Understanding Arc Flash and Coordination Studies

Thursday, September 11

Dunham Associates, Inc.

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Today's Agenda

01	Introduction + Class Information
02	Code References
03	What is Arc Flash/Fault Current/Selective Coordination
04	The Benefits
05	The Process
06	Outcomes and Frequency
07	Questions

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Introduction

JUSTIN THINER, PE, LEED AP

PARTNER // ELECTRICAL ENGINEER
20 YEARS OF EXPERIENCE, ALL WITH DUNHAM

Justin.Thiner@Dunhameng.com
(612) 465-7647

MARK J. AZURE, PE, LEED AP BD+C

PARTNER // ELECTRICAL ENGINEER
30 YEARS OF EXPERIENCE, 27 WITH DUNHAM

Mark.Azure@Dunhameng.com
(612) 465-7640

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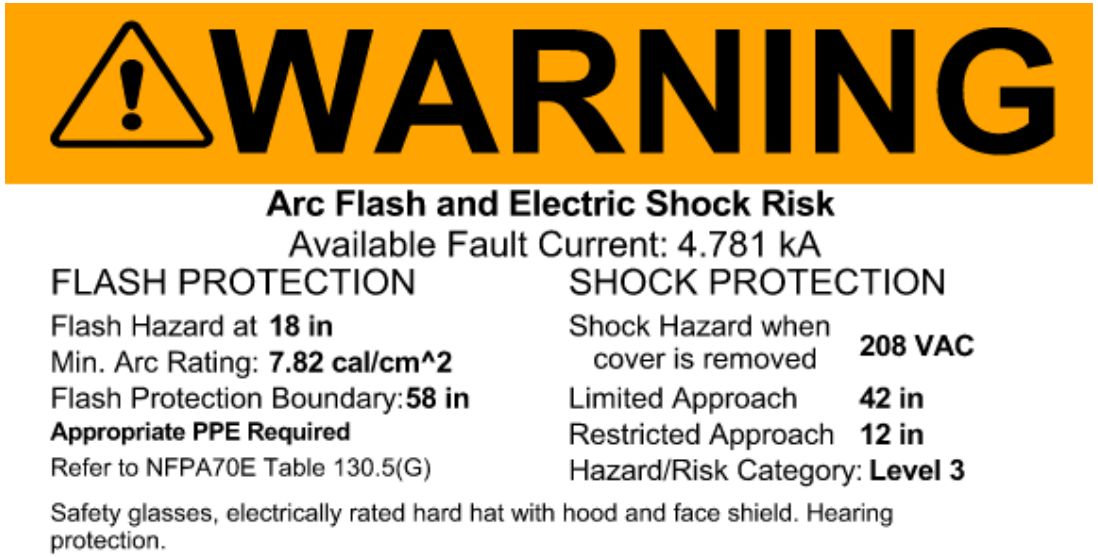
Class Information

- What is arc flash?
- What is available fault current and why is it important?
- What is selective coordination and what does it affect?



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Code References

- NFPA 70E - Standard for Electrical Safety in the Workplace
  - NFPA 70E mandates arc flash risk assessments to understand and mitigate risks, requiring the use of Personal Protective Equipment (PPE) and the labeling of equipment with hazard warnings
  - Employees must be trained on arc flash hazards, safety protocols, and the correct use of PPE
- NFPA 70 - National Electric Code (NEC)
  - 110.24 - Service equipment must be marked with available fault current.
  - Marking is required to include the date that the calculation was performed.
  - 620.16 - Requires that elevator controllers be labeled with fault current rating

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Code References

- NEC 700.32 - Selective Coordination
  - Emergency system(s) overcurrent protective devices (OPCDs) shall be selectively coordinated with all supply-side and load-side OPCDs.
  - Must be reevaluated when replacing OCPDs.
  - Must be reevaluated when modifying the emergency system.
- NEC 701.32 - Selective Coordination
  - Same requirements as 700.32
  - NEC 701 pertains to legally required standby systems

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What is Available Fault Current?

- Amount of current possible in a bolted fault condition
- Why is this important?
  - Equipment ratings (AIC)
  - Equipment cost
  - Directly affects arc flash
- What is AIC?
  - Withstand rating of equipment
  - Also referred to as SCCR (short circuit current rating)
  - Ability of equipment to contain a fault, survive a fault, and continue to operate

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What is Arc Flash?

- A dangerous, explosive release of energy from an electrical fault
- An arc flash can create immense heat (up to 35,000°F), blinding light, and deafening sound
- An arc blast is a dangerous, high-pressure shock wave created by an arc flash event, where a sudden, explosive expansion of air and vaporized metal produce an immense force.
- Powerful blast wave can cause blunt force trauma, broken bones, internal injuries, and loud noise levels.

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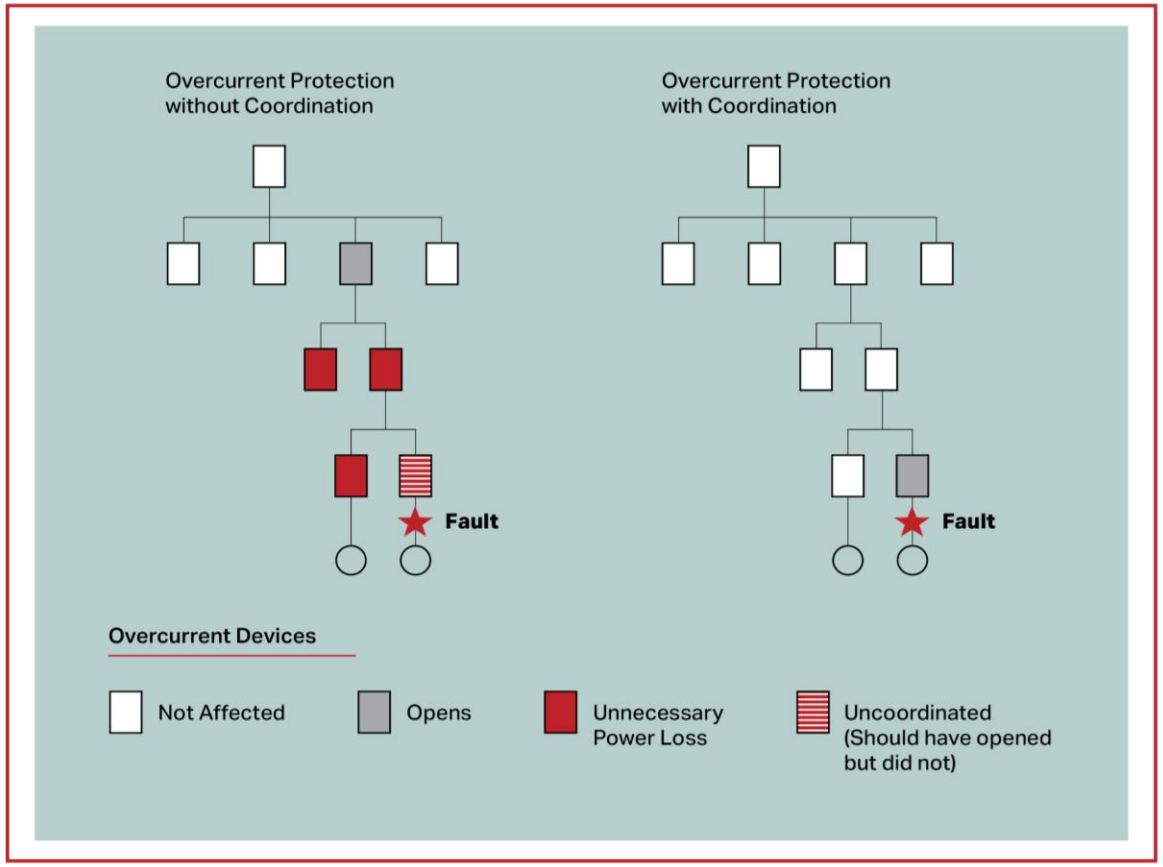
Selective Coordination – What is it and why do we need it?



- Prevent Unnecessary Power outages
- Prevent Nuisance Tripping
- Code required

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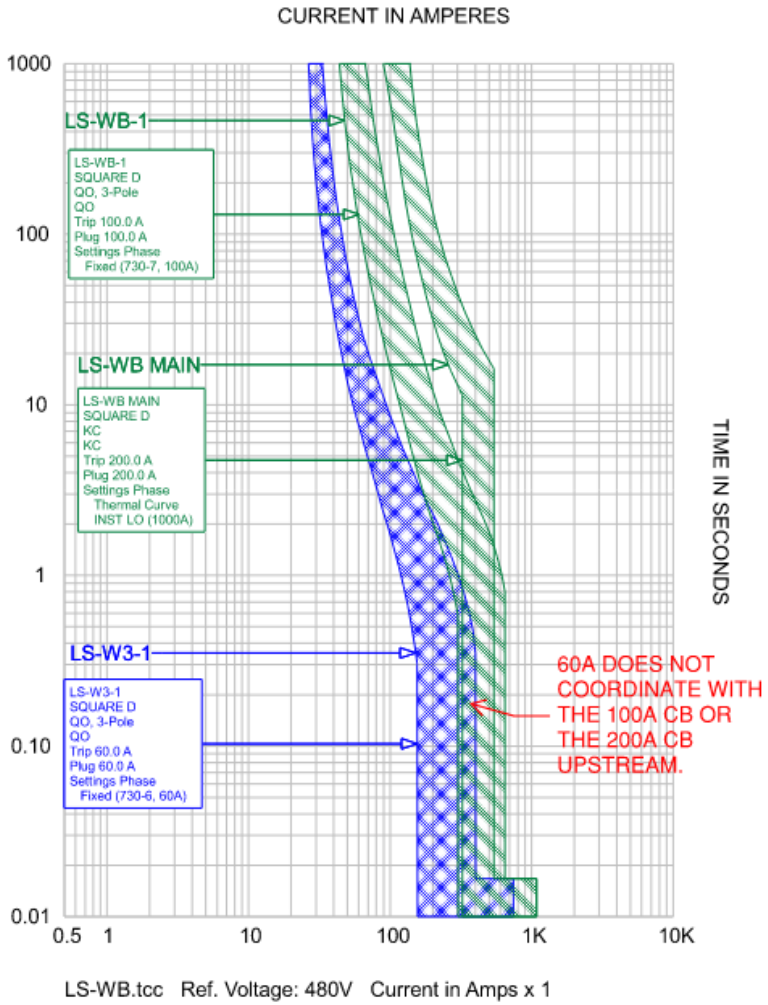
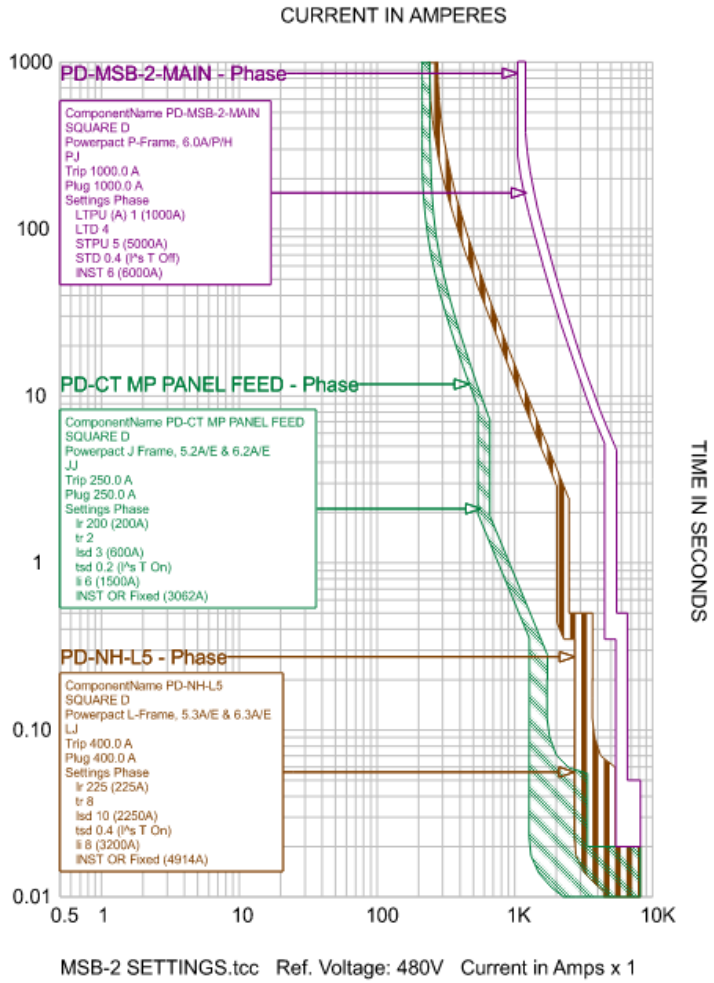
What does Selective Coordination look like?





Setting of Breakers based on Curves

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The Benefits

- Code Compliance

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The Benefits

- Safety
- Live Work

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The Benefits

- PPE Understanding

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The Benefits

- Future Addition to the System

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The Process

- Team for studies
  - Contractor
    - Gather information
      - All feeder sizes and lengths
      - All overcurrent protective device information including manufacturer and model number
      - Motor sizes (HP) and whether VFD has bypass or not
      - Current breaker settings
    - Adjustments to breakers or issues
    - Installation of labels

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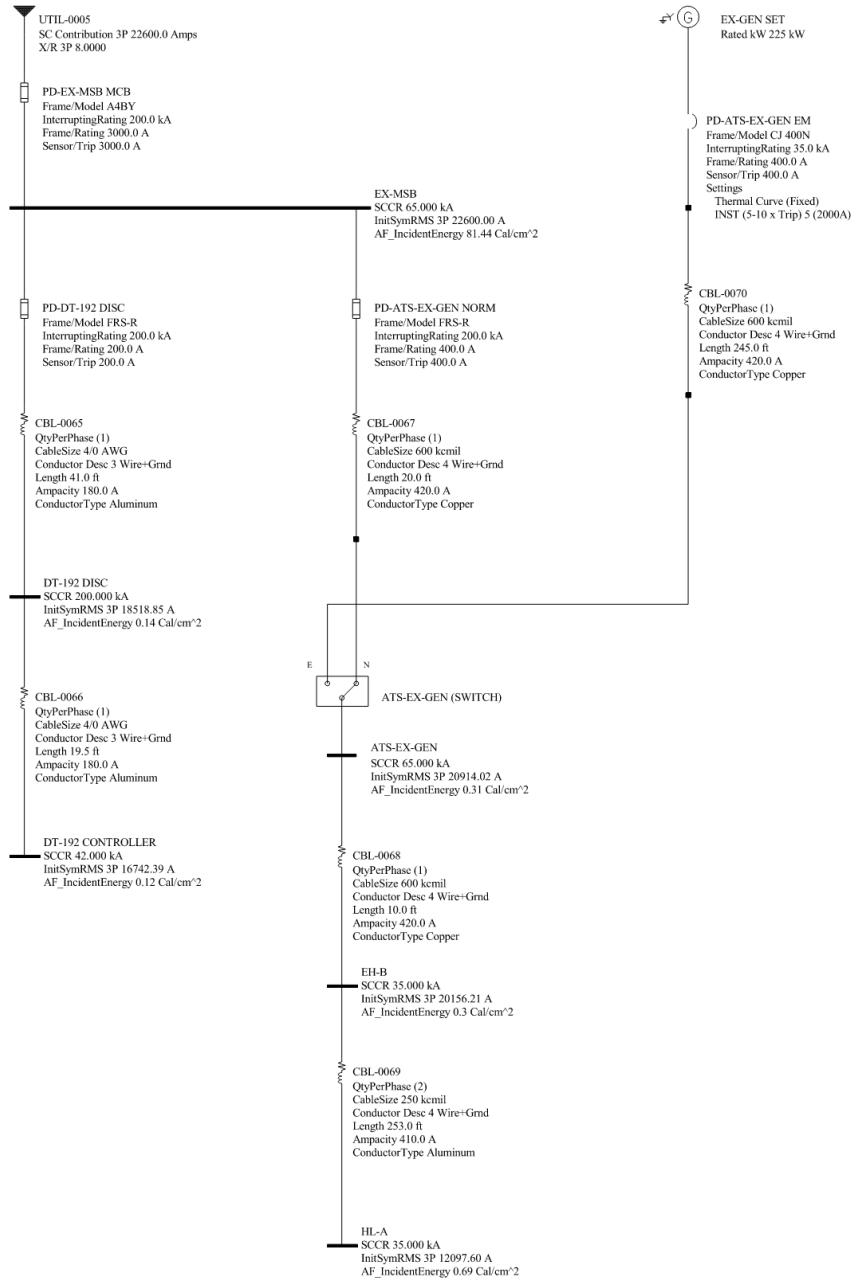
The Process

- Team for studies
  - Engineer
    - Build model based on information gathered by contractor
    - Computer program (i.e. SKM Power Tools)
    - Breaker settings
    - Print labels
    - Solutions for coordination issues



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The Process

- What happens when doing studies

- Preliminary Information
  - Onelines/Risers
  - Panel Locations
  - Prior Studies
- Information Gathering
  - Feeder lengths
  - Existing Breaker settings and Models

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The Process

- What happens when doing studies

- Computation
  - Data entered into system
  - Preliminary Study Performed
  - Request missing/incomplete information
- More Information Gathering
  - Missing Information
  - Confirmation of Information

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The Process

- What happens when doing studies

- More Computation
  - Additional Data entered into system
  - Study Finalized
  - Report and Labels Produced
- Final Sitework
  - Installation of Labels
  - Adjustment of Breakers

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The Process

- What happens when coordination can’t be achieved

- Conversation with the owner
- Options to achieve coordination explored
- Design of new options performed as a new project.

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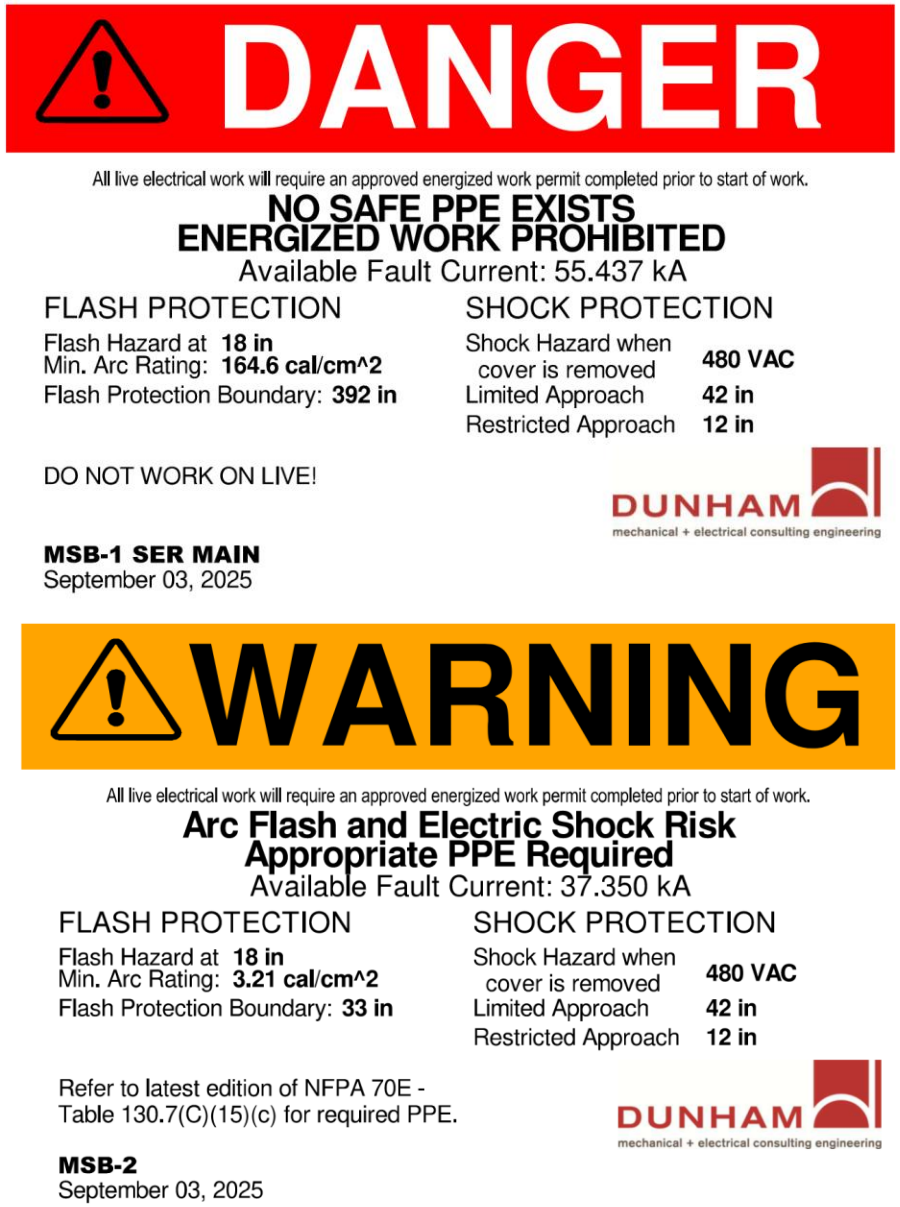
Outcomes

- Labels (New or Updated)
- Report



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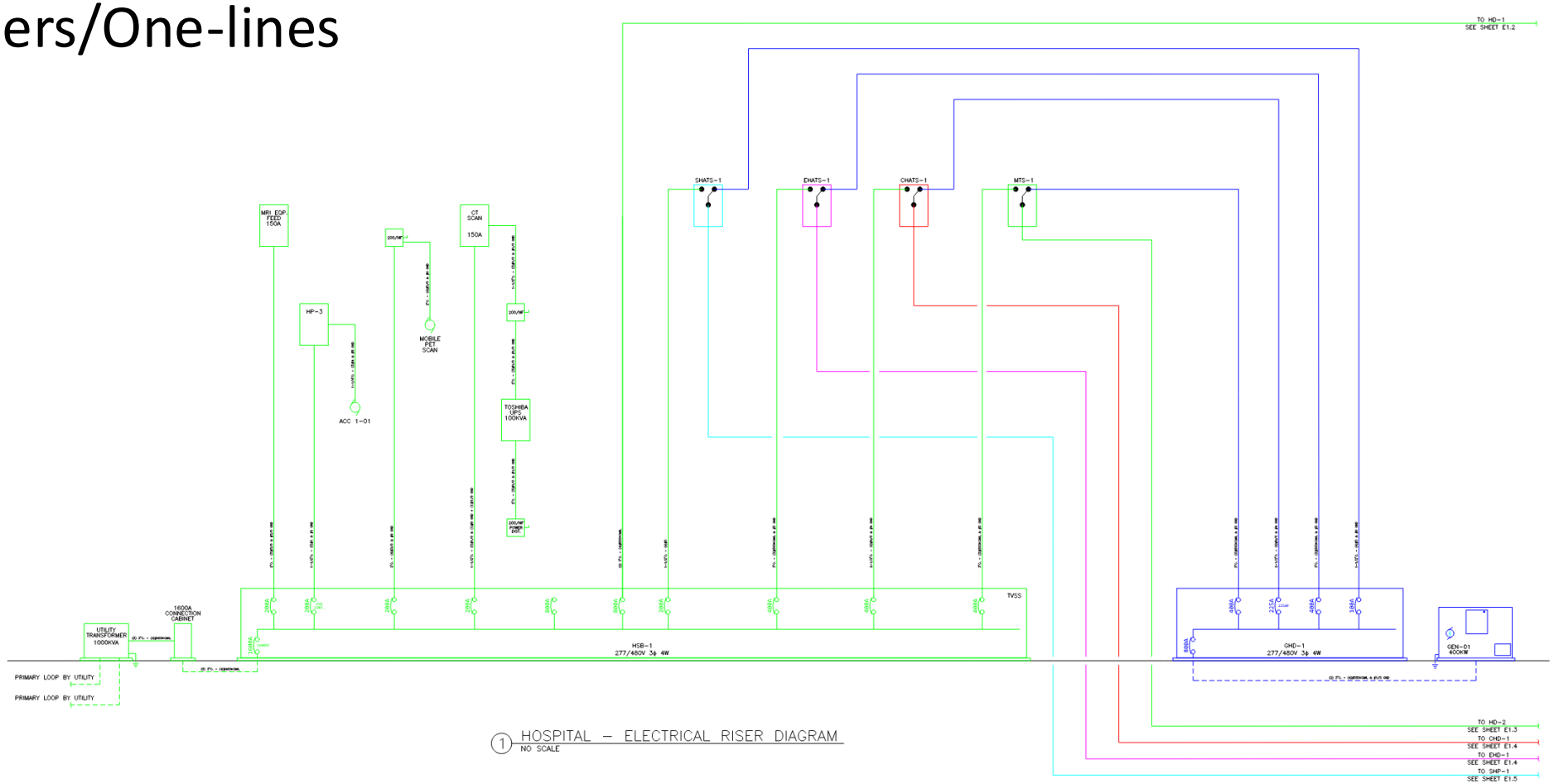
Outcomes

- Updated Risers/One-lines



1 HOSPITAL – ELECTRICAL RISER DIAGRAM
NO SCALE

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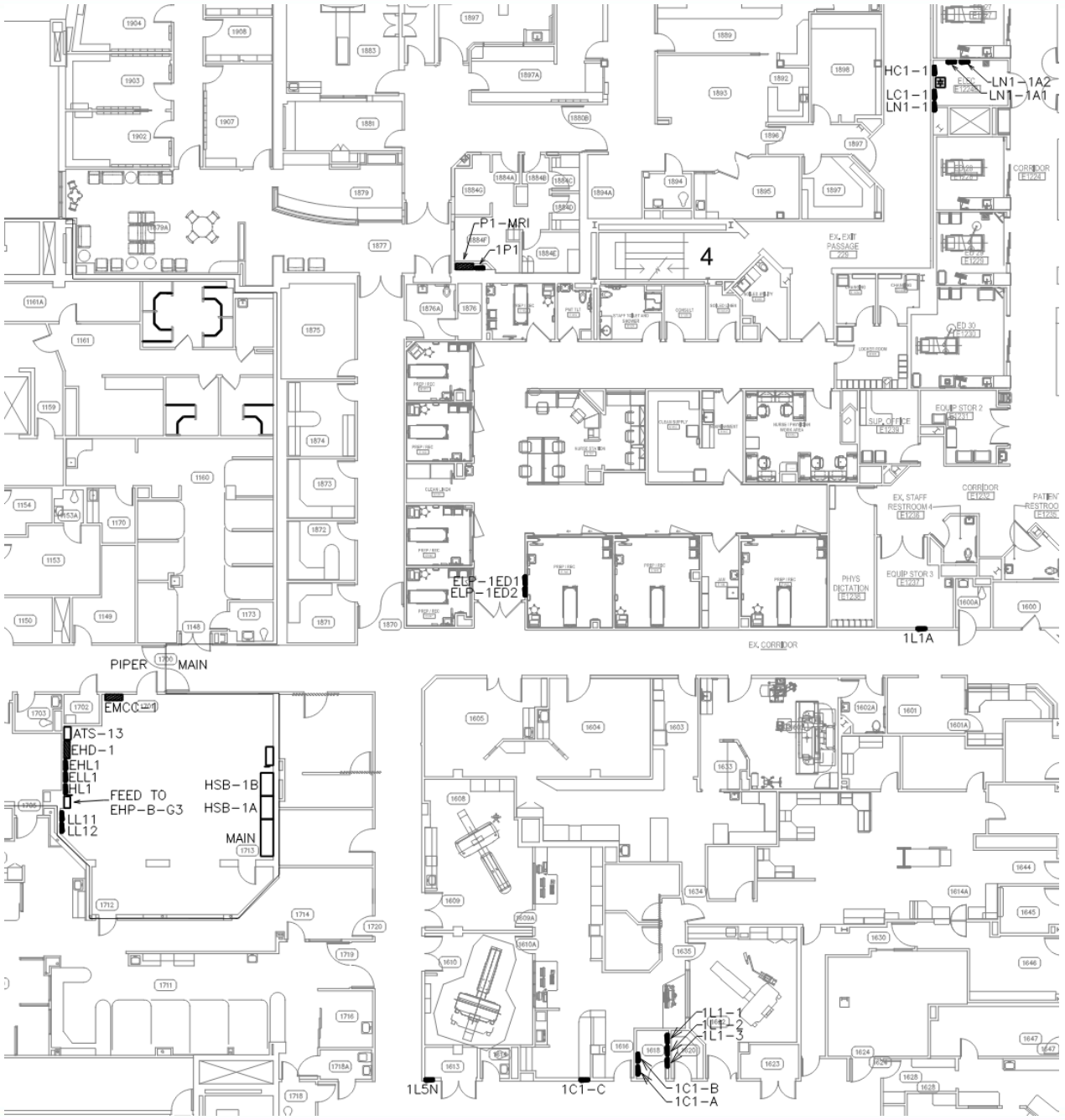
Outcomes

- Panel Location Plans



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Outcomes

- Update panelboard schedules and data base

NAME: OL-L1

ENCLOSURE: NEMA 1
MOUNTING: SURFACE
INCOMING FEED: EC TO VERIFY
SUPPLY FROM: OT-L1
FEED THRU LUGS: Yes
FTL SUB PANEL: OL-L2
VOLTAGE: 120/208
PHASE: 3
WIRE: 4
CALCULATED AFC: SEE RISER
MIN. BUS RATING: 225 A
MAIN SIZE: 225 A
MAIN OPTIONS: FB, LSI

CKT	CIRCUIT DESCRIPTION	NOTE	TRIP	POLE		POLE	TRIP	NOTE	CIRCUIT DESCRIPTION	CKT
1	DA_R INF. BAY A0367		20	1		1	20		OPTIONAL LOAD	2
3	DA_R NOURISH A0359		20	1		1	20		OPTIONAL LOAD	4
5	DA_R INF. BAY A0355		20	1		1	20		OPTIONAL LOAD	6
7	DA_R INF. BAY A0341		20	1		1	20		SPARE	8
9	DA_R LINEN-1 A0007A-1		20	1		1	20		SPARE	10
11	DA_R COLLAB HUB A0331		20	1		1	20		SPARE	12
13	DA_MI MEDS A0352		20	1		1	20		SPARE	14
15	DA_R EQ STOR A0350		20	1		1	20		SPARE	16
17	DA_R OFFICE SHARED A0327		20	1		1	20		SPARE	18
19	DA_R COLLAB HUB A0310		20	1		1	20		SPARE	20
21	DA_R COLLAB HUB A0310		20	1		1	20		SPARE	22
23	DA_R ONC EXAM A0338		20	1		1	20		SPARE	24
25						1	20		SPARE	26
27						1	20		SPARE	28
29						1	20		SPARE	30
31						1	20		SPARE	32
33						1	20		SPARE	34
35						1	20		SPARE	36
37						1	20		SPARE	38
39						1	20		SPARE	40
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43						1	20		SPARE	44
45						1	20		SPARE	46
47						1	20		SPARE	48
49						1	20		SPARE	50
51						1	20		SPARE	52
53						1	20		SPARE	54
55						1	20		SPARE	56
57						1	20		SPARE	58
59						1	20		SPARE	60

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Outcomes

- What happens during a study update?

- Confirmation of added equipment
- Confirmation of existing settings
- Rerun study
- Produce new Labels

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Frequency

- How often do we need to do this?

- New Project
- Each time equipment is added/updated
- NFPA 70e notes the equipment labels be reviewed at intervals not to exceed 5 years.

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Any Questions?