



U.S. Department  
of Transportation

**Federal Highway  
Administration**

June 12, 1996

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

Refer to: HNG-14

Mr. Don H. Johnson  
President  
Syro, Inc.  
2525 Stemmons Freeway  
Dallas, Texas 75356-8887

Dear Mr. Johnson:

In your May 29 letter to Mr. Gerald L. Eller, you requested the Federal Highway Administration's (FHWA) acceptance of a truck-mounted attenuator (TMA) called the Mobile Protection System 350 (MPS 350) as a National Cooperative Highway Research Program (NCHRP) Report 350 test level 2 (TL-2) TMA. Included with your letter were copies of a report from Southwest Research Institute dated May 1996 and entitled "Full-Scale Crash Evaluation of a Truck-Mounted Attenuator" and videotapes of the compliance tests that were run.

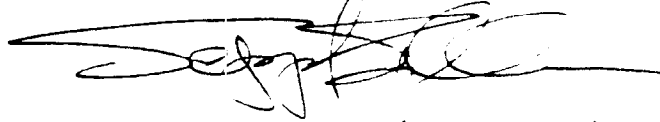
The MPS 350 consists of a bracket which is attached to the rear of a support vehicle and a frame which consists of two beams connected by an "impact face" and a series of steel cross-braces. Each beam in the frame is made from two horizontal c-channels (top and bottom) connected by a series of steel plates which bridge the 25-mm gap between the opposing flanges of the channels, thus creating a box section. On impact, the rear portion of the frame slides into a cutter assembly which makes up the lower portion of the bracket. As the frame slides forward, the metal plates on the sides of each beam are torn apart by the cutter assembly, thereby dissipating the energy of the impacting vehicle to slow and stop it safely. Five sheets of drawings depicting an overview of the MPS 350 and its major components are Enclosure 1. The MPS 350 is 3350 mm long and 1220 mm wide at the impact face. Its total weight is approximately 640 kg.

Two NCHRP Report 350 compliance tests were conducted: test 2-50 and test 3-51. The results of these tests are summarized in Enclosure 2. The support vehicle for both tests was a 9,000-kg dump truck. For test 2-50 the truck was blocked to prevent movement. For test 3-51 the truck was in second gear with its brakes locked. It rolled ahead 4 meters after the 100 km/h impact.

In spite of the fact that the 100-km/h TL-3 test with the 2000P vehicle was successful, the MPS 350 can only be accepted as a TL-2 TMA at present since the 820C vehicle test was not run at 100 km/h. We understand that you plan to request TL-3 acceptance in the near future following additional developmental work and crash testing. We would encourage also running the two supplemental tests recommended in the NCHRP Report 350 for TMA's, since off-center and angle hits are likely to occur in the field and these tests have been successfully run on other TMA's, at least at TL-2 impact speeds.

To summarize, the MPS 350 is acceptable for use on the National Highway System (NHS) as a TL-2 TMA when such use is requested by a highway agency. As a proprietary device, its use on Federal-aid highway projects, except exempt, non-NHS projects, is subject to the conditions stated in Title 23, Code of Federal Regulations, Section 635.411, a copy of which is Enclosure 3.

Sincerely yours,

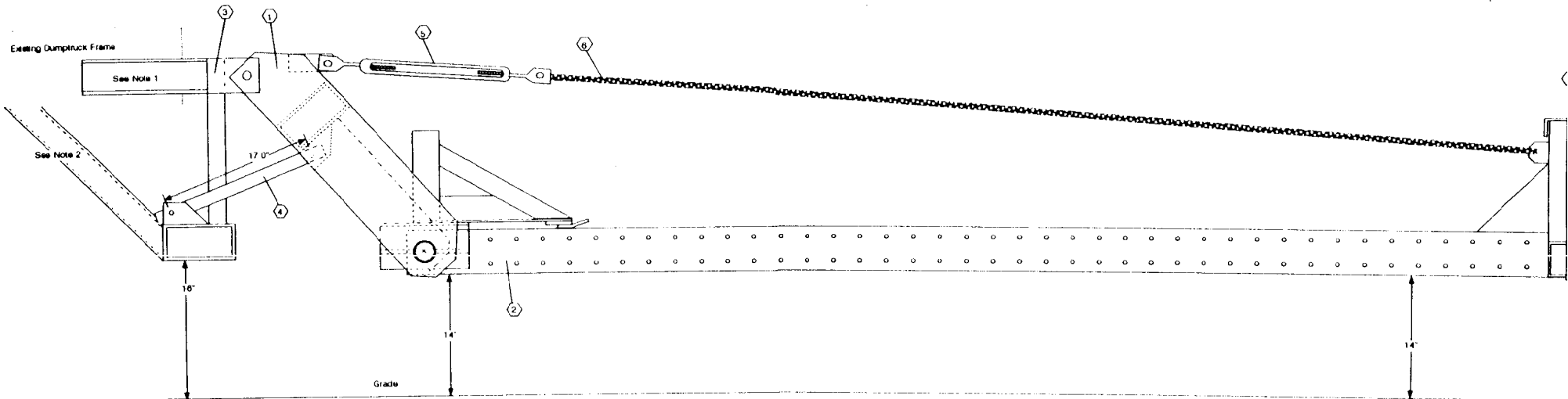


Seppo I. Sillan, Acting Chief  
Federal-Aid and Design Division

3 Enclosures

Geometric and Roadside Design Acceptance Letter CC-34

Item	Qty	Part Number	Description
1	1	6-002	Bracket Assembly
2	1	6-006	Frame Assembly
3	1	6-007	Bumper Weldment
4	2		1/2" x 1/2" x 21" A-36 HRS
5	2		0.5" x 9" Turnbuckle
6	2		3/8" x 72" Grade 4 (?) Chain
7	1		Plastic Nose Cover
8	1		Reflective Decals



**Notes**

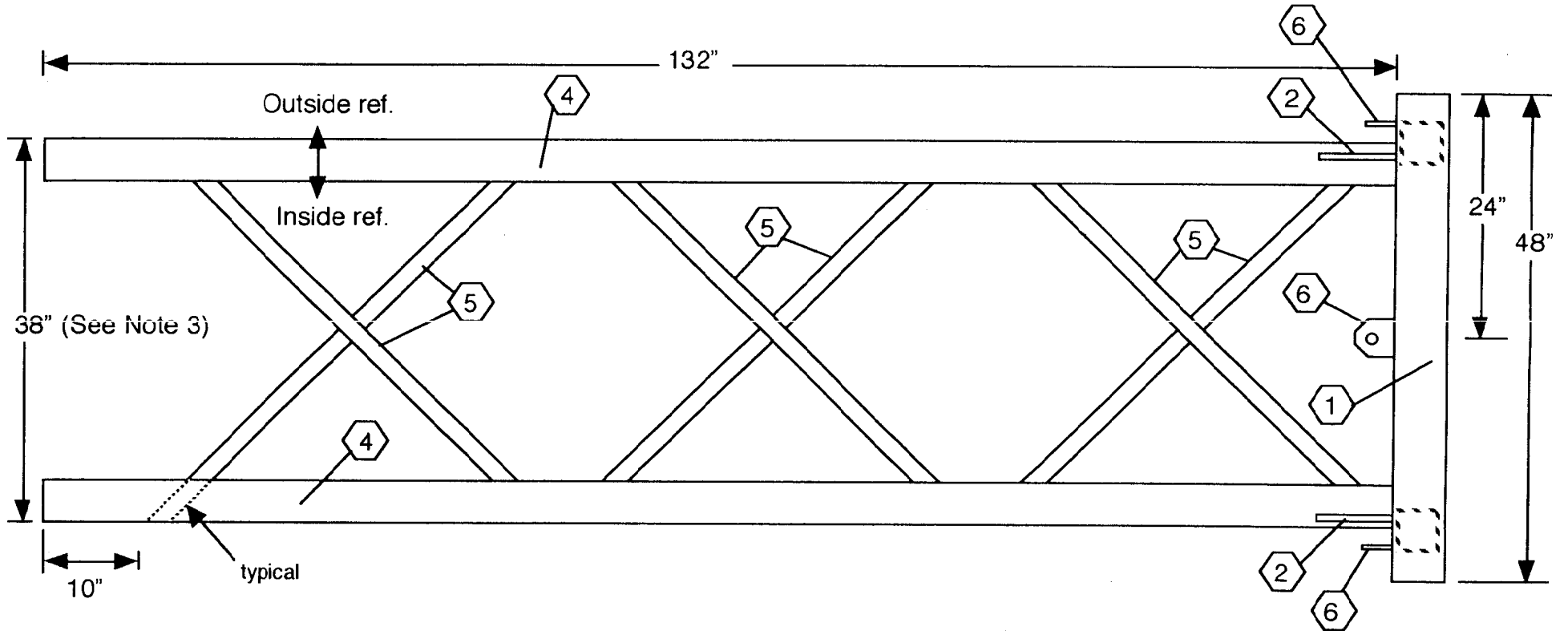
1. Attachment to truck will be performed by customer. Engineering recommends at least a 4" channel for upper support.
2. Braces back to truck frame should extend as far forward as possible. Engineering recommends at least a 3" x 3" x 0.25" tube.

**EXODYNE TECHNOLOGIES, INC.**

P.O. Box 121008  
 Fort Worth, TX 76121-1008  
 (817) 560-1459

James R. Albritton, P.E.	Part Name: Truck Mounted Attenuator
	DRWG Number: 6-017
	Date Released:

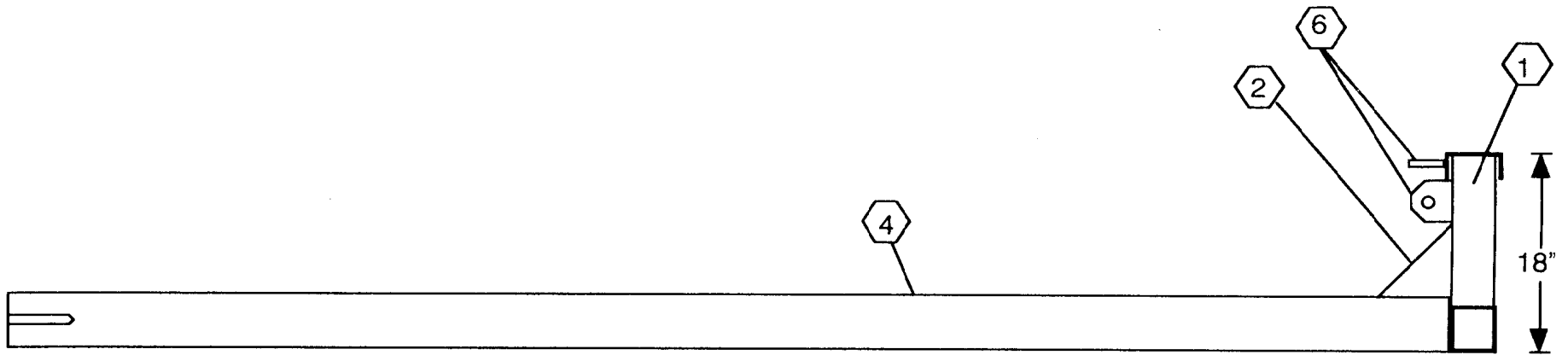
Parts List			
Item	Qty	Part Number	Description
1	1	6-014	Impact Fence Weldment
2	2		Gusset - 8" x 8" x 1/2" HRS
3			
4	2	6-013	Main Beam
5	6		0.25" x 2" x 50" HRS
6	3	6-012 (item 2)	Miscellaneous Tabs - (item 2)



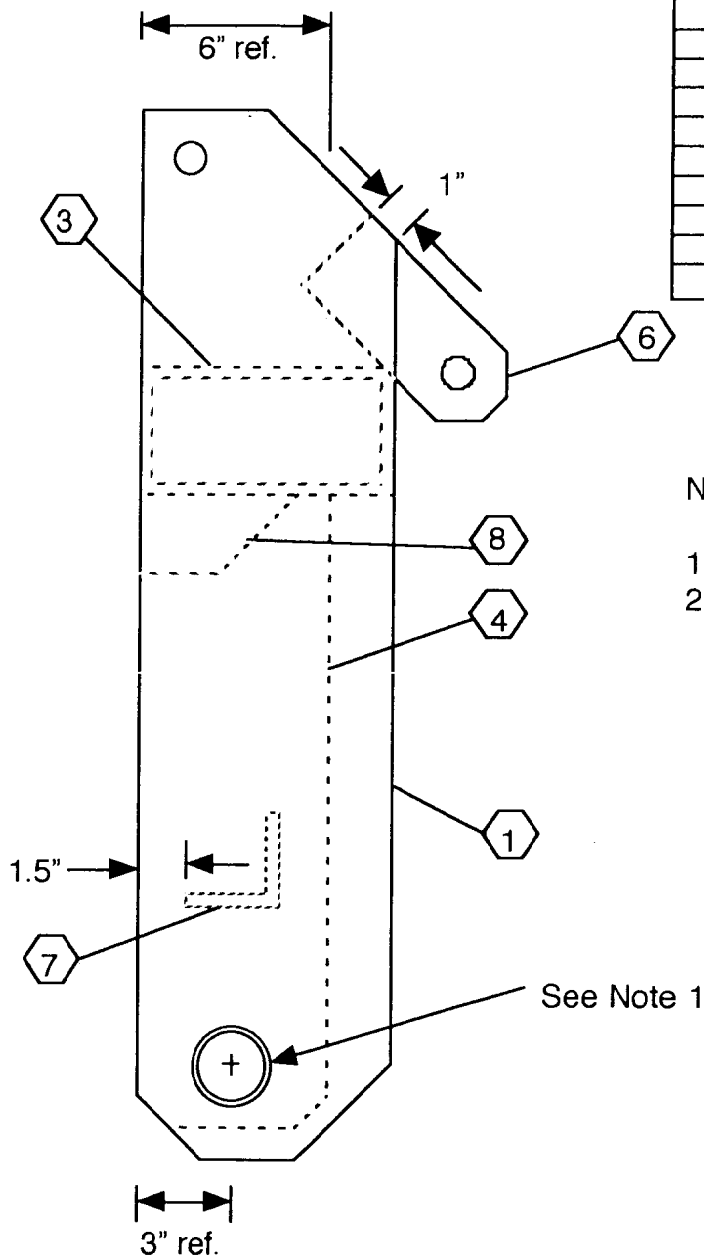
Note

1. All welds 5/16" fillets.
2. Crossbraces should be welded where they cross.
3. Dimension from outside of 5" shopmade channels.

Exodyne Technologies, Inc. P.O. Box 121008 Fort Worth, Texas 76121	James R. Albritton, P.E. 817-560-1459
Part Name: Rail System - Frame view	
DRWG Number: 6-006 - Page 1	
Date Released:	



Exodyne Technologies, Inc.	James R. Albritton, P.E.
P.O. Box 121008	817-560-1459
Fort Worth, Texas 76121	
Part Name:	Rail System - Frame view
DRWG Number:	6-006 - Page 2
Date Released:	



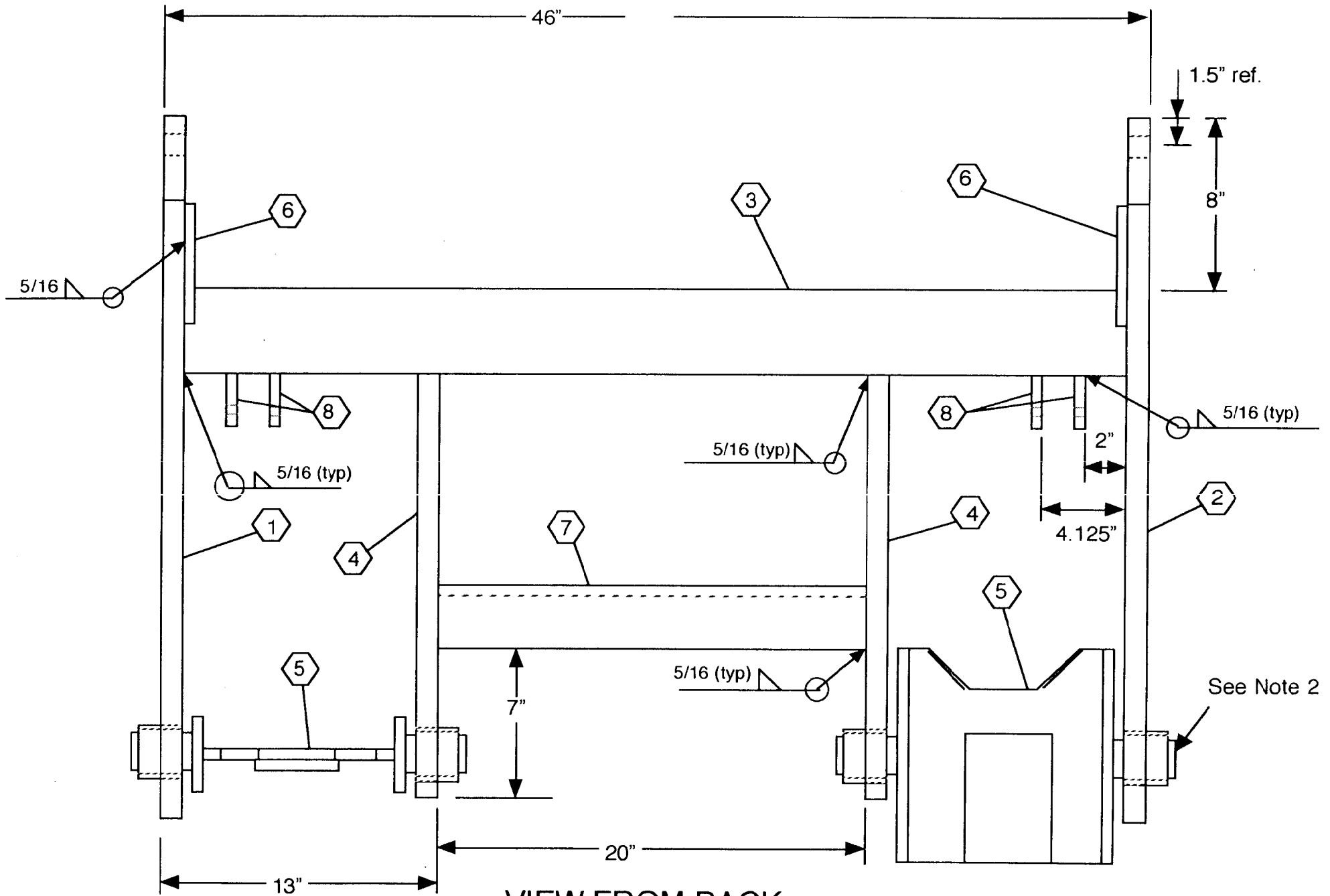
**SIDE VIEW**

Parts List			
Item	Qty	Part Number	Description
1	1	6-001L	Left Support
2	1	6-001R	Right Support
3	1		4" x 8" x 0.375" tube x 44"
4	2	6-001C	Center Support
5	2	6-003	Cutter Weldment
6	2	6-012 (item 1)	Miscellaneous Tab
7	1		0.375" x 3" x 3" Angle x 20"
8	4	6-015 (item 1)	Breakaway Tab

**Notes**

1. Cutter Weldment (Item 5) not shown in side view.
2. Cutter Weldment should freely rotate after assembly.

Exodyne Technologies, Inc.	James R. Albritton, P.E.
P.O. Box 121008	817-560-1459
Fort Worth, Texas 76121	
Part Name:	Bracket Assembly
DRWG Number:	6-002 (page 1)
Date Released:	



**VIEW FROM BACK**

Part Name:	Bracket Assembly
DRWG Number:	6-002 (page 2)
Date Released:	

**Test Assessment Summary - Test 2-50**

<b>Designation</b>	<b>Factor</b>	<b>Description</b>	<b>Test Results</b>	<b>Assessment</b>		
C	Structural Adequacy	Acceptable test article performance may be redirection, controlled penetration, or controlled stopping of the vehicle.	The vehicle was controlled and stopped.	<b>PASS</b>		
D	Occupant Risk	Detached elements, fragments, or other debris from the test article shall not penetrate or show potential for penetrating the occupant compartment, or present an undue hazard to other traffic, pedestrians, or personnel in a work zone. Deformation of, or intrusions into, the occupant compartment that could cause serious injuries shall not be permitted.	This article and its elements did not penetrate the occupant compartment.	<b>PASS</b>		
F	Occupant Risk	The vehicle shall remain upright during and after collision although moderate roll, pitching, and yawing are acceptable.	Vehicle remained upright during and after the collision.	<b>PASS</b>		
H	Occupant Risk	Occupant impact velocities shall satisfy the following: Occupant Impact Velocity Limits (m/s)		Impact Velocity (m/s)		
		<b>Component</b>	<b>Preferred</b>			<b>Maximum</b>
		Longitudinal	9	12	10.31	<b>PASS</b>
		Lateral	9	12	-0.43	<b>PASS</b>
I	Occupant Risk	Occupant ridedown accelerations shall satisfy the following: Occupant Ridedown Acceleration Limits (G's)		Ridedown Acceleration (G's)		
		<b>Component</b>	<b>Preferred</b>			<b>Maximum</b>
		Longitudinal	15	20	-19.6	<b>PASS</b>
		Lateral	15	20	-2.23	<b>PASS</b>
K	Vehicle Trajectory	After collision, it is preferable that the vehicle's trajectory not intrude into adjacent traffic lanes.	Vehicle did not intrude into adjacent traffic lanes.	<b>PASS</b>		



**Test Assessment Summary - Test 3-51**

<b>Designation</b>	<b>Factor</b>	<b>Description</b>	<b>Test Results</b>	<b>Assessment</b>		
C	Structural Adequacy	Acceptable test article performance may be by redirection, controlled penetration, or controlled stopping of the vehicle.	Vehicle brought to a controlled stop.	PASS		
D	Occupant Risk	Detached elements, fragments, or other debris from the test article shall not penetrate or show potential for penetrating the occupant compartment, or present an undue hazard to other traffic, pedestrians, or personnel in a work zone. Deformation of, or intrusions into, the occupant compartment that could cause serious injuries shall not be permitted.	This article and its elements did not penetrate the occupant compartment.	PASS		
F	Occupant Risk	The vehicle shall remain upright during and after collision although moderate roll, pitching, and yawing are acceptable.	Vehicle remained upright during and after the collision.	PASS		
H	Occupant Risk	Occupant impact velocities shall satisfy the following: Occupant Impact Velocity Limits (m/s)		Impact Velocity (m/s)		
		<b>Component</b>	<b>Preferred</b>			<b>Maximum</b>
		Longitudinal	9	12	8.44	PASS
		Lateral	9	12	-0.08	PASS
I	Occupant Risk	Occupant ridedown accelerations shall satisfy the following: Occupant Ridedown Acceleration Limits (G's)		Ridedown Acceleration (G's)		
		<b>Component</b>	<b>Preferred</b>			<b>Maximum</b>
		Longitudinal	15	20	-16.4	PASS
		Lateral	15	20	-1.34	PASS
K	Vehicle Trajectory	After collision, it is preferable that the vehicle's trajectory not intrude into adjacent traffic lanes.	Vehicle did not intrude into adjacent traffic lanes.	PASS		

these materials must occur in the United States.

(2) The State has standard contract provisions that require the use of domestic materials and products, including steel materials, to the same or greater extent as the provisions set forth in this section.

(3) The State elects to include alternate bid provisions for foreign and domestic steel materials which comply with the following requirements. Any procedure for obtaining alternate bids based on furnishing foreign steel materials which is acceptable to the Division Administrator may be used. The contract provisions must (i) require all bidders to submit a bid based on furnishing domestic steel materials, and (ii) clearly state that the contract will be awarded to the bidder who submits the lowest total bid based on furnishing domestic steel materials unless such total bid exceeds the lowest total bid based on furnishing foreign steel materials by more than 25 percent.

(4) When steel materials are used in a project, the requirements of this section do not prevent a minimal use of foreign steel materials, if the cost of such materials used does not exceed one-tenth of one percent (0.1 percent) of the total contract cost or \$2,500, whichever is greater. For purposes of this paragraph, the cost is that shown to be the value of the steel products as they are delivered to the project.

(c)(1) A State may request a waiver of the provisions of this section if:

(i) The application of those provisions would be inconsistent with the public interest; or

(ii) Steel materials/products are not produced in the United States in sufficient and reasonably available quantities which are of a satisfactory quality.

(2) A request for waiver, accompanied by supporting information, must be submitted in writing to the Regional Federal Highway Administrator (RFHWA) through the FHWA Division Administrator. A request must be submitted sufficiently in advance of the need for the waiver in order to allow time for proper review and action on the request. The RFHWA will have approval authority on the request.

(3) Requests for waivers may be made for specific projects, or for certain materials or products in specific geographic areas, or for combinations of both, depending on the circumstances.

(4) The denial of the request by the RFHWA may be appealed by the State to the Federal Highway Administrator (Administrator), whose action on the request shall be considered administratively final.

(5) A request for a waiver which involves nationwide public interest or availability issues or more than one FHWA region may be submitted by the RFHWA to the Administrator for action.

(6) A request for waiver and an appeal from a denial of a request must include facts and justification to support the granting of the waiver. The FHWA response to a request or appeal will be in writing and made available to the public upon request. Any request for a nationwide waiver and FHWA's action on such a request may be published in the FEDERAL REGISTER for public comment.

(7) In determining whether the waivers described in paragraph (c)(1) of this section will be granted, the FHWA will consider all appropriate factors including, but not limited to, cost, administrative burden, and delay that would be imposed if the provision were not waived.

(d) Standard State and Federal-aid contract procedures may be used to assure compliance with the requirements of this section.

(23 U.S.C. 315, sec. 10 of Pub. L. 98-229, 98 Stat. 55, sec. 165 of Pub. L. 97-424, 96 Stat. 2136 and 49 CFR 1.48(b))

(48 FR 53104, Nov. 25, 1983, as amended at 49 FR 18821, May 3, 1984)

#### § 635.411 Material or product selection.

(a) Federal funds shall not participate, directly or indirectly, in payment for any premium or royalty on any patented or proprietary material, specification, or process specifically set forth in the plans and specifications for a project, unless:

(1) Such patented or proprietary item is purchased or obtained through

#### Federal Highway Administration, DOT

competitive bidding with equally suitable unpatented items; or

(2) The State highway agency certifies either that such patented or proprietary item is essential for synchronization with existing highway facilities, or that no equally suitable alternate exists; or

(3) Such patented or proprietary item is used for research or for a distinctive type of construction on relatively short sections of road for experimental purposes.

(b) When there is available for purchase more than one nonpatented, nonproprietary material, semifinished or finished article or product that will fulfill the requirements for an item of work of a project and these available materials or products are judged to be of satisfactory quality and equally acceptable on the basis of engineering analysis and the anticipated prices for the related item(s) of work are estimated to be approximately the same, the PS&E for the project shall either contain or include by reference the specifications for each such material or product that is considered acceptable for incorporation in the work. If the State highway agency wishes to substitute some other acceptable material or product for the material or product designated by the successful bidder or bid as the lowest alternate, and such substitution results in an increase in costs, there will not be Federal-aid participation in any increase in costs.

(c) A State highway agency may require a specific material or product when there are other acceptable materials and products, when such specific choice is approved by the Division Administrator as being in the public interest. When the Division Administrator's approval is not obtained, the item will be nonparticipating unless bidding procedures are used that establish the unit price of each acceptable alternative. In this case Federal-aid participation will be based on the lowest price so established.

(d) Appendix A sets forth the FHWA requirements regarding (1) the specification of alternative types of culvert pipes, and (2) the number and types of such alternatives which must

be set forth in the specifications for various types of drainage installations.

(e) Reference in specifications and on plans to single trade name materials will not be approved on Federal-aid contracts.

#### § 635.413 Guaranty and warranty clauses.

(a) Except as provided in paragraph (b) of this section, clauses that require the contractor to guarantee or warrant materials and workmanship or to otherwise maintain the work for a specified period after its satisfactory completion by the contractor and its final acceptance by the State, will not be approved for use in Federal-aid contracts. Work performed and materials replaced under such guaranty or warranty clauses after final acceptance of work are not eligible for Federal participation.

(b) Contracts which involve furnishing and/or installing electrical or mechanical equipment should generally include contract clauses that require:

(1) Manufacturer's warranties or guarantees on all electrical and mechanical equipment consistent with those provided as customary trade practice, or

(2) Contractors' warranties or guarantees providing for satisfactory in-service operation of the mechanical and electrical equipment and related components for a period not to exceed 6 months following project acceptance.

#### § 635.417 Convict produced materials.

(a) Materials produced by convict labor may only be incorporated in a Federal-aid highway construction project if such materials have been:

(1) Produced by convicts who are on parole, supervised release, or probation from a prison or

(2) Produced in a qualified prison facility and the cumulative annual production amount of such materials for use in Federal-aid highway construction does not exceed the amount of such materials produced in such facility for use in Federal-aid highway construction during the 12-month period ending July 1, 1987.

(b) *Qualified prison facility* means any prison facility in which convicts,