U.S. Department of Transportation
Federal Highway Administration

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

OCT 5 1993

Refer to: HNG-14

Mr. Wade Linnertz
Design Engineer
Millerbernd Manufacturing Company
Winsted, Minnesota 55395

Dear Mr. Linnertz:

Thank you for your August 11 and September 17 letters requesting acceptance of your company's lighting poles on your "HIGH" progressive shear breakaway bases 40C63 and 40C49. These bases were tested for compliance with the American Association of State Highway and Transportation Officials (AASHTO) Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, dated 1985, at the Federal Outdoor Impact Facility (FOIL.) The AASHTO specifications have been adopted, with minor modifications, by the Federal Highway Administration (FHWA). Your August 11 letter referenced the FOIL tests numbers 86F067, 86F068, 86F069, and 86F070 and transmitted drawings of the bases and of the poles for which you requested acceptance, some of which were not crash tested.

Because we were concerned that the pole shaft to base attachment on the untested poles was different from those actually tested, we were reluctant to accept them as you requested. After some discussion with our office, you agreed to change the pole shaft to base attachment on the untested poles so that the attachment was the same as on the tested poles. You sent us revised drawings of the poles and bases with the September 17 letter.

The test results are summarized here:

Test Number	86F067	86F068	86F069	86F070
Base Number	40C63		40C49	
Bolt Circle Diam. mm (in)	432 (17)		381 (15)	
Mounting Ht, mm (ft)	15 636 (51.3)		12 090 (39.7)	
Mast Arm Length, mm (ft)	1957 (6.42)		2082 (6.83)	
Total Mass, kg (weight,lbs)	177 (390)		136 (300)	
Test Speed, km/h (mph)	33.0 (20.5)	99.3 (61.7)	32.5 (20.2)	98.0 (60.9)
Velocity Change m/s (fps)	2.96 (9.7)	3.11 (10.2)	1.86 (6.1)	2.68 (8.8)
Stub Ht., mm (in)	46 (1.8)	46 (1.8)	71 (2.8)	71 (2.8)

Technical notes: For all tests the poles were of stainless steel and the. vehicle mass was 841 kg (weight, 1850 pounds). Because the breakaway action consists of failing the rivets that connect the body of the base to the foundation or base plate, the number of rivets must be strictly limited to that used in the tested hardware. In addition, we assume that quality control during fabrication limits the number, size, and penetration of the tack welds to ensure that they are limited to those that will not affect breakaway. Base number 40C63 requires that the poles have a notch cut from each corner that we assume is essential for breakaway performance.

The results, of these tests meet the change-in-velocity and stub-height requirements adopted by the FHWA. The Millerbernd progressive shear bases 40C63 and 40C49 with the tested stainless steel poles are therefore acceptable for use on projects on the National Highway Systems, within the range of conditions tested, if proposed by a State.

Your letters also requested acceptance for using the same stainless steel bases attached to carbon steel poles and self-weathering (COR-TEN A) poles.

The poles are compared below:

Pole Type	Stainless Steel	Carbon Steel	COR-TEN A Steel
Drawing Nos.	40C63, 40C49	750C4,750C5,750C6*	750C1,750C2,750C3*
Pole Wall Thickness	1.83 mm (0.0721 in)	1.90 mm (14 gage, 0.0147 in)	3.04 mm (11 gage, 0.1196 in)
Grade	Stainless Type 201	ASTM A607 Gr 60	ASTM A606 Type 4
Yield Strength	414 MPa (60,000 psi)	414 MPa (60,000 psi)	345 MPa (50,000 psi)
Mass Compared to Stainless	--	Approximately the same	81.8 kg greater (180 lbs greater)
Butt Diameters	237.9 and 265.2 mm (9.368 and 10.44 in)	237.9 and 265.2 mm (9.362 and 10.44 in)	240.3 and 267.7 mm (9.46 and 10.54 in)

*Three combinations of mast arm length and mounting height. A table which relates the eight drawing numbers to the two bases, the two mounting heights and the two mast arm lengths is included as an attachment to this document

Based upon the FOIL crash test results and the supplemental data you supplied on the alternate pole materials, it is our opinion that the 401363 and 40C49 progressive shear bases will perform in an acceptable manner when used with the carbon steel and COR-TEN A steel poles shown on the drawings cited in the table above. Therefore, these pole-base combinations are acceptable for use on projects on the National Highway System (NHS), within the range of conditions tested or described above, if proposed by a State. Although FOIL testing only used mast arms around 2000 mm long, arms of up to 2750 (9 ft.)

long may be used with the 18 300 mm (50 ft.) poles and arms of up to 3660 mm (12 ft.) may be used with 12 200 mm (40 ft.) poles as you requested. Drawings of the tested bases and pole combinations are enclosed, together with drawings of the bases combined with the carbon steel and COR-TEN A steel poles.

Our acceptance is limited to the breakaway characteristics of the systems and does not cover the structural features. Presumably, you will supply potential users with sufficient information on structural design and installation requirements to ensure proper performance. We anticipate that the States will require certification from Millerbernd that the hardware furnished has essentially the same chemistry, mechanical properties, and geometry as that used in the tests or the alternative material combinations as described above, and that the base-pole combinations will meet the FHWA change in velocity requirements.

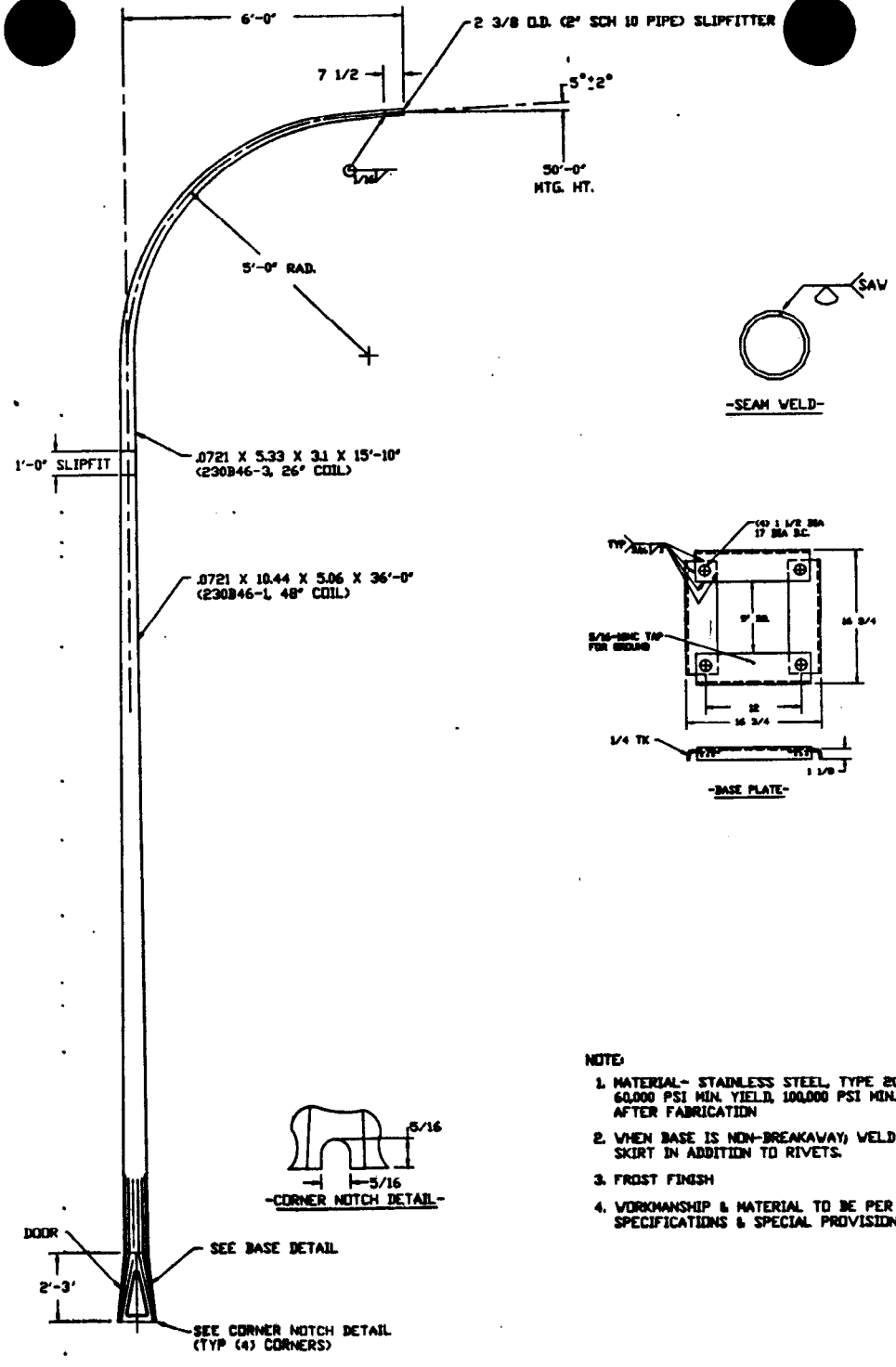
Because the Millerbernd progressive shear bases are proprietary, to be used in Federal-aid projects on the NHS: (a) they must be supplied through competitive bidding with equally suitable unpatented items; (b) the highway agency must certify that they are essential for synchronization with existing highway facilities or that no equally suitable alternate exists; or (c) they must be used for research or for a distinctive type of construction on relatively short sections of road for experimental purposes. Our regulations concerning proprietary products are contained in Title 23, Code of Federal Regulations, Section 635.411, a copy of which is enclosed.

Sincerely yours,

L. A. Staron

Lawrence A. Staron
Chief, Federal-Aid and Design Division

10 Enclosures



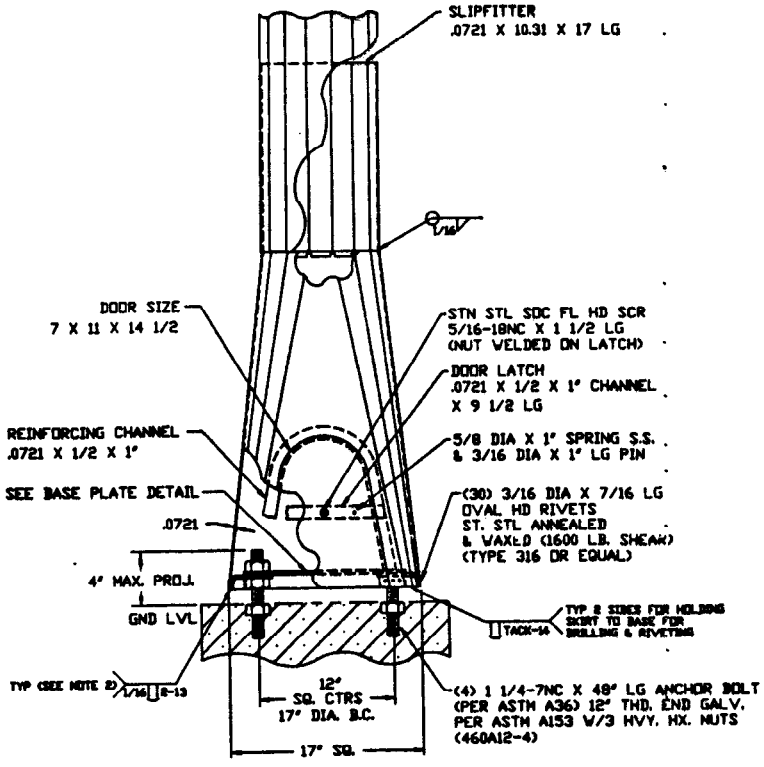
-SEAM WELD-

-BASE PLATE-

-CORNER NOTCH DETAIL-

NOTE:

1. MATERIAL- STAINLESS STEEL, TYPE 201 60,000 PSI MIN. YIELD, 100,000 PSI MIN. TENSILE AFTER FABRICATION
2. WHEN BASE IS NON-BREAKAWAY, WELD BASE TO SKIRT IN ADDITION TO RIVETS.
3. FROST FINISH
4. WORKMANSHIP & MATERIAL TO BE PER MN/DOT SPECIFICATIONS & SPECIAL PROVISIONS.

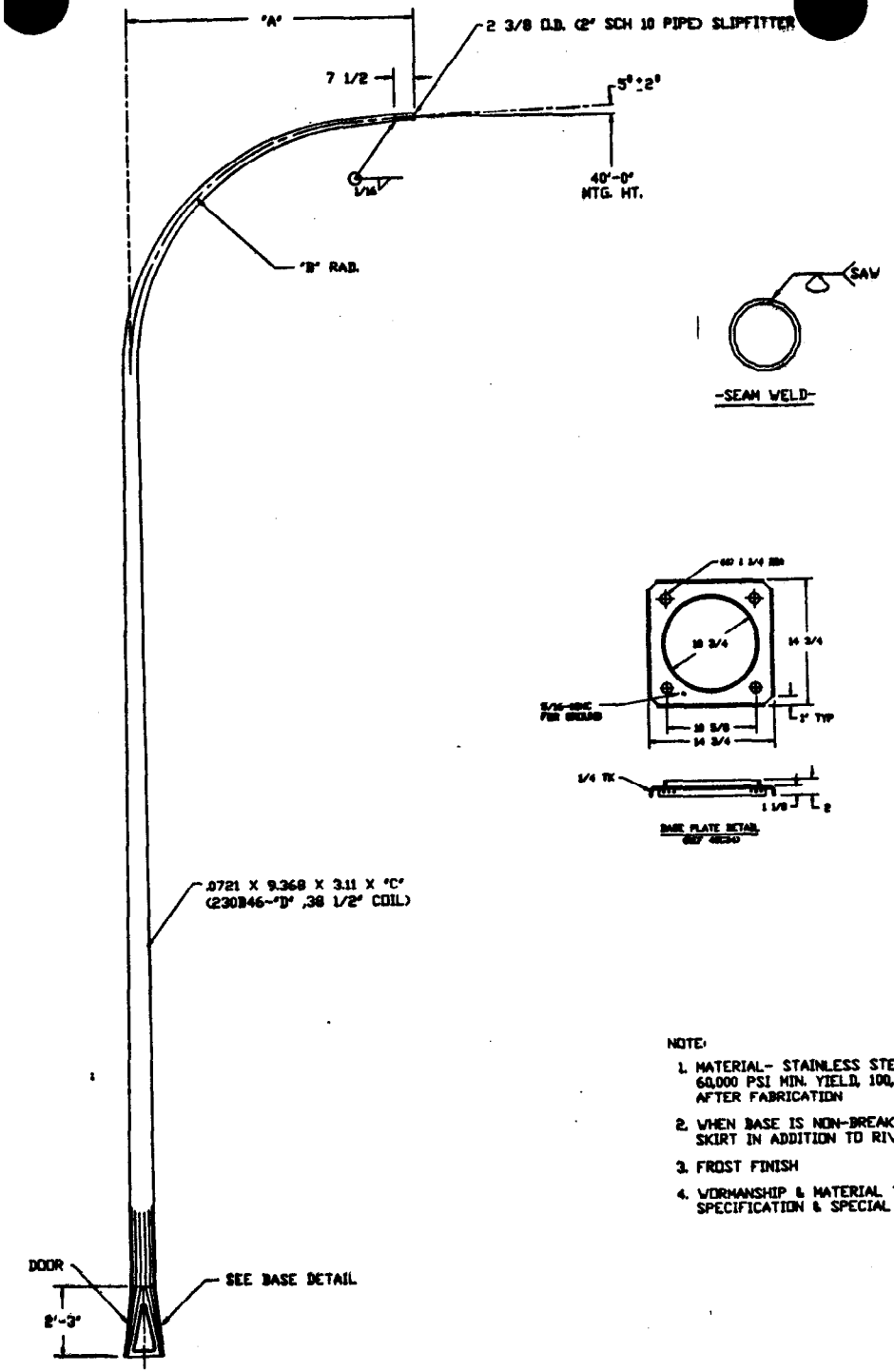


-BASE DETAIL-

DASH NO.	QTY.	MILLERBERND PART NO.
2		NON-BREAKAWAY 16-SD6-6-500
1		16-SD6-6-500

ENG	G.N.	6-13-88	16-SD6-6-500 STAINLESS STEEL LIGHT STANDARD
MFG			
SLS			
DWN	G.N.	6-13-88	Millerbernd MANUFACTURING CO. WESTBY, WI 40C63

NOT TO SCALE



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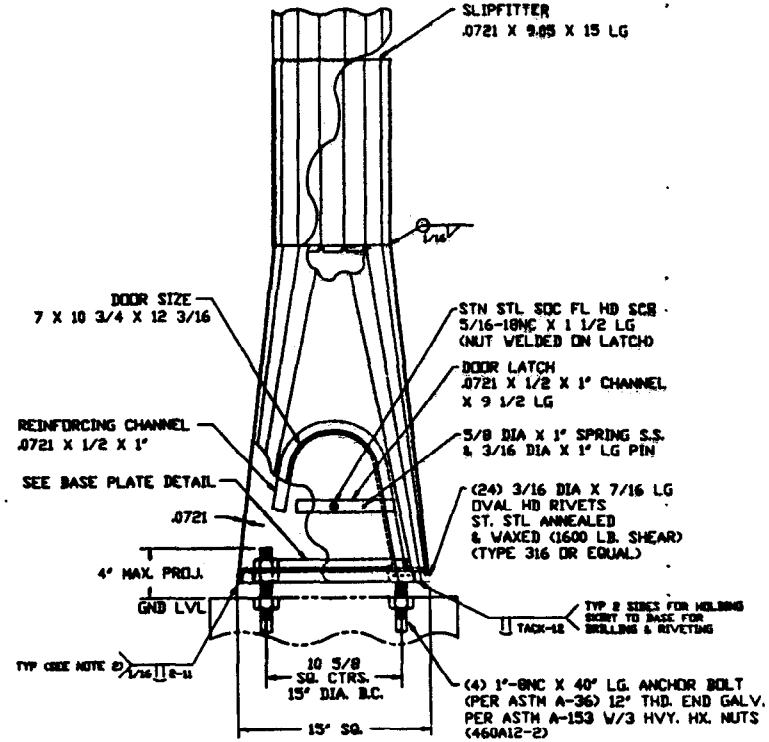


-BASE DETAIL-

NOTE:

1. MATERIAL- STAINLESS STEEL, TYPE 201
   60,000 PSI MIN. YIELD, 100,000 PSI MIN. TENSILE
   AFTER FABRICATION
2. WHEN BASE IS NON-BREAKAWAY, WELD BASE TO
   SKIRT IN ADDITION TO RIVETS.
3. FROST FINISH
4. WORKMANSHIP & MATERIAL TO BE PER MN/DOT
   SPECIFICATION & SPECIAL PROVISIONS.

SP 3103-48 Grand Rapids, MN

DASH NO.	QTY	"A"	"B"	"C"	"D"	STATE PART NO.	MILLERBERND PART NO.
4		9'-0"	8'-0"	42'-0"	-6	9-40	16-SD4-9-400 NON-BREAKAWAY
3	3	9'-0"	8'-0"	42'-0"	-6	9-40	16-SD4-9-400
2		6'-0"	5'-0"	40'-5"	-4	6-40	16-SD4-6-400 NON-BREAKAWAY
1		6'-0"	5'-0"	40'-5"	-4	6-40	16-SD4-6-400

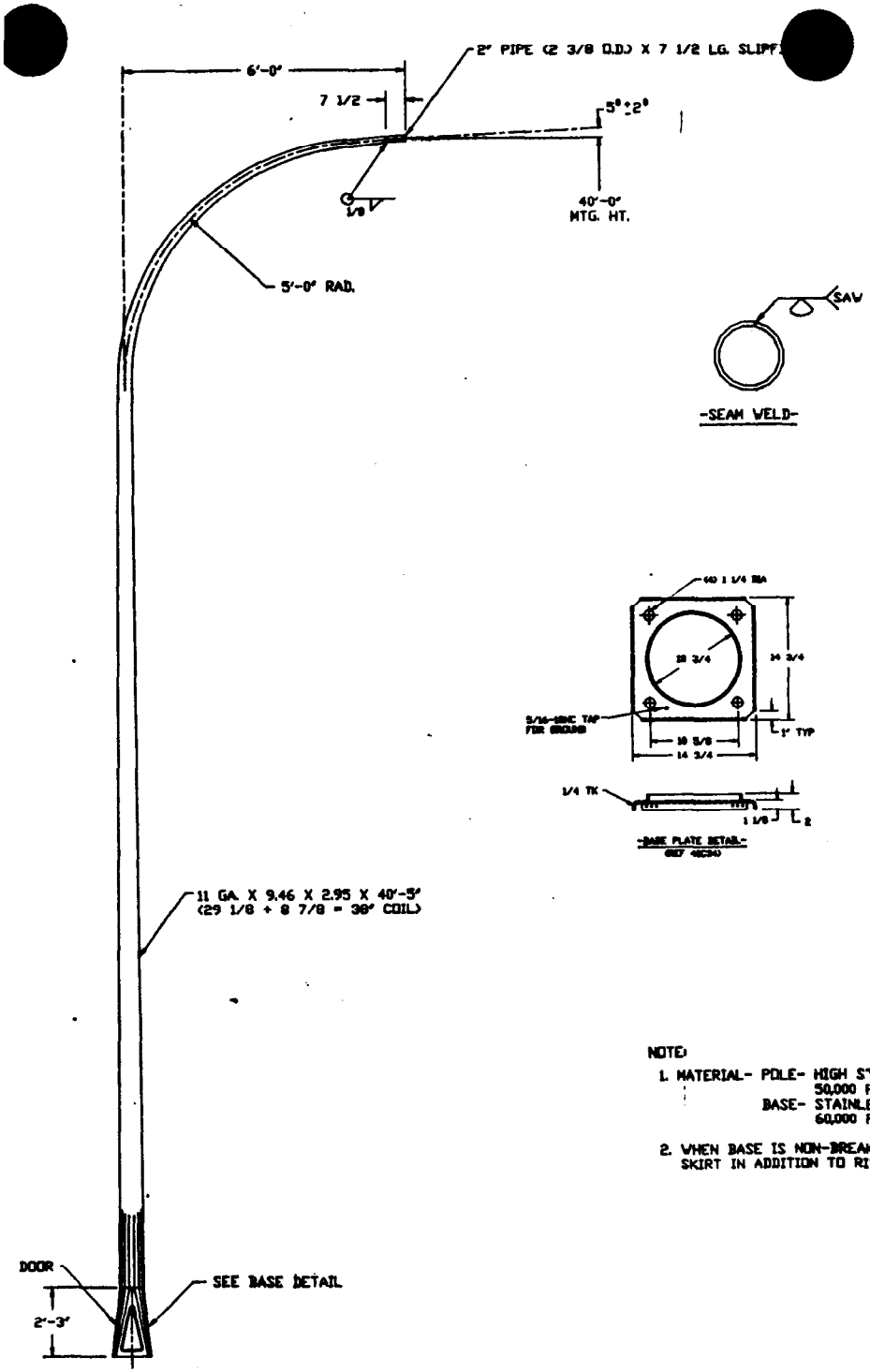
ENG	GW	5-9-88
MFG		
SLS		
DWN	F.F.	5-4-88

16-SD4-6-400 & 16-SD4-9-400
STAINLESS STEEL LIGHT STANDARD

NOT TO SCALE

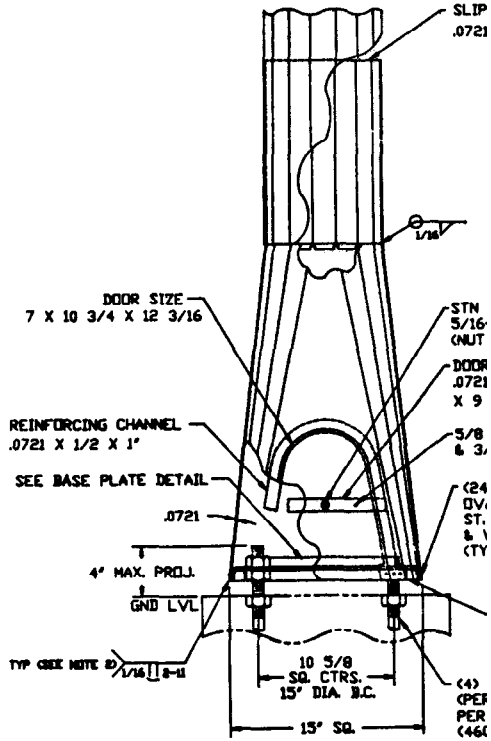
Millerbernd MANUFACTURING CO. WINSTED, MN

40C49



-SEAM WELD-

-BASE PLATE DETAIL-



-BASE DETAIL-

NOTE:

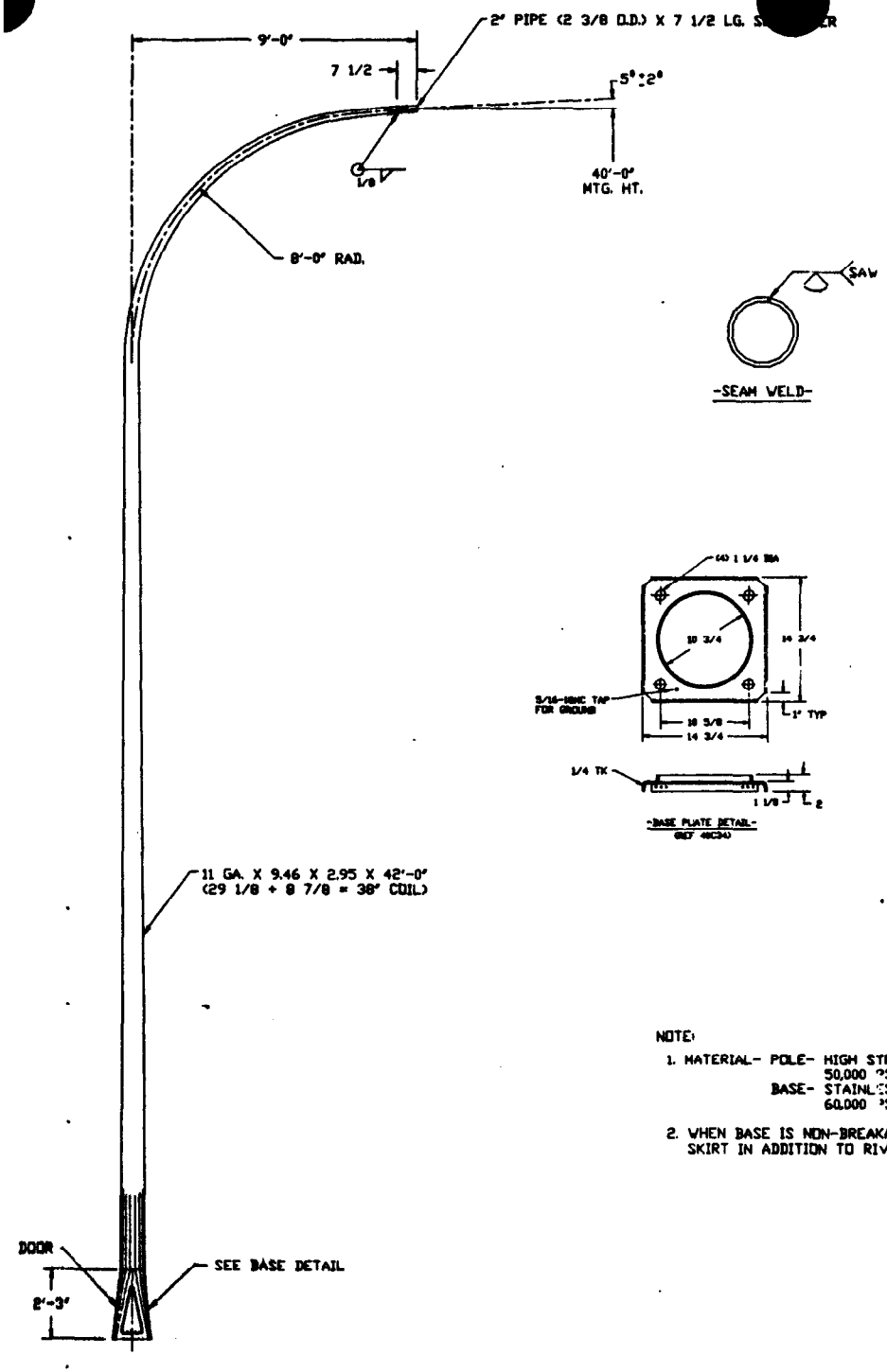
1. MATERIAL- POLE- HIGH STRENGTH, LOW ALLOY STEEL
50,000 PSI MIN. YIELD (ASTM A606 TYPE 4)
BASE- STAINLESS STEEL, TYPE 201
60,000 PSI MIN. YIELD AFTER FABRICATION

2. WHEN BASE IS NON-BREAKAWAY, WELD BASE TO SKIRT IN ADDITION TO RIVETS.

ENG			
MFG			
SLS			
DWN	WQ	7-28-93	Mill

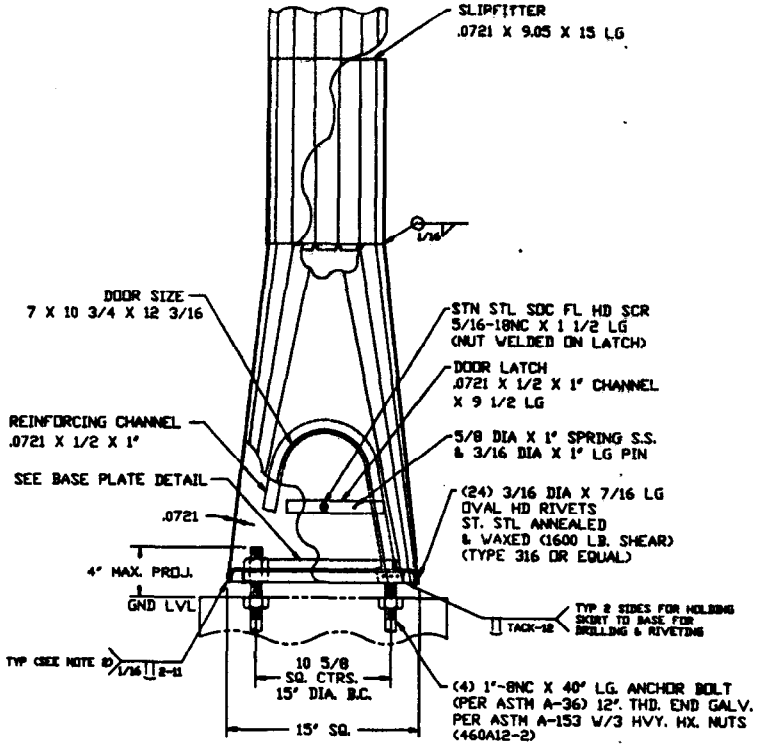
REV 9-1-93

NOT TO SCALE



-SEAM WELD-

-BASE PLATE DETAIL-



-BASE DETAIL-

NOTE:

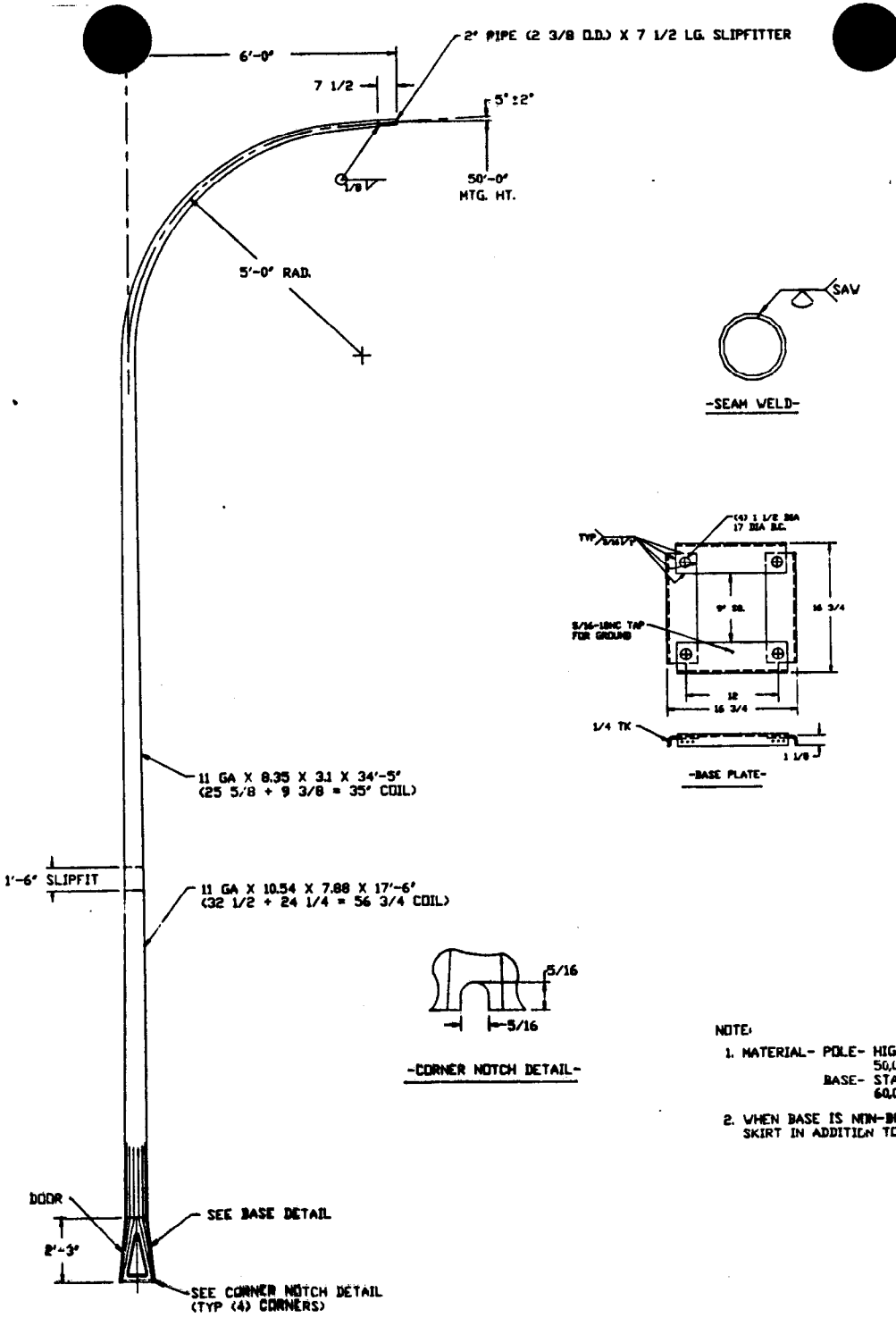
1. MATERIAL- POLE- HIGH STRENGTH, LOW ALLOY STEEL
   50,000 PSI MIN. YIELD (ASTM A606 TYPE 4)
   BASE- STAINLESS STEEL, TYPE 201
   60,000 PSI MIN. YIELD AFTER FABRICATION

2. WHEN BASE IS NON-BREAKAWAY, WELD BASE TO SKIRT IN addition TO RIVETS.

DASH NO.	QTY.	MILLERBERND PART NO.
2		NON-BREAKAWA 16-SDCS4-9-4
1		16-SDCS4-9-4

ENG			16-SDCS4-9-400 LIGHTING STANDARD
MFG			
SLS			
DWN	VG	7-28-93	Millerbernd MANUFACTURING CO. WINSTED, MN 750C

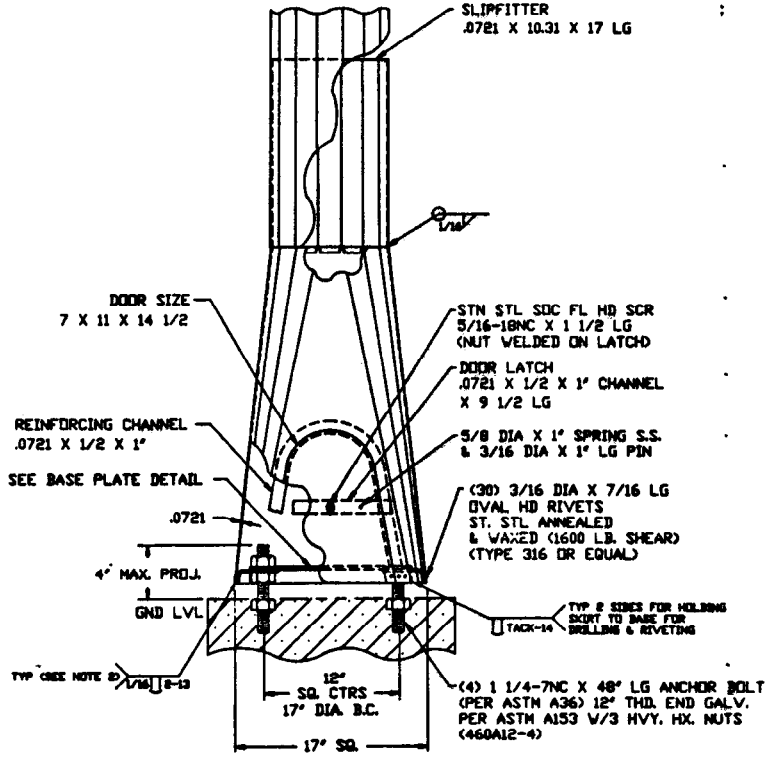
REV. 9-1-93 NOT TO SCALE



-SEAM WELD-

-BASE PLATE-

-CORNER NOTCH DETAIL-



-BASE DETAIL-

NOTE:

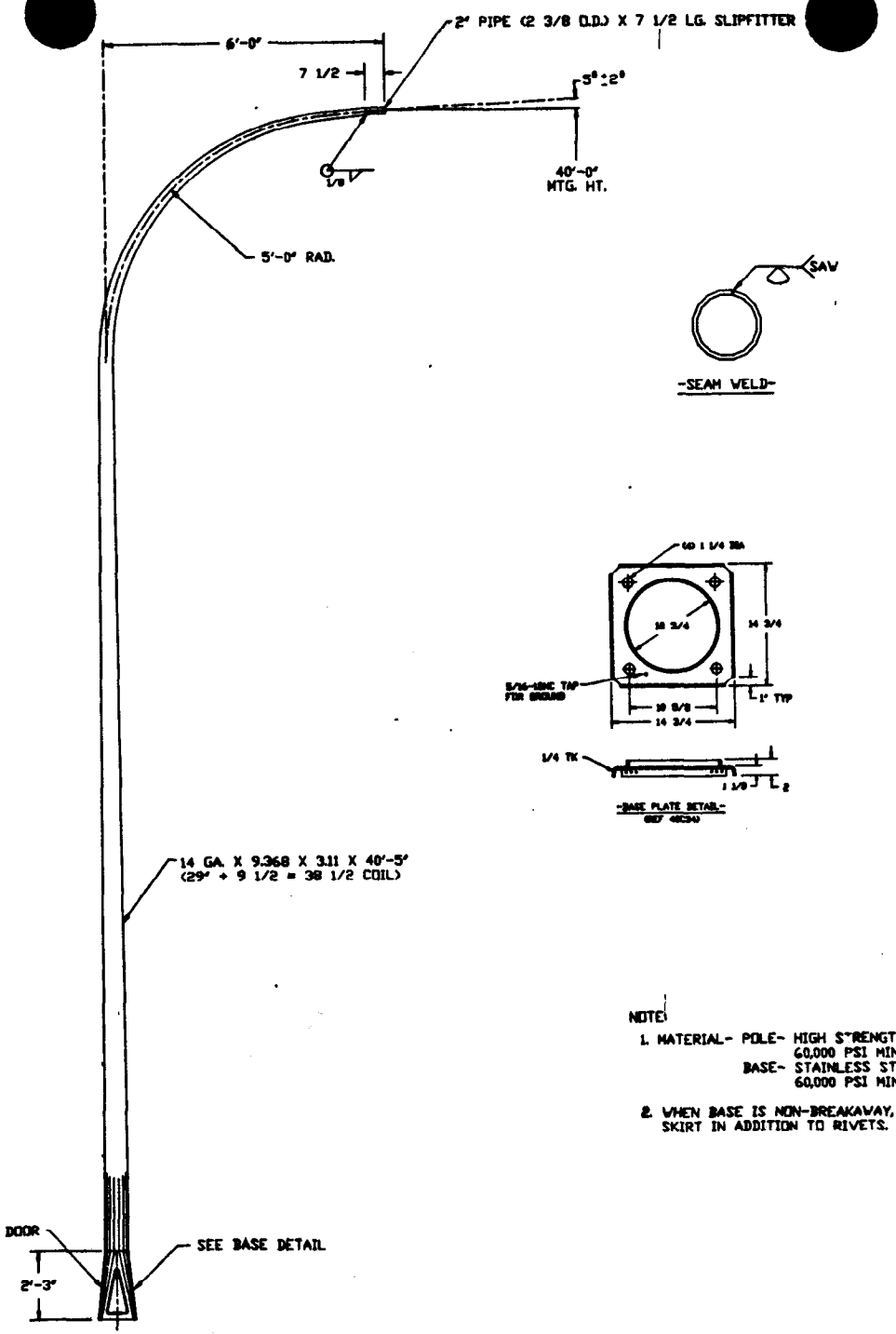
1. MATERIAL- POLE- HIGH STRENGTH, LOW ALLOY STEEL
50,000 PSI MIN. YIELD (ASTM A606 TYPE 4)
BASE- STAINLESS STEEL, TYPE 201
60,000 PSI MIN. YIELD AFTER FABRICATION

2. WHEN BASE IS NON-BREAKAWAY, WELD BASE TO SKIRT IN ADDITION TO RIVETS.

DASH NO.	QTY.	MILLERBERND PART NO.
2		NON-BREAKAWAY 16-SDCS6-6-500
1		16-SDCS6-6-500

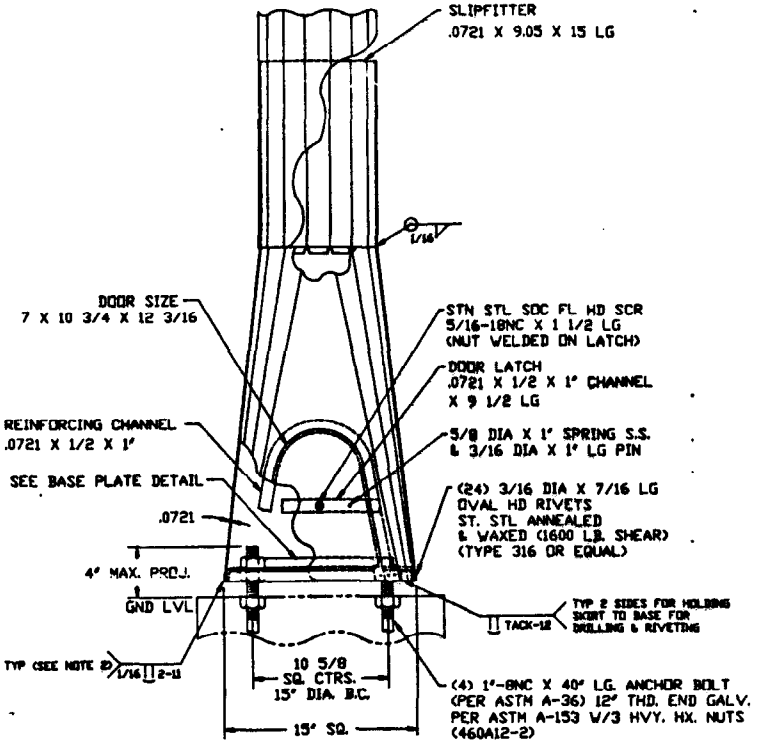
ENG			16-SDCS6-6-500 LIGHTING STANDARD
MFG			
SLS			
DWN	VG	7-28-93	Millerbernd MANUFACTURING CO. WINSTED, MN — 750C3

REV. 9-1-99 NOT TO SCALE



-SEAM WELD-

-BASE PLATE DETAIL-



-BASE DETAIL-

NOTE:

1. MATERIAL- POLE- HIGH STRENGTH, LOW ALLOY STEEL
60,000 PSI MIN. YIELD (ASTM A607 GRADE 60)
BASE- STAINLESS STEEL, TYPE 201
60,000 PSI MIN. YIELD AFTER FABRICATION

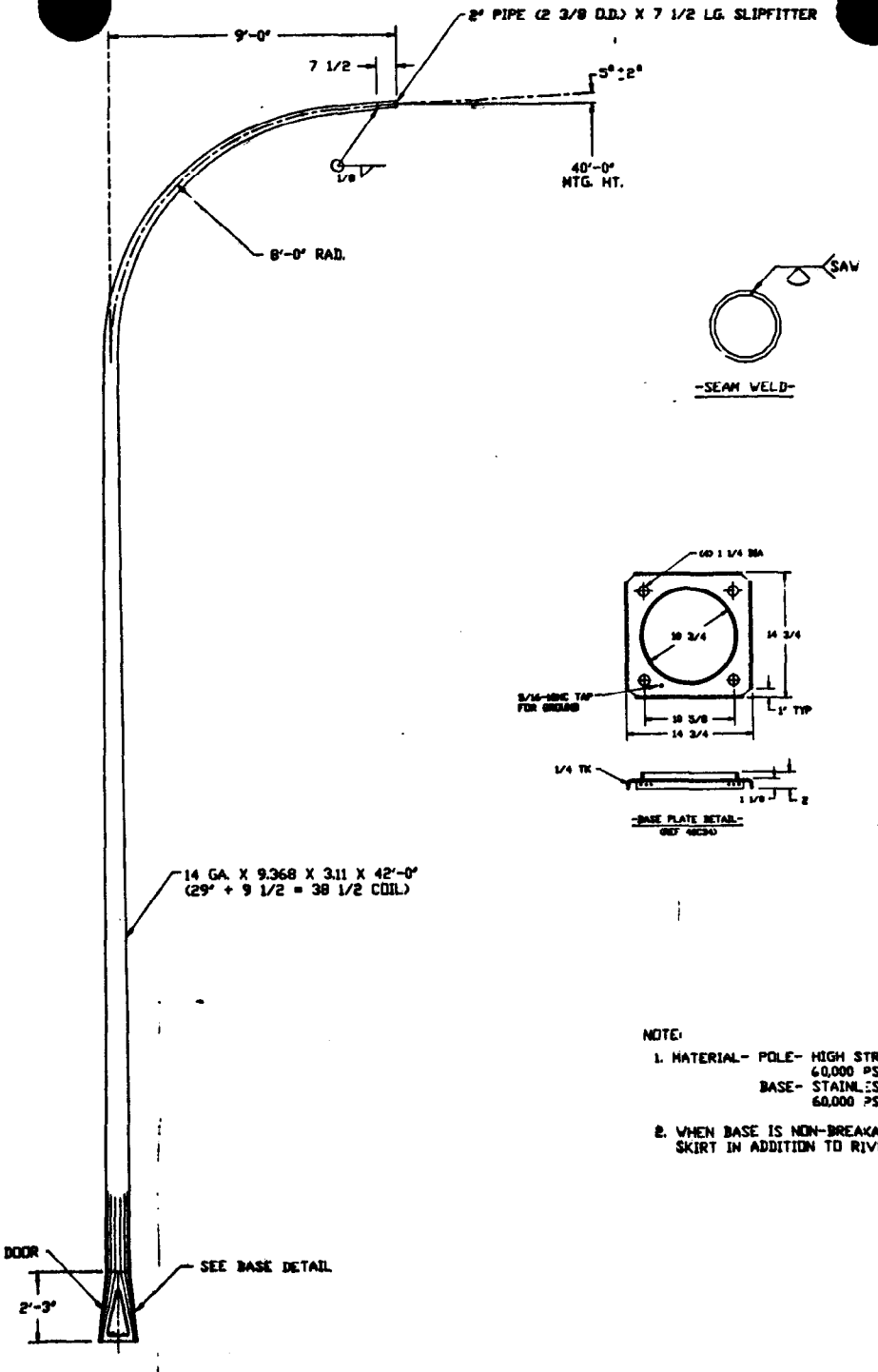
2. WHEN BASE IS NON-BREAKAWAY, WELD BASE TO SKIRT IN ADDITION TO RIVETS.

DASH NO.	QTY.	MILLERBERND PART NO.
2		NON-BREAKAWAY 16-SDCS4-6-400-S
1		16-SDCS4-6-400-S

ENG			16-SDCS4-6-400-S LIGHTING STANDARD
MFG			
SLS			
DWN	WL	8-10-93	Millerbernd MANUFACTURING CO. WINSTED, MN — 750C4

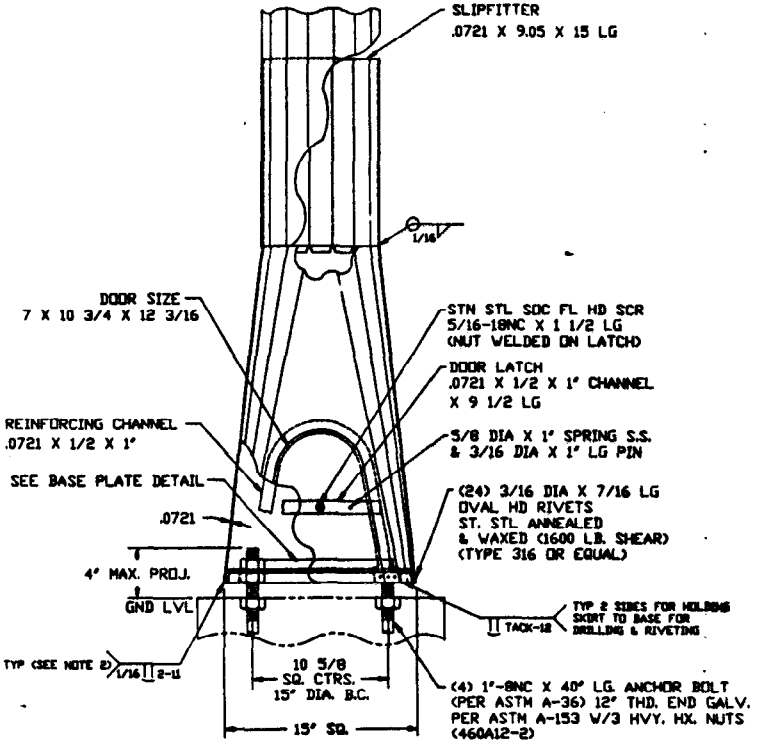
REV. 9-1-98

NOT TO SCALE



-SEAM WELD-

-BASE PLATE DETAIL-
(REF 460C54)



-BASE DETAIL-

NOTE:

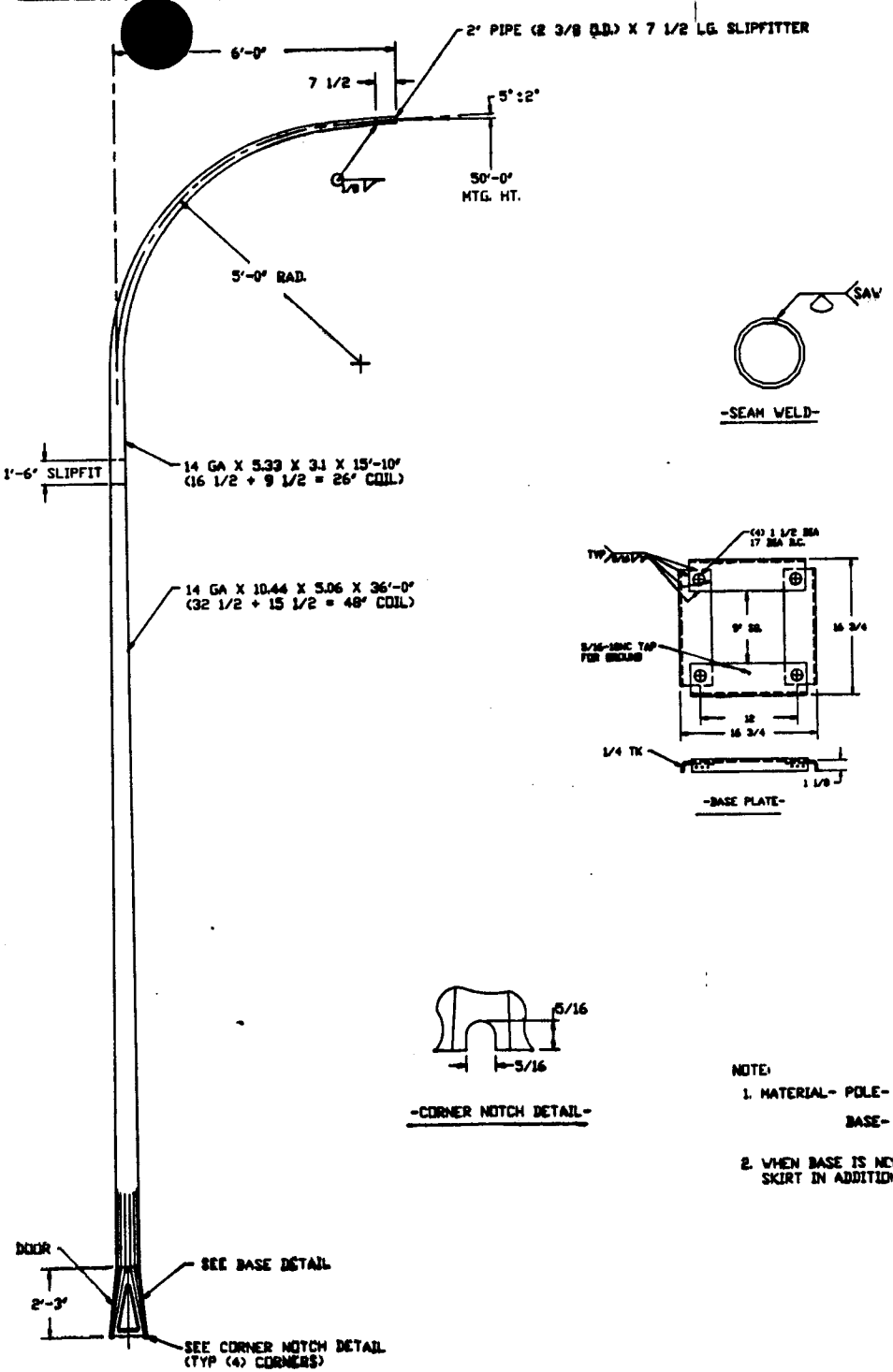
1. MATERIAL- POLE- HIGH STRENGTH, LOW ALLOY STEEL
60,000 PSI MIN. YIELD (ASTM A607 GRADE 60)
BASE- STAINLESS STEEL, TYPE 201
60,000 PSI MIN. YIELD AFTER FABRICATION

2. WHEN BASE IS NON-BREAKAWAY, WELD BASE TO SKIRT IN ADDITION TO RIVETS.

DASH NO.	QTY.	MILLERBERND PART NO.
2		NON-BREAKAWAY 16-SDCS4-9-400-S
1		16-SDCS4-9-400-S

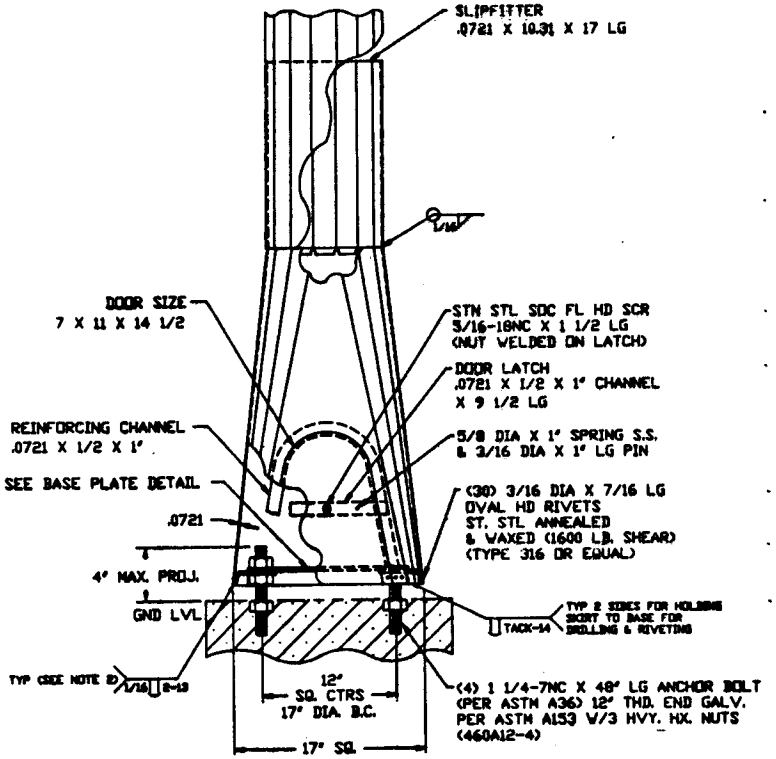
ENG			16-SDCS4-9-400-S LIGHTING STANDARD
MFG			
SLS			
DWN	WL	8-10-93	Millerbernd MANUFACTURING CO. WINSTED, MN — 750C5

REV. 9-1-98 NOT TO SCALE



-SEAM WELD-

-BASE PLATE-



-BASE DETAIL-

-CORNER NOTCH DETAIL-

NOTE:

1. MATERIAL- POLE- HIGH STRENGTH, LOW ALLOY STEEL
   60,000 PSI MIN. YIELD (ASTM A607 GRADE 60)
   BASE- STAINLESS STEEL, TYPE 201
   60,000 PSI MIN. YIELD AFTER FABRICATION
2. WHEN BASE IS NON-BREAKAWAY; WELD BASE TO SKIRT IN ADDITION TO RIVETS.

DASH NO.	QTY.	MILLERBERND PART NO.
2		NON-BREAKAWAY 16-SDCS6-6-500-S
1		16-SDCS6-6-500-S

ENG			16-SDCS6-6-500-S LIGHTING STANDARD
MFG			
SLS			
DWN	WL	8-10-93	Millerbernd MANUFACTURING CO. WINSTED, MN

750C6

REV. 9-9-99 NOT TO SCALE