



U.S. Department
of Transportation
**Federal Highway
Administration**

400 Seventh St., S.W.
Washington, D.C. 20590

July 26, 1999

Refer to: HMHS

Mr. Francisco D. Estrada, Supervisor
Los Angeles County SAFE
One Gateway Plaza
Los Angeles, California 90012-2932

Dear Mr. Estrada:

Thank you for your February 25 letter to the Director, Office of Engineering, requesting acceptance of the Comarco Wireless Technologies' TTY Call Box support system as a breakaway support for use on the National Highway System. Accompanying your letter was a report of crash testing done at E-Tech Testing Services dated December, 1998, and videos of the crash tests.

Testing of the supports was in compliance with the guidelines contained in the National Cooperative Highway Research Program (NCHRP) Report 350, Recommended Procedures for the Safety Performance Evaluation of Highway Features. Requirements for breakaway supports are those in the American Association of State Highway and Transportation Officials' (AASHTO) Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals.

The test articles each consisted of a callbox, a 102-mm diameter by 4267-mm steel pole conforming to ASTM A 500, with an A.B.Chance auger foundation, a "Call Box" sign, a "TTY" sign, a unity gain antenna, and a 6.5 Watt solar panel. The poles were equipped with rectangular slip base mounting hardware consisting of (4) 5/8-11 UNC 3 1/4" long hot-dipped galvanized SAE J429 GD 2 hex bolts and J995 GD 2 nuts. SAE wide Type A plain washers were used against the faces of the nuts and bolts and between the slip base plates. All mating surfaces of the slip base plates, washer surfaces, and bolt threads were rubbed down with a layer of paraffin wax. The supports were augured 1664 mm (65.5 inches) into "weak" soil, and the slip base nuts were torqued to 54 N-m prior to testing. The hardware and torque specifications differ from those shown in the enclosed illustration of the tested support.

A summary of the crash tests is presented in the following table.

Test #	11-4501-001	11-4501-002
NCHRP 350 Designation	3-60	3-61
Vehicle Mass	834.4 kg	809.4 kg
Vehicle Impact Speed	38.09 km/h	101.05 km/h
Soil Type	Weak (S-2)	Weak (S-2)
Impact Angle	20 degrees	20 degrees
Test Article Mass ¹	103 kg	103 kg
Occupant Impact Speed	1.49 m/s	2.30 m/s
Vehicle Velocity Change	4.25 km/hr (1.18 m/s)	7.02 km/hr (1.95 m/s)
Windshield Damage	None, no contact	None, no contact
Vehicle Deformation ²	Major roof dents, 89 mm max	Major bumper, body dents
Stub Height	Approximately 75 mm	Approximately 75 mm

Notes:

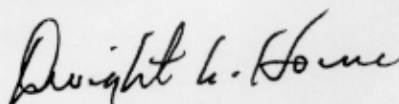
1. The test article mass includes the pole, slip base assembly, and callbox, signs, and solar panel assemblies. That part of the test article which remains in the soil is included in this total even though it does not have to be put in motion by the test vehicle.
2. The 89 mm maximum deformation of the roof is within the 125-mm tolerance allowed by FHWA for roof deformation under impact by luminaire supports in a memorandum dated August 19, 1994.

The tested supports met the change in velocity and stub height requirements of the AASHTO Standard Specifications and NCHRP Report 350. There were no excessive deformations of the passenger compartment and no damage to the windshield. Therefore, the callbox supports are acceptable for use on the National Highway System (NHS) within the range of conditions tested, when requested by a State. The "weak" soil testing was the "worst-case scenario" for any slip-base design. Therefore the Comarco Wireless Technologies' TTY Call Box support system will be acceptable when installed in strong soil as well. Should you wish to use the same slip base mechanism on a support embedded in concrete, that too will be acceptable if the foundation is adequate to support the typical structural loadings imposed by such an installation. To prevent misunderstanding by others, this letter of acceptance, numbered SS-84, shall not be reproduced except in full.

Our acceptance is limited to the breakaway characteristics of the supports and does not cover the structural features, compliance with the Americans with Disabilities Act, nor the devices'

conformity with the Manual on Uniform Traffic Control Devices. Presumably, users will be provided with sufficient information on structural design and installation requirements to ensure proper performance of the supports. Comarco Wireless Technologies should provide certification to other transportation agencies wishing to use this breakaway support system that the hardware furnished will have essentially the same chemistry, mechanical properties, and geometry as those used in the tests and that they will meet FHWA change in velocity requirements.

Sincerely yours,

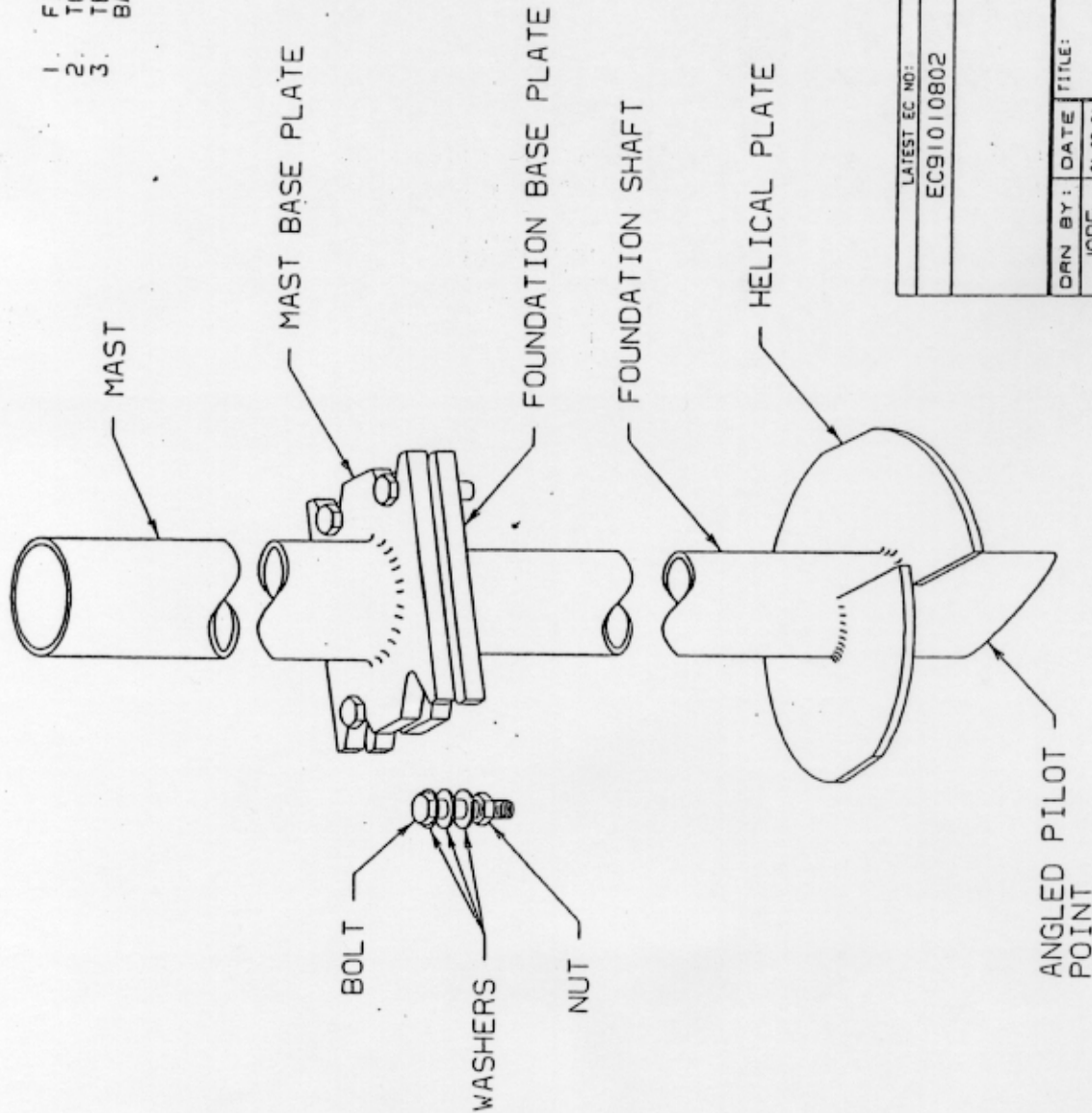
A handwritten signature in cursive script that reads "Dwight A. Horne".

Dwight A. Horne

Director, Office of Highway Safety Infrastructure

==NOTES==

1. FINISH: HOT DIP GALVANIZED
2. TORQUE BOLTS TO ~~60~~ 40 FT-LBS
3. TERMINATE INSTALLATION OF FOUNDATION WHEN BASEPLATE IS 3" ABOVE GRADE



LATEST EC NO:	REV.	DATE	CHANGED BY	RESP ENGINEER
EC91010802	-	-----	---	SEIDER
DRN BY: DATE		THIRD ANGLE PROJECTION		
JOB# 01-08-91		DO NOT SCALE THIS DWG		
TITLE: ERECTION DRAWING FOR CALL BOX FOUNDATION		ISO DUAL DIMENSIONS IN INCH, MM+MILLIMETER		
DRAWING NO: SA 112-10020				SIZE: B

CHANGE
 A.B. CHANCE CO.
 CENTRALIA, MO. USA

CONFIDENTIAL: THIS DRAWING AND ITS CONTENTS ARE CONFIDENTIAL AND THE EXCLUSIVE PROPERTY OF A. B. CHANCE COMPANY. NO PUBLICATION, DISTRIBUTION OR COPIES MAY BE MADE WITHOUT WRITTEN CONSENT BY A. B. CHANCE COMPANY.
 © 1991 A. B. CHANCE CO. UNPUBLISHED - ALL RIGHTS RESERVED UNDER THE COPYRIGHT LAWS

==NOTES==

1. FINISH: HOT DIP GALVANIZE PER ASTM-153 (LATEST REVISION).
2. BASEPLATE TO BE PERPENDICULAR TO SHAFT AXIS (± 1.0°) AND HOLE TO BE CONCENTRIC (± .125 I.D.) TO SHAFT AXIS.
3. STENCIL MIN. 1/2 IN. LETTERS MANUFACTURER'S NUMBER AFTER GALVANIZING.
4. TUMBLAST, HAND GRIND OR PICKLE & PREHEAT BASEPLATE AND SHAFT BEFORE WELDING.
5. FLAMECUT IRREGULARITIES PERMISSIBLE: (1) VALLEYS NOT TO EXCEED 3/32 IN. BELOW NOMINAL SURFACE LEVEL, (2) PEAKS OR POSITIVE IRREGULARITIES NOT TO EXCEED 1/32 IN. ABOVE NOMINAL SURFACE LEVEL OR INTERSECTIONS OF NOMINAL SURFACES.
6. MANUFACTURER TO HAVE IN EFFECT INDUSTRY RECOGNIZED WRITTEN QUALITY CONTROL FOR ALL MATERIALS AND MANUFACTURING PROCESSES. ALL MATERIAL IS TO BE NEW, UNUSED AND HILL TRACEABLE.
7. HEETING THE FOLLOWING SPECIFICATIONS:

BASEPLATE: ASTM A36-(LATEST REVISION) HOT ROLLED STEEL PLATE, TO CONFORM TO CALTRANS SLIP PLATE DESIGN.
 MAST: ASTM 500, GRADE B (LATEST REVISION), STRUCTURAL TUBING.

8. FASTENERS: (ORDER SEPARATELY)
 MOUNTING HARDWARE: T112-0314
 4 - 5/8-11 X 3" LG. HEX. HEAD MACH. BOLT PER SAE J429, GRADE 2, ZINC PLATED STEEL
 4 - 5/8-11 HEX. NUTS, ZINC PLATED STEEL
 12 - 5/8" TYPE A WIDE FLAT WASHERS, ZINC PLATED STEEL
 CALL BOX HARDWARE: T112-0315
 2 - 5/8-11 X 5-1/2" LG. ROUND HEAD REG. SQ. NECK CARR. BOLT PER SAE J429, GR. 2.
 2 - 5/8-11 HEX. NUT
 2 - 5/8" TYPE A NARROW FLAT WASHERS
9. LUBRICATE SLIP BASE AND WASHERS WITH PARAFFIN, TORQUE MOUNTING BOLTS TO 60 FT.-LBS.
10. POLE ONLY TO BE USED ON MATTING & POINT SLIP BASE.

APPROVALS

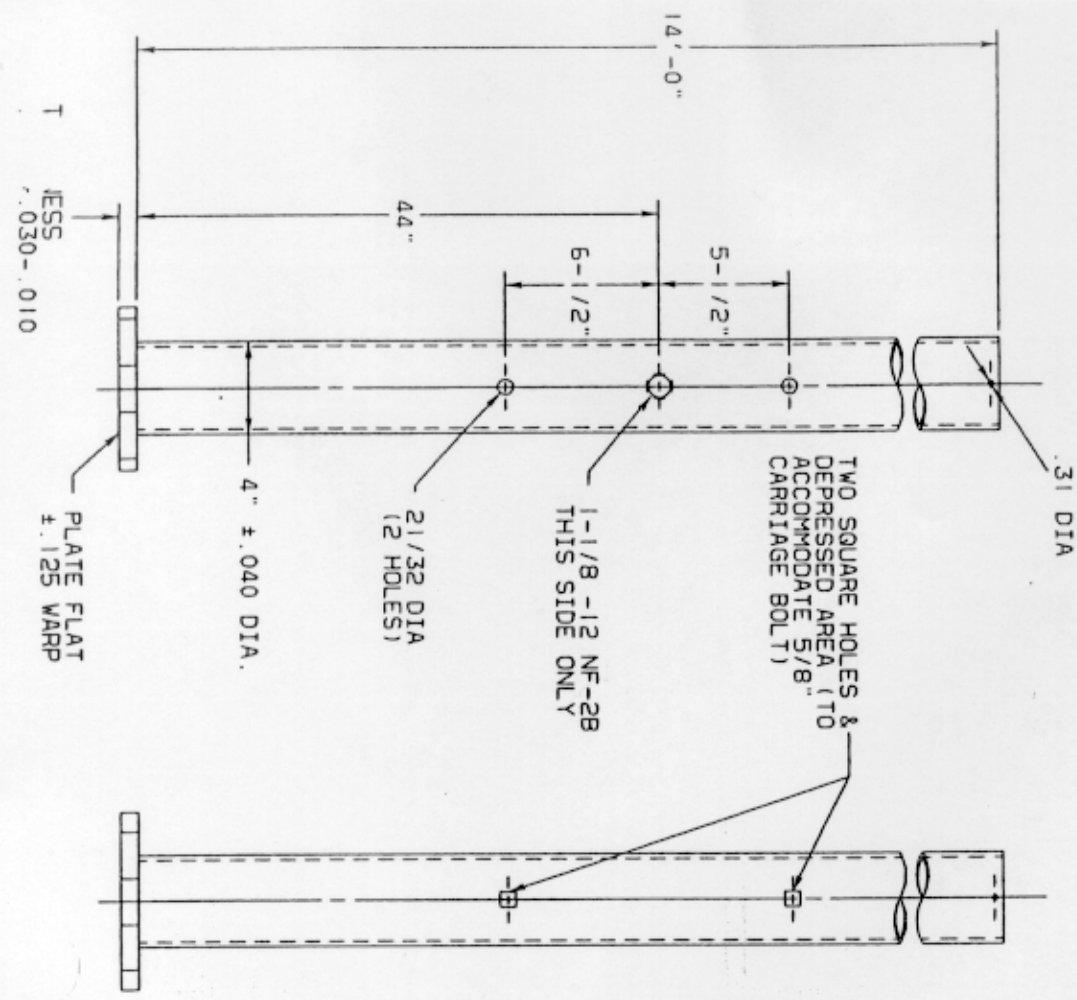
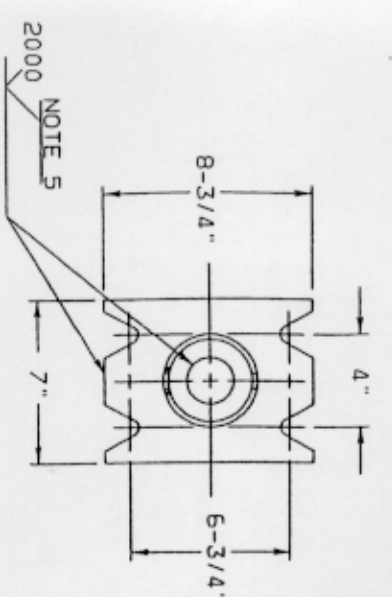
DATE	ORGANIZATION	SIGNATURE

4" DIAMETER MAST

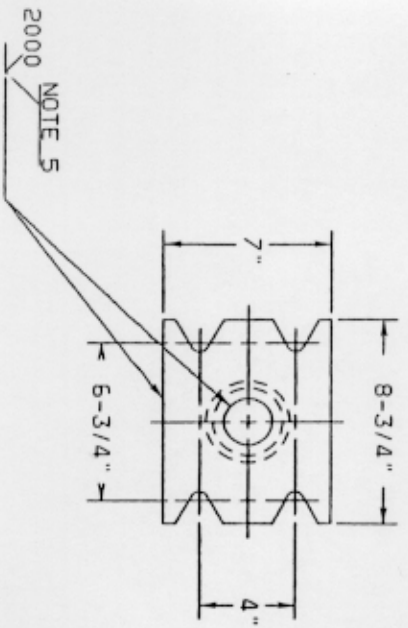
CATALOG NUMBER

T112-0350

LESS HARDWARE - SEE NOTE #8



DATE	REV	DATE	CHANGED BY	REPR. ENGINEER
08-19-93	B	08-19-93	HOWARD	SEIDER
LATEST EC NO: EC93081806				
DRAWN BY: MARTIN				
TESTED PER ASNT Q1 & FED 2301				
EMERGENCY CALL				
SAI				
.0350				

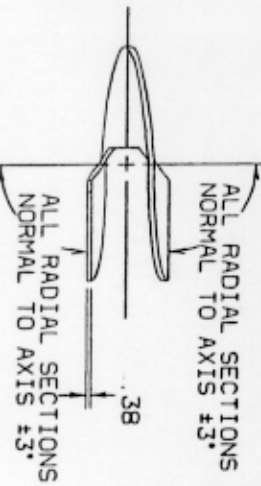
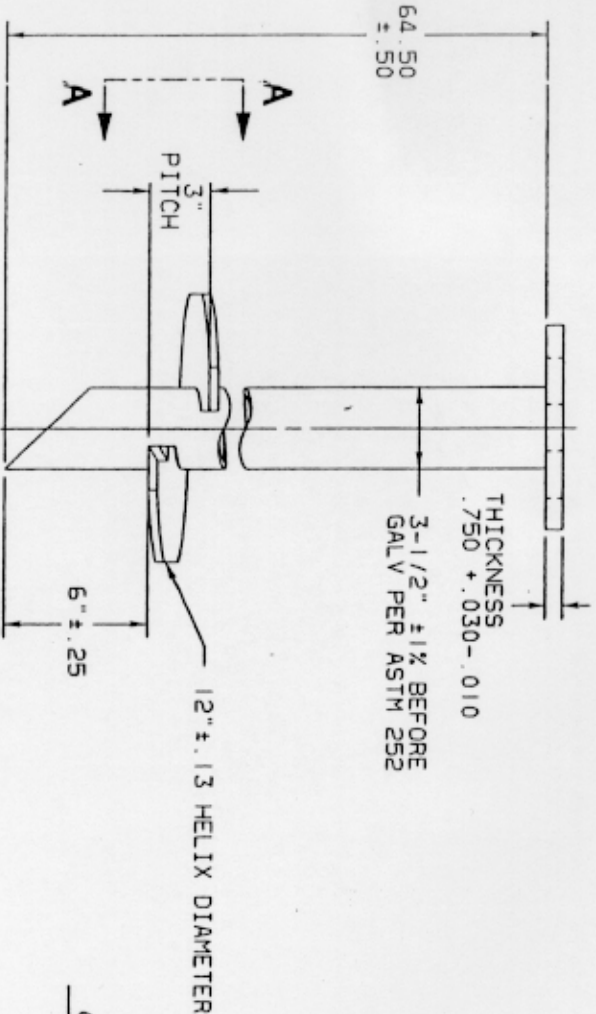


- ==NOTES==
1. FINISH: HOT DIP GALVANIZE PER ASTM-A153 (LATEST REVISION)
 2. BASEPLATE TO BE PERPENDICULAR TO SHAFT AXIS (±1°) AND HOLE TO BE CONCENTRIC (±.125 I.D.) TO SHAFT AXIS.
 3. STENCIL MIN. 1/2 IN. LETTERS MANUFACTURER'S NUMBER AFTER GALVANIZING.
 4. TUMBLAST HAND GRIND OR PICKLE & PREHEAT BASEPLATE.
 5. WELDING AND SHAFT BEFORE WELDING: (1) VALLEYS NOT TO EXCEED 3/32 IN. BELOW NOMINAL SURFACE LEVEL. (2) PEAKS OR POSITIVE IRREGULARITIES NOT TO EXCEED 1/32 IN. ABOVE NOMINAL SURFACE LEVEL OR INTERSECTIONS OF NOMINAL SURFACES.
 6. MANUFACTURER TO HAVE IN EFFECT INDUSTRY RECOGNIZED WRITTEN QUALITY CONTROL FOR ALL MATERIALS AND HANDWORKING PROCESSES.
 7. MAXIMUM TORQUE RATING IS 10,000 LBS. FT.
 8. ALL MATERIAL IS TO BE NEW, UNUSED AND MILL TRACEABLE MEETING THE FOLLOWING SPECIFICATIONS:

BASEPLATE: ASTM A153-(LATEST REVISION) HOT ROLLED STEEL PLATE, TO CONFORM TO CALTRAN SLIP PLATE DESIGN.

SHAFT: STEEL PIPE PILES, SEAMLESS OR STRAIGHT WELDED, GRADE 2 PER ASTM A252; ALL MATERIAL: STEEL PIPE, TYPE E OR S, GRADE B PER ASTM A53.

HELIX: ASTM A29-(LATEST REVISION) HOT ROLLED STEEL PLATE



MUST BE FORMED BY MATCHING METAL DIE
VIEW A-A
(SIDE VIEW OF TRUE HELICAL FORM)

APPROVALS

DATE	ORGANIZATION	SIGNATURE

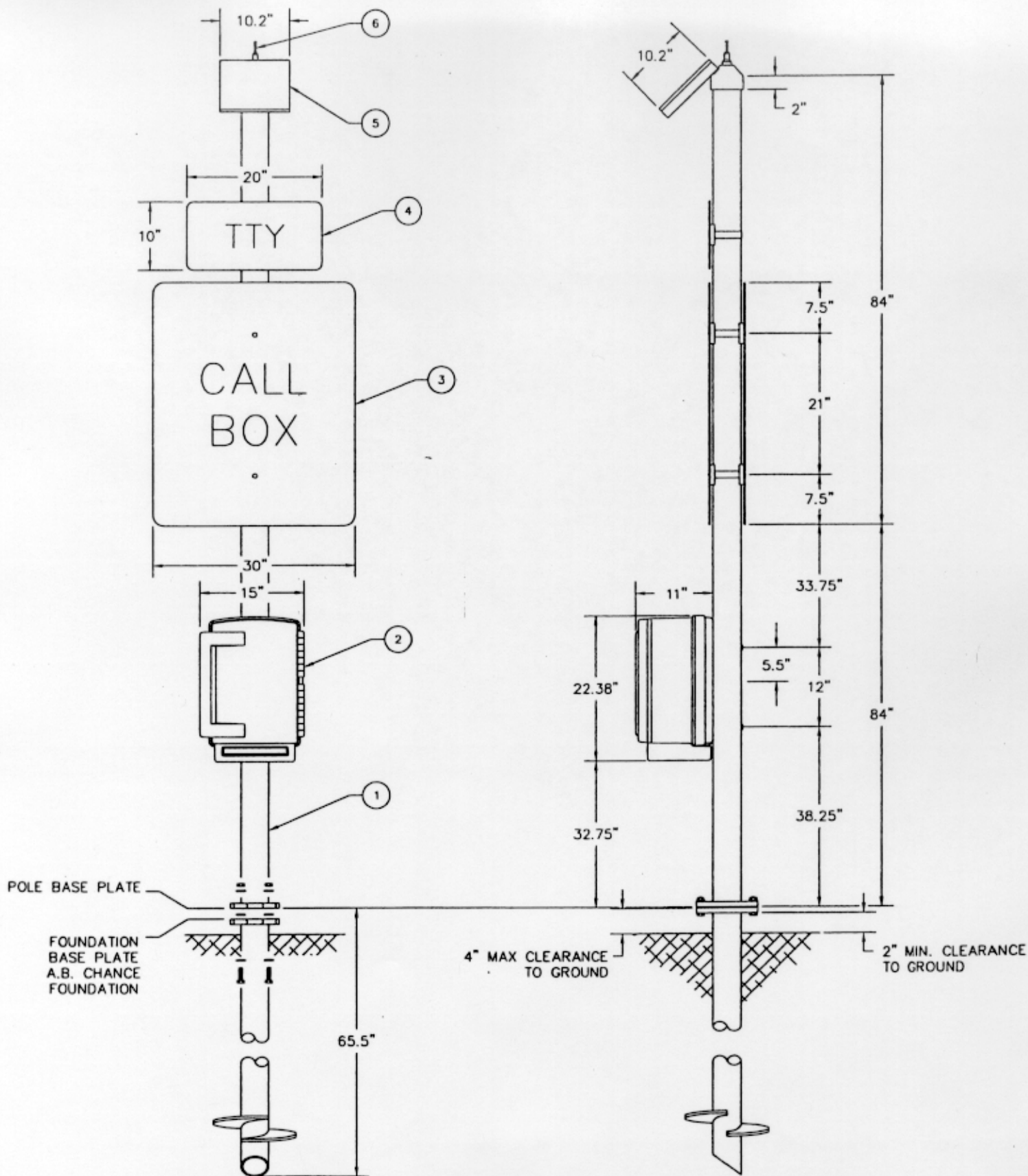
CATALOG NUMBER
T112-0300

3-1/2" DIAMETER FOUNDATION

DATE	11/12/92	REV.	E	DATE	11-24-90	DESIGNED BY	JONES	SEAL	SET/DR
DATE	10-24-90	REV.	E	DATE	11-24-90	DESIGNED BY	JONES	SEAL	SET/DR
DATE	10-24-90	REV.	E	DATE	11-24-90	DESIGNED BY	JONES	SEAL	SET/DR

4 POINT SLIP BASE FOUR

CHANCE COMPANY



DRAWING #3
INSTALLATION CONFIGURATION AND MOUNTING DETAILS