1. LOCATION: 437.16' 64.68' / W 132.54' 18.55', ELEVATION (TERRAIN & TOWERS): 135' 
2. ANTENNA AZIMUTH: 354' / 104' (DUAL YAGI ANTENNAS DIRECTED 180' WRT EACH OTHER) 
3. DRAWING OCEPTS THE COAXIAL RELAYS CONFIGURED TO SUPPORT BASE STATION TRANSIT OPERATIONS
1. LOCATION: N37° 56' 35.6" / W122° 26' 14.1", ELEVATION (TERRAIN & TOWER): 316'
2. ANTENNA AZIMUTH: 156° (DIRECTIONAL TOWER)
3. DRAWING DEPICTS THE COAXIAL RELAYS CONSTRUCTED TO SUPPORT BASE STATION TRANSMIT OPERATIONS
4. THE COLD / STANDBY BASE STATION IS PROGRAMMED TO THE SAME OPERATING FREQUENCIES & CONFIGURATIONS RELATIVE TO THE ACTIVE BASE STATION. HOWEVER ITS POWER SWITCH IS SET TO OFF
NOTES:
1. THIS CONFIGURATION IS USED FOR OPERATIONS ON WEEKDAYS ONLY
GENERAL NOTES OF MATERIALS AND PROCEDURES

EXTERIOR FEATURES (1 THROUGH 8):
1. House constructed of aluminum with PVC peel coat to protect exterior surface during manufacturing. (Peel coat removed prior to shipping to customer.)
2. Enclosure equipped with rigid wall type foundations constructed of diamond steel frame 60" long with 12" square flooring plate and adjustable from 30" to 52" in 1" increments.
3. Enclosure equipped with lifting lugs located at the four reinforced roof corners.
4. Intake and exhaust vents located at cable doors of roof with fuses.
5. All exterior seams sealed with gray silicone caulking.
6. Manufacturer's name plate with serial number located above the front door.
7. Cable entry holes provided as shown.
8. Four grounding lugs located below the floor.

DOORS (5):
9. Doors to include the following:
   A. Hinge resistant bolts on stainless steel hinges with grease plugs.
   B. Heavy duty three pint locking system with exterior handle that will accept a standard hardkey padlock.
   C. Prop rod to hold door open at 90 and 180 degrees.
   D. Punched extruded rubber gasket providing a weather tight seal.

INTERIOR FEATURES:
10. Walls insulated with 1/2 inch insulation and 3/8 in the doors. Ceiling insulated with 2 1/4 g class A white plastic laminated insulation.
11. Walls covered with 14" plywood with 0.030" class A white plastic laminate between the plywood.
12. Floor covered with 1/2" plywood, 3/4" OSB plywood and 1/2" rubber matting.
13. Wire chase is a purchased open ladder style modular aluminum assembly.
14. Two 24-1/4" x 14-1/2" aluminum boxes provided with 12-24 surface mounted on EIA universal spacers.
15. Six 4-5/8" diameter cable entry holes provided with shipping cover plates.

ELECTRICAL:
16. All supplied electrical components to be UL listed. All power circuits to be run in conduit and secured to house structure.
   A. (1) EACH 1200A 12 SPACE MAIN CIRCUIT BREAKER LEAD LOAD CENTER (SQUARE 3 FOOTED).6 MCM.
   B. (1) EACH 125A LIGHT SWITCH.
   C. (1) EACH 15A DUPLEX RECEPTACLE.
   D. (1) EACH 3 FOOT 2W REUSCIENT LIGHT FIXTURE (T-8) WITH LAMPS, SHATTER PROOF Converter and fuse block.
   E. (1) EACH 50 CFM 1/2 HP CIRCUIT FAN 930 CFM.
   F. (1) EACH 120V 20" TO 110" RANGE THERMOSTAT.
   G. (6) EACH 120V 2" EXT CONDUIT FOR POWER ENTRY.
   H. (1) EACH 120 / 240 VOLT SURGE PROTECTOR (BRID / PLS120/240/TV).

SHIP LOOSE ITEMS:
17. The following items ship loose with house:
   A. (1) EACH 3 FOOT LENGTH OF 3/16" I.D. TRIDENT CONDUIT WITH 3/4" EXT. COMPRESSION CONNECTOR, 3/4" STRAIGHT CONNECTOR, 3/4" NPT COUPLING AND PLASTIC CAP.
   B. (5) EACH 24" LENGTHS OF 4" SCH 40 PVC CONDUIT W/ COUPLINGS, LOCK RINGS AND PLASTIC BUSHINGS.
NOTE:

1. The transmit power of each DED shall be reduced to an EIRP (depending on the terrain in the immediate vicinity of the DED) that will restrict radio coverage to provide a separate coverage of -100 dBm within a +/- 1 mile radius of track.

2. DED shall also be received by the nearest base station. The base stations are geographically required to the base station of front end.
MOUNTAIN PEAK
BASE STATION SITE PLAN
NOT TO SCALE
12 ELEMENT YAGI 11 3/4 FREQUENCY: 980-950 MHz 11 3 15 35.0 35.0 2.0 115 5.0 0.27 16.6 23.3
DATA RADIO FREQUENCY SPECIFICATION
SINGLE ANTENNA SPECIFICATIONS
NOTE:
1. 0 DB REFERENCE ON SINGLE ANTENNA PATTERN CORRESPONDS TO 1.0 KH IMPEDANCE
2. 0 DB REFERENCE ON PHASED ARRAY PATTERN CORRESPONDS TO 15.0 KH IMPEDANCE
3. ANTENNA POINTING ADJUSTMENTS ARE WITH RESPECT TO TRUE NORTH
### Table

<table>
<thead>
<tr>
<th>Option</th>
<th>Flat Plate Area</th>
<th>Weight</th>
<th>Elevation</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Ice</td>
<td>40.0 sq. ft.</td>
<td>5,920 lbs.</td>
<td>80.0 ft.</td>
</tr>
<tr>
<td>1/2 Ice</td>
<td>49.5 sq. ft.</td>
<td>6,080 lbs.</td>
<td>80.0 ft.</td>
</tr>
<tr>
<td>No Ice</td>
<td>71.5 sq. ft.</td>
<td>9,025 lbs.</td>
<td>60 ft to 30 ft.</td>
</tr>
<tr>
<td>1/2 Ice</td>
<td>87.0 sq. ft.</td>
<td>11,000 lbs.</td>
<td>60 ft to 30 ft.</td>
</tr>
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</tr>
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<td>No Ice</td>
<td>76.5 sq. ft.</td>
<td>9,025 lbs.</td>
<td>60 ft to 30 ft.</td>
</tr>
<tr>
<td>1/2 Ice</td>
<td>93.0 sq. ft.</td>
<td>11,000 lbs.</td>
<td>60 ft to 30 ft.</td>
</tr>
</tbody>
</table>

### Diagram

- **LEGS:** 2.375" x 0.154"
- **DIAGONALS:** 
  - L1 3/4 x 1 3/4 x 1/8
  - L1 1/2 x 1 1/2 x 1/8
- **FRAMES:** 
  - L1 3/4 x 1 3/4 x 1/8
  - L1 1/2 x 1 1/2 x 1/8
- **BRACE BOLTS:** 
  - (4) 1/2" dia.
  - (4) 3/4" dia.
- **SPICE BOLTS:** 
  - (4) 1/2" dia.
  - (4) 3/4" dia.
- **ANCHOR BOLTS:** 
  - (4) 3/4" dia. (C1018 threaded rod)

### Notes

- **Foundation Reactions:**
  - Total Weight: 90.7 kips
  - Total Shear: 4 kips
  - Total Downward: 3 kips
  - Note: The number of kips may vary depending on the tower design.

- **Necessary Additional Information:**
  - Interim Spacing (Not Required)
  - See Note 1

- **Extensions:**
  - Section A
  - Section B
  - Section C

### Signature Details

- **Approved By:**
  - [Signature] [Date]

- **Contract No.:** 00-6056

- **Date:** 09/30/11

- **Train Control Communication System:**
  - ATCS (data), radio system, CEMOF base station, tower extension details

- **Peninsula Corridor Joint Powers Board:**
  - [Signature]

- **Caltrain:**
  - [Signature]
DATA RADIO BASE STATION ANTENNA

ANTS 2000 AND TOWER
PENINSULA CORRIDOR JOINT POWERS BOARD

Manufacturer: MADSAT
Model/Part Number: MMA2002

Antenna Type: 12 ELEMENT YAGI

DESCRIPTION:
12 ELEMENT YAGI 60°
DIRECTLY CABLED, SOLID ELEMENTS MOUNTED THROUGH BOOM FOR LONG LIFE. ALSO AVAILABLE WITH A DURABLE BLACK FINISH

ELECTRICAL SPECIFICATIONS
- General Frequency (MHz): 890-950 MHz
- Bandwidth (rated): 80 MHz
- Specific Frequency: see below
- Gain (dBi): 11, 13, 15
- Elevation (degrees): 36, 34
- Polarization: VERT (VERTICAL)
- Wind Load (wet): 200 (80)
- Maximum Power Input (Watts): 150
- VSWR: 1.5:1
- Grounding: DC GROUND

MECHANICAL SPECIFICATIONS
- Size (inches): 4'
- Weight (lbs): 2
- Rated Wind Velocity (mph): 125
- Wind Load: 25 (PSI)
- Location: 16.8
- Location: 23.3

NOTES:
1. ANTENNA MASTS SHALL USE An EXTERIOR CABLES TO THE TOWER FRAME. THE CABLES SHALL PROVIDE THE STRENGTH TO MEET THE STRUCTURAL AND WIND LOADING REQUIREMENTS OF THE TECHNICAL SPECIFICATION. THE CONTRACTOR'S ENGINEER (M.E.) SHALL DETERMINE THE APPROPRIATE EXTERIOR CABLE AND STRUCTURAL HEAD AND SUBMIT THE CALCULATIONS TO CALTRANS FOR REVIEW AND APPROVAL.

2. A CUSTOM ANTENNA MAST IS REQUIRED. MAST SHALL BE OF AN EXCELLENT CONSTRUCTION. ANTENNA MOUNTED THROUGH THE MAST TO TOWER: GROUND CONDUCTORS SHALL USE THE TECHNICAL CABLES ApproPRIATE CONDUCTORS: EQUAL

3. ANTENNA POINTING GAINshall be with respect to true north
DATA RADIO BASE STATION ANTENNA

SINGLE ANTENNA SPECIFICATIONS

NOTE:
1. 0 dB reference on single antenna pattern corresponds to 15dBd gain
2. 0 dB reference on phased array pattern corresponds to 15dBd gain
3. Antenna pointing azimuths are with respect to true north

ANTENNA ELEMENT (ELEMENT #3)
New Pointing Azimuth: 140°
BEAMLET: -7°

ANTENNA ELEMENT (ELEMENT #1)
New Pointing Azimuth: 125°
BEAMLET: -7°

VERTICAL PLANE

TUNED COAX CABLE

NOTE: THE 54° ANGLE REPRESENTS THE VERTICAL BEAM WIDTH

DESIGN OF CALTAIN DATA RADIO ANTENNA BEAMWIDTH

SINGLE ANTENNA: VERTICALLY POLARIZED

4 ANTENNA PHASED ARRAY. VERTICALLY POLARIZED

PENINSULA CORRIDOR JOINT POWERS BOARD

STANDARD DRAWINGS

TRAIN CONTROL COMMUNICATION

ATCS (DATA) RADIO SYSTEM

SAN BRUNO MOUNTAIN BASE STATION

ATCS ANTENNA ARRAY DETAILS

CALTRAIN

DATE REV

08/10

2011

08/08

08/08

08/08
NOTE:
1. ELECTRICAL LOAD ANALYSIS:
   - DATA RADIO POWER CONSUMPTION: 11A 24VDC
     EQUIVALENT TO: 3A @ 110 VAC
   - ADD CORRECTION FOR EFFICIENCY, TEMP AND VARIATION = 1.5A @ 110VAC
   - ADD CONSUMPTION FOR MOD(s), RELAYS, PRE-AMPS
   - OTHER ACCESSORIES:
     - ESTIMATED AT: 5A @ 240VDC(MAX)
     - EQUIVALENT TO: 5A @ 110VAC
   - TOTAL AC POWER CONSUMPTION: 7A @ 110VAC
NOTE:
1. CONFIGURE TOWER SO THAT IT TILTS DOWN PARALLEL TO THE TRACKS
2. ENGINEER'S SEAL IS ONLY FOR ELECTRICAL PORTION OF DESIGN. SEE FOUNDATION DRAWINGS FOR Civil STRUCTURAL ENGINEER'S CERTIFICATION
3. THIS DRAWING SHOWS A GENERIC ANTENNA LAYOUT FOR THE FOLLOWING CP LOCATIONS

<table>
<thead>
<tr>
<th>CP NO.</th>
<th>CP NAME</th>
<th>M.L.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>CP GENEVA</td>
<td>5.5</td>
</tr>
<tr>
<td>4</td>
<td>CP CREDO</td>
<td>12.5</td>
</tr>
<tr>
<td>5</td>
<td>CP TROUSHALE</td>
<td>14.0</td>
</tr>
<tr>
<td>6</td>
<td>CP PALM</td>
<td>18.2</td>
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<tr>
<td>7</td>
<td>CP MALTRON</td>
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<tr>
<td>8</td>
<td>CP CUMBARTON</td>
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<tr>
<td>9</td>
<td>CP JUNCTION</td>
<td>27.2</td>
</tr>
<tr>
<td>10</td>
<td>CP ALMA</td>
<td>30.3</td>
</tr>
<tr>
<td>11</td>
<td>CP BOWERS</td>
<td>41.6</td>
</tr>
</tbody>
</table>

TRAITS WILL BE HEADED ON THIS SIDE FOR THESE ANTENNA STATIONS ONLY

PENINSULA CORRIDOR JOINT POWERS BOARD

STANDARD DRAWINGS

TRAIN CONTROL COMMUNICATION
ATCS (DATA) RADIO SYSTEM
40 FOOT TILT-DOWN TOWER
TILT MECHANISM

DRAWN BY
APPROVED BY
B. F. Brown
T. C. Boykin

Caltrain
1. Construct tower so that it tilts down parallel to the tracks.
2. Engineer's seal is only for electrical portion of design. See tower foundation drawings for civil structural engineer certification.
3. This drawing shows a generic antenna layout for telecommunications.

<table>
<thead>
<tr>
<th>Control Points with 80 ft Tenders</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
</tr>
<tr>
<td>-----</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
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Section NTS