National Accident Sampling System

Special Studies Number Four

Side Intrusion

User's Guide

and

Coding Manual

Revised Edition
July, 1979

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15. Supplementary Notes

16. Abstract

This User's Guide describes the National Accident Sampling System (NASS) Special Studies data collection project Number Four: Side Intrusion. Contained herein is the necessary information and instructions for the field investigator to use in measuring, recording, and encoding the data on the NASS Side Intrusion Form necessary to describe the location and extent of exterior crush to the side surface of the vehicle and to quantitatively describe vehicle interior intrusion resulting from this side surface crush.

This is a revision of the April, 1979 edition.

17. Key Words	18. Distribution Statement
Crash; Side Surface Measurement; Intrusion; Data Recording; Coding; Data Form; Accident Investigation	Unlimited

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Unclassified	Unclassified		

CONTENTS

1. PURPOSE

The purpose of this Special Study is to gather data on the performance
of the passenger compartment lower side surface during a collision, to docu-
ment the location and extent of intrusion of the side surface into the
passenger compartment, and to note resulting occupant contact and injury.

2. SIDE SURFACE DEFINITIONS

2.1 Side Surface

The side surface of the vehicle is defined as the area extending rearward
from the A-pillar to the last passenger compartment pillar and from the bottom
edge of the door sill-rocker panel (extended) to the belt line. Window
glass and upper pillars are not included in this area. The side surface
consists of up to three zones (depending upon the vehicle) defined as:
(1) front--the area between the A and B pillars, (2) back--the area between
the B and C pillars, and (3) rear--the area between the C and D pillars.
There are two side surfaces, right and left, corresponding to the right and
left sides of the vehicle.

2.2 Passenger Compartment

The passenger compartment is defined as that interior occupant space
which is normally available for occupant seating, based upon both the vehicle
design and seat configuration at the time of the accident.

A vehicle with fixed seating that can be folded down (i.e., station wagons)
is considered to have an applicable side zone at that seat location whether
the seat is open or folded.

A vehicle that has removable seating is considered to have an applicable
side zone at that seat location only if the seat was present at the time of
the collision.

The cargo space behind seats is not considered as having a side zone
even though people could "occupy" the space.

There are also certain exceptions. The table below summarizes the common vehicle types and applicable side zones.

	Zone		
	Front	Back	Rear
Between Pillars:	A & B	B & C	C & D

Vehicle Type

	Front A & B	Back B & C	Rear C & D
2 seat sports car	x		
Sedan 2 & 4 door, incl. hatchback	x	x	
Station wagon- 2 seat	x	x	
3 seat	x	x	x
dual facing rear seat	x	x	X
Pick-up truck- std.	x		
w/crew cab	x	x	
Van- cargo [1]	x		
passenger [2]	x	x	x
custom-customized [3]	x		
Jeep-type [4]	x	x	
Multi-purpose passenger [5]	x	x	x

Notes:

1. Cargo van has only front seating; rest is for cargo.
2. Passenger van has all seating in factory-installed, removable seats.
3. Custom van has only front seating. Rest of area has been customized and has non-standard seating. Includes camper conversions.
4. Jeep-type includes back seating if installed. Otherwise, just front.
5. Multi-purpose passenger van or truck-based station wagon has all three zones or less, depending on available passenger seating.
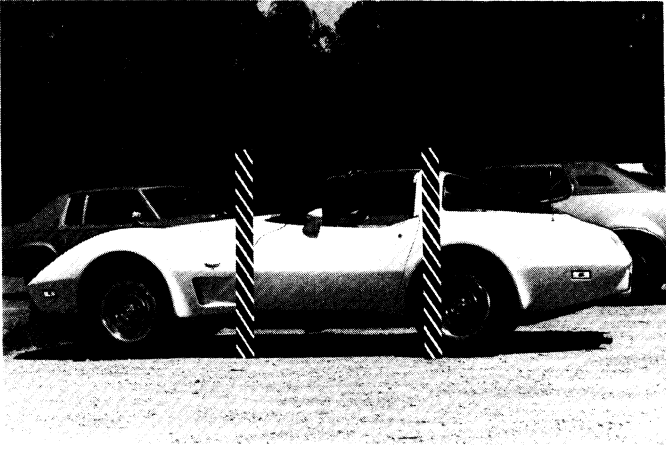
2 Seat Passenger*
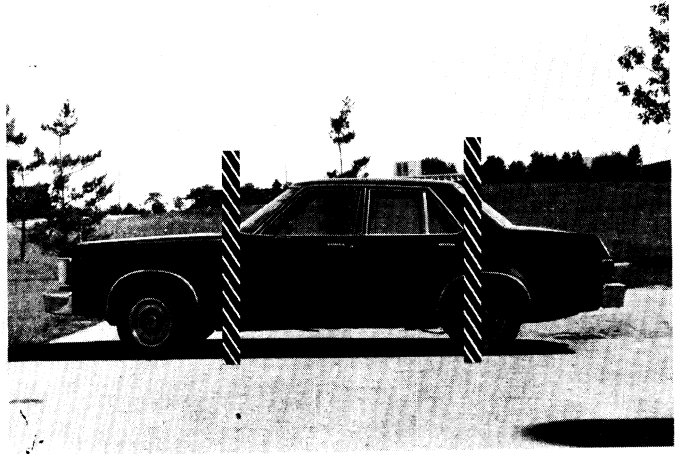
Passenger Sedan*
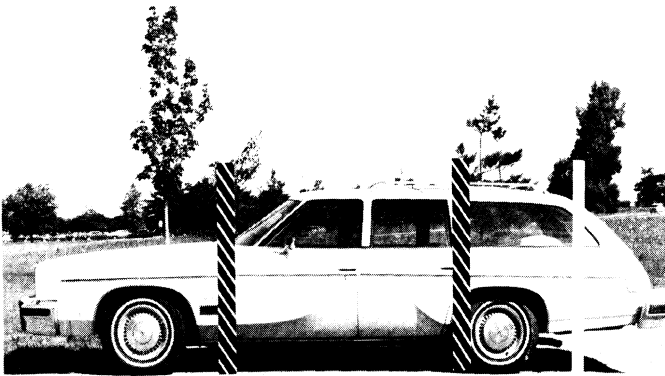
Station Wagon*
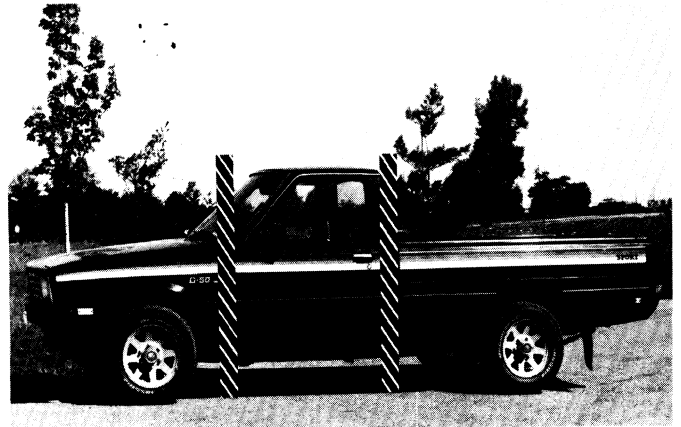
Pick-up Truck*

Passenger Van*
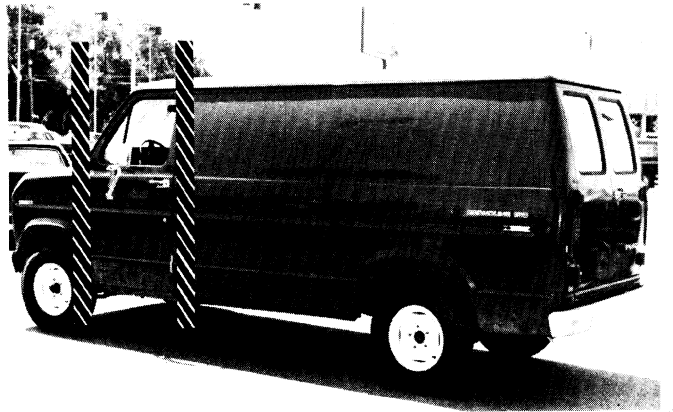
Cargo Van*

Passenger Compartment Definitions

Continued

3
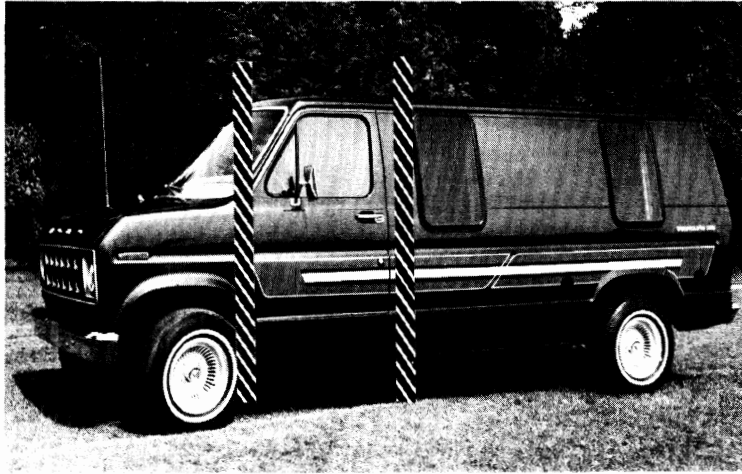
Custom Van*

Utility Vehicle*

*The area between the two ⧅ lines denotes the applicable passenger compartment area. Where optional rear seating is available, the compartment is extended to the ⧠ line.

Passenger Compartment Definitions

Continued

4

2.3 Zone

A zone is that portion of the side surface area located between two pillars. The applicable zones are:

Zone	Area Between
FRONT	A & B Pillar
BACK	B & C Pillar
REAR	C & D Pillar

The sum of all zones on a side equals the applicable side surface.
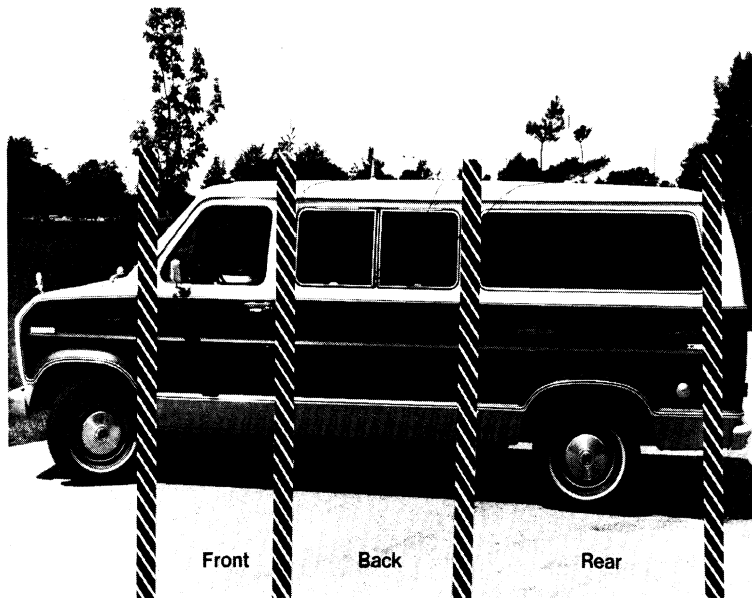
Location of Side Zones

3. ORGANIZATION OF THE DATA FORM

The data form is organized into three distinct major sections: (1) Crushing Force; (2) Component Damage; (3) Intrusion. The first two sections describe the location and extent of the damage to the exterior skin of the side surface, while the third describes the intrusion of the inner side surface into the passenger compartment.

4. CASE SELECTION--WHEN TO USE THIS FORM

The basic case selection criteria are the same for the study as for the NASS Vehicle Section.

This special study is to be completed whenever this vehicle has met the initial NASS sample selection and whenever an external crushing force has been applied to the side surface of the vehicle as a result of a side contact. The force can be from any direction but must crush the exterior side skin inward. Induced damage is not applicable.

5. ADDITIONAL DOCUMENTATION--PHOTOGRAPHIC

The data form is designed to be a response- only form with no additional drawing or sketching required. However, to facilitate a complete understanding of the damage pattern, photographic documentation is necessary.

Internal--Photograph each side surface intrusion. Take at least two views so as to best depict the location and magnitude of the intrusions.

External--Photograph each side surface zone where the side surface was contacted by a crushing force. Take at least two views so as to best depict the location and magnitude of the crush.

6. SUPPLEMENTAL INFORMATION

Additional notes, supplemental drawings, etc., are extremely valuable for understanding unusual situations. Such notation should be placed on the data form or supplemental paper as necessary. Extra pictures, brief descriptions, etc., are encouraged and should be included in the Special Studies documentation.

7. DATA RECORDING

The data form is designed for ease of data recording by the field investigator such that only a check mark or investigator-supplied number is needed to indicate the desired response. Provision is made in the lower right hand corner of each variable (or group of related variables) for subsequent coding by a data editor. See example below.

```
Right Door Hardware Contact
46. 47. 48. 49. 50. 51.
       Latch/
       Striker Hinges   Sill                          Component Damage CODES
       F   B   F   B    F   B   Zone:                  ----------------------
Results --- --- --- --- --- ---                        (1) Not damaged,
  of    __  __  __  __  __  __  (1) ⎫                   (2) Direct damage, no separation*
Investi-__  __  __  __  __  __  (2) ⎪   See            (3) Direct damage, separation*
gation  __  __  __  __  __  __  (3) ⎬  Codes            (4) Indirect damage, no separation*
        __  __  __  __  __  __  (4) ⎪  Above            (5) Indirect damage, separation*
        __  __  __  __  __  __  (5) ⎭    or             (8) Not applicable [not equipped]
        __  __  __  __  __  __  (8) ⎫ Adjacent          (9) Unknown
        __  __  __  __  __  __  (9) ⎭ LF LB HF HB SF SB * Separation must be complete.
                                     -- -- -- -- -- --

                                     46 47 48 49 50 51   Coded Data Value
```

To increase understanding of the coding, the element (code) values have been separated from the element (code) structure in this document only.

8. VARIABLE CODING AND DESCRIPTION

Each variable's coding structure is displayed on the following pages and accompanied by explanatory notes. The field data form is included in Section 9.0.

VARIABLE CODING AND DESCRIPTION

8

VARIABLE GROUP: Form Identification

VARIABLE NAME: 1-6. Form Header and Case Identification

FORMAT: 12 columns, numeric, beginning in column 1*

ELEMENT VALUES: 1 Primary Sampling Unit Number
2 Case Number
3 Special Study Number
4 Record Number   Pre-coded on data form
5 Card Number
6 Vehicle Number

SOURCE: NASS Vehicle Form

REMARKS: Use the same number as coded for this vehicle in variable 06
on the Vehicle Form.

*See Section 9. "DATA FORM" for layout.

VARIABLE GROUP: Side Surface Zones

VARIABLE NAME: 7-12.   Side Surface Zones

FORMAT: 1 x 6 columns, numeric, beginning in column 13

ELEMENT STRUCTURE:*   7. 8.   9. 10.   11. 12.

	Front		Back		Rear	
	L	R	L	R	L	R
	---	---	---	---	---	---
	___	___	___	___	___	___

ELEMENT VALUES: L = Left, R = Right

           1 Door

           2 Panel

           8 Not an applicable side surface

           9 Unknown

SOURCE: Inspection only

REMARKS: The side surfaces of the passenger compartment consist of the two sides (left and right), each of which are divided into three zones:

           Front zone: from the A to the B pillar

           Back zone: from the B to the C pillar

           Rear zone: from the C to the D pillar

Depending on the type of vehicle, there may be up to six side zones. Each side zone is filled by either a door or a panel. If the vehicle configuration is such that a particular side zone does not exist, the zone area is coded "8 Not an applicable side surface."

See Section 2. "Side Surface Definitions" for more detailed definitions.

*See section 7. "Data Recording".

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Code each zone to indicate which components make up each side surface. A standard two-door passenger car would be coded as follows:

PASSENGER CAR

		Left side		Right side
Front	1	Door	1	Door
Back	2	Panel	2	Panel
Rear	8	NA	8	NA

Zone

A passenger van would be coded as follows:

VAN

		Left side		Right side
Front	1	Door	1	Door
Back	2	Panel	2	Door
Rear	2	Panel	2	Panel

Zone

VARIABLE GROUP: Crushing Force

VARIABLE NAME: 13. Angle of Intersecting Longitudinal Axes

FORMAT: 3 column, numeric, beginning column 19

ELEMENT VALUES: __ __ __ degrees -- Code to nearest ten degrees

                500 Vehicle-object contact

                999 Unknown

SOURCE: Inspection of crash scene

        Crash scene data or drawings

        Inspection of vehicles involved

REMARKS: Record the forward longitudinal axis of the other vehicle relative to the forward longitudinal axis of this vehicle at the moment of the initial collision between the two vehicles. In the case of multiple impacts from more than one vehicle, code the first impact only for this variable. The forward longitudinal axis of the other vehicle is to be measured clockwise from the forward longitudinal axis of this vehicle. This value is equal to the algebraic difference between the heading angles of the two vehicles. The value should be rounded off and recorded to the nearest 10 degrees.

     The heading angle of a vehicle is the direction the front of the vehicle is pointing, relative to a fixed coordinate. This can be different from the direction in which the vehicle is moving. For example, the heading angle of a vehicle being driven eastbound is 90" relative to north. If this same vehicle, while being driven in an easterly direction, begins sliding sideways (south), the heading angle remains 90°. If, however, the vehicle rotates so that the front is now point south (while skidding), the heading angle becomes 180°.

     Vehicle being driven east

11
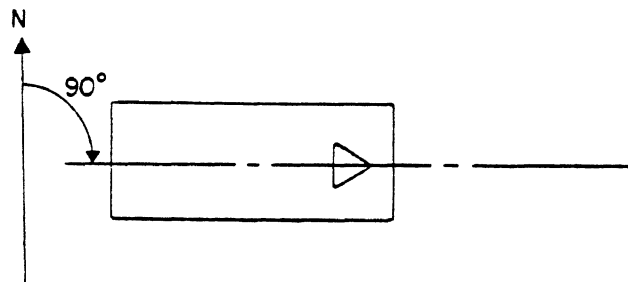
Vehicle being driven east but skidding sideways
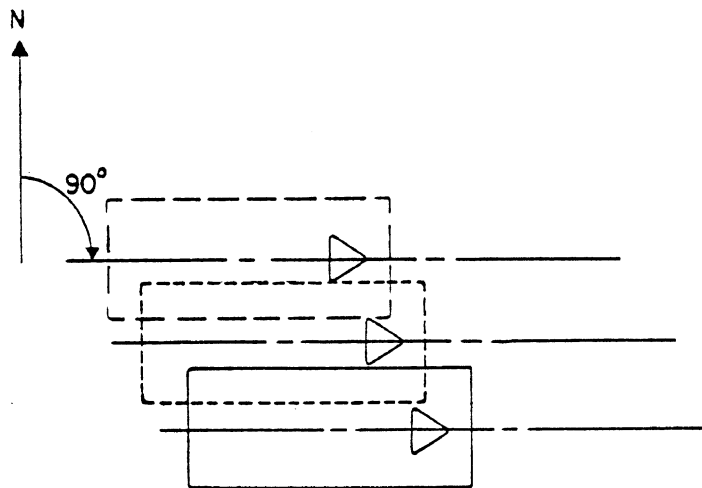
Vehicle, originally headed east, rotated and is skidding south
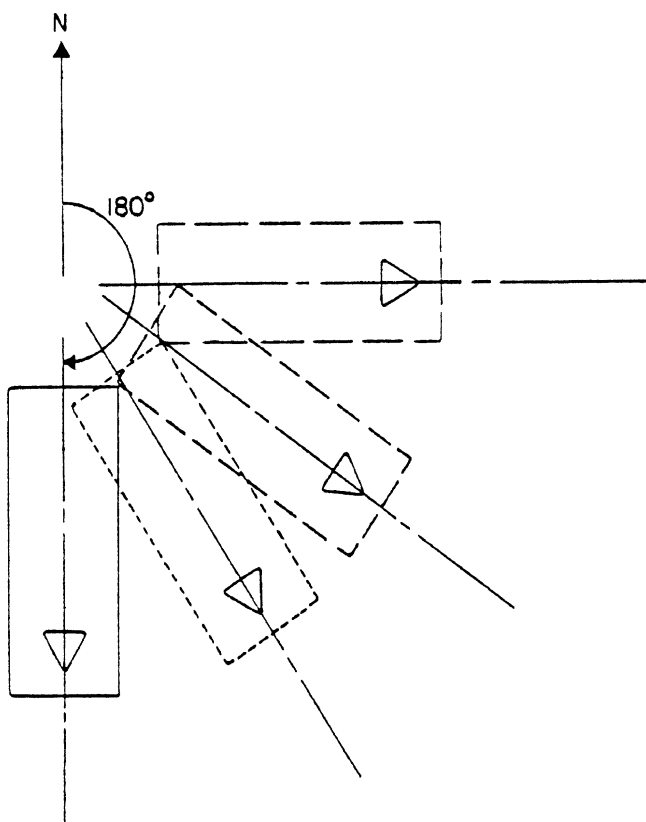
Method for determining heading angle

(1) Make a sketch by drawing in the case vehicle and its centerline at the time of initial contact relative to the roadway.

(2) Continue the sketch by drawing in the other vehicle and its centerline at the time of initial contact relative to the case vehicle.

(3) Extend the centerlines (longitudinal axis) of each vehicle so they intersect and continue beyond the point of intersection.

(4) Place an arrowhead beyond the point of intersection to show the forward end of the path of travel had they not collided.

(5) Measure (in a clockwise direction) the angle formed by the direction-of-travel arrows, using the case vehicle (THIS VEHICLE) as the baseline.

Example 1:

INTENDED PATH AND DIRECTION OF THIS VEHICLE

INTENDED PATH AND DIRECTION OF OTHER VEHICLE

THIS VEHICLE

OTHER VEHICLE

TV

OV
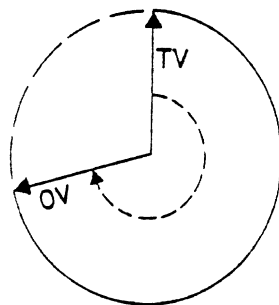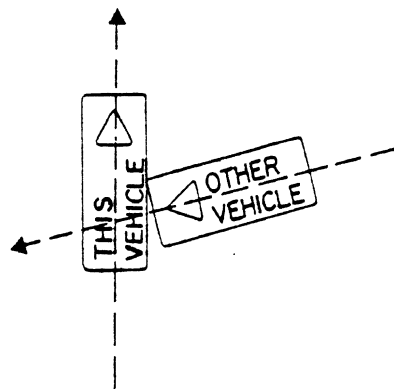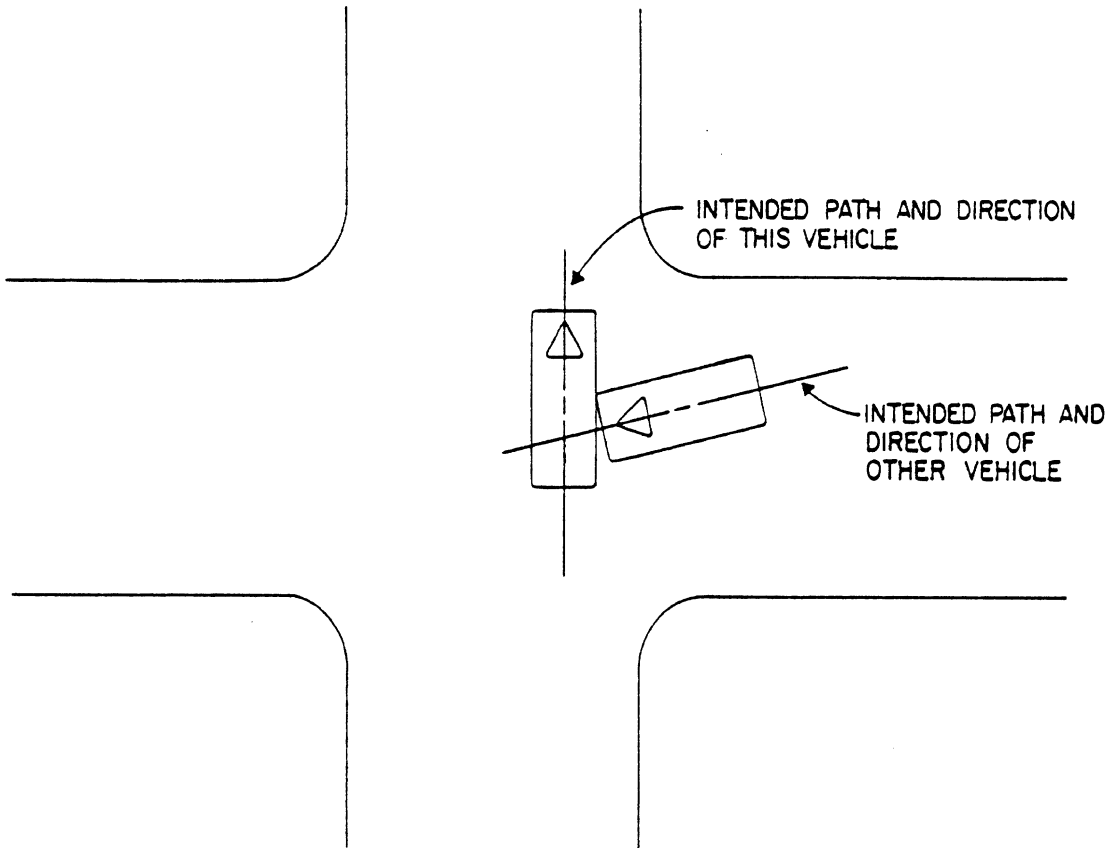
Result = 263°

Record as 260°

Example 2:

Non-Tracking

(other vehicle skidding)

330°

THIS VEHICLE

OTHER VEHICLE SKIDDING
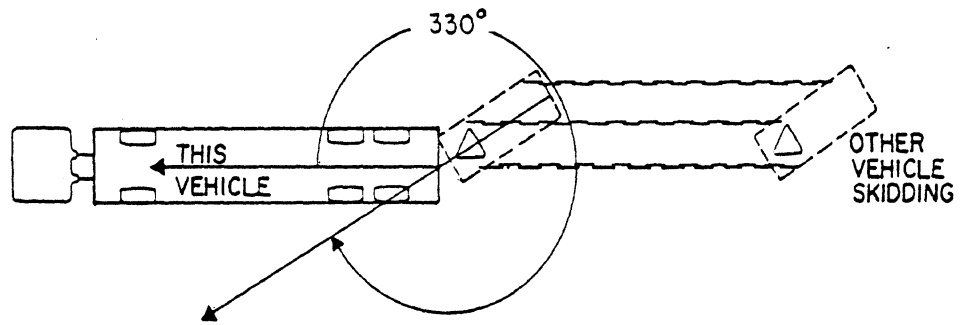
Tracking

(other vehicle non-skidding)

330°

THIS VEHICLE

OTHER VEHICLE NOT SKIDDING
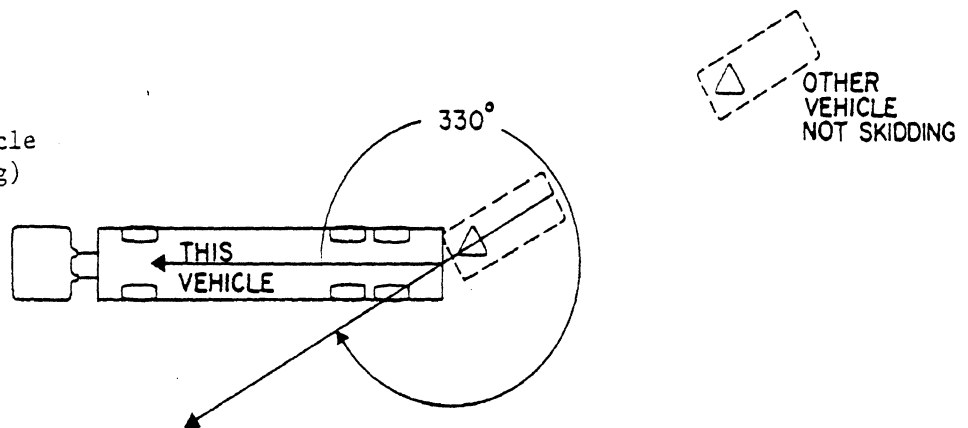
VARIABLE GROUP: Crushing Force

VARIABLE NAME: 14-19.   Which Zones Were Contacted by a Crushing Force

FORMAT: 1 x 6 columns*, numeric, beginning column 22

ELEMENT STRUCTURE: 14. 15.   16. 17.   18. 19.

	Front		Rear		Back	
	L	R	L	R	L	R
	---	---	---	---	---	---
	——	——	——	——	——	——

ELEMENT VALUES: Side: L = Left, R = Right

1   Contacted

2   Not contacted

8   Not applicable, not a side surface

9   Unknown if contacted

SOURCE: Inspection

REMARKS: Inspect the vehicle and record whether or not each side zone was contacted by a crushing force. If no side zone is present (see variables 7-12) it cannot have been contacted and must be coded "8--Not applicable".

The force that contacts a side zone can be the same or different from the force that contacts another zone. The only restriction is that the force be direct and crush the side inward. Induced damage alone is not applicable damage because there was no direct crushing force application. There can be as many crushing forces as there are applicable side zones.

*Format specification indicates that each of the six variables described on this page have a field width of one column.

VARIABLE GROUP: Crushing Force

VARIABLE NAME: 20-25. Location of the Center of the Crushing Force in Each
Side Zone Contacted

FORMAT: 2 x 6 columns, numeric, beginning column 28

ELEMENT STRUCTURE:

Front		Back		Rear	
L	R	L	R	L	R
---	---	---	---	---	---

—— —— —— ——   —— —— —— ——   —— —— —— ——

ELEMENT VALUES: Side: L = Left, R = Right

      11-43 Center of crush

        55 Crush distributed over all of zone (no crush
center possible)

        98 Not applicable, no side surface zone, or not damaged

        99 Unknown center

SOURCE: Inspection only

REMARKS: This variable further defines the location of the crushing force by
locating the point of application of the force to each of the side zones
affected by the particular force.

Each zone is divided into a matrix of 12 cells. The door or panel itself
is divided into nine equal cells numbered 1 to 3 vertically (from the top) and
1 and 3 horizontally (front to back). The door sill-rocker panel area below
the door (or similar area in a panel-filled zone) is divided into three cells
horizontally to correspond with the three cells in the door or panel above it.
The number for the rocker-sill cells is 1 to 3 horizontally (front to back) and
4 vertically. The matrix applied to each zone will vary in width depending upon
the style of the vehicle and the location of the zone on the vehicle. Back
zones are often narrower than front (except in some vans).

To implement the coding, the side zone is examined and the location of the
maximum penetration is determined. The matrix outline is mentally superimposed

on the door or panel. The cell is then determined which best represents or includes the location of the maximum crush. The two-digit number associated with this cell is recorded on the data form.

The vertical component is the left digit and the horizontal component is the right digit.

$$\underline{\hphantom{vertical}} \quad \underline{\hphantom{horizontal}}$$
vertical   horizontal

A note of caution: The damage and crush must be by <u>direct</u> contact with an object. Induced damage--no matter how severe--is not recorded.

In certain instances the location of the center of crush will be distributed in one or both directions. The use of code 5 for distributed crush allows the coding of tree or post impacts, guardrail contact, or totally distributed contacts made by a broad surface impact.

In the case of a pole-type impact, determine in which horizontal cells the contact lies and code 1, 2, or 3. Code the vertical component 5. Thus a tree impact to the center of the front door would be coded 52. The same code would be used for either the left or right side. A guardrail contact to the rear door near the rocker panel would be coded 35. In a pole or guardrail type impact, the depth of the contact need not be completely uniform and symmetrical. Pole and similar type impacts have varying depth due to the varying stiffness of the side structure and to the relationship of the vertical plane of the side to the pole.

In the case of overall contact to a zone (large truck into a small van), where the damage is uniformly distributed over the entire zone, code 55.

Where the contact is on a borderline, choose the cell most representative of the location of the contact.

The above procedure is repeated for each zone that makes up the side surface. The same crushing force can contact two or more zones, or a different crushing force can contact each zone. Code a center for each zone. If there are multiple contacts to a zone, choose the most severe.

If a zone was previously coded as not applicable or not contacted, then it cannot be coded as having a crush center. Code as "98 Not applicable".
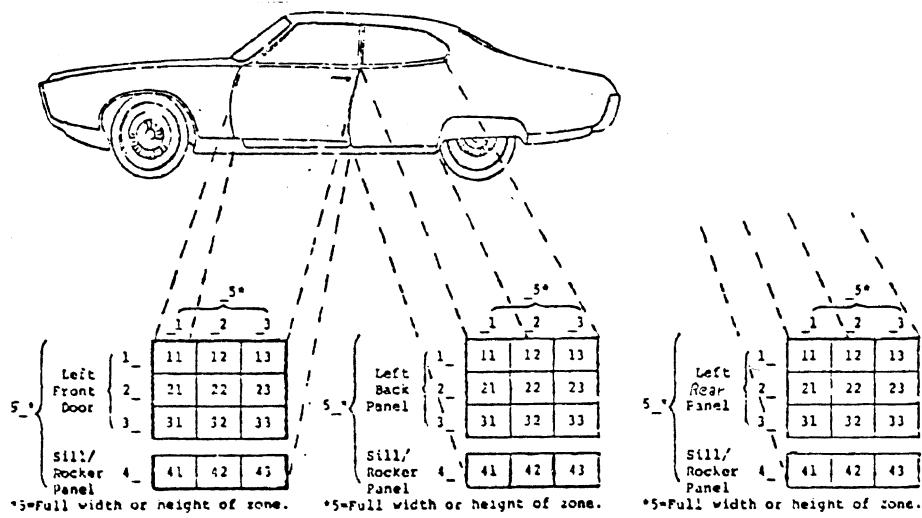
Front Zone   Back Zone   Rear Zone
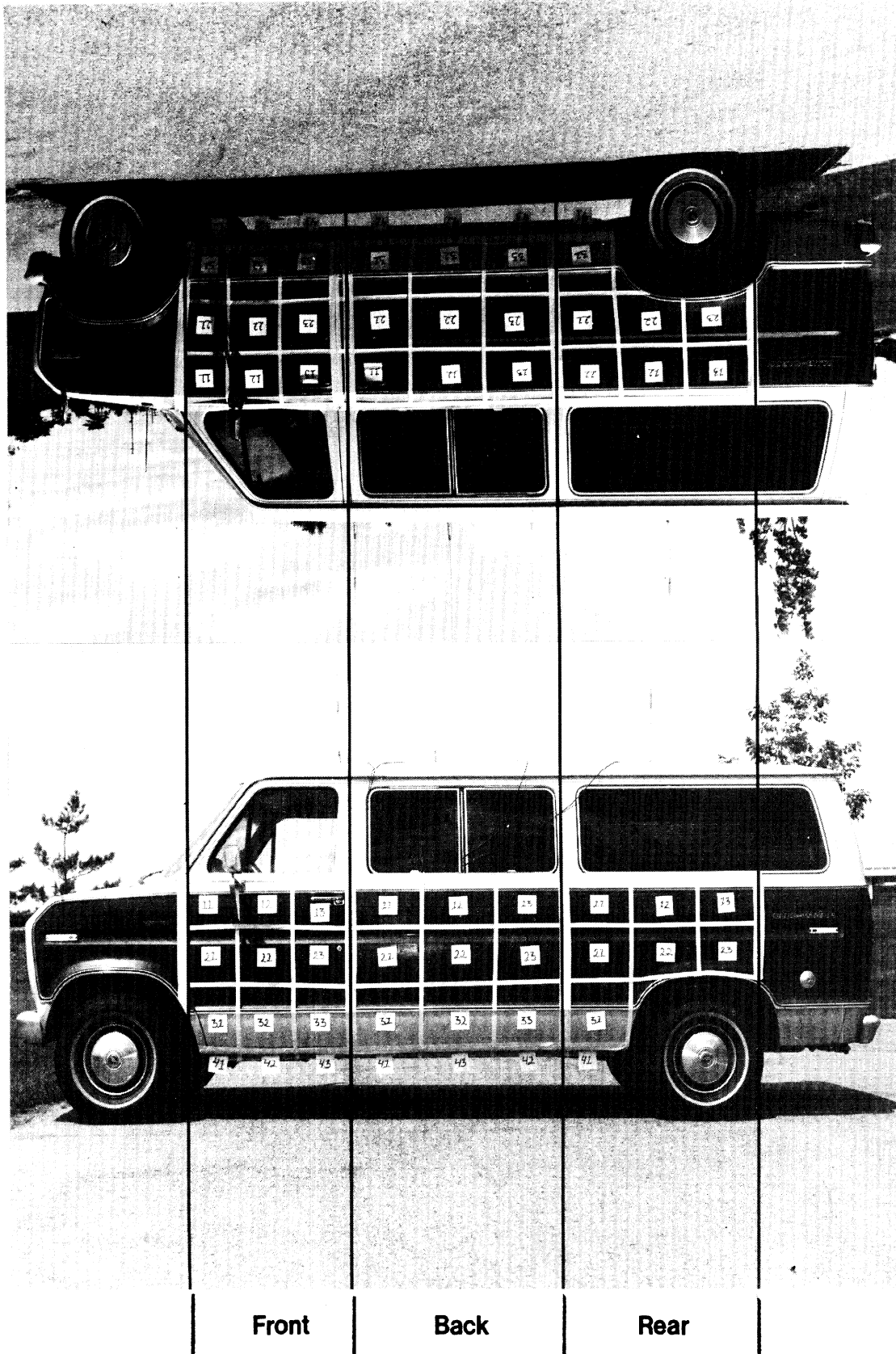
Cell Matrix Layout for Each Zone

VARIABLE GROUP: Crushing Force

VARIABLE NAME: 26-31. Depth of Crush to Each Zone

FORMAT: 1 x 6 columns, numeric, beginning column 40

ELEMENT STRUCTURE: Front   Back   Rear
                     L   R   L   R   L   R
                    --- ---   --- ---   --- ---

                    ___ ___   ___ ___   ___ ___

ELEMENT VALUES: Zone:

                 Side: L = Left, R = Right

                 1   0-2 inches

                 2   2-4 inches

                 3   4-6 inches

                 4   6-8 inches

                 5   8 inches

                 8   Not applicable, no contact or no side surface

                 9   Unknown

SOURCE: Inspection

REMARKS: Estimate the depth of crush to each zone, using the cell with maximum
crush. If a zone was previously coded as not applicable or not contacted, then
it cannot have a crush depth. Code as "8 Not applicable". The crush must
result from a direct contact.

VARIABLE GROUP: Component Damage

VARIABLE NAME: 32-39.   Structural Contact
                           (Pillar Damage)

FORMAT: 1 x 8 columns, numeric, beginning column 46

ELEMENT STRUCTURE: Pillar
                        Left Side   Right Side
                      A   B   C   D   A   B   C   D
                     --- --- --- ---   --- --- --- ---

                     ___ ___ ___ ___   ___ ___ ___ ___

ELEMENT VALUES: 1 Not damaged

                  2 Direct damage, no separation*

                  3 Direct damage, separation*

                  4 Indirect damage, no separation*

                  5 Indirect damage, separation*

                  8 Not applicable (not equipped)

                  9 Unknown

                     *Separation must be complete.

SOURCE: Inspection

REMARKS: In addition to the damage described previously, were any structural/
hardware components contacted or damaged?   NOTE: Contact and damage (direct
and induced) must result from a direct application of a crushing force to the
side surface between the A-pillar and the last pillar of the passenger com-
partment.

     Code all components present on the vehicle, either damaged or not damaged.
Use 'not applicable' only if the component is not on the vehicle.

General Comments Relating to Variables 32-51

The side structure components are subject to damage from the side crushing force. This damage may be either direct or induced, depending upon the contact location of the side crushing force.

Direct damage occurs when: (1) the crushing force directly hits the exposed component; or (2) contacts the sheet metal surface directly over a concealed component. In this latter case, a concealed component is one which is normally obscured by sheet metal.

Examples include the lower B pillar when obscured by the door edge, door hinges, etc.

Induced (indirect) damage occurs when the crushing force is applied to the door/panel surface at a location other than directly over or on the component. The subsequent panel deformation distorts or damages the associated component. An example is when a panel is contacted in the center and the inward deformation damages the pillar. There was no direct contact to the pillar; however, it was damaged.

The components subject to damage are:

Lower Pillars:
   A
   B
   C
   D
Latch/Striker
Hinges
Sill

NOTE: If there is an upper pillar present, then there must be a lower pillar.

23

VARIABLE GROUP: Component Damage

VARIABLE NAME: 40-45.   Left Door Hardware Contact

FORMAT: 1 x 6 columns, numeric, beginning column 54

ELEMENT STRUCTURE:

Latch/							
Striker		Hinges		Sill		Zone:	F = Front
F	B	F	B	F	B		B = Back
---	---	---	---	---	---		
___	___	___	___	___	___		

ELEMENT VALUES: 1   Not damaged

2   Direct damage, no separation*

3   Direct damage, separation*

4   Indirect damage, no separation*

5   Indirect damage, separation*

8   Not applicable (not equipped)

9   Unknown

*Separation must be complete.

SOURCE: Inspection

REMARKS: A continuation of the component contact and damage assessment.

In addition to the damage described previously, were any structural/ hardware components contacted or damaged?   NOTE: Contact and damage (direct and induced) must result from a direct application of a crushing force to the side surface between the A-pillar and the last pillar of the passenger compartment.

Induced damage to concealed components is permitted as long as the damage was a result of a crushing force applied to an applicable side surface.

Code all components present on the vehicle, either damaged or not damaged.   Use 'not applicable' only if the component is not on vehicle.

---

*The latch is that portion of the lock mechanism which contacts the striker to hold the door shut.   The door handle is part of the mechanism which operates the latch.
See variables 32-39 for further information.

VARIABLE GROUP: Component Damage

VARIABLE NAME: 46-51. Right Door Hardware Contact

FORMAT: 1 x 6 columns, numeric, beginning column 60

ELEMENT STRUCTURE:

Latch/ Striker		Hinges		Sill		Zone:	F = Front
F	B	F	B	F	B		B = Back
---	---	---	---	---	---		
___	___	___	___	___	___		

ELEMENT VALUES:

1 Not damaged

2 Direct damage, no separation*

3 Direct damage, separation*

4 Indirect damage, no separation*

5 Indirect damage, separation*

8 Not applicable (not equipped)

9 Unknown

*Separation must be complete.

SOURCE: Inspection

REMARKS: A continuation of the component contact and damage assessment.

In addition to the damage described previously, were any structural/ hardware components contacted or damaged? NOTE: Contact and damage (direct and induced) must result from a direct application of a crushing force to the side surface between the A-pillar and the last pillar of the passenger compartment.

Induced damage to concealed components is permitted as long as the damage was a result of a crushing force applied to an applicable side surface.

Code all components present on the vehicle, either damaged or not damaged. Use 'not applicable' only if the component is not on vehicle.

See variable 32-39 for further information.

VARIABLE GROUP: Intrusion

VARIABLE NAME: 52. Did Intrusion of the Internal Side Surface Result
                       From the Side Crushing Force

FORMAT: 1 column, numeric, beginning column 66

ELEMENT VALUES: 1 Yes

                 2 No   } STOP! Complete external photographs only
                 9 Unknown

SOURCE: Inspection

REMARKS: Intrusion Defined: Intrusion results whenever the internal boundary surface of the passenger compartment is moved inward due to direct damage resulting from the application of a crushing force to the exterior surfaces of the vehicle.

EXAMPLE

Undamaged Side Surface

Direct Damage

⇑ Crushing Force
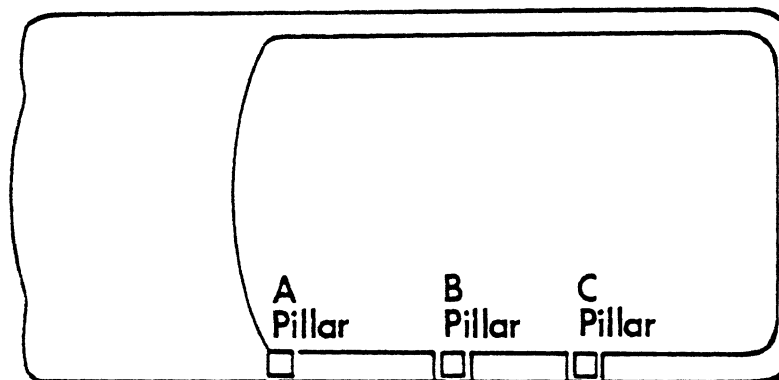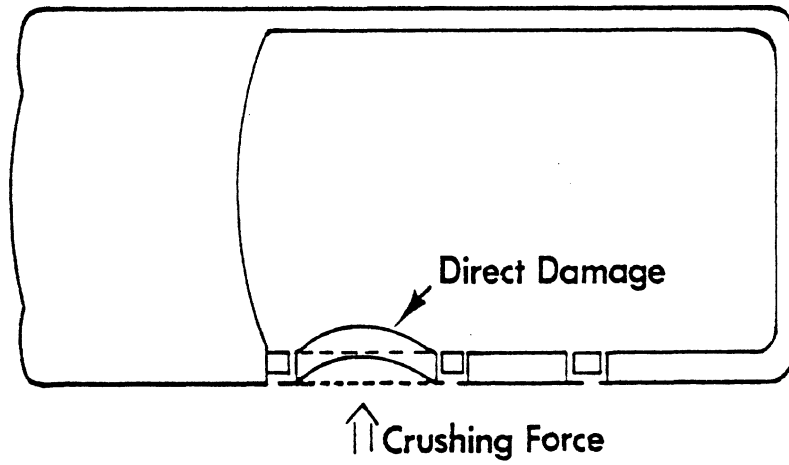
Intruded Side Surface with Direct Damage Only

Direct
Damage

Induced
Damage

⇑ Crushing Force
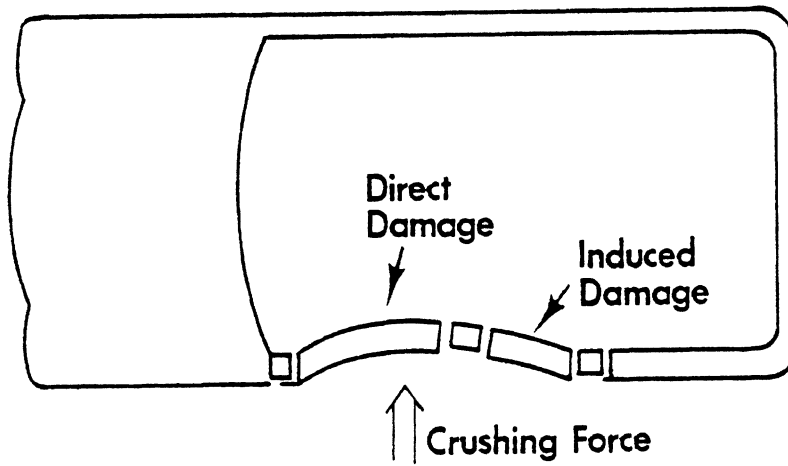
Intruded Side Surface with Direct and Induced Damage

27

Internal Side Surface. For the purposes of intrusion, the inner side surface extends from the inner door sill to the top of the upper window frame or top edge of the side glass. The roof rail is NOT included. Thus the inner side surface area is increased to include all of the door or panel area.

If the response is No or Unknown, do not complete the rest of the form. However, take external photographs as described earlier.

Discussion of Intrusion Matrix. When intrusion (other than catastrophic) is indicated, the matrix (variables 62-169) is to be completed. The matrix allows for both a description of the intrusion and occupant contact and injury (if any).

One line of the matrix should be completed for each intrusion. An intrusion occurs when a component intrudes into an occupant space. If a component intrudes into more than one occupant space, then there are multiple intrusions and multiple lines are to be used to describe these intrusions. Additionally, more than one component can intrude into an occupant space resulting in multiple intrusions.

For each intrusion, code the Intruding Component (Column A), Occupant Space Intruded (Column B), Associated Impact (Column C), Number of Occupant Spaces in Seat Row (Column D), as descriptive of the location of the intrusion. Columns E and F permit description of the amount of intrusion. Columns G, H and I describe occupant contact and injury, if any.

Each intrusion is to be documented whether the space was occupied or not and regardless of occupant contact and injury.

The intrusions are to be coded beginning with occupant space 11 and proceeding across the seat (left to right) and then by seat row (front to rear). If insufficient space is available (i.e., more than 12 intrusions) continue recording on the back of the form.

VARIABLE GROUP: Intrusion

VARIABLE NAME: 53. Was There Catastrophic Intrusion into the
                       Passenger Compartment by the Side Surface

FORMAT: 1 column, numeric, beginning column 67

ELEMENT VALUES: 1 Yes   STOP! Complete both internal and external
                 9 Unknown   photographs.

                 2 No--continue! (completing data form)

SOURCE: Inspection only

REMARKS: Catastrophic Intrusion is declared when the passenger compartment is compromised through gross ruptures, tears, openings, avulsions and/or excessive passenger compartment compression or separation such that the performance of the side surface had little or no impact on the structural integrity of the passenger compartment. The intrusion is beyond measurement.

If the response is Yes or Unknown, do not complete the rest of the form. However, take both internal and external photographs as described earlier.

If the response is No, continue completing the Intrusion variable group.

VARIABLE GROUP: Intrusion

VARIABLE NAME: 54-59. Zone(s) in Which Intrusion(s) Occurred

FORMAT: 1 x 6 columns, numeric, beginning column 68

ELEMENT STRUCTURE: Front   Back   Rear
                      L   R   L   R   L   R
                     --- ---   --- ---   --- ---

                     ___ ___   ___ ___   ___ ___

ELEMENT VALUES: Side: L = Left, R = Right

                 1 Intrusion

                 2 No intrusion

                 8 Not applicable, no side zone

                 9 Unknown

SOURCE: Inspection

REMARKS: Code all applicable zones to indicate either intruded or not in-
truded. Use "8, Not Applicable" only if the zone is not present. The cod-
ing should correlate with that of variables 7-12, i.e.: include only those
zones coded '2' for variables 7-2.

VARIABLE GROUP: Intrusion

VARIABLE NAME: 60. Number of Occupant Spaces in Vehicle

FORMAT: 2 columns, numeric, beginning column 74

ELEMENT VALUES: __ __ -- Code actual value
                 99 Unknown

SOURCE: Inspection

REMARKS: Count and record the total number of occupant spaces in the vehicle. See variable 63 for a definition of occupant space.

VARIABLE GROUP: Intrusion

VARIABLE NAME: 61. Total Number of Intrusions

FORMAT: 2 columns, numeric, beginning column 76

ELEMENT VALUES: __ __ -- Code actual value
                  99 Unknown

SOURCE: Total from Intrusion Matrix, Column A

REMARKS: Give the total number of intrusions.

This number can be equal to or greater than the number documented in the 12-row matrix.

VARIABLE GROUP: Intrusion

VARIABLE NAME: 62. Intruding Component

FORMAT: 2 columns, numeric, card no. 2, beginning column 11

ELEMENT VALUES: Column A: Intruding Component** Codes for intruded area(s)
               or component(s).

                01 Window frame

                02 A pillar--upper

                03 A pillar--lower

                04 B pillar--upper

                05 B pillar--lower

                06 C pillar--upper

                07 C pillar--lower

                08 D pillar--upper

                09 D pillar--lower

                10 Door panel or side panel--includes all hardware

                97 Other side component--(specify)_____

                98 Not applicable

                99 Unknown

SOURCE: Inspection

REMARKS: The roof rail is not a side component. The door panel and side panel are inclusive. The various hardware components should not be listed separately.

*Also variables 71, 80, 89, 98, 107, 116, 125, 134, 143, 152, 161
**See variable 52 for definition of internal side surface.

33

VARIABLE GROUP: Intrusion

VARIABLE NAME: 63. Occupant Space Intruded

FORMAT: 2 columns, numeric, beginning column 13

ELEMENT VALUES: Column B: Occupant Space Intruded A two-digit code denotes occupant seat space. The first digit (left digit) denotes the seat row, with code values from 1-5. The second digit (right digit) denotes the position on the seat and (in some instances) the width of the seat.

Second Digit Codes:

Seat Type	Code Value	
Individual seat (bucket)	1	Left
	3	Right
Bench: full width 3 passenger	1	Left, 2 Center
	3	Right
Bench: full width 4 passenger	1	Left, 2 L. center,
	6	R. center, 3 Right
Bench: partial width --left justified	1	Left, 2 Center,
	5	Right + aisle space
Bench: partial width --centered	0	L.+space, 2 Center,
	5	R.+space
Cargo area	4	Entire vehicle width

SOURCE: Inspection

REMARKS: An individual occupant space is that space (volume) defined by the manufacturer for the seating of an adult occupant and normally available to the occupant.   The boundary surfaces are the six planes defined by the appropriate combinations of the following undeformed surfaces: (1) the interior side(s) of the vehicle; (2) a vertical plane parallel to the longitudinal axis of the vehicle extending upwards at the boundary between manufacturer designated seating positions; (3) the headliner (or interior roof surface); (4) the seatback surface and cushion surface (including cushion edges); (5) the seat-

---

*Also variables 72, 81, 90, 99, 108, 117, 126, 135, 144, 153, 162

back surface (extended to the headliner); (6) the instrument-panel surface,
windshield, cowl surface and toe pan surface; (7) the floor-pan surface; (8)
the rear surface (back panels/back door surface).

In general the entire interior volume of the vehicle is divided into
occupant spaces whose sum equals the total interior volume. Thus an intrusion
into the vehicle anywhere on a side surface intrudes into some occupant
space.
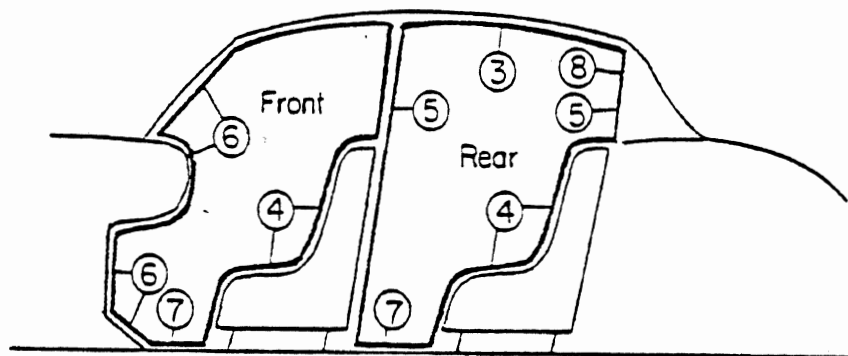
OCCUPANT SPACE BOUNDARIES IN A PASSENGER VEHICLE

This cargo area is: (1) the seat row vacant because the seats have
been removed; or (2) the area behind the last row of seats, normally de-
signated and/or designed by the manufacturer for cargo, which is integral
with the passenger compartment.

Examples of Occupant Space Numbering.

Passenger Car--5 passengers

```
11        13    | X    X |
21   22   23    | X X X |
```

Van--12 passenger capacity

```
11           13    | X       X |
21   22   25       | X X X     |
31   32   35       | X X X     |
41   42   46   43  | X X X X |
```

35

VARIABLE GROUP: Intrusion

VARIABLE NAME: 64. Associated Impact

FORMAT: 1 column, numeric, beginning column 15

ELEMENT VALUES: Column C: Associated Impact   Code relevant impact from the
                  bottom of page 3 of the CSS VEHICLE FORM as follows:

   1 Most severe impact (V15)

   2 Secondary impact (V22)

   3 Other recorded impact (i.e., remaining CDC's
      from top of page 3)

   4 Other impact (not recorded on page 3)

   9 Unknown impact

SOURCE: Inspection

REMARKS: Determine, if possible, which impact caused the intrusion and code
according to the element values given above. NOTE: The CDC's at the top of
page 3 are not coded directly and hence this coding scheme is necessary.

*Also variables 73, 82, 91, 100, 109, 118, 127, 136, 145, 154, 163

VARIABLE GROUP: Intrusion

VARIABLE NAME: 65. Number of Occupant Spaces in Seat Row

FORMAT: 1 column, numeric, beginning column 16

ELEMENT VALUES: <u>Column D: Number of Occupant Spaces in Seat Row</u>

    2 Two occupant spaces

    3 Three occupant spaces

    4 Four occupant spaces

    9 Unknown

SOURCE: Inspection

REMARKS: A count of occupant spaces in the seat row. See variable 63 for definition of Occupant Space.

*Also variables 74, 83, 92, 101, 110, 119, 128, 137, 146, 155, 164

VARIABLE GROUP: Intrusion

VARIABLE NAME: 66. Amount of Intrusion*

FORMAT: 2 columns, numeric, beginning column 17

ELEMENT VALUES: <u>Column E: Amount of Intrusion</u>
            .(NOTE: Measured laterally in inches.)

    __ __   Code actual value

    99 Unknown

SOURCE: Inspection

REMARKS: Measure laterally the maximum amount of intrusion of <u>each</u> occupant space.

*Also variables 75, 84, 93, 102, 111, 120, 129, 138, 147, 156, 164

VARIABLE GROUP: Intrusion

VARIABLE NAME: 67. Occupant Space Reduction*

FORMAT: 1 column, numeric, beginning column 19

ELEMENT VALUES: Column F: Occupant Space Reduction

      1 No reduction

      2 Up to 25 percent

      3 25 percent to 50 percent

      4 Greater than 50 percent

      9 Unknown reduction

SOURCE: Inspection

REMARKS: Estimate the amount of reduction in each occupant space resulting from the intrusion. While this is a guesstimate, the measured intrusion divided by the original width of the space should yield an accurate value. It is not required that the original dimension be ascertained, but this may be helpful.

*Also variables 76, 85, 94, 103, 112, 121, 130, 139, 148, 157, 166

VARIABLE GROUP: Intrusion

VARIABLE NAME: 68. Contacted by Occupant Number *

FORMAT: 2 columns, numeric, beginning column 20

ELEMENT VALUES: <u>Column G: Contacted by Occupant Number</u>

      00 No contact

  __ __ Number of the occupant contacting the intrusion--use occupant number from CSS OCCUPANT FORM, page 1, variable 007

      97 Contacted, occupant unknown

      98 Not applicable (vehicle not occupied)

      99 Unknown if contacted

SOURCE: Inspection

        Injury Data

REMARKS: If the intrusion was not contacted by any occupant, code "00 No Contact." If the vehicle was unoccupied at the time of the crash, code "98 Not Applicable." If an occupant contacted (or is suspected of having contacted) an intrusion, code his occupant number as per above. In this scheme, only one occupant can contact an intrusion in an occupant space and be recorded on the data form. The same intruding component can intrude into more than one space, hence multiple intrusions are possible and multiple contacts are permitted--provided the contacts occur in different occupant spaces.

The contacting occupant need not necessarily have been an occupant of the associated space.

*Also variables 77, 86, 95, 104, 113, 122, 131, 140, 149, 158, 167

VARIABLE GROUP: Intrusion

VARIABLE NAME: 69.   Associated Injury #1.   CSS Row No.*
                  70.   Associated Injury #2.   CSS Row No.*

FORMAT: 1 x 2 columns, numeric, beginning column 22

ELEMENT VALUES: Column H: Associated Injury #1.-CSS Row No.
                  Column I: Associated Injury #2.-CSS Row No.
                    Code the injury (if injured) associated with the specific
                    intrusion described on this line.

                  0   No injury

                1-6   Injury row number as listed at the bottom of page 7 of
                        the CSS OCCUPANT FORM

                  7   Other (unlisted) injury

                  8   Not applicable (vehicle not occupied)

                  9   Unknown if injured or unknown injury number

SOURCE: Inspection

          Injury Data

REMARKS: If the occupant contact number (Column G) was "00 No injury", in-
dicating no contact, there can be no injury. An occupant can contact an
intrusion and not be injured. If there was injury, up to two injuries can be
listed (Columns H and I) for the contacting occupant. Code injuries that
had the highest probability of resulting from the intrusion.

*Also variables 78, 79, 87, 88, 96, 97, 105, 106, 114, 115, 123, 124, 132,
133

9. FIELD DATA FORM

The field data form is reproduced here for reference purposes.

SIDE INTRUSION FORM

1. Primary Sampling Unit Number

    ___ ___
     1   2

2. Case Number

    ___ ___ ___ ___
     3   4   5   6

3. Special Study Number

    0   4
    ___ ___
     7   8

4. Record Number

    3
    ___
     9

5. Card Number

    1
    ___
    10

6. Vehicle Number

    ___ ___
    11 12

LOWER SIDE SURFACE ASSESSMENT

When To Use This Form: Complete this form whenever an external crushing force has been applied to the side surface of the vehicle as a result of a side contact. The force can be from any direction but must crush the exterior side skin inward.

Photographic Instructions:

[Internal]--Photograph each side surface intrusion. Take at least 2 views, so as to best depict the location and magnitude of the intrusion.

[External]--Photograph each side surface zone where the side surface was contacted by a crushing force. Take at least 2 views, so as to best depict the location and magnitude of the crush.

Side Surface Zones
(NOTE: Indicate which component is located in each zone to make up the side surface.)

7. 8. 9. 10. 11. 12.

Front		Back		Rear		Zone:
L	R	L	R	L	R	L=Left, R=Right
___	___	___	___	___	___	(1) Door
___	___	___	___	___	___	(2) Panel
___	___	___	___	___	___	(8) Not an applicable side surface
___	___	___	___	___	___	(9) Unknown

FL FR BL BR RL RR
-- -- -- -- -- --

13 14 15 16 17 18

Side Surface Defined: The side surface of the vehicle is defined as the area extending from the A-pillar to the last passenger compartment pillar and from the bottom edge of the door sill/rocker panel (extended) to the belt line. Window glass and upper pillars are not included in this area. The side surface consists of up to three zones (depending upon the vehicle) defined as: (1) front--the areas between the A and B pillars, (2) back--the area between the B and C pillars, and (3) rear-- the area between the C and D pillars.

CRUSHING FORCE

13. Angle of Intersecting Longitudinal Axes
(NOTE: Record the forward longitudinal axis of the other vehicle relative to the forward longitudinal axis of this vehicle at the moment of the initial collision between the two. The forward longitudinal axis of the other vehicle is to be measured clockwise from the forward longitudinal axis of this vehicle. This value is equal to the algebraic difference between the heading angles of the two vehicles.)

_____ degrees -- Code to nearest ten degrees.
___ (500) Vehicle-object contact
___ (999) Unknown

19 20 21
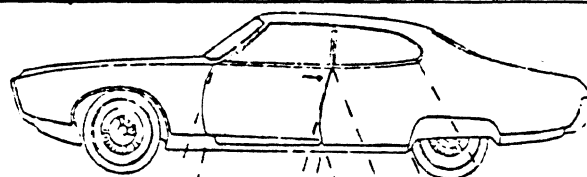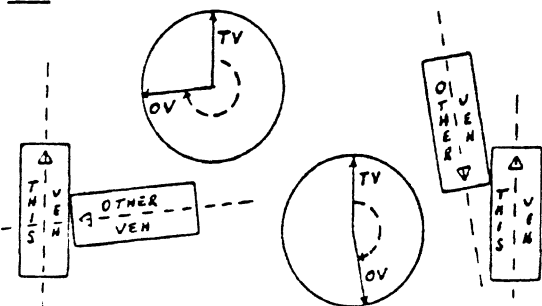
Which Zones Were Contacted by a Crushing Force

14. 15. 16. 17. 18. 19.

Front		Back		Rear		Zone:	
L	R	L	R	L	R	Side:	L=Left, R=Right
___	___	___	___	___	___	(1) Contacted	
___	___	___	___	___	___	(2) Not contacted	
___	___	___	___	___	___	(8) Not applicable, not a side surface	
___	___	___	___	___	___	(9) Unknown if contacted	

FL FR BL BR RL RR
-- -- -- -- -- --

22 23 24 25 26 27

Location of the Center of the Crushing
Force in Each Side Zone Contacted

20. 21. 22. 23. 24. 25.

Front		Back		Rear		Zone:
L	R	L	R	L	R	Side: L=Left, R=Right
---	---	---	---	---	---	
						(11-43) Center of crush
___	___	___	___	___	___	[preceding page]*
						(55) Crush distributed
						over all of zone
						[no crush center
						possible]
___	___	___	___	___	___	(98) Not applicable, no
						side surface zone,
						or not damaged
___	___	___	___	___	___	(99) Unknown center

* Select from the table on the preceding page
  the value most representative of the center
  of crush.

FL	FR	BL	BR	RL	RR
_____	_____	_____	_____	_____	_____

28 29 30 31 32 33 34 35 36 37 38 39

Depth of Crush to Each Zone

26. 27. 28. 29. 30. 31.

Front		Back		Rear		Zone:
L	R	L	R	L	R	Side: L=Left, R=Right
---	---	---	---	---	---	
						(1) 0-2 inches
___	___	___	___	___	___	(2) >2-4 inches
___	___	___	___	___	___	(3) >4-6 inches
___	___	___	___	___	___	(4) >6-8 inches
___	___	___	___	___	___	(5) >8 inches
___	___	___	___	___	___	(8) Not applicable, no
___	___	___	___	___	___	contact or no side
						surface
___	___	___	___	___	___	(9) Unknown

FL	FR	BL	BR	RL	RR
--	--	--	--	--	--

40 41 42 43 44 45

COMPONENT DAMAGE

In addition to the damage described above, were
any structural/hardware components contacted or
damaged? [NOTE: Contact and damage (direct
and induced) must result from a direct applica-
tion of a crushing force to the side surface
between the A-pillar and the last pillar of
the vehicle.]

Component Damage CODES
----

(1) Not damaged
(2) Direct damage, no separation*
(3) Direct damage, separation*
(4) Indirect damage, no separation*
(5) Indirect damage, separation*
(8) Not applicable [not equipped]
(9) Unknown
* Separation must be complete.

Structural Contact

32. 33. 34. 35. 36. 37. 38. 39.

Left Side				Right Side				Pillar:
A	B	C	D	A	B	C	D	
---	---	---	---	---	---	---	---	
__	__	__	__	__	__	__	__	(1)
__	__	__	__	__	__	__	__	(2)
__	__	__	__	__	__	__	__	(3) See
__	__	__	__	__	__	__	__	(4) Codes
__	__	__	__	__	__	__	__	(5) Below
__	__	__	__	__	__	__	__	(8)
__	__	__	__	__	__	__	__	(9)

LA	LB	LC	LD	RA	RB	RC	RD
--	--	--	--	--	--	--	--

46 47 48 49 50 51 52 53

Component Damage CODES
----

(1) Not damaged
(2) Direct damage, no separation*
(3) Direct damage, separation*
(4) Indirect damage, no separation*
(5) Indirect damage, separation*
(8) Not applicable [not equipped]
(9) Unknown
* Separation must be complete.

Left Door Hardware Contact

40. 41. 42. 43. 44. 45.

Latch/						
Striker		Hinges		Sill		
F	B	F	B	F	B	Zone:
---	---	---	---	---	---	
__	__	__	__	__	__	(1)
__	__	__	__	__	__	(2)
__	__	__	__	__	__	(3) See
__	__	__	__	__	__	(4) Codes
__	__	__	__	__	__	(5) Above
__	__	__	__	__	__	(8)
__	__	__	__	__	__	(9)

LF	LB	HF	HB	SF	SB
--	--	--	--	--	--

54 55 56 57 58 59

Right Door Hardware Contact

46. 47. 48. 49. 50. 51.

Latch/						
Striker		Hinges		Sill		
F	B	F	B	F	B	Zone:
---	---	---	---	---	---	
__	__	__	__	__	__	(1)
__	__	__	__	__	__	(2) See
__	__	__	__	__	__	(3) Codes
__	__	__	__	__	__	(4) Above
__	__	__	__	__	__	(5) or
__	__	__	__	__	__	(8) Adjacent
__	__	__	__	__	__	(9)

LF	LB	HF	HB	SF	SB
--	--	--	--	--	--

60 61 62 63 64 65

I N T R U S I O N

Intrusion Defined: Intrusion results whenever the internal boundary (surface) of the passenger compartment is moved inward due to direct damage resulting from the application of a crushing force as applied to the exterior surfaces of the vehicle.

Internal Side Surface: For the purposes of intrusion, the inner side surface extends from the inner door sill to the top of the upper window frame or top edge of the side glass. The roof rail is **NOT** included.

Zone(s) in which Intrusion(s) Occurred
(NOTE: Zones were specified in Q 7-12.)

54. 55. 56. 57. 58. 59.

Front		Back		Rear		Zone:
L	R	L	R	L	R	Side: L=Left, R=Right
---	---	---	---	---	---	
—	—	—	—	—	—	(1) Intrusion
—	—	—	—	—	—	(2) No intrusion
—	—	—	—	—	—	(8) Not applicable, no side zone
—	—	—	—	—	—	(9) Unknown

FL FR BL BR RL RR
-- -- -- -- -- --

68 69 70 71 72 73

---

52. Did Intrusion of the Internal Side Surface Result from the Side Crushing Force

___(1) Yes
___(2) No   } STOP! Complete external
___(9) Unknown   } photographs only.
                                          66

53. Was There Catastrophic Intrusion Into the Passenger Compartment by the Side Surface.

___(1) Yes*
___(2) No -- continue!
___(9) Unknown*
* STOP! Complete both internal   67
and external photographs.

60. Number of Occupant Spaces in Vehicle

_____ -- Code actual value.
___(99) Unknown
                                          74 75

61. Total Number of Intrusions
(NOTE: This number can be greater than or equal to the number documented below.)

_____ -- Code actual value.
___(99) Unknown
                                          76 77

Code intrusions from left to right, front to rear starting with Occupant Space #11.

Col:	-A- Intruding Component	-B- Occupant Space Intruded	-C- Associated Impact	-D- Number of Occupant Spaces in Seat Row	-E- Amount of Intrusion (inches)	-F- Occupant Space Reduction	-G- Contacted by Occupant Number:	-H- Associated Injury #1. CSS Row No	-I- Associated Injury #2. CSS Row No
1 2°	62.__ 10	63.__ __ 11 12	64.__ 13 14	65.__ 15	66.__ __ 16	67.__ 17 18	68.__ __ 19	69.__ 20 21	70.__ 22 / 23
2	71.__ __ 24 25	72.__ __ 26 27	73.__ 28	74.__ 29	75.__ __ 30 31	76.__ 32	77.__ __ 33 34	78.__ 35	79.__ 36
3	80.__ __ 37 38	81.__ __ 39 40	82.__ 41	83.__ 42	84.__ __ 43 44	85.__ 45	86.__ __ 46 47	87.__ 48	88.__ 49
4	89.__ __ 50 51	90.__ __ 52 53	91.__ 54	92.__ 55	93.__ __ 56 57	94.__ 58	95.__ __ 59 60	96.__ 61	97.__ 62
5	98.__ __ 63 64	99.__ __ 65 66	100.__ 67	101.__ 68	102.__ __ 69 70	103.__ 71	104.__ __ 72 73	105.__ 74	106.__ 75
6 3°	107.__ __ 10 11 12	108.__ __ 13 14	109.__ 15	110.__ 16	111.__ __ 17 18	112.__ 19	113.__ __ 20 21	114.__ 22	115.__ 23
7	116.__ __ 24 25	117.__ __ 26 27	118.__ 28	119.__ 29	120.__ __ 30 31	121.__ 32	122.__ __ 33 34	123.__ 35	124.__ 36
8	125.__ __ 37 38	126.__ __ 39 40	127.__ 41	128.__ 42	129.__ __ 43 44	130.__ 45	131.__ __ 46 47	132.__ 48	133.__ 49
9	134.__ __ 50 51	135.__ __ 52 53	136.__ 54	137.__ 55	138.__ __ 56 57	139.__ 58	140.__ __ 59 60	141.__ 61	142.__ 62
10	143.__ __ 63 64	144.__ __ 65 66	145.__ 67	146.__ 68	147.__ __ 69 70	148.__ 71	149.__ __ 72 73	150.__ 74	151.__ 75
11 4°	152.__ __ 10 11 12	153.__ __ 13 14	154.__ 15	155.__ 16	156.__ __ 17 18	157.__ 19	158.__ __ 20 21	159.__ 22	160.__ 23
12	161.__ __ 24 25	162.__ __ 26 27	163.__ 28	164.__ 29	165.__ __ 30 31	166.__ 32	167.__ __ 33 34	168.__ 35	169.__ 36

°Duplicate columns 1-9, GO TO Card Number: _____   *Intrusion and reduction are measured laterally.

Column A: Intruding Component Codes for in-
   truded area(s) or component(s).
(01) Window frame
(02) A pillar--upper
(03) A pillar--lower
(04) B pillar--upper
(05) B pillar--lower
(06) C pillar--upper
(07) C pillar--lower
(08) D pillar--upper
(09) D pillar--lower
(10) Door panel or side panel--includes all
     hardware
(97) Other side component--[specify]

(98) Not applicable
(99) Unknown

Column B: Occupant Space Intruded A two digit
   code denotes occupant seat space. The first
   digit (left digit) denotes the seat row,
   with code values from 1-5. The second digit
   (right digit) denotes the position on the
   seat and (in some instances) the width of
   the seat.

Second Digit Codes:
Seat Type	Code Value
Individual seat	(1) Left,
(bucket)	(3) Right
Bench: full width 3	(1) Left,(2) Center,
passenger	(3) Right
Bench: full width 4	(1) Left,(2) L. center,
passenger	(6) R. center,(3) Right
Bench: partial width	(1) Left,(2) Center,
--left justified	(5) Right + aisle space
Bench: partial width	(0) L.+space,(2) Center,
--centered	(5) R.+space
Cargo area	(4) Entire vehicle width

Example: Passenger Car--5 passengers

        11   13 | X   X |
        21 22 23 | X X X |

Example: Van--12 passenger capacity

        11   13 | X   X |
        21 22 25 | X X X |
        31 32 35 | X X X |
        41 42 46 43 | X X X X |

Column C: Associated Impact Code relevant
   impact from the bottom of page 3 of the CSS
   VEHICLE FORM as follows:
(1) Most severe impact [V15]
(2) Secondary impact [V22]
(3) Other recorded impact [i.e., remaining
    CDC's from top of page 3]
(4) Other impact [not recorded on page 3]
(9) Unknown impact

Column D: Number of Occupant Spaces in Seat
   Row

(2) Two occupant spaces
(3) Three occupant spaces
(4) Four occupant spaces
(9) Unknown

Column E: Amount of Intrusion
   (NOTE: Measured laterally in inches.)

-- Code actual value
(99) Unknown

Column F: Occupant Space Reduction

(1) No reduction
(2) Up to 25 percent
(3) 25 percent to 50 percent
(4) Greater than 50 percent
(9) Unknown reduction

Column G: Contacted by Occupant Number:

(00) No contact
-- Number of the occupant contacting the
    intrusion--use occupant number from CSS
    OCCUPANT FORM, page 1, variable 007
(97) Contacted, occupant unknown
(98) Not applicable [vehicle not occupied]
(99) Unknown if contacted

Column H: Associated Injury #1.-CSS Row No
Column I: Associated Injury #2.-CSS Row No
   Code the injury (if injured) associated with
   the specific intrusion described on this
   line.
(0) No injury
(1-6) Injury row number as listed at the bottom
    of page 7 of the CSS OCCUPANT FORM
(7) Other [unlisted] injury
(8) Not applicable [vehicle not occupied]
(9) Unknown if injured or unknown injury number