

July 6, 2001

Refer to: HSA-10/B87

Mr. James R. Keaton
Vice President of Sales and Marketing
Barrier Systems, Inc.
180 River Road
Rio Vista, California 94571-1208

Dear Mr. Keaton:

In your June 22 letter, you requested the Federal Highway Administration's acceptance of your company's SafeGuard Gate System as meeting the requirements for a test level 3 (TL-3) longitudinal barrier under the National Cooperative Highway Research Program (NCHRP) Report 350. To support this request, you also sent me copies of Safe Technologies, Inc. June 22, 2001 report entitled "NCHRP Report 350 Crash Test Results for SafeGuard Gate System," video tapes of the crash tests you conducted, and CD-ROMS containing test data for each of the crash tests.

The SafeGuard Gate System (SGS) is a steel barrier specifically designed to span a permanent opening in a concrete median barrier ranging from 8 meters long to 16 meters long. The typical length of each gate section is 4 m and the effective overall height is 829 mm. The SGS is 700-mm wide at its base and 513-mm wide at the top. Each 4-m section weighs approximately 675 kg. Hinge assemblies at the ends of each unit and compressed air-activated, retractable wheels on each unit allow the SGS to be disconnected from the rigid barrier after removal of the aluminum cover plate and the 28.6-mm diameter ASTM C1018 steel connecting pin. The SGS can then be swung open from one end or completely removed to allow passage of vehicles. One or two persons can accomplish this process manually in five minutes or less. Enclosure 1 shows some of the design details for the SGS.

Tests were conducted with an 820-kg vehicle at a 20-degree impact angle and with the 2000-kg pickup truck at 25 degrees. Both tests were run at the NCHRP Report 350 test level 3 (TL-3) speed of 100 km/h. Two critical impact point tests were also conducted with the pickup truck: one to test the hinge assembly in a 12-m span and one to test the SGS-to-concrete barrier transition in an 8-m span. One additional test was run with an 820-kg vehicle at the TL-2 speed of 70 km/h to confirm acceptable low-speed performance. Maximum dynamic deflection noted in the length of need truck test into a 12-m long SGS was 570 mm. Summary reports for each of the four TL-3 tests are included in Enclosure 2.

Based on staff review of the information you provided and its recommendations, I find the SafeGuard Gate System to be acceptable for use on the National Highway System (NHS) as an NCHRP Report 350 TL-3 device to close permanent openings from 8 to 16 meters in length in a rigid concrete barrier. Since the SGS is a proprietary device, its use on Federal-aid projects, except exempt, non-NHS

projects, is subject to the conditions listed in Title 23, Code of Federal Regulations, Section 635.411. Please do not hesitate to call Mr. Richard Powers at (202) 366-1320 if you have any questions regarding this acceptance letter.

Sincerely yours,

(original signed by Frederick G. Wright, Jr.)

**Frederick G. Wright, Jr.
Program Manager, Safety**

2 Enclosures

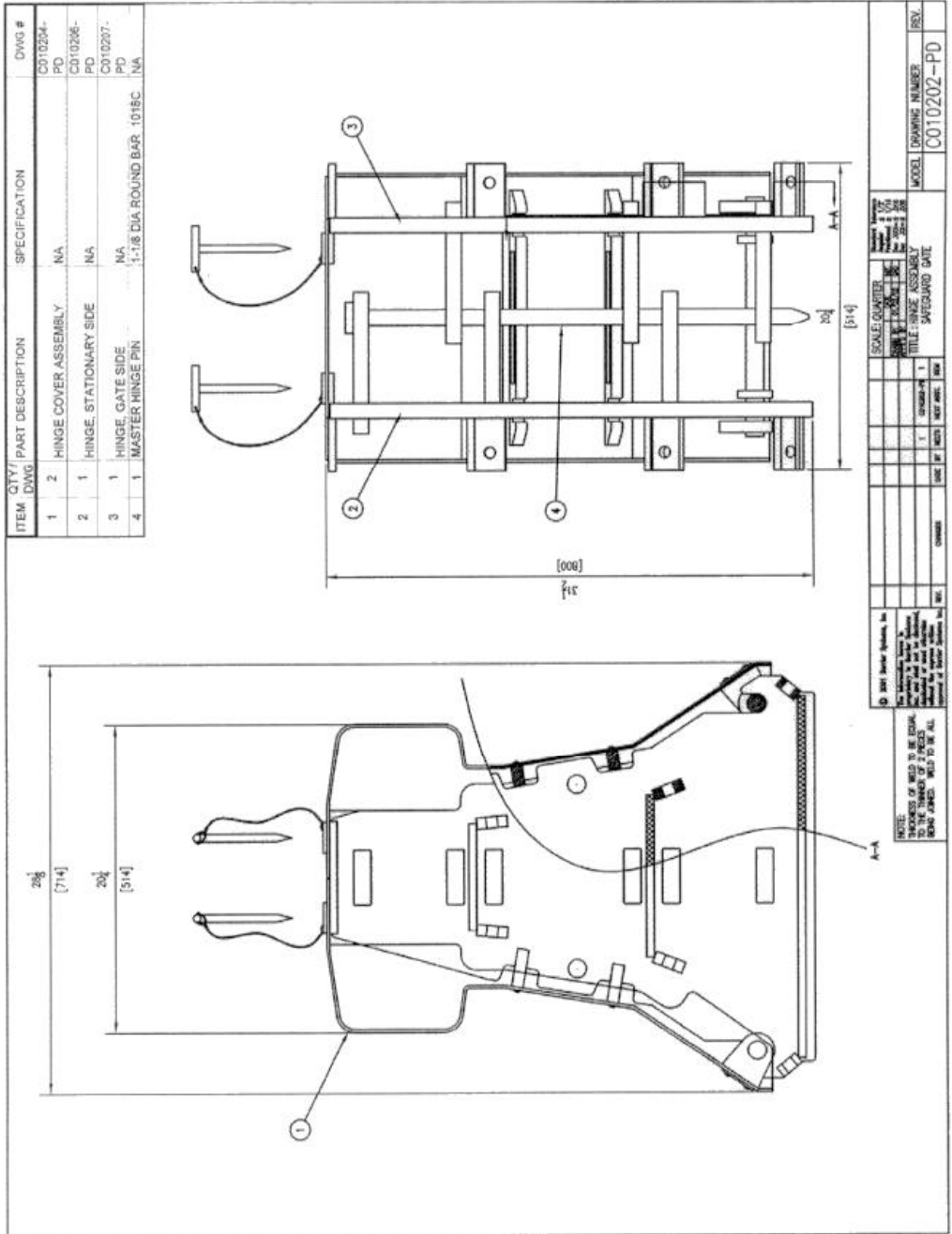


Figure D-4

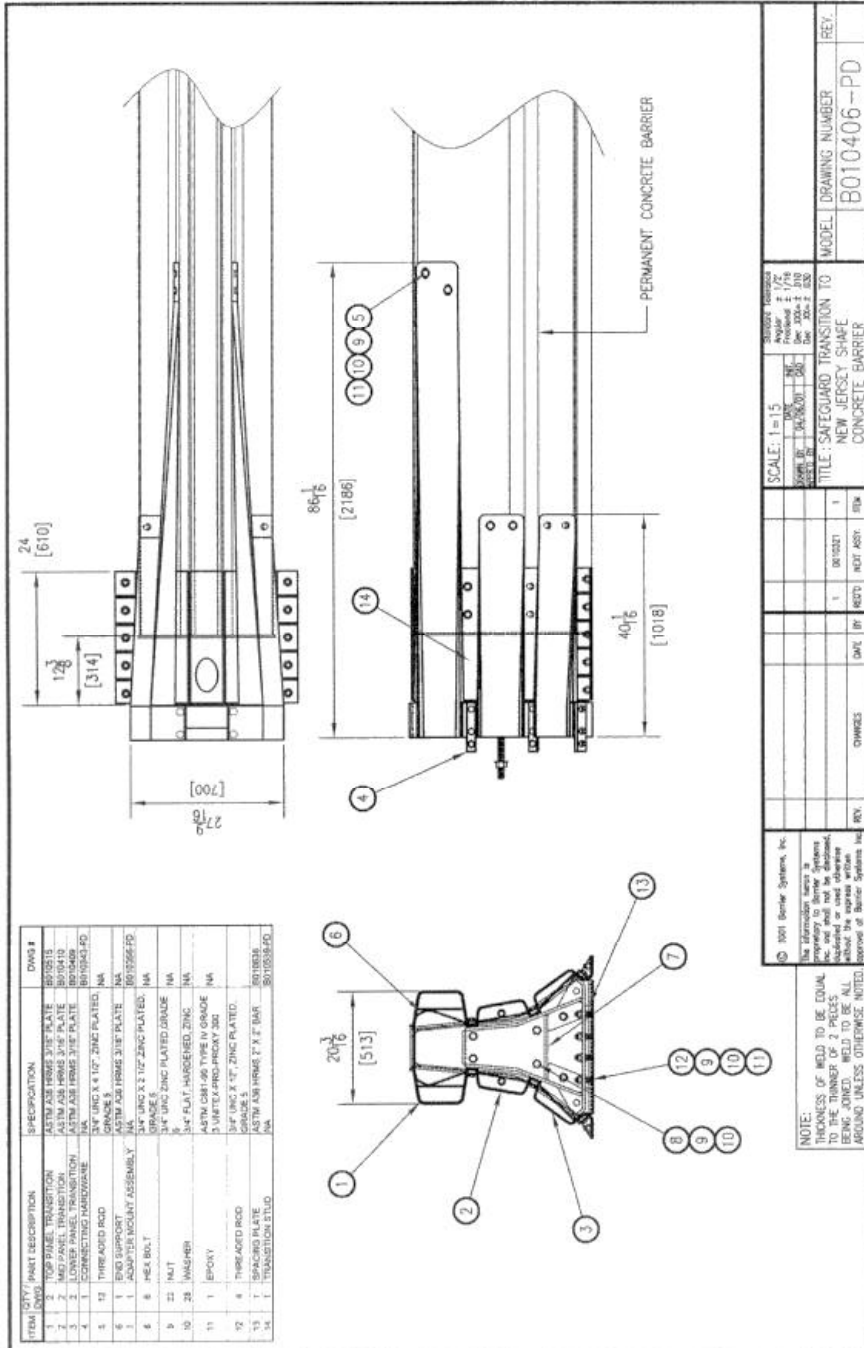
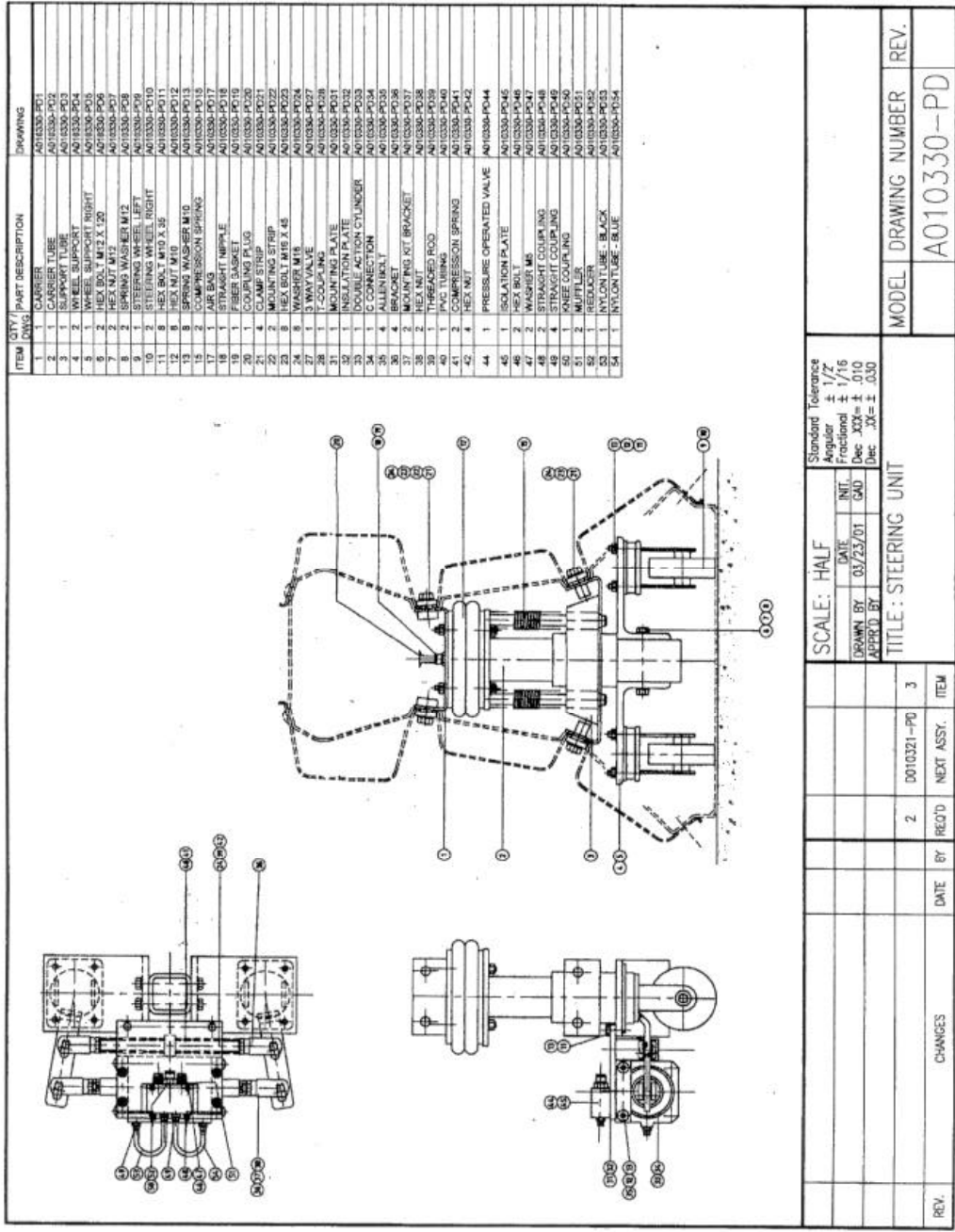
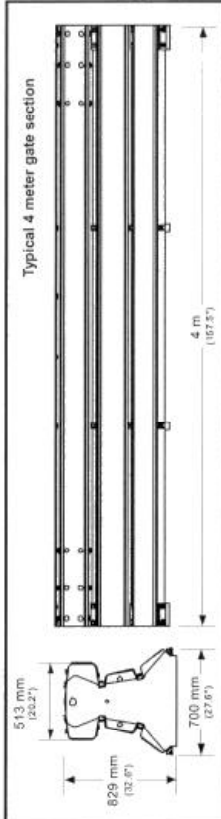
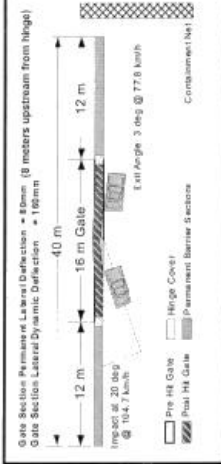
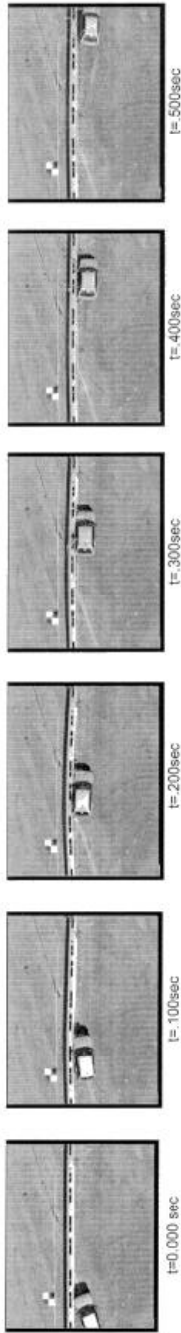


Figure D-9



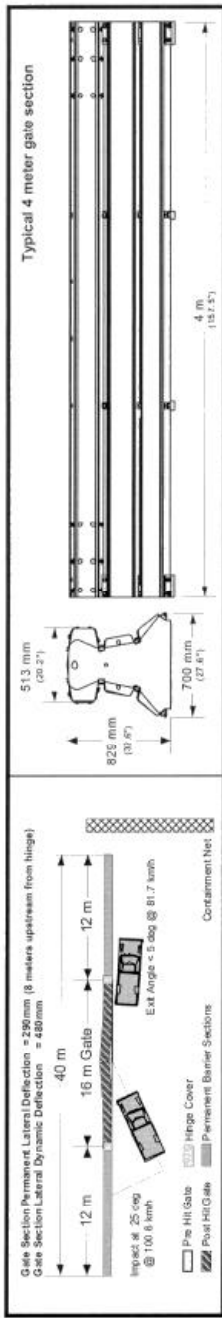
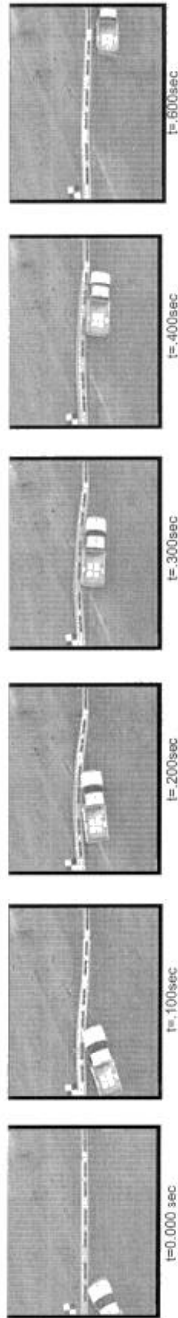
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				2	0010321-PO	3		
TITLE : STEERING UNIT							MODEL	DRAWING NUMBER
SCALE: HALF								REV.
DRAWN BY: GAD								A010330-PD
DATE: 03/23/01								
INIT: GAD								
STANDARD TOLERANCE								
Acquirer ± 1/2"								
Fractional ± 1/16"								
Dec .XXX ± .010								
Dec .XX ± .030								

Figure D-14
SafeGuard™ Gate System



General Information	
Test Agency.....	SAFE TECHNOLOGIES, INC.
Test Designation.....	NCHRP Report 350 3-10 (LON)
Test No.....	STI Test #SGB09
Date.....	3/15/2001
Test Article	Barrier Systems, Inc.
Type.....	SafeGuard Barrier Gate System
Installation Length.....	16 meter gate section (40 meters overall)
Size and/or dimension and material of key elements.....	Height 829 mm, Base width 700 mm, Top width 513mm, Mass 2700kg+128 / 16 meter {
Test Vehicle	Production Model
Type.....	820C
Designation.....	1987, Ford Festiva
Model.....	
Mass (kg)	
Curb.....	800
Test Inertial.....	832.5
Dummy(s).....	75
Gross Static.....	909
Impact Conditions	
Speed (km/h).....	104.7
Angle (deg).....	20
Impact Severity (ku).....	41.7
Exit Conditions	
Speed (km/h).....	77.8
Angle (deg).....	3
Occupant risk Values	
Impact Velocity (m/s)	
x-direction.....	3.1
y-direction.....	-6.1
Ride-down Acceleration (g's)	
x-direction.....	-2.9
y-direction.....	9.7
THIV (m/s).....	6.6
PHD (g's).....	9.7
ASI.....	1.4
Test Article Deflection (mm)	
Dynamic.....	160
Permanent.....	80
Vehicle Damage	
Exterior	
VDS.....	LFQ-3
CDC.....	11FLEE3
Interior	
CCDI.....	AS0000000
Post-Impact Vehicular behavior (deg - gyro @ c.g.)	
Maximum Roll Angle.....	-7.7
Maximum Pitch Angle.....	-2.4
Maximum Yaw Angle.....	50

Figure 16. Summary of Results - SafeGuard Gate System- STI Test #SGB09



General Information

Test Agency..... SAFE TECHNOLOGIES, INC.
 Test Designation..... NCHRP Report 350 3-11 (LON)
 Test No..... STI Test #SGB07
 Date..... 3/1/2001

Test Article
 Type..... Barrier Systems, Inc.
 SafeGuard Gate System
 Installation Length..... 16 meter gate section (40 meters overall)
 Size and/or dimension and material
 of key elements..... Height 826mm, Base width 700mm,
 Top width 513mm, Mass 2700kg / 16 meter gate

Test Vehicle
 Type..... Production Model
 Designation..... 2000P
 Model..... 1993, Chevrolet Cheyenne 2500
 3/4 Ton Pickup

* Mass (kg)
 Curb..... 1875
 Test Inertial..... 1962
 Dummy(s)..... n/a
 Gross Static..... 1962

Impact Conditions
 Speed (km/h)..... 100.6
 Angle (deg)..... 25
 Impact Severity (kJ)..... 136.8

Exit Conditions

Speed (km/h)..... 81.7
 Angle (deg)..... <5
 Occupant risk Values
 Impact Velocity (m/s)
 x-direction..... 3.4
 y-direction..... -5.1
 Ridedown Acceleration (g/s)
 x-direction..... -4.5
 y-direction..... 11.4
 THIV (m/s)..... 5.8
 PHD (g/s)..... 11.6
 ASI..... 0.94

Test Article Deflection (mm)

Dynamic..... 480
 Permanent..... 290

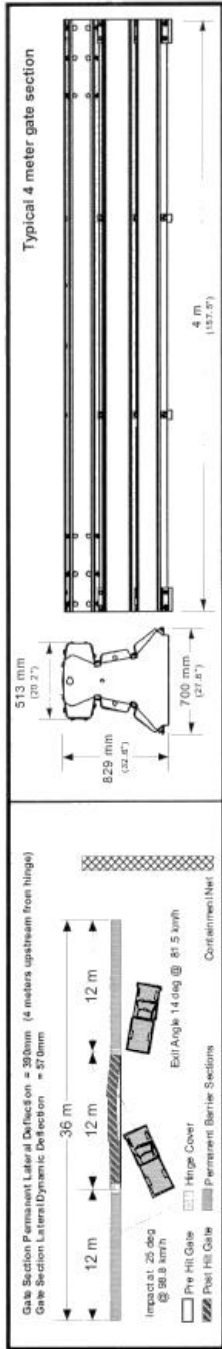
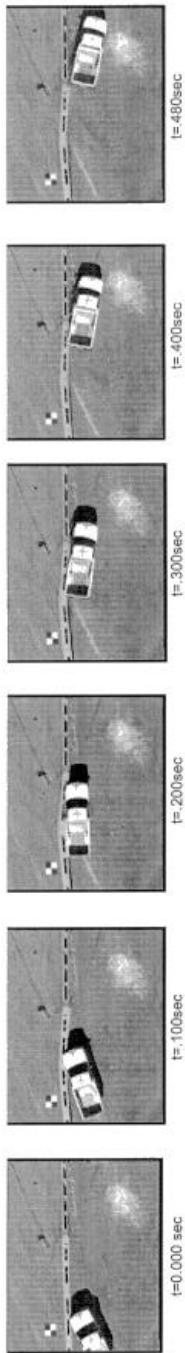
Vehicle Damage

Exterior
 VDS..... LFG-3
 CDC..... 11FLEE3
 Interior
 OCDI..... AS0000000

Post-Impact Vehicular behavior (deg - gyro @ c.g.)

Maximum Roll Angle..... -6.1
 Maximum Pitch Angle..... 2.8
 Maximum Yaw Angle..... 30 (at vehicle exit)

Figure 6. Summary of Results - SafeGuard™ Gate System - STI Test #SGB07



General Information

Test Agency..... **SAFE TECHNOLOGIES, INC.**
 Test Designation..... **NCHRP Report 350 3-21 (CIP)**
 Test No..... **STI Test #SGB06**
 Date..... **2/6/2001**

Test Article

Type..... **Barrier Systems, Inc. SafeGuard Gate System**
 Installation Length..... **12 meter gate section (36 meters overall)**
 Size and/or dimension and material of key elements..... **Height 829mm, Base width 700mm, Top width 513mm, Mass 2700kg / 16 meter gate**

Test Vehicle

Type..... **Production Model**
 Designation..... **2000P**
 Model..... **1992, Chevrolet Silverado 2500 3/4 Ton Pickup**

Mass (kg)..... **1921**
 Curb..... **1972**
 Test Inertial..... **n/a**
 Dummy(s)..... **1972**
 Gross Static..... **1972**

Impact Conditions

Speed (km/h)..... **98.8**
 Angle (deg)..... **25**
 Impact Severity (kJ)..... **132.6**

Exit Conditions

Speed (km/h)..... **81.5**
 Angle (deg)..... **14**

Occupant risk Values

Impact Velocity (m/s)
 x-direction..... **3.2**
 y-direction..... **-5.2**
 Ridedown Acceleration (g's)
 x-direction..... **-6.2**
 y-direction..... **12**
 THIV (m/s)..... **5.7**
 PHD (g's)..... **12**
 ASI..... **0.83**

Test Article Deflection (mm)

Dynamic..... **570**
 Permanent..... **390**

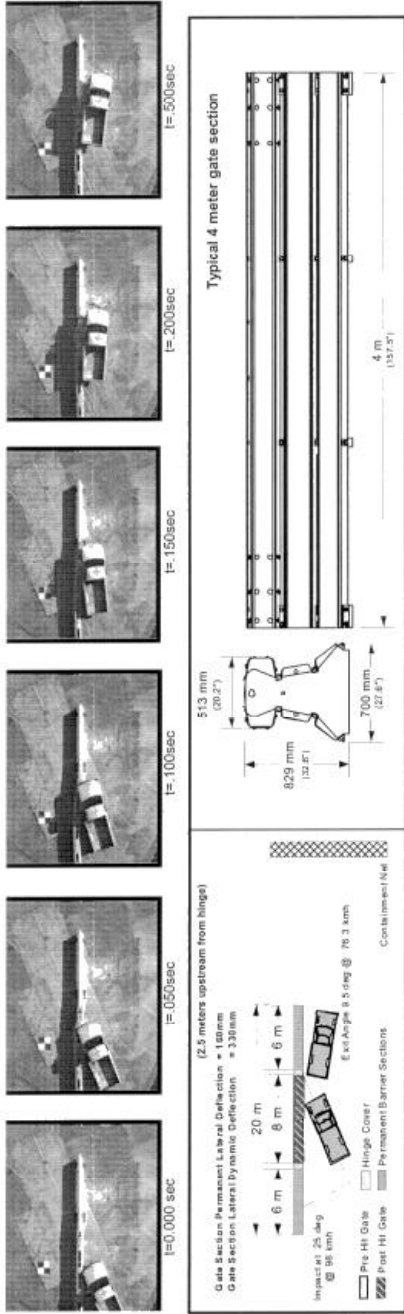
Vehicle Damage

Exterior
 VDS..... **LFO-3**
 CDC..... **11FLEE2**
 Interior
 OCDI..... **AS00000000**

Post-Impact Vehicular behavior (deg - gyro @ c.g.)

Maximum Roll Angle..... **-5.5**
 Maximum Pitch Angle..... **-1.5**
 Maximum Yaw Angle..... **39 (at vehicle exit)**

Figure 1. Summary of Results - SafeGuard Gate System- STI Test #SGB06



General Information	
Test Agency.....	SAFE TECHNOLOGIES, INC.
Test Designation.....	NCHRP Report 350 3-21 (CIP)
Test No.....	STI Test #SGB11
Date.....	3/16/2001
Test Article	
Type.....	Barrier Systems, Inc.
Installation Length.....	SafeGuard Gate System
Size and/or dimension and material of key elements.....	8 meter gate section (20 meters overall) Height 829 mm, Base width 700 mm, Top width 513mm, Mass 2700kg / 16 m gate
Test Vehicle	
Type.....	Production Model
Designation.....	2000P
Model.....	1988 Chevrolet 3/4 ton pickup
Mass (kg)	
Curb.....	1664
Test Inertial.....	1956
Dummy(s).....	n/a
Gross Static.....	1956
Impact Conditions	
Speed (km/h).....	98
Angle (deg).....	25
Impact Severity (kJ).....	130
Exit Conditions	
Speed (km/h).....	76.3
Angle (deg).....	9.5
Occupant risk Values	
Impact Velocity (m/s)	
x-direction.....	6
y-direction.....	-8.8
Ride-down Acceleration (g's)	
x-direction.....	-14.3
y-direction.....	-13
THIV (m/s).....	10
PHD (g's).....	18.4
ASI.....	1.75
Test Article Deflection (mm)	
Dynamic.....	330
Permanent.....	160
Vehicle Damage	
Exterior	
VDS.....	LFO3n
CDC.....	11FLEE3
Interior	
OCDI.....	LF0001100
Post-impact Vehicular behavior (deg - gyro @ c.g.)	
Maximum Roll Angle.....	-11
Maximum Pitch Angle.....	-5.5
Maximum Yaw Angle.....	95 (at vehicle exit)

Figure 21. Summary of Results - SafeGuard Gate System-STI Test #SGB11