



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

January 5, 2006

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

In Reply Refer To:  
HSA-10/SS-130

Mr. Scott Adams  
Northwest Pipe Company  
Traffic Systems Group  
200 S.W. Market St, Suite 1800  
Portland, Oregon 97201

Dear Mr. Adams:

This is in response to the March 28, 2005, letter from Dean Alberson of Safety Quest requesting Federal Highway Administration (FHWA) acceptance of your company's Triangular Slipbase Casting 16819 with Set Screws for perforated square tubes (PSST) as a breakaway feature for sign supports for use on the National Highway System (NHS). Accompanying the letter was a report from Texas Transportation Institute (TTI) and details of the pendulum crash tests of the same base using a pin to secure the PSST posts. You requested that we find this slipbase using the set screw to secure the post acceptable for use on the NHS under the provisions of National Cooperative Highway Research Program (NCHRP) Report 350 "Recommended Procedures for the Safety Performance Evaluation of Highway Features." You also provided additional information on November 18, 2005.

### **Introduction**

Testing of the supports was in compliance with the guidelines contained in the 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.

Two pendulum bogie tests were conducted to determine the range of post wall thickness that could be acceptable. The test articles consisted of single 2.5 x 2.5 in 10 gage or 12 gage perforated square tube sign supports mounted in a triangular slip base system. For the 10-gage test, the lower portion of the slip base was rigidly anchored to the steel anchor plate in the pendulum facility. For the 12-gage test it was mounted in a standard Texas Department of Transportation concrete footing (12 in diameter, 42 in deep) placed in the NCHRP Report 350 Standards Soil. A 4.0 x 4.0 ft, 5/8 inch thick plywood sign panel was mounted to the upper portion of the support with a crossbar at the top. The slip base bolts were torqued to 40 foot-



pounds for the 10-gage post test, and to 60 foot-pounds for the 12-gage test. The ASTM A-536 Grade 65-45-12 ductile cast iron slipbase device weighs 5 kg (11 pounds), the 10 gage post was 65 pounds and the 12 gage post was 27 pounds. The sign panel was approximately 15 kg (33 pounds, 8 oz.)

### Testing

Pendulum bogie testing was conducted on your company's base with PSST posts with pin connections. The mass of the test vehicle was 820 kg in all tests. The complete devices as tested are shown in the Enclosures.

Test No.	NCHRP 350	Speed km/hr	Post Gage	Occup. Speed	Delta V	Delta V 60 mph est.
1	3-60	35.1	10	None	0.42 m/s	0.56 m/s
2	3-60	35.1	12	None	0.47 m/s	0.53 m/s

Occup. Speed: Occupant Impact Speed: Speed at which a theoretical front seat occupant will contact the windshield. In meters per second.

Delta V: Speed change of the test vehicle.

Delta V 60 mph est.: Calculated velocity change at 60 mph impact speed.

Calculations based on the FHWA memorandum of November 12, 1993, performed by the TTI show the expected velocity change during a 100-km/hr impact to be within acceptable limits. This device was found acceptable in our acceptance letter SS-119 dated February 27, 2003.

Pendulum bogie testing was also conducted on your company's slip base casting 2709 with a schedule 10 steel pipe post with set screw connection. The mass of the test vehicle was 820 kg in all tests. The casting weighted 11 pounds, the pipe weighted 10 pounds, 4 ounces, and the sign panel was 32 pounds 8 ounces. The set screws were torqued to 45 pounds and the keeper bolts to 40 pounds. Height to the bottom of the sign panel was 7 feet. The complete devices as tested are shown in the Enclosures.

Test No.	NCHRP 350	Speed km/hr	Impact height	Occup Speed	Delta V	Delta V 60 mph est.
1	3-60	35.1	457 mm	none	.33 m/s	0.48 m/s
2	3-60	35.1	622 mm	none	.47 m/s	0.55 m/s

Occup. Speed: Occupant Impact Speed: Speed at which a theoretical front seat occupant will contact the windshield. In meters per second.

Delta V: Speed change of the test vehicle.

Delta V 60 mph est.: Calculated velocity change at 60 mph impact speed.

Calculations based on the FHWA memorandum of November 12, 1993, performed by the TTI show the expected velocity change during a 100-km/hr impact to be within acceptable limits.

## Findings

The results of the low-speed bogie testing and the high speed extrapolations met the FHWA requirements and, therefore, the devices described above and shown in the enclosed drawings for reference are acceptable for use as Test Level 3 devices on the NHS under the range of conditions tested, when proposed by a State. In addition, we find the PSST system acceptable with the set screw based on the successful testing with the pin and the successful test with the schedule 10 pipe and set screw. Finally, as discussed in the original acceptance for the Northwest Pipe three-bolt slip base (FHWA acceptance letter SS-88 dated August 15, 2000), these systems will be acceptable when either one or two posts are used within a seven foot path.

Please note the following standard provisions that apply to the FHWA letters of acceptance:

- Our acceptance is limited to the crashworthiness characteristics of the devices and does not cover their structural features, nor conformity with the Manual on Uniform Traffic Control Devices.
- Any changes that may adversely influence the crashworthiness of the device will require a new acceptance letter.
- Should the FHWA discover that the qualification testing was flawed, that in-service performance reveals unacceptable safety problems, or that the device being marketed is significantly different from the version that was crash tested, it reserves the right to modify or revoke its acceptance.
- You will be expected to supply potential users with sufficient information on design and installation requirements to ensure proper performance.
- You will be expected to certify to potential users that the hardware furnished has essentially the same chemistry, mechanical properties, and geometry as that submitted for acceptance, and that they will meet the crashworthiness requirements of the FHWA and NCHRP Report 350.
- To prevent misunderstanding by others, this letter of acceptance, designated as number SS-130 shall not be reproduced except in full. As this letter and the supporting documentation which support it become public information, it will be available for inspection at our office by interested parties.
- The Triangular Slipbase Casting 16819 with Set Screws is a patented device and is considered "proprietary." When proprietary devices are *specified by a highway agency* for use on Federal-aid projects they: (a) 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 alternative 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.

- This acceptance letter shall not be construed as authorization or consent by the FHWA to use, manufacture, or sell any patented device for which the applicant is not the patent holder. The acceptance letter is limited to the crashworthiness characteristics of the candidate device, and the FHWA is neither prepared nor required to become involved in issues concerning patent law. Patent issues, if any, are to be resolved by the applicant.

Sincerely yours,

*/original signed by/*

John R. Baxter, P.E.  
Director, Office of Safety Design  
Office of Safety

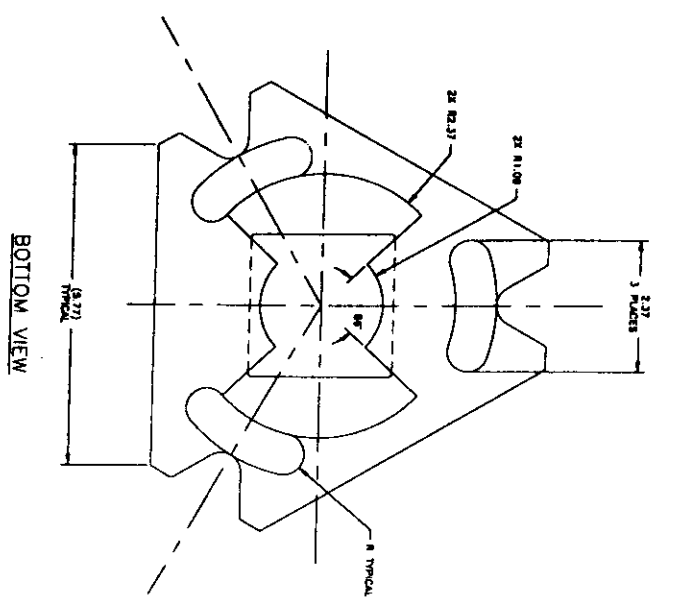
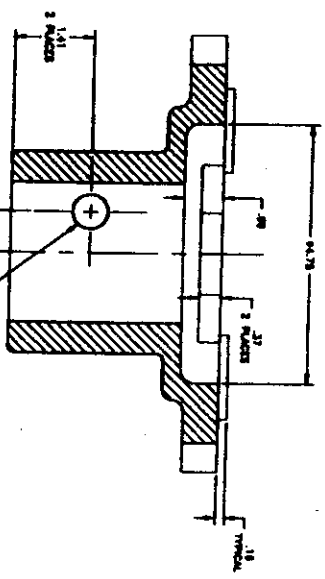
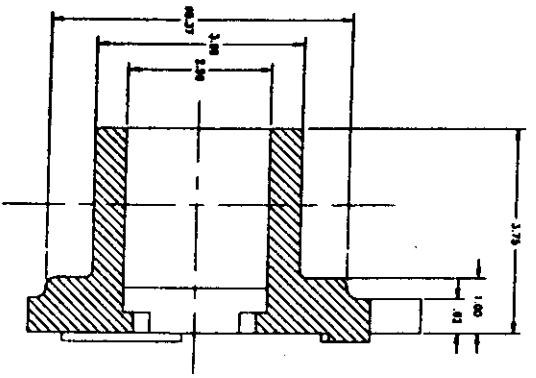
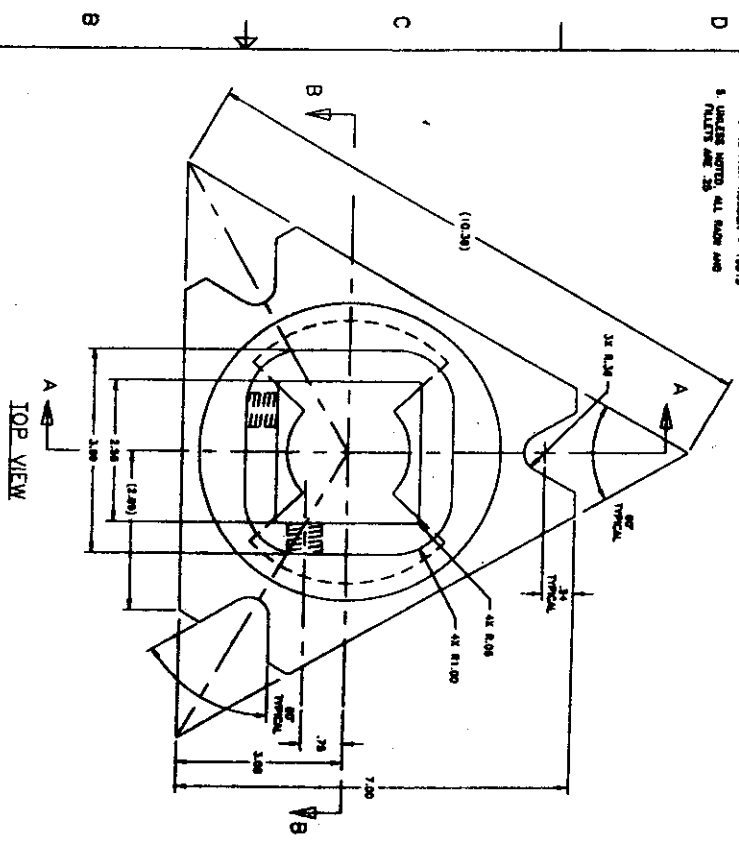
Enclosures

FHWA:HSA-10:NArtimovich:tb:x61331:12/27/05

File: h://directory folder/artimovich/SS130-NWpipeFIN.doc

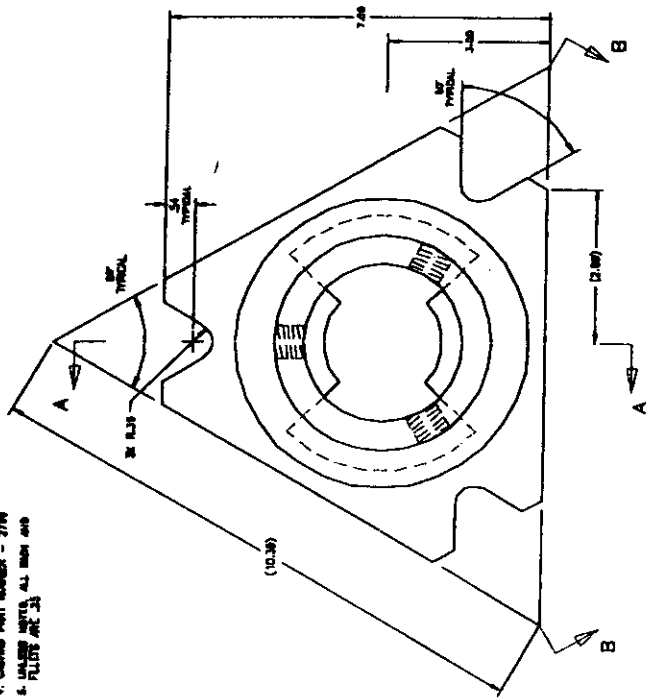
cc: HSA-10 (Reader, HSA-1; Chron File, HSA-10;  
N.Artimovich, HSA-10)

- NOTES:
1. MATERIAL: ASTM A-133 GRADE 65-45-12 DUCTILE IRON
  2. HOT DIP GALVANNE PER ASTM A-153
  3. CLEAN & BOND AFTER GALVANIZING TO REMOVE EXCESS ZINC
  4. CASTING PART NUMBER - 16815
  5. UNLESS NOTED, ALL DIMS ARE FINISH AND 25

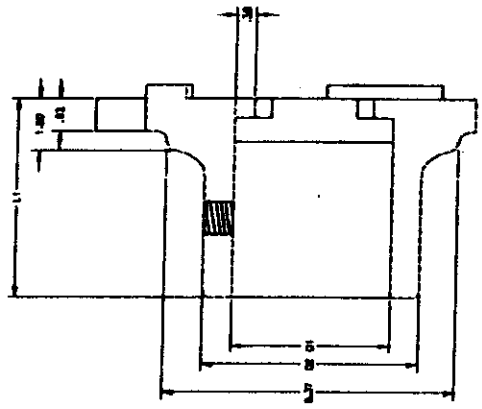


Unless Noted:		Northwest Pipe Co.	
ASTM A-133		SUPBASE CASTING 16815	
REV. 0/0		REV. 0/0	
DATE 1/28/78		DATE 1/28/78	
BY 101		BY 101	
C 1		C 1	
A 1		A 1	

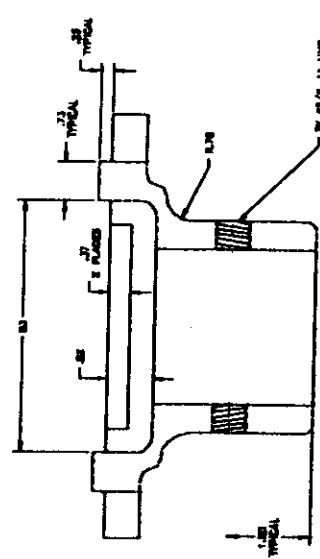
- NOTES
1. MATERIAL: ASTM A-105 WOULD BE OK - 15 GRADE 100
  2. HOT DIP GALVANIZE PER ASTM A-153
  3. CLEAN UP WELD AND SURFACE AFTER GALVANIZING TO REMOVE HYDROGEN
  4. CASTING PART NUMBER - 2779
  5. UNLESS NOTED, ALL DIMS ARE IN INCHES



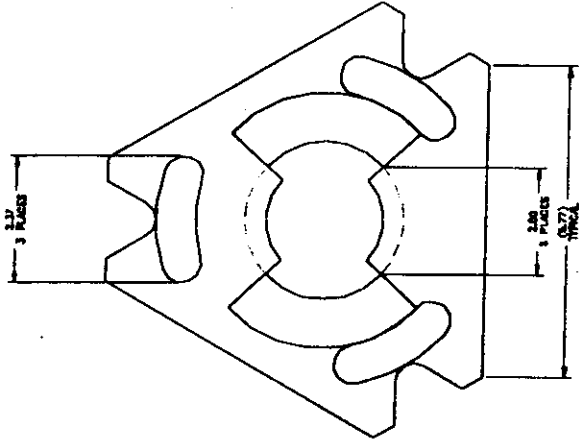
TOP VIEW



SECTION A-A



SECTION B-B



BOTTOM VIEW

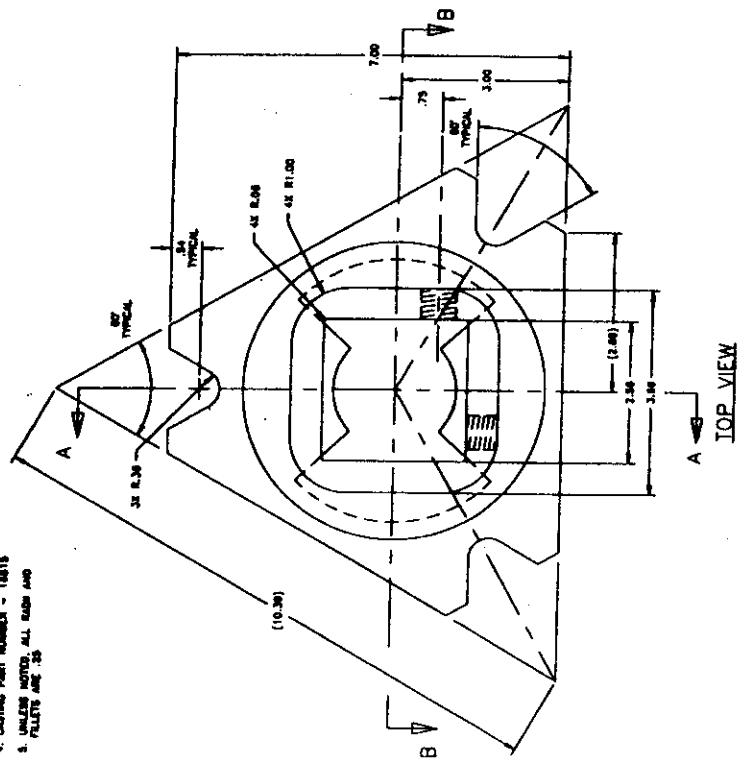
SIZE	PART NO. (LBS)	D1	D2	D3	L1
24"	28-250-C (10.5)	8.03	4.00	4.75	3.75

Unless Noted: Temperature 100 +/- 5 deg F

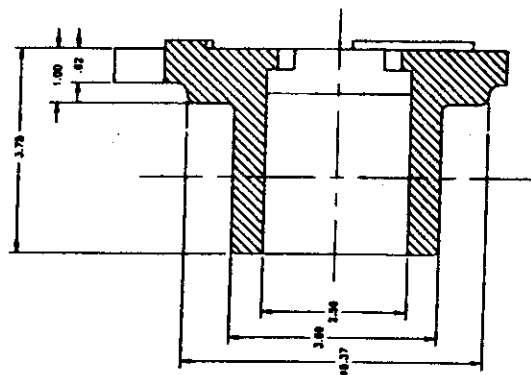
Northwest Pipe Co.  
SLIPBASE CASTING 2709

REV	DATE	BY	CHKD
1	10/15/78	SD	SD
2	10/15/78	SD	SD

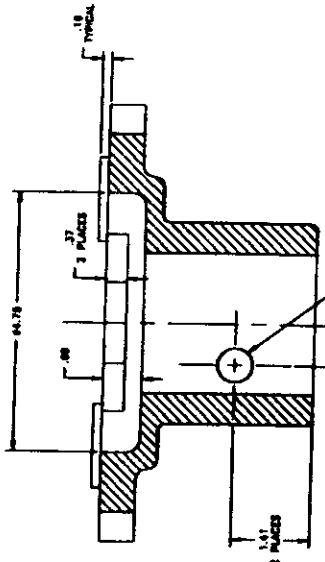
- NOTE:
1. MATERIAL ASTM A-538 GRADE 65-60-12 DUCTILE IRON
  2. HOT DIP GALVANIZED PER ASTM A-153
  3. CLEAN & BAKE AFTER GALVANIZING TO REMOVE EXCESS ZINC
  4. CASTING PART NUMBER - 16815
  5. UNLESS NOTED, ALL DIMS AND FILLETS ARE .35



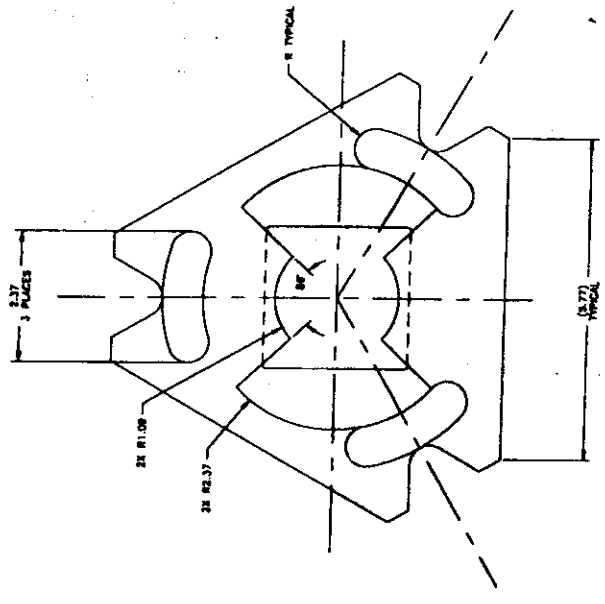
TOP VIEW



SECTION A-A



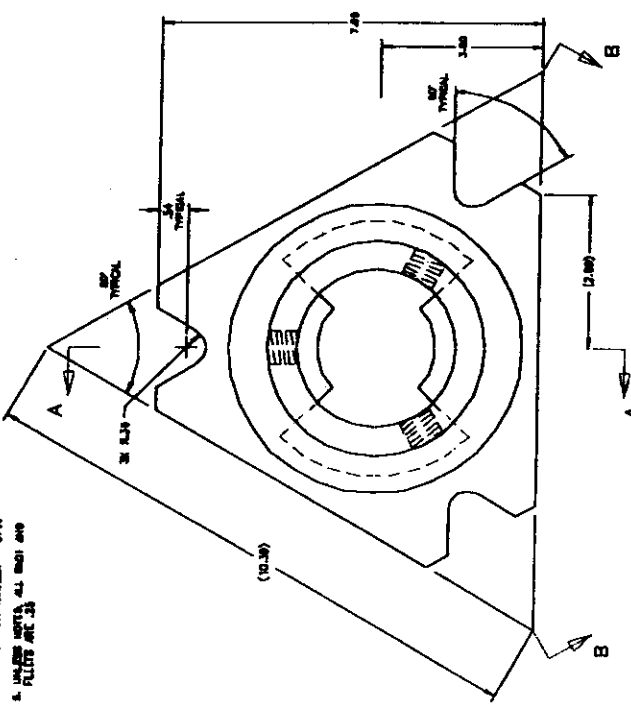
SECTION B-B



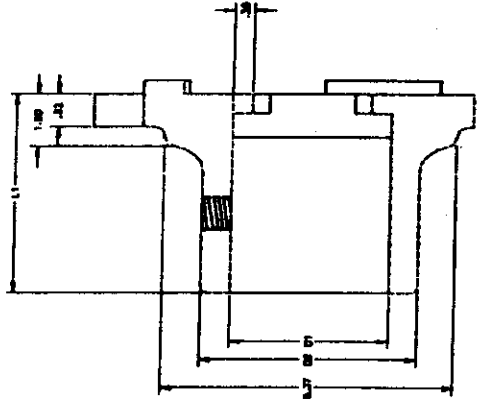
BOTTOM VIEW

Unless Noted: Tolerances XX - +/- 0.010		Northwest Pipe Co.	
REV	DATE	BY	CHK
0	08/29/78	SM	SM
16815		SLIPBASE CASTING 16815	
0	08/29/78	SM	SM

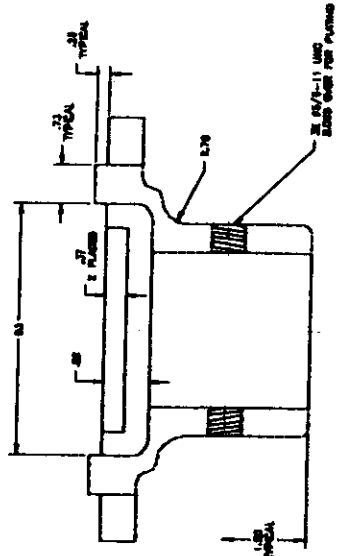
- NOTES**
1. MATERIAL: ASTM A-53B GRADE B-10-12 DOUBLE END
  2. HOT DIP GALVANIZED FOR ASTM A-53
  3. DIM. B, END VIEW, DIMENSIONED AFTER GALVANIZING
  4. CASTING PART NUMBER - 2708
  5. UNLESS NOTED, ALL DIMS. AND FLUITS ARE .31



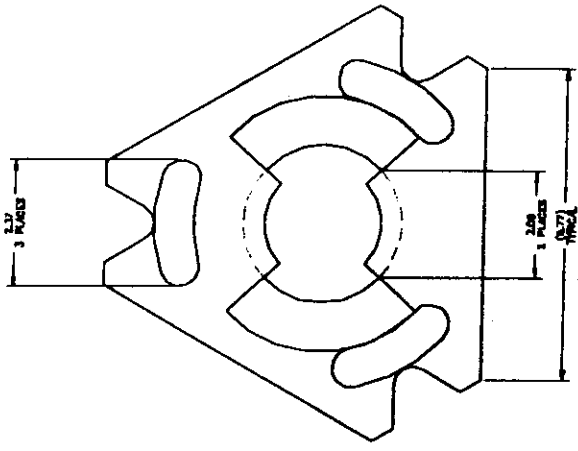
**TOP VIEW**



**SECTION A-A**



**SECTION B-B**



**BOTTOM VIEW**

SIZE	PART NO. (L1)	Q1	Q2	Q3	L1
3/4"	SB-850-0 (18.5)	0.83	4.00	4.75	3.75

Update Number: Job - 1/2-8410		Northwest Pipe Co. SLIPBASE CASTING 2708	
DESIGN	DATE	REVISED	DATE
1	1/2/78	SB 8521 C	1/2/78