APPENDIX B

IMPERIAL IRRIGATION DISTRICT
SCOPE OF WORK

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TRANSMISSION ENGINEERING

SCOPE OF WORK
230KV ID TRANSMISSION LINE
[PREFERRED ROUTE]

Imperial County
California

Imperial Irrigation District
Energy- System Engineering
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June 19th, 2008

ID 230KV TRANSMISSION LINE

1.0 Scope of Work of Proposed Project

Imperial Irrigation District (IID) proposes to construct a new 230 kV transmission line from IID/SDG&E's Imperial Valley Substation (IV Sub) located in the County of Imperial to IID's Dixieland Substation located in Dixieland, CA. The proposed 230 kV overhead transmission project from IV Sub to Dixieland is referred to as the "ID" Line. The entire project will span an estimated 7.3 miles +/-. The proposed ID Line route is illustrated in an extract of **Figure 1.0** (Proposed Project Overview) shown below. Figure 1 – Proposed Project Overview is annexed to the end of this report.

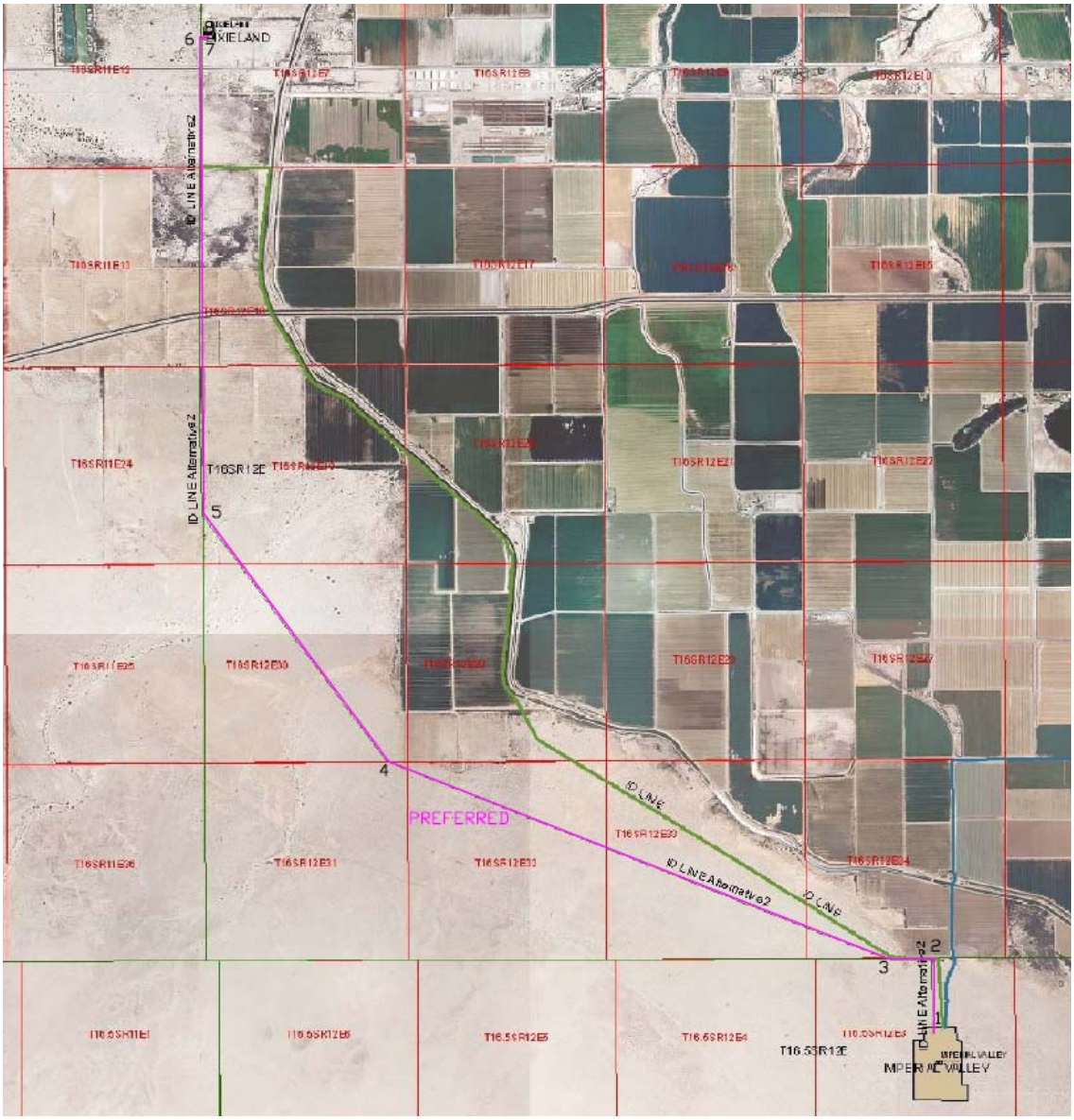


Figure 1.0 [Extract] – Proposed Project Overview

1.1 Project Location

The entire project will be located in the Imperial County in the State of California. The ID Line will start at SDG&E's Imperial Valley Substation located southwest of the City of El Centro, CA. The ID Line will exit from the north side of IV Sub and head northwest in land pertaining to The Bureau of Land Management (BLM) which runs adjacent to agricultural lands. It will continue northwest for an approximate 4.5 miles +/- and then turn north along the Eastern edge of BLM Land until reaching the west side of Carriso Avenue up to the Dixieland Substation area. ID Line will then continue east, supported on single pole structures, along the north side of Cocupa Avenue for a short distance. It will connect to the south side of the new 230/92 kV transformer addition at Dixieland Substation.

1.2 Land Ownership and Land Use

Land ownership for the entire ID Line will primarily be BLM Land. ID Line will intersect private property on the north of Interstate 8 (I-8). An estimate of four private properties near the Dixieland Substation area will be encountered. Land use along the area includes very little agriculture and open space and recreation.

2.0 Project Overview

This section addresses the transmission engineering portion of the new proposed ID Line. As stated above, the 230 kV ID Line has an approximate length of 7.3 miles +/- of transmission line from Imperial Valley Substation to Dixieland Substation. The Proposed Project consists of installing an approximate fifty seven (57) new transmission structures supporting a single 230 kV three phase electrical wire circuit, one Optical Ground Wire (OPGW), and one 3/8 inch static or overhead ground wire.

The new 230 kV ID Line will interconnect IV Sub to Dixieland Substation through a 300 MVA transformer [230 kV to 92 kV]. This transformer will be installed prior to the completion of the construction of the ID Line. The transmission line and the associated 230/92 kV transformer will provide a second interconnection between IID and San Diego Gas & Electric (SDG&E). This will increase IID's import/export capacity to the Imperial Valley Substation 230 kV bus. The proposed construction will increase IID's reliability by providing voltage support to the Imperial Valley electric service area.

As of today, the only major interconnection with SDG&E is through the 230 kV "S" Line connecting the Imperial Valley Substation to the El Centro Switching Station (ECSS). The "S" line is essential and brings IID's generation resources delivery to the Imperial Valley Substation 230 kV bus from the Palo Verde generation hub through the South Western Power Link (SWPL) 500 kV line. The proposed ID Line will provide another path to import reliable energy from major sources to the Imperial Valley Substation. Furthermore, the "S" Line is constructed on aging single wood pole structures which are not reliable for these types of power lines. The ID Line will increase IID's transmission system reliability by providing a redundant path to the "S" 230 kV transmission line.

Several route alternatives were analyzed during the route development process and the optimum route was designated as shown on **Figure 1.0**. This alternative was found to prevent costly permitting delays, avoid or mitigate land use conflicts, and reduce environmental impacts. At the same time the proposed route meets economical goals, maintains the reliability of the service, reduces energy costs, and improves IID's transmission infrastructure.

2.1 Project Configuration

The 230 kV ID Line will require construction of approximately forty-eight (48) new H-Frame structures, four (4) Three-pole structures, and three (3) single monopole steel structures. In total, there will be an approximate fifty-seven (57) new structures with an average height of 90 feet above the ground and an average span length of 800/900 feet. Single pole steel structures will primarily be used as control structures for entering and exiting substations.

Typical structure details are presented in **Figure 2.1A** - Tangent H-Frame, **Figure 2.1B** – Dead-End/Angle, and **Figure 2.1C** – Steel Dead End Pole. H-Frame and Three-Pole Structures will either be hybrid, steel, or fiber glass.

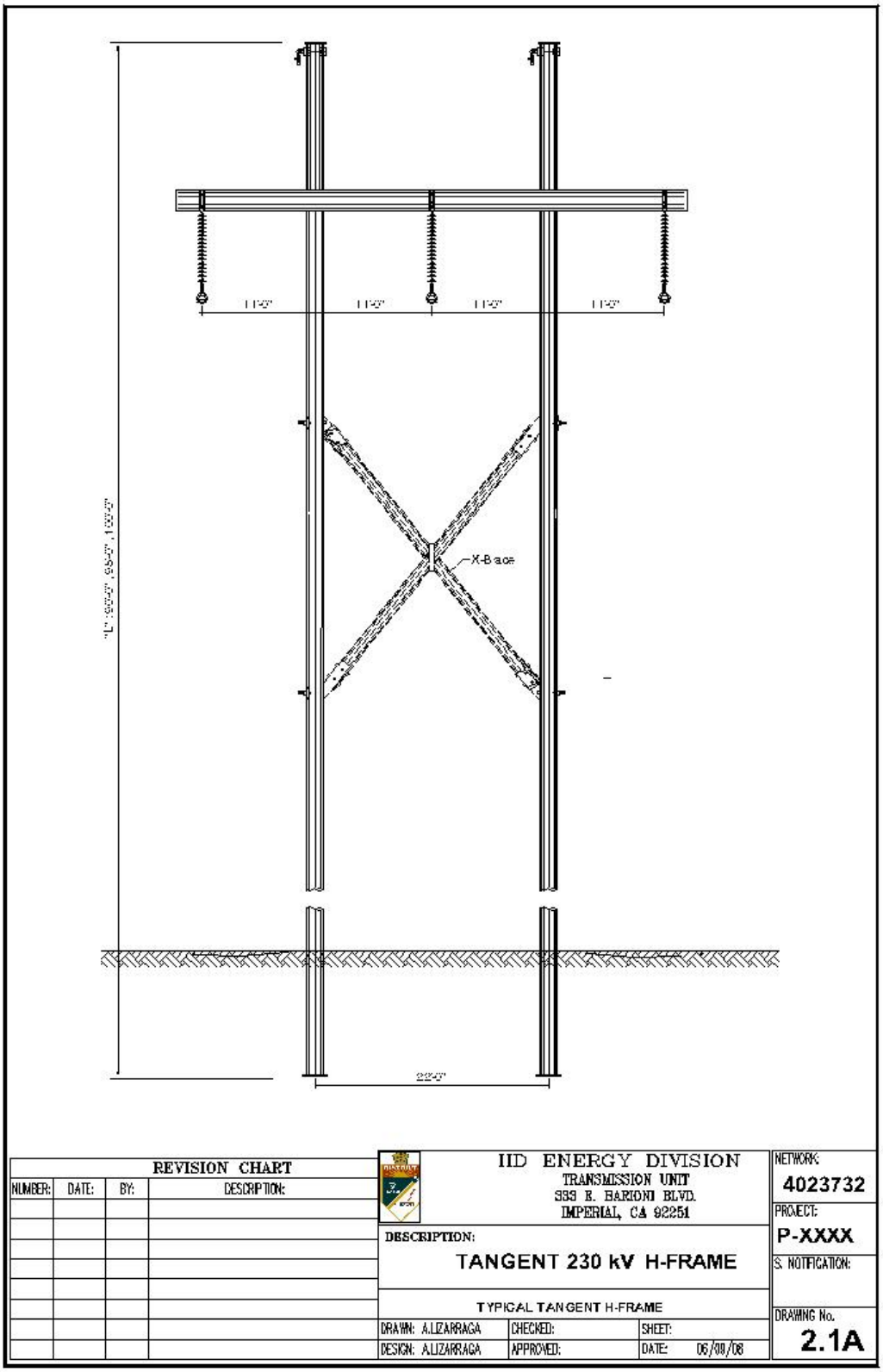


Figure 2.1A - Tangent H-Frame

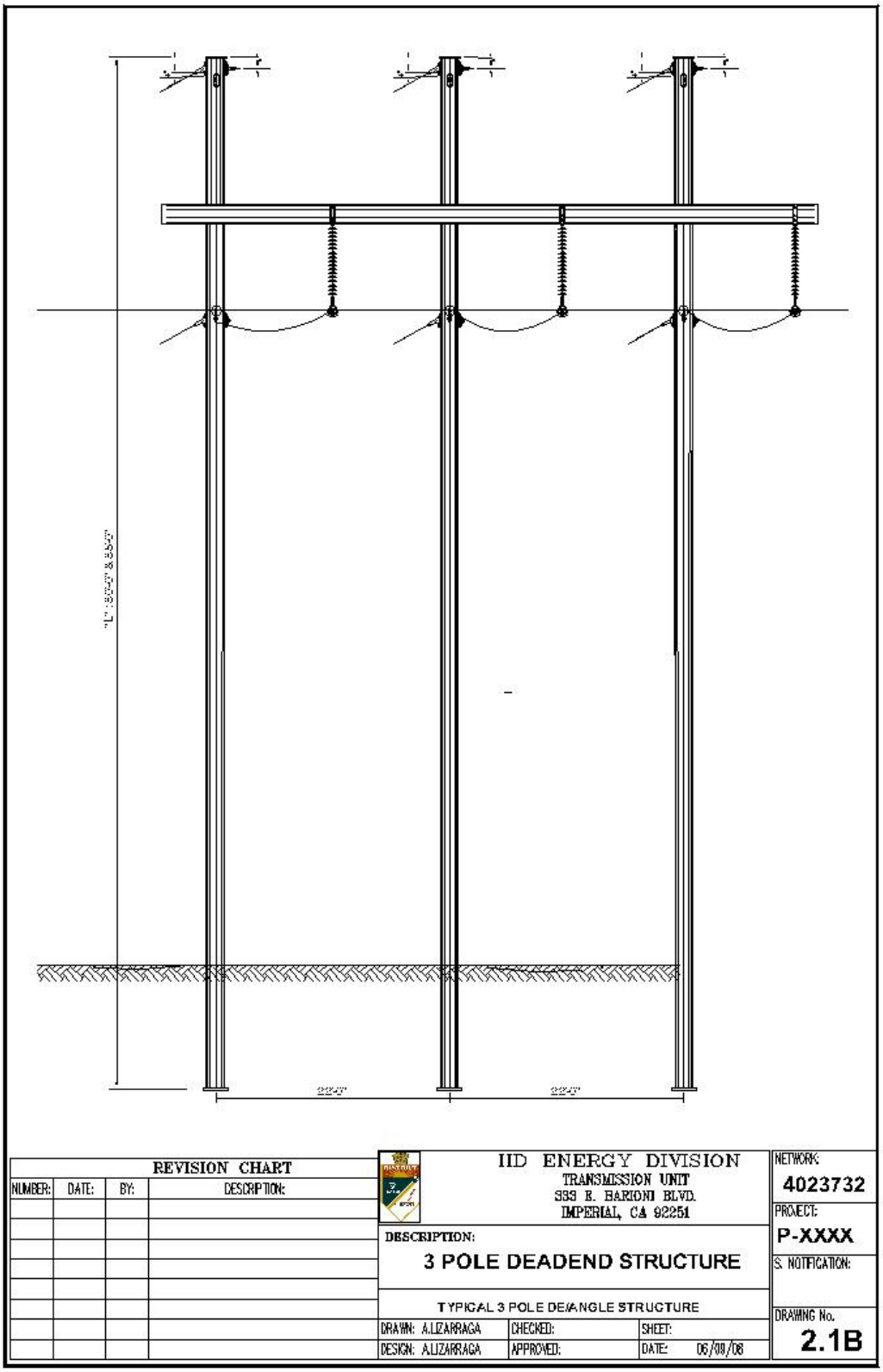


Figure 2.1B – Three Pole Dead End Structure

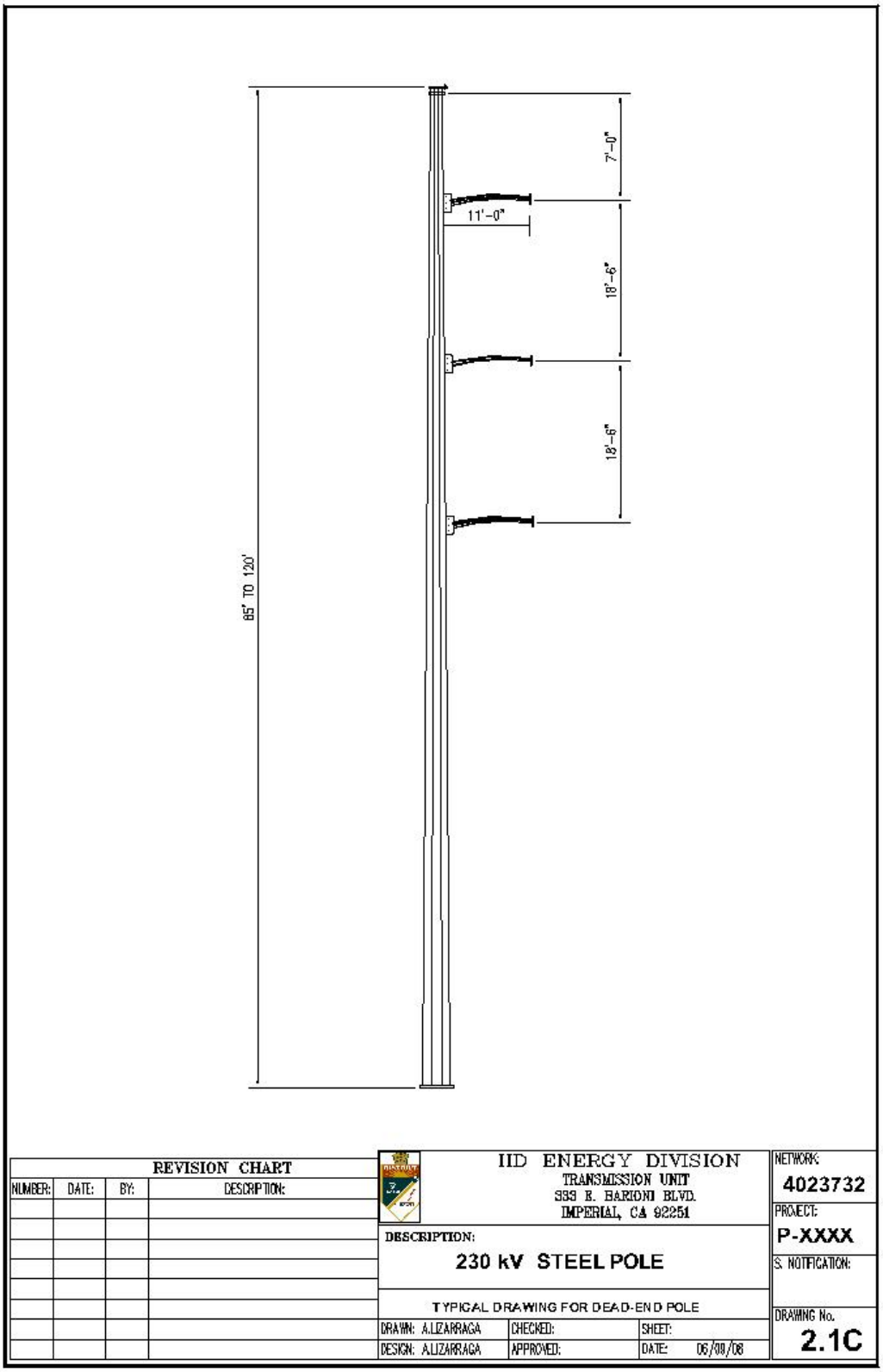


Figure 2.1C – Typical Steel Dead End Pole

3.0 Project Components

Table 1-1 summarizes the various components of the Proposed Project. These components are discussed in detail in the following sections.

Table 1-1 **Summary of Proposed Project Components**
Proposed Route and Right-of-Way • Transmission Line Length: 7 .3 miles +/- • Starting Point: Imperial Valley Substation. • Termination Point: Dixieland Substation. • Right-of-Way Width: ID Line would require that IID obtain a 140 ft. ROW for the portion of the ID Line which is in BLM Land. All construction will be within the140 ft. ROW and a couple of material staging areas that will be specified by construction.
Transmission Line Facilities (230-kV, single circuit) • Conductors: One (1), three-phase Alternating Current circuit consisting of one (1), 1.504 inch Aluminum Conductor Steel Reinforced (ACSR) conductor per phase. • Minimum Conductor Distance from Ground: Meets California General Order 95 (GO 95) requirements of 34 feet at 60 degrees Fahrenheit (°F) for crossing above tracks of railroads which transport or propose to transport freight carts not operated by overhead contact wires, 30 feet at 60 degrees Fahrenheit (°F) for crossing or along thoroughfares in urban districts or rural districts, and 25 feet for water areas not suitable for sail boating. All this clearances conform with Table 1 of Rule 37. GO95 Clearances were found to govern over NESC's required vertical clearances according to Rule 232. • Shield Wires: One (1) Optical Ground Wire (OPGW) 0.528" diameter and One (1) 3/8" EHS Static or Overhead Ground Wire • Transmission Line Structure Types: - Two Pole Structure [H-Frame], Three Pole Structure, and Steel Monopole Structure • Distance between Structures (approximate): 800 to 900 feet. Total Number of structures to be installed: 48 H-Frame tangent structures, 4 three pole structures for dead end and angles, 3 steel monopole dead end structures.

3.1 Project Structure Location

Table 1-2 summarizes reference information on each structure location including landownership from data available. The IID Real Estate office will need to confirm stated ownership.

Stations and Property Owner to be defined when Survey Data is obtained and Preliminary Engineering is done.

Table 1-2				
Structure Locations				
Structure No.	**Station (ft)**	**Legal Description**	**Property Owner**	**L-Dwg**
Dixieland Subs.	0		IID	
1	1.78		IID	
2	544.37		IID	
3	1,075.43		IID	
4	1,678.11		IID	
5	2,180.08		IID	
6	2,541.54		IID	
7	2,917.04		IID	
8	3,092.19		IID	
9	3,695.03		IID	
10	4,356.22		IID	
11	5,017.73		IID	
12	5,679.24		IID	
13	6,340.75		IID	
14	7,002.27		IID	
15	7,663.78		IID	
16	8,335.60		IID	
17	8,839.61		IID	
18	9,476.84		IID	
19	9,849.70		IID	
20	10,446.16		IID	
21	11,059.56		IID	
22	11,674.42		IID	
23	12,022.22		IID	
24	12,718.26		IID	
25	13,375.07		IID	
26	14,031.94		IID	
27	14,688.81		IID	
28	15,345.68		IID	
29	16,002.55		IID	
30	16,659.42		IID	
31	17,316.30		IID	
32	17,838.43		IID	
33	18,390.35		IID	
34	18,900.37		IID	
35	19,547.82		IID	
36	20,226.97		IID	

Table 1-2				
Structure Locations				
Structure No.	**Station (ft)**	**Legal Description**	**Property Owner**	**L-Dwg**
37	20,906.13		IID	
38	21,585.29		IID	
39	21,996.60		IID	
40	22,269.36		IID	
41	22,519.50		IID	
42	22,853.38		IID	
43	23,554.18		BLM	
44	24,204.70		BLM	
45	24,854.70		BLM	
46	25,504.70		BLM	
47	26,154.70		BLM	
48	26,804.70		BLM	
49	27,454.70		BLM	
50	28,104.70		BLM	
51	28,754.70		BLM	
52	29,404.70		BLM	
53	30,054.70		BLM	
54	30,704.70		BLM	
55	31,354.70		BLM	
56	32,004.70		BLM	
57	32,654.70		BLM	
58	33,304.70		BLM	
59	33,954.70		BLM	
60	34,604.70		BLM	
61	35,254.70		BLM	
62	35,904.70		BLM	
63	36,350.18		BLM	
64	36,775.48		BLM	
65	37,315.48		BLM	
66	37,853.74		BLM	
I.V. Subs.			IID	

3.2 Right-of-Way Acquisition

The 230 kV “ID” Line would require that IID obtain a new 140 feet ROW through BLM Land and easement in four private properties at North side of Interstate 8 at the entrance of Dixieland Substation.

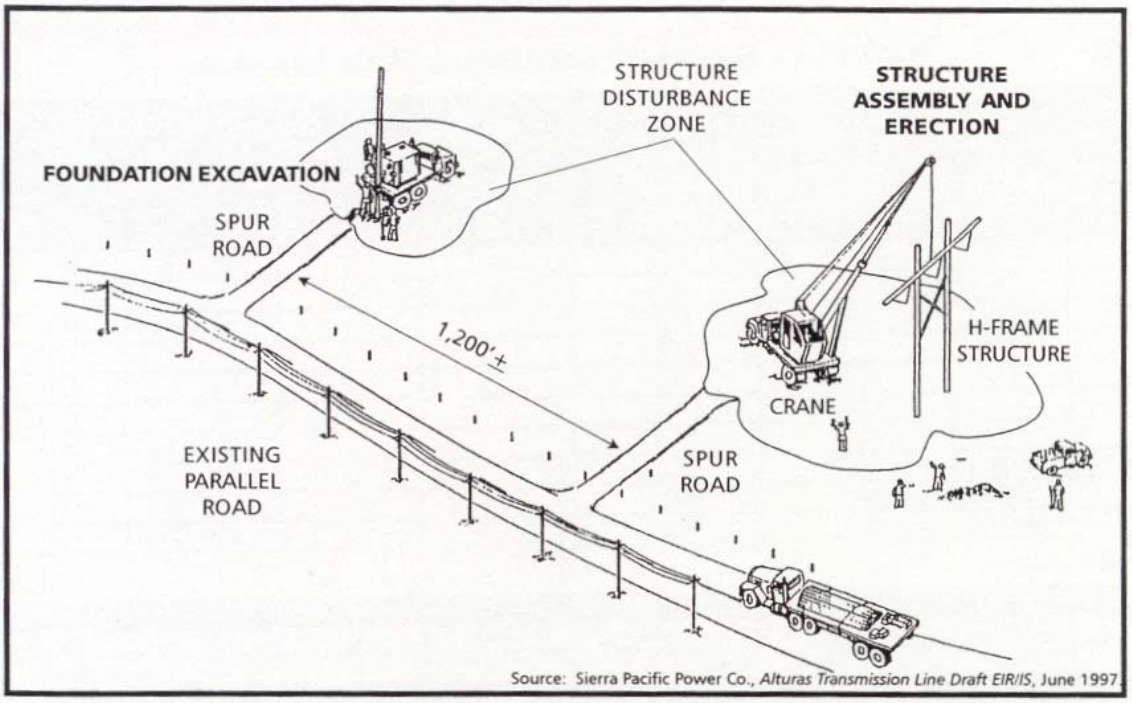
IID is in the process of applying for Right-of-Way (ROW) from The Bureau of Land Management (BLM). Most of the ID Line will run on BLM Land. It was found from several alternatives that this was the best route possible. It is also necessary to point out that the existing Imperial Valley Substation already lies in BLM Land; thus, the need to obtain ROW from such.

IID Real Estate will negotiate easements with private property owners where necessary.

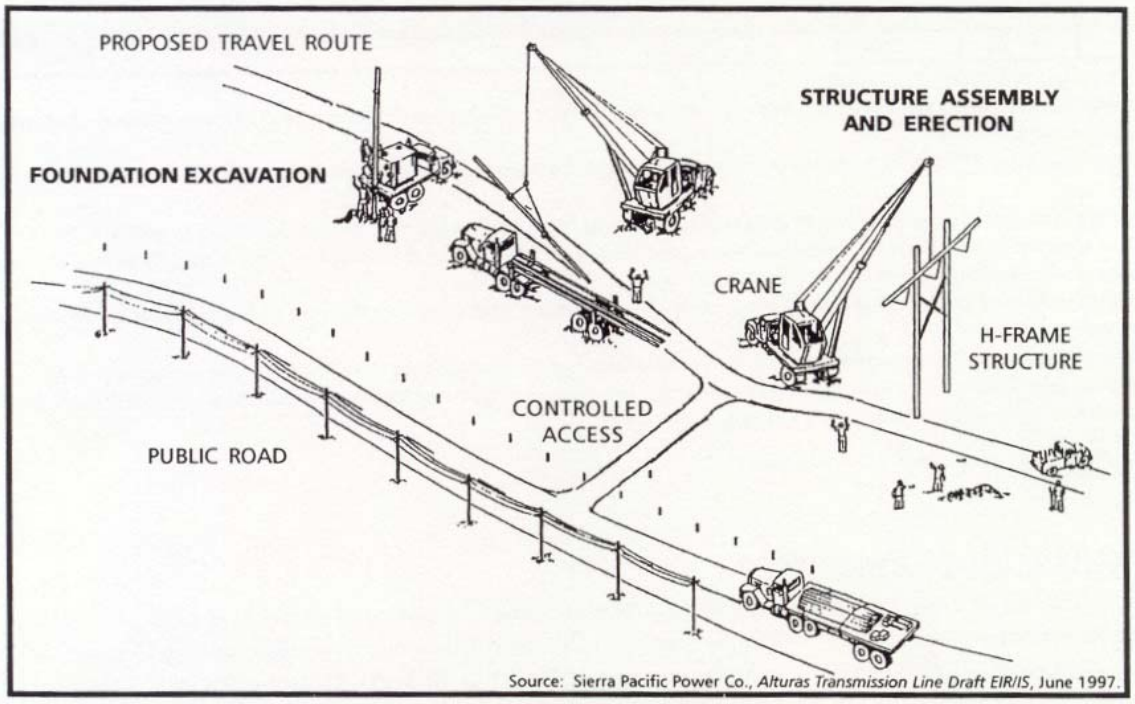
3.3 Project Construction

Construction of a transmission line follows a sequence of operations. Among these are right-of-way acquisition, access road identifications, structure site clearing, construction staging (including construction yards and foundation concrete mixing areas, or “batch plants”), foundation installation, assembly and erection of structures, clearing areas, grounding installation (including ground rods and tying grounding between poles), and finally cleanup and site reclamation. For this reason, various phases of construction occur at the same time at different locations throughout the construction process. This would require several construction crews operating simultaneously in different locations. **Figure 3.3** below depicts the typical construction procedures for installation of transmission line structures and wires.

Note Drawing is not to scale.



A. Structure Erection - Type I: Use of Existing Parallel Access Road and Spur Road



B. Structure Erection - Type II: Use Centerline Travel Route

Figure 3.3 Construction Methods Diagram

3.3.1 Access Roads

The construction, operation, and maintenance of the proposed transmission line would require that heavy vehicles access structure sites along the right-of-way. Access will be acquired through the proposed travel route [**SEE Figure 3.3 B**]. In addition, there may be areas where a spur road will be used to mitigate disturbances. This will more likely occur near Substations where entering/exiting power lines already have travel routes [**SEE Figure 3.3 A**].

The proposed travel route will be 25 feet wide and will be inside the new 140 feet ROW. The new ROW is required across BLM Land. Use of other existing City/County roads as well as use of maintenance roads within existing transmission line right-of-ways is planned to the greatest extent possible.

3.3.2 Staging/Working Areas

Staging areas shall be determined by construction and shall try to fall within IID's ROW and/or IID property. Material will be staged and carried to the proper station for construction, assembly, and erection. Temporary staging areas might be required in BLM Land. These shall be determined before approval of construction and will be stated in the temporary construction ROW permit in case needed.

3.3.3 Foundation Installation

Installation of foundations [drilled shafts, drilled piers, caissons and or direct embedment] would require appropriate drilling equipment. Trucks with augers, cranes, bucket trucks, material trucks, and ready mix trucks are some typical equipment trucks that would need to access the site for construction of foundations. Foundations will be excavated with a 2 ½ to 3 ft. auger. Various types of foundations will be used depending on structure type and soil conditions.

Foundations for tangent and light angle structures will range in diameter size from 5 to 10 feet. Excavation depths will vary from 15 for tangent structures to 30 feet for light angle structures. For these types of structures a direct embedment type of foundation will most likely be used. Direct embedment foundation construction processes are as follows:

- Excavation of Foundation
- Placing of Steel Caisson
- Bottom section of pole is set and foundation is filled with concrete
- Pole is maintained in place until the concrete reaches the specific strength where it is safe and appropriate for release.
- Pressure inject grout in annular space

Dead End and Heavy Angle Structures will require drilled shaft foundations. For drilled shafts the following processes are as follows:

- Excavation of Foundation
- Anchor Bolt Cage is installed
- Foundation is filled with concrete encasing anchor bolt cage

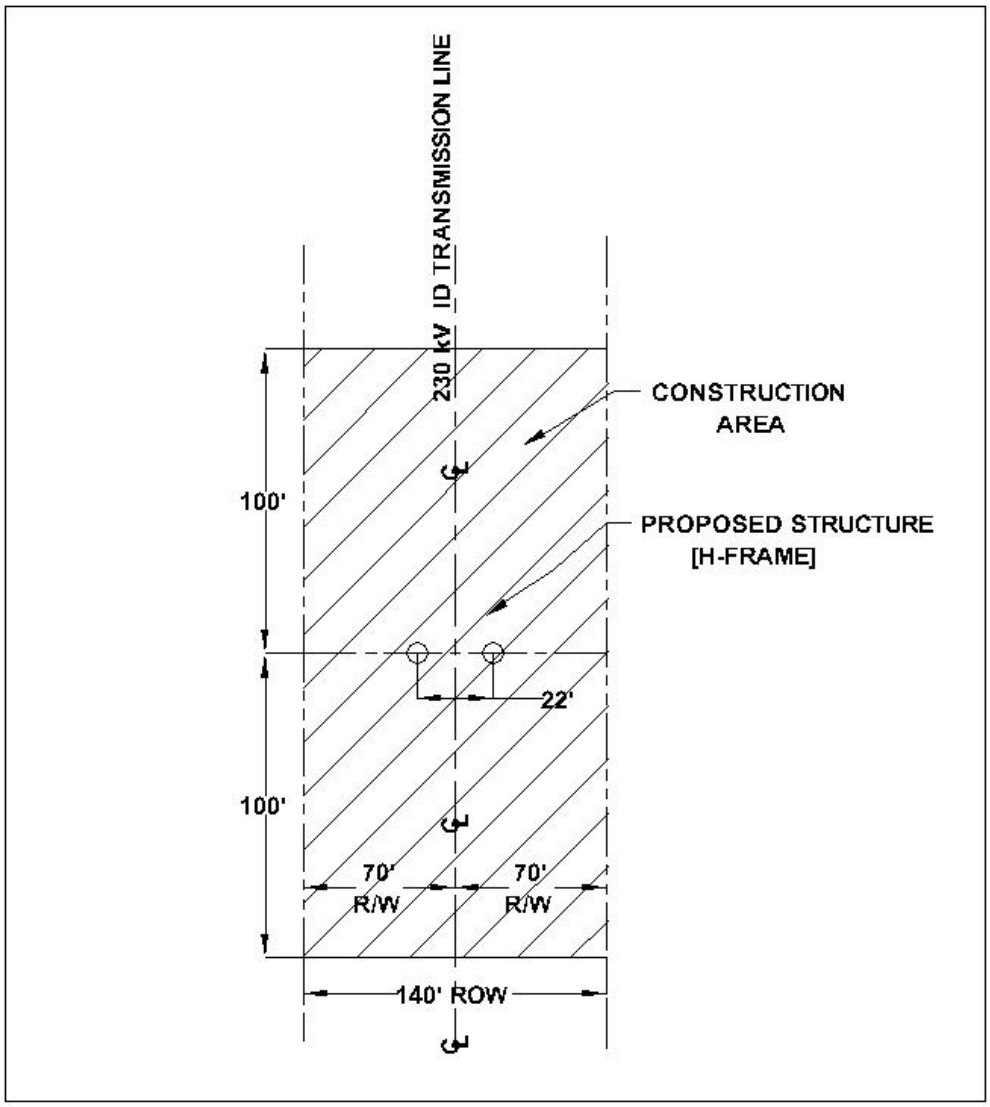
Spoil material [dirt] would be used for fill where suitable. Spoil materials that cannot be used for fill would be dispersed around the area to produce a general grade.

3.3.4 Structure Assembly and Erection

Structures come in various components. In the case of direct embedded poles, after the bottom section is set in place [**SEE 3.3.3 Foundation Installation**] the next step is to install the remaining pole sections by following proper standard procedures to create the appropriate joint. The steel arms along with the use of minor components, such as hardware, will then be installed preparing the structure for insulator and cable installation. Similar erection procedures apply for poles with drilled shaft foundations.

3.3.5 Structure Working Areas

Structure working areas for two pole structures [H-Frames] would be within 140X200 feet [**SEE Figure 3.3.5A**]. Three pole Dead End and Heavy Angle structures would require a 150X200 feet in order to properly guying poles where required [**SEE Figure 3.3.5B &C**].



FOR TANGENT STRUCTURES #s:

REF. DWGS.

SH._____OF_____

IMPERIAL IRRIGATION DISTRICT
IMPERIAL, CALIFORNIA
ENERGY DEPARTMENT

230kV ID TRANSMISSION LINE
CONSTRUCTION EASEMENT
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SEC 11, T.16S., R.12E. TO SEC. 3, T.16.5S., R12E.

ISSUE 3	ISSUE 2	ISSUE 1	DATE 6/19/08	SCALE N.T.S.	APPROVED
			DRAWN	DWG.No. L-1	
			CHECKED		

Figure 3.3.5A Construction Working Area for Tangent [H-Frame] Structures

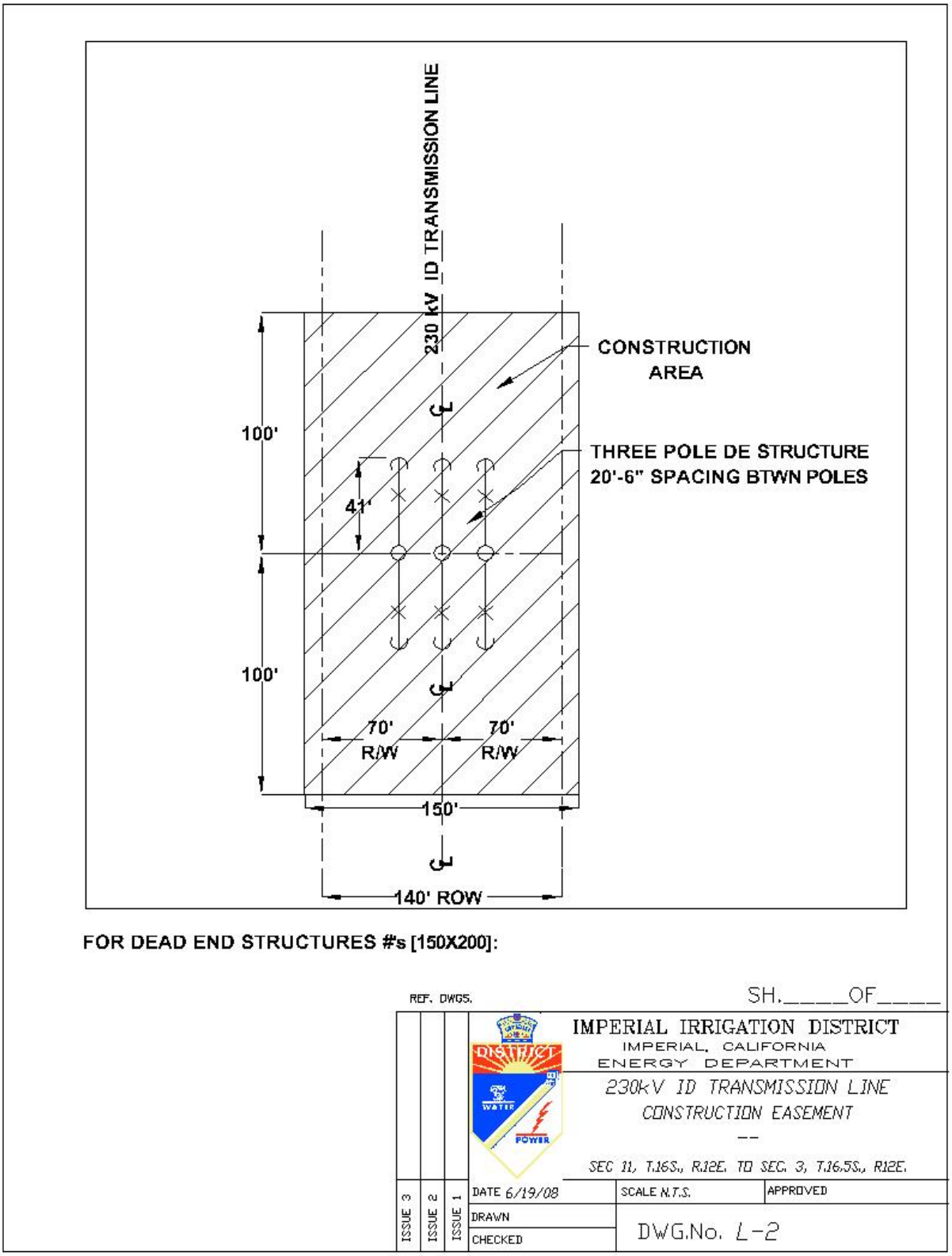

Figure 3.3.5B Construction Working Area for Dead End Three Pole Structure

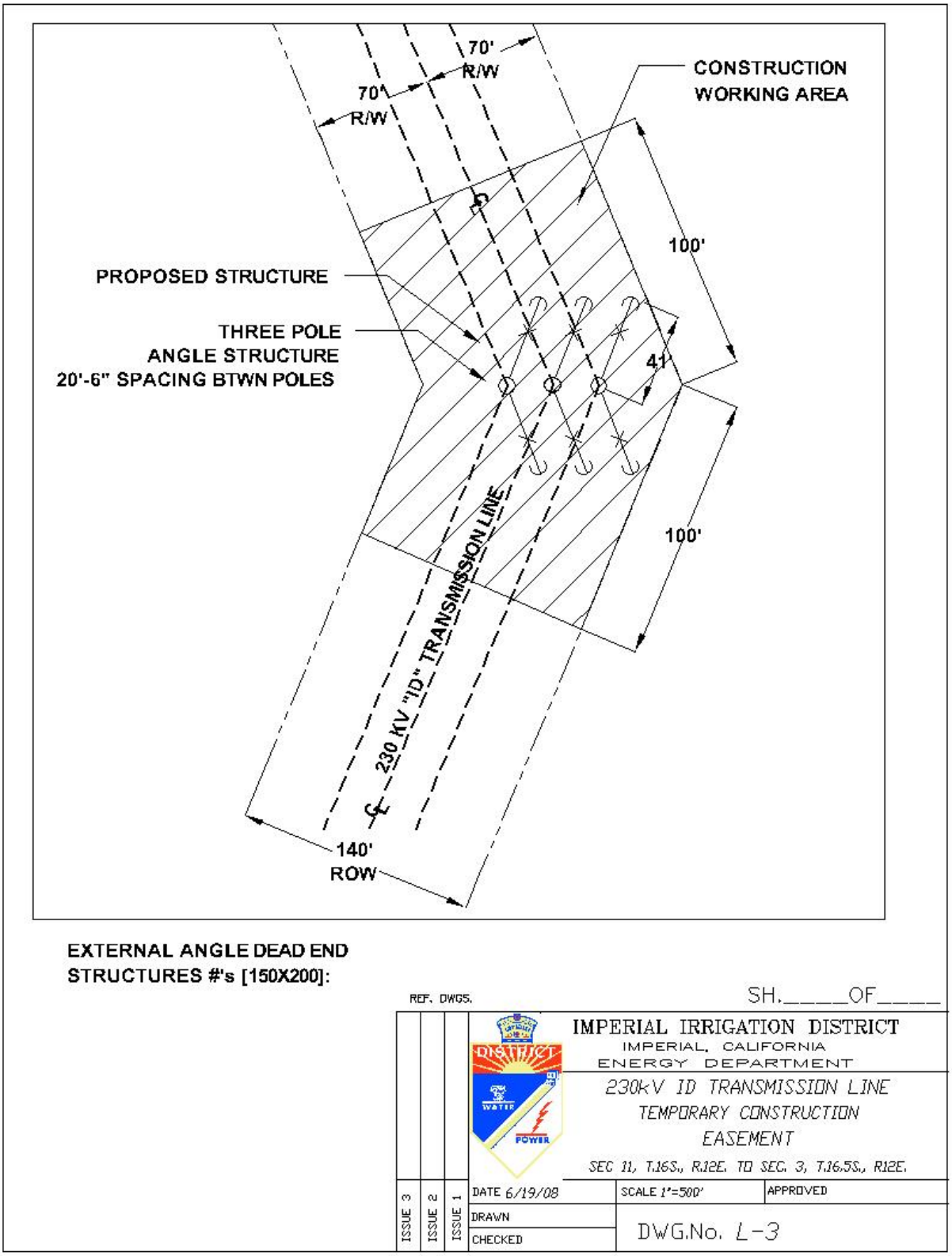

Figure 3.3.5C Construction Working Area for Three Pole Heavy Angle Structure

3.3.6 Conductor Installation

After the structures are erected, new insulators, and hardware would be installed to each structure. The structures would be rigged with insulator strings at each ground wire and position conductor.

3.3.7 Grounding

Installation of all required structure grounding shall be completed promptly following structure erection.

3.3.8 Guying

Guying is the process of using guy/cable wire to provide support to a structure. The Structure Designer should identify the need for timely guy installation to provide structure stability. For angle or dead-end poles or H-frames, the guys are usually installed so that the structure is plumb or has slight negative deflection under the transverse or longitudinal pulls from everyday cable tensions. Guying requires the use of anchors which may cause ground disturbance.

Typical guy placing resists/absorbs the tension induced by line angles. See **Figure 3.3.5C** for an example of guyed supports.

4.0 Operational Characteristics

The nominal voltage for the transmission line would be 230 kV AC. There may be minor variations of up to five percent above the nominal level depending upon load flow.

4.1 Maintenance

Maintenance of the transmission line is subject to IID procedures.

5.0 Construction Schedule

The tentative construction schedule shall start October 2009 and will be completed May 2010.