
THOSE WEREN'T THE DROIDS
WE WERE LOOKING FOR
Lessons Learned from Integrated Systems Testing


# THOSE WEREN'T THE DROIDS WE WERE LOOKING FOR

## Lessons Learned from Integrated Systems Testing

Mark Gelfo, PE, CxA, LEED Fellow, EMP

Managing Principal

THINK. LISTEN. CREATE.

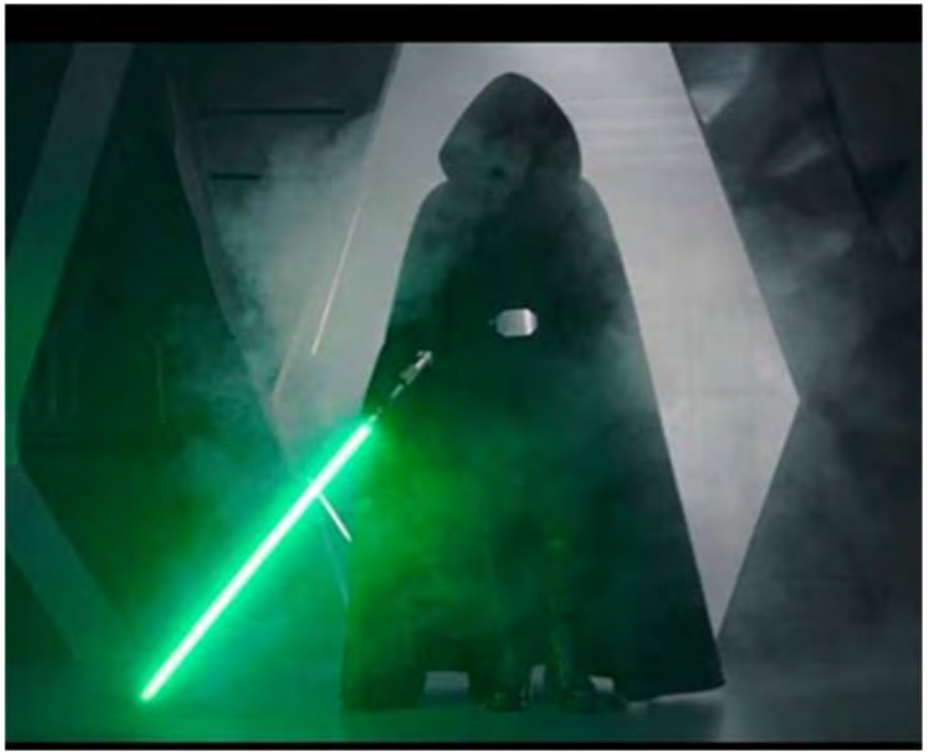
# The Force Will Be With You

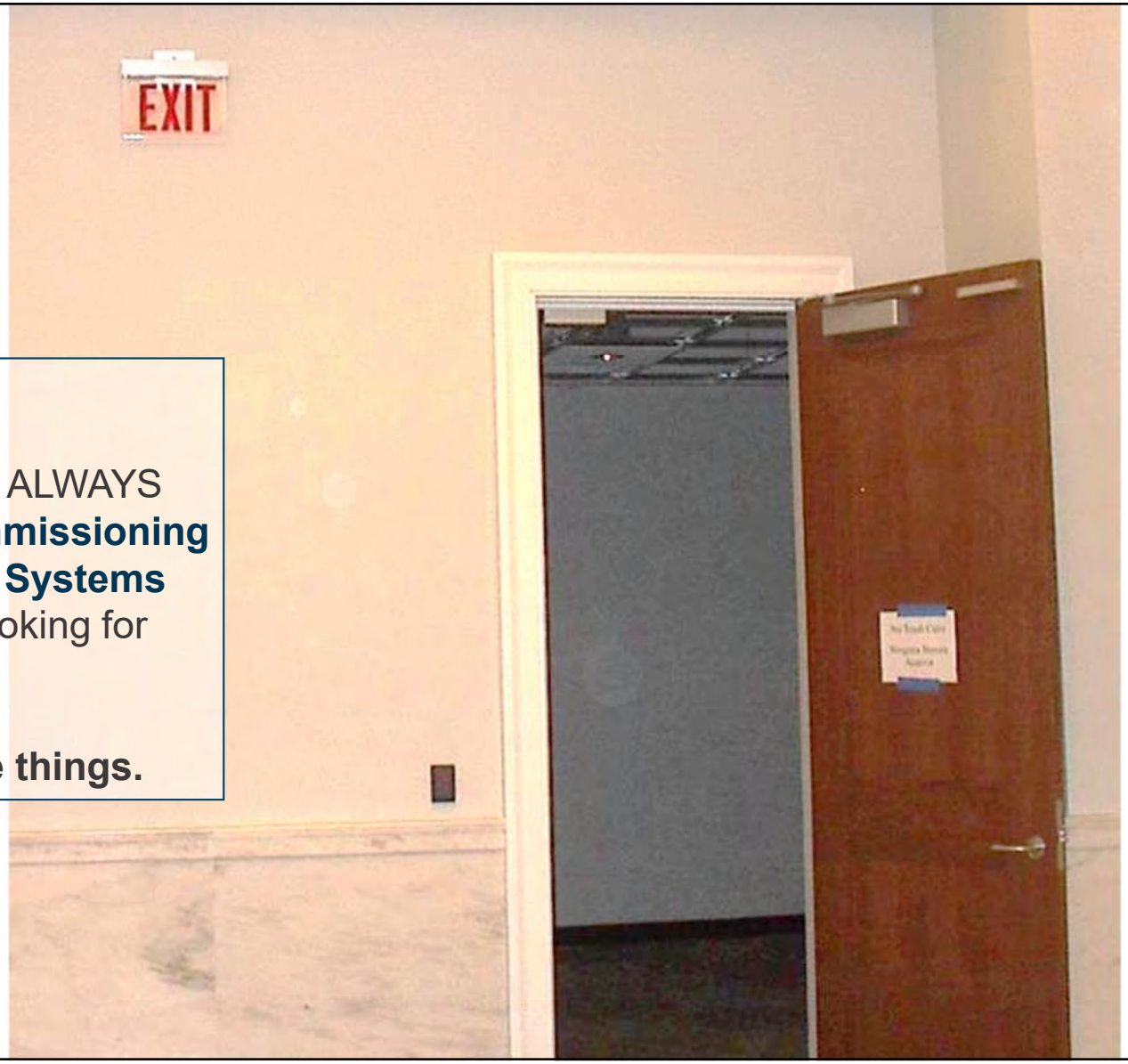
**Learning Objective 1:** Understand what **Integrated Systems Testing** is and why it is an important part of the commissioning process

**Learning Objective 2:** Know what a **Black-Site Test** is, and why it is an important test for any new building

**Learning Objective 3:** Apply **lessons learned** from our projects case study examples on their next commissioning project.

**Learning Objective 4:** Understand how to prepare a **Functional Test Procedure** for IST that is repeatable.

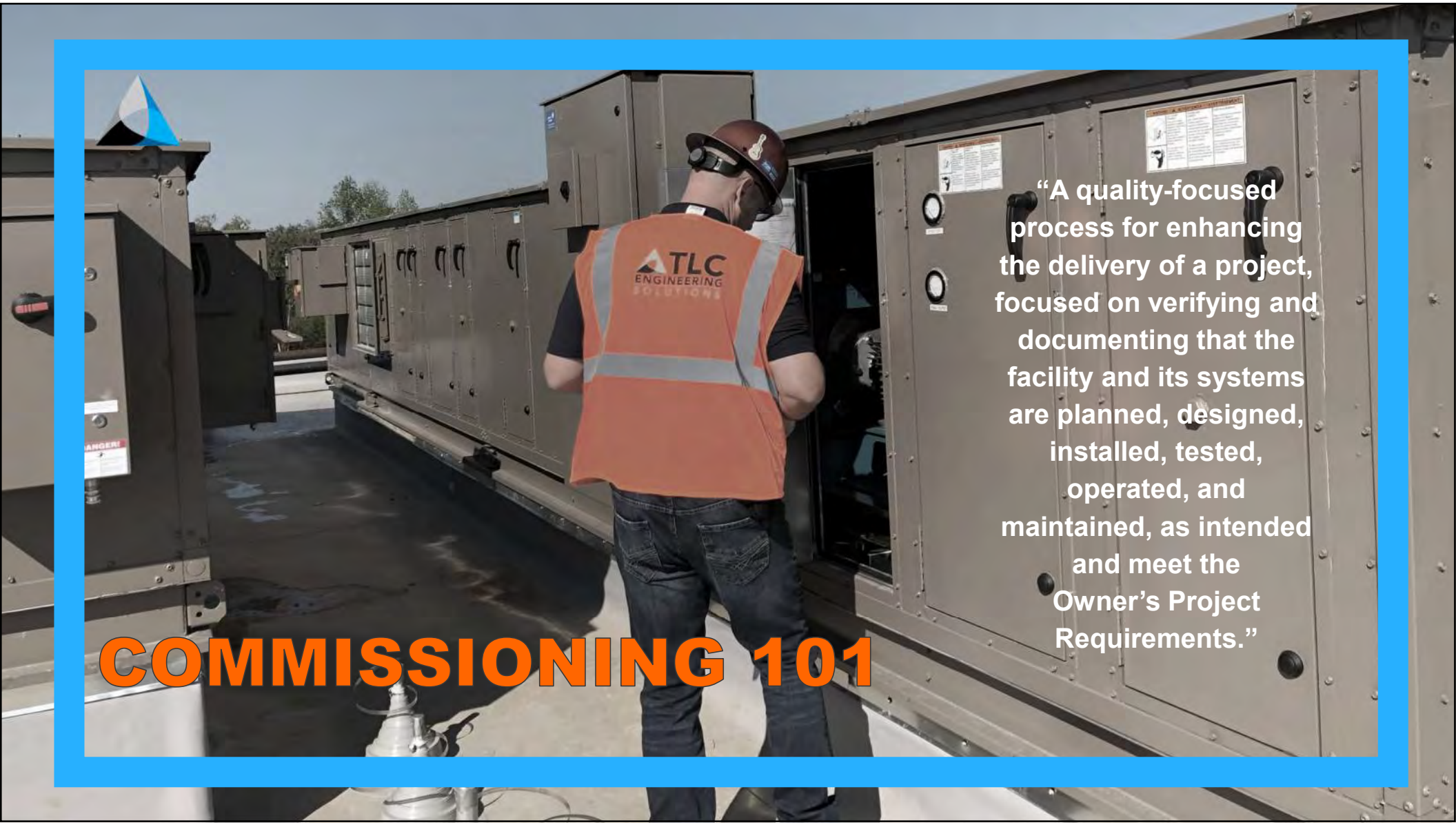





**The Premise:**

There are always, always, ALWAYS things we find during **Commissioning** and especially **Integrated Systems Testing** that we weren't looking for and didn't expect.

**These are some of those things.**




# COMMISSIONING 101

"A quality-focused process for enhancing the delivery of a project, focused on verifying and documenting that the facility and its systems are planned, designed, installed, tested, operated, and maintained, as intended and meet the Owner's Project Requirements."

# When is Commissioning Required ?

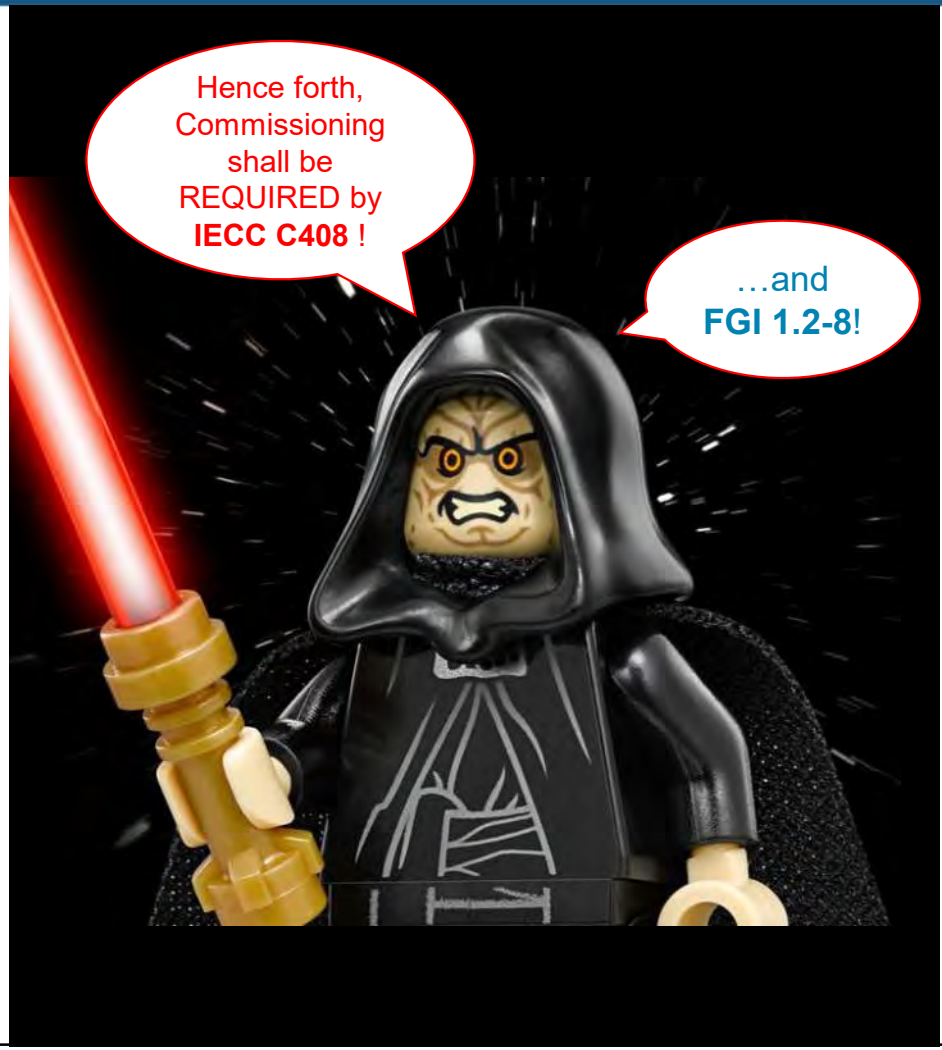
## 8th Edition FBC 2023 C408 Maintenance Information and Systems Commissioning

- Mechanical Systems (C408.2): >40 Tons Cooling, 600 MBH Heating
  - *Code official SHALL REQURE Preliminary Cx Report be made available for review by code official prior to final inspection (C408.2.4.2)
- Service Water Heating (C408.2): If Mech Cx is Required
- Lighting Controls (C408.3): All Projects
  - Expanded Requirements for Lighting Controls Testing

## 2022 FGI Guidelines for Design and Construction of Hospitals

Chapter 1.2-8 Commissioning:

- HVAC
- Automatic temperature control
- Domestic hot water
- Fire alarm and fire protection integration
- Essential electrical power systems
- Security systems
- *Telecommunications & Wireless Communication Systems



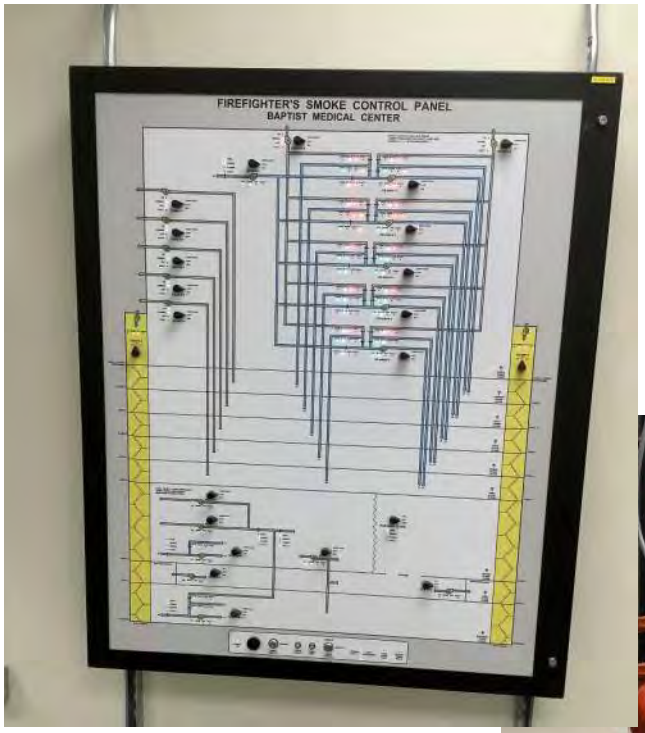
# When is Commissioning Required ?

**NFPA 3-2018: Standard for Commissioning of Fire Protection and Life Safety Systems (NOT ADOPTED)**

- Developed as request from the National Institute of Building Sciences (NIBS),
- outlines the commissioning process and integrated testing of fire protection & life safety systems
- Goal to ensure systems perform in per design intent.

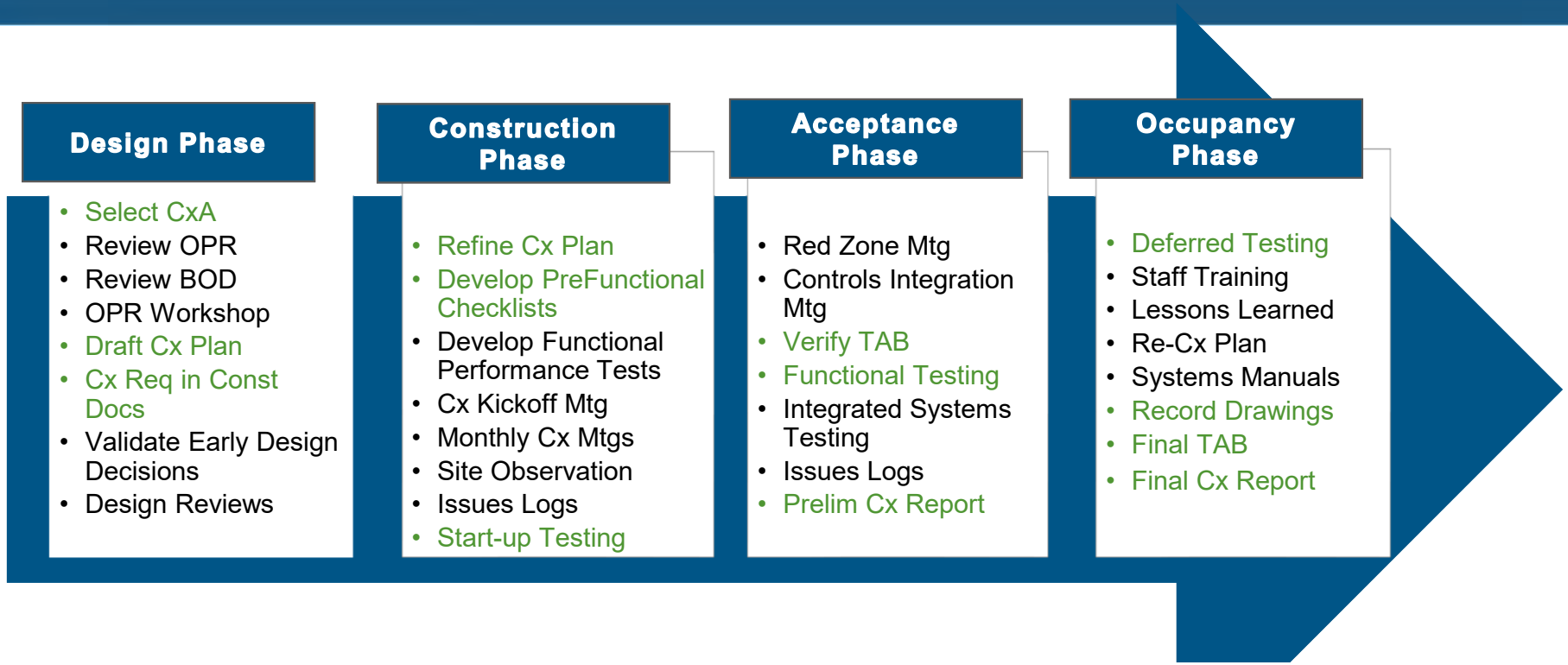
**NFPA 4-2021: Standard for Integrated Fire Protection and Life Safety System Testing**

- Requires Commissioning and Integrated Testing of FP & LS systems
- Defines Role of the Integrated Testing Agent (ITa)
- outlines test scenarios to confirm the operation & interaction of FP & LS systems via Integrated Testing Plan




2018 is code TODAY

# Commissioning is a Process, not an Event




**FBC 2023, Florida Energy Code C408**

**Cooling > 40 Tons** **Heating > 600 MBH**

1. Mechanical Systems Commissioning (C408.2)
2. Service Water Heating Systems, Pools, Spas (C408.2) – same as Mechanical Systems
3. Lighting Controls Functional Testing (C408.3)

**Guidelines for Design and Construction of Hospitals, 2022**

4. Essential Electrical Systems
5. Security Systems

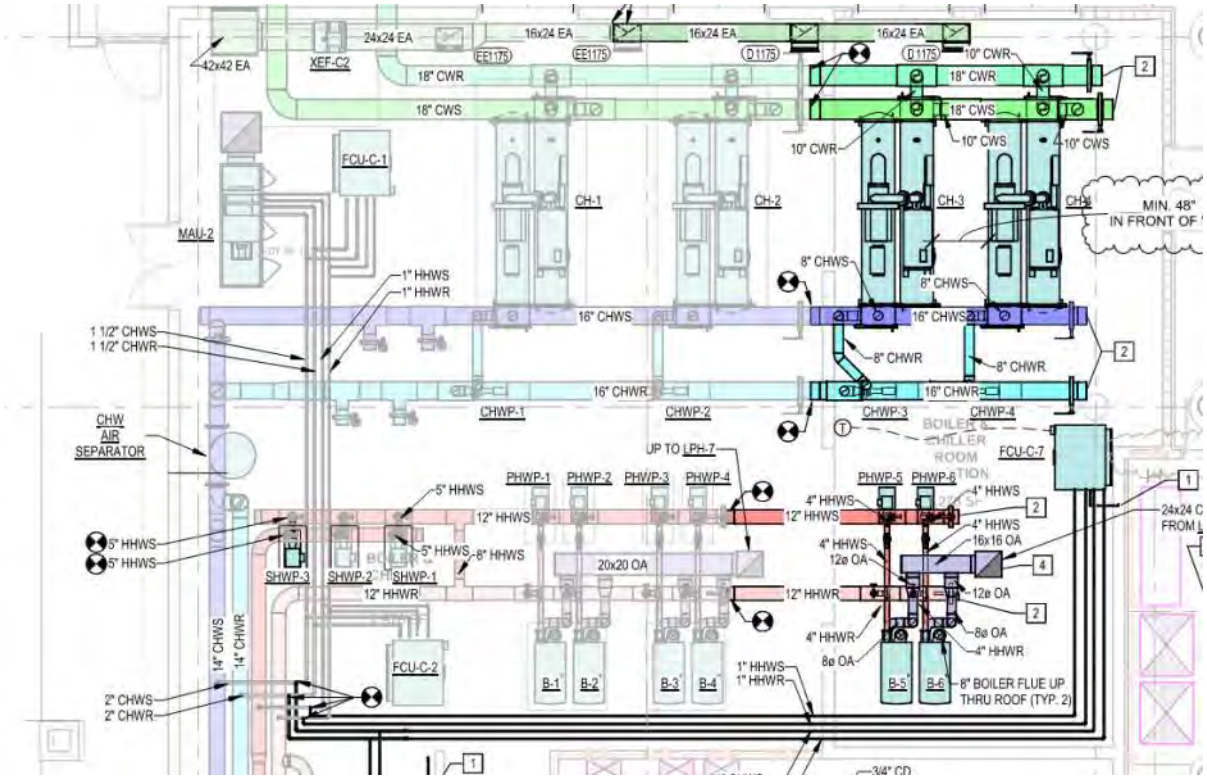
**NFPA 4, 2021 Standard for Integrated Fire Protection and Life Safety System Testing**

6. Fire Alarm
7. Fire Protection
8. Integrated Life Safety Systems


WHAT IS
INTEGRATED
SYSTEMS TESTING ?

# IST: New Equipment added to Existing

## Example: New Chillers & Boilers added to Existing CEP




Test New Equipment Independently

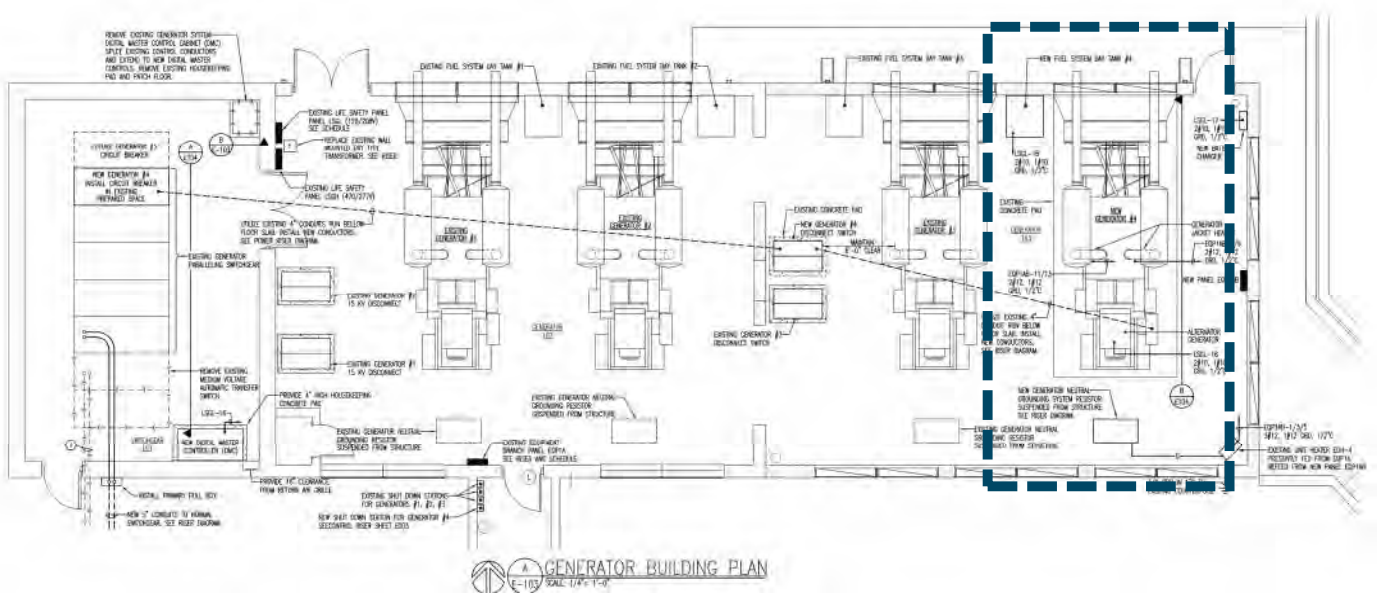
Then Test New Equipment in Combination with Existing Equipment

Ensure Operating as “One System”

- Lead Machine Logic
- Lag Machine Logic
- Pumping

# IST: New Equipment added to Existing

## Example: New Generator added to Existing CEP




Test New Generator Independently

Then Test New Generator in Combination with Existing Generator

Ensure Operating as “One System”

- Paralleling
- Load Shed / Load Add
- Load Prioritization Changes
- Fuel System

# Integrated Systems Testing (IST) – Full Building

## We've testing everything individually… now lets test it all together

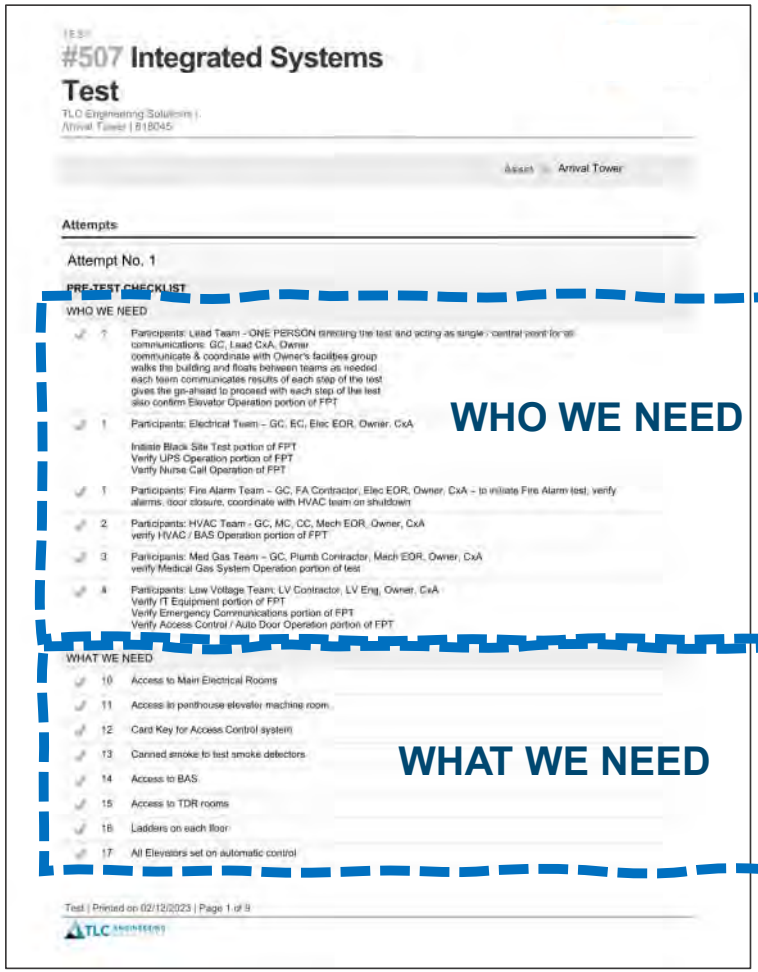
- Does HVAC system work properly on emergency power? Chillers? After return to normal power?
- Does FIRE ALARM SYSTEM work on emergency power? AHU shutdown? Damper Closing and Reopening?
- Do ELEVATORS run properly on emergency power? Recall? After return to normal power?
- UPS SYSTEMS? Large and Small?
- Are EMERGENCY COMMUNICATION SYSTMS functional?
- SECURITY / ACCESS CONTROL ?


**"Black Site Test"**

**Step 1:** Simulate Power Loss

**Step 2:** See What Happens

# Commissioning Plan: Integrated System Test



#507 Integrated Systems Test

TLC Engineering Solutions | Arrival Tower | 818045

Asset: Arrival Tower

Attempts

Attempt No. 1

PRE-TEST CHECKLIST

WHO WE NEED

- 1 Participants: Lead Team - ONE PERSON directing the test and acting as single central point for all communications: GC, Lead CxA, Owner
  communicate & coordinate with Owner's facilities group
  walks the building and floats between teams as needed
  each team communicates results of each step of the test
  gives the go-ahead to proceed with each step of the test
  also confirm Elevator Operation portion of FPT
- 1 Participants: Electrical Team – GC, EC, Elec EOR, Owner, CxA
  Initiate Black Site Test portion of FPT
  Verify UPS Operation portion of FPT
  Verify Nurse Call Operation of FPT
- 1 Participants: Fire Alarm Team – GC, FA Contractor, Elec EOR, Owner, CxA – to initiate Fire Alarm test, verify alarms, door closure, coordinate with HVAC team on shutdown
- 2 Participants: HVAC Team - GC, MC, CC, Mech EOR, Owner, CxA
  verify HVAC / BAS Operation portion of FPT
- 3 Participants: Med Gas Team – GC, Plumb Contractor, Mech EOR, Owner, CxA
  verify Medical Gas System Operation portion of test
- 4 Participants: Low Voltage Team: LV Contractor, LV Eng, Owner, CxA
  Verify IT Equipment portion of FPT
  Verify Emergency Communications portion of FPT
  Verify Access Control / Auto Door Operation portion of FPT

WHAT WE NEED

- 10 Access to Main Electrical Rooms
- 11 Access to penthouse elevator machine room
- 12 Card Key for Access Control system
- 13 Canned smoke to test smoke detectors
- 14 Access to BAS
- 15 Access to TDR rooms
- 16 Ladders on each floor
- 17 All Elevators set on automatic control

Test | Printed on 02/12/2023 | Page 1 of 9

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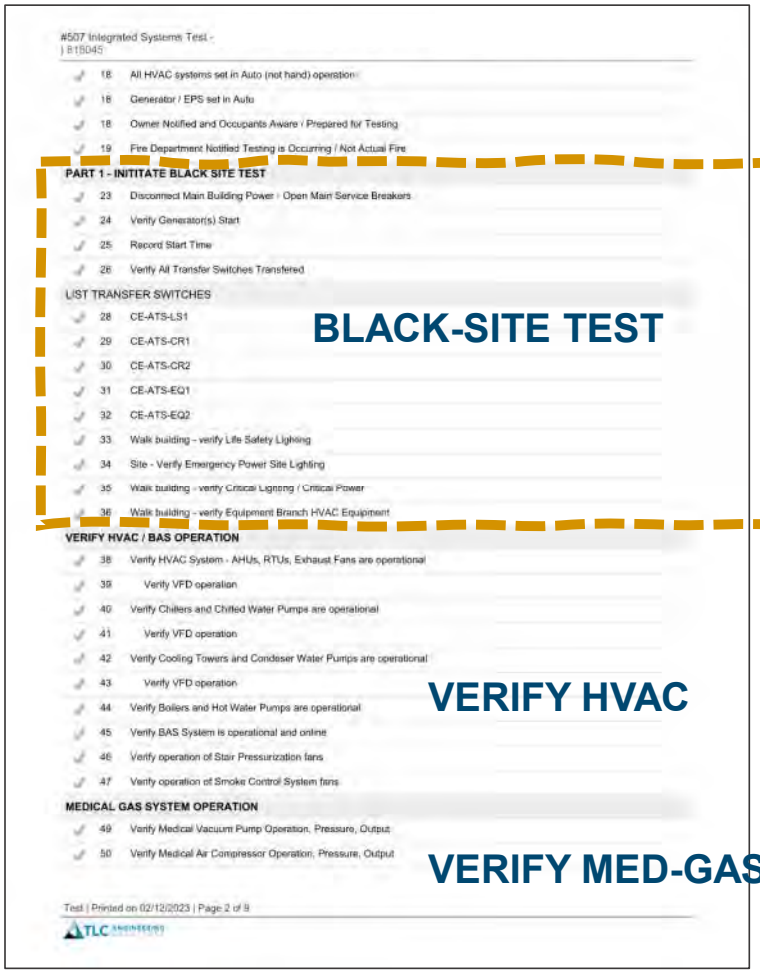
WHO WE NEED

WHAT WE NEED



#507 Integrated Systems Test -
| 818045

- 18 All HVAC systems set in Auto (not hand) operation
- 18 Generator / EPS set in Auto
- 18 Owner Notified and Occupants Aware / Prepared for Testing
- 19 Fire Department Notified Testing is Occurring / Not Actual Fire

PART 1 - INITITATE BLACK SITE TEST

- 23 Disconnect Main Building Power / Open Main Service Breakers
- 24 Verify Generator(s) Start
- 25 Record Start Time
- 26 Verify All Transfer Switches Transfered

LIST TRANSFER SWITCHES

- 28 CE-ATS-LS1
- 29 CE-ATS-CR1
- 30 CE-ATS-CR2
- 31 CE-ATS-EQ1
- 32 CE-ATS-EQ2
- 33 Walk building - verify Life Safety Lighting
- 34 Site - Verify Emergency Power Site Lighting
- 35 Walk building - verify Critical Lighting / Critical Power
- 36 Walk building - verify Equipment Branch HVAC Equipment

VERIFY HVAC / BAS OPERATION

- 38 Verify HVAC System - AHUs, RTUs, Exhaust Fans are operational
- 39 Verify VFD operation
- 40 Verify Chillers and Chilled Water Pumps are operational
- 41 Verify VFD operation
- 42 Verify Cooling Towers and Condeser Water Pumps are operational
- 43 Verify VFD operation
- 44 Verify Boilers and Hot Water Pumps are operational
- 45 Verify BAS System is operational and online
- 46 Verify operation of Stair Pressurization fans
- 47 Verify operation of Smoke Control System fans

MEDICAL GAS SYSTEM OPERATION

- 49 Verify Medical Vacuum Pump Operation, Pressure, Output
- 50 Verify Medical Air Compressor Operation, Pressure, Output

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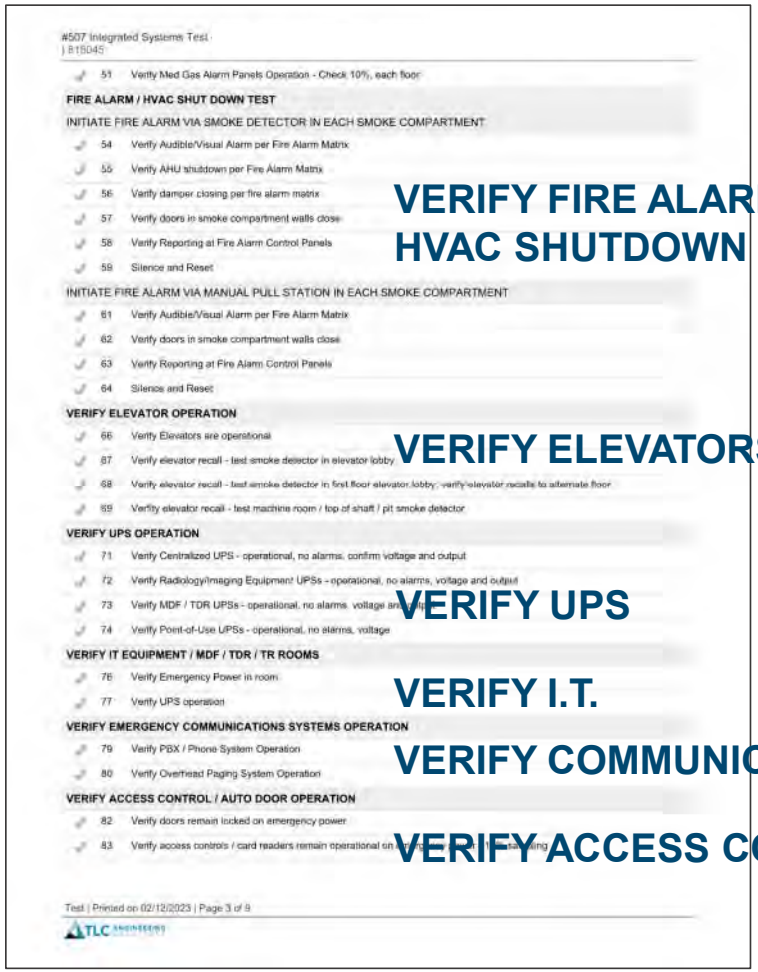
BLACK-SITE TEST

VERIFY HVAC

VERIFY MED-GAS

# Integrated System Test



#507 Integrated Systems Test -
) 815045

51 Verify Med Gas Alarm Panels Operation - Check 10%, each floor

**FIRE ALARM / HVAC SHUT DOWN TEST**

INITIATE FIRE ALARM VIA SMOKE DETECTOR IN EACH SMOKE COMPARTMENT

54 Verify Audible/Visual Alarm per Fire Alarm Matrix
55 Verify AHU shutdown per Fire Alarm Matrix
56 Verify damper closing per fire alarm matrix
57 Verify doors in smoke compartment walls close
58 Verify Reporting at Fire Alarm Control Panels
59 Silence and Reset

INITIATE FIRE ALARM VIA MANUAL PULL STATION IN EACH SMOKE COMPARTMENT

61 Verify Audible/Visual Alarm per Fire Alarm Matrix
62 Verify doors in smoke compartment walls close
63 Verify Reporting at Fire Alarm Control Panels
64 Silence and Reset

**VERIFY ELEVATOR OPERATION**

66 Verify Elevators are operational
67 Verify elevator recall - test smoke detector in elevator lobby
68 Verify elevator recall - test smoke detector in first floor elevator lobby; verify elevator recalls to alternate floor
69 Verify elevator recall - test machine room / top of shaft / pit smoke detector

**VERIFY UPS OPERATION**

71 Verify Centralized UPS - operational, no alarms, confirm voltage and output
72 Verify Radiology/Imaging Equipment UPSs - operational, no alarms, voltage and output
73 Verify MDF / TDR UPSs - operational, no alarms, voltage and output
74 Verify Point-of-Use UPSs - operational, no alarms, voltage

**VERIFY IT EQUIPMENT / MDF / TDR / TR ROOMS**

76 Verify Emergency Power in room
77 Verify UPS operation

**VERIFY EMERGENCY COMMUNICATIONS SYSTEMS OPERATION**

79 Verify PBX / Phone System Operation
80 Verify Overhead Paging System Operation

**VERIFY ACCESS CONTROL / AUTO DOOR OPERATION**

82 Verify doors remain locked on emergency power
83 Verify access controls / card readers remain operational on emergency power

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VERIFY FIRE ALARM & HVAC SHUTDOWN

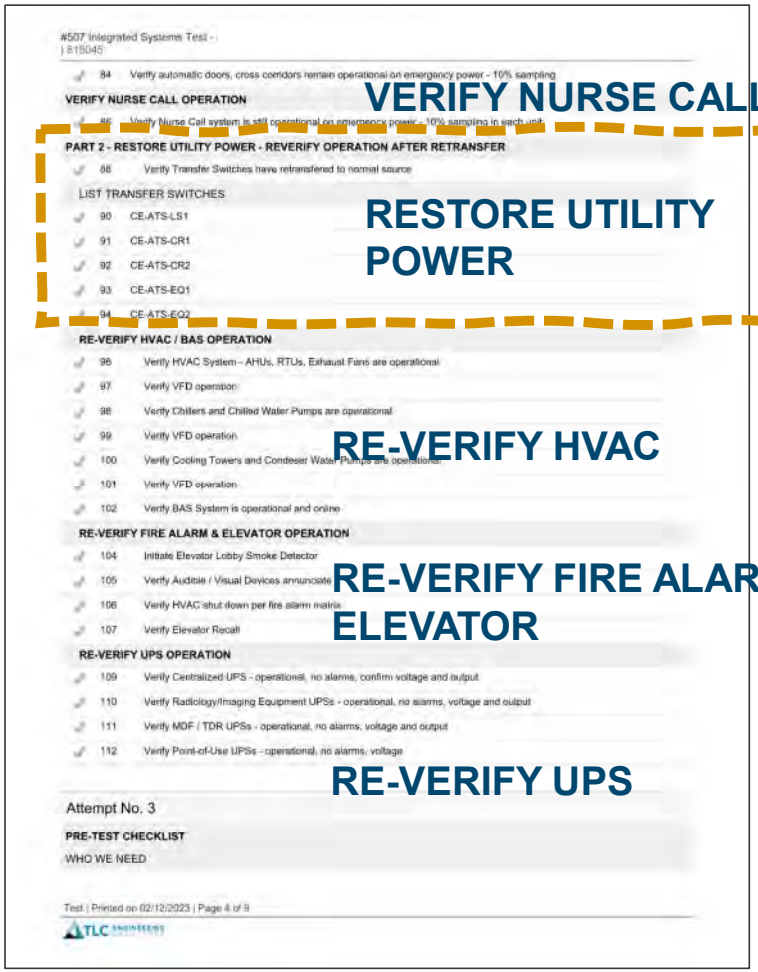
VERIFY ELEVATORS

VERIFY UPS

VERIFY I.T.

VERIFY COMMUNICATIONS

VERIFY ACCESS CONTROL



#507 Integrated Systems Test -
) 815045

84 Verify automatic doors, cross corridors remain operational on emergency power - 10% sampling

**VERIFY NURSE CALL OPERATION**

86 Verify Nurse Call system is still operational on emergency power - 10% sampling in each unit

**PART 2 - RESTORE UTILITY POWER - REVERIFY OPERATION AFTER RETRANSFER**

88 Verify Transfer Switches have retransfered to normal source

LIST TRANSFER SWITCHES

90 CE-ATS-LS1
91 CE-ATS-CR1
92 CE-ATS-CR2
93 CE-ATS-EQ1
94 CE-ATS-EQ2

**RE-VERIFY HVAC / BAS OPERATION**

96 Verify HVAC System - AHUs, RTUs, Exhaust Fans are operational
97 Verify VFD operation
98 Verify Chillers and Chilled Water Pumps are operational
99 Verify VFD operation
100 Verify Cooling Towers and Condeser Water Pumps are operational
101 Verify VFD operation
102 Verify BAS System is operational and online

**RE-VERIFY FIRE ALARM & ELEVATOR OPERATION**

104 Initiate Elevator Lobby Smoke Detector
105 Verify Audible / Visual Devices annunciate
106 Verify HVAC shut down per fire alarm matrix
107 Verify Elevator Recall

**RE-VERIFY UPS OPERATION**

109 Verify Centralized UPS - operational, no alarms, confirm voltage and output
110 Verify Radiology/Imaging Equipment UPSs - operational, no alarms, voltage and output
111 Verify MDF / TDR UPSs - operational, no alarms, voltage and output
112 Verify Point-of-Use UPSs - operational, no alarms, voltage

Attempt No. 3

**PRE-TEST CHECKLIST**

WHO WE NEED

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VERIFY NURSE CALL

RESTORE UTILITY POWER

RE-VERIFY HVAC

RE-VERIFY FIRE ALARM & ELEVATOR

RE-VERIFY UPS

# Special Consideration for Existing Hospitals

Assigned To Commissioning Authority
Asset Phase 3

**Attempts** Most Recent

Attempt No. 1

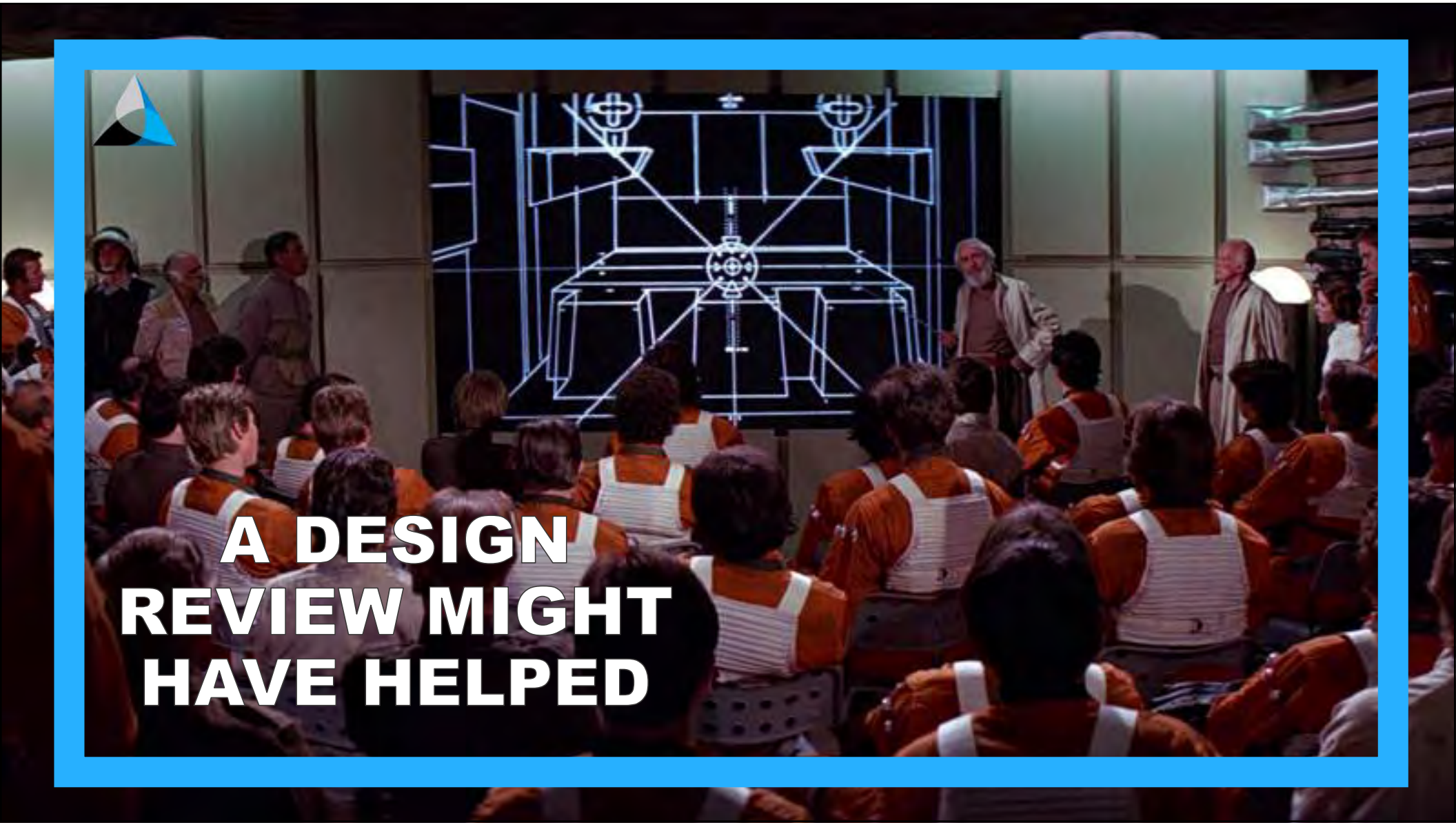
**The purpose of this test is to test all new systems and equipment together in all modes including emergency operations modes. This test is NOT INTENDED TO IMPACT EXISTING OCCUPIED AREAS OF THE HOPSITAL . If you see something in this testing procedure that might directly or indirectly impact existing occupied areas of the hospital, please notify the commissioning team, construction team, or owner immediately.**

**PRE-TEST CHECKLIST**

WHO WE NEED

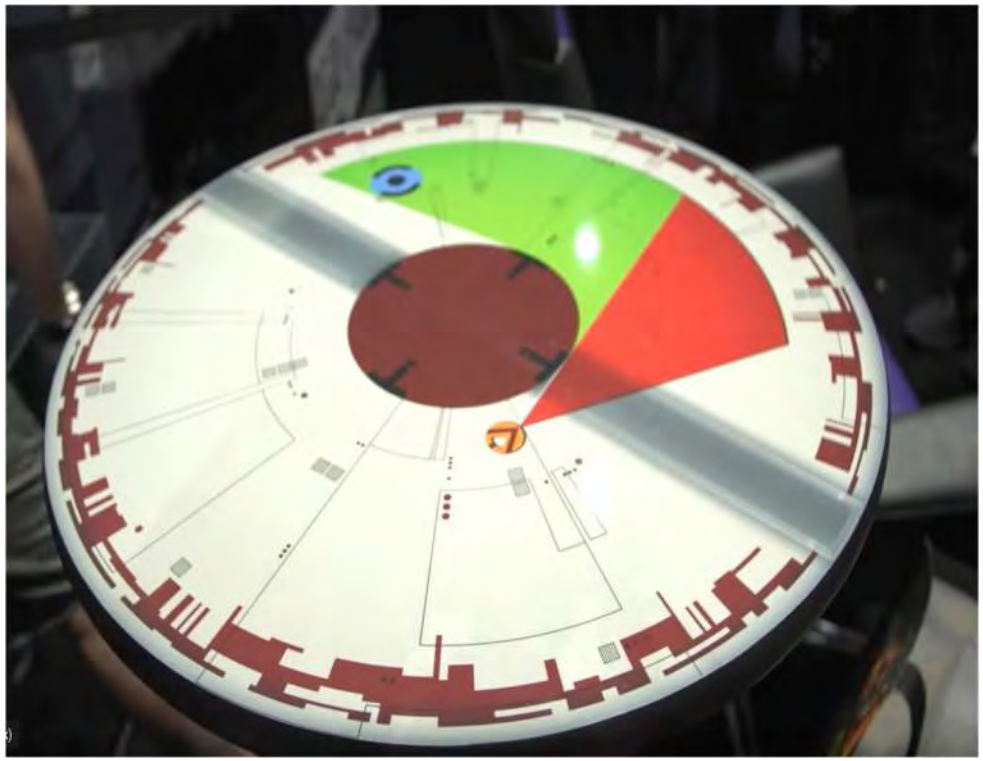
1 Participants: Electrical Team

Initiate Black Site Test portion of FPT
Verify UPS Operation portion of FPT

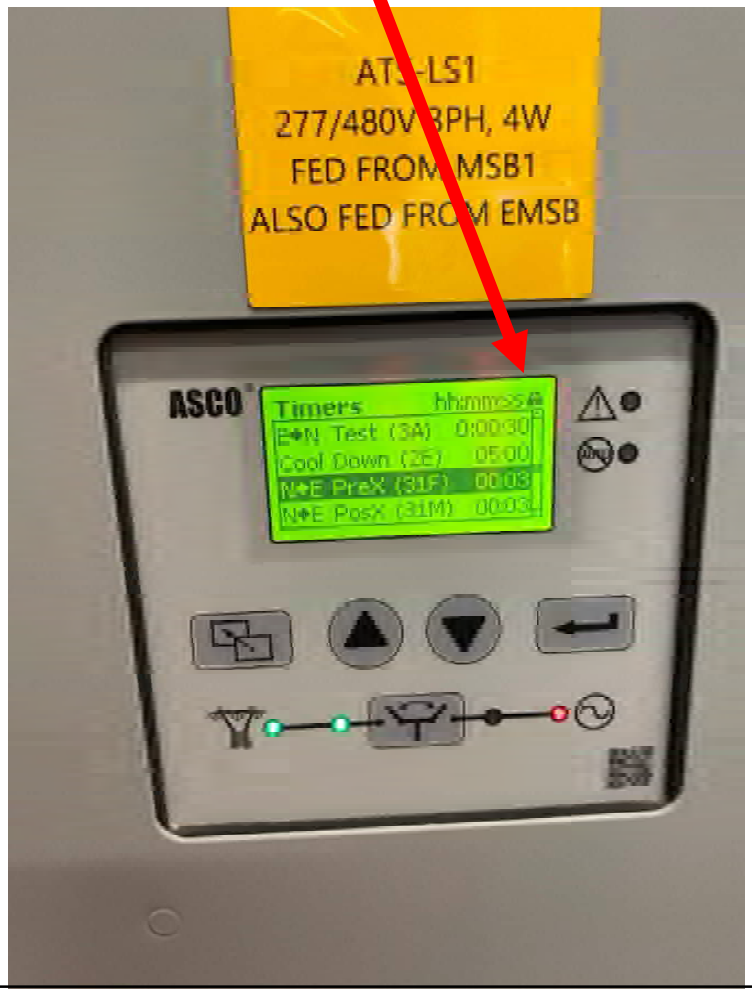

A DESIGN
REVIEW MIGHT
HAVE HELPED

# Top 10 Common Design Review Issues

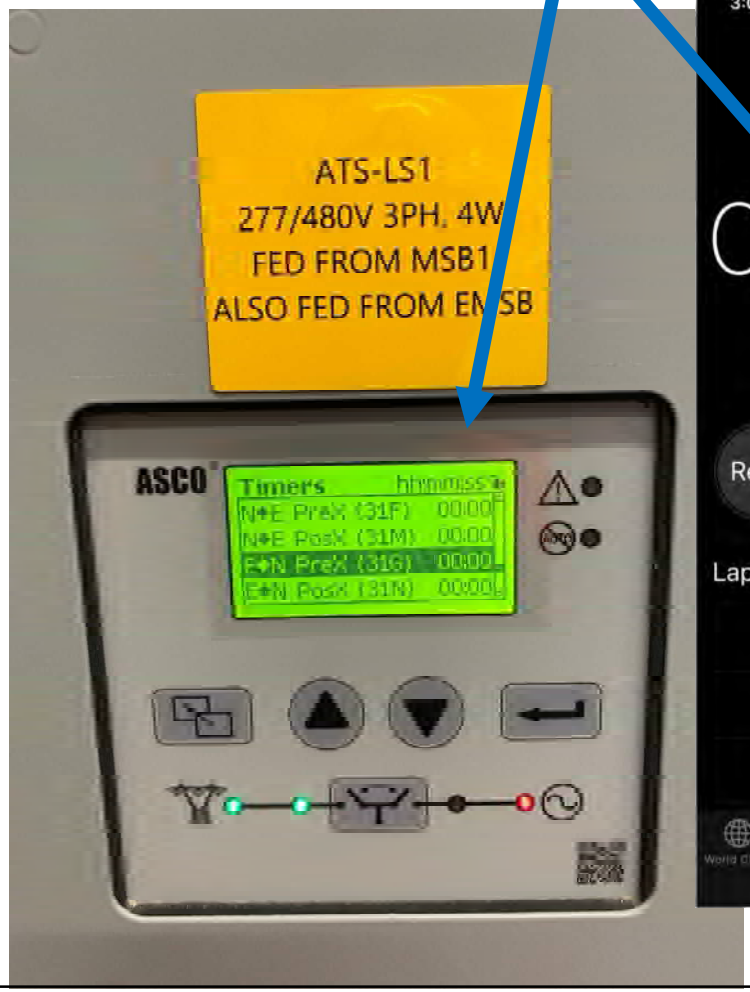
10. Commissioning Specifications / Testing Requirements
9. Equipment Naming / Labeling
8. Unclear / Boiler Plate Documents
7. Lighting Controls Placement
6. Fuel System
5. Heating / Reheat
4. Phasing / Constructability Issues
3. Working Clearances
2. Maintenance Access
1. ***SEQUENCE OF OPERATIONS***



## What Happens When There's No Sequence of Operations




## What Happens When There Is





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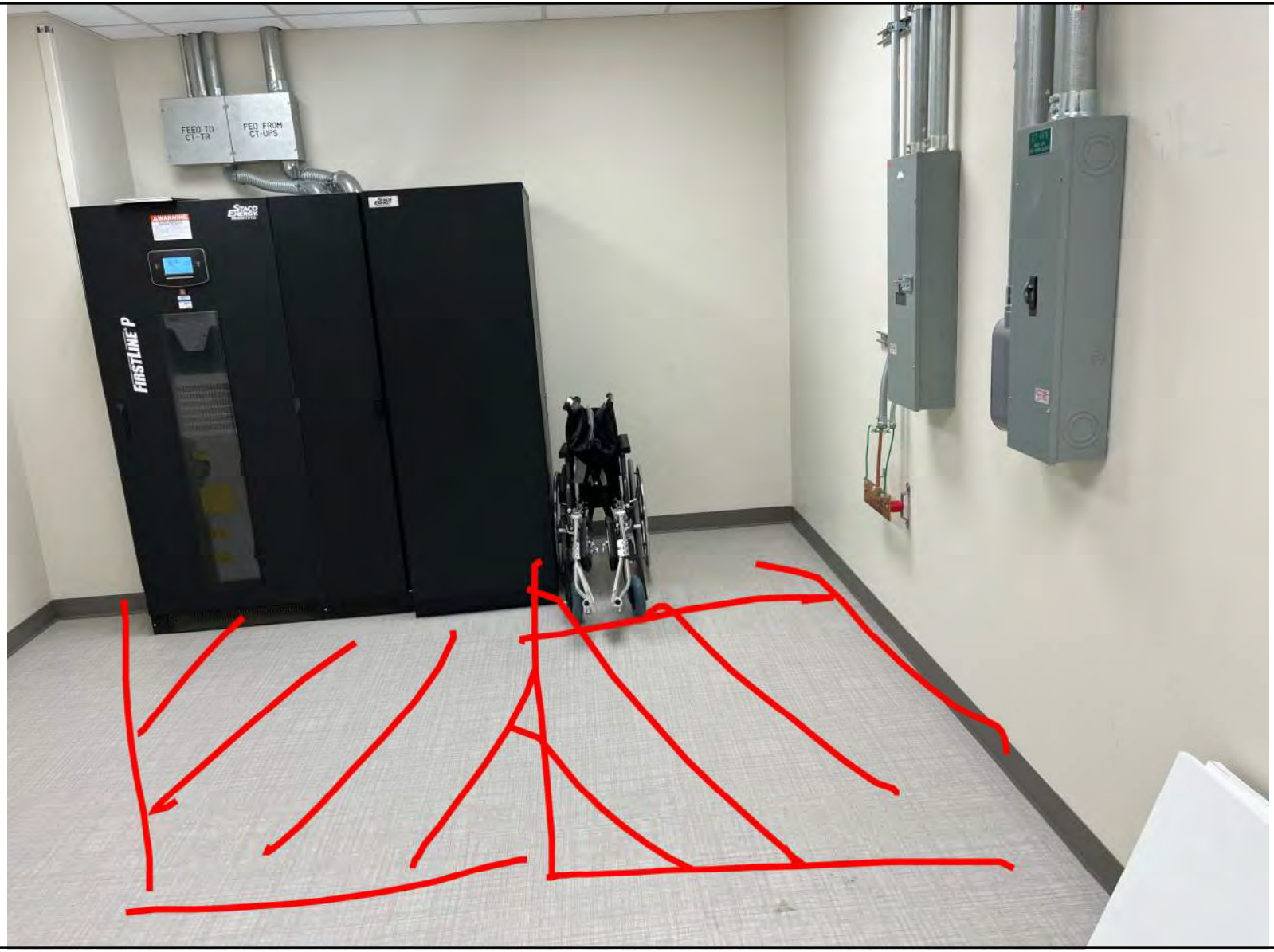
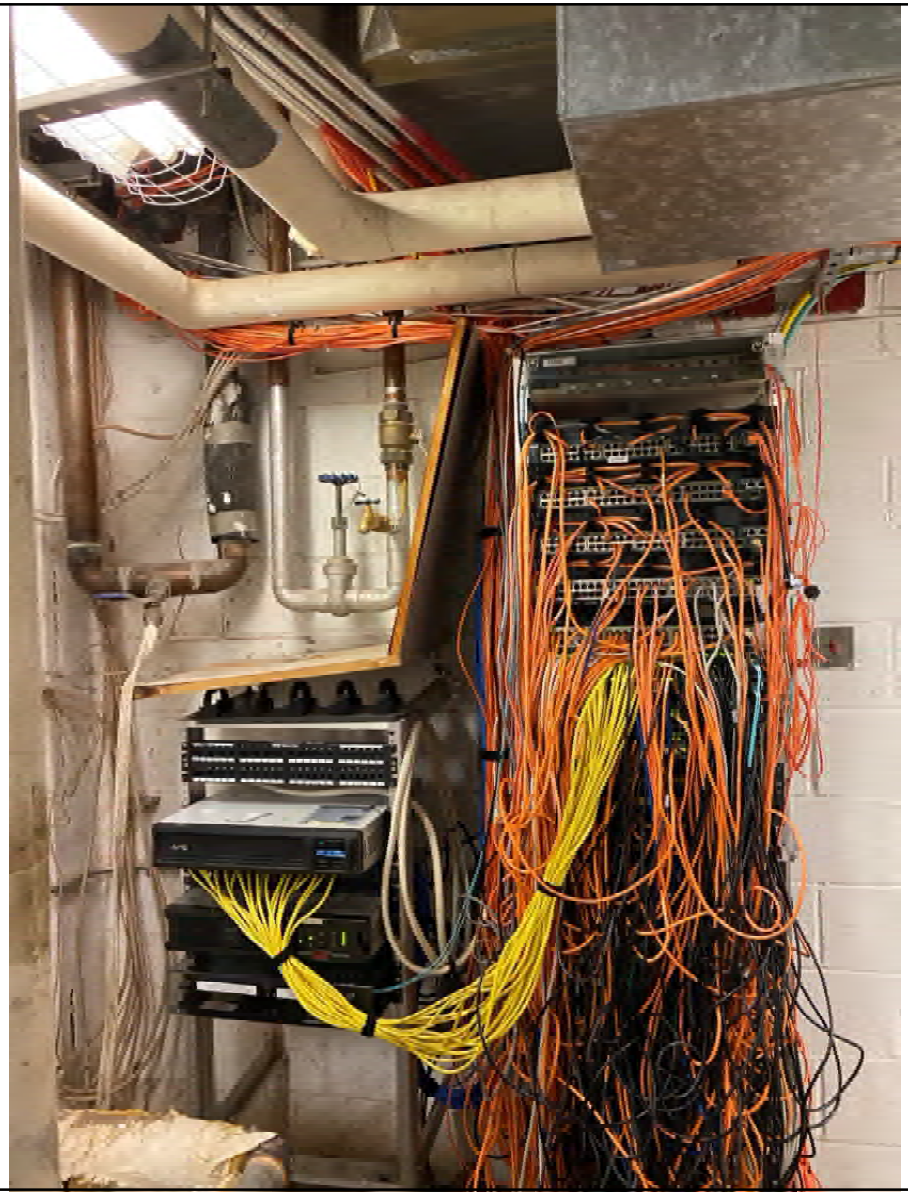
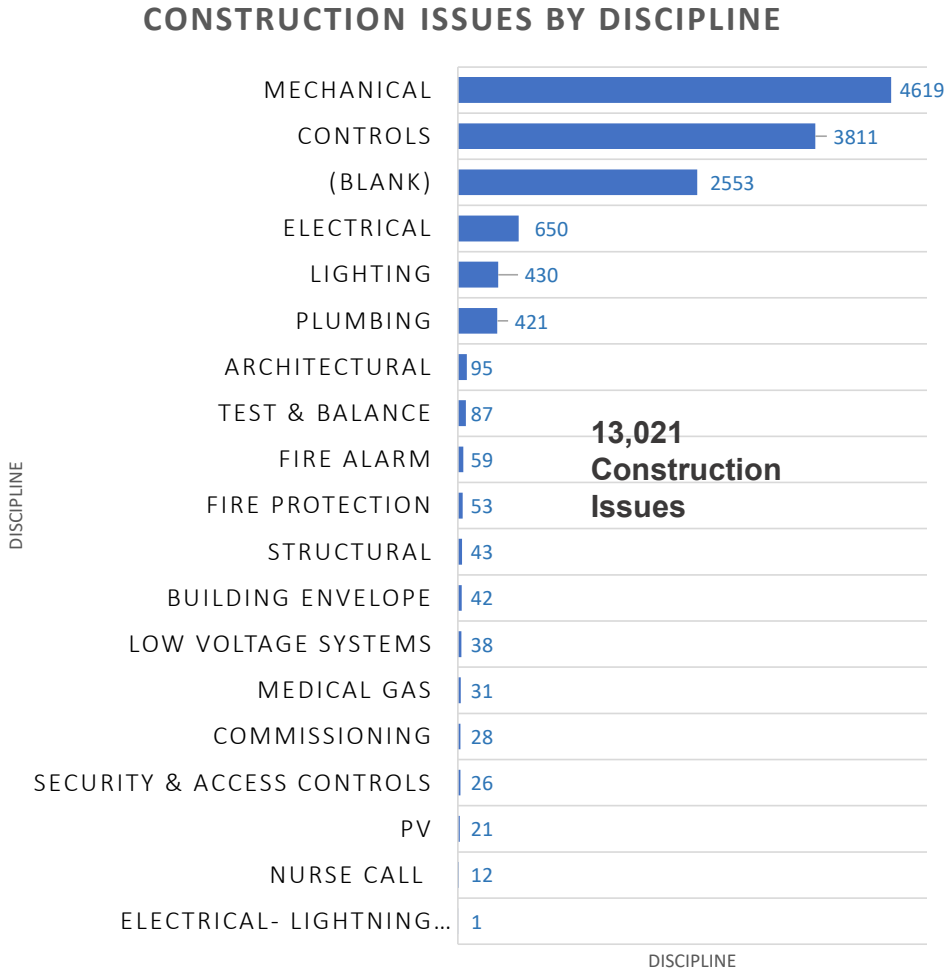
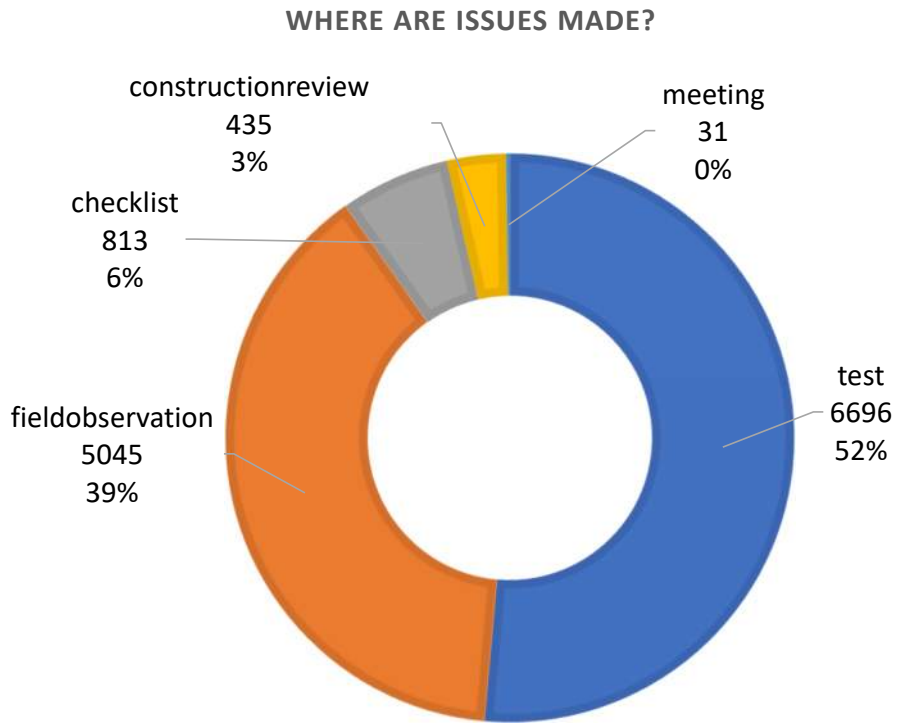

FEED TO
CT-TM
FEED FROM
CT-UPS
WARNING
FIRSTLINE P



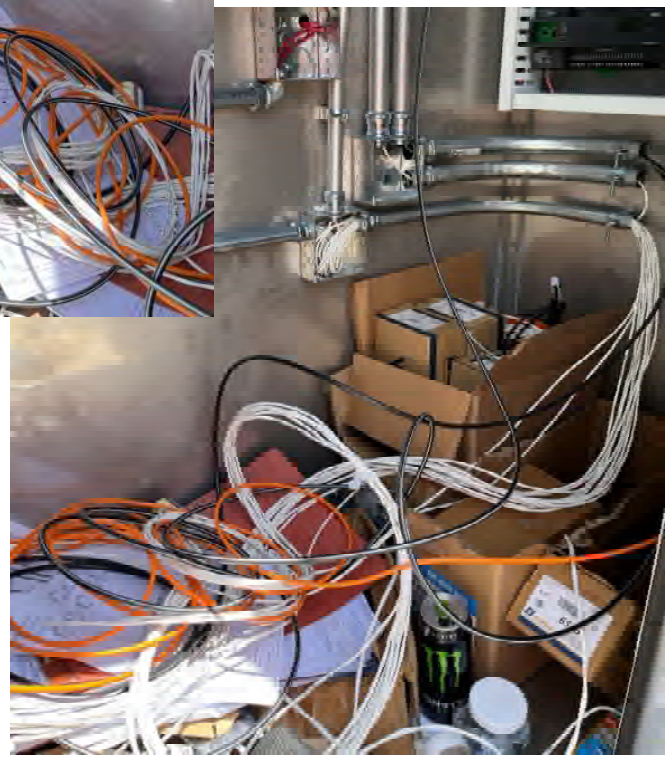

WHEN IS READY READY?

# Some Data Analytics (300+ Cx Projects)



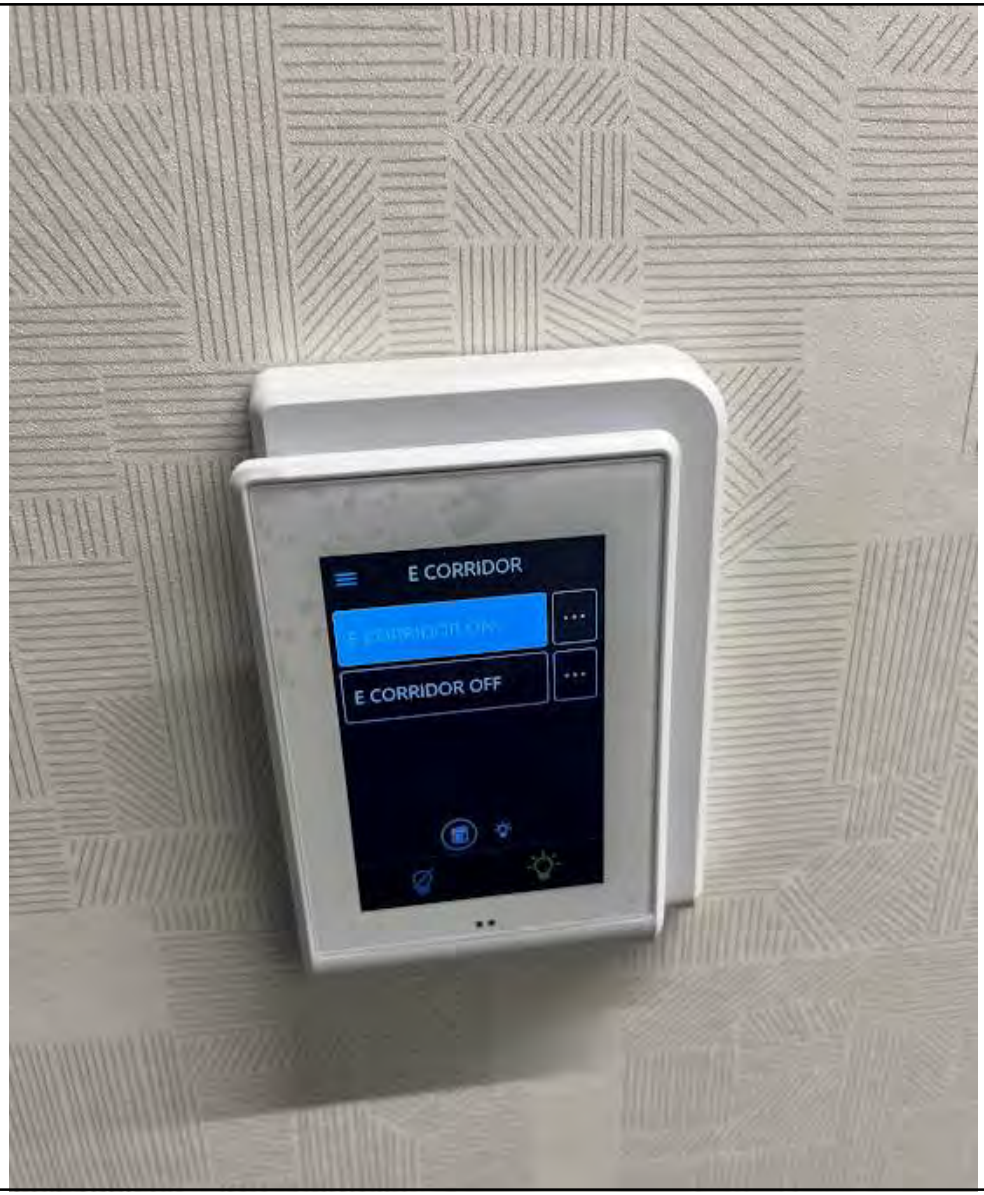




TLC
ENGINEERING
SOLUTIONS




DOAS-1
ON
OFF
WARNING


MRI TRAILER
DATA
NURSE CALL
MRI TRAILER
FIRE ALARM


E CORRIDOR
E CORRIDOR OFF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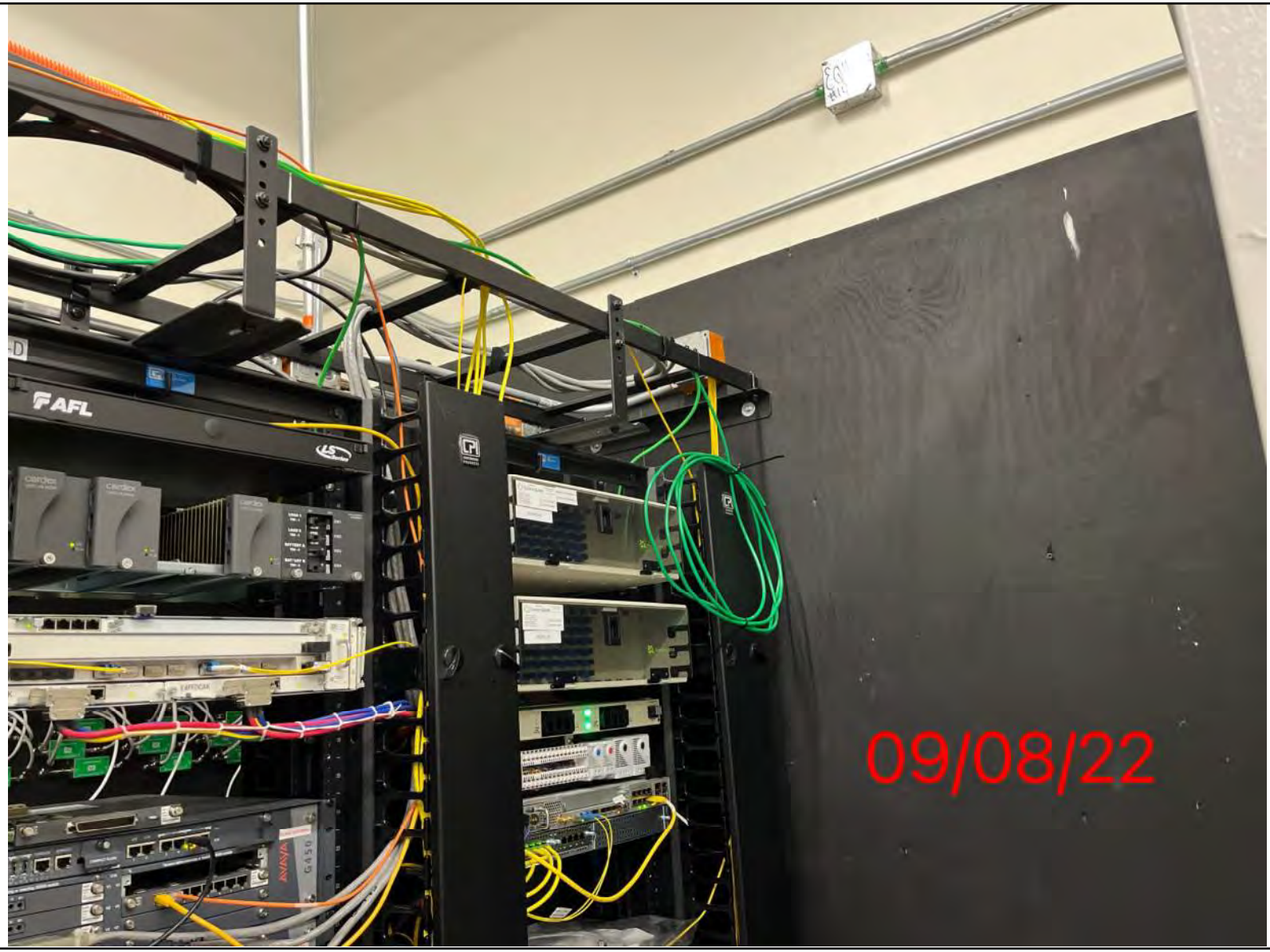
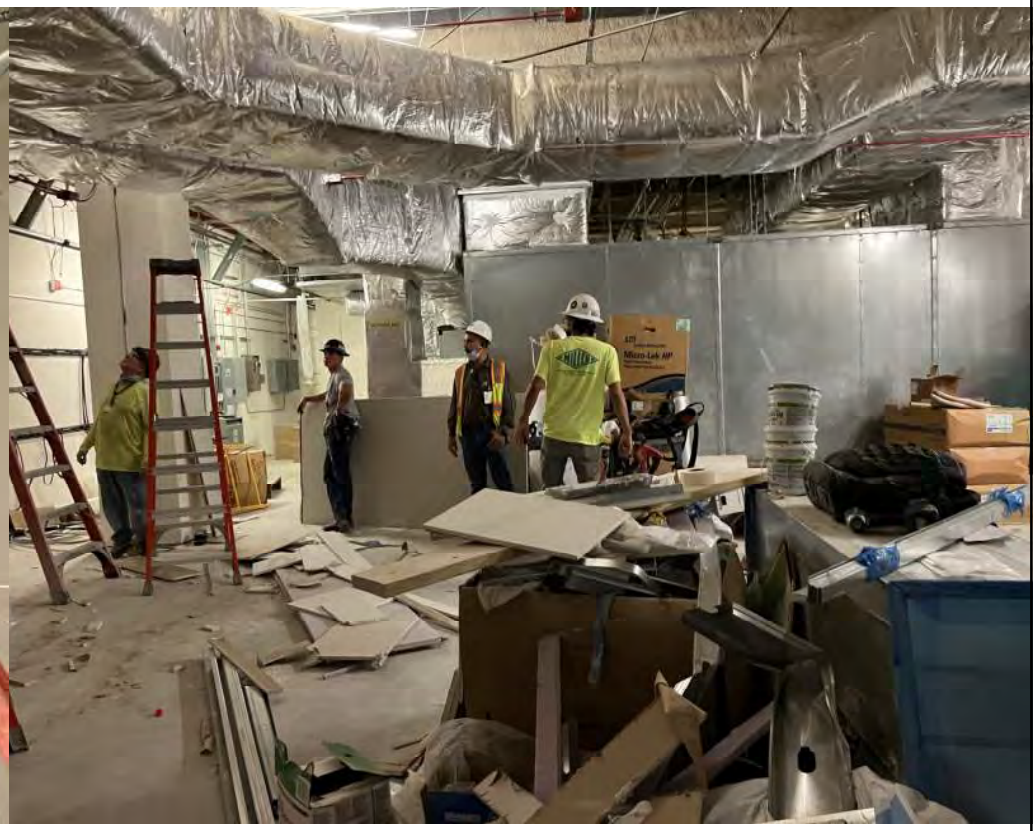
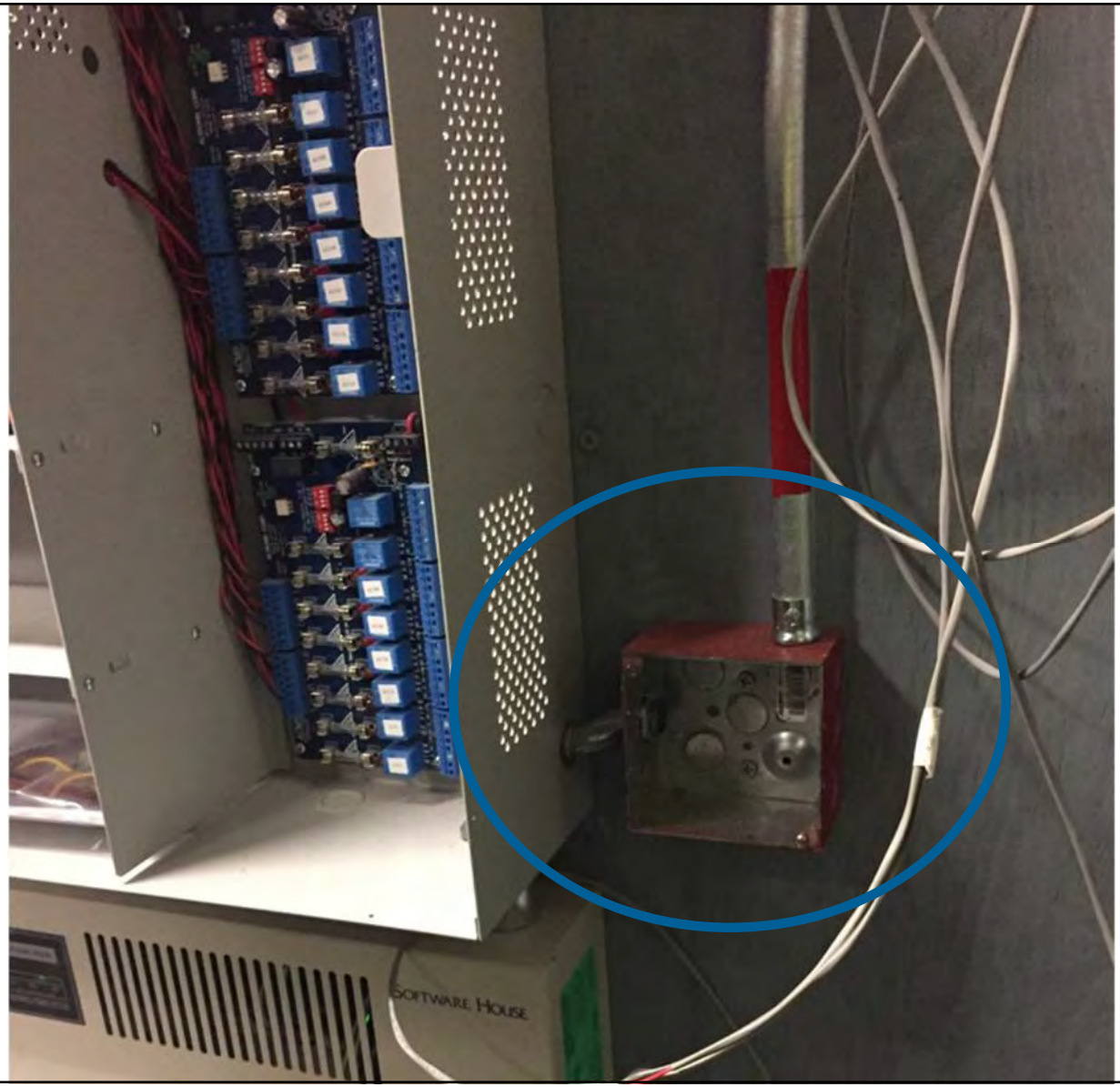
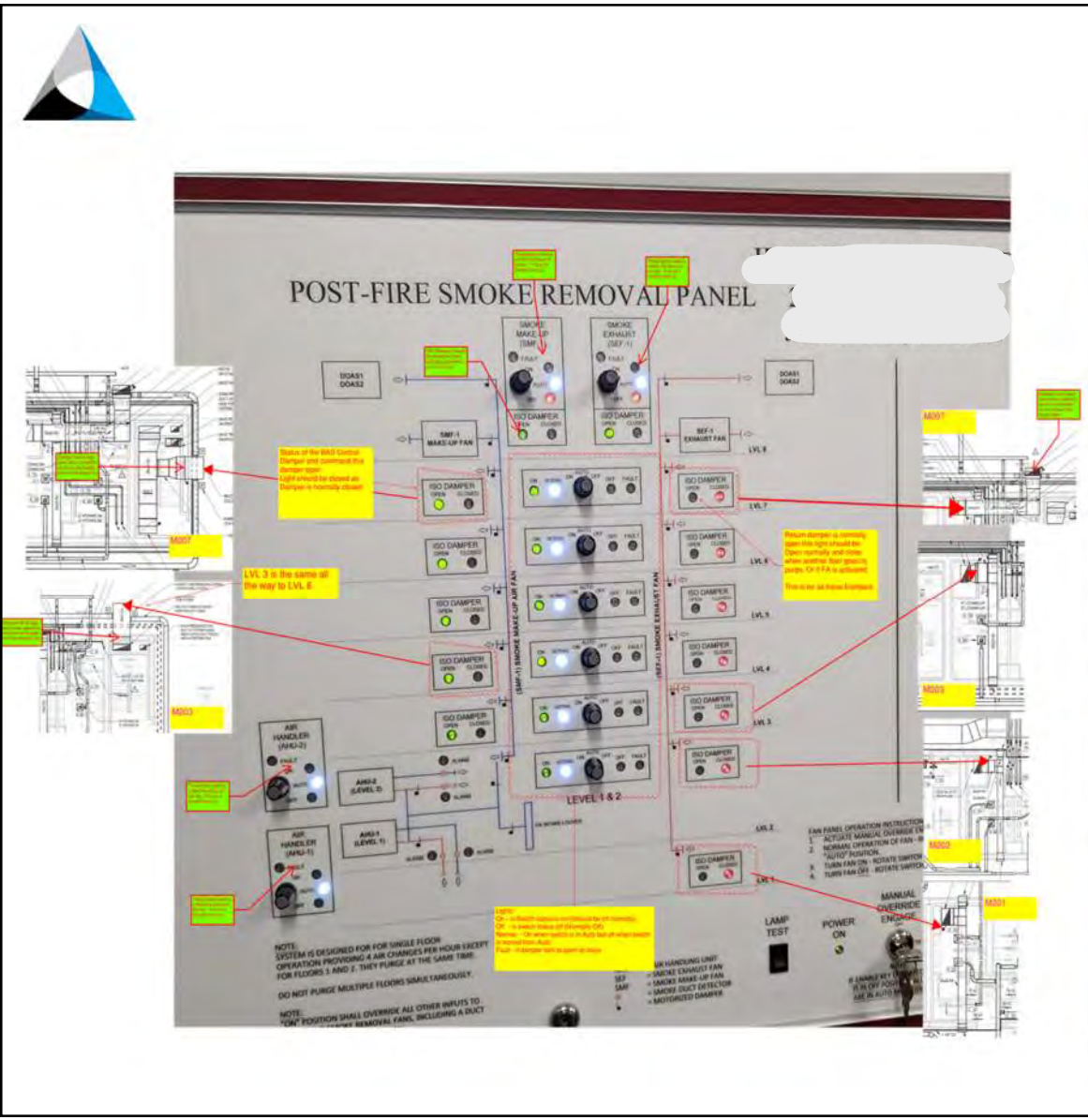

AFL
09/08/22




SOFTWARE HOUSE


SIEMENS
Healthineers


SIEMENS
Healthineers


POST-FIRE SMOKE REMOVAL PANEL
LVL 3 is the same all the way to LVL 8
LEVEL 1 & 2
LAMP TEST
POWER ON
MANUAL OVERRIDE ENGAGE
M007
M003
M002
M001

# When Is Ready Ready?

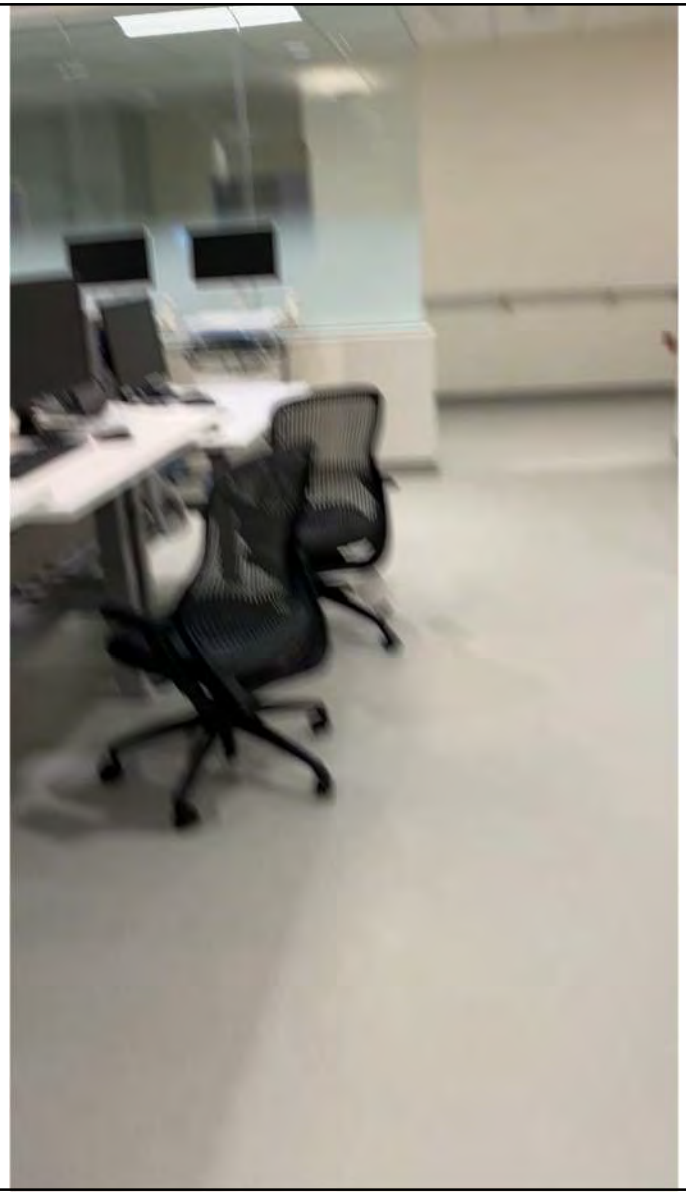
**When is Ready Ready: System Cx**

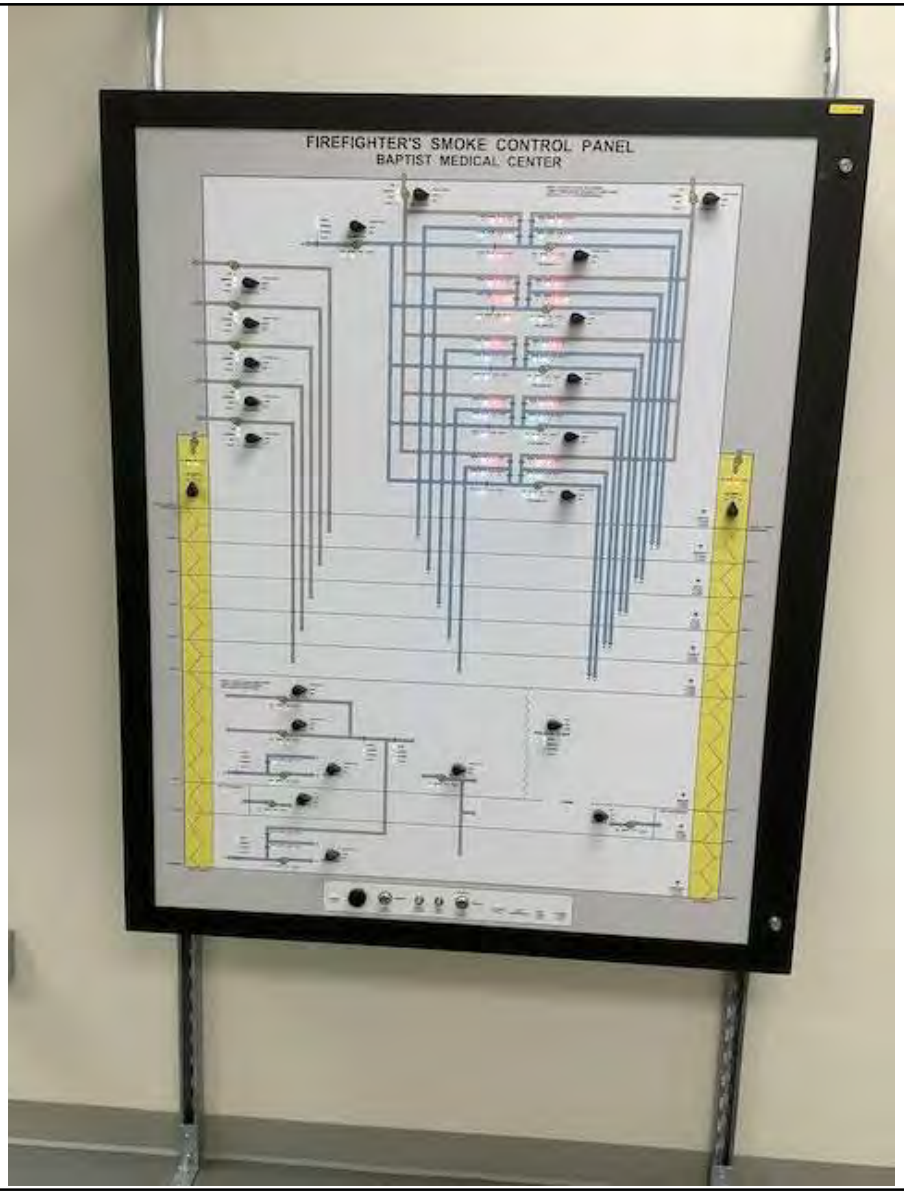
- Controls Integration Meeting
- Red Zone Meeting
- All Checklists are Complete
- Start-Up is Complete:
  - TAB
  - Load Bank
  - Manufactures Reports
- Controls are Complete

**When is Ready Ready: IST**

- O/E/C Team Bought into IST Plan
- IST Prep Meeting
- All Tests Passed


THESE WERE THE DROIDS
WE WERE LOOKING FOR !!

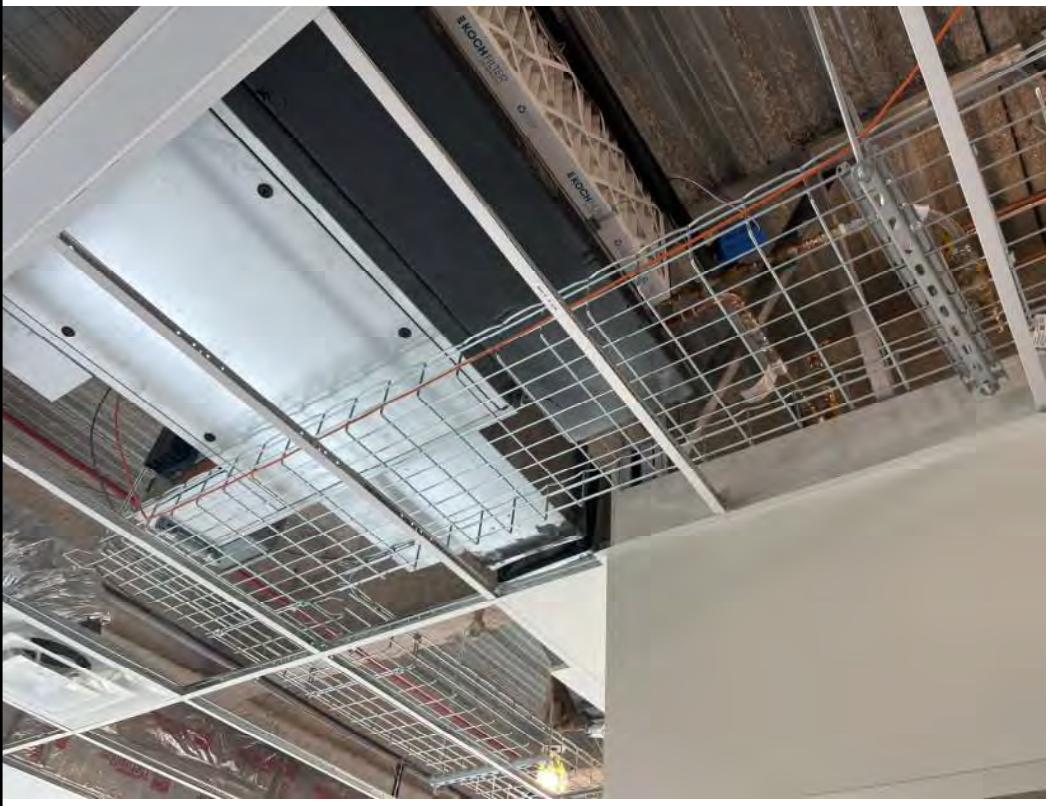



FIREFIGHTER'S SMOKE CONTROL PANEL
BAPTIST MEDICAL CENTER


Amico
MEDICAL VACUUM
LOW
MEDVAC
11
LOW
MEDICAL AIR
51
PSI
NORMAL
OXYGEN
53
PSI
NORMAL
ROOM#C601-C604,C621-C626


Amico
OXYGEN
LOW
OXYGEN
38
LOW
MEDICAL AIR
27
LOW
MEDVAC
11
LOW

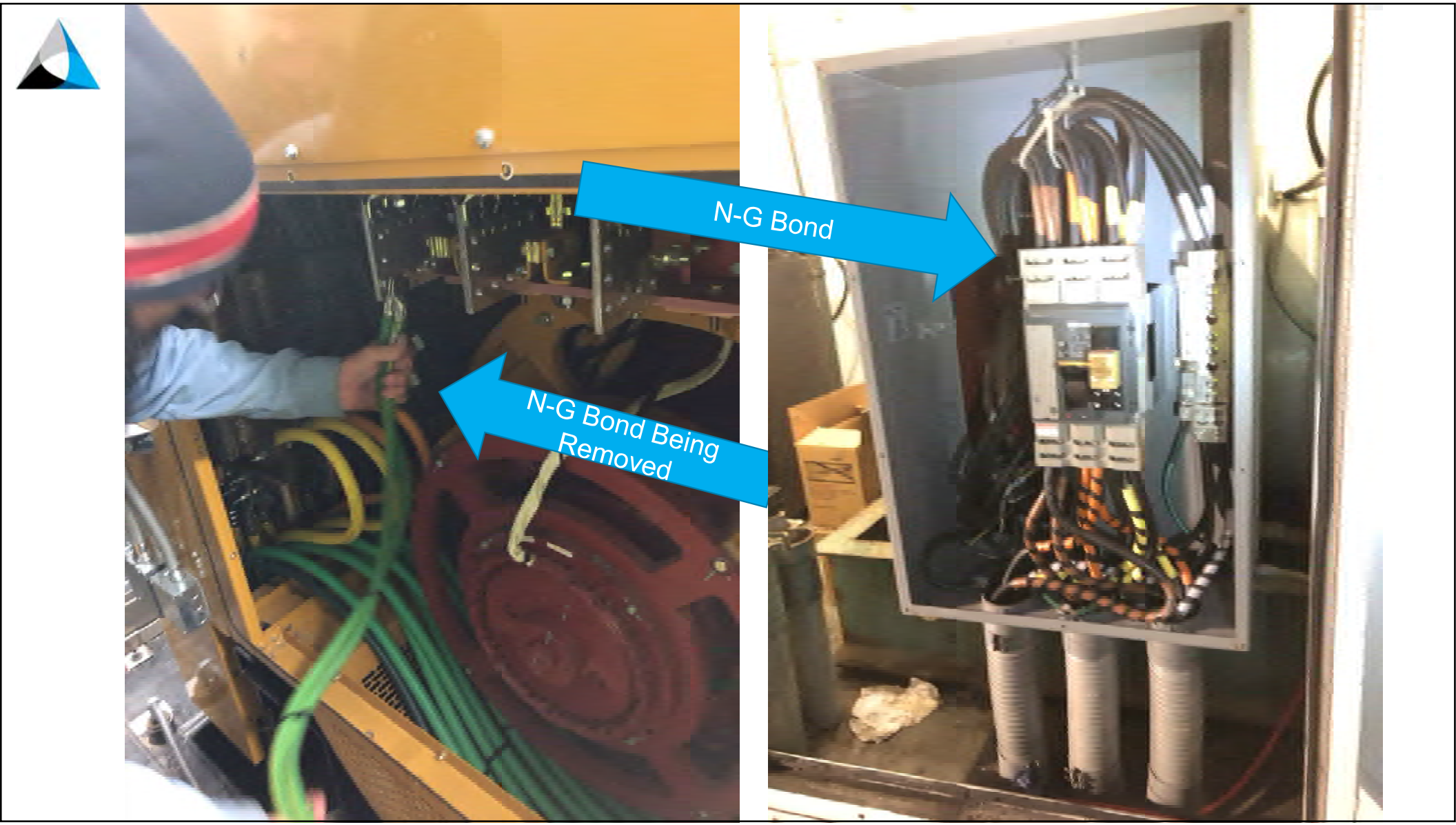

28359
MEDICAL VACUUM
PLANT FACILITIES DIVISION
28360

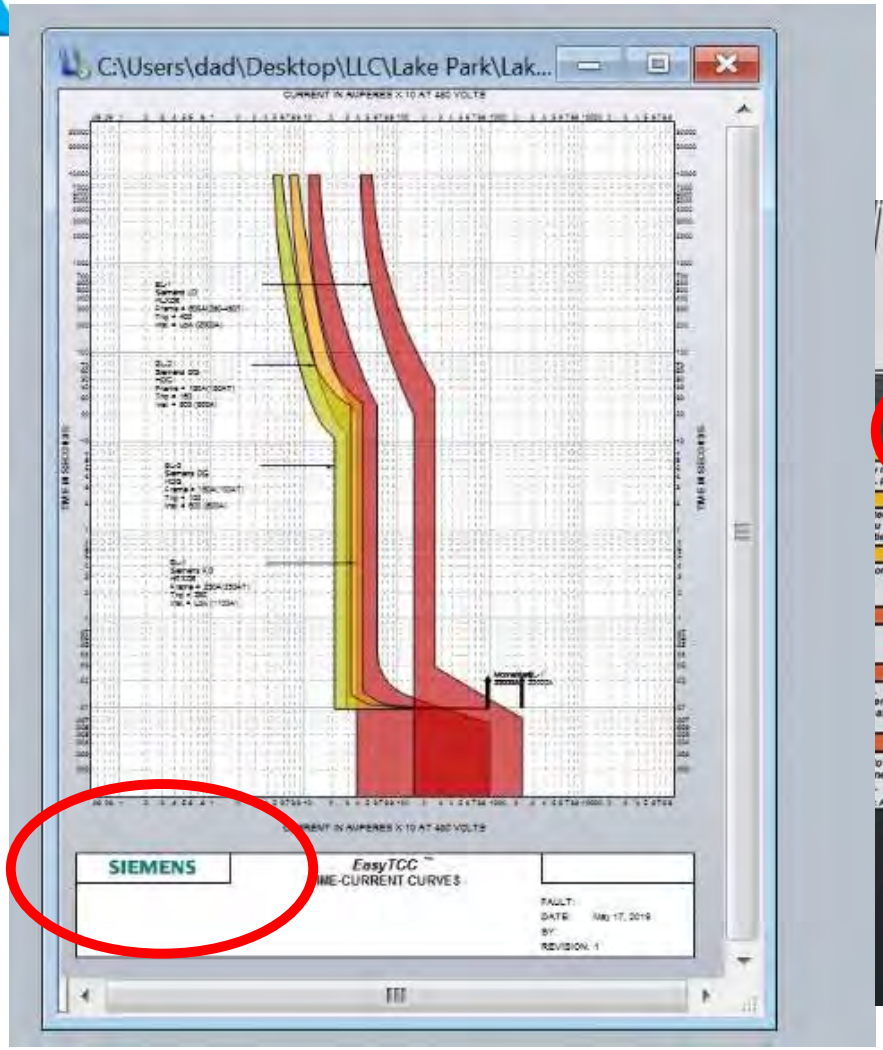

KOCH FIBER


ON
OFF


DIESEL FUEL ONLY
This Tank is Provided With An Integral Steel Foundation And Is Intended For STATIONARY INSTALLATION ONLY
Maximum Leakage Test Gauge Pressure of 3 psi
CLOSED TOP DIKE
(Double Wall)
110% Containment Of Primary Tank
Vacuum Pressure Testing Annular Space
(Double Wall Area Outer Tank)


Flanders
PREpleat
PerfectPleat
with Duraflex® Media
AAF Flanders
24" • 20" • 4"


N-G Bond
N-G Bond Being Removed


C:\Users\dad\Desktop\LLC\Lake Park\Lak...
CURRENT IN AMPERES X 10 AT 480 VOLTS
SIEMENS
EasyTCC
TIME-CURRENT CURVES
FAULT:
DATE: May 17, 2019
BY:
REVISION: 1


À L'INTÉRIEUR
ADENTRO,
CONEXIONES
DE ALTO VOLTAJE
cette directive peut causer des blessures personnelles voire mortelles.
PELIGRO
Alto voltaje.
Es imprescindible que vuelva a colocar la tapa antes de hacer funcionar el generador. No hacerlo puede ocasionar lesiones personales o la muerte.
EATON
Industrial Circuit Breaker
Frame
NGS-C
1200 AMPS MAX
600 VAC
3 POLE
40 °C
Off/O
Push to Trip
Cat. 84E2764
Ir Settings
A = 500
B = 600
C = 630
D = 700
E = 800
F = 900
G = 1000
H = 1200
BREAKER IS UL489
LISTED SUITABLE FOR USE WITHIN
SERVICE RATED EQUIPMENT

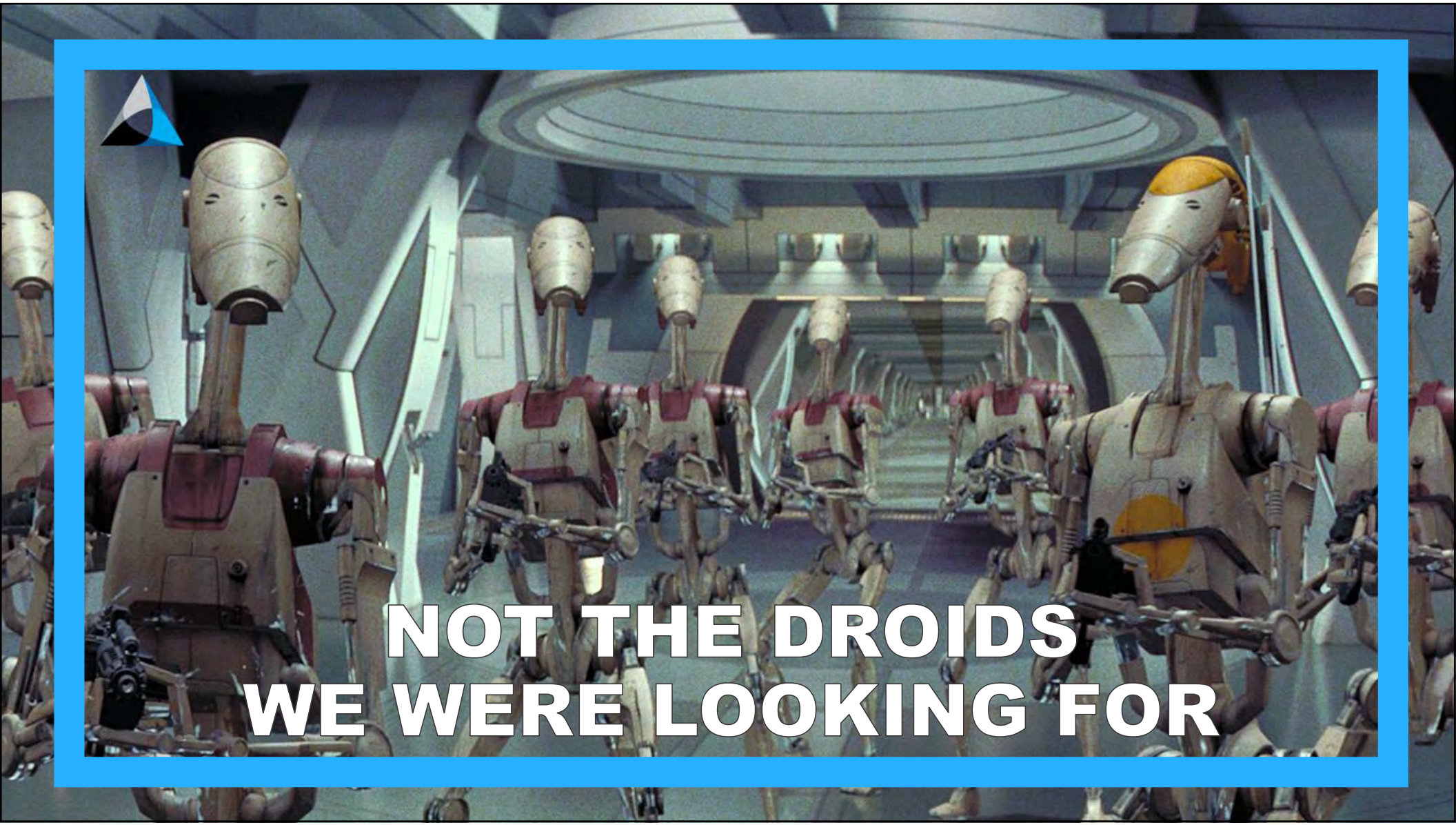
# SINGLE POINTS OF FAILURE

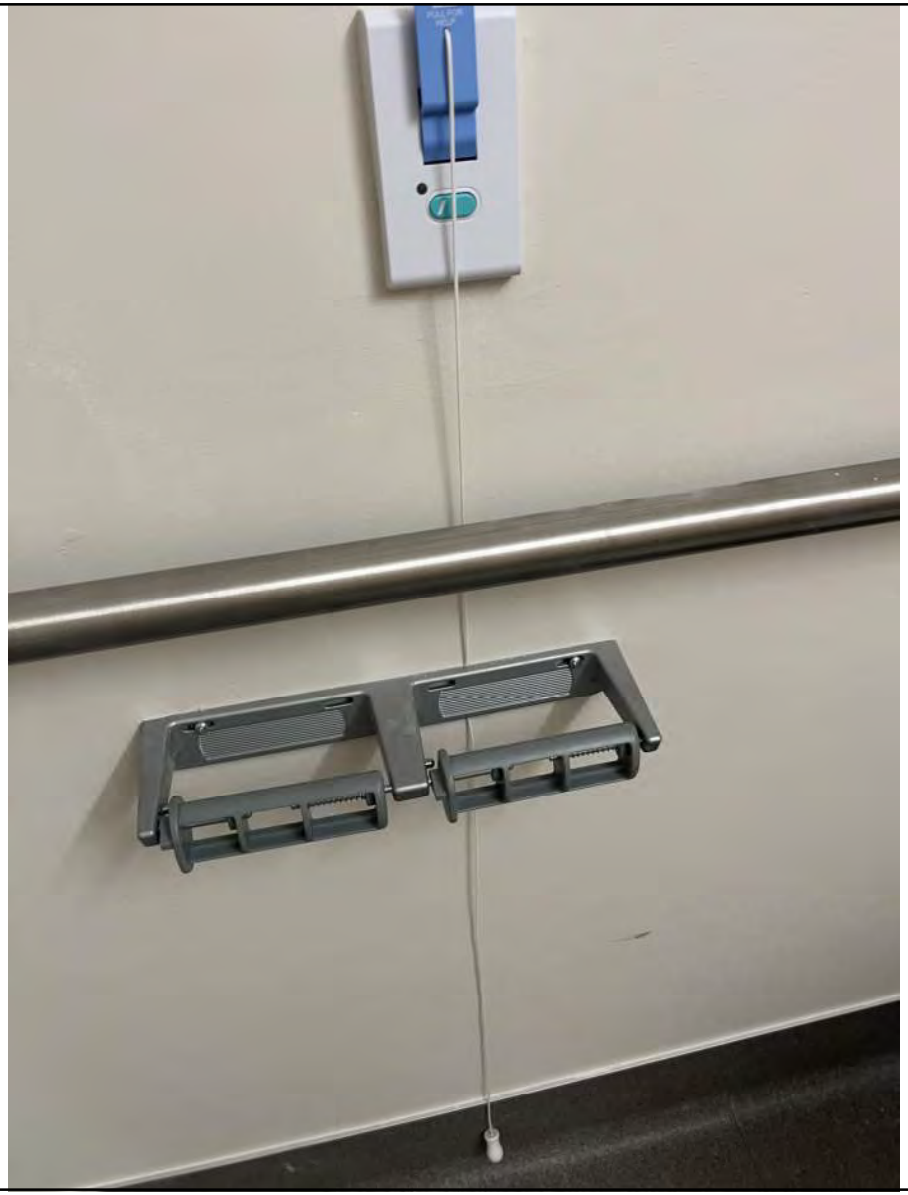

Johnson Controls
YORK


YORK®
SMART EQUIPMENT
YORK® YMC² CENTRIFUGAL CHI


Power Generation
Oneline
LCM
09/08/22 05:31:28
Gen-1
Gen-2
0 kW
ATS-CRA
ATS-CRB
ATS-LS
ATS-EQA
ATS-EQB
ATS-EQCH
ADVANTECH


EXIT

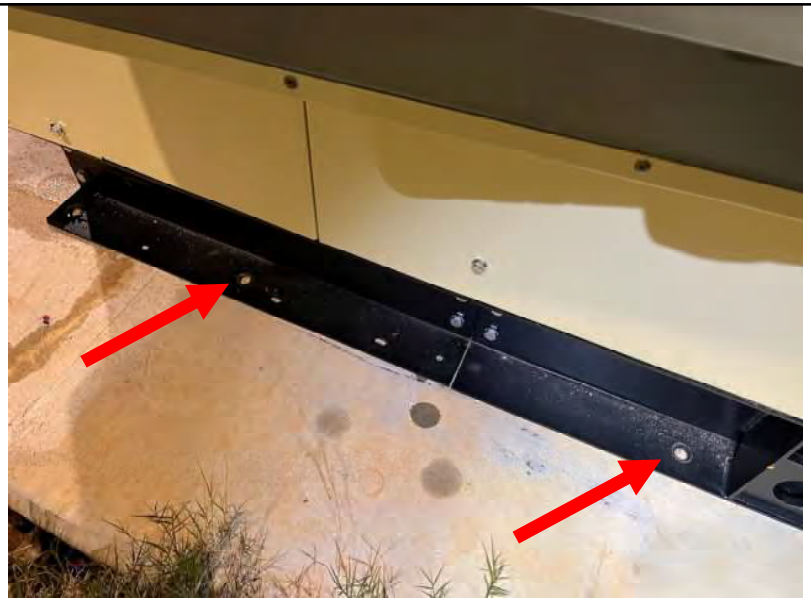

NOT THE DROIDS
WE WERE LOOKING FOR




ROTATION
460 V

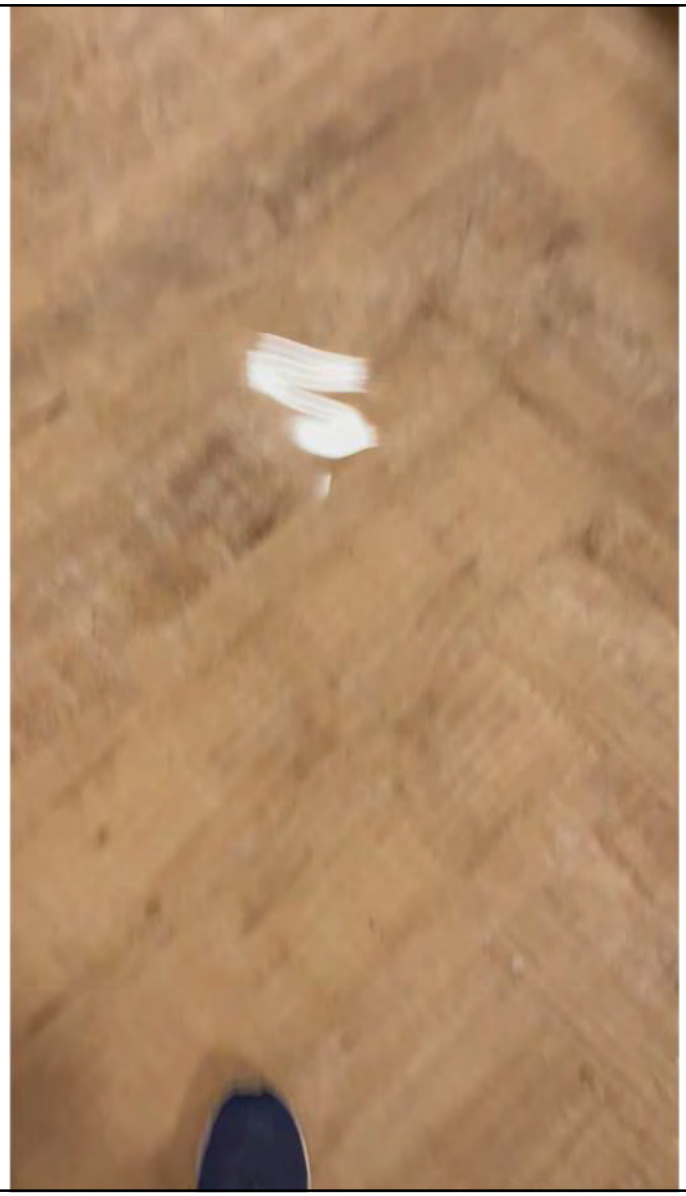

ROTATION
460 V

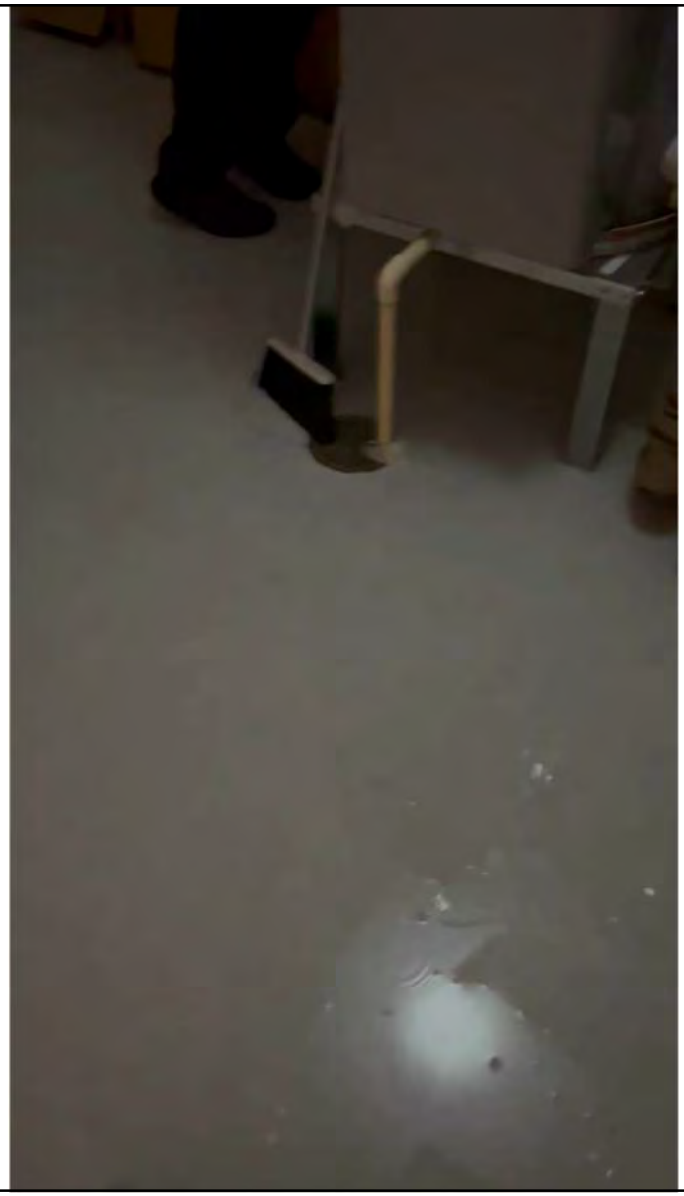

KOHLER
KOHLER
180
KOHLERPower.com




180


FUEL OIL RETURN
FUEL OIL SUPPLY

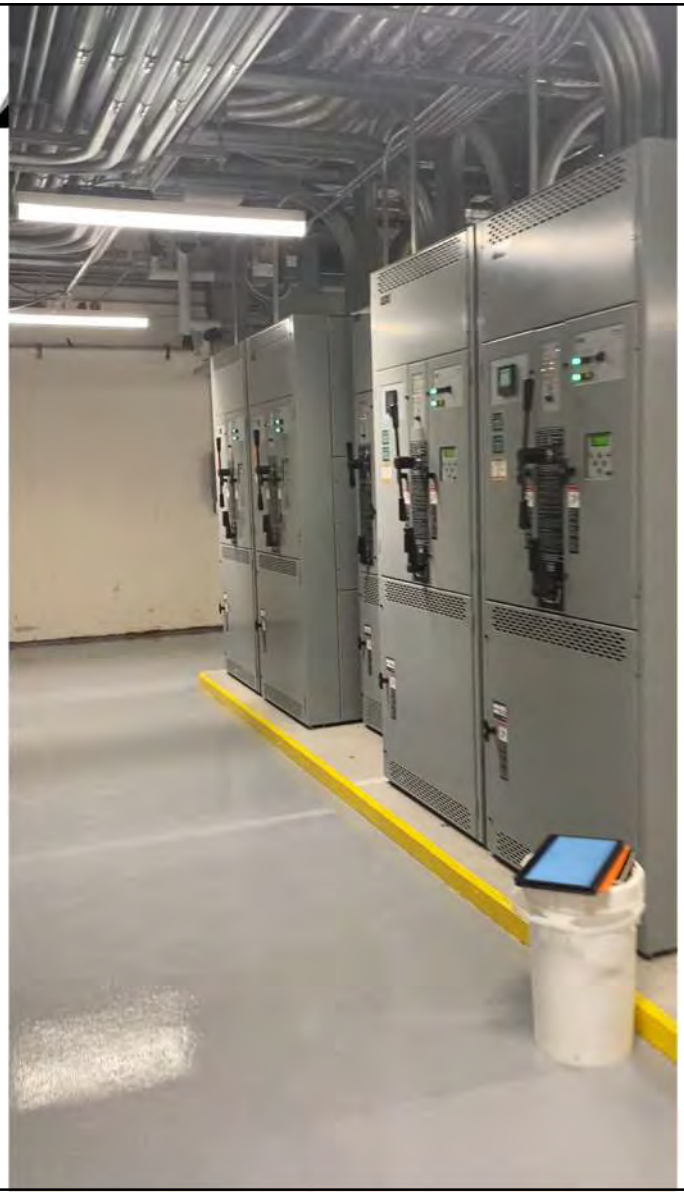


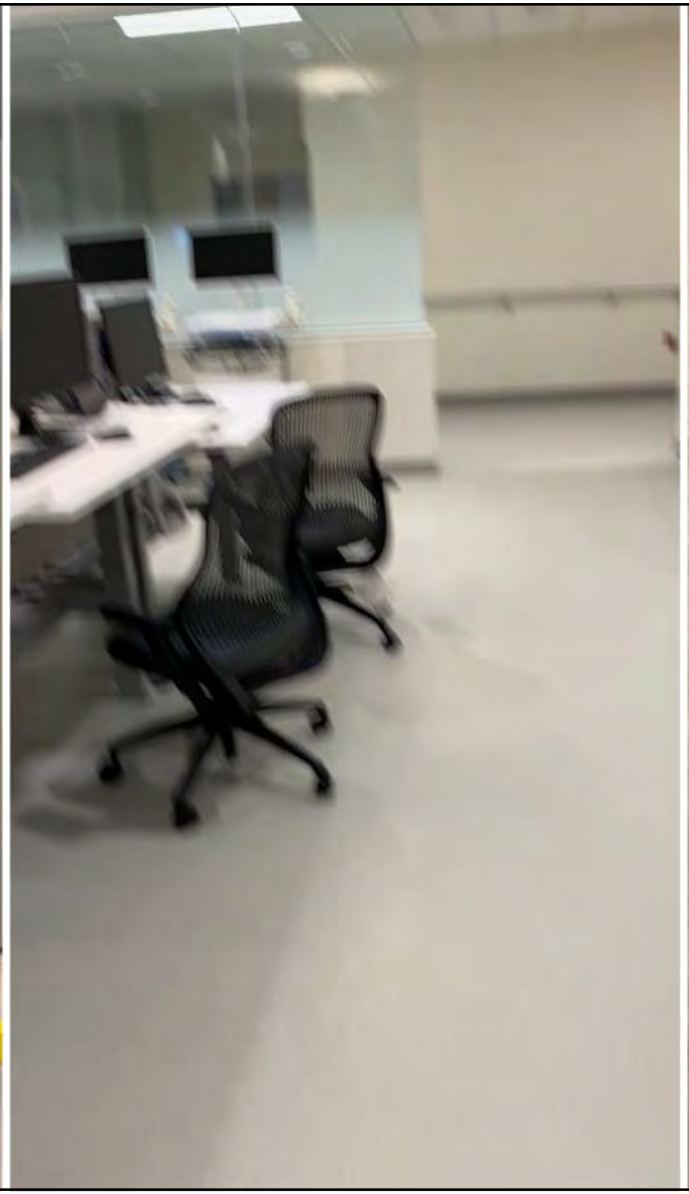


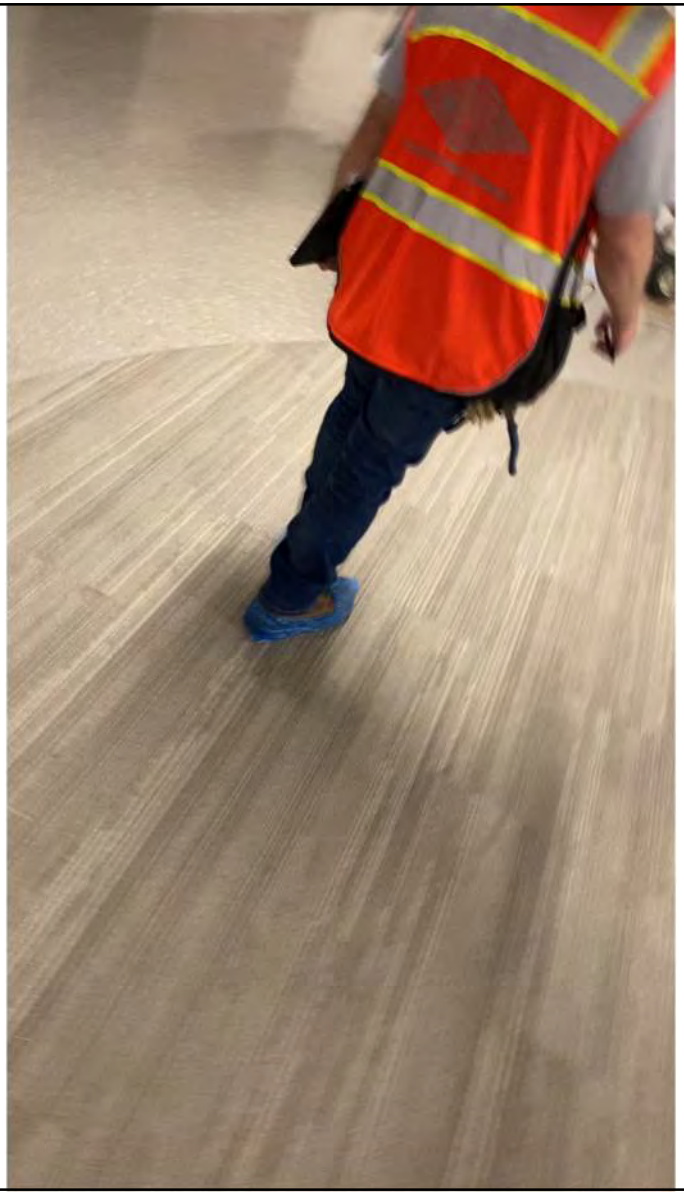

I was always here, Obi-Wan.
You just were not ready to see.

# IST CASE STUDY
# EXAMPLE #1

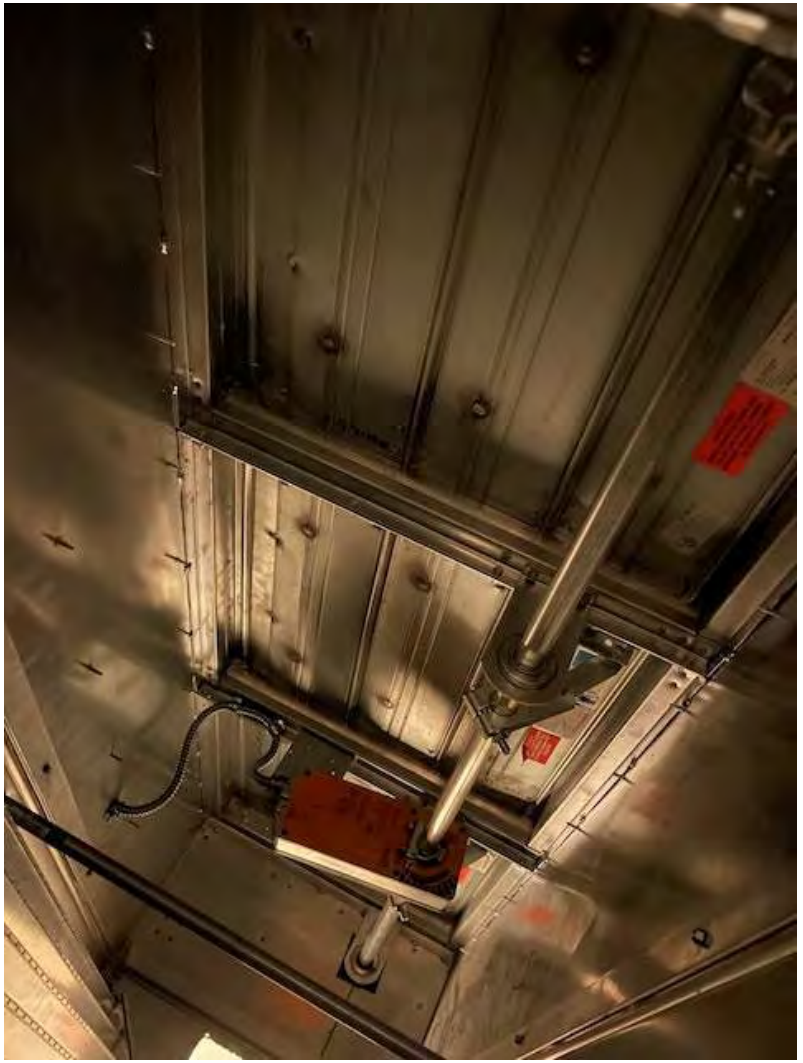
New Critical Care Tower Addition to
Existing Hospital
7 Stories, 200,000 sf
Mechanical / Electrical Penthouse
Added Generator & Chiller in CEP





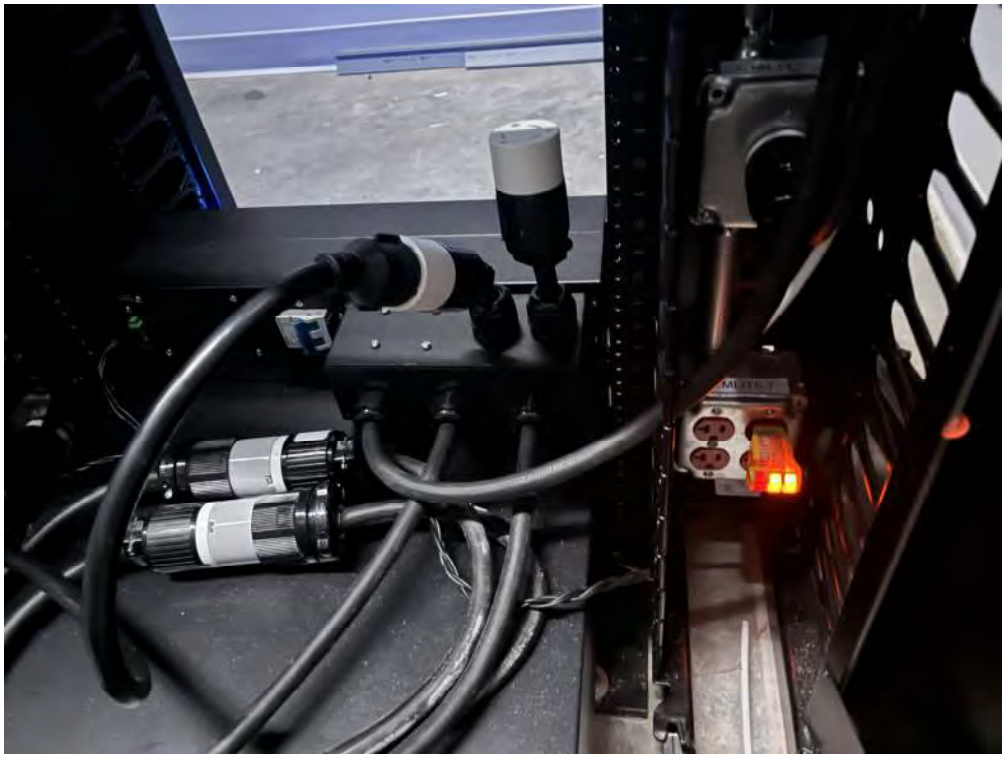


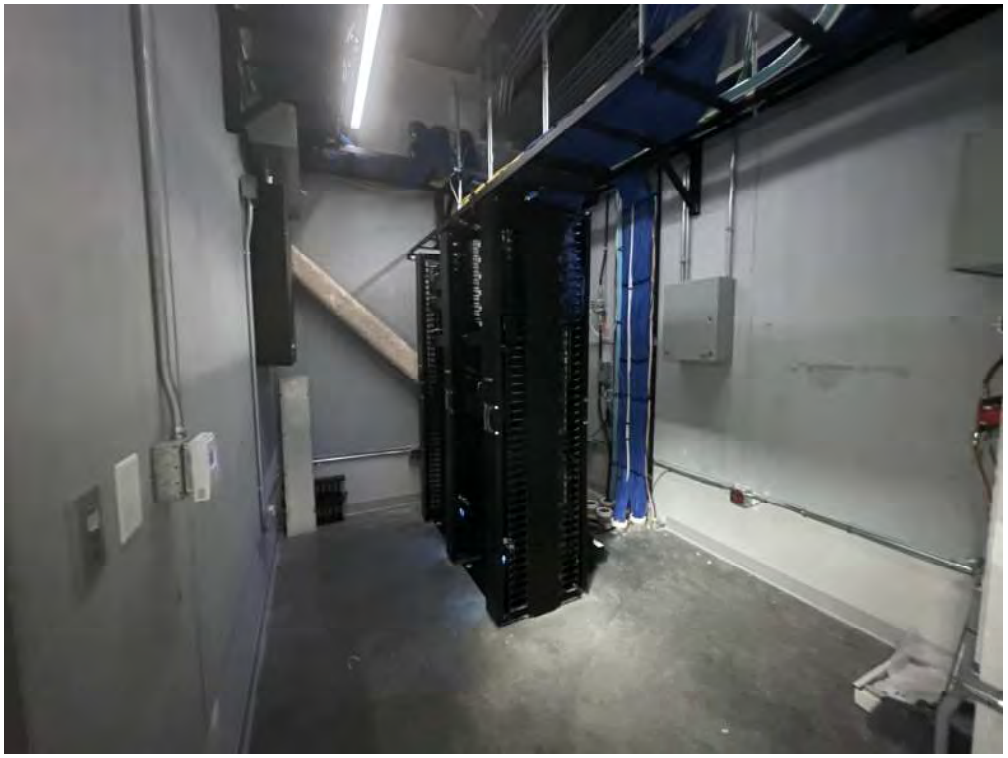

DANGER
YASKAWA

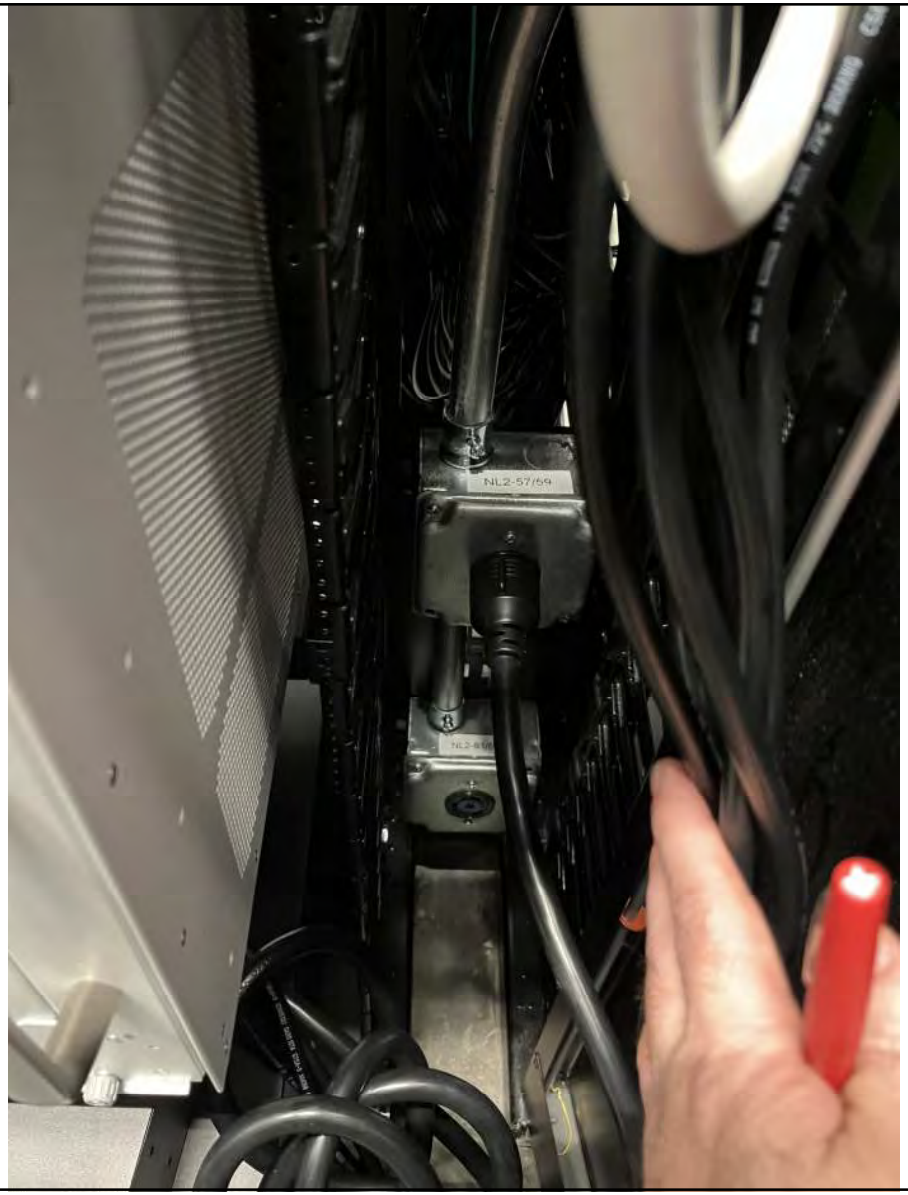


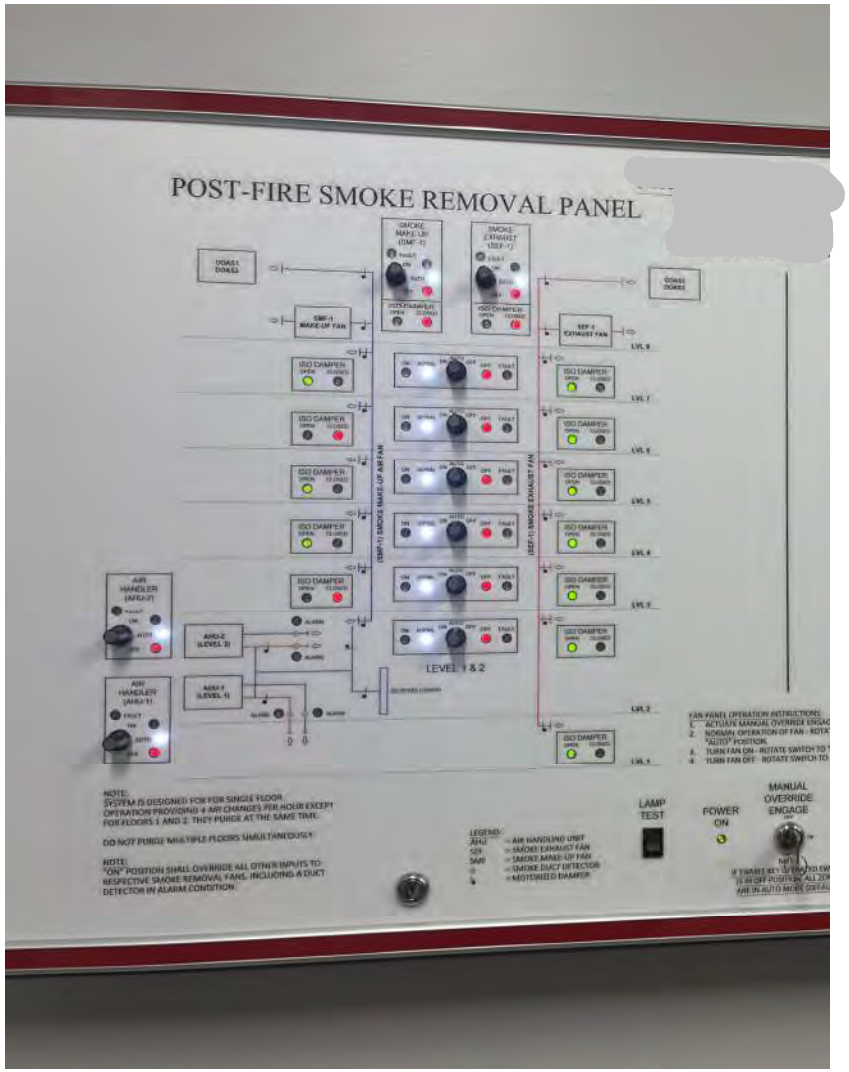
# IST CASE STUDY EXAMPLE #2

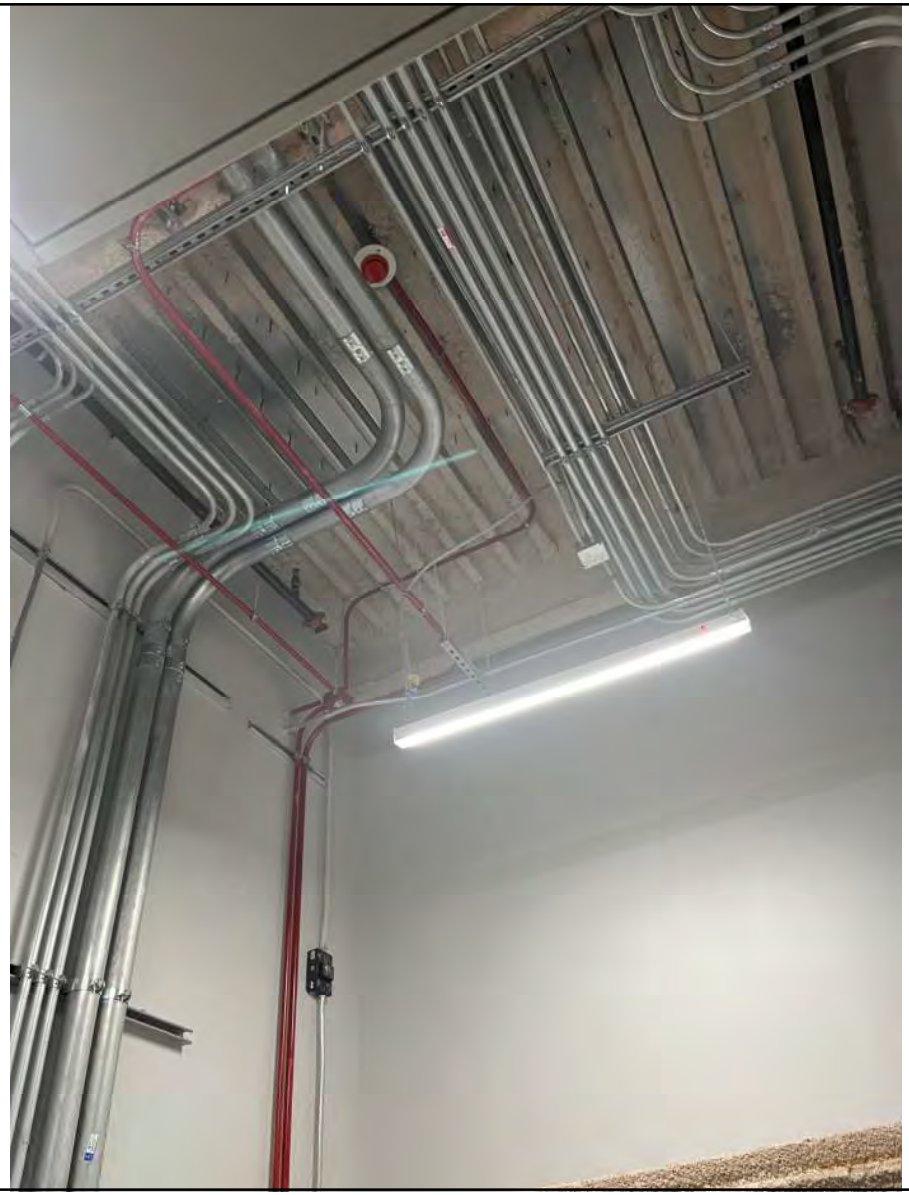
New Corporate HQ Office Building
7 Stories, 160,000 sf
Mechanical Penthouse
2nd Floor Electrical
8 Story Parking Garage

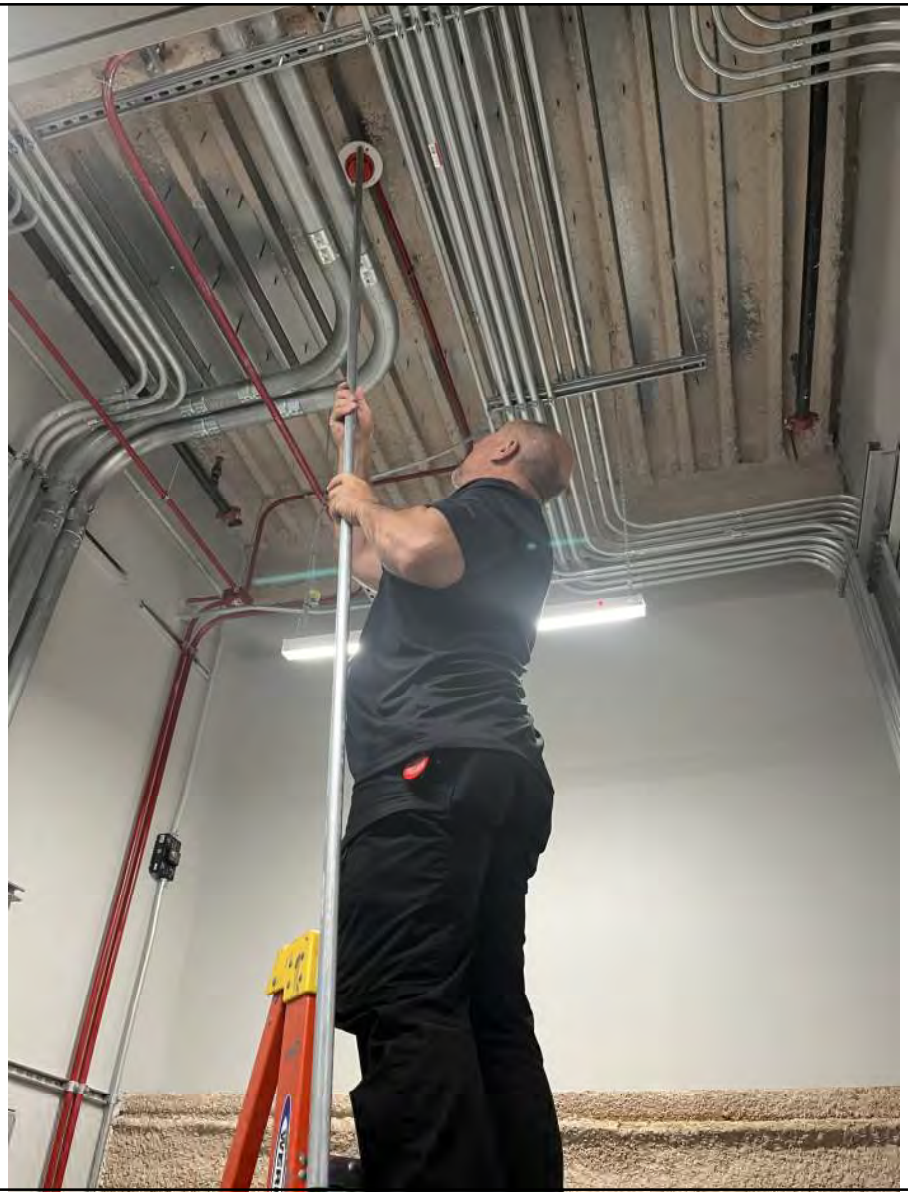


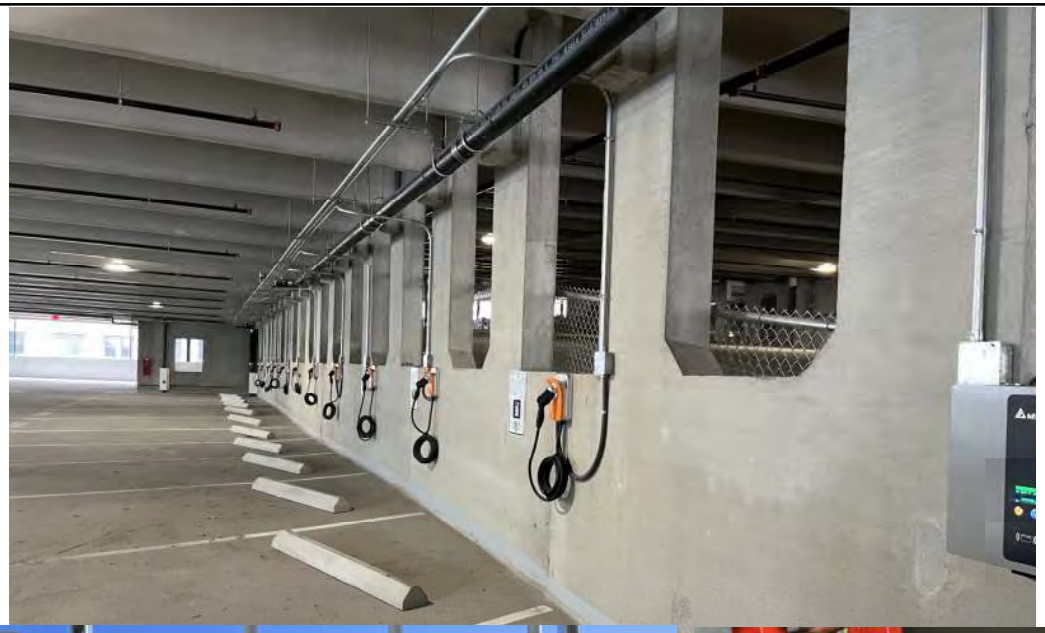



NL2-57/59


POST-FIRE SMOKE REMOVAL PANEL
LEVEL 1 & 2
LAMP TEST
POWER ON
MANUAL OVERRIDE ENGAGE
NOTE:
SYSTEM IS DESIGNED FOR FOR SINGLE FLOOR OPERATION PROVIDING 4 AIR CHANGES PER HOUR EXCEPT FOR FLOORS 1 AND 2. THEY PURGE AT THE SAME TIME.
DO NOT PURGE MULTIPLE FLOORS SIMULTANEOUSLY.
NOTE:
"ON" POSITION SHALL OVERRIDE ALL OTHER INPUTS TO RESPECTIVE SMOKE REMOVAL FANS, INCLUDING A DUCT DETECTOR IN ALARM CONDITION.





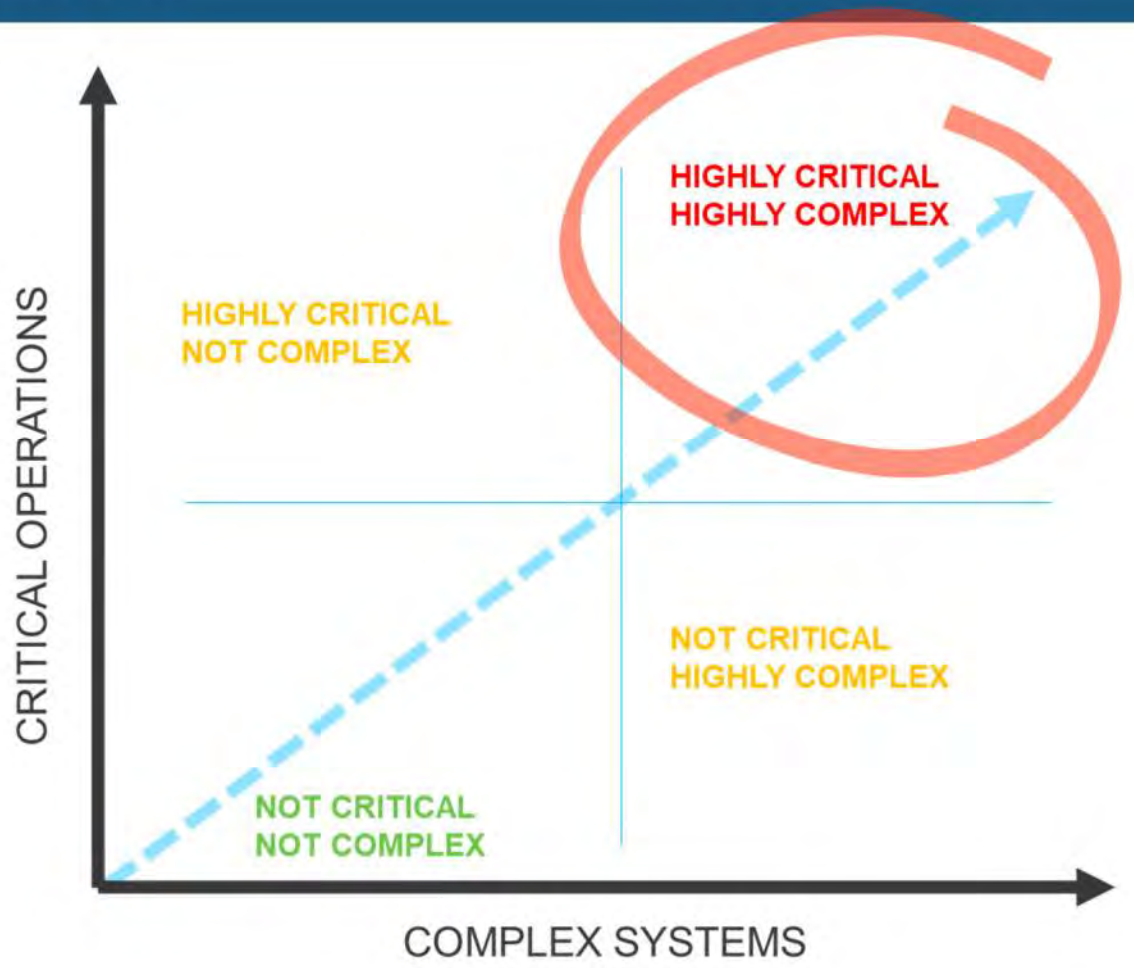



RS
OFF
FLUKE 323
TRUE RMS CLAMP METER


LESSONS LEARNED

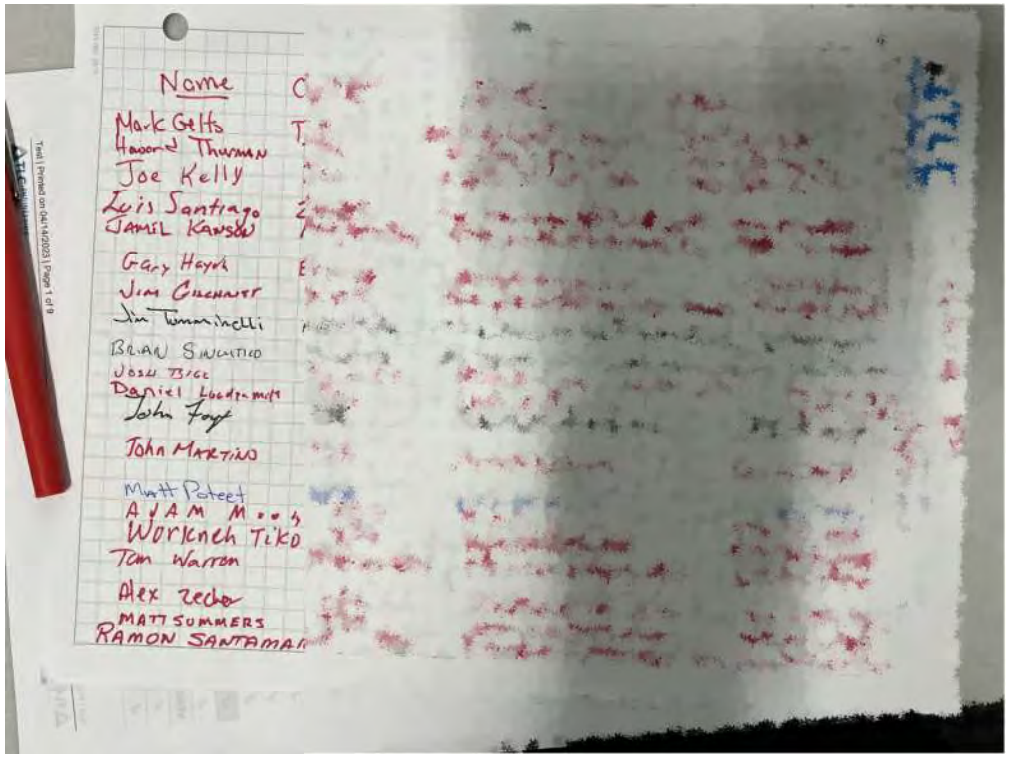
# Who Should Do IST ?

- Mission Critical
- Healthcare
- Large / Complex Buildings
- Public / Life Safety
- Any Building You Want



# Kickoff & Safety Briefing

# Coffee and Sign In (and Clipboard)



# Fire Alarm Matrix

Key Notes:

RUN Indicates Shutdown of HVAC Unit Not Required; Normal Operating Condition

SHUTDOWN Indicates Shutdown of HVAC Unit Required, Unit Serves Zone in Alarm

ADJ-SHUTDOWN Indicates Shutdown of HVAC Unit Required, unit serves zone ADJACENT to Zone in Alarm

S-RUN Indicates Specific Shutdown of HVAC Unit in Zone of Alarm NOT REQUIRED; ie ISOLATION FANS, HOOD EXHAUST, ETC

A-RUN Indicates Specific Shutdown of HVAC Unit in Adjacent Compartment NOT REQUIRED due to presence of Critical Care Patient Function, i.e. CATH LAB, SURGERY, E

Fire Alarm System Requirements:

1) Fire Alarm configuratio is designed for Relocation and Partial Evacuation in accordance with NFPA 72 (Fire Alarm Code), Section 24.4.2.8 (2016 Edition)

2) Manual Devices, i.e pull stations, do not activate HVAC shutdown. Only automatic devices initiate HVAC shutdown. Refer to specification section 284621.11 for further information.

3) Automatic Devices, i.e. Heat Detectors, Smoke detectors, and Flow Switches, all initiate this HVAC shutdown sequence.

Typical shutdown sequence, as identified in this matrix, is that upon the activation of an automatic device in any smoke compartment.

4) Duct smoke detectors shall initiate a TROUBLE ALARM but shall not shut down the unit or initiate audible/visual alarm

| | | | | FiRE ALARM | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Area Description | EVACUATION ZONE | Fire Alarm Audible / Visual Annunciation | Door Closure in SC Walls | RTU-01<br>F-01-4<br>Emergency Dept | F-01-1 (ED Lobby)<br>F-01-2 (ED Decon)<br>F-01-3 (ED ISO) | RTU-2<br>F-02-2<br>F-02-3<br>Radiology / Admin | F-( | RTU-10<br>d & 3rd FL North | RTU-9 & RTU-10 Dampers: 2nd FL<br>FSD-9-2S, FSD-9-2R, FSF-9-2E FSD-10-2S, FSD-10-2R, FSD-10-2E | RTU-9 & RTU-10 Dampers: 3rd FL<br>FSD-9-3S, FSD-9-3R, FSF-9-3E FSD-10-3S, FSD-10-3R, FSD-10-3E | F-10-1 (ISO)<br>F-10-2 (ISO)<br>F-09-1 (ISO)<br>2nd & 3rd FL ISO Rms | ALL FCUs AND CRUs |
| AUTOMATIC DEVICE ACTIVATION IN SMOKE COMPARMENT | FIRST FLOOR | | | | | | | | | | | | | |
| | SC 1.01 | Lobby, Conf, Chapel | ZONE 1 | Hosp Wide | Entire 1st FL | A-RUN | A-RUN | ADJ-SHUTDOWN | | RUN | OPEN | OPEN | RUN | RUN |
| | SC 1.02 | Radiology / Admin | ZONE 2 | Hosp Wide | Entire 1st FL | A-RUN | A-RUN | SHUTDOWN | | RUN | OPEN | OPEN | RUN | RUN |
| | SC 1.03 | Emergency Dept | ZONE 3 | Hosp Wide | Entire 1st FL | SHUTDOWN | S-RUN | ADJ-SHUTDOWN | | RUN | OPEN | OPEN | RUN | RUN |
| | SC 1.04 | PACU / Prep Recov | ZONE 1 | Hosp Wide | Entire 1st FL | A-RUN | A-RUN | RUN | | RUN | OPEN | OPEN | RUN | RUN |
| | SC 1.05 | Cath / Surgery / SPD | ZONE 4 | Hosp Wide | Entire 1st FL | A-RUN | A-RUN | RUN | | RUN | OPEN | OPEN | RUN | RUN |
| | SC 1.06 | Kitchen / Dining | ZONE 5 | Hosp Wide | Entire 1st FL | RUN | RUN | RUN | | RUN | OPEN | OPEN | RUN | RUN |
| | | Kitchen Hood Fire Suppresion (Ansul) | | Hosp Wide | Entire 1st FL | RUN | RUN | RUN | | RUN | OPEN | OPEN | | |
| | SC 1.07 | Engineering & CEP (RTU8) / Lab & Pharm (RTU6) | ZONE 6 | Hosp Wide | Entire 1st FL | RUN | RUN | RUN | | RUN | OPEN | OPEN | RUN | RUN |
| | SECOND FLOOR | | | | | | | | | | | | | RUN |
| | SC 2.01 | 2nd FL Sector 1 South | ZONE 7 | Hosp Wide | Entire 2nd FL | RUN | RUN | RUN | | S-RUN | CLOSE | OPEN | S-RUN | RUN |
| | SC 2.02 | 2nd FL Sector 2 North | ZONE 7 | Hosp Wide | Entire 2nd FL | RUN | RUN | RUN | | S-RUN | CLOSE | OPEN | S-RUN | RUN |
| | THIRD FLOOR | | | | | | | | | | | | | RUN |
| | SC 3.01 | 3rd FL Sector 1 South | ZONE 7 | Hosp Wide | Entire 3rd FL | RUN | RUN | RUN | | S-RUN | OPEN | CLOSE | S-RUN | RUN |
| | SC 3.02 | 3rd FL Sector 2 North | ZONE 7 | Hosp Wide | Entire 3rd FL | RUN | RUN | RUN | | S-RUN | OPEN | CLOSE | S-RUN | RUN |

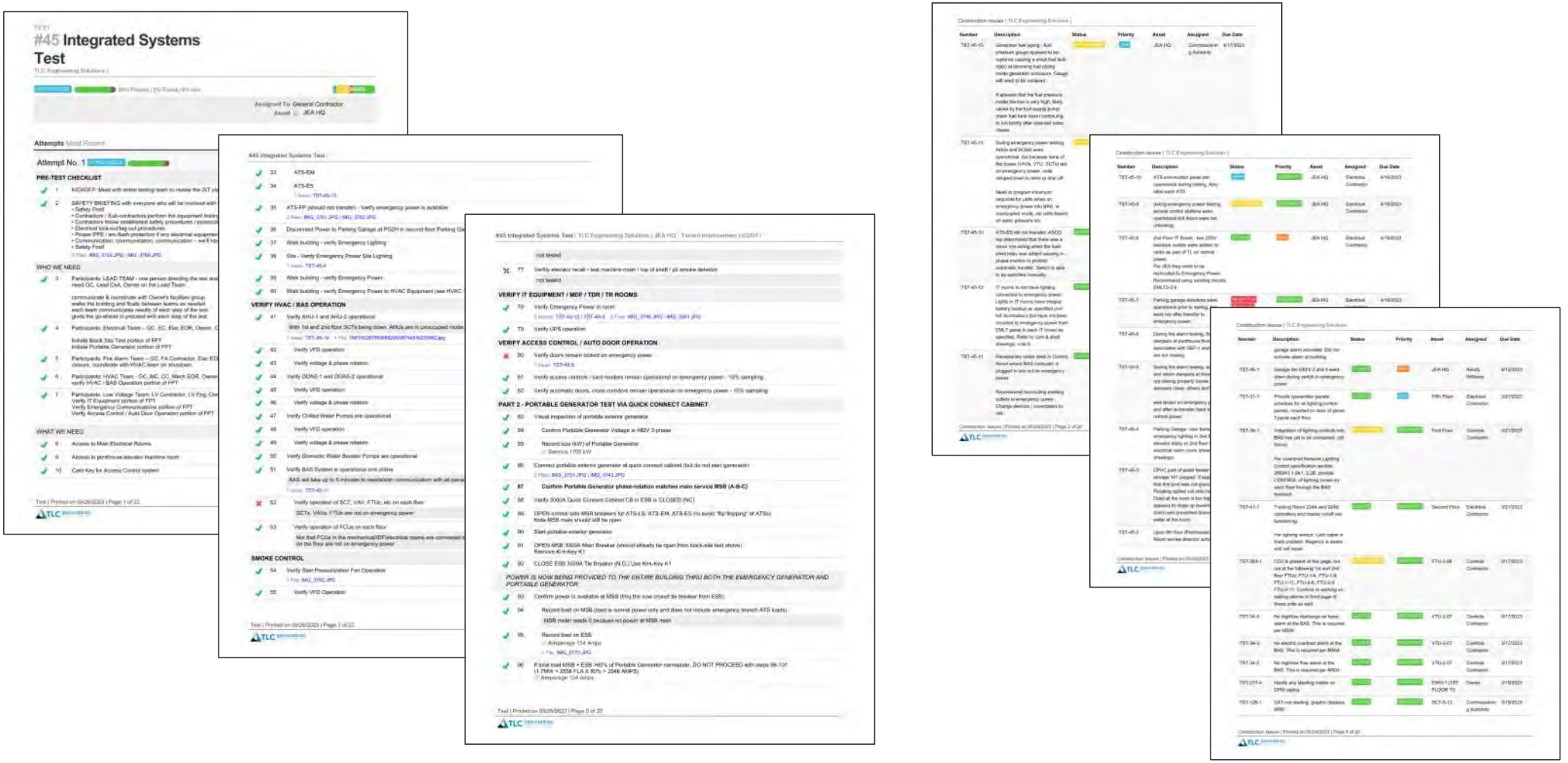
# Owner Involvement

# Waiting Around


# Be Prepared to Repair... But Not If It Holds Up Testing


# Debrief – Action Items and Next Steps

# Document, Document, Document!



# Issues Logs

## Issues Logs

Construction Issues | TLC Engineering Solutions | ZZ Southwell Medical Hospital | 819002

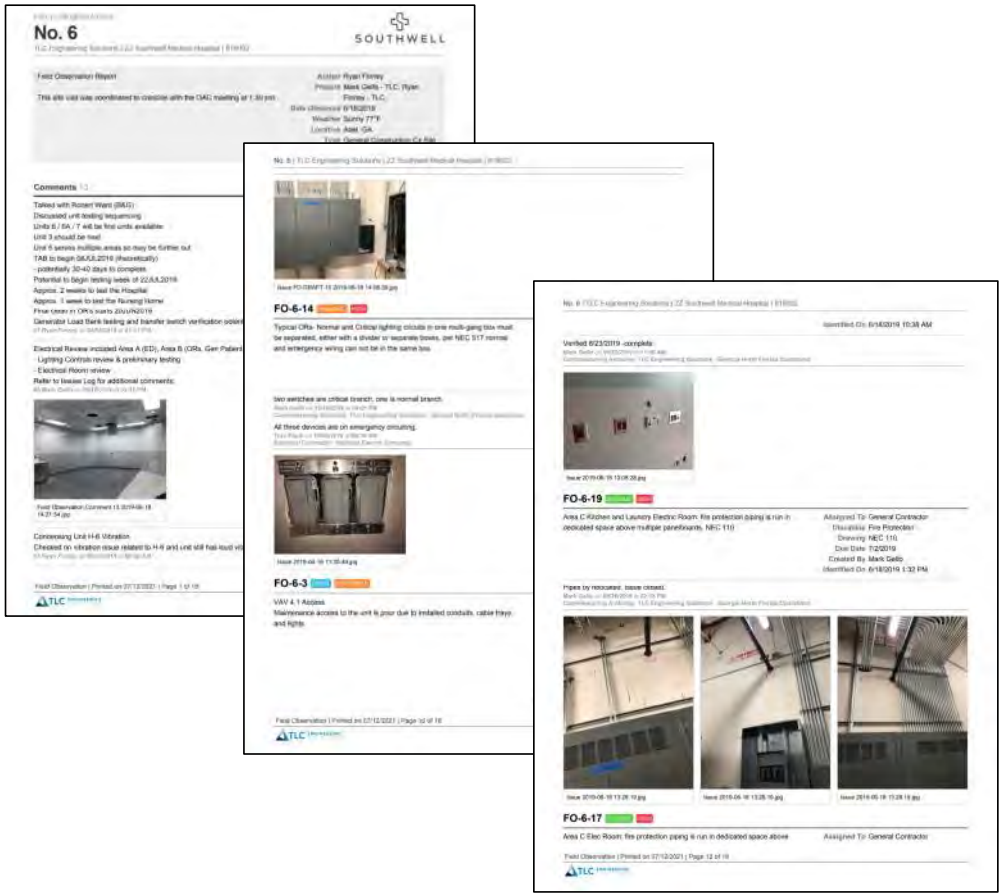
Lighting: 15 Issues

| Number | Description | Status | Priority | Asset | Assigned | Due Date |
|---|---|---|---|---|---|---|
| TST-268-6 | Skilled Nursing Exterior Lighting Verify operation of exterior lighting with roof mounted photocells and contactors - exterior lighting did not operate when photocell was covered | | | Area G - Skilled Nursing 1 | | 9/26/2019 |
| TST-262-2 | Hospital exterior lighting: Verify operation of exterior lighting with roof mounted photocells and contactors - exterior lighting did not operate when photocell was covered | | | Area A - ER | Electrical Contractor | 10/10/2019 |
| TST-268-5 | Patient room over bed light (typical): fixes specified with direct/ indirect component controlled by wall switch and pull chain. Per Valdosta electric, pull chain switch was rated for 120 V (fixture is 277V) therefore Owner elected to use only direct down light component of fixture.<br><br>Noted here for record only. | | | Area G - Skilled Nursing 1 | Electrical Contractor | 10/10/2019 |
| TST-268-3 | Occupancy Sensor General Comment Skilled Nursing Areas: Design documents call for Vacancy Sensors - Manual on / Auto off, however wall mounted occupancy sensors appear to be installed with are installed with factory default settings. | | | Area G - Skilled Nursing 1 | Electrical Contractor | 9/26/2019 |
| TST-268-1 | One of the pendant fixtures at ND 2403 is not operational | | | Area G - Skilled Nursing 1 | | 10/10/2019 |
| TST-262-1 | Occupancy Sensor General Comment All Areas: Design documents call for Vacancy Sensors - Manual on / Auto off, however wall mounted occupancy sensors appear to be installed with are installed with factory default settings. Refer to photos. | | | | Electrical Contractor | 9/7/2019 |
| FO-6-13 | Area B ORs - emergency battery fixtures appear to be "switched" outside of room. Emergency battery lights should not be | | | | Electrical Contractor | 7/2/2019 |

Construction Issues | Printed on 07/12/2021 | Page 7 of 9

TLC

## Reports



No. 6

SOUTHWELL

Field Observation Report

Comments

FO-6-14

FO-6-3

FO-6-19

FO-6-17

# THANK YOU

Mark Gelfo
PE, CxA, LEED Fellow, EMP
TLC Engineering Solutions
mark.gelfo@tlc-eng.com