The Inspection Selection System with Driver Conviction Data (ISS-D)

The Inspection Selection System (ISS) is a decision-aid for commercial vehicle roadside driver/vehicle safety inspections which guides safety inspectors in selecting vehicles for inspection. The ISS provides a three tiered recommendation as follows:

Recommendation	ISS Inspection Value
Inspect (inspection warranted)	75-100
Optional (may be worth a look)	50-74
Pass (inspection not warranted)	1-49

The underlying inspection value is based on data analysis of the motor carrier's safety performance record using information from FMCSA's Motor Carrier Management Information System (MCMIS). This **safety algorithm** for assigning the inspection value is described in the next pages. It is primarily based on SafeStat with an additional carrier-driver-conviction measure. SafeStat ranks all carriers by their safety performance in areas of crash history, inspection history, driver history, and safety management experience. A full description of SafeStat can be found at:

> SafeStat, Motor Carrier Safety Status Measurement System, Methodology: Version 8.6, January 2004, FMCSA, U.S. Dept of Transportation. Available at:
> http://ai.fmcsa.dot.gov/CarrierResearchResults/PDFs/SafeStat_method.pdf

In the case of motor carriers for which there is little information on file, the ISS determines the inspection value by weighing the carrier size and number of past inspections. This is called the **insufficient data algorithm** and is also explained in detail in the following pages. The underlying concept is to encourage inspections when there is little carrier history or past inspections. As the inspection data increases, the inspection value decreases and eventually the carrier will move into SafeStat and be monitored via safety performance as described above.

In ISS, all carriers have an inspection value. When the inspection value is displayed, there is an accompanying message that states whether the inspection value is based on SafeStat data or lack of safety performance data.

As an application, ISS also provides a great deal of current carrier specific information which is easily accessed by US DOT number, MC/MX number, State number, or carrier legal or DBA name. ISS works with intrastate carriers who have been assigned a US DOT number or if states supply the carrier data.

For a detailed analysis of the statistical success of ISS and ISS-D in optimizing inspection resources and maximizing the risk reduction potential of roadside inspections, please refer to the following reports:

> Integration of the Motor Carrier Safety Status Measurement System into the Roadside Inspection Selection System, Transportation Research Record, Journal of the Transportation Research Board, No. 1734, 2000.
> Report also available at: http://www.ugpti.org/tssc/projects/mcp005.php
>
> Development and Implementation of a Driver Safety History Indicator into the Roadside Inspection Selection System, Transportation Research Record, Journal of the Transportation Research Board, No. 1969, 2006.
> Report also available at: http://www.ugpti.org/tssc/projects/drivesafe.php

The ISS-D Safety Algorithm

The **Safety Algorithm** for ISS-D is calculated as follows:

(1)   Calculate the ISS Safety Management Safety Evaluation Area (SEA) value using the following steps:

- Associate drivers with carriers based on inspection and crash reports in the prior year.

- Based on the event date of the inspection or crash report, calculate a driver conviction measure (DCM) using driving convictions three (3) years prior to the event date as follows:
> - Separate the conviction data into three time periods based on the age of each conviction: 0 to 6 months before the event date (time weight=3), 7 to 18 months before the event date (time weight=2), and 19 to 36 months before the event date (time weight=1).
> - Within each time period, weight disqualifying convictions by three (3), serious convictions by two (2), and all other driving convictions by one (1), and sum the severity scores.
> - Time weight the severity scores for the three time periods so that the most recent convictions receive the most weight, and then sum the weighted scores for all three periods to arrive at the DCM.

- Calculate a carrier-driver-conviction measure (CDCM) by taking the mean (average) of all the carrier's DCMs (sum of the DCMs divided by the number of drivers associated with the carrier).

If the number of convictions assigned to the carrier < 2, then do not use
If the number of convictions assigned to the carrier = 2-3, then = group 1
If the number of convictions assigned to the carrier = 4-6, then = group 2
If the number of convictions assigned to the carrier = 7-14, then = group 3
If the number of convictions assigned to the carrier > 14, then = group 4

- For each group, rank CDCM values and transform into percentiles (0-100) to arrive at the carrier-driver-conviction indicator (CDCI). Use the <u>higher</u> of this CDCI indicator and the carrier's current SafeStat Safety Management SEA value as the new ISS Safety Management SEA value.

(2)   All carriers are placed in categories and groups based on their score in each Safety Evaluation Area (SEA) similar to those used by SafeStat (see Table 1). Note that the groups use the carrier's *applicable highest* SEA values.

(3)   Within each group 1 through 11 and 16 through 26, the carrier's SEA indicators are summed placing two (2) times as much weight on the Accident SEA and 1.5 times as much weight on the Driver SEA if applicable.

(4)   For groups 12, 13, 14, 15, 28, 29, 30, 43, 44, and 45, the "sum" is simply the SEA value (the only one applicable).

(5)   For groups 27 and 42 (with an Accident SEA value <75 AND no other value in any other SEA), they are placed in category I (with group 46)

(6)   For groups 31 through 41, the *maximum* of the Accident, Driver, Vehicle, and/or ISS Safety Management SEA is used (for example, if a carrier received a Driver SEA of 49, a Vehicle SEA of 35, and an Accident SEA of 20, the value 49 is used as the "sum").

(7)   Starting with category A, all carriers are ranked based on their sum, and then category B carriers are ranked based on their sum, continuing the ranking down through category F.

Note that these rankings (for categories A through F) are then assigned percentile ranks from 75 to 100.

(8)   The remaining G and H categories are combined and ranked all together. However, category G (group 15) carriers should be ranked higher than all category H carriers.

Note that these rankings (for categories G and H) are then assigned percentile ranks from 1 to 74.

These percentile ranks (for all categories) then become the Safety ISS-D inspection value.

Table 1. Groups and ISS-D Value Range

Category	Group	SEA Values	ISS-D Value Range
A	1	Acc≥75, Drv≥75, Veh≥75, ISS Saf≥75	100
SafeStat score:	2	Acc≥75, Drv≥75, Veh≥75	100
≥ 350 to ≤ 550	3	Acc≥75, Drv≥75, ISS Saf≥75	100
	4	Acc≥75, Veh≥75, ISS Saf≥75	99-100
B	5	Drv≥75, Veh≥75, ISS Saf≥75	97-100
SafeStat score:	6	Acc≥75, Drv≥75	98-100
≥ 225 to < 350	7	Acc≥75, Veh≥75	97-99
	8	Acc≥75, ISS Saf≥75	95-99
B or C	9	Drv≥75, Veh≥75	95-98
B or C	10	Drv≥75, ISS Saf≥75	93-98
C	11	Veh≥75, ISS Saf≥75	86-96
SafeStat score:			
≥ 150 to < 225			
D	12	Acc≥75	93-95
E	13	Drv≥75	87-93
F	14	Veh≥75	75-86
G	15	ISS Saf≥75	69-74

(continued)

Table 1. Groups and ISS-D Value Range (continued)

Category	Group	SEA Values	ISS-D Value Range
H	16	50≤Acc<75, 50≤Drv<75, 50≤Veh<75, 50≤ISS Saf<75	69
	17	50≤Acc<75, 50≤Drv<75, 50≤Veh<75	68-69
	18	50≤Acc<75, 50≤Drv<75, 50≤ISS Saf<75	68-69
	19	50≤Acc<75, 50≤Veh<75, 50≤ISS Saf<75	67-69
	20	50≤Drv<75, 50≤Veh<75, 50≤ISS Saf<75	65-69
	21	50≤Acc<75, 50≤Drv<75	64-69
	22	50≤Acc<75, 50≤Veh<75	61-68
	23	50≤Acc<75, 50≤ISS Saf<75	61-68
	24	50≤Drv<75, 50≤Veh<75	59-67
	25	50≤Drv<75, 50≤ISS Saf<75	59-67
	26	50≤Veh<75, 50≤ISS Saf<75	59-60
	28	50≤Drv<75	32-59
	29	50≤Veh<75	32-59
	30	50≤ISS Saf<75	32-59
	31	0<Acc<75, 0≤Drv<50, 0≤Veh<50, 0≤ISS Saf<50	20-59
	32	0<Acc<75, 0≤Drv<50, 0≤Veh<50	20-59
	33	0<Acc<75, 0≤Drv<50, 0≤ISS Saf<50	20-45
	34	0<Acc<75, 0≤Veh<50, 0≤ISS Saf<50	22-25
	35	0≤Drv<50, 0≤Veh<50, 0≤ISS Saf<50	10-32
	36	0<Acc<75, 0≤Drv<50	20-59
	37	0<Acc<75, 0≤Veh<50	20-53
	38	0<Acc<75, 0≤ISS Saf<50	-
	39	0≤Drv<50, 0≤Veh<50	10-32
	40	0≤Drv<50, 0≤ISS Saf<50	20-32
	41	0≤Veh<50, 0≤ISS Saf<50	22-25
	43	0≤Drv<50	10-23
	44	0≤Veh<50	10-31
	45	0≤ISS Saf<50	-
I	27	50≤Acc<75 AND no SEA value in any other SEA	50-100
	42	0≤Acc<50 AND no SEA value in any other SEA	50-100
	46	No SEA value in any SEA	50-100

The ISS Insufficient Data Algorithm

The **Insufficient Data** Algorithm for ISS is calculated as follows:

Only if a carrier does not receive a score from the Safety Algorithm (Category I):

All data is based on the past 30 months.

Case 1: *If a carrier has zero (0) roadside inspections (Level I, II, III, or V),* an ISS value is assigned based only on their size as follows:

Category				ISS Value
1001+ power units	OR	1001+ drivers	=	100
201-1000 power units	OR	201-1000 drivers	=	99
64-200 power units	OR	72-200 drivers	=	98
16-63 power units	OR	16-71 drivers	=	97
7-15 power units	OR	6-15 drivers	=	96
2-6 power units	OR	2-5 drivers	=	95
1 power unit	OR	1 driver	=	94

(1)   The carrier is assigned the *higher* of their values. For example, if a carrier has 75 power units (ISS value=98) and 50 drivers (ISS value=97), they would receive a final ISS value of 98.

(2)   *If there is neither power unit information nor driver information,* the carrier is assigned the midpoint ISS value of 97.

Case 2: *For carriers with one or more previous roadside inspections,* their Inspection per Power Unit Rate, their Inspection per Driver Rate, and subsequent Inspection Average Rate is determined as follows and ranked from 50 to 100.

(1)   The <u>Inspection per Power Unit Rate</u> is determined by dividing the number of <u>Level 1, 2 and 5</u> inspections the carrier has had in the previous 30 months by the number of power units they indicate.

(2)   The <u>Inspection per Driver Rate</u> is determined by dividing the number of <u>Level 1, 2, and 3</u> inspections the carrier has had in the previous 30 months by the number of drivers they indicate.

(3)   The **Inspection Average Rate** is then the average of these two rates (the Inspection per Power Unit Rate and the Inspection per Driver Rate). *If one of the rates is unable to be determined (because of no power unit or driver information), the Inspection Average Rate is simply the rate which can be determined.*

(4)   Using these Inspection Average Rates, a ranking of 50 to 100 is assigned to the carriers (the *lowest* Inspection Average Rates receive the highest rankings), which then becomes these carriers' ISS values.

- If there is no size information available to calculate the Inspection Average Rate (but, the carrier does have at least one inspection), the ISS value is simply the arbitrary value, 92.

Thus, ALL carriers have a Safety ISS-D value OR an Insufficient Data ISS value.