Pacific Gas and Electric Company

BRANDON LIDDELL
SENIOR LAND PLANNER
LAND & ENVIRONMENTAL MANAGEMENT

245 MARKET STREET
SAN FRANCISCO, CA 94109

MAILING ADDRESS:
MAIL CODE N10A
PO BOX 770000
SAN FRANCISCO, CA 94177

March 13, 2018

Ms. Billie Blanchard
California Public Utilities Commission
505 Van Ness Avenue
San Francisco, CA 94102

RE: Ravenswood-Cooley Landing 115 kV Reconductoring Project (A. 17-12-010)
Response to California Public Utilities Commission Data Request No.1

Dear Ms. Blanchard:

This letter is in response to Data Request No.1 dated February 14, 2018 in which you identify additional items that require information from PG&E to continue your review of PG&E's application (A.12-01-012) for a Permit to Construct the Ravenswood-Cooley Landing 115 kilovolt (kV) Reconductoring Project (project). The original text for each Data Request item identified by the CPUC is included in Attachment 1, followed by PG&E's response.

This document includes the following attachments:

- Attachment 1. PG&E Responses to Data Request No. 1
- Attachment 2. CalEEMod Files
- Attachment 3. PG&E Drawing No. 405799 – Existing Tower Configuration
- Attachment 4. PG&E Drawing No. 3010510 – Cage-top Extensions
- Attachment 5. PG&E Drawing No. 325992 – OPGW Peaks
- Attachment 6. Cooley Landing Substation Single-line Diagram and General Layout
- Attachment 7. Estimated Daily Trips During AM and PM Peak Hours

We trust the information provided herein is fully responsive to your requests. However, should you have any further questions, please do not hesitate to contact me at (415) 973-4893.

Sincerely,

Brandon Liddell
Senior Land Planner

Enclosure(s) electronic

cc:
Mike Monasmith, California Energy Commission
Mathew Swain, PG&E Law Department
Scott Oppelt, Stantec

Attachment 1
PG&E Responses to Data Request No. 1

Attachment 1: PG&E Responses to Data Request No. 1

Ravenswood Data Request No. 1 includes the first round of data requests for the following issue areas:

- Air Quality
- Project Description
- Transportation and Traffic

Air Quality

AQ-1 Air Quality and Greenhouse Gas Emissions Assumptions and Methodology with Appendices A and B of the PEA provided construction emissions calculations and assumptions used in CalEEMod. Staff needs the original CalEEMod input and output files as well as the spreadsheet file for the helicopter emissions estimates with live, embedded calculations to complete the analysis of the project. Please provide the original CalEEMod input and output files as well as the spreadsheet file for the helicopter emissions estimates with live, embedded calculations.

PG&E Response: Revised CalEEMod input and output files, as well as the Excel spreadsheet file for the helicopter emissions estimates with live, embedded calculations are provided as Attachment 2 to this response.

AQ-2 The project is scheduled to begin construction in September 2020 and be completed in December 2020. However, Appendix A of the Air Quality and Greenhouse Gas Emissions Assumptions and Methodology shows that the applicant used either 2021 or 2022 as the operational year for different phases in CalEEMod for emissions estimates. Staff needs to understand how the assumption of operational year would affect the emissions estimates. Please justify the use of either 2021 or 2022 as the operational year in CalEEMod.

PG&E Response: The operational year should be 2021 for all phases because the project will be operational in 2021. However, the selected operational year does not affect the CalEEMod construction emissions calculations. This is because the construction emissions are based on the construction year, which was set to 2020 for the CalEEMod run.

AQ-3 Please update the emissions estimates with the operational year set at 2020 if it would result in more conservative construction period emissions.

PG&E Response: As stated above, the selected operational year does not affect the construction phase emissions calculations. No updates to the construction emissions calculations are necessary to reflect the operational year.

AQ-4 PEA Appendix A of the Air Quality and Greenhouse Gas Emissions Assumptions and Methodology shows that the applicant assumed construction would occur 7 days per week in CalEEMod. However, pages 2-18 and 3.1-24 of the PEA show that construction would occur 5 days per week. Staff needs to know which version is more accurate. Please clarify how many days per week that construction would occur.

PG&E Response: The assumption that construction would typically occur 5 days per week stated on PEA pages 2-18 and 3.1-24 is the correct workweek assumption. The CalEEMod modeling used 7 days per week because work could conceivably occur on

any day of the week if road closures or planned outages were scheduled for Saturday or Sunday. For the emissions calculations, the total estimated work days and hours of equipment use by construction phase were reflected in the modeling. Thus, regardless of whether 5 or 7 days was used, the total anticipated hours of usage have been accounted for in the modeling.

AQ-5 PEA Tables 2 and 4 in Air Quality and Greenhouse Gas Emissions Assumptions and Methodology summarize the parameters and assumptions of the off-road construction equipment and construction offsite trips. Appendix A of the document shows the detailed parameters and assumptions used in CalEEMod. Staff noticed the following inconsistencies between the summary tables (Tables 2 and 4) and Appendix A: Off-road Equipment during the Work Area Establishment and Removal Phase: Table 2 shows that there would be three units of off-road equipment during the Work Area Establishment and Removal phase. Appendix A shows that there would be a total of six off-road units of equipment during the Work Area Establishment and Removal phase: three for architectural coating and the other three for building construction. Staff needs to confirm whether Table 2 missed the three units of off-road equipment for architectural coating.

PG&E Response: The CalEEMod default construction phases were deleted from the model and replaced with project-specific construction phases except for the "architectural coating" phase, which should have been deleted but was missed. However, emissions from equipment associated with the "architectural coating" phase were not included in the modeling since the modeling run did not include any equipment hours for that phase. Table 2 in the Air Quality and Greenhouse Gas Emissions Assumptions and Methodology is correct and only includes the 3 pieces of off-road equipment.

AQ-6 Off-road Equipment Ratings during the Foundation Work Phase: Table 2 shows that the ratings of the rough terrain forklift and skid steer during the Foundation Work phase would be 125 and 66 horsepower (hp) respectively. However, Appendix A shows that the applicant assumed in CalEEMod that the ratings of the rough terrain forklift and skid steer during the Foundation Work phase would be 100 and 65 hp respectively. Staff needs to know which version of the assumptions is more accurate.

PG&E Response: The horsepower ratings for the rough terrain forklift and skid steer should be 100 and 65 horsepower (hp) respectively, as shown in the CalEEMod model runs included as Appendix A of the Air Quality and Greenhouse Gas Emissions Assumptions and Methodology.

AQ-7 Offsite Trips during the Staging Area – Receiving and Distribution Phase: Table 4 shows that during the Staging Area – Receiving and Distribution phase, there would be one boom truck, two light-duty pickup trucks, and one water tender with pickup truck traveling 6, 5, and 5 miles per day of operation respectively. In Appendix A, staff could not find the 5-mile trips used in CalEEMod during the Staging Area – Receiving and Distribution phase. Staff needs to know how the 5-mile trips were modeled in CalEEMod.

PG&E Response: The 6-mile trip for the boom truck was modeled as a hauling trip with the total number of trips listed as 20, and the mileage per haul trip length set to 6. The water tender with pickup truck was modeled as a vendor trip; however, CalEEMod changed the 5-mile trip length to the default value of 7.3 miles. The two

light-duty pickup trucks were included with the Environmental Monitoring, Project Management /Inspection, and Worker Commutes, but the 25-mile trip length was used. Both differences resulted in a slight overestimation of emissions for the project.

AQ-8 The note under Table 4 says the vehicle trips for Environmental monitoring, Project Management/Inspection, and Worker Commutes were included in the CalEEMod run for the Staging Area – Receiving and Distribution. The note under Table 2 says there is no off-road equipment use associated with the following phases: Tower Modifications, Guard Structures, Project Management/Inspection, and Worker Commute. Assuming all the 6-mile trips occur during the Staging Area, Tower Modifications, Guard Structures, Environmental monitoring, and Project Management/Inspection phases shown in Table 4 were all included in the CalEEMod run for the Staging Area phase, the total number for the 6-mile trips would be 8, instead of 20, which the applicant used in CalEEMod as shown in Appendix A. Staff needs to know which version of the assumptions is more accurate. Staff also needs to know whether the applicant considered the differences between the heavy-duty diesel trucks and light-duty gas trucks for the 6-mile trips in the CalEEMod emission estimates.

PG&E Response: The vehicle trips associated with Environmental Monitoring and Project Management/Inspection were included with the Worker Commute trips in CalEEMod with a light-duty auto fleet mix and 25-mile trip length. By using a trip length of 25 miles instead of 6 miles, the emissions were slightly overstated. The 20 haul trips in the CalEEMod run are associated with the boom truck. PG&E did consider the differences between heavy-duty diesel and light-duty gas trucks and separated those out, but as described above, the 6-mile light duty vehicle trips were included with worker commute trips and the longer 25-mile trip length. PG&E has revised the CalEEMod assumptions to better align with Table 4 so that Worker Commute, Environmental Monitoring, and Project Management/Inspection are modeled separately.

AQ-9 Table 4 shows that the estimated quantity of units of equipment for worker commute would be 15. However, Appendix A shows that the applicant assumed in CalEEMod that the worker trip number would be 25, which was presented in the tables for the Staging Area – Receiving and Distribution phase. Staff needs to know which version of the assumptions is more accurate.

PG&E Response: The correct number of worker commute trips is 15. As stated above, the CalEEMod run has been revised to model Worker Commute, Environmental Monitoring, and Project Management/Inspection phases separately with vehicle trips that align with Table 4.

AQ-10 Please provide clarifications on the above inconsistencies between the summary tables (Tables 2 and 4) and Appendix A and re-compute construction period emissions as needed.

PG&E Response: Please see the above responses for clarifications between the summary tables (Tables 2 and 4) and Appendix A. As stated above, the CalEEMod run has been revised to model Worker Commute, Environmental Monitoring, and Project Management/Inspection phases separately so that vehicle trips align with Table 4. The revised CalEEMod input and output files are included as Attachment 2. This has resulted in a slight decrease in estimated construction emissions for the project when compared to the emissions estimates presented in the PEA.

Project Description

PD-1 PEA Section 2.5.1 states that the proposed project would require replacing both the conductors and insulators, and provide spacing between conductors both horizontally and vertically. Would the proposed changes to the conductors and insulators affect the spacing between the conductors and potentially require changes to the towers in order to maintain GO 95 spacing requirements? Show tower structure and dimensions.

PG&E Response: The reconductored power line will maintain GO 95 spacing requirements between conductors; no changes to the towers will be required to maintain GO 95 spacing. For existing and proposed tower structures and dimensions, please refer to PG&E's Response to California Public Utilities Commission Review of Application Completeness, dated February 15, 2018, Attachments 5 and 6. For ease of review, the typical drawings referenced in the February 15, 2018 letter are included as Attachments 3 and 4 to this response.

PD-2 Section 2.5.2 states that all towers required modification. Please provide the existing, and modified tower configurations, dimensions, and measurements.

PG&E Response: Please refer to Table 1 for existing and proposed tower heights. For existing and proposed tower structures and dimensions, please refer to PG&E's Response to California Public Utilities Commission Review of Application Completeness, dated February 15, 2018, Attachments 5, 6, and 7. For ease of review, the typical drawings referenced in the February 15, 2018 letter are included as Attachments 3, 4, and 5 to this response.

Table 1: Existing and Proposed Tower Heights

Tower	Tower Modifications	Foundation Improvements	Existing Height (feet)	Proposed Height (feet)
1	Cage-top Extension, Body Modification, Fiber Peak	Yes	116.8	131.3
2	Cage-top Extension, Body Modification, Fiber Peak	Yes	118.5	133
3	Fiber Peak	No	121	125.5
4	Fiber Peak	No	138.4	142.
5	Fiber Peak	No	137.4	141.9
6	Fiber Peak	No	132.8	137.3
7	Fiber Peak	No	125.1	129.6
8	Body Modification, Fiber Peak	Yes	85.7	90.2
9	Body Modification, Fiber Peak	Yes	84.7	89.2
Note: This table is preliminary and subject to change based on CPUC requirements, final engineering, ground conditions at time of construction, and other factors.				

PD-3 PEA Section 2.5.5 discusses a modification will be required in the Cooley Landing Substation. Please provide one-line diagrams of the Cooley-Landing substation. Please show bay arrangements and breaker ratings.

PG&E Response: Please refer to Attachment 6 for the single-line diagram of Cooley Landing Substation showing the breaker ratings, the general arrangement map showing the locations of existing bay arrangements and existing Circuit Breaker 122,

and the new optical fiber ground wire (OPGW) line termination point at the existing control building.

PD-4 PEA Section 2.0 states that the proposed new conductor, 477 kcmil steel-supported aluminum (ACSS) conductors, has a relatively heavy weight and a high coefficient of thermal expansion. Aluminum composite core conductors (ACCC) may be lighter and combine high-temperature low-sag properties with a low coefficient of thermal expansion. Was the use of a composite core conductor considered? Could a lighter composite core conductor provide the same or greater reliability without reinforcing towers 1, 2, 8 and 9?

PG&E Response: PG&E considered the use of composite core conductor during the engineering phase of the project. PG&E determined that a lighter weight composite core conductor still requires reinforcement of Towers 1, 2, 8, and 9. PG&E selected ACSS conductor for this project since the cost of ACSS is significantly less in material cost than ACCC. Preliminary assessments also determined that the blow out of a lighter-weight conductor such as ACCC would sway further than ACSS and could require wider easements per General Order 95.

▪ Transportation and Traffic

T-1 Regarding PEA Section 2.7.7. Please provide more detail regarding trip generation during AM and PM peak hours. The PEA states that approximately 15 workers would be at the project site on a typical day, with a maximum of 25 workers during peak construction, but it does not identify the timing of worker or truck trips. Provide a trip generation table that shows number of truck trips and worker trips expected to take place during the AM and PM peak hours during both average construction and peak construction.

PG&E Response: Please refer to Attachment 7 for a trip generation table that shows the estimated number of truck trips and worker trips expected to take place during the AM and PM peak hours during both average construction and peak construction. Consistent with PEA Section 3.16.4.3, the project will not generate additional AM and PM peak hour trips that would cause roadways to exceed LOS standards in the 2015 San Mateo County Congestion Management Program (CMP).

T-2 Regarding PEA Section 2.5.4.1. Please provide the timing and duration of anticipated lane closures. The PEA states that a combination of temporary lane closures and rolling road blocks would be required to install nets onto the guard structures. Identify all phases of the project when lane closures would be required, the anticipated locations of lane closures, and the anticipated general times of day and duration of closures.

PG&E Response: PG&E will need to implement a temporary lane closure to install K-Rails along the eastbound lane of State Route 84 to secure a safe road shoulder for delivery of construction materials at Tower 2. The installation of these K-Rails will take approximately 6 hours to install and 6 hours to remove. PG&E would likely install K-Rails during night time hours typically between 10:00 PM and 5:00 AM per anticipated Caltrans encroachment permit requirements.

PG&E will implement rolling stops for approximately 10 to 15 minutes at a time on State Route 84 to install netting across the highway. PG&E may require up to 10

rolling stops to complete. PG&E would likely start installation during night time hours typically between 10:00 PM and 5:00 AM per Caltrans encroachment permit requirements. Removal of netting will be completed during the same timeframes and will take the same amount of time as installation. PG&E will also need one rolling stop to install the OPGW line with a helicopter across State Route 84. The rolling stop will take less than 10 minutes and occur between daylight hours and 9:00 AM on a Sunday, per Caltrans encroachment permit requirements.

PG&E will also need to implement a temporary lane closure along the northbound lane of Bay Road to transport matting, equipment, and construction materials to Tower 8. This temporary lane closure would likely occur daily between 7:00 AM and 5:00 PM for approximately 5 to 10 days per Midpeninsula Regional Open Space District (District) Permit to Enter requirements.

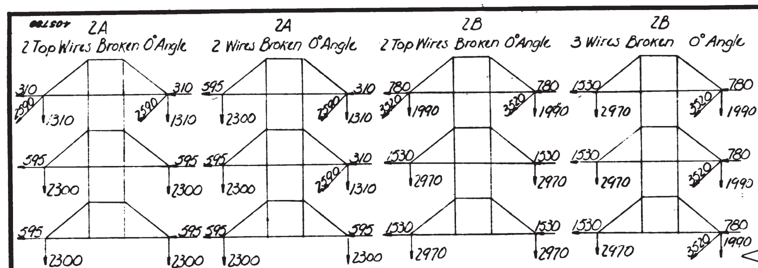
Netting and guard structure installation across Bay Road adjacent to Tower 8 will take approximately 5 hours to install and 5 hours to remove and will likely occur between 7:00 AM and 5:00 PM per District Permit to Enter requirements. PG&E will likely implement temporary stops with flaggers for installation and removal of netting, installation of OPGW line, and temporary lane closures for guard pole installations per District Permit to Enter requirements.

T-3 Regarding PEA Section 1.2.1. Please include information about any project review by or coordination with the Palo Alto Airport. The PEA includes a list of agencies contacted about the project but does not include the Palo Alto Airport. Please indicate if the Palo Alto Airport has reviewed the project, and if so, what their comments were. The CEC and the CPUC have received copies of the FAA Determinations.

PG&E Response: PG&E has not consulted with or received comments from the Palo Alto Airport. PG&E reviewed the Comprehensive Land Use Plan (CLUP) to assess the compatibility of the project scope with the CLUP. The Palo Alto Airport CLUP has adopted Federal Aviation Regulations Part 77 (Part 77) imaginary surfaces to determine height restrictions for natural and artificial objects. PG&E submitted Federal Aviation Administration (FAA) Notice of Proposed construction for all tower modifications and received determinations from the FAA per Part 77. As discussed above in the question, PG&E has submitted copies of the FAA determinations to the CPUC and CEC. PG&E plans to follow the guidance from the FAA as conditions of the project.

Attachment 2
CalEEMod Files (transmitted electronically)

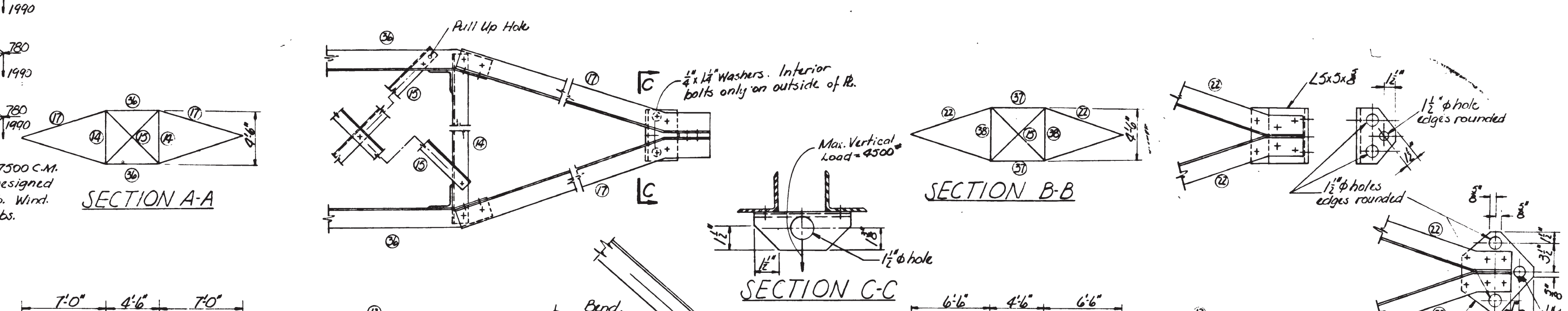
Attachment 3
PG&E Drawing No. 405799 – Existing Tower Configuration

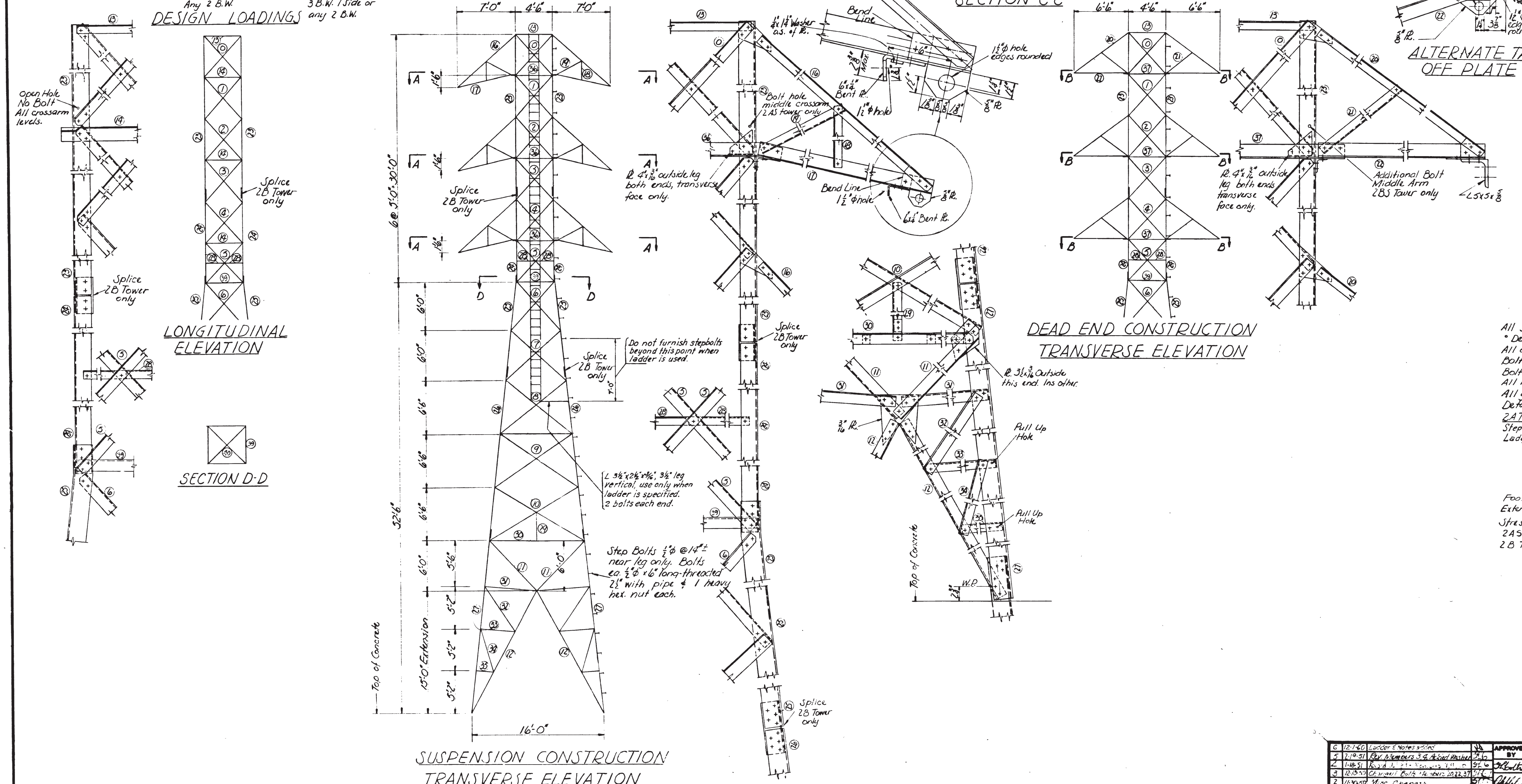


	2A Tower	2B Tower	
Angle	0°	0°	15° Max.
Maximum Span	1100 ft.	2850 ft.	1100 ft.
Max. Sum Adjacent Spans	2200 ft.	5700 ft.	2200 ft.
Dead Weight Wire 2 Spans	4000 ft.	5000 ft.	5000 ft.
Maximum Tension	2590 lbs.	3520 lbs.	3520 lbs.
Dead Weight Wire 1 Span	2000 ft.	3200 ft.	3200 ft.
Maximum Uplift	0	2100 ft.	2100 ft.
	7' Suspension Arm Any 2 B.W.	7' Suspension Arm 3 B.W. 1 Side or any 2 B.W.	

Conductor: 397500 C.M. ACSR Ibis. Designed for 25°F, 8 lb. Wind. Final 3520 lbs.

DESIGN LOADINGS





LIST OF MEMBER SIZES

Mark No.	No. Req'd.	2A Tower	Bolts w/ hex. nuts	2B Tower	Bolts w/ recessed nuts	Remarks
0	8	2x1 1/2x1/8	2	2x1 1/2x1/8	2	
1	8	"	2	2x2x1/8	2	
2	8	"	2	"	2	
3	8	2x1 1/2x3/16	2	2x1 1/2x1/4	2	
4	8	"	2	"	2	
5	8	2x2x3/16	2	3x2 1/2x3/16	3	
6	8	2x2x3/16	2	2 1/2x2 1/2x3/16	2	
7	8	2x2x1/8	2	2 1/2x2x3/16	2	
8	8	2x2x1/8	2	2 1/2x2 1/2x3/16	2	
9	8	2 1/2x2x3/16	2	"	2	
10	8	2 1/2x2 1/2x3/16	2	2 1/2x2 1/2x3/16	2	
11	8	2x1 1/2x1/8	3	2x1 1/2x1/4	3	
12	8	2x1 1/2x1/8	3	2x1 1/2x3/16	3	
13	4	1 1/2x1 1/2x1/8°	1	1 1/2x1 1/2x1/8°	1	
14	6	2 1/2x2x1/8	2	2 1/2x2x1/8	2	
15	6	1 1/2x1 1/2x1/8	1	1 1/2x1 1/2x1/8	1	
16	12	"	2	1 1/2x1 1/2x1/8	2	
17	12	2 1/2x2 1/2x3/16	2	2 1/2x2 1/2x3/16	2	
18	12	1 1/2x1 1/2x1/8°	1	1 1/2x1 1/2x1/8°	1	
19	12	"	1	"	1	
20	12	—	—	2x1 1/2x1/8	2	
21	12	—	—	1 1/2x1 1/2x1/8°	1	
22	12	—	—	2 1/2x2 1/2x3/16	3	
23	4	3x3x3/16	—	3x3x3/16	4	
24	4	"	8	3x3x1/4	10	
25	4	3 1/2x3 1/2x1/4	—	4x4x5/16	10	
26	4	"	10	4x4x3/16	10	
27	4	"	10 12	4x4x3/8	12 14	2'-6" to 15'-0" Ext. 17'-6" to 25'-0" Ext.
28	8	1 1/2x1 1/2x1/8°	1	1 1/2x1 1/2x1/8°	1	
29	4	"	1	"	1	
30	4	2Ls 2x2x1/8 T	2	2Ls 2x2x1/8 T	2	
31	8	2x2x1/8°	2	2x2x1/8°	2	
32	8	"	1	"	1	
33	8	1 1/2x1 1/2x1/8°	1	1 1/2x1 1/2x1/8°	1	
34	8	1 3/4x1 3/4x1/8°	1	1 3/4x1 3/4x1/8°	1	
35	8	1 1/2x1 1/2x1/8°	1	1 1/2x1 1/2x1/8°	1	
36	6	2 1/2x2 1/2x3/16	2	2 1/2x2 1/2x3/16	2	
37	6			2 1/2x2 1/2x3/16	3	
38	6			2 1/2x2x1/8	2	
39	4	2x2x1/8	2	2x2x3/16	2	
40	2	1 3/4x1 3/4x1/8	2	1 3/4x1 3/4x1/8	2	

NOTES

All steel shall meet the requirements of A.S.T.M. Spec. A7-49T.
° Denotes optional use of structural grade steel. All plates structural grade steel
All other angles to have a minimum elastic limit of 45000 psi.
Bolts 1/2" φ; holes 17/32" φ.
Bolt all diagonal intersections.
All material to be hot dip galvanized.
All gusset plates 3/16" thick unless otherwise noted.
Details for all faces alike unless otherwise shown.
2A Tower - bolts with hex. nuts; 2B Tower - bolts with recessed nuts.
Step bolts to be used for tangent towers & angle towers where line angle does not exceed 2°
Ladder to be used for angle towers where line angle exceeds 2°

REFERENCES

Footings for Types 2A & 2B Towers Dwg. 406816
Extensions for Type 2A & 2B Towers Dwg. 406734
Stress Diagrams 2A & 2B Towers
2AS, 2BS Towers Dwg. 406745
2B Transposition Tower Dwg. 406854

THIS DRAWING HAS BEEN REPRODUCED WITHOUT CHANGE FROM ORIGINAL DRAWING, CHANGE NO. 6 DATE 1-8-63 APPROVED ____

REGISTERED CIVIL ENGINEER WALTER DREYER NO. 404 STATE OF CALIFORNIA

NO	DATE	DESCRIPTION		APPR'D
8	7-31-73	Members 5 & 25 Revd.	J.M.	FAK
7	1-4-72	[illegible]	[illegible]	[illegible]
6	12-1-60	Ladder & Notes added		
5	2-19-51	Rev. Members 3 & 4, Added Washer		
4	1-18-51	Revised [illegible] Members [illegible]		
3	12-15-50	Changed Bolts Members 20, 22, 37		
2	11-30-50	Misc. Changes		
1	11-16-50	Changed members, step bolts, Add'l bolts		

TABLE OF CHANGES

APPROVED BY

GM DRAWING LIST

BY O. Thompson
DR. R.H.H.
CH. 9.L.B.
O.K. 7WB
DATE 10-20-50
SCALES None

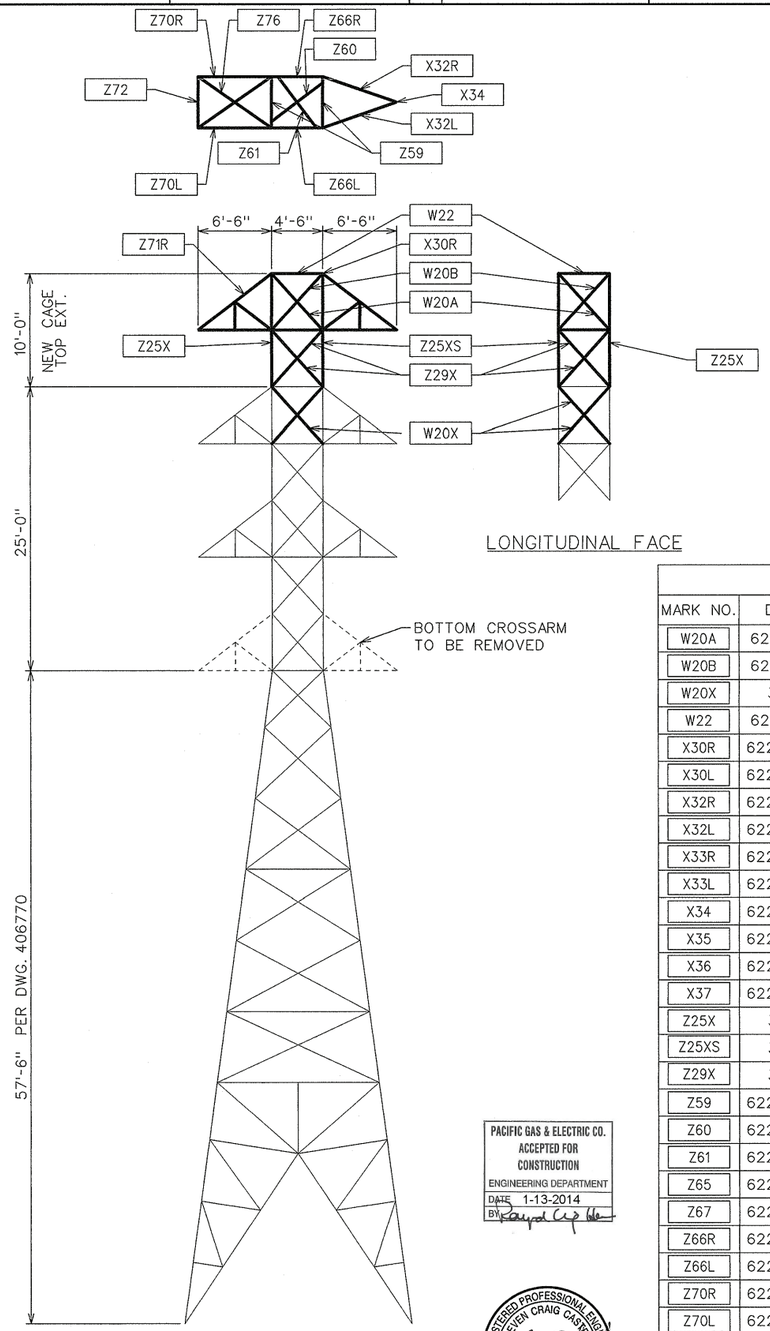
TYPES 2A & 2B
110 KV DOUBLE CIRCUIT TOWERS

DEPARTMENT OF ENGINEERING
PACIFIC GAS AND ELECTRIC COMPANY
SAN FRANCISCO CALIFORNIA

BILL OF MATERIAL
SUPERSEDES
SUPERSEDED BY
SHEET NO. SHEETS
DRAWING NUMBER 405799 CHANGE 8

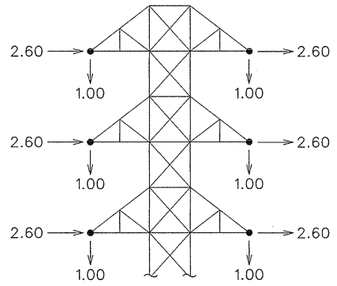
SCAN 8

Attachment 4
PG&E Drawing No. 3010510 – Cage-top Extensions



LONGITUDINAL FACE

TOWER
(TYPE 2D)



INTACT WIRE

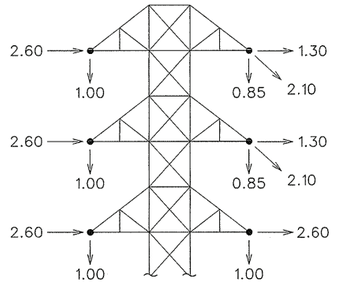
TOWER WORKING LOADS SHOWN

LOADING DIAGRAM (KIPS)
N.T.S.

TOWERS ARE STRUCTURALLY ADEQUATE FOR:

DESIGN CODE - ASCE 10-97
INTACT WIRE S.F.=1.5
AT 25°F, 8# WIND

T=TRANSVERSE
V=VERTICAL
L=LONGITUDINAL



BROKEN WIRE

TOWER WORKING LOADS SHOWN

LOADING DIAGRAM (KIPS)
N.T.S.

TOWERS ARE STRUCTURALLY ADEQUATE FOR:

DESIGN CODE - ASCE 10-97
ANY 2 PHASES BROKEN WIRE S.F.=1.0
AT 25°F, 8# WIND

LIST OF NEW MEMBERS
(ALL FOUR FACES TYPICAL)

MARK NO.	DRAWING	NO. REQUIRED PER TOWER	DESCRIPTION	LENGTH FT	LENGTH IN	NO. OF BOLTS PER CONNECTION	APPROX. WT. EA. (LBS)
W20A	622771 SH.6	4	L 2x1½x⅛	6	7½	2	10.9
W20B	622771 SH.6	4	L 2x1½x⅛	6	7½	2	10.9
W20X	3010512	8	L 2x2x3/16	6	7½	2	16.2
W22	622771 SH.6	4	L 1½x1½x⅛	4	4½	1	5.4
X30R	622782 SH.9	1	PL 4½x3/16	0	9⅞	-	2.3
X30L	622782 SH.9	1	PL 4½x3/16	0	9⅞	-	2.3
X32R	622782 SH.9	1	L 2½x2½x3/16	6	11⅛	-	21.3
X32L	622782 SH.9	1	L 2½x2½x3/16	6	11⅛	-	21.3
X33R	622782 SH.9	1	L 2x1½x⅛	8	0	2	11.5
X33L	622782 SH.9	1	L 2x1½x⅛	8	0	2	11.5
X34	622782 SH.9	1	L 5x5x⅝	0	6	-	10.0
X35	622782 SH.9	1	PL 6x3/16	0	7 15/16	-	2.4
X36	622782 SH.9	2	L 1½x1½x⅛	3	11 7/16	1	4.9
X37	622782 SH.9	2	L 1½x1½x⅛	2	6 3/16	1	3.1
Z25X	3010512	3	L 3x3x¼	9	11⅞	-	48.9
Z25XS	3010512	1	L 3x3x¼	9	11⅞	-	48.9
Z29X	3010512	8	L 2x2x3/16	6	6⅛	2	15.9
Z59	622768 SH.7	2	L 2½x2½x⅛	4	10⅞	-	10.2
Z60	622768 SH.7	1	L 1½x1½x⅛	6	2¼	1	7.6
Z61	622768 SH.7	1	L 1½x1½x⅛	6	1 7/16	-	7.5
Z65	622768 SH.7	4	PL 4½x3/16	0	4⅜	-	1.0
Z67	622768 SH.7	2	PL 4½x3/16	0	7¼	-	1.7
Z66R	622768 SH.7	1	L 2½x2½x3/16	5	7 13/16	-	17.2
Z66L	622768 SH.7	1	L 2½x2½x3/16	5	7 13/16	-	17.2
Z70R	622768 SH.7	1	L 2½x2½x3/16	6	5 11/16	-	19.9
Z70L	622768 SH.7	1	L 2½x2½x3/16	6	5 11/16	-	19.9
Z71R	622768 SH.7	1	L 1½x1½x⅛	8	0⅛	2	9.8
Z71L	622768 SH.7	1	L 1½x1½x⅛	8	0⅛	2	9.8
Z72	622768 SH.7	1	L 3x3x½	5	5⅞	-	51.6
Z73A	622768 SH.7	1	L 1½x1½x⅛	2	5 15/16	1	3.1

LIST OF NEW MEMBERS
(ALL FOUR FACES TYPICAL)

MARK NO.	DRAWING	NO. REQUIRED PER TOWER	DESCRIPTION	LENGTH FT	LENGTH IN	NO. OF BOLTS PER CONNECTION	APPROX. WT. EA. (LBS)
Z73B	622768 SH.7	1	L 1½x1½x⅛	2	5 15/16	1	3.1
Z74	622768 SH.7	2	L 1½x1½x⅛	3	11 3/16	1	4.8
Z75	622768 SH.7	2	PL 6x3/16	0	8⅜	-	2.6
Z76	622768 SH.7	2	L 1½x1½x⅛	7	2¾	3	8.8
Z77	622768 SH.7	2	PL 8x3/16	0	6⅞	-	2.8
2DX1	3010512	4	L 3x3x¼	0	11½	-	4.7
		6	1/2" STEP BOLT	-	6"	-	0.5
		6	1/2" PIPE	-	4½"	-	0.3
		2	FILLS 11/16"ø x ⅛"	-	-	-	0.16
		2	FILLS 11/16"ø x ¼"	-	-	-	0.20
		6	FILLS 11/16"ø x ⅜"	-	-	-	0.24
		4	FILLS 11/16"ø x ½"	-	-	-	0.4
		114	BOLTS ½" ø	-	1¼"	-	0.19
		52	BOLTS ½" ø	-	1½"	-	0.20
		28	BOLTS ½" ø	-	1¾	-	0.23
						TOTAL WEIGHT	944.2

GENERAL NOTES

1. MATERIAL AND FABRICATION SHALL BE IN ACCORDANCE WITH P. G. & E. ENGINEERING STD. NO. 30, LATEST REVISION.
2. ALL NEW ANGLES SHALL BE GRADE 50 HIGH ELASTIC STEEL. PLATES SHALL BE A36 STEEL.
3. ALL NEW BOLTS SHALL BE ½" DIA. A394 TYPE 1 WITH HVY HEX NUTS. HOLES SHALL BE 9/16" DIA. UNLESS OTHERWISE NOTED.
4. ALL FIELD DRILLED HOLES AND DAMAGED AREAS SHALL BE TREATED WITH P. G. & E. #56 ZINC-RICH PRIMER OR EQUIVALENT.
5. PROVIDE FILLER PLATES AND SHIMS AS REQUIRED.
6. MODIFCATIONS SHOWN ARE FOR CRITICAL TOWERS ONLY. REFER TO STRUCTURE DATA SHEETS FOR COMPLETE LIST OF TOWERS TO BE MODIFIED.

REFERENCES

1. TYPE 2D SINGLE CIRCUIT TOWERS_____406770
2. DETAILS FOR TYPE 2D TOWER_____622768
3. 10'-0" CAGE TOP EXTENSION_____3010511
4. DETAILS FOR TYPE 2B & 2BS TOWER_____622782

PACIFIC GAS & ELECTRIC CO.
ACCEPTED FOR CONSTRUCTION
ENGINEERING DEPARTMENT
DATE 1-13-2014
BY

REGISTERED PROFESSIONAL ENGINEER
STEVEN CRAIG CASTEEL
81622
1-6-2014
CIVIL
STATE OF CALIFORNIA

Burns & McDonnell
SINCE 1898

NO.	DATE	DESCRIPTION	GM/SPEC	DWN	CHKD	SUPV	APVD BY
1	1/6/14	ISSUED FOR CONSTRUCTION	30932678	AJA	AKO	SCC	

REVISIONS

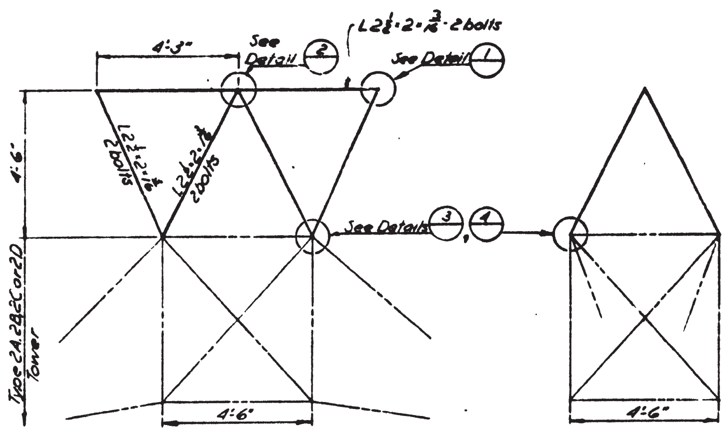
APPROVED BY
GM
SUPV S. CASTEEL
DSGN T. NEIDERT
DWN A. ARTH
CHKD A. K. OO
OK
DATE 12/20/13
SCALES NONE

CIVIL
10'-0" TOP CAGE EXTENSION
TYPE 2D TOWER
SAN LUIS OBISPO-CALLENDAR 115kV NERC PII
ELECTRIC T & D LINE ENGINEERING DEPARTMENT
PACIFIC GAS AND ELECTRIC COMPANY
SAN FRANCISCO, CALIFORNIA

MICROFILM
BILL OF MATL
DWG LIST
SUPSDS
SUPSD BY
SHEET NO. SHEETS
3010510 REV 1

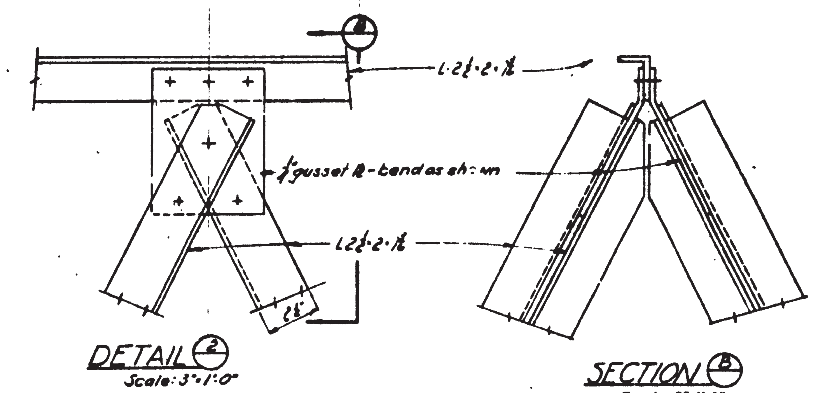
N1808

Attachment 5
PG&E Drawing No. 325992 – OPGW Peaks



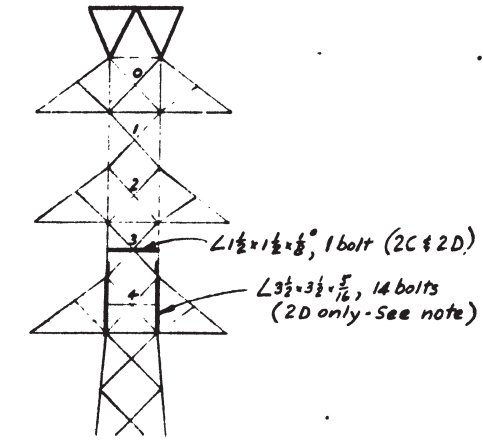
ELEVATION-DOUBLE GROUND WIRE FRAME
Scale: 1/8" = 1'-0"

See Elev. A-A for modifications to cage section of 2C & 2D towers with ground wires.



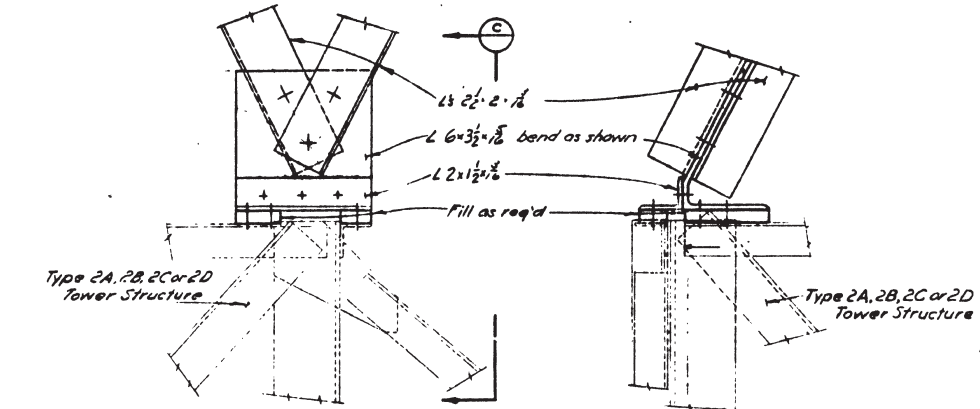
DETAIL ②
Scale: 3" = 1'-0"

SECTION Ⓑ
Scale: 3" = 1'-0"



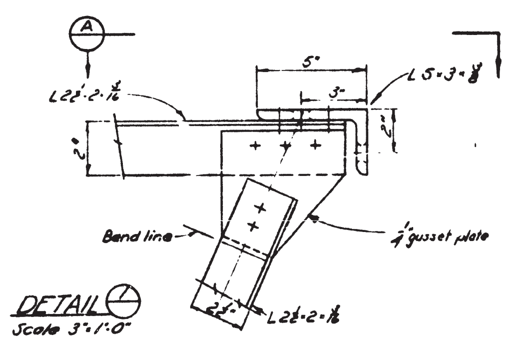
ELEV. A-A

Note: New leg size in panel ④ of 2D tower applies where ground wires are to installed on a new tower or on an existing tower where the line angle exceeds 55°



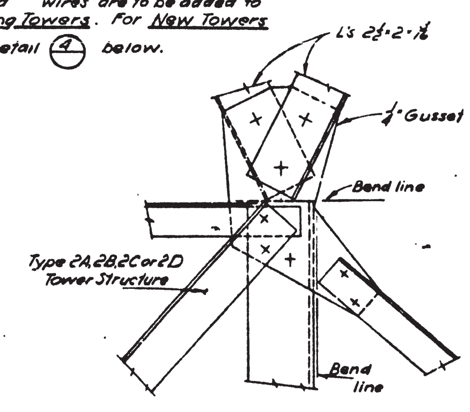
DETAIL ③
Scale: 3" = 1'-0"

SECTION Ⓒ
Scale: 3" = 1'-0"

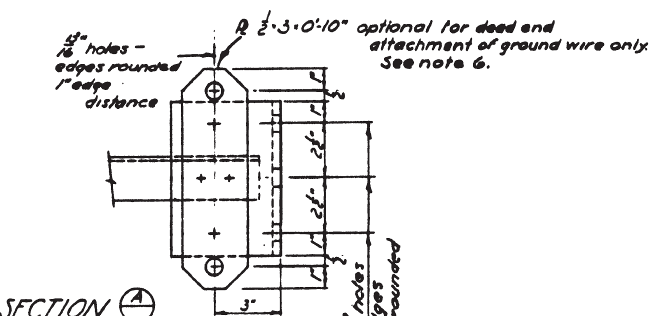


DETAIL ①
Scale 3" = 1'-0"

NOTE: Detail ③ to be used when ground wires are to be added to Existing Towers. For New Towers see Detail ④ below.



DETAIL ④
Scale: 3" = 1'-0"



SECTION Ⓐ
Scale: 3" = 1'-0"

Notes:
1. All steel to meet ASTM A36 except min. elastic limit to be 45,000 psi.
2. All bolts ⅝"φ with heavy hex nuts for 2A tower. All bolts ⅝"φ full shank with recessed hex nuts for 2B, 2C & 2D Towers.
3. All steel hot dip galvanize after fabrication.
4. Ground wire frame designed for ⅜" steel cable, max tension 2500#
5. For rules of location for 2A, 2B, 2C & 2D 110KV Double Circuit Towers With Double Ground Wire Frame, consult Civil Engineering Dept
6. Ground wires to be dead ended when line angle exceeds 25°

REFERENCES:

1.	Types 2A & 2B Towers	405799
2.	Types 2C & 2D Towers	406770

REGISTERED CIVIL ENGINEER
F. F. MAUTZ
No. 5707
STATE OF CALIFORNIA

NO.	DATE	DESCRIPTION	GM	BY	CH.	APPD.	NO.	DATE	DESCRIPTION	GM	BY	CH	APPD.
		TABLE OF CHANGES							TABLE OF CHANGES				

APPROVED BY
GM
SUPT. OF D. Cole
DSGN. K. Gho
DR. H. Bogatka
CH.
O.K.
DATE 5-21-65
SCALES As Noted

DOUBLE GROUND WIRE FRAME FOR TYPES 2A, 2B, 2C & 2D 110KV TOWERS

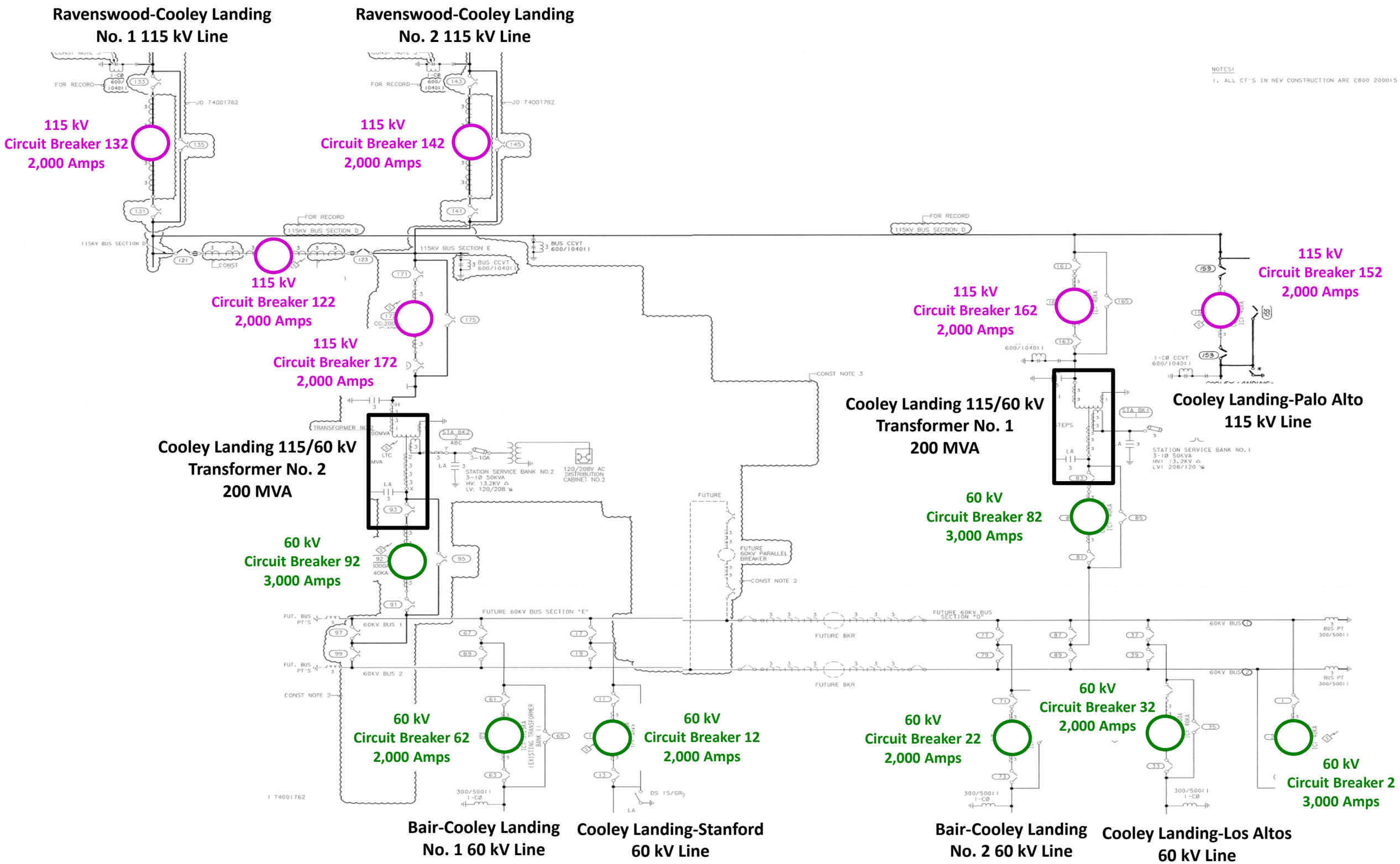
DEPARTMENT OF ENGINEERING
PACIFIC GAS AND ELECTRIC COMPANY
SAN FRANCISCO, CALIFORNIA

BILL OF MATERIAL
DRAWING LIST
SUPERSEDES
SUPERSEDED BY
SHEET NO. SHEETS
DRAWING NUMBER 325992
CHANGE

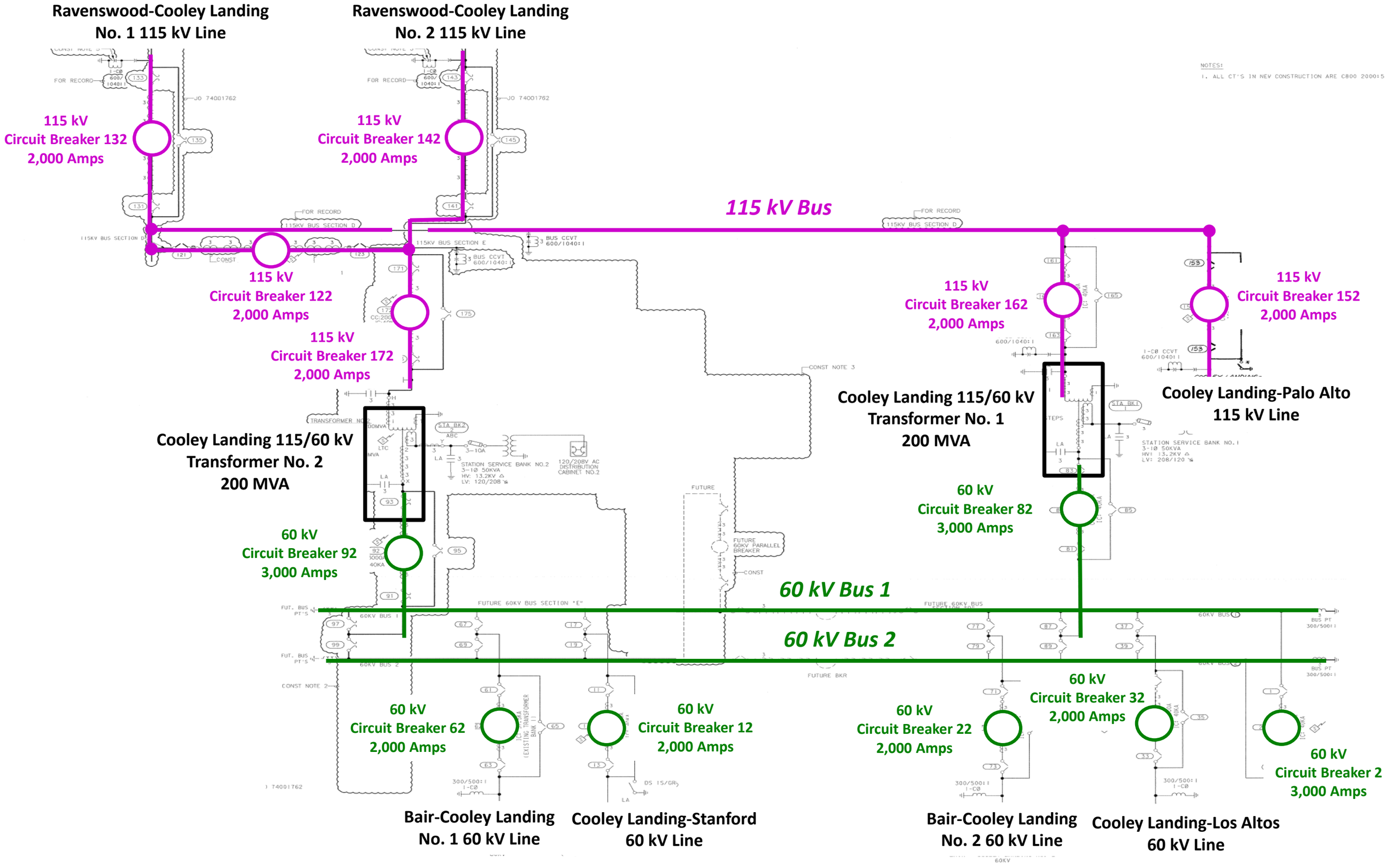
SCAN — IC

Attachment 6
Cooley Landing Substation Single-line Diagram and General Layout

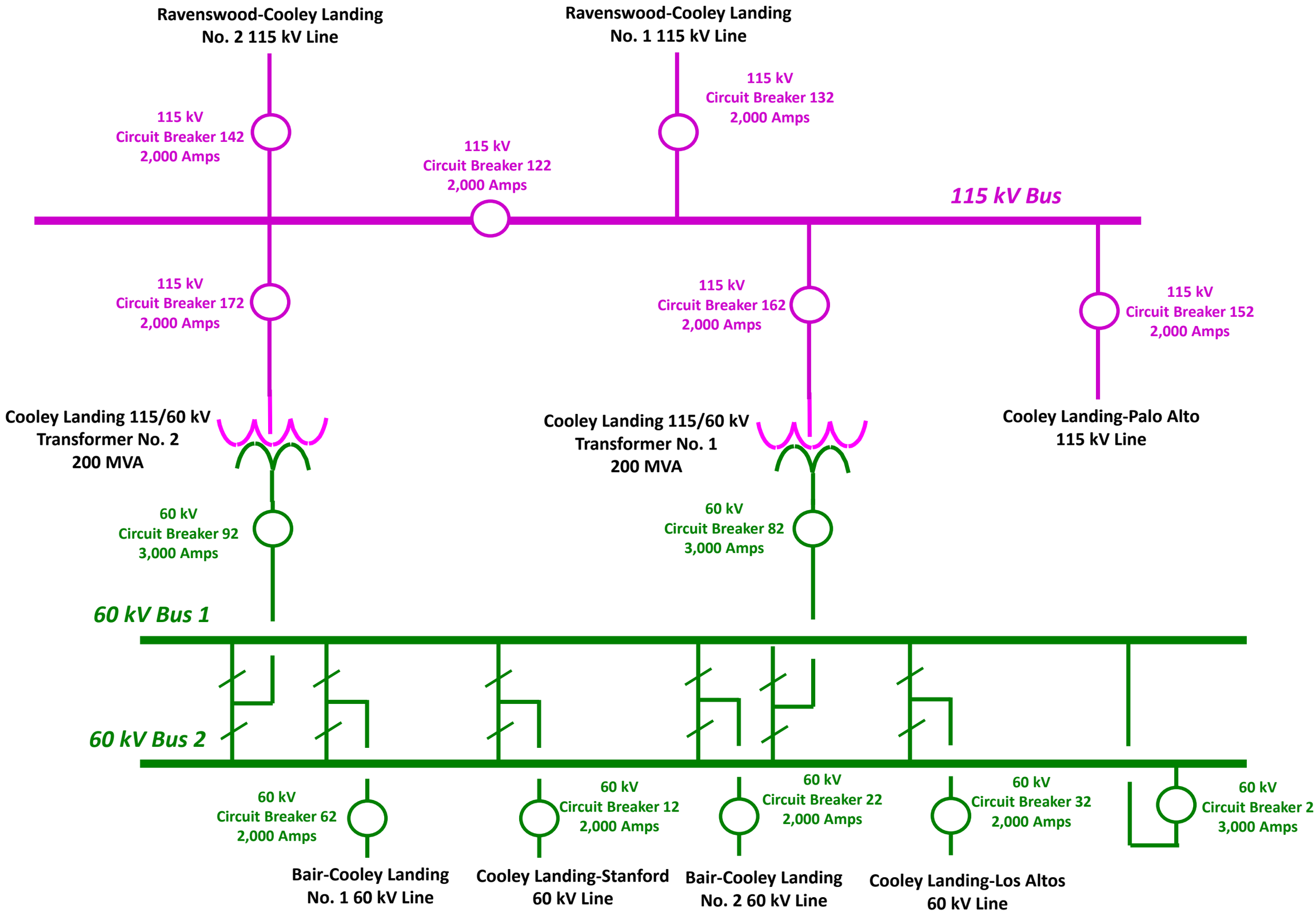
Cooley Landing – Single Line Diagram



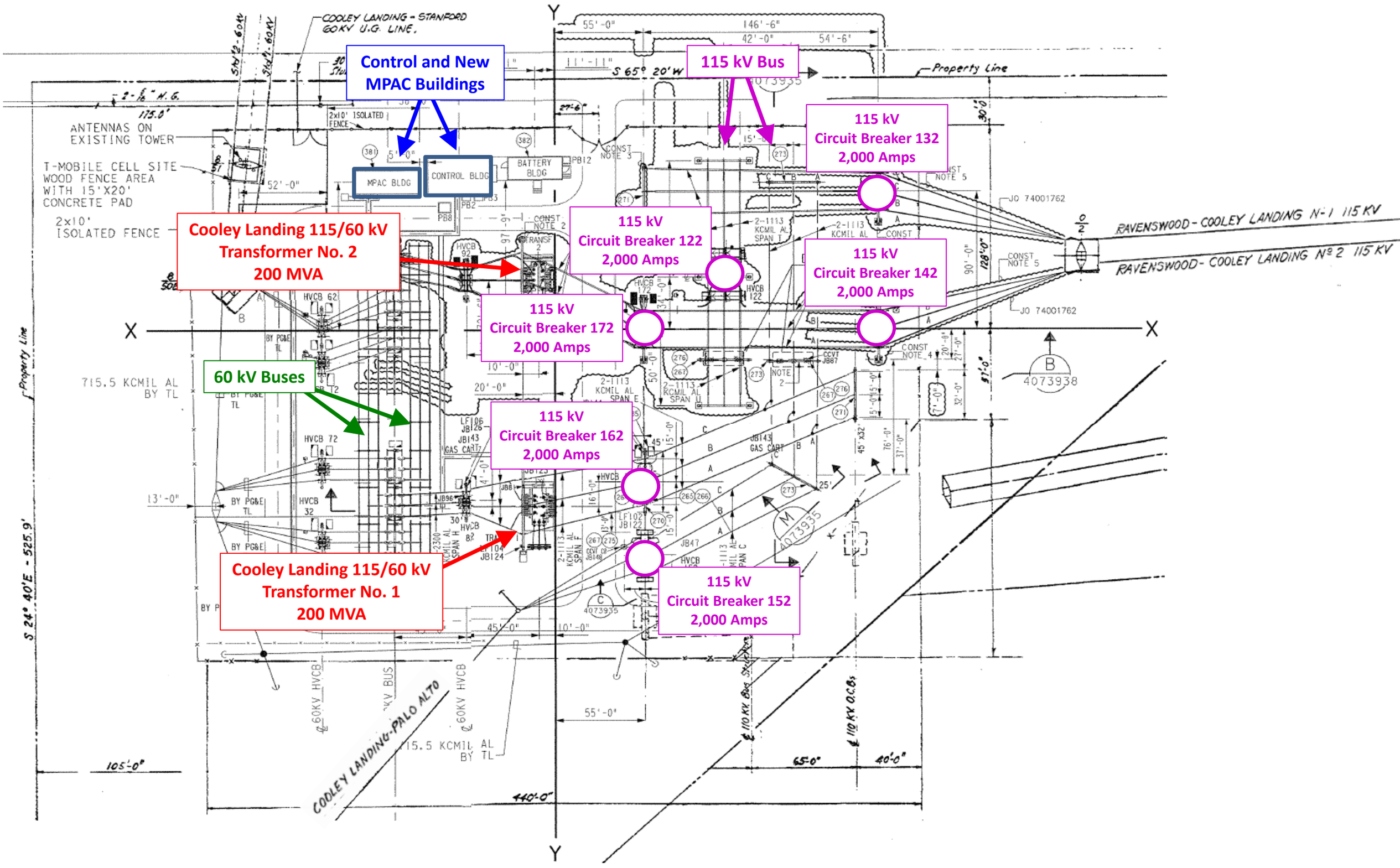
Cooley Landing – Single Line Diagram



Cooley Landing – Simplified Single Line Diagram



Cooley Landing – General Arrangement Outdoors



Attachment 7
Estimated Daily Trips During AM and PM Peak Hours

Attachment 7 – Estimated Daily Trips During AM and PM Peak Hours

Activity	Estimated Quantity and Type of Equipment		Typical Crew Size	Typical Hours or Miles per Day of Operation	Daily Trips - AM and PM Peak Hours – Average Construction	Daily Trips - AM and PM Peak Hours – Peak Construction	Estimated Duration of Use (days)
Staging Area – Receiving, Distribution	1	Boom truck	4	6 miles	2	2	20
	1	Rough terrain forklift		3 hours	n/a	n/a	20
	2	Generators		2 hours	n/a	n/a	20
	2	Light-duty pickup truck		6 miles	2	2	80
	1	Water tender w/ pickup truck		6 miles	2	2	20
Work Area Establishment and Removal	1	Rough terrain forklift	3	6 hours	n/a	n/a	26
	1	Tractor with mower		3 hours	n/a	n/a	1
	1	Boom truck		3 hours	n/a	n/a	26
	1	Light-duty pickup truck		6 miles	2	2	26
Foundation work	1	Drill rig	4	8 hours	n/a	n/a	16
	1	Rough terrain forklift		5 hours	n/a	n/a	20
	1	Skid steer		1 hours	n/a	n/a	16
	1	Concrete truck		20 miles	2	2	8
	2	Light-duty pickup truck		6 miles	2	2	20
	1	Grout injector (concrete pump)		4 hours	n/a	n/a	4
	1	Generators		4 hours	n/a	n/a	16
Tower Modifications (Top - cage Extensions, OPGW Peaks, Body Mods)	1	Helicopter (medium) Bell Twin Ranger	4	3 hours	n/a	n/a	10
	1	Light-duty pickup truck		6 miles	2	2	10

Activity	Estimated Quantity and Type of Equipment		Typical Crew Size	Typical Hours or Miles per Day of Operation	Daily Trips - AM and PM Peak Hours – Average Construction	Daily Trips - AM and PM Peak Hours – Peak Construction	Estimated Duration of Use (days)
Guard Structures	1	Line Truck	3	6 miles	2	2	8
	1	Pickup		6 miles	2	2	8
	1	Bucket truck		6 miles	2	2	8
Conductor Installation, OPGW Installation, and CB 122 Reconfiguration (includes old conductor removal)	2	Helicopter (small) MD-500	15	3 hours	n/a	n/a	26
	1	Tensioner		8 hours	n/a	n/a	3
	1	Puller		8 hours	n/a	n/a	3
	1	Line truck w/ wire reel		4 hours	n/a	n/a	2
	1	Boom truck		1 hour	n/a	n/a	26
	2	Bucket truck		2 hours	n/a	n/a	26
	1	Man lift		2 hours	n/a	n/a	26
	3	Light-duty pickup truck		6 miles	0	2	26
	1	Dump Truck		20 miles	0	2	1
Right-of-Way Cleanup	1	Skid steer	2	4 hours	n/a	n/a	4
	1	Light-duty pickup truck		6 miles	2	2	4
Environmental Monitoring	2	Light-duty pickup truck	1	6 miles	2	2	80
Project Management/Inspection	1	Light-duty pickup truck	1	6 miles	2	2	80
Worker Commute	15	Light-duty auto/pickup truck	N/A	25 miles	8	15	80