



624 SOUTH GRAND AVENUE, SUITE 2500

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FREEDOM TELECOMMUNICATIONS LLC  
dba WILCON

## MASTER STRUCTURAL PLANS PTS#511688

**SCOPE OF WORK:** TO ATTACH MICRO-CELLULAR ANTENNAS AND ASSOCIATED  
EQUIPMENT TO EXISTING STREETLIGHTS AND TRAFFIC  
SIGNALS WITHIN THE CITY OF SAN DIEGO RIGHT OF WAY.

### DESIGN CODE REFERENCES:

1. BOWLES, 1982, "FOUNDATION DESIGN AND ANALYSIS" THIRD EDITION
2. 2012 UBC
3. 2013 CBC
4. ASCE MINIMUM DESIGN LOADS - 7-10
5. STANDARD HANDBOOK FOR CIVIL ENGINEERS, 4TH EDITION, 1996
6. AISC, STEEL CONSTRUCTION MANUAL, 14TH EDITION, 2005



DESIGNER: [Signature] DATE: [Blank]

|               |          |                                                                                           |
|---------------|----------|-------------------------------------------------------------------------------------------|
| SITE ADDRESS: |          | Varies                                                                                    |
| TITLE:        |          | EXISTING STREETLIGHT POLE (WITHOUT SIGNS) WITH ANTENNA SIDE MOUNT AND RADIO EQUIPMENT BOX |
| PTS NO:       | S11688   | SHEET<br>1                                                                                |
| DRAWING NO:   | ECL DSD  |                                                                                           |
| DATE:         | 07/28/16 |                                                                                           |
| SCALED:       | N.T.S.   |                                                                                           |

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DAVID L. SMITH      DAVID L. SMITH      DAVID L. SMITH      DAVID L. SMITH

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**Master Structural Schematic**  
 EXISTING STREETLIGHT POLE (WITHOUT SIGNS)  
 WITH ANTENNA TOP MOUNT AND RADIO EQUIPMENT BOX

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|                                                                                                  |       |
|--------------------------------------------------------------------------------------------------|-------|
| SITE ADDRESS: Varies                                                                             |       |
| TITLE: EXISTING STREETLIGHT POLE (WITHOUT SIGNS) WITH ANTENNA SIDE MOUNT AND RADIO EQUIPMENT BOX |       |
| PTS. NO. 511088                                                                                  | SHEET |
| DRAWING NO. SCL OSD                                                                              | 2     |
| DATE: 07/26/18                                                                                   |       |
| SCALED: N.T.S.                                                                                   |       |

**MASTER STRUCTURAL CALCULATIONS  
FOR FOUNDATION BEARING PRESSURE**



\_\_\_\_\_  
A. C. CHEN  
Professional Engineer  
No. 511688  
Exp. 12/31/16

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|                                                                                                  |                |
|--------------------------------------------------------------------------------------------------|----------------|
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| TITLE: EXISTING STREETLIGHT POLE (WITHOUT SIGNS) WITH ANTENNA SIDE MOUNT AND RADIO EQUIPMENT BOX |                |
| PTS NO. 511688                                                                                   | SHEET<br><br>3 |
| DRAWING NO. SCL DSD                                                                              |                |
| DATE: 07/28/16                                                                                   |                |
| SCALED: N.T.S.                                                                                   |                |

# FOUNDATION BEARING PRESSURE

REFERENCE: BOWLES, 1982, "FOUNDATION DESIGN AND ANALYSIS"  
THIRD EDITION

PER TERZAGHI, ROUND FOUNDATION DESIGN - Table 4-1

$$Q_{ult} = 1.3C N_c + q N_q + 0.3 \gamma B N_\gamma$$

Where: C = 100 Nc = 37.2 γ = 125 pcf  
Nq = 22.5 q = (8)(125) = 1000 psf  
Nγ = 19.7 B = 2 ft.

$$Q_{ult} = (1.3)(100)(37.2) + (1000)(22.5) + (0.3)(125)(2)(19.7)$$

$$Q_{ult} = 28813.5 \text{ psf}$$

$$\text{for FS} = 5 \quad Q_n = 5762.7 \text{ psf}$$

For 8-foot embedment use  $Q_n = 3500 \text{ psf}$ .



Page / of /



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|                                               |            |
|-----------------------------------------------|------------|
| SITE ADDRESS: Varies                          |            |
| TITLE: STRUCTURAL CALCULATIONS FOR FOUNDATION |            |
| PTS NO: 511668                                | SHEET<br>4 |
| DRAWING NO: SCL DSD                           |            |
| DATE: 07/26/16                                |            |
| SCALED: N.T.S.                                |            |

# MASTER STRUCTURAL PLANS FOR EXISTING STREETLIGHT POLE

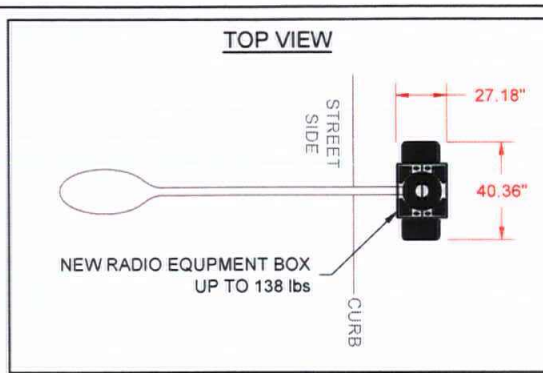


JERRY L. DUNN  
 07/28/16  
 07/28/16  
 07/28/16

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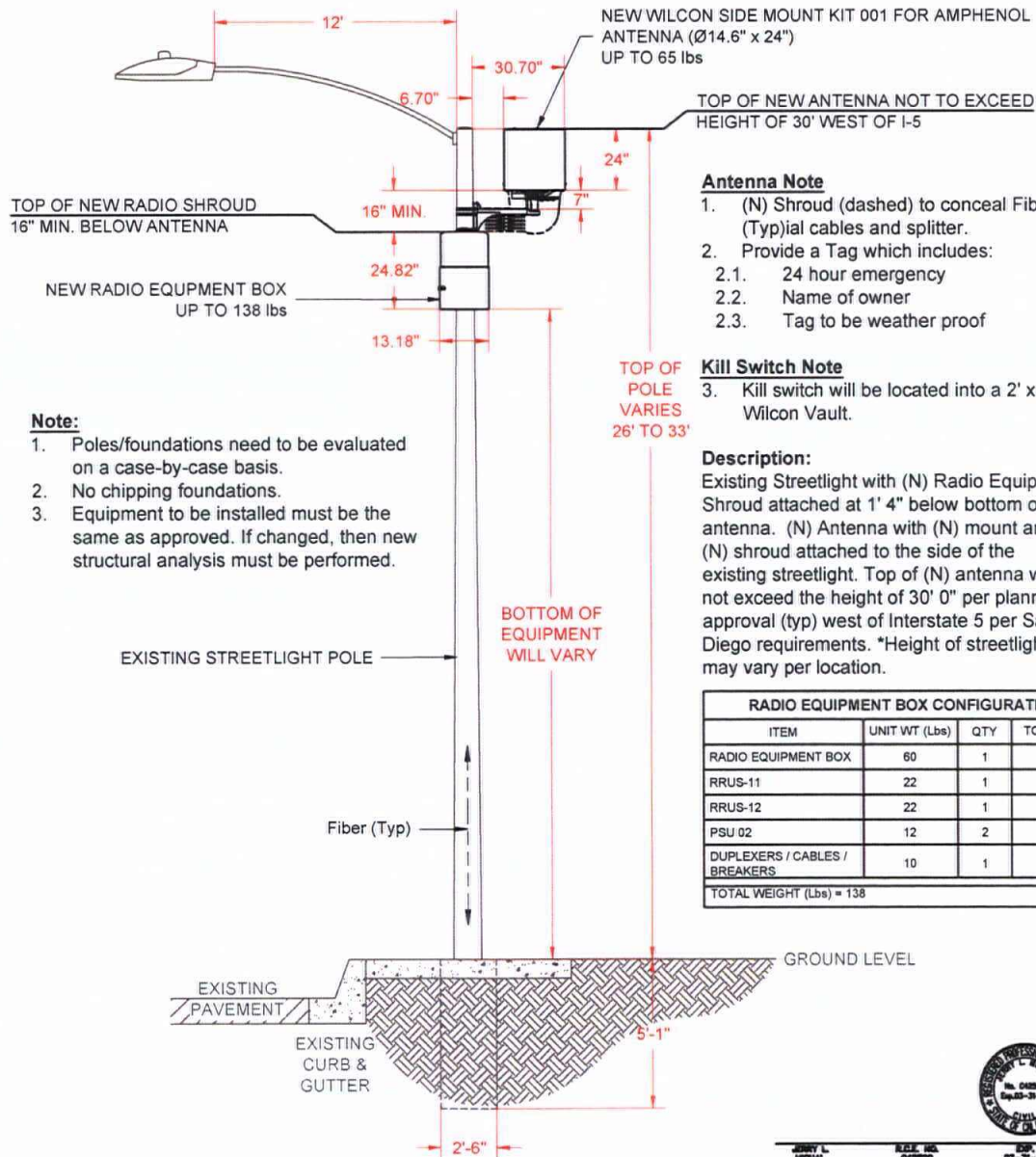
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 EXISTING STREETLIGHT POLE (WITHOUT SIGNS)  
 WITH ANTENNA TOP MOUNT AND RADIO EQUIPMENT BOX

|                                                                                                  |          |            |
|--------------------------------------------------------------------------------------------------|----------|------------|
| SITE ADDRESS:                                                                                    |          | Verlan     |
| TITLE: EXISTING STREETLIGHT POLE (WITHOUT SIGNS) WITH ANTENNA SIDE MOUNT AND RADIO EQUIPMENT BOX |          |            |
| PTS NO.                                                                                          | 511688   | SHEET<br>5 |
| DRAWING NO.                                                                                      | SCL DSD  |            |
| DATE:                                                                                            | 07/28/16 |            |
| SCALED:                                                                                          | N.T.S.   |            |



**Notes:**

1. Check adequacy of connection between street/traffic poles and foundations.
2. Existing connections between light/traffic poles and their foundations shall be field verified for their type (plate size, number/size of bolts) and current structural conditions.
3. Structure(s) will be located on undisturbed native soil." Signature \_\_\_\_\_ Owner/Licensed Engineer or Architect
4. "As a California licensed Architect/Engineer, I have classified the undisturbed native soils to be silty sands, sandy silts and per Table 1804.2 of the 2007 CBC, I have assigned a foundation pressure of 3500 psf. for the design of foundations related to this project".  
Signature of Licensed Architect/Engineer \_\_\_\_\_



**Note:**

1. Poles/foundations need to be evaluated on a case-by-case basis.
2. No chipping foundations.
3. Equipment to be installed must be the same as approved. If changed, then new structural analysis must be performed.

**Antenna Note**

1. (N) Shroud (dashed) to conceal Fiber (Typ)ial cables and splitter.
2. Provide a Tag which includes:
  - 2.1. 24 hour emergency
  - 2.2. Name of owner
  - 2.3. Tag to be weather proof

**Kill Switch Note**

3. Kill switch will be located into a 2' x 3' Wilcon Vault.

**Description:**

Existing Streetlight with (N) Radio Equipment Shroud attached at 1' 4" below bottom of antenna. (N) Antenna with (N) mount and (N) shroud attached to the side of the existing streetlight. Top of (N) antenna will not exceed the height of 30' 0" per planning approval (typ) west of Interstate 5 per San Diego requirements. \*Height of streetlight may vary per location.

**RADIO EQUIPMENT BOX CONFIGURATION**

| ITEM                          | UNIT WT (Lbs) | QTY | TOTAL (Lbs) |
|-------------------------------|---------------|-----|-------------|
| RADIO EQUIPMENT BOX           | 60            | 1   | 60          |
| RRUS-11                       | 22            | 1   | 22          |
| RRUS-12                       | 22            | 1   | 22          |
| PSU 02                        | 12            | 2   | 24          |
| DUPLEXERS / CABLES / BREAKERS | 10            | 1   | 10          |
| TOTAL WEIGHT (Lbs) = 138      |               |     |             |

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WITH ANTENNA TOP MOUNT AND RADIO EQUIPMENT BOX

SITE ADDRESS: Varies  
TITLE: EXISTING STREETLIGHT POLE (WITHOUT SIGNS) WITH ANTENNA SIDE MOUNT AND RADIO EQUIPMENT BOX  
PTS NO: 511688  
DRAWING NO: SCL DSD  
DATE: 07/26/16  
SCALED: N.T.S.  
SHEET 6

# STRUCTURAL DESIGN AND CALCULATIONS

PROJECT NO. Typical Antenna/Strut Installation CALCULATIONS BY: J.L.M.

PROJECT NAME: VZW DTSD DATE: 7-18-2016

PROJECT ADDRESS: DOWNTOWN San Diego  
San Diego, California

## DESIGN PARAMETERS

Bearing Capacity: 1500 psf (per CBC Table 1802) Allowable Lateral Pressure: 150 psf/ft  
STEEL Pole Ht. = 30.0' Ave. Pole Dia. = as noted Pole Strength = 50000kai (per manufacturer)  
Total Pole and Equipment Weight = 1570 lbs

References: 1. 2012 UBC 3. ASCE MINIMUM DESIGN LOADS - 7-10  
2. 2013 CBC  
4. Standard Handbook for Civil Engineers, 4th Edition, 1996  
5. AISI, Steel Construction Manual, 14th Edition, 2005

Light pole with side mount Antenna kit at top of pole and equipment box at 21 feet above side wall.

## 1. Area Calculations

Area of pole: Ave. Dia. (8'-6") = 8.43 in.  $A_p = (16) (8.43/12) = 11.2 \text{ sq. ft.}$   
Ave. Dia. (16'-30") = 7.43 in.  $A_m = (14.0) (7.43/12) = 8.66 \text{ sq. ft.}$

Area of Arm:  $A = (0.25)(8) + (0.5)(2) = 3 \text{ sq. ft.}$

Area of antenna:  $\text{Area} = (38.72/12)(14.6/12) = 3.92 \text{ sq. ft.}$

Area of Equipment Unit:  $\text{Area} = (2.1)(1.1) = 2.31 \text{ sq. ft.}$

## 2. Wind Loading:

Wind Zone: (Fig. 3-2.3)  $V = 85 \text{ mph (3 sec. Gust)}$

Coefficients:  $K_z (16) = 0.87$   $K_z (30) = 0.94$   
 $I_w = 0.87$   $G = 1.142$

Wind Pressures:  $P_x (16) = (0.00256) K_z (16) Q V^2 I_w = 16 \text{ psf}$   
 $P_x (30) = (0.00256) K_z (30) Q V^2 I_w = 17.2 \text{ psf}$



Page 1 of 3

## 3. Pole Forces

Force on pole:  $F = P_x A_p + P_m A_m = 387.4 \text{ pounds}$

Force on Arm:  $F = P_x A = 51.6 \text{ pounds}$

Force on Antenna:  $F = P_x A_a = 67.4 \text{ pounds}$

Force on Equip. Box:  $F = P_x A_e = 39.7 \text{ pounds}$

Total wind load = 546.3 pounds

Depth Requirement: Typical Standard Depth is 8 feet 6 inches + concrete slab and plate = 8' 11"

$D = 0.5A (1 + [1 + (4.36b/A)]^2)$

Where  $A = (2.34 P/S_b) = [(2.34) (546.3)/(1200) (2.0)] = 0.53$

Therefore  $D_m = 4.43 \text{ ft.} < 6.9 \text{ feet ok}$

## 4. Bearing Capacity

Gross pole wt: 1570 pounds (for pole + equipment)

$Q_u = 2500 \text{ psf}$  Pole fig dia. = 1.5 ft. Footing area = 1.77 sq. ft.

$Q_u = 2500 \cdot (ft)(150) = 1300 \text{ psf} > Q = (1570)/(1.77) = 882 \text{ psf OK}$

## 5. Antenna Attachment Calculations:

Bolt Tension Loading (5/8" A325 bolts):

Bolt Cross Sectional Area in Tension:  $A = 0.307 \text{ in}^2$

Allowable Tensile Strength:  $T = 13.8 \text{ ksi}$   
(Table 7-2 Ref. 5)

Allowable Load on Bolt:  $P_a = A T = (0.307) (13.8) = 4.23 \text{ Kips}$

Moment on Attachment Bolts

Page 2 of 3

From Wind:  $P_1 = (2)(38.2) = 76.4 \text{ ft-lbs}$

From WL:  $P_2 = (1)(165.5) = 165.5 \text{ ft-lbs}$

Worst Case - Diagonal Bolts

$M_{max} = ((165.5)' + (76.4)') = 182.3 \text{ ft-lbs}$

$T = C = (12)(182.3)(4.24) = 515.9 \text{ lbs}$

Bolt Loading = 515.9 lbs <<  $P_a = 4236 \text{ pounds OK}$

Therefore bolts are adequate.

Page 3 of 3

|                             |          |                                                                                                         |   |
|-----------------------------|----------|---------------------------------------------------------------------------------------------------------|---|
| SITE ADDRESS: <u>Varies</u> |          | TITLE: <u>EXISTING STREETLIGHT POLE (WITHOUT SIGNS) WITH ANTENNA SIDE MOUNT AND RADIO EQUIPMENT BOX</u> |   |
| PTS NO.                     | 811088   | SHEET                                                                                                   | 7 |
| DRAWING NO.                 | SC1.DSD  |                                                                                                         |   |
| DATE:                       | 07/26/16 |                                                                                                         |   |
| SCALE:                      | N.T.S.   |                                                                                                         |   |

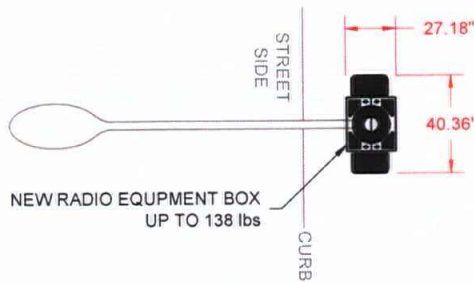
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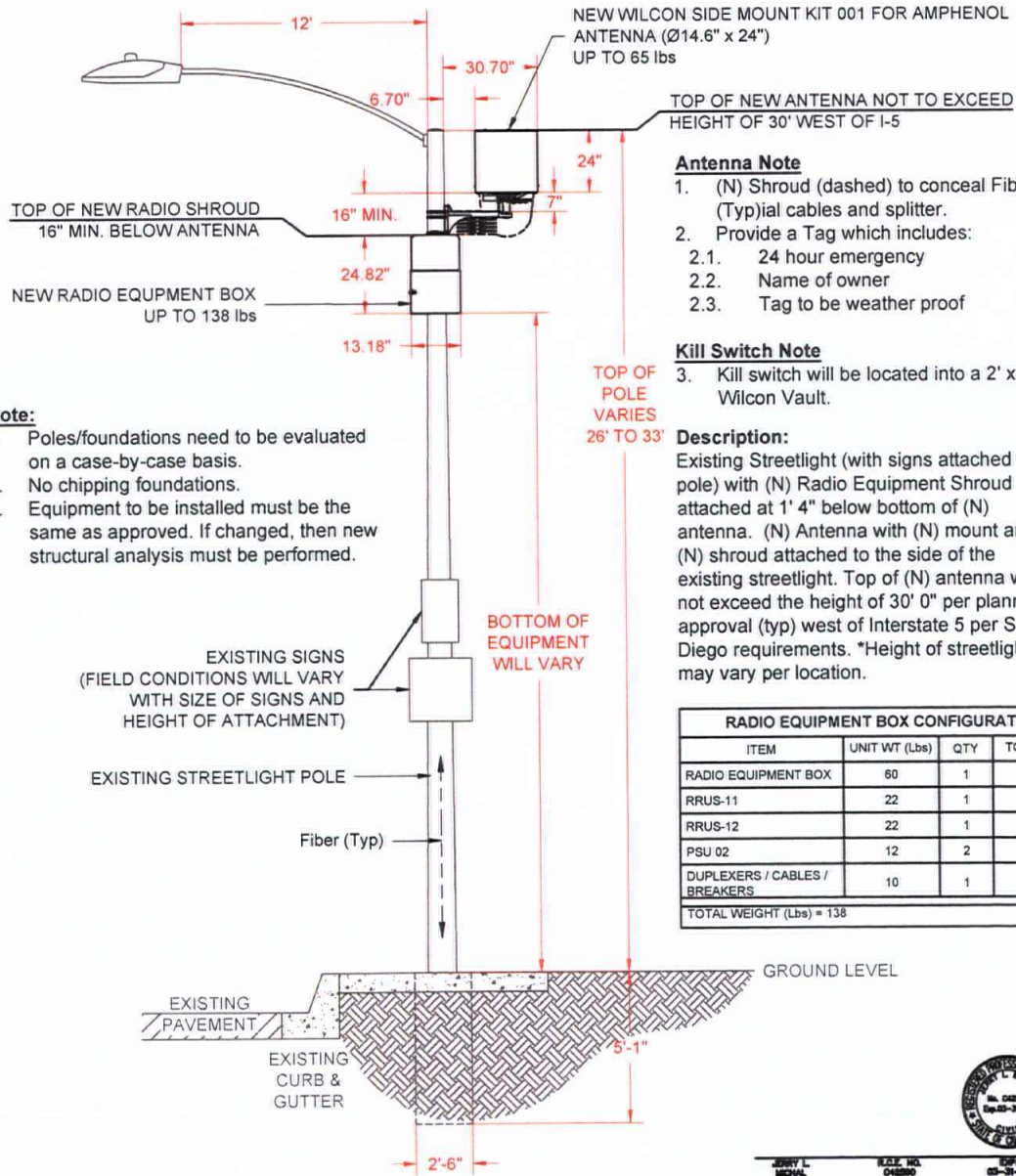
JERRY L. MEDAL  
CIVIL ENGINEER  
03-31-18

# TOP VIEW



## Notes:

1. Check adequacy of connection between street/traffic poles and foundations.
2. Existing connections between light/traffic poles and their foundations shall be field verified for their type (plate size, number/size of bolts) and current structural conditions.
3. Structure(s) will be located on undisturbed native soil." Signature \_\_\_\_\_ Owner/Licensed Engineer or Architect
4. "As a California licensed Architect/Engineer, I have classified the undisturbed native soils to be silty sands, sandy silts and per Table 1804.2 of the 2007 CBC, I have assigned a foundation pressure of 3500 psf. for the design of foundations related to this project". Signature of Licensed Architect/Engineer \_\_\_\_\_



## Note:

1. Poles/foundations need to be evaluated on a case-by-case basis.
2. No chipping foundations.
3. Equipment to be installed must be the same as approved. If changed, then new structural analysis must be performed.

## Antenna Note

1. (N) Shroud (dashed) to conceal Fiber (Typ)ial cables and splitter.
2. Provide a Tag which includes:
  - 2.1. 24 hour emergency
  - 2.2. Name of owner
  - 2.3. Tag to be weather proof

## Kill Switch Note

3. Kill switch will be located into a 2' x 3' Wilcon Vault.

## Description:

Existing Streetlight (with signs attached to pole) with (N) Radio Equipment Shroud attached at 1' 4" below bottom of (N) antenna. (N) Antenna with (N) mount and (N) shroud attached to the side of the existing streetlight. Top of (N) antenna will not exceed the height of 30' 0" per planning approval (typ) west of Interstate 5 per San Diego requirements. \*Height of streetlight may vary per location.

## RADIO EQUIPMENT BOX CONFIGURATION

| ITEM                          | UNIT WT (Lbs) | QTY | TOTAL (Lbs) |
|-------------------------------|---------------|-----|-------------|
| RADIO EQUIPMENT BOX           | 60            | 1   | 60          |
| RRUS-11                       | 22            | 1   | 22          |
| RRUS-12                       | 22            | 1   | 22          |
| PSU 02                        | 12            | 2   | 24          |
| DUPLEXERS / CABLES / BREAKERS | 10            | 1   | 10          |
| TOTAL WEIGHT (Lbs) = 138      |               |     |             |

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EXISTING STREETLIGHT POLE (WITH SIGNS)  
WITH ANTENNA TOP MOUNT AND RADIO EQUIPMENT BOX



DATE: 07/26/16  
SCALE: N.T.S.

SITE ADDRESS: \_\_\_\_\_  
TITLE: EXISTING STREETLIGHT POLE (WITH SIGNS) WITH ANTENNA SIDE MOUNT AND RADIO EQUIPMENT BOX  
PTS NO. 511688  
DRAWING NO. SCL DSD  
DATE: 07/26/16  
SCALE: N.T.S.

# STRUCTURAL DESIGN AND CALCULATIONS

PROJECT NO. Typical Antenna/Shroud Installation

CALCULATIONS BY: JLM

PROJECT NAME: VZW DTSD

DATE: 7-18-2016

PROJECT ADDRESS: DOWNTOWN San Diego  
San Diego, California

## DESIGN PARAMETERS

Bearing Capacity: 1500 psf (per CBC Table 1802) Allowable Lateral Pressure: 150 psf  
STEEL Pole Ht. = 30.0' Ave. Pole Dia. = as noted Pole Strength = 50000ksi (per manufacturer)  
Total Pole and Equipment Weight = 1570 lbs

References: 1. 2012 UBC 3. ASCE MINIMUM DESIGN LOADS - 7-10  
2. 2013 CBC  
4. Standard Handbook for Civil Engineers, 4th Edition, 1996  
5. AISC, Steel Construction Manual, 14th Edition, 2005

Light pole with side mount Antenna kit at top of pole, equipment box at 24 feet above side walk with signs.

## 1. Area Calculations

Area of pole: Ave. Dia. (0-16) = 8.43 in.  $A_p = (16)(8.43/12) = 11.2 \text{ sq. ft.}$   
Ave. Dia. (16-30) = 7.43 in.  $A_m = (14.0)(7.43/12) = 8.66 \text{ sq. ft.}$

Area of Arm:  $A = (0.25)(8) + (0.5)(2) = 3 \text{ sq. ft.}$

Area of antenna:  $A_a = (38.72/12)(14.6/12) = 3.92 \text{ sq. ft.}$

Area of Equipment Unit:  $A_e = (2.1)(1.1) = 2.31 \text{ sq. ft.}$

Area of signs:  $A_s = (2)(3) + (1)(1) = 7 \text{ sf}$

## 2. Wind Loading:

Wind Zone: (Fig. 3-2.3)  $V = 85 \text{ mph}$  (3 sec. Gust)

Coefficients:  $K_z(16) = 0.87$   $K_z(30) = 0.94$   
 $G = 0.87$   $G = 1.142$



Page 1 of 3

Wind Pressure:  $P_z(16) = (0.00256) K_z(16) G V^2 = 16 \text{ psf}$   
 $P_z(30) = (0.00256) K_z(26.1) G V^2 = 17.2 \text{ psf}$

## 3. Pole Forces

Force on pole:  $F = P_z A_p + P_m A_m = 387.4 \text{ pounds}$

Force on Arm:  $F = P_z A_p = 51.6 \text{ pounds}$

Force on Antenna:  $F = P_z A_a = 67.4 \text{ pounds}$

Force on Equip. Box  $F = P_z A_e = 39.7 \text{ pounds}$

Force on upper sign:  $F = (6)(17.2) = 103 \text{ pounds}$

Force on lower sign:  $F = (1)(16.0) = 16.0 \text{ pounds}$

Total wind load = 665.3 pounds

Depth Requirement: Typical Standard Depth is 8 feet 6 inches + concrete slab and plate = 8' 11"

$D = 0.5A (1 + \{1 + (4.36h / A)\}^2)^{1/4}$

Where  $A = (2.34 P/S_b) = \{ (2.34) (665.3) / (1200) (2.0) \} = 0.64$

Therefore  $D_m = 4.90 \text{ ft.} < 8.9 \text{ feet OK}$

## 4. Bearing Capacity

Gross pole wt: 1575 pounds (for pole + equipment)

$Q_u = 2500 \text{ psf}$  Pole ftg dia. = 1.5 ft. Footing area = 1.77 sq. ft.

$Q_u = 2500 \cdot (8)(150) = 1200 \text{ psf} > Q = (1575)(1.78) = 887 \text{ psf OK}$

## 5. Antenna Attachment Calculations:

Bolt Tension Loading (5/8" A325 bolts):

Bolt Cross Sectional Area In Tension:  $A = 0.307 \text{ in}^2$

Allowable Tensile Strength:  $T = 13.8 \text{ ksi}$   
(Table 7-2 Ref. 5)

Allowable Load on Bolt:  $P_n = A F_t = (0.307) (13.8) = 4.23 \text{ Kips}$

Moment on Attachment Bolts

From Wind:  $P_1 = (2)(38.2) = 76.4 \text{ ft-lbs}$

From WL:  $P_2 = (1)(165.5) = 165.5 \text{ ft-lbs}$

Worst Case - Diagonal Bolts

$M_{max} = \{ (165.5)^2 + (76.4)^2 \} = 182.3 \text{ ft-lbs}$

$T = C = (12)(182.3)/(4.24) = 515.9 \text{ lbs}$

Bolt Loading = 515.9 lbs  $< P_n = 4236 \text{ pounds. OK}$

Therefore bolts are adequate.

Page 3 of 3

|               |                                                                                        |
|---------------|----------------------------------------------------------------------------------------|
| SITE ADDRESS: | Verona                                                                                 |
| TITLE:        | EXISTING STREET LIGHT POLE (WITH SIGNS) WITH ANTENNA TOP MOUNT AND RADIO EQUIPMENT BOX |
| PTS NO.       | 51188                                                                                  |
| DRAWING NO.   | SCL 050                                                                                |
| DATE:         | 07/28/16                                                                               |
| SCALE:        | N.T.S.                                                                                 |
|               | 9                                                                                      |

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SEAL OF THE STATE OF CALIFORNIA  
J. L. Mendenhall  
No. 47580  
Exp. 3-31-18

**MASTER STRUCTURAL PLANS  
FOR EXISTING STREETLIGHT POLE**



REVIEWED BY: [Signature] DATE: 07-28-16

**WILCON**  
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**FREEDOM TELECOMMUNICATIONS LLC**  
dba **WILCON**  
**Master Structural Schematic**  
EXISTING STREETLIGHT POLE (WITHOUT SIGNS)  
WITH ANTENNA TOP MOUNT AND RADIO EQUIPMENT BOX

|                                                                                                  |             |
|--------------------------------------------------------------------------------------------------|-------------|
| SITE ADDRESS: Varies                                                                             |             |
| TITLE: EXISTING STREETLIGHT POLE (WITHOUT SIGNS) WITH ANTENNA SIDE MOUNT AND RADIO EQUIPMENT BOX |             |
| PTS NO. 511688                                                                                   | SHEET<br>10 |
| DRAWING NO. SCL DSD                                                                              |             |
| DATE: 07/28/16                                                                                   |             |
| SCALED: N.T.S.                                                                                   |             |

Diagram illustrating the installation of a radio equipment box on a street side curb. The box is mounted vertically, with dimensions indicating a width of 27.18" and a height of 40.36". The box is labeled "NEW RADIO EQUIPMENT BOX UP TO 138 lbs". The diagram also shows the "STREET SIDE" and "CURB" labels.

1. Check adequacy of connection between street/traffic poles and foundations.
2. Existing connections between light/traffic poles and their foundations shall be field verified for their type (plate size, number/size of bolts) and current structural conditions.
3. Structure(s) will be located on undisturbed native soil." Signature \_\_\_\_\_, Owner/Licensed Engineer or Architect
4. "As a California licensed Architect/Engineer, I have classified the undisturbed native soils to be silty sands, sandy silts and per Table 1804.2 of the 2007 CBC, I have assigned a foundation pressure of 3500 psf. for the design of foundations related to this project".

Signature of Licensed Architect/Engineer

TOP OF NEW ANTENNA NOT TO EXCEED HEIGHT OF 30' WEST OF I-5

**Antenna Note**

- (N) Shroud (dashed) to conceal Fiber (Typ) cables and splitter.
- Provide a Tag which includes:
  - 24 hour emergency
  - Name of owner
  - Tag to be weather proof

**Kill Switch Note**

- Kill switch will be located into a 2' x 3' Wilcon Vault.

**Note:**  
Approval of structural does not constitute approval to connect to traffic signal (TS)

**Description:**  
Existing Multiple Traffic Signal with (N) Radio Equipment Shroud attached at 1' 4" below antenna. (N) Antenna with (N) mount and (N) shroud attached to the side of the existing traffic signal. Top of (N) antenna will not exceed the height of 30' 0" per planning approval (typ) west of Interstate 5 per San Diego requirements. \*Height of traffic signal may vary per location.

**RADIO EQUIPMENT BOX CONFIGURATION**

| ITEM                          | UNIT WT (Lbs) | QTY | TOTAL |
|-------------------------------|---------------|-----|-------|
| RADIO EQUIPMENT BOX           | 60            | 1   | 60    |
| RRUS-11                       | 22            | 1   | 22    |
| RRUS-12                       | 22            | 1   | 22    |
| PSU 02                        | 12            | 2   | 24    |
| DUPLEXERS / CABLES / BREAKERS | 10            | 1   | 10    |
| TOTAL WEIGHT (Lbs) = 138      |               |     |       |

1. (N) Shroud (dashed) to conceal Fiber (Typ)ial cables and splitter.
2. Provide a Tag which includes:
  - 2.1. 24 hour emergency
  - 2.2. Name of owner
  - 2.3. Tag to be weather proof

3. Kill switch will be located into a 2' x 3' Wilcon Vault.

Approval of structural does not constitute approval to connect to traffic signal (TS)

Existing Multiple Traffic Signal with (N) Radio Equipment Shroud attached at 1' 4" below antenna. (N) Antenna with (N) mount and (N) shroud attached to the side of the existing traffic signal. Top of (N) antenna will not exceed the height of 30' 0" per planning approval (typ) west of Interstate 5 per San Diego requirements. \*Height of traffic signal may vary per location.

| RADIO EQUIPMENT BOX CONFIGURATION |               |     |             |
|-----------------------------------|---------------|-----|-------------|
| ITEM                              | UNIT WT (Lbs) | QTY | TOTAL (Lbs) |
| RADIO EQUIPMENT BOX               | 60            | 1   | 60          |
| RRUS-11                           | 22            | 1   | 22          |
| RRUS-12                           | 22            | 1   | 22          |
| PSU 02                            | 12            | 2   | 24          |
| DUPLEXERS / CABLES /<br>BREAKERS  | 10            | 1   | 10          |
| TOTAL WEIGHT (Lbs) = 138          |               |     |             |



|                    |                     |                  |      |
|--------------------|---------------------|------------------|------|
| JERRY L.<br>MICHAL | R.C.E. NO.<br>04800 | EXP.<br>03-31-10 | DATE |
|--------------------|---------------------|------------------|------|

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**FREEDOM TELECOMMUNICATIONS LLC**  
**dba WILCON**  
**Master Structural Schematic**  
**EXISTING MULTIPLE TRAFFIC SIGNAL POLE**  
**WITH ANTENNA TOP MOUNT AND RADIO EQUIPMENT BOX**

|                                                                                                    |          |        |  |
|----------------------------------------------------------------------------------------------------|----------|--------|--|
| SITE ADDRESS:                                                                                      |          | Varies |  |
| TITLE: EXISTING MULTIPLE TRAFFIC SIGNAL POLE<br>WITH ANTENNA SIDE MOUNT AND RADIO<br>EQUIPMENT BOX |          |        |  |
| PTS. NO.                                                                                           | 511688   | SHEET  |  |
| DRAWING NO.                                                                                        | SCL DSD  | 11     |  |
| DATE:                                                                                              | 07/26/16 |        |  |
| SCALED:                                                                                            | N.T.S.   |        |  |

**STRUCTURAL DESIGN AND CALCULATIONS**

PROJECT NO. Typical Antenna/Shield Installation CALCULATIONS BY: JLM  
 PROJECT NAME: VZWBTS DATE: 7-10-2016  
 PROJECT ADDRESS: Devonawa San Diego  
San Diego, California

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**DESIGN PARAMETERS**

Bearing Capacity: 1500 psf (per CBC Table 1802) Allowable Lateral Pressure: 150 psf/in  
 Steel Pole Ht. = 30' Ave. Pole Dia. = As Noted, Steel Strength = 50000 psi (per manufacturer)  
 Footing by Design: Dia. = 1.5' x 11' deep Pole and Equipment Weight = 1975 pounds

References: 1. 2012 UBC 3. ASCE MINIMUM DESIGN LOADS - 7-10  
 2. 2013 CBC  
 4. Standard Handbook for Civil Engineers, 4th Edition, 1996  
 5. AISI, Steel Construction Manual, 14th Edition, 2005

Traffic signal light pole with side mount antenna at top, equipment unit at 23 feet, signal arm with three signals, and two pole mounted signals.

---

**1. AREA CALCULATIONS**

Area of pole: Ave. Dia. (0-16') = 9.75 in.  $A_p = (16)(9.75/12) = 13.0$  sq. ft.  
 Ave. Dia. (16-30') = 7.88 in.  $A_m = (14.0)(7.88/12) = 9.19$  sq. ft.

Area of traffic arm:  $A = (0.47)(45) + (1.0)(2)(2) = 25.2$  sq. ft.

Area of arm signal:  $A = (3)(2)(3) = 18$  sq. ft.

Area of pole signals:  $A = (2)(2)(3) = 12$  sq. ft.

Area of antenna:  $A = (38.72/12)(14.6/12) = 3.92$  sq. ft.

Area of Equipment Unit:  $A = (2.1)(1.1) = 2.31$  sq. ft.

Area of light Arm:  $A = (0.25)(8) + (0.5)(2) = 3$  sq. ft.



Page 1 of 3

**2. Wind Loading:**

Wind Zone: (Fig. 3-2.3)  $V = 85$  mph (3 sec. Gust)

Coefficients:  $K_z(16) = 0.87$   $K_{zt}(32) = 0.94$   
 $b = 0.87$   $G = 1.142$

Wind Pressures:  $P_z(16) = (0.00256) K_z(16) G V^2 = 16$  psf  
 $P_z(30.0) = (0.00256) K_z(30.0) G V^2 = 17.2$  psf

**3. FORCE ON POLE**

Force on pole:  $F = P_z P_z I_{Lp} A - P_{ze} P_{ze} I_{Lp} A + P_{ze} P_{ze} A_{em} = 387.4$  pounds

Force on Antenna:  $F = P_{ze} P_{ze} I_{Lp} A_{em} = 51.8$  pounds

Force on Equipment:  $F = P_{ze} P_{ze} I_{Lp} A_{em} = 67.4$  pounds

Force on Traffic Arm:  $F = P_z P_z I_{Lp} A = 432.5$  pounds

Force on arm Signal:  $F = (18)(17.2) = 309.6$  pounds

Force on pole Signal:  $F = (6)(16.0) = 96.0$  pounds

Total wind load = 1344.7 pounds

**3. Depth Requirement:** Typical Standard Depth is 11 feet (per design)

$D = 0.5A(1 + [1 + (4.36b/A)]^{1/2})$   
 Where  $A = (2.34 P/S_b) = [(2.34)(1344.7)/(1650)(1.5)] = 1.27$   
 Therefore  $D_m = 7.11$  ft. < 11.0 feet ok

**4. Bearing capacity**

Gross pole wt: 2095 pounds (for pole + equipment)

$Q_u = 3500$  psf Pole dia. = 1.5 ft. Fixing area = 1.77 sq. ft.

$Q_u = 3500 \cdot (1.1)(1.50) = 1850$  psf >  $Q = (2095)/(1.78) = 1176$  psf OK

Page 2 of 3

**5. Antenna Attachment Calculations:**

Bolt Tension Loading (5/8" A325 bolts):

Bolt Cross Sectional Area in Tension:  $A = 0.307$  in<sup>2</sup>

Allowable Tensile Strength:  $T = 13.8$  ksi  
 (Table 7-2 Ref. 2)

Allowable Load on Bolt:  $P_a = A F_t = (0.307)(13.8) = 4.23$  Kips

**Moment on Attachment Bolts**

From Wind:  $P_1 = (2)(18.2) = 76.4$  ft-lbs

From WL:  $P_2 = (1)(165.5) = 165.5$  ft-lbs

**Worst Case - Diagonal Bolts**

$M_{max} = ((165.5)^2 + (76.4)^2)^{1/2} = 182.3$  ft-lbs

$T = C = (12)(182.3)/(4.24) = 284.8$  lbs

Bolt Loading = 515.9 lbs <<  $P_a = 4236$  pounds. OK

Therefore bolts are adequate.

Page 3 of 3

SITE ADDRESS: VZWBTS

TITLE: EXISTING MULTIPLE TRAFFIC SIGNAL POLE WITH ANTENNA SIDE MOUNT AND RADIO EQUIPMENT BOX

PTS NO. 511888 SHEET 12

DRAWING NO. SCLOD

DATE: 07/28/16

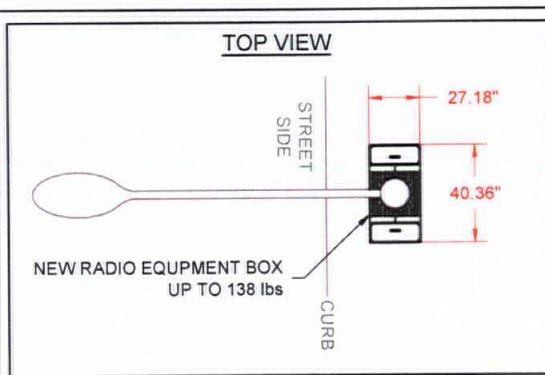
SCALE: N.T.S.

FREEDOM TELECOMMUNICATIONS LLC  
 dba WILCON  
 Master Structural Schematic  
 EXISTING MULTIPLE TRAFFIC SIGNAL POLE  
 WITH ANTENNA TOP MOUNT AND RADIO EQUIPMENT BOX

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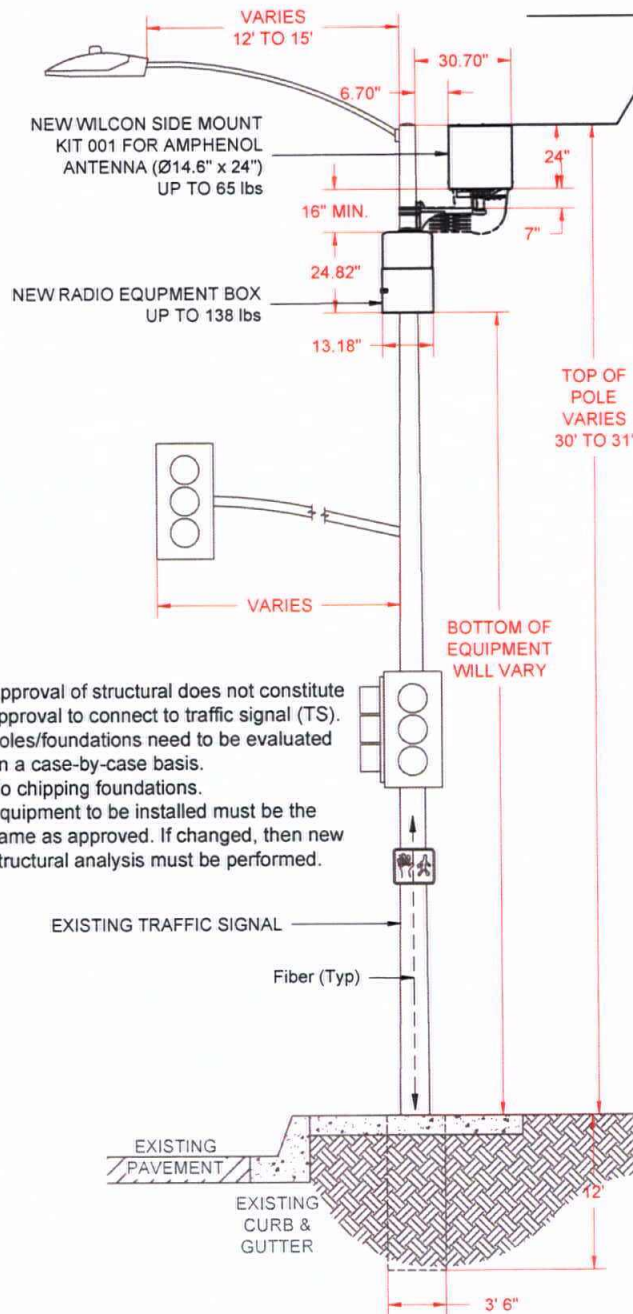


J. L. MENDEHALL, State of California, No. 42590, Exp. 8-31-18, DATE



**Notes:**

1. Check adequacy of connection between street/traffic poles and foundations.
2. Existing connections between light/traffic poles and their foundations shall be field verified for their type (plate size, number/size of bolts) and current structural conditions.
3. Structure(s) will be located on undisturbed native soil." Signature \_\_\_\_\_ Owner/Licensed Engineer or Architect
4. "As a California licensed Architect/Engineer, I have classified the undisturbed native soils to be silty sands, sandy silts and per Table 1804.2 of the 2007 CBC, I have assigned a foundation pressure of 3500 psf. for the design of foundations related to this project". Signature of Licensed Architect/Engineer \_\_\_\_\_



**Antenna Note**

1. (N) Shroud (dashed) to conceal Fiber (Typ)ial cables and splitter.
2. Provide a Tag which includes:
  - 2.1. 24 hour emergency
  - 2.2. Name of owner
  - 2.3. Tag to be weather proof

**Kill Switch Note**

3. Kill switch will be located into a 2' x 3' Wilcon Vault.

**Note:**

Approval of structural does not constitute approval to connect to traffic signal (TS)

**Description:**

Existing Single Traffic Signal with (N) Radio Equipment Shroud attached at 1' 4" below antenna. (N) Antenna with (N) mount and (N) shroud attached to the side of the existing traffic signal. Top of (N) antenna will not exceed the height of 30' 0" per planning approval (typ) west of Interstate 5 per San Diego requirements. \*Height of traffic signal may vary per location.

**Note:**

1. Approval of structural does not constitute approval to connect to traffic signal (TS).
2. Poles/foundations need to be evaluated on a case-by-case basis.
3. No chipping foundations.
4. Equipment to be installed must be the same as approved. If changed, then new structural analysis must be performed.

| RADIO EQUIPMENT BOX CONFIGURATION |               |     |             |
|-----------------------------------|---------------|-----|-------------|
| ITEM                              | UNIT WT (Lbs) | QTY | TOTAL (Lbs) |
| RADIO EQUIPMENT BOX               | 60            | 1   | 60          |
| RRUS-11                           | 22            | 1   | 22          |
| RRUS-12                           | 22            | 1   | 22          |
| PSU 02                            | 12            | 2   | 24          |
| DUPLEXERS / CABLES / BREAKERS     | 10            | 1   | 10          |
| TOTAL WEIGHT (Lbs) = 138          |               |     |             |

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FREEDOM TELECOMMUNICATIONS LLC  
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Master Structural Schematic  
EXISTING SINGLE TRAFFIC SIGNAL POLE  
WITH ANTENNA TOP MOUNT AND RADIO EQUIPMENT BOX



JERRY L. MOHAL R.E.P. NO. 62880 EXP. 05-31-18 DATE

SITE ADDRESS: Varies  
TITLE: EXISTING SINGLE TRAFFIC SIGNAL POLE WITH ANTENNA SIDE MOUNT AND RADIO EQUIPMENT BOX  
PTS NO. 511688 SHEET  
DRAWING NO. SCL DSD  
DATE: 07/26/16  
SCALED: N.T.S. 13

# STRUCTURAL DESIGN AND CALCULATIONS

PROJECT NO. Typical Antenna/Shroud Installation CALCULATIONS BY: JLM

PROJECT NAME: VZV.DTSD DATE: 7-10-2016

PROJECT ADDRESS: Downey, San Diego  
San Diego, California

## DESIGN PARAMETERS

Bearing Capacity: 1500 psf (per CBC Table 1802) Allowable Lateral Pressure: 150 psf/ft  
Steel Pole Ht. = 30' Ave. Pole Dia. = As Noted, Steel Strength = 50000 psi (per manufacturer)  
Footings by Design: Dia = 1.5' x 11' deep Pole and Equipment Weight = 1975 pounds

References: 1. 2012 UBC 3. ASCE MINIMUM DESIGN LOADS - 7-10  
2. 2013 CBC  
4. Standard Handbook for Civil Engineers, 4th Edition, 1996  
5. AISC, Steel Construction Manual, 14th Edition, 2005

Traffic signal light pole with side mount antenna at top, equipment unit at 23 feet, signal arm with one signal, and two pole mounted signals.

## 1. AREA CALCULATIONS

Area of pole: Ave. Dia. (0-16) = 9.75 in.  $A_p = (16)(9.75/12) = 13.0$  sq. ft.  
Ave. Dia. (16-30) = 7.88 in.  $A_p = (14.0)(7.88/12) = 9.19$  sq. ft.

Area of traffic arm:  $A = (0.47)(30) + (1.0)(2)(2) = 18.3$  sq. ft.

Area of arm signal:  $A = (2)(3) = 6$  sq. ft.

Area of pole signals:  $A = (2)(2)(3) = 12$  sq. ft.

Area of antenna:  $A = (38.72/12)(14.6/12) = 3.92$  sq. ft.

Area of Equipment Unit:  $A = (2.1)(1.1) = 2.31$  sq. ft.

Area of light arm:  $A = (0.25)(8) + (0.5)(2) = 3$  sq. ft.



Page 1 of 3

## 2. Wind Loading:

Wind Zone: (Fig. 1-2.3) V=85 mph (3 sec. Gust)

Coefficients:  $K_z(16) = 0.87$   $K_z(32) = 0.94$   
 $I_z = 0.87$   $G = 1.142$

Wind Pressure:  $P_z(16) = (0.00256) K_z(16) G V^2 I_z = 16$  psf  
 $P_z(30.0) = (0.00256) K_z(30.0) G V^2 I_z = 17.2$  psf

## 3. FORCE ON POLE

Force on pole:  $F = P_z P_z H_{t, \text{ant}} A + P_z P_z H_{t, \text{eq}} A + P_z P_z A_{\text{arm}} = 387.4$  pounds

Force on Antenna:  $F = P_z P_z H_{t, \text{ant}} A = 51.8$  pounds

Force on Shroud:  $F = P_z P_z H_{t, \text{eq}} A = 67.4$  pounds

Force on Traffic Arm:  $F = P_z P_z H_{t, \text{arm}} A = 314.8$  pounds

Force on arm Signal:  $F = (6)(17.2) = 103.2$  pounds

Force on pole Signal:  $F = (6)(16.0) = 96.0$  pounds

Total wind load = 1020.6 pounds

3. Depth Requirement: Typical Standard Depth is 11 feet (per design)

$D = 0.5A(1 + [1 + (4.36h/A)^2])$

Where  $A = (2.34 P/S, b) = [(2.34)(1020.6)/(1500)(1.5)] = 1.06$

Therefore  $D_{\text{req}} = 6.39$  ft. < 11.0 feet ok

## 4. Bearing capacity

Gross pole wt: 1975 pounds (for pole + equipment)

$Q_u = 3500$  psf Pole dia. = 1.5 ft. Footing area = 1.77 sq. ft.

$Q_u = 3500 - (11)(150) = 1850$  psf >  $Q = (1975)(1.78) = 1110$  psf OK

Page 2 of 3

## 5. Antenna Attachment Calculations:

Bolt Tension Loading (5/8" A325 bolts):

Bolt Cross Sectional Area in Tension:  $A = 0.307$  in<sup>2</sup>

Allowable Tensile Strength:  $T = 13.8$  ksi  
(Table 7-2 Ref. 2)

Allowable Load on Bolt:  $P_a = A T = (0.307)(13.8) = 4.23$  Kips

## Moment on Attachment Bolts

From Wind:  $P_1 = (2)(38.2) = 76.4$  ft-lbs

From Wt.:  $P_2 = (1)(165.5) = 165.5$  ft-lbs

## Worst Case - Diagonal Bolts

$M_{\text{max}} = ((165.5)^2 + (76.4)^2)^{0.5} = 182.3$  ft-lbs

$T = C = ((12)(182.3)/(4.24)) = 284.8$  lbs

Bolt Loading = 515.9 lbs <<  $P_a = 4236$  pounds OK

Therefore bolts are adequate.

Page 3 of 3

|               |                                                                            |
|---------------|----------------------------------------------------------------------------|
| SITE ADDRESS: | Varies                                                                     |
| TITLE:        | EXISTING SINGLE TRAFFIC SIGNAL POLE WITH ANTENNA, EQUIPMENT UNIT AND RADIO |
| PTS NO.       | 511888                                                                     |
| DRAWING NO.   | SCL DSD                                                                    |
| DATE:         | 07/25/16                                                                   |
| SCALE:        | N.T.S.                                                                     |
| SHEET         | 14                                                                         |

FREEDOM TELECOMMUNICATIONS LLC  
dba WILCON  
Master Structural Schematic  
EXISTING SINGLE TRAFFIC SIGNAL POLE  
WITH ANTENNA TOP MOUNT AND RADIO EQUIPMENT BOX

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JEFFREY L. BLAND  
M.E.C. No. C42590  
Exp. 3-31-18  
DATE

# MASTER STRUCTURAL PLANS FOR EXISTING STREETLIGHT POLE WITH PEDESTRIAN SIGNAL

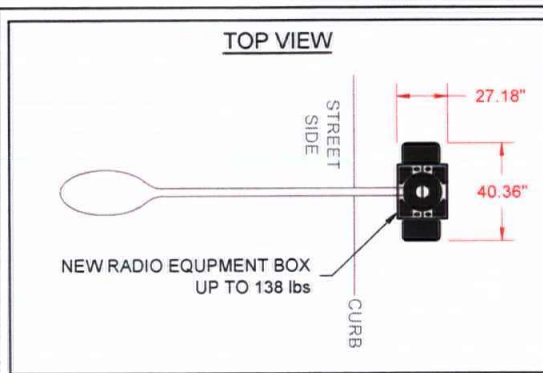


DRAWN:                        
 CHECKED:                        
 DATE: 02-25-16   
 DATE:                     

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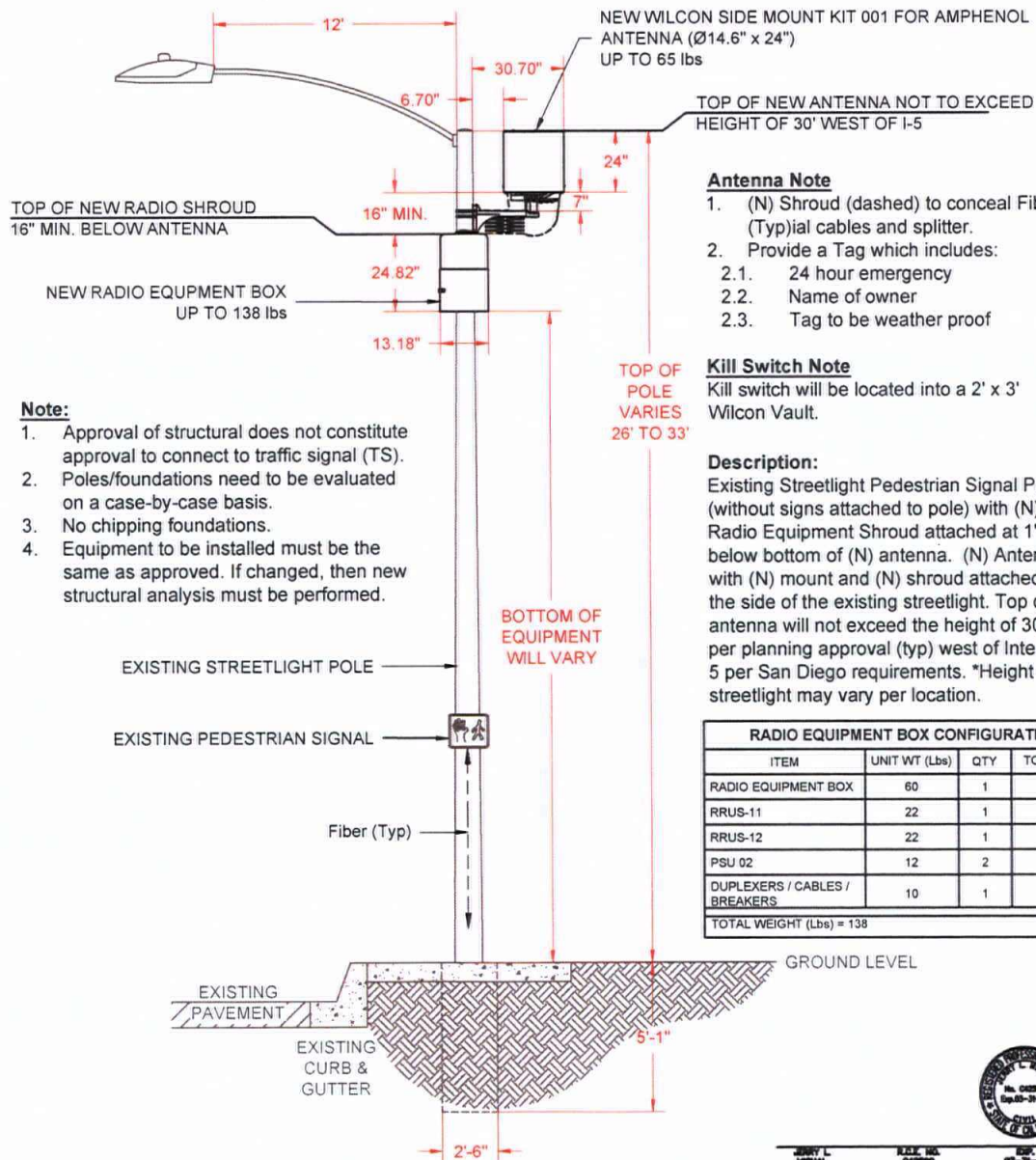
FREEDOM TELECOMMUNICATIONS LLC  
 dba WILCON  
 Master Structural Schematic  
 EXISTING STREETLIGHT POLE (WITHOUT SIGNS)  
 WITH ANTENNA TOP MOUNT AND RADIO EQUIPMENT BOX

|                                                                                                         |                        |
|---------------------------------------------------------------------------------------------------------|------------------------|
| SITE ADDRESS: <u>Varies</u>                                                                             |                        |
| TITLE: <u>EXISTING STREETLIGHT POLE (WITHOUT SIGNS) WITH ANTENNA SIDE MOUNT AND RADIO EQUIPMENT BOX</u> |                        |
| PTS NO. <u>511658</u>                                                                                   | SHEET<br><br><b>15</b> |
| DRAWING NO. <u>SCL DSD</u>                                                                              |                        |
| DATE: <u>07/29/16</u>                                                                                   |                        |
| SCALED: <u>N.T.S.</u>                                                                                   |                        |



**Notes:**

1. Check adequacy of connection between street/traffic poles and foundations.
2. Existing connections between light/traffic poles and their foundations shall be field verified for their type (plate size, number/size of bolts) and current structural conditions.
3. Structure(s) will be located on undisturbed native soil." Signature \_\_\_\_\_ Owner/Licensed Engineer or Architect
4. "As a California licensed Architect/Engineer, I have classified the undisturbed native soils to be silty sands, sandy silts and per Table 1804.2 of the 2007 CBC, I have assigned a foundation pressure of 3500 psf. for the design of foundations related to this project".  
Signature of Licensed Architect/Engineer \_\_\_\_\_



**Antenna Note**

1. (N) Shroud (dashed) to conceal Fiber (Typ) cables and splitter.
2. Provide a Tag which includes:
  - 2.1. 24 hour emergency
  - 2.2. Name of owner
  - 2.3. Tag to be weather proof

**Kill Switch Note**

Kill switch will be located into a 2' x 3' Wilcon Vault.

**Description:**

Existing Streetlight Pedestrian Signal Pole (without signs attached to pole) with (N) Radio Equipment Shroud attached at 1' 4" below bottom of (N) antenna. (N) Antenna with (N) mount and (N) shroud attached to the side of the existing streetlight. Top of (N) antenna will not exceed the height of 30' 0" per planning approval (typ) west of Interstate 5 per San Diego requirements. "Height of streetlight may vary per location.

**RADIO EQUIPMENT BOX CONFIGURATION**

| ITEM                          | UNIT WT (Lbs) | QTY | TOTAL (Lbs) |
|-------------------------------|---------------|-----|-------------|
| RADIO EQUIPMENT BOX           | 60            | 1   | 60          |
| RRUS-11                       | 22            | 1   | 22          |
| RRUS-12                       | 22            | 1   | 22          |
| PSU 02                        | 12            | 2   | 24          |
| DUPLEXERS / CABLES / BREAKERS | 10            | 1   | 10          |
| TOTAL WEIGHT (Lbs) = 138      |               |     |             |

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**Master Structural Schematic**  
EXISTING MULTIPLE TRAFFIC SIGNAL POLE  
WITH ANTENNA TOP MOUNT AND RADIO EQUIPMENT BOX

SITE ADDRESS: Varies  
TITLE: EXISTING STREETLIGHT PEDESTRIAN POLE (WITHOUT SIGNS) WITH ANTENNA SIDE MOUNT AND RADIO EQUIPMENT BOX  
PTS NO: 511988  
DRAWING NO: SCL OSD  
DATE: 07/26/16  
SCALED: N.T.S.

# STRUCTURAL DESIGN AND CALCULATIONS

PROJECT NO. Typical Antenna/Shroud Installation CALCULATIONS BY: JLM

PROJECT NAME: VZW DTSD DATE: 9-26-2016

PROJECT ADDRESS: DOWNTOWN San Diego  
San Diego, California

## DESIGN PARAMETERS

Bearing Capacity: 1500 psf (per CBC Table 1802) Allowable Lateral Pressure: 150 psf/ft  
STEEL Pole Ht. = 30.0' Ave. Pole Dia. = as noted Pole Strength = 50000ksi (per manufacturer)  
Total Pole and Equipment Weight = 1570 lbs

References: 1. 2012 UBC 3. ASCE MINIMUM DESIGN LOADS - 7-10  
2. 2013 CBC  
4. Standard Handbook for Civil Engineers, 4<sup>th</sup> Edition, 1996  
5. AISC, Steel Construction Manual, 14<sup>th</sup> Edition, 2005

Light pole with side mount Antenna kit at top of pole and equipment box at 24 feet above side walk, with side mount std traffic signal, pedestrian signal, signs

## 1. Area Calculations

Area of pole: Ave. Dia. (0-16') = 8.43 in.  $A_p = (16)(8.43/12) = 11.2$  sq. ft.  
Ave. Dia. (16-30') = 7.43 in.  $A_m = (14.0)(7.43/12) = 8.66$  sq. ft.

Area of Light Arm:  $A = (0.25)(8) + (0.5)(2) = 3$  sq. ft.

Area of antenna:  $A = (38.72/12)(14.6/12) = 3.92$  sq. ft.

Area of Equipment Unit:  $A = (2.1)(1.1) = 2.31$  sq. ft.

Area of Traffic Signal:  $A = (3)(1) = 3$  sq. ft.

Area of Pedestrian Signal:  $A = (1)(1) = 1$  sq. ft.



## 2. Wind Loading:

Wind Zone: (Fig. 3-2.3)  $V = 85$  mph (3 sec. Gust)

Page 1 of 3

Coefficients:  $K_z(16) = 0.87$   $K_z(30) = 0.94$   
 $I_w = 0.87$   $Q = 1.142$

Wind Pressures:  $P_x(16) = (0.00256) K_z(16) Q V^2 / R = 16$  psf  
 $P_x(30) = (0.00256) K_z(26.1) Q V^2 / R = 17.2$  psf

## 3. Pole Forces

Force on pole:  $F = P_x P_z L_{w1} A + P_m P_z L_{w2} A = 387.4$  pounds

Force on Light Arm:  $F = P_x P_z L_{w1} A = 51.6$  pounds

Force on Antenna:  $F = P_x P_z L_{w1} A_m = 67.4$  pounds

Force on Equip. Box:  $F = P_x P_z L_{w1} A_m = 39.7$  pounds

Force on upper sign:  $F = 17.2$  pounds

Force on lower sign:  $F = 24.0$  pounds

Force on pedestrian signal:  $F = 16$  pounds

Force on traffic signal:  $F = 48$  pounds

Total wind load = 651.3 pounds

Depth Requirements: Typical Standard Depth is 8 feet 6 inches + concrete slab and plate = 8' 11"

$D = 0.5A(1 + [1 + (4.36h/A)^2])$

Where  $A = (2.34 P/N, b) = [(2.34)(651.3)/(1200)(2.0)] = 0.64$

Therefore  $D_m = 4.58$  ft. < 8.0 feet ok

## 4. Bearing Capacity

Gross pole wt: 1570 pounds (for pole + equipment)

$Q_u = 3500$  psf Pole tip dia. = 2.0 ft. Footing area = 1.78 sq. ft.

Page 2 of 3

# STRUCTURAL DESIGN AND CALCULATIONS

PROJECT NO. Typical Antenna/Shroud Installation

CALCULATIONS BY: JLM

PROJECT NAME: VZW DTSD DATE: 9-26-2016

PROJECT ADDRESS: DOWNTOWN San Diego  
San Diego, California

## DESIGN PARAMETERS

Bearing Capacity: 1500 psf (per CBC Table 1802) Allowable Lateral Pressure: 150 psf/ft  
STEEL Pole Ht. = 30.0' Ave. Pole Dia. = as noted Pole Strength = 50000ksi (per manufacturer)  
Total Pole and Equipment Weight = 1570 lbs

References: 1. 2012 UBC 3. ASCE MINIMUM DESIGN LOADS - 7-10  
2. 2013 CBC  
4. Standard Handbook for Civil Engineers, 4<sup>th</sup> Edition, 1996  
5. AISC, Steel Construction Manual, 14<sup>th</sup> Edition, 2005

Light pole with side mount Antenna kit at top of pole and equipment box at 24 feet above side walk, with side mount std traffic signal, pedestrian signal, signs

## 1. Area Calculations

Area of pole: Ave. Dia. (0-16') = 8.43 in.  $A_p = (16)(8.43/12) = 11.2$  sq. ft.  
Ave. Dia. (16-30') = 7.43 in.  $A_m = (14.0)(7.43/12) = 8.66$  sq. ft.

Area of Light Arm:  $A = (0.25)(8) + (0.5)(2) = 3$  sq. ft.

Area of antenna:  $A = (38.72/12)(14.6/12) = 3.92$  sq. ft.

Area of Equipment Unit:  $A = (2.1)(1.1) = 2.31$  sq. ft.

Area of Traffic Signal:  $A = (3)(1) = 3$  sq. ft.

Area of Pedestrian Signal:  $A = (1)(1) = 1$  sq. ft.



## 2. Wind Loading:

Wind Zone: (Fig. 3-2.3)  $V = 85$  mph (3 sec. Gust)

Page 1 of 3

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EXISTING MULTIPLE TRAFFIC SIGNAL POLE  
WITH ANTENNA TOP MOUNT AND RADIO EQUIPMENT BOX

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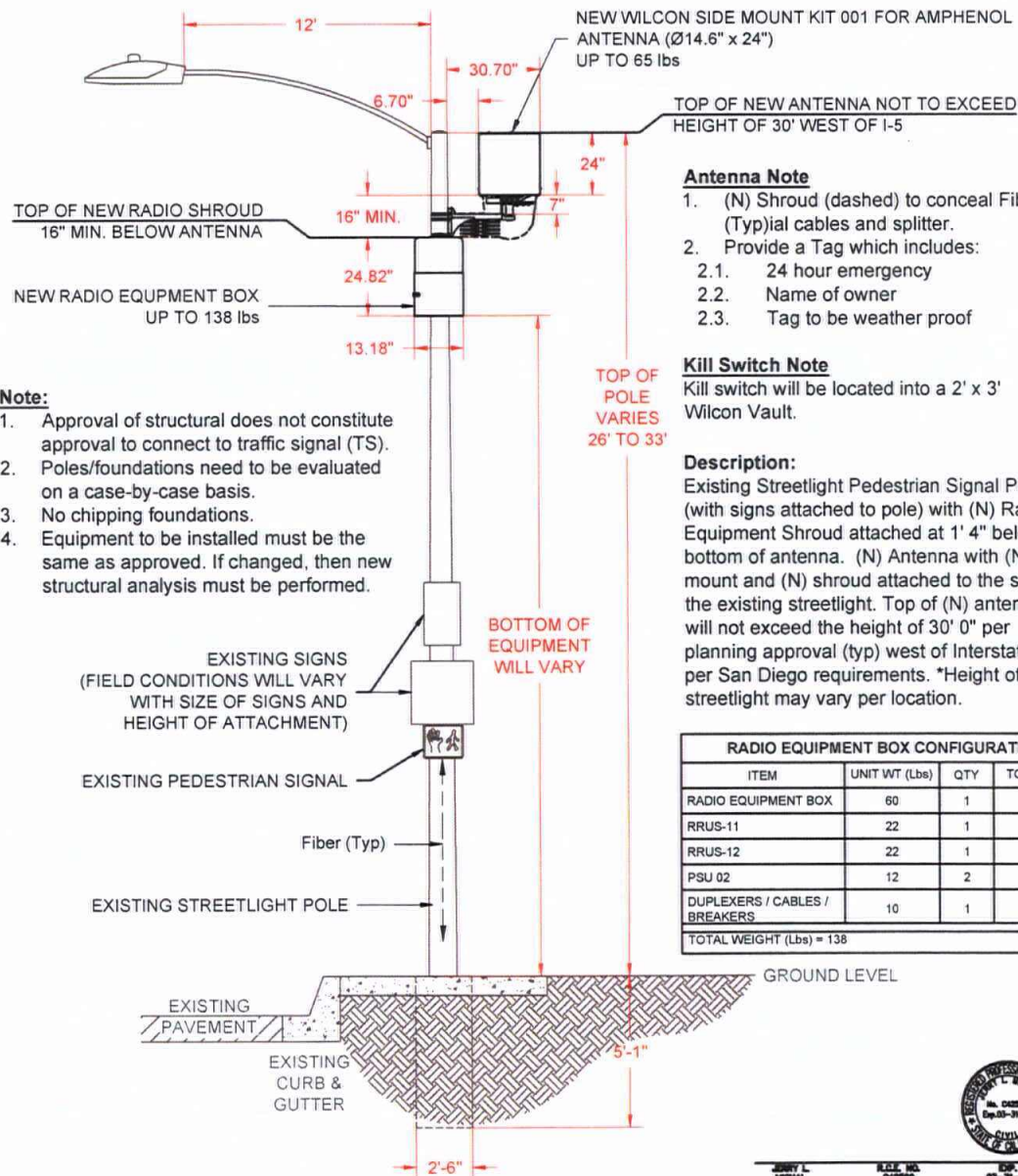
SITE ADDRESS: Verona  
TITLE: EXISTING MULTIPLE TRAFFIC SIGNAL POLE WITH ANTENNA SIDE MOUNT AND RADIO EQUIPMENT BOX  
SHEET NO. 11188  
DRAWING NO. SQL 050  
DATE: 07/26/18  
SCALE: N.T.S.  
17



APPROVAL: JLM DATE: 09-26-16

Diagram illustrating the installation of a new radio equipment box. The box is mounted on the street side of a curb. The box is labeled "NEW RADIO EQUIPMENT BOX UP TO 138 lbs". The dimensions shown are 27.18" for the width and 40.36" for the height.

1. Check adequacy of connection between street/traffic poles and foundations.
2. Existing connections between light/traffic poles and their foundations shall be field verified for their type (plate size, number/size of bolts) and current structural conditions.
3. Structure(s) will be located on undisturbed native soil." Signature \_\_\_\_\_ Owner/Licensed Engineer or Architect
4. "As a California licensed Architect/Engineer, I have classified the undisturbed native soils to be silty sands, sandy silts and per Table 1804.2 of the 2007 CBC, I have assigned a foundation pressure of 3500 psf. for the design of foundations related to this project".  
\_\_\_\_\_  
Signature of Licensed Architect/Engineer



1. (N) Shroud (dashed) to conceal Fiber (Typ)al cables and splitter.
2. Provide a Tag which includes:
  - 2.1. 24 hour emergency
  - 2.2. Name of owner
  - 2.3. Tag to be weather proof

Kill switch will be located into a 2' x 3' Wilcon Vault.

Existing Streetlight Pedestrian Signal Pole (with signs attached to pole) with (N) Radio Equipment Shroud attached at 1' 4" below bottom of antenna. (N) Antenna with (N) mount and (N) shroud attached to the side of the existing streetlight. Top of (N) antenna will not exceed the height of 30' 0" per planning approval (typ) west of Interstate 5 per San Diego requirements. \*Height of streetlight may vary per location.

| RADIO EQUIPMENT BOX CONFIGURATION |               |     |             |
|-----------------------------------|---------------|-----|-------------|
| ITEM                              | UNIT WT (Lbs) | QTY | TOTAL (Lbs) |
| RADIO EQUIPMENT BOX               | 60            | 1   | 60          |
| RRUS-11                           | 22            | 1   | 22          |
| RRUS-12                           | 22            | 1   | 22          |
| PSU 02                            | 12            | 2   | 24          |
| DUPLEXERS / CABLES /<br>BREAKERS  | 10            | 1   | 10          |
| TOTAL WEIGHT (Lbs) = 138          |               |     |             |



|                    |                    |                  |      |
|--------------------|--------------------|------------------|------|
| JERRY L.<br>MICHAL | FILE NO.<br>042580 | EXP.<br>03-31-68 | DATE |
|--------------------|--------------------|------------------|------|



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EXISTING MULTIPLE TRAFFIC SIGNAL POLE  
WITH ANTENNA TOP MOUNT AND RADIO EQUIPMENT BOX

|                                                                                                                       |          |               |
|-----------------------------------------------------------------------------------------------------------------------|----------|---------------|
| <b>SITE ADDRESS:</b>                                                                                                  |          | <b>Varies</b> |
| <b>TITLE:</b> EXISTING STREETLIGHT PEDESTRIAN POLE<br>(WITH SIGNS) WITH ANTENNA SIDE MOUNT<br>AND RADIO EQUIPMENT BOX |          |               |
| <b>PTS NO.</b>                                                                                                        | 511688   | <b>SHEET</b>  |
| <b>DRAWING NO.</b>                                                                                                    | SCL DSD  | <b>18</b>     |
| <b>DATE:</b>                                                                                                          | 07/26/16 |               |
| <b>SCALED:</b>                                                                                                        | N.T.S.   |               |
|                                                                                                                       |          |               |

**STRUCTURAL DESIGN AND CALCULATIONS**

PROJECT NO. Typical Antenna/Shroud Installation CALCULATIONS BY: FLM  
 PROJECT NAME: VZWW DTD DATE: 9-26-2016  
 PROJECT ADDRESS: DOWNTOWN San Diego  
San Diego, California

---

**DESIGN PARAMETERS**

Bearing Capacity: 1500 pcf (per CBC Table 1802) Allowable Lateral Pressure: 150 pcf/ft  
 STEEL Pole Ht. = 30.0' Ave. Pole Dia. = as noted Pole Strength = 50000kai (per manufacture)  
 Total Pole and Equipment Weight = 1975 lbs

References: 1. 2012 UBC 3. ASCE MINIMUM DESIGN LOADS - 7-10  
 2. 2013 CBC  
 4. Standard Handbook for Civil Engineers, 4th Edition, 1996  
 5. AISC, Steel Construction Manual, 14th Edition, 2003

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Light pole with side mount Antenna kit at top of pole and equipment box at 24 feet above side walk, with side mount sid traffic signal, pedestrian signal, sign.

**1. Area Calculations**

Area of pole: Ave. Dia. (0-16') = 7.43 in.  $A_w = (16)(7.43/12) = 11.2 \text{ sq. ft.}$   
 Ave. Dia. (16-30') = 7.43 in.  $A_w = (14.0)(7.43/12) = 8.66 \text{ sq. ft.}$

Area of Light Arm:  $A = (0.25)(8) + (0.5)(2) = 3 \text{ sq. ft.}$

Area of antenna:  $A = (38.72/12)(14.6/12) = 3.92 \text{ sq. ft.}$

Area of Equipment Unit:  $A = (2.1)(1.1) = 2.31 \text{ sq. ft.}$

Area of Traffic Signal:  $A = (3)(1) = 3 \text{ sq. ft.}$   
 (Pole Mounted)

Area of Pedestrian Signal:  $A = (1)(1) = 1 \text{ sq. ft.}$

Area of Frequency sign:  $A = (0.5)(.75) = 0.38 \text{ sq. ft.}$



Page 1 of 3

**2. Wind Loading:**

Wind Zone: (Fig. 3-2.3)  $V = 85 \text{ mph (3 sec. Gust)}$

Coefficients:  $K_z(16) = 0.87$   $K_z(30) = 0.94$   
 $I_r = 0.87$   $G = 1.142$

Wind Pressure:  $P_x(16) = (0.00256) K_z(16) G V^2 I_r = 16 \text{ pcf}$   
 $P_x(30) = (0.00256) K_z(26.1) G V^2 I_r = 17.2 \text{ pcf}$

**3. Pole Forces**

Force on pole:  $F = P_w P_z H_{wA} + P_w P_z H_{wA} = 387.4 \text{ pounds}$

Force on Light Arm:  $F = P_w P_z H_{wA} = 51.6 \text{ pounds}$

Force on Antenna:  $F = P_w P_z H_{wA} = 67.4 \text{ pounds}$

Force on Equip. Box  $F = .7 \text{ pounds}$

Force on upper sign:  $F = 6.5 \text{ pounds}$

Force on Traffic Signal:  $F = 48 \text{ pounds}$

Force on Pedestrian Signal:  $F = 16.0 \text{ pounds}$

Total wind load = 577.0 pounds

**Depth Requirement:** Typical Standard Depth is 8 feet 6 inches + concrete slab and plate = 8' 11"

$D = 0.5A [1 + (4.36h / A)]^2$   
 Where  $A = (2.34 PWS_b) / [(2.34) (577.0) / (1200) (2.0)] = 0.60$   
 Therefore  $D_w = 4.44 \text{ ft.} < 8.0 \text{ feet ok}$

**4. Bearing Capacity**

Gross pole wt: 1975 pounds (for pole + equipment)

Page 2 of 3

$Q_s = 3500 \text{ pcf}$  Pole ftg dia. = 2.0 ft. Footing area = 1.78 sq. ft.

$Q_s = 3500 - (8)(150) = 2300 \text{ pcf} > Q = (1975)(1.78) = 1109 \text{ pcf OK}$

**5. Antenna Attachment Calculations:**

Bolt Tension Loading (5/8" A325 bolts):  
 Bolt Cross Sectional Area in Tension:  $A = 0.307 \text{ in}^2$

Allowable Tensile Strength:  $T = 13.8 \text{ ksi}$   
 (Table 7-2 Ref. 5)

Allowable Load on Bolt:  $P_a = A F_t = (0.307) (13.8) = 4.23 \text{ Kips}$

**Moments on Attachment Bolts**

From Wind:  $P_1 = (2)(38.2) = 76.4 \text{ ft-lbs}$

From Wt.:  $P_2 = (1)(165.5) = 165.5 \text{ ft-lbs}$

**Worst Case - Diagonal Bolts**

$M_{max} = ((165.5) + (76.4)) = 182.3 \text{ ft-lbs}$

$T = C = (12)(182.3)(4.24) = 515.9 \text{ lbs}$

Bolt Loading = 515.9 lbs <<  $P_a = 4236 \text{ pounds. OK}$

Therefore bolts are adequate.

Page 3 of 3

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**Master Structural Schematic**  
 EXISTING MULTIPLE TRAFFIC SIGNAL POLE  
 WITH ANTENNA TOP MOUNT AND RADIO EQUIPMENT BOX

19

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19

# AMPHENOL DUALBAND TRI SECTOR OMNI CYLINDRICAL ANTENNA (MODEL #CWD070X06Fxy-0) (PRIVATE)

Dual Band | Dual Sector Back-to-Back Bi-Spherical Omni Cylindrical Antenna | XX-Pol | 180°/180° | 6.0/7

- Dual band, cylindrical antenna
- Dual sector, back-to-back bi-spherical omni configuration with 4 connectors
- Ideal for Small Cell / DAS applications with coverage on roadways
- Can be ordered with a variety of different mounting options
- Also available with internal diplexer and/or GPS system

| Electrical Characteristics  | 400-500 MHz | 1700-2100 MHz |
|-----------------------------|-------------|---------------|
| Frequency Range (MHz)       | 400-500     | 1700-2100     |
| Return Loss                 | >15 dB      | >15 dB        |
| Impedance (ohms)            | 50          | 50            |
| Voltage Standing Wave Ratio | 1.2         | 1.2           |
| Gain                        | 1.5 dBi     | 1.5 dBi       |
| Horizontal Coverage         | 180°        | 180°          |
| Vertical Coverage           | 180°        | 180°          |
| SWR                         | 1.5         | 1.5           |
| Upper Sideband Suppression  | >15 dB      | >15 dB        |

| Mechanical Characteristics | 400-500 MHz     | 1700-2100 MHz   |
|----------------------------|-----------------|-----------------|
| Dimensions (H x D x W)     | 1.0 x 1.0 x 1.0 | 1.0 x 1.0 x 1.0 |
| Weight (lbs)               | 1.0             | 1.0             |
| Material                   | Aluminum        | Aluminum        |
| Finish                     | Black           | Black           |
| Mounting Options           | 1.0             | 1.0             |
| Notes                      | 1.0             | 1.0             |



1 SCALE  
N.T.S.

# AMPHENOL DUALBAND TRI SECTOR OMNI CYLINDRICAL ANTENNA (MODEL #CWB180X06Fxy-0) (PRIVATE)

Dual Band | Dual Sector Back-to-Back Bi-Spherical Omni Cylindrical Antenna | XX-Pol | 180°/180° | 6.0/10.0 dB | Fixed Tilt

- Dual band, cylindrical antenna
- Dual sector, back-to-back bi-spherical omni configuration with 4 connectors
- Ideal for Small Cell / DAS applications with coverage on roadways
- Can be ordered with a variety of different mounting options
- Also available with internal diplexer and/or GPS system

| Electrical Characteristics  | 400-500 MHz | 1700-2100 MHz |
|-----------------------------|-------------|---------------|
| Frequency Range (MHz)       | 400-500     | 1700-2100     |
| Return Loss                 | >15 dB      | >15 dB        |
| Impedance (ohms)            | 50          | 50            |
| Voltage Standing Wave Ratio | 1.2         | 1.2           |
| Gain                        | 1.5 dBi     | 1.5 dBi       |
| Horizontal Coverage         | 180°        | 180°          |
| Vertical Coverage           | 180°        | 180°          |
| SWR                         | 1.5         | 1.5           |
| Upper Sideband Suppression  | >15 dB      | >15 dB        |

| Mechanical Characteristics | 400-500 MHz     | 1700-2100 MHz   |
|----------------------------|-----------------|-----------------|
| Dimensions (H x D x W)     | 1.0 x 1.0 x 1.0 | 1.0 x 1.0 x 1.0 |
| Weight (lbs)               | 1.0             | 1.0             |
| Material                   | Aluminum        | Aluminum        |
| Finish                     | Black           | Black           |
| Mounting Options           | 1.0             | 1.0             |
| Notes                      | 1.0             | 1.0             |



2 SCALE  
N.T.S.

# AMPHENOL DUALBAND TRI SECTOR OMNI CYLINDRICAL ANTENNA (MODEL #CWT360X06Fxy-0) (PRIVATE)

Dual Band | Tri Sector Pseudo Omni Cylindrical Antenna | XX-Pol | 360°/360° | 4.2/8.3 dB | Fixed Tilt

- Dual band, cylindrical antenna
- Tri sector configuration, Pseudo Omni with 4 connectors

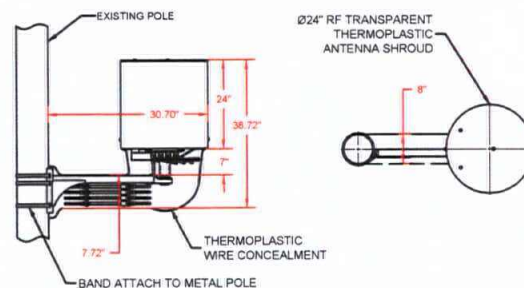
| Electrical Characteristics  | 400-500 MHz | 1700-2100 MHz |
|-----------------------------|-------------|---------------|
| Frequency Range (MHz)       | 400-500     | 1700-2100     |
| Return Loss                 | >15 dB      | >15 dB        |
| Impedance (ohms)            | 50          | 50            |
| Voltage Standing Wave Ratio | 1.2         | 1.2           |
| Gain                        | 1.5 dBi     | 1.5 dBi       |
| Horizontal Coverage         | 360°        | 360°          |
| Vertical Coverage           | 360°        | 360°          |
| SWR                         | 1.5         | 1.5           |
| Upper Sideband Suppression  | >15 dB      | >15 dB        |

| Mechanical Characteristics | 400-500 MHz     | 1700-2100 MHz   |
|----------------------------|-----------------|-----------------|
| Dimensions (H x D x W)     | 1.0 x 1.0 x 1.0 | 1.0 x 1.0 x 1.0 |
| Weight (lbs)               | 1.0             | 1.0             |
| Material                   | Aluminum        | Aluminum        |
| Finish                     | Black           | Black           |
| Mounting Options           | 1.0             | 1.0             |
| Notes                      | 1.0             | 1.0             |



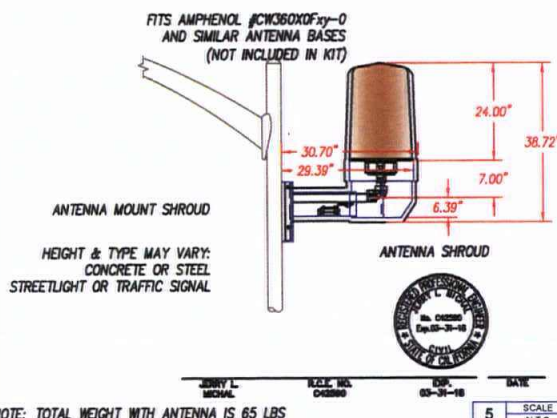
3 SCALE  
N.T.S.

# CONCEALFAB SIDE ARM MOUNT & SHROUD (FOR KATHREIN SCALA #840-10525 PANEL ANTENNA)



4 SCALE  
N.T.S.

# WILCON ANTENNA KIT 001 PRIVATE - N.T.S.



NOTE: TOTAL WEIGHT WITH ANTENNA IS 65 LBS

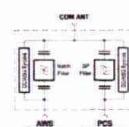
5 SCALE  
N.T.S.

# Dual-Band Combiner 1850 - 1910 / 1920 - 1990 MHz PCS 1710 - 1755 / 2110 - 2155 MHz AWS



| Technical Data           | 782 10809<br>Single unit                 | 782 10810<br>Double unit                 |
|--------------------------|------------------------------------------|------------------------------------------|
| Type No.                 | 782 10809                                | 782 10810                                |
| Pass band                | 1850 - 1910 (Rx) / 1920 - 1990 (Tx) MHz  | 1710 - 1755 (Rx) / 2110 - 2155 (Tx) MHz  |
| Insertion loss           | < 0.3 dB (1850 - 1910 / 1920 - 1990 MHz) | < 0.3 dB (1710 - 1755 / 2110 - 2155 MHz) |
| Isolation                | > 50 dB (1850 - 1910 / 1920 - 1990 MHz)  | > 50 dB (1710 - 1755 / 2110 - 2155 MHz)  |
| VSWR                     | < 1.25 (1850 - 1910 / 1920 - 1990 MHz)   | < 1.25 (1710 - 1755 / 2110 - 2155 MHz)   |
| Impedance                | 50 Ohm                                   | 50 Ohm                                   |
| Input power              | < 250 W (1850 - 1910 / 1920 - 1990 MHz)  | < 250 W (1710 - 1755 / 2110 - 2155 MHz)  |
| Intermodulation products | < -150 dBc (2nd order, with 2 x 20 W)    | < -150 dBc (2nd order, with 2 x 20 W)    |
| Lightning protection     | 3 kA, 10/350 us pulses                   | 3 kA, 10/350 us pulses                   |
| Temperature range        | -40 - +85 °C                             | -40 - +85 °C                             |
| Connections              | 7-16 female (DIN 41612)                  | 7-16 female (DIN 41612)                  |
| Application              | Indoor or outdoor (IP 68)                | Indoor or outdoor (IP 68)                |
| OC/ISO transparency      | By-pass between all ports (max. 2500 mA) | By-pass between all ports (max. 2500 mA) |
| Weight                   | 2.5 kg                                   | 5 kg                                     |
| Dimensions (w x h x d)   | 122 x 220 x 154 mm                       | 122 x 220 x 154 mm                       |

- Designed for co-siting purposes
- Enables feeder sharing
- Suitable for indoor or outdoor applications
- DC by-pass between all ports
- External DC stop available as an accessory



6 SCALE  
N.T.S.

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Master Structural Schematic  
EXISTING STREETLIGHT POLE  
WITH ANTENNA TOP MOUNT AND RADIO EQUIPMENT BOX

|               |                                                                          |
|---------------|--------------------------------------------------------------------------|
| SITE ADDRESS: | Varies                                                                   |
| TITLE:        | EXISTING STREETLIGHT POLE WITH ANTENNA TOP MOUNT AND RADIO EQUIPMENT BOX |
| PTS NO.       | 511688                                                                   |
| DRAWING NO.   | SOL OSD                                                                  |
| DATE:         | 07/26/16                                                                 |
| SCALED:       | N.T.S.                                                                   |

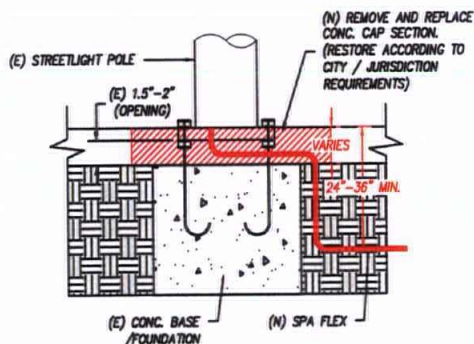
20



**NOTE:**  
SIGN TO BE PLACED 8' FROM BOTTOM OF ANTENNA TO THE TOP OF THE SIGN.

7 SCALE  
N.T.S.

# CABLING DETAIL FIBER AND POWER CABLING DETAIL

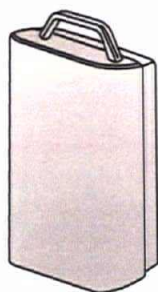


**NOTE:**  
CONCRETE SHALL CONTAIN CEMENT, COARSE AGGREGATE, AND FINE AGGREGATE WITH A MINIMUM OF 3,000 POUNDS COMPRESSIVE STRENGTH PER SQUARE INCH IN 28 DAYS.

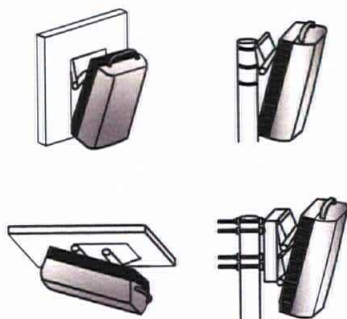
8 SCALE  
N.T.S.

**DESCRIPTION:** VALUE

**WEIGHT** 10kg  
**COLOR** WHITE



- (1) INFORMATION ABOUT INSTANTANEOUS BANDWIDTH (IBW) CAN BE FOUND IN DOCUMENT RBS CONFIGURATIONS.
- (2) B12 SUPPORTS UP TO 1.5 MHz LTE, 1-4 CARRIERS. IN SINGLE CARRIER OPERATION WITH E-UTRA, 1.4 MHz AND 3 MHz IS ONLY USED IN MULTICARRIER OPERATION TOGETHER WITH A WIDER CARRIER (UTRA OR E-UTRA). FOR E-UTRA 1.4 MHz AND 3 MHz, THE REQUIREMENTS ON OUTPUT POWER ACCURACY AND SENSITIVITY MUST NOT BE FULFILLED AT BAND EDGE. THEY ARE TO BE FULLIED IN ANY MULTICARRIER CONFIGURATION WITH 1.4 MHz OR 3 MHz CARRIER CENTER FREQUENCY SET AT 2.5 MHz FROM BAND EDGE.
- (3) B13 ONLY SUPPORTS 5 AND 10 MHz LTE, THAT IS ONE OR TWO CARRIERS.



**TABLE 2 mRRUS OUTPUT POWER**

| STANDARD                 | MAXIMUM NUMBERS OF CARRIERS PER BRANCH | CONFIGURABLE OUTPUT POWER PER BRANCH                       | MINIMUM CONFIGURABLE CARRIER OUTPUT POWER                   |
|--------------------------|----------------------------------------|------------------------------------------------------------|-------------------------------------------------------------|
| WCDMA SINGLE RAT MODE    | 4                                      | 125 mW to 5 W                                              | 125mW/4 (15 dBm) <sup>(1)</sup>                             |
| LTE SINGLE STANDARD MODE | 4                                      | FOR 1 CARRIER: 125 Mw to 5 W<br>FOR >1 CARRIER: 1 W TO 5 W | 125 Mw/4 (15 dBm)<br>1 W/4 = 250 mW (24 dBm) <sup>(1)</sup> |
| MIXED MODE               | 4                                      | 1 W TO 5 W                                                 | 1 W/4 = 250 Mw (24 DbM)                                     |

(1) ACCORDING TO THE FOUR CARRIER CASE. NOTE THAT THE mRRUS DYNAMIC RANGE IS DIMENSIONED FOR ONE CARRIER OUT OF FOUR ACTIVATED.

## **DIMENSIONS**

THIS SECTION PROVIDES TECHNICAL DATA AND DIMENSIONS FOR THE mRRUS. TABLE 1 AND TABLE 2 LIST TECHNICAL DATA AND FIGURE 2 SHOWS THE DIMENSIONS FOR THE mRRUS.

| TABLE 1 | mRRUS TECHNICAL DATA         | VALUE                               |
|---------|------------------------------|-------------------------------------|
|         | DESCRIPTION                  | 2x5 W                               |
|         | MAXIMUM NOMINAL OUTPUT POWER |                                     |
|         | NUMBER OF CARRIERS           | WCDMA AND LTE: ONE TO FOUR CARRIERS |



JERRY L. MEDAL RAY M. CARRERA ESP. 05-25-16 DATE

**NOTE:** POWER CONSUMPTION ESTIMATE 100W @ OUTPUT 2X5 W

9 SCALE  
N.T.S.

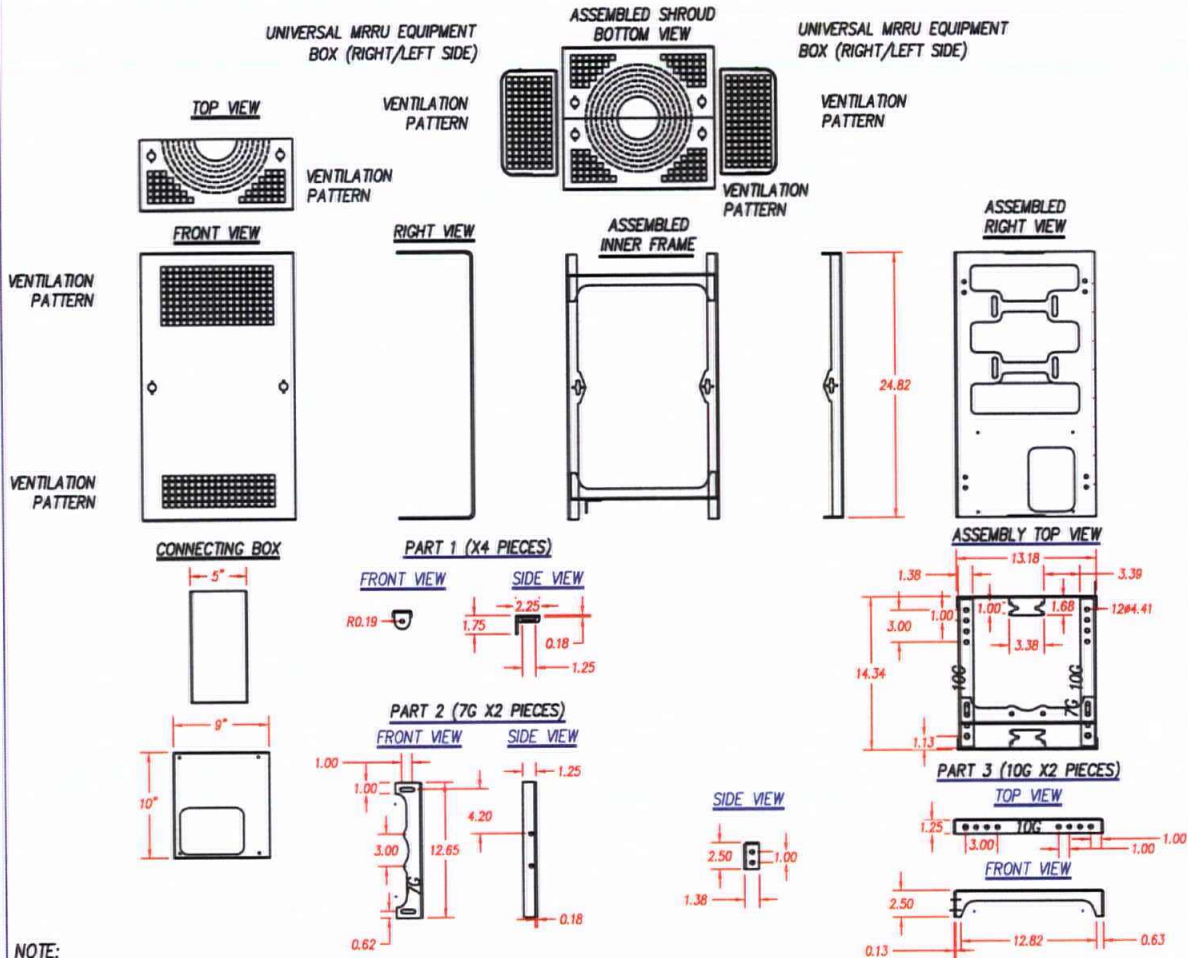
**WILCON**  
624 SOUTH GRAND AVENUE, SUITE 2500  
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D: +1.888.800.2800  
E: INFO@WILCON.COM

FREEDOM TELECOMMUNICATIONS LLC  
dba WILCON  
Master Structural Schematic  
EXISTING STREETLIGHT POLE  
WITH ANTENNA TOP MOUNT AND RADIO EQUIPMENT BOX

|               |                                                                          |
|---------------|--------------------------------------------------------------------------|
| SITE ADDRESS: | Varies                                                                   |
| TITLE:        | EXISTING STREETLIGHT POLE WITH ANTENNA TOP MOUNT AND RADIO EQUIPMENT BOX |
| PTS NO.       | 511588                                                                   |
| DRAWING NO.   | SCL DSD                                                                  |
| DATE:         | 07/26/16                                                                 |
| SCALED:       | N.T.S.                                                                   |

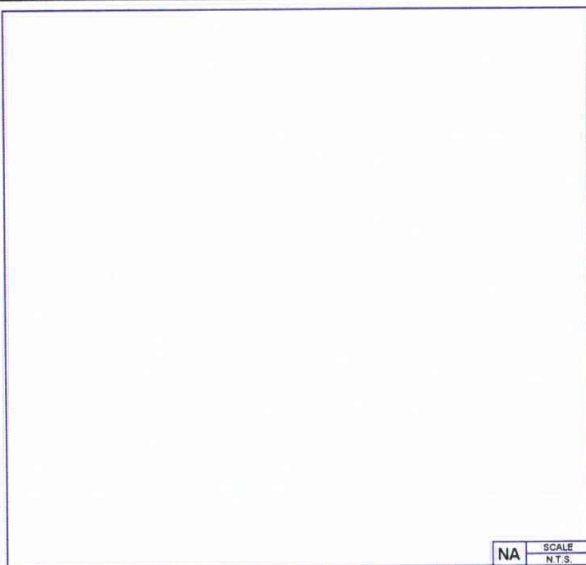
21

(1) EQUIPMENT BOX & (2) RADIOS - ASSEMBLY

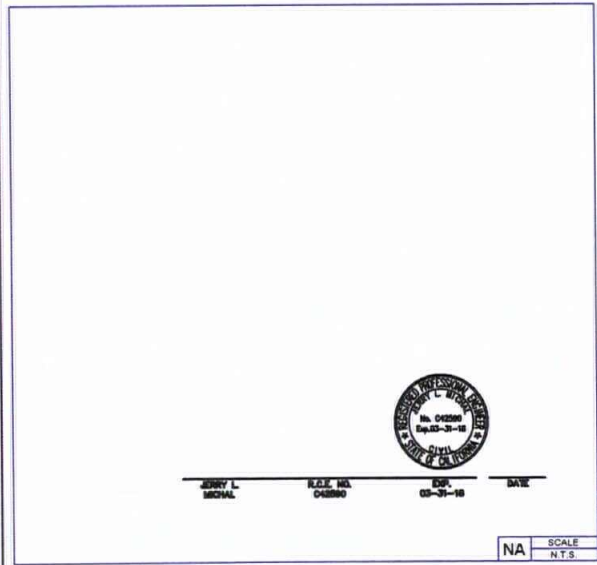


TOTAL WEIGHT WITHOUT RADIOS : 60 LBS.  
TOTAL WEIGHT WITH RADIOS: 104 LBS.

10 SCALE  
N.T.S.



NA SCALE  
N.T.S.



NA SCALE  
N.T.S.

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EXISTING STREETLIGHT POLE  
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|                                                                                 |          |
|---------------------------------------------------------------------------------|----------|
| SITE ADDRESS:                                                                   |          |
| Varies                                                                          |          |
| TITLE: EXISTING STREETLIGHT POLE WITH ANTENNA TOP MOUNT AND RADIO EQUIPMENT BOX |          |
| PTS NO.                                                                         | 511688   |
| DRAWING NO.                                                                     | SCL DSD  |
| DATE                                                                            | 07/26/16 |
| SCALED:                                                                         | N.T.S.   |
| SHEET                                                                           |          |
| 22                                                                              |          |