FRICTION TESTING – KJ LAW (DYNATEST) SKID TRAILER

General Description

Pavement surface friction is regarded as an indicator of safety of vehicles on highways because it is a measure of the force that resists sliding of vehicles tires on a pavement. Friction resistance is the force developed when a tire that is prevented from rotating slides along the surface of the pavement. Although friction resistance is often thought of as a pavement property, it is actually a property of both the pavement surface characteristics and the vehicle tires.

Figure 1. KJ Law (Dynatest) Skid Trailer

The friction of most dry pavements is high. Wet pavements are the problem. Thus, the Friction Number testing process involves application of water to the pavement surface prior to determination of the friction value. Such data allows Mn/DOT to identify potential low friction pavements that in conjunction with accident history and roadway geometrics are used to minimize wet weather skidding accidents.

COLLECTION FREQUENCY

Surface friction is measured at MnROAD at regular intervals, typically twice per year (spring and fall).

Specifications

ASTM E-867, “Standard Terminology Relating to Traveled Surface Characteristics,” defines friction resistance as “the ability of the traveled surface to prevent the loss of traction."

Mn/DOT uses a KJ Law (Dynatest) 1295 Pavement Friction Tester to conduct testing according to ASTM-E274, "Specification For Skid Resistance Using A Full Scale Tire."

Field Data Collection Process

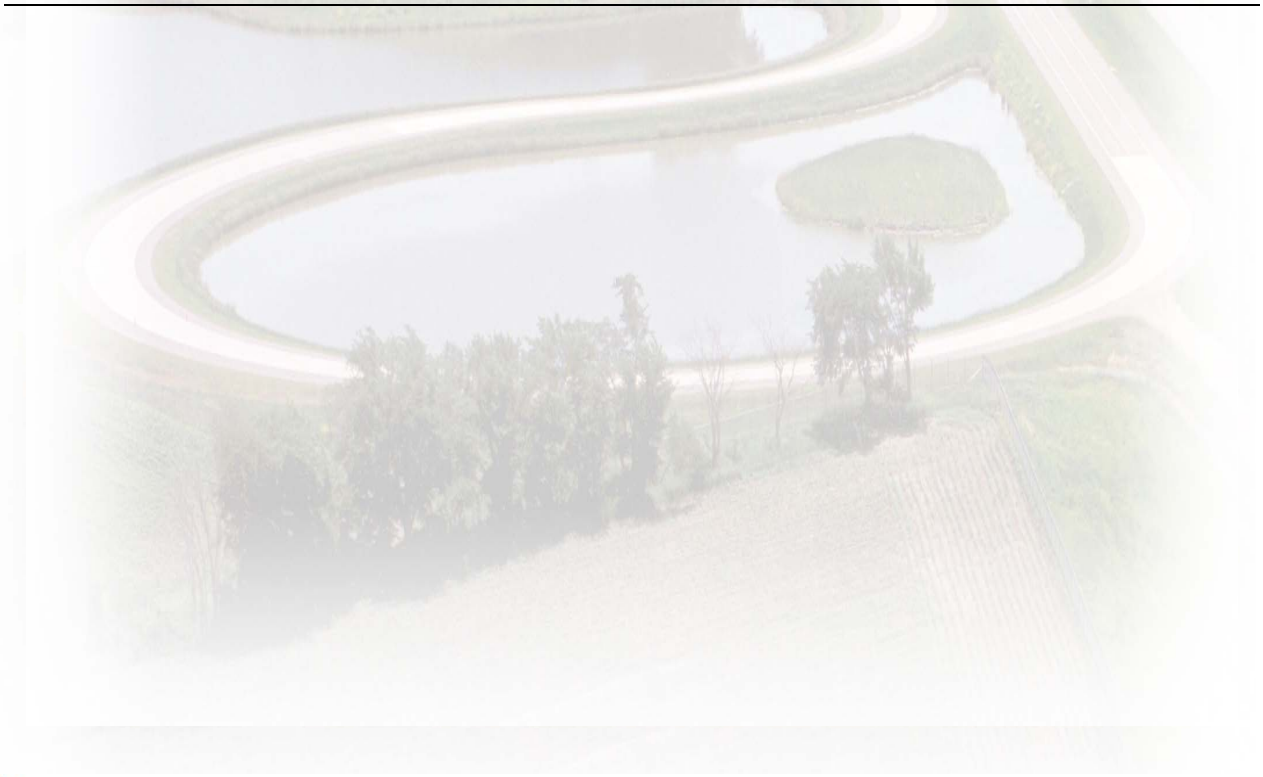
Upon arriving at MnROAD, the skid testing technician will fill up the water tank on his/her truck via the well by the polebarn. The technician will then drive out to the Mainline or the Low Volume Road and make a dry run along the road to make other researches aware that testing will begin shortly. The

technician will find a smooth spot on the pavement to calibrate his equipment and set up the software. The software setup includes inputting the proper location (i.e., LVR Inside), tire type (i.e., ribbed), and starting location (i.e., Cell 54 to 40).

It will take four runs to complete an entire testing sequence on each roadway: 2 lanes and 2 tire types. The smooth tire travels in the right wheelpath, and the ribbed tire travels in the left wheelpath. Testing on the Mainline starts at Cell 23 and progresses west to Cell 1. Testing on the Low Volume Road starts at Cell 54 and progresses clockwise around the loop to Cell 40 (inside lane), or from Cell 40 counterclockwise around to Cell 54 (outside lane). The concrete loops on either end (Cell 41-46) are not typically tested.

The technician's role is to safely drive the skid truck at a constant speed of 40 mph throughout each test run. A second person rides along in the truck (typically the engineer in charge of monitoring), and his role is to actually collect the skid data on each cell. This is done by manually clicking a button at each cell to initiate each test. The trailer will spray water under the selected tire, lock the wheel, and measure the vertical and horizontal forces imparted by the pavement. Each test takes approximately 200 ft, so the engineer is challenged to accurately collect data on each cell, especially cells shorter than 500 ft. Where possible, the engineer starts a test near the middle of each cell and away from any patch or distress that could negatively affect the test.

When testing in complete for the day, the technician will shut down the equipment and software properly. A printout of each testing summary is made, and the engineer will mark any notes or comments on the printouts (i.e., missed Cell 53). He will also copy all of the electronic data files collected that day from the laptop computer to a jump stick, and eventually to the R drive.



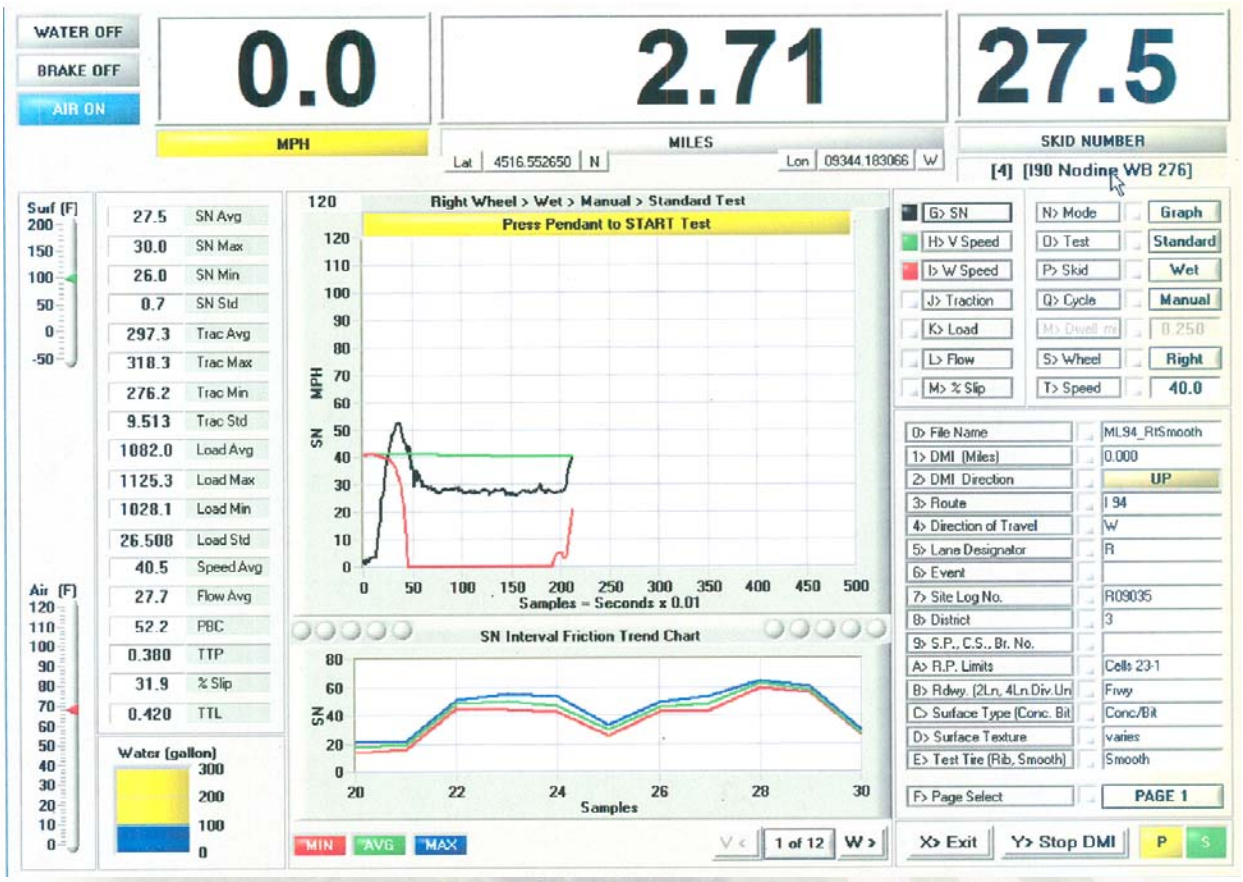
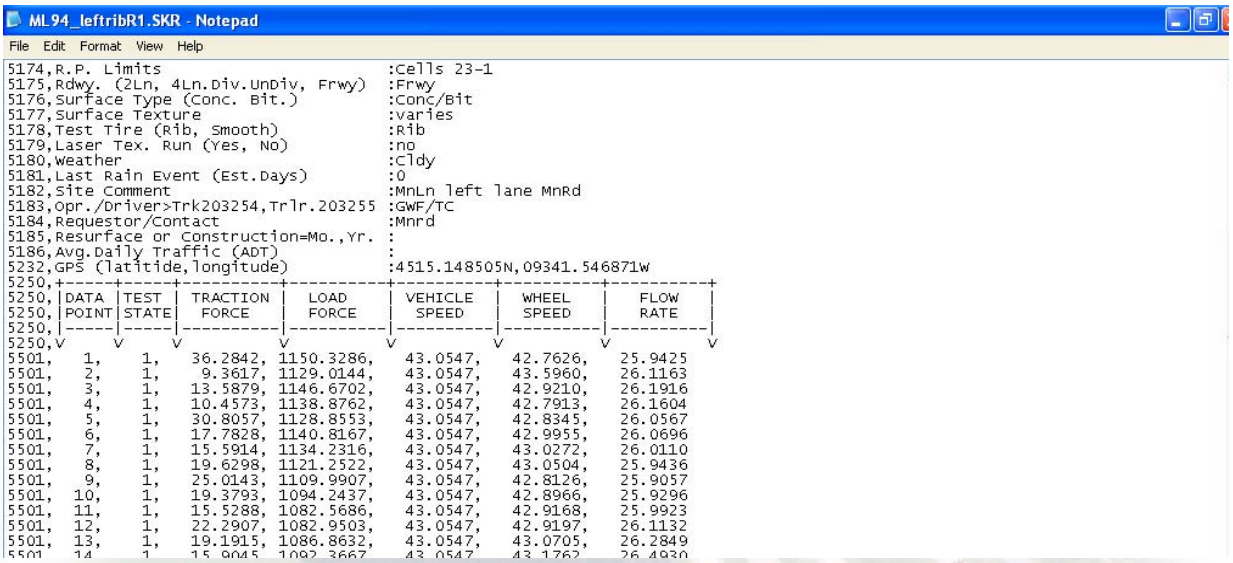


Figure 2. Screenshot of the Friction Testing Software in the Field

Data Processing

The data files output from the skid trailer come in two forms. *.skr files contain the horizontal and vertical force measurements for each individual test (each click of the button in the field). See Figure 3. *.sks files are a summary of all the test results for a given run (i.e. LVR inside lane, ribbed tire). Each of these files can be viewed and edited with a basic text editor program such as Notepad. *.skr files are not typically used by researchers, but they are stored on the R drive if needed. *.sks files are manipulated and stored in the database.



ML94_leftribR1.SKR - Notepad

File Edit Format View Help

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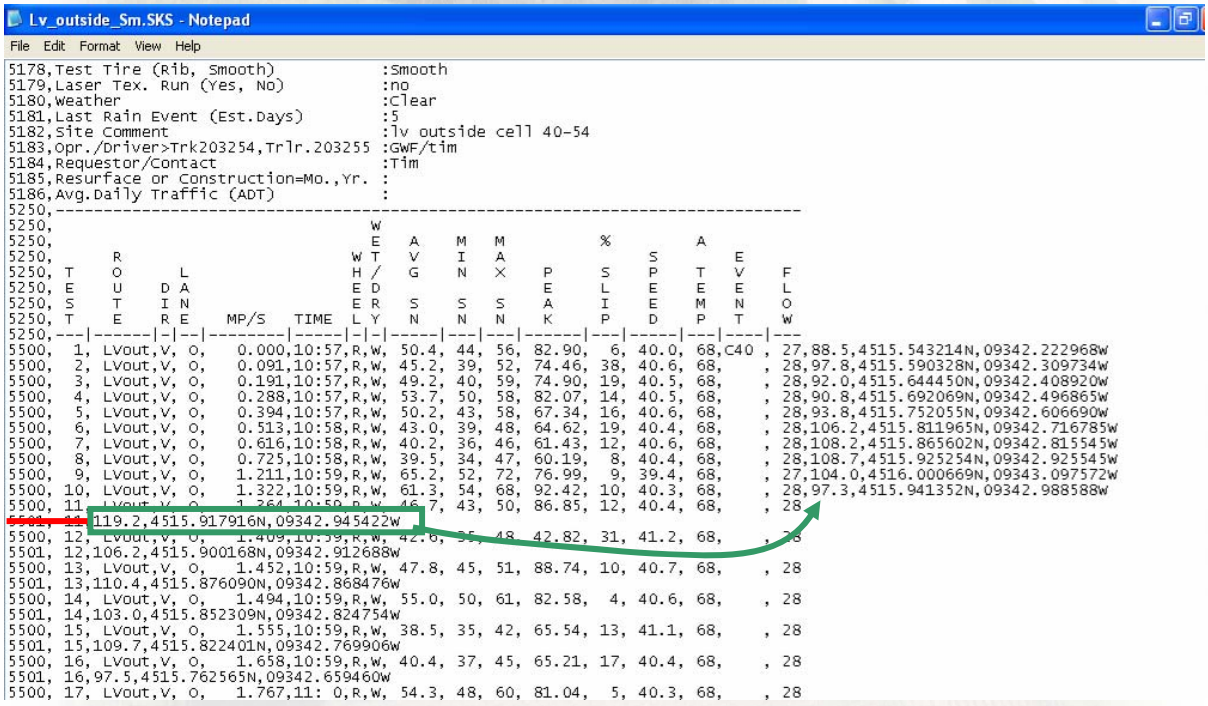
5174,R.P. Limits                          :Cells 23-1
5175,Rdwy. (2Ln, 4Ln.Div.UnDiv, Frwy)     :Frwy
5176,Surface Type (Conc. Bit.)            :Conc/Bit
5177,Surface Texture                      :varies
5178,Test Tire (Rib, Smooth)              :Rib
5179,Laser Tex. Run (Yes, No)             :no
5180,Weather                              :Cldy
5181,Last Rain Event (Est.Days)           :0
5182,Site Comment                         :MnLn left lane MnRd
5183,Opr./Driver>Trk203254,Trlr.203255    :GWF/TC
5184,Requestor/Contact                    :Mnrd
5185,Resurface or Construction=Mo.,Yr.    :
5186,Avg.Daily Traffic (ADT)              :
5232,GPS (latitide,longitude)             :4515.148505N,09341.546871W
5250,+-----+-----+----------+----------+----------+----------+----------+
5250,|DATA |TEST | TRACTION |  LOAD    | VEHICLE  |  WHEEL   |   FLOW   |
5250,|POINT|STATE|  FORCE   |  FORCE   |  SPEED   |  SPEED   |   RATE   |
5250,|-----|-----|----------|----------|----------|----------|----------|
5250,V     V     V          V          V          V          V          V
5501,   1,    1,   36.2842, 1150.3286,   43.0547,   42.7626,   25.9425
5501,   2,    1,    9.3617, 1129.0144,   43.0547,   43.5960,   26.1163
5501,   3,    1,   13.5879, 1146.6702,   43.0547,   42.9210,   26.1916
5501,   4,    1,   10.4573, 1138.8762,   43.0547,   42.7913,   26.1604
5501,   5,    1,   30.8057, 1128.8553,   43.0547,   42.8345,   26.0567
5501,   6,    1,   17.7828, 1140.8167,   43.0547,   42.9955,   26.0696
5501,   7,    1,   15.5914, 1134.2316,   43.0547,   43.0272,   26.0110
5501,   8,    1,   19.6298, 1121.2522,   43.0547,   43.0504,   25.9436
5501,   9,    1,   25.0143, 1109.9907,   43.0547,   42.8126,   25.9057
5501,  10,    1,   19.3793, 1094.2437,   43.0547,   42.8966,   25.9296
5501,  11,    1,   15.5288, 1082.5686,   43.0547,   42.9168,   25.9923
5501,  12,    1,   22.2907, 1082.9503,   43.0547,   42.9197,   26.1132
5501,  13,    1,   19.1915, 1086.8632,   43.0547,   43.0705,   26.2849
5501,  14,    1,   15.9045, 1092.3667,   43.0547,   43.1762,   26.4930
```

Figure 3. Example of a *.skr File

The engineer will open each *.sks file in Notepad and delete the unnecessary header information. Each test runs onto two lines, so part of the second line is deleted and moved up to the first line (see Figure 4). The file is then saved as a *.txt file.



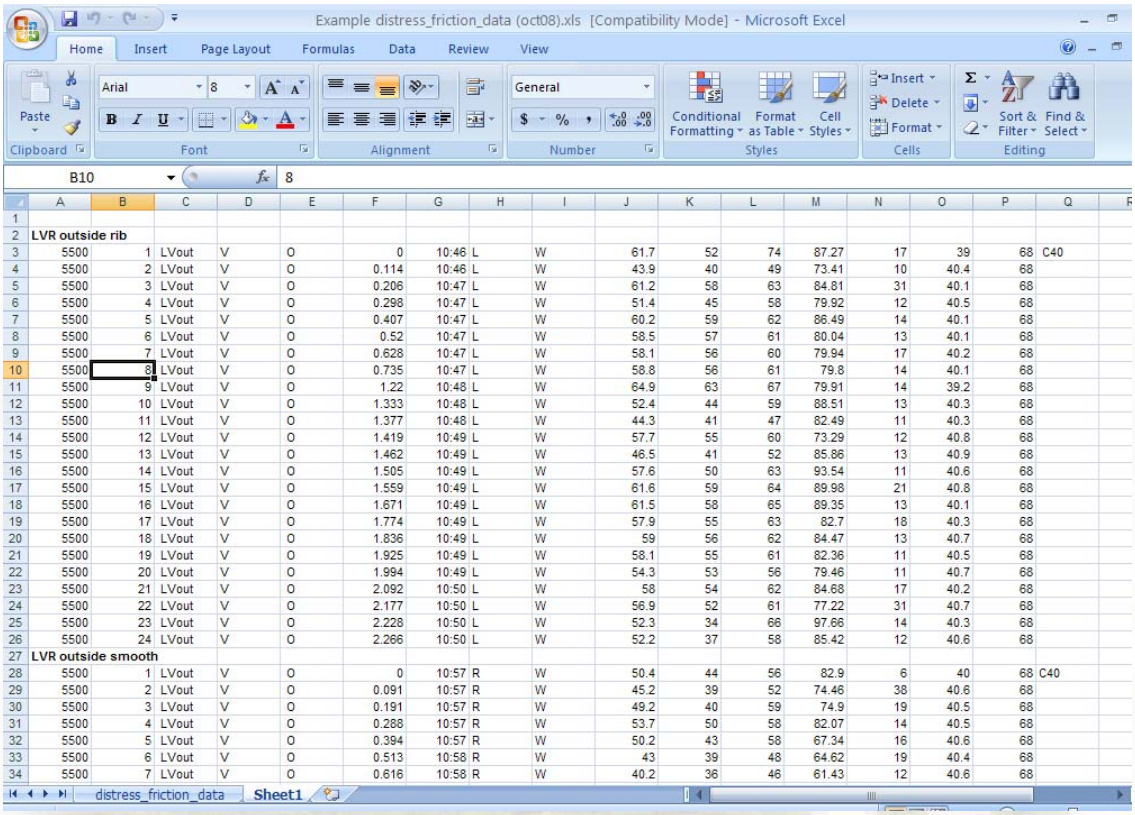
Lv_outside_Sm.SKS - Notepad

File Edit Format View Help

```
5178,Test Tire (Rib, Smooth)              :Smooth
5179,Laser Tex. Run (Yes, No)             :no
5180,Weather                              :Clear
5181,Last Rain Event (Est.Days)           :5
5182,Site Comment                         :lv outside cell 40-54
5183,Opr./Driver>Trk203254,Trlr.203255    :GWF/tim
5184,Requestor/Contact                    :Tim
5185,Resurface or Construction=Mo.,Yr.    :
5186,Avg.Daily Traffic (ADT)              :
5250,-------------------------------------------------------------------------------
5250,                                  W
5250,                                  E   A    M   M          %         A
5250,      R                          W T   V    I   A                S         E
5250, T    O      L                   H /   G    N   X    P     S     P    T    V    F
5250, E    U    D A                   E D                   E     L     E    E    E    L
5250, S    T    I N                   E R   S    S   S    A     I     E    M    N    O
5250, T    E    R E    MP/S   TIME    L Y   N    N   N    K     P     D    P    T    W
5250,---|------|-|--|--------|-----|-|-|-----|---|---|------|---|-----|---|----|---
5500,  1, LVout,V, O,    0.000,10:57,R,W, 50.4, 44, 56, 82.90,  6, 40.0, 68,C40 , 27,88.5,4515.543214N,09342.222968W
5500,  2, LVout,V, O,    0.091,10:57,R,W, 45.2, 39, 52, 74.46, 38, 40.6, 68,    , 28,97.8,4515.590328N,09342.309734W
5500,  3, LVout,V, O,    0.191,10:57,R,W, 49.2, 40, 59, 74.90, 19, 40.5, 68,    , 28,92.0,4515.644450N,09342.408920W
5500,  4, LVout,V, O,    0.288,10:57,R,W, 53.7, 50, 58, 82.07, 14, 40.5, 68,    , 28,90.8,4515.692069N,09342.496865W
5500,  5, LVout,V, O,    0.394,10:57,R,W, 50.2, 43, 58, 67.34, 16, 40.6, 68,    , 28,93.8,4515.752055N,09342.606690W
5500,  6, LVout,V, O,    0.513,10:58,R,W, 43.0, 39, 48, 64.62, 19, 40.4, 68,    , 28,106.2,4515.811965N,09342.716785W
5500,  7, LVout,V, O,    0.616,10:58,R,W, 40.2, 36, 46, 61.43, 12, 40.6, 68,    , 28,108.2,4515.865602N,09342.815545W
5500,  8, LVout,V, O,    0.725,10:58,R,W, 39.5, 34, 47, 60.19,  8, 40.4, 68,    , 28,108.7,4515.925254N,09342.925545W
5500,  9, LVout,V, O,    1.211,10:59,R,W, 65.2, 52, 72, 76.99,  9, 39.4, 68,    , 27,104.0,4516.000669N,09343.097572W
5500, 10, LVout,V, O,    1.322,10:59,R,W, 61.3, 54, 68, 92.42, 10, 40.3, 68,    , 28,97.3,4515.941352N,09342.988588W
5500, 11, LVout,V, O,    1.364,10:59,R,W, 46.7, 43, 50, 86.85, 12, 40.4, 68,    , 28,
5501, 11,119.2,4515.917916N,09342.945422W
5500, 12, LVout,V, O,    1.409,10:59,R,W, 42.6, 35, 48, 42.82, 31, 41.2, 68,    , 28
5501, 12,106.2,4515.900168N,09342.912688W
5500, 13, LVout,V, O,    1.452,10:59,R,W, 47.8, 45, 51, 88.74, 10, 40.7, 68,    , 28
5501, 13,110.4,4515.876090N,09342.868476W
5500, 14, LVout,V, O,    1.494,10:59,R,W, 55.0, 50, 61, 82.58,  4, 40.6, 68,    , 28
5501, 14,103.0,4515.852309N,09342.824754W
5500, 15, LVout,V, O,    1.555,10:59,R,W, 38.5, 35, 42, 65.54, 13, 41.1, 68,    , 28
5501, 15,109.7,4515.822401N,09342.769906W
5500, 16, LVout,V, O,    1.658,10:59,R,W, 40.4, 37, 45, 65.21, 17, 40.4, 68,    , 28
5501, 16,97.5,4515.762565N,09342.659460W
5500, 17, LVout,V, O,    1.767,11: 0,R,W, 54.3, 48, 60, 81.04,  5, 40.3, 68,    , 28
```

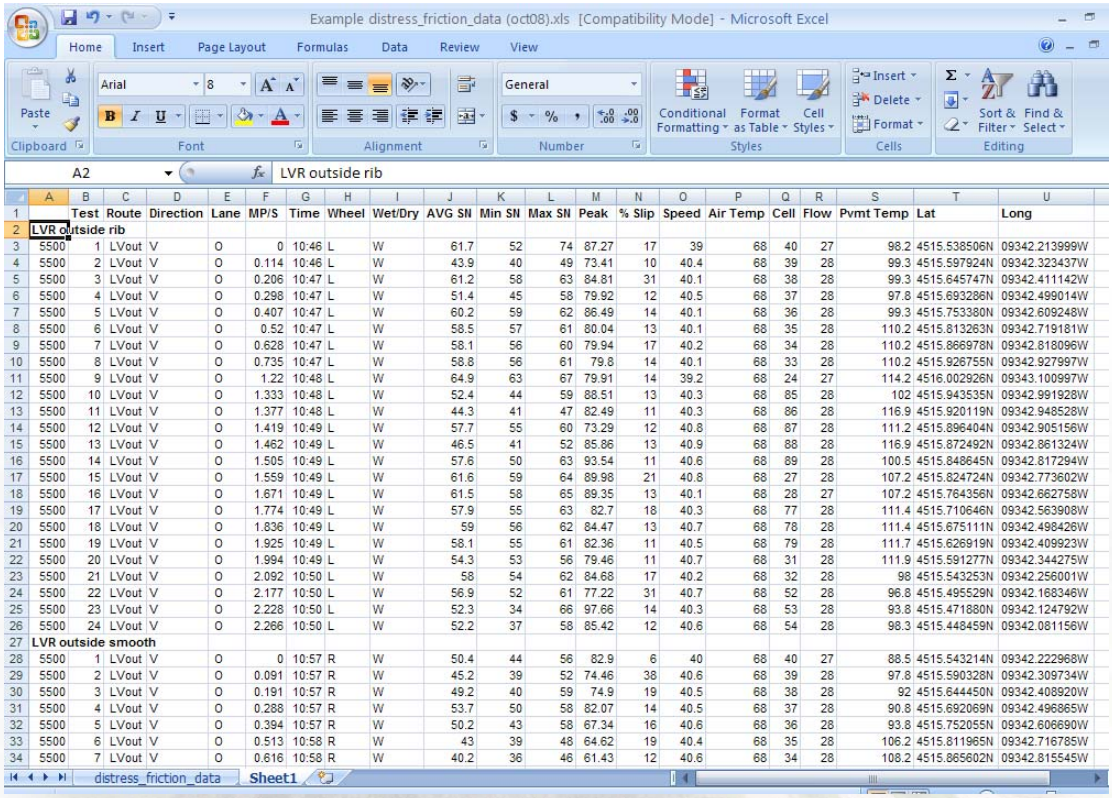
Figure 4. Editing a *.sks File

Each *.txt file is imported into Excel as a comma delimited file, and the headers from the *.sks file are retyped. See Figures 5 and 6.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1																	
2	LVR outside rib																
3	5500	1	LVout	V	O	0	10:46	L	W	61.7	52	74	87.27	17	39	68	C40
4	5500	2	LVout	V	O	0.114	10:46	L	W	43.9	40	49	73.41	10	40.4	68	
5	5500	3	LVout	V	O	0.206	10:47	L	W	61.2	58	63	84.81	31	40.1	68	
6	5500	4	LVout	V	O	0.298	10:47	L	W	51.4	45	58	79.92	12	40.5	68	
7	5500	5	LVout	V	O	0.407	10:47	L	W	60.2	59	62	86.49	14	40.1	68	
8	5500	6	LVout	V	O	0.52	10:47	L	W	58.5	57	61	80.04	13	40.1	68	
9	5500	7	LVout	V	O	0.628	10:47	L	W	58.1	56	60	79.94	17	40.2	68	
10	5500	8	LVout	V	O	0.735	10:47	L	W	58.8	56	61	79.8	14	40.1	68	
11	5500	9	LVout	V	O	1.22	10:48	L	W	64.9	63	67	79.91	14	39.2	68	
12	5500	10	LVout	V	O	1.333	10:48	L	W	52.4	44	59	88.51	13	40.3	68	
13	5500	11	LVout	V	O	1.377	10:48	L	W	44.3	41	47	82.49	11	40.3	68	
14	5500	12	LVout	V	O	1.419	10:49	L	W	57.7	55	60	73.29	12	40.8	68	
15	5500	13	LVout	V	O	1.462	10:49	L	W	46.5	41	52	85.86	13	40.9	68	
16	5500	14	LVout	V	O	1.505	10:49	L	W	57.6	50	63	93.54	11	40.6	68	
17	5500	15	LVout	V	O	1.559	10:49	L	W	61.6	59	64	89.98	21	40.8	68	
18	5500	16	LVout	V	O	1.671	10:49	L	W	61.5	58	65	89.35	13	40.1	68	
19	5500	17	LVout	V	O	1.774	10:49	L	W	57.9	55	63	82.7	18	40.3	68	
20	5500	18	LVout	V	O	1.836	10:49	L	W	59	56	62	84.47	13	40.7	68	
21	5500	19	LVout	V	O	1.925	10:49	L	W	58.1	55	61	82.36	11	40.5	68	
22	5500	20	LVout	V	O	1.994	10:49	L	W	54.3	53	56	79.46	11	40.7	68	
23	5500	21	LVout	V	O	2.092	10:50	L	W	58	54	62	84.68	17	40.2	68	
24	5500	22	LVout	V	O	2.177	10:50	L	W	56.9	52	61	77.22	31	40.7	68	
25	5500	23	LVout	V	O	2.228	10:50	L	W	52.3	34	66	97.66	14	40.3	68	
26	5500	24	LVout	V	O	2.266	10:50	L	W	52.2	37	58	85.42	12	40.6	68	
27	LVR outside smooth																
28	5500	1	LVout	V	O	0	10:57	R	W	50.4	44	56	82.9	6	40	68	C40
29	5500	2	LVout	V	O	0.091	10:57	R	W	45.2	39	52	74.46	38	40.6	68	
30	5500	3	LVout	V	O	0.191	10:57	R	W	49.2	40	59	74.9	19	40.5	68	
31	5500	4	LVout	V	O	0.288	10:57	R	W	53.7	50	58	82.07	14	40.5	68	
32	5500	5	LVout	V	O	0.394	10:57	R	W	50.2	43	58	67.34	16	40.6	68	
33	5500	6	LVout	V	O	0.513	10:58	R	W	43	39	48	64.62	19	40.4	68	
34	5500	7	LVout	V	O	0.616	10:58	R	W	40.2	36	46	61.43	12	40.6	68	

Figure 5. Importing a *.txt File into Excel



Example distress_friction_data (oct08).xls [Compatibility Mode] - Microsoft Excel

A2: LVR outside rib

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1		Test	Route	Direction	Lane	MP/S	Time	Wheel	Wet/Dry	AVG SN	Min SN	Max SN	Peak	% Slip	Speed	Air Temp	Cell	Flow	Pvmt Temp	Lat	Long
2	LVR outside rib																				
3	5500	1	LVout	V	O	0	10:46	L	W	61.7	52	74	87.27	17	39	68	40	27	98.2	4515.538506N	09342.213999W
4	5500	2	LVout	V	O	0.114	10:46	L	W	43.9	40	49	73.41	10	40.4	68	39	28	99.3	4515.597924N	09342.323437W
5	5500	3	LVout	V	O	0.206	10:47	L	W	61.2	58	63	84.81	31	40.1	68	38	28	99.3	4515.645747N	09342.411142W
6	5500	4	LVout	V	O	0.298	10:47	L	W	51.4	45	58	79.92	12	40.5	68	37	28	97.8	4515.693286N	09342.499014W
7	5500	5	LVout	V	O	0.407	10:47	L	W	60.2	59	62	86.49	14	40.1	68	36	28	99.3	4515.753380N	09342.609248W
8	5500	6	LVout	V	O	0.52	10:47	L	W	58.5	57	61	80.04	13	40.1	68	35	28	110.2	4515.813263N	09342.719181W
9	5500	7	LVout	V	O	0.628	10:47	L	W	58.1	56	60	79.94	17	40.2	68	34	28	110.2	4515.866978N	09342.818096W
10	5500	8	LVout	V	O	0.735	10:47	L	W	58.8	56	61	79.8	14	40.1	68	33	28	110.2	4515.926755N	09342.927997W
11	5500	9	LVout	V	O	1.22	10:48	L	W	64.9	63	67	79.91	14	39.2	68	24	27	114.2	4516.002926N	09343.100997W
12	5500	10	LVout	V	O	1.333	10:48	L	W	52.4	44	59	88.51	13	40.3	68	85	28	102	4515.943535N	09342.991928W
13	5500	11	LVout	V	O	1.377	10:48	L	W	44.3	41	47	82.49	11	40.3	68	86	28	116.9	4515.920119N	09342.948528W
14	5500	12	LVout	V	O	1.419	10:49	L	W	57.7	55	60	73.29	12	40.8	68	87	28	111.2	4515.896404N	09342.905156W
15	5500	13	LVout	V	O	1.462	10:49	L	W	46.5	41	52	85.86	13	40.9	68	88	28	116.9	4515.872492N	09342.861324W
16	5500	14	LVout	V	O	1.505	10:49	L	W	57.6	50	63	93.54	11	40.6	68	89	28	100.5	4515.848645N	09342.817294W
17	5500	15	LVout	V	O	1.559	10:49	L	W	61.6	59	64	89.98	21	40.8	68	27	28	107.2	4515.824724N	09342.773602W
18	5500	16	LVout	V	O	1.671	10:49	L	W	61.5	58	65	89.35	13	40.1	68	28	27	107.2	4515.764356N	09342.662758W
19	5500	17	LVout	V	O	1.774	10:49	L	W	57.9	55	63	82.7	18	40.3	68	77	28	111.4	4515.710646N	09342.563908W
20	5500	18	LVout	V	O	1.836	10:49	L	W	59	56	62	84.47	13	40.7	68	78	28	111.4	4515.675111N	09342.498426W
21	5500	19	LVout	V	O	1.925	10:49	L	W	58.1	55	61	82.36	11	40.5	68	79	28	111.7	4515.626919N	09342.409923W
22	5500	20	LVout	V	O	1.994	10:49	L	W	54.3	53	56	79.46	11	40.7	68	31	28	111.9	4515.591277N	09342.344275W
23	5500	21	LVout	V	O	2.092	10:50	L	W	58	54	62	84.68	17	40.2	68	32	28	98	4515.543253N	09342.256001W
24	5500	22	LVout	V	O	2.177	10:50	L	W	56.9	52	61	77.22	31	40.7	68	52	28	96.8	4515.495529N	09342.168346W
25	5500	23	LVout	V	O	2.228	10:50	L	W	52.3	34	66	97.66	14	40.3	68	53	28	93.8	4515.471880N	09342.124792W
26	5500	24	LVout	V	O	2.266	10:50	L	W	52.2	37	58	85.42	12	40.6	68	54	28	98.3	4515.448459N	09342.081156W
27	LVR outside smooth																				
28	5500	1	LVout	V	O	0	10:57	R	W	50.4	44	56	82.9	6	40	68	40	27	88.5	4515.543214N	09342.222968W
29	5500	2	LVout	V	O	0.091	10:57	R	W	45.2	39	52	74.46	38	40.6	68	39	28	97.8	4515.590328N	09342.309734W
30	5500	3	LVout	V	O	0.191	10:57	R	W	49.2	40	59	74.9	19	40.5	68	38	28	92	4515.644450N	09342.408920W
31	5500	4	LVout	V	O	0.288	10:57	R	W	53.7	50	58	82.07	14	40.5	68	37	28	90.8	4515.692069N	09342.496865W
32	5500	5	LVout	V	O	0.394	10:57	R	W	50.2	43	58	67.34	16	40.6	68	36	28	93.8	4515.752055N	09342.606690W
33	5500	6	LVout	V	O	0.513	10:58	R	W	43	39	48	64.62	19	40.4	68	35	28	106.2	4515.811965N	09342.716785W
34	5500	7	LVout	V	O	0.616	10:58	R	W	40.2	36	46	61.43	12	40.6	68	34	28	108.2	4515.865602N	09342.815545W

distress_friction_data | Sheet1

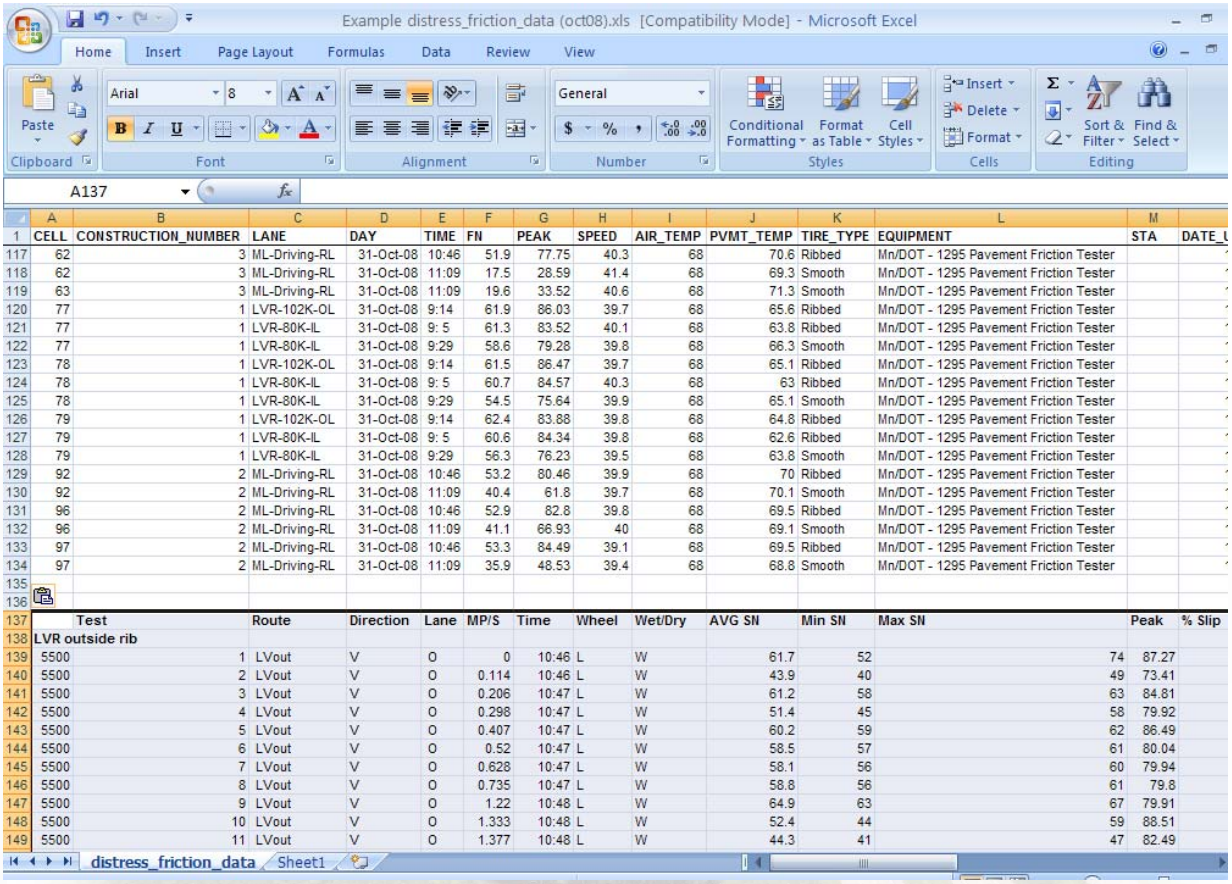
Figure 6. Putting Headers on the Imported Data

A template file is then opened, in the same format as the database table. The imported *.txt files are then rearranged to fit into the appropriate database columns. Unnecessary data is deleted, and pertinent information such as cell, lane, tire type, date, etc. is inserted into the appropriate columns. See Figure 7. The Skid Number (SN) is calculated as the average coefficient of friction across the test interval. Skid Numbers could theoretically range from 0-100, with higher SN values meaning greater friction.

Once the spreadsheet is complete, the engineer will email it to the database administrator, who will then add the data to the database. The raw data files continue to be stored on the R drive.

February 2010 Update

In late 2009 a macro was written in Excel (see Figure 8) that took all of the above steps and ran them automatically with a few simple mouse clicks. The program still goes through this process of rearranging the data inside each file and adding data to the appropriate columns, and it allows the engineer to note if any cells were skipped during the field data collection. This macro made data processing much more efficient by taking what used to be a 2-3 hour process and instead processing the data in under one minute.

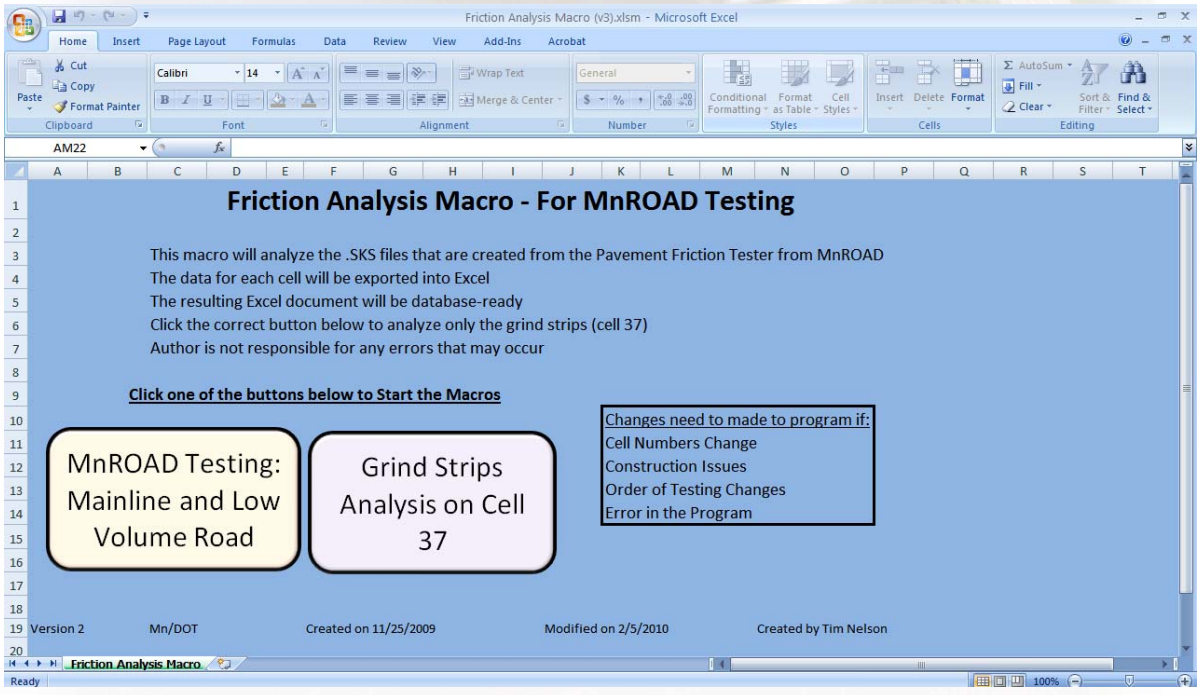


Example distress_friction_data (oct08).xls [Compatibility Mode] - Microsoft Excel

CELL	CONSTRUCTION_NUMBER	LANE	DAY	TIME	FN	PEAK	SPEED	AIR_TEMP	PVMT_TEMP	TIRE_TYPE	EQUIPMENT	STA	DATE_U
62	3	ML-Driving-RL	31-Oct-08	10:46	51.9	77.75	40.3	68	70.6	Ribbed	Mn/DOT - 1295 Pavement Friction Tester		
62	3	ML-Driving-RL	31-Oct-08	11:09	17.5	28.59	41.4	68	69.3	Smooth	Mn/DOT - 1295 Pavement Friction Tester		
63	3	ML-Driving-RL	31-Oct-08	11:09	19.6	33.52	40.6	68	71.3	Smooth	Mn/DOT - 1295 Pavement Friction Tester		
77	1	LVR-102K-OL	31-Oct-08	9:14	61.9	86.03	39.7	68	65.6	Ribbed	Mn/DOT - 1295 Pavement Friction Tester		
77	1	LVR-80K-IL	31-Oct-08	9: 5	61.3	83.52	40.1	68	63.8	Ribbed	Mn/DOT - 1295 Pavement Friction Tester		
77	1	LVR-80K-IL	31-Oct-08	9:29	58.6	79.28	39.8	68	66.3	Smooth	Mn/DOT - 1295 Pavement Friction Tester		
78	1	LVR-102K-OL	31-Oct-08	9:14	61.5	86.47	39.7	68	65.1	Ribbed	Mn/DOT - 1295 Pavement Friction Tester		
78	1	LVR-80K-IL	31-Oct-08	9: 5	60.7	84.57	40.3	68	63	Ribbed	Mn/DOT - 1295 Pavement Friction Tester		
78	1	LVR-80K-IL	31-Oct-08	9:29	54.5	75.64	39.9	68	65.1	Smooth	Mn/DOT - 1295 Pavement Friction Tester		
79	1	LVR-102K-OL	31-Oct-08	9:14	62.4	83.88	39.8	68	64.8	Ribbed	Mn/DOT - 1295 Pavement Friction Tester		
79	1	LVR-80K-IL	31-Oct-08	9: 5	60.6	84.34	39.8	68	62.6	Ribbed	Mn/DOT - 1295 Pavement Friction Tester		
79	1	LVR-80K-IL	31-Oct-08	9:29	56.3	76.23	39.5	68	63.8	Smooth	Mn/DOT - 1295 Pavement Friction Tester		
92	2	ML-Driving-RL	31-Oct-08	10:46	53.2	80.46	39.9	68	70	Ribbed	Mn/DOT - 1295 Pavement Friction Tester		
92	2	ML-Driving-RL	31-Oct-08	11:09	40.4	61.8	39.7	68	70.1	Smooth	Mn/DOT - 1295 Pavement Friction Tester		
96	2	ML-Driving-RL	31-Oct-08	10:46	52.9	82.8	39.8	68	69.5	Ribbed	Mn/DOT - 1295 Pavement Friction Tester		
96	2	ML-Driving-RL	31-Oct-08	11:09	41.1	66.93	40	68	69.1	Smooth	Mn/DOT - 1295 Pavement Friction Tester		
97	2	ML-Driving-RL	31-Oct-08	10:46	53.3	84.49	39.1	68	69.5	Ribbed	Mn/DOT - 1295 Pavement Friction Tester		
97	2	ML-Driving-RL	31-Oct-08	11:09	35.9	48.53	39.4	68	68.8	Smooth	Mn/DOT - 1295 Pavement Friction Tester		

Test	Route	Direction	Lane	MP/S	Time	Wheel	Wet/Dry	AVG SN	Min SN	Max SN	Peak	% Slip
LVR outside rib												
5500	1 LVout	V	O	0	10:46	L	W	61.7	52	74	87.27	
5500	2 LVout	V	O	0.114	10:46	L	W	43.9	40	49	73.41	
5500	3 LVout	V	O	0.206	10:47	L	W	61.2	58	63	84.81	
5500	4 LVout	V	O	0.298	10:47	L	W	51.4	45	58	79.92	
5500	5 LVout	V	O	0.407	10:47	L	W	60.2	59	62	86.49	
5500	6 LVout	V	O	0.52	10:47	L	W	58.5	57	61	80.04	
5500	7 LVout	V	O	0.628	10:47	L	W	58.1	56	60	79.94	
5500	8 LVout	V	O	0.735	10:47	L	W	58.8	56	61	79.8	
5500	9 LVout	V	O	1.22	10:48	L	W	64.9	63	67	79.91	
5500	10 LVout	V	O	1.333	10:48	L	W	52.4	44	59	88.51	
5500	11 LVout	V	O	1.377	10:48	L	W	44.3	41	47	82.49	

Figure 7. Merging the Imported Data into the Database Format



Friction Analysis Macro (v3).xlsm - Microsoft Excel

Friction Analysis Macro - For MnROAD Testing

This macro will analyze the .SKS files that are created from the Pavement Friction Tester from MnROAD
The data for each cell will be exported into Excel
The resulting Excel document will be database-ready
Click the correct button below to analyze only the grind strips (cell 37)
Author is not responsible for any errors that may occur

Click one of the buttons below to Start the Macros

MnROAD Testing: Mainline and Low Volume Road

Grind Strips Analysis on Cell 37

Changes need to made to program if:
Cell Numbers Change
Construction Issues
Order of Testing Changes
Error in the Program

Version 2 Mn/DOT Created on 11/25/2009 Modified on 2/5/2010 Created by Tim Nelson

Figure 8. Macro to Process Skid Data

Database Tables

Friction data is stored in the table MNR.DISTRESS_FRICTION_DATA. See the table below for a description of the data.

DATABASE TABLE – DISTRESS_FRICTION_DATA

Name	Null?	Type
CELL		NUMBER (3,0)
CONSTRUCTION_NUMBER	NOT NULL	NUMBER (3,0)
LANE		VARCHAR2 (15)
DAY		DATE
TIME		VARCHAR2 (5)
FN		NUMBER (3,1)
PEAK		NUMBER (5,2)
SPEED		NUMBER (3,1)
AIR_TEMP		NUMBER (5,2)
PVMT_TEMP		NUMBER (5,2)
TIRE_TYPE		VARCHAR2 (10)
EQUIPMENT		VARCHAR2 (50)
STA		VARCHAR2 (10)
DATE_UPDATED		DATE
LATITUDE		VARCHAR2 (14)
LONGITUDE		VARCHAR2 (14)
MINFN		NUMBER (2,0)
MAXFN		NUMBER (2,0)
SLIP		NUMBER (2,0)
COMMENTS		VARCHAR2 (80)

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