

DATE: December 6, 2024

DEPARTMENT OF GENERAL SERVICES  
BUREAU OF CAPITAL PROJECT DESIGN MANAGEMENT  
1800 HERR STREET  
HARRISBURG, PENNSYLVANIA

**ADDENDUM NO. 4**

on

**PROJECT NO. DGS C-0948-0104 PHASE 001**

**PROJECT TITLE - Capitol Complex - Fire Alarm System Replacement**

**PROFESSIONAL:**

Windward Engineers  
777 East Park Drive  
Harrisburg, PA, 17111

**If you submitted a bid prior to this Addendum being issued, your bid has been discarded and you must re-submit your bid(s) prior to the bid opening date and time.**

**ADMINISTRATIVE CHANGES – ALL CONTRACTS**

Item 1 - All quotations for elevator work/testing shall be obtained from the Commonwealth's current service provider, Otis.

Item 2 - Siemens is not required to fill out Appendix G for Designated Critical Work. Siemens will be providing the same scope for all bidders. The intent behind the scoring is to assess the .4 Contractor's experience working with Siemens and installing fire alarm systems of this size and nature.

Item 3 - The prevailing wage rates were calculated for the wrong county. The correct prevailing wage rates for Harrisburg (Dauphin County) are attached. The attached wage rates are the ones to be used.

Item 4 - Due to the incorrect wage rates being issued earlier, the Bid submission due date has been changed from December 10, 2024 to December 17, 2024 at 2:00pm. Bids need to be submitted in person to the Arsenal Building, 1800 Herr Street, Harrisburg Pennsylvania 17125 by 2:00pm

**SPECIFICATION CHANGES – CONTRACT NO. DGS C-0948-0104 PHASE 1.4**

Item 1 - Section 010100, 1.5: Updated the cost for Siemens work based on the addition of the additional devices required by specification 010250. Also updated the fire alarm responsibilities matrix provided in this section to match the one being provided by Siemens in their quote.

Item 2 - Section 260533, 3.1: Added items B and C for outdoor and wet/damp locations.

Item 3 - Section 260533, 3.2: Added item U for conduit fittings at building control and expansion joints.

Item 4 - Section 261200: Added Attachment A with supporting info for the transformer oil. Added section 1.7 referencing the attachment. Added item B to section 2.1 referencing the attachment.

**DRAWING CHANGES – CONTRACT NO. DGS C-0948-0104 PHASE 1.4**

Item 1 - 4-FA-205A: Removed the notification devices from the exterior balcony and associated keyed notes 7 and 12. Deleted keyed notes 7 and 22.

Item 2 - 4-FA-205B: Removed the notification devices from the exterior balcony and associated keyed note 7

and 22. Deleted keyed note 22.

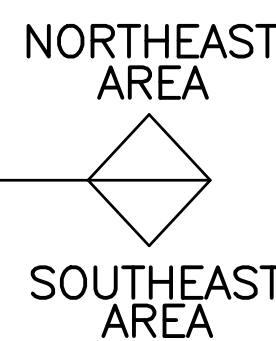
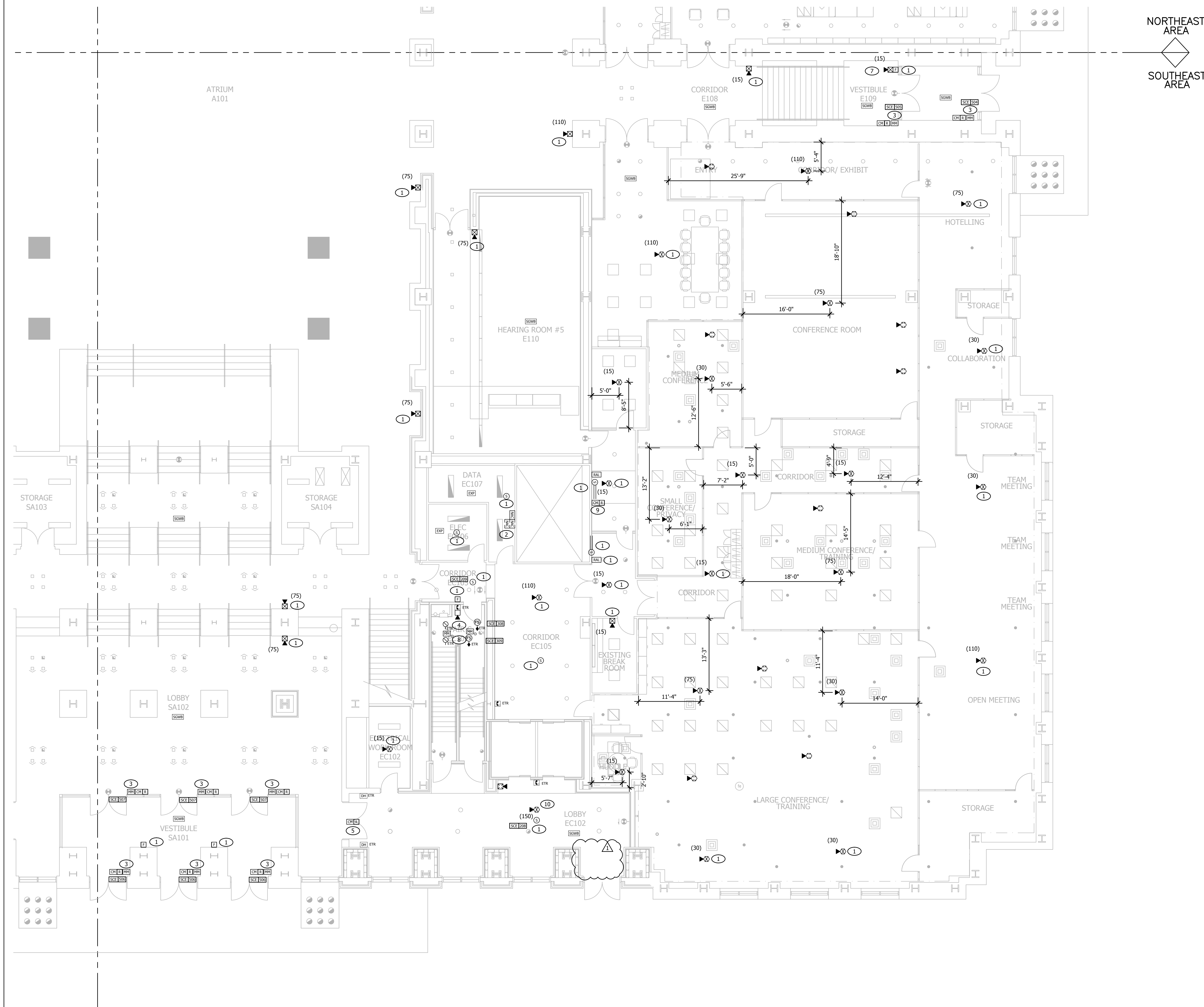
Item 3 - 4-FA-205C: Removed the notification devices from the exterior balcony and associated keyed notes 7 and 10.

Item 4 - 2-FA-203C: Removed the pull station from Lobby EC102 and associated keyed note 6. Deleted keyed note 6.

Item 5 - 2-FA-203D: Removed the pull station from Lobby EC102 and associated keyed note 6. Deleted keyed note 6.

Item 6 - 11-E-201: Updated drawing to provide additional guidance and procedural steps for changing the transformer oil. Added information from existing transformer's installation drawings. Added keyed note 3.



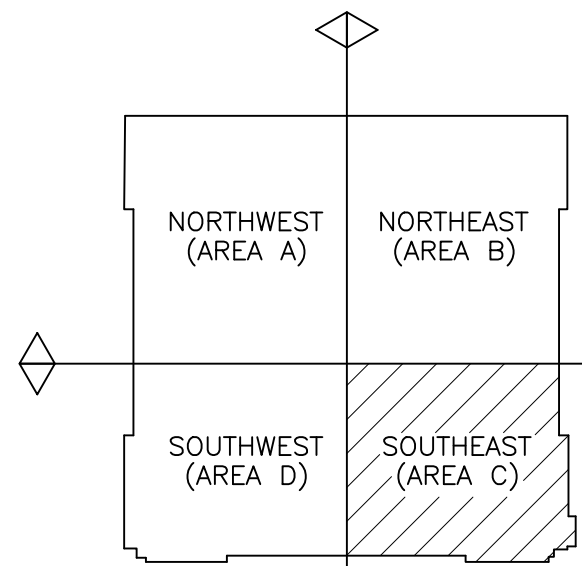


**GENERAL NOTES:**

1. ALL CEILINGS ARE ACOUSTICAL CEILING TILES (ACT) UNLESS OTHERWISE NOTED.

**KEYED NOTES:**

1. PROVIDE A NEW DEVICE AT THE EXISTING DEVICES LOCATION.
2. DISCONNECT AND REMOVE THE EXISTING WHEELOCK POWER SUPPLIES AND ASSOCIATED MONITOR MODULES. PROVIDE A NEW SIEMENS PAD4 NAC PANEL AT THE SAME LOCATION. CONNECT TO EXISTING 120VAC CIRCUIT.
3. PROVIDE A MONITOR MODULE FOR THE EXISTING TO REMAIN DOOR POSITION SWITCH TO MONITOR THE DOOR POSITION FOR SMOKE CONTROL. PROVIDE A CONTROL MODULE TO OPEN THE DOORS WHEN THE ATRIUM SMOKE EXHAUST SYSTEM ACTIVATES. INSTALL ALL MODULES USING THE EXISTING LOCATIONS.
4. REPLACE THE EXISTING SPEAKER/STROBE WITH A SPEAKER ONLY DEVICE.
5. PROVIDE CONTROL MODULE / RELAY FOR THE EXISTING TO REMAIN FLOOR-MOUNTED DOOR HOLDERS.
6. DELETED
7. INSTALL THE NEW SPEAKER/STROBE VERTICALLY IN LINE WITH THE EXISTING PULL STATION.
8. PROVIDE NEW MONITOR MODULES TO INTERFACE THE EXISTING SPRINKLER SYSTEM FLOW AND TAMPER SWITCHES WITH THE FIRE ALARM SYSTEM. THE CONTRACTOR IS PERMITTED TO REUSE THE EXISTING DEVICE LOCATIONS.
9. PROVIDE CONTROL MODULE AND RELAY FOR EXISTING TO REMAIN SMOKE DAMPER CONTROL.
10. MOUNT THE NEW SPEAKER/STROBE IN THE SAME PANEL AS THE LIGHTS, SPRINKLER HEAD AND SMOKE DETECTOR. INSTALL THE DEVICE AT THE END OF THE PANEL CLOSEST TO THE ELEVATORS FOR A SYMMETRICAL LOOK.



Key Plan:

**VERIFY SCALE**

BAR IS ONE (1) INCH LONG ON ORIGINAL DRAWING:

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IF BAR IS NOT ONE (1) INCH LONG, ADJUST SCALE ACCORDINGLY

CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS. VARIANCE FROM CONTRACT DOCUMENTS NOT PERMITTED WITHOUT PROFESSIONAL & BUREAU OF CONSTRUCTION APPROVAL.

0 8' 16'

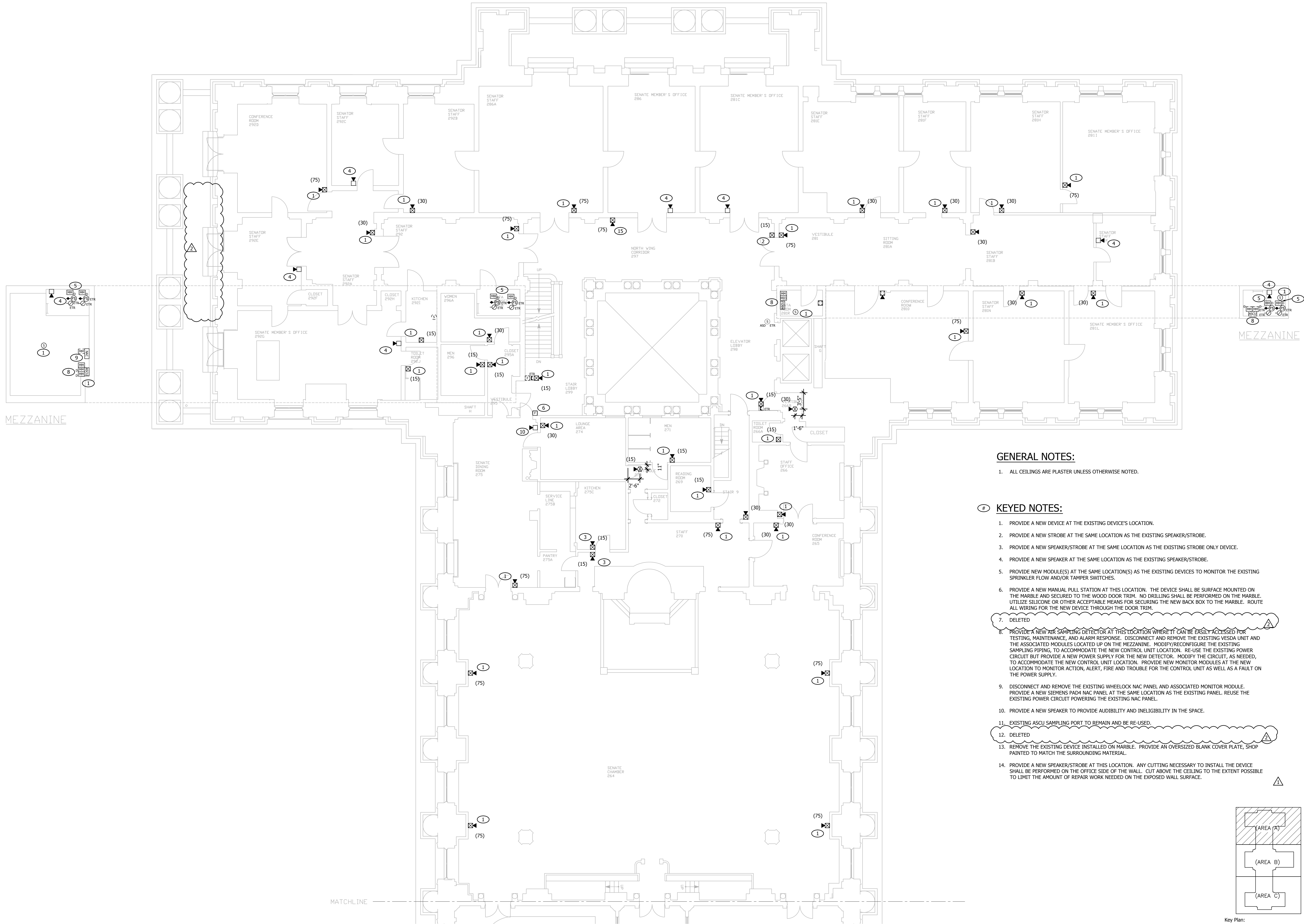
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**PLAZA LEVEL - AREA C - CONSTRUCTION PLAN - FIRE ALARM**  
SCALE: 1/8"=1'-0"

12/06/24 - ADDENDUM 4	
RECORD REVISIONS	
SIGNATURE DATE	
777 East Park Drive Harrisburg, PA 17111 (717) 233-4502 WWW.WINDWARDDEC.COM	
COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF GENERAL SERVICES HARRISBURG, PENNSYLVANIA	
D.G.S. PROJECT No. C-0948 - 0104 PHASE 1	
CAPITOL COMPLEX FIRE ALARM REPLACEMENT	
DEPARTMENT OF GENERAL SERVICES HARRISBURG, DAUPHIN COUNTY, PA	
KEYSTONE BUILDING	
PLAZA LEVEL - AREA C - CONSTRUCTION PLAN - FIRE ALARM	
DRAWN BY AT	DATE 10-18-2024
CHECKED BY SRT	SCALE AS NOTED
DRAWING No. 2-FA-203C	

FILE PATH: \\sean.com\Compaq\Windward\Proj\Pennsylvania Dept of General Services\PA\230000959-000-Capitol Complex Fire Alarm Replacement\DRAWINGS\MEP\Vegetosa\2-FA-203C-230000959-000.dwg  
LAST SAVED: 2024/12/05 03:17 PM PLOTTED BY: Sean Taylor



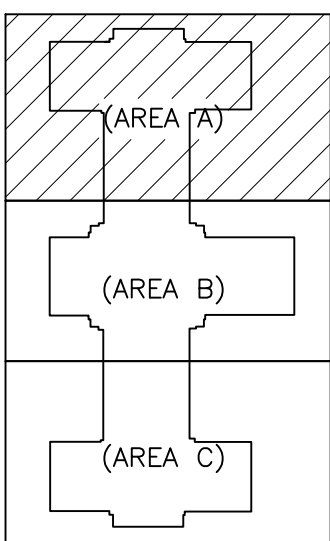


**GENERAL NOTES:**

1. ALL CEILINGS ARE PLASTER UNLESS OTHERWISE NOTED.

**KEYED NOTES:**

1. PROVIDE A NEW DEVICE AT THE EXISTING DEVICE'S LOCATION.
2. PROVIDE A NEW STROBE AT THE SAME LOCATION AS THE EXISTING SPEAKER/STROBE.
3. PROVIDE A NEW SPEAKER/STROBE AT THE SAME LOCATION AS THE EXISTING STROBE ONLY DEVICE.
4. PROVIDE A NEW SPEAKER AT THE SAME LOCATION AS THE EXISTING SPEAKER/STROBE.
5. PROVIDE NEW MODULE(S) AT THE SAME LOCATION(S) AS THE EXISTING DEVICES TO MONITOR THE EXISTING SPRINKLER FLOW AND/OR TAMPER SWITCHES.
6. PROVIDE A NEW MANUAL PULL STATION AT THIS LOCATION. THE DEVICE SHALL BE SURFACE MOUNTED ON THE MARBLE AND SECURED TO THE WOOD DOOR TRIM. NO DRILLING SHALL BE PERFORMED ON THE MARBLE. UTILIZE SILICONE OR OTHER ACCEPTABLE MEANS FOR SECURING THE NEW BACK BOX TO THE MARBLE. ROUTE ALL WIRING FOR THE NEW DEVICE THROUGH THE DOOR TRIM.
7. DELETED
8. PROVIDE A NEW AIR SAMPLING DETECTOR AT THIS LOCATION WHERE IT CAN BE EASILY ACCESSED FOR TESTING, MAINTENANCE, AND ALARM RESPONSE. DISCONNECT AND REMOVE THE EXISTING VESDA UNIT AND THE ASSOCIATED MODULES LOCATED UP ON THE MEZZANINE. MODIFY/RECONFIGURE THE EXISTING SAMPLING PIPING, TO ACCOMMODATE THE NEW CONTROL UNIT LOCATION. RE-USE THE EXISTING POWER CIRCUIT BUT PROVIDE A NEW POWER SUPPLY FOR THE NEW DETECTOR. MODIFY THE CIRCUIT, AS NEEDED, TO ACCOMMODATE THE NEW CONTROL UNIT LOCATION. PROVIDE NEW MONITOR MODULES AT THE NEW LOCATION TO MONITOR ACTION, ALERT, FIRE AND TROUBLE FOR THE CONTROL UNIT AS WELL AS A FAULT ON THE POWER SUPPLY.
9. DISCONNECT AND REMOVE THE EXISTING WHEELLOCK NAC PANEL AND ASSOCIATED MONITOR MODULE. PROVIDE A NEW SIEMENS PAD4 NAC PANEL AT THE SAME LOCATION AS THE EXISTING PANEL. REUSE THE EXISTING POWER CIRCUIT POWERING THE EXISTING NAC PANEL.
10. PROVIDE A NEW SPEAKER TO PROVIDE AUDIBILITY AND INELIGIBILITY IN THE SPACE.
11. EXISTING ASCU SAMPLING PORT TO REMAIN AND BE RE-USED.
12. DELETED
13. REMOVE THE EXISTING DEVICE INSTALLED ON MARBLE. PROVIDE AN OVERSIZED BLANK COVER PLATE, SHOP PAINTED TO MATCH THE SURROUNDING MATERIAL.
14. PROVIDE A NEW SPEAKER/STROBE AT THIS LOCATION. ANY CUTTING NECESSARY TO INSTALL THE DEVICE SHALL BE PERFORMED ON THE OFFICE SIDE OF THE WALL. CUT ABOVE THE CEILING TO THE EXTENT POSSIBLE TO LIMIT THE AMOUNT OF REPAIR WORK NEEDED ON THE EXPOSED WALL SURFACE.



Key Plan:

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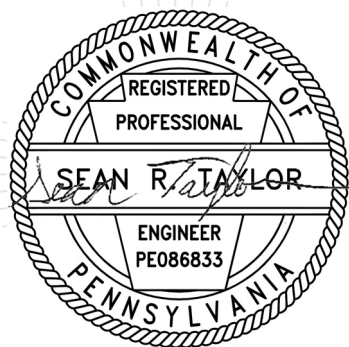
CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS. VARIANCE FROM CONTRACT DOCUMENTS NOT PERMITTED WITHOUT PROFESSIONAL & BUREAU OF CONSTRUCTION APPROVAL.

0 8' 16'

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

11/20/24 - ADDENDUM 3	
12/06/24 - ADDENDUM 4	

**RECORD REVISIONS**



SIGNATURE DATE

**WINDWARD**  
ENGINEERS & CONSULTANTS  
777 East Park Drive  
Harrisburg, PA 17111  
(717) 233-4502  
WWW.WINDWARDREC.COM

**COMMONWEALTH OF PENNSYLVANIA**  
**DEPARTMENT OF GENERAL SERVICES**  
HARRISBURG, PENNSYLVANIA

D.G.S. PROJECT No.  
**C-0948 - 0104 PHASE 1**

**CAPITOL COMPLEX FIRE ALARM REPLACEMENT**

DEPARTMENT OF GENERAL SERVICES  
HARRISBURG, DAUPHIN COUNTY, PA

MAIN CAPITOL BUILDING

**SECOND FLOOR - AREA A - CONSTRUCTION PLAN - FIRE ALARM**

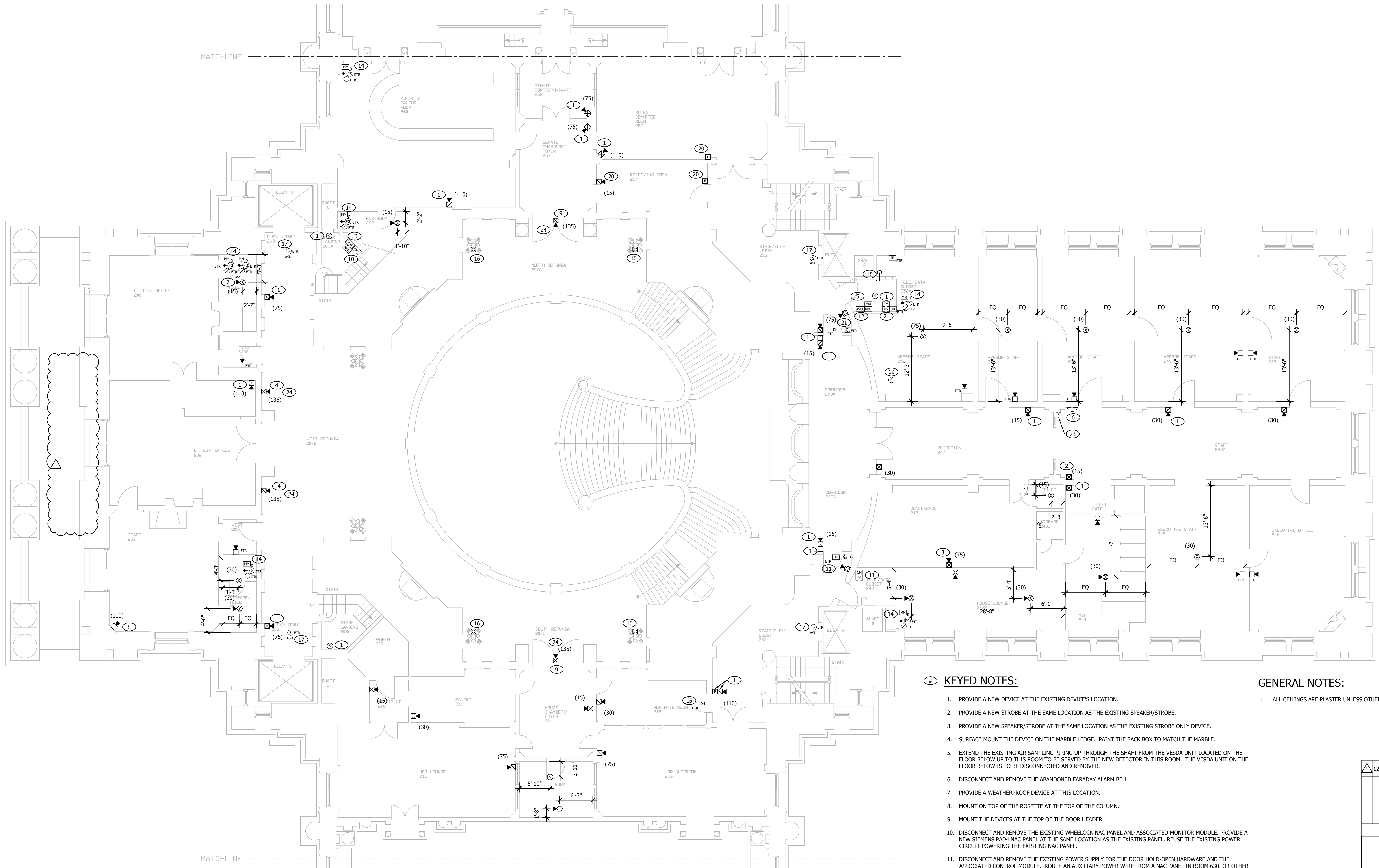
DRAWN BY AT DATE 10-18-2024 DRAWING No.

CHECKED BY SRT SCALE AS NOTED

**4-FA-205A**

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44x304

**SECOND FLOOR - AREA A - CONSTRUCTION PLAN - FIRE ALARM**  
SCALE: 1/8"=1'-0"



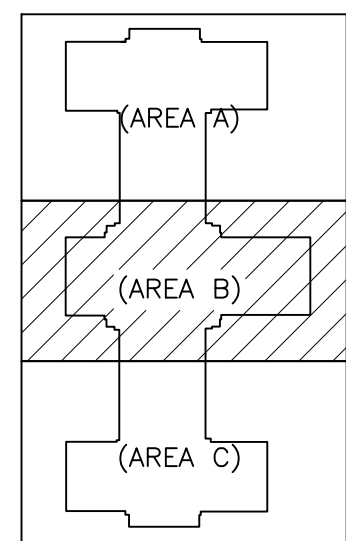
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448-305 SECOND FLOOR - AREA B - CONSTRUCTION PLAN - FIRE ALARM  
SCALE: 1/8" = 1'-0"

**KEYED NOTES:**

1. PROVIDE A NEW DEVICE AT THE EXISTING DEVICE'S LOCATION.
2. PROVIDE A NEW STROBE AT THE SAME LOCATION AS THE EXISTING SPEAKER/STROBE.
3. PROVIDE A NEW SPEAKER/STROBE AT THE SAME LOCATION AS THE EXISTING STROBE ONLY DEVICE.
4. SURFACE MOUNT THE DEVICE ON THE MARBLE LEDGE. PAINT THE BACK BOX TO MATCH THE MARBLE.
5. EXTEND THE EXISTING AIR SAMPLING PIPING UP THROUGH THE SHAFT FROM THE VESDA UNIT LOCATED ON THE FLOOR BELOW UP TO THIS ROOM TO BE SERVED BY THE NEW DETECTOR IN THIS ROOM. THE VESDA UNIT ON THE FLOOR BELOW IS TO BE DISCONNECTED AND REMOVED.
6. DISCONNECT AND REMOVE THE ABANDONED FARADAY ALARM BELL.
7. PROVIDE A WEATHERPROOF DEVICE AT THIS LOCATION.
8. MOUNT ON TOP OF THE ROSETTE AT THE TOP OF THE COLUMN.
9. MOUNT THE DEVICES AT THE TOP OF THE DOOR HEADER.
10. DISCONNECT AND REMOVE THE EXISTING WHEELLOCK NAC PANEL AND ASSOCIATED MONITOR MODULE. PROVIDE A NEW SIEMENS PAD4 NAC PANEL AT THE SAME LOCATION AS THE EXISTING PANEL. REUSE THE EXISTING POWER CIRCUIT POWERING THE EXISTING NAC PANEL.
11. DISCONNECT AND REMOVE THE EXISTING POWER SUPPLY FOR THE DOOR HOLD-OPEN HARDWARE AND THE ASSOCIATED CONTROL MODULE. ROUTE AN AUXILIARY POWER WIRE FROM A NAC PANEL IN ROOM 630, OR OTHER SUITABLE PANEL, TO CLOSE THE DOOR UPON FIRE ALARM ACTIVATION. RECONNECT THE EXISTING DOOR HARDWARE CIRCUITS TO THE NEW AUXILIARY POWER CIRCUIT.
12. PROVIDE A NEW AIR SAMPLING DETECTOR AT THE SAME GENERAL LOCATION AS THE EXISTING VESDA UNIT. MODIFY/RECONFIGURE THE EXISTING SAMPLING PIPING TO ACCOMMODATE THE NEW CONTROL UNIT. RE-USE THE EXISTING POWER CIRCUIT BUT PROVIDE A NEW POWER SUPPLY FOR THE NEW DETECTOR. PROVIDE NEW MONITOR MODULES AT THE NEW LOCATION TO MONITOR ACTION, ALERT, FIRE AND TROUBLE FOR THE CONTROL UNIT AS WELL AS A FAULT ON THE POWER SUPPLY. INSTALL THE NEW CONTROL UNIT, POWER SUPPLY, AND MODULES AT A LOWER HEIGHT WHERE THEY CAN BE ACCESSED EASIER FOR TESTING, MAINTENANCE, AND ALARM RESPONSE.
13. REUSE THE EXISTING FIRE ALARM NETWORK PANEL ENCLOSURE TO SUPPORT THE NEW FIRE ALARM SYSTEM, AS NEEDED. PROVIDE AMP CARDS/MODULES TO SUPPORT NOTIFICATION DEVICES. PROVIDE ONE (1) ADDITIONAL AMP CARD/MODULE IN EACH ENCLOSURE, CONFIGURED AS A HOT STANDBY.
14. PROVIDE NEW MODULE(S) AT THE SAME LOCATION(S) AS THE EXISTING DEVICES TO MONITOR THE EXISTING SPRINKLER FLOW AND/OR TAMPER SWITCHES.
15. THE EXISTING POWER SUPPLY FOR THE DOOR HARDWARE IS ON A LOWER LEVEL IN THE INTERSTITIAL SPACE. SEE 4-FA-203B FOR MORE INFORMATION.
16. DISCONNECT THE EXISTING WHEELLOCK STROBES LOCATED IN THE CRYSTAL GLOBE. THE DEVICE SHALL BE ABANDONED IN PLACE UNTIL THE NEXT OPPORTUNITY WHEN THE GLOBES ARE REMOVED.
17. EXISTING ASCU SAMPLING PORT TO REMAIN AND BE RE-USED.
18. SEE KEYED NOTE 9 ON DRAWING 4-FA-204B FOR ADDITIONAL INFORMATION.
19. PROVIDE SMOKE DETECTOR ABOVE EXISTING SERVER CABINETS.
20. NEW DEVICE TO BE INSTALLED IN WOOD PANELING. REMOVE PORTIONS OF THE PANELING, AS POSSIBLE, TO ALLOW CIRCUITS TO BE FISHED IN ORDER TO LIMIT THE AMOUNT OF WOOD CUT/DAMAGED.
21. DISCONNECT AND REMOVE THE EXISTING POWER SUPPLY FOR THE DOOR HOLD-OPEN HARDWARE AND THE ASSOCIATED CONTROL MODULE. ROUTE AN AUXILIARY POWER WIRE FROM A NAC PANEL IN ROOM 329, OR OTHER SUITABLE PANEL, TO CLOSE THE DOOR UPON FIRE ALARM ACTIVATION. RECONNECT THE EXISTING DOOR HARDWARE CIRCUITS TO THE NEW AUXILIARY POWER CIRCUIT.
22. DELETED
23. REMOVE THE EXISTING DEVICE INSTALLED ON MARBLE. PROVIDE AN OVERSIZED BLANK COVER PLATE, SHOP PAINTED TO MATCH THE SURROUNDING MATERIAL. FILL AND STAIN
24. PROVIDE WHITE NOTIFICATION DEVICE AT THIS LOCATION.

**GENERAL NOTES:**

1. ALL CEILINGS ARE PLASTER UNLESS OTHERWISE NOTED.



Key Plan:

**VERIFY SCALE**

BAR IS ONE (1) INCH LONG ON ORIGINAL DRAWING:

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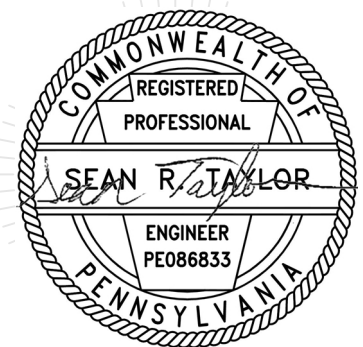
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Scale: 1/8"=1'-0"

12/06/24 - ADDENDUM 4	

RECORD REVISIONS



SIGNATURE DATE 12/5/2024

**WINDWARD**  
ENGINEERS & CONSULTANTS

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**COMMONWEALTH OF PENNSYLVANIA**  
DEPARTMENT OF GENERAL SERVICES  
HARRISBURG, PENNSYLVANIA

D.G.S. PROJECT No. C-0948 - 0104 PHASE 1

**CAPITOL COMPLEX FIRE ALARM REPLACEMENT**

DEPARTMENT OF GENERAL SERVICES  
HARRISBURG, DAUPHIN COUNTY, PA

MAIN CAPITOL BUILDING

SECOND FLOOR - AREA B -  
CONSTRUCTION PLAN - FIRE ALARM

DRAWN BY AT DATE 10-18-2024 DRAWING No. 4-FA-205B  
CHECKED BY SRT SCALE AS NOTED



SECTION 010100  
SUMMARY OF WORK

PART 1 – GENERAL

1.1 STIPULATIONS

- A. The specifications sections "General Conditions of the Construction Contract", "Special Conditions", and "Division 1 - General Requirements" form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

1.2 LOCATION

- A. PA Main Capitol Building, 501 North 3<sup>rd</sup> Street, Harrisburg PA 17120-0302.
- B. PA Capitol East Wing, 500 Commonwealth Avenue, Harrisburg PA 17120-0501.
- C. MJ Ryan Office Building, 451 North 3<sup>rd</sup> Street, Harrisburg PA 17120-0301.
- D. Commonwealth Keystone Building, 400 North Street, Harrisburg PA 17120-0211.
- E. Health & Human Services Building, 625 Forster Street, Harrisburg PA 17120-0701.
- F. Labor & Industry Building, 651 Boas Street, Harrisburg PA 17120-0750.
- G. Capitol Substation, 509 North 7<sup>th</sup> Street, Harrisburg PA 17120-0110.
- H. Capitol Central Plant, 501 Commonwealth Avenue, Harrisburg PA 17120-0502.
- I. Commonwealth Garage, 601 Boas Street, Harrisburg PA 17120-0751.
- J. State Records Center, 1825 Stanley Drive, Harrisburg PA 17103-1256.
- K. 22<sup>nd</sup> & Forster Warehouse & Garage, 2221 Forster Street, Harrisburg PA 17103-1729.
- L. Agriculture Lab, 2305 North Cameron Street, Harrisburg PA 17110-9405.
- M. Arsenal Building, 1800 Herr Street, Harrisburg PA 17103-1540.
- N. Education/Forum Building (Rare Books Area), 607 South Drive, Harrisburg PA 17120-0600.

1.3 PROJECT DESCRIPTION

- A. Replace the existing fire alarm systems in the facilities listed in paragraph 1.2 with new Desigo modular voice fire alarm systems by Siemens. Replace the existing oil in each of four (4) medium voltage substation transformers at the Capitol Substation and disconnect and remove the existing non-functioning fire suppression systems associated with those transformers.

1.4 CONTRACT DURATION

- A. The Construction Contract duration shall be **540** calendar days commencing on the date of the Initial Job Conference.
- B. Refer to Section 013100 for how the contract duration may be impacted by long lead-time materials and equipment.

1.5 WORK INCLUDED

- A. The Work of this Project consists of, but is not necessarily limited to, the following. Detailed requirements of the Work are described in the pertinent specification Sections and/or shown on the Drawings.
- B. Plumbing Construction (.3) Contract:
  - 1. Disconnect and cap the existing Compressed Air Foam (CAF) system supply piping for each of four (4) existing oil filled transformers located at the Capitol Substation yard. Abandon all underground piping in place. Disconnect and remove all associated CAF system above ground piping.
  - 2. Disconnect and remove the existing air compressor serving the CAF system pilot line at the Capitol Substation and turn over to the Department.

## E. Electrical Construction (.4) Contract:

1. Update the fire alarm systems in the subject buildings to the DGS standard Desigo modular system by Siemens. Update all fire alarm systems to voice.
2. All fire alarm systems shall communicate via the existing Commonwealth of Pennsylvania (CWOPA) network.
3. Provide new detection, initiating and audio/visual (voice) notification devices. Provide monitor and control modules and relays to interface with other existing to remain systems including, but not limited to, sprinkler, fire suppression, door control, HVAC, elevator control, and access control.
4. Provide new fire alarm control panels, fire alarm annunciator panels, notification appliance circuit (NAC) power supply panels, amplifiers, and communicators.
5. Disconnect and remove existing devices, panels, power supplies, and equipment, unless specifically notes otherwise. Disconnect and remove all existing low voltage fire alarm system cables that are not being used to power the new devices. Disconnect and remove existing surface raceway, surface boxes, and mounting hardware not required to support the new system layout. Patch holes in existing finished surfaces or provide cover plates.
6. Provide new low voltage fire alarm power and control cables, where required, to power new fire alarm initiating devices, interface modules, and notification appliances. Reuse existing pathways and raceway to the extent feasible. Provide new raceway, pathways, boxes, and appurtenances for devices or panels in areas without suitable existing raceway and pathways.
7. Connect new fire alarm main panels, NAC panels, and amplifier panels to existing 120VAC normal emergency or normal optional circuits where available. Provide new 120VAC normal emergency or normal optional circuits at new fire alarm panel and power supply locations and at existing locations currently connected to normal circuits.
8. Where elevators are present, provide testing by each facility's elevator maintenance contractor of all the interfaces with the upgraded fire alarm system.
9. Schedule shutdowns for each of four (4) substation transformers, drain and properly dispose of the existing oil and provide with new low ignition point oil. All work shall be performed by factory-qualified personnel, per the manufacturer O&M requirements. Replace all system components required for compatibility with the replacement oil.
10. Fire alarm systems: Engage Siemens to provide the fire alarm/detection system devices, panels, terminations and all programming in accordance with the drawings and specifications. The .4 Electrical Contractor shall carry the following costs in their overall bids for Siemens scope of work:

Base Bid 1: ~~\$4,743,861.00~~ **\$4,805,661.00**

Base Bid 2: ~~\$4,827,682.00~~ **\$4,889,482.00**

Base Bid 3: ~~\$4,931,507.00~~ **\$4,993,307.00**

Base Bid 4: ~~\$6,447,127.00~~ **\$6,508,927.00**

The Siemens account executive, Rohan Beasley, can be contacted at ~~(717) 791-4323~~ **(717) 602-8252** or [rohan.beasley@siemens.com](mailto:rohan.beasley@siemens.com). The Siemens Smart Infrastructure Branch Office is the exclusive provider of the Siemens Desigo fire alarm system, per specification 283100.

- 1) Scope of work to be provided by Siemens:
  - a. Siemens will supply all listed equipment and perform all terminations of all devices connected to the fire alarm system. Refer to Equipment List at the end of this Section and the Scope of Work section from Siemens quote included in and approved by PPA-1.
  - b. The .4 Electrical Contractor shall provide and install all 120VAC power, wiring, network drops, conduit, raceways, back boxes and J hooks associated with the fire alarm system and coordinate with Siemens on all installation questions and timeline expectations.
  - c. Siemens will provide all required shop drawings and submittal documents.

- d. The .4 Electrical Contractor will be responsible to provide Siemens with accurately marked-up construction drawings to enable Siemens to provide accurate as built drawings at the project completion.
- e. Siemens shall provide and test for proper for proper operation of fire alarm relay interface to air handlers and building automation systems. Shutdown responsibilities to be determined by Client Agency per provided Sequence of Operations listed below.
- f. Refer to the fire alarm responsibilities matrix, below, for additional information.

**Fire Alarm Responsibilities Matrix:**

	<b>.4 Electrical Contractor</b>	<b>Siemens</b>	<b>PA State</b>
<b>Provide/Install 120VAC Power for New or Relocated Panels</b>	<b>X</b>		
<b>Provide/Install Back Boxes for New or Relocated devices</b>	<b>X</b>		
<b>Provide/Install J Hooks/Raceways/Conduit for New Panels, Relocated Panels, New Devices, or Relocated Devices as required</b>	<b>X</b>		
<b>Provide/Install all Cabling for New Panels, Relocated Panels, New Devices, or Relocated Devices as required</b>	<b>X</b>		
<b>Label Cabling 6" into New or Relocated Panels</b>	<b>X</b>		
<b>Test/Verify cabling for grounds, shorts &amp; opens</b>	<b>X</b>		
<b>No T-Tapping Allowed</b>	<b>X</b>		
<b>Install New and Relocated Panel Enclosures</b>	<b>X</b>		
<b>Provide/Install (3) IP Network Drops Per Fire Alarm Control Panel</b>	<b>X</b>		
<b>Provide raceways and Core Drilling for Air Sampling Detection for Flag Cases in Main Capitol</b>	<b>X</b>		
<b>Demo Existing Panels/Devices that are to be Deleted or Relocated</b>	<b>X</b>		
<b>Label Cabling in Existing Panels Prior to Relocation and/or Updates</b>		<b>X</b>	
<b>Demo Existing Device and Install/terminate New Device for 1 for 1 Replacements as required</b>		<b>X</b>	
<b>Provide and Install Piping for Air Sampling Detection for Flag Cases in Main Capitol</b>		<b>X</b>	
<b>Provide Fire Alarm Panels/Devices</b>		<b>X</b>	
<b>Terminate Control Panels and PAD Panels</b>		<b>X</b>	
<b>Mount/Terminate Field Devices</b>		<b>X</b>	
<b>Connection to Desigo CC</b>		<b>X</b>	
<b>Program/Commission</b>		<b>X</b>	
<b>Testing</b>	<b>X</b>	<b>X</b>	
<b>Provide Accurate AHU Sequence of Operation</b>			<b>X</b>
<b>Provide Ethernet connectivity to Desigo CC</b>			<b>X</b>

## 1.6 SPECIFICATION FORMAT

- A. The Specifications for the work of the separate prime Contracts are bound in one volume. Technical provisions which apply to each prime Contract are included in the Divisions listed below:
- B. Plumbing Construction (.3) Contract: Division 01.
- C. Electrical Construction (.4) Contract: Divisions 01, 26, and 28.

Note: The term Professional refers to the Architectural or Engineering firm retained by the Department to design and document the work of the Project, or the Professional's authorized representative. The term Professional may also refer to the Client Agency if the Project design was delegated to the Client Agency. Throughout the Specifications and Drawings wherever the terms 'A/E', 'Architect' or 'Engineer' are used it shall mean Professional.

## 1.7 WORK BY OTHERS

- A. None.

## 1.8 E-BUILDER CONSTRUCTION MANAGEMENT SOFTWARE

- A. The electronic document repository to improve productivity and efficiency, and to streamline the process of construction management during all phases of design, procurement, award and contract administration. The Department and all Prime Contractors will utilize the e-Builder Enterprise Software Program (e-Builder) for all Work and administrative duties provided under this Contract. Any and all notifications, request, submittals, approvals, etc. between the Department, The Prime Contractors, and/or the Professional shall be through the e-Builder system.

## 1.9 QUESTIONS DURING BIDDING PERIOD

- A. Direct all questions pertaining to the Project to the Project Professional utilizing the e-Builder Enterprise Software Program (e-Builder) as described in the Instructions To Bidders.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

## SECTION 260533

### CONDUIT

#### PART 1 - GENERAL

##### 1.1 STIPULATIONS

- A. The specifications sections "General Conditions of the Construction Contract", "Special Conditions", and "Division 1 – General Requirements" form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

##### 1.2 WORK INCLUDED

- A. Metal conduit.
- B. Electrical metallic tubing.
- C. Flexible metal conduit.

##### 1.3 SUBMITTALS

- A. Submit under provisions of Section 260500.
- B. Show fabrication and installation details of components for raceways and fittings.

##### 1.4 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 260500.
- B. Accurately record actual routing of conduits larger than 2 inches that are installed underground.

##### 1.5 REGULATORY REQUIREMENTS

- A. Conform to requirements of ANSI/NFPA 70.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

##### 1.6 PROJECT CONDITIONS

- A. Verify that field measurements are as shown on Drawings.
- B. Verify routing and termination locations of conduit prior to rough-in.
- C. Conduit routing, where shown on the drawings, is in approximate locations unless dimensioned. Route as required to complete wiring system in accordance with this specification.

## PART 2 - PRODUCTS

### 2.1 METALLIC CONDUIT

#### A. Manufacturers:

1. Allied Tube and Conduit Corporation.
2. LTV Steel Company.
3. Triangle PWC, Inc.
4. Wheatland Tube Company.
5. Approved equal by the Design Professional.

### 2.2 METALLIC CONDUIT BODIES AND FITTINGS

#### A. Manufacturers:

1. Crouse Hinds Company.
2. O/Z Gedney.
3. Appleton Electric Company.
4. Thomas and Betts/Steel City.
5. Approved equal by the Design Professional.

### 2.3 METAL CONDUIT

#### A. Rigid Steel Conduit: ANSI C80.1. (Feeder Circuits Only)

1. Minimum size – 3/4 inch.
2. Maximum size - 6 inches.

#### B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; All fittings shall be steel. Conduit bodies shall be malleable iron.

#### C. All couplings and connections shall be of the threaded type.

#### D. Radius of conduit bends to comply with 2017 N.E.C. Article 342.24, 344.24 and table 2 of Chapter 9.

### 2.4 ELECTRICAL METALLIC TUBING (EMT) (Branch Circuits Only)

#### A. Description: ANSI C80.3; Unthreaded thin-wall raceway.

1. Minimum size – 1/2 inch.
2. Maximum size – 4 inches

- B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; Steel or malleable iron; compression type.
- C. Radius of conduit bends to comply with 2017 N.E.C. Article 358.24 and table 344.24.

### PART 3 - EXECUTION

#### 3.1 CONDUIT LOCATION REQUIREMENTS

- A. Minimum size acceptable for this project - 3/4 inch.
- B. **Outdoor Locations, Above Grade: Use rigid steel conduit or intermediate metal conduit.**
- C. **Wet and Damp Locations: Use rigid steel conduit, intermediate metal conduit, or electrical metallic tubing.**
- D. Dry Locations:
  - 1. Concealed: Use rigid steel conduit or electrical metallic tubing.
  - 2. Exposed: Use rigid steel conduit, or electrical metallic tubing.

#### 3.2 INSTALLATION

- A. Install conduit in accordance with NECA "Standard of Installation".
- B. Arrange supports to prevent misalignment during wiring installation.
- C. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers and split hangers.
- D. Group related conduits support using conduit rack. Construct rack using steel channel.
- E. Fasten conduit supports to building structure and surfaces under provisions of Section 260529.
- F. Do not support conduit with wire or perforated straps. Remove wire used for temporary supports.
- G. Do not attach conduit to ceiling support wires.
- H. Arrange conduit to maintain headroom and present neat appearance.
- I. For RMC running threads shall not be used on conduit for connection at couplings. Use threaded couplings such as 3 piece type (union type) coupling. Use steel on malleable compression type couplings for EMT.
- J. Route exposed conduit parallel and perpendicular to walls.
- K. Route conduit in and under slab from point-to-point.
- L. Do not cross conduits in slab.
- M. Maintain adequate clearance between conduit and piping.

- N. Maintain 12-inch clearance between conduit and surfaces with temperatures exceeding 104 degrees Fahrenheit (40 degrees Celsius).
- O. Cut conduit square using saw or pipe cutter; de-burr cut ends.
- P. Bring conduit to shoulder of fittings; fasten securely.
- Q. Use conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations.
- R. Each end of every conduit run terminating in a pressed steel box of any type shall be provided with a galvanized locknut and bushing inside and a locknut outside.
- S. Use conduit bodies to make sharp changes in direction as around beams. Use hydraulic one-shot bender to fabricate bends in metal conduit larger than 2 inch size. Factory made elbows may be used.
- T. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
- U. **Provide suitable fittings to accommodate expansion and deflection where conduit crosses control and expansion joints. Provide copper bonding jumpers across these fittings. Bonding jumper shall be of the same size as the ground wire within the conduit.**
- V. Provide suitable pull string in each empty conduit except sleeves and nipples. Conduit shall be identified at both ends indicating destination and future use.
- W. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
- X. Ground and bond conduit as required by code..
- Y. Identify conduit under provisions of Section 260553.
- Z. Conduits in masonry walls shall be run in core of blocks. No horizontal conduit runs shall be made in tile or masonry walls.
- AA. All underground conduits entering the building above finished floor shall be sealed with duct seal to prevent water entrance.
- BB. There shall not be more than the equivalent of 4 quarter bends (360 degrees total) between pull points.
- CC. Securing and supporting for RMC shall comply with 2017 N.E.C. Article 344.30.
- DD. RMC conduit shall be marked with the letters RMC every, 10 feet.
- EE. Cable wiring methods shall not be used as a means of support for other cables, raceways, or non-electrical equipment.
- FF. Provide expansion conduit fittings on all branch and feeder circuits crossing existing building expansion joints.

### 3.3 DELIVERY, STORAGE AND HANDLING

- A. Accept conduit onsite. Inspect for damage.
- B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

END OF SECTION

SECTION 261200  
MEDIUM-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 STIPULATIONS

- A. The specifications sections "General Conditions of the Construction Contract", "Special Conditions", and "Division 1 - General Requirements" form a part of this Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

1.2 WORK INCLUDED

- A. Section includes insulating liquid for liquid-filled pad-mounted distribution transformers.

1.3 REFERENCES

- A. American National Standards Institute:
  - 1. ANSI C57.12.26 - Pad-Mounted Compartmental-Type, Self-Cooled, Three-Phase Distribution Transformers for Use with Separable Insulated High-Voltage Connectors, High Voltage, 34 500 Grd Y/19 920 Volts and Below; 2500 kVA and Smaller.
- B. Institute of Electrical and Electronics Engineers:
  - 1. IEEE 386 - Standard for Separable Insulated Connector Systems for Power Distribution Systems Above 600 V.
  - 2. IEEE C57.12.00 - Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers.
  - 3. IEEE C57.12.90 - Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers and IEEE Guide for Short Circuit Testing of Distribution and Power Transformers.
  - 4. IEEE C57.106 - Guide for Acceptance and Maintenance of Insulating Oil in Equipment.
  - 5. IEEE C57.121 - Guide for Acceptance and Maintenance of Less-Flammable Hydrocarbon Fluid in Transformers.

1.4 SUBMITTALS

- A. Product Data: Submit electrical characteristics and connection requirements, standard model design tests, and options.
- B. Test Reports: Indicate procedures and results for specified factory and field testing and inspection.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Submit maintenance procedures for sampling and maintaining fluid.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years of experience.
- B. Testing Agency: Company specializing in testing products specified in this section with minimum three years of experience.

1.7 ATTACHMENTS

- A. **Attachment A – FR3 Reference Documentation**

## PART 2 - PRODUCTS

### 2.1 LIQUID-FILLED TRANSFORMERS

- A. Insulating Liquid "K": Less flammable, dielectric, and UL listed as complying with NFPA 70 requirements for fire point of not less than 300 deg C when tested according to ASTM D 92. Liquid shall be biodegradable and nontoxic, similar to FR3.
- B. For FR3 reference material see Attachment A in this specification section.**

## PART 3 - EXECUTION

### 3.1 FIELD QUALITY CONTROL

- A. Perform inspections and tests listed in NETA ATS, Section 7.2.
  - 1. Insulating liquid specific gravity, power factor, water content, dissolved gas, and total combustible gas.

# **ATTACHMENT A**

## **FR3 Reference Documentation**

# Dielectric Fluids

Service Information

## Guide for Retrofilling Power Class Transformers > 7500KVA

# G2040

### IMPORTANT:

This reference guide applies to retrofilling transformers in general and is not intended to convey safety information. Refer to original manufacturer's Operation and Maintenance guide for each transformer prior to beginning the retrofill process. Each installation may require additional steps. Stricter compliance with the above steps, or additional steps not listed, may be indicated by service records, test results, manufacturer and installer's recommendations, applicable code requirements, site inspection of the transformer or other industry maintenance and operating practices. All applicable safety codes and procedures must be followed.

## RETROFILLING PROCEDURE

Replacing the mineral oil in a power class transformer (retrofilling) with Envirotemp™ FR3™ fluid can be an effective way to upgrade fire safety, slow the thermal aging of insulation, lower the environmental risk and improve the short term overload-ability of an otherwise healthy transformer.

Extensive laboratory testing and field experience has confirmed excellent miscibility and overall retrofill compatibility for Envirotemp FR3 natural ester fluid with conventional mineral oil and high temperature hydrocarbon fluids (i.e. R-Temp® fluid). Envirotemp FR3 fluid is not miscible with silicone and should not be applied in transformers previously containing silicone.

Envirotemp FR3 fluid has service proven stability in sealed transformers. Transformers with free breathing conservators should be modified to prevent the dielectric fluid from coming in contact with replenishing air. This will help ensure long term stability of the natural ester fluid.

Draining and flushing cannot remove all the dielectric fluid from a transformer, particularly from insulating paper. The mineral oil in the paper insulation will eventually leach out into the Envirotemp FR3 fluid until equilibrium is achieved. Mineral oil is fully miscible and compatible with Envirotemp FR3 fluid; however if the concentration of residual mineral oil exceeds 7.5% by volume, then Envirotemp FR3 fluid's fire point will fall below 300°C. Following this guide should limit the residual oil to 3-5%.

A transformer designed for conventional mineral oil may run at higher temperature after retrofilling with Envirotemp FR3 fluid. For ratings up to 10 MVA, a 4-5°C increase is typical. Forced oil cooling design (FOA and OFAF ratings) operating temperatures will be closer to those for mineral oil. Since the fan operation is triggered by fluid temperature, the higher temperature rise will only affect operating temperatures at the fan-cooled rating. Because insulating paper aging rate is significantly slower when impregnated with Envirotemp FR3 fluid, any typical temperature increase should not negatively impact the insulation life.

It is strongly recommended that filling power class transformers be completed under vacuum, within the constraint of the tank capability. Some transformers may not be rated for full (or partial) vacuum. When filling units at atmospheric pressure with Envirotemp FR3 fluid, heating and filtering the fluid are strongly recommended to maximize performance. Fluid temperatures during tank filling operations at atmospheric pressure should be 75°-80°C (165°-175°F). Longer set times to allow for trapped air bubble gas absorption are recommended when filling at atmospheric pressure.

Performance issues related to deficient dielectric design and construction, such as corona or partial discharge may not be remedied by fluid replacement. Retrofilling may be viable for reducing PCB or other contamination levels. However, this guide does not address regulations for the handling or disposal of PCB or other regulated hazardous materials.

Refer to the following Envirotemp FR3 fluid documents for additional information: Envirotemp FR3 Data Sheet (R2000), Envirotemp FR3 Fluid Storage and Handling Guide (S10), Envirotemp FR3 Fluid Test Summary (R2030), Dissolved Gas Guide (R2060), Transformer Power Factor and Envirotemp FR3 fluid (R2100), Loading Guide A and B Factors for Envirotemp FR3 Fluid and Thermally Upgraded Kraft Insulation (R2110).

## **TRANSFORMER CONDITION ASSESSMENT**

A visual inspection to confirm integrity of all seals/ bolted connections, and proper operation of gauges should be performed. This may indicate whether additional maintenance operations should be performed while the unit is out of service.

### **Pre-Retrofill Steps:**

1. Adhere to all safety precautions, codes and regulations. Follow all locally approved safety practices and procedures.
2. Obtain original Operation and Maintenance guide for each transformer
3. Obtain transformer gasket set
4. Order needed replacement parts
5. Note site limitations for service equipment
6. Schedule old oil disposal
7. Schedule new fluid delivery
8. Obtain container for flush fluid
9. Note location of drain, fill, & vacuum connections
10. Limit air and moisture exposure whenever possible
11. If moisture removal (dry out) of coils is required, several methods are acceptable, however hot air drying is not. Refer to Storage and Handling Guide (S10) for additional information.

Step	Key Points	Comments
1. Adhere to all required safety precautions, codes, and regulations	Follow manufacturer's recommendations for servicing each transformer; additionally, adhere to all required safety precautions, codes, and regulations	
2. Access the unit	Follow applicable safety precautions and regulations	Record all nameplate information and determine allowable tank vacuum. Make sure the unit is isolated from the power system.
3. Ground all equipment	Includes transformer, pump, and tanks	Ensures static discharge
4. Take oil samples	Take samples for fluid analysis and dissolved gas per ASTM procedures.	Provides a baseline of transformer condition at the time of retrofill.
5. Drain oil	If transformer is level or tilted towards the drain plug, force oil out by applying a positive pressure of 5 psig (34 kPa) using dry gas. Otherwise, pump out oil through drain valve.	Radiators must be completely drained by removing drain plugs after oil level is below the lower headers, if upper headers are not accessible for flushing (see Step 8).
6. Replace all oil-immersed gaskets	Tighten to proper compression based on component function and gasket material.	Original gaskets that weep or leak should be replaced. Elastomers including NBR types with higher nitrile content, silicone or fluoropolymer are recommended. Gaskets with higher temperature demands warrant the use of silicone or fluoropolymer (Viton) compositions.
7. Allow minimum ½ hour drip after draining	Two hours is preferred. Pulling vacuum within tank mechanical limit will accelerate drip.	A longer drip time is advantageous to reduce residual mineral oil
8. Flush with hot Envirotemp™ FR3™ fluid ( ≈ 5% of fluid volume)	Use minimum pressure to avoid dislodging contaminants. Flush through the fill plug or bolted access. Be sure to flush radiators. Set bolted access in place ASAP.	To reduce viscosity, Cargill recommends flushing fluid temperature between 50-80°C.
9. Allow ½ hour drip	A longer drip time is advantageous.	
10. Remove dregs from bottom of transformer	Access can be gained by removing drain valve.	Minimizes the residual mineral oil.
11. Fill Transformer	Pull vacuum within tank mechanical limits. Start fill through drain plug when base pressure is reached.	Minimum 50°C fluid temp. Use 0.5 µm filters. Limit base pressure to tank rating.
12. Top with dry air or nitrogen blanket. Bring headspace pressure to 2-3 psig (13-20 kPa).	Verify gaskets and seals are working properly	Limits exposure to oxygen and atmospheric contaminants.
13. Install retrofill label	Fill out label using #2 pencil.	
14. Wait to energize unit	24 hours is preferred. Wait time depends on fluid fill temperature.	Allows gas bubbles to dissipate.
15. Take oil samples	Check & maintain positive pressure. Take samples as in 4.	Verifies the unit is leak-free. Provides a base line for new fluid.
16.		
a. Energize unit (no load)		
b. Wait prior to adding load	Three hours minimum.	
c. Connect load	Observe unit for leaks.	
17. Next day, check the temperature and pressure	Observe unit for leaks and other signs of problems.	
18. Follow the standard maintenance schedule and procedures	Pay close attention to signs of leaks from gaskets. Take samples as in 4 after six months.	
19. Periodically monitor and record tank pressure to confirm tank seal.	A constant 0 psig (0 kPa) on gauge, despite temperature changes, indicates a leak.	



Cargill Industrial Specialties  
P.O. Box 5700, MS 66  
Minneapolis, MN 55440-5700  
1-800-842-3631  
[envirottempfluids.com](http://envirottempfluids.com)

## Envirotemp FR3 Fluid in Cold Climate Applications

### 1. Does FR3 fluid meet IEEE's limit for normal operating temperatures down to -20°C?

A: Yes, FR3 fluid's pour point is typically -21 °C per test method ASTM D-97.

### 2. What happens to FR3 fluid when it's cold?

A: Like all dielectric fluids, FR3 fluid's viscosity increases as temperature decreases, and as it approaches its pour point, it thickens.

The pour point of FR3 fluid is typically -21 °C (-6 °F) vs. the standard limit of -40 °C (-40 °F) for mineral insulating oil. Pour point is the lowest temperature at which fluid will flow. Unlike water, FR3 fluid does not have a well-defined liquid/solid transition temperature. However, we know that volume, temperature, and time at temperature all have influence over how much viscosity increases at cold temperatures. As little as 15 gallons exposed to -25 °C (-13 °F) ambient for 11 days remains fluid, while a quart may solidify within 48 hours. For detailed information, see the PPT 'How Cold is Cold'.

### 3. It gets cold for long periods of time here. Can I use FR3 fluid in my transformers?

A: Yes, even where people perceive their climate is colder than our pour point temperature.

In distribution transformers, CPS has cold tested FR3 fluid in conjunction with all of our components down to temperatures of -25 °C (-13 °F) for 3 days. CPS Load-break switches, de-energized switches, and Bay-O-Net fuses meet the ratings published in the test reports, which allow installation and operation of distribution transformers, even in very cold conditions for up to a week. Re-energizing CPS transformers (whether they contain these components or not) even when the fluid is solid is typically acceptable. If by chance the transformer is faulted, bayonets and isolation links will still operate as designed.

In power transformers, CPS has conducted many tests to understand how these transformers operate with FR3 fluid as the dielectric fluid. FR3 fluid works effectively as an electrical insulator even when solid. Transformers containing FR3 fluid below its pour point temperature may lose convective cooling (heat transfer via flowing fluid) and rely on conductive cooling (dielectric absorbs heat) to get the heat out of the coils. As the fluid warms, convective cooling is restored. Gelling in the main tank can only occur in a transformer that is de-energized for an extended time in very cold conditions. We have data indicating that this is very unlikely in the contiguous US.

For further information, see the PPT 'How Cold is Cold'.

### 4. Can I energize a distribution transformer where FR3 fluid is gelled?

A: Typically, Yes.

The exception may include applications where devices require mechanical movement to complete their function (ie: switches and circuit breakers). FR3 fluid can inhibit physical movement of the device at very high viscosities. In these instances, the transformer should be warmed to at least -10 °C.

### 5. Will transformers operate normally in cold weather?

A: Yes.

As long as the transformer is energized, the fluid will stay in liquid form, even in cold weather.

The energy losses in an unloaded transformer are enough to keep it from solidifying in the main tank. Field experience includes 230 kV power transformers that have endured ambient temperatures as low as -40 °C and operated normally.

### 6. What happens if FR3 fluid gels in the radiators?

A: CPS tests show that the gelled fluid in the radiators headers warms, restoring flow.

This occurred before the top oil temperatures exceeded IEEE's limits outlined in the Transformer Loading Guide. These test results are summarized in the PPT 'How Cold is Cold'.

### 7. What if the power is lost for a long time during cold weather?

A: When transformers experience a prolonged outage due to upstream loss of power, the fluid slowly cools to ambient temperature.

The time required to reach ambient is dependent on many variables, including volume of fluid, ambient temperature, and rate of cooling. If the ambient is below FR3 fluid's pour point, tests show as little as 15 gallons in the tank does not solidify when exposed to temperatures of -25 °C (-13 °F) for as long as 11 days. For details, see the PPT 'How Cold is Cold'.

### 8. Can I use CPS Bay-o-Net, tap changer or load break switches in cold weather?

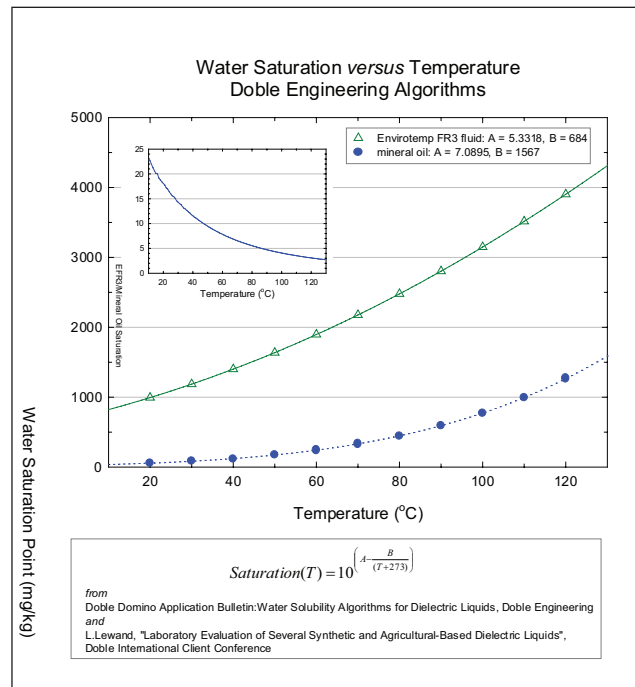
A: Typically Yes.

Certified test reports of Cooper Power Systems switches and fuses confirm that equipment operated at -20 °C meets all CPS performance ratings for distribution transformers.

## 9. Will cold FR3 fluid form ‘free water’, as can happen with cold mineral oil?

A: Typically, FR3 fluid will not contain enough moisture to precipitate out free water during the cooling process due to its more favorable saturation vs. temperature curve. (See Water Saturation Curve)

### Water Saturation Curve



## 10. Can I use FR3 fluid in LTC applications in colder environments?

A: The customer should consult their transformer or LTC OEM to validate performance of LTC in FR3 fluid in their environment.

CPS does offer voltage regulators filled with FR3 fluid that prevent operation at temperatures below -10 °C. Both Reinhausen and Waukesha Electric Systems will conditionally offer FR3 fluid in LTCs, provided that they are of sealed design (non-free breathing).

## 11. Does FR3 fluid meet the Canadian standard CSA 50?

A: No

The Canadian Standard CAN/CSA-C50 'Insulating Oil, Electrical for Transformers and Switches' is specifically for mineral oil, and does not apply to other fluid types such as natural esters like FR3 fluid.

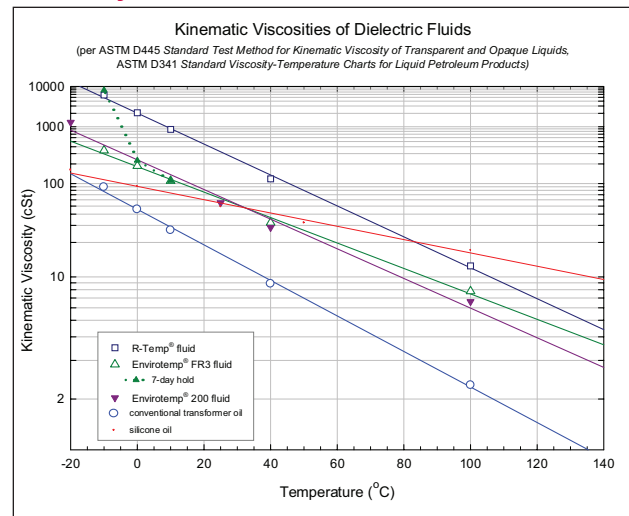
## 12. Can FR3 fluid be transferred by pump when it's cold?

A: The customer should provide to his pump manufacturer our FR3 fluid viscosity versus temperature

curve so that the pump OEM can verify the pump will work properly at low temperatures.

The pump manufacturer can best address operation at cold fluid temperatures. Care should be exercised when energizing pumps when the fluid temperature is near its gel point. See CPS Storage and Handling guide for additional details. (See Viscosity Curve)

### Viscosity Curve



## 13. I tried to take a sample from my transformer, and the FR3 fluid would not flow. Why?

A: The FR3 fluid gelled, due to prolonged exposure of a small volume of fluid in the drain valve to cold temperatures.

In colder climates, it is not unusual for the small volume of FR3 fluid in the drainpipe and valve to be at ambient temperature, even though the unit may have been in service during or just prior to sampling. Because the sampling valve (typically located at the lowest point of the transformer temperature gradient) contains a small volume of stagnant fluid, and the valve metal "transmits" the cold, the probability of gelling is a magnitude higher than other areas of the transformer. In these cases, the service pipe and drain valve should be heated until the fluid flows. In these instances, CPS recommends you flush a small volume of fluid through the pipe and valve before taking your sample.

## 14. Are you aware of any field failures of an installed transformer due to cold FR3 fluid?

A: No

We are not aware of any FR3 fluid related failures with approximately 150,000 installed transformers, including many with cold temperature exposure. Installations include US, Canada, Norway, and mountainous regions. Additionally, we possess over 30 years of experience with R-Temp (same D97 pour point as FR3 fluid filled transformers with no cold temperature related field failures, including installations near the Arctic Circle.

# ENVIROTEMP® FR3™ FLUID

## DESCRIPTION

Envirotemp® FR3™ fluid is a Fire Resistant Natural Ester based dielectric coolant specifically formulated for use in distribution transformers where its unique environmental, electrical, thermal and safety properties are advantageous. Envirotemp FR3 fluid is formulated from edible seed oils and food grade performance enhancing additives. It does not contain any petroleum, halogens, silicones, or any other questionable material. It is fully biodegradable, is eminently satisfactory to environmentalists and complies with the Edible Oil Regulatory Reform Act US Public Law 104-55, that distinguishes edible oil from non-edible oil regulations.

Envirotemp FR3 fluid has an exceptionally high fire point of 360°C and a flash point of 330°C. It is referred to as a High Fire Point or "Less-Flammable" Fluid and is Listed as a Less-Flammable Dielectric Liquid by Factory Mutual and Underwriters Laboratories for use in complying with the National Electric Code® (NEC®) and insurance requirements.

Envirotemp FR3 fluid is compatible with standard transformer insulating materials, components and processing equipment and procedures. Due to its exceptional ability to absorb water driven off by aging paper, it has superior ability to maintain high dielectric strength over time, when compared to other dielectric fluids. Its unique chemical structure enables the fluid to significantly minimize the rate of paper aging. Furthermore, it has vastly superior resistance to sludge and coke formation relative to conventional mineral oil. It has the highest ignition resistance of all available less-flammable fluids with lower operating temperatures and viscosity. It better maintains its dielectric strength when used as a load break switch medium and has the lowest gassing tendencies under electrical stress.

Unlike silicone dielectric fluid, Envirotemp FR3 fluid is fully miscible with conventional transformer oil and High Molecular Weight Hydrocarbons (HMWH). It does not cause foaming in oil like trace amounts of silicone can under vacuum degassification. Nor does it not cause paint adhesion problems like those

## TYPICAL INITIAL ENVIROTEMP FR3 FLUID PROPERTIES

Property	Value	Test Method
<b>Electrical</b>		
Dielectric Strength	56 kV @ 25°C (0.080" gap) 47 kV @ 25°C	ASTM D1816 ASTM D877
Relative Permittivity [Dielectric Constant]	3.2 @ 25°C	ASTM D924
Dissipation Factor [Power Factor]	0.05% @ 25°C	ASTM D924
Volume Resistivity	30 X 10 <sup>12</sup> Ω-cm @ 25°C	ASTM D1169
Impulse Strength (Sphere to Sphere)	226 kV @ 0.15" gap	ASTM D3300
Gassing Tendency	-79 (uL/min.)	ASTM D2300
<b>Physical and Chemical</b>		
Specific Gravity	0.92 @ 25°C	ASTM D1298
Interfacial Tension	27 mN/m @ 25°C	ASTM D971
PH	5.8	EPA 9045C
Neutralization (Acid) Number	0.022 KOH/g	ASTM D974
Kinematic Viscosity	33 cSt @ 40°C 8 cSt @ 100°C	ASTM D445
Moisture Content	20 mg/kg	ASTM 1533B
Percent Saturation of Moisture	1 - 2%	CPS Method
Air Solubility	16% @ 25°C @ 1 atm.	ATSM D2779
Appearance	Clear, Light Green	ASTM D1524
Color	L 0.5	ASTM D1500
<b>Thermal</b>		
Flash Point (Closed Cup)	316°C	ASTM D93
Flash Point (Open Cup)	330°C	ASTM D92
Fire Point (Open Cup)	360°C	ASTM D92
Pour Point	-19°C	ASTM D97
Thermal Conductivity	4.0 X 10 <sup>-4</sup> cal/(cm · sec · °C) @ 25°C	CPS Method
Specific Heat	0.45 (cal/gm°C) @ 25°C	ASTM D2766
Coefficient of Expansion	7.4 x 10 <sup>-4</sup> /°C @ 25°C	CPS Method
Heat Capacity	2.10 @ 50°C 2.39 @ 100°C	ASTM E1269
<b>Environmental Properties</b>		
BOD/COD Ratio	45%	SM5210B
Aquatic Biodegradation	100%	EPA OPPTS 835.3100
Acute Toxicity to Trout Fry	Zero Mortality to Test End Point	OECD G.L. 203

The typical properties shown above are for new fluid prior to factory shipment. These properties are subject to change without notice. Contact CPS Dielectric Fluids Products for recommended acceptance values. Ask for Envirotemp FR3 fluid Specification Guideline, Bulletin 97080.

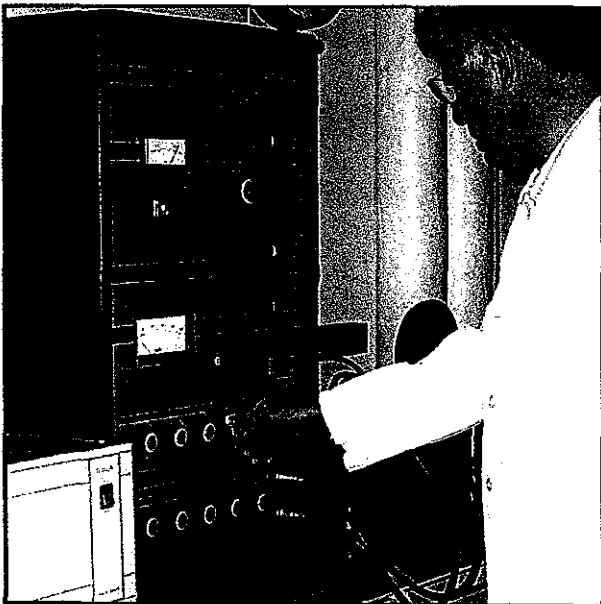
**Bulletin 00092**  
**Product Information**  
**November, 2000**  
**New Issue**

reported involving silicone, nor from the carbon silicates during switching that can lead to severe lowering of dielectric strength.

Because of its excellent environmental, safety and performance characteristics, applications for Envirotemp FR3 fluid have expanded into a variety of other equipment, including sectionalizing switches, electromagnets and voltage supply circuits for luminaries. Other potential applications under study include voltage regulators, rectifiers, high voltage cables and substations. The fluid is also used in retrofit applications for mineral oil-filled transformers.

## **FIELD PERFORMANCE HISTORY**

Since the energization of prototypes in 1996, hundreds of Envirotemp FR3 fluid filled transformers have been installed, accumulating hundreds of unit-years of reliable field service. Their performance and fire safety record has been flawless. In addition to new transformer application, several mineral oil-filled units have also been successfully retrofilled and operated with Envirotemp FR3 fluid. All units have maintained a long term fire point well in excess of 300°C. The monitoring of operating Envirotemp FR3 fluid filled transformers, including the earliest prototypes, has demonstrated Envirotemp FR3 fluid to be exceptionally stable. Dissolved gas analysis has proven to be functional for transformer preventative maintenance.



*Prior to shipment, Envirotemp FR3 fluid undergoes extensive quality assurance testing.*

## **APPLICATIONS**

### **■ NEW TRANSFORMERS**

Transformers filled with Envirotemp FR3 fluid for indoor, submersible and outdoor applications are available from several manufacturers in the United States and abroad.

For indoor applications, Envirotemp FR3 fluid filled transformers not only provide the proven performance of liquid-filled design, but at a lower total life cycle cost than other alternatives with equal ratings.

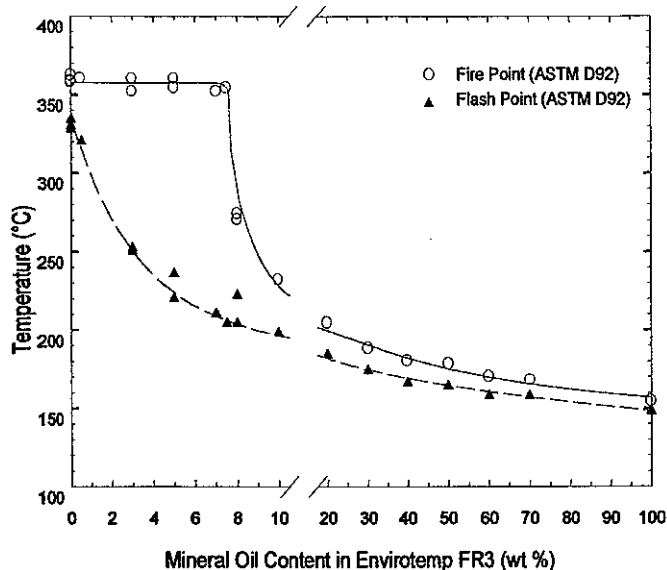
Envirotemp FR3 fluid filled transformers are an excellent choice for outdoor, network or subsurface vault installations where an extra margin of safety against explosion and fire or where protection from adverse environmental impact is desired as compared to conventional oil. Outdoor applications where enhanced safety is recommended include close proximity to buildings or valuable equipment, rooftop installations and close proximity to pedestrian areas. Types of transformers presently operating with Envirotemp FR3 fluid include pole-mounted, pad-mounted, small and medium power substations. Envirotemp FR3 fluid filled transformers are accepted in both industry and government. The fluid's favorable health and environmental properties make Envirotemp FR3 fluid filled transformers a frequent choice in food and pharmaceutical processing plants. Contact CPS Dielectric Fluids Products or your equipment supplier for a copy of the User's List, Bulletin 99020

### **■ RETROFILLING CONVENTIONAL OIL-FILLED TRANSFORMERS**

Envirotemp FR3 fluid is well suited as a replacement fluid for upgrading the safety margin of conventional mineral oil-filled transformers from both an environmental and fire safety aspect. Envirotemp FR3 fluid advantages for mineral oil retrofitting are high dielectric strength, excellent lubricity, material compatibility and a coefficient of expansion similar to conventional mineral oil. This fluid acts as a drying agent for paper that becomes wet from the aging, extending the useful life of the insulation systems. Transformers with mineral oil and HMWH fluids can be retrofilled with Envirotemp FR3 fluid. Unlike retrofitting with silicone and HMWHs, the residual oil from the paper in retrofilled transformers typically will not reduce the fire

point below the industry limit of 300°C. Even after full equilibrium has been achieved between the oil in the paper and the replacement fluid. See the following graph that plots the flash and fire points as a percent of mineral oil content.

**Envirotemp FR3 Fluid  
Flash & Fire Point Variation with Mineral Oil Content**



## ■ LOADBREAK SWITCHING DEVICES

Excellent dielectric strength retention, lubricity, essentially non-coking, and a very low gassing tendency make Envirotemp FR3 fluid an excellent loadbreak switching medium at temperatures above -10°C. Proven applications include new and retrofilled sectionalizing switches and transformers with loadbreak accessories such as bay-o-net fusing, on-off switches, sectionalizing switches and Vacuum Fault Interruption protection devices. Due to viscosity differences compared to conventional mineral oil, suitability of each application should be reviewed by the equipment manufacturer particularly for very low ambient temperature installations.

## ■ OTHER APPLICATIONS

The inherent safety and performance features of Envirotemp FR3 fluid have led to its application in electrical equipment other than transformers, including industrial electromagnets, klystron modulators, power supplies for luminars and heat transfer applications for testing equipment. Envirotemp FR3 fluid has

excellent lubricity, an important characteristic for application in equipment with movable parts. Due to its excellent ability to minimize insulating paper degradation, unequalled gassing tendency value of -70 uL/min., high voltage paper, oil, cable and bushing application appear very favorable.

Envirotemp FR3 fluid has been successfully used in each of the listed applications. However, suitability of each application of Envirotemp FR3 fluid is the responsibility of the user. Contact CPS Dielectric Fluids Products for application guidelines.

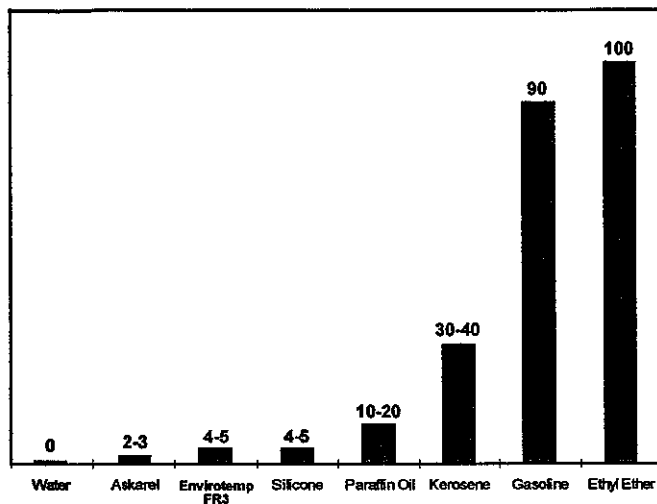
**Note:** For all applications, continuous free breathing equipment is not recommended, even if desiccants are available. Occasional headspace exposure to air can occur, such as the operation of pressure relief devices, temporary hand-hole cover removal, etc. without detectable degradation of the fluid properties. Minimal exposure is preferred.

## FIRE SAFETY

Envirotemp FR3 fluid is certified as a less-flammable dielectric coolant by Factory Mutual and Underwriters Laboratories in compliance with the listing requirements of the NEC. The National Fire Protection Association has not had any report of fires or explosions involving transformers filled with Envirotemp FR3 fluid. This attests to the fire resistance of Envirotemp FR3 fluid. The flash point of 330°C is higher than most less-flammable fluids fire point. Its fire point is 360°C, well above the National Electrical Code minimum of 300°C. In many large and small-scale tests, Envirotemp FR3 fluid has demonstrated greater fire resistance than other askarel substitutes. Based on large scale testing, a study developed by Factory Mutual Research concluded that the probability of a pool fire evolving the fluid was so low, that it does not require heat release rate to be determined nor applied in determining the installation requirements of the fluid. Factory Mutual accepts Envirotemp FR3 fluid for transformers Approved per FM Standard 3990. OSHA has recognized this standard. The standard allows Envirotemp FR3 fluid filled transformers to be installed indoors, typically without sprinklers or vaults, with minimum clearance to walls of just 36 inches.

A fire hazard rating standard was developed by Underwriters Laboratories in 1972, UL Standard 340. The graph below demonstrates the favorable rating assigned to Envirotemp FR3 fluid.

**Fire Hazard Rating  
UL Standard 340**



## MEETING THE CODES

Less Flammable fluids are recognized as a fire safeguard by Section 15 of the National Electrical Safety Code (Accredited Standards Committee C2-1997). Envirotemp FR3 fluid meets the 1999 National Electrical Code Section 450-23 requirements as a listed less-flammable liquid. It is covered by OSHA Article §1910.305, Section 5(v). For additional information, request the NEC/NESC Requirements Guideline, Bulletin 92046.

**Envirotemp FR3 fluid is Factory Mutual Approved and UL Classified "Less-Flammable" per NEC Article 450-23, both fitting the definition of a listed product per NEC.**

## ENVIRONMENTAL & HEALTH

Envirotemp FR3 fluid is specifically formulated to minimize health and environmental risk. It is made entirely of food grade seed oils and food grade performance enhancing additives. The base oils come from renewable resources - commodity seeds - and are easily recyclable and reusable. It has a trademark green tint to help differentiate it from other dielectric fluids. Its biodegradation rate exceeds the EPA standard reference material deemed "ultimately biodegradable". In one of the most extremely sensi-

tive acute toxicity tests, the Trout Fry Acute Toxicity test, Envirotemp FR3 fluid out-performed other food grade materials by achieving a zero mortality rate throughout the entire test period.

Because Envirotemp FR3 fluid is formulated from food-grade oils and additives, it is not subject to the Federal Regulation of Used Oils (Title 40, No. 270). It is instead covered by the Edible Oil Regulatory Reform Act (US Public Law 104-55, 1995), and therefore eligible for current and future regulatory relief. The option of alternative spill response procedures, such as natural bio-remediation, becomes more viable. The fluids slightly higher viscosity when compared to transformer oil, combined with its ability to polymerize when thin layers are exposed to warmth and air flow, help prevent migration along the surface and into subsurface soils.

Envirotemp FR3 fluid is not listed as hazardous by EPA, OSHA or DOT. Oral toxicity animal tests reported no signs of toxicological reactions, nor have human contact reactions been reported. Envirotemp FR3 fluid is not classified as bioaccumulating or mutagenic. It is a candidate for classification as an "Environmentally Preferred Product". Its HMIS rating is 0 for both health and reactivity, and negative for carcinogenicity, NTP, IAREC monographs and OSHA Regulation. The thermal decomposition by-products from Envirotemp FR3 fluid are essentially limited to CO<sub>2</sub> and H<sub>2</sub>O, with trace CO depending on the availability of oxygen and temperature. Envirotemp FR3 fluid can not produce PCDFs (Furans), PCDDs (Dioxins), nor silicates.

Additional product safety information is provided in the Envirotemp FR3 fluid Material Safety Data Sheet (MSDS), Bulletin 98082, available upon request.

## GENERAL INFORMATION

### ■ SPECIFICATION GUIDELINE

The dielectric coolant shall be a listed less-flammable fluid meeting the requirements of National Electrical Code Section 450-23 and the requirements of the National Electrical Safety Code (IEEE C2-1997), Section 15. The fluid shall be non-toxic, non-bio-accumulating and be readily and completely biodegradable per EPA OPPTS 835.3100. It shall be

comprised of edible oils and food grade performance enhancing additives. It shall result in zero mortality when tested on trout fry per OECD G.L. 203. It shall not require oils derived from genetically altered seeds. It shall be Factory Mutual Approved and UL Classified, Envirotemp FR3 fluid or equal. It shall have a minimum open cup flash point of  $\geq 325^{\circ}\text{C}$  and a fire point of  $\geq 350^{\circ}\text{C}$ .

## ■ STORAGE AND HANDLING

The same basic procedures for storing and handling conventional mineral oil should be followed with Envirotemp FR3 fluid. For additional storage and handling information, contact CPS Dielectric Fluids Products or your equipment supplier. To help maintain the extremely low percent moisture saturation at time of fluid manufacturer, it is recommended that exposure time to air be as minimal as practical. Storage should be indoors or outdoors in sealed bulk tanks. For additional storage and handling information, request Bulletin 99048.

## ■ FLUID MAINTENANCE

Periodic maintenance tests for Envirotemp FR3 fluid-filled equipment should follow the same schedule used for conventional mineral oil-filled equipment. Recommended maintenance tests include:

1. Dielectric strength per ASTM D1816. The acceptable limit for continued use of service-aged Envirotemp FR3 fluid is 30 kV minimum (69 kV equipment and below).
2. Flash Point and Fire Point. Relatively small amounts of conventional oil should not significantly reduce the flash point and fire point of Envirotemp FR3 fluid. Contamination above 7% may reduce the fire point to under  $300^{\circ}\text{C}$ . If it is suspected that the fluid may be contaminated, flash point and fire point should be measured in accordance with ASTM D92.
3. Dissolved Gas Analysis. Recommended particularly for high value equipment or equipment servicing critical loads. ANSI/IEEE guide C57.104-1991 for detection and analysis of generated gases should be applied.
4. Testing one or more of the following properties provides a good indication of possible fluid contamination or unusual degradation. Acceptable limits

for continued use of service-aged Envirotemp FR3 fluids:

Dissipation Factor	D924	1.0% at $25^{\circ}\text{C}$ max.
Neutralization Number	D974	2.5 mg KOH/g max.
Interfacial Tension	D971	18 mN/m

For fluid not to be reconditioned, recommended disposal options include selling to processors for recycling/refining, or conversion into bio-diesel oil, or blending with fuel oil for industrial grade boilers and industrial furnaces. Assuming the fluid has not been contaminated by controlled material, the used fluid is not under the jurisdiction of the Federal Used Oil Regulation (Title 40, No. 279).

### TYPICAL PROPERTIES FOR ENVIROTEMP FR3 FLUID FILLED EQUIPMENT

Property	New Equipment	Continued Service	ASTM Method
<b>Electrical</b>			
Dielectric Breakdown (kV)	45	-	D877
	55	$\geq 34$	D1816
Dissipation Factor (%)	0.13	$\leq 1.0$	D924
Volume Resistivity ( $10^{12} \Omega\text{-cm}$ )	30	-	D1169
<b>Physical</b>			
Flash Point ( $^{\circ}\text{C}$ )	330	-	D92
Fire Point ( $^{\circ}\text{C}$ )	360	$\geq 300$	D92
Viscosity (cSt)	33 ( $40^{\circ}\text{C}$ ) 8 ( $100^{\circ}\text{C}$ )	-	D445
Appearance	clear, lt. green	-	D1524
Color	L 0.5	-	D1500
<b>Chemical</b>			
Moisture Content (mg/kg)	40	$\leq 400$	D1533B
Neutralization Number (mg KOH/g)	0.04	$\leq 2.5$	D974
Interfacial Tension (mN/m)	24	$\geq 18$	D971

## ORDERING INFORMATION

To order Envirotemp FR3 fluid, specify:

	Catalog Number
Bulk	0425200A03
330 gallon Ecobulk container	0425589A05
55 gallon drum	0425589A08
5 gallon container	0425589A09

For warranty, sales terms and conditions information contact CPS Dielectric Fluids Products or your equipment supplier for Cooper Power Systems Terms and Conditions Sheet.

To the best of our knowledge, the information and data in this brochure are accurate at the time of printing.

## UL CLASSIFICATION MARKING



CLASSIFIED BY UNDERWRITERS LABORATORIES INC.® AS TO FIRE HAZARDS ONLY.

Envirotemp® FR3™ Fluid. Classed 4 to 5 less hazardous than paraffin oil in respect to Fire Hazard.

CLASSIFIED BY UNDERWRITERS LABORATORIES INC.® AS TO SECTION 450-23 OF THE 1999 NATIONAL ELECTRICAL CODE.

Classified as a "Less-flammable liquid" as specified in the National Electric Code when used in 3-phase transformers, 45 through 10,000 kVA with the following "use restrictions":

- A For use only in 3-phase transformers having tanks capable of withstanding an internal pressure of 12 psig without rupture,
- B Required use of pressure relief devices on transformer tank in accordance with the following tabulation to limit internal pressure buildup and prevent tank rupture due to gas generation under low current arcing faults, and
- C1 Required use of current limiting fusing in the transformer primary having  $I^2t$  characteristics not exceeding the values in the following tabulation. Under-fluid expulsion fuses may be used in series with the current-limiting fuses, in accordance with the manufacturer's protection scheme,
- or
- C2 Required use of overcurrent protection in the transformer primary having  $I^2t$  characteristics not exceeding the values in the following tabulation. If the fuse is designed to vent during operation (such as an expulsion fuse), it shall be located external to the transformer tank.

TRANSFORMER	REQUIRED PROTECTION		REQUIRED PRC
3-Phase Transformer Rating, kVA	Required Current Limiting Fusing (+) Maximum $I^2t$ (A <sup>2</sup> s)	Required Overcurrent Protection (+) Maximum $I^2t$ (A <sup>2</sup> s)	Minimum Required Pressure Relief Capacity, (+++) SCFM at 15 psi
45	500,000	700,000	35
75	500,000	800,000	35
112.5	550,000	900,000	35
150	600,000	1,000,000	50
225	650,000	1,200,000	100
300	750,000	1,400,000	100
500	900,000	1,900,000	350
750	1,100,000	2,200,000	350
1,000	1,250,000	3,400,000	350
1,500	1,500,000	4,500,000	700
2,000	1,750,000	6,000,000	700
2,500	2,000,000	7,500,000	5,000
3,000	2,250,000	9,000,000	5,000
3,750	2,500,000	11,000,000	5,000
5,000	3,000,000	14,000,000	5,000
7,500	3,000,000	14,000,000	5,000
10,000	3,000,000	14,000,000	5,000

(+)- This is an additional requirement to the overcurrent protection required in accordance with Section 450-3 of the 1999 National Electrical Code.

(++)- Opening pressure, 10 psig maximum.

**COOPER** Power Systems

Dielectric Fluids Products  
1900 East North Street  
Waukesha, WI 53188-3899  
800-643-4335 Fax 262-524-4654

**HYVOLT II**

Date of Preparation: June 5, 2003

## Section 1 - Chemical Product and Company Identification

**Product Name:** Hyvolt II  
**Chemical Name:** Severely Hydrotreated Light Naphthenic Distillate  
**Chemical Family:** Petroleum Distillate  
**Chemical Formula:** Not Applicable  
**CAS Number:** 64742-53-6  
**Other Designations:** Contains Oil  
**Manufacturer:** Ergon Refining, Inc., P.O. Box 309, Vicksburg, MS 39181  
**Company Contact:** Will Poe, Phone (601) 630-8319

**EMERGENCY TELEPHONE NUMBERS:**

Ergon Refining, Inc. (601) 638-4960 Normal Business Hours  
 Chemtrec (800) 424-9300 After Business Hours

## Section 2 - Composition / Information on Ingredients

A complex combination of hydrocarbons obtained by treating a petroleum fraction with hydrogen in the presence of a catalyst. It consists of hydrocarbons having carbon numbers predominantly in the range of C15 through C30 and produces finished oil with a viscosity near 60 SUS @ 100°F (9 cSt @ 40°C).

Ingredient Name	CAS Number	%
Severely Hydrotreated Light Naphthenic Petroleum Oil	64742-53-6	> 99.7
Butylated Hydroxytoluene (BHT) or 2,6-Di- <i>tert</i> -butyl- <i>p</i> -cresol (DBPC)	128-37-0	< 0.3

**Trace Impurities:**

Ingredient	OSHA PEL		ACGIH TLV		NIOSH REL		NIOSH IDLH
	TWA	STEL	TWA	STEL	TWA	STEL	
Severely Hydrotreated Light Naphthenic Petroleum Oil	5 mg/m <sup>3</sup> (oil mist)	None estab.	5 mg/m <sup>3</sup> (oil mist)	10 mg/m <sup>3</sup> (oil mist)	none estab.	none estab.	none estab.

## Section 3 - Hazards Identification

### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Not Expected to cause a severe emergency hazard.

**HMIS**
**H** 1

**F** 1

**R** 0

**PPE†** B

†Sec. 8

### Potential Health Effects

**Primary Entry Routes:** Skin

**Inhalation:** Inhalation of vapors or mist may be irritating to respiratory passages. Prolonged exposure may result in dizziness and nausea. Target Organ for mineral oil mist is lungs.

**Eye:** Eye contact may result in slight irritation and redness.

**Skin:** Short term contact with skin is unlikely to cause any problems; excessive or prolonged and repeated contact and poor hygiene conditions may result in dryness, dermatitis, erythema, oil acne, cracking and defatting of the skin.

**Ingestion:** May result in nausea or stomach discomfort.

**Carcinogenicity:** Based on OSHA 1910.1200 and IARC study requirements, this product does not require labeling.

Meets EU requirement of less than 3% (w/w) DMSO extract for total polycyclic aromatic compound (PAC) using IP 346.

NTP and OSHA do not list this product as a potential carcinogen.

**Mutagenicity:** This product gives negative mutagenic results from Modified Ames Assay.

**Medical Conditions Aggravated by Long-Term Exposure:** Personnel with pre-existing skin disorders should avoid contact with this product.

## Section 4 - First Aid Measures

**Eye Contact:** Wash with water. If irritation or redness persists seek medical help.

**Skin Contact:** Wash thoroughly with soap and water. Remove contaminated clothing. Reuse only after cleaning.

**Inhalation:** Remove to fresh air. Assist breathing if necessary. Seek medical help.

**Aspiration:** If there is any suspicion of aspiration into the lungs obtain medical advise.

**Ingestion:** If swallowed, observe for signs of stomach discomfort or nausea. If symptoms persist, seek medical help. Do not induce vomiting.

## Section 5 - Fire-Fighting Measures

**Flash Point:** > 295°F (> 145 °C)

**Flash Point Method:** COC

**Burning Rate:** Not available

**Autoignition Temperature:** > 600 °F (> 315 °C)

**Lower Explosive Level (LEL):** Not determined

**Upper Explosive Limit (UEL):** Not determined

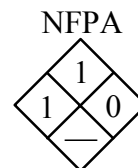
**Flammability Classification:** OSHA Class III-B Combustible Liquid

**Extinguishing Media:** Halon, dry chemical, foam, CO2 and water mist or fog. Water may be used to cool below flash point.

**Unusual Fire or Explosion Hazards:** Do not use forced stream as this could cause fire to spread.

**Combustion Products:** Fumes, smoke and carbon monoxide.

**Fire-Fighting Instructions and Equipment:** Use water to cool containers exposed to flames. Do not enter enclosed or a confined workspace without proper protective equipment. Fire fighting personnel should wear respiratory protection (positive pressure if available).



## Section 6 - Accidental Release Measures

**Spill /Leak Procedures:** Stop spill at source if possible without risk. Contain spill. Eliminate sources of ignition. Spill area will be slick. Recover all possible material for reclamation. Use non-flammable absorbent material to pick up remainder of spill.

**Spill to Navigable Waters:** If this material is spilled into navigable waters and creates a visible sheen, it is reportable to the National Response Center.

## Section 7 - Handling and Storage

**Handling and Storage Precautions:** Keep away from flames, sparks or hot surfaces. Never use a torch to cut or weld on or near container. Empty oil containers can contain explosive vapors. NFPA Class IIIB storage. Wash thoroughly after handling.

**Work / Hygienic Practices:** Wash hands with soap and water before eating, drinking, smoking or use of toilet facilities. Do not use gasoline, solvents, kerosene, or harsh abrasive skin cleaners for washing exposed skin areas. Take a shower after work if general contact occurs. Remove oil-soaked clothing and launder before reuse. Discard contaminated shoes and leather gloves.

**Shelf Life:** Product should be stored in clean, dry containers at ambient temperatures and it should remain stable with exception of slight color stability loss unless it is contaminated.

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** Adequate ventilation is required where excessive heating or agitation may occur to maintain concentration below exposure limits.

**Eye / Face Protection:** Safety glasses or face shield where splashing is possible.

**Skin Protection:** As needed to prevent repeated skin contact. Solvent resistant gloves should be used if needed.

**Respiratory Protection:** Not Normally Needed. Respirator should be used in areas where vapor concentrations are excessive due to high temperatures or where oil misting occurs.

**Section 9 - Physical and Chemical Properties****Physical State:** Liquid**Appearance:** Clear & bright**Color:** Water white to pale**Odor:** Mild Petroleum Odor**Odor Threshold:** Not determined**Vapor Pressure:** Not applicable**Vapor Density (Air=1):** > 5**Specific Gravity (H<sub>2</sub>O=1):** 0.88**Water Solubility:** Nil**Boiling Point:** 500-700°F (260-370°C)**Melting Point:** - 65°F ( - 55°C)**% Volatile:** Nil LVP-VOC**Evaporation Rate:** Not available**pH:** Not applicable**Section 10 - Stability and Reactivity****Stability:** Stable**Polymerization:** Polymerization will not occur.**Chemical Incompatibilities:** Strong Oxidizers.**Conditions to Avoid (Stability):** Sources of ignition.**Hazardous Decomposition Products:** Combustion products include carbon dioxide and carbon monoxide.**Section 11- Toxicological Information****Acute Studies:** Tests on similar materials show a low order of acute oral and dermal toxicity.**Eye Effects:** Minimal irritation on contact.**Skin Effects:** Practically non-toxic if absorbed. May cause mild irritation with prolonged and repeated exposure.**Acute Oral Effects:** Tests on similar materials indicate low order of acute oral toxicity.**Acute Inhalation Effects:** Low acute toxicity expected on inhalation.

This product is severely hydrotreated. Severely hydrotreated naphthenic petroleum oils have not been found to be carcinogenic or potential carcinogens.

**Section 12 - Ecological Information****Aquatic Release:** Advise authorities if product has entered or may enter watercourses or sewer drains.**Section 13 - Disposal Considerations**

Follow Federal, State, and Local regulations. Not a RCRA hazardous waste if uncontaminated. If "used", RCRA criteria must be determined. Do not flush to drain / storm sewer. Contract to authorized disposal service. If permitted incineration may be practical. Consider recycling.

**Section 14 - Transport Information****Proper Shipping Name:** Not regulated by DOT

(Contains Oil)

**Hazard Class:** Not Applicable**DOT ID No.:** Not Applicable**DOT Shipping Label:** Not regulated by DOT

## Section 15 - Regulatory Information

### U.S. Federal Regulatory Information:

#### CERCLA / SARA

302/303/304 Categories: Extremely Hazardous Substances None

311/312 Categories: Immediate (Acute) Health Effects No

Delayed (Chronic) Health Effects No

Fire Hazard No

Sudden Release of Pressure Hazard No

Reactivity Hazard No

313 Categories: Toxic Chemicals (40 CFR 372) None

Clean Air Act: Hazardous Air Pollutants (HAPS) None

Ozone Depleting Compounds (ODC) None

Clean Water Act: If spilled into navigable waters it is reportable to National Response Center, 800-424-8802

(40 CFR 116; 401.15) Reportable Quantity = Oil Sheen present on navigable water surface

OSHA (29 CFR 1910): This product is not hazardous under Hazard Communication Standard 29 CFR 1910.1200

RCRA (40 CFR 261.33) This product does not meet hazardous waste criteria.

### State Regulations:

California Prop 65 No Proposition 65 chemicals exists in this product, no labeling required.

Florida No listed ingredients are present

Massachusetts RTK No listed ingredients are present

Minnesota RTK No listed ingredients are present

New Jersey RTK Lists petroleum oil, but this product does not contain hazardous ingredients.

Pennsylvania RTK Lists petroleum oil, but this product does not contain hazardous ingredients greater than 3%.

Illinois DOL TSL No listed ingredients are present

### Other Regulations:

CONEG Metals: Since cadmium, chromium, lead and mercury are not detectable and it does not exceed 100 ppm total in this product, it is compliant with CONEG Metals regulation.

EEC (Europe): This product is not known to be a dangerous good internationally, unlabeled

EPA/TSCA Inventory: The components of this product are listed on the EPA/TSCA inventory of chemicals.  
CAS No. 64742-53-6

Foreign Inventories: The components of this product are listed under the following foreign inventories:

European Union's EINICS No. 265-156-6

Korea's ECL No. KE-12552

Australia's AICS No. 64742-53-6

Canada's DSL No. 64742-53-6

Philippines' PICCS – on List

## Section 16 - Other Information

**NFPA Hazard Rating**

- Health	<b>1 Slight</b>
- Fire	<b>1 Slight</b>
- Reactivity	<b>0 Least</b>

**Prepared By:** Will Poe **Phone:** (601) 630-8319

**Supersedes MSDS Dated:**

March 28, 2001	Added additional regulatory references, color
January 1, 2000	Change from 100% to > 99.7 %, add BHT in Section 2
May 21, 1999	Change date

This MSDS complies with OSHA Hazard Communication Standard (HCS) 29 CFR 1910.1200 and conforms to ANSI Z 400.1 16-Section Format.

**Disclaimer:** Ergon Refining, Inc. believes this information is accurate but not all-inclusive in all circumstances. It is the responsibility of the user to determine suitability of the material for their purposes. No warranty, expressed or implied, is given.

END OF SECTION