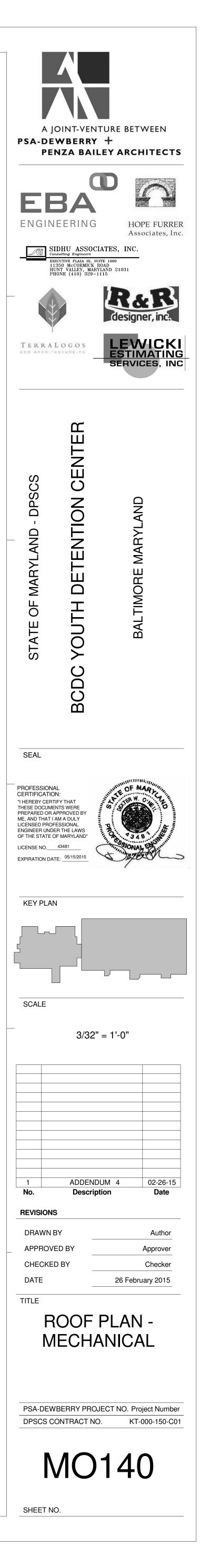
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## GENERAL SHEET NOTES:

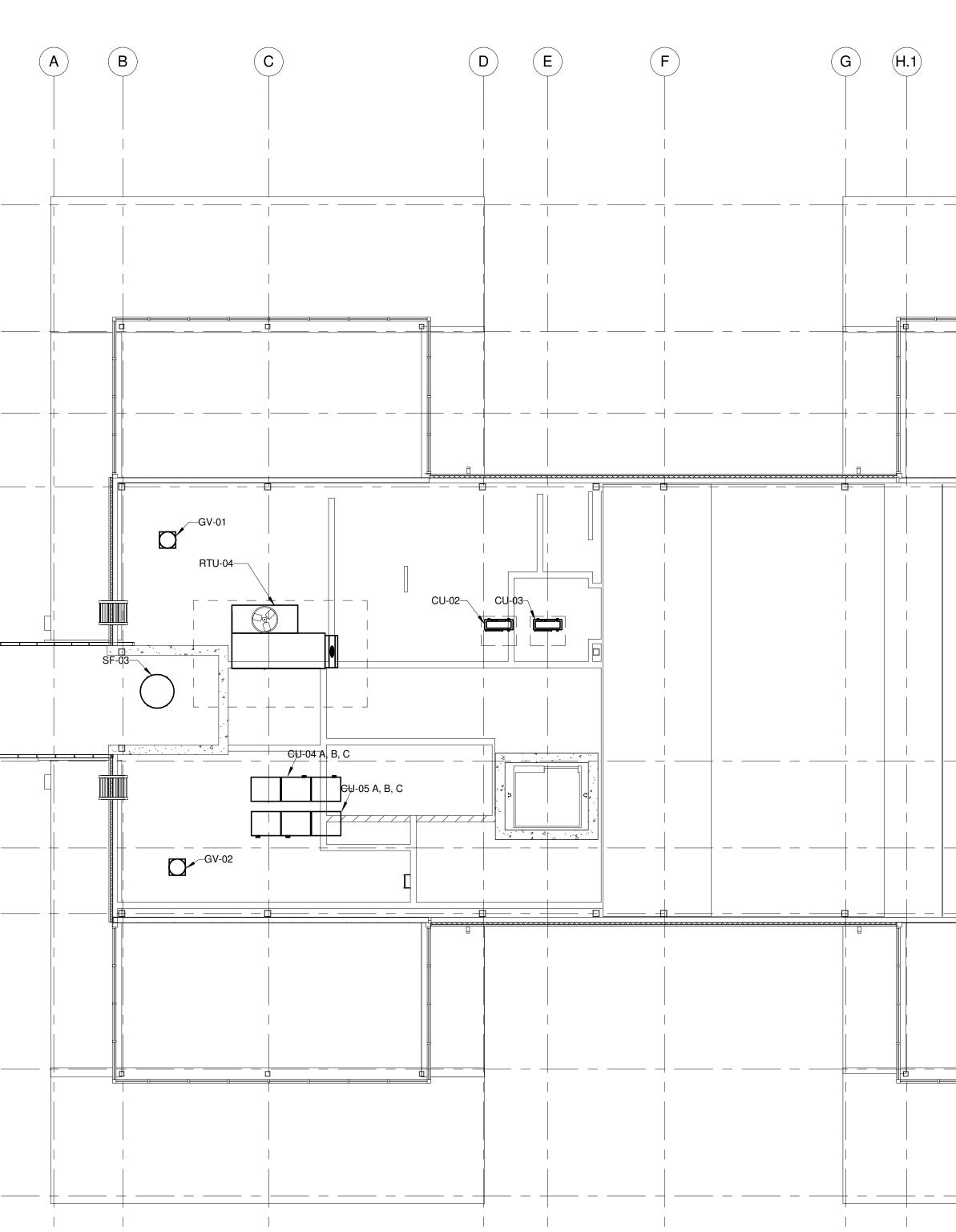
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- 1. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS IN THE FIELD AND SHALL REPORT
- WORK. 2. EXACT LOCATION OF ALL EQUIPMENT AND ACCESSORIES SHALL BE VERIFIED IN THE FIELD
- ALL MATERIALS SHALL BE AS PER THE DRAWINGS AND SPECIFICATIONS AND SHALL BE APPROVED BY THE ENGINEER PRIOR TO ITS INSTALLATION.



DISCREPANCIES, IF ANY, TO THE ENGINEER FOR CLARIFICATION PRIOR TO STARTING ANY

	6		
F			
		<u>(1)</u>	
		2	
E		(3)	
		( <u>4</u> )	
D		<u>(</u> 5)	
		(6)———— (7)————	
С		8	
		9	
		(10)	
В	Ν	1 ROOF PL Scale: 1/8" = 1'-0"	AN
A			



E

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(**H.1**)

4

# N - HVAC MECHANICAL - AREA A

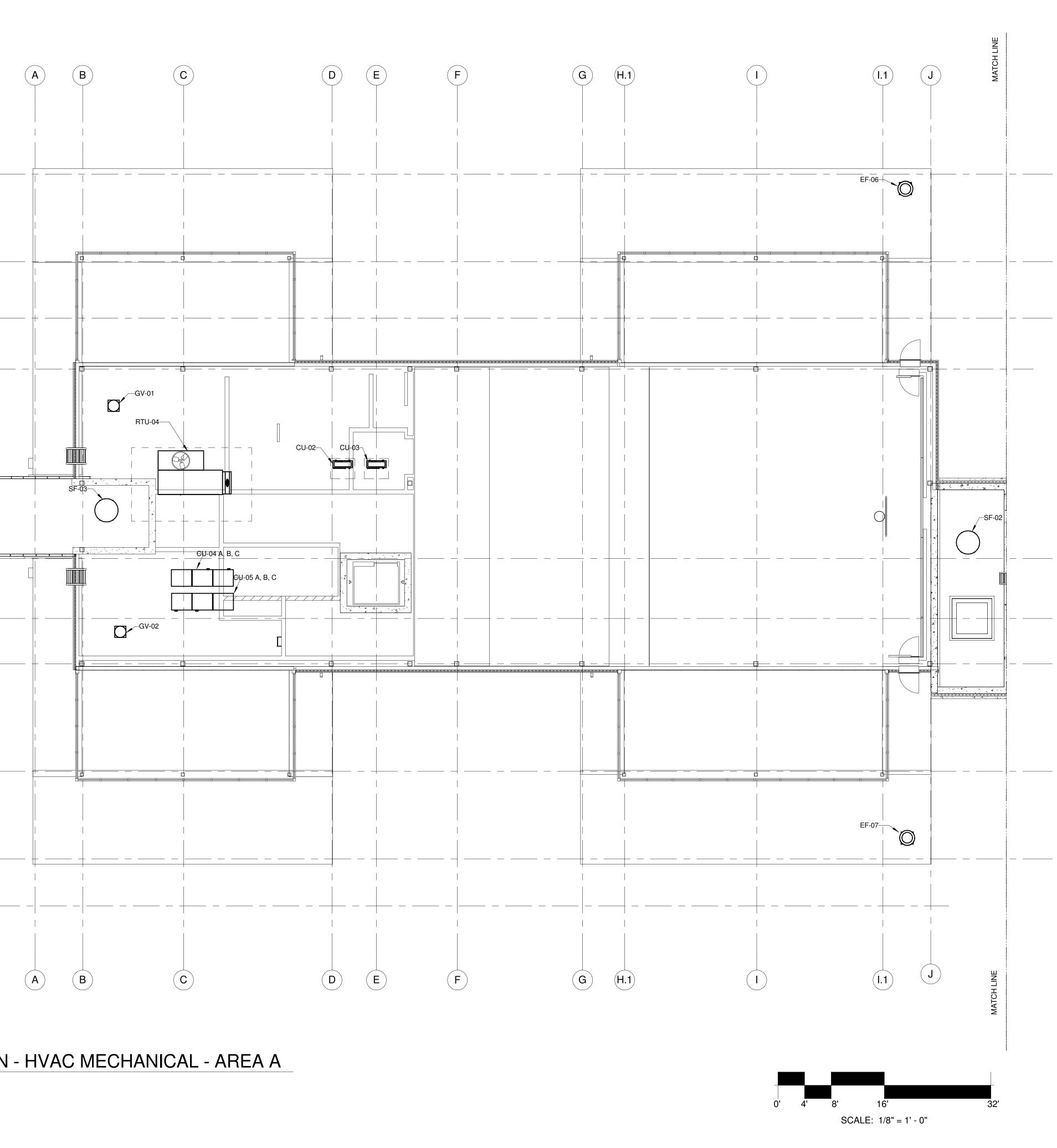
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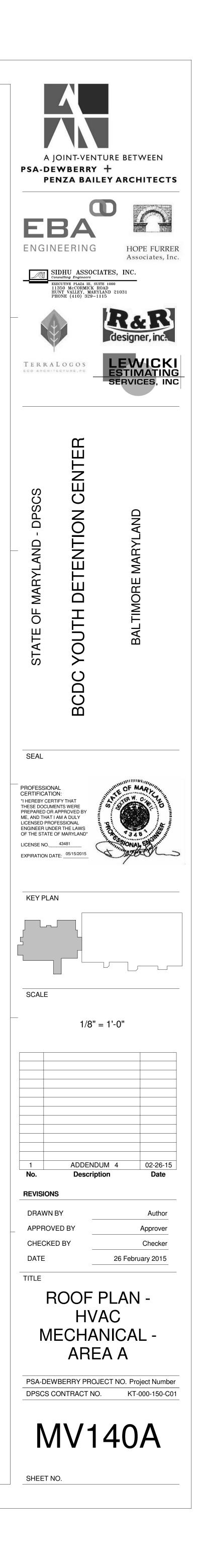
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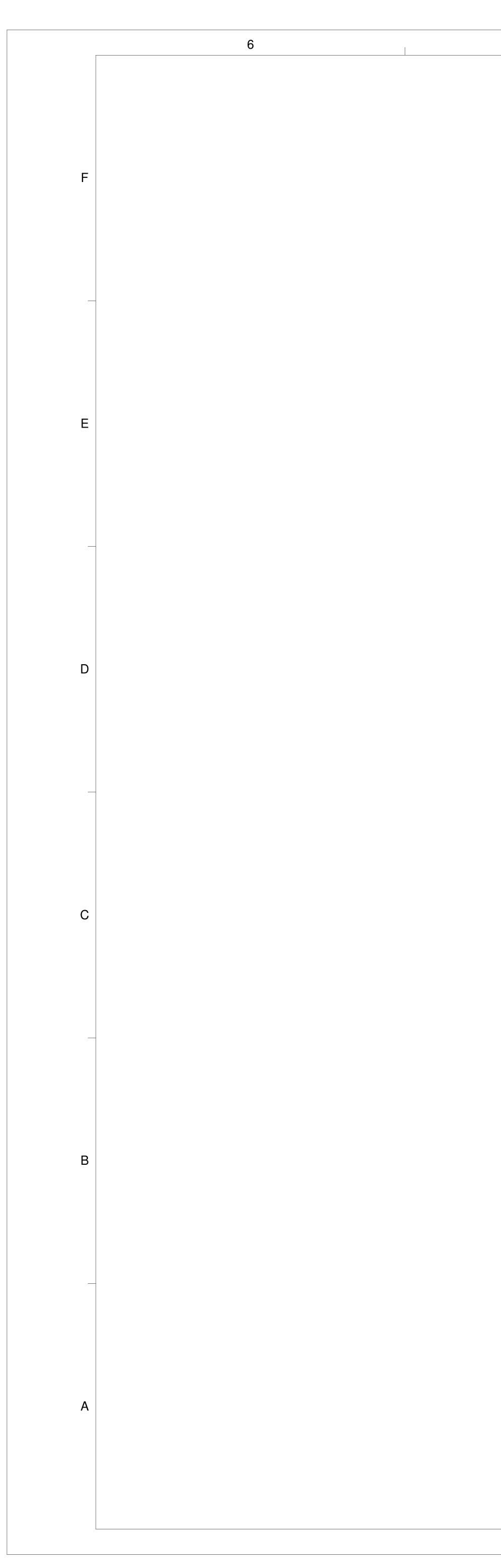
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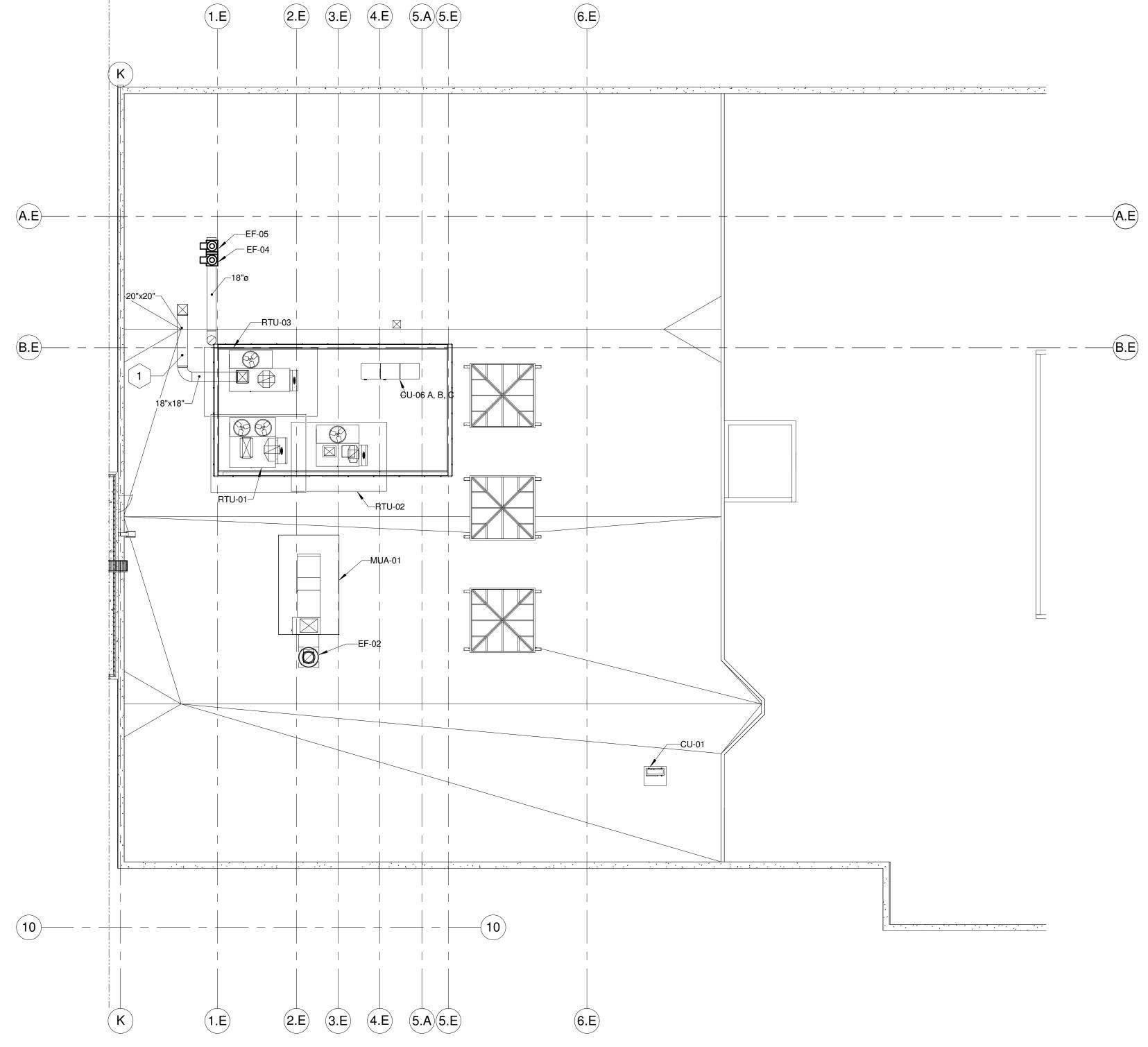
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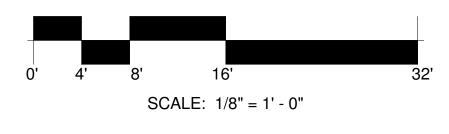






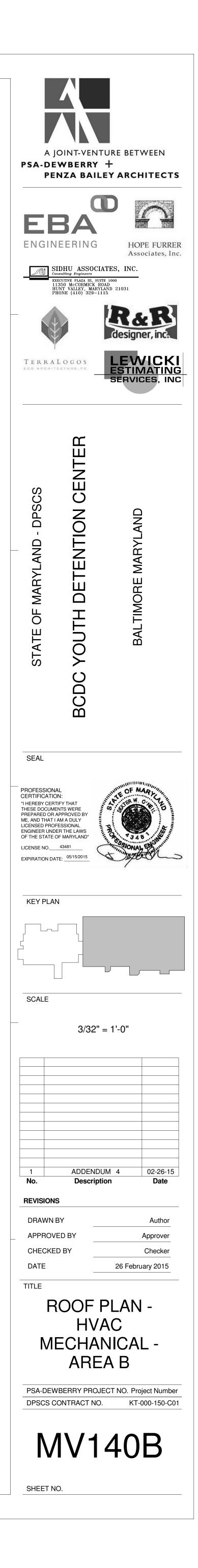


I



SHEET NOTES

1 PROVIDE WEATHERIZE INSULATION BOARD FOR DUCT RUNS ON ROOF. PROVIDE DUCT SUPPORT WITH A MINIMUM SPACING OF 3 FEET.



			AI	R DISTR	IBUTION DEVICE	SCHEDULE	
	CFM	FACE	NECK				
MARK	RANGE	(IN)	(IN)	TYPE	MANU./MODEL #	NOTES	REMARKS
CD-1	0 - 400	24 x 24	8"	SUPPLY	TITUS/ SG-TDC	CEILING MOUNTED SECURITY SUPPLY DIFFUSER	1, 2 AND 5
CD-2	0 - 100	12 x 12	4"	SUPPLY	TITUS/ SG-TDC	CEILING MOUNTED SECURITY SUPPLY DIFFUSER	1, 2 AND 5
CD-3	0 - 100	8 x 8	6"	SUPPLY	TITUS/ SG-PR	SIDEWALL MOUNTED SECURITY SUPPLY GRILL	2 AND 5
CD-4	0 - 600	22"	12"	SUPPLY	TITUS/ TMR	CEILING MOUNTED SUPPLY DIFFUSER	2, 5 AND 6
CD-5	0 - 1200	14 x 14	VARY	SUPPLY	TITUS/ SG-3300RL	SIDEWALL MOUNTED SECURITY SUPPLY GRILL	2 AND 5
RG-1	0 - 800	24 x 24	VARY	RETURN	TITUS/ SG-LFF	CEILING MOUNTED SECURITY SUPPLY DIFFUSER	2
RG-2	0 - 400	12 x12	VARY	RETURN	TITUS/ SG-LFF	CEILING MOUNTED SECURITY SUPPLY DIFFUSER	2
RG-3	0 - 52000	62 x 38	60 x 36	RETURN	TITUS/ 300RS	SIDEWALL MOUNTED SECURITY SUPPLY DIFFUSER	2
SD-1	0 - 1200	16 x12	14 x 10	RETURN	TITUS/ SG-LFF	SIDEWALL MOUNTED SECURITY SUPPLY GRILL	2
EG-1	0 - 100	12 x12	4"	EXHAUST	TITUS/ SG-PS	CEILING MOUNTED SECURITYEXHAUST GRILLE	4
EG-2	0 - 600	12 x12	10 x 10	EXHAUST	TITUS/ SG-LFF	SIDEWALL MOUNTED SECURITY SUPPLY GRILL	3
NOTE:							

 2. ALL AIR DEVICES SHALL BE SECURED WITH TAMPER PROOF SCREWS.
 3. PROVIDE GRILLE WITH 3/4" STEEL ANCHOR BARS. POSITION 3" FROM BACK OF FACE OF PLATE.
 4. PROVIDE GRILLE WITH 10 GAUGE x #2 MESH WIRE, WITH 3/16" STEEL PLATE WITH 2" SQUARE HOLES, 1" FRET BARS AND 1" BORDERS.

AIR DEVICES SHALL BE SELECTED WITH A MAXIMUM NC RATING OF 30.
 PROVIDE WITH RADIAL SLIDING BLADE DAMPER.

					CO	NDENSING	UNIT (CU) SCHEDU	LE					ELECTR	ICAL UNIT HEA	TERS SCHEE	DULE			
	UNIT	EL	ECTRICAL DA	ΓA	MIN CIR	MAX OVER						HEATING			ELECTRIC	CAL DATA			
UNIT#	SERVED	V	PH	HZ	AMP	CURRENT	COOLING CAPACITY (MBH)	MAKE/MODEL	REMARKS			CAPACITY(							
CU-01	AHU1	208	1	60	8.75	15	12	DAIKIN RZQ12PVJU OR APPROVED EQUAL	SEE NOTE 1	UNIT NO	LOCATION	KW)	CFM	V	PH	HZ	FLA	MAKE/MODEL	REMARKS
CU-02	AHU-2	208	1	60	17.5	15	24	DAIKIN RZQ24PVJU OR APPROVED EQUAL	SEE NOTE 1	EUH -02	BASEMENT AREA A	5	350	480	3	60	6	QMARK MUH541	SEE NOTE 1
CU-03	AHU-3	208	1	60	13	15	18	DAIKIN RZQ18PVJU OR APPROVED EQUAL	SEE NOTE 1	EUH - 01	BASEMENT AREA A	5	350	480	3	60	6	QMARK MUH541	SEE NOTE 1
CU-04 A, B, C		460	2	60	43, 43, 43	50, 50, 50	307	DAIKIN-REYQ(160-240 MBH) VRV-IV-HEAT	SEE NOTE 1	EUH-03	FIRST FLOOR MECHANICAL RM	3	350	480	3	60	3.6	QMARK MUH341	SEE NOTE 1
СО-04 А, В, С	AU0-4	400	5	00	43, 43, 43	50, 50, 50	307	RECOVERY-COMBO OR APPROVED EQUAL	SEENOTET	EUH-04	FIRST FLOOR ELECTRICAL RM	3	350	480	3	60	3.6	QMARK MUH341	SEE NOTE 1
CU-05 A, B, C	VRV SYS.	460	3	60	43, 43, 43	50, 50, 50	334	DAIKIN-REYQ(160-240 MBH) VRV-IV-HEAT	SEE NOTE 1	EUH-05	THIRD FLOOR MECH. ROOM	5	350	480	3	60	6	QMARK MUH541	SEE NOTE 1
00 00 / 1, 2, 0					10, 10, 10			RECOVERY-COMBO OR APPROVED EQUAL		EUH-06	THIRD FLOOR MECH ROOM	5	350	480	3	60	6	QMARK MUH541	SEE NOTE 1
CU-06 A, B, C	VRV SYS.	460	3	60	43, 43, 43	50, 50, 50	192	DAIKIN-REYQ(160-240 MBH) VRV-IV-HEAT RECOVERY-COMBO OR APPROVED EQUAL	SEE NOTE 1	NOTE:									
NOTE:	1					1	1		I	1. DISCON	NECT PROVIDED BY ELECTRICAL C	ONTRACTOR.							

1. DISCONNECT PROVIDED BY ELECTRICAL CONTRACTOR.

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		E.S.P					ELECTRI	CAL DATA			
UNIT NO	CFM	INCHES W.G.	FAN RPM	TYPE	DRIVE	HP	V	PH	HZ	MAKE/MODEL	REMARKS
EF-01	2700	0.4	1770	CENTRIFUGAL	BELT	1	460	3	60	GREENHECK/AX-47-190-0428-A10 OR APROVED EQUAL	SEE NOTE 3
EF-02	4900	1.5	1929	CENTRIFUGAL	BELT	3	460	3	60	GREENHECK/18-TCF-1-I OR APROVED EQUAL	SEE NOTE 3
EF-03	110	0.1	950	CENTRIFUGAL	DIRECT	0.08	120	1	60	GREENHECK/SP-B110 OR APROVED EQUAL	SEE NOTE 1, 2
EF-04	2030	1.2	3847	CENTRIFUGAL	BELT	2	460	3	60	GREENHECK/VECTOR-H-10-9 OR APROVED EQUAL	SEE NOTE 3
EF-05	2030	1.2	3847	CENTRIFUGAL	BELT	2	460	3	60	GREENHECK/VECTOR-H-10-9 OR APROVED EQUAL	SEE NOTE 3
EF-06	1300	0.75	1200	CENTRIFUGAL	DIRECT	0.5	208	1	60	GREENHECK/G-143- VG OR APPROVED EQUAL	SEE NOTE 3
EF-07	1300	0.75	1200	CENTRIFUGAL	DIRECT	0.5	208	1	60	GREENHECK//G-143- VG OR APPROVED EQUAL	SEE NOTE 3
EF-08	465	0.1	1725	CENTRIFUGAL	DIRECT	0.1	208	1	60	GREENHECK/CBF OR APROVED EQUAL	SEE NOTE 1, 2
EF-09	465	0.1	1725	CENTRIFUGAL	DIRECT	0.1	208	1	60	GREENHECK/CBF OR APROVED EQUAL	SEE NOTE 1, 2
EF-10	150	0.1	1050	CENTRIFUGAL	DIRECT	0.17	208	1	60	GREENHECK/CSP-B OR APROVED EQUAL	SEE NOTE 1, 2
EF-11	150	0.1	1050	CENTRIFUGAL	DIRECT	0.17	208	1	60	GREENHECK/CSP-B OR APROVED EQUAL	SEE NOTE 1, 2
SF-01	2700	0.4	1725	CENTRIFUGAL	BELT	0.75	460	3	60	GREENHECK/AX-47-190-0428-A10 OR APROVED EQUAL	SEE NOTE 3
SF-02	2000	0.2	1725	CENTRIFUGAL	BELT	0.75	460	3	60	GREENHECK/RSFP OR APROVED EQUAL	SEE NOTE 3
SF-03	2000	0.2	1725	CENTRIFUGAL	BELT	0.75	460	3	60	GREENHECK/RSFP OR APROVED EQUAL	SEE NOTE 3
NOTE:											

1. DISCONNECT AND STARTER PROVIDED BY MECHANICAL CONTRACTOR. 2. ON/OFF CONTROL SHALL BE INTERCONNECTED LOCAL LIGHTING.
 3. DISCONNECT AND STARTER PROVIDED BY ELECTRICAL CONTRACTOR.

							A	IR HANDLI	NG UNI	T (AHU)	SCHEDU	JLE				
		SUPPLY AIR		HEATING	COOLIN	IG DATA		SU	IPPLY FAN		ELE	ECTRICAL D	ATA			
UNIT NO	SA CFM	RA CFM	OA CFM	TOTAL MBH	TOTAL COOLING CAPACITY (MBH)	EAT DB/WB.	LAT DB/WB.	EXT.SP (IN WG)	FAN RPM	MCA	V	HZ	PH	AREA SERVED	MAKE/MODEL	REMARKS
AHU-01	600	600	0	21	18	72/68	56/67	0.2	850	0.4	208	60	1	SECOND FLOOR	DAIKIN-FCQ30PAVJU	SEE NOTE 1
AHU-02	750	670	80	24	22	72/68	56/67	0.3	1030	0.5	208	60	1	SECOND FLOOR	DAIKIN-FXMQ24PVJU	SEE NOTE 1
AHU-03	400	360	40	13.5	12	72/68	56/67	0.1	950	0.5	208	60	1	THIRD FLOOR	DAIKIN-FBQ36PVJU	SEE NOTE 1
AHU-04	8090	7060	1030	240	307	82/66	56/54	1.34	1750	3	480	60	3	GYM, FITNESS RM	AAON-RN015	SEE NOTE 1
NOTE:									·		· · · · · ·		·			

1. DISCONNECT PROVIDED BY ELECTRICAL CONTRACTOR.

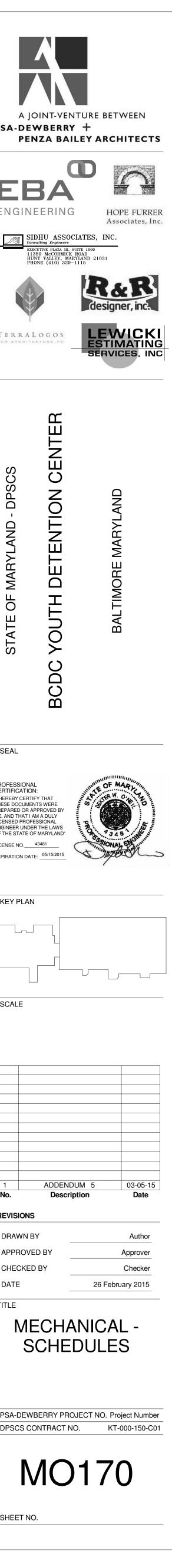
FAN COIL SCHEDULE
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				-	HEATING	DATA		COOLII	NG DATA			ELE	ECTRICAL DA			-	
					HEATING CAPACITY	LAT(F)DB/	COOLING CAPACITY	EAT(F)	LAT(F)	COOLING INPUT							
UNIT #	LOCATION	MAKE/MODEL	AREA SERVED	CFM	(BTU/H)	WB	(BTU/H)	DB/WB.	DB/WB.	POWER (KW)	V	HZ	PH	MCA	MOA		REMARKS
VRV-01	FIRST FLOOR	DAIKIN-FCQ18PAVJU	CONFERENCE ROOM 1.3	400	20000	70/60	18000	72/68	57/54	0.8	208	60	1	0.8	15	SEE NOTE 1	
VRV-02	FIRST FLOOR	DAIKIN-FXMQ36PAVJU	SECURITY SCREEN 0.6	1090	20000	70/60	18000	72/68	57/54	0.22	208	60	1	1.6	15	SEE NOTE 1	
VRV-03	FIRST FLOOR	DAIKIN-FXMQ36PAVJU	VISITATION 8.2	1200	18000	70/60	72000	72/68	57/54	0.61	208	60	1	1.6	15	SEE NOTE 1	
VRV-04	FIRST FLOOR	DAIKIN-FXMQ36PAVJU	STAFF MUSTER 7.2	1050	18000	70/60	20000	72/68	57/54	0.22	208	60	1	1.6	15	SEE NOTE 1	
VRV-05	FIRST FLOOR	DAIKIN-FXMQ24PAVJU	ADMIN. SUPPORT 1.1, 1.2, 1.3, 1.4	750	27000	70/60	24000	72/68	57/54	0.23	208	60	1	1.6	15	SEE NOTE 1	
VRV-06	FIRST FLOOR	DAIKIN-FXMQ18PAVJU	2F.5, 2F.4	490	18000	70/60	20000	72/68	57/54	0.22	208	60	1	1.6	15	SEE NOTE 1	
VRV-07	FIRST FLOOR	DAIKIN-FXMQ36PAVJU	FEMALE DAYROOM	900	18000	70/60	20000	72/68	57/54	0.22	208	60	1	1.6	15	SEE NOTE 1	
VRV-08	FIRST FLOOR	DAIKIN-FXLQ18MVJU	STAIR WELL A	490	18000	70/60	20000	72/68	57/54	0.23	208	60	1	1.6	15	SEE NOTE 1	
VRV-09	FIRST FLOOR	DAIKIN-FXMQ24PAVJU	3.2, 3.6, 3.12	675	27000	70/60	24000	72/68	57/54	0.25	208	60	1	1.8	15	SEE NOTE 1	
VRV-10	FIRST FLOOR	DAIKIN-FXMQ36PAVJU	CELLS	1000	81000	70/60	72000	72/68	57/54	0.61	208	60	1	1.6	15	SEE NOTE 1	
VRV-11	FIRST FLOOR	DAIKIN-FXZQ07M7VJU	COUNSELOR OFFICE	200	8700	70/60	7500	72/68	57/54	0.11	208	60	1	0.8	15	SEE NOTE 1	
VRV-12	FIRST FLOOR	DAIKIN-FXZQ07M7VJU	CASE MGR OFFICE	200	8700	70/60	7500	72/68	57/54	1.38	208	60	1	0.8	15	SEE NOTE 1	
VRV-13	FIRST FLOOR	DAIKIN-FXAQ18PAVJU	MECH. 11.1.6	635	2000	70/60	24000	72/68	57/54	0.23	208	60	1	1.6	15	SEE NOTE 1	
VRV-14	FIRST FLOOR	DAIKIN-FXAQ24PAVJU	SECURITY ELEC. 7.4.1	635	20000	70/60	24000	72/68	57/54	0.23	208	60	1	1.6	15	SEE NOTE 1	
VRV-15	FIRST FLOOR	DAIKIN-FXZQ07M7VJU	LT OFFICE	200	8700	70/60	7500	72/68	57/54	0.08	208	60	1	0.8	15	SEE NOTE 1	
VRV-16	FIRST FLOOR	DAIKIN-FXZQ07M7VJU	CAPT. OFFICE	200	8700	70/60	7500	72/68	57/54	0.08	208	60	1	0.8	15	SEE NOTE 1	
VRV-17	SECOND FLOOR	DAIKIN-FXMQ36PAVJU	DAYROOM 2A.3	1020	27000	70/60	24000	72/68	80/67	0.23	208	60	1	1.8	15	SEE NOTE 1	
VRV-18	SECOND FLOOR	DAIKIN-FXMQ36PAVJU	DAYROOM 2D.3	1020	27000	70/60	24000	72/68	80/67	0.23	208	60	1	1.8	15	SEE NOTE 1	
VRV-19	SECOND FLOOR	DAIKIN-FXMQ36PAVJU	DAYROOM 2B.3	1020	27000	70/60	24000	72/68	80/67	0.23	208	60	1	1.8	15	SEE NOTE 1	
VRV-20	SECOND FLOOR	DAIKIN-FXMQ36PAVJU	DAYROOM 2C.3	1020	27000	70/60	24000	72/68	80/67	0.23	208	60	1	1.8	15	SEE NOTE 1	
VRV-21	SECOND FLOOR	DAIKIN-FXDQ24PAVJU	CLASSROOM-1	600	27000	70/60	24000	72/68	80/67	0.19	208	60	1	1.4	15	SEE NOTE 1	
VRV-22	SECOND FLOOR	DAIKIN-FXDQ24PAVJU	CLASSROOM-2	600	27000	70/60	24000	72/68	80/67	0.19	208	60	1	1.4	15	SEE NOTE 1	
VRV-23	SECOND FLOOR	DAIKIN-FXDQ24PAVJU	CLASSROOM-3	600	27000	70/60	24000	72/68	80/67	0.19	208	60	1	1.4	15	SEE NOTE 1	
VRV-24	SECOND FLOOR	DAIKIN-FXDQ24PAVJU	SCIENCE LAB	600	27000	70/60	24000	72/68	80/67	0.19	208	60	1	1.4	15	SEE NOTE 1	
VRV-25	SECOND FLOOR	DAIKIN-FXDQ24PAVJU	ARTROOM	800	27000	70/60	24000	72/68	80/67	0.19	208	60	1	1.4	15	SEE NOTE 1	
VRV-26	SECOND FLOOR	DAIKIN-FXDQ24PAVJU	9.6,9.11,9.14	800	27000	70/60	24000	72/68	80/67	0.19	208	60	1	1.4	15	SEE NOTE 1	
VRV-27	SECOND FLOOR	DAIKIN-FXDQ12PAVJU	TEACHER WORK ROOM	280	13500	70/60	12000	72/68	80/67	0.09	208	60	1	0.9	15	SEE NOTE 1	
VRV-28	SECOND FLOOR	DAIKIN-FXDQ12PAVJU	TITLE, SOCIAL WORK	280	13500	70/60	12000	72/68	80/67	0.09	208	60	1	0.9	15	SEE NOTE 1	
VRV-29	SECOND FLOOR	DAIKIN-FXDQ36PAVJU	MEDIA CENTER	1200	40000	70/60	36000	72/68	80/67	0.38	208	60	1	2.9	15	SEE NOTE 1	
VRV-30	SECOND FLOOR	DAIKIN-FXDQ24PAVJU	CLASSROOM-4	600	27000	70/60	24000	72/68	80/67	0.23	208	60	1	1.8	15	SEE NOTE 1	
VRV-31	SECOND FLOOR	DAIKIN-FXDQ18PAVJU	9.12	600	27000	70/60	24000	72/68	80/67	0.23	208	60	1	1.8	15	SEE NOTE 1	
VRV-32	SECOND FLOOR	DAIKIN-FXDQ24PAVJU	CLASSROOM-4	600	27000	70/60	24000	72/68	80/67	0.23	208	60	1	1.8	15	SEE NOTE 1	
VRV-33	SECOND FLOOR	DAIKIN-FXDQ24PAVJU	CLASSROOM-5	600	27000	70/60	24000	72/68	80/67	0.23	208	60	1	1.8	15	SEE NOTE 1	
VRV-34	SECOND FLOOR	DAIKIN-FXDQ24PAVJU	CLASSROOM-6	600	27000	70/60	24000	72/68	80/67	0.23	208	60	1	1.8	15	SEE NOTE 1	
VRV-36	THIRD FLOOR	DAIKIN-FXMQ36PAVJU	CELLS	1200	40000	70/60	36000	72/68	57/54	0.38	208	60	1	2.9	15	SEE NOTE 1	
VRV-37	THIRD FLOOR	DAIKIN-FXMQ36PAVJU	CELLS	1200	40000	70/60	36000	72/68	57/54	0.38	208	60	1	2.9	15	SEE NOTE 1	
VRV-38	THIRD FLOOR	DAIKIN-FXMQ48PAVJU	CELLS	1300	54000	70/60	48000	72/68	57/54	0.46	208	60	1	3.4	15	SEE NOTE 1	
VRV-39	THIRD FLOOR	DAIKIN-FXMQ48PAVJU	CELLS	1300	54000	70/60	48000	72/68	57/54	0.46	208	60	1	3.4	15	SEE NOTE 1	
VRV-40	SECOND FLR, AREA A	DAIKIN-FXAQ24PAVJU	SEC. ELEC. 7.4.2	638	0	70/60	24000	72/68	57/54	0.23	208	60	1	1.6	15	SEE NOTE 1	
VRV-41	SECOND FLR, AREA A	DAIKIN-FXAQ24PAVJU	STOR/CU. 2.7	638	0	70/60	24000	72/68	57/54	0.23	208	60	1	1.8	15	SEE NOTE 1	
VRV-42	THIRD FLOOR	DAIKIN-FXLQ18MVJU	STAIRWELL B	490	18000	70/60	24000	72/68	57/54	0.11	208	60	1	1.6	15	SEE NOTE 1	
VRV-43	BASEMENT AREA B	DAIKIN-FXAQ24PAVJU	MDF ROOM, 11.0.3	635	0	70/60	24000	72/68	57/54	0.05	208	60	1	0.6	15	SEE NOTE 1	
VRV-44	SECOND FLOOR, AREA B	DAIKIN-FXAQ24PAVJU	I.T. CLOS. 11.2.17	635	0	70/60	24000	72/68	57/54	0.05	208	60	1	0.6	15	SEE NOTE 1	
VRV-45	SECOND FLOOR, AREA B	DAIKIN-FXAQ24PAVJU	ELEC. 11.2.18	635	24000	70/60	26500	72/68	57/54	0.05	208	60	1	0.6	15	SEE NOTE 1	
VRV-46	BASEMENT AREA B	DAIKIN-FXAQ24PAVJU	EMERGENCY ELECTRIC ROOM	635	24000	70/60	26500	72/68	57/54	0.05	208	60	1	0.6	15	SEE NOTE 1	
NOTE:																	

1. DISCONNECT PROVIDED BY ELECTRICAL CONTRACTOR. 2. VRV-35 USED.

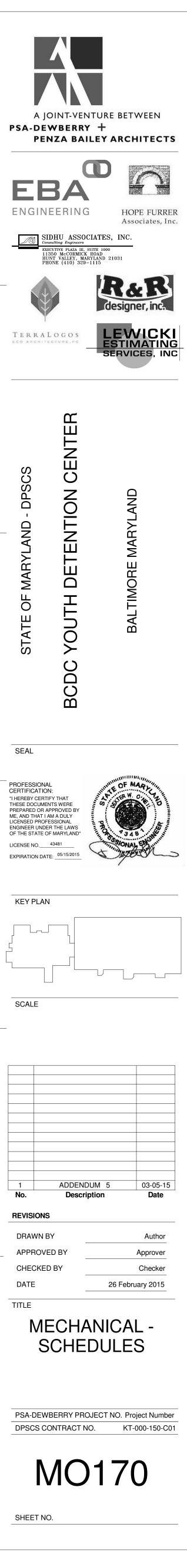
## EXHAUST/SUPPLY AIR FANS (EF/SF) SCHEDULE

## E (VRV)



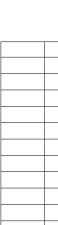


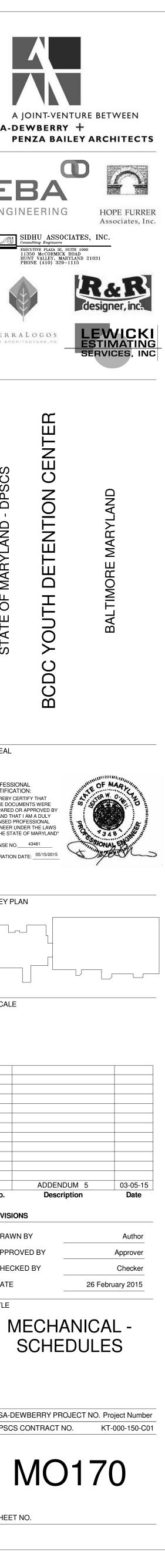
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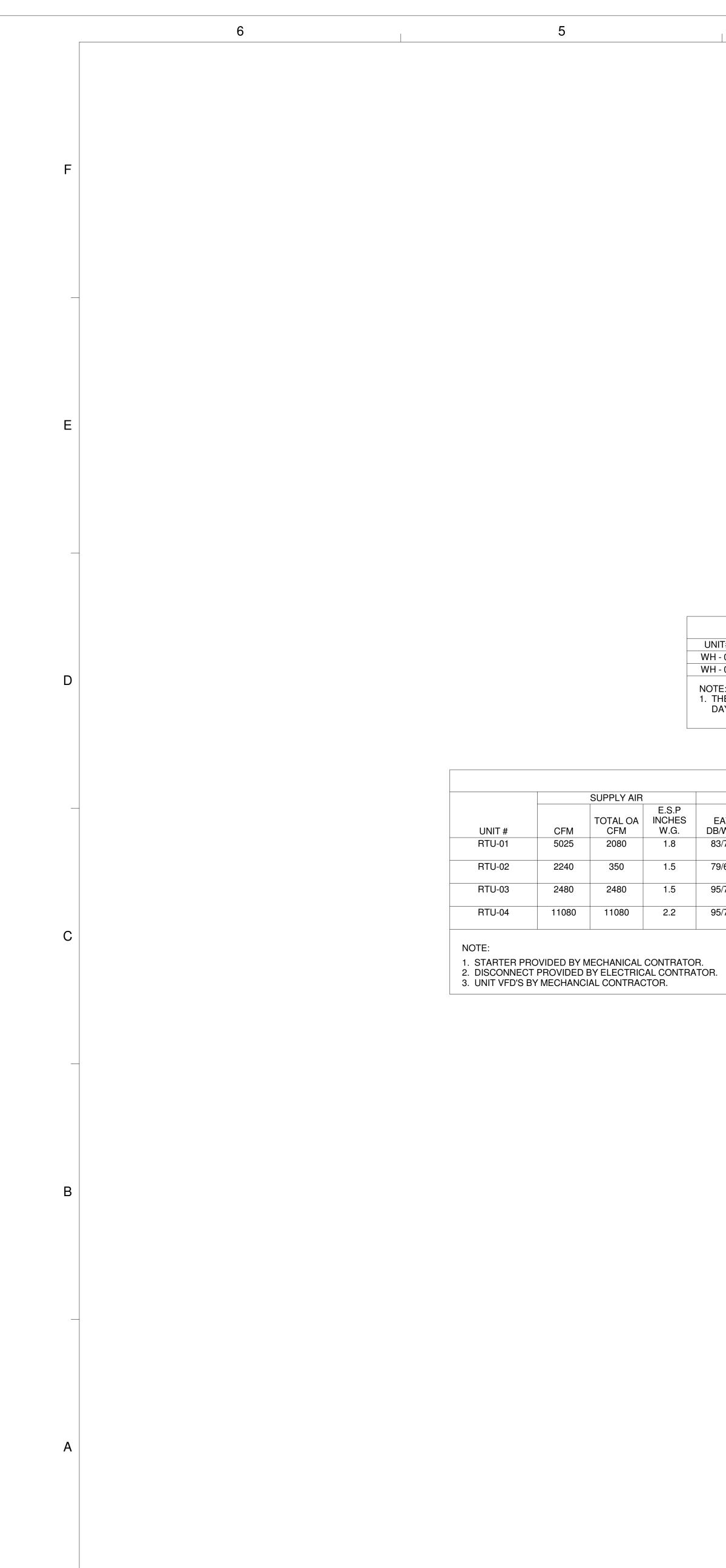




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	LICENSE NO
	EXPIRATION D







AREA SERVED CAPACI UNIT# EIH-01 VEHICLE SALLY EIH-02 VEHICLE SALLY

								MAK	E UP AIF	R UNIT (M	AU) SCH	IEDULE			
					EL	ECTRICAL DA	ТА			HEAT	ING				
	TOTAL SUPPLY AIR	EXT SP (IN.	TOTAL SP						OUTDOOR			OUTPUT	UNIT		
UNIT NO	CFM	WG)	(IN. WG)	FLA	HP	V	PH	HZ	AIR (F)	LEAVING AIR	INPUT (MBH)	(MBH)	WEIGHT(IBS)	MAKE/MODEL	NOTES
MUA-01	4900	0.4	0.6	4.8	3	460	3	60	13	65	300	280	0	IGX-112-H22 (BASIC OF DESIGN)	

UNIT GV-GV

			AIF	R DIFFUSING	UNIT (ADU)	SCHEDU	ILE			
					ELECTR	ICAL DAT	ΓA			
UNIT#	LOCATION	CFM	WEIGHT(lb)	WATTS	AMPS	V	PH	HZ	MAKE/MODEL	REMARKS
ADU-01	GYMNASIUM	547	9	35	0.32	120	1	60	AIRIUS A25SPSTD120W OR APPROVED EQUAL	
ADU-02	GYMNASIUM	547	9	35	0.32	120	1	60	AIRIUS A25SPSTD120W OR APPROVED EQUAL	
ADU-03	GYMNASIUM	547	9	35	0.32	120	1	60	AIRIUS A25SPSTD120W OR APPROVED EQUAL	
ADU-04	GYMNASIUM	547	9	35	0.32	120	1	60	AIRIUS A25SPSTD120W OR APPROVED EQUAL	

					ELECT	RICAL WALI	L UNIT HEAT	ER			
UNIT#	AREA SERVED	HEATING CAPACITY (KW)	CFM	V	PH	HZ	AMPS	DEPTH	HEIGHT	WIDTH	MAKE/MODEL
WH - 01	CORR. 11.1.5	1.5	100	120	1	60	15	4-1/2	19-3/8	16-1/4	QMARK MODEL CWH3150F OR APPROVED EQUAL
WH - 02	SALLY 11.2.16	1.5	100	120	1	60	15	4-1/2	19-3/8	16-1/4	QMARK MODEL CWH3150F OR APPROVED EQUAL
		RECESSED TYPE. THERMOS OR APPROVED EQUAL.	TAT SHALL	_ BE INTERN	ALLY MOUN	TED. PROVI	DE SECURIT	TY COVER FO	OR EACH WA	LL HEATER	R. USE

## ROOF TOP UNIT (RTU) SCHEDULE

SUPPLY AIR		(	COOLING COI	L		HEA	TING			ELE	ECTRICAL D	DATA			
TOTAL OA CFM	E.S.P INCHES W.G.	EAT DB/WB.	LAT DB/WB.	TOTAL MBH	EAT DB/WB	LAT DB/WB	MBH IN	MBH OUT	V	РН	HZ	MCA	MOA	MAKE/MODEL	REMARKS
2080	1.8	83/71	65/63	132	45	95	275	220	460	3	60	39	50	AAON/RN-013-3-0-E-AC-GAS-ECONOMIZER OR APPROVED EQUAL	SERVING MEDICAL AREA. SEE NOTE 1 AND 2.
350	1.5	79/69	63/62	56	60	95	106	85	460	3	60	29	35	AAON/RN-090-3-0-E-AC-GAS-ECONOMIZER OR APPROVED EQUAL	SERVING KITCHEN AREA. SEE NOTE 1 AND 2.
2480	1.5	95/75	70/68	214	10	70	157	126	460	3	60	29	35	AAON/RN-018-3-0-E-AC-GAS-ECONOMIZER OR APPROVED EQUAL	DOAS, SERVING SECOND FLOOR CLASS ROOM AREA B. SEE NOTE 1AND 2
11080	2.2	95/75	70/68	428	10	70	810	648	460	3	60	111	125	AAON/RN-040-3-0-E-AC-GAS-ECONOMIZER OR APPROVED EQUAL	DOAS, SERVING FIRST, SECOND, AND THIRD FLOOR AREA A. SEE NOTE 1 AND 2

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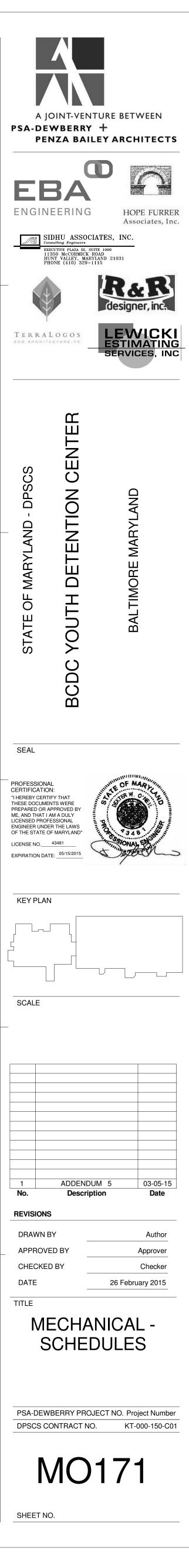
ELECTRICAL INFRARED HEATER SCHEDULE									
HEATING			ELECTRI	CAL DATA					
CAPACITY( kW)	CFM	V	PH	HZ	HP	MAKE/MODEL			
6	0	480	3	60	0	INFRATECH COMFORT MODEL# WD 6024SS OR APPROVED EQUAL			
6	0	480	3	60	0	INFRATECH COMFORT MODEL# WD 6024SS OR APPROVED EQUAL			
		•							

GRAVITY VENTILATOR										
NIT NO	LOCATION	TYPE	DEPTH(IN)	HEIGHT(IN)	WIDTH(IN)	MAKE/MODEL				
3V-01	THIRD FLOOR MECH ROOM	GRAVITY	12	10	10	GREENHECK				
3V-02	THIRD FLOOR MECH. ROOM	GRAVITY	12	10	10	GREENHECK				

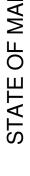
			CFM	HEATING
Mark	UNIT SIZE	MAX	MIN	CAPACITY (kW)
VAV#1-1	3	540	160	-
VAV#1-2	2	235	100	-
VAV#1-3	2	330	330	1.5
VAV#1-4	2	430	430	2
VAV#1-5	2	460	140	1
VAV#1-6	2	500	500	1
VAV#1-7	2	200	100	-
VAV#1-8	5	720	270	-
VAV#1-9	2	280	100	-
VAV#1-10	3	520	160	-
VAV#1-11	3	810	180	-
VAV#2-1	2	300	100	-
VAV#2-2	5	900	270	-
VAV#2-3	5	1020	300	-

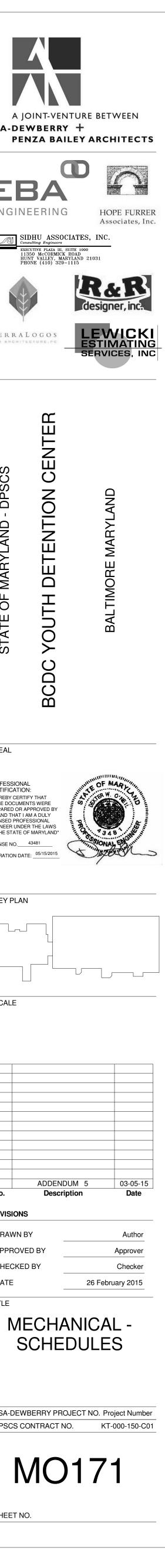
VARIABLE AIR VOLUME BOX (VAV) SCHEDULE

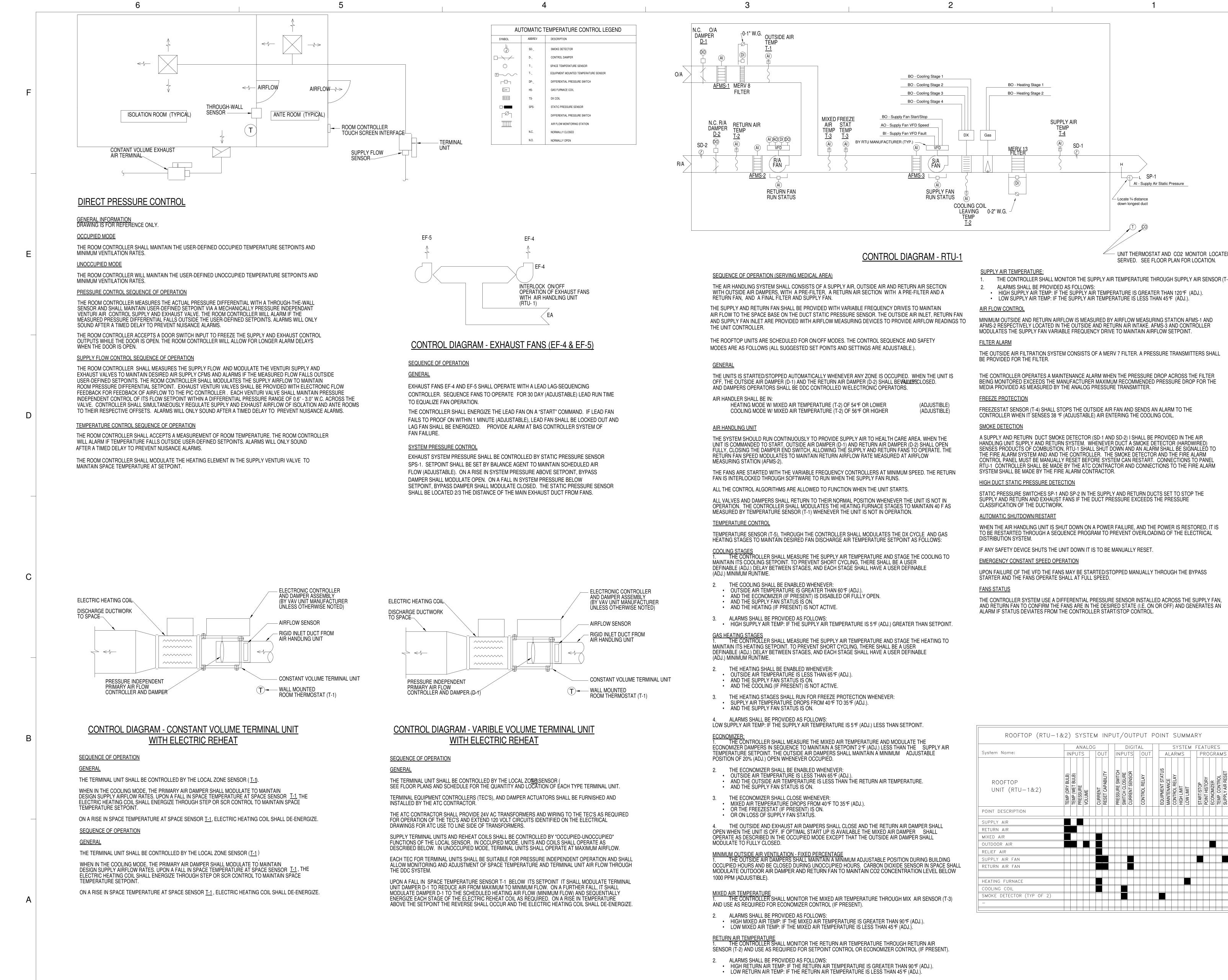
1. FOR LEFT HAND OR RIGHT HAND ORIENTATION OF VAV CONTROL PANEL SEE FLOOR PLANS.











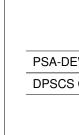


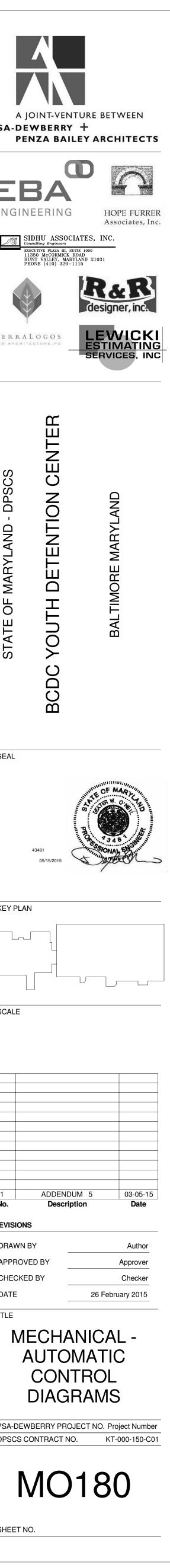


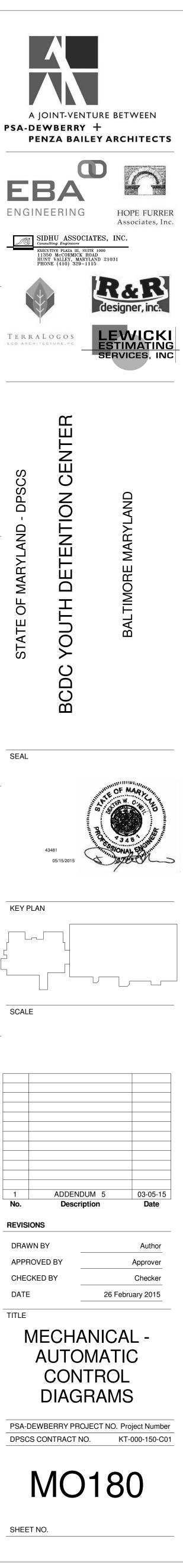


## UNIT THERMOSTAT AND CO2 MONITOR LOCATED IN AREA

1. THE CONTROLLER SHALL MONITOR THE SUPPLY AIR TEMPERATURE THROUGH SUPPLY AIR SENSOR (T-5).

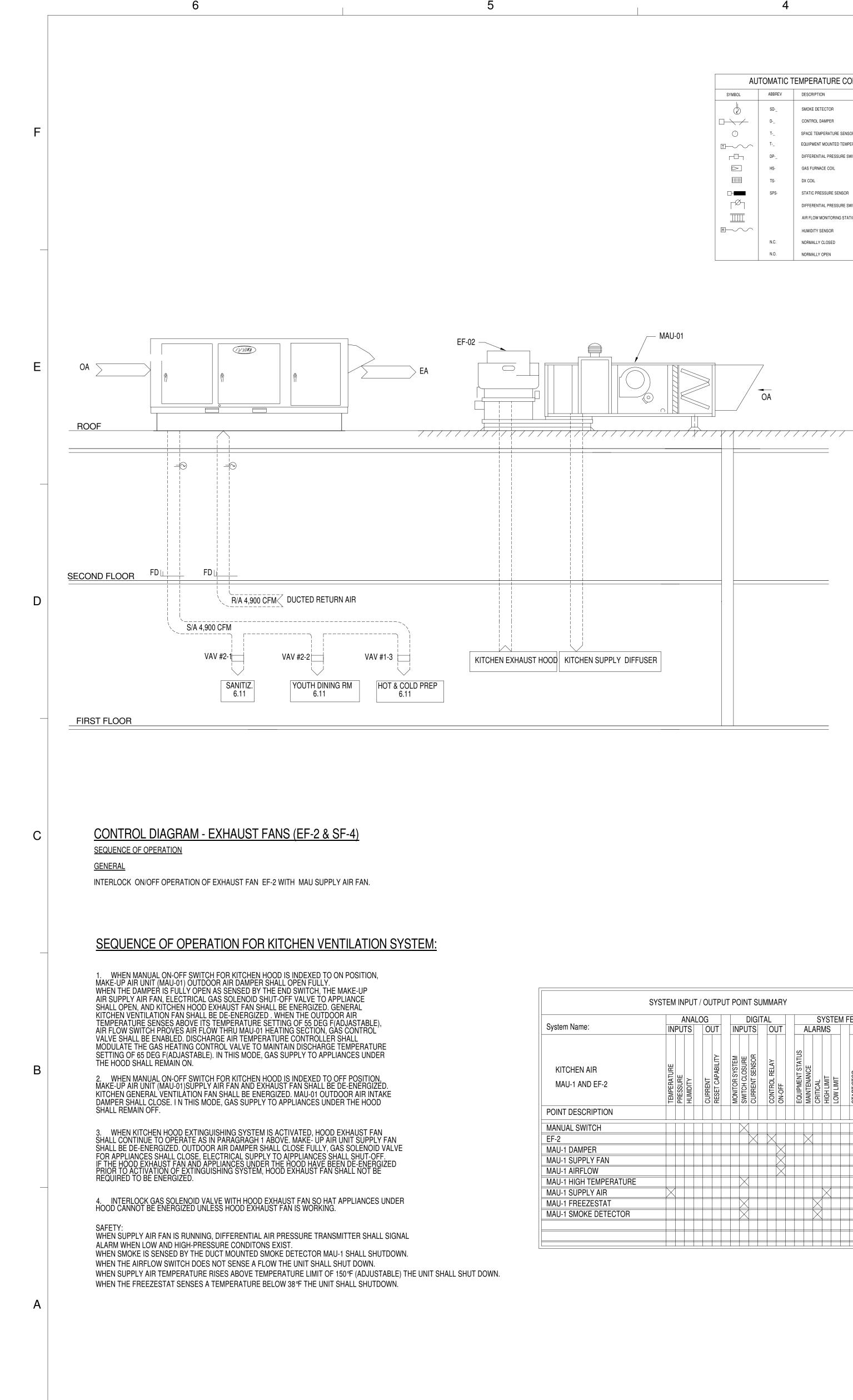


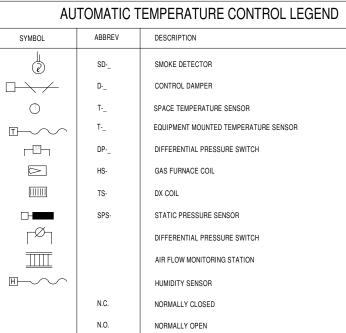




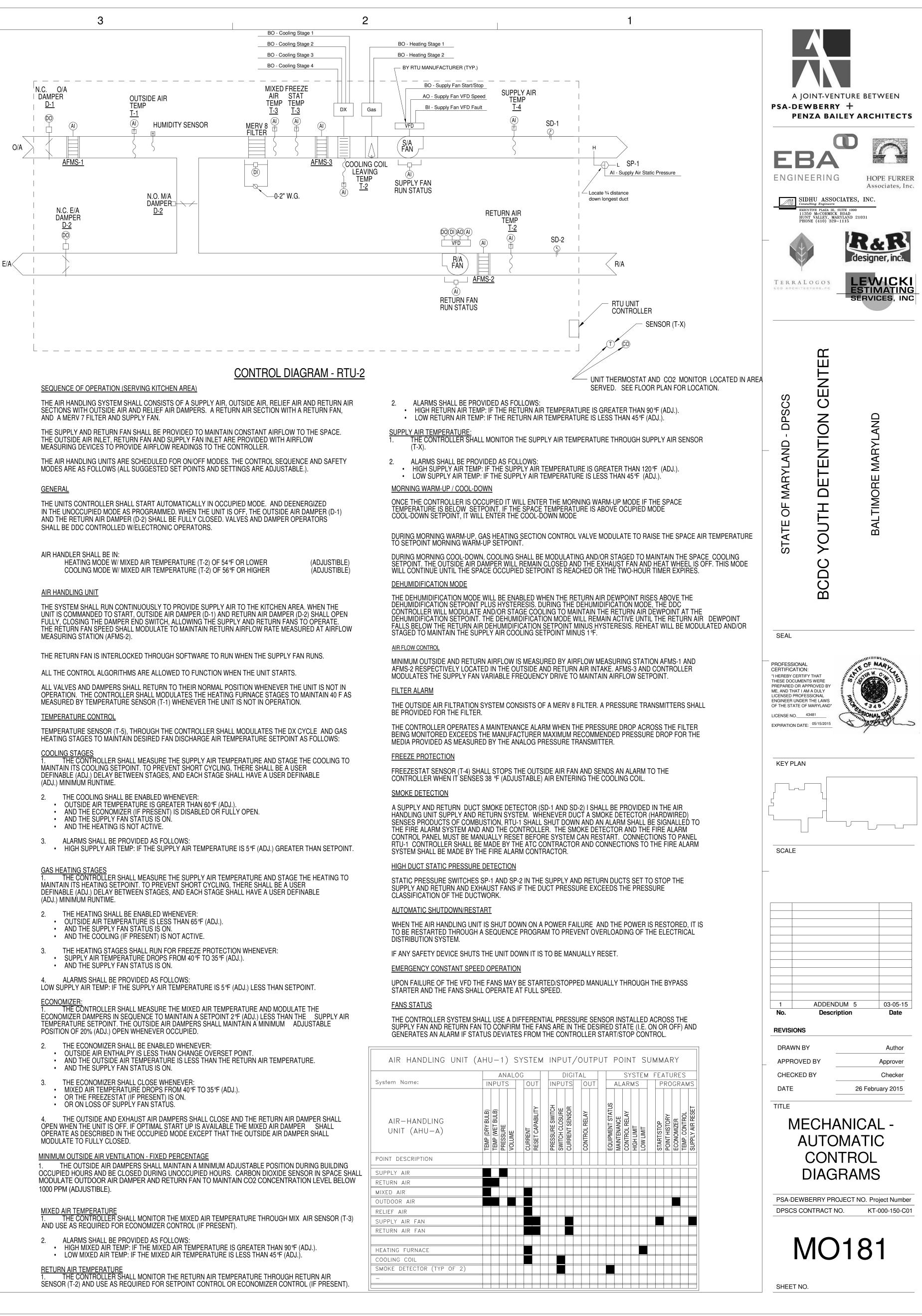


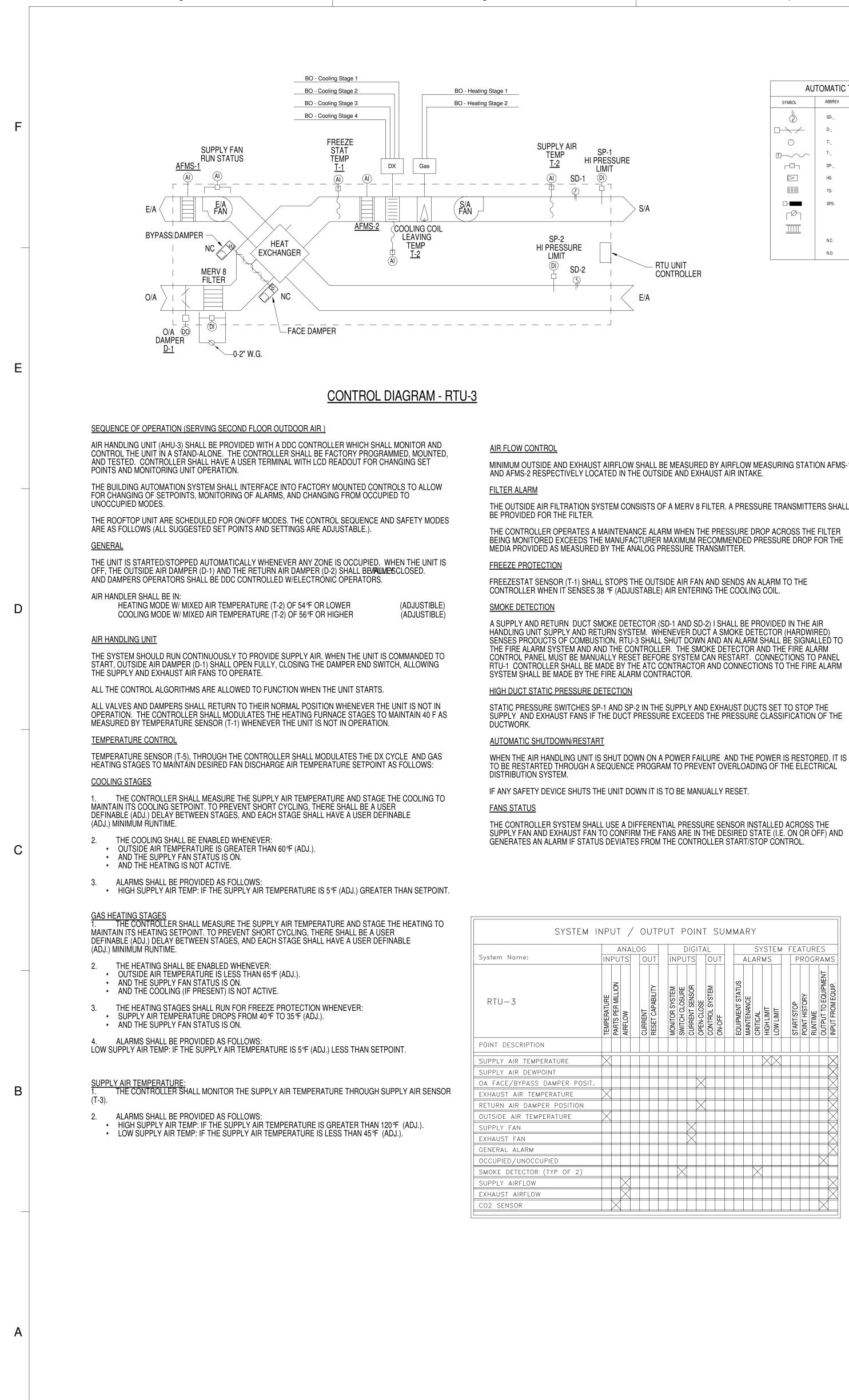
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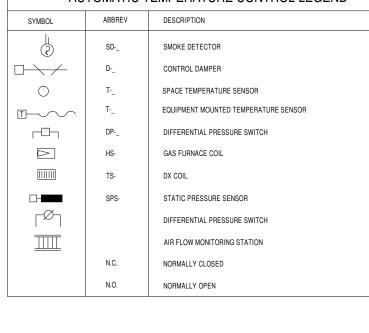
	ANALOG					DIGITAL							SYSTEM FEATURES									
System Name:	IN	INPUTS OUT			INPUTS OUT						ALA	٩RM	ИS		PROGRAMS							
KITCHEN AIR MAU-1 AND EF-2	TEMPERATURE	PRESSURE	HUMIDITY		RESET CAPABILITY	MONITOR SYSTEM	SWITCH CLOSURE	CURRENT SENSOR	CONTROL RELAY	ON-OFF		EQUIPMENT STATUS	MAINTENANCE	CRITICAL	HIGH LIMIT	LOW LIMIT	START/STOP	POINT HISTORY	RUNTIME	TEMP. CONTROL	SLIPPLY AIR RESET	
POINT DESCRIPTION																						
MANUAL SWITCH							$\bowtie$															
EF-2								X					Х									
MAU-1 DAMPER										$\boxtimes$												
MAU-1 SUPPLY FAN										$\boxtimes$												
MAU-1 AIRFLOW										$\boxtimes$												
MAU-1 HIGH TEMPERATURE							$\boxtimes$															
MAU-1 SUPPLY AIR															$\times$							
MAU-1 FREEZESTAT							$\square$							X								
MAU-1 SMOKE DETECTOR							$\mathbf{X}$							X								

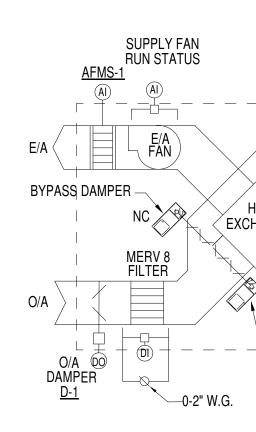




3







SEQUENCE OF OPERATION (SERVING SECOND FLOOR OUTDOOR AIR

POINTS AND MONITORING UNIT OPERATION.

UNOCCUPIED MODES.

AIR HANDLER SHALL BE IN:

THE SUPPLY AND EXHAUST AIR FANS TO OPERATE

THE COOLING SHALL BE ENABLED WHENEVER:

THE HEATING SHALL BE ENABLED WHENEVER:

AND THE COOLING (IF PRESENT) IS NOT ACTIVE

ALARMS SHALL BE PROVIDED AS FOLLOWS:

ALARMS SHALL BE PROVIDED AS FOLLOWS:

AND THE SUPPLY FAN STATUS IS ON.

• AND THE SUPPLY FAN STATUS IS ON.

• OUTSIDE AIR TEMPERATURE IS LESS THAN 65 °F (ADJ.).

AND THE SUPPLY FAN STATUS IS ON.

3. ALARMS SHALL BE PROVIDED AS FOLLOWS:

AND THE HEATING IS NOT ACTIVE.

OUTSIDE AIR TEMPERATURE IS GREATER THAN 60°F (ADJ.).

<u>AIR HANDLING UNIT</u>

TEMPERATURE CONTROL

(ADJ.) MINIMUM RUNTIME.

(ADJ.) MINIMUM KUNTIME.

COOLING STAGES

<u>GENERAL</u>

ROOF TOP UNIT (RTU-4) SHALL BE PROVIDED WITH A DDC CONTROLLER WHICH SHALL MONITOR AND

AND TESTED. CONTROLLER SHALL HAVE A USER TERMINAL WITH LCD READOUT FOR CHANGING SET

FOR CHANGING OF SETPOINTS, MONITORING OF ALARMS, AND CHANGING FROM OCCUPIED TO

ARE AS FOLLOWS (ALL SUGGESTED SET POINTS AND SETTINGS ARE ADJUSTABLE.).

AND DAMPERS OPERATORS SHALL BE DDC CONTROLLED W/ELECTRONIC OPERATORS.

HEATING MODE W/ MIXED AIR TEMPERATURE (T-2) OF 54 °F OR LOWER

COOLING MODE W/ MIXED AIR TEMPERATURE (T-2) OF 56°F OR HIGHER

ALL THE CONTROL ALGORITHMS ARE ALLOWED TO FUNCTION WHEN THE UNIT STARTS.

MEASURED BY TEMPERATURE SENSOR (T-1) WHENEVER THE UNIT IS NOT IN OPERATION.

MAINTAIN ITS COOLING SETPOINT. TO PREVENT SHORT CYCLING, THERE SHALL BE A USER

MAINTAIN ITS HEATING SETPOINT. TO PREVENT SHORT CYCLING, THERE SHALL BE A USER

THE HEATING STAGES SHALL RUN FOR FREEZE PROTECTION WHENEVER: • SUPPLY AIR TEMPERATURE DROPS FROM 40 °F TO 35 °F (ADJ.).

LOW SUPPLY AIR TEMP: IF THE SUPPLY AIR TEMPERATURE IS 5°F (ADJ.) LESS THAN SETPOINT.

THE CONTROLLER SHALL MONITOR THE SUPPLY AIR TEMPERATURE THROUGH SUPPLY AIR SENSOR

• HIGH SUPPLY AIR TEMP: IF THE SUPPLY AIR TEMPERATURE IS GREATER THAN 120°F (ADJ.).

LOW SUPPLY AIR TEMP: IF THE SUPPLY AIR TEMPERATURE IS LESS THAN 45 °F (ADJ.).

DEFINABLE (ADJ.) DELAY BETWEEN STAGES, AND EACH STAGE SHALL HAVE A USER DEFINABLE

DEFINABLE (ADJ.) DELAY BETWEEN STAGES, AND EACH STAGE SHALL HAVE A USER DEFINABLE

CONTROL THE UNIT IN A STAND-ALONE. THE CONTROLLER SHALL BE FACTORY PROGRAMMED, MOUNTED,

THE BUILDING AUTOMATION SYSTEM SHALL INTERFACE INTO FACTORY MOUNTED CONTROLS TO ALLOW

THE ROOFTOP UNIT ARE SCHEDULED FOR ON/OFF MODES. THE CONTROL SEQUENCE AND SAFETY MODES

THE UNIT IS STARTED/STOPPED AUTOMATICALLY WHENEVER ANY ZONE IS OCCUPIED. WHEN THE UNIT IS

THE SYSTEM SHOULD RUN CONTINUOUSLY TO PROVIDE SUPPLY AIR. WHEN THE UNIT IS COMMANDED TO

ALL VALVES AND DAMPERS SHALL RETURN TO THEIR NORMAL POSITION WHENEVER THE UNIT IS NOT IN OPERATION. THE CONTROLLER SHALL MODULATES THE HEATING FURNACE STAGES TO MAINTAIN 40 F AS

TEMPERATURE SENSOR (T-5), THROUGH THE CONTROLLER SHALL MODULATES THE DX CYCLE AND GAS

THE CONTROLLER SHALL MEASURE THE SUPPLY AIR TEMPERATURE AND STAGE THE COOLING TO

• HIGH SUPPLY AIR TEMP: IF THE SUPPLY AIR TEMPERATURE IS 5 °F (ADJ.) GREATER THAN SETPOINT.

GAS HEATING STAGES 1. THE CONTROLLER SHALL MEASURE THE SUPPLY AIR TEMPERATURE AND STAGE THE HEATING TO

HEATING STAGES TO MAINTAIN DESIRED FAN DISCHARGE AIR TEMPERATURE SETPOINT AS FOLLOWS:

START, OUTSIDE AIR DAMPER (D-1) SHALL OPEN FULLY, CLOSING THE DAMPER END SWITCH, ALLOWING

OFF. THE OUTSIDE AIR DAMPER (D-1) AND THE RETURN AIR DAMPER (D-2) SHALL BEVAULVESCLOSED.

MINIMUM OUTSIDE AND EXHAUST AIRFLOW SHALL BE MEASURED BY AIRFLOW MEASURING STATION AFMS-1

AND AFMS-2 RESPECTIVELY LOCATED IN THE OUTSIDE AND EXHAUST AIR INTAKE.

THE OUTSIDE AIR FILTRATION SYSTEM CONSISTS OF A MERV 8 FILTER. A PRESSURE TRANSMITTERS SHALL

THE CONTROLLER OPERATES A MAINTENANCE ALARM WHEN THE PRESSURE DROP ACROSS THE FILTER BEING MONITORED EXCEEDS THE MANUFACTURER MAXIMUM RECOMMENDED PRESSURE DROP FOR THE MEDIA PROVIDED AS MEASURED BY THE ANALOG PRESSURE TRANSMITTER.

SYSTEM FEATURES

PROGRAMS

ALARMS

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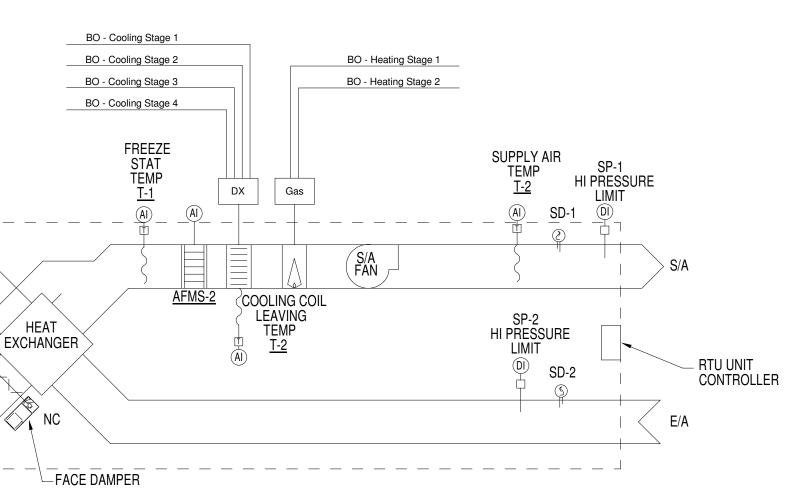
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AIR FLOW CONTROL

FREEZE PROTECTION

SMOKE DETECTION

SMOKE CONTROL

DUCTWORK.

FANS STATUS

System Name:

RTU-4

SUPPLY FAN

EXHAUST FAN

GENERAL ALARM

SUPPLY AIRFLOW EXHAUST AIRFLOW

02 SENSOR

POINT DESCRIPTION

SUPPLY AIR TEMPERATURE

EXHAUST AIR TEMPERATURE

OUTSIDE AIR TEMPERATURE

OA FACE/BYPASS DAMPER POSIT.

RETURN AIR DAMPER POSITION

SUPPLY AIR DEWPOINT

BE PROVIDED FOR THE FILTER.

FILTER ALARM

MINIMUM OUTSIDE AND EXHAUST AIRFLOW SHALL BE MEASURED BY AIRFLOW MEASURING STATION AFMS-1

THE OUTSIDE AIR FILTRATION SYSTEM CONSISTS OF A MERV 8 FILTER. A PRESSURE TRANSMITTERS SHALL

THE CONTROLLER OPERATES A MAINTENANCE ALARM WHEN THE PRESSURE DROP ACROSS THE FILTER.

BEING MONITORED EXCEEDS THE MANUFACTURER MAXIMUM RECOMMENDED PRESSURE DROP FOR THE

FREEZESTAT SENSOR (T-1) SHALL STOPS THE OUTSIDE AIR FAN AND SENDS AN ALARM TO THE

A SUPPLY AND EXHAUST DUCT SMOKE DETECTOR (SD-1 AND SD-2) SHALL BE PROVIDED IN THE AIR

HANDLING UNIT SUPPLY AND EXHAUST SYSTEM. WHENEVER DUCT A SMOKE DETECTOR (HARDWIRED)

SENSES PRODUCTS OF COMBUSTION, RTU-4 SHALL SHUT DOWN AND AN ALARM SHALL BE SIGNALED TO

THE FIRE ALARM SYSTEM AND AND THE CONTROLLER. THE SMOKE DETECTOR AND THE FIRE ALARM

CONTROL PANEL MUST BE MANUALLY RESET BEFORE SYSTEM CAN RESTART. CONNECTIONS TO PANEL

RTU-1 CONTROLLER SHALL BE MADE BY THE ATC CONTRACTOR AND CONNECTIONS TO THE FIRE ALARM

UPON ACTIVATION OF THE SMOKE CONTROL SYSTEM, RTU-4 CONTROLLER SHALL SHUT DOWN THE SUPPLY

AIR FAN. THE UNIT EXHAUST AIR FAN SHALL CONTINUE TO OPERATE UNTIL THE UNIT IS MANUALLY RESET.

STATIC PRESSURE SWITCHES SP-1 AND SP-2 IN THE SUPPLY AND EXHAUST DUCTS SET TO STOP THE

SUPPLY AND EXHAUST FANS IF THE DUCT PRESSURE EXCEEDS THE PRESSURE CLASSIFICATION OF THE

WHEN THE AIR HANDLING UNIT IS SHUT DOWN ON A POWER FAILURE AND THE POWER IS RESTORED. IT IS

TO BE RESTARTED THROUGH A SEQUENCE PROGRAM TO PREVENT OVERLOADING OF THE ELECTRICAL

THE CONTROLLER SYSTEM SHALL USE A DIFFERENTIAL PRESSURE SENSOR INSTALLED ACROSS THE

GENERATES AN ALARM IF STATUS DEVIATES FROM THE CONTROLLER START/STOP CONTROL.

SYSTEM INPUT / OUTPUT POINT SUMMARY

 OCCUPIED/UNOCCUPIED
 ISOLATION VALVE END SWITCH
 ISOLATION VALVE V-1

 ISOLATION VALVE V-1
 ISOLATION PUMP ERUP
 ISOLATION PUMP ERUP

 SMOKE DETECTOR (TYP OF 2)
 ISOLATION

ANALOG

NPUTS

SUPPLY FAN AND EXHAUST FAN TO CONFIRM THE FANS ARE IN THE DESIRED STATE (I.E. ON OR OFF) AND

DIGITAL

TOUT INPUTS OUT ALARMS

SYSTEM FEATURES

PROGRAMS

IF ANY SAFETY DEVICE SHUTS THE UNIT DOWN IT IS TO BE MANUALLY RESET.

CONTROLLER WHEN IT SENSES 38 °F (ADJUSTABLE) AIR ENTERING THE COOLING COIL.

AND AFMS-2 RESPECTIVELY LOCATED IN THE OUTSIDE AND EXHAUST AIR INTAKE.

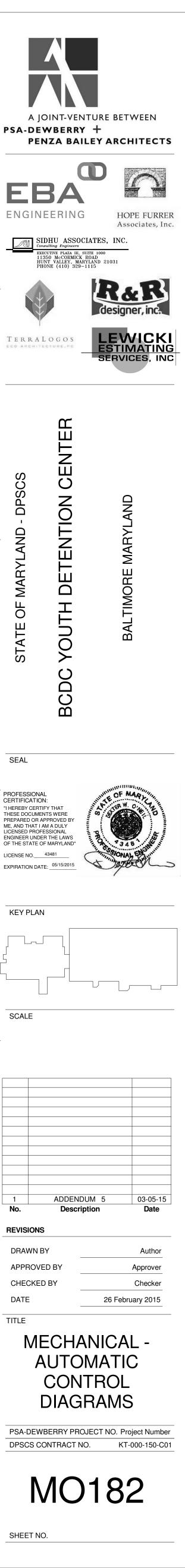
MEDIA PROVIDED AS MEASURED BY THE ANALOG PRESSURE TRANSMITTER.

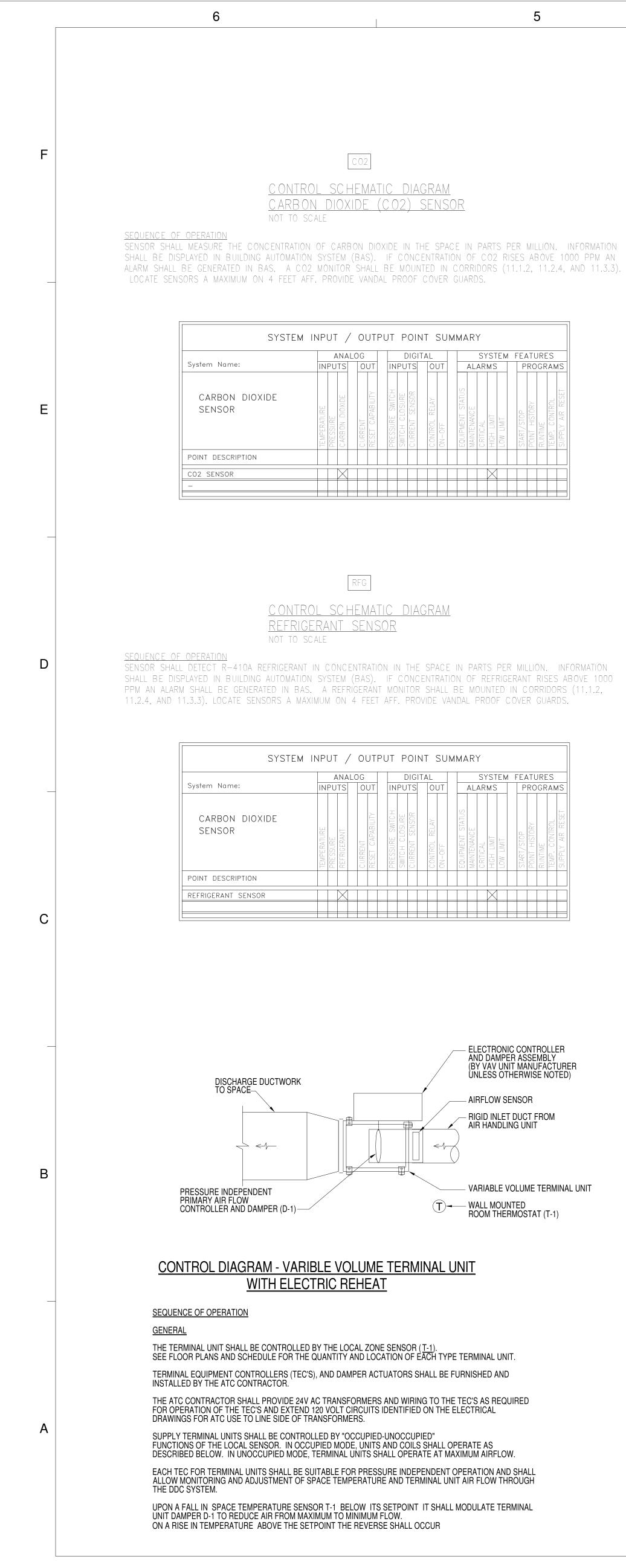
SYSTEM SHALL BE MADE BY THE FIRE ALARM CONTRACTOR.

HIGH DUCT STATIC PRESSURE DETECTION

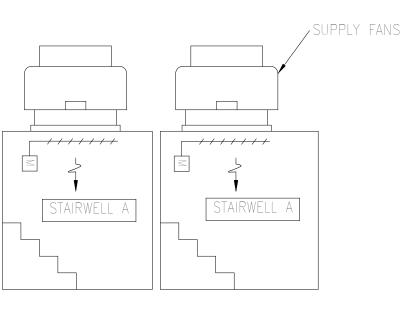
AUTOMATIC SHUTDOWN/RESTART

DISTRIBUTION SYSTEM.



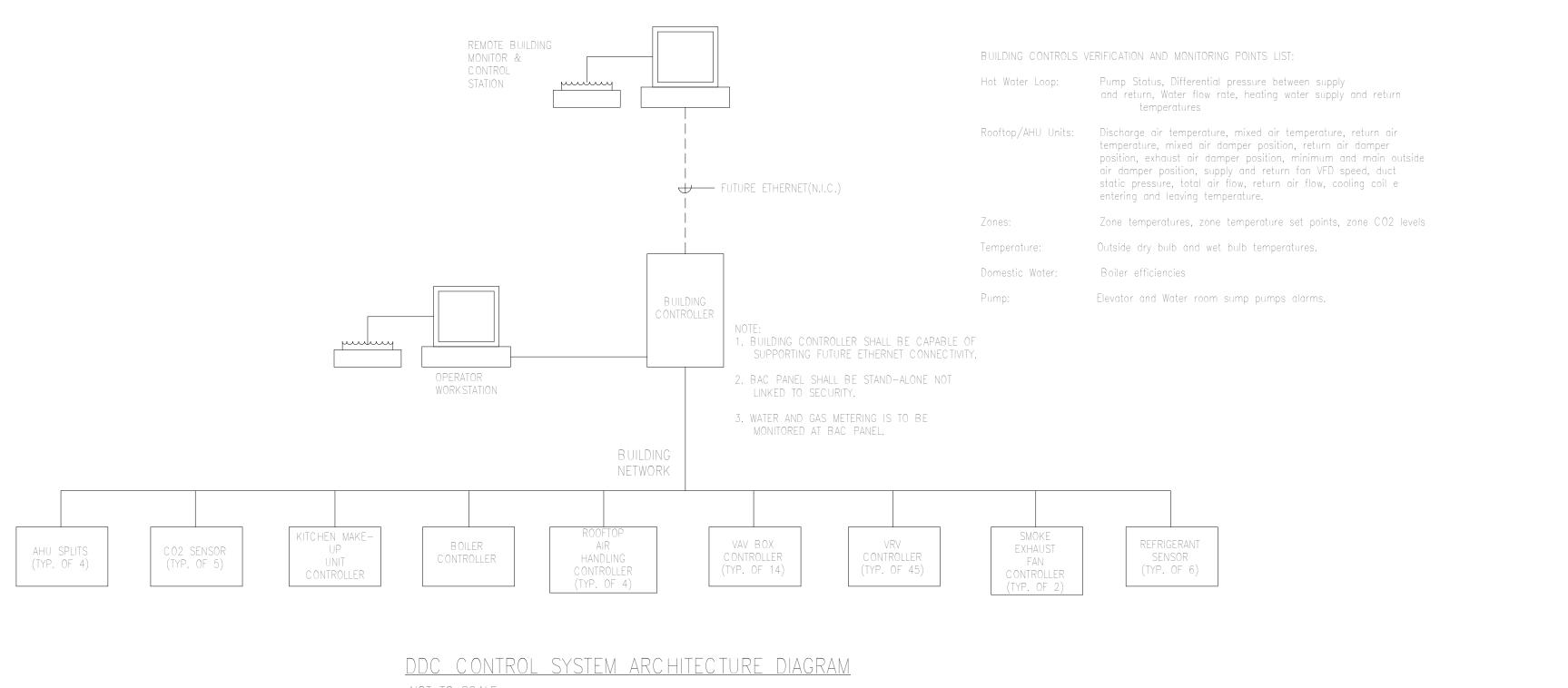


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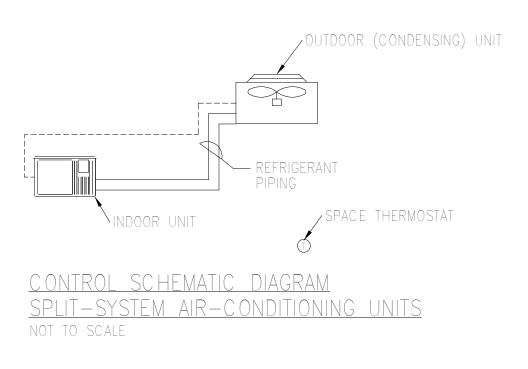


<u>CONTROL SCHEMATIC DIAGRAM</u> <u>SUPPLY FANS SF-2, & 3</u> NOT TO SCALE

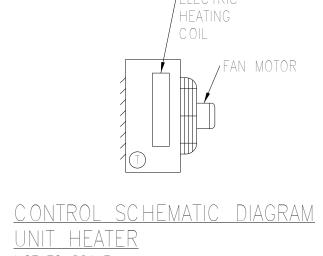
SEQUENCE OF OPERATION SUPPLY FANS SHALL BE INTERLOCKED WITH INTAKE AIR DAMPER. UPON AN SMOKE ALARM BY BAS SYSTEM THE DAMPER SHALL OPEN AND FAN SHALL ENERGIZE. FANS SHALL OPERATE UNTIL SYSTEM IS MANUALLY RESET.



NOT TO SCALE

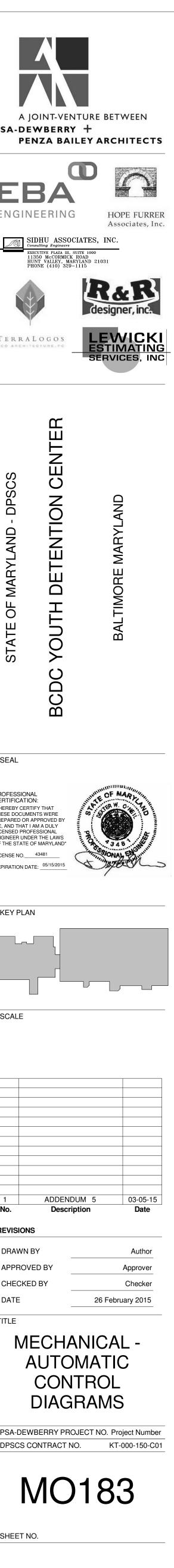


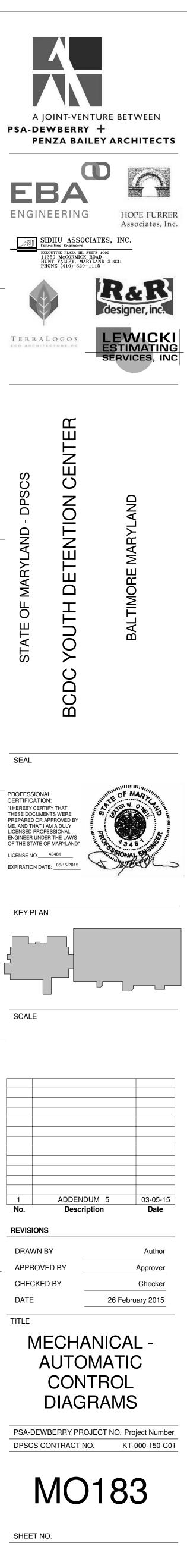
<u>SEQUENCE OF OPERATION</u> THE SPACE THERMOSTAT SHALL CYCLE THE INDOOR AND OUTDOOR UNIT TO MAINTAIN THE TEMPERATURE SETPOINT OF 80°F (ADJUSTABLE).

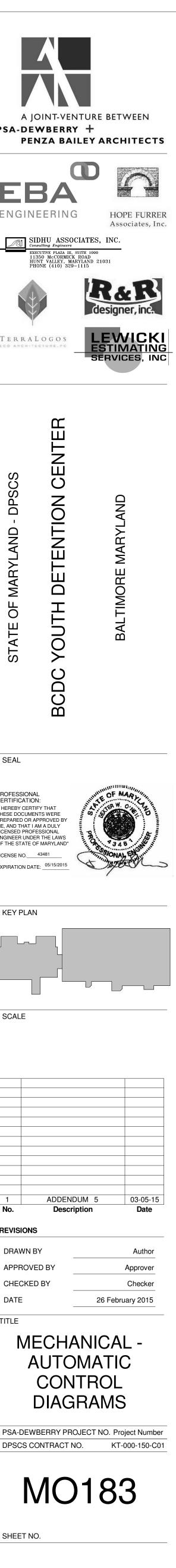


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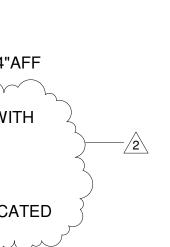
SEQUENCE OF OPERATION UPON A DECREASE IN TEMPERATURE BELOW 60°F THE FAN AND HEATING COIL SHALL ENERGIZE. UPON AN INCREASE IN TEMPERATURE THE SEQUENCE SHALL BE REVERSED.







	6	5	4	3
		ELECTRICAL LE	<u>EGEND</u>	
F	<u>SYMBOL</u>	DESCRIPTION	<u>SYMBOL</u>	DESCRIPTION
		RECESSED 2'X2' LIGHT FIXTURE		TV OUTLET; MH=84"AFF; 3/4" C TO CABLE TRAY.
		PENDANT-MOUNTED LIGHT FIXTURE	$\nabla$	.TELEPHONE OUTLET; MH=24"AFF; 3/4" C TO CABLE TRAY
		SURFACE-MOUNTED MAXIMUN SECURITY 1'X4' LIGHT FIXTURE	$\mathbf{V}$	2 TELEPHONE / 2 DATA OUTLET; MH=24"AFF; PROVIDE DOUBLE G/ BOX & 1" C TO CABLE TRAY.
		RECESSED MAXIMUN SECURITY 2'X2' LIGHT FIXTURE	$\bigtriangledown$ W	WALL-MOUNTED TELEPHONE OUTLET; MH=54"AFF, 3/4" C TO CABI TRAY.
			▼ ▽ <sup>IP</sup>	4 DATA OUTLET; MH=24"AFF; PROVIDE DOUBLE GANG BOX & 1" C CABLE TRAY. IMMATE TELEPHONE OUTLET; MH=54"AFF; 3/4" C TO CABLE TRAY.
E		UNSWITCHED EMERGENCY EGRESS LIGHT FIXTURE	PS	NURSE CALL SYSTEM PATIENT STATION; MH=54"AFF
		RECESSED / SURFACE-MOUNTED MAXIMUN SECURITY 1'X1' LIGHT FIXTURE	ES	NURSE CALL EMERGENCY STATION; 48"AFF
	0	SURFACE-MOUNTED SCONCE	MS	NURSE CALL DESK-MOUNTED MASTER STATION AND OUTLET; MH
	$\bigcirc$	PENDANT-MOUNTED HIGH BAY LIGHT FIXTURE		NURSE CALL DOME LIGHT
	<u> </u>	WALL-MOUNTED LIGHT FIXTURE	R	LOW VOLTAGE LIGHTING RELAY
		EXIT LIGHT WITH LIGHTED FACE AND CHEVRONS AS INDICATED	[SC]	SIDECOM OUTLET; MH=24"AFF
	\$	SINGLE-POLE TOGGLE SWITCH; MH=48"AFF		SPECIAL 3 GANG BOX, 2 1/4" DEEP A/V OUTLET; MH=24"AFF; SEE
D	<b>\$</b> 3	THREEWAY TOGGLE SWITCH; MH=48"AFF	WG	DENOTES WIRE GUARD
	<b>\$</b> 4	FOURWAY TOGGLE SWITCH; MH=48"AFF	(A) V ■ RATING	FIRE ALARM SYSTEM WALL-MOUNTED COMBINATION SPEAKER / ST
	• \$o	OCCUPANCY SWITCH; MH=48"AFF	(V) Cd ▼ RATING	FIRE ALARM SYSTEM WALL-MOUNTED STROBE; MH=80"AFF
	• \$к	KEY-OPERATED TOGGLE SWITCH; MH=48"AFF	♥ RATING	FIRE ALARM SYSTEM MANUAL PULL STSTION; MH=48"AFF
	<b>\$</b> вк	KEY-OPERATED THREEWAY TOGGLE SWITCH; MH=48"AFF		
	Ş <sub>i</sub> k	KEY-OPERATED FOURWAY TOGGLE SWITCH; MH=48"AFF	EK	FIRE ALARM SYSTEM MANUAL PULL STSTION KEY TYPE; MH=48"AFI
	<b>\$</b> .∨	LOW VOLTAGE, MOMENTARY CONTACT SWITCH; MH=48"AFF	FS	FIRE ALARM SYSTEM SPRINKLER FLOW SWITCH
С	OS	CEILING-MOUNTED, DUAL TECHNOLOGY, OCCUPANCY SENSOR / RELAY.	VPS	FIRE ALARM SYSTEM SPRINKLER VALVE POSITION SWITCH
	DH	CEILING-MOUNTED, DAYLIGHT HARVESTING SENSOR / RELAY.		FIRE ALARM SYSTEM HEAT DETECTOR
	Φ			FIRE ALARM SYSTEM SMOKE DETECTOR
	Ψ Φ GFIC	DUPLEX RECEPTACLE; MH=24"AFF		FIRE ALARM SYSTEM DUCT SMOKE DETECTOR
	"	GROUND-FAULT CIRCUIT INTERRUPTER TYPE DUPLEX RECEPTACLE; MH=24"AFF		EXISTING
	₽т	TAMPER-RESISTANT TYPE DUPLEX RECEPTACLE; MH=24"AFF		NEW
	₽ WP	DUPLEX RECEPTACLE WITH WEATHER-PROOF COVER; MH=24"AFF		RELOCATED
В	P S	STAINLESS STEEL TELE/POWER POLE; PROVIDE COMPLETE WITH WIRING DEVICES AS INDICATED.		
	{ P1	POKE-THRU SERVICE FITTING WITH WIRING DEVICES AS INDICATED		CONDUIT AND WIRING; HATCH MARKS DENOTE QUANTITY OF IN 3/4" CONDUIT UNLESS NOTED OTHERWISE; ARROW DENOT PANELBOARD INDICATED.
		ELECTRICAL DISTRIBUTION PANEL		
		277/480VAC BRANCH CIRCUIT PANELBOARD		
		120/208VAC BRANCH CIRCUIT PANELBOARD	P F	PHOTOCELL SWITCH
	Т	TRANSFORMER		IMECLOCK IN NEMA 1 ENCLOSURE
A		DISCONNECT SWITCH		2 POLE, 20A, 277VAC RATED, 120VAC COIL MECHANICALLY-HELD IN IEMA 1 ENCLOSURE



## 2

## **GENERAL NOTES:**

1. ALL SPECIAL SYSTEM WIRING SHALL BE IN CONDUIT.

I

2. ALL RECEPTACLE & SWITCHES IN INMATE AREAS SHALL BE TAMPER PROOF & SECURITY TYPE FACE PLATE WITH 4 TEMPER PROOF SCREWS.

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- 3. ALL SPARE CONDUITS SHALL HAVE PULL STRINGS.
- 4. ALL SCREWS IN INMATE AREAS SHALL BE TAMPER PROOF.
- 5. ALL BEDROOM SWITCHES SHALL BE INSTITUTIONAL GRADE OF THE TOGGLE TYPE.
- 6. FOR ALL 15A AND 20A SINGLE PHASE 120V CIRCUITS, USE #10 AWG CONDUCTORS FOR CONDUCTOR LENGTHS OF 75' TO 120' AND #8 AWG CONDUCTORS FOR CONDUCTOR LENGTHS OF 120' TO 200'. FOR ALL 15A AND 20A SINGLE PHASE 277V CIRCUITS, USE # 10 AWG CONDUCTORS FOR CONDUCTOR LENGTHS OF 150' TO 250' AND #8 AWG CONDUCTORS FOR CONDUCTOR LENGTHS OF WIRE FOR LENGTHS 250' TO 450'.

## E GANG CABLE

1

## 1" C TO

## RAY.

Γ; MH=24"AFF

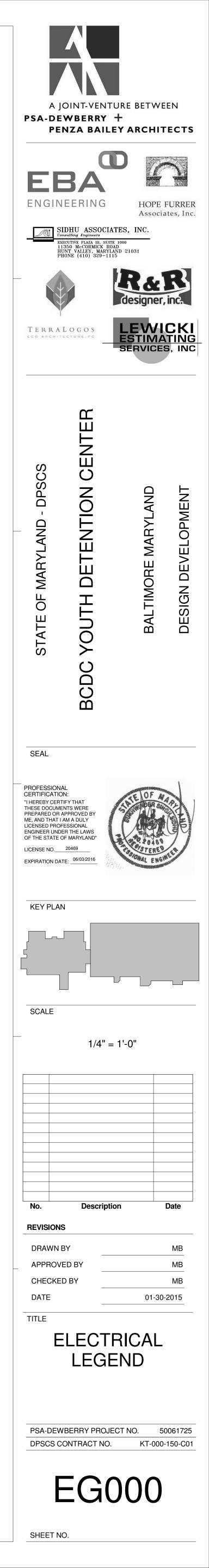
## SEE SPEC.

8"AFF

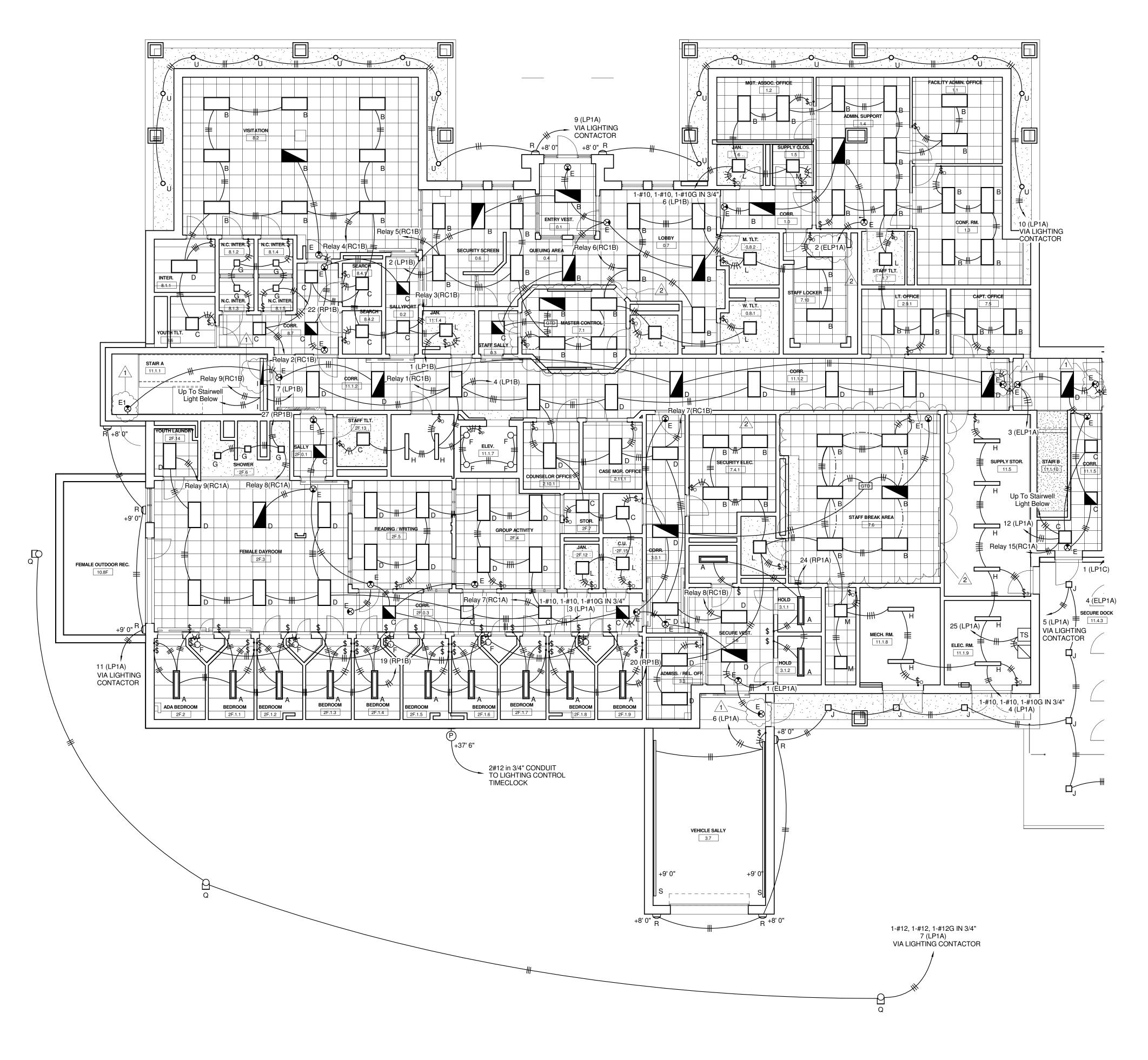
# Y OF #12AWG CONDUCTORS ENOTES HOMERUN TO

 $\sim$ 

R / STROBE; MH=80"AFF



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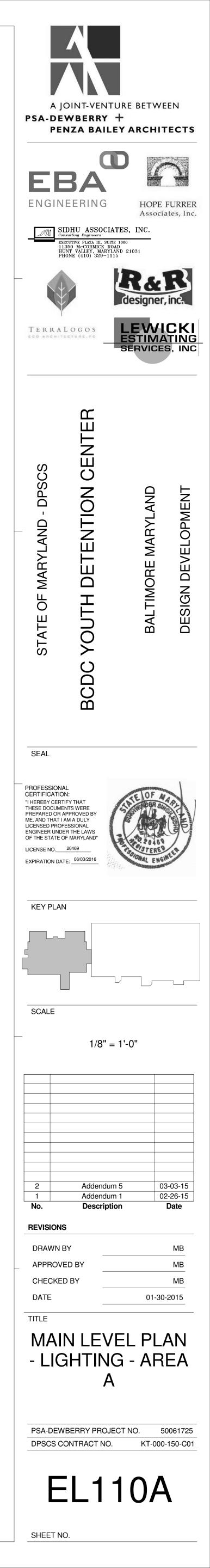


MAIN LEVEL PLAN - LIGHTING - AREA A Scale: 1/8" = 1'-0"

## <u>GENERAL SHEET NOTES:</u>

2

1. REFER TO SHEET E500 FOR LIGHTING FIXTURE SCHEDULE.







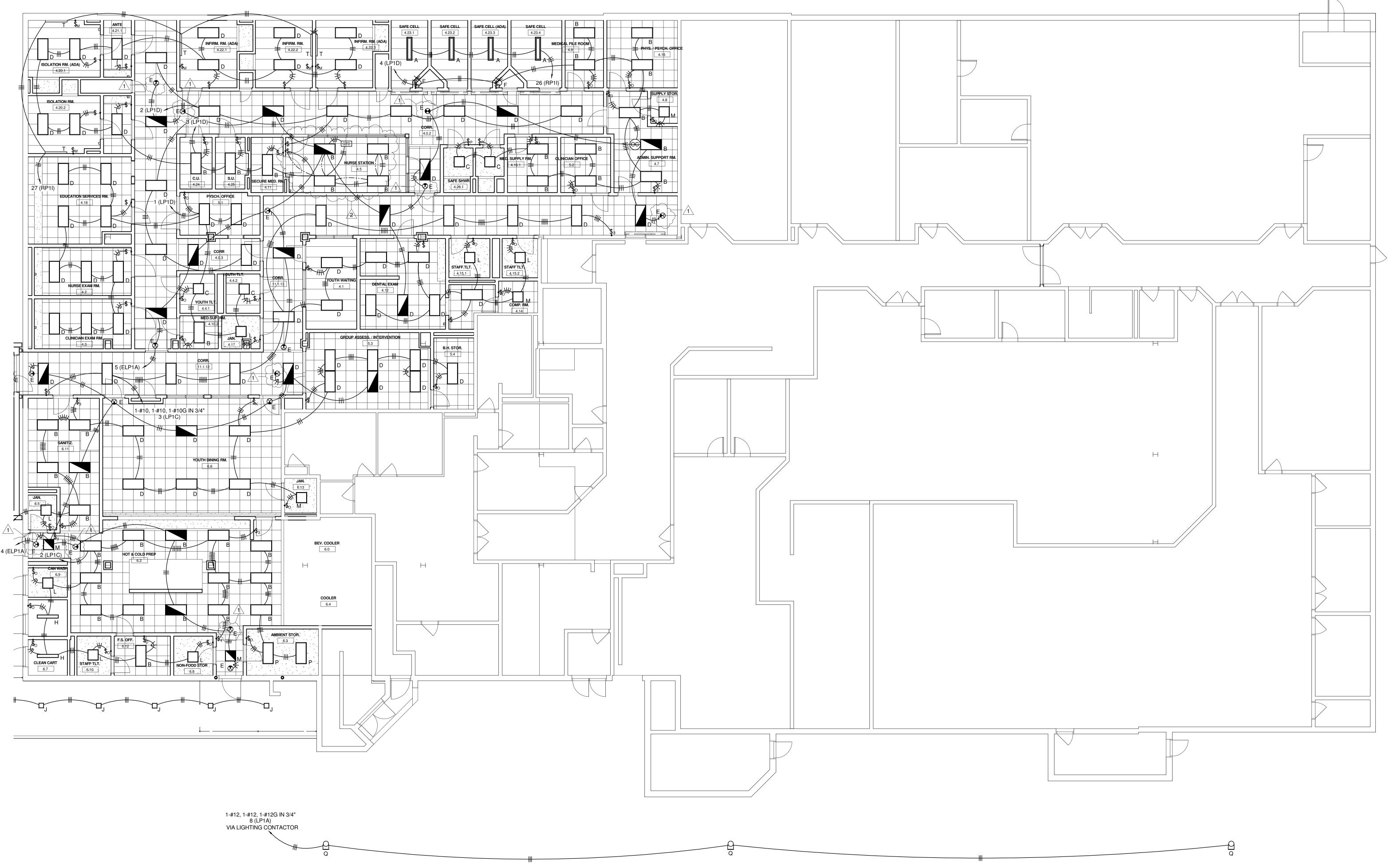






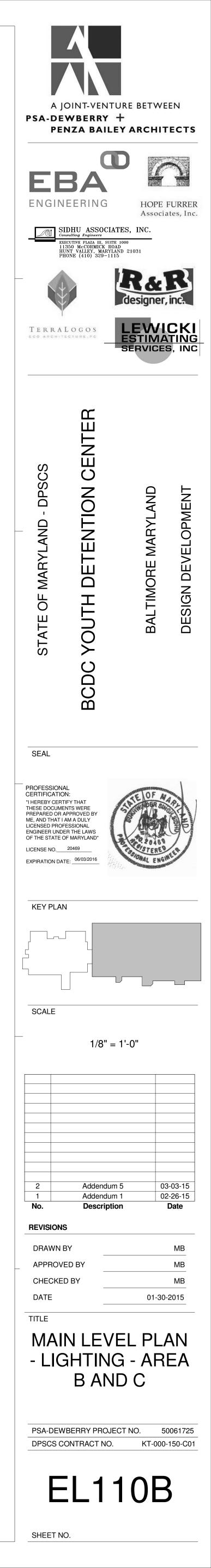


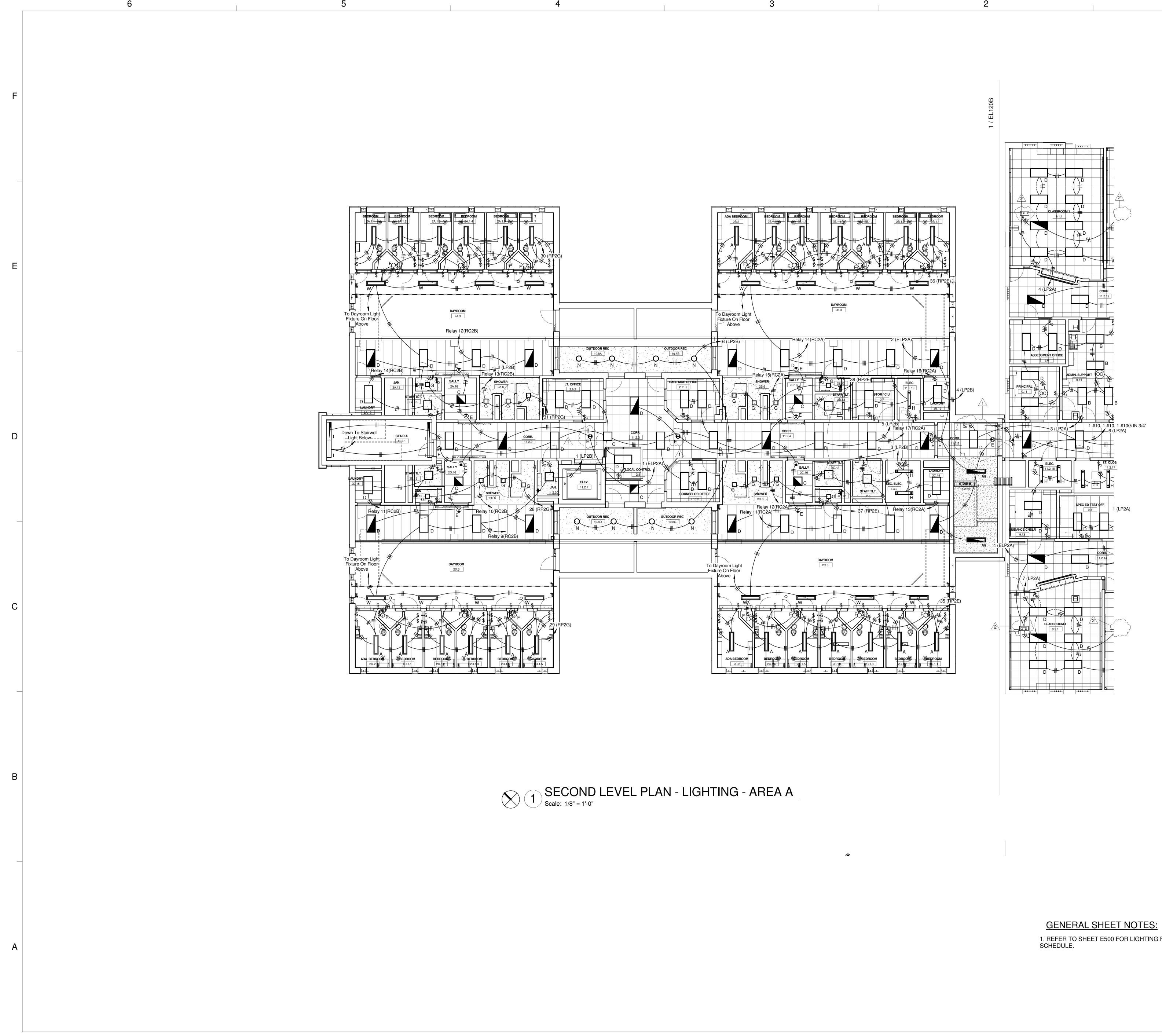
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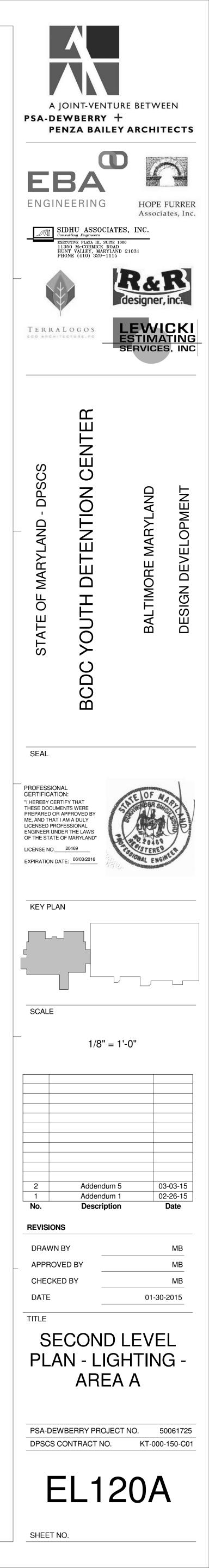
MAIN LEVEL PLAN - LIGHTING - AREA B Scale: 1/8" = 1'-0"

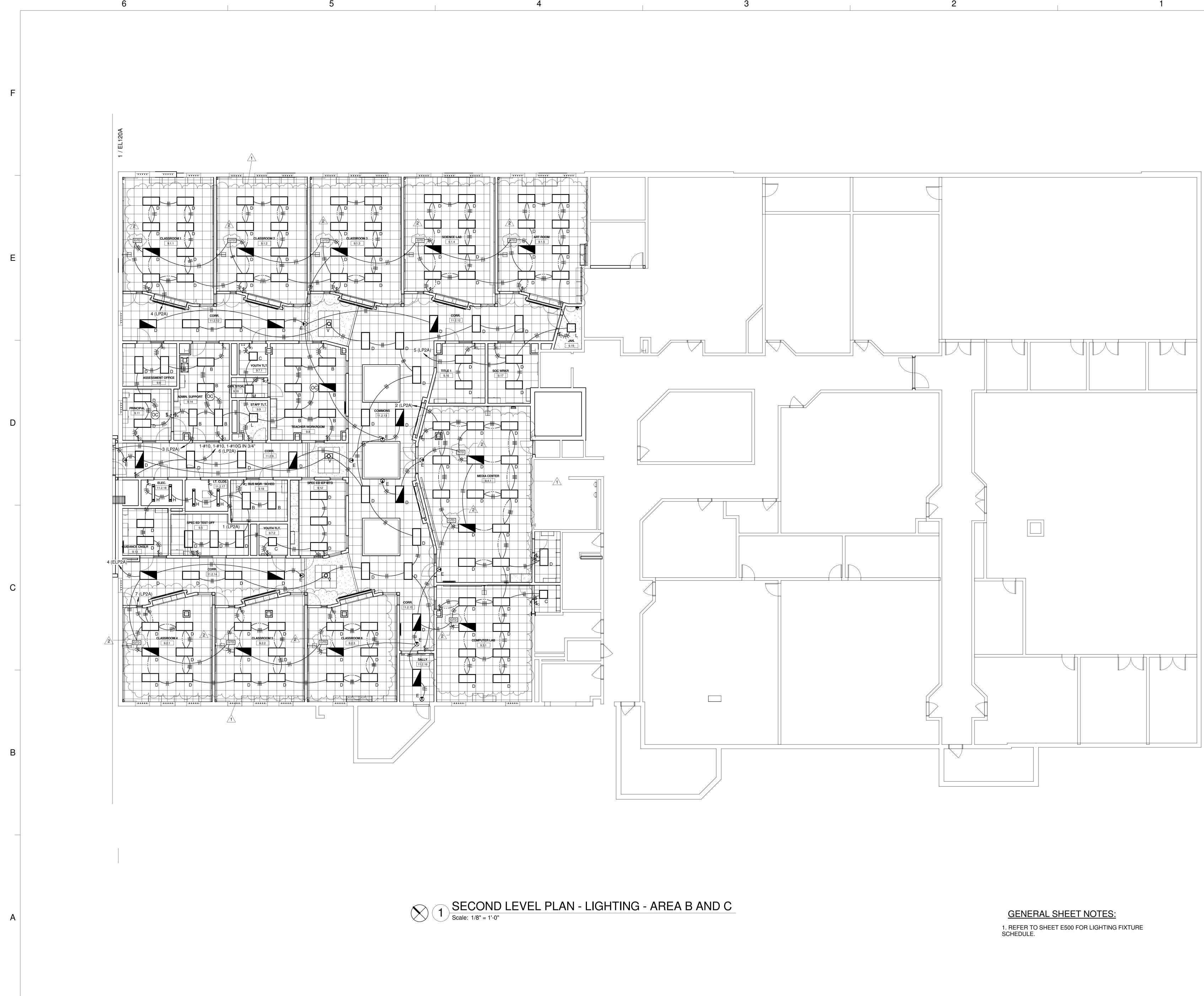
GENERAL SHEET NOTES: 1. REFER TO SHEET E500 FOR LIGHTING FIXTURE SCHEDULE.

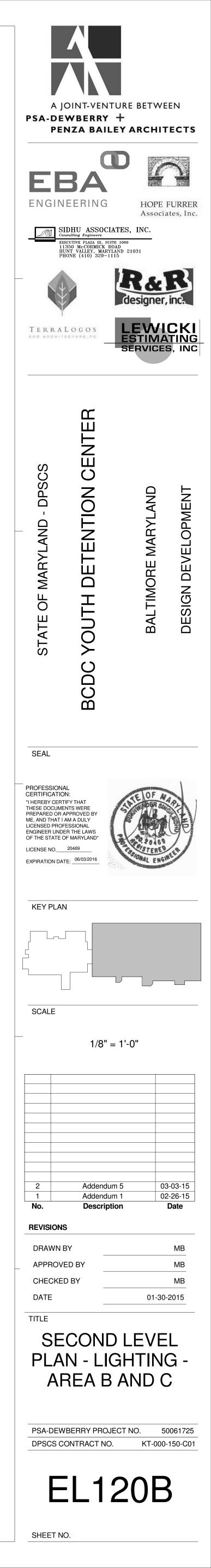




1. REFER TO SHEET E500 FOR LIGHTING FIXTURE SCHEDULE.

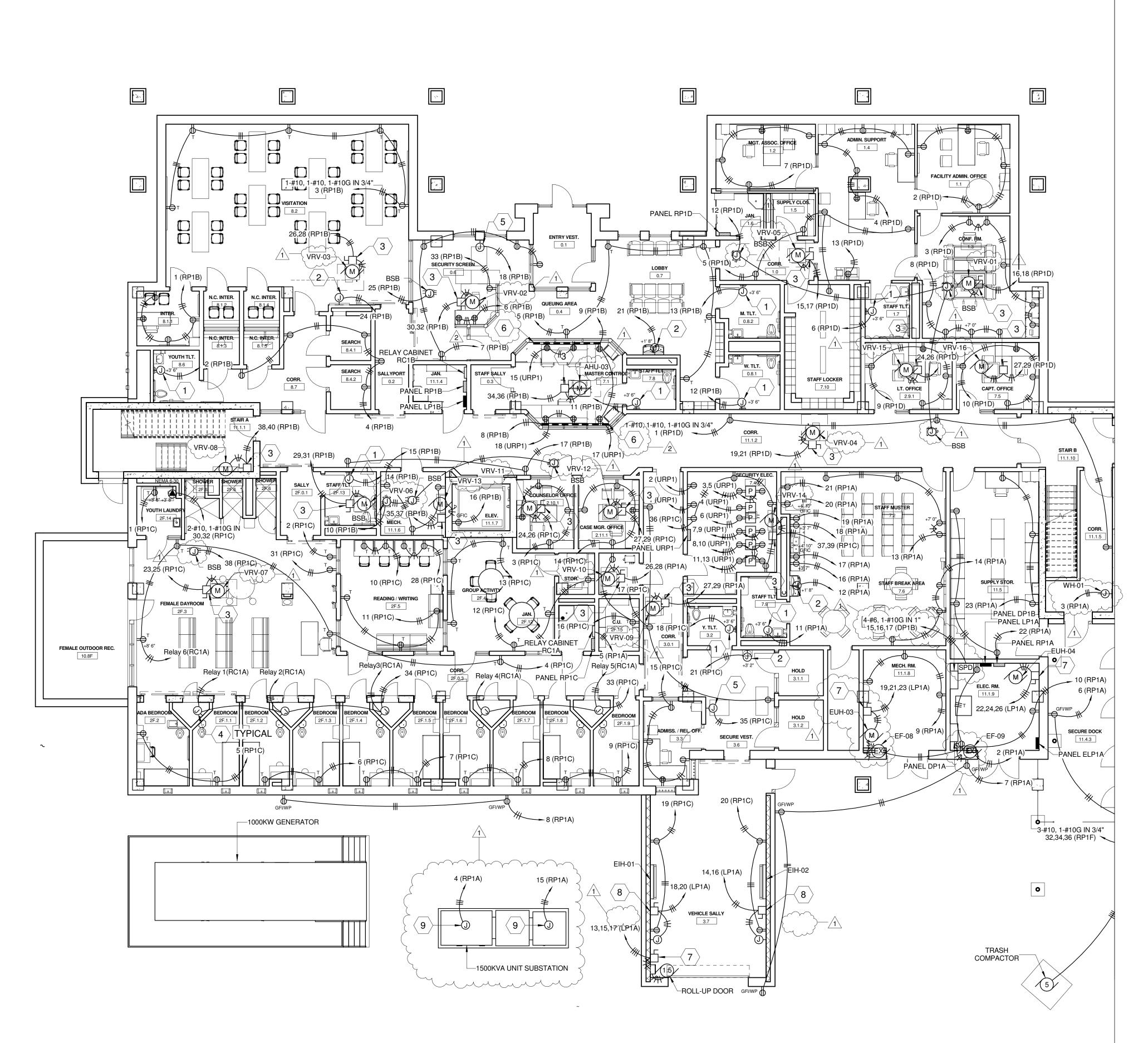




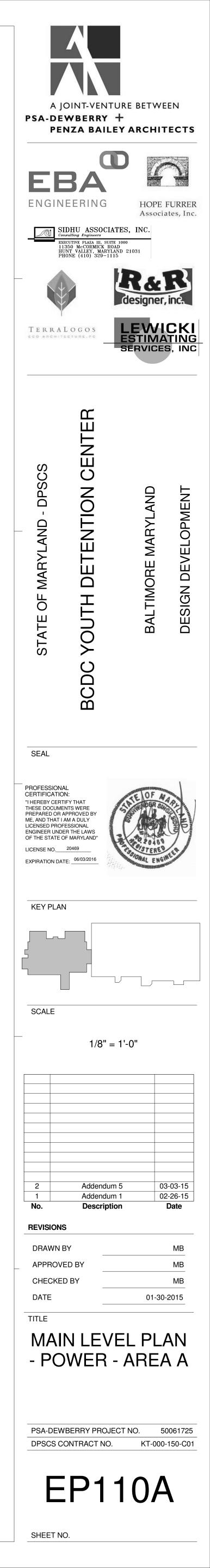


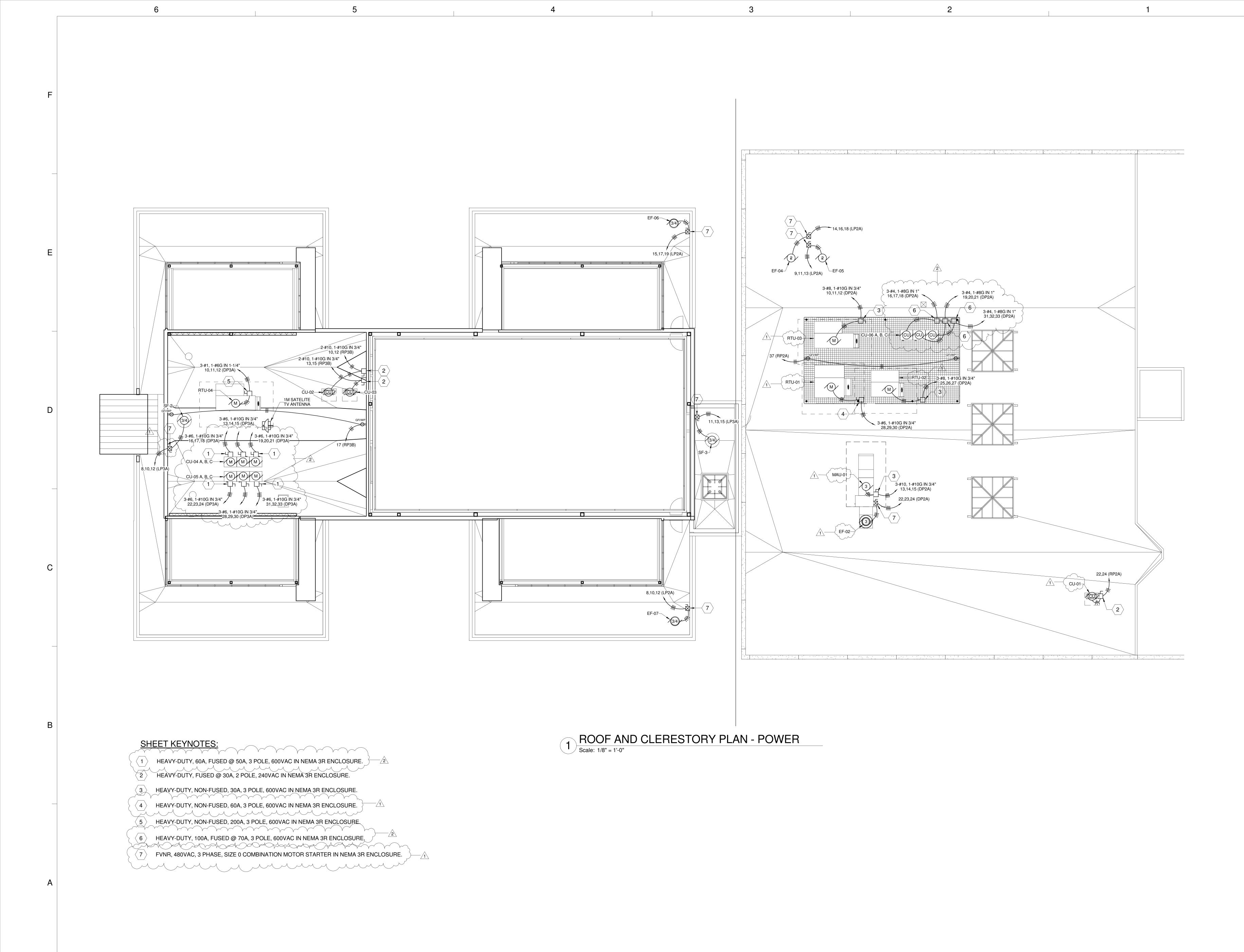


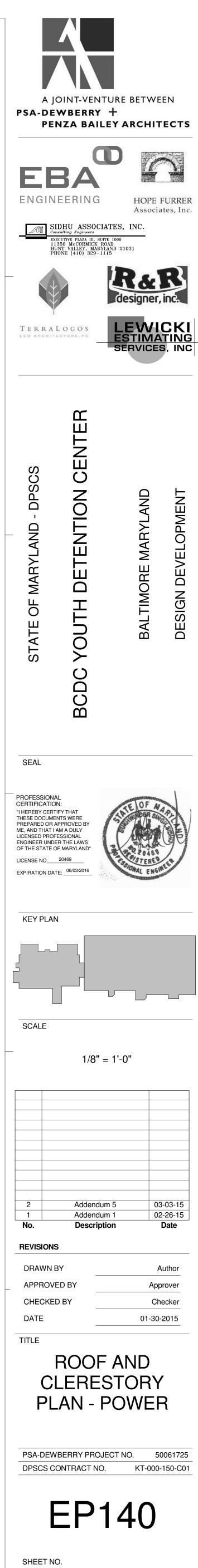
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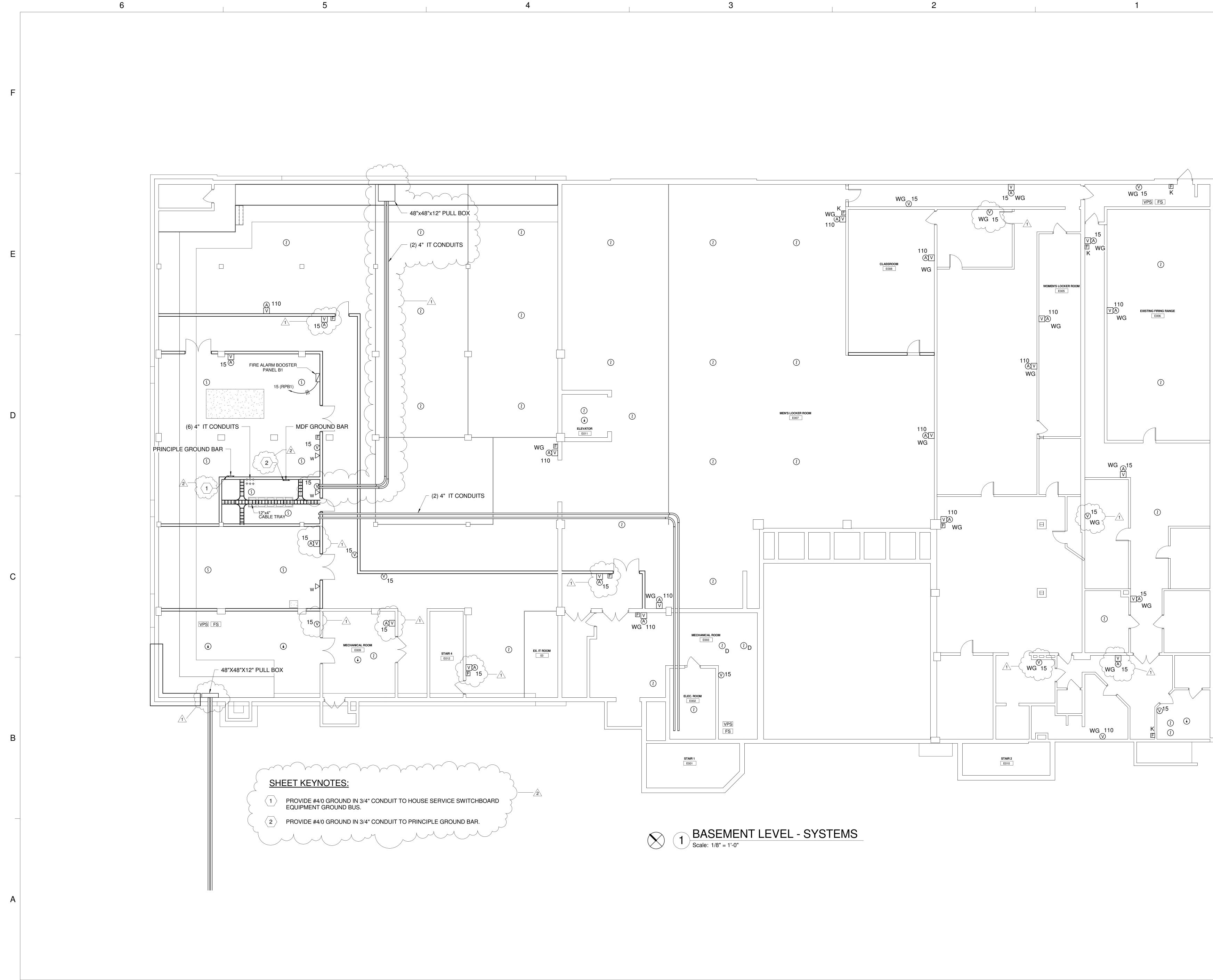


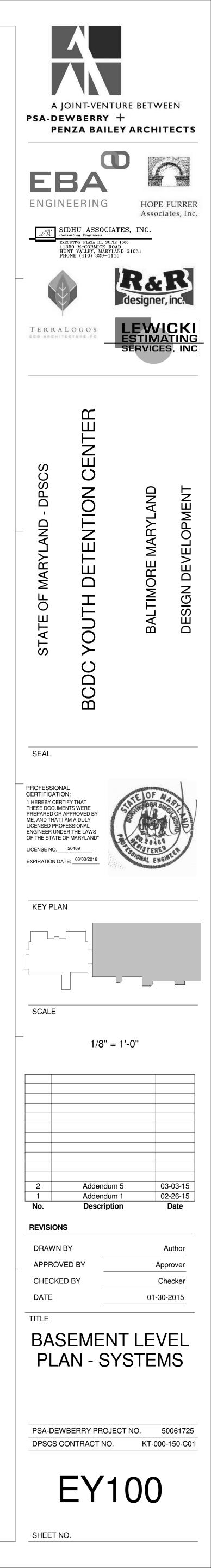
MAIN LEVEL PLAN - POWER - AREA A Scale: 1/8" = 1'-0"

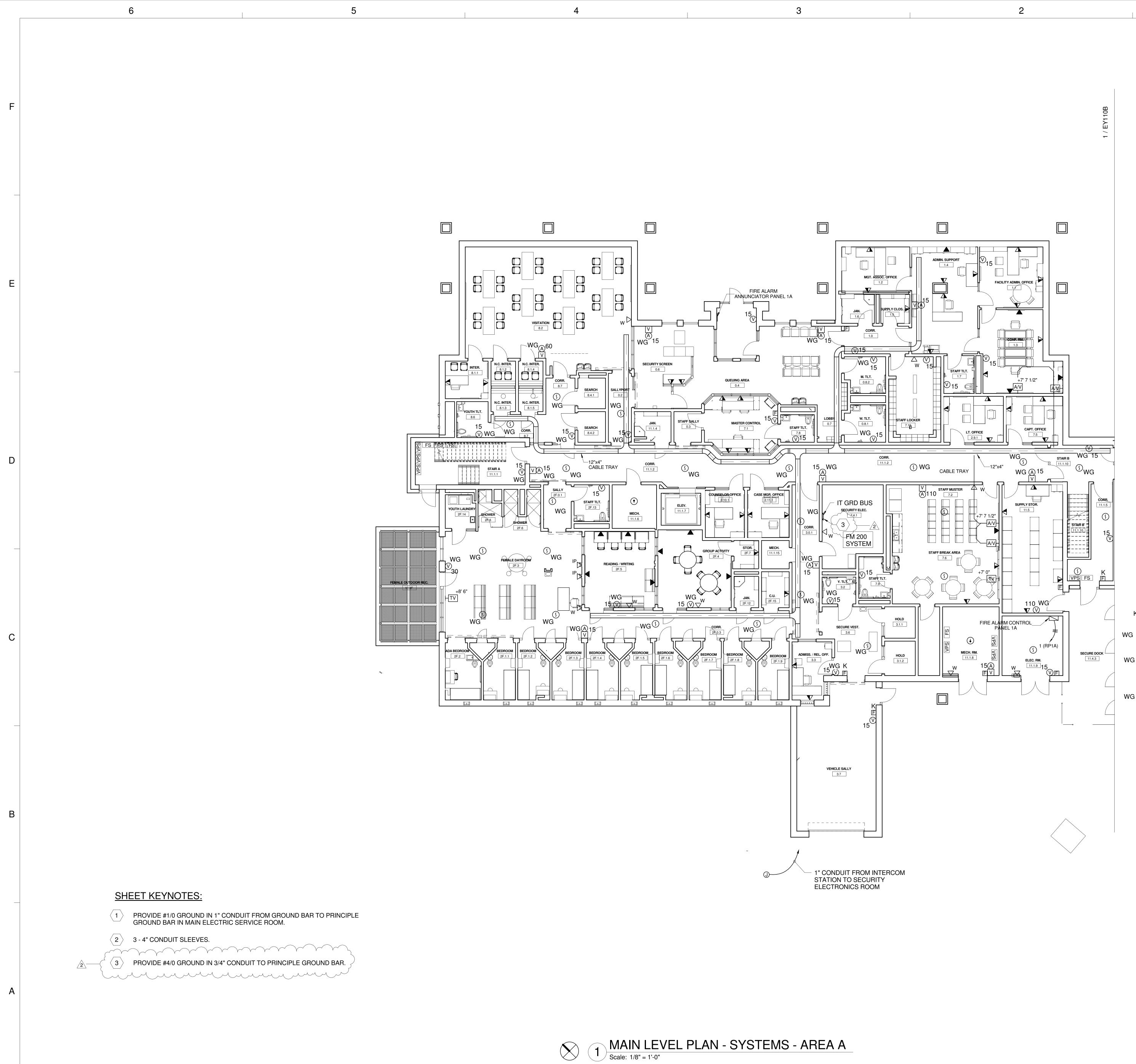


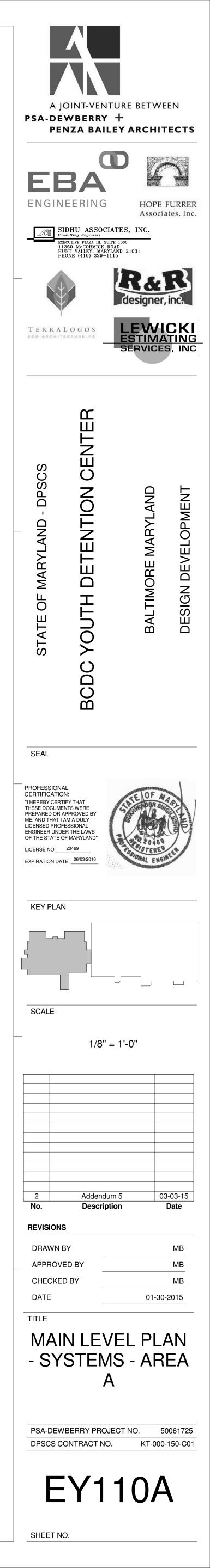


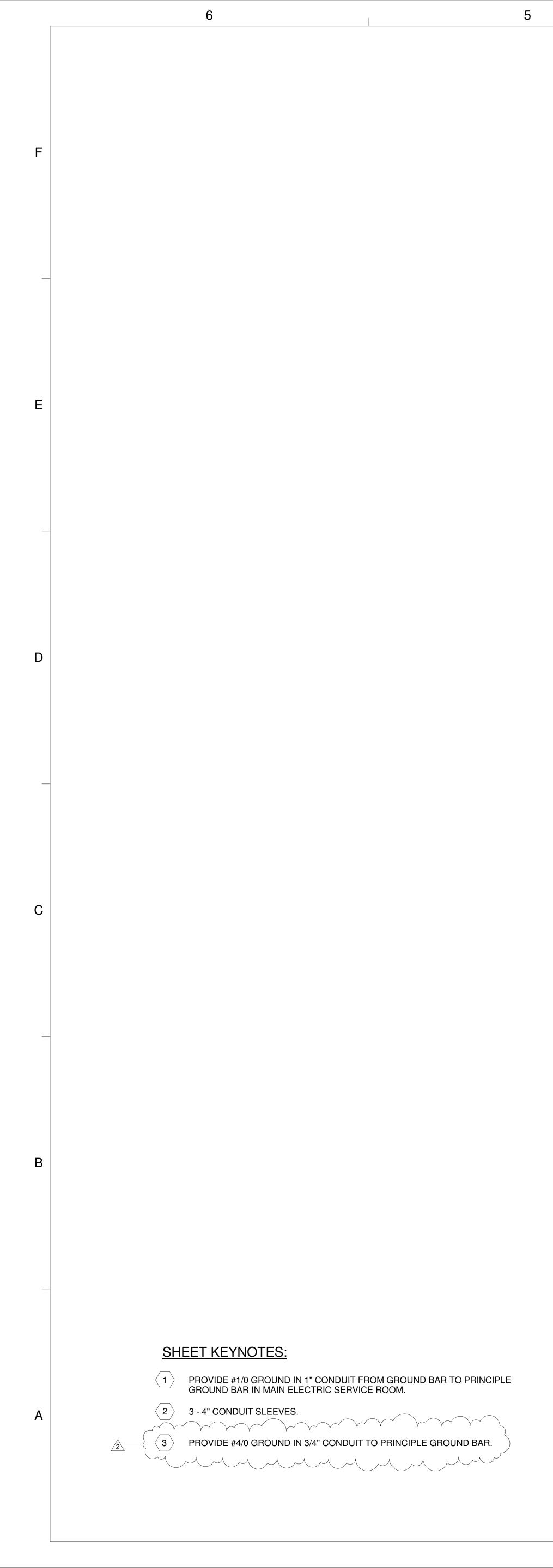


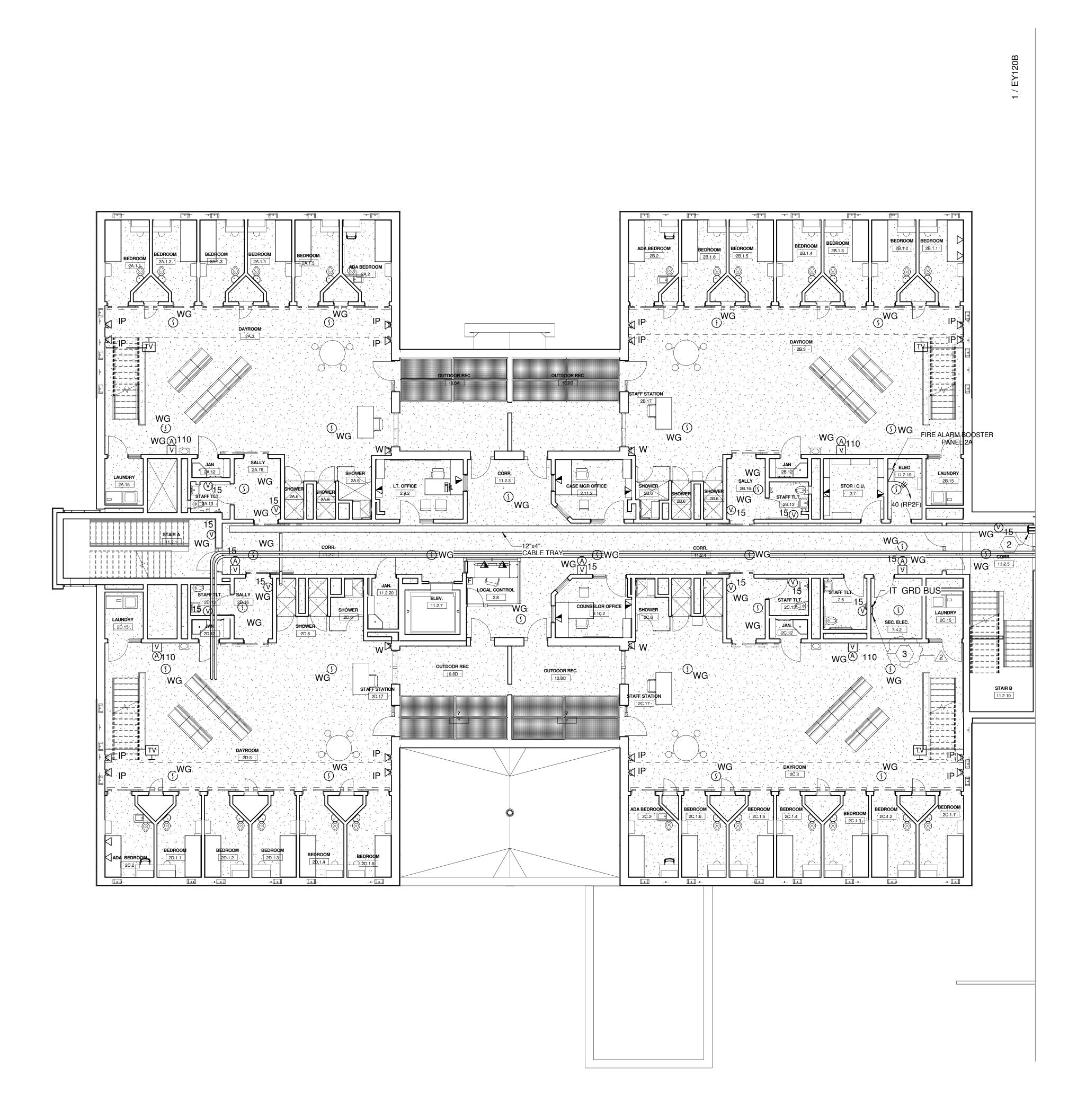




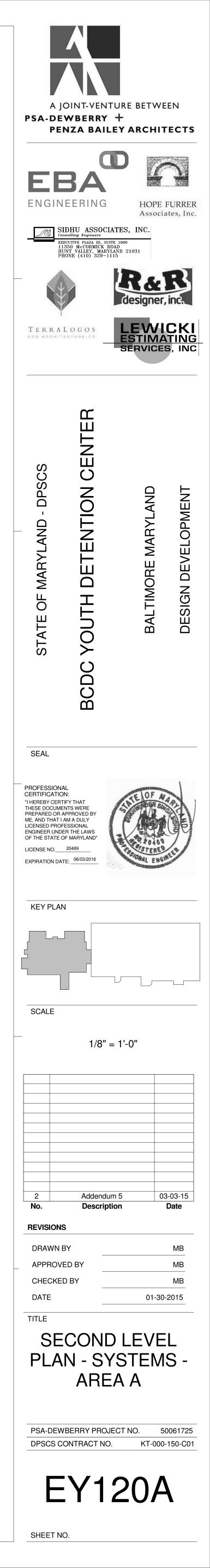


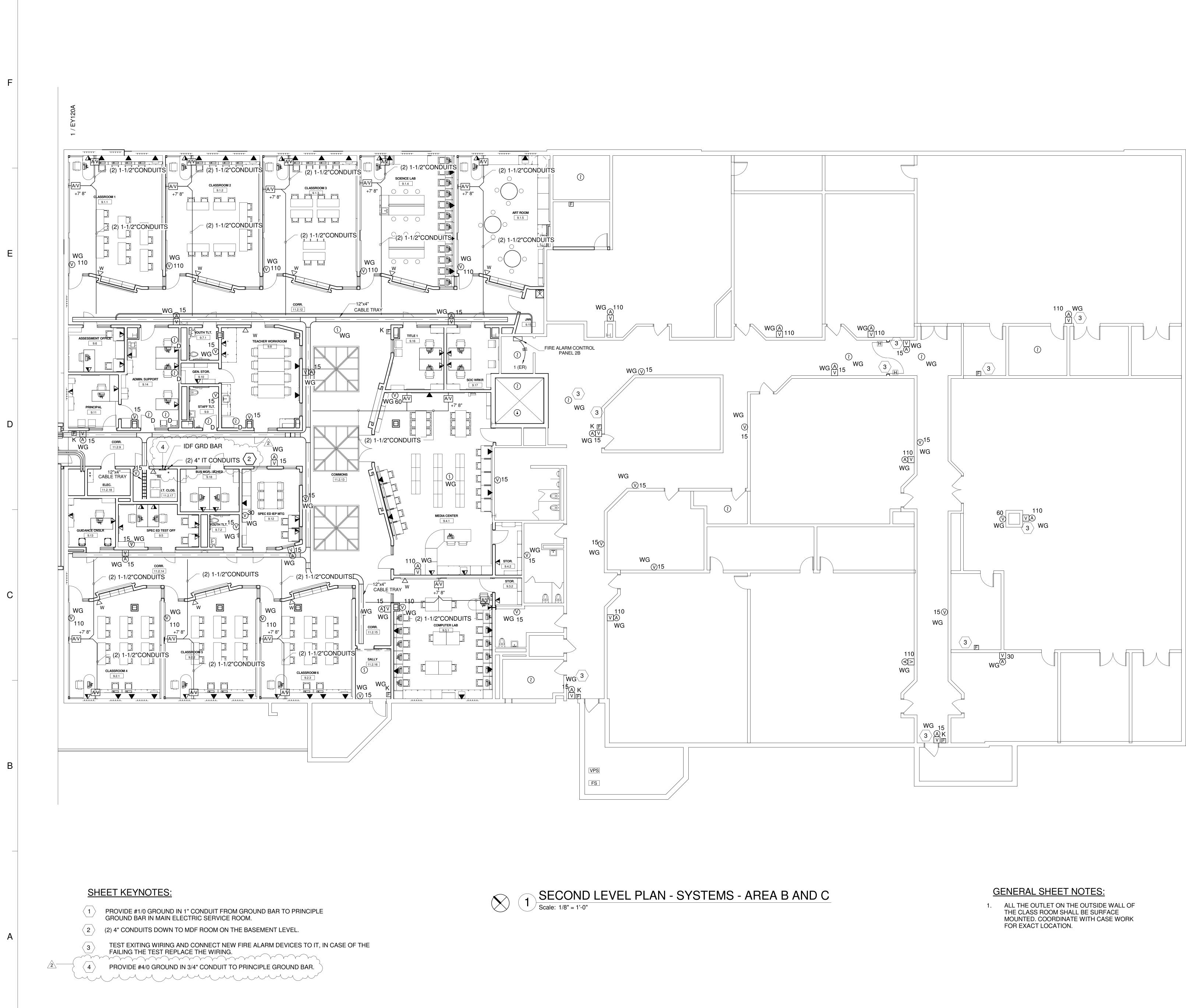


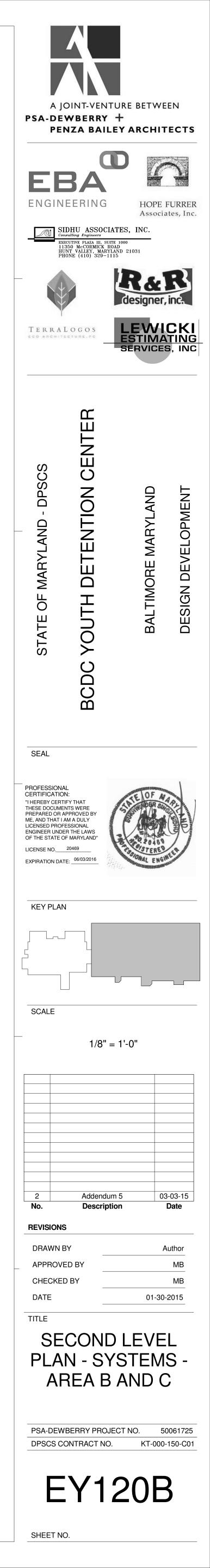


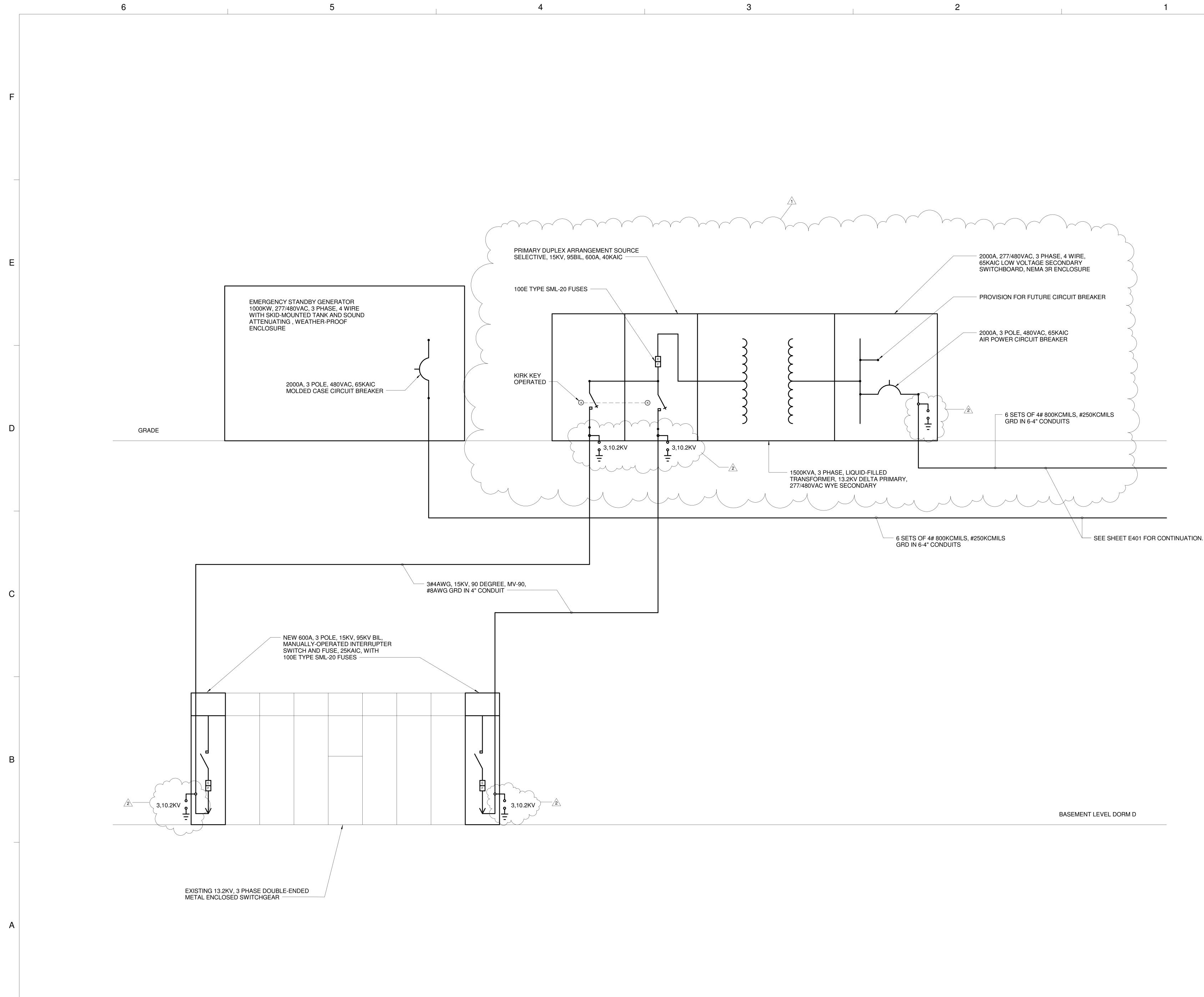


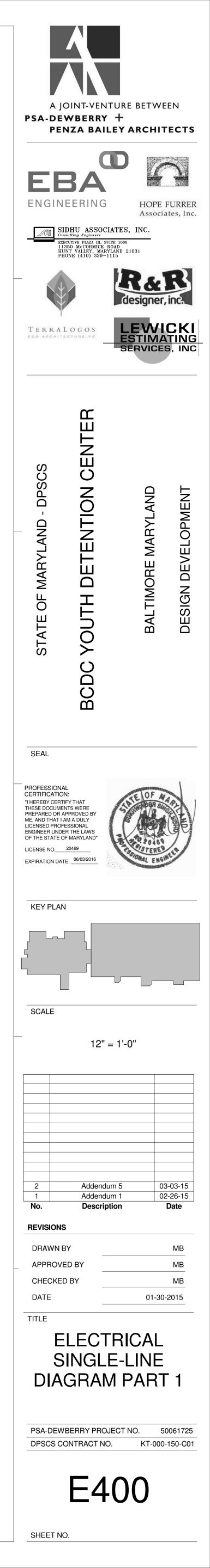












					Lighting Fixture Schedule			
Ty Ma	pe ark N	Mounting Type	Description	Manufacturer	Catalog Number	Lamp	Voltage	Remark
A	SUP		MAXIMUM SECURITY SURFACE-MOUNTED LED LIGHT WITH CLAMSHELL HOUSING, SECURITY LENSING, TAMPER-RESISTANT FASTENERS AND INTEGRAL NIGHT LIGHT	FAIL-SAFE	FUSL-S-12-4-LD3-2STD-35000-UNV-80/86-ED2C-LLNL	LED	120	ALTERNATE MANUFACTURER: KENALL
В	REC		2'X4' RECESSED LED TROFFER WITH ACRYLIC PRISMATIC DIFFUSER	LITHONIA	2TL4-46L-FW-A12-D50-LP835-N100	LED	277	ALTERNATE MANUFACTURER: METALUX
C	REC	CESSED	MAXIMUM SECURITY RECESSED GRID 2'X2' LED LIGHT WITH OVERLAPPING DOOR FRAME, SECURITY LENSING AND TAMPER-RESISTANT FASTENERS	FAIL-SAFE	FSR-SC-S-24-2-LD3-3-STD-35-UNV-80/86-ED1C-CPH	LED	277	ALTERNATE MANUFACTURER: KENALL
D	REC	$\sim$	MAXIMUM SECURITY RECESSED GRID 2'X4' LED LIGHT WITH OVERLAPPING DOOR FRAME, SECURITY LENSING AND TAMPER-RESISTANT	FAIL-SAFE	FSR-SC-S-24-4-LD3-3-STD-35-UNV-80/86-ED1C-CPH	LED	277	ALTERNATE MANUFACTURER: KENALL
F			FASTENERS	Cooper Industries, Inc.	EXL-6-AS INDICATED-GW-WH-AS INDICATED-54600WHT		277	ALTERNATE MANUFACTURER: KENALL
			EXIT LIGHT UNIVERSAL MOUNTING, LED SINGLE-FACE	FAIL SAFE	EXL-6-AS INDICATED-GW-WH-AS INDICATED-54600WHT EXL-6-AS INDICATED-GW-WH-AS INDICATED-54600WHT			ALTERNATE MANUFACTURER: KENALL
			EMERGENCY EXIT LIGHT				277 ~	ALTERNATE MANUFACTURER: COORER
			ALUMINUM HOUSING AND GLASS GLOBE		FMR-S-12-1-LD3-2-STD-35-UNV-80/86-ED1C-CPH-WL			
G	REC		MAXIMUM SECURITY RECESSED FLANGE 1'X1' LED LIGHT WITH OVERLAPPING DOOR FRAME, SECURITY LENSING AND TAMPER-RESISTANT FASTENERS	FAIL-SAFE	FINIR-S-12-1-LD3-2-STD-35-UNV-80/86-EDTC-CPH-VVL		120	ALTERNATE MANUFACTURER: KENALL
Н	PEN		STEM-MOUNTED LED WRAPAROUND WITH FROSTED ACRYLIC LENS	METALUX	2-WNLED-LD1-54-F-UNV-L835-CD-1-SCF-12"	LED	277	ALTERNATE MANUFACTURER: LITHONIA
I	WAL	LL-MOUNTED	WALL-MOUNTED LED LIGHT WITH HIGH IMPACT ACRYLIC DIFFUSER	COOPER	FMB-S-4-LD3-1-STD/1-STD-35-UNV-80/86-ED1C	LED	277	ALTERNATE MANUFACTURER: KENALL
J	SUR		EXTERIOR SURFACE-MOUNTED LED LIGHT FIXTURE WITH ACRYLIC PRISMATIC REFRACTOR	KENALL	P-DB-50L35K-1-277-ASA	LED	277	ALTERNATE MANUFACTURER: FAIL-SAFE
L	REC		2'X2' RECESSED FLANGE LED TROFFER WITH		2TL2-33L-FW-A12-D38-LP835-N100-DGA22	LED	277	ALTERNATE MANUFACTURER: KENALL
Μ	REC		2'X2' RECESSED GRID LED TROFFER WITH		2TL2-33L-FW-A12-D38-LP835-N100	LED	277	ALTERNATE MANUFACTURER: KENALL
N	CEIL		SHALLOW CASTING LED ROUND WITH OPAL POLYCARBONATE LENS	FAIL-SAFE	TRE15-C-LD2-40-8-35-BZ-UNV-ED-CSTG	LED	120	ALTERNATE MANUFACTURER: KENALL
0			FHL Luminaire LED High Bay	Cooper Lighting	FHL-11L-30-3A-UNV-PCLNS	LED		ALTERNATE MANUFACTURER: LITHONIA
P	REC		2'X4' RECESSED FLANGE LED TROFFER WITH ACRYLIC PRISMATIC DIFFUSER	LITHONIA	2TL4-46L-FW-A12-D50-LP835-N100-DGA24	LED	277	ALTERNATE MANUFACTURER: METALUX
Q	POL	E-MOUNTED	20' POLE-MOUNTED EXTERIOR LED LIGHT FIXTURE WITH TYPE 4 MEDIUM DISTRIBUTION	LITHONIA	DSX1LED-60C-700-30K-T4M-480-SPA-PER-DDBXD	LED	277	ALTERNATE MANUFACTURER: METALUX
R	WAL	LL-MOUNTED	SHALLOW CASTING LED ROUND WITH HEMISPHERE POLYCARBONATE LENS	FAIL-SAFE	TRE15-W-LD2-40-8-35-BZ-UNV-ED-CSTG	LED	277	ALTERNATE MANUFACTURER: KENALL
S	WAL	LL-MOUNTED	WALL-MOUNTED CONTINUOUS LED INDIRECT LIGHT FIXTURE WITH FIXED-MOUNT AND WIDE BEAM DISTRIBUTION AND SUITABLE FOR WET LOCATION	WINONA	WSL-405W-24-60-35K-ND24V-F-RB-X-STD	LED	277	ALTERNATE MANUFACTURER:
Т	WAL	LL-MOUNTED		FAIL-SAFE	FWL-D-4-LED3-UNV-STD/STD-35-80/86-ED2C	LED	120	ALTERNATE MANUFACTURER: FAIL SAFE, PROVIDE L SEQUENTIAL RELAY
U	REC	CESSED	RECESSED EXTERIOR LED DOWNLIGHT WITH POLYCARBONATE LENS U.L. FOR WET LOCATION	KENALL	TDL6VL2-13L35-DV-5BR-9	LED	277	ALTERNATE MANUFACTURER: FAIL SAFE
V	REC		RECESSED 6" LED INSTITUTIONAL-GRADE	KENALL	HADL6VL2-13L35K-DV-2FW-G	LED		ALTERNATE MANUFACTURER: FAIL SAFE
W	SUR	RFACE	POLYCARBONATE LENS MAXIMUM SECURITY SURFACE-MOUNTED LED LIGHT WITH CLAMSHELL HOUSING, SECURITY LENSING AND TAMPER-RESISTANT FASTENERS	FAIL-SAFE	FUSL-S-12-4-LD3-2STD-35000-UNV-80/86-ED1C		277	ALTERNATE MANUFACTURER: KENALL





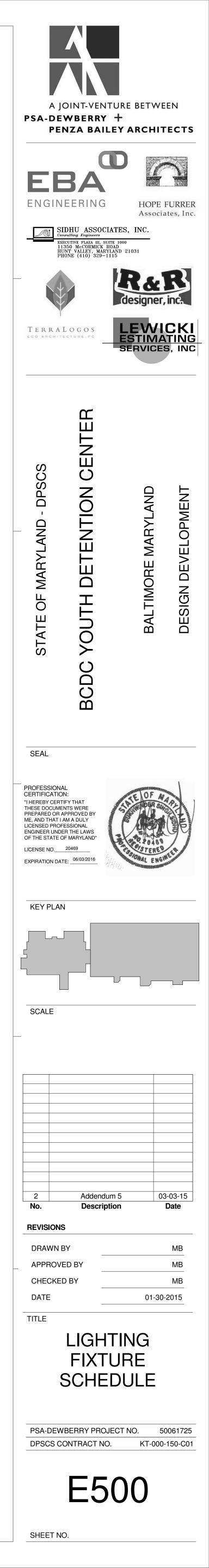
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Q
J

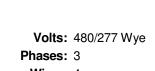


2



		6			5		
	Br	Tanch Panel: DP2A Location: ELEC. 11.2.18 Supply From: HSB Mounting: Surface Enclosure: Type 1		Volts: 480/277 Phases: 3 Wires: 4	Wye	A.I.C.   Mains Mains   MCB	s Type Rating
F	4,5,6 7,8,9 10,11,12 13,14,15 16,17,18 19,20,21 22,23,24 25,26,27 28,29,30	C LP2A LP2B 225 kVA Step-down Transformer RTU-03 MAU-01 CU-06A CU-06B EF-02 RTU-02 RTU-01 CU-06C			Trip 225 A 225 A 350 A 35 A 30 A 70 A 70 A 15 A 35 A 50 A 70 A	Poles 3 3 3 3 3 3 3 3 3 3 3 3 3	57 285 386 800 133 168 133 168 133 800 108 168
E	36       37       38       39       40       41       42						
D	Legend: Load Classificat Motor Other	ion	Connected Load 257821 VA 20495 VA	Demand Factor 104.92% 100.00%	Estimated Demand 270494 VA 20495 VA	Total Load: Total Amps:	127; 4
	Receptacle Lighting Power Notes:	Tanch Panel: DP2B Location: ELEC. 11.2.18 Supply From: 225 kVA, 0 V/480 Mounting: Surface Enclosure: Type 1	76560 VA 12317 VA 2400 VA	Volts: 120/208 V Phases: 3 Wires: 4	43280 VA 15397 VA 2400 VA	Tota Total Total Est. De A.I.C. 1	Rating Rating Rating
C	4,5,6 7,8,9 10,11,12 13,14,15 16,17,18 19,20,21	C RP2A RP2B RP2C RP2D RP2E RP2F RP2G SPD	Fircuit Description		Trip           225 A           60 A	Poles 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	244 674 522 594 819 289 718 0
В	29 30 31 32 33 34 35 36 37 38 39 40 41 42 						
	Legend:		Connected Load	Demand Factor	Estimated Demand	Total Load: Total Amps:	386
A	Motor Other Receptacle Lighting Power		8850 VA 17100 VA 76560 VA 1180 VA 2400 VA	105.14% 100.00% 56.53% 125.00% 100.00%	9305 VA 17100 VA 43280 VA 1475 VA 2400 VA	Tota	tal Cor al Est. Conn. emand





3

**Trip** 100 A

70 A

15 A

125 A

50 A

50 A

50 A

50 A

300 A

50 A

50 A

**Estimated Demand** 

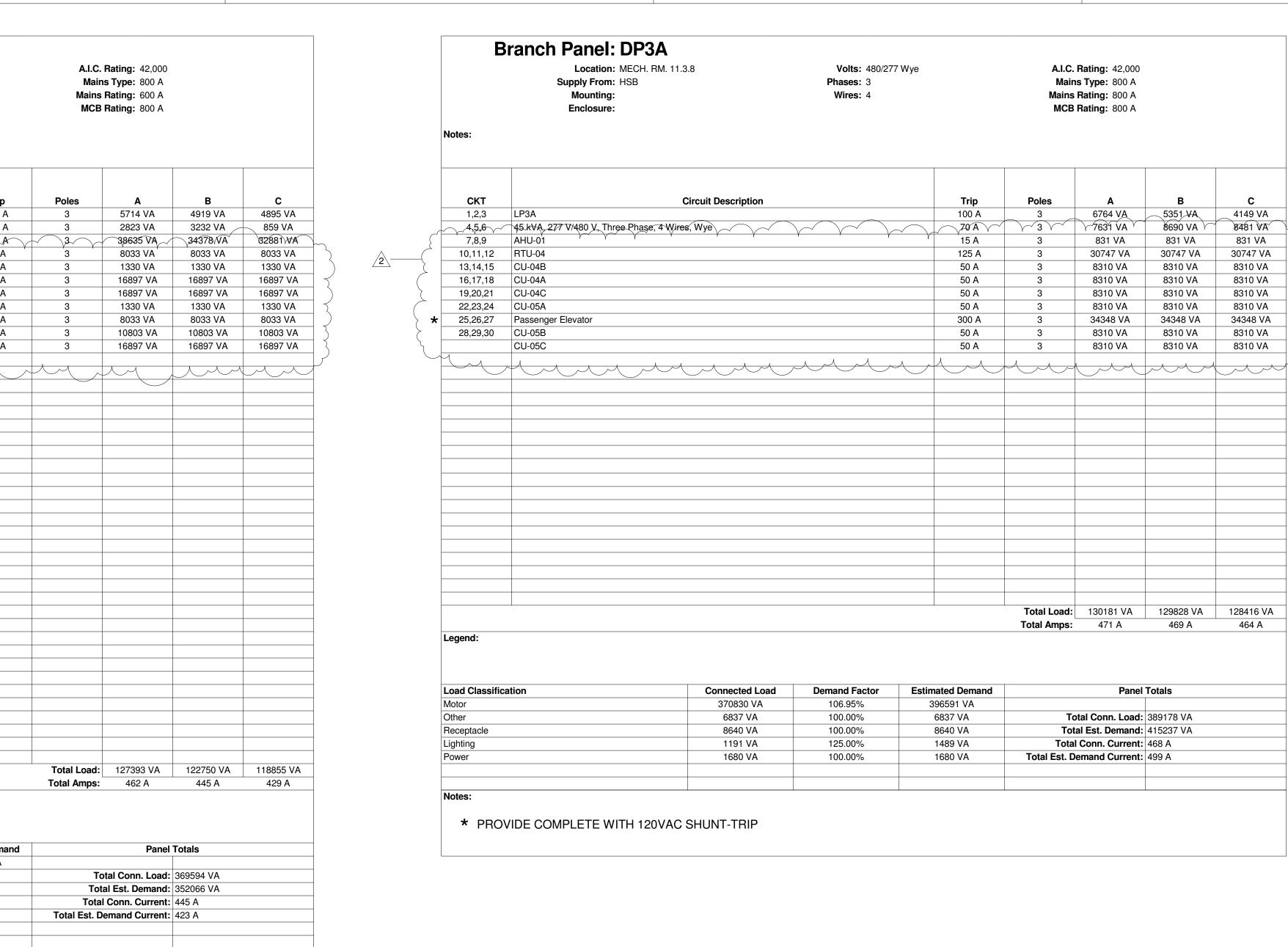
6837 VA

8640 VA

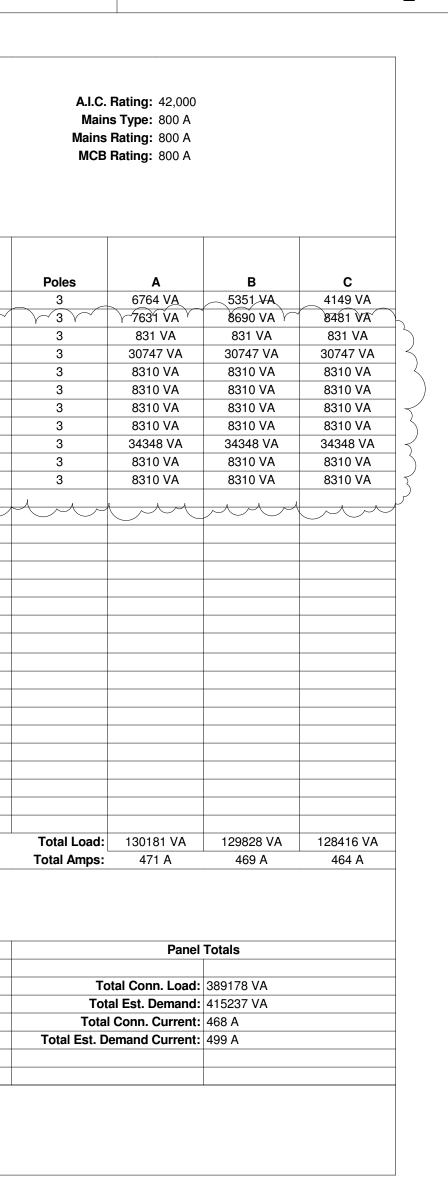
1489 VA

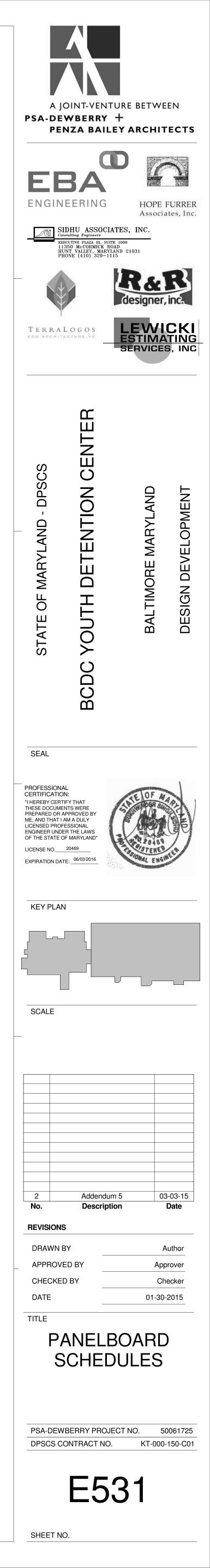
1680 VA

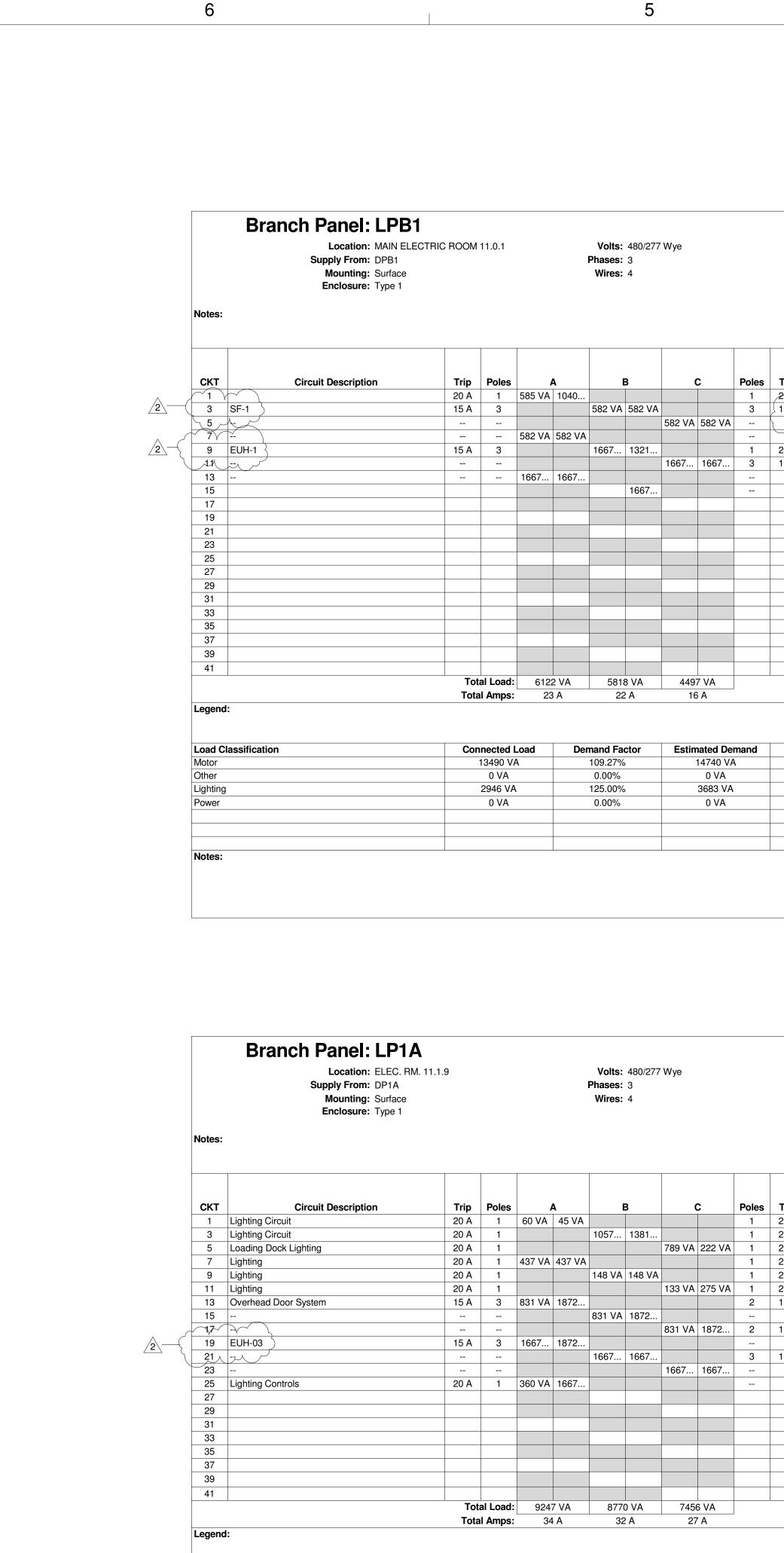
396591 VA



_		
ing: 22,000		
<b>/pe:</b> 800 A		
ing: 800 A		
ing: 800 A		
Α	В	С
2450 VA	2556 VA	2151 VA
6743 VA	7320 VA	7643 VA
5220 VA	4500 VA	3720 VA
5940 VA	6660 VA	5340 VA
8198 VA	5460 VA	6349 VA
2895 VA	1862 VA	1681 VA
7189 VA	6049 VA	6034 VA
0 VA	0 VA	0 VA
38636 VA	34407 VA	32919 VA
324 A	289 A	274 A
324 A	209 A	274 A
Danal	Totals	
Failel		
Conn Lasa		
Conn. Load:		
st. Demand:		
nn. Current:	-	
and Current:	204 A	







D

С

Motor

Other

Lighting

Power

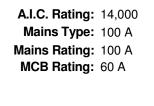
Load Classification



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3

	A.I.C. Rating: 14,000 Mains Type: 100 Mains Rating: 100 A MCB Rating: 60 A	
Trip	Circuit Description	СКТ
_20 A		2
15 A	EF-1 2	4
)		6
		8
20 A	Lighting Basement	10
15 A	EUH-2	12
7	2	14
(		16
		18
		20
		22
		24
		26
		28
		30
		32
		34
		36
		38
		40 42

Panel	Totals
Total Conn. Load:	16436 VA
Total Est. Demand:	18423 VA
Total Conn.:	20 A
Total Est. Demand:	22 A



Trip	Circuit Description	СКТ
20 A	Lighting Circuit	2
20 A	Lighting Circuit	4
20 A	Other	6
20 A	Lighting	8
20 A	Lighting	10
20 A	Lighting	12
15 A	IH-02	14
		16
15 A	IH-01	18
		20
15 A	EUH-04	22
		24
		26
		28
		30
		32
		34
		36
		38
		40
		42
	·	

Panel Totals											
Total Conn. Load: 25	484 VA										
Total Est. Demand: 27	843 VA										
Total Conn.: 31	A										
Total Est. Demand: 33	A										
· · ·											

Demand Factor

110.01%

100.00%

125.00%

0.00%

Connected Load 12493 VA

8557 VA

4434 VA

0 VA

Estimated Demand

13743 VA

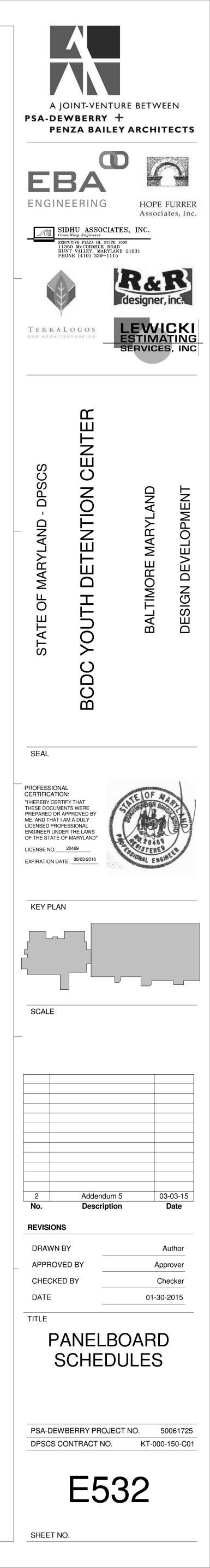
8557 VA

5542 VA

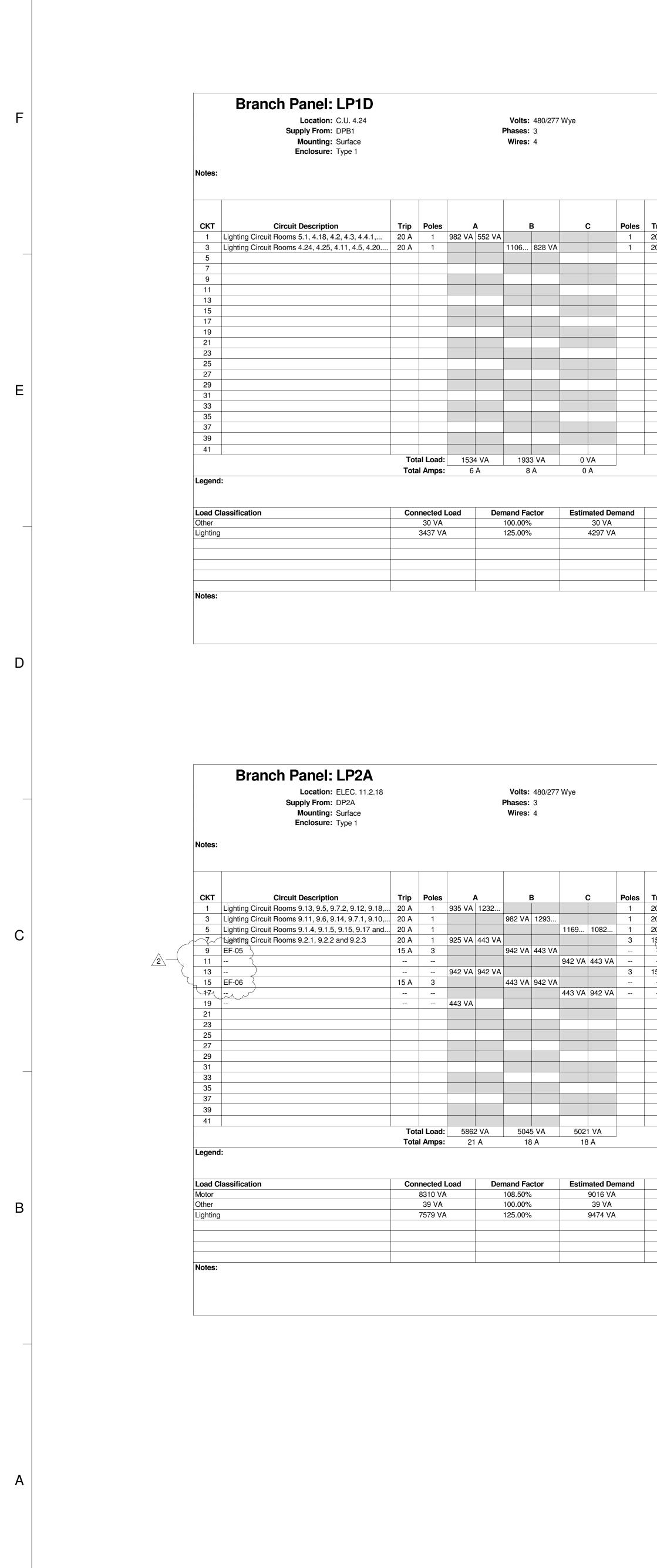
0 VA

	Location: JAN. 11.1.4 Supply From: DP1A Mounting: Surface Enclosure: Type 1				I	Volts: 480/277 Phases: 3 Wires: 4	′ Wye				A.I.C. Rating: 14,000 Mains Type: 100 A Mains Rating: 100 A MCB Rating: 60 A		
Notes:													
0.17						_		•					010
СКТ	Circuit Description	Trip	Poles		<b>A</b>	В		C	Poles	Trip		escription	CK
1	Lighting Branch Circuit Rooms 8.1.1, 8.1.2, 8.1.3,	20 A 20 A	1	982 VA	983 VA	45 V/A 1000			1		Lighting Branch Circuit Ro	DUITIS U.6, U.4, 7.1, U.8.1,	2
3	Lighting Circuit		1			45 VA 1233	60.1/4	1007	1		Lighting Circuit		4
5 7	Lighting Circuit	20 A 20 A	1	422 VA			60 VA	1227	1	20 A	Lighting Circuit		6 8
9	Lighting	20 A		422 VA									8 10
9 11													12
13													14
15													16
17							-						18
19													20
21													22
23													24
25													26
27													28
29													30
31													32
33													34
35													36
37													38
39													40
41													42
		Tota	al Load:	2387	7 VA	1278 VA	128	7 VA					
			I Amps:			5 A		A					
Legend	:												
	assification	Con	nected			nand Factor	Estin	nated De	mand		Panel	Totals	
Other			165 VA			100.00%		165 VA					
Lighting			4787 VA	١		125.00%		5984 VA			Total Conn. Load:		
											Total Est. Demand:		
											Total Conn.:		
											Total Est. Demand:	7 A	

	Location: JAN. 6.5 Supply From: DPB1 Mounting: Surface Enclosure: Type 1					Volts: 480/2 Phases: 3 Wires: 4	77 Wye			A.I.C. Rating: 25,000 Mains Type: 100 A Mains Rating: 100 A MCB Rating: 100 A		
Notes:												
скт	Circuit Description	Trip	Poles		A	В	с	Poles	Trip	Circuit De	scription	СКТ
1	Lighting Circuit Rooms 6.5, 6.11, 6.6. 6.13, 5.3 an	20 A	1	1043	1173			1	20 A	Lighting Circuit Room 6.2,		. 2
3	Lighting Circuit Rooms 11.1.12, 5.3, 5.4, 4.1, 4.12,	20 A	1			1104						4
5												6
7												8
9												10
11												12
13												14
15												16
17												18
19												20
21												22
23 25												24 26
25												28
29												30
31												32
33												34
35						_						36
37												38
39												40
41												42
		Tot	al Load:	221	6 VA	1104 VA	0 VA		1			
		Tota	al Amps:	9	A	5 A	0 A					
egeno	d: Classification	Cor	nected		De	mand Factor	Estimate	d Demand		Panel	Totals	
Dther		501	0 VA			0.00%		VA				
_ighting	]		3320 VA	١		125.00%		60 VA		Total Conn. Load:	3320 VA	
										Total Est. Demand:		
										Total Conn.:		
										Total Est. Demand:	5 A	
Notes:							1					







		A.I.C. Rating: 14,000 Mains Type: 100 A Mains Rating: 100 A MCB Rating: 60 A	
5	Trip	Circuit Description	СКТ
	20 A	Lighting Circuit Rooms 4.01, 4.02 and 4.03	2
	20 A	Lighting Circuit Rooms 4.9, 4.8 ,4.7, 5.2, 4.10.1 an	4
			6
			8
			10
			12
			14
			16
			18
			20
			22
			24
			26
			28
			30
			32
			34
			36
			38
			40
			42

Panel Totals									
Total Conn. Load:	3467 VA								
Total Est. Demand:	4327 VA								
Total Conn.:	4 A								
Total Est. Demand:	5 A								

		A.I.C. Rating: 25,000 Mains Type: 100 A Mains Rating: 100 A MCB Rating: 60 A		
s	Trip	Circuit De	escription	СКТ
	20 A	Lighting Circuit Rooms 9.3	3.1 and 9.4.1	2
	20 A	Lighting Circuit Rooms 9.1	1.1, 9.1.2 and 9.1.3	4
	20 A	Lighting Circuit Rooms 11	.2.9, 11.2.13, 11.2.14,	6
	15 A	EF-07		8
	5	-		10
	>	2		12
	15 A	EF-04		14
	\			16
				18
				20
				22
				24
				26
				28
				30
				32
				34
				36
				38
				40
				42
		Panel	Totala	
		Paner	IUIDIS	
		Total Conn. Load:	15928 \/A	
		Total Est. Demand:		
		Total Conn.:		

Total Est. Demand: 22 A

	Location: ELEC 11.2.19 Supply From: DP2A Mounting: Surface Enclosure: Type 1					Volts: Phases: Wires:		Wye				A.I.C. Rating: 14,000 Mains Type: 100 A Mains Rating: 100 A MCB Rating: 60 A	
Notes:													
СКТ	Circuit Description	Trip	Poles		Α		В		C	Poles	Trip	Circuit Description	СК
1	Lighting Circuit Rooms 2D.3, 2D.15, 2D.13, 2D.16	20 A	1	1442	1381					1	20 A	Lighting Circuit Rooms 11.2.9, 11.2.13, 11.2.14,	2
3	Lighting Circuit Rooms 2C.3, 2.6, 7.4.2, 2C.15 and	20 A	1			1649	1584			1	20 A	Lighting Circuit Rooms 2B.13, 2B.12, 2.7, 11.2.19,	4
5		20 A	1					859 VA	0 VA	1	20 A	Lighting	6
7													8
9													10
11													12
13													14
15													16
17													18
19													20
21													22
23													24
25													26
27													28
29													30
31													32
33													34
35													36
37													38
39													40
41													42
- 1		Tot	al Load:	282	23 VA	323	32 VA	850	) VA				74
			al Amps:		1 A		3 A		A				
Legend	:		<u> </u>										
_oad C	lassification	Con	nected I	oad	De	mand Fa	actor	Estin	nated De	mand		Panel Totals	
Other			3356 VA			100.00%	6		3356 VA				
_ighting			3558 VA			125.00%	6		4448 VA			Total Conn. Load: 6915 VA	
												Total Est. Demand: 7804 VA	
												Total Conn.: 8 A	
												Total Est. Demand: 9 A	
Notes:													

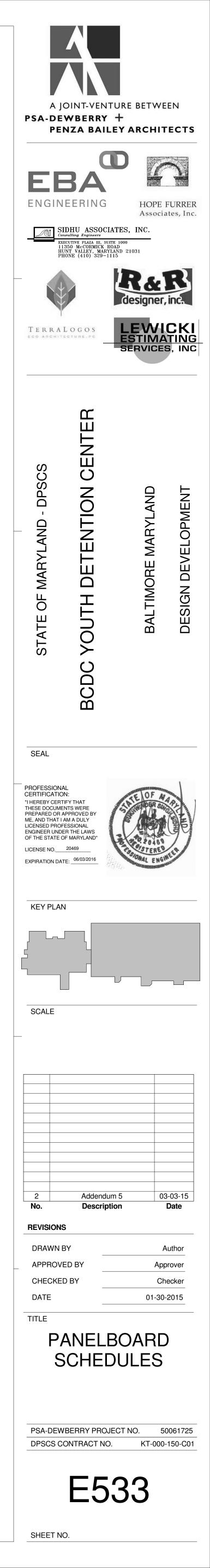
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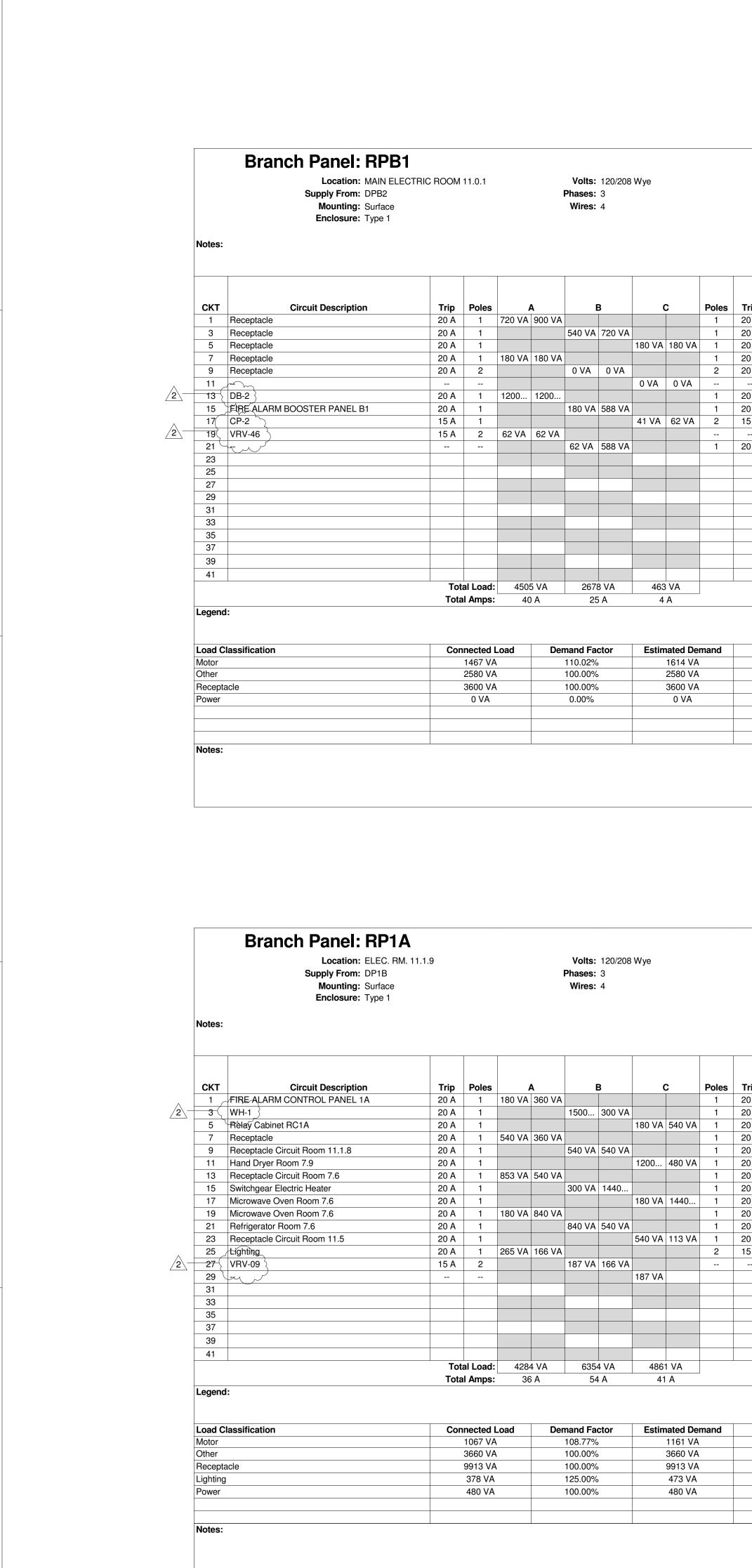
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	Location: MECH. RM Supply From: DP3A Mounting: Surface Enclosure: Type 1	1. 11.3.8			I	Volts: Phases: Wires:	-	Wye				A.I.C. Rating: 14,000 Mains Type: 100 Mains Rating: 100 A MCB Rating: 60 A	)	
Notes:														
СКТ	Circuit Description	Trip	Poles		4		В	C		Poles	Trin	Circuit I	Description	СКТ
	Lighting Circuit	20 A	1	2622	<b>4</b> 1667		в 		,	3	Trip 15 A	EUH-06	Description	2
<u>،</u> مرجم	Lighting Circuit	20 A 20 A	1	2022	1007	1206	1667							4
<u>√ 5</u> γ ·	EUH-05	15 A	3			1200	1007	1667	1667		$\rightarrow$			6
$\frac{1}{1}$	f f			1667	443 VA			1007	1007	3	15 A	2 SF-2		8
$_{9}$				1007	-++3 VA	1667	443 VA				<b>FCI</b>			10
9 11		20 A	3			1007	443 VA	443 VA	113 \/A		(			10
13				443 VA				443 VA	443 VA					14
15				443 VA		443 VA								14
17						443 VA								18
19														20
21														20
23														24
25														24
25														28
29														30
31														30
33														32
35														34
35														38
39														40
41				004		E 400		4000						42
			al Load: al Amps:		2 VA 5 A		6 VA ) A	4220 15						
Legend	:	100				20								
	assification		nected I			nand Fa			ated Der			Pane	el Totals	
Motor			12659 V/			109.87%			13909 VA			<b>.</b>		
Other			2637 VA			100.00%			2637 VA			Total Conn. Load		
Lighting			1191 VA	1		125.00%	<b>)</b>		1489 VA			Total Est. Demand		
Power			0 VA			0.00%			0 VA			Total Conn.		
												Total Est. Demand	1: 22 A	
Notes:														

	Location: MECH. RM. 1 Supply From: DP3A Mounting: Surface Enclosure: Type 1	1.3.8			I	Volts: Phases: Wires:		Wye				Mains T Mains Ra	ting: 14,000 'ype: 100 ting: 100 A ting: 60 A		
Notes:															
0//T		Taila	Dalaa							Dalas	Tulu		Oliversit D		0//
<b>CKT</b>	Circuit Description	20 A	Poles	2622	<b>A</b> 1667		B			Poles 3		EUH-06	Circuit D	escription	2 CK
। ⁄_3⁄_⁄	Lighting Circuit	20 A 20 A	1	2022	1007	1206	1667								4
<u> </u>	EUH-05	15 A	3			1200	1007	1667	1667			¥	— <u>2</u>		6
<del>ر</del> 7				1667	443 VA			1007	1007	3	15 A		<u> </u>		8
9					2	1667	443 VA				7				10
11		20 A	3					443 VA	443 VA						12
13				443 VA											14
15						443 VA									16
17															18
19															20
21															22
23															24
25															26
27															28
29															30
31 33															32
35															34
37															38
39															40
41															40
41		Tot	al Load:	6843	2 VA	542	6 VA	422	O VA						42
			al Amps:		5 A		0 A		5 A						
egend															
	assification		nected L			mand Fa			nated Der				Pane	I Totals	
lotor			12659 VA			109.87%			13909 VA			T-1-1	Constant	16407\/A	
Other			2637 VA			100.00%			2637 VA				Conn. Load		
ighting 'ower			1191 VA 0 VA			125.00% 0.00%			1489 VA 0 VA				Total Conn.		
Ower			UVA			0.00%			UVA				Est. Demand		
					1			1							

2\_\_\_\_(





С

3

# Branch Panel: RP1B

	Location: JAN. 11.1.4 Supply From: DP1B Mounting: Surface Enclosure: Type 1					Volts: Phases: Wires:		8 Wye				A.I.C. Rating: 10,000 Mains Type: 225 A Mains Rating: 225 A MCB Rating: 225 A		
Notes:														
СКТ	Circuit Description	Trip	Poles		A		В		0	Poles	Trip	Circuit D	escription	СК
1	Receptacle Circuit Room 8.1.1	20 A	1	720 VA	1200					1	20 A	Hand Dryer Room 8.6	-	2
3	Receptacle Circuit Room 8.2	20 A	1			900 VA	900 VA			1	20 A	Receptacle Circuit Rooms	s 0.2, 8.4.1, 8.4.2, 8.7	4
5	Receptacle Circuit Rooms 0.4, 0.7	20 A	1					900 VA	360 VA	1	20 A	Receptacle Circuit Room	0.6	6
7	Receptacle Circuit 0.6	20 A	1	720 VA	600 VA					1	20 A	Plugmold Room 7.1		8
9	Plugmold Room 7.1	20 A	1			600 VA	540 VA			1	20 A	Other		10
11	Hand Dryer Room 7.8	20 A	1					1200	1200	1	20 A	Hand Dryer Room 0.8.1		12
13	Hand Dryer Room 0.8.2	20 A	1	1200	1200					1	20 A	Hand Dryer Room 2F.13		14
15	Receptacle Circuit Room 11.1.6	20 A	1			540 VA	180 VA			1	20 A	Receptacle Circuit Room	11.1.7	16
17	Receptacle Circuit	20 A	1					360 VA	800 VA	1	20 A	Pass-Through Metal Dete	ctor Room 0.6	18
19	Lighting	20 A	1	189 VA	189 VA					1	20 A	Lighting		20
21	Power	20 A	1			480 VA	0 VA			1	20 A	Other		22
23	Lighting	20 A	1					227 VA	480 VA	1	20 A	Power		24
25	BSB Unit	20 A	1	180 VA	166 VA					2	15(A	VRV-03 <		26
ے 27		20 A	1			37 VA	166 VA				(			28
29	VRV-06	15 A	2					166 VA	166 VA	2	15 A	VRV-02 2		30
31 🔨				166 VA	166 VA						-£	<		32
33	Receptacle	20 A	1			800 VA	52 VA			2	15 A	AHU-03		34
-35(	VRV-13 }	20 A	2					166 VA	52 VA		(	}		36
37 \				166 VA	166 VA					2	15 A	VRV-08		38
39							166 VA				7			40
41														42
1		Tot	al Load:	703	) VA	536	2 VA	607	8 VA			1		
		Tota	al Amps:	60	A	45	5 A	52	2 A	1				
Legend	:													
Load Cl	assification	Con	nected I	Load	Der	mand Fa	ctor	Estim	nated De	mand		Panel	Totals	
Motor			1768 VA			104.71%			1851 VA					
Other			7920 VA	1		100.00%			7920 VA			Total Conn. Load:	18470 VA	
Decente	cle		6380 VA	1		100.00%	, 0		6380 VA			Total Est. Demand:	18713 VA	
Recepta			642 VA			125.00%		1	802 VA			Total Conn.:	<b>E1</b> A	
Lighting			042 VA			125.00%	0		002 VA				DIA	

	Location: JAN. 2F.12 Supply From: DP1B Mounting: Surface Enclosure: Type 1				
Notes:					
СКТ	Circuit Description	Trip	Poles		A
1 (	Clothes Washer	20 A	1	180 VA	
3 I	Receptacle Circuit Room 2.10.1	20 A	1		
5 I	Receptacle Circuit Rooms 2F.2 and 2F.1.1	20 A	1		
7 I	Receptacle Circuit Rooms 2F.1.4 and 2F.1.5	20 A	1	360 VA	3
9 I	Receptacle Circuit Rooms 2F.1.8 and 2F.1.9	20 A	1		
11	Receptacle Circuit Room 2F.5	20 A	1		
13 I	Receptacle Circuit Room 2F.4	20 A	1	540 VA	7
15 I	Receptacle Circuit Room 3.3	20 A	1		
17 I	Receptacle Circuit Rooms 3.0.1 and 3.6	20 A	1		
19 I	Receptacle	20 A	1	360 VA	3
21	Power	20 A	1		
23	VRV-07	30 A	2		T
25				166 VA	Γ
27	VRV-12	15 A	2		T
29					F
31 I	Receptacle	20 A	1	1200	
	Other	20 A	1		t
35 _1	Power	20 A	1		T
37	VRV-14	15 A	2	166 VA	1
39	en l				F
41					t
		Tot	al Load:	611	6
		Tota	al Amps:	5-	

\* PROVIDE A GFCI CIRCUIT BREAKER

		A.I.C. Rating: 10,000 Mains Type: 100 A Mains Rating: 100 A MCB Rating: 100 A	
S	Trip	Circuit Description	СК
	20 A	Receptacle	2
	20 A	Receptacle	4
	20 A 20 A	Receptacle Receptacle	6 8
	20 A 20 A	Receptacle	0 10
			10
	20 A	DB-1	14
	20 A	CP-1	16
	15 A	VRV-43	18
	\	) /2	20
	20 A	SP-2	22
	(		24
			26
			28
			30
			32
			34
			36
			38
			40
			42

5

Panel Totals
Total Conn. Load: 7647 VA
Total Est. Demand: 7794 VA
Total Conn.: 21 A
Total Est. Demand: 22 A

on

A.I.C. Rating: 10,000

207	Teceptacie	0
20 A	Receptacle	8
20 A	Receptacle Circuit Room 11.1.9	10
20 A	Electric Water Cooler	12
20 A	Receptacle Circuit 7.6	14
20 A	Microwave Oven Room 7.6	16
20 A	Microwave Oven Room 7.6	18
20 A	Refrigerator Room 7.6	20
20 A	Receptacle Circuit Room 11.5	22
20 A	Lighting	24
15 Ą	VRV-10 }	26
\		28
		30
		32
		34
		36
		38
		40
		42

СКТ

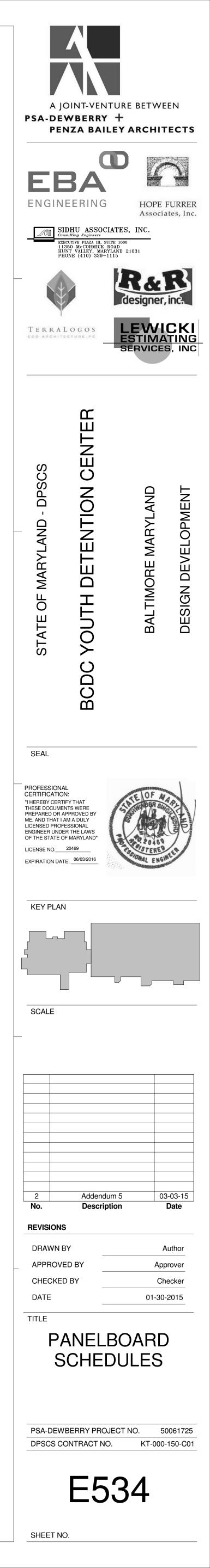
4

	Panel Totals								
	Total Conn. Load:	15498 VA							
	Total Est. Demand:	15686 VA							
	Total Conn.:	43 A							
	Total Est. Demand:	44 A							
-									

### Volts: 120/208 Wye Phases: 3 Wires: 4

## A.I.C. Rating: 10,000 Mains Type: 225 A Mains Rating: 225 A MCB Rating: 225 A

180 VA -	1440	-	3	С		Poles	Trip	Circuit De	escription	СКТ	
360 VA 3						1	20 A	Receptacle	•	2	
360 VA 3		720 VA	720 VA			1	20 A	Receptacle Circuit Rooms	2F	4	
360 VA 3				360 VA	360 VA	1	20 A	Receptacle Circuit Rooms	2F.1.2 and 2F.1.3	6	
	360 VA					1	20 A	Receptacle Circuit Room	2F.1.6 and 2F.1.7	8	
		360 VA	360 VA			1	20 A	Receptacle Circuit Room	2F.5	10	
				540 VA	540 VA	1	20 A	Receptacle Circuit Room	2F.4 and 2F.7	12	
540 VA 7	720 VA					1	20 A	Receptacle Circuit Room	2.11.1	14	
		720 VA	360 VA			1	20 A	Receptacle Circuit Room	2F.15	16	
				540 VA	1200	1	20 A	Hand Dryer room 3.2		18	
360 VA 3	360 VA					1	20 A	Receptacle	20		
		480 VA	227 VA			1	20 A	Lighting		22	
				166 VA	83 VA	2	15 A	VRV-11 2 2		24	
166 VA	83 VA					26					
		83 VA	360 VA			1	20 A	Beceptacle		28	
				83 VA	0 VA	2	30 A	Electric Clothes Dryer Roo	s Dryer Room 2F.14		
1200	0 VA									32	
		360 VA	540 VA			1	20 A	Other		34	
				800 VA	720 VA	1	20 A	Receptacle		36	
166 VA 1	180 VA					1	20 A	BSB Units		38	
		166 VA								40	
										42	
6116	VA	5456	5 VA	5393	3 VA						
51 /	A	46	5 A	45	δA						



5

Volts: 120/208 Wye

28 A

**Phases:** 3

Wires: 4

## Branch Panel: RP1D Location: JAN. 1.6 Supply From: DP1B

## Mounting: Surface Enclosure: Type 1

		Enclosure. Type T								
1	Notes:									
	СКТ	Circuit Description	Trip	Poles		4	F	В	(	5
	1	Receptacle Circuit Rooms 11.1.2 and 11.1.10	20 A	1	720 VA	720 VA				
	3	Receptacle Circuit Room 1.3	20 A	1			900 VA	900 VA		
	5	Receptacle Circuit Rooms 1.4, 1.5, 1.0, 7.10	20 A	1					900 VA	12
	7	Receptacle Circuit Room 1.2	20 A	1	720 VA	853 VA				
	9	Receptacle Circuit Room 2.9.1	20 A	1			720 VA	720 VA		
	11	Lighting	20 A	1					265 VA	54
	13	Printer/Copier Machine	20 A	1	1200					
	15	VRV-05 \	15 A	2			166 VA	83 VA		
	17	)							166 VA	83
	19-	VRV-04	15 A	2	166 VA					
	21						166 VA			
	23									83
	25	$\langle \rangle$				83 VA				
	27 (	VRV-16	15 A	2			83 VA			
Γ	29	-+							83 VA	

# Legend:

29 31 33

35 37 39

41

oad Classification	Connected Load	Demand Factor	Estimated Demand	Panel	l Totals		
lotor	1165 VA	107.14%	1248 VA				
Other	1740 VA	100.00%	1740 VA	Total Conn. Load:	11522 VA		
leceptacle	8353 VA	100.00%	8353 VA	Total Est. Demand:	11672 VA		
ighting	265 VA	125.00%	331 VA	Total Conn.:	32 A		
ower	0 VA	0.00%	0 VA	Total Est. Demand:	32 A		

3739 VA

32 A

Total Load:4463 VATotal Amps:38 A

Notes:

Notes:	Branch Panel: RP1E Location: JAN. 6.5 Supply From: DPB2 Mounting: Surface Enclosure: Type 1				I	Volts: Phases: Wires:	-	Wye				A.I.C. Rating: 10,000 Mains Type: 225 A Mains Rating: 225 A MCB Rating: 225 A	
СКТ	Circuit Description	Trip	Poles		4	E			C	Poles	Trip	Circuit Description	СКТ
1	Three Door Reach-in Refrigerator	20 A	2	1342	<b>1</b> 1373		<b>)</b>			2	Trip 20 A	Ice Maker	2
3		20 A		1342	1373	1342	1373				20 A		4
5	Exhaust Hood	20 A	1			1042	1070	1200	1200	1	20 A	Other	6
7	Combi-Oven	70 A	3	6360	7080			1200	1200	3	80 A	Receptacle	8
9				0000	7000	6360	7080						10
11							7000	6360	7080				12
13	2 HP Disposal	15 A	3	552 VA	2640					3	30 A	Receptacle	14
15						552 VA	2640						16
17								552 VA	2640				18
19	Receptacle	20 A	1	720 VA	1200					1	20 A	Other	20
21	Receptacle	20 A	1			540 VA	360 VA			1	20 A	Receptacle Circuit Room 6.2	22
23	Other	20 A	1					1200	360 VA	1	20 A	Receptacle Circuit Room 6.2	24
25	Receptacle	20 A	1	540 VA	0 VA					1	20 A		26
27													28
29													30
31													32
33													34
35													36
37													38
39													40
41													42
			al Load:	2180		2024			92 VA				
Legend	1:	Tota	I Amps:	182	2 A	169	9 A	17	2 A				
	lassification		nected I			nand Fac			nated De			Panel Totals	

Connected Load	Demand Factor	Estimated Demand	Panel	Totals
0 VA	0.00%	0 VA		
11885 VA	100.00%	11885 VA	Total Conn. Load:	62645 VA
50760 VA	59.85%	30380 VA	Total Est. Demand:	42265 VA
0 VA	0.00%	0 VA	Total Conn.:	174 A
			Total Est. Demand:	117 A
· · · · ·	•			
	0 VA 11885 VA 50760 VA	0 VA         0.00%           11885 VA         100.00%           50760 VA         59.85%	0 VA         0.00%         0 VA           11885 VA         100.00%         11885 VA           50760 VA         59.85%         30380 VA	0 VA         0.00%         0 VA           11885 VA         100.00%         11885 VA         Total Conn. Load:           50760 VA         59.85%         30380 VA         Total Est. Demand:

3

## A.I.C. Rating: 10,000 Mains Type: 225 A Mains Rating: 225 A MCB Rating: 225 A

	С					
	C	>	Poles	Trip	Circuit Description	СКТ
			1	20 A	Receptacle Circuit Room 1.1	2
A			1	20 A	Receptacle Circuit Room 1.4	4
	900 VA	1200	1	20 A	Hand Dryer Room 1.7	6
			1	20 A	Receptacle Circuit Room 1.3	8
A			1	20 A	Receptacle Circuit Room 7.5	10
	265 VA	540 VA	1	15 A	BSB Units	12
				کے		14
ł			2	15 A	VRV-01	16
	166 VA	83 VA		}	2	18
				}	)/2	20
				(		22
		83 VA	2	15 À,	VRV-15 {	24
				(	tere and the second sec	26
						28
	83 VA					30
						32
						34
						36
						38
						40
						42
	3321	I VA				
		•				

## Branch Panel: RP1F

Location: JAN. 6.5 Supply From: DPB2 Mounting: Surface Enclosure: Type 1

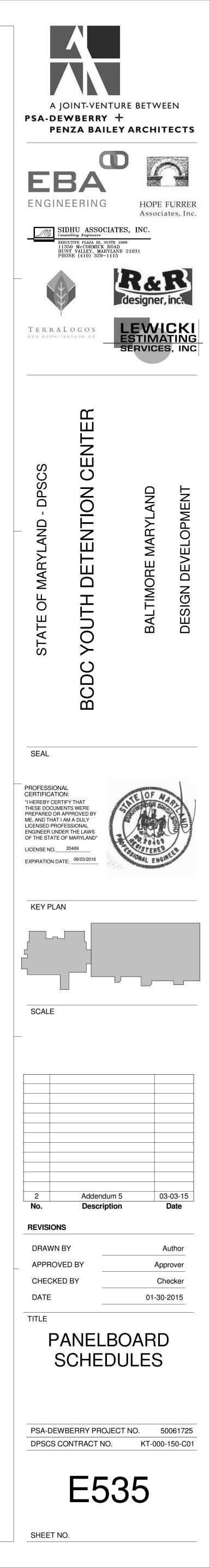
СКТ	Circuit Description	Trip	Poles		4		В	(	2	Poles	Trip	Circuit Description	CK
1	Receptacle	20 A	1	540 VA	4740					3	60 A		2
3	1HP Disposal	15 A	3			552 VA	4740						4
5								552 VA	4740				6
7				552 VA	1200					1	20 A	Hand Dryer Room 6.11	8
9	Dishwasher	70 A	3			6012	540 VA			1	20 A	Receptacle	10
11								6012	180 VA	1	20 A	Walk-in Cooler Room 6.0	12
13				6012	180 VA					1	20 A	walk-in Cooler Room 6.4	14
15	Power	20 A	1			480 VA	360 VA			1	20 A	Receptacle	16
17	Walk-in Cooler Evaporator Room 6.0	20 A	2					915 VA	360 VA	1	20 A	Receptacle Circuit Room 6.6	18
19				0 VA	360 VA					1	20 A	Receptacle	20
21	Walk-in Cooler Evaporator Room 6.4	20 A	2			915 VA	540 VA			1	20 A	Receptacle	22
23								0 VA	540 VA	1	20 A	VAV Units	24
25	Q O Load Center	40 A	2	2000	1080					3	20 A	AIR CURTAIN	26
27						2000	1080						28
29	AIR CURTIAN	20 A	3					1080	1080				30
31				1080	2004					3	30 A	Trash Compactor	32
33						1080	2004						34
35	EF-12	20 A	1					0 VA	2004				36
37													38
39													40
41													42
		Tota	al Load:	1974	9 VA	2030	4 VA	1746	4 VA				
		Tota	I Amps:	16	8 A	17	2 A	14	6 A	1			

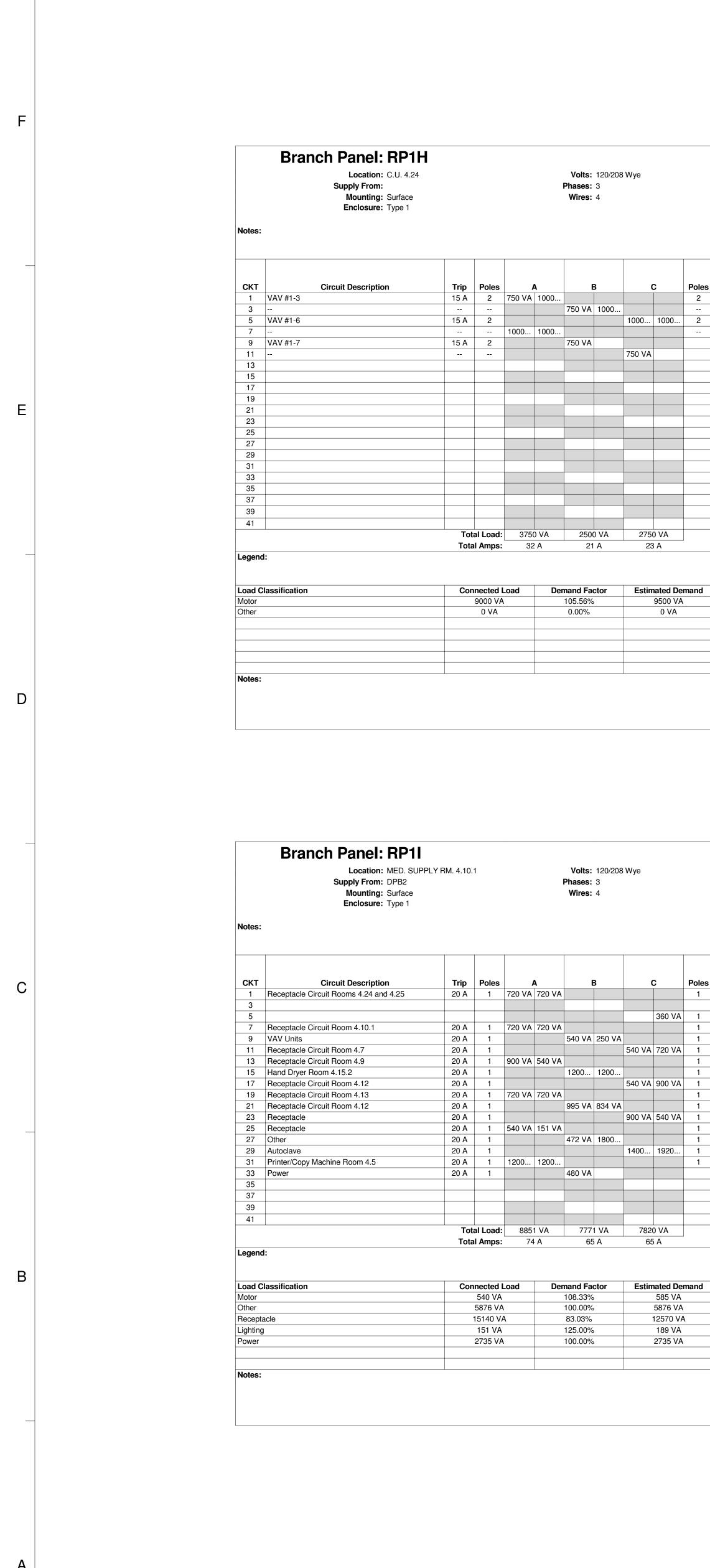
Load Classification	Connected Load	Demand Factor	Estimated Demand	Panel Totals
Motor	20772 VA	117.11%	24327 VA	
Other	29564 VA	100.00%	29564 VA	Total Conn. Load: 53516 VA
Receptacle	2700 VA	100.00%	2700 VA	Total Est. Demand: 57071 VA
Power	480 VA	100.00%	480 VA	Total Conn.: 149 A
				Total Est. Demand: 158 A
Notes:	L			

	Location: C.U. 4.24 Supply From: DPB2 Mounting: Surface Enclosure: Type 1					Volts: Phases: Wires:	-	Wye				A.I.C. Rating: 10,000 Mains Type: 100 A Mains Rating: 100 A MCB Rating: 100 A	
Notes:													
СКТ	Circuit Description	Trip	Poles		A	-	3	(	0	Poles	Trip	Circuit Description	скт
1	Receptacle Circuit Room 4.0.1 and 4.0.3	20 A	1	540 VA	720 VA					1	20 A	Receptacle Circuit Room 4.3	2
3	Receptacle Circuit Room 4.3	20 A	1			720 VA	360 VA			1	20 A	Receptacle Circuit Room 4.3	4
5	Receptacle Circuit Room 4.3	20 A	1					180 VA	180 VA	1	20 A	Receptacle Circuit Room 4.3	6
7	Receptacle Circuit Room 4.2	20 A	1	720 VA	360 VA					1	20 A	Receptacle Circuit Room 4.2	8
9	Receptacle	20 A	1			180 VA	180 VA			1	20 A	Receptacle Circuit Room4.2	10
11	Receptacle Circuit Room 4.2	20 A	1					720 VA	900 VA	1	20 A	Receptacle Circuit Room 4.18	12
13	Power	20 A	1	480 VA	720 VA					1	20 A	Receptacle Circuit Room 4.18	14
15	Receptacle	20 A	1			360 VA	180 VA			1	20 A	Receptacle	16
17	Receptacle	20 A	1	0001/4	100.14			180 VA	720 VA	1	20 A	Receptacle Circuit Rooms 4.20.2 and 4.21.2	18
19	Receptacle Circuit Room 4.20.1	20 A	1	360 VA	180 VA		700.1/4			1	20 A	Receptacle Circuit Room 4.20.1	20
21	Receptacle Circuit Room 4.20.1	20 A	1			180 VA	720 VA	000.1/4	100.1/4	1	20 A	Receptacle Circuit Rooms 4.20.1 and 4.21.1	22
23	Receptacle	20 A	1	100.1/4				360 VA	180 VA	1	20 A	Receptacle	24
25	Receptacle	20 A	1	180 VA	540 VA		180 VA			1	20 A	Receptacle Circuit Room 4.22.1	26
27 29	Receptacle Circuit Room 4.22.2 Receptacle Circuit Room 4.22.2	20 A 20 A	1			360 VA	160 VA	190.\/A	540 VA	1	20 A 20 A	Receptacle Circuit Room 4.22.2 Receptacle Circuit Room 4.22.2	28 30
31	Receptacle	20 A	1	260 \/A	180 VA			100 VA	540 VA	1	20 A	Receptacle Circuit Room 4.22.2	30
33	Receptacle Circuit room 4.22.3	20 A	1	300 VA	100 VA		540 VA			1	20 A	Receptacle Circuit Room 4.22.3	32
35	Receptacle	20 A	1			100 VA	J40 VA	540 VA	720 VA	1		Receptacle	36
37	Receptacle	20 A	1	900 \/A	540 VA			J40 VA	720 VA	1	20 A		38
39	Receptacle Circuit Room 5.1	20 A	1	300 VA	540 VA	900 \/A	180 VA			1		Receptacie	40
41	Other	20 A	1			900 VA	100 VA	1200	1200	1		Other	40
41	Other		al Load	678	0 VA	522	D VA		1200 0 VA	I	20 A	Other	42
			I Amps:		) A		A		' A				
Legend			•					1				Deniel Tetale	
Load C Motor	lassification	Con	nected 540 VA			mand Fa 108.33%		ESUM	nated De 585 VA	manu		Panel Totals	
Other			2400 V/		-	100.00%			2400 VA			Total Conn. Load: 19800 VA	
Recepta	acle		16380 V			80.53%			13190 VA			Total Est. Demand: 16655 VA	
Power			480 VA			100.00%			480 VA	-		Total Conn.: 55 A	
												Total Est. Demand: 46 A	
Notes:													

## Volts: 120/208 Wye **Phases:** 3 Wires: 4

A.I.C. Rating: 10,000 Mains Type: 225 A Mains Rating: 225 A MCB Rating: 225 A





			A.I.C. Rating: 10,000 Mains Type: 100 A Mains Rating: 100 A MCB Rating: 100 A	
	Poles	Trip	Circuit Description	СКТ
	2	15 A	VAV #1-4	2
				4
	2	15 A	VAV #1-6	6
				8
				10
				12
				14
				16
				18
				20
				22
				24
				26
				28
				30
				32
				34
				36
				38
				40
				42
e	mand		Panel Totals	

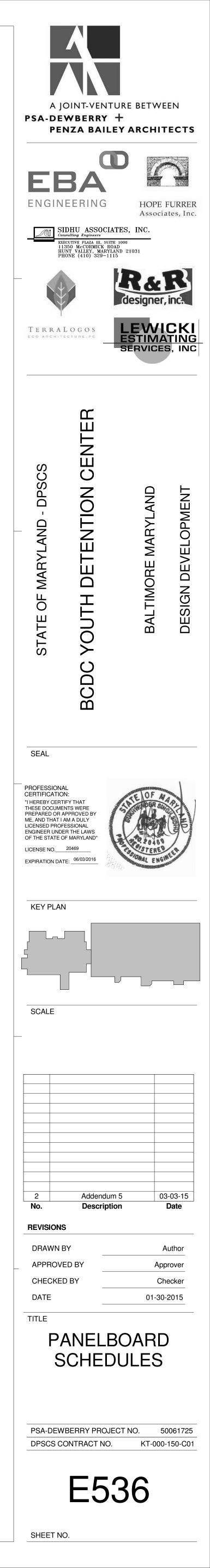
VA		
4	Total Conn. Load:	9000 VA
	Total Est. Demand:	9500 VA
	Total Conn.:	25 A
	Total Est. Demand:	26 A

			A.I.C. Rating: 10,000 Mains Type: 100 A Mains Rating: 100 A MCB Rating: 100 A		
_	Poles	Trip		escription	СКТ
_	1	20 A	Receptacle Circuit Room	4.11	2
		00 1	Desentesis Oirerit Deser	A E	4
4	1	20 A	Receptacle Circuit Room		6
	1	20 A 20 A	Receptacle Circuit Room	J.Z	8
٩	1	20 A 20 A	Receptacle Circuit Room	1 16	10
1	1	20 A 20 A	Receptacle Circuit Room 4		12
	1	20 A 20 A	Hand Dryer Room 4.15.1		14
1	1	20 A	Receptacle		18
•	1	20 A	Receptacle Circuit Room	4 12	20
	1	20 A	Dental Compressor		20
1	1	20 A	Receptacle		24
-	1	20 A	Lighting		26
	1	20 A	Dental Xray Unit		28
	1	20 A	Dental Vacuum System		30
	1	20 A	Printer/Copy Machine Roo	om 4.7	32
					34
					36
t					38
					40
					42
]					
er	nand		Panel	Totals	
١					
A			Total Conn. Load:		
/Α			Total Est. Demand:		
١			Total Conn.:		
			Total Est. Demand:	61 A	
A					

Branch Panel: RP2A Location: ELEC. 11.2.18 Supply From: DP2B Mounting: Surface Enclosure: Type 1					Volts: Phases: Wires:		Wye				A.I.C. Rating: 10,000 Mains Type: 225 A Mains Rating: 225 A MCB Rating: 225 A	
Notes:												
CKT Circuit Description	Trip	Poles		A	E	В		C	Poles	Trip	Circuit Description	СКТ
( VRV-31	15 A	2	187 VA	302 VA					2	(15 A	VRV-29	2
3 )					187 VA	302 VA				(		4
5 VRV-26	15 A	2					146 VA	94 VA	2	(15 A	VRV-27	6
7			146 VA	94 VA						<u> </u>	)	8
9 VRV-28 -	15 A	2			94 VA	146 VA		140 1/4	2 (	15 A	VRV-21	10
11 1,3 VRV-22 ≺	 15 A	2	146 \/A	146 VA			94 VA	146 VA	(	 15 A	  VRV-23 →	12 14
15			140 VA	140 VA	146 VA	146 VA			2	15 A	VNV-23 <	14
17 VRV-24	15 A	2			140 17	140 VA	146 VA	146 VA	2	15 A	VRV-25	18
19			146 VA	146 VA			110 171	110 171	(		VRV-252	20
21 VRV-45 2	15 A	2	-			910 VA			2	15 A	CU-1 2	22
23							62 VA	910 VA			)	24
25_ VRV-34	15 A	2	187 VA	187 VA					2	15 A	VRV-33	26
27 <					187 VA	187 VA			(		}	28
29 Receptacle	20 A	1					180 VA	42 VA	2	15 A	AHU-01	30
31 VRV-32 ≺	15 A	2	187 VA	42 VA							t ~	32
33					187 VA	0 VA			2	30 A	Special Receptacle Room 11.2.17	34
35 Receptacle	20 A	1					180 VA	0 VA				36
37 Other	20 A	1	360 VA	180 VA					1	20 A	Receptacle Elec. 11.2.18	38
39, VRV-44	15 A	2			62 VA							40
41							62 VA					42
		al Load:		4 VA		6 VA		6 VA				
	Tota	al Amps:	21	A	22	2 A	18	3 A				
Legend: Load Classification	Сог	nnected		Dei	mand Fac			nated De			Panel Totals	
Motor		6375 VA			107.14%			6830 VA				
Other		360 VA			100.00%			360 VA			Total Conn. Load: 7275 VA	
Receptacle		540 VA			100.00%	<b>)</b>		540 VA			Total Est. Demand: 7730 VA	
Power		0 VA			0.00%			0 VA			Total Conn.: 20 A	
											Total Est. Demand: 21 A	
Notes:												

Branch Panel: RP2A												
Location: ELEC. 11.2.18 Supply From: DP2B Mounting: Surface Enclosure: Type 1					Volts: Phases: Wires:		3 Wye				A.I.C. Rating: 10,000 Mains Type: 225 A Mains Rating: 225 A MCB Rating: 225 A	
Notes:												
CKT Circuit Description	Trip	Poles		A		в		c	Poles	Trip	Circuit Description	СКТ
( VRV-31	15 A	2	187 VA	302 VA					2	(15 A	VRV-29	2
3					187 VA	302 VA				(		4
5 VRV-26	15 A	2					146 VA	94 VA	2	(15 A	VRV-27	6
<b>7</b>			146 VA	94 VA						<u> </u>	)	8
9 VRV-28	15 A	2			94 VA	146 VA		1 40 1/4	2 (	15 A	VRV-21 <	10
11 13 VRV-22 <	 15 A	2	146 \/A	146 VA			94 VA	146 VA	2	 15 A	 VRV-23 →	12 14
15	15 A		146 VA	140 VA		146 VA			2	15 A		14
17 VRV-24	15 A	2			140 VA	140 VA		146 VA	2	15 A	VRV-25	18
19			146 VA	146 VA				140 17			VRV-25	20
21 VRV-45 2	15 A	2				910 VA			2	15 A	CU-1	22
								910 VA				24
23 25 VRV-34	15 A	2	187 VA	187 VA					2	15 A	VRV-33 _	26
27 <					187 VA	187 VA			(		}	28
29 Receptacle	20 A	1					180 VA	42 VA	2	15 A	AHU-01	30
31 VRV-32	15 A	2	187 VA	42 VA						<u> </u>		32
3(3					187 VA	0 VA			2	30 A	Special Receptacle Room 11.2.17	34
35 Receptacle	20 A	1					180 VA	0 VA				36
37 Other	20 A	1	360 VA	180 VA					1	20 A	Receptacle Elec. 11.2.18	38
39 VRV-44	15 A	2			62 VA		-					40
41 4							62 VA					42
		al Load:		4 VA		6 VA		6 VA				
	lota	al Amps:	21	А	22	2 A	18	3 A				
Legend:	Cor	nected	and	Dev	mand Fa	atar	Fatin	nated De	un o u d		Danal Tatala	
Motor	Cor	6375 VA			mand Fa			6830 VA			Panel Totals	
Other		360 VA			100.00%			360 VA			Total Conn. Load: 7275 VA	
Receptacle		540 VA			100.00%			540 VA			Total Est. Demand: 7730 VA	
Power		0 VA			0.00%			0 VA			Total Conn.: 20 A	
											Total Est. Demand: 21 A	
Notes:												

	Location: ELEC. 11.2.18 Supply From: DP2B Mounting: Surface Enclosure: Type 1					Volts: Phases: Wires:		Wye				A.I.C. Rating: 10,000 Mains Type: 100 A Mains Rating: 100 A MCB Rating: 100 A		
Notes:														
скт	Circuit Description	Trip	Poles		A	E	3	(	0	Poles	Trip	Circuit De	escription	
1	Receptacle Circuit Room 9.13	20 A	1	900 VA	540 VA					1	20 A	Receptacle Circuit Room S		
3	Receptacle Circuit Room 9.5	20 A	1			360 VA	360 VA			1	20 A	Receptacle Circuit Room S		
5	Hand Dryer Room 9.7.2	20 A	1					1200	540 VA	1	20 A	Receptacle Circuit Room S		
7	Receptacle Circuit Room 9.12	20 A	1	720 VA	720 VA					1	20 A	Receptacle Circuit Room S		
9	Receptacle Circuit Room 9.18	20 A	1			540 VA	540 VA			1	20 A	Receptacle Circuit Room S		
11	Receptacle Circuit Room 9.4.1	20 A	1					360 VA	360 VA	1	20 A	Receptacle Circuit Room S		
13	Receptacle Circuit Room 9.4.1	20 A	1	360 VA	360 VA					1	20 A	Receptacle Circuit Room S		
15	Receptacle Circuit Room 9.4.1	20 A	1			360 VA	360 VA			1	20 A	Receptacle Circuit Room S		
17	Receptacle Circuit Room 9.4.1	20 A	1					540 VA	540 VA	1	20 A	Receptacle Circuit Room S	9.4.1	
19	Ultra-Short Throw Projector Room 9.4.1	20 A	1	180 VA	540 VA					1	20 A	Receptacle		
21	Receptacle	20 A	1			540 VA	360 VA	= ( 0 ) ( 1	0001/4	1	20 A	Receptacle	<u> </u>	
23	Receptacle	20 A	1	<b>E</b> 40 1 44	0001/4			540 VA	360 VA	1	20 A	Receptacle Circuit Rooms		
25	Receptacle Circuit Room 9.11	20 A	1	540 VA	360 VA	<b>5</b> ( <b>0</b> ) ( <b>1</b>	0001/4			1	20 A	Receptacle Circuit Room 9		
27	Receptacle Circuit Room 9.14	20 A	1			540 VA	360 VA	= ( 0 ) ( 1	(000	1	20 A	Receptacle Circuit Room 9	9.14	
29	Receptacle	20 A	1	<b>E</b> 40 1 44	<b>-</b> 10 1/4			540 VA	1200	1	20 A	Printer/Copy Machine		
31	Receptacle	20 A	1	540 VA	540 VA	700.1/4	1000			1	20 A	Receptacle		
33 35	Receptacle Circuit Rooms 9.8 and 9.10Hand Dryer Room 9.7.1	20 A 20 A	1			720 VA	1200	1200	180 VA	1	20 A	Hand Dryer Room 9.9 Refrigerator Circuit Room	0.0	
35	Receptacle Circuit Room 9.8	20 A	1	190 \/A	180 VA			1200	160 VA	1	20 A 20 A	Receptacle Circuit Room		
	•			100 VA	100 VA	700.1/4	360 VA			1				
$\vdash$	Receptacle Circuit Room 9.8	20 A	1			720 VA	360 VA	00.1/4		I	20 A	Receptacle Circuit Room	11.2.9	
41	VRV-30	15 A	2 al Load:	074		700		83 VA						
			I Amps:		3 VA 5 A		2 VA 2 A		3 VA					
Legend			•									Damal	Tatala	
Load C Motor	Classification	Con	nected I 166 VA			nand Fa		Estim	208 VA	mand		Panel	iotais	
Other			3600 VA			125.00%			208 VA 3600 VA			Total Conn. Load:	21706 \/A	
Recept	tacle		17940 VA			77.87%			13970 VA			Total Est. Demand:		
Power			0 VA	•		0.00%			0 VA	-		Total Conn.:		
					0.0070						Total Est. Demand:			
Notes:		1			1									



33 Other

35

41

Legend:

37 39 5





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	Drevels Devels DD00									
	Branch Panel: RP2C Location: STOR. 9.3.2 Supply From: DP2B Mounting: Surface Enclosure: Type 1				I	Volts: Phases: Wires:	•	Wye		
Notes:	Enclosure: Type 1         Iotes:       Circuit Description         1       Receptacle Circuit Room 9.2.1									
скт	Circuit Description	Trip	Poles		4	E	3		<b>c</b>	Po
1	Receptacle Circuit Room 9.2.1	20 A	1	540 VA	540 VA					
3	Ultra-Short Throw Projector Room 9.2.1	20 A	1			180 VA	360 VA			
5	Receptacle Circuit Room 9.2.1	20 A	1					360 VA	360 VA	
7	Receptacle Circuit Room 9.2.2	20 A	1	540 VA	540 VA					
9	Receptacle Circuit Room 9.2.2	20 A	1			360 VA	360 VA			
11	Ultra-Short Throw Projector Room 9.2.2	20 A	1					180 VA	360 VA	
13	Receptacle Circuit Room 9.2.3	20 A	1	540 VA	360 VA					
15	Receptacle Circuit Room 9.2.3	20 A	1			360 VA	360 VA			
17	Ultra-Short Throw Projector Room 9.2.3	20 A	1					180 VA	540 VA	
19	Receptacle Circuit Room 9.3.1	20 A	1	360 VA	540 VA					
21	Receptacle Circuit Room 9.3.1	20 A	1			360 VA	360 VA			
23	Receptacle Circuit Room 9.3.1	20 A	1					360 VA	360 VA	
25	Receptacle Circuit Room 9.3.1	20 A	1	360 VA	360 VA					
27	Receptacle Circuit Room 9.3.1	20 A	1			360 VA	360 VA			
29	Receptacle Circuit Rooms 11.2.14 and 11.2.15	20 A	1					540 VA	480 VA	
31	Receptacle Circuit Room 11.2.13	20 A	1	360 VA	180 VA					

20 A 1

Total Load: 5220 VA

Total Amps: 45 A

oad Classification	Connected Load	Demand Factor	Estimated Demand	Panel	Totals
Dther	1080 VA	100.00%	1080 VA		
Receptacle	11880 VA	92.09%	10940 VA	Total Conn. Load:	13440 VA
Power	480 VA	100.00%	480 VA	Total Est. Demand:	12500 VA
				Total Conn.:	37 A
				Total Est. Demand:	35 A
lotes:	·				1

360 VA 720 VA

4500 VA 3720 VA

	Branch Panel: RP2D													
	Location: JAN. 9.15 Supply From: DP2B Mounting: Surface Enclosure: Type 1				I	Volts: Phases: Wires:	-	Wye				A.I.C. Rating: 10,000 Mains Type: 100 A Mains Rating: 100 A MCB Rating: 100 A		
lotes:														
СКТ	Circuit Description	Trip	Poles		4	E	3	(	0	Poles	Trip	Circuit De	escription	СК
1	Smart Board/Projector Room 9.1.1	20 A	1	180 VA	720 VA					1	20 A	Receptacle Circuit Room	9.1.1	2
3	Receptacle Circuit Room 9.1.1	20 A	1			360 VA	360 VA			1	20 A	Receptacle Circuit Room	9.1.1	4
5	Receptacle Circuit Room 9.1.1	20 A	1					360 VA	720 VA	1	20 A	Receptacle Circuit Room	9.1.2	6
7	Smart Board/Projector Room 9.1.2	20 A	1	180 VA	720 VA					1	20 A	Receptacle Circuit Room	9.1.2	8
9	Receptacle Circuit Room 9.1.2	20 A	1			360 VA	360 VA			1	20 A	Receptacle Circuit Room	9.1.2	10
11	Receptacle Circuit Room 9.1.2	20 A	1					360 VA	720 VA	1	20 A	Receptacle Circuit Room	9.1.3	12
13	Receptacle Circuit Room 9.1.3	20 A	1	360 VA	360 VA					1	20 A	Receptacle Circuit Room	9.1.3	14
15	Receptacle Circuit Room 9.1.3	20 A	1			360 VA	720 VA			1	20 A	Receptacle Circuit Room	9.1.4	16
17	Smart Board/Projector Room 9.1.4	20 A	1					180 VA	180 VA	1	20 A	Smart Board/Projector Ro	om 9.1.3	18
19	Receptacle Circuit Room 9.1.4	20 A	1	540 VA	540 VA					1	20 A	Receptacle Circuit Room	9.1.4	20
21	Receptacle Circuit Room 9.1.4	20 A	1			540 VA	540 VA			1	20 A	Receptacle Circuit Room	9.1.4	22
23	Receptacle Circuit Room 9.1.4	20 A	1					360 VA	360 VA	1	20 A	Receptacle Circuit Room	9.1.4	24
25	Receptacle Circuit Room 9.1.4	20 A	1	360 VA	360 VA					1	20 A	Receptacle Circuit Room	9.1.4	26
27	Receptacle Circuit Room 9.1.4	20 A	1			360 VA	360 VA			1	20 A	Receptacle Circuit Room	9.1.4	28
29	Receptacle Circuit Room 9.1.4	20 A	1					540 VA	720 VA	1	20 A	Receptacle Circuit Room	9.1.5	30
31	Smartboard/Projector Room 9.1.5	20 A	1	180 VA	540 VA					1	20 A	Receptacle Circuit Room	9.1.5	32
33	Receptacle Circuit Room 9.1.5	20 A	1			360 VA	720 VA			1	20 A	Receptacle Circuit Room	9.1.1	34
35	Receptacle Circuit Room 11.2.12	20 A	1					360 VA	480 VA	1	20 A	Electric Water Cooler Roc	m 11.2.12	36
37	Receptacle Circuit Rooms 9.15 and 11.2.12	20 A	1	540 VA	360 VA					1	20 A	Receptacle Circuit Room	11.2.12	38
39	Receptacle Circuit Room 9.1.3	20 A	1			720 VA	540 VA			1	20 A	Other		40
41														42
		Tot	al Load:	5940	) VA	6660	) VA	534	O VA					
		Tota	I Amps:	50	A	56	А	45	5 A					
egend								<b>-</b>					1	
oad Cl	assification	Con	nected   540 VA			nand Fac 100.00%		Estin	nated Der 540 VA	mand		Panel	IOTAIS	
ecepta			540 VA 16920 V/			79.55%			540 VA 13460 VA			Total Conn. Load:	17940 \/A	
ower			480 VA			100.00%			480 VA	۱ ۱		Total Est. Demand:		
			-100 VA			100.00 /0			-100 VA			Total Conn.:		
												Total Est. Demand:		
-														

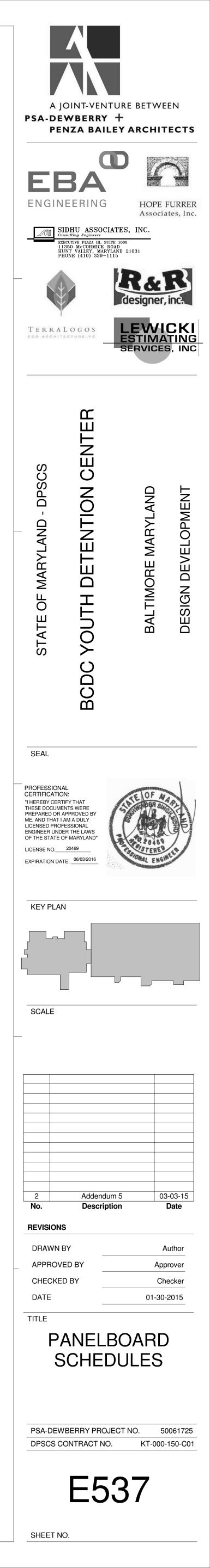
/olts: ases: /ires:		Wye				A.I.C. Rating: 10,000 Mains Type: 100 A Mains Rating: 100 A MCB Rating: 100 A	
F	3		0	Poles	Trip	Circuit Description	СКТ
_				1	20 A	Receptacle Circuit Room 9.2.1	2
80 VA	360 VA			1	20 A	Receptacle Circuit Room 9.2.1	4
		360 VA	360 VA	1	20 A	Receptacle Circuit Room 9.2.1	6
				1	20 A	Receptacle Circuit Room 9.2.2	8
60 VA	360 VA			1	20 A	Receptacle Circuit Room 9.2.2	10
		180 VA	360 VA	1	20 A	Receptacle Circuit Room 9.2.2	12
				1	20 A	Receptacle Circuit Room 9.2.3	14
60 VA	360 VA			1	20 A	Receptacle Circuit Room 9.2.3	16
		180 VA	540 VA	1	20 A	Receptacle Circuit Room 9.2.3	18
				1	20 A	Receptacle Circuit Room 9.3.1	20
60 VA	360 VA			1	20 A	Receptacle Circuit Room 9.3.1	22
		360 VA	360 VA	1	20 A	Receptacle Circuit Room 9.3.1	24
				1	20 A	Receptacle Circuit Room 9.3.1	26
60 VA	360 VA			1	20 A	Receptacle Circuit Room 9.3.1	28
		540 VA	480 VA	1	20 A	Electric Water Cooler Room 11.2.14	30
				1	20 A	Ultra-Short Throw Projector Room 9.3.1	32
60 VA	720 VA			1	20 A	Floor Box Receptacle	34
							36
							38
							40
							42
4500	O VA	3720	O VA				
39	A	31	А				

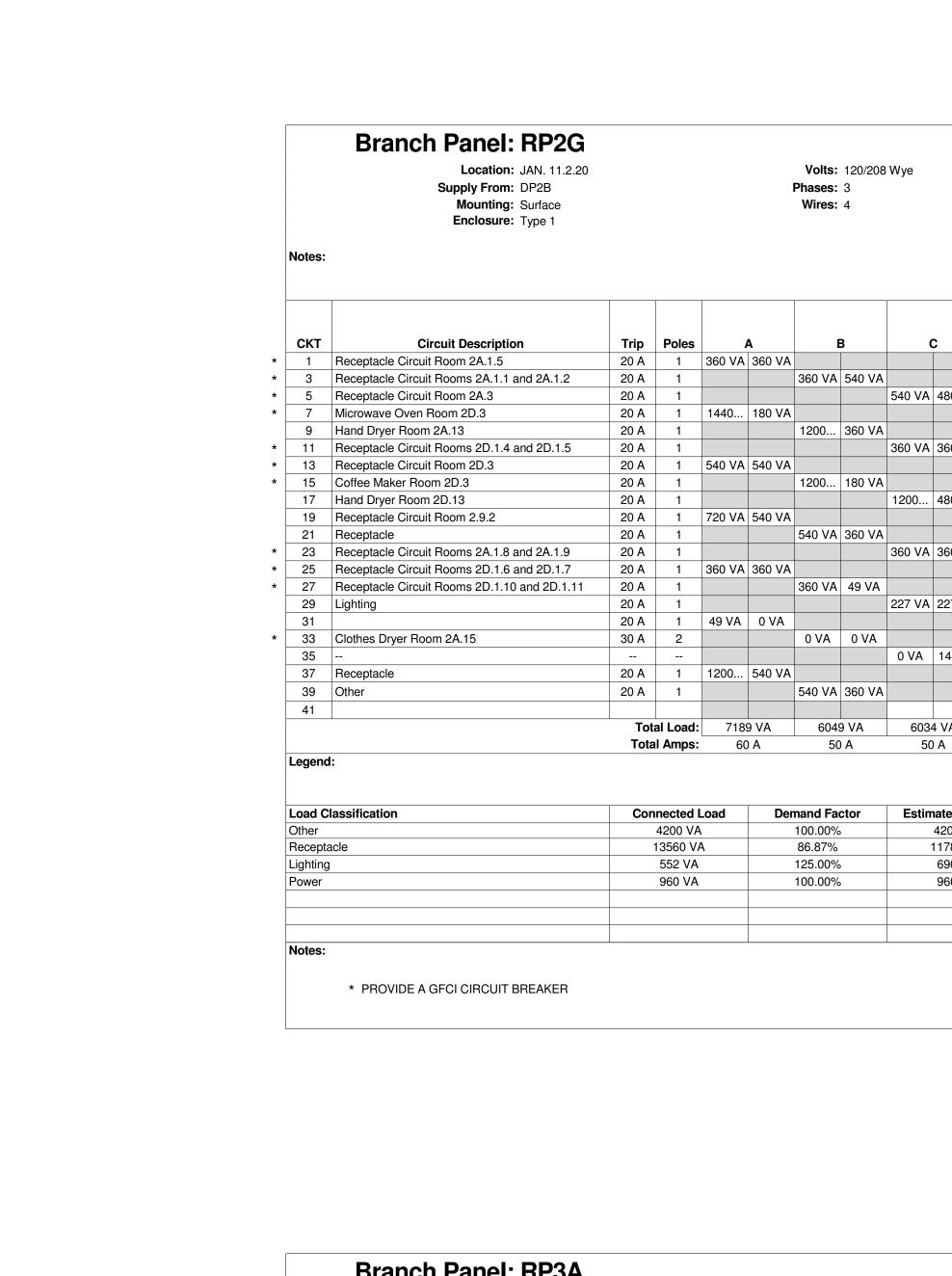
# Branch Panel: RP2E Location: ELEC 11.2.19 Supply From: DP2B

	Location: ELEC 11.2.19 Supply From: DP2B Mounting: Surface Enclosure: Type 1				I	Volts: Phases: Wires:	3					A.I.C. Rating: 10,000 Mains Type: 100 A Mains Rating: 100 A MCB Rating: 100 A		
lotes:														
СКТ	Circuit Description	Trip	Poles		4	E	3			Poles	Trip	Circuit De	scription	СКТ
1	Receptacle Circuit Room 2B.1.1	20 A	1	360 VA			-			1	20 A	Receptacle Circuit Rooms		2
3	Receptacle Circuit Rooms 2B.1.2 and 2B.1.3	20 A	1			360 VA	180 VA			1	20 A	Receptacle Circuit Rooms		4
5	Receptacle Circuit Room 2B.3	20 A	1					540 VA	540 VA	1	20 A	Receptacle Circuit Room 2		6
7	Receptacle	20 A	1	1200	180 VA					1	20 A	Clothes Washer Room 2B	.3	8
9	Electric Water Cooler Room 2B.3	20 A	1			480 VA	900 VA			1	20 A	Receptacle Circuit Rooms	2.7 and 11.2.19	10
11	Hand Dryer Room 2B.13	20 A	1					1200	360 VA	1	20 A	Receptacle Circuit Rooms	2C.1.1 and 2C.1.2	12
13	Receptacle Circuit Rooms 2C.1.3 and 2C.1.4	20 A	1	360 VA	360 VA					1	20 A	Receptacle Circuit Rooms	2C.1.5 and 2C.1.6	14
15	Receptacle Circuit Room 2C.2	20 A	1			180 VA	540 VA			1	20 A	Receptacle Circuit Room 2	2C.3	16
17	Receptacle Circuit Room 2C.3	20 A	1					540 VA	180 VA	1	20 A	Clothes Washer Room 2C	.15	18
19	Microwave Oven Room 2C.3	20 A	1	1440	1200					1	20 A	Electric water Cooler Roor	n 2C.3	20
21	Receptacle Circuit Room 7.4.2	20 A	1			360 VA	1200			1	20 A	Hand Dryer Room 2.6		22
23	Hand Dryer Room 2C.13	20 A	1					1200	720 VA	1	20 A	Receptacle		24
25	Receptacle	20 A	1	720 VA	1200					1	20 A	Coffee Maker Room 2C.3		26
27	Receptacle Circuit Rooms 2B.1.7 and 2B.1.8	20 A	1			360 VA	360 VA			1	20 A	Receptacle Circuit Rooms	2B.1.9 and 2B.1.10	28
29	Receptacle Circuit Rooms 2B.1.11 and 2B.1.12	20 A	1					360 VA	180 VA	1	20 A	Receptacle Circuit Room 2	2B.1.13	30
31	Receptacle Circuit Rooms 2C.1.7 and 2C.1.8	20 A	1	360 VA	360 VA					1	20 A	Receptacle Circuit Rooms	2C.1.9 and 2C.1.10	32
33	Receptacle Circuit Rooms 2C.1.11 and 2C.1.12	20 A	1			360 VA	180 VA			1	20 A	Receptacle Circuit Room 2	2C.1.13	34
35	Lighting Circuit Rooms 2C.1.1, 2C.1.2, 2C.1.3,	20 A	1					265 VA	265 VA	1	20 A	Lighting Circuit Rooms 2B	.1.1, 2B.1.2, 2B.1.3,	36
37	Lighting Circuit Rooms 2C.6 and 2C.12	20 A	1	49 VA	49 VA					1	20 A	Lighting Circuit Rooms 2B	.6 and 2B.12	38
39	Clothes Dryer Room 2B.15	30 A	2			0 VA	0 VA			2	30 A	Special Receptacle		40
41								0 VA	0 VA					42
		Tot	al Load:	8198	3 VA	5460	) VA	6349	9 VA					•
		Tota	I Amps:	69	A	46	A	54	A					
egend	:													
	assification		nected I			mand Fa			ated Der			Panel	<b>Fotals</b>	
other	-1-		5160 VA			100.00%			5160 VA				00000 \//	
ecepta	CIE		13740 VA	4		86.39%			11870 VA	۱		Total Conn. Load:		
ighting			628 VA			125.00%			785 VA			Total Est. Demand:		
ower			480 VA			100.00%			480 VA			Total Conn.:		
												Total Est. Demand:	51 A	
lotes:								1			1			

2

Location: ELEC 11.2.19 Supply From: DP2B Mounting: Surface Enclosure: Type 1					Volts: Phases: Wires:		Wye				A.I.C. Rating: 10,000 Mains Type: 225 A Mains Rating: 225 A MCB Rating: 225 A	
Notes:												
CKT Circuit Description	Trip	Poles		<b>A</b>	E	3		C	Poles	Trip	Circuit Description	СКТ
1 (Other	20 A	1	540 VA	187 VA		107\/A			2	15 A	VRV-20	2
3 / / / / / / / / / / / / / / / / / / /	15 A	2				187 VA	187 VA			(		4
7 ( <			187 VA				107 VA			+		8
	15 A	2			52 VA	187 VA			2	15 A	VRV-18	10
11 <u>2</u>							52 VA	187 VA			~	12
13 VRV-17	15 A	2	187 VA	1440					1	20 A	Receptacle	14
15					187 VA	720 VA			1		Other	16
17 Other	20 A	1		100110			720 VA	540 VA	1		Réceptacle	18
19 VRV-41 21	15 A	2	187 VA	166 VA		166 VA			2	15 A	VRV-40	20
23					187 VA	166 VA						22
25												24
27												28
29												30
31												32
33												34
35												36
37						1001/4						38
39						180 VA			1	20 A	FIRE ALARM BOOSTER PANEL 2A	40
41	Tot	al Load:	280	5 VA	196	7 VA	169	6 VA				42
		al Load.		A A		A A		A A				
Legend:		inected l			nand Fa			nated Der	mond		Panel Totals	
Motor		2309 VA			104.05%			2402 VA				
Other		2160 VA			100.00%			2160 VA			Total Conn. Load: 6449 VA	
Receptacle		1980 VA	۱ <u> </u>		100.00%	•		1980 VA			Total Est. Demand: 6542 VA	
Power		0 VA			0.00%			0 VA			Total Conn.: 18 A	
											Total Est. Demand: 18 A	
Notes:												
10(63.												





	Dialicii Fanel. NEJA							
	Location: MECH. RM. 11 Supply From: 45 kVA, 0 V/48 Mounting: Surface Enclosure: Type 1		Phase			Volts: Phases: Wires:		Wye
Notes:								
скт	Circuit Description	Trip	Poles		4	E	3	
1	Receptacle Circuit Room 11.3.8	20 A	1	900 VA	720 VA			
3	Receptacle Circuit Rooms 11.3.2 and 11.3.3	20 A	1			540 VA	540 VA	
5	Receptacle Circuit Room 10.10	20 A	1					720
7	Treadmill Room 10.3	20 A	1	1440	180 VA			
9	Elliptical Machine Room 10.3	20 A	1			180 VA	1200	
11	Hand Dryer Room 10.4	20 A	1					120
13	Receptacle	20 A	1	360 VA	360 VA			
15	Receptacle Circuit Room 10.1	20 A	1			360 VA	180 VA	
17	Motorized Partition	15 A	3					420
19				420 VA	360 VA			
21						420 VA	720 VA	
23								
25								
27								
29								
31								
33								
35								
37								
39								
41								
			al Load:		AV C	414(	0 VA	Į
		Tota	I Amps:	40	A	35	δA	
Legend	:							
Load Cl	assification	Con	nected I	_oad	Der	nand Fac	ctor	E
Motor			1260 VA			125.00%		
Other			2760 VA			100.00%		
Recepta	acle		8640 VA			100.00%		
Power			1680 VA			100.00%	1	

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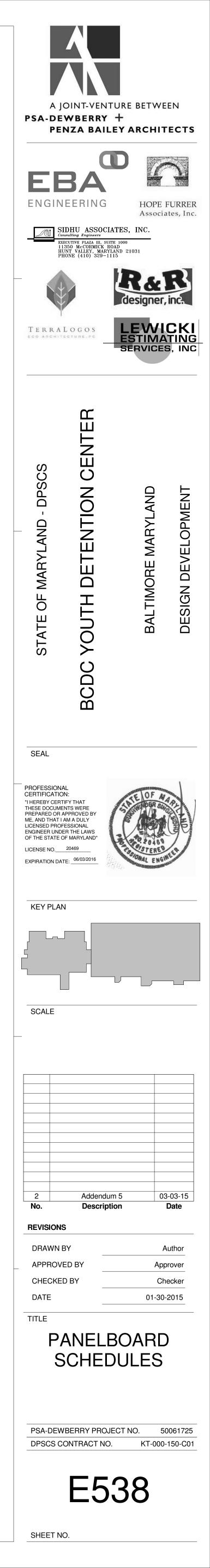
				A.I.C. Rating: 10,000 Mains Type: 100 A Mains Rating: 100 A MCB Rating: 100 A		
C	;	Poles	Trip	Circuit De	escription	СКТ
		1	20 A	Receptacle Circuit Rooms	-	2
		1	20 A	Receptacle Circuit Room	2A.3	4
ł	480 VA	1	20 A	Electric Water Cooler Roc	om 2A.3	6
		1	20 A	Clothes Washer Room 2A	A.15	8
		1	20 A	Receptacle Circuit Rooms	s 2D.1.2 and 2D.1.3	10
١	360 VA	1	20 A	Receptacle Circuit Rooms	s 2D.1.1 and 2D.2	12
		1	20 A	Receptacle Circuit Room	2D.3	14
		1	20 A	Clothes Washer Room 2D	D.15	16
	480 VA	1	20 A	Electric Water Cooler Roc	om 2D.3	18
		1	20 A	Receptacle Circuit Room	2.8	20
		1	20 A	Receptacle Circuit Rooms	s 2A.1.6 and 2A.1.7	22
	360 VA	1	20 A	Receptacle Circuit Rooms	s 2A.1.10 and 2A.1.11	24
1		1	20 A	Receptacle Circuit Rooms	s 2D.1.8 and 2D.1.9	26
ĺ		1	20 A			28
	227 VA	1	20 A	Lighting		30
		2	30 A	Clothes Dryer Room 2D.1	5	32
						34
	1440	1	20 A	Receptacle		36
		1	20 A	Other		38
		1	20 A	BSB Units		40
						42
4	VA			,		
	A ated Der			Panel	Totals	
	4200 VA			Total Conn. Load:	10272 \/A	
	1780 VA	<b>`</b>		Total Est. Demand:		
	690 VA 960 VA			Total Est. Demand: Total Conn.:		
	300 VA			Total Est. Demand:		
					1	

			A.I.C. Rating: 10,000 Mains Type: 225 A Mains Rating: 225 A MCB Rating: 175 A	
С	Poles	Trip	Circuit Description	СКТ
	1	20 A	Receptacle Circuit Room 11.3.7	2
	1	20 A	Receptacle Circuit Room 10.3	4
A 1440.		20 A	Treadmill Room 10.3	6
	1	20 A	Elliptical Machine Room 10.3	8
	1	20 A	Hand Dryer Room 10.7	10
480 V		20 A	Electric Water Cooler Room 10.4	12
	1	20 A	Receptacle Circuit Room 10.1	14
	1	20 A	Receptacle Circuit Room 10.9	16
A 1200.		20 A	Elevator Lights and Controls	18
	1	20 A	SA/CA Head-ene Equipment Cabinet	20
	1	20 A	Receptacle	22
				24
				26
				28
				30
				32
				34
_				36
				38
				40
				42
60 VA				
46 A				
	Demand		Panel Totals	

stimated Demand	Panel	Totals
1575 VA		
2760 VA	Total Conn. Load:	14340 VA
8640 VA	Total Est. Demand:	14655 VA
1680 VA	Total Conn.:	40 A
	Total Est. Demand:	41 A

	Location: MECH. RM Supply From: 45 kVA, 0 V Mounting: Surface Enclosure: Type 1		Phase		I	Volts: Phases: Wires:		Wye				A.I.C. Rating: 10,000 Mains Type: 225 A Mains Rating: 225 A MCB Rating: 175 A	
lotes:													
скт	Circuit Description	Trip	Poles	ŀ		E	3	(	0	Poles	Trip	Circuit Description	СК
1	Other	20 A	1	180 VA	302 VA					2	15 A	VRV-37	2
3	Other	20 A	1			180 VA							4
5 7	VRV-36	15 A	2	302 VA	254 \/A			302 VA	354 VA	2	15 A	VRV-38 2	6 8
/9	VRV-39 2	 15 A	 2	302 VA	554 VA	354 VA	1820			 2	30 A		8
13 13	{					557 VA		354 VA	1820		\		10
13 <sub>7</sub>	CU-3	30 A	2	1352	180 VA					1	20 A	FIRE ALARM BOOSTER PANEL 3A	14
15	<u>~</u>					1352	588 VA			1		EF-10	16
17	Receptacle	20 A	1					360 VA	0 VA	3	60 A	SPD	18
19	Other	20 A	1	360 VA	0 VA								20
21	Other	20 A	1			180 VA	0 VA						22
23													24
25													26
27 29													28 30
31													30
33													34
35													36
37													38
39													40
41													42
			al Load:			4775			9 VA				
.egend	:	Tota	I Amps:	25	A	40	A	27	Ά				
oad C	lassification	Con	nected L	oad	Den	nand Fac	rtor	Fetim	nated De	mand		Panel Totals	
lotor			9553 VA			109.53%			10463 VA				
Other			1440 VA			100.00%			1440 VA			Total Conn. Load: 10993 VA	
ower			0 VA			0.00%			0 VA			Total Est. Demand: 11903 VA	
												Total Conn.: 31 A	
												Total Est. Demand: 33 A	
lotes:													

	Branch Panel: URP													
	Location: EMERGE Supply From: Mounting: Surface Enclosure: Type 1	NCY ELECTRIC	; ROO		F	Volts: Phases: Wires:		Wye				A.I.C. Rating: 10,000 Mains Type: 225 A Mains Rating: 125 A MCB Rating: 225 A		
Notes:														
СКТ	Circuit Description	Trip	Poles	A		B	3		c	Poles	Trip	Circuit De		СКТ
1	URP1	100 A	3	1260 3	360 VA					1	20 A	Receptacle Circuit Room		2
3						1260	360 VA	4000	0001/4	1	20 A	Receptacle Circuit Room		4
5 7								1620	360 VA	1	20 A	Receptacle Circuit Room	t.5	6 8
7 9														10
11														10
13														14
15														16
17														18
19														20
21														22
23														24
25														26
27 29														28 30
31														30
33														34
35														36
37														38
39														40
41														42
			al Load:			1620			0 VA					
		Tota	I Amps:	14	A	14	А	17	7 A					
_egend	L													
<b>Load C</b> Recepta	lassification		nected L 5220 VA			nand Fac 100.00%			nated Dei 5220 VA			Panel	Totals	
- 1												Total Conn. Load:	5220 VA	
												Total Est. Demand:		
												Total Conn.:		
												Total Est. Demand:	14 A	
Notes:														



5

Frame Size

400 A

400 A

2000 A

400 A

400 A

12000 A

1200 A

1200 A

1200 A

1200 A

1200 A 1200 A 1200 A

1200 A

2000 A

1200 A

1200 A

1200 A

1200 A

1200 A

1200 A

400 A

2000 A

400 A

1200 A

400 A

Estimated Demand

711538 VA

353290 VA

110303 VA

42618 VA

11295 VA

CKT #18

U

CKT #20

CKT #21

CKT #22

CKT #24

CKT #25

CKT #26

3

13m

3

- 3

3

Trip Rating

20 A

20 A

2000 A

20 A

20 A

1200 A

800 A

400 A

1200 A

1200 A

-800 A

800 A 1200 A

1200 A

2000 A

1200 A

1200 A

1200 A

1200 A

,1200 A ~

1200 A

20 A

2000 A

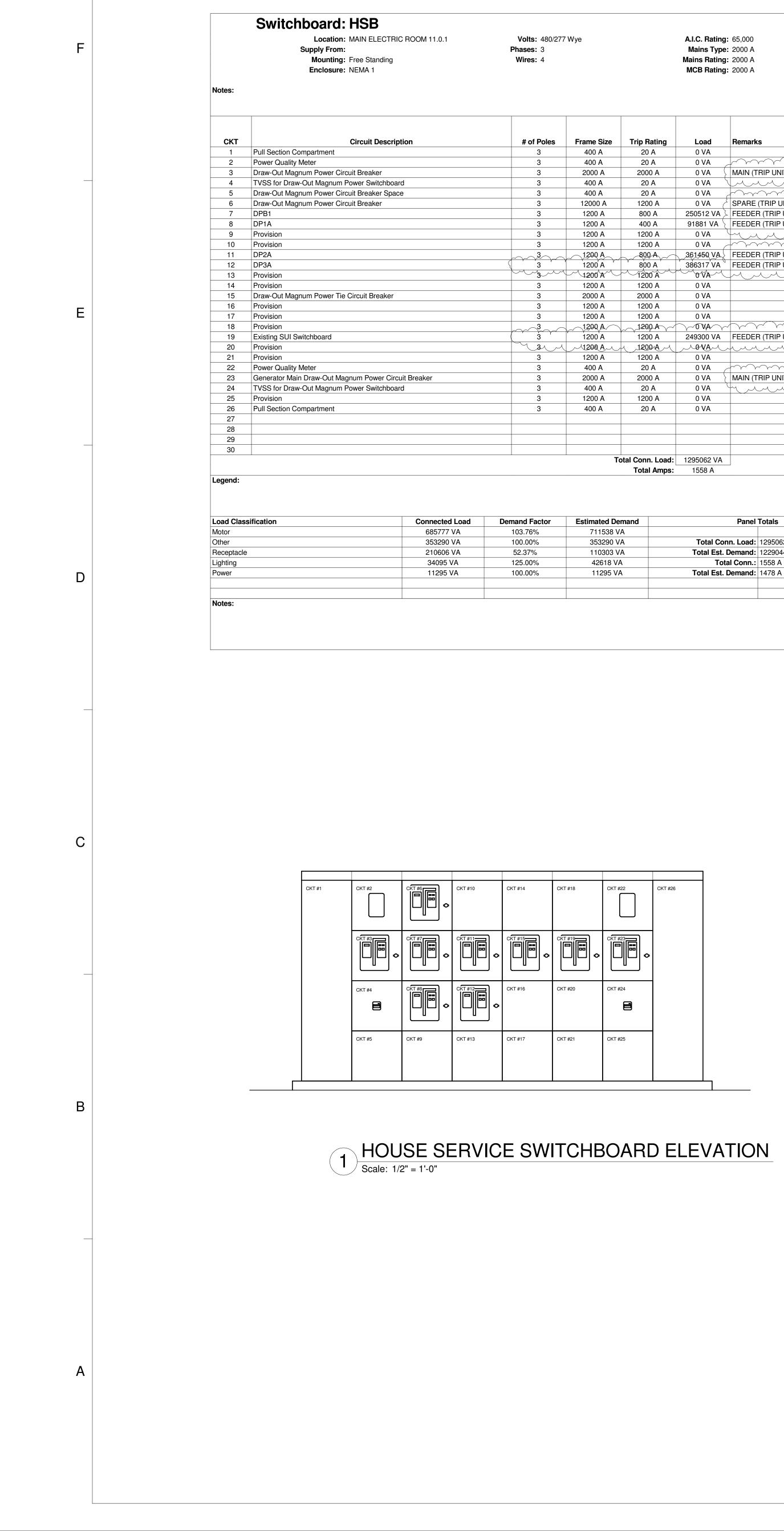
20 A

1200 A

20 A

Total Conn. Load:

Total Amps:

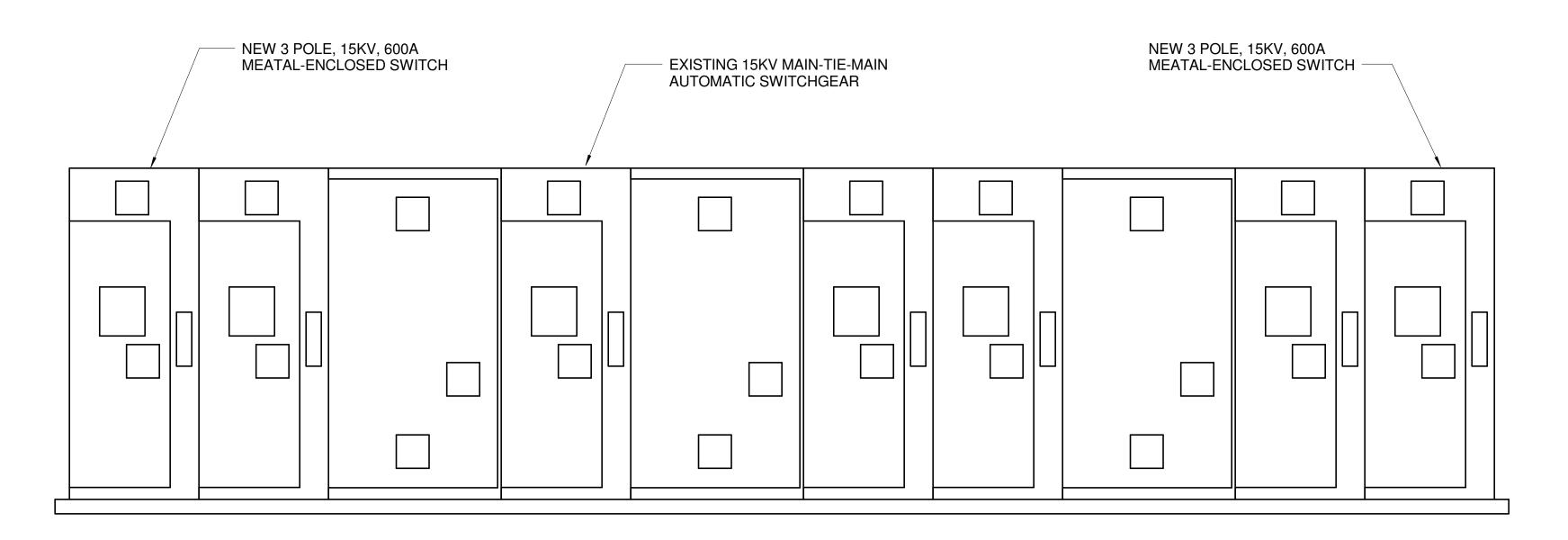


3

	A.I.C. Rating: Mains Type: Mains Rating: MCB Rating:	2000 A 2000 A	
	Load 0 VA	Remark	S
	0 VA	$\frown\frown\frown$	
	0 VA	MAIN (T	
	0 VA	$\overline{\neg}$	
	0 VA	$\sim$	
	0 VA		(TRIP UNIT-LSIG)
	250512 VA		R (TRIP UNIT-LSIG)
	91881 VA	FEEDER	R (TRIP UNIT-LSIG)
	0 VA		<u> </u>
	0 VA		
+	361450 VA 386317 VA		
┦	0VA		R (TRIP UNIT-LSIG)
	0 VA <sup>O</sup> C	$\vdash$	
	0 VA 0 VA		
	0 VA		
+	0 VA		
		$h \sim$	
	249300 VA	FEEDE	
1	0 VA		_
	0 VA	$\sim$	
	0 VA  🗧	MAIN (T	RIP UNIT-LSIG)
	0 VA (	<u>m</u>	
	0 VA		
	0 VA		
	1295062 VA		
• L	1558 A	]	
-	1000 A		
		<b>_</b>	T-4-1-
		Panel	Totals
	Total Con	n l nadi	1295062 VA
			1295062 VA 1229044 VA
Total Conn.:			
	Total Est. D		
	<b>20</b> (1 B		

	Location: Supply From: Mounting: Enclosure:		Volts: 13200 Phases: 3 Wires: 3	Delta		A.I.C. Rating Mains Type Mains Rating MCB Rating	:	
otes:								
СКТ	Circuit Descri	ation	# of Poles	Frame Size	Trip Rating	Load	Remarks	
1	NEW FEEDER SWITCH AND FUSE		3	600 A	125 A	0 VA		
2	EXISTING FEEDER SWITCH AND FUSE		3	600 A	0 A	0 VA		
3	EXISTING METERING / CONTROLS		3	600 A	20 A	0 VA		
4	EXISTING MAIN SWITCH		3	600 A	20 A	0 VA		
5	EXISTING METERING / CONTROLS		3	600 A	20 A	0 VA		
6	EXISTING TIE		3	600 A	20 A	0 VA		
7	EXISTING MAIN SWITCH		3	600 A	20 A	0 VA		
8	EXISTING METERING / CONTROLS		3	600 A	20 A	0 VA		
9	EXISTING FEEDER SWITCH AND FUSE		3	600 A	20 A	0 VA		
10	NEW FEEDER SWITCH AND FUSE		3	600 A	125 A	0 VA		
11 12								
12								
13								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28 29								
30								
50					otal Conn. Load	: 0 VA		
					Total Amps			
egend:	sification	Connected Lond	Domend Factor	Entimeted D	mond		Donal Totala	
oad Clas	Sincation	Connected Load	Demand Factor 0.00%	Estimated De			Panel Totals	
			0.00 /0			Total Cor	nn. Load: 0 VA	
							Demand: 0 VA	
						Total Conn.: 0 A		
					Total Est. Demand: 0 A			
otes:								

2



 $\checkmark$ 

2 EXISTING 15KV SWITCHGEAR ELEVATION Scale: 1/2" = 1'-0"

