

# Critical Utilities Infrastructure Revitalization

Subproject 1 – Design Build Subcontract – SOW Overview

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CUIR Industry Day  
29 January 2024

# Outline

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- Overview of Scopes
- Virtual Tour
- Key Considerations
  - Government Furnished Equipment
  - Schedule Constraints and Outage Plan
  - Temporary Power
  - Preliminary Design Report and Specifications
  - As-built documents

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# Overview of Scopes



# Overview of SP1 Design-Build Subcontract Scopes

## Need for Integrated Design & Construction

- Scopes 1, 2 and 3 are interconnected and have numerous physical interfaces with existing electrical systems
- Existing electrical system must remain energized as much as possible to reduce adverse impacts to other laboratory activities
- Constructability at each physical interface between new and existing electrical components must be considered in the final design of each scope item
- The design must also incorporate realistic construction durations to minimize power outage durations

| Scope  | Type       |
|--|------------|
| <b>Scope 1: Master Substation Improvements</b>               |            |
| Scope 1-1: Master Substation Expansion                       | Base       |
| Scope 1-2: Transformer T-1                                   | Base       |
| Scope 1-3: Transformer T-2                                   | Additive 1 |
| Scope 1-4: Trigger Current Limiters                          | Additive 2 |
| <b>Scope 2: LINAC Power Distribution System Improvements</b> |            |
| Scope 2-1: Cable Trays and CUIR1-4 Feeders                   | Base       |
| Scope 2-2: CUIR3 and CUIR4 Final Load Connections            | Additive 3 |
| Scope 2-3: CUIR5-8 Feeders                                   | Additive 4 |
| Scope 2-4: CUIR5-8 Final Load Connections                    | Additive 5 |
| <b>Scope 3: Sector 4 Switchgear Installation*</b>            | Base       |

# Subproject 1 DB Subcontract – Scope 1

## Scope 1: Master Substation Improvements

- 2 Base Scopes
- 2 Additive Scopes

| Scope  | Type       |
|--|------------|
| <b>Scope 1: Master Substation Improvements</b>               |            |
| Scope 1-1: Master Substation Expansion                       | Base       |
| Scope 1-2: Transformer T-1                                   | Base       |
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| Scope 2-3: CUIR5-8 Feeders                                   | Additive 4 |
| Scope 2-4: CUIR5-8 Final Load Connections                    | Additive 5 |
| <b>Scope 3: Sector 4 Switchgear Installation*</b>            | Base       |

# Scope 1 – Master Substation Improvements

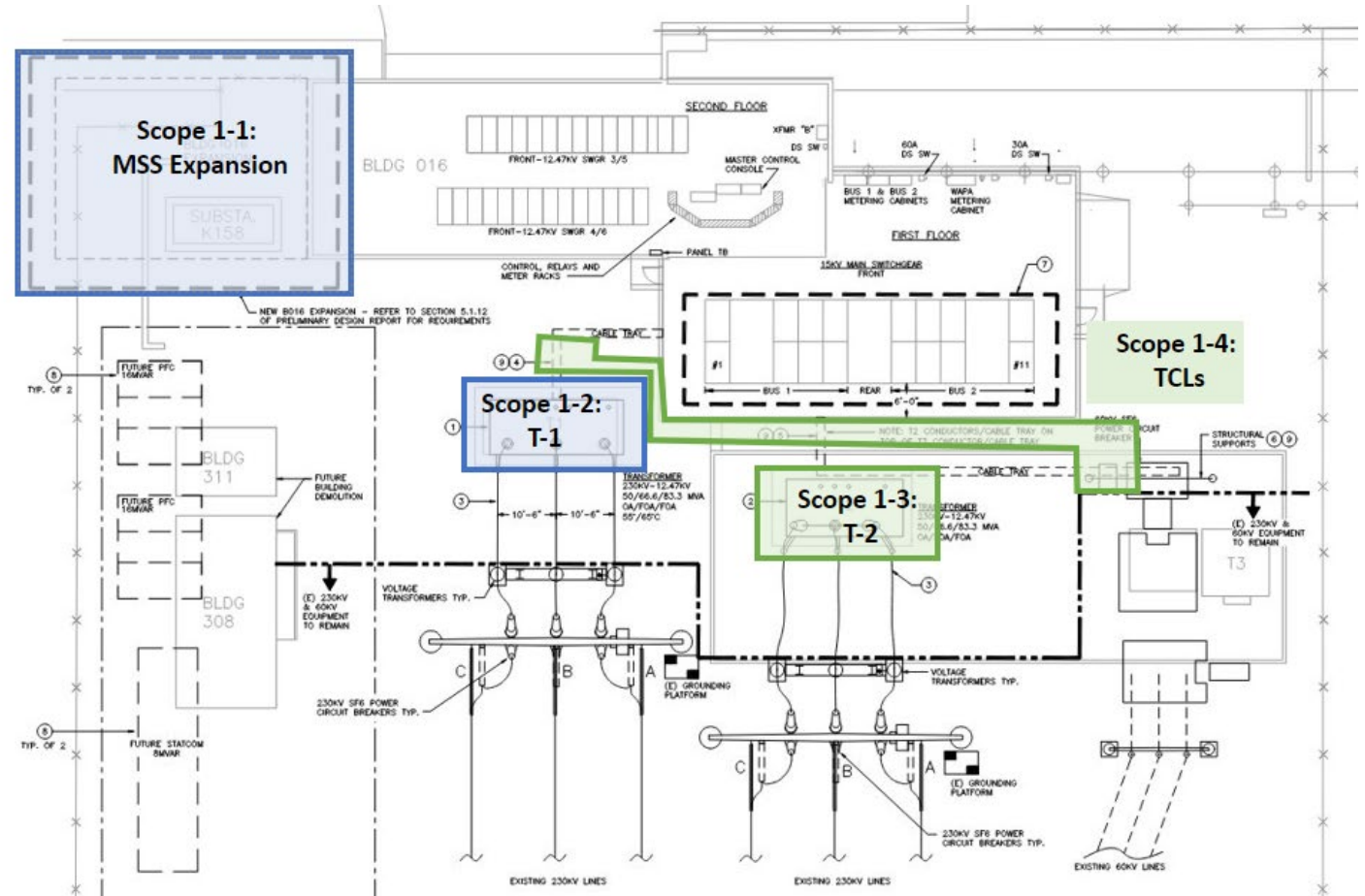
## Scope 1: Master Substation Improvements





# Scope 1 – Master Substation Improvements

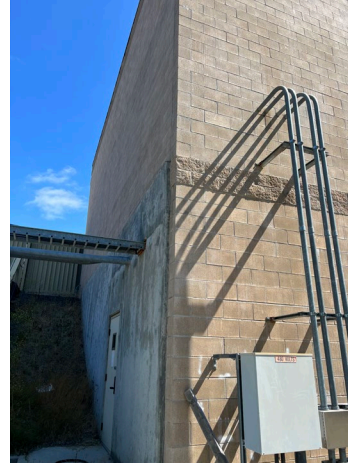
- **Scope 1-1 (BASE)** – Expansion of the Master Substation Expansion Building (B016), installation of the new MV switchgear, and all associated enabling works, including relocation of an existing generator and replacement of low voltage transformer
- **Scope 1-2 (BASE)** - Replacement of Transformer T-1
- **Scope 1-3 (ADDITIVE)** - Replacement of Transformer T-2
- **Scope 1-4 (ADDITIVE)** - Addition of Triggered Current Limiters (TCL) for T-1, T-2 and T-3



# Scope 1 – Master Substation Improvements

## Scope 1-1 – Master Substation Expansion – Structural Works (BASE SCOPE)

1. Construction material to be same as existing:
  - Concrete Masonry Unit (CMU) walls,
  - Cast-in-place concrete slab on grade,
  - Cast-in-place concrete metal deck (2<sup>nd</sup> floor),
  - Insulating concrete on metal roof deck
2. Expansion footprint: Approx. 1500-1800 sq. ft.
3. Direct Access to level 1 and level 2
4. Direct Access between levels
5. Direct Access from existing and proposed through interior

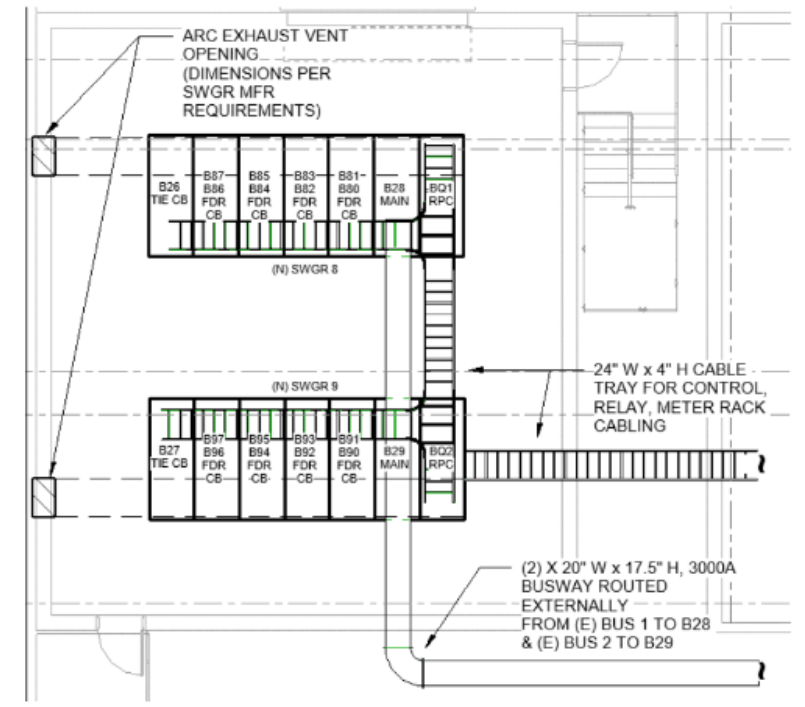




# Scope 1 – Master Substation Improvements

## Scope 1-1 – Master Substation Expansion – Electrical Installations (BASE SCOPE)

- Disconnect and dispose existing substation K15B, installation of new substation B016S (GFP)
- Relocation of existing outdoor diesel generator and ATS into new MSS expansion
- Specify, design, permit, furnish and install outdoor 12.47kV busway between Bus 1 & 2 and Bus 8 & 9



# Scope 1 – Master Substation Improvements

Scope 1-2 - Replacement of Transformer T-1 (BASE SCOPE)

Scope 1-3 - Replacement of Transformer T-2 (ADDITIVE SCOPE)

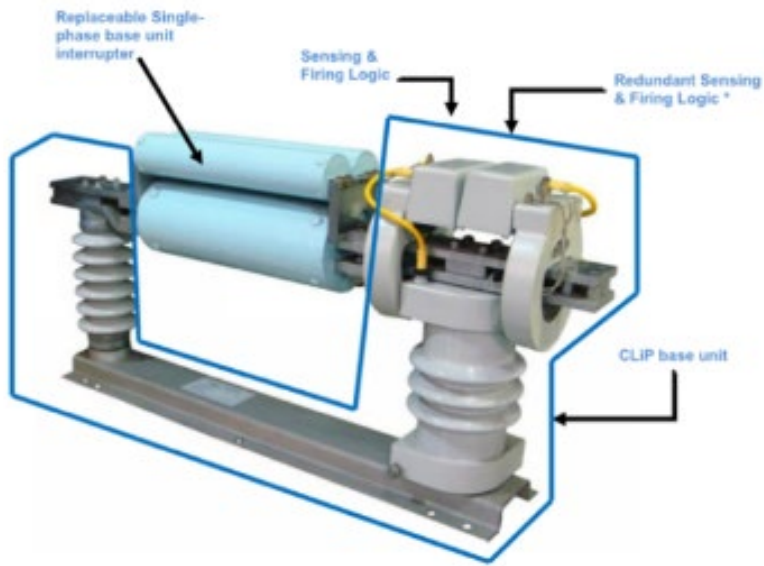
- Demolish existing transformer and related materials
- Install new HV Transformer (GFP)
- 230kV Connection



# Scope 1 – Master Substation Improvements

## Scope 1-4 – Triggered Current Limiters (TCL) (ADDITIVE SCOPE)

- Design, furnish and install 3 three-phased 15kV TCL outdoors
- Provide measures to reduce available fault energy during moments in time during transfer procedures where transformers are paralleled under various bus transfer conditions for T-1, T-2 and T-3





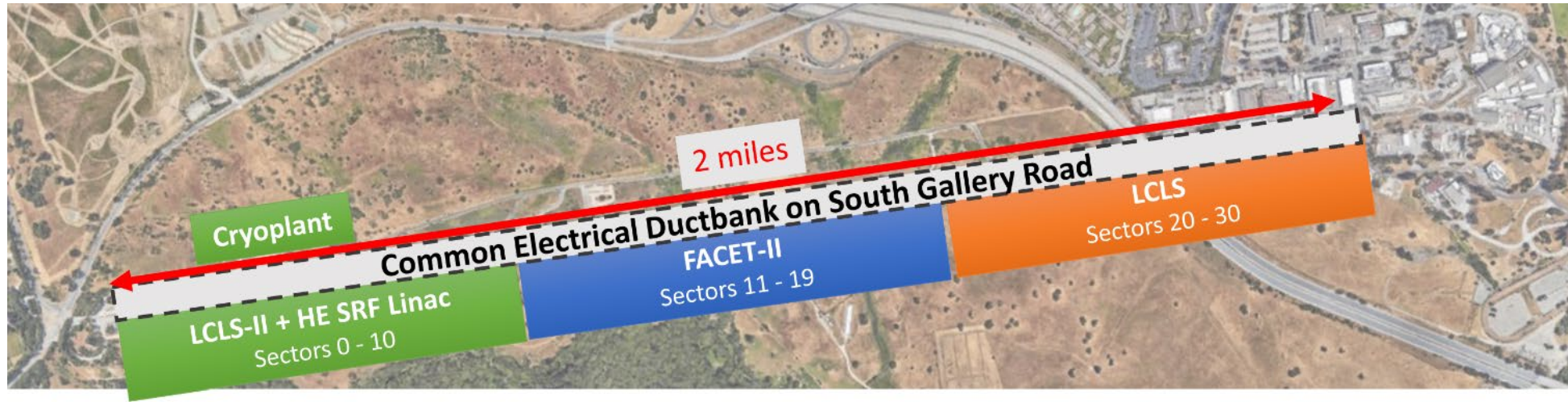
# Subproject 1 DB Subcontract – Scope 2

## Scope 2: Linac Power Distribution System Improvements

- 1 Base Scope
- 3 Additive Scopes

| Scope  | Type       |
|--|------------|
| <b>Scope 1: Master Substation Improvements</b>               |            |
| Scope 1-1: Master Substation Expansion                       | Base       |
| Scope 1-2: Transformer T-1                                   | Base       |
| Scope 1-3: Transformer T-2                                   | Additive 1 |
| Scope 1-4: Trigger Current Limiters                          | Additive 2 |
| <b>Scope 2: LINAC Power Distribution System Improvements</b> |            |
| Scope 2-1: Cable Trays and CUIR1-4 Feeders                   | Base       |
| Scope 2-2: CUIR3 and CUIR4 Final Load Connections            | Additive 3 |
| Scope 2-3: CUIR5-8 Feeders                                   | Additive 4 |
| Scope 2-4: CUIR5-8 Final Load Connections                    | Additive 5 |
| <b>Scope 3: Sector 4 Switchgear Installation*</b>            | Base       |

# Scope 2 – Linac Power Distribution System Improvements



# Scope 2 – Linac Power Distribution System Improvements

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## 1. Scope 2-1 (BASE)

- Design of FULL cable tray and 12.47kV voltage feeder cables connection system on roof of Gallery
- Install two cable trays to support CUIR1 to CUIR8 feeders
- Install CUIR1 and CUIR2 feeders with connections to the MSS and Substation 905
- Install CUIR3 and CUIR4 with connections from the MSS to cable boxes with provisions for connection to individual substations

2. Scope 2-2 (ADDITIVE) Connecting CUIR3 and CUIR4 feeders from cable boxes to individual substations, including any work needed to renovate and upgrade the substations to enable the connection

3. Scope 2-3 (ADDITIVE) Installation of CUIR5 to CUIR8 feeders with connections from the MSS to cable boxes with provisions for connection to individual substations

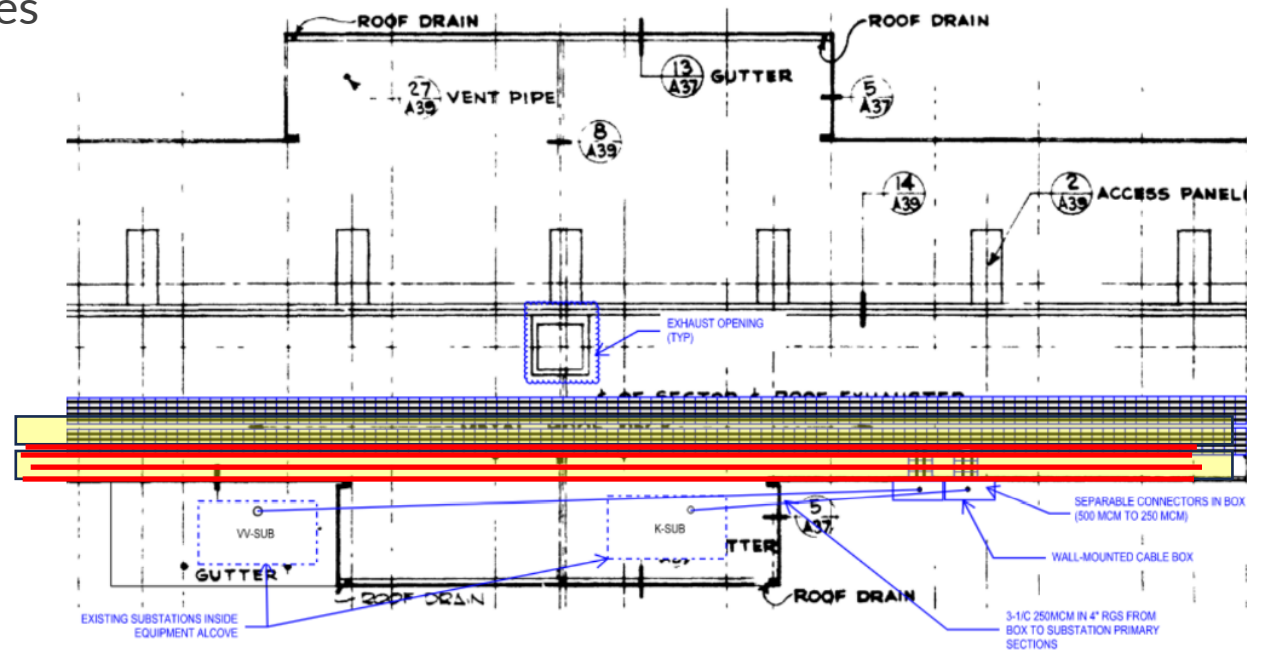
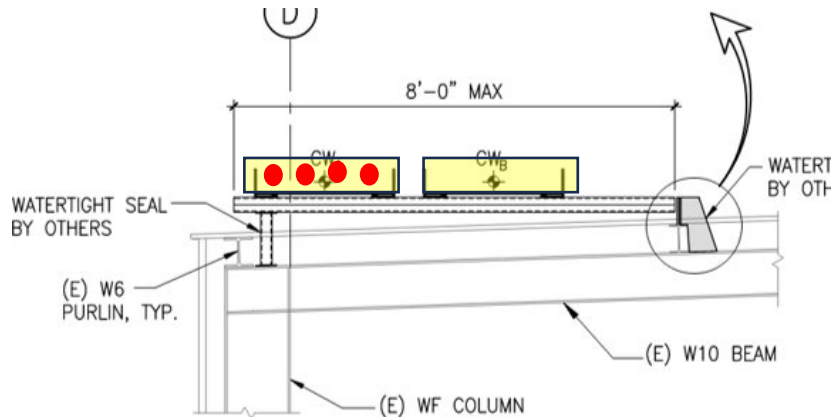
4. Scope 2-4 (ADDITIVE) Connecting CUIR5 to CUIR8 feeders from cable boxes to individual substations, including any work needed to renovate and upgrade the substations to enable the connection



# Scope 2 – Linac Power Distribution System Improvements

## Scope 2-1 (BASE SCOPE)

- Design **FULL** cable trays and feeder connection system for CUIR1 to CUIR8
- Install two cable trays at roof of existing Klystron Building
- Install feeders CUIR1 to CUIR4
- Connection of CUIR1 and CUIR2 to final substation
- Connection of CUIR 3 and CUIR4 to cable boxes

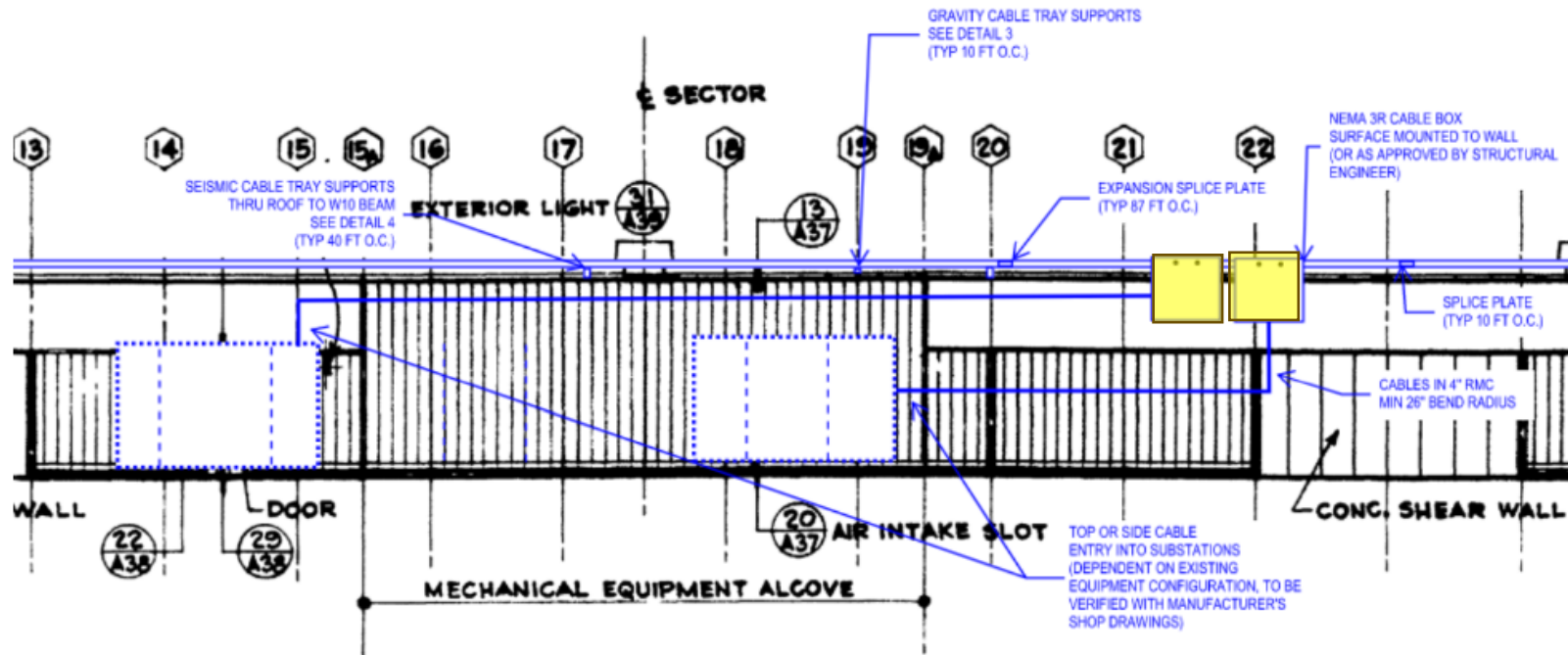


Conceptual Typical CUIR Cable Tray Connection Gallery Roof Plan

# Scope 2 – Linac Power Distribution System Improvements

## Scope 2-2 (ADDITIVE SCOPE)

- Connection of CUIR3 and CUIR4 from cable boxes to final substation



Conceptual Typical CUIR Cable Tray Connection Elevation (Proposed Work Indicated in Blue)

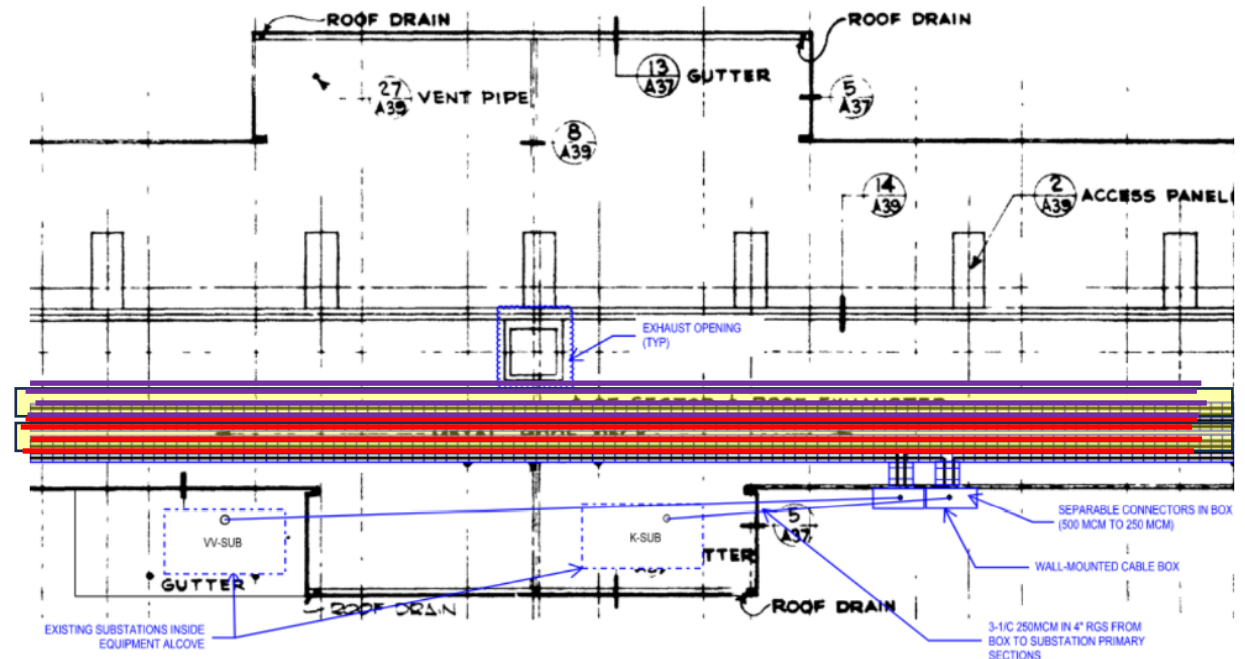
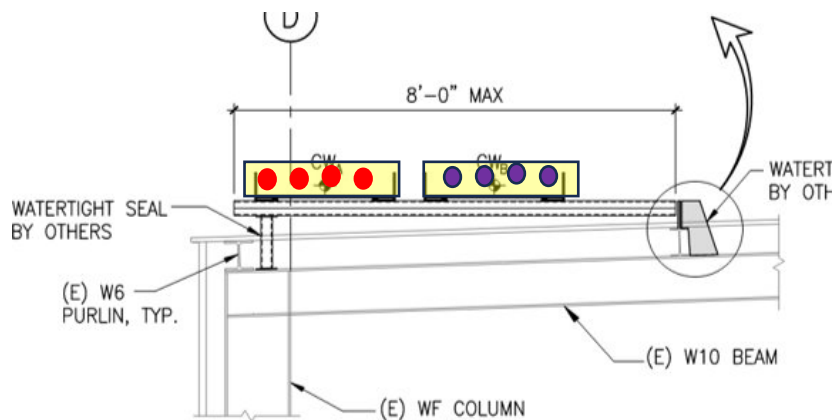
# Scope 2 – Linac Power Distribution System Improvements

## Scope 2-3 (ADDITIVE SCOPE)

- Installation of feeders CUIR5 - CUIR8 to cable boxes

## Scope 2-4 (ADDITIVE SCOPE)

- Connection of feeders CUIR5 - CUIR8 to final substations



Conceptual Typical CUIR Cable Tray Connection Gallery Roof Plan



# Subproject 1 DB Subcontract – Scope 3

## Scope 3: Sector 4 Switchgear Installation

- 1 Base Scope
- No additive scope

| Scope  | Type       |
|--|------------|
| <b>Scope 1: Master Substation Improvements</b>               |            |
| Scope 1-1: Master Substation Expansion                       | Base       |
| Scope 1-2: Transformer T-1                                   | Base       |
| Scope 1-3: Transformer T-2                                   | Additive 1 |
| Scope 1-4: Trigger Current Limiters                          | Additive 2 |
| <b>Scope 2: LINAC Power Distribution System Improvements</b> |            |
| Scope 2-1: Cable Trays and CUIR1-4 Feeders                   | Base       |
| Scope 2-2: CUIR3 and CUIR4 Final Load Connections            | Additive 3 |
| Scope 2-3: CUIR5-8 Feeders                                   | Additive 4 |
| Scope 2-4: CUIR5-8 Final Load Connections                    | Additive 5 |
| <b>Scope 3: Sector 4 Switchgear Installation*</b>            | Base       |

# Scope 3 – Sector 4 Switchgear Installation

New 15kV outdoor pad-mounted switchgear (GFP) to be installed on the south side of the Klystron Gallery and connected to existing circuits VV1, VV2, and VV4



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# Virtual Tour



# VIDEO

YouTube

Search



[Link to Video](#)

CUIR Subproject 1 Design-Build Scopes Virtual Tour

Unlisted

SLAC CUIR

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CUIR INDUSTRY DAY, JANUARY 29<sup>TH</sup>, 2024

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# Key Considerations

# Key Considerations

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1. Government Furnished Property
2. Schedule Constraints, Power Outages and Construction Activities Coordination
3. Temporary Power
4. Preliminary Design Report and Specifications
5. As-Build Documents
6. Other construction projects concurrent at SLAC



# Key Considerations

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To be presented by other speakers:

1. SLAC Safety and Work Planning Control
2. Electrical Hazards and LOTO Procedures
3. Environmental Safety Risks
  - Radiologically Controlled Areas
  - Lead Paint & Asbestos
  - Air Quality

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# Government Furnished Equipment

# Government Furnished Property (GFP)

The following equipment are procured as GFP to be installed by the DB subcontractor:

## Scope 1:

- Medium Voltage Switchgear
- High Voltage Substation Transformers

## Scope 2:

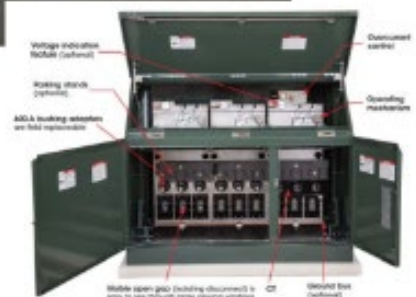
- 12kV Medium Voltage Cables

## Scope 3:

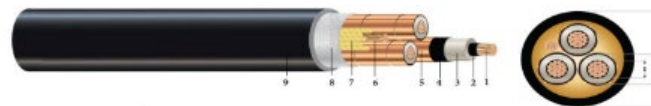
- Sector 4 Switchgear



230kV MSS  
Transformer



Switchgear



500 MCM 12kV  
cables



# Government Furnished Property (GFP)

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## Schedule

**The current CUIR schedule expectation is that most GFP will arrive at SLAC:**

Between calendar years 2024 and 2028

**Temporary storage durations are currently planned:**

Range from 3 to 12 months and will be refined after equipment are approved for manufacturing and receiving Subproject 1 preliminary construction schedule

# Government Furnished Property (GFP)

|   | Responsible Party |                   |
|---|-------------------|-------------------|
|   | SLAC              | D-B Subcontractor |
| Acceptance of equipment at time of delivery and temporary storage placement | X                 |                   |
| Performing indoor/outdoor space inspections or SLA's                        | X                 |                   |
| Storage location preparation and acceptance                                 | X                 | *                 |
| Acceptance of equipment prior to final installation                         |                   | X                 |
| Transporting any equipment elsewhere on site after delivery acceptance      |                   | X                 |

\* If subcontractor's schedule requires the HV Transformer to be stored for more than 6 months, the subcontractor will carry additional responsibilities for storage site preparation prior to delivery such as providing secondary oil containment to meet requirements.

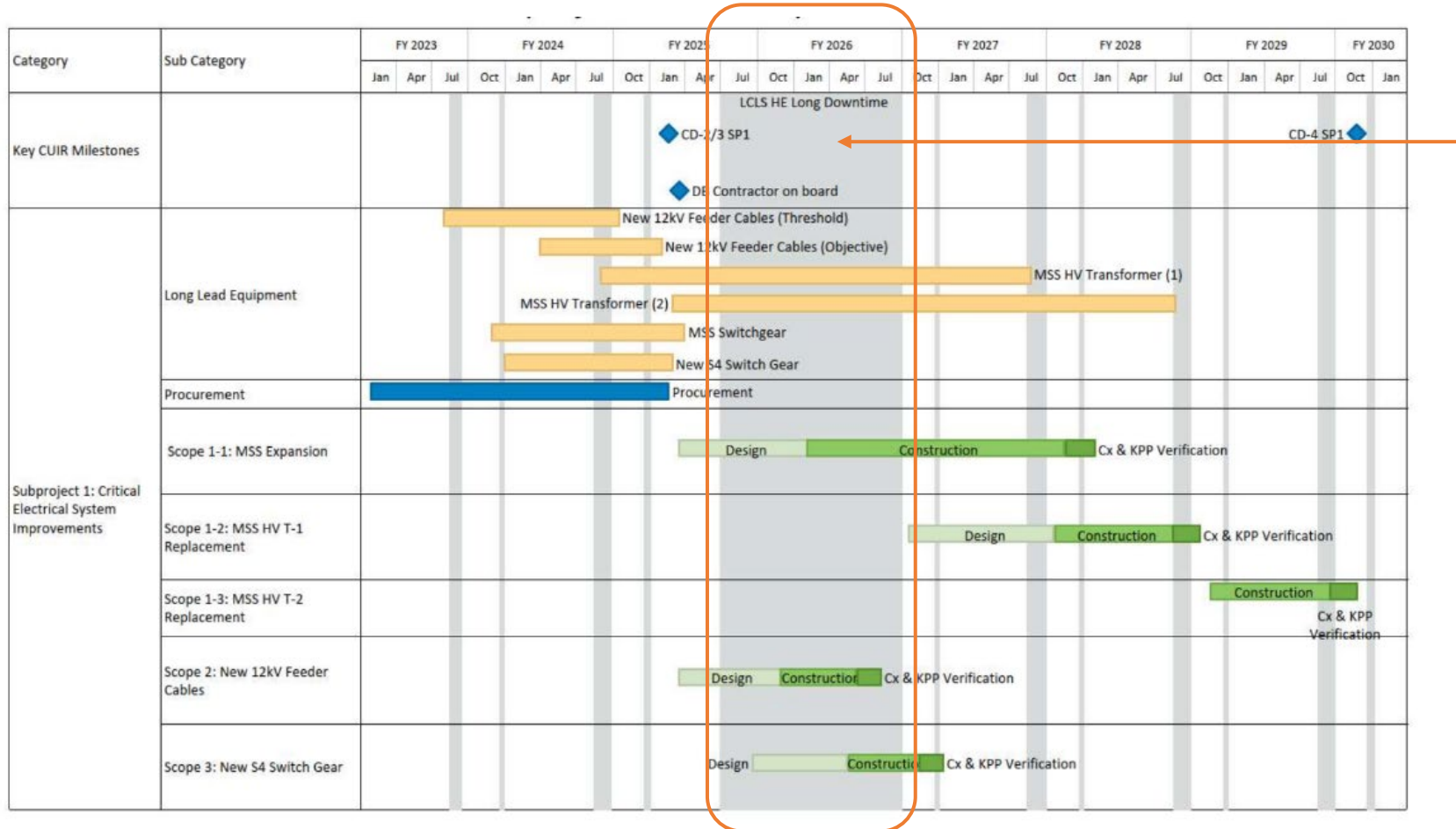
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# Schedule Constraints and Outage Plan



# Summary Schedule of SP1 LLE Delivery schedule and contractor's anticipated work plan

The overall project schedule reflects preliminary planning-level forecasts available to the project team as of November 2023.



**Reduced Program Window**

## Design and Construction Subcontract for Awarded Scopes

|  |                         |
|--|-------------------------|
| <b>Award</b> SP1 Design Build Subcontract (after receiving DOE approval)   | <b>March 2025</b>       |
| Start Design-Build Subcontract   | Upon Execution of Award |
| Complete Design on Scopes 2 and 3 (receive BIO approval on 100% submittal) | November 2025           |
| Complete Scope 1 Design (receive BIO approval on 100% submittal)           | February 2026           |
| Complete Construction Scope 2  | June 2026               |
| Commission and Transition to Operations Scopes 2                           | August 2026             |
| Complete Construction Scope 3  | October 2026            |
| Commission and Transition to Operations Scopes 3                           | November 2026           |
| Complete Construction Scope 1  | Spring/Summer 2030      |
| Commission and Transition to Operations                                    | Spring/Summer 2030      |
| <b>Close out</b> Subproject 1 Design Build Subcontract                     | <b>Summer 2030</b>      |

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# Temporary Power



# Temporary Power

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- Each scope has varying temporary power requirements as documented in the Subproject 1 Outage Plan. Any temporary generator power sustaining operational loads will need to demonstrate a high level of reliability and operate on a 24/7 schedule with a SPARE of each site ready for replacement on site
- Generators provided by subcontractor, installation by SLAC
- The Design-Build Subcontractor shall submit a Temporary Power Plan for each discrete scope of work
- Some scopes may require additional outages and temporary power outside the Subproject 1 Outage Plan as the subcontractor's schedule is coordinated in detail with various science programs and stakeholders

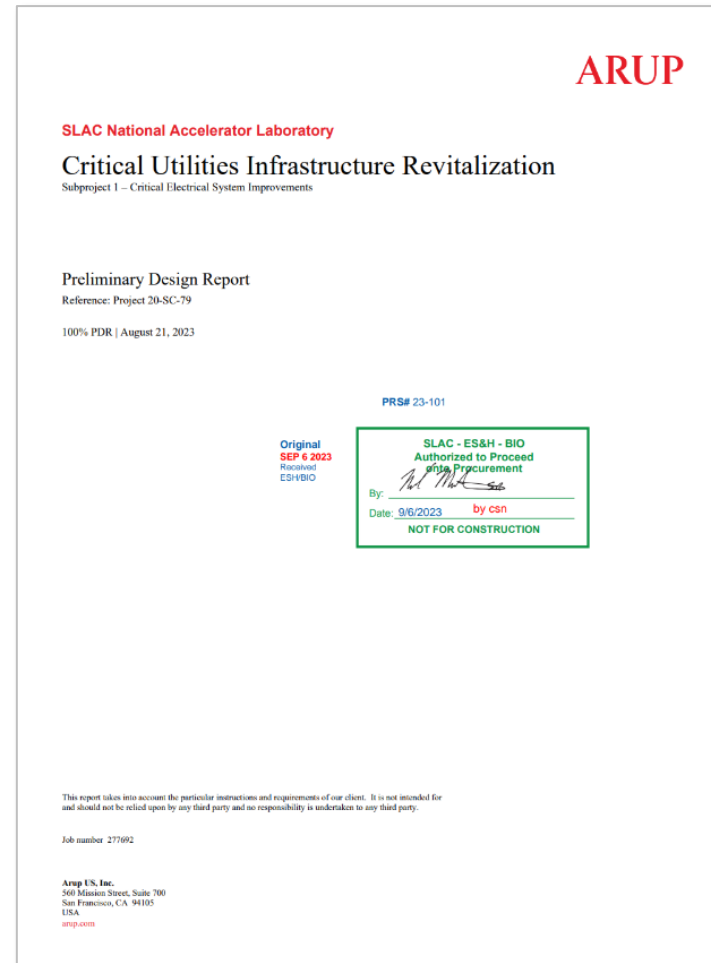
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# Preliminary Design Report and Specifications

# Preliminary Design Report and Specifications

This Preliminary Design Report along with the Concept Sketches and Performance Specifications are complementary to each other.

The Preliminary Design Report includes functional, programmatic, architectural, engineering, and background information for the Design-Build Subcontractor to submit a Final Design and Technical Proposal to carry the Project to completion.



All changes from the BIO approved job set of plans and specifications shall be submitted to and approved by the BIO office prior to the changes being made in the field.

Original Received SEP 6 2023

PRIS# 23-101

SLAC - ES&H - BIO Authorized to Proceed with Procurement

Date: 9/8/2023 by csn

NOT FOR CONSTRUCTION

| Section | Title  |
|---------|--|
| 010000  | General Requirements   |
| 012500  | Substitution Procedure   |
| 012613  | Requests for Information (RFI)                                     |
| 012900  | Payment Procedures   |
| 013100  | Project Management and Coordination                                |
| 013119  | Project Meetings   |
| 013200  | Construction Progress Documentation                                |
| 013300  | Submittal Procedures   |
| 013301  | Design Substantiation and Submittal Procedures                     |
| 013523  | Owner Safety Requirements  |
| 013543  | Environmental Procedures   |
| 013553  | Security Procedures  |
| 014000  | Quality Requirements   |
| 014200  | References   |
| 014523  | Testing and Inspecting Services                                    |
| 015000  | Temporary Facilities and Controls                                  |
| 015639  | Temporary Tree and Plant Protection                                |
| 017419  | Construction Waste Management and Disposal                         |
| 017700  | Closout Procedures   |
| 017823  | Operation and Maintenance Data                                     |
| 017836  | Warranties   |
| 017839  | Project Record Documents   |
| 017900  | Demonstration and Training   |
| 018113  | Sustainable Design Requirements                                    |
| 018119  | Indoor Air Quality Requirements                                    |
| 019113  | General Commissioning Requirements                                 |
| 260010  | General Electrical Requirements                                    |
| 260513  | Medium Voltage Cables  |
| 260519  | Low Voltage Wires, Cables, and Connectors                          |
| 260526  | Grounding  |
| 260529  | Supporting Devices   |
| 260533  | Raceway  |
| 260534  | Boxes for Electrical Systems                                       |
| 260536  | Cable Trays for Electrical Systems                                 |
| 260543  | Underground Ducts, Electrical Manholes, Handholes, & Utility Boxes |

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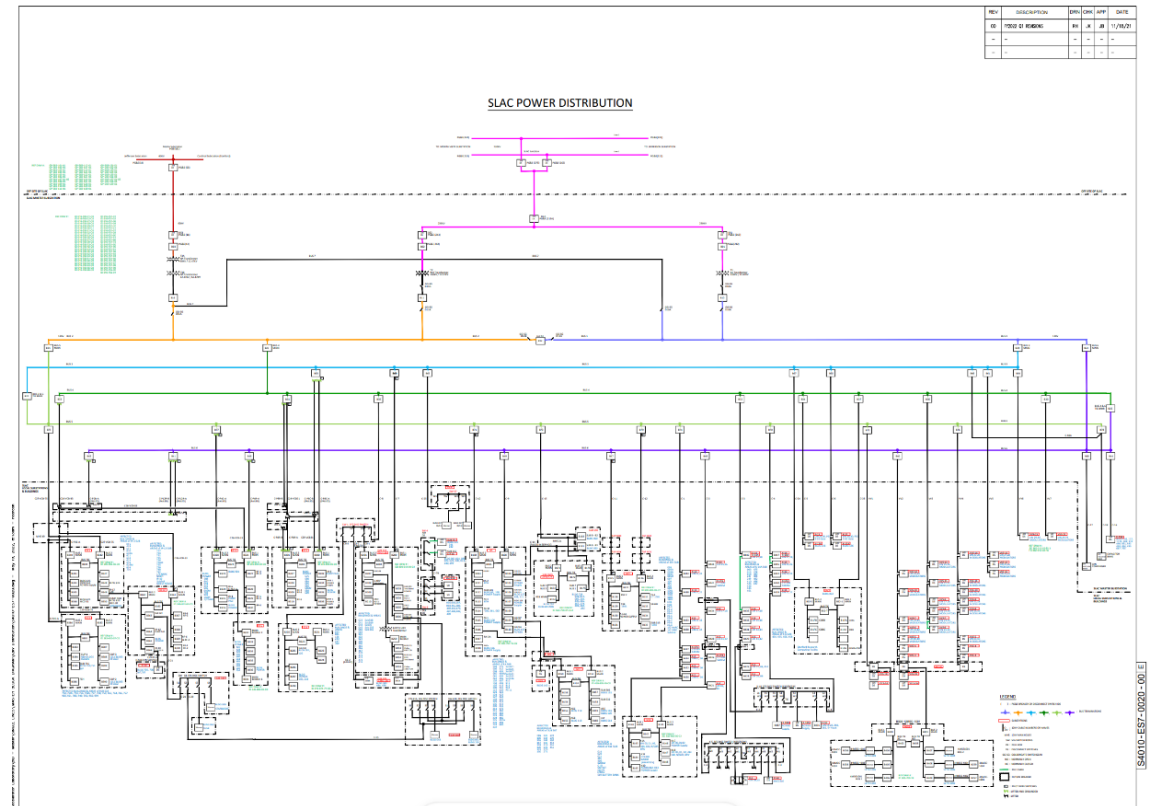
# As-built Documents



# As-Built Documents

## The Design-Build Subcontractor shall:

- Verify and validate existing conditions prior to the start of construction
- Provided record drawings are to be considered diagrammatic in nature
- Identify any ambiguity in the drawings and work with SLAC SMEs to verify existing conditions
- Missing information that is needed to complete the design drawings shall be supplemented



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Other construction projects will be concurrent at SLAC





*Thank  
You*



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