THE ACADEMY OF ELECTRICAL CONTRACTING

PAPER PRESENTED BY FELLOW
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A New Paradigm for Electrical Contractors
Using Electrical Installation Shop Drawings For Jobsite Labor Savings

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Every electrical contracting company has to estimate jobs time and again.

In order to come up with the best estimates possible, we make assumptions – such as that a good bit of measurement and planning will be done on the work site – and we use resources like NECA's *Manual of Labor Units.* In fact, it's safe to assume that most of the people reading this paper have at least one copy of the *Manual* in their offices.

Of course, even with these tried and true industry standards, we all work to find time-saving installation techniques that will allow us to come in under our estimated time and budgets. Generally, these techniques impact one segment of an estimate.

For example, we may choose a light fixture that exists in a large quantity upon which we focus attention to reduce labor cost. After all, saving five minutes on one fixture is nice, but that same five minute short cut used in the installation of 1,000 identical fixtures leads to real savings.

Or we may choose prefabrication techniques on portions of the project so that construction and experimentation happen in a laboratory setting instead of on the job site.

Rarely, though, do we ever consider that our businesses could adopt new techniques that would lead to global improvements in labor hours. Quite accidentally, our company has discovered one such technique.

DISCOVERING A BETTER WAY

In 2008, our company, Allison-Smith Co., LLC, was working on a $10 million Georgia Tech Nanotechnology project. One of our electricians, Charlie, was assigned the task for doing layout for others; coincidentally, he had taught himself some basic CAD skills. Entirely of his own volition, he decided to produce electrical installation shop drawings (hereafter referred to as EIS drawings) for the entire project.

Word from the work site was that these drawings were an extraordinary success. It wasn't until the project was more than 90 percent complete that I finally visited the worksite at the insistence of the project manager who said I had to see Charlie's drawings.

They were impressive, it's true, but more impressive still was a comment from the field superintendent who said that these drawings, completed by one man, had likely eliminated the need for two foremen and possibly several electricians as well as improving efficiency on the overall project.

At that point, we didn't have measurements to back these claims, but the on-site reports from the Georgia Tech project were compelling enough that we moved Charlie into our office and outfitted him with a CAD computer.

A SECOND CHANCE TO PROVE A GOOD IDEA

Shortly thereafter, we were awarded the Kennesaw State University Health and Human Services Project by the same general contractor that built the Nanotechnology project. We assigned the same field team but a different project manager.

Our estimate for this project included:

- Original estimate of man hours: 64,378 hours
- Electrical change orders: 6,888
- Voice data work: 5,501 hours
- **For a total of 76,767 estimated hours**

At the conclusion of the project, the actual used hours totaled only 66,460 hours, 1,713 of which were spent producing the EIS drawings.

The bottom line was a 13.4 percent savings in labor hours.

At this point, we did a hindsight review of the Georgia Tech Nanotechnology building estimates and final man hours and found similar results.

INSTALLATION DRAWINGS VERSUS DIAGRAMMATIC DRAWINGS

We're all accustomed to working with engineer's diagrammatic drawings, but what about installation drawings? How do they differ?

Attachments 1 and 2 are from the Georgia Tech Nanotechnology project. Attachment 1 is the drawing produced by the design engineer and Attachment 2 is our installation drawing of the same area.

While some of the differences are obvious, I will elaborate on some details which are not so obvious. (Admittedly, however, it is very difficult to make a good presentation of the drawings at the scale of this document.)

For example, the engineer's drawing (Attachment 1) doesn't tell us that the fixture is mounted 10'-10" above the finished floor. Likewise, the conduit runs and wiring is not shown but, rather, is inferred by the circuit numbers only. There are no locations noted for the fixtures, of course, because they would normally be determined from scaling the plans and measuring in the field.

From the installation drawing (Attachment 2) the electrician is given dimensions for the fixture location, conduit locations, conduit supports, and a detailed method for hanging the fixture (not shown on this drawing).

Additionally, we see a similar fleshing out of plans in Attachments 3 through 9, which show feeder conduits from some static transfer switches to distribution panels.

Once again, Attachment 3 is the engineer's drawing from which the feeder sizes would be derived from schedules on the work site. The consequent drawings show each elevation of conduit by a color code and all of feeders and conduit sizes required by the project.

The more we explore using full-project EIS drawings, the more advantages we find, including:

Reduced Labor Costs

Not only have our earliest tests of using EIS project drawings shown significant reductions in labor hours, it also minimizes labor costs by:

- Freeing the foremen to actually supervise the labor force (rather than being distracted by field layouts).
- Increasing efficiency by clarifying needs and expectations from the start of the project.
- Minimizing the need for highly-qualified (and therefore more expensive) field staff, again by having all planning completed from the start of the project.
- Reducing spikes in the labor curve.

Error Reduction

With onsite measurements and plan creation eliminated by the EIS drawing, we've also found a reduction of errors due to having one person – the creator of the EIS drawing – reviewing the entire project from shop drawings to code requirements to specifications, before the first tool is even lifted.

Error reduction also comes from:

- No longer having full sets of drawings on the job site and exposed to the elements which can smudge or otherwise deteriorate the drawings.
- Finding conflicts before they necessitate reworking a segment of the job.
- Reviewing installation methods earlier which allows for more discussion and greater accuracy in the installations themselves.

Similarly, with comprehensive drawings created at the start, fewer drawings are used in the field since they can be reproduced for each electrician in a localized area.

Improved Final Products

Because installation drawings take a global look at a project before beginning, we've also found that our end results have improved. For example, with this bird's-eye view, we can more easily determined the best routes for conduit runs and can install more in slabs in PVC rather than in metal conduit overhead.

MAKING THE TRANSITION

With a dramatic change in approach such as this, plenty of questions naturally and necessarily arise.

First, does it require special skills to produce these drawings?

The answer is an emphatic yes.

In order to complete these drawing expertly, the creator needs to not only understand how to use CAD software, he must also have installation experience so that he can approach it as though the drawings were being prepared for a job he is personally preparing to do.

Admittedly, it's not so easy to find someone who has not only the right expertise but also the patience to complete these lengthy drawings. We were lucky to have already had Charlie on staff; if we were to bring someone on now, we would look for a motivated field staff person because it would be easier to train a field staff person CAD than to train a CAD staff person field installation. Regardless of which person you choose, enthusiasm for the job would be essential to its success.

Another reasonable question is whether the process will be immediately accepted by the office staff and field?

The answer is no.

We are creatures of habit and changing long-held habits like our industry's standards for planning and accomplishing projects is no mean fete. Often, the field does not readily see the benefit until they experience the new process themselves and see how effective it can be.

Because of this, project managers must plan ahead and implement the new strategy thoughtfully. Moreover, the time must be allotted to complete the drawings prior to time that the information is needed in the field. This is not normally an issue on a ground-up project.

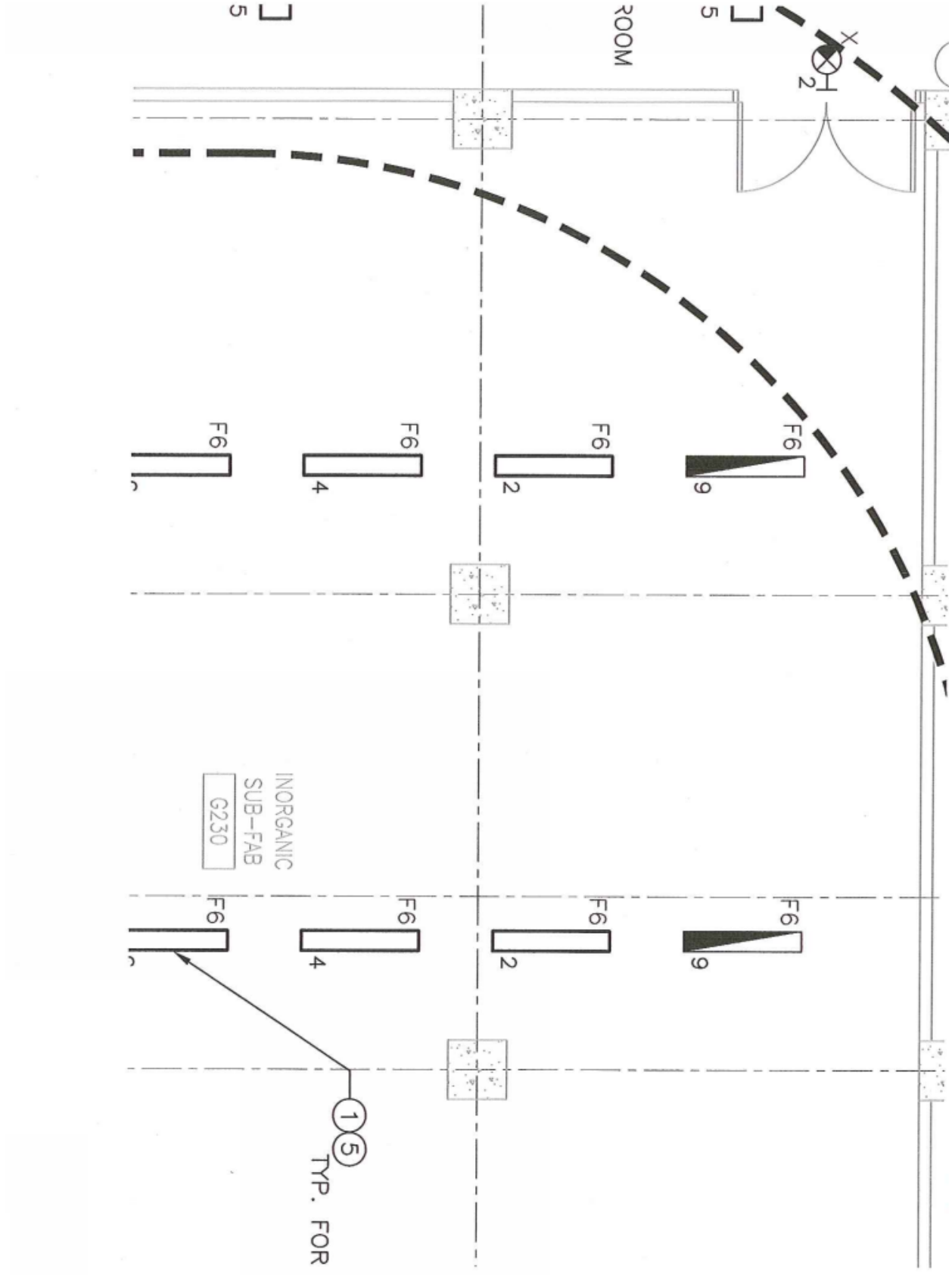
Patience, of course, is the most important component of making sea change such as this. After four years, we're proud to estimate that we have about a 75 percent acceptance rate.

IN CONCLUSION

With this new system in place, I look back at the days when our crews showed up at the gang box on the jobsite and started planning the work and it looks like showing up at the airport before planning my vacation – it just doesn't make sense.

We believe this methodology is a game changer for the industry and should be widely adopted including course work in the NJATC.

Lanny Thomas *is the Chairman of Allison-Smith Company. After joining Allison-Smith Co. in 1986, he agreed to serve as the accredited rep. He soon became a director on the board of the Atlanta Chapter, NECA, going on to serve as chapter treasurer, president, chairman and governor. He was also a trustee on the chapter's health and pension committee and later served as chairman of that board and on his local Labor Management Committee. Nationally, he served as Vice President of NECA District 3 in 2010. He has chaired the Management Development Committee and been a member of the Manpower Development Committee, the Technology Committee, CIR and the Governance Task Force.*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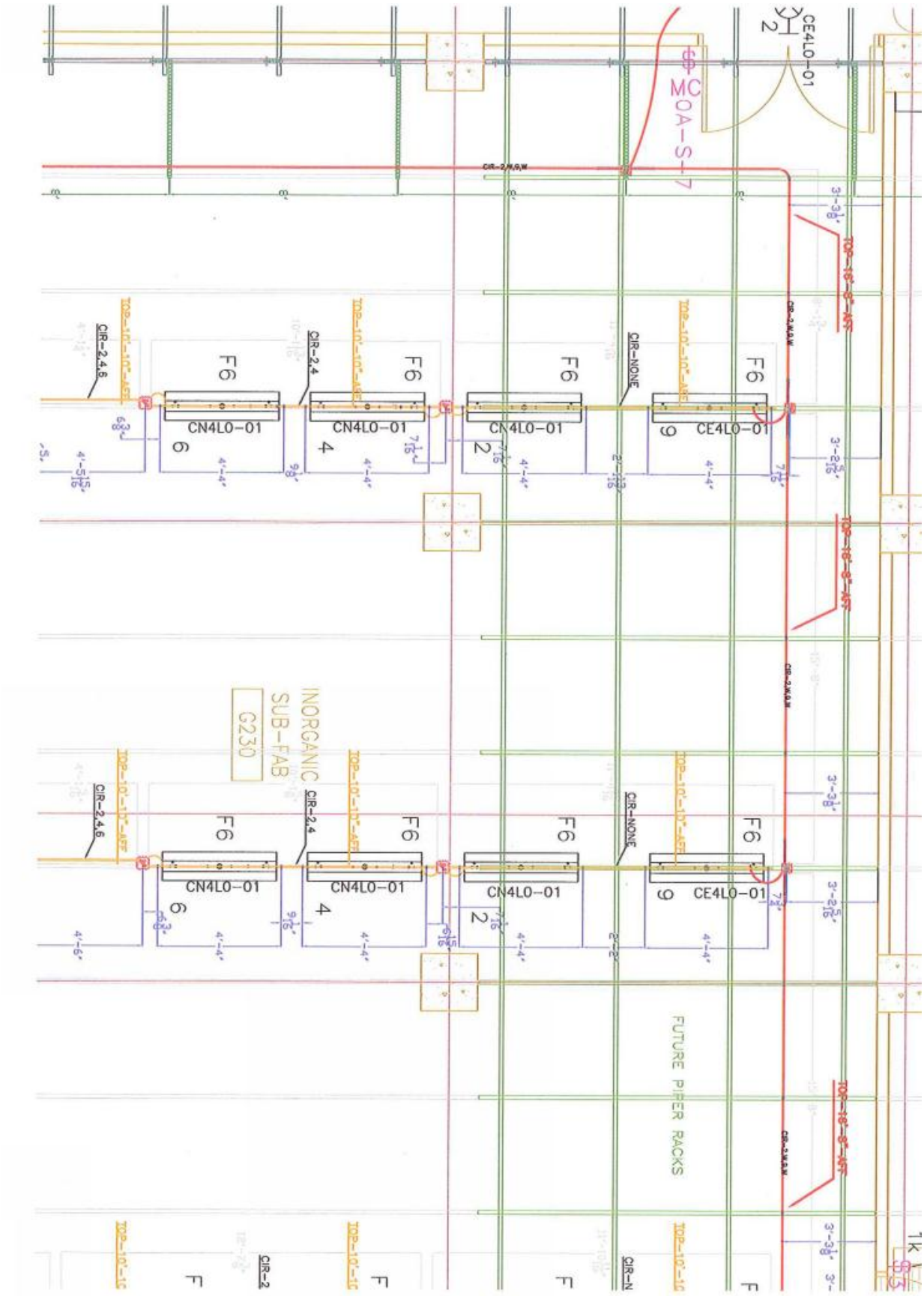
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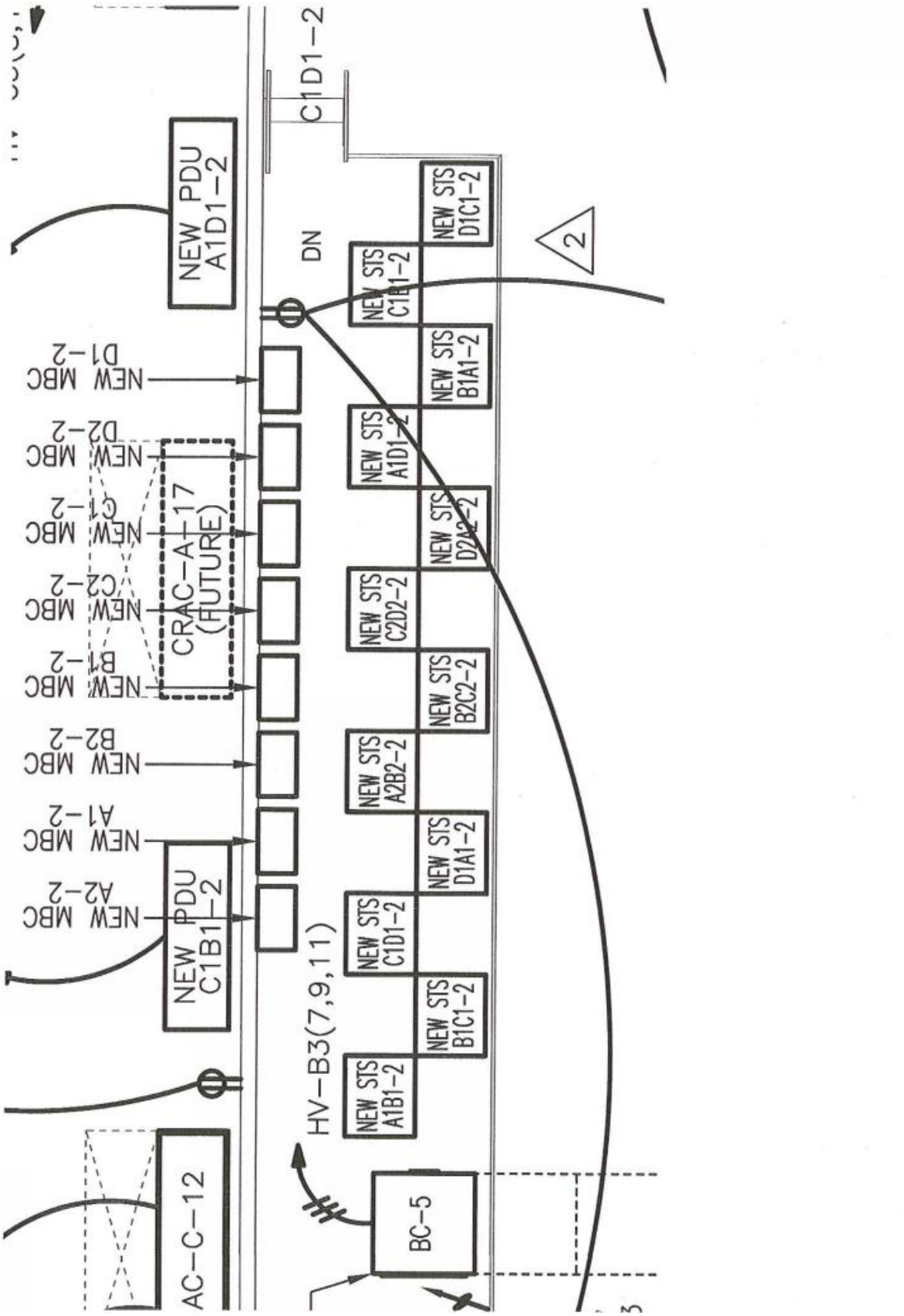
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AC-C-12
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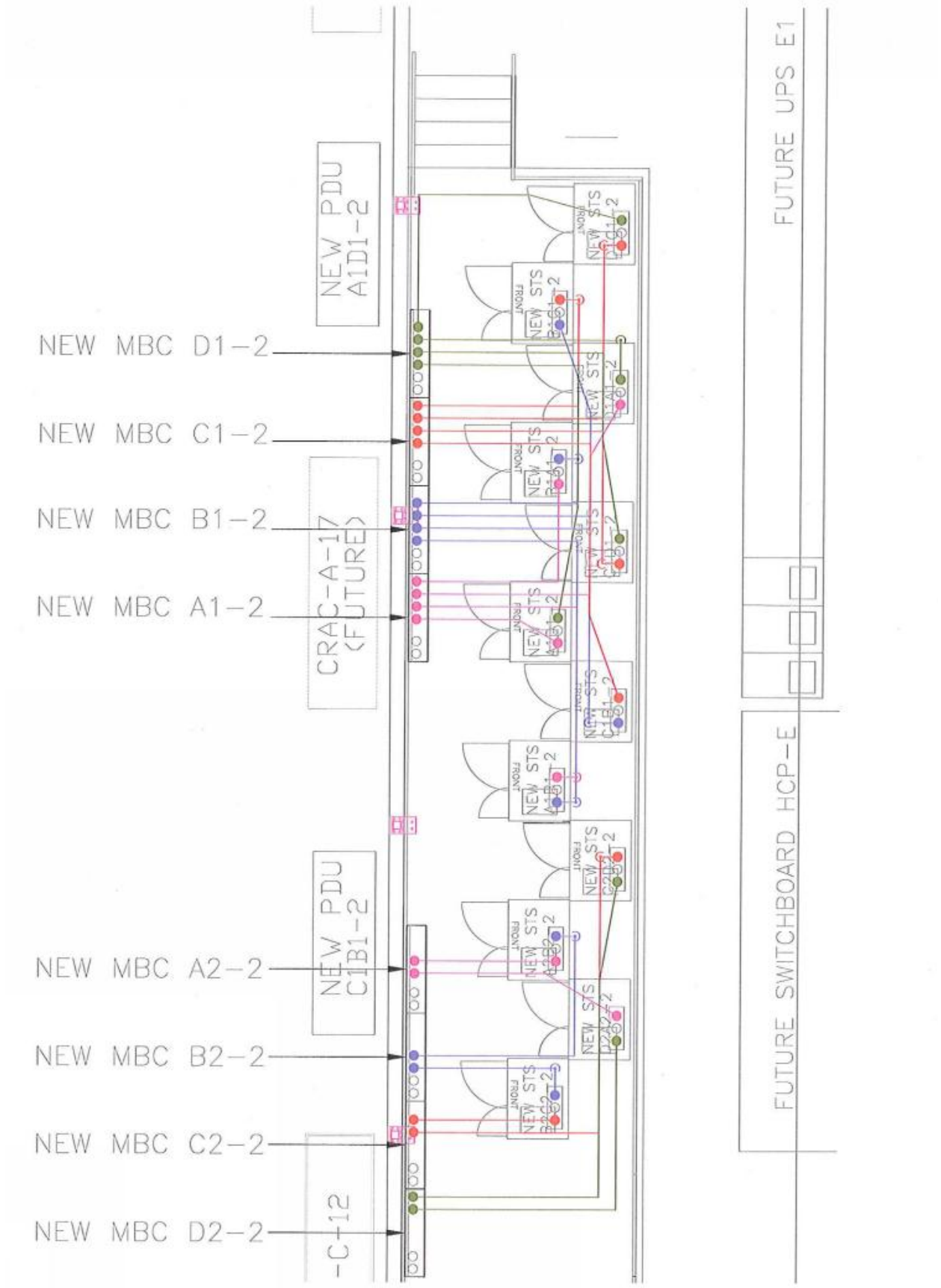
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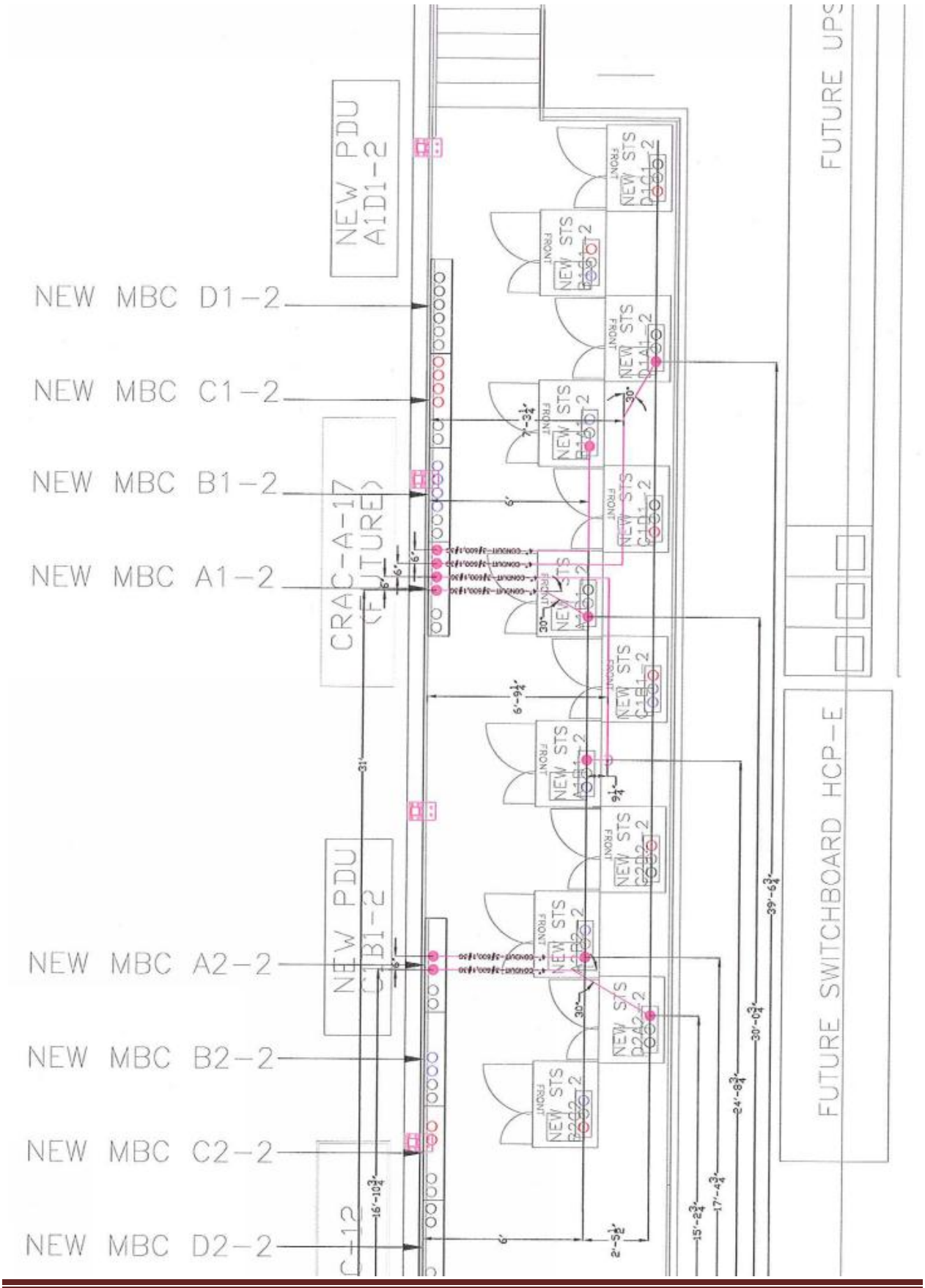
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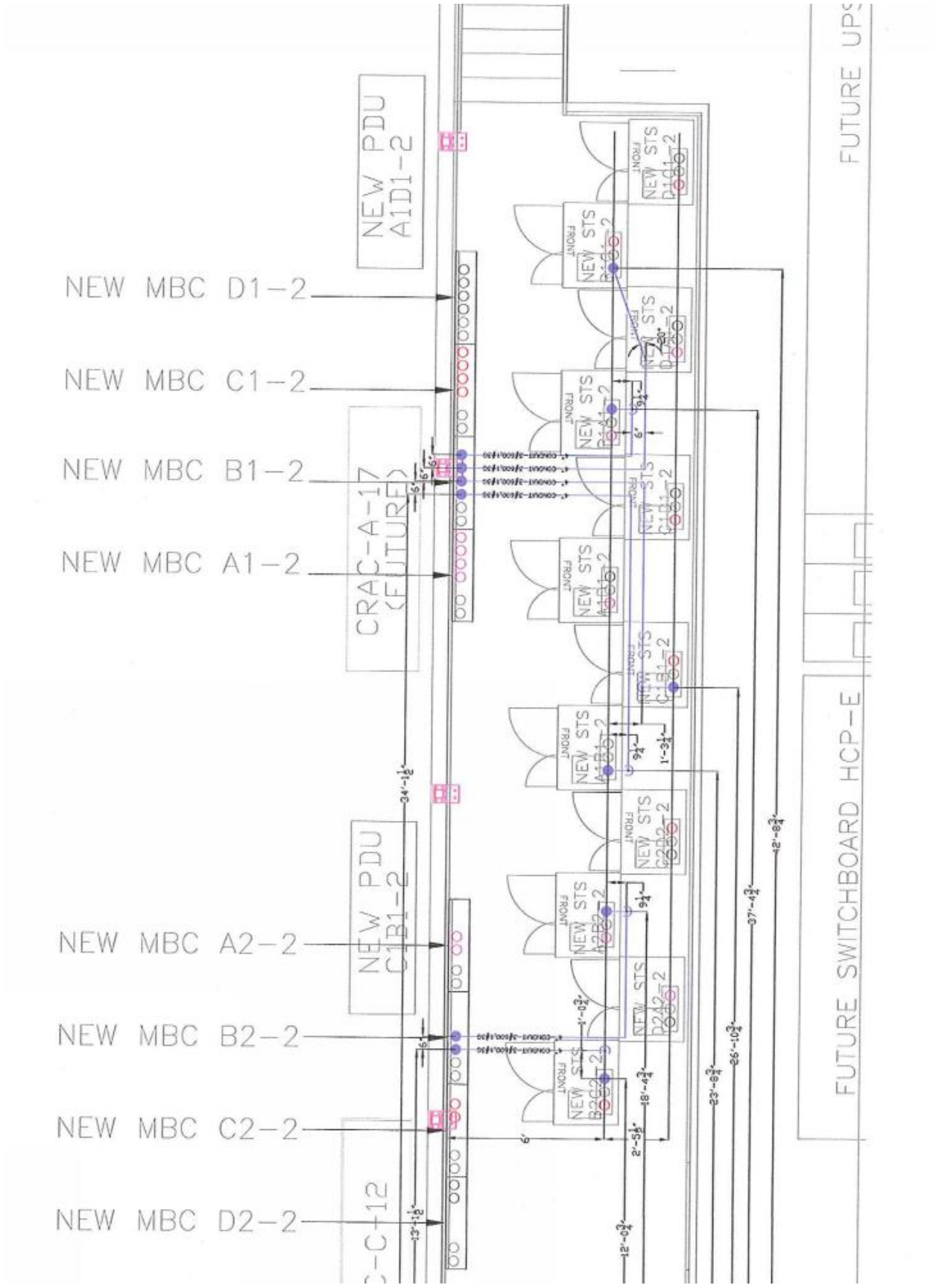
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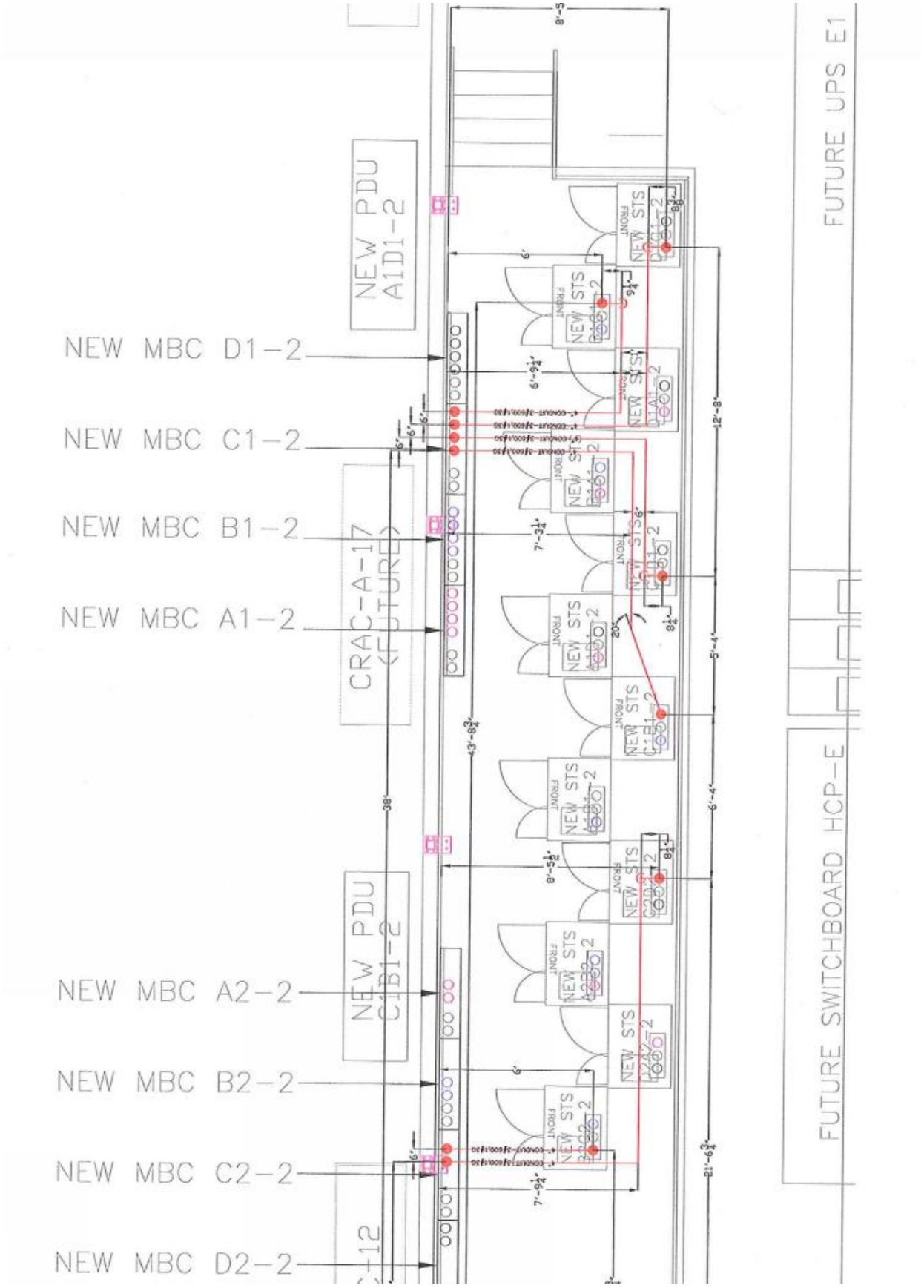
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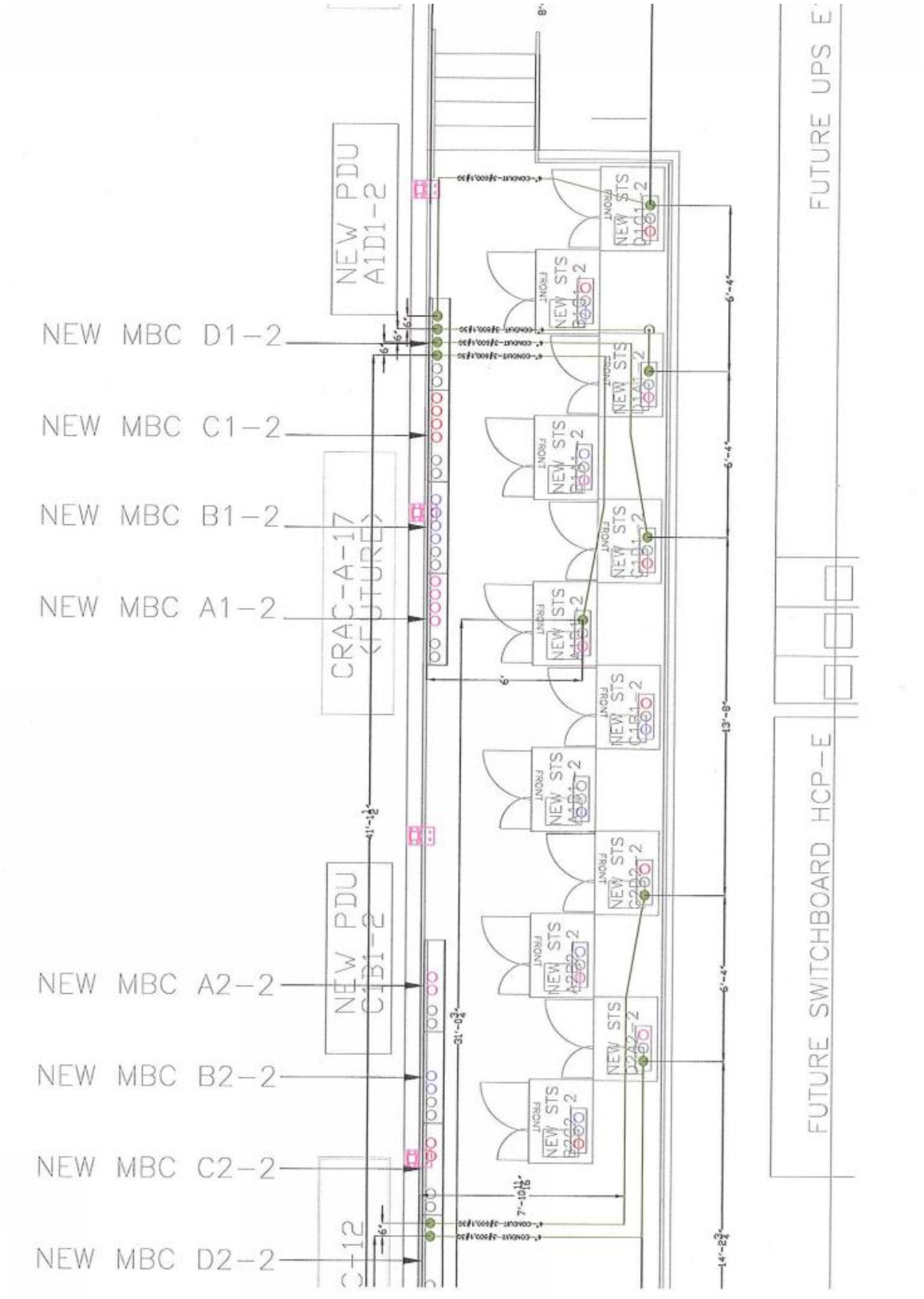
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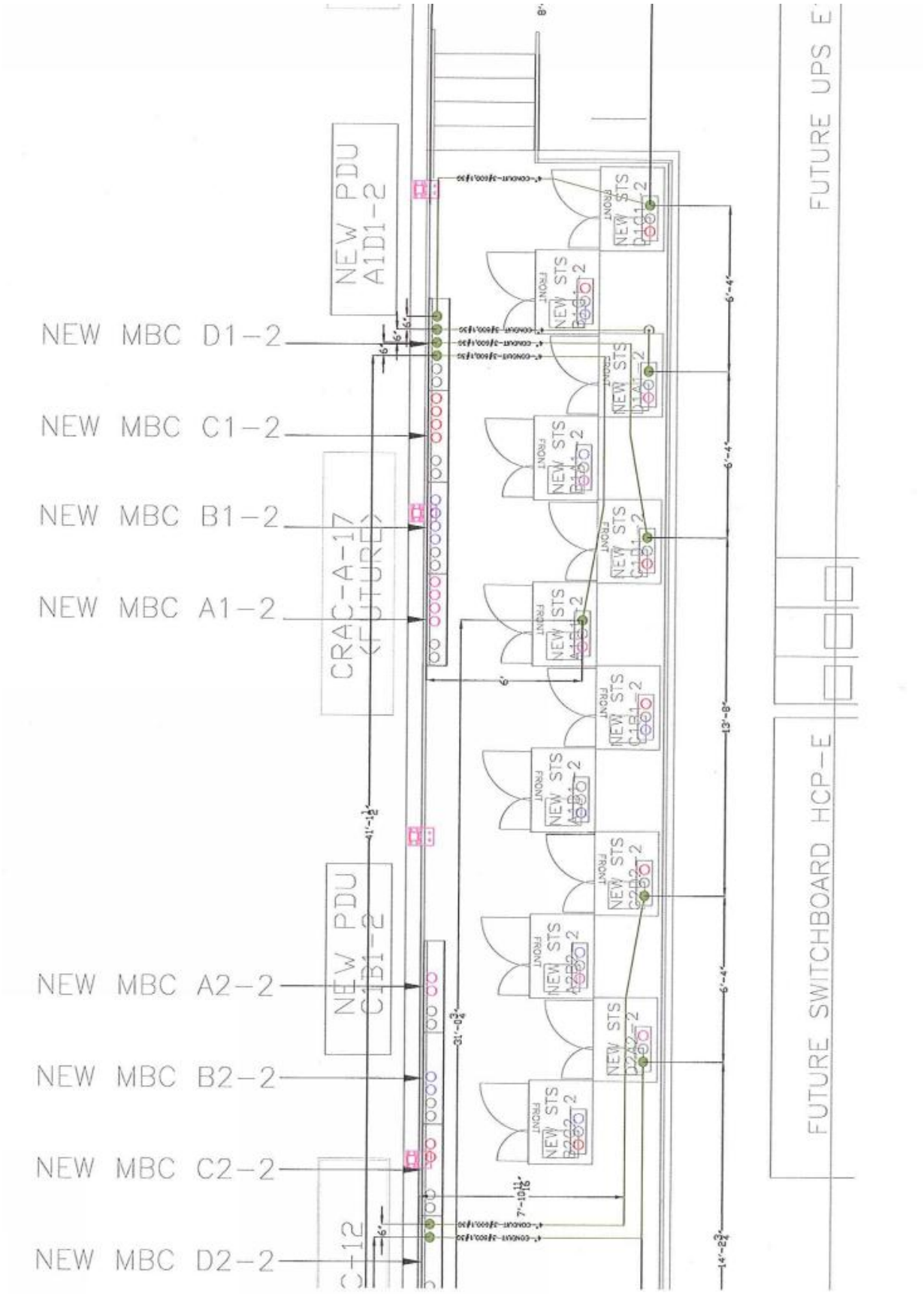
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