UNDERGROUND DEVICES
INCORPORATED

420 ACADEMY DRIVE
NORTHBROOK, ILLINOIS 60062
Phone: 847-205-9000 • Fax: 847-205-9004 • www.udevices.com

INFORMATION ON THE LA-8W20-2 FAMILY OF LOW EMF WUNPEECE SPACERS

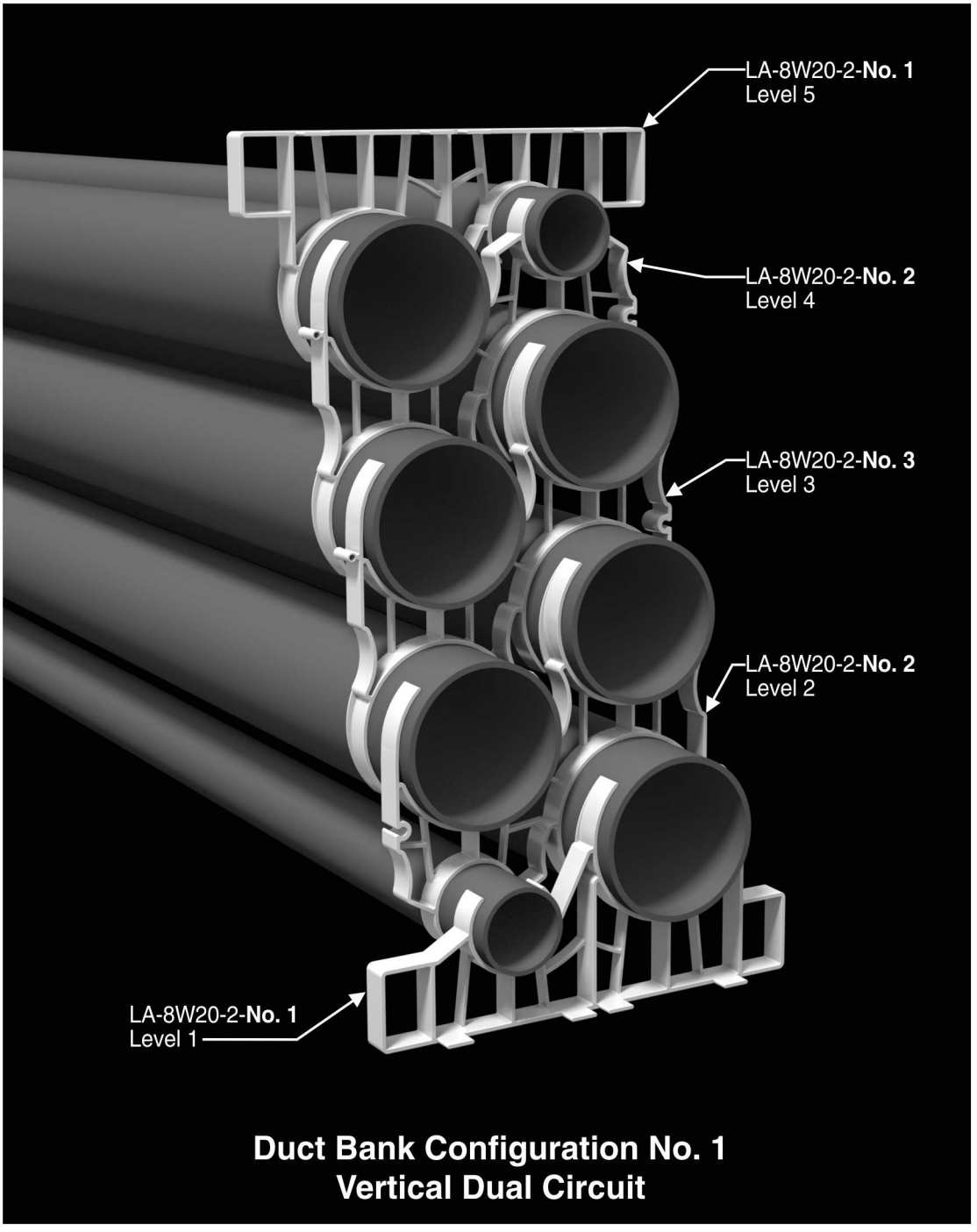
The Low Electro Magnetic Field (Low EMF) LA-8W20-2 Wunpeece Duct Spacer Family was developed for The LA Department of Water and Power (LA-DWP) for an 11.4 mile long, 230 kV, 187 Amp average load, 751 Amp 95 percentile load, transmission line through the city of LA. Actual construction on this project was started in July of 2013. As of March 2014 approximately 85% of the 11.4 mile duct bank has been installed. The LA-8W20-2 Configuration No. 1 dual circuit duct bank is being installed for the full 11.4 mile run.

Initially The LA-DWP will pull cables in the lower three 8" conduits and energize this single circuit. In the future they expect to pull cables in the upper 8" conduits and energize the second circuit.

The Low EMF configuration obtained by use of the LA-8W20-2 Family of duct spacers is documented in the March 2012 "Draft Environmental Impact Report" for The "Scattergood-Olympic Transmission Line Project". The portion of this report that is applicable to the low EMF duct bank and LA-8W20-2 Wunpeece Duct Spacer configuration is attached. Additional documentation can be found in Underground Devices US patents 8,783,631, 8,876,068 and Australian patent 2,013,206,301. These US patents may be accessed at http://patft.uspto.gov/ . (Other UDI US and Canadian patents on low EMF duct spacers are pending)

LA-8W20-2 WUNPEECE Low EMF Duct Spacer Family

Designed for The LA Department of Water & Power Scattergood Olympic 230 kV Transmission Line Project



Duct Bank Configuration No. 1
Vertical Dual Circuit

When the LA-8W20-2 Wunpeece Spacer Family is configured as shown at the left they will accommodate:

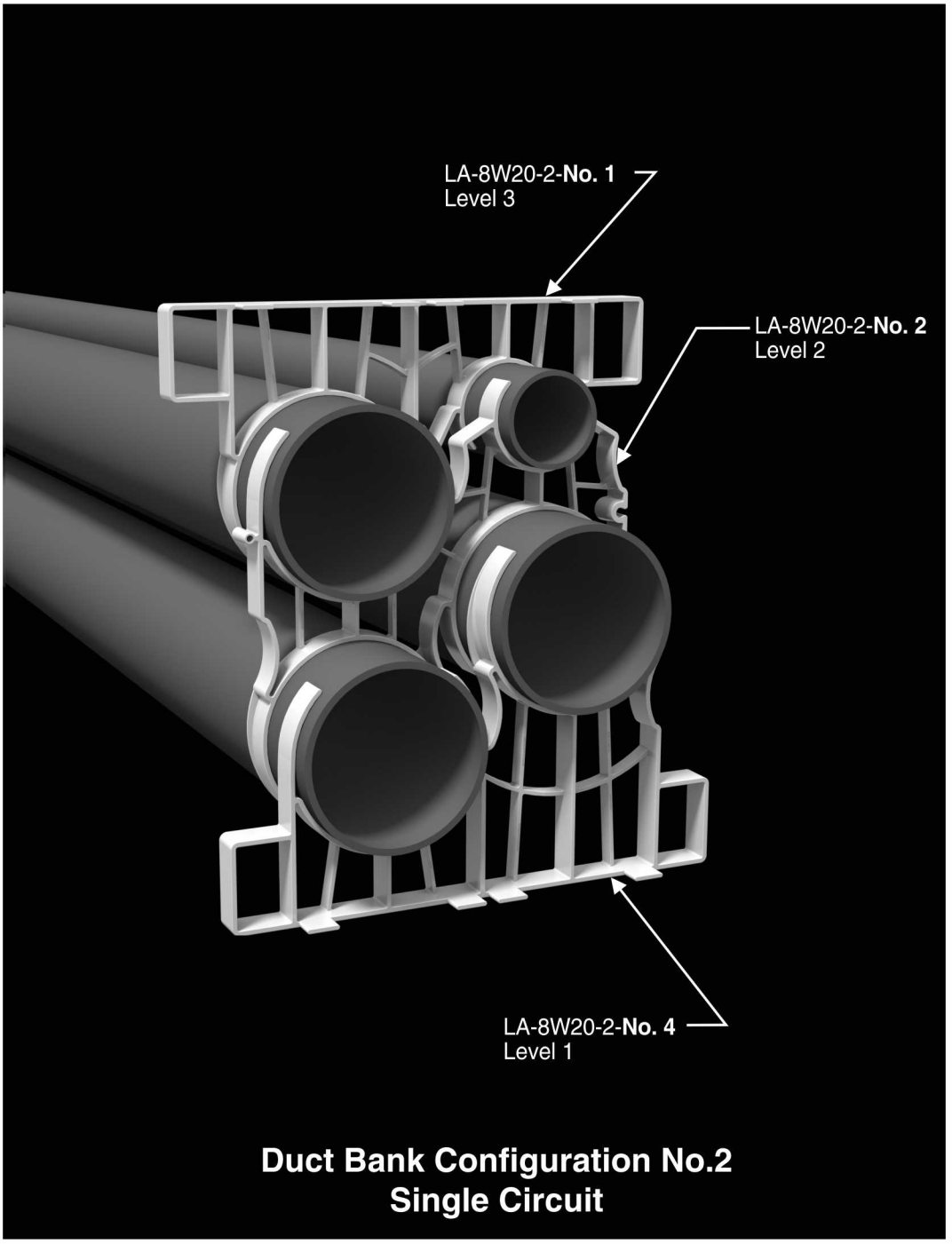
- 6 Ea. 8" Nom. Conduits (8.625" Actual OD) and 2 Ea. 4" Nom. Conduits (4.500" Actual OD).
- Separation between the 8" conduits and 8" and 4" conduits is 2".
- Distance between the floor of the trench and the bottom of the lower most conduit is 3.000".
- The LA-8W20-2-**No.1** level 5 Spacer is used to gage the 3" top cover of concrete and to provide a level "hold down" support surface.
- The LA-8W20-2-**No.1** Side Extensions that are molded into the level 1 and level 5 spacers insure 3 inches of side wall concrete.
- The LA-8W20-2 Wunpeece Spacer Family configuration reduces EMF levels considerably.
- The LA-8W20-2 Wunpeece Spacer Family is designed for concrete or flowable fill encased duct banks.
- See UDI drawings 90-6430 thru 90-6432, 90-6873 thru 90-6875 and 90-6877 for additional LA-8W20-2 Family dimensions, installation details and duct bank configurations.

Per Drawing 90-6330, 90-6430 thru 90-6432, 90-6873 thru 90-6875 & 90-6877

UNDERGROUND DEVICES, INC. - Northbrook, IL 60062
Phone: 847-205-9000 - Fax: 847-205-9004 - Web: udevices.com

LA-8W20-2 WUNPEECE Low EMF Duct Spacer Family

Designed for The LA Department of Water & Power Scattergood Olympic 230 kV Transmission Line Project



Duct Bank Configuration No.2
Single Circuit

When the LA-8W20-2 Wunpeece Spacer Family is configured as shown at the left they will accommodate:

- 3 Ea. 8" Nom. Conduits (8.625" Actual OD) and 1 Ea. 4" Nom. Conduits (4.500" Actual OD).

Separation between the 8" conduits and 8" and 4" conduits is 2".

Distance between the floor of the trench and the bottom of the lower most conduit is 3 inches.

The LA-8W20-2-**No.1** level 3 Spacer is used to gage the 3" top cover of concrete and to provide a level "hold down" support surface.

The LA-8W20-2-**No.1** and LA-8W20-2-**No.4** Side Extensions that are Molded into the level 1 and level 3 spacers insure 3 inches of side wall concrete.

The LA-8W20-2 Wunpeece Spacer Family configuration reduces EMF levels considerably.

The LA-8W20-2 Wunpeece Spacer Family is designed for concrete or flowable fill encased duct banks.

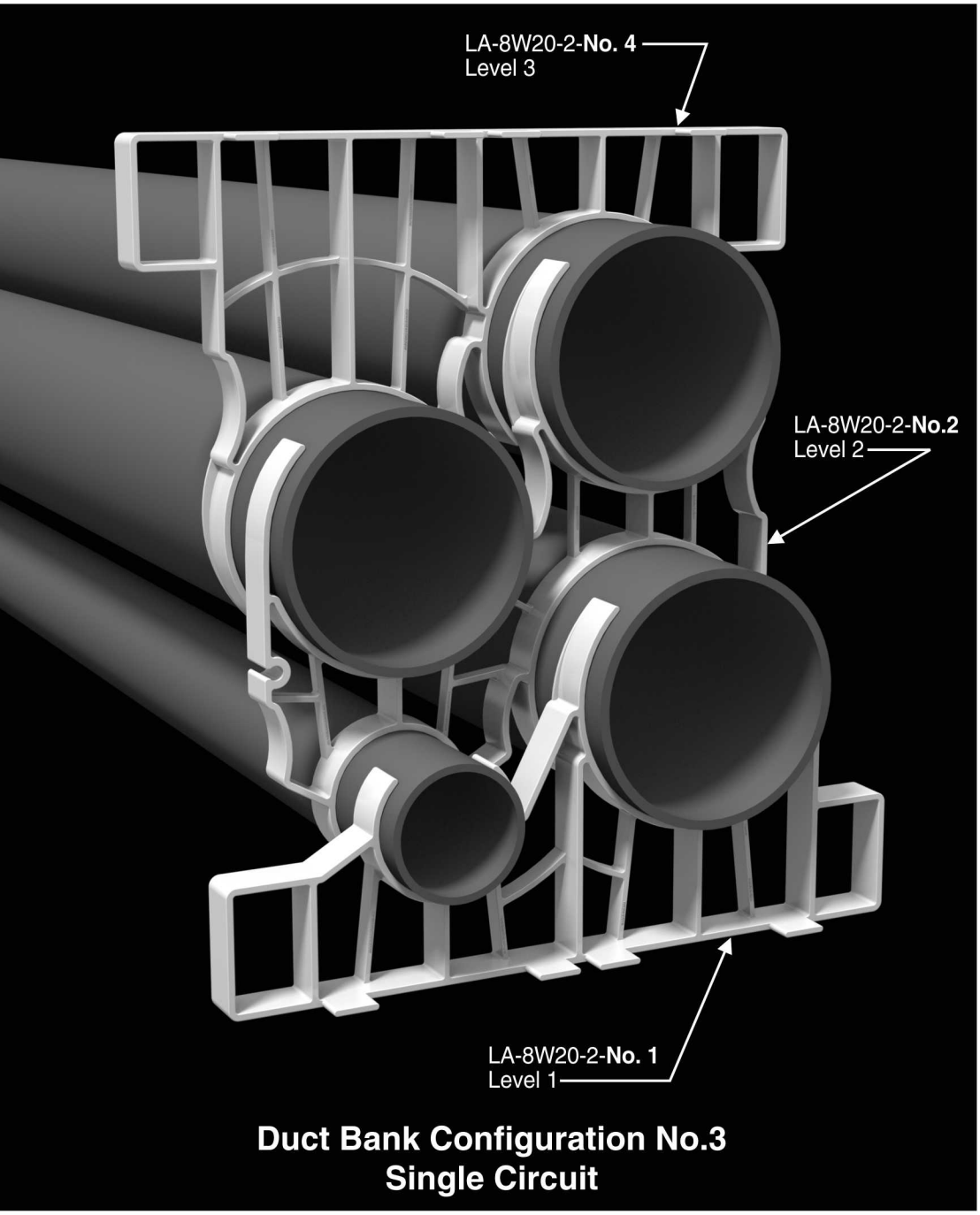
See UDI drawings 90-6430 thru 90-6432, 90-6873 thru 90-6875 and 90-6877 for additional LA-8W20-2 Family dimensions, installation details and duct bank configurations.

Per Drawing 90-6330, 90-6430 thru 90-6432, 90-6873 thru 90-6875 & 90-6877

UNDERGROUND DEVICES, INC. - Northbrook, IL 60062
Phone: 847-205-9000 - Fax: 847-205-9004 - Web: udevices.com

LA-8W20-2 WUNPEECE Low EMF Duct Spacer Family

Designed for The LA Department of Water & Power Scattergood Olympic 230 kV Transmission Line Project



Duct Bank Configuration No.3
Single Circuit

When the LA-8W20-2 Wunpeece Spacer Family is configured as shown at the left they will accommodate:

3 Ea. 8" Nom. Conduits (8.625" Actual OD) and 1 Ea. 4" Nom. Conduits (4.500" Actual OD).

Separation between the 8" conduits and 8" and 4" conduits is 2".

Distance between the floor of the trench and the bottom of the lower most conduit is 3 inches.

The LA-8W20-2-**No.4** level 3 Spacer is used to gage the 3" top cover of concrete and to provide a level "hold down" support surface.

The LA-8W20-2-**No.1** & LA-8W20-2-**No.4** Side Extenions that are Molded into the level 1 and level 3 spacers insure 3 inches of side wall concrete.

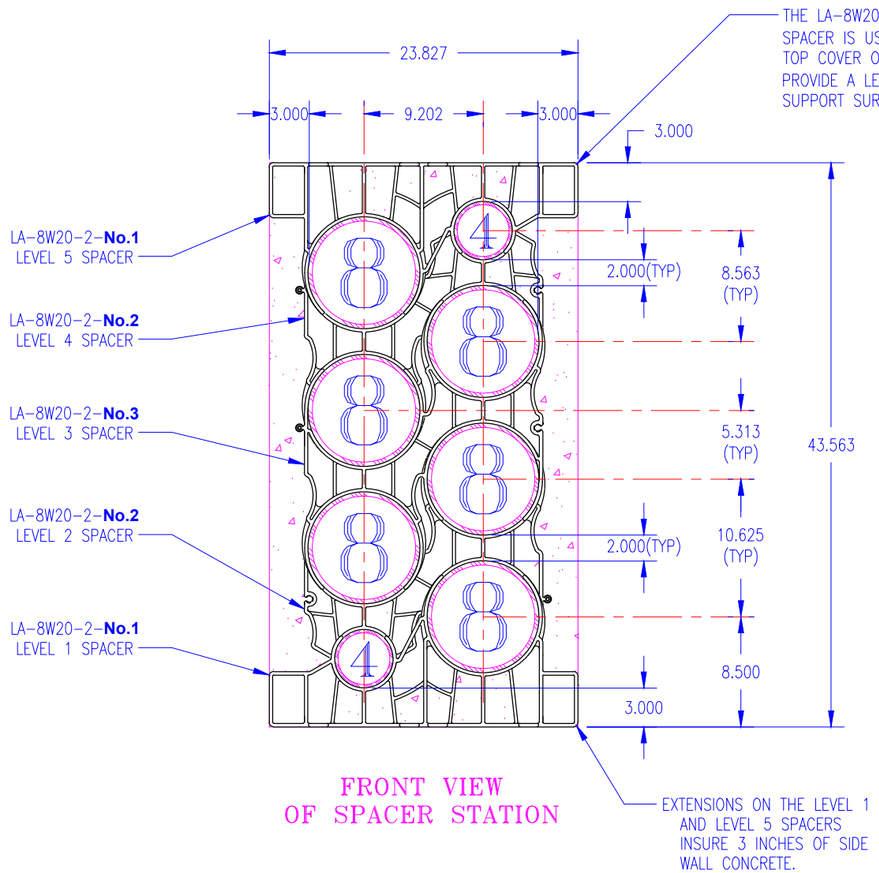
The LA-8W20-2 Wunpeece Spacer Family configuration reduces EMF levels considerably.

The LA-8W20-2 Wunpeece Spacer Family is designed for concrete or flowable fill encased duct banks.

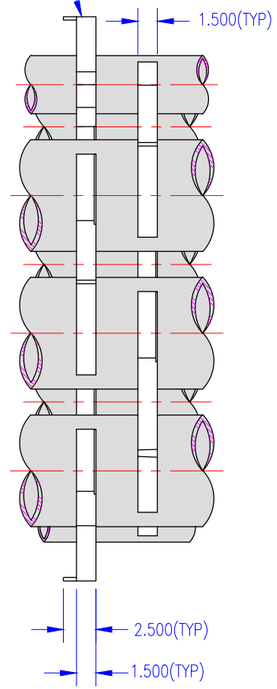
See UDI drawings 90-6430 thru 90-6432, 90-6873 thru 90-6875 and 90-6877 for additional LA-8W20-2 Family dimensions, installation details and duct bank configurations.

Per Drawing 90-6330, 90-6430 thru 90-6432, 90-6873 thru 90-6875 & 90-6877

UNDERGROUND DEVICES, INC. - Northbrook, IL 60062
Phone: 847-205-9000 - Fax: 847-205-9004 - Web: udevices.com



FRONT VIEW
OF SPACER STATION



SIDE VIEW
OF SPACER STATION

NOTES:
1. THE LA-8W20-2 WUNPEECE SPACER FAMILY CONFIGURATION REDUCES EMF LEVELS CONSIDERABLY.
2. USE ONE "SPACER STATION" FOR EVERY 5 FEET OF DUCT BANK.
3. ONE "SPACER STATION" CONSISTS OF:
   2 EA. LA-8W20-2-**No.1** SPACER.
   2 EA. LA-8W20-2-**No.2** SPACER.
   1 EA. LA-8W20-2-**No.3** SPACER.
4. SPACERS ARE STAGGERED VERTICALLY FOR A MORE STRUCTURALLY SOUND DUCT BANK. THE VERTICAL STAGGER ELIMINATES WEAK VERTICAL SHEAR PLANES IN THE CONCRETE ENCASEMENT.
5. WE SUGGEST THAT THE CONCRETE USED WITH THESE SPACERS HAVE A SLUMP OF 7 TO 8 INCHES. IT SHOULD HAVE JUST ENOUGH SLUMP TO FLOW TO THE BOTTOM OF THE DUCT BANK AND YET NOT BE SO WET THAT IT CAUSES THE CONDUITS TO FLOAT EXCESSIVELY.
6. TO AID IN THE CONCRETE FLOW THE AGGREGATE SIZE SHOULD BE CONTROLLED. 3/8" MAXIMUM AGGREGATE IS OFTEN SPECIFIED.
7. WHEN PLACING CONCRETE AROUND CONDUITS ADJUST THE DELIVERY CHUTE SO THE FALL OF THE CONCRETE IS MINIMAL. POUR THE CONCRETE SLOWLY AND DISTRIBUTE IT EVENLY SO AS NOT TO DISLODGE THE SPACERS.
8. THE DUCT BANK MUST BE HELD DOWN DURING AND IMMEDIATELY AFTER THE CONCRETE POUR. THIS IS NECESSARY DUE TO THE FLOATATION CAUSED BY DUCT BANK BUOYANCY AND CONCRETE CHURNING.
9. HOLD DOWN HARDWARE, THAT MAY BE REQUIRED, IS NOT SHOWN IN THIS DRAWING AND MUST BE ORDERED SEPARATELY.
10. CONDUIT, PLASTIC CABLE TIES AND ANY REBAR THAT MAY BE REQUIRED IS TO BE SUPPLIED BY OTHERS.
11. THE EPC40 (SCH.40) PVC ELECTRICAL CONDUITS SHOWN IN THIS DRAWING ARE PER NEMA TC 2.
12. "(TYP)" INDICATES THE DIMENSION IS TYPICAL OF TWO OR MORE PLACES.

CONDUIT SIZES	
CONDUIT	
NOMINAL SIZE	ACTUAL OD
4"	4.500
8"	8.625

DUCT BANK CONFIGURATION No.1
VERTICAL DUAL CIRCUIT

SCALE: 1.000

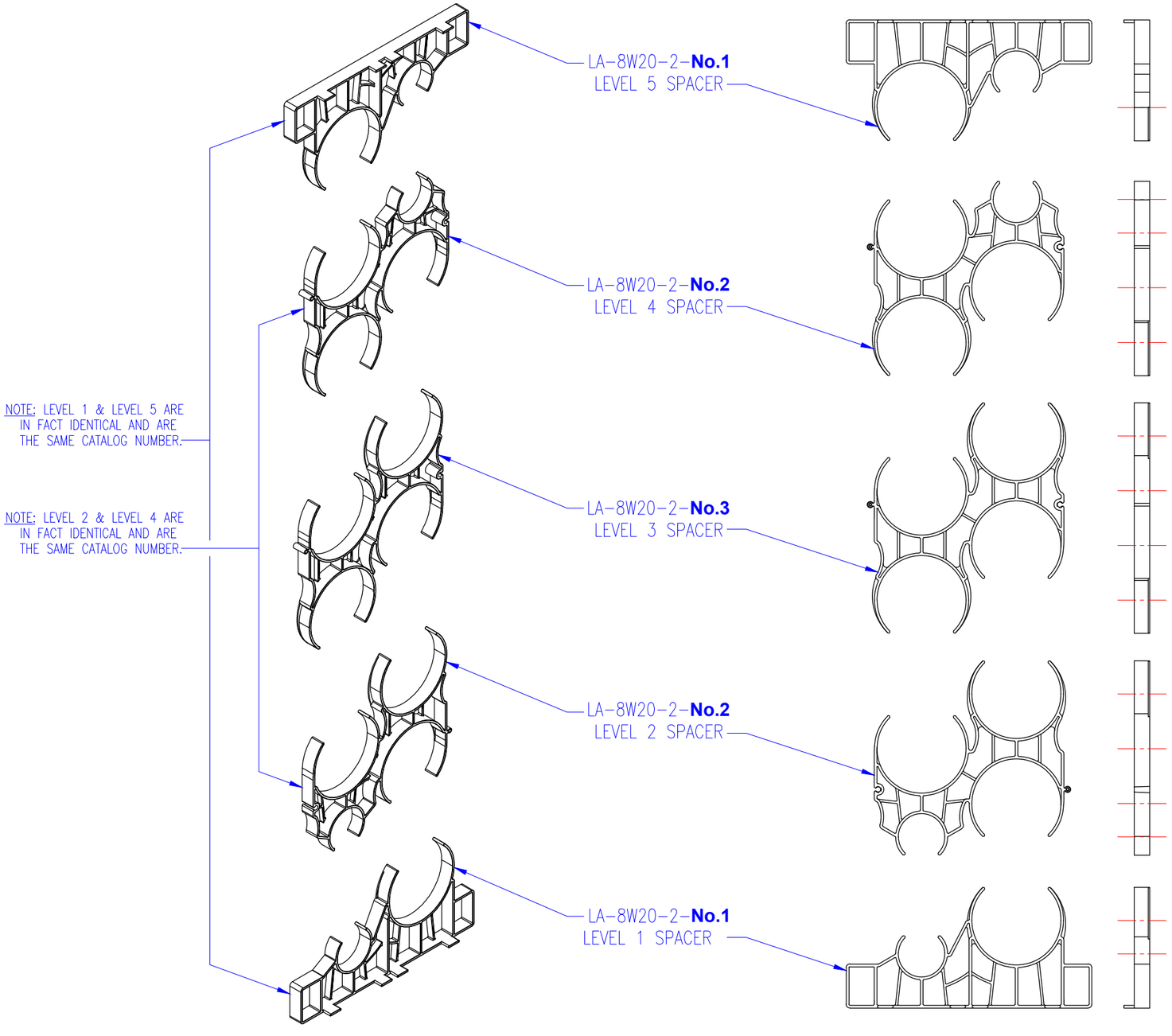
LA-8W20-2 LOW EMF WUNPEECE SPACER STATION OUTLINE DRAWING
With 6 Ea. 8" & 2 Ea. 4" EPC40 (Sch.40) PVC Conduits

SCALE: See At Left	DESIGNED BY: Alan Armstrong	DETAILED BY: Alan Armstrong	CHECKED BY: Don McCoy
DATE: 5-29-12	APPROVED BY:		REVISION: C 2-12-15

1st Designed For Los Angeles Department of Water and Power
SCATTERGOOD-OLYMPIC 230kV TRANSMISSION LINE PROJECT

UNDERGROUND DEVICES, INC.
NORTHBROOK, ILLINOIS 60062 - (847)205-9000 - udevices.com

DRAWING NUMBER: 90-6430
PAGE 1 OF 2



PERSPECTIVE VIEW
OF SPACER STATION

ORTHOGRAPHIC VIEW
OF SPACER STATION

SCALE: 1.000

DUCT BANK CONFIGURATION No.1
VERTICAL DUAL CIRCUIT

LA-8W20-2 LOW EMF WUNPEECE
SPACER STATION OUTLINE DRAWING
With 6 Ea. 8" & 2 Ea. 4" EPC40 (Sch.40) PVC Conduits

SCALE: See At Left	DESIGNED BY: Alan Armstrong	DETAILED BY: Alan Armstrong	CHECKED BY: Don McCoy
DATE: 5-29-12	APPROVED BY:		REVISION: C 2-12-15

1st Designed For Los Angeles Department of Water and Power
SCATTERGOOD-OLYMPIC 230kV TRANSMISSION LINE PROJECT

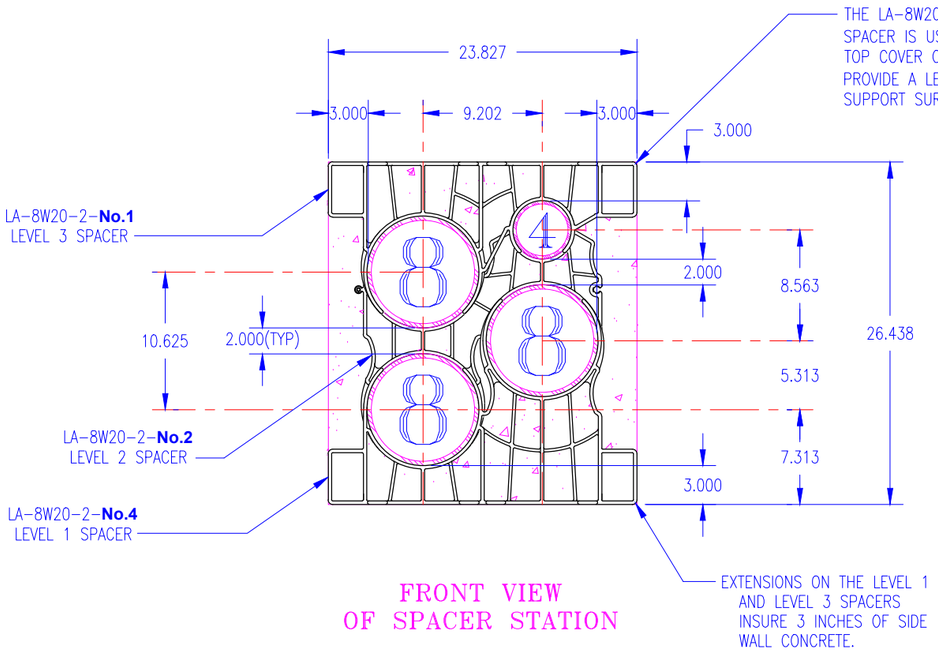
UNDERGROUND DEVICES, INC.
NORTHBROOK, ILLINOIS 60062 - (847)205-9000 - udevices.com

DRAWING NUMBER: 90-6430
PAGE 2 OF 2

THIS INFORMATION IS BASED ON OUR EXPERIENCE TO DATE AND WE BELIEVE IT TO BE RELIABLE. IT IS INTENDED ONLY AS A GUIDE FOR USE AT YOUR DISCRETION AND RISK. WE CANNOT GUARANTEE FAVORABLE RESULTS AND ASSUME NO LIABILITY IN CONNECTION WITH ITS USE OR USE OF THE PRODUCTS DESCRIBED.

THIS DUCT SPACER DESIGN IS COVERED BY ONE OR MORE PENDING PATENT APPLICATIONS. FURTHER, THIS DRAWING AND PROPRIETARY DESIGN IS SOLEY THE PROPERTY OF UNDERGROUND DEVICES, INC. AND IS SUBMITTED WITH THE UNDERSTANDING THAT IT WILL BE KEPT IN STRICT CONFIDENCE.

* US PATENTS 8,783,631 & 8,876,068 *
* AUSTRALIAN PATENT 2013206301 *
* OTHER US & FOREIGN PATENTS PENDING *



FRONT VIEW
OF SPACER STATION

SIDE VIEW
OF SPACER STATION

NOTES:

1. THE LA-8W20-2 WUNPEECE SPACER FAMILY CONFIGURATION REDUCES EMF LEVELS CONSIDERABLY.
2. USE ONE "SPACER STATION" FOR EVERY 5 FEET OF DUCT BANK.
3. ONE "SPACER STATION" CONSISTS OF:
   1 EA. LA-8W20-2-**No.1** SPACER.
   1 EA. LA-8W20-2-**No.2** SPACER.
   1 EA. LA-8W20-2-**No.4** SPACER.
4. SPACERS INTERLOCK HORIZONTALLY AND ARE STAG-GERED VERTICALLY FOR A MORE STRUCTURALLY SOUND DUCT BANK. THE VERTICAL STAGGER ELIMINATES WEAK VERTICAL SHEAR PLANES IN THE CONCRETE ENCASEMENT.
5. WE SUGGEST THAT THE CONCRETE USED WITH THESE SPACERS HAVE A SLUMP OF 7 TO 8 INCHES. IT SHOULD HAVE JUST ENOUGH SLUMP TO FLOW TO THE BOTTOM OF THE DUCT BANK AND YET NOT BE SO WET THAT IT CAUSES THE CONDUITS TO FLOAT EXCESSIVELY.
6. TO AID IN THE CONCRETE FLOW THE AGGREGATE SIZE SHOULD BE CONTROLLED. 3/8" MAXIMUM AGGREGATE IS OFTEN SPECIFIED.
7. WHEN PLACING CONCRETE AROUND CONDUITS ADJUST THE DELIVERY CHUTE SO THE FALL OF THE CONCRETE IS MINIMAL. POUR THE CONCRETE SLOWLY AND DISTRIBUTE IT EVENLY SO AS NOT TO DISLODGE THE SPACERS.
8. THE DUCT BANK MUST BE HELD DOWN DURING AND IMMEDIATELY AFTER THE CONCRETE POUR. THIS IS NECESSARY DUE TO THE FLOATATION CAUSED BY DUCT BANK BUOYANCY AND CONCRETE CHURNING.
9. HOLD DOWN HARDWARE, THAT MAY BE REQUIRED, IS NOT SHOWN IN THIS DRAWING AND MUST BE ORDERED SEPARATELY.
10. CONDUIT, PLASTIC CABLE TIES AND ANY REBAR THAT MAY BE REQUIRED IS TO BE SUPPLIED BY OTHERS.
11. THE EPC40 (SCH.40) PVC ELECTRICAL CONDUITS SHOWN IN THIS DRAWING ARE PER NEMA TC 2.
12. "(TYP)" INDICATES THE DIMENSION IS TYPICAL OF TWO OR MORE PLACES.

CONDUIT SIZES	
CONDUIT	
NOMINAL SIZE	ACTUAL OD
4"	4.500
8"	8.625

DUCT BANK CONFIGURATION No.2
SINGLE CIRCUIT

SCALE: 1.000

LA-8W20-2 LOW EMF WUNPEECE
SPACER STATION OUTLINE DRAWING
With 3 Ea. 8" & 1 Ea. 4" EPC40 (Sch.40) PVC Conduits

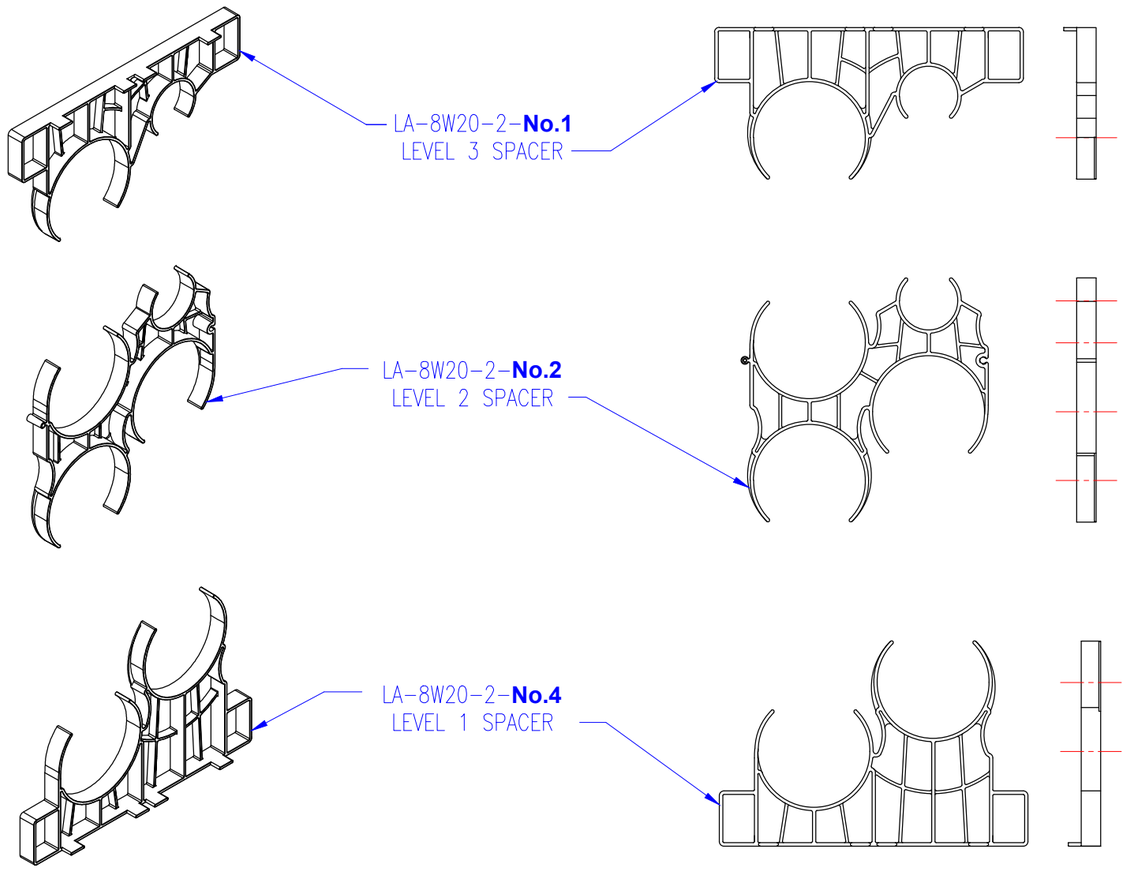
SCALE: See At Left	DESIGNED BY: Alan Armstrong	DETAILED BY: Alan Armstrong	CHECKED BY: Don McCoy
DATE: 5-29-12	APPROVED BY:		REVISION: C 2-12-15

1st Designed For Los Angeles Department of Water and Power
SCATTERGOOD-OLYMPIC 230kV TRANSMISSION LINE PROJECT

UNDERGROUND DEVICES, INC.
NORTHBROOK, ILLINOIS 60062 - (847)205-9000 - udevices.com

DRAWING NUMBER: 90-6431
PAGE 1 OF 2

* US PATENTS 8,783,631 & 8,876,068 *
* AUSTRALIAN PATENT 2013206301 *
* OTHER US & FOREIGN PATENTS PENDING *



PERSPECTIVE VIEW
OF SPACER STATION

ORTHOGRAPHIC VIEW
OF SPACER STATION

DUCT BANK CONFIGURATION No.2
SINGLE CIRCUIT

SCALE: 1.000

LA-8W20-2 WUNPEECE SPACER STATION OUTLINE DRAWING
With 3 Ea. 8" & 1 Ea. 4" EPC40 (Sch.40) PVC Conduits

SCALE: See At Left	DESIGNED BY: Alan Armstrong	DETAILED BY: Alan Armstrong	CHECKED BY: Don McCoy
DATE: 5-29-12	APPROVED BY:		REVISION: C 2-12-15

1st Designed For Los Angeles Department of Water and Power
SCATTERGOOD-OLYMPIC 230kV TRANSMISSION LINE PROJECT

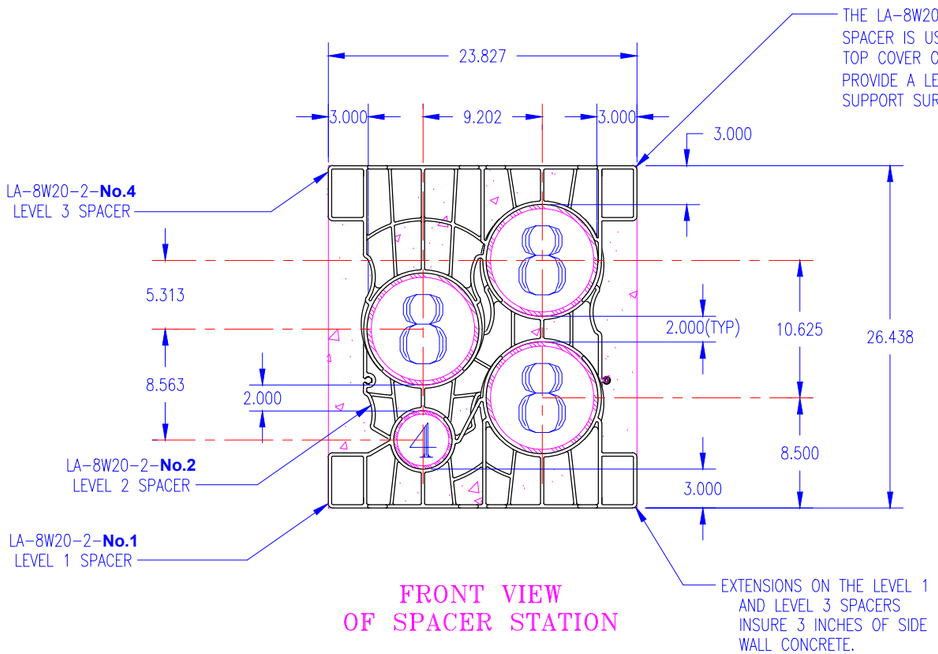
UNDERGROUND DEVICES, INC.
NORTHBROOK, ILLINOIS 60062 - (847)205-9000 - udevices.com

DRAWING NUMBER: 90-6431
PAGE 2 OF 2

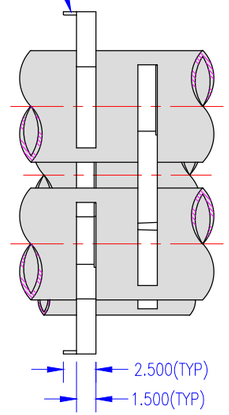
THIS INFORMATION IS BASED ON OUR EXPERIENCE TO DATE AND WE BELIEVE IT TO BE RELIABLE. IT IS INTENDED ONLY AS A GUIDE FOR USE AT YOUR DISCRETION AND RISK. WE CANNOT GUARANTEE FAVORABLE RESULTS AND ASSUME NO LIABILITY IN CONNECTION WITH ITS USE OR USE OF THE PRODUCTS DESCRIBED.

THIS DUCT SPACER DESIGN IS COVERED BY ONE OR MORE PENDING PATENT APPLICATIONS. FURTHER, THIS DRAWING AND PROPRIETARY DESIGN IS SOLEY THE PROPERTY OF UNDERGROUND DEVICES, INC. AND IS SUBMITTED WITH THE UNDERSTANDING THAT IT WILL BE KEPT IN STRICT CONFIDENCE.

* US PATENTS 8,783,631 & 8,876,068 *
* AUSTRALIAN PATENT 2013206301 *
* OTHER US & FOREIGN PATENTS PENDING *



FRONT VIEW
OF SPACER STATION



SIDE VIEW
OF SPACER STATION

NOTES:
1. THE LA-8W20-2 WUNPEECE SPACER FAMILY CONFIGURATION REDUCES EMF LEVELS CONSIDERABLY.
2. USE ONE "SPACER STATION" FOR EVERY 5 FEET OF DUCT BANK.
3. ONE "SPACER STATION" CONSISTS OF:
   1 EA. LA-8W20-2-**No.1** SPACER.
   1 EA. LA-8W20-2-**No.2** SPACER.
   1 EA. LA-8W20-2-**No.4** SPACER.
4. SPACERS INTERLOCK HORIZONTALLY AND ARE STAGGERED VERTICALLY FOR A MORE STRUCTURALLY SOUND DUCT BANK. THE VERTICAL STAGGER ELIMINATES WEAK VERTICAL SHEAR PLANES IN THE CONCRETE ENCASEMENT.
5. WE SUGGEST THAT THE CONCRETE USED WITH THESE SPACERS HAVE A SLUMP OF 7 TO 8 INCHES. IT SHOULD HAVE JUST ENOUGH SLUMP TO FLOW TO THE BOTTOM OF THE DUCT BANK AND YET NOT BE SO WET THAT IT CAUSES THE CONDUITS TO FLOAT EXCESSIVELY.
6. TO AID IN THE CONCRETE FLOW THE AGGREGATE SIZE SHOULD BE CONTROLLED. 3/8" MAXIMUM AGGREGATE IS OFTEN SPECIFIED.
7. WHEN PLACING CONCRETE AROUND CONDUITS ADJUST THE DELIVERY CHUTE SO THE FALL OF THE CONCRETE IS MINIMAL. POUR THE CONCRETE SLOWLY AND DISTRIBUTE IT EVENLY SO AS NOT TO DISLODGE THE SPACERS.
8. THE DUCT BANK MUST BE HELD DOWN DURING AND IMMEDIATELY AFTER THE CONCRETE POUR. THIS IS NECESSARY DUE TO THE FLOATATION CAUSED BY DUCT BANK BUOYANCY AND CONCRETE CHURNING.
9. HOLD DOWN HARDWARE, THAT MAY BE REQUIRED, IS NOT SHOWN IN THIS DRAWING AND MUST BE ORDERED SEPARATELY.
10. CONDUIT, PLASTIC CABLE TIES AND ANY REBAR THAT MAY BE REQUIRED IS TO BE SUPPLIED BY OTHERS.
11. THE EPC40 (SCH.40) PVC ELECTRICAL CONDUITS SHOWN IN THIS DRAWING ARE PER NEMA TC 2.
12. "(TYP)" INDICATES THE DIMENSION IS TYPICAL OF TWO OR MORE PLACES.

CONDUIT SIZES	
CONDUIT	
NOMINAL SIZE	ACTUAL OD
4"	4.500
8"	8.625

DUCT BANK CONFIGURATION No.3
SINGLE CIRCUIT

SCALE: 1.000

LA-8W20-2 LOW EMF WUNPEECE SPACER STATION OUTLINE DRAWING
With 3 Ea. 8" & 1 Ea. 4" EPC40 (Sch.40) PVC Conduits

SCALE: See At Left	DESIGNED BY: Alan Armstrong	DETAILED BY: Alan Armstrong	CHECKED BY: Don McCoy
DATE: 5-29-12	APPROVED BY:		REVISION: C 2-12-15

1st Designed For Los Angeles Department of Water and Power
SCATTERGOOD-OLYMPIC 230kV TRANSMISSION LINE PROJECT

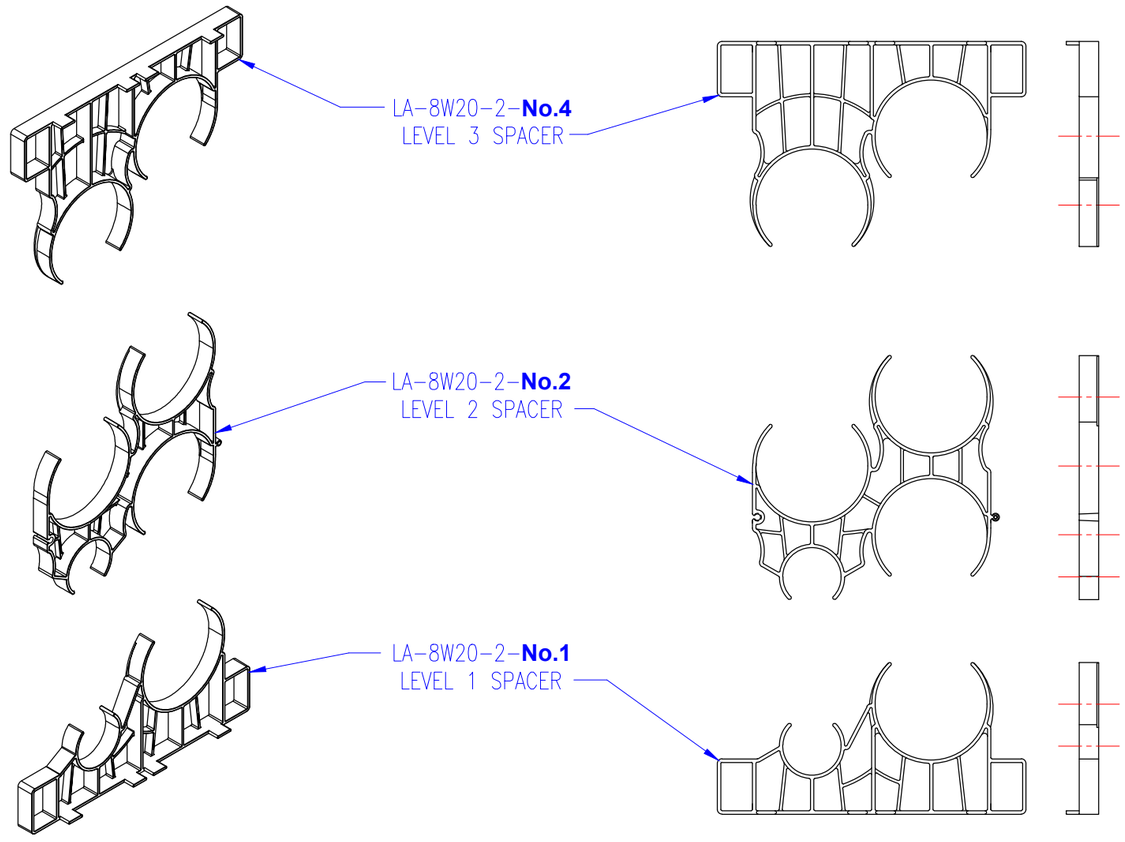
UNDERGROUND DEVICES, INC.
NORTHBROOK, ILLINOIS 60062 - (847)205-9000 - udevices.com

DRAWING NUMBER: 90-6432
PAGE 1 OF 2

THIS INFORMATION IS BASED ON OUR EXPERIENCE TO DATE AND WE BELIEVE IT TO BE RELIABLE. IT IS INTENDED ONLY AS A GUIDE FOR USE AT YOUR DISCRETION AND RISK. WE CANNOT GUARANTEE FAVORABLE RESULTS AND ASSUME NO LIABILITY IN CONNECTION WITH ITS USE OR USE OF THE PRODUCTS DESCRIBED.

THIS DUCT SPACER DESIGN IS COVERED BY ONE OR MORE PENDING PATENT APPLICATIONS. FURTHER, THIS DRAWING AND PROPRIETARY DESIGN IS SOLEY THE PROPERTY OF UNDERGROUND DEVICES, INC. AND IS SUBMITTED WITH THE UNDERSTANDING THAT IT WILL BE KEPT IN STRICT CONFIDENCE.

* US PATENTS 8,783,631 & 8,876,068 *
* AUSTRALIAN PATENT 2013206301 *
* OTHER US & FOREIGN PATENTS PENDING *



PERSPECTIVE VIEW
OF SPACER STATION

ORTHOGRAPHIC VIEW
OF SPACER STATION

DUCT BANK CONFIGURATION No.3
SINGLE CIRCUIT

SCALE: 1.000

LA-8W20-2 LOW EMF WUNPEECE
SPACER STATION OUTLINE DRAWING
With 3 Ea. 8" & 1 Ea. 4" EPC40 (Sch.40) PVC Conduits

SCALE: See At Left	DESIGNED BY: Alan Armstrong	DETAILED BY: Alan Armstrong	CHECKED BY: Don McCoy
DATE: 5-29-12	APPROVED BY:		REVISION C 2-12-15

1st Designed For Los Angeles Department of Water and Power
SCATTERGOOD-OLYMPIC 230kV TRANSMISSION LINE PROJECT

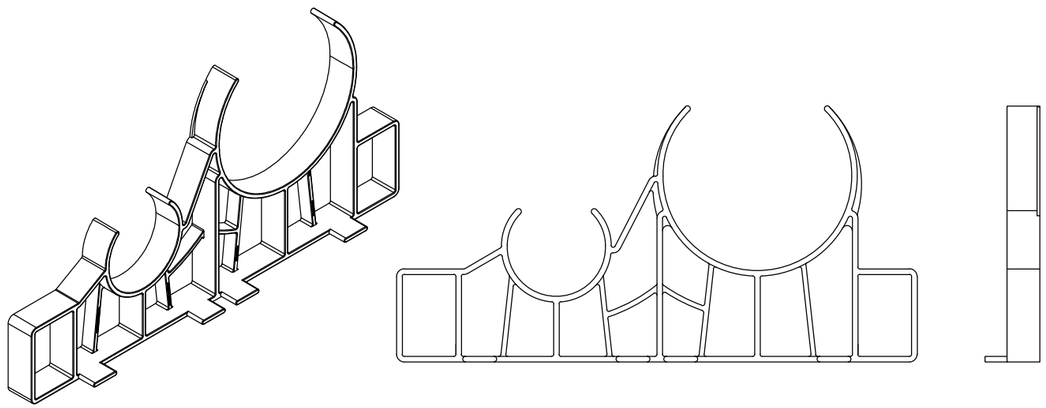
UNDERGROUND DEVICES, INC.
NORTHBROOK, ILLINOIS 60062 - (847)205-9000 - udevices.com

DRAWING NUMBER: 90-6432
PAGE 2 OF 2

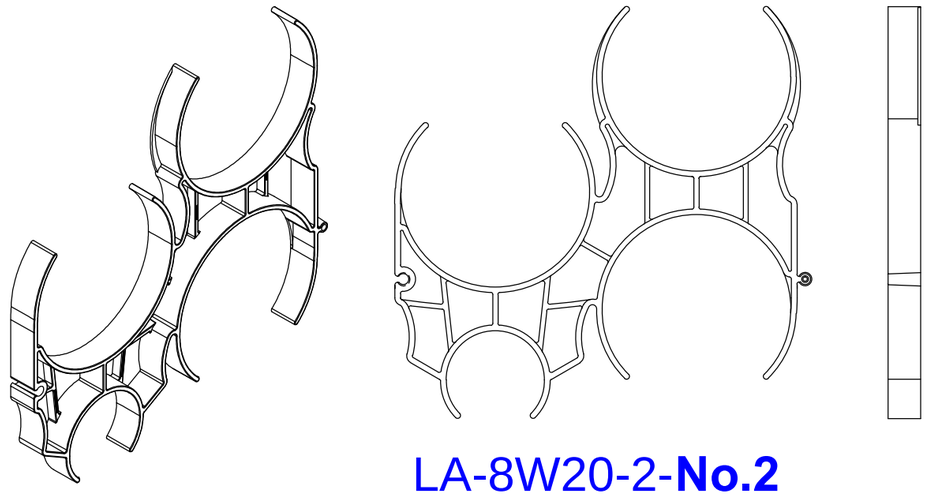
THIS INFORMATION IS BASED ON OUR EXPERIENCE TO DATE AND WE BELIEVE IT TO BE RELIABLE. IT IS INTENDED ONLY AS A GUIDE FOR USE AT YOUR DISCRETION AND RISK. WE CANNOT GUARANTEE FAVORABLE RESULTS AND ASSUME NO LIABILITY IN CONNECTION WITH ITS USE OR USE OF THE PRODUCTS DESCRIBED.

THIS DUCT SPACER DESIGN IS COVERED BY ONE OR MORE PENDING PATENT APPLICATIONS. FURTHER, THIS DRAWING AND PROPRIETARY DESIGN IS SOLEY THE PROPERTY OF UNDERGROUND DEVICES, INC. AND IS SUBMITTED WITH THE UNDERSTANDING THAT IT WILL BE KEPT IN STRICT CONFIDENCE.

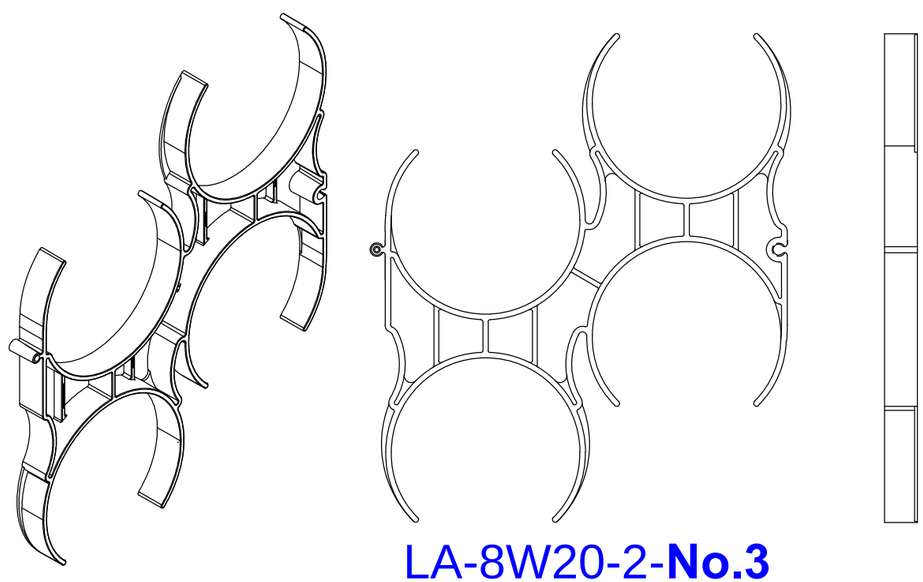
* US PATENTS 8,783,631 & 8,876,068 *
* AUSTRALIAN PATENT 2013206301 *
* OTHER US & FOREIGN PATENTS PENDING *



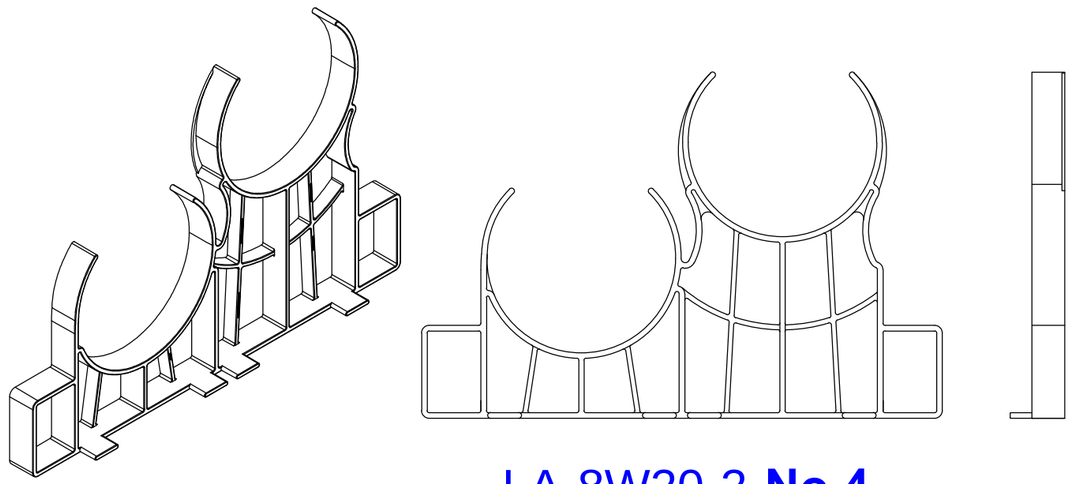
LA-8W20-2-**No.1**



LA-8W20-2-**No.2**



LA-8W20-2-**No.3**



LA-8W20-2-**No.4**

CONDUIT SIZES	
CONDUIT	
NOMINAL SIZE	ACTUAL OD
4”	4.500
8”	8.625

SCALE: 1.000

LA-8W20-2 LOW EMF WUNPEECE SPACER FAMILY COMPONENT PARTS
Accommodates 8” & 4” IPS PVC Conduits

SCALE: See At Left	DESIGNED BY: Alan Armstrong	DETAILED BY: Alan Armstrong	CHECKED BY: Don McCoy
DATE: 3-29-13	APPROVED BY:		REVISION: B 2-12-15

1st Designed For Los Angeles Department of Water and Power
SCATTERGOOD-OLYMPIC 230kV TRANSMISSION LINE PROJECT

UNDERGROUND DEVICES, INC.
NORTHBROOK, ILLINOIS 60062 - (847)205-9000 - udevices.com

DRAWING NUMBER: 90-6877
PAGE 1 OF 1

THIS INFORMATION IS BASED ON OUR EXPERIENCE TO DATE AND WE BELIEVE IT TO BE RELIABLE. IT IS INTENDED ONLY AS A GUIDE FOR USE AT YOUR DISCRETION AND RISK. WE CANNOT GUARANTEE FAVORABLE RESULTS AND ASSUME NO LIABILITY IN CONNECTION WITH ITS USE OR USE OF THE PRODUCTS DESCRIBED.

THIS DUCT SPACER DESIGN IS COVERED BY ONE OR MORE PENDING PATENT APPLICATIONS. FURTHER, THIS DRAWING AND PROPRIETARY DESIGN IS SOLEY THE PROPERTY OF UNDERGROUND DEVICES, INC. AND IS SUBMITTED WITH THE UNDERSTANDING THAT IT WILL BE KEPT IN STRICT CONFIDENCE.

* US PATENTS 8,783,631 & 8,876,068 *
* AUSTRALIAN PATENT 2013206301 *
* OTHER US & FOREIGN PATENTS PENDING *

Scattergood-Olympic

TRANSMISSION LINE PROJECT

4.2.9 Electric and Magnetic Fields
Pages 4-127 through 4-133

With the permission of The LA-DWP this section was extracted from the "Scattergood-Olympic Transmission Line Project" "Draft Environmental Impact Report" dated March 2012.

DRAFT ENVIRONMENTAL IMPACT REPORT

SCH# 2009091085 | March 2012

City Clerk Filing # EIR-12-007-WP

Prepared by:

Los Angeles Department of Water and Power
111 North Hope Street, Room 1044
Los Angeles, CA 90012

Technical Assistance Provided by:

POWER Engineers, Inc.
731 East Ball Road, Suite 100
Anaheim, CA 92805

would be located within a 100-year floodplain, and no impacts would occur. No mitigation would be required.

i) Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam?

There are no levees within the Project area. The portion of the Project north of the Ballona Escarpment lies within the Stone Canyon Reservoir Inundation Area, and could be affected in the event of a catastrophic collapse of the dam. However, the Project as described would not add to the existing risk and therefore would not expose people or structures to a significant risk as a result of levee or dam failure. No impact would occur, and no mitigation would be required.

j) Inundate by seiche, tsunami, or mudflow?

The Project would cross the tsunami inundation area associated with Ballona Creek, and would run adjacent to the upper limit of the coastal tsunami inundation area along Vista Del Mar south of Sandpiper Street. However, the tsunami inundation area for Ballona Creek is confined to the upper reaches of the channel, and would not affect the transmission line, which would be within a conduit bank anchored to an open bay on the underside of the Lincoln Boulevard Bridge. South of Sandpiper Street, the transmission line would be adjacent to the upper limit of the tsunami inundation area, but the transmission line and maintenance vaults would be underground, and would neither affect nor be affected by a tsunami. Modifications at the Olympic RS and SGS would occur within the existing facility footprints, which are not within a tsunami inundation area. No impact would occur, and no mitigation would be required.

Mitigation Measures

All impacts to hydrology and water quality would be at a level of less than significant or no impact. Therefore, no mitigation measures would be required.

Significance of Impact After Mitigation

There are no significant impacts to hydrology and water resources.

Cumulative Impacts

As no significant impacts to hydrology and water resources are anticipated within the Project area or its vicinity, no cumulatively significant impacts are expected to result from Project construction and operation.

4.2.9 ELECTRIC AND MAGNETIC FIELDS

Introduction

This section describes electric and magnetic fields (EMF) in the vicinity of the SOTLP. This section does not consider EMF in the context of CEQA and determination of environmental impact, first because there is no agreement among scientists that EMF does create a potential health risk, and second because there are no defined or adopted CEQA standards related to EMF. Therefore, the information presented is for the benefit of the public and decision-makers. An EMF Management Plan has also been prepared and can be found in Appendix F.

EMF are present wherever electricity flows: around appliances, equipment, wiring, and transmission lines. Electric fields are present whenever voltage exists on a wire, and are not dependent on current. The magnitude of the electric field is primarily a function of the configuration and operating voltage of the transmission line and decreases with the distance from the source. The strength of an electric field is measured in volts per meter (V/m) or kilovolts per meter (kV/m).

Magnetic fields are present whenever current flows in a conductor, and are not dependent on the voltage of the conductor. The strength of these fields also decreases with distance from the source. However, unlike electric fields, most common materials have little blocking effect on magnetic fields. In the United States, magnetic fields are measured in units called Gauss. However, for the low levels normally encountered near electric utility facilities, the field strength is expressed in a much smaller unit, the milliGauss (mG), which is one thousandth of a Gauss. Much of the world's scientific community measures magnetic field strength in units of Tesla (T) and microTesla (μT), where 10,000 G = 1 T, 1G = 100 μT, and 1mG = 0.1 μT.

Since electric fields are effectively blocked by most materials, such as trees and walls, the majority of the following information related to EMF focuses primarily on exposure to magnetic fields. Table 4.2.9-1 lists an estimated average magnetic field exposure from residential sources. It is noteworthy that some of the common sources of higher magnetic fields are appliances and electrical devices found within the home. The magnetic field levels from such sources in typical use can range up to hundreds of mG or higher; however, the duration of exposure from many appliances is typically much shorter than that from other sources.

TABLE 4.2.9-1. RESIDENTIAL SOURCES: REDUCTION OF MAGNETIC FIELDS WITH DISTANCE

Source	Magnetic Field Strength (mG)		
	1 Foot Away	2 Feet Away	4 Feet Away
Blenders	20	3	-
Digital Clock	8	2	1
Color Televisions	20	8	4
Window Air Conditioners	20	6	4
Washing Machines	30	6	-
Vacuum Cleaners	200	50	10
Drills	40	6	-
Power Saws	300	40	4

Source: "EMF Questions & Answers," U.S. National Institute of Environmental Health Services, EMF-RAPID Program, 2002

Magnetic fields diminish with distance, but can pass through most materials. Fields from compact sources (i.e., those containing coils, such as small appliances and transformers) drop off with distance ~~"r"~~ from the source by a factor of $1/r^3$. For three-phase power lines with balanced currents, the magnetic field strength drops off at a rate of $1/r^2$. Fields from unbalanced currents that flow in paths (such as neutral or ground conductors) fall off in inverse proportion to the distance from the source, 1/r. Conductor spacing and configuration also affect the rate at which the magnetic field strength decreases, as well as the presence of other sources of electricity. The magnetic field levels of transmission lines will vary with loading conditions of the power system. Table 4.2.9-1 also shows how the magnetic field strength is reduced at various distances away from various sources of magnetic fields.

Environmental Setting

Land use along the proposed alignment consists of a variety of uses. In the southern portion of the Project area, land use along Grand Avenue, Vista Del Mar, and Sandpiper Street consists of a combination of industrial and recreational/open space uses. Land adjacent to the proposed alignment along Westchester Parkway consists of LAX on the south and vacant land on the north. Along Loyola Boulevard, La Tijera Boulevard, and Lincoln Boulevard, land adjacent to the proposed alignment consists of a combination of residential, commercial, recreational/open space, and educational facilities. Land adjacent to the proposed alignment along Centinela Avenue, Bundy Drive, and Olympic Boulevard consists of a combination of residential, commercial, industrial, educational, and recreational/open space uses.

EMF receptors in the Project area include schools, daycare centers, and residential, commercial/industrial, and recreational land uses. Schools (public and private) and daycare centers are typically considered

receptors of greatest public interest and concern. Unpopulated areas are of least concern, since those areas have limited or no public exposure.

Five schools are located adjacent to the proposed alignment. The James J. McBride and Pacifica Montessori Schools are located on Centinela Avenue, which is an approximately 70-foot-wide street. Ocean Charter School is located on Culver Boulevard, an approximately 50-foot-wide street. The Otis College of Art and Design is located on La Tijera Boulevard, an approximately 60-foot-wide street. Loyola Marymount University is located on Lincoln Boulevard, an approximately 110-foot-wide street. The California Department of Education (CDE) has provided guidance to Local Educational Agencies that wish to seek an exemption from school site power transmission line setbacks as established in the California Code of Regulations, Title 5, Section 14010(c). This guidance has been developed in consultation with international experts on the health effects of EMF; State agencies such as the Department of Health Services, the Division of the State Architect, and the CPUC; electric utilities; school districts; consultants; and private citizens with an interest in the topic. These guidelines recommend a setback distance of 37.5 feet for schools proposed near 230 kV underground transmission lines. The proposed routing alignment meets the CDE requirements.

Six parks are located adjacent to the proposed alignment: Dockweiler State Beach, Westchester Recreation Center, Vista Del Mar Park, Playa Vista Park, Culver Marina Little League, and Santa Monica Airport Park.

EMF Research

For more than 20 years, questions have been asked regarding the potential EMF effects on humans. A substantial amount of research investigating both electric and magnetic fields has been conducted in response. However, much of the body of national and international research regarding EMF and public health risks remains contradictory or inconclusive. Research related to EMF can be grouped into three general categories: cellular level studies, animal and human experiments, and epidemiological studies. These studies have provided mixed results, with some studies showing an apparent relationship between magnetic fields and health effects while other, similar studies do not. Although some reports state that EMF could have the potential to cause some degree of increased risk, the degree of risk was never quantified, nor was the specific level of EMF exposure that could constitute a health risk (CPUC 2003). Research on possible health effects associated with EMF is continuing. Chapter 7 lists major research efforts, along with website addresses where the reports can be read. These efforts include those by the California Department of Health Services and the National Institute of Environmental Health Sciences. In addition, reliable information on possible EMF health effects can be found on the websites of recognized national and international organizations such as the World Health Organization and National Cancer Institute. These are also included in Chapter 7.

Calculated Magnetic Fields

EMF can be calculated using information on voltage or currents (loading conditions). The electrical current that is available is measured in Amps. To understand the anticipated magnetic field levels with the implementation of the Proposed Project, the construction of a new 230 kV underground transmission line was assumed to occur within the middle of the street. The existing Scattergood-Olympic 230 kV transmission line electrical current loadings from December 2010 to November 2011 were utilized as a basis for calculating the magnetic fields of the proposed Project. It was determined that the average loading was 187 Amps and the 95 percentile loading was 751 Amps. The 95 percentile current is the historical current value that was exceeded only 5 percent of the time. The load currents are assumed to be balanced between the three phases. The loads can vary during the 24 hour day and/or throughout the year.

The magnetic field strength values are calculated one meter above the ground. The calculated magnetic fields were determined for a perpendicular profile distance of 100 feet on both sides of the center of the duct bank of the proposed 230 kV transmission line.

Two duct bank configurations were analyzed to assess potential Project-related EMF levels—this includes a horizontal (Figure 4.2.9-1) and triangular (Figure 4.2.9-2) duct bank configuration. The horizontal duct bank configuration represents the preliminary design, or "base case," configuration in which the top of the duct bank is buried at a depth of approximately three feet below the ground surface and the cables are arranged horizontally along the bottom of the duct bank. The triangular configuration represents the "low cost" duct bank configuration proposed for a majority of the route (at the SGS, Olympic RS, and some substructure crossings, this design cannot be used) in which the top of the duct bank of the proposed transmission line would be buried at a depth of approximately three feet below the ground surface and the cables are arranged in a "delta" (triangular) configuration; the triangular design would cost more than four percent of the total Project cost.

FIGURE 4.2.9-1. HORIZONTAL DUCT BANK CONFIGURATION

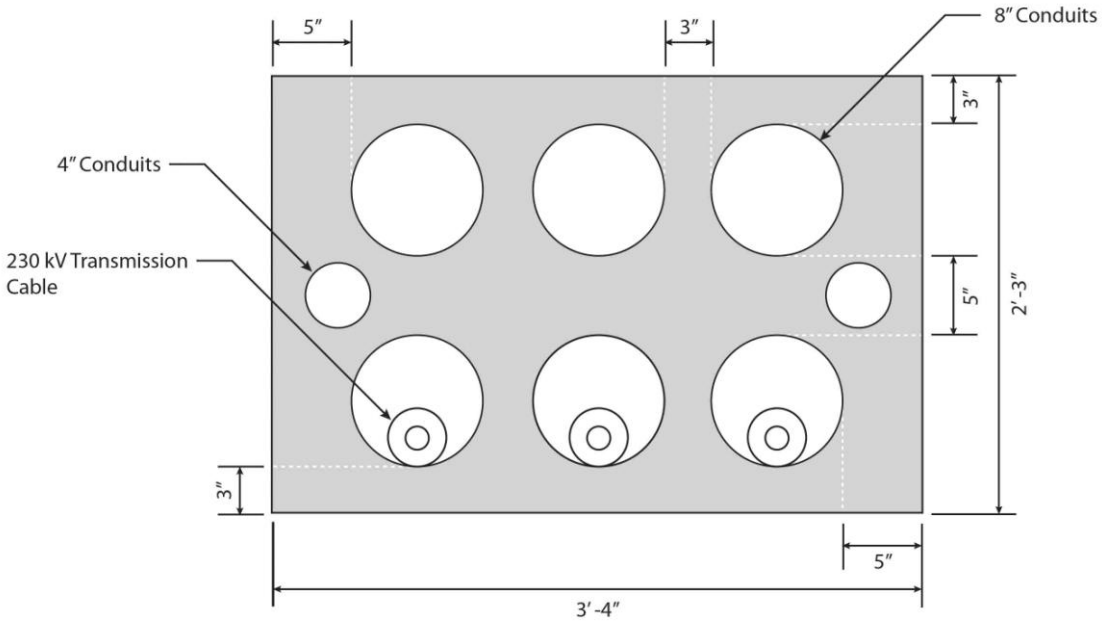


FIGURE 4.2.9-2. TRIANGULAR DUCT BANK CONFIGURATION

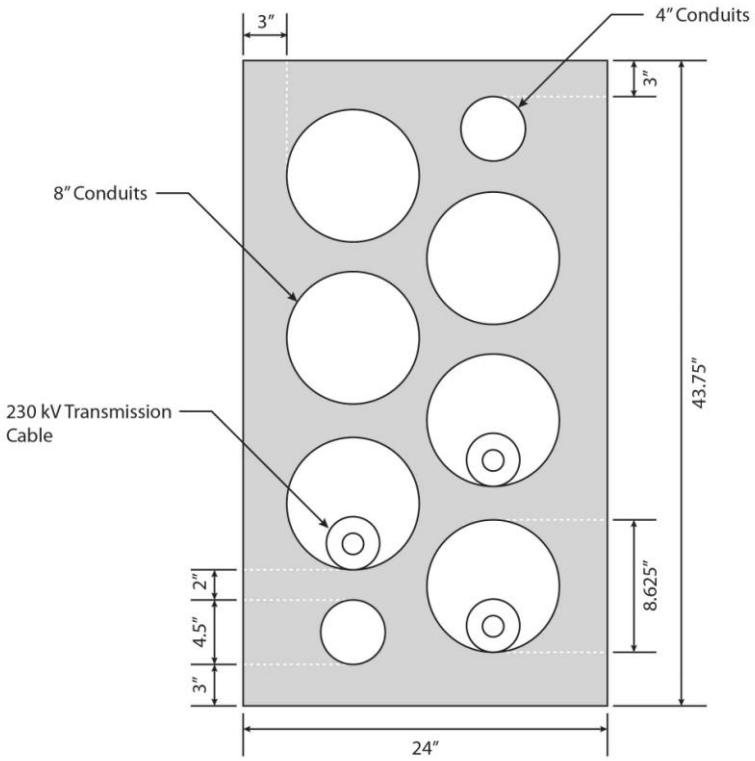


Figure 4.2.9-3 illustrates the calculated magnetic field levels for the average loading condition in relationship to the distance from the center of each duct bank configuration. As shown in Figure 4.2.9-3, the highest magnetic field levels would occur directly above the center of the duct bank; the horizontal duct bank configuration would produce a magnetic field of 26.08 mG and the triangular configuration would produce a magnetic field of 11.21 mG. As you move further from the center of the duct bank, the magnetic fields quickly diminish and the levels vary between the duct bank configuration. For example, at 25 feet from the center of the duct bank, the magnetic field level would be 2.33 mG for the horizontal configuration and 1.35 mG for the triangular configuration. At 50 feet from the center of the duct bank, the magnetic field level would be 0.62 mG for the horizontal configuration and 0.37 mG for the triangular configuration. At 75 feet from the center of the duct bank, the magnetic field level would be 0.28 mG for the horizontal configuration and 0.17 mG for the triangular configuration. At 100 feet from the center of the duct bank, the magnetic field level would be 0.16 mG for the horizontal configuration and 0.09 mG for the triangular configuration.

FIGURE 4.2.9-3. CALCULATED MAGNETIC FIELD FOR AVERAGE LOADING CONDITIONS (187 AMPS)

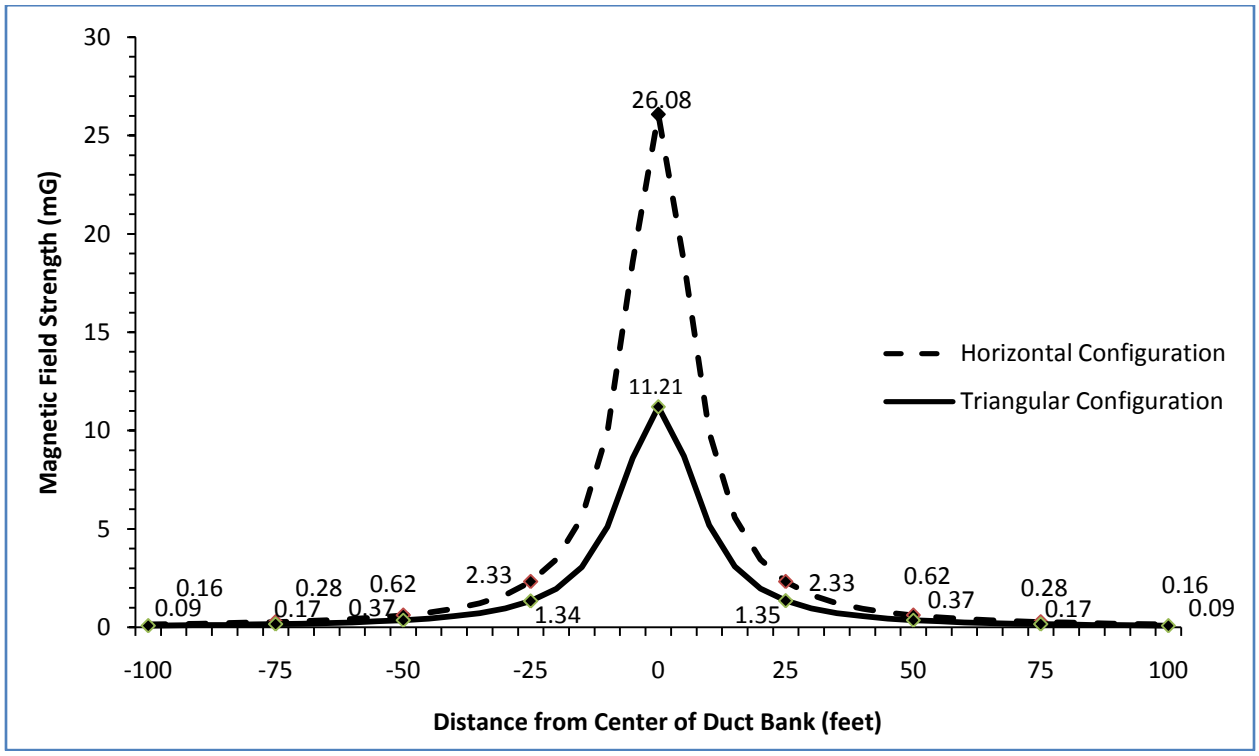
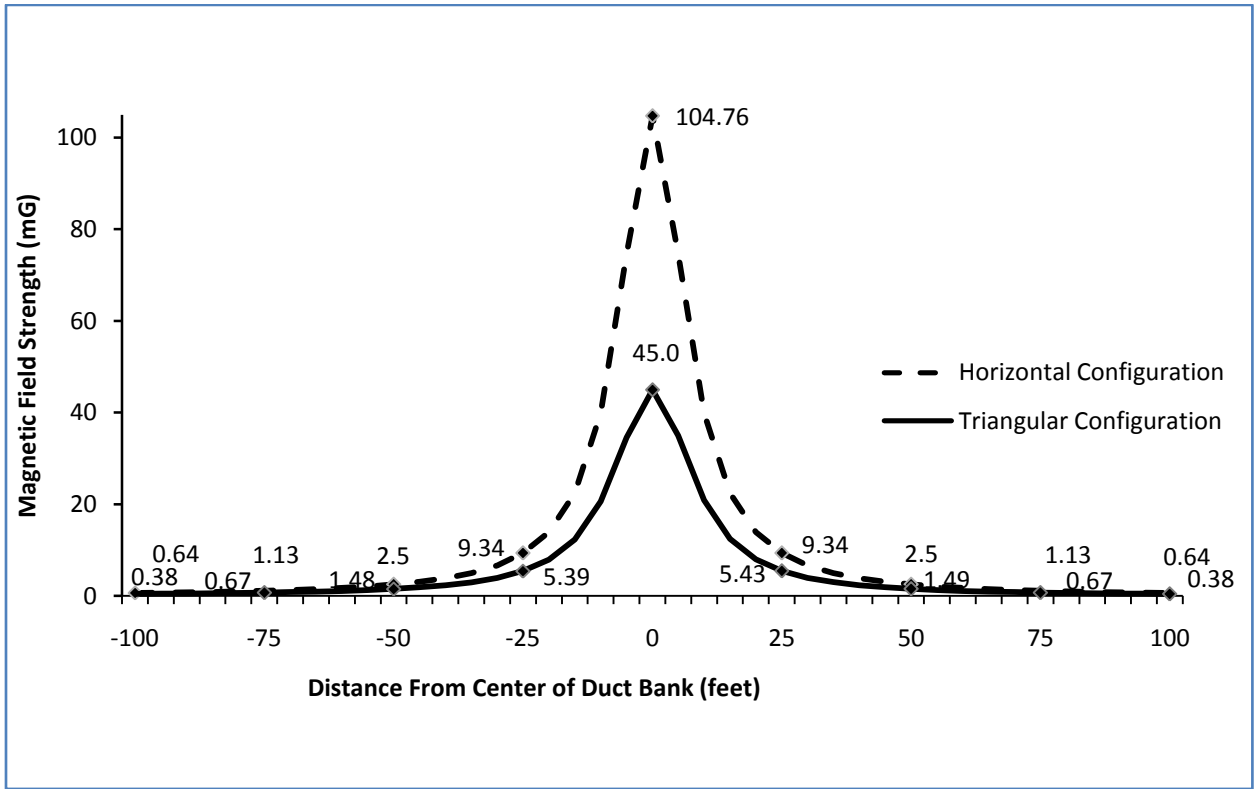


Figure 4.2.9-4 illustrates the calculated magnetic field levels for the 95 percentile loading conditions in relationship to the distance from the center of each duct bank configuration. As shown in Figure 4.2.9-4, the highest magnetic field level would occur directly over the duct bank—104.76 mG for the horizontal configuration and 45.00 mG for the triangular configuration. At 25 feet from the center of the duct bank, the horizontal configuration would have a magnetic field level of 9.34 mG; the triangular configuration would have a magnetic field level of 5.43 mG. At 50 feet from the center of the duct bank, the magnetic field level would be 2.50 mG for the horizontal configuration, and 1.49 mG for the triangular configuration. At 75 feet from the center of the duct bank, the magnetic field level would be 1.13 mG for the horizontal configuration and 0.67 mG for the triangular configuration. At 100 feet, the magnetic field level would be 0.64 mG for the horizontal configuration and 0.38 mG for the triangular configuration.

FIGURE 4.2.9-4. CALCULATED MAGNETIC FIELD FOR 95 PERCENTILE LOADING CONDITIONS (751 AMPS)



Reduction in Magnetic Effects

Several different methods can be used to manage the above-ground EMF values produced by underground transmission lines. The EMF values can be reduced by installing the cables closer together and by installing the cables in a triangular configuration compared to a horizontal configuration.

The proposed Project would utilize a triangular duct bank configuration (Figure 4.2.9-3) with conduits one-inch closer than the horizontal duct bank configuration (Figure 4.2.9-2). This would result in a magnetic field reduction of approximately 57 percent at the center of the duct bank at one meter the above ground, which is the location of the highest magnetic field level. In addition, the proposed cable would contain a metallic sheath, which contains the electric field.

Although not regulated by the CPUC, LADWP follows their guidelines of allocating a minimum of four percent of the total Project cost for implementing EMF reduction measures with a goal of achieving magnetic field reductions of at least 15 percent. The methods utilized for this project would exceed both the four percent allocation and the goal for a 15 percent reduction in magnetic field levels.