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Subcontractor Report

Evaluation of Biodiesel Fuel in an EMD GP38-2 Locomotive

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LIST OF ABBREVIATIONS

AAR	Association of American Railroads
API	American Petroleum Institute
ASTM	American Society for Testing and Materials
BSFC	brake specific fuel consumption
BTU	British Thermal Units
CFR	Code of Federal Regulations
cm	centimeter
CO	carbon monoxide
CO_2	carbon dioxide
cSt	centistokes
EMD	Electro-Motive Division of General Motors Corporation
EP	end point
EPA	Environmental Protection Agency
°F	degrees Fahrenheit
f/a	mass fuel to dry air ratio
FBP	final boiling point
FTP	Federal Test Procedure
g	gram
gal	gallon
H_2O	water
HC	hydrocarbons
HFID	heated flame ionization detector
hp	horsepower
hr	hour
IBP	initial boiling point
in	inch
kW	kilowatt
lb	pound
min	minute
mm	millimeter
NREL	National Renewable Energy Laboratory
NDIR	non-dispersive infrared
NO_X	oxides of nitrogen
O_2	Oxygen
PHS	Public Health Service
PM	particulate matter
rpm	revolutions per minute
sec	seconds
SwRI	Southwest Research Institute
TDC	top dead center
wt	weight
%	percent

EXECUTIVE SUMMARY

This report documents results of fuel consumption and exhaust emission tests performed on a 2,000 hp EMD GP38-2 locomotive operating on four different fuels. No operational problems were observed by SwRI on any of the test fuels, and the locomotive engine was able to produce within 1% to 2% of full rated power while operating on the biodiesel blends. Locomotive tests were performed at the SwRI Locomotive Exhaust Emissions Test Center in October, 2000.

Table ES-1 summarizes the average EPA Line-Haul and Switch duty-cycle weighted exhaust emissions from triplicate tests using a diesel fuel meeting EPA locomotive certification test specifications, on a CARB diesel fuel, with a blend of 20% bio-fuel into the EPA locomotive certification fuel (B20), and a second blend of 20 percent bio-fuel with the CARB diesel (C20). The 4% to 6% increase in NO_X emissions with B20 fuel compared to EPA locomotive certification diesel is consistent with B20 tests performed in other engine test programs. The lack of PM response with any of the test fuels is attributed to the fact that most of the PM emissions from this two-stroke EMD engine are lubricating-oil derived. Long term durability and reliability were not addressed in this study.

Table ES-1. Summary of Locomotive Tests Using Biodiesel Fuel Blends

Fuel	HC	CO	NO_X	PM
EPA Line-Haul Duty-Cycle Weighted Emissions, g/hp-hr [a]				
EPA Loco. Cert. Diesel	0.64	5.4	12.4	0.46
CARB diesel	0.64	4.3	12.3	0.46
B20	0.64	4.5	13.1	0.50
C20	0.64	4.0	12.8	0.48
EPA Switch Duty-Cycle Weighted Emissions, g/hp-hr [a]				
EPA Loco. Cert. Diesel	0.82	2.2	12.8	0.38
CARB diesel	0.76	1.8	12.5	0.34
B20	0.78	2.0	13.5	0.37
C20	0.73	1.8	13.1	0.37

[a] Average of three runs on each fuel.

I. TECHNICAL APPROACH

Locomotive exhaust emission tests for this project were performed by Southwest Research Institute (SwRI) at the Locomotive Exhaust Emissions Test Center in San Antonio, Texas. This facility was established in August 1993 in cooperation with the Association of American Railroads (AAR).

Presented below is an overview of the technical approach used to conduct locomotive exhaust emissions testing. Included is a description of the locomotive selected for testing, engine power measurements, fuel consumption measurements, the test fuels, exhaust emissions test procedures, analytical procedures, particulate measurement procedures, and smoke opacity test procedures.

A. Test Locomotive

The locomotive tested in this project was CSX No. 2629, a model GP38-2, manufactured in 1973 by the Electro-Motive Division (EMD) of General Motors Corporation. CSX No. 2629 shown in Figure 1, is generally classified as a "road-switcher" locomotive, meaning it serves as a local switcher locomotive as well as a line-haul locomotive.

FIGURE 1. CSX NO. 2629 at the SWRI Locomotive Test Center

The GP-38 locomotive was equipped with a 2,000 hp roots-blown EMD model 16-645-E diesel engine (SN 84-B3-1505). Table 1 gives the specifications for the EMD engine. Immediately

before shipping the locomotive to SwRI, the locomotive was serviced at CSX's Cumberland, Maryland shop. Service included replacing the fuel injectors, changing the fuel, lubricating oil and engine intake air filters, and changing the engine lubricating oil.

Table 1. EMD 16-645-E Engine Specifications

Type		2-stroke, uniflow scavenged diesel	
Aspiration		roots-blown, non-turbocharged	
Bore, in.	(mm)	9 1/16	(230)
Stroke, in.	(mm)	10	(254)
No. of Cylinders		16	
Displacement, cu. in./cyl.	(L)	645	(10.6)
Total displacement cu. in.	(L)	10,320	(169.1)
Compression Ratio		16:1	
Fuel Injection System		Unit Injector	
Rated Power, bhp	(kW)	2,000	(1,491)
Rated Speed, rpm		900	

B. EMD Engine Power Measurement

Most line-haul locomotives are equipped with the "dynamic brake" feature in which the electric motors used for traction are reverse-excited to become generators for slowing the train. The electrical power generated is dissipated in resistance grids. Locomotives with the self-load feature can dissipate the main alternator power into these "dynamic brake" resistance grids. The CSX locomotive tested in this program was equipped with dynamic brake grids capable of dissipating the full engine power, and these grids were used to load the stationary locomotive.

Engine flywheel (gross) power was determined by direct measurement of the main alternator voltage and current, plus auxiliary power values obtained from load box testing procedures published by EMD. EPA locomotive test procedures call for direct measurement of main generator voltage and current, and for the manufacturer to apply a known generator efficiency to calculate gross power. In this case, a single alternator efficiency of 93.9%was used for all test points, following EMD load box testing procedures. Power for the various auxiliary systems (auxiliary generator, traction motor blower, inertial separator blower, and radiator fans) was computed using published EMD test procedures. The air compressor on the locomotive was disabled during testing, and compressed air was supplied to the locomotive.

Power and fuel rates were recorded as observed values. Corrected brake-specific fuel

consumption (BSFC) values were computed using published EMD power correction factors. Observed power was used to report brake-specific exhaust emissions in g/hp-hr.

C. Fuel Consumption Measurement

Fuel consumption was measured on a mass basis, using a mass flow meter. The system was equipped with a heat exchanger to control fuel supply temperature to 90±10°F. Hot return fuel, which would normally return to the locomotive on-board fuel tank, was cooled before returning to the fuel measurement reservoir ("day tank") to assure a consistent fuel supply temperature at the engine.

D. Test Fuels

Four fuels were included in this study, and selected properties of the fuels are summarized in Table 2. Baseline tests were performed using diesel fuel meeting EPA specifications for locomotive emissions test fuel given in the Code of Federal Regulations, Title 40, Part 92, Section 92.113. This "locomotive cert fuel" had a sulfur content of 0.30 percent, which is the midpoint of the EPA specification of 0.2%to 0.4% sulfur for locomotive testing. Table 2 also gives the specifications for EPA locomotive test fuel.

The second fuel used in this program was a "CARB fuel." This fuel was used in a recently completed locomotive fuel-effects program performed by SwRI for CARB.[1] The "CARB" fuel was a 50/50 blend of two commercially available CARB-approved fuels, one batch was from the Texaco refinery in Los Angeles, California, and the second batch was from the ARCO refinery in South Gate, California. The properties of the CARB fuel, as reported in Table 2, were considered by ARB to be representative of commercially available on-highway fuel sold in California.

The third and fourth fuels tested in this program were 20% blends (by volume) bio-fuel blended into the two different base fuels. These are referred to as "B20," which was 20% bio-fuel blended with the "locomotive cert fuel," and "C20," which was 20% biodiesel blended with the CARB diesel fuel.

The bio-fuel used in this program was supplied by Griffin Industries, Inc. of Cold Spring, Kentucky. Eleven 55-gallon drums of Bio "G-3000™" were supplied to SwRI for blending. Blended fuels were stored in 550-gallon totes that were located next to the locomotive, as shown in Figure 2.

[1] Fritz, S.G., "Diesel Fuel Effects on Locomotive Exhaust Emissions," SwRI Report No. 08-02062 (October 2000).

Table 2. Properties of Diesel Fuels Used in Locomotive Testing

Determinations	ASTM Test Method	Locomotive Cert. Fuel EM-2834-F	B20 EM-3004-F	CARB Fuel EM-2663-F	C20 EM-3005-F	EPA Locomotive Spec. [a]
API Gravity @ 60°F	D4052	34.4	33.2	39.1	36.8	32 - 37
specific gravity		0.8529	0.8594	0.8295	0.8409	ns
density (lb/gal)		7.12	7.17	6.92	7.02	ns
Viscosity @ 40°C (cSt)	D445-83	2.77	3.17	2.46	2.82	2.0 - 3.2
Sulfur (Wt%)	D2622-94	0.2996	0.2264	0.005	0.004	0.2 - 0.4
Cetane Index	D976	47.7	49.0	52.0	53.4	40 - 48
Cetane Index	D4737	47.6	47.6	53.1	53.4	ns
Cetane Number	D613-84	45.7	47.0	51.0	50.5	40 - 48
Heat of Combustion	D240					
Gross (BTU/lb)		19,470	18,942	19,715	19,149	ns
Net (BTU/lb)		18,272	17,772	18,479	17,940	ns
Gross (BTU/gal)		138,600	135,900	136,400	134,400	ns
Net (btu/gal)		130,100	127,500	127,900	125,900	ns
Carbon-Hydrogen Ratio	D3178					
% Carbon		86.77	84.13	86.37	83.76	ns
% Hydrogen		13.23	12.82	13.63	13.25	ns
Hydrogen/Carbon Ratio		1.82	1.82	1.88	1.89	ns
SFC Aromatics	D5186-96					
Total Mass %		30.6	nd	22.4	nd	27 min.
Total Volume Percent [b]		29.4		21.8		
PNA Mass %		nd		1.7		
Hydrocarbon Type	D1319-84					
Aromatics (%)		36.2	nd	22.4	nd	ns
Olefins (%)		1.2		2.0		ns
Saturates (%)		62.6		75.6		ns
Flash Point (°F)	D93-80	166	172	167	170	130 min.
Distillation	D86-96					
	% Recovered					Temp. °F
	IBP	382	374	368	376	340 - 400
	10	423	431	413	418	400 - 460
	50	519	553	490	533	470 - 540
	90	627	639	606	633	560 - 630
	EP	676	670	659	663	610 - 690

Note: a - Diesel fuel for locomotive testing as specified by EPA in 40 CFR 92, §92.113, Table B113-1.
b - Aromatic hydrocarbons expressed in percent volume = 0.916 x (aromatic hydrocarbons expressed in percent weight) + 1.33, per California Code of Regulations, Title 13, §2282 (c)(1).
ns - not specified
nd - not determined

Figure 2. 550-Gallon Fuel Storage Tanks Located Next to Locomotive

E. Exhaust Emissions Test Procedure

Exhaust emission tests were performed using the locomotive Federal Test Procedure (FTP) detailed in the U.S. Code of Federal Regulations (CFR), Title 40, Part 92, "Emission Standards for Locomotives and Locomotive Engines."

1. Gaseous Emissions Sampling

A gaseous sample probe was designed using EPA locomotive test specifications. Gaseous emissions were sampled within the exhaust stack extension installed on the roof of the locomotive. A heated line was used to transfer the raw exhaust sample to the emission instruments for analysis. Measured gaseous emissions included hydrocarbons (HC), carbon monoxide (CO), carbon dioxide (CO_2), oxygen (O_2), and oxides of nitrogen (NO_X).

The hydrocarbon concentration in the raw exhaust was determined using a Rosemount Analytical model 402 heated flame ionization detector (HFID), calibrated on propane. NO_X concentration in the raw exhaust was measured with a Rosemount model 955 chemiluminescent analyzer. NO_X correction factors for engine intake manifold air temperature and ambient air humidity were applied as specified by EPA in 40 CFR §86.132(d). Concentrations of CO and CO_2 in the raw exhaust were determined by non-dispersive infrared (NDIR) instruments.

Gaseous mass emission rates were computed using the measured concentration, the observed (measured) fuel consumption rate, and calculated engine air flow. Following the FTP, engine air flow was not directly measured in this test program. Instead, engine air flow was determined using a carbon balance of the carbon-containing constituents in the exhaust (CO_2, CO, and HC) to compute the fuel/air ratio (f/a). Engine air flow rate was then computed using the measured fuel consumption rate and the computed f/a ratio.

2. Particulate Emissions Sampling

Particulate emissions were measured at each test point using a "split then dilute" technique, in which a portion of the raw locomotive exhaust was "split" from the total exhaust and mixed with filtered dilution air in a 10-inch diameter dilution tunnel. The split sample of raw exhaust was transferred to the dilution tunnel through a 2-inch diameter stainless steel tube that was insulated and electrically heated to 375°F. Using filtered dilution air, the raw exhaust was diluted and the temperature reduced to less than 125°F before sampling for particulate emissions.

A particulate sample was extracted from the dilution tunnel through sample probes fitted with stainless steel filter holders. Particulate was accumulated on 90 mm fluorocarbon-coated glass fiber filters (Pallflex T60A20) at a target filter face velocity of 70 cm/s. Following the FTP, PM sampling began ten seconds after a throttle notch change, and continued for five minutes. Particulate filters were preconditioned and weighed before and after testing, following the FTP. The particulate mass emission rate was computed using the increase of mass on the filters, the volume of dilute exhaust drawn through the filters, and dilution air and raw exhaust flow parameters (fuel and computed air flow).

3. Smoke Opacity Test Procedures

Smoke opacity was measured using a modified Public Health Service (PHS) full-flow opacity meter (smokemeter) mounted above one of the two locomotive exhaust stacks. This smokemeter used standard PHS smokemeter optics and electronics, but was modified to a 20-inch diameter to accommodate larger exhaust plume diameters. The construction, calibration, and operation of the smokemeter adhered to the FTP.

The smokemeter was aligned with the long axis of the rectangular exhaust stack, resulting in a through-exhaust path length of approximately 14 inches (as determined by the dimensions of the exhaust stack extension). The center of the light beam was positioned 5±1 inches above the outlet of the exhaust stack extension. The smokemeter control unit was located in the control building. Voltage output proportional to opacity was recorded on a strip chart, along with engine speed. Smoke opacity was continuously monitored during the EPA Locomotive Test Sequence.

4. Duty-Cycle Weighting Factors

Table 3 gives the weighting factors for the two duty cycles applied to the individual notch data points to compute "EPA Line-Haul" and "EPA Switch" duty-cycle weighted composite results. The two EPA cycles are specified in Table B132-1 of §92.131 of CFR Title 40, Part 92 of the FTP.

Table 3. Duty Cycles Used to Compute Weighted Composite Emissions

Throttle Notch Setting	EPA Line-Haul Cycle	EPA Switch Cycle
Low Idle	19.0 %	29.9 %
Idle	19.0 %	29.9 %
Dynamic Brake	12.5 %	0.0 %
Notch 1	6.5 %	12.4 %
Notch 2	6.5 %	12.3 %
Notch 3	5.2 %	5.8 %
Notch 4	4.4 %	3.6 %
Notch 5	3.8 %	3.6 %
Notch 6	3.9 %	1.5 %
Notch 7	3.0 %	0.2 %
Notch 8	16.2 %	0.8 %
TOTAL	**100.0 %**	**100.0 %**

F. Test Sequence

One problem commonly reported with the use of biodiesel fuels in older engines is fuel filter plugging resulting from the solvent nature of the biodiesel, removing accumulated deposits, gum, and varnish from the fuel system. Filter plugging usually occurs only once, after the initial removal of deposits. In anticipation of this potential problem with the nearly 30-year locomotive, SwRI ran the locomotive on neat bio-fuel for approximately two hours at rated power, then shut the locomotive engine down with the neat bio-fuel in the fuel system. The next morning, the locomotive was restarted and run for another hour on neat bio-fuel. Although no operational problems were noticed during this fuel system conditioning, as a precautionary measure, the primary and secondary fuel filters on the locomotive were replaced before beginning the fuel-effects testing.

Triplicate tests were run on each of the four test fuels. The test sequence was randomized to minimize potential bias due to ambient temperature, humidity, and barometric pressure changes during the test program. Table 4 gives the test sequence used.

Table 4. Test Sequence

Test Number	Fuel	Run Number
1	EPA	1 / 3
2	B20	1 / 3
3	C20	1 / 3
4	CARB	1 / 3
5	CARB	2 / 3
6	B20	2 / 3
7	EPA	2 / 3
8	C20	2 / 3
9	C20	3 / 3
10	CARB	3 / 3
11	B20	3 / 3
12	EPA	3 / 3

II. TEST RESULTS

Table 5 summarizes duty-cycle weighted results from each of the triplicate tests performed on the four fuels. Detailed test results are given in Appendices A through F. Table 5 includes both EPA Line-Haul and Switch duty cycle composite brake-specific emissions of HC, CO, NO_X, and PM, and AAR-corrected brake-specific fuel consumption. Average results for the triplicate runs are given for each fuel, along with the coefficient of variation (cov). At the bottom of Table 5, the average percentage change between fuels is reported. No formal statistical analysis of the data was performed to establish statistically significant differences.

Observations of the data in Table 5 show that the use of the CARB diesel reduced NO_X by one percent on the Line-Haul cycle and by two percent on the Switch cycle, compared to the baseline EPA locomotive certification fuel. This level of NO_X reduction is notably smaller than the four to six percent reduction in the average Line-Haul cycle NO_X measured by SwRI in three 4,000 hp, turbocharged, EMD 710 engines in a study for CARB, using the same batch of CARB fuel.[2]

B20 fuel increased NO_X by six percent on the Line-Haul cycle and by five percent on the Switch cycle, compared to the baseline EPA locomotive certification fuel. This NO_X increase is in the range noted for other diesel engine studies using B20 fuel. Comparing C20 to CARB fuel, NO_X increased by four percent for both cycles. Comparing C20 to the baseline EPA locomotive certification fuel, the NO_X increase associated with the biodiesel is partially offset with the NO_X reduction associated with the CARB fuel, resulting in a NO_X increase of three percent on the Line-Haul cycle and two percent on the Switch cycle.

PM emissions for this locomotive engine were generally unresponsive to fuel type, with small changes likely due to test-to-test variability. Because PM emissions from two-stroke EMD engines are dominated by lubricating-oil derived components, the influence of fuel type is relatively small. In the CARB locomotive fuel effects study, the soluble organic fraction (SOF) of PM emissions from the turbocharged EMD engines accounted for about 75 percent of total PM. Although no SOF analyses were performed on the PM samples in this project, non-turbocharged EMD engines, like that tested in this project, typically have higher brake-specific lubricating oil consumption than their turbocharged counterparts, suggesting that the SOF of PM would be even higher than observed for the turbocharged engines.

Hydrocarbon emissions also were generally unresponsive to fuel type using the Line-Haul cycle, but some reductions on the Switch cycle were noted with all three fuels compared to the EPA certification fuel, although the changes were likely not be statistically significant.

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2 "S. G. Fritz, "Diesel Fuel Effects on Locomotive Exhaust Emissions," SwRI Final Report 08-02062 (October 2000), prepared for the California Air Resources Board.

Table 5. CSX No 2629 Test Summary

	EPA Line-Haul Duty Cycle					EPA Switch Duty Cycle				
	HC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	PM g/hp-hr	AAR Corr. BSFC lb/hp-hr	HC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	PM g/hp-hr	AAR Corr. BSFC lb/hp-hr
EPA Cert Baseline #1/3	0.71	5.9	11.9	0.47	0.433	0.87	2.4	12.7	0.37	0.464
EPA Cert Baseline #2/3	0.62	5.1	12.3	0.49	0.435	0.80	2.2	12.9	0.42	0.474
EPA Cert Baseline #3/3	0.58	5.1	12.9	0.44	0.434	0.78	2.1	12.9	0.36	0.460
Average	**0.64**	**5.4**	**12.4**	**0.46**	**0.434**	**0.82**	**2.2**	**12.8**	**0.38**	**0.466**
c.o.v.	10%	9%	4%	5%	0%	6%	7%	1%	8%	2%
CARB #1/3	0.63	4.6	12.2	0.48	0.431	0.78	1.8	12.7	0.34	0.467
CARB #2/3	0.62	4.7	12.0	0.46	0.429	0.77	1.9	12.3	0.35	0.457
CARB #3/3	0.67	3.7	12.6	0.45	0.433	0.72	1.6	12.7	0.32	0.466
Average	**0.64**	**4.3**	**12.3**	**0.46**	**0.431**	**0.76**	**1.8**	**12.5**	**0.34**	**0.463**
c.o.v.	4%	13%	3%	4%	0%	4%	6%	2%	5%	1%
B20 #1/3	0.66	5.3	12.6	0.48	0.430	0.78	2.2	13.4	0.36	0.462
B20 #2/3	0.63	4.2	13.0	0.55	0.431	0.73	2.0	13.4	0.38	0.468
B20 #3/3	0.64	3.9	13.6	0.46	0.434	0.82	1.9	13.8	0.38	0.470
Average	**0.64**	**4.5**	**13.1**	**0.50**	**0.432**	**0.78**	**2.0**	**13.5**	**0.37**	**0.467**
c.o.v.	2%	17%	3%	10%	0%	6%	9%	2%	3%	1%
C20 #1/3	0.63	4.2	12.9	0.49	0.434	0.75	1.9	13.1	0.36	0.468
C20 #2/3	0.63	3.9	12.8	0.48	0.431	0.80	1.8	13.3	0.39	0.473
C20 #3/3	0.67	3.9	12.8	0.48	0.432	0.73	1.8	13.1	0.37	0.467
Average	**0.64**	**4.0**	**12.8**	**0.48**	**0.432**	**0.73**	**1.8**	**13.1**	**0.37**	**0.467**
c.o.v.	4%	4%	1%	2%	0%	11%	3%	2%	5%	1%
Average Percent Change from Average EPA Cert. Diesel Baseline										
CARB vs. EPA Cert.	1%	-19%	-1%	0%	-1%	-7%	-21%	-2%	-12%	-1%
B20 vs EPA Cert.	1%	-17%	6%	7%	-1%	-5%	-10%	5%	-3%	0%
C20 vs EPA Cert	1%	-26%	3%	4%	0%	-11%	-19%	2%	-5%	0%
C20 vs. CARB	1%	-8%	4%	4%	0%	-4%	2%	4%	8%	1%
C20 vs. B20	0%	-11%	-2%	-2%	0%	-6%	-10%	-3%	-2%	0%

Carbon monoxide (CO) emissions were reduced on both cycles for all three fuels compared to the EPA certification fuel, although again, the changes may not be statistically significant beyond test-to-test variability.

Table 5 also includes AAR-corrected brake-specific fuel consumption results. SwRI used published AAR corrections for ambient air temperature, barometric pressure, fuel temperature, fuel specific gravity, and fuel heating value to compute “AAR-corrected” brake-specific fuel

consumption from observed values. Results given in Table 5 show that there was essentially no change in the AAR-corrected brake-specific fuel consumption results between the four test fuels.

Compared to the baseline EPA certification fuel, locomotive power output was 1.7 percent lower with the CARB fuel, 0.9 percent lower with the B20 fuel, and 2.4 percent lower with the C20 fuel. The power reductions observed are due to the lower volumetric heating value of the fuels (see Table 2), and that fact that the engine load control system on the GP38-2 locomotive essentially sets to a fixed volumetric fuel rate at each notch position.

Smoke opacity from this type of locomotive engine is characteristically very low, in most cases below the five percent threshold of visibility. Smoke test results show that CSX No. 2629 had very low smoke opacity during steady-state conditions, and during throttle notch changes, and that there was no appreciable change in smoke opacity between the four test fuels.

III. CONCLUSIONS

Exhaust emissions and fuel consumption testing was performed on an EMD GP38-2 locomotive operating on a 20-percent by volume biodiesel blended into EPA locomotive certification diesel fuel and into CARB diesel fuel. No operational problems were observed by SwRI on any of the test fuels, and the locomotive engine was able to produce within 1 to 2 percent of full rated power while operating on the biodiesel blends. Long term durability and reliability were not addressed in this study.

The 5 to 6 percent increase in NO_X emissions with B20 fuel compared to EPA locomotive certification diesel was consistent with B20 tests performed in other engine test programs. The lack of PM response with any of the test fuels is attributed to the fact that most of the PM emissions from this mode of two-stroke EMD engine are lubricating-oil derived.

The EMD 645E engine is arguably the most likely candidate for use of biodiesel-blended fuels by the freight railroads, as the 645E engine is used extensively in switcher and road-switcher applications, where they are likely to be centrally fueled, and operated in urban areas. However, a roots-blown (non-turbocharged) EMD 645E locomotive engine may not have been the best choice for demonstrating fuel effects on PM emissions, due to the dominance lubricating oil consumption has on the PM emissions from these engines.

APPENDIX A

BASELINE TESTS WITH EPA CERTIFICATION DIESEL FUEL

CSX #2629 EMD GP38 EMD 16-645-E3
Tested 10/26/00 @ SwRI, Baseline (EM-2834-F)

Notch	Gross HP	obs Fuel Rate (lb/hr)	HC (g/hr)	CO (g/hr)	Corr. NOx (g/hr)	PM (g/hr)	AAR Corr bsfc	Corr. Fuel Rate (lb/hr)
8	2,140	912	1,451	18,180	24,443	1,139	0.426	912
7	1,894	768	1,128	9,730	22,683	867	0.406	768
6	1,575	620	697	4,245	18,723	552	0.394	620
5	1,283	498	497	1,337	15,065	405	0.388	498
4	1,032	394	365	658	11,455	356	0.382	394
3	586	228	285	430	5,659	154	0.389	228
2	320	134	173	452	3,041	107	0.419	134
1	83	51	143	235	1,311	26	0.615	51
Idle	11	25	131	191	718	15	2.349	25
DB-2	18	40	182	343	990	28	2.216	40
						sum =		

AAR 3x3 Weighted Results

WF	w-BHP	obs w-Fuel w-(lb/hr)	corr w-Fuel w-(lb/hr)	w-HC w-(g/hr)	w-CO w-(g/hr)	w-NOx w-(g/hr)	w-PM w-(g/hr)
25.0%	535.1	228.0	227.9	362.8	4545.0	6110.8	284.8
0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25.0%	320.8	124.5	124.5	124.3	334.3	3766.3	101.3
0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50.0%	5.3	12.4	12.3	65.5	95.5	359.0	7.5
0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
100.0%	861.1	364.9	364.7	552.5	4974.8	10236.0	393.5

AAR 3x3 duty cycle weighted brake-specific emissions = 0.424 bsfc, 0.424 corr bsfc, 0.64, 5.78, 11.89, 0.457

EPA Switcher Duty Cycle Weighted Results

Notch	WF	w-BHP	obs w-Fuel w-(lb/hr)	corr w-Fuel w-(lb/hr)	w-HC w-(g/hr)	w-CO w-(g/hr)	w-NOx w-(g/hr)	w-PM w-(g/hr)
8	0.8%	17.1	7.3	7.3	11.6	145.4	195.5	9.1
7	0.2%	3.8	1.5	1.5	2.3	19.5	45.4	1.7
6	1.5%	23.6	9.3	9.3	10.5	63.7	280.8	8.3
5	3.6%	46.2	17.9	17.9	17.9	48.1	542.3	14.6
4	3.6%	37.1	14.2	14.2	13.1	23.7	412.4	12.8
3	5.8%	34.0	13.2	13.2	16.5	24.9	328.2	8.9
2	12.3%	39.3	16.5	16.5	21.3	55.6	374.0	13.2
1	12.4%	10.3	6.3	6.3	17.7	29.1	162.6	3.2
Idle	59.8%	6.3	14.8	14.7	78.3	114.2	429.4	9.0
DB	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
sum =	100.0%	217.7	101.1	101.0	189.2	524.3	2770.7	80.8

EPA switcher duty cycle weighted brake-specific emissions = 0.464 obs bsfc, 0.464 corr bsfc, 0.87, 2.41, 12.72, 0.371

EPA Freight Duty Cycle Weighted Results

Notch	WF	w-BHP	obs w-Fuel w-(lb/hr)	corr w-Fuel w-(lb/hr)	w-HC w-(g/hr)	w-CO w-(g/hr)	w-NOx w-(g/hr)	w-PM w-(g/hr)
8	16.2%	346.7	147.7	147.7	235.1	2945.2	3959.8	184.5
7	3.0%	56.8	23.0	23.0	33.8	291.9	680.5	26.0
6	3.9%	61.4	24.2	24.2	27.2	165.6	730.2	21.5
5	3.8%	48.8	18.9	18.9	18.9	50.8	572.5	15.4
4	4.4%	45.4	17.3	17.3	16.1	29.0	504.0	15.7
3	5.2%	30.5	11.9	11.9	14.8	22.4	294.3	8.0
2	6.5%	20.8	8.7	8.7	11.2	29.4	197.7	7.0
1	6.5%	5.4	3.3	3.3	9.3	15.3	85.2	1.7
Idle	38.0%	4.0	9.4	9.4	49.8	72.6	272.8	5.7
DB	12.5%	2.3	5.0	5.0	22.8	42.9	123.8	3.5
sum =	100.0%	622.0	269.5	269.4	438.9	3664.8	7420.7	289.0

EPA freight duty cycle weighted brake-specific emissions = 0.433 obs bsfc, 0.433 corr bsfc, 0.71, 5.89, 11.93, 0.465

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	IDLE	TEST CONFIGURATION	=	Cert 100
TEST DATE	=	10/26/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	1/10			
SwRI FUEL CODE	=	EM-2834-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.21 (in. Hg)	ENGINE INTAKE AIR	=	87.(°F)
DRY BULB TEMP	=	79. (°F)	WET BULB TEMP	=	71. (°F)
ABS HUMIDITY	=	106.11 (GR/LB)	RELATIVE HUMIDITY	=	69. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	4.3
TRACTION MOTOR BLOWER HP	=	1.9
INERTIAL SEPERATOR BLOWER HP	=	.3
RADIATOR FAN HP	=	.0
TOTAL ACCESSORY HP	=	10.5

FUEL RATE (OBS) = 24.8 (LB/HR)
ALT. VOLTS = 3. ALT. AMPS = 0. ALT. EFF. = .939
FLYWHEEL HP = 10.5 OBS. SFC = 2.3562 AAR CORR. SFC = 2.3491 (LB/HP-HR)
CALCULATED A/F = 321.54 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	131.	12.43	75.PPMC
CO	191.	18.14	55. PPM
NOX	661.	62.76	115. PPM (D)
NOX,CORR	718.	68.24	
CO2		3331.	.64 PCT
O2			20.03 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0874	NOX-KH	= 1.0714	NOX-KT	= 1.0000
WET EXH HC CF	= .9892	AIR TEMP CF	= .9878	BAROM CF	= 1.0030
FUEL TEMP CF	= .9850	FUEL S.G. CF	= .9907	FUEL HHV CF	= 1.0062

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	8364.0-122
FILTER PAIR WEIGHT GAIN (mg)	1.501
SAMPLE VOLUME (scf)	38.667
DILUTE PM CONCENTRATION (mg/scf)	.039
CO2-BASED DILUTION FACTOR	3.540
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.137
PARTICULATE MASS EMISSION RATE (g/hr)	15.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	1.390

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	DB2	TEST CONFIGURATION	=	Cert 100
TEST DATE	=	10/26/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	2/10			
SwRI FUEL CODE	=	EM-2834-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.21 (in. Hg)	ENGINE INTAKE AIR	=	82.(°F)
DRY BULB TEMP	=	79. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	107.80 (GR/LB)	RELATIVE HUMIDITY	=	71. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	6.5
TRACTION MOTOR BLOWER HP	=	6.6
INERTIAL SEPERATOR BLOWER HP	=	1.0
RADIATOR FAN HP	=	.0
TOTAL ACCESSORY HP	=	18.0

FUEL RATE (OBS) = 40.0 (LB/HR)
ALT. VOLTS = 7. ALT. AMPS = 0. ALT. EFF. = .939
FLYWHEEL HP = 18.0 OBS. SFC = 2.2174 AAR CORR. SFC = 2.2157 (LB/HP-HR)
CALCULATED A/F = 286.11 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	182.	10.07	73.PPMC
CO	343.	19.04	69. PPM
NOX	906.	50.25	110. PPM (D)
NOX,CORR	990.	54.88	
CO2		3137.	.72 PCT
O2			20.03 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0921	NOX-KH	= 1.0752	NOX-KT	= 1.0000
WET EXH HC CF=	.9884	AIR TEMP CF =	.9901	BAROM CF	= 1.0030
FUEL TEMP CF =	.9835	FUEL S.G. CF =	.9907	FUEL HHV CF	= 1.0062

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	8365.0-123
FILTER PAIR WEIGHT GAIN (mg)	1.919
SAMPLE VOLUME (scf)	38.379
DILUTE PM CONCENTRATION (mg/scf)	.050
CO2-BASED DILUTION FACTOR	3.713
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.186
PARTICULATE MASS EMISSION RATE (g/hr)	28.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	1.573

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 1	TEST CONFIGURATION	=	Cert 100
TEST DATE	=	10/26/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	3/10			
SwRI FUEL CODE	=	EM-2834-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.21 (in. Hg)	ENGINE INTAKE AIR	=	82.(°F)
DRY BULB TEMP	=	79. (°F)	WET BULB TEMP	=	71. (°F)
ABS HUMIDITY	=	104.78 (GR/LB)	RELATIVE HUMIDITY	=	6B. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	5.3
TRACTION MOTOR BLOWER HP	=	3.6
INERTIAL SEPERATOR BLOWER HP	=	.5
RADIATOR FAN HP	=	.0
TOTAL ACCESSORY HP	=	13.4

FUEL RATE (OBS) = 51.0 (LB/HR)
ALT. VOLTS = 181. ALT. AMPS = 269. ALT. EFF. = .939
FLYWHEEL HP = 82.9 OBS. SFC = .6151 AAR CORR. SFC = .6147 (LB/HP-HR)
CALCULATED A/F = 189.15 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	143.	1.72	68.PPMC
CO	235.	2.84	56. PPM
NOX	1214.	14.64	176. PPM (D)
NOX,CORR	1311.	15.81	
CO2		877.	1.10 PCT
O2			19.53 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0804	NOX-KH	= 1.0657	NOX-KT	= 1.0000
WET EXH HC CF=	.9852	AIR TEMP CF =	.9901	BAROM CF	= 1.0030
FUEL TEMP CF =	.9835	FUEL S.G. CF =	.9907	FUEL HHV CF	= 1.0062

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	8366.0-126
FILTER PAIR WEIGHT GAIN (mg)	1.968
SAMPLE VOLUME (scf)	38.547
DILUTE PM CONCENTRATION (mg/scf)	.051
CO2-BASED DILUTION FACTOR	3.895
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.199
PARTICULATE MASS EMISSION RATE (g/hr)	26.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.310

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 2	TEST CONFIGURATIDN	=	Cert 100
TEST DATE	=	10/26/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	4/10			
SwRI FUEL CODE	=	EM-2834-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.20 (in. Hg)	ENGINE INTAKE AIR	=	80.(°F)
DRY BULB TEMP	=	80. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	104.85 (GR/LB)	RELATIVE HUMIDITY	=	66. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	6.5
TRACTION MOTOR BLOWER HP	=	6.7
INERTIAL SEPERATOR BLOWER HP	=	1.0
RADIATOR FAN HP	=	3.1
TOTAL ACCESSORY HP	=	21.3

FUEL RATE (OBS) = 134.0 (LB/HR)
ALT. VOLTS = 377. ALT. AMPS = 554. ALT. EFF. = .939
FLYWHEEL HP = 319.6 OBS. SFC = .4192 AAR CORR. SFC = .4193 (LB/HP-HR)
CALCULATED A/F = 93.80 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	173.	.54	63.PPMC
CO	452.	1.41	83. PPM
NOX	2830.	8.85	316. PPM (D)
NOX,CORR	3041.	9.52	
CO2		601.	2.24 PCT
O2			17.91 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0747	NOX-KH	= 1.0610	NOX-KT	= 1.0000
WET EXH HC CF=	.9752	AIR TEMP CF	= .9910	BAROM CF	= 1.0029
FUEL TEMP CF =	.9835	FUEL S.G. CF	= .9907	FUEL HHV CF	= 1.0062

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	8367.0-127
FILTER PAIR WEIGHT GAIN (mg)	5.774
SAMPLE VOLUME (scf)	38.067
DILUTE PM CONCENTRATION (mg/scf)	.152
CO2-BASED DILUTION FACTOR	4.175
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.633
PARTICULATE MASS EMISSION RATE (g/hr)	107.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.335

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 3	TEST CONFIGURATION	=	Cert 100
TEST DATE	=	10/26/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	5/10			
SwRI FUEL COOE	=	EM-2834-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.20 (in. Hg)	ENGINE INTAKE AIR	=	78.(°F)
DRY BULB TEMP	=	80. (°F)	WET BULB TEMP	=	71. (°F)
ABS HUMIDITY	=	99.70 (GR/LB)	RELATIVE HUMIOITY	=	62. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	8.3
TRACTION MOTOR BLOWER HP	=	14.0
INERTIAL SEPERATOR BLOWER HP	=	2.1
RADIATOR FAN HP	=	6.5
TOTAL ACCESSORY HP	=	35.0

FUEL RATE (OBS) = 228.0 (LB/HR)
ALT. VOLTS = 514. ALT. AMPS = 751. ALT. EFF. = .939
FLYWHEEL HP = 586.4 OBS. SFC = .3888 AAR CORR. SFC = .3892 (LB/HP-HR)
CALCULATED A/F = 70.63 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	285.	.49	80.PPMC
CO	430.	.73	62. PPM
NOX	5334.	9.10	466. PPM (D)
NOX,CORR	5659.	9.65	
CO2		558.	2.99 PCT
O2			16.78 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0608	NOX-KH	= 1.0498	NOX-KT	= 1.0000
WET EXH HC CF=	.9690	AIR TEMP CF	= .9919	BAROM CF	= 1.0029
FUEL TEMP CF =	.9835	FUEL S.G. CF =	.9907	FUEL HHV CF	= 1.0062

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6716.0-1
FILTER PAIR WEIGHT GAIN (mg)	5.279
SAMPLE VOLUME (scf)	38.13B
DILUTE PM CONCENTRATION (mg/scf)	.138
CO2-BASED DILUTION FACTOR	5.126
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.710
PARTICULATE MASS EMISSION RATE (g/hr)	154.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.263

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 4	TEST CONFIGURATION	=	Cert 100
TEST DATE	=	10/26/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	6/10			
SwRI FUEL CODE	=	EM-2834-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.20 (in. Hg)	ENGINE INTAKE AIR	=	80.(°F)
DRY BULB TEMP	=	81. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	103.47 (GR/LB)	RELATIVE HUMIDITY	=	64. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	9.6
TRACTION MOTOR BLOWER HP	=	21.2
INERTIAL SEPERATOR BLOWER HP	=	3.2
RADIATOR FAN HP	=	9.8
TOTAL ACCESSORY HP	=	47.8

FUEL RATE (OBS) = 394.0 (LB/HR)
ALT. VOLTS = 690. ALT. AMPS = 998. ALT. EFF. = .939
FLYWHEEL HP = 1031.5 OBS. SFC = .3820 AAR CORR. SFC = .3820 (LB/HP-HR)
CALCULATED A/F = 46.28 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	365.	.35	90.PPMC
CO	658.	.64	84. PPM
NOX	10705.	10.38	832. PPM (D)
NOX,CORR	11455.	11.10	
CO2		549.	4.60 PCT
O2			14.65 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0701	NOX-KH	= 1.0573	NOX-KT	= 1.0000
WET EXH HC CF=	.9553	AIR TEMP CF	= .9910	BAROM CF	= 1.0029
FUEL TEMP CF =	.9830	FUEL S.G. CF =	.9907	FUEL HHV CF	= 1.0062

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6717.0-2
FILTER PAIR WEIGHT GAIN (mg)	9.043
SAMPLE VOLUME (scf)	38.158
DILUTE PM CONCENTRATION (mg/scf)	.237
CO2-BASED DILUTION FACTOR	6.051
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	1.434
PARTICULATE MASS EMISSION RATE (g/hr)	356.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.345

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 5	TEST CONFIGURATION	=	Cert 100
TEST DATE	=	10/26/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	7/10			
SwRI FUEL CODE	=	EM-2834-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.20 (in. Hg)	ENGINE INTAKE AIR	=	80.(°F)
DRY BULB TEMP	=	82. (°F)	WET BULB TEMP	=	71. (°F)
ABS HUMIDITY	=	101.52 (GR/LB)	RELATIVE HUMIDITY	=	61. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	10.8
TRACTION MOTOR BLOWER HP	=	30.4
INERTIAL SEPERATOR BLOWER HP	=	4.6
RADIATOR FAN HP	=	28.1
TOTAL ACCESSORY HP	=	77.8

FUEL RATE (OBS) = 498.0 (LB/HR)
ALT. VOLTS = 765. ALT. AMPS = 1103. ALT. EFF. = .939
FLYWHEEL HP = 1283.2 OBS. SFC = .3881 AAR CORR. SFC = .3881 (LB/HP-HR)
CALCULATED A/F = 41.62 (LB DRY AIR/L8 FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	497.	.39	108.PPMC
CO	1337.	1.04	150. PPM
NOX	14145.	11.02	969. PPM (D)
NOX,CORR	15065.	11.74	
CO2		557.	5.12 PCT
O2			13.77 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0651	NOX-KH	= 1.0532	NOX-KT	= 1.0000
WET EXH HC CF	= .9511	AIR TEMP CF	= .9910	BAROM CF	= 1.0029
FUEL TEMP CF	= .9850	FUEL S.G. CF	= .9907	FUEL HHV CF	= 1.0062

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6718.0-3
FILTER PAIR WEIGHT GAIN (mg)	8.095
SAMPLE VOLUME (scf)	37.614
DILUTE PM CONCENTRATION (mg/scf)	.215
CO2-BASED DILUTION FACTOR	6.665
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	1.434
PARTICULATE MASS EMISSION RATE (g/hr)	405.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.316

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 6	TEST CONFIGURATION	=	Cert 100
TEST DATE	=	10/26/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	8/10			
SwRI FUEL CODE	=	EM-2834-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.19 (in. Hg)	ENGINE INTAKE AIR	=	81.(°F)
DRY BULB TEMP	=	81. (°F)	WET BULB TEMP	=	71. (°F)
ABS HUMIDITY	=	102.46 (GR/LB)	RELATIVE HUMIDITY	=	64. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	12.2
TRACTION MOTOR BLOWER HP	=	44.0
INERTIAL SEPERATOR BLOWER HP	=	6.6
RADIATOR FAN HP	=	40.7
TOTAL ACCESSORY HP	=	107.6

FUEL RATE (OBS) = 620.0 (LB/HR)
ALT. VOLTS = 848. ALT. AMPS = 1211. ALT. EFF. = .939
FLYWHEEL HP = 1574.6 OBS. SFC = .3937 AAR CORR. SFC = .3936 (LB/HP-HR)
CALCULATED A/F = 37.24 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	697.	.44	135.PPMC
CO	4245.	2.70	430. PPM
NOX	17541.	11.14	1082. PPM (D)
NOX,CORR	18723.	11.89	
CO2		562.	5.71 PCT
O2			13.02 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0674	NOX-KH	= 1.0551	NOX-KT	= 1.0000
WET EXH HC CF=	.9461	AIR TEMP CF	= .9905	BAROM CF	= 1.0029
FUEL TEMP CF =	.9845	FUEL S.G. CF =	.9907	FUEL HHV CF	= 1.0062

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6719.0-4
FILTER PAIR WEIGHT GAIN (mg)	8.056
SAMPLE VOLUME (scf)	37.261
DILUTE PM CONCENTRATION (mg/scf)	.216
CO2-BASED DILUTION FACTOR	8.088
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	1.749
PARTICULATE MASS EMISSION RATE (g/hr)	552.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.350

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 7	TEST CONFIGURATION	=	Cert 100
TEST DATE	=	10/26/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	9/10			
SwRI FUEL CODE	=	EM-2834-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.19 (in. Hg)	ENGINE INTAKE AIR	=	80.(°F)
DRY BULB TEMP	=	81. (°F)	WET BULB TEMP	=	71. (°F)
ABS HUMIDITY	=	100.27 (GR/LB)	RELATIVE HUMIDITY	=	61. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	13.8
TRACTION MOTOR BLOWER HP	=	63.2
INERTIAL SEPERATOR BLOWER HP	=	9.5
RADIATOR FAN HP	=	58.5
TOTAL ACCESSORY HP	=	148.9

FUEL RATE (OBS) = 768.0 (LB/HR)
ALT. VOLTS = 926. ALT. AMPS = 1319. ALT. EFF. = .939
FLYWHEEL HP = 1893.8 OBS. SFC = .4055 AAR CORR. SFC = .4055 (LB/HP-HR)
CALCULATED A/F = 33.59 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	1128.	.60	195.PPMC
CO	9730.	5.14	885. PPM
NOX	21361.	11.28	1182. PPM (D)
NOX,CORR	22683.	11.98	
CO2		575.	6.30 PCT
O2			12.15 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0619	NOX-KH	= 1.0506	NOX-KT	= 1.0000
WET EXH HC CF	= .9411	AIR TEMP CF	= .9910	BAROM CF	= 1.0029
FUEL TEMP CF	= .9860	FUEL S.G. CF	= .9907	FUEL HHV CF	= 1.0062

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6720.0-5
FILTER PAIR WEIGHT GAIN (mg)	11.375
SAMPLE VOLUME (scf)	36.273
DILUTE PM CONCENTRATION (mg/scf)	.314
CO2-BASED DILUTION FACTOR	7.824
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	2.453
PARTICULATE MASS EMISSION RATE (g/hr)	867.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.458

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 8	TEST CONFIGURATION	=	Cert 100
TEST DATE	=	10/26/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	10/10			
SwRI FUEL CODE	=	EM-2834-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.19 (in. Hg)	ENGINE INTAKE AIR	=	81.(°F)
DRY BULB TEMP	=	81. (°F)	WET BULB TEMP	=	71. (°F)
ABS HUMIDITY	=	102.01 (GR/LB)	RELATIVE HUMIDITY	=	62. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	15.1
TRACTION MOTOR BLOWER HP	=	83.4
INERTIAL SEPERATOR BLOWER HP	=	12.5
RADIATOR FAN HP	=	77.2
TOTAL ACCESSORY HP	=	192.2

FUEL RATE (OBS) = 912.0 (LB/HR)
ALT. VOLTS = 981. ALT. AMPS = 1390. ALT. EFF. = .939
FLYWHEEL HP = 2140.2 OBS. SFC = .4261 AAR CORR. SFC = .4259 (LB/HP-HR)
CALCULATED A/F = 30.74 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	1451.	.68	230.PPMC
CO	18180.	8.49	1524. PPM
NOX	22924.	10.71	1170. PPM (D)
NOX,CORR	24443.	11.42	
CO2		599.	6.84 PCT
O2			11.52 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0663	NOX-KH	= 1.0542	NOX-KT	= 1.0000
WET EXH HC CF=	.9364	AIR TEMP CF =	.9905	BAROM CF	= 1.0029
FUEL TEMP CF =	.9860	FUEL S.G. CF =	.9907	FUEL HHV CF	= 1.0062

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6721.0-6
FILTER PAIR WEIGHT GAIN (mg)	14.368
SAMPLE VOLUME (scf)	34.970
DILUTE PM CONCENTRATION (mg/scf)	.411
CO2-BASED DILUTION FACTOR	7.197
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	2.957
PARTICULATE MASS EMISSION RATE (g/hr)	1139.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.532

LOCOMOTIVE TEST SUMMARY

SwRI Project No. 08.02999.001

Test Date 10-26-00

Notch	Idle	DB-2	1	2	3	4	5	6	7	8
Run Number										
Barometer (in. Hg)	29.21	29.21	29.21	29.20	29.20	29.20	29.20	29.19	29.19	29.19
Dry Bulb Temp. (°F)	79.0	78.7	79.1	80.1	80.4	80.9	81.7	80.5	81.1	81.1
Wet Bulb Temp. (°F)	71.4	71.6	71.2	71.5	70.7	71.5	71.4	71.2	71.0	71.3
Fuel Supply Temp. (°F)	90	93	93	93	93	94	90	91	88	88
Water Inlet Temp. (°F)	160	169	173	169	163	168	177	178	183	182
Engine Intake Air @ Filter (°F)	87	82	82	80	78	80	80	81	80	81
Engine Speed (rpm)	258	388	316	390	~~574~~ 590	574	647	732	826	906
Traction Volts	2.75	6.78	181	377	~~8~~ 514	690	765	848	926	981
Traction Amps	0	0	269	554	751	998	1103	1211	1319	1390
Fuel Rate (lb/hr)	24.8	40.0	51.0	134	228	394	498	620	768	912
# of Fans	0	0	0	1	1	1	2	2	2	2
HC (ppmC)	75.14	72.63	67.62	62.61	80.15	90.16	107.70	135.25	195.35	230.42
CO (ppm)	54.76	68.67	55.91	82.81	61.69	84.00	150.48	439.13	884.55	1523.76
Raw Exhaust CO_2 (%)	.64	.72	1.10	2.24	2.99	4.60	5.12	5.71	6.30	6.84
NO_x (ppm)	115.34	110.33	175.52	315.74	466.09	831.94	969.27	1081.93	1182.05	1169.54
O_2 (%)	20.03	20.03	19.53	17.91	16.78	14.65	13.77	13.02	12.15	11.52
Tunnel Dilute CO_2 (%)	2257	2412	3236	5713	6240	7892	7989	7333	8286	9581
Background CO_2 (ppm)	651	675	604	604	699	699	748	699	748	699

Notes: 1 - Air compressor locked off.

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Test Configuration: EM- 2834-F Cert 100 Run #1

Operator: E.A.

LOCOMOTIVE TEST SUMMARY

SwRI Project No.08.02999.001

Test Date 10-26-00

Notch	Idle	DB-2	1	2	3	4	5	6	7	8
Time ~~Run Number~~	11:10	11:25	11:38	11:47	12:00	12:10	12:21	12:33	12:45	12:55
Observed Fuel Rate at X minutes into test point (lb/hr)										
3 min.	25.3	40.2	51.4	135	229	396	496	619	771	910
5 min.	24.8	40.6	51.9	134	228	394	496	622	766	911
7 min.	23.5	40.1	51.5	134	229	395	497	619	767	910
Averaged Fuel Rate over Time										
Cumulative Fuel Used (lbs)	3.3	4.3	3.4	6.7	11.4	19.7	24.9	31.0	38.4	45.6
Over X Minutes	8.0	6.8	4.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
x 60. = Fuel Rate (lb/hr)	24.8	40.0	51.0	134	228	~~498~~ 394	498	620	768	912
Traction Volts	2.75	6.78	181	377	514	690	765	846	926	981
Current Shunt mV	0	0	3.36	6.93	9.39	12.48	13.79	15.14	14.49	17.37
Traction Current = Shunt mV * 80.	0	0	269	554	751	998	1103	1211	1319	1390
Right Airbox Temp., °F	132	128	127	130	129	133	138	149	160	178
Left Airbox Temp., °F	102	106	102	107	113	119	129	143	159	179
Airbox Pressure, in. Hg	.89	1.91	1.32	1.91	2.96	4.01	5.26	6.91	9.20	11.32
Left Exhaust Temperature, °F	—	—	—	—	—	—	—	—	—	—
Right Exhaust Temperature, °F	—	—	—	—	—	—	—	—	—	—
SS Smoke, % Opacity	0	0	0	1.5	1.9	3.4	4.7	4.0	6.1	8.0
Notes: 1 - Air compressor locked off.	215	900	1655	2310	3035	3610	4300	4995	5705	6240

0 drift
+3.6

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Test Configuration: EM-2834-F Cert 100 Run #1

Operator: Ed

290.prn

CSX #2629 EMD GP38 EMD 16-645-E3
Tested 10/30/00 @ SwRI, Baseline (EM-2834-F)

AAR 3x3 Weighted Results

Notch	Gross HP	obs Fuel Rate (lb/hr)	HC (g/hr)	CO (g/hr)	Corr. NOx (g/hr)	PM (g/hr)	AAR Corr bsfc	Corr. Fuel Rate (lb/hr)	WF	w-BHP	obs w-Fuel w-(lb/hr)	corr w-Fuel w-(lb/hr)	w-HC w-(g/hr)	w-CO w-(g/hr)	w-NOx w-(g/hr)	w-PM w-(g/hr)
8	2,134	908	1,228	15,743	25,483	1,147	0.425	908	25.0%	533.6	227.0	226.9	307.0	3935.8	6370.8	286.8
7	1,892	766	914	8,081	23,557	922	0.404	765	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	1,561	618	644	3,503	19,322	563	0.396	617	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	1,283	496	446	1,039	14,963	449	0.386	496	25.0%	320.8	124.0	123.9	111.5	259.8	3740.8	112.3
4	1,022	392	360	594	11,523	440	0.383	392	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	582	232	254	437	4,683	197	0.399	232	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	319	132	164	426	3,019	119	0.413	132	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	83	54	123	249	1,414	26	0.650	54	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Idle	11	28	121	190	803	17	2.626	28	50.0%	5.3	13.8	13.8	60.5	95.0	401.5	8.5
DB-2	18	40	175	338	990	27	2.224	40	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
						sum =			100.0%	859.6	364.8	364.6	479.0	4290.5	10513.0	407.5

AAR 3x3 duty cycle weighted brake-specific emissions = 0.424 obs bsfc, 0.424 corr bsfc, 0.56, 4.99, 12.23, 0.474

EPA Switcher Duty Cycle Weighted Results

Notch	WF	w-BHP	obs w-Fuel w-(lb/hr)	corr w-Fuel w-(lb/hr)	w-HC w-(g/hr)	w-CO w-(g/hr)	w-NOx w-(g/hr)	w-PM w-(g/hr)
8	0.8%	17.1	7.3	7.3	9.8	125.9	203.9	9.2
7	0.2%	3.8	1.5	1.5	1.8	16.2	47.1	1.8
6	1.5%	23.4	9.3	9.3	9.7	52.5	289.8	8.4
5	3.6%	46.2	17.9	17.8	16.1	37.4	538.7	16.2
4	3.6%	36.8	14.1	14.1	13.0	21.4	414.8	15.8
3	5.8%	33.7	13.5	13.5	14.7	25.3	271.6	11.4
2	12.3%	39.2	16.2	16.2	20.2	52.4	371.3	14.6
1	12.4%	10.3	6.7	6.7	15.3	30.9	175.3	3.2
Idle	59.8%	6.3	16.4	16.5	72.4	113.6	480.2	10.2
DB	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
sum =	100.0%	216.8	102.9	102.8	172.8	475.7	2792.8	90.9

EPA switcher duty cycle weighted brake-specific emissions = 0.475 obs bsfc, 0.474 corr bsfc, 0.80, 2.19, 12.88, 0.419

EPA Freight Duty Cycle Weighted Results

Notch	WF	w-BHP	obs w-Fuel w-(lb/hr)	corr w-Fuel w-(lb/hr)	w-HC w-(g/hr)	w-CO w-(g/hr)	w-NOx w-(g/hr)	w-PM w-(g/hr)
8	16.2%	345.7	147.1	147.0	198.9	2550.4	4128.2	185.8
7	3.0%	56.7	23.0	22.9	27.4	242.4	706.7	27.7
6	3.9%	60.9	24.1	24.1	25.1	136.6	753.6	22.0
5	3.8%	48.8	18.8	18.8	16.9	39.5	568.6	17.1
4	4.4%	45.0	17.2	17.2	15.8	26.1	507.0	19.4
3	5.2%	30.3	12.1	12.1	13.2	22.7	243.5	10.2
2	6.5%	20.7	8.6	8.6	10.7	27.7	196.2	7.7
1	6.5%	5.4	3.5	3.5	8.0	16.2	91.9	1.7
Idle	38.0%	4.0	10.5	10.5	46.0	72.2	305.1	6.5
DB	12.5%	2.3	5.0	5.0	21.9	42.3	123.8	3.4
sum =	100.0%	619.7	269.9	269.8	384.0	3176.1	7624.7	301.4

EPA freight duty cycle weighted brake-specific emissions = 0.436 obs bsfc, 0.435 corr bsfc, 0.62, 5.13, 12.30, 0.486

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	IDLE	TEST CONFIGURATION	=	CERT 100
TEST DATE	=	10/30/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	1/10			
SwRI FUEL CODE	=	EM-2834-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.23 (in. Hg)	ENGINE INTAKE AIR	=	82.(°F)
DRY BULB TEMP	=	83. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	103.95 (GR/LB)	RELATIVE HUMIDITY	=	59. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	4.3
TRACTION MOTOR BLOWER HP	=	1.9
INERTIAL SEPERATOR BLOWER HP	=	.3
RADIATOR FAN HP	=	.0
TOTAL ACCESSORY HP	=	10.5

FUEL RATE (OBS) = 27.5 (LB/HR)
ALT. VOLTS = 3. ALT. AMPS = 0. ALT. EFF. = .939
FLYWHEEL HP = 10.5 OBS. SFC = 2.6273 AAR CORR. SFC = 2.6258 (LB/HP-HR)
CALCULATED A/F = 322.45 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	121.	11.58	63.PPMC
CO	190.	18.15	49. PPM
NOX	743.	70.94	117. PPM (D)
NOX,CORR	803.	76.69	
CO2		3725.	.64 PCT
O2			20.03 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0811	NOX-KH	= 1.0662	NOX-KT	= 1.0000
WET EXH HC CF=	.9893	AIR TEMP CF	= .9901	BAROM CF	= 1.0032
FUEL TEMP CF =	.9800	FUEL S.G. CF =	.9907	FUEL HHV CF	= 1.0062

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6772.0-57
FILTER PAIR WEIGHT GAIN (mg)	1.386
SAMPLE VOLUME (scf)	38.880
DILUTE PM CONCENTRATION (mg/scf)	.036
CO2-BASED DILUTION FACTOR	4.109
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.146
PARTICULATE MASS EMISSION RATE (g/hr)	17.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	1.657

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	D82	TEST CONFIGURATION	=	CERT 100
TEST DATE	=	10/30/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	2/10			
SwRI FUEL CODE	=	EM-2834-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.23 (in. Hg)	ENGINE INTAKE AIR	=	82.(°F)
DRY BULB TEMP	=	84. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	103.43 (GR/LB)	RELATIVE HUMIDITY	=	5B. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	6.5
TRACTION MOTOR BLOWER HP	=	6.5
INERTIAL SEPERATOR BLOWER HP	=	1.0
RADIATOR FAN HP	=	.0
TOTAL ACCESSORY HP	=	18.0

FUEL RATE (OBS) = 40.0 (LB/HR)
ALT. VOLTS = 8. ALT. AMPS = 0. ALT. EFF. = .939
FLYWHEEL HP = 18.0 OBS. SFC = 2.2251 AAR CORR. SFC = 2.2239 (LB/HP-HR)
CALCULATED A/F = 286.25 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	175.	9.76	70.PPMC
CO	338.	18.79	68. PPM
NOX	917.	51.02	112. PPM (D)
NOX,CORR	990.	55.07	
CO2		3149.	.72 PCT
O2			19.91 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0793	NOX-KH	= 1.0648	NOX-KT	= 1.0000
WET EXH HC CF=	.9886	AIR TEMP CF	= .9901	BAROM CF	= 1.0032
FUEL TEMP CF =	.9830	FUEL S.G. CF =	.9907	FUEL HHV CF	= 1.0062

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6773.0-58
FILTER PAIR WEIGHT GAIN (mg)	1.716
SAMPLE VOLUME (scf)	38.626
DILUTE PM CONCENTRATION (mg/scf)	.044
CO2-BASED DILUTION FACTOR	3.904
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.173
PARTICULATE MASS EMISSION RATE (g/hr)	27.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	1.475

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 1	TEST CONFIGURATION	=	CERT 100
TEST DATE	=	10/30/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	3/10			
SwRI FUEL CODE	=	EM-2834-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.22 (in. Hg)	ENGINE INTAKE AIR	=	84.(°F)
DRY BULB TEMP	=	84. (°F)	WET BULB TEMP	=	73. (°F)
ABS HUMIDITY	=	103.29 (GR/LB)	RELATIVE HUMIDITY	=	57. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	5.3
TRACTION MOTOR BLOWER HP	=	3.5
INERTIAL SEPERATOR BLOWER HP	=	.5
RADIATOR FAN HP	=	.0
TOTAL ACCESSORY HP	=	13.3

FUEL RATE (OBS) = 54.0 (LB/HR)
ALT. VOLTS = 182. ALT. AMPS = 268. ALT. EFF. = .939
FLYWHEEL HP = B3.0 OBS. SFC = .6506 AAR CORR. SFC = .6496 (LB/HP-HR)
CALCULATED A/F = 189.37 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	123.	1.49	55.PPMC
CO	249.	3.01	56. PPM
NOX	1314.	15.83	179. PPM (0)
NOX.CORR	1414.	17.04	
CO2		929.	1.10 PCT
O2			19.41 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0762	NOX-KH	= 1.0623	NOX-KT	= 1.0000
WET EXH HC CF=	.9852	AIR TEMP CF	= .9892	BAROM CF	= 1.0031
FUEL TEMP CF =	.9820	FUEL S.G. CF	= .9907	FUEL HHV CF	= 1.0062

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6774.0-59
FILTER PAIR WEIGHT GAIN (mg)	1.780
SAMPLE VOLUME (scf)	38.555
DILUTE PM CONCENTRATION (mg/scf)	.046
CO2-BASED DILUTION FACTOR	4.130
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.191
PARTICULATE MASS EMISSION RATE (g/hr)	26.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.314

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 2	TEST CONFIGURATION	=	CERT 100
TEST DATE	=	10/30/ 0	ENGINE MODEL	=	EMD I6-645E3
TEST NUMBER	=	4/10			
SwRI FUEL CODE	=	EM-2834-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.22 (in. Hg)	ENGINE INTAKE AIR	=	84.(°F)
DRY BULB TEMP	=	86. (°F)	WET BULB TEMP	=	73. (°F)
ABS HUMIDITY	=	101.40 (GR/LB)	RELATIVE HUMIDITY	=	54. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	6.5
TRACTION MOTOR BLOWER HP	=	6.6
INERTIAL SEPERATOR BLOWER HP	=	1.0
RADIATOR FAN HP	=	3.0
TOTAL ACCESSORY HP	=	21.1

FUEL RATE (OBS) = 132.0 (LB/HR)
ALT. VOLTS = 377. ALT. AMPS = 553. ALT. EFF. = .939
FLYWHEEL HP = 318.9 OBS. SFC = .4139 AAR CORR. SFC = .4133 (LB/HP-HR)
CALCULATED A/F = 93.83 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	164.	.51	60.PPMC
CO	426.	1.34	79. PPM
NOX	2833.	8.88	321. PPM (D)
NOX,CORR	3019.	9.47	
CO2		593.	2.24 PCT
O2			17.91 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0658	NOX-KH	= 1.0538	NOX-KT	= 1.0000
WET EXH HC CF=	.9754	AIR TEMP CF	= .9892	BAROM CF	= 1.0031
FUEL TEMP CF =	.9835	FUEL S.G. CF	= .9907	FUEL HHV CF	= 1.0062

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6775.0-60
FILTER PAIR WEIGHT GAIN (mg)	6.323
SAMPLE VOLUME (scf)	37.995
DILUTE PM CONCENTRATION (mg/scf)	.166
CO2-BASED DILUTION FACTOR	4.295
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.715
PARTICULATE MASS EMISSION RATE (g/hr)	119.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.373

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMO GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 3	TEST CONFIGURATION	=	CERT 100
TEST DATE	=	10/30/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	5/10			
SwRI FUEL CODE	=	EM-2834-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.22 (in. Hg)	ENGINE INTAKE AIR	=	80.(°F)
DRY BULB TEMP	=	84. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	103.13 (GR/LB)	RELATIVE HUMIDITY	=	58. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	8.3
TRACTION MOTOR BLOWER HP	=	13.9
INERTIAL SEPERATOR BLOWER HP	=	2.1
RADIATOR FAN HP	=	6.4
TOTAL ACCESSORY HP	=	34.7

FUEL RATE (OBS) = 232.0 (LB/HR)
ALT. VOLTS = 512. ALT. AMPS = 748. ALT. EFF. = .939
FLYWHEEL HP = 581.8 OBS. SFC = .3988 AAR CORR. SFC = .3989 (LB/HP-HR)
CALCULATED A/F = 70.66 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	254.	.44	70.PPMC
CO	437.	.75	62. PPM
NOX	4379.	7.53	376. PPM (D)
NOX,CORR	4683.	8.05	
CO2		573.	2.99 PCT
O2			16.78 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0696	NOX-KH	= 1.0569	NOX-KT	= 1.0000
WET EXH HC CF=	.9689	AIR TEMP CF	= .9910	BAROM CF	= 1.0031
FUEL TEMP CF =	.9830	FUEL S.G. CF	= .9907	FUEL HHV CF	= 1.0062

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6776.0-61
FILTER PAIR WEIGHT GAIN (mg)	5.782
SAMPLE VOLUME (scf)	38.223
DILUTE PM CONCENTRATION (mg/scf)	.151
CO2-BASED DILUTION FACTOR	5.880
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.889
PARTICULATE MASS EMISSION RATE (g/hr)	197.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.338

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 4	TEST CONFIGURATION	=	CERT 100
TEST DATE	=	10/30/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	6/I0			
SwRI FUEL CODE	=	EM-2834-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.21 (in. Hg)	ENGINE INTAKE AIR	=	B2.(°F)
DRY BULB TEMP	=	83. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	101.66 (GR/LB)	RELATIVE HUMIDITY	=	58. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	9.5
TRACTION MOTOR BLOWER HP	=	20.9
INERTIAL SEPERATOR BLOWER HP	=	3.1
RADIATOR FAN HP	=	9.7
TOTAL ACCESSORY HP	=	47.3

FUEL RATE (OBS) = 392.0 (L8/HR)
ALT. VOLTS = 687. ALT. AMPS = 993. ALT. EFF. = .939
FLYWHEEL HP = 1021.8 OBS. SFC = .3836 AAR CORR. SFC = .3833 (LB/HP-HR)
CALCULATED A/F = 45.90 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	360.	.35	90.PPMC
CO	594.	.58	77. PPM
NOX	10815.	10.58	852. PPM (D)
NOX,CORR	11523.	11.28	
CO2		551.	4.64 PCT
O2			14.65 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0655	NOX-KH	= 1.0535	NOX-KT	= 1.0000
WET EXH HC CF=	.9551	AIR TEMP CF	= .9901	BAROM CF	= 1.0030
FUEL TEMP CF =	.9850	FUEL S.G. CF	= .9907	FUEL HHV CF	= 1.0062

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6777.0-62
FILTER PAIR WEIGHT GAIN (mg)	11.287
SAMPLE VOLUME (scf)	37.666
DILUTE PM CONCENTRATION (mg/scf)	.300
CO2-BASED DILUTION FACTOR	6.003
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	1.799
PARTICULATE MASS EMISSION RATE (g/hr)	440.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.431

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 5	TEST CONFIGURATION	=	CERT 100
TEST DATE	=	10/30/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	7/10			
SwRI FUEL CODE	=	EM-2834-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.20 (in. Hg)	ENGINE INTAKE AIR	=	82.(°F)
DRY BULB TEMP	=	84. (°F)	WET BULB TEMP	=	71. (°F)
ABS HUMIDITY	=	97.86 (GR/LB)	RELATIVE HUMIDITY	=	55. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	10.8
TRACTION MOTOR BLOWER HP	=	30.1
INERTIAL SEPERATOR BLOWER HP	=	4.5
RADIATOR FAN HP	=	27.9
TOTAL ACCESSORY HP	=	77.3

FUEL RATE (OBS) = 496.0 (LB/HR)
ALT. VOLTS = 766. ALT. AMPS = 1102. ALT. EFF. = .939
FLYWHEEL HP = 1283.2 OBS. SFC = .3865 AAR CORR. SFC = .3862 (LB/HP-HR)
CALCULATED A/F = 41.35 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	446.	.35	98.PPMC
CO	1039.	.81	118. PPM
NOX	14172.	11.04	982. PPM (D)
NOX,CORR	14963.	11.66	
CO2		555.	5.16 PCT
O2			13.77 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0559	NOX-KH	= 1.0457	NOX-KT	= 1.0000
WET EXH HC CF=	.9509	AIR TEMP CF	= .9901	BAROM CF	= 1.0029
FUEL TEMP CF =	.9850	FUEL S.G. CF	= .9907	FUEL HHV CF	= 1.0062

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6778.0-63
FILTER PAIR WEIGHT GAIN (mg)	8.630
SAMPLE VOLUME (scf)	37.265
DILUTE PM CONCENTRATION (mg/scf)	.232
CO2-BASED DILUTION FACTOR	6.941
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	1.607
PARTICULATE MASS EMISSION RATE (g/hr)	449.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.350

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 6	TEST CONFIGURATION	=	CERT 100
TEST DATE	=	10/30/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	8/10			
SwRI FUEL CODE	=	EM-2834-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.21 (in. Hg)	ENGINE INTAKE AIR	=	82.(°F)
DRY BULB TEMP	=	83. (°F)	WET BULB TEMP	=	71. (°F)
ABS HUMIDITY	=	97.41 (GR/LB)	RELATIVE HUMIDITY	=	55. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	12.2
TRACTION MOTOR BLOWER HP	=	43.5
INERTIAL SEPERATOR BLOWER HP	=	6.5
RADIATOR FAN HP	=	40.2
TOTAL ACCESSORY HP	=	106.4

FUEL RATE (OBS) = 618.0 (LB/HR)
ALT. VOLTS = 844. ALT. AMPS = 1206. ALT. EFF. = .939
FLYWHEEL HP = 1560.5 OBS. SFC = .3960 AAR CORR. SFC = .3957 (LB/HP-HR)
CALCULATED A/F = 37.29 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	644.	.41	125.PPMC
CO	3503.	2.24	356. PPM
NOX	18320.	11.74	1132. PPM (D)
NOX,CORR	19322.	12.38	
CO2		566.	5.71 PCT
O2			13.15 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0547	NOX-KH	= 1.0448	NOX-KT	= 1.0000
WET EXH HC CF	= .9463	AIR TEMP CF	= .9901	BAROM CF	= 1.0030
FUEL TEMP CF	= .9850	FUEL S.G. CF	= .9907	FUEL HHV CF	= 1.0062

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6779.0-64
FILTER PAIR WEIGHT GAIN (mg)	8.328
SAMPLE VOLUME (scf)	37.073
DILUTE PM CONCENTRATION (mg/scf)	.225
CO2-BASED DILUTION FACTOR	7.963
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	1.789
PARTICULATE MASS EMISSION RATE (g/hr)	563.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.361

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 7	TEST CONFIGURATION	=	CERT 100
TEST DATE	=	10/30/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	9/10			
SwRI FUEL CODE	=	EM-2834-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.20 (in. Hg)	ENGINE INTAKE AIR	=	83.(°F)
DRY BULB TEMP	=	83. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	100.29 (GR/LB)	RELATIVE HUMIDITY	=	57. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	13.8
TRACTION MOTOR BLOWER HP	=	62.8
INERTIAL SEPERATOR BLOWER HP	=	9.4
RADIATOR FAN HP	=	58.1
TOTAL ACCESSORY HP	=	148.0

FUEL RATE (OBS) = 766.0 (LB/HR)
ALT. VOLTS = 926. ALT. AMPS = 1318. ALT. EFF. = .939
FLYWHEEL HP = 1891.5 OBS. SFC = .4050 AAR CORR. SFC = .4044 (LB/HP-HR)
CALCULATED A/F = 33.23 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	914.	.48	160.PPMC
CO	8081.	4.27	745. PPM
NOX	22183.	11.73	1245. PPM (D)
NOX,CORR	23557.	12.45	
CO2		576.	6.39 PCT
O2			12.27 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0619	NOX-KH	= 1.0507	NOX-KT	= 1.0000
WET EXH HC CF	= .9405	AIR TEMP CF	= .9896	BAROM CF	= 1.0029
FUEL TEMP CF	= .9845	FUEL S.G. CF	= .9907	FUEL HHV CF	= 1.0062

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6780.0-65
FILTER PAIR WEIGHT GAIN (mg)	12.253
SAMPLE VOLUME (scf)	36.537
DILUTE PM CONCENTRATION (mg/scf)	.335
CO2-BASED DILUTION FACTOR	7.881
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	2.643
PARTICULATE MASS EMISSION RATE (g/hr)	922.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.488

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 8	TEST CONFIGURATION	=	CERT 100
TEST DATE	=	10/30/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	10/10			
SwRI FUEL CODE	=	EM-2834-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.19 (in. Hg)	ENGINE INTAKE AIR	=	81.(°F)
DRY BULB TEMP	=	83. (°F)	WET BULB TEMP	=	71. (°F)
ABS HUMIDITY	=	98.00 (GR/LB)	RELATIVE HUMIDITY	=	56. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	15.1
TRACTION MOTOR BLOWER HP	=	82.8
INERTIAL SEPERATOR BLOWER HP	=	12.4
RADIATOR FAN HP	=	76.6
TOTAL ACCESSORY HP	=	191.0

FUEL RATE (OBS) = 908.0 (LB/HR)
ALT. VOLTS = 980. ALT. AMPS = 1388. ALT. EFF. = .939
FLYWHEEL HP = 2134.2 OBS. SFC = .4255 AAR CORR. SFC = .4253 (LB/HP-HR)
CALCULATED A/F = 30.85 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	1228.	.58	195.PPMC
CO	15743.	7.38	1321. PPM
NOX	24127.	11.31	1232. PPM (D)
NOX,CORR	25483.	11.94	
CO2		600.	6.84 PCT
O2			11.52 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0562	NOX-KH	= 1.0460	NOX-KT	= 1.0000
WET EXH HC CF=	.9367	AIR TEMP CF =	.9905	BAROM CF	= 1.0029
FUEL TEMP CF =	.9860	FUEL S.G. CF =	.9907	FUEL HHV CF	= 1.0062

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6781.0-66
FILTER PAIR WEIGHT GAIN (mg)	11.577
SAMPLE VOLUME (scf)	35.551
DILUTE PM CONCENTRATION (mg/scf)	.326
CO2-BASED DILUTION FACTOR	9.150
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	2.980
PARTICULATE MASS EMISSION RATE (g/hr)	1147.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.537

LOCOMOTIVE TEST SUMMARY

SwRI Project No. 08.02999.001

Test Date 10-30-00

Notch	Idle	DB-2	1	2	3	4	5	6	7	8
Run Number										
Barometer (in. Hg)	29.23	29.23	29.22	29.22	29.22	29.21	29.20	29.21	29.20	29.19
Dry Bulb Temp. (°F)	83.3	83.6	84.4	85.5	83.8	83.3	83.5	83.4	83.1	83.1
Wet Bulb Temp. (°F)	72.3	72.3	72.5	72.5	72.3	71.9	71.3	71.2	71.6	71.2
Fuel Supply Temp. (°F)	100	94	96	93	94	90	90	90	91	88
Water Inlet Temp. (°F)	168	162	163	168	166	176	175	178	183	180
Engine Intake Air @ Filter (°F)	82	82	84	84	80	82	82	82	83	81
Engine Speed (rpm)	257	388	316	389	499	572	646	730	825	905
Traction Volts	2.61	7.79	182	377	512	687	766	844	926	980
Traction Amps	0	0	268	553	748	993	1102	1206	1318	1388
Fuel Rate (lb/hr)	27.5	40.0	54.0	132	232	392	496	618	766	908
# of Fans	0	0	0	1	1	1	2	2	2	2
HC (ppmC)	62.61	70.13	55.10	60.11	70.13	90.16	97.68	125.23	160.29	195.35
CO (ppm)	49.02	67.50	55.91	79.25	61.69	76.88	118.26	355.55	744.90	1320.78
Raw Exhaust CO_2 (%)	.64	.72	1.10	2.24	2.99	4.64	5.16	5.71	6.39	6.84
NO_x (ppm)	116.60	111.58	179.28	320.75	375.88	851.99	981.79	1131.99	1244.64	1232.12
O_2 (%)	20.03	19.91	19.41	17.91	16.78	14.65	13.77	13.15	12.27	11.52
Tunnel Dilute CO_2 (%)	1963	2257	3050	5569	5428	7892	7608	7333	8186	7608
Background CO_2 (ppm)	557	581	557	604	581	557	581	581	581	627

Notes: 1 - Air compressor locked off.

u:/fritz/wp/csx2629.fm1 9/2000

Test Configuration: EM-2834-F Cert Run #2

Operator: [illegible]

LOCOMOTIVE TEST SUMMARY

SwRI Project No.08.02999.001

Test Date 10-30-00

Notch	Idle	DB-2	1	2	3	4	5	6	7	8
Time ~~Run Number~~	11:50	12:04	12:18	12:28	12:38	12:50	12:58	1:08	1:20	1:30
Observed Fuel Rate at X minutes into test point (lb/hr)										
3 min.	28.5	40.6	54.0	133	233	393	495	616	766	903
5 min.	27.8	39.8	53.9	135	232	392	495	616	763	904
7 min.	27.6	40.1	54.1	133	232	393	494	617	766	903
Averaged Fuel Rate over Time										
Cumulative Fuel Used (lbs)	3.9	4.0	3.6	6.6	11.6	19.6	24.8	30.9	38.3	45.4
Over X Minutes	8.5	6.0	4.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
x 60. = Fuel Rate (lb/hr)	27.5	40.0	54.0	132	232	392	496	618	766	908
Traction Volts	2.61	7.79	182	377	512	687	766	844	926	980
Current Shunt mV	0	0	3.35	6.91	9.35	12.41	13.77	15.08	16.47	17.35
Traction Current = Shunt mV * 80.	0	0	268	553	748	993	1102	1206	1318	1388
Right Airbox Temp., °F	133	128	127	123	127	135	140	147	162	177
Left Airbox Temp., °F	106	109	104	105	111	122	131	141	162	180
Airbox Pressure, in. Hg	.84	1.90	1.28	1.92	2.93	3.98	5.19	6.92	9.10	11.32
Left Exhaust Temperature, °F										
Right Exhaust Temperature, °F										
SS Smoke, % Opacity	0	0	0	2.0	1.5	2.5	2.8	3.0	3.5	5.7
Notes: 1 - Air compressor locked off.	330	1025	1890	2525	3090	3695	4275	4910	5650	6160

u:/fritz/wp/csx2629.fm2 9/2000

Test Configuration: EM-2834-F Cert Run #2 Smokemeter bulb out N-6 Operator: C.H

298.prn

CSX #2629 EMD GP38 EMD 16-645-E3
Tested 11/01/00 @ SwRI, Baseline (EM-2834-F)

AAR 3x3 Weighted Results

Notch	Gross HP	obs Fuel Rate (lb/hr)	HC (g/hr)	CO (g/hr)	Corr. NOx (g/hr)	PM (g/hr)	AAR Corr bsfc	Corr. Fuel Rate (lb/hr)	WF	w-BHP	obs w-Fuel w-(lb/hr)	corr w-Fuel w-(lb/hr)	w-HC w-(g/hr)	w-CO w-(g/hr)	w-NOx w-(g/hr)	w-PM w-(g/hr)
8	2,124	912	1,075	15,735	27,024	1,067	0.429	910	25.0%	531.1	228.0	227.6	268.8	3933.8	6756.0	266.8
7	1,903	768	877	7,186	24,960	823	0.404	769	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	1,573	618	581	3,453	19,909	527	0.394	619	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	1,288	496	427	1,001	15,383	425	0.386	496	25.0%	321.9	124.0	124.1	106.8	250.3	3845.8	106.3
4	1,032	394	389	633	11,610	353	0.383	395	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	583	228	347	432	5,721	146	0.392	228	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	316	132	154	432	3,027	95	0.417	132	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	83	51	126	240	1,334	20	0.618	51	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Idle	11	23	111	164	669	16	2.226	23	50.0%	5.3	11.7	11.7	55.5	82.0	334.5	8.0
DB-2	18	41	173	363	1008	29	2.286	41	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
						sum =			100.0%	858.2	363.7	363.4	431.0	4266.0	10936.3	381.0
AAR 3x3 duty cycle weighted brake-specific emissions =											0.424 obs bsfc	0.423 corr bsfc	0.50	4.97	12.74	0.444

EPA Switcher Duty Cycle Weighted Results

Notch	WF	w-BHP	obs w-Fuel w-(lb/hr)	corr w-Fuel w-(lb/hr)	w-HC w-(g/hr)	w-CO w-(g/hr)	w-NOx w-(g/hr)	w-PM w-(g/hr)
8	0.8%	17.0	7.3	7.3	8.6	125.9	216.2	8.5
7	0.2%	3.8	1.5	1.5	1.8	14.4	49.9	1.6
6	1.5%	23.6	9.3	9.3	8.7	51.8	298.6	7.9
5	3.6%	46.4	17.9	17.9	15.4	36.0	553.8	15.3
4	3.6%	37.1	14.2	14.2	14.0	22.8	418.0	12.7
3	5.8%	33.8	13.2	13.2	20.1	25.1	331.8	8.5
2	12.3%	38.9	16.2	16.2	18.9	53.1	372.3	11.7
1	12.4%	10.2	6.3	6.3	15.6	29.8	165.4	2.5
Idle	59.8%	6.3	13.9	14.0	66.4	98.1	400.1	9.6
DB	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
sum =	100.0%	217.1	99.9	100.0	169.5	456.9	2806.1	78.3
EPA switcher duty cycle weighted brake-specific emissions =			0.460 obs bsfc	0.460 corr bsfc	0.78	2.10	12.92	0.361

EPA Freight Duty Cycle Weighted Results

Notch	WF	w-BHP	obs w-Fuel w-(lb/hr)	corr w-Fuel w-(lb/hr)	w-HC w-(g/hr)	w-CO w-(g/hr)	w-NOx w-(g/hr)	w-PM w-(g/hr)
8	16.2%	344.1	147.7	147.5	174.2	2549.1	4377.9	172.9
7	3.0%	57.1	23.0	23.1	26.3	215.6	748.8	24.7
6	3.9%	61.4	24.1	24.1	22.7	134.7	776.5	20.6
5	3.8%	48.9	18.8	18.9	16.2	38.0	584.6	16.2
4	4.4%	45.4	17.3	17.4	17.1	27.9	510.8	15.5
3	5.2%	30.3	11.9	11.9	18.0	22.5	297.5	7.6
2	6.5%	20.6	8.6	8.6	10.0	28.1	196.8	6.2
1	6.5%	5.4	3.3	3.3	8.2	15.6	86.7	1.3
Idle	38.0%	4.0	8.9	8.9	42.2	62.3	254.2	6.1
DB	12.5%	2.2	5.1	5.1	21.6	45.4	126.0	3.6
sum =	100.0%	619.4	268.8	268.7	356.5	3139.0	7959.7	274.6
EPA freight duty cycle weighted brake-specific emissions =			0.434 obs bsfc	0.434 corr bsfc	0.58	5.07	12.85	0.443

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	IDLE	TEST CONFIGURATION	=	CERT 100
TEST DATE	=	11/ 1/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	1/10			
SwRI FUEL CODE	=	EM-2834-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.09 (in. Hg)	ENGINE INTAKE AIR	=	75.(°F)
DRY BULB TEMP	=	77. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	115.48 (GR/LB)	RELATIVE HUMIDITY	=	79. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	4.3
TRACTION MOTOR BLOWER HP	=	1.9
INERTIAL SEPERATOR BLOWER HP	=	.3
RADIATOR FAN HP	=	.0
TOTAL ACCESSORY HP	=	10.5

FUEL RATE (OBS) = 23.3 (LB/HR)
ALT. VOLTS = 3. ALT. AMPS = 0. ALT. EFF. = .939
FLYWHEEL HP = 10.5 OBS. SFC = 2.2231 AAR CORR. SFC = 2.2263 (LB/HP-HR)
CALCULATED A/F = 361.62 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	111.	10.55	60.PPMC
CO	164.	15.63	44. PPM
NOX	599.	57.20	99. PPM (D)
NOX,CORR	669.	63.80	
CO2		3149.	.57 PCT
O2			20.03 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.1154	NOX-KH	= 1.0940	NOX-KT	= 1.0000
WET EXH HC CF=	.9894	AIR TEMP CF	= .9932	BAROM CF	= 1.0020
FUEL TEMP CF =	.9835	FUEL S.G. CF =	.9907	FUEL HHV CF	= 1.0062

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6822.0-107
FILTER PAIR WEIGHT GAIN (mg)	1.234
SAMPLE VOLUME (scf)	39.075
DILUTE PM CONCENTRATION (mg/scf)	.032
CO2-BASED DILUTION FACTOR	4.578
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.145
PARTICULATE MASS EMISSION RATE (g/hr)	16.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	1.551

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	DB2	TEST CONFIGURATION	=	CERT 100
TEST DATE	=	11/ 1/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	2/10			
SwRI FUEL CODE	=	EM-2834-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.09 (in. Hg)	ENGINE INTAKE AIR	=	77.(°F)
DRY BULB TEMP	=	78. (°F)	WET BULB TEMP	=	73. (°F)
ABS HUMIDITY	=	115.82 (GR/LB)	RELATIVE HUMIDITY	=	78. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	6.4
TRACTION MOTOR BLOWER HP	=	6.5
INERTIAL SEPERATOR BLOWER HP	=	1.0
RADIATOR FAN HP	=	.0
TOTAL ACCESSORY HP	=	17.9

FUEL RATE (OBS) = 41.0 (LB/HR)
ALT. VOLTS = 7. ALT. AMPS = 0. ALT. EFF. = .939
FLYWHEEL HP = 17.9 OBS. SFC = 2.2846 AAR CORR. SFC = 2.2858 (LB/HP-HR)
CALCULATED A/F = 321.89 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	173.	9.66	60.PPMC
CO	363.	20.20	63. PPM
NOX	903.	50.32	95. PPM (D)
NOX,CORR	1008.	56.17	
CO2		3233.	.64 PCT
O2			20.03 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.1163	NOX-KH	= 1.0947	NOX-KT	= 1.0000
WET EXH HC CF=	.9887	AIR TEMP CF	= .9923	BAROM CF	= 1.0020
FUEL TEMP CF =	.9825	FUEL S.G. CF =	.9907	FUEL HHV CF	= 1.0062

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6823.0-108
FILTER PAIR WEIGHT GAIN (mg)	1.607
SAMPLE VOLUME (scf)	38.668
DILUTE PM CONCENTRATION (mg/scf)	.042
CO2-BASED DILUTION FACTOR	3.912
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.163
PARTICULATE MASS EMISSION RATE (g/hr)	29.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	1.596

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 1	TEST CONFIGURATION	=	CERT 100
TEST DATE	=	11/ 1/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	3/10			
SwRI FUEL CODE	=	EM-2834-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.09 (in. Hg)	ENGINE INTAKE AIR	=	76.(°F)
DRY BULB TEMP	=	78. (°F)	WET BULB TEMP	=	73. (°F)
ABS HUMIDITY	=	118.16 (GR/LB)	RELATIVE HUMIDITY	=	79. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	5.3
TRACTION MOTOR BLOWER HP	=	3.5
INERTIAL SEPERATOR BLOWER HP	=	.5
RADIATOR FAN HP	=	.0
TOTAL ACCESSORY HP	=	13.3

FUEL RATE (OBS) = 51.0 (LB/HR)
ALT. VOLTS = 181. ALT. AMPS = 268. ALT. EFF. = .939
FLYWHEEL HP = 82.6 OBS. SFC = .6175 AAR CORR. SFC = .6181 (LB/HP-HR)
CALCULATED A/F = 214.51 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	126.	1.52	53.PPMC
CO	240.	2.90	50. PPM
NOX	1190.	14.41	152. PPM (D)
NOX,CORR	1334.	16.15	
CO2		881.	.97 PCT
O2			19.53 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.1205	NOX-KH	= 1.0982	NOX-KT	= 1.0000
WET EXH HC CF=	.9857	AIR TEMP CF =	.9928	BAROM CF	= 1.0020
FUEL TEMP CF =	.9840	FUEL S.G. CF =	.9907	FUEL HHV CF	= 1.0062

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6824.0-109
FILTER PAIR WEIGHT GAIN (mg)	1.518
SAMPLE VOLUME (scf)	38.248
DILUTE PM CONCENTRATION (mg/scf)	.040
CO2-BASED DILUTION FACTOR	3.497
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.139
PARTICULATE MASS EMISSION RATE (g/hr)	20.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.246

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 2	TEST CONFIGURATION	=	CERT 100
TEST DATE	=	11/ 1/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	4/10			
SwRI FUEL CODE	=	EM-2834-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.08 (in. Hg)	ENGINE INTAKE AIR	=	78.(°F)
DRY BULB TEMP	=	78. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	113.88 (GR/LB)	RELATIVE HUMIDITY	=	77. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	6.5
TRACTION MOTOR BLOWER HP	=	6.6
INERTIAL SEPERATOR BLOWER HP	=	1.0
RADIATOR FAN HP	=	3.1
TOTAL ACCESSORY HP	=	21.2

FUEL RATE (OBS) = 132.0 (LB/HR)
ALT. VOLTS = 375. ALT. AMPS = 551. ALT. EFF. = .939
FLYWHEEL HP = 316.3 OBS. SFC = .4173 AAR CORR. SFC = .4173 (LB/HP-HR)
CALCULATED A/F = 106.04 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	154.	.49	50.PPMC
CO	432.	1.37	71. PPM
NOX	2754.	8.71	276. PPM (D)
NOX,CORR	3027.	9.57	
CO2		598.	1.98 PCT
O2			18.16 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0990	NOX-KH	= 1.0808	NOX-KT	= 1.0000
WET EXH HC CF=	.9770	AIR TEMP CF	= .9919	BAROM CF	= 1.0019
FUEL TEMP CF =	.9830	FUEL S.G. CF	= .9907	FUEL HHV CF	= 1.0062

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6825.0-110
FILTER PAIR WEIGHT GAIN (mg)	4.165
SAMPLE VOLUME (scf)	38.395
DILUTE PM CONCENTRATION (mg/scf)	.108
CO2-BASED DILUTION FACTOR	4.638
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.503
PARTICULATE MASS EMISSION RATE (g/hr)	95.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.299

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 3	TEST CONFIGURATION	=	CERT 100
TEST DATE	=	11/ 1/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	5/10			
SwRI FUEL CODE	=	EM-2B34-F	FUEL H/C RATIO	=	1.B1
BAROMETER	=	29.09 (in. Hg)	ENGINE INTAKE AIR	=	75.(°F)
DRY BULB TEMP	=	77. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	112.07 (GR/LB)	RELATIVE HUMIDITY	=	77. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	8.3
TRACTION MOTOR BLOWER HP	=	14.1
INERTIAL SEPERATOR BLOWER HP	=	2.1
RADIATOR FAN HP	=	6.5
TOTAL ACCESSORY HP	=	35.0

FUEL RATE (OBS) = 228.0 (LB/HR)
ALT. VOLTS = 513. ALT. AMPS = 748. ALT. EFF. = .939
FLYWHEEL HP = 583.2 OBS. SFC = .3909 AAR CORR. SFC = .3915 (LB/HP-HR)
CALCULATED A/F = 76.67 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	347.	.60	90.PPMC
CO	432.	.74	57. PPM
NOX	5235.	8.98	421. PPM (D)
NOX,CORR	5721.	9.81	
CO2		561.	2.75 PCT
O2			17.15 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0928	NOX-KH	= 1.0757	NOX-KT	= 1.0000
WET EXH HC CF	= .9705	AIR TEMP CF	= .9932	BAROM CF	= 1.0020
FUEL TEMP CF	= .9840	FUEL S.G. CF	= .9907	FUEL HHV CF	= 1.0062

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6826.0-111
FILTER PAIR WEIGHT GAIN (mg)	4.578
SAMPLE VOLUME (scf)	38.138
DILUTE PM CONCENTRATION (mg/scf)	.120
CO2-BASED DILUTION FACTOR	5.168
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.620
PARTICULATE MASS EMISSION RATE (g/hr)	146.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.251

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 4	TEST CONFIGURATION	=	CERT 100
TEST DATE	=	11/ 1/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	6/10			
SwRI FUEL CODE	=	EM-2834-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.09 (in. Hg)	ENGINE INTAKE AIR	=	75.(°F)
DRY BULB TEMP	=	77. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	113.35 (GR/LB)	RELATIVE HUMIDITY	=	79. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	9.6
TRACTION MOTOR BLOWER HP	=	21.2
INERTIAL SEPERATOR BLOWER HP	=	3.2
RADIATOR FAN HP	=	9.8
TOTAL ACCESSORY HP	=	47.7

FUEL RATE (OBS) = 394.0 (LB/HR)
ALT. VOLTS = 690. ALT. AMPS = 998. ALT. EFF. = .939
FLYWHEEL HP = 1031.5 OBS. SFC = .3820 AAR CORR. SFC = .3825 (LB/HP-HR)
CALCULATED A/F = 49.33 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	389.	.38	90.PPMC
CO	633.	.61	76. PPM
NOX	10598.	10.28	772. PPM (D)
NOX,CORR	11610.	11.26	
CO2		549.	4.31 PCT
O2			15.03 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0954	NOX-KH	= 1.0779	NOX-KT	= 1.0000
WET EXH HC CF=	.9573	AIR TEMP CF =	.9932	BAROM CF	= 1.0020
FUEL TEMP CF =	.9845	FUEL S.G. CF =	.9907	FUEL HHV CF	= 1.0062

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6B27.0-112
FILTER PAIR WEIGHT GAIN (mg)	7.511
SAMPLE VOLUME (scf)	37.978
DILUTE PM CONCENTRATION (mg/scf)	.198
CO2-BASED DILUTION FACTOR	6.771
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	1.339
PARTICULATE MASS EMISSION RATE (g/hr)	353.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.343

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 5	TEST CONFIGURATION	=	CERT 100
TEST DATE	=	11/ 1/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	7/10			
SwRI FUEL CODE	=	EM-2834-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.08 (in. Hg)	ENGINE INTAKE AIR	=	76.(°F)
DRY BULB TEMP	=	76. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	113.66 (GR/LB)	RELATIVE HUMIDITY	=	81. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	10.8
TRACTION MOTOR BLOWER HP	=	30.4
INERTIAL SEPERATOR BLOWER HP	=	4.6
RADIATOR FAN HP	=	28.1
TOTAL ACCESSORY HP	=	77.8

FUEL RATE (OBS) = 496.0 (LB/HR)
ALT. VOLTS = 767. ALT. AMPS = 1104. ALT. EFF. = .939
FLYWHEEL HP = 1287.5 OBS. SFC = .3852 AAR CORR. SFC = .3856 (LB/HP-HR)
CALCULATED A/F = 45.50 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	427.	.33	85.PPMC
CO	1001.	.78	103. PPM
NOX	14033.	10.90	882. PPM (D)
NOX,CORR	15383.	11.95	
CO2		553.	4.68 PCT
O2			14.52 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0962	NOX-KH	= 1.0785	NOX-KT	= 1.0000
WET EXH HC CF=	.9542	AIR TEMP CF	= .9928	BAROM CF	= 1.0019
FUEL TEMP CF =	.9845	FUEL S.G. CF =	.9907	FUEL HHV CF	= 1.0062

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6828.0-113
FILTER PAIR WEIGHT GAIN (mg)	8.343
SAMPLE VOLUME (scf)	37.400
DILUTE PM CONCENTRATION (mg/scf)	.223
CO2-BASED DILUTION FACTOR	6.201
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	1.383
PARTICULATE MASS EMISSION RATE (g/hr)	425.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.330

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 6	TEST CONFIGURATION	=	CERT 100
TEST DATE	=	11/ 1/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	8/10			
SwRI FUEL CODE	=	EM-2834-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.09 (in. Hg)	ENGINE INTAKE AIR	=	74.(°F)
DRY BULB TEMP	=	76. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	112.44 (GR/LB)	RELATIVE HUMIDITY	=	80. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	12.2
TRACTION MOTOR BLOWER HP	=	44.1
INERTIAL SEPERATOR BLOWER HP	=	6.6
RADIATOR FAN HP	=	40.7
TOTAL ACCESSORY HP	=	107.6

FUEL RATE (OBS) = 618.0 (LB/HR)
ALT. VOLTS = 848. ALT. AMPS = 1210. ALT. EFF. = .939
FLYWHEEL HP = 1573.4 OBS. SFC = .3928 AAR CORR. SFC = .3935 (LB/HP-HR)
CALCULATED A/F = 40.12 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	581.	.37	105.PPMC
CO	3453.	2.19	325. PPM
NOX	18215.	11.5B	1044. PPM (D)
NOX,CORR	19909.	12.65	
CO2		562.	5.30 PCT
O2			13.65 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0930	NOX-KH	= 1.0759	NOX-KT	= 1.0000
WET EXH HC CF=	.9490	AIR TEMP CF	= .9937	BAROM CF	= 1.0020
FUEL TEMP CF =	.9855	FUEL S.G. CF =	.9907	FUEL HHV CF	= 1.0062

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6829.0-114
FILTER PAIR WEIGHT GAIN (mg)	7.499
SAMPLE VOLUME (scf)	37.120
DILUTE PM CONCENTRATION (mg/scf)	.202
CO2-BASED DILUTION FACTOR	7.714
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	1.558
PARTICULATE MASS EMISSION RATE (g/hr)	527.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.335

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 7	TEST CONFIGURATION	=	CERT 100
TEST DATE	=	11/ 1/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	9/10			
SwRI FUEL CODE	=	EM-2834-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.09 (in. Hg)	ENGINE INTAKE AIR	=	75.(°F)
DRY BULB TEMP	=	77. (°F)	WET BULB TEMP	=	71. (°F)
ABS HUMIDITY	=	110.91 (GR/LB)	RELATIVE HUMIDITY	=	78. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	13.8
TRACTION MOTOR BLOWER HP	=	63.5
INERTIAL SEPERATOR BLOWER HP	=	9.5
RADIATOR FAN HP	=	58.8
TOTAL ACCESSORY HP	=	149.6

FUEL RATE (OBS) = 768.0 (LB/HR)
ALT. VOLTS = 929. ALT. AMPS = 1321. ALT. EFF. = .939
FLYWHEEL HP = 1902.8 OBS. SFC = .4036 AAR CORR. SFC = .4042 (LB/HP-HR)
CALCULATED A/F = 37.13 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	877.	.46	138.PPMC
CO	7186.	3.78	590. PPM
NOX	22920.	12.05	1145. PPM (D)
NOX,CORR	24960.	13.12	
CO2		575.	5.71 PCT
O2			13.02 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0890	NOX-KH	= 1.0727	NOX-KT	= 1.0000
WET EXH HC CF=	.9456	AIR TEMP CF =	.9932	BAROM CF	= 1.0020
FUEL TEMP CF =	.9860	FUEL S.G. CF =	.9907	FUEL HHV CF	= 1.0062

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6830.0-115
FILTER PAIR WEIGHT GAIN (mg)	9.949
SAMPLE VOLUME (scf)	36.758
DILUTE PM CONCENTRATION (mg/scf)	.271
CO2-BASED DILUTION FACTOR	7.801
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	2.112
PARTICULATE MASS EMISSION RATE (g/hr)	823.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.432

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 8	TEST CONFIGURATION	=	CERT 100
TEST DATE	=	11/ 1/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	10/10			
SwRI FUEL CODE	=	EM-2834-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.09 (in. Hg)	ENGINE INTAKE AIR	=	82.(°F)
DRY BULB TEMP	=	76. (°F)	WET BULB TEMP	=	71. (°F)
ABS HUMIDITY	=	111.08 (GR/LB)	RELATIVE HUMIDITY	=	79. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	15.1
TRACTION MOTOR BLOWER HP	=	83.9
INERTIAL SEPERATOR BLOWER HP	=	12.6
RADIATOR FAN HP	=	77.6
TOTAL ACCESSORY HP	=	193.1

FUEL RATE (OBS) = 912.0 (LB/HR)
ALT. VOLTS = 981. ALT. AMPS = 1378. ALT. EFF. = .939
FLYWHEEL HP = 2124.3 OBS. SFC = .4293 AAR CORR. SFC = .4286 (LB/HP-HR)
CALCULATED A/F = 33.90 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	1075.	.51	155.PPMC
CO	15735.	7.41	1193. PPM
NOX	24806.	11.68	1145. PPM (D)
NOX,CORR	27024.	12.72	
CO2		606.	6.21 PCT
O2			12.27 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0894	NOX-KH	= 1.0730	NOX-KT	= 1.0000
WET EXH HC CF=	.9412	AIR TEMP CF	= .9901	BAROM CF	= 1.0020
FUEL TEMP CF =	.9860	FUEL S.G. CF	= .9907	FUEL HHV CF	= 1.0062

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6831.0-116
FILTER PAIR WEIGHT GAIN (mg)	12.241
SAMPLE VOLUME (scf)	35.866
DILUTE PM CONCENTRATION (mg/scf)	.341
CO2-BASED DILUTION FACTOR	7.377
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	2.518
PARTICULATE MASS EMISSION RATE (g/hr)	1067.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.502

LOCOMOTIVE TEST SUMMARY

SwRI Project No. 08.02999.001

Test Date 11-1-00

Notch	Idle	DB-2	1	2	3	4	5	6	7	8
Run Number										
Barometer (in. Hg)	29.09	29.09	29.09	29.08	29.09	29.09	29.08	29.09	29.09	29.09
Dry Bulb Temp. (°F)	77.3	77.8	78.2	77.9	77.2	76.8	76.3	76.3	76.5	76.4
Wet Bulb Temp. (°F)	72.4	72.6	73.1	72.3	71.8	71.9	71.8	71.6	71.4	71.4
Fuel Supply Temp. (°F)	93	95	92	94	92	91	91	89	88	88
Water Inlet Temp. (°F)	171	169	163	167	161	170	173	179	183	180
Engine Intake Air @ Filter (°F)	75	77	76	78	75	75	76	74	75	82
Engine Speed (rpm)	257	387	315	389	500	573	646	731	826	906
Traction Volts	2.71	6.99	181	375	513	690	767	848	929	981
Traction Amps	0	0	268	551	748	998	1104	1210	1321	1378
Fuel Rate (lb/hr)	23.3	41.0	51.0	132	228	394	496	618	768	912
# of Fans	0	0	0	1	1	1	2	2	2	2
HC (ppmC)	60.11	60.11	52.60	50.09	90.16	90.16	85.15	105.19	137.75	155.28
CO (ppm)	44.45	62.85	50.17	71.01	57.06	75.71	103.36	325.23	589.54	1192.69
Raw Exhaust CO_2 (%)	.57	.64	.97	1.98	2.75	4.31	4.68	5.30	5.71	6.21
NO_x (ppm)	99.04	95.28	151.70	275.64	420.98	771.80	881.60	1044.38	1144.51	1144.51
O_2 (%)	20.03	20.03	19.53	18.16	17.15	15.03	14.52	13.65	13.02	12.27
Tunnel Dilute CO_2 (%)	1723	2034	3188	4642	5713	6643	7796	7067	7515	8490
Background CO_2 (ppm)	627	557	627	581	651	604	651	581	627	581

Notes: 1 - Air compressor locked off.

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Test Configuration: EM-2834-F Cert Run #3

Operator: CS

LOCOMOTIVE TEST SUMMARY

SwRI Project No.08.02999.001

Test Date 11-1-00

Notch	Idle	DB-2	1	2	3	4	5	6	7	8
Time ~~Run Number~~	2:55	3:11	3:23	3:33	3:47	3:56	4:07	4:17	4:30	4:38
Observed Fuel Rate at X minutes into test point (lb/hr)										
3 min.	23.2	40.7	51.3	134	228	394	498	620	766	912
5 min.	24.5	41.6	51.4	133	228	394	497	619	768	911
7 min.	23.8	41.5	50.8	134	228	393	497	620	769	912
Averaged Fuel Rate over Time										
Cumulative Fuel Used (lbs)	3.1	4.1	3.4	6.6	11.4	19.7	24.8	30.9	38.4	45.6
Over X Minutes	8.0	6.0	4.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
x 60. = Fuel Rate (lb/hr)	23.3	41.0	51.0	132	228	394	496	618	768	912
Traction Volts	2.71	6.99	181	375	513	690	767	848	929	981
Current Shunt mV	0	0	3.35	6.89	9.35	12.47	13.80	15.12	16.51	17.23
Traction Current = Shunt mV * 80.	0	0	268	551	748	998	1104	1210	1321	1378
Right Airbox Temp., °F	134	130	125	127	124	127	135	141	157	170
Left Airbox Temp., °F	102	105	99	103	107	113	125	135	156	172
Airbox Pressure, in. Hg	—	—	—	—	—	—	—	—	—	—
Left Exhaust Temperature, °F	—	—	—	—	—	—	—	—	—	—
Right Exhaust Temperature, °F	—	—	—	—	—	—	—	—	—	—
SS Smoke, % Opacity	0	0	1.2	1.5	1.7	2.6	3.4	3.8	4.0	5.3
Notes: 1 - Air compressor locked off.	960	2020	~~3260~~	3260	4075	4615	5255	5860	6650	7150

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Test Configuration: EM-2834-F Cert Run #3

Operator: [illegible]

304,000

APPENDIX B

CARB FUEL TEST RESULTS

CSX #2629 EMD GP38 EMD 16-645-E3
Tested 10/27/00 @ SwRI, CARB (EM-2663-F)

Notch	Gross HP	obs Fuel Rate (lb/hr)	HC (g/hr)	CO (g/hr)	Corr. NOx (g/hr)	PM (g/hr)	AAR Corr bsfc	Corr. Fuel Rate (lb/hr)
8	2,099	878	1,282	14,299	24,817	1,224	0.423	887
7	1,859	738	1,003	6,742	22,787	871	0.402	747
6	1,535	590	572	1,645	18,475	520	0.388	596
5	1,256	478	423	981	14,404	389	0.385	484
4	1,007	382	347	597	11,114	317	0.384	386
3	586	226	221	410	5,635	158	0.391	229
2	316	132	154	431	2,988	87	0.423	134
1	84	50	121	197	1,163	17	0.600	50
Idle	11	26	119	129	729	11	2.457	26
DB-2	18	39	145	247	913	17	2.199	40
						sum =		

AAR 3x3 Weighted Results

Notch	WF	w-BHP	obs w-Fuel w-(lb/hr)	corr w-Fuel w-(lb/hr)	w-HC w-(g/hr)	w-CO w-(g/hr)	w-NOx w-(g/hr)	w-PM w-(g/hr)
8	25.0%	524.8	219.5	221.8	320.5	3574.8	6204.3	306.0
7	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	25.0%	314.0	119.5	120.9	105.8	245.3	3601.0	97.3
4	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Idle	50.0%	5.3	12.8	12.9	59.5	64.5	364.5	5.5
DB-2	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
sum =	100.0%	844.0	351.8	355.5	485.8	3884.5	10169.8	408.8

AAR 3x3 duty cycle weighted brake-specific emissions = 0.417 obs bsfc, 0.421 corr bsfc, 0.58, 4.60, 12.05, 0.484

EPA Switcher Duty Cycle Weighted Results

Notch	WF	w-BHP	obs w-Fuel w-(lb/hr)	corr w-Fuel w-(lb/hr)	w-HC w-(g/hr)	w-CO w-(g/hr)	w-NOx w-(g/hr)	w-PM w-(g/hr)
8	0.8%	16.8	7.0	7.1	10.3	114.4	198.5	9.8
7	0.2%	3.7	1.5	1.5	2.0	13.5	45.6	1.7
6	1.5%	23.0	8.9	8.9	8.6	24.7	277.1	7.8
5	3.6%	45.2	17.2	17.4	15.2	35.3	518.5	14.0
4	3.6%	36.2	13.8	13.9	12.5	21.5	400.1	11.4
3	5.8%	34.0	13.1	13.3	12.8	23.8	326.8	9.2
2	12.3%	38.9	16.2	16.4	18.9	53.0	367.5	10.7
1	12.4%	10.4	6.1	6.2	15.0	24.4	144.2	2.1
Idle	59.8%	6.3	15.2	15.4	71.2	77.1	435.9	6.6
DB	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
sum =	100.0%	214.5	99.0	100.2	166.5	387.7	2714.4	73.3

EPA switcher duty cycle weighted brake-specific emissions = 0.462 obs bsfc, 0.467 corr bsfc, 0.78, 1.81, 12.66, 0.342

EPA Freight Duty Cycle Weighted Results

Notch	WF	w-BHP	obs w-Fuel w-(lb/hr)	corr w-Fuel w-(lb/hr)	w-HC w-(g/hr)	w-CO w-(g/hr)	w-NOx w-(g/hr)	w-PM w-(g/hr)
8	16.2%	340.1	142.2	143.7	207.7	2316.4	4020.4	198.3
7	3.0%	55.8	22.1	22.4	30.1	202.3	683.6	26.1
6	3.9%	59.9	23.0	23.3	22.3	64.2	720.5	20.3
5	3.8%	47.7	18.2	18.4	16.1	37.3	547.4	14.8
4	4.4%	44.3	16.8	17.0	15.3	26.3	489.0	13.9
3	5.2%	30.5	11.8	11.9	11.5	21.3	293.0	8.2
2	6.5%	20.5	8.6	8.7	10.0	28.0	194.2	5.7
1	6.5%	5.4	3.2	3.3	7.9	12.8	75.6	1.1
Idle	38.0%	4.0	9.7	9.8	45.2	49.0	277.0	4.2
DB	12.5%	2.3	4.9	4.9	18.1	30.9	114.1	2.1
sum =	100.0%	610.4	260.5	263.3	384.1	2788.4	7414.8	294.7

EPA freight duty cycle weighted brake-specific emissions = 0.427 obs bsfc, 0.431 corr bsfc, 0.63, 4.57, 12.15, 0.483

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	IDLE	TEST CONFIGURATION	=	CARB 100
TEST DATE	=	10/27/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	1/10			
SwRI FUEL CODE	=	EM-2663-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.25 (in. Hg)	ENGINE INTAKE AIR	=	79.(°F)
DRY BULB TEMP	=	81. (°F)	WET BULB TEMP	=	73. (°F)
ABS HUMIDITY	=	110.20 (GR/LB)	RELATIVE HUMIDITY	=	67. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	4.3
TRACTION MOTOR BLOWER HP	=	1.9
INERTIAL SEPERATOR BLOWER HP	=	.3
RADIATOR FAN HP	=	.0
TOTAL ACCESSORY HP	=	10.5

FUEL RATE (OBS) = 25.5 (LB/HR)
ALT. VOLTS = 3. ALT. AMPS = 0. ALT. EFF. = .939
FLYWHEEL HP = 10.5 OBS. SFC = 2.4239 AAR CORR. SFC = 2.4568 (LB/HP-HR)
CALCULATED A/F = 328.04 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	119.	11.31	65.PPMC
CO	129.	12.28	35. PPM
NOX	663.	63.01	110. PPM (D)
NOX,CORR	729.	69.27	
CO2		3441.	.63 PCT
O2			20.03 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0995	NOX-KH	= 1.0812	NOX-KT	= 1.0000
WET EXH HC CF=	.9891	AIR TEMP CF	= .9914	BAROM CF	= 1.0034
FUEL TEMP CF =	.9815	FUEL S.G. CF	= 1.0187	FUEL HHV CF	= 1.0189

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6742.0-27
FILTER PAIR WEIGHT GAIN (mg)	.718
SAMPLE VOLUME (scf)	39.552
DILUTE PM CONCENTRATION (mg/scf)	.018
CO2-BASED DILUTION FACTOR	5.560
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.101
PARTICULATE MASS EMISSION RATE (g/hr)	11.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	1.071

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	D82	TEST CONFIGURATION	=	CARB 100
TEST DATE	=	10/27/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	2/10			
SwRI FUEL CODE	=	EM-2663-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.24 (in. Hg)	ENGINE INTAKE AIR	=	81.(°F)
DRY BULB TEMP	=	85. (°F)	WET BULB TEMP	=	73. (°F)
ABS HUMIDITY	=	105.77 (GR/LB)	RELATIVE HUMIDITY	=	57. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	6.5
TRACTION MOTOR BLOWER HP	=	6.5
INERTIAL SEPERATOR BLOWER HP	=	1.0
RADIATOR FAN HP	=	.0
TOTAL ACCESSORY HP	=	1B.0

FUEL RATE (OBS) = 39.0 (LB/HR)
ALT. VOLTS = B. ALT. AMPS = 0. ALT. EFF. = .939
FLYWHEEL HP = 18.0 OBS. SFC = 2.1715 AAR CORR. SFC = 2.19B8 (LB/HP-HR)
CALCULATED A/F = 295.53 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	145.	8.07	58.PPMC
CO	247.	13.75	49. PPM
NOX	840.	46.79	102. PPM (D)
NOX,CORR	913.	50.83	
CO2		3085.	.70 PCT
O2			20.03 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0862	NOX-KH	= 1.0704	NOX-KT	= 1.0000
WET EXH HC CF=	.9887	AIR TEMP CF	= .9905	BAROM CF	= 1.0033
FUEL TEMP CF =	.9830	FUEL S.G. CF	= 1.0187	FUEL HHV CF	= 1.0189

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6743.0-28
FILTER PAIR WEIGHT GAIN (mg)	1.075
SAMPLE VOLUME (scf)	38.86B
DILUTE PM CONCENTRATION (mg/scf)	.028
CO2-BASED DILUTION FACTOR	3.972
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.110
PARTICULATE MASS EMISSION RATE (g/hr)	17.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.941

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 1	TEST CONFIGURATION	=	CARB 100
TEST DATE	=	10/27/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	3/10			
SwRI FUEL CODE	=	EM-2663-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.24 (in. Hg)	ENGINE INTAKE AIR	=	82.(°F)
DRY BULB TEMP	=	82. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	105.64 (GR/LB)	RELATIVE HUMIDITY	=	63. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	5.3
TRACTION MOTOR BLOWER HP	=	3.5
INERTIAL SEPERATOR BLOWER HP	=	.5
RADIATOR FAN HP	=	.0
TOTAL ACCESSORY HP	=	13.3

FUEL RATE (OBS) = 49.5 (LB/HR)
ALT. VOLTS = 182. ALT. AMPS = 270. ALT. EFF. = .939
FLYWHEEL HP = 83.5 OBS. SFC = .5925 AAR CORR. SFC = .5997 (LB/HP-HR)
CALCULATED A/F = 194.71 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	121.	1.45	58.PPMC
CO	197.	2.35	47. PPM
NOX	1074.	12.86	155. PPM (D)
NOX,CORR	1163.	13.93	
CO2		846.	1.07 PCT
O2			19.41 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0831	NOX-KH	= 1.0679	NOX-KT	= 1.0000
WET EXH HC CF=	.9854	AIR TEMP CF	= .9901	BAROM CF	= 1.0033
FUEL TEMP CF =	.9835	FUEL S.G. CF	= 1.0187	FUEL HHV CF	= 1.0189

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6744.0-29
FILTER PAIR WEIGHT GAIN (mg)	1.364
SAMPLE VOLUME (scf)	38.248
DILUTE PM CONCENTRATION (mg/scf)	.036
CO2-BASED DILUTION FACTOR	3.651
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.130
PARTICULATE MASS EMISSION RATE (g/hr)	17.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.201

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 2	TEST CONFIGURATION	=	CARB 100
TEST DATE	=	10/27/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	4/10			
SwRI FUEL CODE	=	EM-2663-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.24 (in. Hg)	ENGINE INTAKE AIR	=	82.(°F)
DRY BULB TEMP	=	82. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	105.71 (GR/LB)	RELATIVE HUMIDITY	=	63. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	6.5
TRACTION MOTOR BLOWER HP	=	6.7
INERTIAL SEPERATOR BLOWER HP	=	1.0
RADIATOR FAN HP	=	3.1
TOTAL ACCESSORY HP	=	21.2

FUEL RATE (OBS) = 132.0 (LB/HR)
ALT. VOLTS = 376. ALT. AMPS = 549. ALT. EFF. = .939
FLYWHEEL HP = 316.1 OBS. SFC = .4176 AAR CORR. SFC = .4226 (LB/HP-HR)
CALCULATED A/F = 96.40 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	154.	.49	55.PPMC
CO	431.	1.36	78. PPM
NOX	2774.	B.7B	306. PPM (D)
NOX,CORR	2988.	9.45	
CO2		599.	2.18 PCT
O2			17.78 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0770	NOX-KH	= 1.0629	NOX-KT	= 1.0000
WET EXH HC CF	= .9757	AIR TEMP CF	= .9901	BAROM CF	= 1.0033
FUEL TEMP CF	= .9825	FUEL S.G. CF	= 1.0187	FUEL HHV CF	= 1.0189

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6745.0-30
FILTER PAIR WEIGHT GAIN (mg)	4.573
SAMPLE VOLUME (scf)	3B.352
DILUTE PM CONCENTRATION (mg/scf)	.119
CO2-BASED DILUTION FACTOR	4.285
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.511
PARTICULATE MASS EMISSION RATE (g/hr)	87.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.277

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 3	TEST CONFIGURATION	=	CARB 100
TEST DATE	=	10/27/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	5/10			
SwRI FUEL CODE	=	EM-2663-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.23 (in. Hg)	ENGINE INTAKE AIR	=	82.(°F)
DRY BULB TEMP	=	83. (°F)	WET BULB TEMP	=	73. (°F)
ABS HUMIDITY	=	105.90 (GR/LB)	RELATIVE HUMIDITY	=	60. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	8.3
TRACTION MOTOR BLOWER HP	=	14.0
INERTIAL SEPERATOR BLOWER HP	=	2.1
RADIATOR FAN HP	=	6.5
TOTAL ACCESSORY HP	=	34.9

FUEL RATE (OBS) = 226.0 (LB/HR)
ALT. VOLTS = 514. ALT. AMPS = 750. ALT. EFF. = .939
FLYWHEEL HP = 585.6 OBS. SFC = .3859 AAR CORR. SFC = .3906 (LB/HP-HR)
CALCULATED A/F = 70.68 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	221.	.38	63.PPMC
CO	410.	.70	59. PPH
NOX	5234.	8.94	461. PPM (D)
NOX,CORR	5635.	9.62	
CO2		554.	2.99 PCT
O2			16.7B PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0767	NOX-KH	= 1.0626	NOX-KT	= 1.0000
WET EXH HC CF=	.9687	AIR TEMP CF	= .9901	BAROM CF	= 1.0032
FUEL TEMP CF =	.9835	FUEL S.G. CF	= 1.01B7	FUEL HHV CF	= 1.0189

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6746.0-31
FILTER PAIR WEIGHT GAIN (mg)	5.529
SAMPLE VOLUME (scf)	38.105
DILUTE PM CONCENTRATION (mg/scf)	.145
CO2-BASED DILUTION FACTOR	5.040
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.731
PARTICULATE MASS EMISSION RATE (g/hr)	158.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.269

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 4	TEST CONFIGURATION	=	CARB 100
TEST DATE	=	10/27/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	6/10			
SwRI FUEL CODE	=	EM-2663-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.22 (in. Hg)	ENGINE INTAKE AIR	=	83.(°F)
DRY BULB TEMP	=	86. (°F)	WET BULB TEMP	=	73. (°F)
ABS HUMIDITY	=	103.37 (GR/LB)	RELATIVE HUMIDITY	=	54. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	9.6
TRACTION MOTOR BLOWER HP	=	20.9
INERTIAL SEPERATOR BLOWER HP	=	3.1
RADIATOR FAN HP	=	9.7
TOTAL ACCESSORY HP	=	47.3

FUEL RATE (OBS) = 382.0 (LB/HR)
ALT. VOLTS = 681. ALT. AMPS = 986. ALT. EFF. = .939
FLYWHEEL HP = 1006.5 OBS. SFC = .3795 AAR CORR. SFC = .3839 (LB/HP-HR)
CALCULATED A/F = 48.03 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	347.	.34	85.PPMC
CO	597.	.59	76. PPM
NOX	10389.	10.32	802. PPM (D)
NOX,CORR	11114.	11.04	
CO2		545.	4.43 PCT
O2			14.77 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0698	NOX-KH	= 1.0571	NOX-KT	= 1.0000
WET EXH HC CF	= .9567	AIR TEMP CF	= .9896	BAROM CF	= 1.0031
FUEL TEMP CF	= .9830	FUEL S.G. CF	= 1.0187	FUEL HHV CF	= 1.0189

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6747.0-32
FILTER PAIR WEIGHT GAIN (mg)	7.907
SAMPLE VOLUME (scf)	38.067
DILUTE PM CONCENTRATION (mg/scf)	.208
CO2-BASED DILUTION FACTOR	6.127
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	1.273
PARTICULATE MASS EMISSION RATE (g/hr)	317.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.315

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 5	TEST CONFIGURATION	=	CARB 100
TEST DATE	=	10/27/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	7/10			
SwRI FUEL CODE	=	EM-2663-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.22 (in. Hg)	ENGINE INTAKE AIR	=	83.(°F)
DRY BULB TEMP	=	85. (°F)	WET BULB TEMP	=	73. (°F)
ABS HUMIDITY	=	105.09 (GR/LB)	RELATIVE HUMIDITY	=	56. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	10.8
TRACTION MOTOR BLOWER HP	=	30.0
INERTIAL SEPERATOR BLOWER HP	=	4.5
RADIATOR FAN HP	=	27.8
TOTAL ACCESSORY HP	=	77.1

FUEL RATE (OBS) = 47B.0 (LB/HR)
ALT. VOLTS = 757. ALT. AMPS = 1090. ALT. EFF. = .939
FLYWHEEL HP = 1255.9 OBS. SFC = .3806 AAR CORR. SFC = .3850 (LB/HP-HR)
CALCULATED A/F = 42.73 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	423.	.34	93.PPMC
CO	981.	.78	112. PPM
NOX	13410.	10.68	932. PPM (D)
NOX,CORR	14404.	11.47	
CO2		547.	4.99 PCT
O2			13.90 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0741	NOX-KH	= 1.0606	NOX-KT	= 1.0000
WET EXH HC CF=	.9520	AIR TEMP CF	= .9896	BAROM CF	= 1.0031
FUEL TEMP CF =	.9870	FUEL S.G. CF	= 1.0187	FUEL HHV CF	= 1.0189

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6748.0-33
FILTER PAIR WEIGHT GAIN (mg)	8.944
SAMPLE VOLUME (scf)	37.340
DILUTE PM CONCENTRATION (mg/scf)	.240
CO2-BASED DILUTION FACTOR	5.836
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	1.398
PARTICULATE MASS EMISSION RATE (g/hr)	389.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.310

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 6	TEST CONFIGURATION	=	CARB 100
TEST DATE	=	10/27/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	8/10			
SwRI FUEL CODE	=	EM-2663-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.21 (in. Hg)	ENGINE INTAKE AIR	=	85.(°F)
DRY BULB TEMP	=	86. (°F)	WET BULB TEMP	=	73. (°F)
ABS HUMIDITY	=	102.98 (GR/LB)	RELATIVE HUMIDITY	=	54. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	12.2
TRACTION MOTOR BLOWER HP	=	43.4
INERTIAL SEPERATOR BLOWER HP	=	6.5
RADIATOR FAN HP	=	40.2
TOTAL ACCESSORY HP	=	106.3

FUEL RATE (OBS) = 590.0 (LB/HR)
ALT. VOLTS = 835. ALT. AMPS = 1198. ALT. EFF. = .939
FLYWHEEL HP = 1535.4 OBS. SFC = .3843 AAR CORR. SFC = .3883 (LB/HP-HR)
CALCULATED A/F = 38.54 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	572.	.37	113.PPMC
CO	1645.	1.07	169. PPM
NOX	17287.	11.26	1082. PPM (D)
NOX,CORR	18475.	12.03	
CO2		551.	5.54 PCT
O2			13.27 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0688	NOX-KH	= 1.0562	NOX-KT	= 1.0000
WET EXH HC CF=	.9476	AIR TEMP CF	= .9887	BAROM CF	= 1.0030
FUEL TEMP CF =	.9870	FUEL S.G. CF	= 1.0187	FUEL HHV CF	= 1.0189

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6749.0-34
FILTER PAIR WEIGHT GAIN (mg)	8.470
SAMPLE VOLUME (scf)	37.125
DILUTE PM CONCENTRATION (mg/scf)	.228
CO2-BASED DILUTION FACTOR	7.336
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	1.674
PARTICULATE MASS EMISSION RATE (g/hr)	520.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.338

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 7	TEST CONFIGURATION	=	CARB 100
TEST DATE	=	10/27/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	9/10			
SwRI FUEL CODE	=	EM-2663-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.21 (in. Hg)	ENGINE INTAKE AIR	=	81.(°F)
DRY BULB TEMP	=	86. (°F)	WET BULB TEMP	=	73. (°F)
ABS HUMIDITY	=	101.27 (GR/LB)	RELATIVE HUMIDITY	=	53. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	13.8
TRACTION MOTOR BLOWER HP	=	62.7
INERTIAL SEPERATOR BLOWER HP	=	9.4
RADIATOR FAN HP	=	58.0
TOTAL ACCESSORY HP	=	147.9

FUEL RATE (OBS) = 738.0 (LB/HR)
ALT. VOLTS = 917. ALT. AMPS = 1306. ALT. EFF. = .939
FLYWHEEL HP = 1858.8 OBS. SFC = .3970 AAR CORR. SFC = .4019 (LB/HP-HR)
CALCULATED A/F = 34.64 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	1003.	.54	175.PPMC
CO	6742.	3.63	618. PPM
NOX	2140B.	11.52	1195. PPM (D)
NOX,CORR	22787.	12.26	
CO2		565.	6.13 PCT
O2			12.40 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0644	NOX-KH	= 1.0527	NOX-KT	= 1.0000
WET EXH HC CF=	.9426	AIR TEMP CF	= .9905	BAROM CF	= 1.0030
FUEL TEMP CF =	.9855	FUEL S.G. CF	= 1.0187	FUEL HHV CF	= 1.0189

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6750.0-35
FILTER PAIR WEIGHT GAIN (mg)	10.494
SAMPLE VOLUME (scf)	36.666
DILUTE PM CONCENTRATION (mg/scf)	.286
CO2-BASED DILUTION FACTOR	8.692
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	2.488
PARTICULATE MASS EMISSION RATE (g/hr)	871.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.469

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 8	TEST CONFIGURATION	=	CARB 100
TEST DATE	=	10/27/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	10/10			
SwRI FUEL CODE	=	EM-2663-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.21 (in. Hg)	ENGINE INTAKE AIR	=	85.(°F)
DRY BULB TEMP	=	84. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	98.02 (GR/LB)	RELATIVE HUMIDITY	=	54. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	15.1
TRACTION MOTOR BLOWER HP	=	B3.0
INERTIAL SEPERATOR BLOWER HP	=	12.4
RADIATOR FAN HP	=	76.7
TOTAL ACCESSORY HP	=	191.2

FUEL RATE (OBS) = 878.0 (LB/HR)
ALT. VOLTS = 972. ALT. AMPS = 1374. ALT. EFF. = .939
FLYWHEEL HP = 2099.1 OBS. SFC = .4183 AAR CORR. SFC = .4226 (LB/HP-HR)
CALCULATED A/F = 31.69 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	1282.	.61	205.PPMC
CO	14299.	6.81	1207. PPM
NOX	23496.	11.19	1207. PPM (D)
NOX,CORR	24817.	11.82	
CO2		591.	6.66 PCT
O2			11.64 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0562	NOX-KH	= 1.0460	NOX-KT	= 1.0000
WET EXH HC CF=	.9382	AIR TEMP CF	= .9887	BAROM CF	= 1.0030
FUEL TEMP CF =	.9850	FUEL S.G. CF	= 1.0187	FUEL HHV CF	= 1.0189

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6751.0-36
FILTER PAIR WEIGHT GAIN (mg)	15.611
SAMPLE VOLUME (scf)	35.195
DILUTE PM CONCENTRATION (mg/scf)	.444
CO2-BASED DILUTION FACTOR	7.223
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	3.204
PARTICULATE MASS EMISSION RATE (g/hr)	1224.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.583

LOCOMOTIVE TEST SUMMARY

SwRI Project No. 08.02999.001

Test Date 10-27-00

Notch	Idle	DB-2	1	2	3	4	5	6	7	8
Run Number										
Barometer (in. Hg)	29.25	29.24	29.24	29.24	29.23	29.22	29.22	29.21	29.21	29.21
Dry Bulb Temp. (°F)	81.0	85.0	81.6	81.9	83.2	86.1	85.1	86.0	85.6	84.4
Wet Bulb Temp. (°F)	72.7	73.1	72.1	72.2	72.6	73.0	73.0	72.9	72.5	71.6
Fuel Supply Temp. (°F)	97	94	93	95	93	94	86	86	89	90
Water Inlet Temp. (°F)	161	173	172	166	172	179	177	176	183	181
Engine Intake Air @ Filter (°F)	79	81	82	82	82	83	83	85	81	85
Engine Speed (rpm)	258	388	316	390	500	573	646	731	826	906
Traction Volts	2.87	7.86	182	376	514	681	757	835	917	972
Traction Amps	0	0	270	549	750	986	1090	1198	1306	1374
Fuel Rate (lb/hr)	25.5	39.0	49.5	132	226	382	478	590	738	878
# of Fans	0	0	0	1	1	1	2	2	2	2
HC (ppmC)	65.12	57.60	57.60	55.10	62.61	85.15	92.97	112.70	175.32	205.37
CO (ppm)	35.34	49.02	~~18.07~~ 46.73	78.07	59.37	75.71	112.01	169.17	618.01	1206.84
Raw Exhaust CO_2 (%)	.63	.70	1.07	2.18	2.99	4.43	4.99	5.54	6.13	6.66
NO_x (ppm)	110.33	101.55	155.46	305.71	461.08	801.87	932.17	1081.93	1194.57	1207.09
O_2 (%)	20.03	20.03	19.41	17.78	16.78	14.77	13.90	13.27	12.40	11.64
Tunnel Dilute CO_2 (%)	1560	2144	~~5428~~ 3338	~~6240~~ 5428	6240	7424	8699	7702	7243	9241
Background CO_2 (ppm)	535	535	~~581~~ 604	581	581	557	604	581	627	604

Notes: 1 - Air compressor locked off.

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Test Configuration: EM-2663-F Carb 100 Run #1

Operator: EG

N.1
3332

LOCOMOTIVE TEST SUMMARY

SwRI Project No.08.02999.001

Test Date 10-27-00

Notch	Idle	DB-2	1	2	3	4	5	6	7	8
Time ~~Run Number~~	12:34	12:49	1:03	1:14	1:23	1:40	1:50	2:00	2:11	2:21
Observed Fuel Rate at X minutes into test point (lb/hr)										
3 min.	26.0	40.3	50.7	132	226	382	479	590	737	874
5 min.	25.2	39.9	50.6	132	226	382	479	591	739	877
7 min.	26.2	40.1	50.1	132	227	382	479	591	740	877
Averaged Fuel Rate over Time										
Cumulative Fuel Used (lbs)	3.4	3.9	3.3	6.6	11.3	19.1	23.9	29.5	36.9	43.9
Over X Minutes	8.0	6.0	4.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
x 60. = Fuel Rate (lb/hr)	25.5	39.0	49.5	132	226	382	478	590	738	878
Traction Volts	2.87	7.86	182	376	574	681	757	835	917	972
Current Shunt mV	0	0	3.37	6.86	9.38	12.32	13.63	14.97	16.32	17.18
Traction Current = Shunt mV * 80.	0	0	270	549	750	986	1090	1198	1306	1374
Right Airbox Temp., °F	131	131	128	129	129	136	143	151	161	180
Left Airbox Temp., °F	104	110	104	108	113	122	133	146	161	181
Airbox Pressure, in. Hg	.90	1.87	1.32	1.86	2.90	3.92	5.09	6.77	9.09	11.23
Left Exhaust Temperature, °F										
Right Exhaust Temperature, °F										
SS Smoke, % Opacity	0	0	0	0	0	2.2	2.5	2.3	3.4	4.3
Notes: 1 - Air compressor locked off.	210	1155	1990	2640	3210	4185	4800	5430	6110	6665

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Test Configuration: EM-2663-F Carb 100 Run #1

Operator: EJ

294.Prn

CSX #2629 EMD GP38 EMD 16-645-E3
Tested 10/27/00 @ SwRI, CARB (EM-2663-F)

Notch	Gross HP	obs Fuel Rate (lb/hr)	HC (g/hr)	CO (g/hr)	Corr. NOx (g/hr)	PM (g/hr)	AAR Corr bsfc	Corr. Fuel Rate (lb/hr)
8	2,098	878	1,234	14,630	24,551	1,124	0.422	886
7	1,859	742	979	6,779	22,965	807	0.403	750
6	1,537	592	623	2,868	18,326	518	0.389	598
5	1,262	480	408	912	14,486	472	0.384	485
4	1,008	380	332	580	10,959	318	0.381	384
3	586	226	221	394	5,571	157	0.390	228
2	320	132	161	412	2,958	100	0.417	133
1	84	50	120	195	1,130	18	0.598	50
Idle	11	23	117	121	641	9	2.163	23
DB-2	18	41	155	247	942	17	2.307	41
						sum =		

AAR 3x3 Weighted Results

WF	w-BHP	obs w-Fuel w-(lb/hr)	corr w-Fuel w-(lb/hr)	w-HC w-(g/hr)	w-CO w-(g/hr)	w-NOx w-(g/hr)	w-PM w-(g/hr)
25.0%	524.5	219.5	221.4	308.5	3657.5	6137.8	281.0
0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25.0%	315.6	120.0	121.2	102.0	228.0	3621.5	118.0
0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50.0%	5.3	11.3	11.4	58.5	60.5	320.5	4.5
0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
100.0%	845.3	350.8	354.0	469.0	3946.0	10079.8	403.5

AAR 3x3 duty cycle weighted brake-specific emissions = 0.415 obs bsfc, 0.419 corr bsfc; 0.55, 4.67, 11.92, 0.477

EPA Switcher Duty Cycle Weighted Results

Notch	WF	w-BHP	obs w-Fuel w-(lb/hr)	corr w-Fuel w-(lb/hr)	w-HC w-(g/hr)	w-CO w-(g/hr)	w-NOx w-(g/hr)	w-PM w-(g/hr)
8	0.8%	16.8	7.0	7.1	9.9	117.0	196.4	9.0
7	0.2%	3.7	1.5	1.5	2.0	13.6	45.9	1.6
6	1.5%	23.1	8.9	9.0	9.3	43.0	274.9	7.8
5	3.6%	45.4	17.3	17.5	14.7	32.8	521.5	17.0
4	3.6%	36.3	13.7	13.8	12.0	20.9	394.5	11.4
3	5.8%	34.0	13.1	13.2	12.8	22.9	323.1	9.1
2	12.3%	39.3	16.2	16.4	19.8	50.7	363.8	12.3
1	12.4%	10.4	6.1	6.2	14.9	24.2	140.1	2.2
Idle	59.8%	6.3	13.5	13.6	70.0	72.4	383.3	5.4
DB	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
sum =	100.0%	215.2	97.3	98.2	165.3	397.4	2643.6	75.8

EPA switcher duty cycle weighted brake-specific emissions = 0.452 obs bsfc, 0.457 corr bsfc; 0.77, 1.85, 12.28, 0.352

EPA Freight Duty Cycle Weighted Results

Notch	WF	w-BHP	obs w-Fuel w-(lb/hr)	corr w-Fuel w-(lb/hr)	w-HC w-(g/hr)	w-CO w-(g/hr)	w-NOx w-(g/hr)	w-PM w-(g/hr)
8	16.2%	339.9	142.2	143.5	199.9	2370.1	3977.3	182.1
7	3.0%	55.8	22.3	22.5	29.4	203.4	689.0	24.2
6	3.9%	59.9	23.1	23.3	24.3	111.9	714.7	20.2
5	3.8%	48.0	18.2	18.4	15.5	34.7	550.5	17.9
4	4.4%	44.4	16.7	16.9	14.6	25.5	482.2	14.0
3	5.2%	30.4	11.8	11.9	11.5	20.5	289.7	8.2
2	6.5%	20.8	8.6	8.7	10.5	26.8	192.3	6.5
1	6.5%	5.4	3.2	3.2	7.8	12.7	73.5	1.2
Idle	38.0%	4.0	8.6	8.6	44.5	46.0	243.6	3.4
DB	12.5%	2.2	5.1	5.2	19.4	30.9	117.8	2.1
sum =	100.0%	610.8	259.8	262.2	377.3	2882.3	7330.3	279.8

EPA freight duty cycle weighted brake-specific emissions = 0.425 obs bsfc, 0.429 corr bsfc; 0.62, 4.72, 12.00, 0.458

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	IDLE	TEST CONFIGURATION	=	CARB 100
TEST DATE	=	10/27/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	1/10			
SwRI FUEL CODE	=	EM-2663-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.20 (in. Hg)	ENGINE INTAKE AIR	=	88.(°F)
DRY BULB TEMP	=	86. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	97.08 (GR/LB)	RELATIVE HUMIDITY	=	51. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	4.3
TRACTION MOTOR BLOWER HP	=	1.9
INERTIAL SEPERATOR BLOWER HP	=	.3
RADIATOR FAN HP	=	.0
TOTAL ACCESSORY HP	=	10.5

FUEL RATE (OBS) = 22.5 (LB/HR)
ALT. VOLTS = 3. ALT. AMPS = 0. ALT. EFF. = .939
FLYWHEEL HP = 10.5 OBS. SFC = 2.1437 AAR CORR. SFC = 2.1629 (LB/HP-HR)
CALCULATED A/F = 327.53 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	117.	11.13	73.PPMC
CO	121.	11.54	38. PPM
NOX	604.	57.53	114. PPM (D)
NOX,CORR	641.	61.06	
CO2		3039.	.63 PCT
O2			20.03 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0613	NOX-KH	= 1.0501	NOX-KT	= 1.0000
WET EXH HC CF=	.9897	AIR TEMP CF	= .9874	BAROM CF	= 1.0029
FUEL TEMP CF =	.9830	FUEL S.G. CF	= 1.0187	FUEL HHV CF	= 1.0189

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6756.0-41
FILTER PAIR WEIGHT GAIN (mg)	.703
SAMPLE VOLUME (scf)	38.924
DILUTE PM CONCENTRATION (mg/scf)	.018
CO2-BASED DILUTION FACTOR	5.054
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.091
PARTICULATE MASS EMISSION RATE (g/hr)	9.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.856

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	DB2	TEST CONFIGURATION	=	CARB 100
TEST DATE	=	10/27/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	2/10			
SwRI FUEL CODE	=	EM-2663-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.20 (in. Hg)	ENGINE INTAKE AIR	=	88.(°F)
DRY BULB TEMP	=	86. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	95.74 (GR/LB)	RELATIVE HUMIDITY	=	50. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	6.5
TRACTION MOTOR BLOWER HP	=	6.5
INERTIAL SEPERATOR BLOWER HP	=	1.0
RADIATOR FAN HP	=	.0
TOTAL ACCESSORY HP	=	17.9

FUEL RATE (OBS) = 41.0 (LB/HR)
ALT. VOLTS = 8. ALT. AMPS = 0. ALT. EFF. = .939
FLYWHEEL HP = 17.9 OBS. SFC = 2.2861 AAR CORR. SFC = 2.3067 (LB/HP-HR)
CALCULATED A/F = 287.42 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	155.	8.62	60.PPMC
CO	247.	13.75	48. PPM
NOX	891.	49.68	105. PPM (D)
NOX,CORR	942.	52.52	
CO2		3249.	.72 PCT
O2			20.03 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0573	NOX-KH	= 1.0469	NOX-KT	= 1.0000
WET EXH HC CF=	.9890	AIR TEMP CF	= .9874	BAROM CF	= 1.0029
FUEL TEMP CF =	.9825	FUEL S.G. CF	= 1.0187	FUEL HHV CF	= 1.0189

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6757.0-42
FILTER PAIR WEIGHT GAIN (mg)	.930
SAMPLE VOLUME (scf)	38.281
DILUTE PM CONCENTRATION (mg/scf)	.024
CO2-BASED DILUTION FACTOR	4.502
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.109
PARTICULATE MASS EMISSION RATE (g/hr)	17.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.960

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 1	TEST CONFIGURATION	=	CARB 100
TEST DATE	=	10/27/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	3/10			
SwRI FUEL CODE	=	EM-2663-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.19 (in. Hg)	ENGINE INTAKE AIR	=	87.(°F)
DRY BULB TEMP	=	85. (°F)	WET BULB TEMP	=	71. (°F)
ABS HUMIDITY	=	94.86 (GR/LB)	RELATIVE HUMIDITY	=	52. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	5.3
TRACTION MOTOR BLOWER HP	=	3.5
INERTIAL SEPERATOR BLOWER HP	=	.5
RADIATOR FAN HP	=	.0
TOTAL ACCESSORY HP	=	I3.4

FUEL RATE (OBS) = 49.5 (LB/HR)
ALT. VOLTS = 182. ALT. AMPS = 270. ALT. EFF. = .939
FLYWHEEL HP = B3.6 OBS. SFC = .5923 AAR CORR. SFC = .5979 (LB/HP-HR)
CALCULATED A/F = 192.94 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	120.	1.44	58.PPMC
CO	195.	2.33	47. PPM
NOX	1073.	12.84	157. PPM (D)
NOX,CORR	1130.	13.52	
CO2		846.	1.08 PCT
O2			19.53 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0531	NOX-KH	= 1.0434	NOX-KT	= 1.0000
WET EXH HC CF=	.9858	AIR TEMP CF	= .9878	BAROM CF	= 1.0029
FUEL TEMP CF =	.9860	FUEL S.G. CF	= 1.0187	FUEL HHV CF	= 1.0189

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6758.0-43
FILTER PAIR WEIGHT GAIN (mg)	1.516
SAMPLE VOLUME (scf)	38.093
DILUTE PM CONCENTRATION (mg/scf)	.040
CO2-BASED DILUTION FACTOR	3.581
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.143
PARTICULATE MASS EMISSION RATE (g/hr)	18.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.218

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 2	TEST CONFIGURATION	=	CARB 100
TEST DATE	=	10/27/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	4/10			
SwRI FUEL CODE	=	EM-2663-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.19 (in. Hg)	ENGINE INTAKE AIR	=	86.(°F)
DRY BULB TEMP	=	85. (°F)	WET BULB TEMP	=	71. (°F)
ABS HUMIDITY	=	94.69 (GR/LB)	RELATIVE HUMIDITY	=	51. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	6.5
TRACTION MOTOR BLOWER HP	=	6.6
INERTIAL SEPERATOR BLOWER HP	=	1.0
RADIATOR FAN HP	=	3.1
TOTAL ACCESSORY HP	=	21.2

FUEL RATE (OBS) = 132.0 (LB/HR)
ALT. VOLTS = 377. ALT. AMPS = 554. ALT. EFF. = .939
FLYWHEEL HP = 319.5 OBS. SFC = .4131 AAR CORR. SFC = .4172 (LB/HP-HR)
CALCULATED A/F = 96.40 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	161.	.50	58.PPMC
CO	412.	1.29	75. PPM
NOX	2820.	8.83	311. PPM (D)
NOX,CORR	2958.	9.26	
CO2		592.	2.18 PCT
O2			17.91 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0488	NOX-KH	= 1.0399	NOX-KT	= 1.0000
WET EXH HC CF	= .9762	AIR TEMP CF	= .9883	BAROM CF	= 1.0029
FUEL TEMP CF	= .9B50	FUEL S.G. CF	= 1.0187	FUEL HHV CF	= 1.0189

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6759.0-44
FILTER PAIR WEIGHT GAIN (mg)	5.049
SAMPLE VOLUME (scf)	38.274
DILUTE PM CONCENTRATION (mg/scf)	.132
CO2-BASED DILUTION FACTOR	4.410
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.582
PARTICULATE MASS EMISSION RATE (g/hr)	100.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.312

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 3	TEST CONFIGURATION	=	CARB 100
TEST DATE	=	10/27/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	5/10			
SwRI FUEL CODE	=	EM-2663-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.19 (in. Hg)	ENGINE INTAKE AIR	=	84.(°F)
DRY BULB TEMP	=	85. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	96.49 (GR/LB)	RELATIVE HUMIDITY	=	52. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	8.3
TRACTION MOTOR BLOWER HP	=	13.9
INERTIAL SEPERATOR BLOWER HP	=	2.1
RADIATOR FAN HP	=	6.4
TOTAL ACCESSORY HP	=	34.8

FUEL RATE (OBS) = 226.0 (LB/HR)
ALT. VOLTS = 514. ALT. AMPS = 750. ALT. EFF. = .939
FLYWHEEL HP = 585.5 OBS. SFC = .3860 AAR CORR. SFC = .3901 (LB/HP-HR)
CALCULATED A/F = 70.68 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	221.	.38	63.PPMC
CO	394.	.67	57. PPM
NOX	5291.	9.04	466. PPM (D)
NOX,CORR	5571.	9.51	
CO2		555.	2.99 PCT
O2			16.78 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0528	NOX-KH	= 1.0432	NOX-KT	= 1.0000
WET EXH HC CF=	.9692	AIR TEMP CF	= .9892	BAROM CF	= 1.0029
FUEL TEMP CF =	.9855	FUEL S.G. CF	= 1.0187	FUEL HHV CF	= 1.0189

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6760.0-45
FILTER PAIR WEIGHT GAIN (mg)	5.306
SAMPLE VOLUME (scf)	37.944
DILUTE PM CONCENTRATION (mg/scf)	.140
CO2-BASED DILUTION FACTOR	5.215
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.729
PARTICULATE MASS EMISSION RATE (g/hr)	157.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.269

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 4	TEST CONFIGURATION	=	CARB 100
TEST DATE	=	10/27/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	6/10			
SwRI FUEL CODE	=	EM-2663-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.19 (in. Hg)	ENGINE INTAKE AIR	=	86.(°F)
DRY BULB TEMP	=	85. (°F)	WET BULB TEMP	=	71. (°F)
ABS HUMIDITY	=	95.57 (GR/LB)	RELATIVE HUMIDITY	=	51. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	9.6
TRACTION MOTOR BLOWER HP	=	21.1
INERTIAL SEPERATOR BLOWER HP	=	3.2
RADIATOR FAN HP	=	9.7
TOTAL ACCESSORY HP	=	47.5

FUEL RATE (OBS) = 380.0 (LB/HR)
ALT. VOLTS = 682. ALT. AMPS = 9B6. ALT. EFF. = .939
FLYWHEEL HP = 100B.2 OBS. SFC = .3769 AAR CORR. SFC = .3806 (LB/HP-HR)
CALCULATED A/F = 47.62 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	332.	.33	83.PPMC
CO	5B0.	.57	75. PPM
NOX	10435.	10.35	B17. PPM (D)
NOX,CORR	10959.	10.87	
CO2		542.	4.47 PCT
O2			14.65 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0502	NOX-KH	= 1.0411	NOX-KT	= 1.0000
WET EXH HC CF=	.9568	AIR TEMP CF	= .9883	BAROM CF	= 1.0029
FUEL TEMP CF =	.9860	FUEL S.G. CF	= 1.0187	FUEL HHV CF	= 1.0189

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6761.0-46
FILTER PAIR WEIGHT GAIN (mg)	7.801
SAMPLE VOLUME (scf)	37.512
DILUTE PM CONCENTRATION (mg/scf)	.208
CO2-BASED DILUTION FACTOR	6.216
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	1.293
PARTICULATE MASS EMISSION RATE (g/hr)	318.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.315

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 5	TEST CONFIGURATION	=	CARB 100
TEST DATE	=	10/27/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	7/10			
SwRI FUEL CODE	=	EM-2663-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.18 (in. Hg)	ENGINE INTAKE AIR	=	85.(°F)
DRY BULB TEMP	=	86. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	98.00 (GR/LB)	RELATIVE HUMIDITY	=	51. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	10.8
TRACTION MOTOR BLOWER HP	=	30.1
INERTIAL SEPERATOR BLOWER HP	=	4.5
RADIATOR FAN HP	=	27.8
TOTAL ACCESSORY HP	=	77.2

FUEL RATE (OBS) = 480.0 (LB/HR)
ALT. VOLTS = 759. ALT. AMPS = 1093. ALT. EFF. = .939
FLYWHEEL HP = 1262.3 OBS. SFC = .3802 AAR CORR. SFC = .3841 (LB/HP-HR)
CALCULATED A/F = 42.40 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	408.	.32	90.PPMC
CO	912.	.72	105. PPM
NOX	13715.	10.86	957. PPM (D)
NOX,CORR	14486.	11.48	
CO2		546.	5.03 PCT
O2			14.02 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0562	NOX-KH	= 1.0460	NOX-KT	= 1.0000
WET EXH HC CF=	.9520	AIR TEMP CF	= .9887	BAROM CF	= 1.0028
FUEL TEMP CF =	.9855	FUEL S.G. CF	= 1.0187	FUEL HHV CF	= 1.0189

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6762.0-47
FILTER PAIR WEIGHT GAIN (mg)	6.962
SAMPLE VOLUME (scf)	37.329
DILUTE PM CONCENTRATION (mg/scf)	.187
CO2-BASED DILUTION FACTOR	9.127
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	1.702
PARTICULATE MASS EMISSION RATE (g/hr)	472.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.374

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 6	TEST CONFIGURATION	=	CARB 100
TEST DATE	=	10/27/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	8/10			
SwRI FUEL CODE	=	EM-2663-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.18 (in. Hg)	ENGINE INTAKE AIR	=	86.(°F)
DRY BULB TEMP	=	86. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	94.31 (GR/LB)	RELATIVE HUMIDITY	=	49. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	12.2
TRACTION MOTOR BLOWER HP	=	43.4
INERTIAL SEPERATOR BLOWER HP	=	6.5
RADIATOR FAN HP	=	40.1
TOTAL ACCESSORY HP	=	106.2

FUEL RATE (OBS) = 592.0 (LB/HR)
ALT. VOLTS = 836. ALT. AMPS = 1198. ALT. EFF. = .939
FLYWHEEL HP = 1537.0 OBS. SFC = .3852 AAR CORR. SFC = .3889 (LB/HP-HR)
CALCULATED A/F = 38.44 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	623.	.41	123.PPMC
CO	2868.	1.87	295. PPM
NOX	17503.	11.39	1094. PPM (D)
NOX,CORR	18326.	11.92	
CO2		551.	5.54 PCT
O2			13.27 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0470	NOX-KH	= 1.0385	NOX-KT	= 1.0000
WET EXH HC CF=	.9479	AIR TEMP CF	= .9883	BAROM CF	= 1.0028
FUEL TEMP CF =	.9865	FUEL S.G. CF	= 1.0187	FUEL HHV CF	= 1.0189

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6763.0-48
FILTER PAIR WEIGHT GAIN (mg)	8.850
SAMPLE VOLUME (scf)	36.968
DILUTE PM CONCENTRATION (mg/scf)	.239
CO2-BASED DILUTION FACTOR	6.962
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	1.667
PARTICULATE MASS EMISSION RATE (g/hr)	518.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.337

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 7	TEST CONFIGURATION	=	CARB 100
TEST DATE	=	10/27/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	9/10			
SwRI FUEL CODE	=	EM-2663-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.18 (in. Hg)	ENGINE INTAKE AIR	=	85.(°F)
DRY BULB TEMP	=	86. (°F)	WET BULB TEMP	=	71. (°F)
ABS HUMIDITY	=	93.50 (GR/LB)	RELATIVE HUMIDITY	=	49. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	13.8
TRACTION MOTOR BLOWER HP	=	62.6
INERTIAL SEPERATOR BLOWER HP	=	9.4
RADIATOR FAN HP	=	57.9
TOTAL ACCESSORY HP	=	147.7

FUEL RATE (OBS) = 742.0 (LB/HR)
ALT. VOLTS = 917. ALT. AMPS = 1306. ALT. EFF. = .939
FLYWHEEL HP = 1858.5 OBS. SFC = .3992 AAR CORR. SFC = .4033 (LB/HP-HR)
CALCULATED A/F = 34.64 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	979.	.53	170.PPMC
CO	6779.	3.65	618. PPM
NOX	21977.	11.82	1220. PPM (D)
NOX,CORR	22965.	12.36	
CO2		569.	6.13 PCT
O2			12.40 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0450	NOX-KH	= 1.0368	NOX-KT	= 1.0000
WET EXH HC CF	= .9430	AIR TEMP CF	= .9887	BAROM CF	= 1.0028
FUEL TEMP CF	= .9835	FUEL S.G. CF	= 1.0187	FUEL HHV CF	= 1.0189

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6764.0-49
FILTER PAIR WEIGHT GAIN (mg)	7.349
SAMPLE VOLUME (scf)	36.910
DILUTE PM CONCENTRATION (mg/scf)	.199
CO2-BASED DILUTION FACTOR	11.520
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	2.294
PARTICULATE MASS EMISSION RATE (g/hr)	807.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.434

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 8	TEST CONFIGURATION	=	CARB 100
TEST DATE	=	10/27/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	10/10			
SwRI FUEL CODE	=	EM-2663-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.18 (in. Hg)	ENGINE INTAKE AIR	=	88.(°F)
DRY BULB TEMP	=	86. (°F)	WET BULB TEMP	=	71. (°F)
ABS HUMIDITY	=	93.60 (GR/LB)	RELATIVE HUMIDITY	=	49. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	15.1
TRACTION MOTOR BLOWER HP	=	82.7
INERTIAL SEPERATOR BLOWER HP	=	12.4
RADIATOR FAN HP	=	76.5
TOTAL ACCESSORY HP	=	190.7

FUEL RATE (OBS) = 878.0 (LB/HR)
ALT. VOLTS = 971. ALT. AMPS = 1375. ALT. EFF. = .939
FLYWHEEL HP = 2098.0 OBS. SFC = .4185 AAR CORR. SFC = .4222 (LB/HP-HR)
CALCULATED A/F = 31.68 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	1234.	.59	198.PPMC
CO	14630.	6.97	1235. PPM
NOX	23489.	11.20	1207. PPM (D)
NOX,CORR	24551.	11.70	
CO2		591.	6.66 PCT
O2			11.64 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF = 1.0452	NOX-KH = 1.0370	NOX-KT = 1.0000
WET EXH HC CF= .9384	AIR TEMP CF = .9874	BAROM CF = 1.0028
FUEL TEMP CF = .9845	FUEL S.G. CF = 1.0187	FUEL HHV CF = 1.0189

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6765.0-50
FILTER PAIR WEIGHT GAIN (mg)	15.194
SAMPLE VOLUME (scf)	35.353
DILUTE PM CONCENTRATION (mg/scf)	.430
CO2-BASED DILUTION FACTOR	6.848
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	2.943
PARTICULATE MASS EMISSION RATE (g/hr)	1124.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.536

LOCOMOTIVE TEST SUMMARY

SwRI Project No. 08.02999.001

Test Date 10-27-00

Notch	Idle	DB-2	1	2	3	4	5	6	7	8
Run Number	~~29.20~~									
Barometer (in. Hg)	29.20	29.20	29.19	29.19	29.19	29.19	29.18	29.18	29.18	29.18
Dry Bulb Temp. (°F)	86.0	86.1	84.6	84.7	85.0	85.2	86.2	86.3	86.1	85.7
Wet Bulb Temp. (°F)	71.9	71.7	71.1	71.1	71.5	71.4	72.1	71.5	71.3	71.2
Fuel Supply Temp. (°F)	94	95	88	90	89	88	89	87	93	91
Water Inlet Temp. (°F)	160	165	173	171	165	171	175	177	183	181
Engine Intake Air @ Filter (°F)	88	88	87	86	84	86	85	86	85	88
Engine Speed (rpm)	258	388	317	390	500	574	647	731	826	906
Traction Volts	2.66	7.76	182	377	514	682	759	836	917	971
Traction Amps	0	0	270	554	750	986	1093	1198	1306	1375
Fuel Rate (lb/hr)	22.5	41.0	49.5	132	226	380	480	592	742	878
# of Fans	0	0	0	1	1	1	2	2	2	2
HC (ppmC)	72.63	60.11	57.60	57.60	62.61	82.65	90.16	122.72	170.31	197.86
CO (ppm)	37.61	47.88	46.73	74.53	57.06	74.53	104.58	294.60	618.01	1235.20
Raw Exhaust CO_2 (%)	.63	.72	1.08	2.18	2.99	4.47	5.03	5.54	6.13	6.66
NO_x (ppm)	114.09	105.31	156.71	310.72	466.09	816.90	~~1094.44~~ 956.75	1094.44	1219.60	1207.09
O_2 (%)	20.93	20.93	19.53	17.91	16.78	14.65	14.02	13.27	12.40	11.64
Tunnel Dilute CO_2 (%)	1756	2034	3429	5290	6086	7424	5786	8087	5569	9697
Background CO_2 (ppm)	651	581	627	581	627	604	581	581	581	581

Notes: 1 - Air compressor locked off.

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Test Configuration: EM-2663-F Cart 100 Run #2

Operator: CA

LOCOMOTIVE TEST SUMMARY

SwRI Project No.08.02999.001

Test Date 10-27-00

Notch	Idle	DB-2	1	2	3	4	5	6	7	8
Time ~~Run Number~~	2:45	2:56	3:10	3:21	3:32	3:42	3:55	4:05	4:17	4:26
Observed Fuel Rate at X minutes into test point (lb/hr)										
3 min.	21.5	41.6	49.5	130	225	379	481	590	743	878
5 min.	22.0	42.6	49.9	132	226	380	479	592	741	877
7 min.	23.0	41.0	49.1	132	226	380	481	593	742	877
Averaged Fuel Rate over Time										
Cumulative Fuel Used (lbs)	3.0	4.1	3.3	6.6	11.3	19.0	24.0	29.6	37.1	43.9
Over X Minutes	8.0	6.0	4.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
x 60. = Fuel Rate (lb/hr)	22.5	41.0	49.5	132	226	380	480	592	742	878
Traction Volts	2.66	7.76	182	377	514	682	759	836	917	971
Current Shunt mV	0	0	3.37	6.92	9.38	12.33	13.66	14.97	16.32	17.19
Traction Current = Shunt mV * 80.	0	0	270	554	750	986	1093	1198	1306	1375
Right Airbox Temp., °F	134	133	130	131	131	135	143	150	164	182
Left Airbox Temp., °F	108	113	107	110	116	123	135	146	164	184
Airbox Pressure, in. Hg	.94	1.89	1.36	1.92	2.92	4.00	5.14	6.80	9.01	11.15
Left Exhaust Temperature, °F	—	—	—	—	—	—	—	—	—	—
Right Exhaust Temperature, °F	—	—	—	—	—	—	—	—	—	—
SS Smoke, % Opacity	0	0	1.2	2.0	1.5	2.7	3.0	3.8	4.5	6.9
Notes: 1 - Air compressor locked off.	110	690	1540	2155	2845	3460	4180	4840	5545	6085

odrift + + 2.0

u:/fritz/wp/csx2629.fm2 9/2000

Test Configuration: EM-2663-F Carb 100 Run #2

Operator: EG

295.9rn

CSX #2629 EMD GP38 EMD 16-645-E3
Tested 10/31/00 @ SwRI, CARB (EM-2663-F)

AAR 3x3 Weighted Results

Notch	Gross HP	obs Fuel Rate (lb/hr)	HC (g/hr)	CO (g/hr)	Corr. NOx (g/hr)	PM (g/hr)	AAR Corr bsfc	Corr. Fuel Rate (lb/hr)	WF	w-BHP	obs w-Fuel w-(lb/hr)	corr w-Fuel w-(lb/hr)	w-HC w-(g/hr)	w-CO w-(g/hr)	w-NOx w-(g/hr)	w-PM w-(g/hr)
8	2,093	878	1,489	11,342	26,270	1,150	0.424	887	25.0%	523.2	219.5	221.7	372.3	2835.5	6567.5	287.5
7	1,856	742	1,024	5,371	23,794	767	0.404	749	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	1,527	598	618	1,497	18,782	461	0.396	604	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	1,253	482	436	827	14,734	367	0.389	487	25.0%	313.2	120.5	121.8	109.0	206.8	3683.5	91.8
4	1,001	380	312	534	11,074	309	0.384	384	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	585	226	210	390	5,669	148	0.390	228	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	318	132	145	438	2,946	83	0.420	133	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	83	51	112	199	1,185	16	0.625	52	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Idle	11	24	99	130	679	9	2.321	24	50.0%	5.3	12.0	12.2	49.5	65.0	339.5	4.5
DB-2	18	40	132	241	927	16	2.254	40	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
						sum =			100.0%	841.7	352.0	355.7	530.8	3107.3	10590.5	383.8
AAR 3x3 duty cycle weighted brake-specific emissions =											0.418 obs bsfc	0.423 corr bsfc	0.63	3.69	12.58	0.456

EPA Switcher Duty Cycle Weighted Results

Notch	WF	w-BHP	obs w-Fuel w-(lb/hr)	corr w-Fuel w-(lb/hr)	w-HC w-(g/hr)	w-CO w-(g/hr)	w-NOx w-(g/hr)	w-PM w-(g/hr)
8	0.8%	16.7	7.0	7.1	11.9	90.7	210.2	9.2
7	0.2%	3.7	1.5	1.5	2.0	10.7	47.6	1.5
6	1.5%	22.9	9.0	9.1	9.3	22.5	281.7	6.9
5	3.6%	45.1	17.4	17.5	15.7	29.8	530.4	13.2
4	3.6%	36.0	13.7	13.8	11.2	19.2	398.7	11.1
3	5.8%	34.0	13.1	13.2	12.2	22.6	328.8	8.6
2	12.3%	39.1	16.2	16.4	17.8	53.9	362.4	10.2
1	12.4%	10.2	6.3	6.4	13.9	24.7	146.9	2.0
Idle	59.8%	6.3	14.4	14.6	59.2	77.7	406.0	5.4
DB	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
sum =	100.0%	214.0	98.5	99.7	153.3	351.8	2712.7	68.1
EPA switcher duty cycle weighted brake-specific emissions =			0.460 obs bsfc	0.466 corr bsfc	0.72	1.64	12.67	0.318

EPA Freight Duty Cycle Weighted Results

Notch	WF	w-BHP	obs w-Fuel w-(lb/hr)	corr w-Fuel w-(lb/hr)	w-HC w-(g/hr)	w-CO w-(g/hr)	w-NOx w-(g/hr)	w-PM w-(g/hr)
8	16.2%	339.0	142.2	143.7	241.2	1837.4	4255.7	186.3
7	3.0%	55.7	22.3	22.5	30.7	161.1	713.8	23.0
6	3.9%	59.6	23.3	23.6	24.1	58.4	732.5	18.0
5	3.8%	47.6	18.3	18.5	16.6	31.4	559.9	13.9
4	4.4%	44.0	16.7	16.9	13.7	23.5	487.3	13.6
3	5.2%	30.4	11.8	11.9	10.9	20.3	294.8	7.7
2	6.5%	20.6	8.6	8.7	9.4	28.5	191.5	5.4
1	6.5%	5.4	3.3	3.4	7.3	12.9	77.0	1.0
Idle	38.0%	4.0	9.1	9.3	37.6	49.4	258.0	3.4
DB	12.5%	2.2	5.0	5.0	16.5	30.1	115.9	2.0
sum =	100.0%	608.6	260.6	263.3	408.1	2253.0	7686.4	274.4
EPA freight duty cycle weighted brake-specific emissions =			0.428 obs bsfc	0.433 corr bsfc	0.67	3.70	12.63	0.451

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	IDLE	TEST CONFIGURATION	=	CARB 100
TEST DATE	=	10/31/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	1/10			
SwRI FUEL CODE	=	EM-2663-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.17 (in. Hg)	ENGINE INTAKE AIR	=	83.(°F)
DRY BULB TEMP	=	86. (°F)	WET BULB TEMP	=	73. (°F)
ABS HUMIDITY	=	101.70 (GR/LB)	RELATIVE HUMIDITY	=	53. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	4.3
TRACTION MOTOR BLOWER HP	=	1.9
INERTIAL SEPERATOR BLOWER HP	=	.3
RADIATOR FAN HP	=	.0
TOTAL ACCESSORY HP	=	10.5

FUEL RATE (OBS) = 24.0 (LB/HR)
ALT. VOLTS = 3. ALT. AMPS = 0. ALT. EFF. = .939
FLYWHEEL HP = 10.5 OBS. SFC = 2.2961 AAR CORR. SFC = 2.3214 (LB/HP-HR)
CALCULATED A/F = 32B.31 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	99.	9.48	58.PPMC
CO	130.	12.39	38. PPM
NOX	631.	60.41	112. PPM (D)
NOX,CORR	679.	64.91	
CO2		3263.	.63 PCT
O2			20.03 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0746	NOX-KH	= 1.0609	NOX-KT	= 1.0000
WET EXH HC CF	= .9895	AIR TEMP CF	= .9896	BAROM CF	= 1.0027
FUEL TEMP CF	= .9835	FUEL S.G. CF	= 1.0187	FUEL HHV CF	= 1.0189

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6802.0-87
FILTER PAIR WEIGHT GAIN (mg)	.865
SAMPLE VOLUME (scf)	38.815
DILUTE PM CONCENTRATION (mg/scf)	.022
CO2-BASED DILUTION FACTOR	3.845
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.086
PARTICULATE MASS EMISSION RATE (g/hr)	9.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.862

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	DB2	TEST CONFIGURATION	=	CARB 100
TEST DATE	=	10/31/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	2/10			
SwRI FUEL CODE	=	EM-2663-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.17 (in. Hg)	ENGINE INTAKE AIR	=	83.(°F)
DRY BULB TEMP	=	85. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	102.40 (GR/LB)	RELATIVE HUMIDITY	=	56. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	6.5
TRACTION MOTOR BLOWER HP	=	6.5
INERTIAL SEPERATOR BLOWER HP	=	1.0
RADIATOR FAN HP	=	.0
TOTAL ACCESSORY HP	=	17.9

FUEL RATE (OBS) = 40.0 (LB/HR)
ALT. VOLTS = 8. ALT. AMPS = 0. ALT. EFF. = .939
FLYWHEEL HP = 17.9 OBS. SFC = 2.2289 AAR CORR. SFC = 2.2535 (LB/HP-HR)
CALCULATED A/F = 287.71 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	132.	7.37	53.PPMC
CO	241.	13.42	48. PPM
NOX	861.	48.00	104. PPM (D)
NOX,CORR	927.	51.67	
CO2		3171.	.72 PCT
O2			19.91 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0763	NOX-KH	= 1.0624	NOX-KT	= 1.0000
WET EXH HC CF	= .9886	AIR TEMP CF	= .9896	BAROM CF	= 1.0027
FUEL TEMP CF	= .9830	FUEL S.G. CF	= 1.0187	FUEL HHV CF	= 1.0189

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6803.0-B8
FILTER PAIR WEIGHT GAIN (mg)	.976
SAMPLE VOLUME (scf)	38.986
DILUTE PM CONCENTRATION (mg/scf)	.025
CO2-BASED DILUTION FACTOR	4.137
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.104
PARTICULATE MASS EMISSION RATE (g/hr)	16.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.887

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 1	TEST CONFIGURATION	=	CARB 100
TEST DATE	=	10/31/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	3/10			
SwRI FUEL CODE	=	EM-2663-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.16 (in. Hg)	ENGINE INTAKE AIR	=	80.(°F)
DRY BULB TEMP	=	84. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	99.09 (GR/LB)	RELATIVE HUMIDITY	=	55. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	5.3
TRACTION MOTOR BLOWER HP	=	3.5
INERTIAL SEPERATOR BLOWER HP	=	.5
RADIATOR FAN HP	=	.0
TOTAL ACCESSORY HP	=	13.3

FUEL RATE (OBS) = 51.0 (LB/HR)
ALT. VOLTS = 181. ALT. AMPS = 268. ALT. EFF. = .939
FLYWHEEL HP = 82.6 OBS. SFC = .6174 AAR CORR. SFC = .6250 (LB/HP-HR)
CALCULATED A/F = 191.28 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	112.	1.36	53.PPMC
CO	199.	2.41	47. PPM
NOX	1113.	13.48	159. PPM (D)
NOX,CORR	1185.	14.35	
CO2		882.	1.09 PCT
O2			19.41 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0646	NOX-KH	= 1.0529	NOX-KT	= 1.0000
WET EXH HC CF=	.9855	AIR TEMP CF	= .9910	BAROM CF	= 1.0026
FUEL TEMP CF =	.9845	FUEL S.G. CF	= 1.0187	FUEL HHV CF	= 1.0189

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6804.0-89
FILTER PAIR WEIGHT GAIN (mg)	1.306
SAMPLE VOLUME (scf)	38.457
DILUTE PM CONCENTRATION (mg/scf)	.034
CO2-BASED DILUTION FACTOR	3.704
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.126
PARTICULATE MASS EMISSION RATE (g/hr)	16.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.199

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 2	TEST CONFIGURATION	=	CARB 100
TEST DATE	=	10/31/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	4/10			
SwRI FUEL CODE	=	EM-2663-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.15 (in. Hg)	ENGINE INTAKE AIR	=	82.(°F)
DRY BULB TEMP	=	85. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	98.76 (GR/LB)	RELATIVE HUMIDITY	=	53. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	6.5
TRACTION MOTOR BLOWER HP	=	6.6
INERTIAL SEPERATOR BLOWER HP	=	1.0
RADIATOR FAN HP	=	3.1
TOTAL ACCESSORY HP	=	21.1

FUEL RATE (OBS) = 132.0 (LB/HR)
ALT. VOLTS = 376. ALT. AMPS = 552. ALT. EFF. = .939
FLYWHEEL HP = 317.6 OBS. SFC = .4156 AAR CORR. SFC = .4203 (LB/HP-HR)
CALCULATED A/F = 95.11 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	145.	.46	53.PPMC
CO	438.	1.38	80. PPM
NOX	2782.	8.76	311. PPM (D)
NOX,CORR	2946.	9.28	
CO2		596.	2.21 PCT
O2			17.78 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0591	NOX-KH	= 1.0483	NOX-KT	= 1.0000
WET EXH HC CF=	.9757	AIR TEMP CF	= .9901	BAROM CF	= 1.0025
FUEL TEMP CF =	.9850	FUEL S.G. CF	= 1.0187	FUEL HHV CF	= 1.0189

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6805.0-90
FILTER PAIR WEIGHT GAIN (mg)	3.853
SAMPLE VOLUME (scf)	38.716
DILUTE PM CONCENTRATION (mg/scf)	.100
CO2-BASED DILUTION FACTOR	4.954
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.493
PARTICULATE MASS EMISSION RATE (g/hr)	83.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.262

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 3	TEST CONFIGURATION	=	CARB 100
TEST DATE	=	10/31/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	5/10			
SwRI FUEL CODE	=	EM-2663-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.15 (in. Hg)	ENGINE INTAKE AIR	=	84.(°F)
DRY BULB TEMP	=	87. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	99.05 (GR/LB)	RELATIVE HUMIDITY	=	50. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	8.3
TRACTION MOTOR BLOWER HP	=	13.9
INERTIAL SEPERATOR BLOWER HP	=	2.1
RADIATOR FAN HP	=	6.4
TOTAL ACCESSORY HP	=	34.7

FUEL RATE (OBS) = 226.0 (LB/HR)
ALT. VOLTS = 514. ALT. AMPS = 750. ALT. EFF. = .939
FLYWHEEL HP = 585.4 OBS. SFC = .3861 AAR CORR. SFC = .3901 (LB/HP-HR)
CALCULATED A/F = 70.00 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	210.	.36	60.PPMC
CO	390.	.67	57. PPM
NOX	5352.	9.14	476. PPM (D)
NOX,CORR	5669.	9.68	
CO2		555.	3.02 PCT
O2			16.65 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0592	NOX-KH	= 1.0484	NOX-KT	= 1.0000
WET EXH HC CF=	.9688	AIR TEMP CF	= .9892	BAROM CF	= 1.0025
FUEL TEMP CF =	.9850	FUEL S.G. CF	= 1.0187	FUEL HHV CF	= 1.0189

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6806.0-91
FILTER PAIR WEIGHT GAIN (mg)	5.229
SAMPLE VOLUME (scf)	38.522
DILUTE PM CONCENTRATION (mg/scf)	.136
CO2-BASED DILUTION FACTOR	5.090
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.691
PARTICULATE MASS EMISSION RATE (g/hr)	148.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.252

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 4	TEST CONFIGURATION	=	CARB 100
TEST DATE	=	10/31/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	6/10			
SwRI FUEL CODE	=	EM-2663-F	FUEL H/C RAT10	=	1.81
BAROMETER	=	29.14 (in. Hg)	ENGINE INTAKE AIR	=	84.(°F)
DRY BULB TEMP	=	87. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	94.72 (GR/LB)	RELATIVE HUMIDITY	=	49. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	9.6
TRACTION MOTOR BLOWER HP	=	20.9
INERTIAL SEPERATOR BLOWER HP	=	3.1
RADIATOR FAN HP	=	9.6
TOTAL ACCESSORY HP	=	47.2

FUEL RATE (OBS) = 380.0 (LB/HR)
ALT. VOLTS = 679. ALT. AMPS = 983. ALT. EFF. = .939
FLYWHEEL HP = 1000.7 OBS. SFC = .3797 AAR CORR. SFC = .3837 (LB/HP-HR)
CALCULATED A/F = 47.63 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	312.	.31	78.PPMC
CO	534.	.53	69. PPM
NOX	10566.	10.56	827. PPM (D)
NOX,CORR	11074.	11.07	
CO2		546.	4.47 PCT
O2			14.77 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0481	NOX-KH	= 1.0394	NOX-KT	= 1.0000
WET EXH HC CF=	.9568	AIR TEMP CF	= .9892	BAROM CF	= 1.0024
FUEL TEMP CF =	.9855	FUEL S.G. CF	= 1.0187	FUEL HHV CF	= 1.0189

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6807.0-92
FILTER PAIR WEIGHT GAIN (mg)	7.642
SAMPLE VOLUME (scf)	38.164
DILUTE PM CONCENTRATION (mg/scf)	.200
CO2-BASED DILUTION FACTOR	6.282
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	1.258
PARTICULATE MASS EMISSION RATE (g/hr)	309.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.309

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 5	TEST CONFIGURATION	=	CARB 100
TEST DATE	=	10/31/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	7/10			
SwRI FUEL CODE	=	EM-2663-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.14 (in. Hg)	ENGINE INTAKE AIR	=	83.(°F)
DRY BULB TEMP	=	84. (°F)	WET BULB TEMP	=	71. (°F)
ABS HUMIDITY	=	94.54 (GR/LB)	RELATIVE HUMIDITY	=	53. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	10.8
TRACTION MOTOR BLOWER HP	=	30.2
INERTIAL SEPERATOR BLOWER HP	=	4.5
RADIATOR FAN HP	=	27.9
TOTAL ACCESSORY HP	=	77.4

FUEL RATE (OBS) = 482.0 (LB/HR)
ALT. VOLTS = 757. ALT. AMPS = 1087. ALT. EFF. = .939
FLYWHEEL HP = 1252.9 OBS. SFC = .3847 AAR CORR. SFC = .3889 (LB/HP-HR)
CALCULATED A/F = 42.74 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	436.	.35	95.PPMC
CO	B27.	.66	94. PPM
NOX	14065.	11.23	969. PPM (D)
NOX,CORR	14734.	11.76	
CO2		553.	4.99 PCT
O2			14.02 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0476	NOX-KH	= 1.0389	NOX-KT	= 1.0000
WET EXH HC CF=	.9525	AIR TEMP CF	= .9896	BAROM CF	= 1.0024
FUEL TEMP CF =	.9860	FUEL S.G. CF	= 1.0187	FUEL HHV CF	= 1.01B9

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6808.0-93
FILTER PAIR WEIGHT GAIN (mg)	7.564
SAMPLE VOLUME (scf)	37.472
DILUTE PM CONCENTRATION (mg/scf)	.202
CO2-BASED DILUTION FACTOR	6.477
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	1.307
PARTICULATE MASS EMISSION RATE (g/hr)	367.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.293

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 6	TEST CONFIGURATION	=	CARB 100
TEST DATE	=	10/31/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	8/10			
SwRI FUEL CODE	=	EM-2663-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.13 (in. Hg)	ENGINE INTAKE AIR	=	84.(°F)
DRY BULB TEMP	=	85. (°F)	WET BULB TEMP	=	71. (°F)
ABS HUMIDITY	=	94.53 (GR/LB)	RELATIVE HUMIDITY	=	51. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	12.2
TRACTION MOTOR BLOWER HP	=	43.4
INERTIAL SEPERATOR BLOWER HP	=	6.5
RADIATOR FAN HP	=	40.2
TOTAL ACCESSORY HP	=	106.3

FUEL RATE (OBS) = 598.0 (LB/HR)
ALT. VOLTS = 835. ALT. AMPS = 1191. ALT. EFF. = .939
FLYWHEEL HP = 1527.0 OBS. SFC = .3916 AAR CORR. SFC = .3956 (LB/HP-HR)
CALCULATED A/F = 38.55 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	618.	.40	120.PPMC
CO	1497.	.98	152. PPM
NOX	17930.	11.74	1107. PPM (D)
NOX,CORR	187B2.	12.30	
CO2		562.	5.54 PCT
O2			13.27 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0475	NOX-KH	= 1.0389	NOX-KT	= 1.0000
WET EXH HC CF	= .9480	AIR TEMP CF	= .9892	BAROM CF	= 1.0023
FUEL TEMP CF	= .9850	FUEL S.G. CF	= 1.0187	FUEL HHV CF	= 1.0189

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6809.0-94
FILTER PAIR WEIGHT GAIN (mg)	6.248
SAMPLE VOLUME (scf)	37.382
DILUTE PM CONCENTRATION (mg/scf)	.167
CO2-BASED DILUTION FACTOR	8.758
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	1.464
PARTICULATE MASS EMISSION RATE (g/hr)	461.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.302

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 7	TEST CONFIGURATION	=	CARB 100
TEST DATE	=	10/31/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	9/10			
SwRI FUEL CODE	=	EM-2663-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.13 (in. Hg)	ENGINE INTAKE AIR	=	85.(°F)
DRY BULB TEMP	=	85. (°F)	WET BULB TEMP	=	71. (°F)
ABS HUMIDITY	=	94.83 (GR/LB)	RELATIVE HUMIDITY	=	51. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	13.8
TRACTION MOTOR BLOWER HP	=	62.8
INERTIAL SEPERATOR BLOWER HP	=	9.4
RADIATOR FAN HP	=	58.1
TOTAL ACCESSORY HP	=	148.2

FUEL RATE (OBS) = 742.0 (LB/HR)
ALT. VOLTS = 916. ALT. AMPS = 1305. ALT. EFF. = .939
FLYWHEEL HP = 1B55.9 OBS. SFC = .3998 AAR CORR. SFC = .4037 (LB/HP-HR)
CALCULATED A/F = 34.71 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	1024.	.55	178.PPMC
CO	5371.	2.89	489. PPM
NOX	22698.	12.23	1257. PPM (D)
NOX,CORR	23794.	12.82	
CO2		570.	6.13 PCT
O2			12.40 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0483	NOX-KH	= 1.0395	NOX-KT	= 1.0000
WET EXH HC CF=	.9430	AIR TEMP CF	= .9887	BAROM CF	= 1.0023
FUEL TEMP CF =	.9860	FUEL S.G. CF	= 1.0187	FUEL HHV CF	= 1.0189

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6810.0-95
FILTER PAIR WEIGHT GAIN (mg)	8.629
SAMPLE VOLUME (scf)	36.752
DILUTE PM CONCENTRATION (mg/scf)	.235
CO2-BASED DILUTION FACTOR	9.266
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	2.176
PARTICULATE MASS EMISSION RATE (g/hr)	767.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.413

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 8	TEST CONFIGURATION	=	CARB 100
TEST DATE	=	10/31/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	10/10			
SwRI FUEL CODE	=	EM-2663-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.13 (in. Hg)	ENGINE INTAKE AIR	=	84.(°F)
DRY BULB TEMP	=	84. (°F)	WET BULB TEMP	=	71. (°F)
ABS HUMIDITY	=	95.21 (GR/LB)	RELATIVE HUMIDITY	=	52. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	15.1
TRACTION MOTOR BLOWER HP	=	82.8
INERTIAL SEPERATOR BLOWER HP	=	12.4
RADIATOR FAN HP	=	76.6
TOTAL ACCESSORY HP	=	190.8

FUEL RATE (OBS) = 878.0 (LB/HR)
ALT. VOLTS = 969. ALT. AMPS = 1374. ALT. EFF. = .939
FLYWHEEL HP = 2092.8 OBS. SFC = .4195 AAR CORR. SFC = .4238 (LB/HP-HR)
CALCULATED A/F = 31.80 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	1489.	.71	238.PPMC
CO	11342.	5.42	954. PPM
NOX	25038.	11.96	1282. PPM (D)
NOX,CORR	26270.	12.55	
CO2		594.	6.66 PCT
O2			11.64 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0492	NOX-KH	= 1.0403	NOX-KT	= 1.0000
WET EXH HC CF	= .9384	AIR TEMP CF	= .9892	BAROM CF	= 1.0023
FUEL TEMP CF	= .9850	FUEL S.G. CF	= 1.0187	FUEL HHV CF	= 1.0189

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6811.0-96
FILTER PAIR WEIGHT GAIN (mg)	16.047
SAMPLE VOLUME (scf)	35.408
DILUTE PM CONCENTRATION (mg/scf)	.453
CO2-BASED DILUTION FACTOR	6.620
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	3.000
PARTICULATE MASS EMISSION RATE (g/hr)	1150.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.549

LOCOMOTIVE TEST SUMMARY

SwRI Project No. 08.02999.001

Test Date 10-31-00

Notch	Idle	DB-2	1	2	3	4	5	6	7	8
Run Number										
Barometer (in. Hg)	29.17	29.17	29.16	29.15	29.15	29.14	29.14	29.13	29.13	29.13
Dry Bulb Temp. (°F)	85.8	84.7	83.9	84.8	86.7	86.5	83.9	84.6	85.1	84.2
Wet Bulb Temp. (°F)	72.6	72.4	71.6	71.8	72.4	71.6	70.8	71.0	71.2	71.0
Fuel Supply Temp. (°F)	93	94	91	90	90	89	88	90	88	90
Water Inlet Temp. (°F)	167	169	164	168	168	177	181	178	183	180
Engine Intake Air @ Filter (°F)	83	83	80	82	84	84	83	84	85	84
Engine Speed (rpm)	257	388	316	390	500	573	647	731	827	906
Traction Volts	2.78	8.40	181	376	514	679	757	835	916	969
Traction Amps	0	0	268	552	750	983	1087	1191	1305	1374
Fuel Rate (lb/hr)	24.0	46.0	51.0	132	226	380	482	598	742	878
# of Fans	0	0	0	1	1	1	2	2	2	2
HC (ppmC)	57.60	52.60	52.60	52.60	60.11	77.64	95.17	120.22	177.82	237.93
CO (ppm)	37.61	47.88	46.73	80.43	57.06	68.67	93.61	151.80	488.74	954.25
Raw Exhaust CO_2 (%)	.63	.72	1.09	2.21	3.02	4.47	4.99	5.54	6.13	6.66
NO_x (ppm)	111.58	104.06	159.22	310.72	476.11	826.93	969.27	1106.96	1257.15	1282.19
O_2 (%)	20.03	19.91	19.41	17.78	16.65	14.77	14.02	13.27	12.40	11.64
Tunnel Dilute CO_2 (%)	2034	2144	3380	4830	6240	7333	7892	6560	6810	10053
Background CO_2 (ppm)	557	557	651	581	581	581	604	604	604	627

Notes: 1 - Air compressor locked off.

u:/fritz/wp/csx2629.fm1 9/2000

Test Configuration: EM-2663-F Carb Run #3

Operator: [illegible]

LOCOMOTIVE TEST SUMMARY

SwRI Project No.08.02999.001

Test Date 10-31-00

Notch	Idle	DB-2	1	2	3	4	5	6	7	8
Time ~~Run Number~~	12:14	12:30	12:42	12:55	1:04	1:14	1:24	1:35	1:47	1:56
Observed Fuel Rate at X minutes into test point (lb/hr)										
3 min.	24.2	39.1	51.2	131	226	379	480	598	745	875
5 min.	24.5	40.1	51.5	133	226	380	479	598	742	877
7 min.	24.7	41.7	50.7	134	226	380	481	598	741	878
Averaged Fuel Rate over Time										
Cumulative Fuel Used (lbs)	3.2	4.0	3.4	6.6	11.3	19.0	24.1	29.9	37.1	43.9
Over X Minutes	8.0	6.0	4.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
x 60. = Fuel Rate (lb/hr)	24.0	40.0	51.0	132	226	380	482	598	742	878
Traction Volts	2.78	8.40	181	376	514	679	757	835	916	969
Current Shunt mV	0	0	3.35	6.90	9.37	12.29	13.59	14.89	16.31	17.18
Traction Current = Shunt mV * 80.	0	0	268	552	750	983	1087	1191	1305	1374
Right Airbox Temp., °F	130	129	124	126	130	135	140	150	167	179
Left Airbox Temp., °F	106	110	103	108	117	124	132	147	168	184
Exhaust ~~Airbox~~ Pressure, in. Hg	.22	.42	.46	.56	.98	1.51	2.10	2.80	3.62	4.89
Left Exhaust Temperature, °F	—	—	—	—	—	—	—	—	—	—
Right Exhaust Temperature, °F	—	—	—	—	—	—	—	—	—	—
SS Smoke, % Opacity	0	0	0	2.1	1.7	2.6	2.1	2.9	3.5	5.2
Notes: 1 - Air compressor locked off.	545	1465	2230	2985	3570	4130	4730	5390	6145	6680

u:/fritz/wp/csx2629.fm2 9/2000

Test Configuration: EM-2663-F Carb Run #3

Operator: CG

301.prn

APPENDIX C

B20 TEST RESULTS

CSX #2629 EMD GP38 EMD 16-645-E3
Tested 10/26/00 @ SwRI, B20 Fuel (EM-3004-F)

Notch	Gross HP	obs Fuel Rate (lb/hr)	HC (g/hr)	CO (g/hr)	Corr. NOx (g/hr)	PM (g/hr)	AAR Corr bsfc	Corr. Fuel Rate (lb/hr)
8	2,104	916	1,382	16,084	25,677	1,149	0.423	890
7	1,862	774	1,037	8,397	24,054	944	0.404	752
6	1,542	622	596	3,822	19,084	568	0.392	604
5	1,261	500	461	1,132	15,385	409	0.386	486
4	1,020	399	329	619	11,631	348	0.380	387
3	587	232	242	425	5,946	152	0.384	226
2	320	136	175	484	3,403	93	0.413	132
1	83	53	126	219	1,320	21	0.621	52
Idle	11	26	112	164	745	13	2.352	25
DB-2	18	40	169	297	981	24	2.160	39
						sum =		

AAR 3x3 Weighted Results

	WF	w-BHP	obs w-Fuel w-(lb/hr)	corr w-Fuel w-(lb/hr)	w-HC w-(g/hr)	w-CO w-(g/hr)	w-NOx w-(g/hr)	w-PM w-(g/hr)
	25.0%	526.1	229.0	222.4	345.5	4021.0	6419.3	287.3
	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	25.0%	315.2	125.0	121.5	115.3	283.0	3846.3	102.3
	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	50.0%	5.3	12.8	12.4	56.0	82.0	372.5	6.5
	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
sum =	100.0%	846.5	366.8	356.2	516.8	4386.0	10638.0	396.0

AAR 3x3 duty cycle weighted brake-specific emissions = 0.433 obs bsfc, 0.421 corr bsfc, 0.61, 5.18, 12.57, 0.468

EPA Switcher Duty Cycle Weighted Results

Notch	WF	w-BHP	obs w-Fuel w-(lb/hr)	corr w-Fuel w-(lb/hr)	w-HC w-(g/hr)	w-CO w-(g/hr)	w-NOx w-(g/hr)	w-PM w-(g/hr)
8	0.8%	16.8	7.3	7.1	11.1	128.7	205.4	9.2
7	0.2%	3.7	1.5	1.5	2.1	16.8	48.1	1.9
6	1.5%	23.1	9.3	9.1	8.9	57.3	286.3	8.5
5	3.6%	45.4	18.0	17.5	16.6	40.8	553.9	14.7
4	3.6%	36.7	14.4	13.9	11.8	22.3	418.7	12.5
3	5.8%	34.1	13.5	13.1	14.0	24.7	344.9	8.8
2	12.3%	39.3	16.7	16.2	21.5	59.5	418.6	11.4
1	12.4%	10.3	6.6	6.4	15.6	27.2	163.7	2.6
Idle	59.8%	6.3	15.2	14.8	67.0	98.1	445.5	7.8
DB	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
sum =	100.0%	215.7	102.6	99.6	168.7	475.2	2885.0	77.5

EPA switcher duty cycle weighted brake-specific emissions = 0.476 obs bsfc, 0.462 corr bsfc, 0.78, 2.20, 13.37, 0.359

EPA Freight Duty Cycle Weighted Results

Notch	WF	w-BHP	obs w-Fuel w-(lb/hr)	corr w-Fuel w-(lb/hr)	w-HC w-(g/hr)	w-CO w-(g/hr)	w-NOx w-(g/hr)	w-PM w-(g/hr)
8	16.2%	340.9	148.4	144.1	223.9	2605.6	4159.7	186.1
7	3.0%	55.9	23.2	22.5	31.1	251.9	721.6	28.3
6	3.9%	60.1	24.3	23.5	23.2	149.1	744.3	22.2
5	3.8%	47.9	19.0	18.5	17.5	43.0	584.6	15.5
4	4.4%	44.9	17.6	17.0	14.5	27.2	511.8	15.3
3	5.2%	30.5	12.1	11.7	12.6	22.1	309.2	7.9
2	6.5%	20.8	8.8	8.6	11.4	31.5	221.2	6.0
1	6.5%	5.4	3.5	3.4	8.2	14.2	85.8	1.4
Idle	38.0%	4.0	9.7	9.4	42.6	62.3	283.1	4.9
DB	12.5%	2.3	5.0	4.9	21.1	37.1	122.6	3.0
sum =	100.0%	612.7	271.5	263.6	406.1	3244.1	7743.9	290.7

EPA freight duty cycle weighted brake-specific emissions = 0.443 obs bsfc, 0.430 corr bsfc, 0.66, 5.30, 12.64, 0.475

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	IDLE	TEST CONFIGURATION	=	B20
TEST DATE	=	10/26/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	1/10			
SwRI FUEL CODE	=	EM-3004-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.15 (in. Hg)	ENGINE INTAKE AIR	=	88.(°F)
DRY BULB TEMP	=	83. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	99.91 (GR/LB)	RELATIVE HUMIDITY	=	57. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	4.3
TRACTION MOTOR BLOWER HP	=	1.9
INERTIAL SEPERATOR BLOWER HP	=	.3
RADIATOR FAN HP	=	.0
TOTAL ACCESSORY HP	=	10.5

FUEL RATE (OBS) = 25.5 (L8/HR)
ALT. VOLTS = 3. ALT. AMPS = 0. ALT. EFF. = .939
FLYWHEEL HP = 10.5 OBS. SFC = 2.4277 AAR CORR. SFC = 2.3524 (LB/HP-HR)
CALCULATED A/F = 322.62 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	112.	10.71	63.PPMC
CO	164.	15.61	46. PPM
NOX	696.	66.29	118. PPM (D)
NOX,CORR	745.	70.89	
CO2		3443.	.64 PCT
O2			20.16 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0694	NOX-KH	= 1.0567	NOX-KT	= 1.0000
WET EXH HC CF=	.9895	AIR TEMP CF	= .9874	BAROM CF	= 1.0025
FUEL TEMP CF =	.9825	FUEL S.G. CF	= .9832	FUEL HHV CF	= .97B9

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6722.0-7
FILTER PAIR WEIGHT GAIN (mg)	1.046
SAMPLE VOLUME (scf)	38.926
DILUTE PM CONCENTRATION (mg/scf)	.027
CO2-BASED DILUTION FACTOR	4.560
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.123
PARTICULATE MASS EMISSION RATE (g/hr)	13.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	1.281

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	DB2	TEST CONFIGURATION	=	B20
TEST DATE	=	10/26/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	2/10			
SwRI FUEL CODE	=	EM-3004-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.14 (in. Hg)	ENGINE INTAKE AIR	=	86.(°F)
DRY BULB TEMP	=	83. (°F)	WET BULB TEMP	=	71. (°F)
ABS HUMIDITY	=	99.37 (GR/LB)	RELATIVE HUMIDITY	=	57. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	6.5
TRACTION MOTOR BLOWER HP	=	6.5
INERTIAL SEPERATOR BLOWER HP	=	1.0
RADIATOR FAN HP	=	.0
TOTAL ACCESSORY HP	=	18.0

FUEL RATE (OBS) = 40.0 (LB/HR)
ALT. VOLTS = 8. ALT. AMPS = 0. ALT. EFF. = .939
FLYWHEEL HP = 18.0 OBS. SFC = 2.2272 AAR CORR. SFC = 2.1599 (LB/HP-HR)
CALCULATED A/F = 286.67 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	169.	9.43	68.PPMC
CO	297.	16.56	59. PPM
NOX	919.	51.14	112. PPM (D)
NOX,CORR	981.	54.60	
CO2		3157.	.72 PCT
O2			20.03 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0676	NOX-KH	= 1.0553	NOX-KT	= 1.0000
WET EXH HC CF	= .9888	AIR TEMP CF	= .9883	BAROM CF	= 1.0024
FUEL TEMP CF	= .9860	FUEL S.G. CF	= .9832	FUEL HHV CF	= .9789

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6723.0-8
FILTER PAIR WEIGHT GAIN (mg)	1.416
SAMPLE VOLUME (scf)	38.756
DILUTE PM CONCENTRATION (mg/scf)	.037
CO2-BASED DILUTION FACTOR	4.246
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.155
PARTICULATE MASS EMISSION RATE (g/hr)	24.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	1.323

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 1	TEST CONFIGURATION	=	B20
TEST DATE	=	10/26/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	3/10			
SwRI FUEL CODE	=	EM-3004-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.14 (in. Hg)	ENGINE INTAKE AIR	=	84.(°F)
DRY BULB TEMP	=	85. (°F)	WET BULB TEMP	=	71. (°F)
ABS HUMIDITY	=	96.81 (GR/LB)	RELATIVE HUMIDITY	=	53. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	5.3
TRACTION MOTOR BLOWER HP	=	3.5
INERTIAL SEPERATOR BLOWER HP	=	.5
RADIATOR FAN HP	=	.0
TOTAL ACCESSORY HP	=	13.2

FUEL RATE (OBS) = 53.2 (LB/HR)
ALT. VOLTS = 1B2. ALT. AMPS = 269. ALT. EFF. = .939
FLYWHEEL HP = 83.2 OBS. SFC = .6395 AAR CORR. SFC = .6208 (LB/HP-HR)
CALCULATED A/F = 1B7.74 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	126.	1.51	5B.PPMC
CO	219.	2.63	50. PPM
NOX	1247.	14.99	174. PPM (D)
NOX,CORR	1320.	15.87	
CO2		914.	1.11 PCT
O2			19.53 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0582	NOX-KH	= 1.0476	NOX-KT	= 1.0000
WET EXH HC CF=	.9B55	AIR TEMP CF	= .9892	BAROM CF	= 1.0024
FUEL TEMP CF =	.9855	FUEL S.G. CF =	.9832	FUEL HHV CF	= .9789

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6724.0-9
FILTER PAIR WEIGHT GAIN (mg)	1.619
SAMPLE VOLUME (scf)	38.119
DILUTE PM CONCENTRATION (mg/scf)	.042
CO2-BASED DILUTION FACTOR	3.787
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.161
PARTICULATE MASS EMISSION RATE (g/hr)	21.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.258

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 2	TEST CONFIGURATION	=	B20
TEST DATE	=	10/26/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	4/10			
SwRI FUEL CODE	=	EM-3004-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.14 (in. Hg)	ENGINE INTAKE AIR	=	84.(°F)
DRY BULB TEMP	=	83. (°F)	WET BULB TEMP	=	71. (°F)
ABS HUMIDITY	=	97.63 (GR/LB)	RELATIVE HUMIDITY	=	56. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	6.5
TRACTION MOTOR BLOWER HP	=	6.6
INERTIAL SEPERATOR BLOWER HP	=	1.0
RADIATOR FAN HP	=	3.1
TOTAL ACCESSORY HP	=	21.2

FUEL RATE (OBS) = 136.0 (LB/HR)
ALT. VOLTS = 377. ALT. AMPS = 554. ALT. EFF. = .939
FLYWHEEL HP = 319.5 OBS. SFC = .4256 AAR CORR. SFC = .4131 (LB/HP-HR)
CALCULATED A/F = 101.90 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	175.	.55	58.PPMC
CO	484.	1.52	80. PPM
NOX	3222.	10.08	326. PPM (D)
NOX,CORR	3403.	10.65	
CO2		610.	2.06 PCT
O2			17.91 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0564	NOX-KH	= 1.0462	NOX-KT	= 1.0000
WET EXH HC CF	= .9771	AIR TEMP CF	= .9892	BAROM CF	= 1.0024
FUEL TEMP CF	= .9860	FUEL S.G. CF	= .9832	FUEL HHV CF	= .9789

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6725.0-10
FILTER PAIR WEIGHT GAIN (mg)	4.848
SAMPLE VOLUME (scf)	38.366
DILUTE PM CONCENTRATION (mg/scf)	.126
CO2-BASED DILUTION FACTOR	3.962
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.501
PARTICULATE MASS EMISSION RATE (g/hr)	93.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.292

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 3	TEST CONFIGURATION	=	B20
TEST DATE	=	10/26/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	5/10			
SwRI FUEL CODE	=	EM-3004-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.14 (in. Hg)	ENGINE INTAKE AIR	=	81.(°F)
DRY BULB TEMP	=	B3. (°F)	WET BULB TEMP	=	71. (°F)
ABS HUMIDITY	=	95.21 (GR/LB)	RELATIVE HUMIDITY	=	55. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	8.3
TRACTION MOTOR BLOWER HP	=	14.0
INERTIAL SEPERATOR BLOWER HP	=	2.1
RADIATOR FAN HP	=	6.5
TOTAL ACCESSORY HP	=	34.8

FUEL RATE (OBS) = 232.0 (LB/HR)
ALT. VOLTS = 515. ALT. AMPS = 751. ALT. EFF. = .939
FLYWHEEL HP = 587.4 OBS. SFC = .3950 AAR CORR. SFC = .3839 (LB/HP-HR)
CALCULATED A/F = 69.97 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	242.	.41	68.PPMC
CO	425.	.72	61. PPM
NOX	5666.	9.65	491. PPM (D)
NOX,CORR	5946.	10.12	
CO2		567.	3.02 PCT
O2			16.78 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0495	NOX-KH	= 1.0405	NOX-KT	= 1.0000
WET EXH HC CF	= .9690	AIR TEMP CF	= .9905	BAROM CF	= 1.0024
FUEL TEMP CF	= .9860	FUEL S.G. CF	= .9832	FUEL HHV CF	= .9789

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6726.0-11
FILTER PAIR WEIGHT GAIN (mg)	4.930
SAMPLE VOLUME (scf)	37.814
DILUTE PM CONCENTRATION (mg/scf)	.130
CO2-BASED DILUTION FACTOR	5.305
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.692
PARTICULATE MASS EMISSION RATE (g/hr)	152.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.258

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 4	TEST CONFIGURATION	=	B20
TEST DATE	=	10/26/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	6/10			
SwRI FUEL CODE	=	EM-3004-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.14 (in. Hg)	ENGINE INTAKE AIR	=	83.(°F)
DRY BULB TEMP	=	83. (°F)	WET BULB TEMP	=	71. (°F)
ABS HUMIDITY	=	94.42 (GR/LB)	RELATIVE HUMIDITY	=	54. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	9.6
TRACTION MOTOR BLOWER HP	=	21.1
INERTIAL SEPERATOR BLOWER HP	=	3.2
RADIATOR FAN HP	=	9.B
TOTAL ACCESSORY HP	=	47.6

FUEL RATE (OBS) = 399.0 (LB/HR)
ALT. VOLTS = 686. ALT. AMPS = 992. ALT. EFF. = .939
FLYWHEEL HP = 1019.7 OBS. SFC = .3913 AAR CORR. SFC = .3800 (LB/HP-HR)
CALCULATED A/F = 46.30 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	329.	.32	80.PPMC
CO	619.	.61	78. PPM
NOX	11106.	10.89	852. PPM (D)
NOX,CORR	11631.	11.41	
CO2		562.	4.60 PCT
O2			14.65 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0473	NOX-KH	= 1.0387	NOX-KT	= 1.0000
WET EXH HC CF=	.9557	AIR TEMP CF	= .9896	BAROM CF	= 1.0024
FUEL TEMP CF =	.9840	FUEL S.G. CF =	.9832	FUEL HHV CF	= .9789

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6727.0-12
FILTER PAIR WEIGHT GAIN (mg)	8.985
SAMPLE VOLUME (scf)	37.873
DILUTE PM CONCENTRATION (mg/scf)	.237
CO2-BASED DILUTION FACTOR	5.844
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	1.387
PARTICULATE MASS EMISSION RATE (g/hr)	348.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.342

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 5	TEST CONFIGURATION	=	B20
TEST DATE	=	10/26/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	7/10			
SwRI FUEL CODE	=	EM-3004-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.13 (in. Hg)	ENGINE INTAKE AIR	=	81.(°F)
DRY BULB TEMP	=	83. (°F)	WET BULB TEMP	=	71. (°F)
ABS HUMIDITY	=	95.54 (GR/LB)	RELATIVE HUMIDITY	=	55. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	10.8
TRACTION MOTOR BLOWER HP	=	30.1
INERTIAL SEPERATOR BLOWER HP	=	4.5
RADIATOR FAN HP	=	27.8
TOTAL ACCESSORY HP	=	77.2

FUEL RATE (OBS) = 500.0 (LB/HR)
ALT. VOLTS = 760. ALT. AMPS = 1090. ALT. EFF. = .939
FLYWHEEL HP = 1260.6 OBS. SFC = .3966 AAR CORR. SFC = .3855 (LB/HP-HR)
CALCULATED A/F = 42.38 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	461.	.37	98.PPMC
CO	1132.	.90	125. PPM
NOX	14652.	11.62	982. PPM (D)
NOX,CORR	15385.	12.20	
CO2		570.	5.03 PCT
O2			13.90 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0501	NOX-KH	= 1.0410	NOX-KT	= 1.0000
WET EXH HC CF	= .9521	AIR TEMP CF	= .9905	BAROM CF	= 1.0023
FUEL TEMP CF	= .9850	FUEL S.G. CF	= .9832	FUEL HHV CF	= .9789

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	672B.0-13
FILTER PAIR WEIGHT GAIN (mg)	8.007
SAMPLE VOLUME (scf)	37.274
DILUTE PM CONCENTRATION (mg/scf)	.215
CO2-BASED DILUTION FACTOR	6.601
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	1.418
PARTICULATE MASS EMISSION RATE (g/hr)	409.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.325

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 6	TEST CONFIGURATION	=	B20
TEST DATE	=	10/26/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	8/10			
SwRI FUEL CODE	=	EM-3004-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.13 (in. Hg)	ENGINE INTAKE AIR	=	84.(°F)
DRY BULB TEMP	=	82. (°F)	WET BULB TEMP	=	70. (°F)
ABS HUMIDITY	=	94.28 (GR/LB)	RELATIVE HUMIDITY	=	55. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	12.2
TRACTION MOTOR BLOWER HP	=	43.6
INERTIAL SEPERATOR BLOWER HP	=	6.5
RADIATOR FAN HP	=	40.3
TOTAL ACCESSORY HP	=	106.7

FUEL RATE (OBS) = 622.0 (LB/HR)
ALT. VOLTS = B38. ALT. AMPS = 1199. ALT. EFF. = .939
FLYWHEEL HP = 1542.1 OBS. SFC = .4034 AAR CORR. SFC = .3915 (LB/HP-HR)
CALCULATED A/F = 37.28 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	596.	.39	115.PPMC
CO	3822.	2.48	386. PPM
NOX	18229.	11.82	1119. PPM (D)
NOX,CORR	19084.	12.38	
CO2		577.	5.71 PCT
O2			13.15 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0469	NOX-KH	= 1.0384	NOX-KT	= 1.0000
WET EXH HC CF	= .9465	AIR TEMP CF	= .9892	BAROM CF	= 1.0023
FUEL TEMP CF	= .9845	FUEL S.G. CF	= .9832	FUEL HHV CF	= .97B9

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6729.0-14
FILTER PAIR WEIGHT GAIN (mg)	8.794
SAMPLE VOLUME (scf)	37.002
DILUTE PM CONCENTRATION (mg/scf)	.238
CO2-BASED DILUTION FACTOR	7.540
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	1.792
PARTICULATE MASS EMISSION RATE (g/hr)	568.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.368

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 7	TEST CONFIGURATION	=	B20
TEST DATE	=	10/26/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	9/10			
SwRI FUEL CODE	=	EM-3004-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.13 (in. Hg)	ENGINE INTAKE AIR	=	83.(°F)
DRY BULB TEMP	=	83. (°F)	WET BULB TEMP	=	71. (°F)
ABS HUMIDITY	=	97.20 (GR/LB)	RELATIVE HUMIDITY	=	56. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	13.8
TRACTION MOTOR BLOWER HP	=	62.9
INERTIAL SEPERATOR BLOWER HP	=	9.4
RADIATOR FAN HP	=	58.2
TOTAL ACCESSORY HP	=	148.3

FUEL RATE (OBS) = 774.0 (LB/HR)
ALT. VOLTS = 91B. ALT. AMPS = 1307. ALT. EFF. = .939
FLYWHEEL HP = 1862.3 OBS. SFC = .4156 AAR CORR. SFC = .4036 (LB/HP-HR)
CALCULATED A/F = 34.14 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	1037.	.56	175.PPMC
CO	8397.	4.51	745. PPM
NOX	22817.	12.25	1232. PPM (D)
NOX,CORR	24054.	12.92	
CO2		591.	6.21 PCT
O2			12.27 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0542	NOX-KH	= 1.0443	NOX-KT	= 1.0000
WET EXH HC CF=	.9421	AIR TEMP CF	= .9896	BAROM CF	= 1.0023
FUEL TEMP CF =	.9855	FUEL S.G. CF =	.9832	FUEL HHV CF	= .9789

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6730.0-15
FILTER PAIR WEIGHT GAIN (mg)	12.061
SAMPLE VOLUME (scf)	35.951
DILUTE PM CONCENTRATION (mg/scf)	.335
CO2-BASED DILUTION FACTOR	7.774
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	2.608
PARTICULATE MASS EMISSION RATE (g/hr)	944.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.507

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 8	TEST CONFIGURATION	=	B20
TEST DATE	=	10/26/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	10/10			
SwRI FUEL CODE	=	EM-3004-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.13 (in. Hg)	ENGINE INTAKE AIR	=	83.(°F)
DRY BULB TEMP	=	84. (°F)	WET BULB TEMP	=	71. (°F)
ABS HUMIDITY	=	96.48 (GR/LB)	RELATIVE HUMIDITY	=	54. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	15.1
TRACTION MOTOR BLOWER HP	=	82.8
INERTIAL SEPERATOR BLOWER HP	=	12.4
RADIATOR FAN HP	=	76.6
TOTAL ACCESSORY HP	=	191.0

FUEL RATE (OBS) = 916.0 (LB/HR)
ALT. VOLTS = 972. ALT. AMPS = 1378. ALT. EFF. = .939
FLYWHEEL HP = 2104.4 OBS. SFC = .4353 AAR CORR. SFC = .4227 (LB/HP-HR)
CALCULATED A/F = 31.23 (LB ORY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	1382.	.66	215.PPMC
CO	16084.	7.64	1321. PPM
NOX	24399.	11.59	1220. PPM (D)
NOX,CORR	25677.	12.20	
CO2		614.	6.75 PCT
O2			11.64 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0524	NOX-KH	= 1.0429	NOX-KT	= 1.0000
WET EXH HC CF=	.9375	AIR TEMP CF	= .9896	BAROM CF	= 1.0023
FUEL TEMP CF =	.9850	FUEL S.G. CF =	.9832	FUEL HHV CF	= .9789

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6731.0-16
FILTER PAIR WEIGHT GAIN (mg)	13.884
SAMPLE VOLUME (scf)	35.266
DILUTE PM CONCENTRATION (mg/scf)	.394
CO2-BASED DILUTION FACTOR	7.428
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	2.924
PARTICULATE MASS EMISSION RATE (g/hr)	1149.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.546

LOCOMOTIVE TEST SUMMARY

SwRI Project No. 08.02999.001

Test Date 10-26-00

Notch	Idle	DB-2	1	2	3	4	5	6	7	8
Run Number										
Barometer (in. Hg)	29.15	29.14	29.14	29.14	29.14	29.14	29.13	29.13	29.13	29.13
Dry Bulb Temp. (°F)	~~71.5~~ 83.1	83.1	84.6	83.1	82.5	83.3	83.0	82.4	82.7	83.8
Wet Bulb Temp. (°F)	71.5	71.4	71.4	71.1	70.5	70.6	70.7	70.3	70.9	71.1
Fuel Supply Temp. (°F)	95	88	89	88	88	92	90	91	89	90
Water Inlet Temp. (°F)	165	175	178	172	164	168	174	178	183	179
Engine Intake Air @ Filter (°F)	~~94~~ 88	86	84	84	81	83	81	84	83	83
Engine Speed (rpm)	258	388	315	390	500	574	646	731	826	906
Traction Volts	2.83	7.92	182	377	515	686	760	838	918	972
Traction Amps	0	0	269	554	751	992	1090	1199	1307	1378
Fuel Rate (lb/hr)	25.5	40.0	53.2	136	232	399	500	622	774	916
# of Fans	0	0	0	1	1	1	2	2	2	2
HC (ppmC)	62.60	67.62	57.60	51.60	67.62	80.15	97.68	115.21	175.32	215.39
CO (ppm)	45.59	59.37	50.17	80.43	60.53	78.07	124.58	385.57	744.90	1320.78
Raw Exhaust CO_2 (%)	.64	.72	1.11	2.06	3.02	4.60	5.03	5.71	6.21	6.75
NO_x (ppm)	117.85	111.58	174.27	325.76	491.15	851.99	981.79	1119.48	1232.12	1219.60
O_2 (%)	20.16	20.03	19.53	17.91	16.78	14.65	13.90	13.15	12.27	11.64
Tunnel Dilute CO_2 (%)	1824	2034	3236	5498	6009	8087	7892	7796	8186	9130
Background CO_2 (ppm)	557	467	467	535	581	627	699	675	699	627

Notes: 1 - Air compressor locked off.

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Test Configuration: EM-3004-F B20 Run #1

Operator: [illegible]

LOCOMOTIVE TEST SUMMARY

SwRI Project No.08.02999.001

Test Date 10-26-00

Notch	Idle	DB-2	1	2	3	4	5	6	7	8
Time ~~Run Number~~	2:12	2:26	2:34	2:54	3:04	3:15	3:25	3:37	3:50	3:59
Observed Fuel Rate at X minutes into test point (lb/hr)										
3 min.	26.3	40.4	52.7	137	231	399	500	621	771	911
5 min.	25.4	40.3	53.6	136	233	399	500	621	773	911
7 min.	25.4	40.5	53.6	136	233	398	500	622	772	912
Averaged Fuel Rate over Time										
Cumulative Fuel Used (lbs)	3.4	4.0	3.7	6.8	11.6	26.6	25.0	31.1	38.7	45.8
Over X Minutes	8.0	6.0	4.0/7	3.0	3.0	4.0	3.0	3.0	3.0	3.0
x 60. = Fuel Rate (lb/hr)	25.5	40.0	53.2	136	232	399	500	622	774	916
Traction Volts	2.83	7.92	182	377	515	686	760	838	918	972
Current Shunt mV	0	0	3.36	6.93	9.39	12.40	13.63	14.49	16.34	17.23
Traction Current = Shunt mV * 80.	0	0	269	554	757	992	1090	1199	1307	1378
Right Airbox Temp., °F	138	133	132	131	128	135	139	151	162	177
Left Airbox Temp., °F	112	113	108	109	111	122	129	145	162	180
Airbox Pressure, in. Hg	.86	1.89	1.37	2.01	3.06	4.09	5.26	6.86	9.13	11.22
Left Exhaust Temperature, °F										
Right Exhaust Temperature, °F										
SS Smoke, % Opacity	0	0	1.2	2.7	2.4	3.3	4.0	4.0	4.6	6.8
Notes: 1 - Air compressor locked off.	740	1890	2500	3310	3965	4600	5260	5995	6700	7250

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0 drift +3.0

Test Configuration: EM-3004-F B20 Run #1

Operator: EH

291.prn

CSX #2629 EMD GP38 EMD 16-645-E3
Tested 10/30/00 @ SwRI, B20 Fuel (EM-3004-F)

Notch	Gross HP	obs Fuel Rate (lb/hr)	HC (g/hr)	CO (g/hr)	Corr. NOx (g/hr)	PM (g/hr)	AAR Corr bsfc	Corr. Fuel Rate (lb/hr)
8	2,121	916	1,308	12,864	26,965	1,403	0.421	893
7	1,871	774	996	6,181	24,712	1,027	0.403	754
6	1,553	622	630	1,557	20,178	651	0.391	607
5	1,270	504	414	906	15,666	434	0.387	491
4	1,021	398	327	559	11,848	330	0.380	388
3	580	232	208	421	5,787	155	0.390	226
2	314	136	152	471	3,139	95	0.422	133
1	82	54	120	249	1,371	23	0.644	53
Idle	11	26	107	203	741	14	2.424	26
DB-2	18	44	166	385	1053	28	2.349	43

AAR 3x3 Weighted Results

	WF	w-BHP	obs w-Fuel w-(lb/hr)	corr w-Fuel w-(lb/hr)	w-HC w-(g/hr)	w-CO w-(g/hr)	w-NOx w-(g/hr)	w-PM w-(g/hr)
	25.0%	530.3	229.0	223.2	327.0	3216.0	6741.3	350.8
	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	25.0%	317.4	126.0	122.8	103.5	226.5	3916.5	108.5
	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	50.0%	5.3	13.2	12.8	53.5	101.5	370.5	7.0
	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
sum =	100.0%	853.1	368.2	358.9	484.0	3544.0	11028.3	466.3
AAR 3x3 duty cycle weighted brake-specific emissions =			0.432 obs bsfc	0.421 corr bsfc	0.57	4.15	12.93	0.547

EPA Switcher Duty Cycle Weighted Results

Notch	WF	w-BHP	obs w-Fuel w-(lb/hr)	corr w-Fuel w-(lb/hr)	w-HC w-(g/hr)	w-CO w-(g/hr)	w-NOx w-(g/hr)	w-PM w-(g/hr)
8	0.8%	17.0	7.3	7.1	10.5	102.9	215.7	11.2
7	0.2%	3.7	1.5	1.5	2.0	12.4	49.4	2.1
6	1.5%	23.3	9.3	9.1	9.5	23.4	302.7	9.8
5	3.6%	45.7	18.1	17.7	14.9	32.6	564.0	15.6
4	3.6%	36.8	14.3	14.0	11.8	20.1	426.5	11.9
3	5.8%	33.6	13.5	13.1	12.1	24.4	335.6	9.0
2	12.3%	38.7	16.7	16.3	18.7	57.9	386.1	11.7
1	12.4%	10.1	6.7	6.5	14.9	30.9	170.0	2.9
Idle	59.8%	6.3	15.7	15.4	64.0	121.4	443.1	8.4
DB	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
sum =	100.0%	215.3	103.3	100.7	158.2	426.0	2893.2	82.4
EPA switcher duty cycle weighted brake-specific emissions =			0.480 obs bsfc	0.468 corr bsfc	0.73	1.98	13.44	0.383

EPA Freight Duty Cycle Weighted Results

Notch	WF	w-BHP	obs w-Fuel w-(lb/hr)	corr w-Fuel w-(lb/hr)	w-HC w-(g/hr)	w-CO w-(g/hr)	w-NOx w-(g/hr)	w-PM w-(g/hr)
8	16.2%	343.7	148.4	144.6	211.9	2084.0	4368.3	227.3
7	3.0%	56.1	23.2	22.6	29.9	185.4	741.4	30.8
6	3.9%	60.6	24.3	23.7	24.6	60.7	786.9	25.4
5	3.8%	48.2	19.2	18.7	15.7	34.4	595.3	16.5
4	4.4%	44.9	17.5	17.1	14.4	24.6	521.3	14.5
3	5.2%	30.2	12.1	11.8	10.8	21.9	300.9	8.1
2	6.5%	20.4	8.8	8.6	9.9	30.6	204.0	6.2
1	6.5%	5.3	3.5	3.4	7.8	16.2	89.1	1.5
Idle	38.0%	4.0	10.0	9.8	40.7	77.1	281.6	5.3
DB	12.5%	2.3	5.5	5.3	20.8	48.1	131.6	3.5
sum =	100.0%	615.7	272.4	265.6	386.4	2583.1	8020.5	339.0
EPA freight duty cycle weighted brake-specific emissions =			0.442 obs bsfc	0.431 corr bsfc	0.63	4.20	13.03	0.551

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	IDLE	TEST CONFIGURATION	=	B20
TEST DATE	=	10/30/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	1/10			
SwRI FUEL CODE	=	EM-3004-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.26 (in. Hg)	ENGINE INTAKE AIR	=	75.(°F)
DRY BULB TEMP	=	75. (°F)	WET BULB TEMP	=	71. (°F)
ABS HUMIDITY	=	111.44 (GR/LB)	RELATIVE HUMIDITY	=	83. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	4.3
TRACTION MOTOR BLOWER HP	=	2.0
INERTIAL SEPERATOR BLOWER HP	=	.3
RADIATOR FAN HP	=	.0
TOTAL ACCESSORY HP	=	10.6

FUEL RATE (OBS) = 26.3 (LB/HR)
ALT. VOLTS = 3. ALT. AMPS = 0. ALT. EFF. = .939
FLYWHEEL HP = 10.6 OBS. SFC = 2.4839 AAR CORR. SFC = 2.4235 (LB/HP-HR)
CALCULATED A/F = 322.41 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	107.	10.08	58.PPMC
CO	203.	19.17	55. PPM
NOX	672.	63.46	110. PPM (D)
NOX,CORR	741.	70.00	
CO2		3521.	.64 PCT
O2			20.03 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.1032	NOX-KH	= 1.0841	NOX-KT	= 1.0000
WET EXH HC CF	= .9889	AIR TEMP CF	= .9932	BAROM CF	= 1.0035
FUEL TEMP CF	= .9805	FUEL S.G. CF	= .9832	FUEL HHV CF	= .9789

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6752.0-37
FILTER PAIR WEIGHT GAIN (mg)	1.211
SAMPLE VOLUME (scf)	38.595
DILUTE PM CONCENTRATION (mg/scf)	.031
CO2-BASED DILUTION FACTOR	3.910
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.123
PARTICULATE MASS EMISSION RATE (g/hr)	14.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	1.312

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	DB2	TEST CONFIGURATION	=	B20
TEST DATE	=	10/30/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	2/10			
SwRI FUEL CODE	=	EM-3004-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.26 (in. Hg)	ENGINE INTAKE AIR	=	79.(°F)
DRY BULB TEMP	=	76. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	112.16 (GR/LB)	RELATIVE HUMIDITY	=	82. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	6.5
TRACTION MOTOR BLOWER HP	=	6.7
INERTIAL SEPERATOR BLOWER HP	=	1.0
RADIATOR FAN HP	=	.0
TOTAL ACCESSORY HP	=	18.2

FUEL RATE (OBS) = 44.0 (LB/HR)
ALT. VOLTS = 8. ALT. AMPS = 0. ALT. EFF. = .939
FLYWHEEL HP = 18.2 OBS. SFC = 2.4114 AAR CORR. SFC = 2.3485 (LB/HP-HR)
CALCULATED A/F = 286.55 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	166.	9.08	60.PPMC
CO	385.	21.09	70. PPM
NOX	953.	52.24	105. PPM (D)
NOX,CORR	1053.	57.73	
CO2		3416.	.72 PCT
O2			20.03 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.1050	NOX-KH	= 1.0856	NOX-KT	= 1.0000
WET EXH HC CF	= .9882	AIR TEMP CF	= .9914	BAROM CF	= 1.0035
FUEL TEMP CF	= .9820	FUEL S.G. CF	= .9832	FUEL HHV CF	= .9789

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6753.0-38
FILTER PAIR WEIGHT GAIN (mg)	1.451
SAMPLE VOLUME (scf)	38.522
DILUTE PM CONCENTRATION (mg/scf)	.038
CO2-BASED DILUTION FACTOR	4.394
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.166
PARTICULATE MASS EMISSION RATE (g/hr)	28.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	1.527

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 1	TEST CONFIGURATION	=	B20
TEST DATE	=	10/30/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	3/10			
SwRI FUEL CODE	=	EM-3004-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.26 (in. Hg)	ENGINE INTAKE AIR	=	74.(°F)
DRY BULB TEMP	=	77. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	111.96 (GR/LB)	RELATIVE HUMIDITY	=	79. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	5.3
TRACTION MOTOR BLOWER HP	=	3.6
INERTIAL SEPERATOR BLOWER HP	=	.5
RADIATOR FAN HP	=	.0
TOTAL ACCESSORY HP	=	13.4

FUEL RATE (OBS) = 54.0 (LB/HR)
ALT. VOLTS = 180. ALT. AMPS = 266. ALT. EFF. = .939
FLYWHEEL HP = 81.8 OBS. SFC = .6598 AAR CORR. SFC = .6441 (LB/HP-HR)
CALCULATED A/F = 192.88 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	120.	1.47	53.PPMC
CO	249.	3.04	55. PPM
NOX	1245.	15.21	167. PPM (D)
NOX,CORR	1371.	16.75	
CO2		942.	1.08 PCT
O2			19.53 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.1010	NOX-KH	= 1.0824	NOX-KT	= 1.0000
WET EXH HC CF	= .9850	AIR TEMP CF	= .9937	BAROM CF	= 1.0035
FUEL TEMP CF	= .9835	FUEL S.G. CF	= .9832	FUEL HHV CF	= .9789

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6754.0-39
FILTER PAIR WEIGHT GAIN (mg)	1.689
SAMPLE VOLUME (scf)	37.793
DILUTE PM CONCENTRATION (mg/scf)	.045
CO2-BASED DILUTION FACTOR	3.623
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.162
PARTICULATE MASS EMISSION RATE (g/hr)	23.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.276

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 2	TEST CONFIGURATION	=	B20
TEST DATE	=	10/30/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	4/10			
SwRI FUEL CODE	=	EM-3004-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.26 (in. Hg)	ENGINE INTAKE AIR	=	76.(°F)
DRY BULB TEMP	=	77. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	113.73 (GR/LB)	RELATIVE HUMIDITY	=	81. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	6.5
TRACTION MOTOR BLOWER HP	=	6.7
INERTIAL SEPERATOR BLOWER HP	=	1.0
RADIATOR FAN HP	=	3.1
TOTAL ACCESSORY HP	=	21.3

FUEL RATE (OBS) = 136.0 (LB/HR)
ALT. VOLTS = 375. ALT. AMPS = 547. ALT. EFF. = .939
FLYWHEEL HP = 314.4 OBS. SFC = .4326 AAR CORR. SFC = .4219 (LB/HP-HR)
CALCULATED A/F = 96.39 (LB ORY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	152.	.48	53.PPMC
CO	471.	1.50	83. PPM
NOX	2858.	9.09	306. PPM (D)
NOX,CORR	3139.	9.98	
CO2		620.	2.18 PCT
O2			17.91 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0981	NOX-KH	= 1.0800	NOX-KT	= 1.0000
WET EXH HC CF=	.9753	AIR TEMP CF	= .9928	BAROM CF	= 1.0035
FUEL TEMP CF =	.9B35	FUEL S.G. CF =	.9832	FUEL HHV CF	= .9789

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6755.0-40
FILTER PAIR WEIGHT GAIN (mg)	3.987
SAMPLE VOLUME (scf)	38.735
DILUTE PM CONCENTRATION (mg/scf)	.103
CO2-BASED DILUTION FACTOR	5.242
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.540
PARTICULATE MASS EMISSION RATE (g/hr)	95.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.303

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 3	TEST CONFIGURATION	=	B20
TEST DATE	=	10/30/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	5/10			
SwRI FUEL CODE	=	EM-3004-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.26 (in. Hg)	ENGINE INTAKE AIR	=	77.(°F)
DRY BULB TEMP	=	7B. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	110.56 (GR/LB)	RELATIVE HUMIDITY	=	75. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	8.4
TRACTION MOTOR BLOWER HP	=	14.2
INERTIAL SEPERATOR BLOWER HP	=	2.1
RADIATOR FAN HP	=	6.6
TOTAL ACCESSORY HP	=	35.3

FUEL RATE (OBS) = 232.0 (LB/HR)
ALT. VOLTS = 511. ALT. AMPS = 746. ALT. EFF. = .939
FLYWHEEL HP = 579.9 OBS. SFC = .4001 AAR CORR. SFC = .3900 (LB/HP-HR)
CALCULATED A/F = 70.69 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	20B.	.36	58.PPMC
CO	421.	.73	59. PPM
NOX	5315.	9.17	456. PPM (D)
NOX,CORR	5787.	9.98	
CO2		575.	2.99 PCT
O2			16.90 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0887	NOX-KH	= 1.0724	NOX-KT	= 1.0000
WET EXH HC CF=	.9685	AIR TEMP CF	= .9923	BAROM CF	= 1.0035
FUEL TEMP CF =	.9835	FUEL S.G. CF =	.9832	FUEL HHV CF	= .9789

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6766.0-51
FILTER PAIR WEIGHT GAIN (mg)	5.299
SAMPLE VOLUME (scf)	38.216
DILUTE PM CONCENTRATION (mg/scf)	.139
CO2-BASED DILUTION FACTOR	5.040
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.699
PARTICULATE MASS EMISSION RATE (g/hr)	155.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.267

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 4	TEST CONFIGURATION	=	820
TEST DATE	=	10/30/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	6/10			
SwRI FUEL CODE	=	EM-3004-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.26 (in. Hg)	ENGINE INTAKE AIR	=	75.(°F)
DRY BULB TEMP	=	79. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	108.84 (GR/LB)	RELATIVE HUMIDITY	=	71. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	9.6
TRACTION MOTOR BLOWER HP	=	21.3
INERTIAL SEPERATOR BLOWER HP	=	3.2
RADIATOR FAN HP	=	9.9
TOTAL ACCESSORY HP	=	48.0

FUEL RATE (OBS) = 398.0 (LB/HR)
ALT. VOLTS = 688. ALT. AMPS = 990. ALT. EFF. = .939
FLYWHEEL HP = 1021.0 OBS. SFC = .3898 AAR CORR. SFC = .3803 (LB/HP-HR)
CALCULATED A/F = 47.63 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	327.	.32	78.PPMC
CO	559.	.55	69. PPM
NOX	10932.	10.71	817. PPM (D)
NOX,CORR	11848.	11.60	
CO2		560.	4.47 PCT
O2			14.77 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0838	NOX-KH	= 1.0684	NOX-KT	= 1.0000
WET EXH HC CF	= .9562	AIR TEMP CF	= .9932	BAROM CF	= 1.0035
FUEL TEMP CF	= .9840	FUEL S.G. CF	= .9832	FUEL HHV CF	= .9789

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6767.0-52
FILTER PAIR WEIGHT GAIN (mg)	7.792
SAMPLE VOLUME (scf)	38.055
DILUTE PM CONCENTRATION (mg/scf)	.205
CO2-BASED DILUTION FACTOR	6.263
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	1.282
PARTICULATE MASS EMISSION RATE (g/hr)	330.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.324

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 5	TEST CONFIGURATION	=	B20
TEST DATE	=	10/30/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	7/10			
SwRI FUEL CODE	=	EM-3004-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.26 (in. Hg)	ENGINE INTAKE AIR	=	77.(°F)
DRY BULB TEMP	=	79. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	108.25 (GR/LB)	RELATIVE HUMIDITY	=	71. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	10.8
TRACTION MOTOR BLOWER HP	=	30.6
INERTIAL SEPERATOR BLOWER HP	=	4.6
RADIATOR FAN HP	=	28.3
TOTAL ACCESSORY HP	=	78.2

FUEL RATE (OBS) = 504.0 (LB/HR)
ALT. VOLTS = 761. ALT. AMPS = 1096. ALT. EFF. = .939
FLYWHEEL HP = 1269.7 OBS. SFC = .3969 AAR CORR. SFC = .3869 (LB/HP-HR)
CALCULATED A/F = 42.08 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	414.	.33	88.PPMC
CO	906.	.71	100. PPM
NOX	14476.	11.40	969. PPM (D)
NOX,CORR	15666.	12.34	
CO2		570.	5.07 PCT
O2			14.02 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0822	NOX-KH	= 1.0671	NOX-KT	= 1.0000
WET EXH HC CF	= .9512	AIR TEMP CF	= .9923	BAROM CF	= 1.0035
FUEL TEMP CF	= .9840	FUEL S.G. CF	= .9832	FUEL HHV CF	= .9789

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6768.0-53
FILTER PAIR WEIGHT GAIN (mg)	8.319
SAMPLE VOLUME (scf)	37.679
DILUTE PM CONCENTRATION (mg/scf)	.221
CO2-BASED DILUTION FACTOR	6.804
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	1.502
PARTICULATE MASS EMISSION RATE (g/hr)	434.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.342

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 6	TEST CONFIGURATION	=	B20
TEST DATE	=	10/30/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	8/10			
SwRI FUEL CODE	=	EM-3004-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.26 (in. Hg)	ENGINE INTAKE AIR	=	75.(°F)
DRY BULB TEMP	=	79. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	108.15 (GR/LB)	RELATIVE HUMIDITY	=	70. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	12.2
TRACTION MOTOR BLOWER HP	=	44.2
INERTIAL SEPERATOR BLOWER HP	=	6.6
RADIATOR FAN HP	=	40.9
TOTAL ACCESSORY HP	=	108.0

FUEL RATE (OBS) = 622.0 (LB/HR)
ALT. VOLTS = 840. ALT. AMPS = 1204. ALT. EFF. = .939
FLYWHEEL HP = 1552.8 OBS. SFC = .4006 AAR CORR. SFC = .3908 (LB/HP-HR)
CALCULATED A/F = 38.55 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	630.	.41	118.PPMC
CO	1557.	1.00	152. PPM
NOX	18650.	12.01	1107. PPM (D)
NOX,CORR	20178.	12.99	
CO2		575.	5.54 PCT
O2			13.27 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0819	NOX-KH	= 1.0669	NOX-KT	= 1.0000
WET EXH HC CF	= .9474	AIR TEMP CF	= .9932	BAROM CF	= 1.0035
FUEL TEMP CF	= .9850	FUEL S.G. CF	= .9832	FUEL HHV CF	= .9789

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6769.0-54
FILTER PAIR WEIGHT GAIN (mg)	9.607
SAMPLE VOLUME (scf)	37.365
DILUTE PM CONCENTRATION (mg/scf)	.257
CO2-BASED DILUTION FACTOR	7.735
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	1.989
PARTICULATE MASS EMISSION RATE (g/hr)	651.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.419

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 7	TEST CONFIGURATION	=	B20
TEST DATE	=	10/30/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	9/10			
SwRI FUEL CODE	=	EM-3004-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.26 (in. Hg)	ENGINE INTAKE AIR	=	78.(°F)
DRY BULB TEMP	=	80. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	107.21 (GR/LB)	RELATIVE HUMIDITY	=	69. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	13.8
TRACTION MOTOR BLOWER HP	=	63.5
INERTIAL SEPERATOR BLOWER HP	=	9.5
RADIATOR FAN HP	=	58.8
TOTAL ACCESSORY HP	=	149.6

FUEL RATE (OBS) = 774.0 (LB/HR)
ALT. VOLTS = 920. ALT. AMPS = 1310. ALT. EFF. = .939
FLYWHEEL HP = 1871.3 OBS. SFC = .4136 AAR CORR. SFC = .4030 (LB/HP-HR)
CALCULATED A/F = 34.26 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	996.	.53	168.PPMC
CO	6181.	3.30	547. PPM
NOX	22892.	12.23	1232. PPM (D)
NOX,CORR	24712.	13.21	
CO2		590.	6.21 PCT
O2			12.40 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0795	NOX-KH	= 1.0649	NOX-KT	= 1.0000
WET EXH HC CF	= .9418	AIR TEMP CF	= .9919	BAROM CF	= 1.0035
FUEL TEMP CF	= .9855	FUEL S.G. CF	= .9832	FUEL HHV CF	= .9789

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6770.0-55
FILTER PAIR WEIGHT GAIN (mg)	13.191
SAMPLE VOLUME (scf)	36.611
DILUTE PM CONCENTRATION (mg/scf)	.360
CO2-BASED DILUTION FACTOR	7.849
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	2.828
PARTICULATE MASS EMISSION RATE (g/hr)	1027.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.549

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 8	TEST CONFIGURATION	=	B20
TEST DATE	=	10/30/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	10/10			
SwRI FUEL CODE	=	EM-3004-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.25 (in. Hg)	ENGINE INTAKE AIR	=	77.(°F)
DRY BULB TEMP	=	80. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	106.84 (GR/LB)	RELATIVE HUMIDITY	=	69. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	15.1
TRACTION MOTOR BLOWER HP	=	83.8
INERTIAL SEPERATOR BLOWER HP	=	12.6
RADIATOR FAN HP	=	77.5
TOTAL ACCESSORY HP	=	193.0

FUEL RATE (OBS) = 916.0 (LB/HR)
ALT. VOLTS = 976. ALT. AMPS = 1383. ALT. EFF. = .939
FLYWHEEL HP = 2121.3 OBS. SFC = .4318 AAR CORR. SFC = .4209 (LB/HP-HR)
CALCULATED A/F = 31.36 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	1308.	.62	203.PPMC
CO	12864.	6.06	1052. PPM
NOX	25002.	11.79	1245. PPM (D)
NOX,CORR	26965.	12.71	
CO2		611.	6.75 PCT
O2			11.77 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0785	NOX-KH	= 1.0642	NOX-KT	= 1.0000
WET EXH HC CF	= .9372	AIR TEMP CF	= .9923	BAROM CF	= 1.0034
FUEL TEMP CF	= .9860	FUEL S.G. CF	= .9832	FUEL HHV CF	= .9789

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6771.0-56
FILTER PAIR WEIGHT GAIN (mg)	19.064
SAMPLE VOLUME (scf)	35.344
DILUTE PM CONCENTRATION (mg/scf)	.539
CO2-BASED DILUTION FACTOR	6.594
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	3.557
PARTICULATE MASS EMISSION RATE (g/hr)	1403.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.661

LOCOMOTIVE TEST SUMMARY

SwRI Project No. 08.02999.001

Test Date 10-30-00

Notch	Idle	DB-2	1	2	3	4	5	6	7	8
Run Number										
Barometer (in. Hg)	29.26	29.26	29.26	29.26	29.26	29.26	29.26	29.26	29.26	29.25
Dry Bulb Temp. (°F)	75.1	75.7	76.5	76.5	78.0	79.0	79.0	79.4	79.6	79.5
Wet Bulb Temp. (°F)	71.2	71.5	71.7	72.0	71.9	71.9	71.8	71.9	71.8	71.7
Fuel Supply Temp. (°F)	99	96	93	93	93	92	92	90	89	88
Water Inlet Temp. (°F)	166	169	171	173	165	169	173	177	183	182
Engine Intake Air @ Filter (°F)	75	79	74	76	77	75	77	75	78	77
Engine Speed (rpm)	259	390	317	390	501	574	647	732	826	906
Traction Volts	2.78	8.24	180	375	511	688	761	840	920	976
Traction Amps	0	0	266	1/ ~~375~~ 47	746	990	1096	1204	1310	1383
Fuel Rate (lb/hr)	26.3	44.0	54.0	136	232	398	504	622	774	916
# of Fans	0	0	0	1	1	1	2	2	2	2
HC (ppmC)	57.60	60.11	52.60	52.60	57.60	77.64	87.66	117.71	167.80	202.87
CO (ppm)	54.76	69.83	54.76	82.81	59.37	68.67	99.68	151.80	546.58	1052.03
Raw Exhaust CO_2 (%)	.64	.72	1.08	2.18	2.99	4.47	5.07	5.54	6.21	6.75
NO_x (ppm)	110.33	105.31	166.74	305.71	456.06	816.90	969.27	1106.96	1232.12	1244.64
O_2 (%)	20.03	20.03	19.53	17.91	16.90	14.77	14.02	13.27	12.40	11.77
Tunnel Dilute CO_2 (%)	2070	2034	3380	4521	6240	7333	7608	7333	7989	10175
Background CO_2 (ppm)	604	535	604	557	581	557	557	581	557	581

Notes: 1 - Air compressor locked off.

u:/fritz/wp/csx2629.fm1 9/2000

Test Configuration: EM-3004-F B20 Run #2

Operator: CH

LOCOMOTIVE TEST SUMMARY

SwRI Project No.08.02999.001

Test Date 10-30-00

Notch	Idle	DB-2	1	2	3	4	5	6	7	8
Time ~~Run Number~~	9:10	9:21	9:35	9:45	9:55	10:05	10:15	10:25	10:37	10:45
Observed Fuel Rate at X minutes into test point (lb/hr)										
3 min.	24.7	44.5	53.6	137	233	397	506	621	775	913
5 min.	28.3	43.5	54.3	137	232	398	503	622	776	914
7 min.	29.0	43.4	54.1	137	233	397	502	622	775	916
Averaged Fuel Rate over Time										
Cumulative Fuel Used (lbs)	3.5	4.4	3.6	6.8	11.6	19.9	25.2	31.1	38.7	45.8
Over X Minutes	8.0	6.0	4.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
x 60. = Fuel Rate (lb/hr)	26.3	44.0	54.0	136	232	398	504	622	774	916
Traction Volts	2.78	8.24	180	375	511	688	761	840	920	976
Current Shunt mV	0	0	3.32	6.84	9.32	12.38	13.70	15.05	16.38	17.29
Traction Current = Shunt mV * 80.	0	0	266	547	746	990	1096	1204	1310	1383
Right Airbox Temp., °F	114	118	117	120	~~125~~	125	135	141	159	172
Left Airbox Temp., °F	91	99	94	99	~~111~~	111	125	136	157	175
Airbox Pressure, in. Hg	.91	1.92	1.34	1.92	~~4.02~~	4.02	5.18	6.90	9.13	11.33
Left Exhaust Temperature, °F										
Right Exhaust Temperature, °F										
SS Smoke, % Opacity	0	0	0	1.1	1.0	2.1	2.6	2.0	3.0	3.9
	415	1165	1935	2560	3145	3720	4360	4935	5690	6180

Notes: 1 - Air compressor locked off.

u:/fritz/wp/csx2629.fm2 9/2000

Test Configuration: EM-3004-F B20 Run # 2

Operator: [illegible]

297.prn

CSX #2629 EMD GP38 EMD 16-645-E3
Tested 11/01/00 @ SwRI, B20 Fuel (EM-3004-F)

Notch	Gross HP	obs Fuel Rate (lb/hr)	HC (g/hr)	CO (g/hr)	Corr. NOx (g/hr)	PM (g/hr)	AAR Corr bsfc	Corr. Fuel Rate (lb/hr)
8	2,115	920	1,299	11,715	28,345	1,085	0.424	897
7	1,870	774	949	5,935	25,495	920	0.404	755
6	1,546	622	576	1,517	20,499	609	0.392	607
5	1,264	506	398	858	16,169	428	0.391	494
4	1,014	396	271	580	11,729	349	0.382	387
3	539	221	199	409	5,670	148	0.399	215
2	315	132	161	444	3,094	91	0.409	128
1	82	53	120	233	1,325	20	0.622	51
Idle	11	27	138	178	785	17	2.491	26
DB-2	18	42	156	332	1000	30	2.263	41
						sum =		

AAR 3x3 Weighted Results

WF	w-BHP	obs w-Fuel w-(lb/hr)	corr w-Fuel w-(lb/hr)	w-HC w-(g/hr)	w-CO w-(g/hr)	w-NOx w-(g/hr)	w-PM w-(g/hr)
25.0%	528.7	229.9	224.2	324.8	2928.8	7086.3	271.3
0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25.0%	316.1	126.6	123.6	99.5	214.5	4042.3	107.0
0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50.0%	5.3	13.5	13.2	69.0	89.0	392.5	8.5
0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
100.0%	850.1	370.0	361.0	493.3	3232.3	11521.0	386.8

AAR 3x3 duty cycle weighted brake-specific emissions = 0.435 obs bsfc, 0.425 corr bsfc, 0.58, 3.80, 13.55, 0.455

EPA Switcher Duty Cycle Weighted Results

Notch	WF	w-BHP	obs w-Fuel w-(lb/hr)	corr w-Fuel w-(lb/hr)	w-HC w-(g/hr)	w-CO w-(g/hr)	w-NOx w-(g/hr)	w-PM w-(g/hr)
8	0.8%	16.9	7.4	7.2	10.4	93.7	226.8	8.7
7	0.2%	3.7	1.5	1.5	1.9	11.9	51.0	1.8
6	1.5%	23.2	9.3	9.1	8.6	22.8	307.5	9.1
5	3.6%	45.5	18.2	17.8	14.3	30.9	582.1	15.4
4	3.6%	36.5	14.3	13.9	9.8	20.9	422.2	12.6
3	5.8%	31.3	12.8	12.5	11.5	23.7	328.9	8.6
2	12.3%	38.7	16.2	15.8	19.8	54.6	380.6	11.2
1	12.4%	10.2	6.5	6.3	14.9	28.9	164.3	2.5
Idle	59.8%	6.3	16.1	15.8	82.5	106.4	469.4	10.2
DB	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
sum =	100.0%	212.3	102.4	99.9	173.8	393.8	2932.7	80.1

EPA switcher duty cycle weighted brake-specific emissions = 0.482 obs bsfc, 0.470 corr bsfc, 0.82, 1.85, 13.81, 0.377

EPA Freight Duty Cycle Weighted Results

Notch	WF	w-BHP	obs w-Fuel w-(lb/hr)	corr w-Fuel w-(lb/hr)	w-HC w-(g/hr)	w-CO w-(g/hr)	w-NOx w-(g/hr)	w-PM w-(g/hr)
8	16.2%	342.6	149.0	145.3	210.4	1897.8	4591.9	175.8
7	3.0%	56.1	23.2	22.7	28.5	178.1	764.9	27.6
6	3.9%	60.3	24.3	23.7	22.5	59.2	799.5	23.8
5	3.8%	48.0	19.2	18.8	15.1	32.6	614.4	16.3
4	4.4%	44.6	17.4	17.0	11.9	25.5	516.1	15.4
3	5.2%	28.0	11.5	11.2	10.3	21.3	294.8	7.7
2	6.5%	20.4	8.6	8.4	10.5	28.9	201.1	5.9
1	6.5%	5.3	3.4	3.3	7.8	15.1	86.1	1.3
Idle	38.0%	4.0	10.3	10.0	52.4	67.6	298.3	6.5
DB	12.5%	2.3	5.3	5.1	19.5	41.5	125.0	3.8
sum =	100.0%	611.8	272.1	265.4	389.0	2367.6	8292.1	283.9

EPA freight duty cycle weighted brake-specific emissions = 0.445 obs bsfc, 0.434 corr bsfc, 0.64, 3.87, 13.55, 0.464

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	IDLE	TEST CONFIGURATION	=	B20
TEST DATE	=	11/ 1/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	1/10			
SwRI FUEL CODE	=	EM-3004-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.13 (in. Hg)	ENGINE INTAKE AIR	=	78.(°F)
DRY BULB TEMP	=	82. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	106.87 (GR/LB)	RELATIVE HUMIDITY	=	64. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	4.3
TRACTION MOTOR BLOWER HP	=	1.9
INERTIAL SEPERATOR BLOWER HP	=	.3
RADIATOR FAN HP	=	.0
TOTAL ACCESSORY HP	=	10.6

FUEL RATE (OBS) = 27.0 (LB/HR)
ALT. VOLTS = 3. ALT. AMPS = 0. ALT. EFF. = .939
FLYWHEEL HP = 10.6 OBS. SFC = 2.5589 AAR CORR. SFC = 2.4905 (LB/HP-HR)
CALCULATED A/F = 322.06 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	138.	13.07	73.PPMC
CO	17B.	16.84	47. PPM
NOX	720.	68.27	115. PPM (D)
NOX,CORR	785.	74.38	
CO2		3623.	.64 PCT
O2			20.03 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0896	NOX-KH	= 1.0732	NOX-KT	= 1.0000
WET EXH HC CF	= .9891	AIR TEMP CF	= .9919	BAROM CF	= 1.0023
FUEL TEMP CF	= .9825	FUEL S.G. CF	= .9B32	FUEL HHV CF	= .9789

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6812.0-97
FILTER PAIR WEIGHT GAIN (mg)	1.238
SAMPLE VOLUME (scf)	39.216
DILUTE PM CONCENTRATION (mg/scf)	.032
CO2-BASED DILUTION FACTOR	4.685
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.148
PARTICULATE MASS EMISSION RATE (g/hr)	17.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	1.627

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	DB2	TEST CONFIGURATION	=	B20
TEST DATE	=	11/ 1/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	2/10			
SwRI FUEL CODE	=	EM-3004-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.12 (in. Hg)	ENGINE INTAKE AIR	=	78.(°F)
DRY BULB TEMP	=	81. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	106.26 (GR/LB)	RELATIVE HUMIDITY	=	66. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	6.5
TRACTION MOTOR BLOWER HP	=	6.6
INERTIAL SEPERATOR BLOWER HP	=	1.0
RADIATOR FAN HP	=	.0
TOTAL ACCESSORY HP	=	18.1

FUEL RATE (OBS) = 42.0 (LB/HR)
ALT. VOLTS = 9. ALT. AMPS = 0. ALT. EFF. = .939
FLYWHEEL HP = 18.1 OBS. SFC = 2.3248 AAR CORR. SFC = 2.2625 (LB/HP-HR)
CALCULATED A/F = 282.93 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	156.	8.64	60.PPMC
CO	332.	18.40	64. PPM
NOX	920.	50.91	108. PPM (D)
NOX,CORR	1000.	55.37	
CO2		3297.	.73 PCT
O2			19.91 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0875	NOX-KH	= 1.0715	NOX-KT	= 1.0000
WET EXH HC CF=	.9884	AIR TEMP CF	= .9919	BAROM CF	= 1.0023
FUEL TEMP CF =	.9830	FUEL S.G. CF =	.9832	FUEL HHV CF	= .9789

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6B13.0-98
FILTER PAIR WEIGHT GAIN (mg)	1.728
SAMPLE VOLUME (scf)	38.307
DILUTE PM CONCENTRATION (mg/scf)	.045
CO2-BASED DILUTION FACTOR	4.155
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.187
PARTICULATE MASS EMISSION RATE (g/hr)	30.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	1.647

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 1	TEST CONFIGURATION	=	820
TEST DATE	=	11/ 1/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	3/10			
SwRI FUEL CODE	=	EM-3004-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.12 (in. Hg)	ENGINE INTAKE AIR	=	80.(°F)
DRY BULB TEMP	=	80. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	105.53 (GR/LB)	RELATIVE HUMIDITY	=	67. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	5.3
TRACTION MOTOR BLOWER HP	=	3.6
INERTIAL SEPERATOR BLOWER HP	=	.5
RADIATOR FAN HP	=	.0
TOTAL ACCESSORY HP	=	13.4

FUEL RATE (OBS) = 52.5 (LB/HR)
ALT. VOLTS = 180. ALT. AMPS = 267. ALT. EFF. = .939
FLYWHEEL HP = 82.0 OBS. SFC = .6399 AAR CORR. SFC = .6221 (LB/HP-HR)
CALCULATED A/F = 189.40 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	120.	1.46	55.PPMC
CO	233.	2.83	54. PPM
NOX	1224.	14.92	172. PPM (D)
NOX,CORR	1325.	16.15	
CO2		914.	1.10 PCT
O2			19.41 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0825	NOX-KH	= 1.0674	NOX-KT	= 1.0000
WET EXH HC CF=	.9B51	AIR TEMP CF	= .9910	BAROM CF	= 1.0023
FUEL TEMP CF =	.9830	FUEL S.G. CF =	.9832	FUEL HHV CF	= .9789

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6814.0-99
FILTER PAIR WEIGHT GAIN (mg)	1.472
SAMPLE VOLUME (scf)	38.644
DILUTE PM CONCENTRATION (mg/scf)	.038
CO2-BASED DILUTION FACTOR	3.967
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.151
PARTICULATE MASS EMISSION RATE (g/hr)	20.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.245

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 2	TEST CONFIGURATION	=	B20
TEST DATE	=	11/ 1/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	4/10			
SwRI FUEL CODE	=	EM-3004-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.11 (in. Hg)	ENGINE INTAKE AIR	=	78.(°F)
DRY BULB TEMP	=	81. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	106.88 (GR/LB)	RELATIVE HUMIDITY	=	65. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	6.5
TRACTION MOTOR BLOWER HP	=	6.6
INERTIAL SEPERATOR BLOWER HP	=	1.0
RADIATOR FAN HP	=	3.1
TOTAL ACCESSORY HP	=	21.2

FUEL RATE (OBS) = 132.0 (LB/HR)
ALT. VOLTS = 376. ALT. AMPS = 546. ALT. EFF. = .939
FLYWHEEL HP = 314.5 OBS. SFC = .4197 AAR CORR. SFC = .4085 (LB/HP-HR)
CALCULATED A/F = 96.37 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	161.	.51	58.PPMC
CO	444.	1.41	80. PPM
NOX	2B65.	9.11	316. PPM (D)
NOX,CORR	3094.	9.84	
CO2		602.	2.18 PCT
O2			17.91 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0801	NOX-KH	= 1.0654	NOX-KT	= 1.0000
WET EXH HC CF	= .9756	AIR TEMP CF	= .9919	BAROM CF	= 1.0022
FUEL TEMP CF	= .9830	FUEL S.G. CF	= .9832	FUEL HHV CF	= .9789

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6815.0-100
FILTER PAIR WEIGHT GAIN (mg)	4.986
SAMPLE VOLUME (scf)	37.887
DILUTE PM CONCENTRATION (mg/scf)	.132
CO2-BASED DILUTION FACTOR	4.047
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.533
PARTICULATE MASS EMISSION RATE (g/hr)	91.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.290

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 3	TEST CONFIGURATION	=	B20
TEST DATE	=	11/ 1/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	5/10			
SwRI FUEL CODE	=	EM-3004-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.10 (in. Hg)	ENGINE INTAKE AIR	=	77.(°F)
DRY BULB TEMP	=	81. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	108.80 (GR/LB)	RELATIVE HUMIDITY	=	67. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	8.3
TRACTION MOTOR BLOWER HP	=	14.0
INERTIAL SEPERATOR BLOWER HP	=	2.1
RADIATOR FAN HP	=	6.5
TOTAL ACCESSORY HP	=	34.9

FUEL RATE (OBS) = 221.0 (LB/HR)
ALT. VOLTS = 495. ALT. AMPS = 713. ALT. EFF. = .939
FLYWHEEL HP = 539.1 OBS. SFC = .4100 AAR CORR. SFC = .3991 (LB/HP-HR)
CALCULATED A/F = 70.69 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	199.	.37	58.PPMC
CO	409.	.76	61. PPM
NOX	5230.	9.70	471. PPM (D)
NOX.CORR	5670.	10.52	
CO2		589.	2.99 PCT
O2			16.90 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0841	NOX-KH	= 1.0687	NOX-KT	= 1.0000
WET EXH HC CF=	.9686	AIR TEMP CF	= .9923	BAROM CF	= 1.0021
FUEL TEMP CF =	.9835	FUEL S.G. CF =	.9832	FUEL HHV CF	= .9789

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6816.0-101
FILTER PAIR WEIGHT GAIN (mg)	4.540
SAMPLE VOLUME (scf)	38.241
DILUTE PM CONCENTRATION (mg/scf)	.119
CO2-BASED DILUTION FACTOR	5.903
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.701
PARTICULATE MASS EMISSION RATE (g/hr)	148.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.274

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 4	TEST CONFIGURATION	=	B20
TEST DATE	=	11/ 1/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	6/10			
SwRI FUEL CODE	=	EM-3004-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.11 (in. Hg)	ENGINE INTAKE AIR	=	70.(°F)
DRY BULB TEMP	=	78. (°F)	WET BULB TEMP	=	73. (°F)
ABS HUMIDITY	=	115.56 (GR/LB)	RELATIVE HUMIDITY	=	78. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	9.6
TRACTION MOTOR BLOWER HP	=	21.2
INERTIAL SEPERATOR BLOWER HP	=	3.2
RADIATOR FAN HP	=	9.8
TOTAL ACCESSORY HP	=	47.7

FUEL RATE (OBS) = 396.0 (LB/HR)
ALT. VOLTS = 683. ALT. AMPS = 990. ALT. EFF. = .939
FLYWHEEL HP = 1013.6 OBS. SFC = .3907 AAR CORR. SFC = .3815 (LB/HP-HR)
CALCULATED A/F = 47.22 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	271.	.27	65.PPMC
CO	580.	.57	72. PPM
NOX	10651.	10.51	807. PPM (D)
NOX,CORR	11729.	11.57	
CO2		562.	4.51 PCT
O2			14.77 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.1012	NOX-KH	= 1.0825	NOX-KT	= 1.0000
WET EXH HC CF	= .9555	AIR TEMP CF	= .9955	BAROM CF	= 1.0022
FUEL TEMP CF	= .9850	FUEL S.G. CF	= .9832	FUEL HHV CF	= .9789

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6817.0-102
FILTER PAIR WEIGHT GAIN (mg)	9.985
SAMPLE VOLUME (scf)	37.662
DILUTE PM CONCENTRATION (mg/scf)	.265
CO2-BASED DILUTION FACTOR	5.179
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	1.373
PARTICULATE MASS EMISSION RATE (g/hr)	349.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.344

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 5	TEST CONFIGURATION	=	B20
TEST DATE	=	11/ 1/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	7/10			
SwRI FUEL CODE	=	EM-3004-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.11 (in. Hg)	ENGINE INTAKE AIR	=	71.(°F)
DRY BULB TEMP	=	76. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	112.79 (GR/LB)	RELATIVE HUMIDITY	=	82. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	10.8
TRACTION MOTOR BLOWER HP	=	30.5
INERTIAL SEPERATOR BLOWER HP	=	4.6
RADIATOR FAN HP	=	28.2
TOTAL ACCESSORY HP	=	78.0

FUEL RATE (OBS) = 506.4 (LB/HR)
ALT. VOLTS = 759. ALT. AMPS = 1094. ALT. EFF. = .939
FLYWHEEL HP = 1264.2 OBS. SFC = .4006 AAR CORR. SFC = .3910 (LB/HP-HR)
CALCULATED A/F = 42.75 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	398.	.32	83.PPMC
CO	858.	.68	92. PPM
NOX	14781.	11.69	969. PPM (D)
NOX,CORR	16169.	12.79	
CO2		576.	4.99 PCT
O2			14.02 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0939	NOX-KH	= 1.0766	NOX-KT	= 1.0000
WET EXH HC CF=	.9517	AIR TEMP CF	= .9950	BAROM CF	= 1.0022
FUEL TEMP CF =	.9845	FUEL S.G. CF =	.9832	FUEL HHV CF	= .9789

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6818.0-103
FILTER PAIR WEIGHT GAIN (mg)	9.060
SAMPLE VOLUME (scf)	37.368
DILUTE PM CONCENTRATION (mg/scf)	.242
CO2-BASED DILUTION FACTOR	5.990
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	1.452
PARTICULATE MASS EMISSION RATE (g/hr)	428.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.339

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 6	TEST CONFIGURATION	=	B20
TEST DATE	=	11/ 1/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	B/10			
SwRI FUEL CODE	=	EM-3004-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.10 (in. Hg)	ENGINE INTAKE AIR	=	73.(°F)
DRY BULB TEMP	=	75. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	114.71 (GR/LB)	RELATIVE HUMIDITY	=	84. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	12.2
TRACTION MOTOR BLOWER HP	=	44.0
INERTIAL SEPERATOR BLOWER HP	=	6.6
RADIATOR FAN HP	=	40.7
TOTAL ACCESSORY HP	=	107.4

FUEL RATE (OBS) = 622.0 (LB/HR)
ALT. VOLTS = 838. ALT. AMPS = 1202. ALT. EFF. = .939
FLYWHEEL HP = 1546.4 OBS. SFC = .4022 AAR CORR. SFC = .3923 (LB/HP-HR)
CALCULATED A/F = 38.56 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	576.	.37	108.PPMC
CO	1517.	.98	148. PPM
NOX	18655.	12.06	1107. PPM (D)
NOX,CORR	20499.	13.26	
CO2		578.	5.54 PCT
O2			13.27 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0988	NOX-KH	= 1.0806	NOX-KT	= 1.0000
WET EXH HC CF	= .9471	AIR TEMP CF	= .9941	BAROM CF	= 1.0021
FUEL TEMP CF	= .9850	FUEL S.G. CF	= .9832	FUEL HHV CF	= .9789

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6819.0-104
FILTER PAIR WEIGHT GAIN (mg)	9.911
SAMPLE VOLUME (scf)	36.933
DILUTE PM CONCENTRATION (mg/scf)	.268
CO2-BASED DILUTION FACTOR	6.928
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	1.859
PARTICULATE MASS EMISSION RATE (g/hr)	609.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.394

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 7	TEST CONFIGURATION	=	B20
TEST DATE	=	11/ 1/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	9/10			
SwRI FUEL CODE	=	EM-3004-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.10 (in. Hg)	ENGINE INTAKE AIR	=	72.(°F)
DRY BULB TEMP	=	75. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	114.71 (GR/LB)	RELATIVE HUMIDITY	=	84. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	13.8
TRACTION MOTOR BLOWER HP	=	63.7
INERTIAL SEPERATOR BLOWER HP	=	9.6
RADIATOR FAN HP	=	58.9
TOTAL ACCESSORY HP	=	149.9

FUEL RATE (OBS) = 774.0 (LB/HR)
ALT. VOLTS = 919. ALT. AMPS = 1310. ALT. EFF. = .939
FLYWHEEL HP = 1869.8 OBS. SFC = .4140 AAR CORR. SFC = .4039 (LB/HP-HR)
CALCULATED A/F = 34.71 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	949.	.51	158.PPMC
CO	5935.	3.17	518. PPM
NOX	23202.	12.41	1232. PPM (D)
NOX,CORR	25495.	13.64	
CO2		591.	6.13 PCT
O2			12.52 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0988	NOX-KH	= 1.0806	NOX-KT	= 1.0000
WET EXH HC CF=	.9421	AIR TEMP CF	= .9946	BAROM CF	= 1.0021
FUEL TEMP CF =	.9860	FUEL S.G. CF =	.9832	FUEL HHV CF	= .9789

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6820.0-105
FILTER PAIR WEIGHT GAIN (mg)	12.858
SAMPLE VOLUME (scf)	36.384
DILUTE PM CONCENTRATION (mg/scf)	.353
CO2-BASED DILUTION FACTOR	7.079
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	2.502
PARTICULATE MASS EMISSION RATE (g/hr)	920.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.492

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 8	TEST CONFIGURATION	=	B20
TEST DATE	=	11/ 1/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	10/10			
SwRI FUEL CODE	=	EM-3004-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.10 (in. Hg)	ENGINE INTAKE AIR	=	73.(°F)
DRY BULB TEMP	=	76. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	115.80 (GR/LB)	RELATIVE HUMIDITY	=	84. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	15.1
TRACTION MOTOR BLOWER HP	=	84.0
INERTIAL SEPERATOR BLOWER HP	=	12.6
RADIATOR FAN HP	=	77.7
TOTAL ACCESSORY HP	=	193.4

FUEL RATE (OBS) = 919.5 (LB/HR)
ALT. VOLTS = 974. ALT. AMPS = 1381. ALT. EFF. = .939
FLYWHEEL HP = 2114.9 OBS. SFC = .4348 AAR CORR. SFC = .4240 (LB/HP-HR)
CALCULATED A/F = 31.82 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	1299.	.61	198.PPMC
CO	11715.	5.54	940. PPM
NOX	25730.	12.17	1257. PPM (D)
NOX,CORR	2B345.	13.40	
CO2		616.	6.66 PCT
O2			11.90 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.1016	NOX-KH	= 1.0829	NOX-KT	= 1.0000
WET EXH HC CF	= .9376	AIR TEMP CF	= .9941	BAROM CF	= 1.0021
FUEL TEMP CF	= .9855	FUEL S.G. CF	= .9832	FUEL HHV CF	= .9789

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6821.0-106
FILTER PAIR WEIGHT GAIN (mg)	12.376
SAMPLE VOLUME (scf)	36.221
DILUTE PM CONCENTRATION (mg/scf)	.342
CO2-BASED DILUTION FACTOR	7.907
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	2.702
PARTICULATE MASS EMISSION RATE (g/hr)	10B5.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.513

LOCOMOTIVE TEST SUMMARY

SwRI Project No. 08.02999.001

Test Date 11-1-00

Notch	Idle	DB-2	1	2	3	4	5	6	7	8
Run Number										
Barometer (in. Hg)	29.13	29.12	29.12	29.11	29.10	29.11	29.11	29.10	29.10	29.10
Dry Bulb Temp. (°F)	81.5	80.5	79.9	81.2	80.8	77.9	75.7	75.3	75.3	75.7
Wet Bulb Temp. (°F)	72.2	71.8	71.5	72.1	72.3	72.6	71.5	71.7	71.7	72.0
Fuel Supply Temp. (°F)	95	94	94	94	93	90	91	90	88	89
Water Inlet Temp. (°F)	163	164	162	163	164	169	178	180	183	182
Engine Intake Air @ Filter (°F)	78	78	80	78	77	70	71	73	72	73
Engine Speed (rpm)	259	389	317	390	500	573	646	730	826	906
Traction Volts	2.90	9.17	180	376	495	683	759	838	919	974
Traction Amps	0	0	267	546	713	990	1094	1202	1310	1381
Fuel Rate (lb/hr)	27.0	42.0	52.5	132	221.	396.	506.4	622.	774.	919.5
# of Fans	0	0	0	1	1	1	2	2	2	2
HC (ppmC)	72.63	60.11	55.10	57.60	57.60	65.12	82.65	107.70	157.79	197.86
CO (ppm)	46.73	64.01	53.61	80.43	60.53	72.18	92.40	147.84	517.74	940.31
Raw Exhaust CO_2 (%)	.64	.73	1.10	2.18	2.99	4.51	4.99	5.54	6.13	6.66
NO_x (ppm)	115.34	107.82	171.76	315.74	471.10	806.88	969.27	1106.96	1232.12	1257.15
O_2 (%)	20.03	19.91	19.41	17.91	16.90	14.77	14.02	13.27	12.52	11.90
Tunnel Dilute CO_2 (%)	1790	2144	3188	5786	5428	8912	8490	8186	8805	8490
Background CO_2 (ppm)	557	535	604	675	604	651	604	651	675	604

Notes: 1 - Air compressor locked off.

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Test Configuration: EM-3004-F B20 Run #3

Operator: EJ

LOCOMOTIVE TEST SUMMARY

SwRI Project No.08.02999.001

Test Date 11-1-00

Notch	Idle	DB-2	1	2	3	4	5	6	7	8
Time ~~Run Number~~	12:10	12:25	12:44	12:54	1:06	1:19	1:26	1:36	1:46	1:54
Observed Fuel Rate at X minutes into test point (lb/hr)										
3 min.	27.3	42.5	52.8	135	217	397	500	622	774	918
5 min.	27.6	42.3	53.1	128	216	397	501		774	918
7 min.	28.8	41.3	52.9	132	231	397	501		777	918
Averaged Fuel Rate over Time										
Cumulative Fuel Used (lbs)	3.6	4.2	3.5	6.6	22.1	39.6	42.2	31.1	38.7	61.3
Over X Minutes	8.0	6.0	4.0	3.0	6.0	6.0	5.0	3.0	3.0	4.0
x 60. = Fuel Rate (lb/hr)	27.0	42.0	52.5	132	221	396.	506.4	622	774.	919.5
Traction Volts	2.90	9.17	180	376	495	683	759	838	919	974
Current Shunt mV	0	0	3.34	6.83	8.907	12.378	13.678	15.024	16.372	17.261
Traction Current = Shunt mV * 80.	0	0	267	546	713	990	1094	1202	1310	1381
Right Airbox Temp., °F	125	123	123	121	126	126	133	143	154	173
Left Airbox Temp., °F	104	103	101	100	109	111	121	134	151	173
~~Airbox~~ Pressure, in. Hg						1.43	1.92	2.66	3.66	
Left Exhaust Temperature, °F										
Right Exhaust Temperature, °F										
SS Smoke, % Opacity	0	0	0	2.5	1.6	2.8	3.3	2.5	2.7	3.9
Notes: 1 - Air compressor locked off.	475	1720	2805	3175	3840	4460	5102	5700	6277	6770

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RAIN

Test Configuration: EM-3004-F B20 Run #3

Operator: CH

303.prn

APPENDIX D

C20 TEST RESULTS

CSX #2629 EMD GP38 EMD 16-645-E3
Tested 10/27/00 @ SwRI, C20 Fuel (EM-3005-F)

AAR 3x3 Weighted Results

Notch	Gross HP	obs Fuel Rate (lb/hr)	HC (g/hr)	CO (g/hr)	Corr. NOx (g/hr)	PM (g/hr)	AAR Corr bsfc	Corr. Fuel Rate (lb/hr)	WF	w-BHP	obs w-Fuel w-(lb/hr)	corr w-Fuel w-(lb/hr)	w-HC w-(g/hr)	w-CO w-(g/hr)	w-NOx w-(g/hr)	w-PM w-(g/hr)
8	2,075	894	1,277	12,727	26,431	1,201	0.424	881	25.0%	518.7	223.5	220.1	319.3	3181.8	6607.8	300.3
7	1,855	760	961	5,503	23,969	987	0.404	749	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	1,526	610	653	1,469	19,213	575	0.394	601	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	1,256	490	436	882	15,127	418	0.385	483	25.0%	313.9	122.5	120.8	109.0	220.5	3781.8	104.5
4	1,005	394	329	564	11,589	333	0.387	389	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	583	232	230	443	5,788	160	0.393	229	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	315	134	149	438	3,034	91	0.420	132	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	83	53	131	228	1,281	20	0.626	52	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Idle	11	26	104	168	707	10	2.373	25	50.0%	5.3	12.8	12.6	52.0	84.0	353.5	5.0
DB-2	18	43	162	326	998	21	2.332	42	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
						sum =			100.0%	837.9	358.8	353.5	480.3	3486.3	10743.0	409.8

AAR 3x3 duty cycle weighted brake-specific emissions = 0.428 obs bsfc, 0.422 corr bsfc, 0.57, 4.16, 12.82, 0.489

EPA Switcher Duty Cycle Weighted Results

Notch	WF	w-BHP	obs w-Fuel w-(lb/hr)	corr w-Fuel w-(lb/hr)	w-HC w-(g/hr)	w-CO w-(g/hr)	w-NOx w-(g/hr)	w-PM w-(g/hr)
8	0.8%	16.6	7.2	7.0	10.2	101.8	211.4	9.6
7	0.2%	3.7	1.5	1.5	1.9	11.0	47.9	2.0
6	1.5%	22.9	9.2	9.0	9.8	22.0	288.2	8.6
5	3.6%	45.2	17.6	17.4	15.7	31.8	544.6	15.0
4	3.6%	36.2	14.2	14.0	11.8	20.3	417.2	12.0
3	5.8%	33.8	13.5	13.3	13.3	25.7	335.7	9.3
2	12.3%	38.7	16.5	16.3	18.3	53.9	373.2	11.2
1	12.4%	10.3	6.5	6.4	16.2	28.3	158.8	2.5
Idle	59.8%	6.3	15.2	15.0	62.2	100.5	422.8	6.0
DB	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
sum =	100.0%	213.7	101.3	99.9	159.6	395.2	2799.9	76.2

EPA switcher duty cycle weighted brake-specific emissions = 0.474 obs bsfc, 0.468 corr bsfc, 0.75, 1.85, 13.10, 0.357

EPA Freight Duty Cycle Weighted Results

Notch	WF	w-BHP	obs w-Fuel w-(lb/hr)	corr w-Fuel w-(lb/hr)	w-HC w-(g/hr)	w-CO w-(g/hr)	w-NOx w-(g/hr)	w-PM w-(g/hr)
8	16.2%	336.1	144.8	142.6	206.9	2061.8	4281.8	194.6
7	3.0%	55.6	22.8	22.5	28.8	165.1	719.1	29.6
6	3.9%	59.5	23.8	23.4	25.5	57.3	749.3	22.4
5	3.8%	47.7	18.6	18.4	16.6	33.5	574.8	15.9
4	4.4%	44.2	17.3	17.1	14.5	24.8	509.9	14.7
3	5.2%	30.3	12.1	11.9	12.0	23.0	301.0	8.3
2	6.5%	20.4	8.7	8.6	9.7	28.5	197.2	5.9
1	6.5%	5.4	3.4	3.4	8.5	14.8	83.3	1.3
Idle	38.0%	4.0	9.7	9.6	39.5	63.8	268.7	3.8
DB	12.5%	2.3	5.4	5.3	20.3	40.8	124.8	2.6
sum =	100.0%	605.6	266.6	262.8	382.1	2513.4	7809.8	299.1

EPA freight duty cycle weighted brake-specific emissions = 0.440 obs bsfc, 0.434 corr bsfc, 0.63, 4.15, 12.89, 0.494

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	IDLE	TEST CONFIGURATION	=	C20
TEST DATE	=	10/27/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	1/10			
SwRI FUEL CODE	=	EM-3005-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.25 (in. Hg)	ENGINE INTAKE AIR	=	77.(°F)
DRY BULB TEMP	=	75. (°F)	WET BULB TEMP	=	71. (°F)
ABS HUMIDITY	=	113.51 (GR/LB)	RELATIVE HUMIDITY	=	86. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	4.3
TRACTION MOTOR BLOWER HP	=	2.0
INERTIAL SEPERATOR BLOWER HP	=	.3
RADIATOR FAN HP	=	.0
TOTAL ACCESSORY HP	=	10.6

FUEL RATE (OBS) = 25.5 (LB/HR)
ALT. VOLTS = 3. ALT. AMPS = 0. ALT. EFF. = .939
FLYWHEEL HP = 10.6 OBS. SFC = 2.4080 AAR CORR. SFC = 2.3728 (LB/HP-HR)
CALCULATED A/F = 322.81 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	104.	9.78	58.PPMC
CO	168.	15.88	47. PPM
NOX	637.	60.19	108. PPM (D)
NOX,CORR	707.	66.77	
CO2		3418.	.64 PCT
O2			20.03 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.1093	NOX-KH	= 1.0891	NOX-KT	= 1.0000
WET EXH HC CF=	.9888	AIR TEMP CF	= .9923	BAROM CF	= 1.0034
FUEL TEMP CF =	.9825	FUEL S.G. CF	= 1.0049	FUEL HHV CF	= .9896

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6732.0-17
FILTER PAIR WEIGHT GAIN (mg)	.940
SAMPLE VOLUME (scf)	38.719
DILUTE PM CONCENTRATION (mg/scf)	.024
CO2-BASED DILUTION FACTOR	3.814
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.093
PARTICULATE MASS EMISSION RATE (g/hr)	10.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.961

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	DB2	TEST CONFIGURATION	=	C20
TEST DATE	=	10/27/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	2/10			
SwRI FUEL CODE	=	EM-3005-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.25 (in. Hg)	ENGINE INTAKE AIR	=	75.(°F)
DRY BULB TEMP	=	75. (°F)	WET BULB TEMP	=	71. (°F)
ABS HUMIDITY	=	113.51 (GR/LB)	RELATIVE HUMIDITY	=	86. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	6.5
TRACTION MOTOR BLOWER HP	=	6.7
INERTIAL SEPERATOR BLOWER HP	=	1.0
RADIATOR FAN HP	=	.0
TOTAL ACCESSORY HP	=	18.2

FUEL RATE (OBS) = 43.0 (LB/HR)
ALT. VOLTS = 8. ALT. AMPS = 0. ALT. EFF. = .939
FLYWHEEL HP = 18.2 OBS. SFC = 2.3647 AAR CORR. SFC = 2.3322 (LB/HP-HR)
CALCULATED A/F = 286.92 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	162.	8.91	60.PPMC
CO	326.	17.95	61. PPM
NOX	899.	49.46	102. PPM (D)
NOX,CORR	998.	54.86	
CO2		3355.	.72 PCT
O2			20.03 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.1090	NOX-KH	= 1.0889	NOX-KT	= 1.0000
WET EXH HC CF=	.9881	AIR TEMP CF	= .9932	BAROM CF	= 1.0034
FUEL TEMP CF =	.9825	FUEL S.G. CF	= 1.0049	FUEL HHV CF	= .9896

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6733.0-18
FILTER PAIR WEIGHT GAIN (mg)	1.219
SAMPLE VOLUME (scf)	38.660
DILUTE PM CONCENTRATION (mg/scf)	.032
CO2-BASED DILUTION FACTOR	4.094
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.129
PARTICULATE MASS EMISSION RATE (g/hr)	21.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	1.170

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 1	TEST CONFIGURATION	=	C20
TEST DATE	=	10/27/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	3/10			
SwRI FUEL CODE	=	EM-3005-F	FUEL H/C RATIO	=	1.B1
BAROMETER	=	29.26 (in. Hg)	ENGINE INTAKE AIR	=	75.(°F)
DRY BULB TEMP	=	76. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	113.10 (GR/LB)	RELATIVE HUMIDITY	=	B3. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	5.3
TRACTION MOTOR BLOWER HP	=	3.6
INERTIAL SEPERATOR BLOWER HP	=	.5
RADIATOR FAN HP	=	.0
TOTAL ACCESSORY HP	=	13.4

FUEL RATE (08S) = 52.5 (LB/HR)
ALT. VOLTS = 181. ALT. AMPS = 268. ALT. EFF. = .939
FLYWHEEL HP = 82.7 OBS. SFC = .6345 AAR CORR. SFC = .6258 (LB/HP-HR)
CALCULATED A/F = 198.30 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	131.	1.59	58.PPMC
CO	22B.	2.75	50. PPM
NOX	1159.	14.01	155. PPM (D)
NOX,CORR	1281.	15.48	
CO2		906.	1.05 PCT
O2			19.53 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.1046	NOX-KH	= 1.0853	NOX-KT	= 1.0000
WET EXH HC CF	= .9B52	AIR TEMP CF	= .9932	BAROM CF	= 1.0035
FUEL TEMP CF	= .9835	FUEL S.G. CF	= 1.0049	FUEL HHV CF	= .9B96

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6734.0-19
FILTER PAIR WEIGHT GAIN (mg)	1.665
SAMPLE VOLUME (scf)	3B.378
DILUTE PM CONCENTRATION (mg/scf)	.043
CO2-BASED DILUTION FACTOR	3.339
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.145
PARTICULATE MASS EMISSION RATE (g/hr)	20.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.244

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 2	TEST CONFIGURATION	=	C20
TEST DATE	=	10/27/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	4/10			
SwRI FUEL CODE	=	EM-3005-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.26 (in. Hg)	ENGINE INTAKE AIR	=	75.(°F)
DRY BULB TEMP	=	76. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	112.48 (GR/LB)	RELATIVE HUMIDITY	=	81. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	6.5
TRACTION MOTOR BLOWER HP	=	6.7
INERTIAL SEPERATOR BLOWER HP	=	1.0
RADIATOR FAN HP	=	3.1
TOTAL ACCESSORY HP	=	21.4

FUEL RATE (OBS) = 134.0 (LB/HR)
ALT. VOLTS = 376. ALT. AMPS = 546. ALT. EFF. = .939
FLYWHEEL HP = 314.6 OBS. SFC = .4259 AAR CORR. SFC = .4201 (LB/HP-HR)
CALCULATED A/F = 96.41 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	149.	.48	53.PPMC
CO	438.	1.39	78. PPM
NOX	2771.	8.81	301. PPM (D)
NOX,CORR	3034.	9.64	
CO2		611.	2.18 PCT
O2			17.91 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0947	NOX-KH	= 1.0773	NOX-KT	= 1.0000
WET EXH HC CF=	.9754	AIR TEMP CF	= .9932	BAROM CF	= 1.0035
FUEL TEMP CF =	.9830	FUEL S.G. CF	= 1.0049	FUEL HHV CF	= .9896

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6735.0-20
FILTER PAIR WEIGHT GAIN (mg)	4.701
SAMPLE VOLUME (scf)	38.300
DILUTE PM CONCENTRATION (mg/scf)	.123
CO2-BASED DILUTION FACTOR	4.269
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.524
PARTICULATE MASS EMISSION RATE (g/hr)	91.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.289

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 3	TEST CONFIGURATION	=	C20
TEST DATE	=	10/27/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	5/10			
SwRI FUEL CODE	=	EM-3005-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.27 (in. Hg)	ENGINE INTAKE AIR	=	73.(°F)
DRY BULB TEMP	=	76. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	114.46 (GR/LB)	RELATIVE HUMIDITY	=	81. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	8.3
TRACTION MOTOR BLOWER HP	=	14.2
INERTIAL SEPERATOR BLOWER HP	=	2.1
RADIATOR FAN HP	=	6.6
TOTAL ACCESSORY HP	=	35.2

FUEL RATE (OBS) = 232.0 (LB/HR)
ALT. VOLTS = 513. ALT. AMPS = 747. ALT. EFF. = .939
FLYWHEEL HP = 582.6 OBS. SFC = .3982 AAR CORR. SFC = .3931 (LB/HP-HR)
CALCULATED A/F = 71.62 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	230.	.39	63.PPMC
CO	443.	.76	62. PPM
NOX	5268.	9.04	446. PPM (D)
NOX,CORR	5788.	9.93	
CO2		572.	2.95 PCT
O2			16.90 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0989	NOX-KH	= 1.0806	NOX-KT	= 1.0000
WET EXH HC CF	= .9687	AIR TEMP CF	= .9941	BAROM CF	= 1.0035
FUEL TEMP CF	= .9835	FUEL S.G. CF	= 1.0049	FUEL HHV CF	= .9896

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6736.0-21
FILTER PAIR WEIGHT GAIN (mg)	5.614
SAMPLE VOLUME (scf)	38.287
DILUTE PM CONCENTRATION (mg/scf)	.147
CO2-BASED DILUTION FACTOR	4.853
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.712
PARTICULATE MASS EMISSION RATE (g/hr)	160.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.274

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 4	TEST CONFIGURATION	=	C20
TEST DATE	=	10/27/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	6/10			
SwRI FUEL CODE	=	EM-3005-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.27 (in. Hg)	ENGINE INTAKE AIR	=	74.(°F)
DRY BULB TEMP	=	77. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	111.99 (GR/LB)	RELATIVE HUMIDITY	=	79. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	9.6
TRACTION MOTOR BLOWER HP	=	21.4
INERTIAL SEPERATOR BLOWER HP	=	3.2
RADIATOR FAN HP	=	9.9
TOTAL ACCESSORY HP	=	48.1

FUEL RATE (OBS) = 394.0 (LB/HR)
ALT. VOLTS = 681. ALT. AMPS = 984. ALT. EFF. = .939
FLYWHEEL HP = 1005.4 OBS. SFC = .3919 AAR CORR. SFC = .3867 (LB/HP-HR)
CALCULATED A/F = 48.48 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	329.	.33	78.PPMC
CO	564.	.56	69. PPM
NOX	10614.	10.56	787. PPM (D)
NOX,CORR	11589.	11.53	
CO2		563.	4.39 PCT
O2			14.90 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0919	NOX-KH	= 1.0750	NOX-KT	= 1.0000
WET EXH HC CF	= .9567	AIR TEMP CF	= .9937	BAROM CF	= 1.0035
FUEL TEMP CF	= .9835	FUEL S.G. CF	= 1.0049	FUEL HHV CF	= .9896

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6737.0-22
FILTER PAIR WEIGHT GAIN (mg)	B.197
SAMPLE VOLUME (scf)	37.731
DILUTE PM CONCENTRATIDN (mg/scf)	.217
CO2-BASED DILUTION FACTOR	5.916
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	1.285
PARTICULATE MASS EMISSION RATE (g/hr)	333.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.332

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 5	TEST CONFIGURATION	=	C20
TEST DATE	=	10/27/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	7/10			
SwRI FUEL CODE	=	EM-3005-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.26 (in. Hg)	ENGINE INTAKE AIR	=	76.(°F)
DRY BULB TEMP	=	78. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	111.15 (GR/LB)	RELATIVE HUMIDITY	=	75. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	10.8
TRACTION MOTOR BLOWER HP	=	30.6
INERTIAL SEPERATOR BLOWER HP	=	4.6
RADIATOR FAN HP	=	28.3
TOTAL ACCESSORY HP	=	78.3

FUEL RATE (OBS) = 490.0 (LB/HR)
ALT. VOLTS = 756. ALT. AMPS = 1090. ALT. EFF. = .939
FLYWHEEL HP = 1255.5 OBS. SFC = .3903 AAR CORR. SFC = .3848 (LB/HP-HR)
CALCULATED A/F = 43.16 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	436.	.35	93.PPMC
CO	882.	.70	97. PPM
NOX	13883.	11.06	932. PPM (D)
NOX,CORR	15127.	12.05	
CO2		561.	4.94 PCT
O2			14.51 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0897	NOX-KH	= 1.0732	NOX-KT	= 1.0000
WET EXH HC CF=	.9522	AIR TEMP CF	= .9928	BAROM CF	= 1.0035
FUEL TEMP CF =	.9860	FUEL S.G. CF	= 1.0049	FUEL HHV CF	= .9896

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6738.0-23
FILTER PAIR WEIGHT GAIN (mg)	8.511
SAMPLE VOLUME (scf)	37.543
DILUTE PM CONCENTRATION (mg/scf)	.227
CO2-BASED DILUTION FACTOR	6.398
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	1.450
PARTICULATE MASS EMISSION RATE (g/hr)	418.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.333

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 6	TEST CONFIGURATION	=	C20
TEST DATE	=	10/27/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	8/10			
SwRI FUEL CODE	=	EM-3005-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.26 (in. Hg)	ENGINE INTAKE AIR	=	77.(°F)
DRY BULB TEMP	=	79. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	109.08 (GR/LB)	RELATIVE HUMIDITY	=	71. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	12.2
TRACTION MOTOR BLOWER HP	=	44.1
INERTIAL SEPERATOR BLOWER HP	=	6.6
RADIATOR FAN HP	=	40.8
TOTAL ACCESSORY HP	=	107.6

FUEL RATE (OBS) = 610.0 (LB/HR)
ALT. VOLTS = 833. ALT. AMPS = 1192. ALT. EFF. = .939
FLYWHEEL HP = 1526.1 OBS. SFC = .3997 AAR CORR. SFC = .3939 (LB/HP-HR)
CALCULATED A/F = 39.10 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	653.	.43	123.PPMC
CO	1469.	.96	144. PPM
NOX	17719.	11.61	1057. PPM (D)
NOX,CORR	19213.	12.59	
CO2		574.	5.46 PCT
O2			13.40 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0843	NOX-KH	= 1.0689	NOX-KT	= 1.0000
WET EXH HC CF=	.9480	AIR TEMP CF	= .9923	BAROM CF	= 1.0035
FUEL TEMP CF =	.9855	FUEL S.G. CF	= 1.0049	FUEL HHV CF	= .9896

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6739.0-24
FILTER PAIR WEIGHT GAIN (mg)	8.732
SAMPLE VOLUME (scf)	37.202
DILUTE PM CONCENTRATION (mg/scf)	.235
CO2-BASED DILUTION FACTOR	7.527
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	1.767
PARTICULATE MASS EMISSION RATE (g/hr)	575.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.377

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 7	TEST CONFIGURATION	=	C20
TEST DATE	=	10/27/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	9/10			
SwRI FUEL CODE	=	EM-3005-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.26 (in. Hg)	ENGINE INTAKE AIR	=	77.(°F)
DRY BULB TEMP	=	79. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	109.26 (GR/LB)	RELATIVE HUMIDITY	=	71. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	13.8
TRACTION MOTOR BLOWER HP	=	63.8
INERTIAL SEPERATOR BLOWER HP	=	9.6
RADIATOR FAN HP	=	59.0
TOTAL ACCESSORY HP	=	150.2

FUEL RATE (OBS) = 760.0 (LB/HR)
ALT. VOLTS = 915. ALT. AMPS = 1304. ALT. EFF. = .939
FLYWHEEL HP = 1854.7 OBS. SFC = .4098 AAR CORR. SFC = .4038 (LB/HP-HR)
CALCULATED A/F = 34.72 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	961.	.52	163.PPMC
CO	5503.	2.97	489. PPM
NOX	22097.	11.91	1195. PPM (D)
NOX,CORR	23969.	12.92	
CO2		585.	6.13 PCT
O2			12.52 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0847	NOX-KH	= 1.0692	NOX-KT	= 1.0000
WET EXH HC CF	= .9423	AIR TEMP CF	= .9923	BAROM CF	= 1.0035
FUEL TEMP CF	= .9870	FUEL S.G. CF	= 1.0049	FUEL HHV CF	= .9896

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6740.0-25
FILTER PAIR WEIGHT GAIN (mg)	14.233
SAMPLE VOLUME (scf)	36.514
DILUTE PM CONCENTRATION (mg/scf)	.390
CO2-BASED DILUTION FACTOR	7.008
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	2.732
PARTICULATE MASS EMISSION RATE (g/hr)	987.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.532

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 8	TEST CONFIGURATION	=	C20
TEST DATE	=	10/27/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	10/10			
SwRI FUEL CODE	=	EM-3005-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.26 (in. Hg)	ENGINE INTAKE AIR	=	78.(°F)
DRY BULB TEMP	=	79. (°F)	WET BULB TEMP	=	72. (°F)
ABS HUMIDITY	=	108.84 (GR/LB)	RELATIVE HUMIDITY	=	71. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	15.1
TRACTION MOTOR BLOWER HP	=	83.9
INERTIAL SEPERATOR BLOWER HP	=	12.6
RADIATOR FAN HP	=	77.6
TOTAL ACCESSORY HP	=	193.3

FUEL RATE (OBS) = 894.0 (LB/HR)
ALT. VOLTS = 967. ALT. AMPS = 1362. ALT. EFF. = .939
FLYWHEEL HP = 2074.8 OBS. SFC = .4309 AAR CORR. SFC = .4244 (LB/HP-HR)
CALCULATED A/F = 32.62 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	1277.	.62	195.PPMC
CO	12727.	6.13	1024. PPM
NOX	24391.	11.76	1195. PPM (D)
NOX,CORR	26431.	12.74	
CO2		610.	6.48 PCT
O2			11.90 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0836	NOX-KH	= 1.0683	NOX-KT	= 1.0000
WET EXH HC CF=	.9393	AIR TEMP CF	= .9919	BAROM CF	= 1.0035
FUEL TEMP CF =	.9865	FUEL S.G. CF	= 1.0049	FUEL HHV CF	= .9896

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6741.0-26
FILTER PAIR WEIGHT GAIN (mg)	13.948
SAMPLE VOLUME (scf)	35.600
DILUTE PM CONCENTRATION (mg/scf)	.392
CO2-BASED DILUTION FACTOR	7.662
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	3.002
PARTICULATE MASS EMISSION RATE (g/hr)	1201.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.579

LOCOMOTIVE TEST SUMMARY

SwRI Project No. 08.02999.001

Test Date 10-27-00

Notch	Idle	DB-2	1	2	3	4	5	6	7	8
Run Number										
Barometer (in. Hg)	29.25	29.25	29.26	29.26	29.27	29.27	29.26	29.26	29.26	29.26
Dry Bulb Temp. (°F)	74.6	74.7	75.5	76.2	76.4	76.8	78.0	79.2	79.1	78.0
Wet Bulb Temp. (°F)	71.4	71.3	71.6	71.7	72.1	71.8	72.0	72.0	72.0	71.9
Fuel Supply Temp. (°F)	95	95	93	94	93	93	88	89	86	87
Water Inlet Temp. (°F)	163	162	170	170	162	169	180	177	183	180
Engine Intake Air @ Filter (°F)	77	75	75	75	73	74	76	77	77	78
Engine Speed (rpm)	259	389	317	390	500	574	647	731	827	906
Traction Volts	2.82	7.70	181	376	513	681	756	833	915	967
Traction Amps	0	0	268	546	747	984	1090	1192	1304	1362
Fuel Rate (lb/hr)	25.5	43.0	52.5	134	232	394	490	610	760	894
# of Fans	0	0	0	1	1	1	2	2	2	2
HC (ppmC)	57.60	60.11	57.60	52.60	62.61	77.64	92.67	122.72	162.80	195.35
CO (ppm)	46.73	60.53	50.17	78.07	61.69	68.67	97.25	143.91	488.74	1024.26
Raw Exhaust CO_2 (%)	.64	.72	1.05	2.18	2.95	4.39	4.94	5.46	6.13	6.48
NO_x (ppm)	107.82	101.55	~~155.36~~ 155.36	300.70	446.04	786.83	931.71	1056.90	1194.57	1194.57
O_2 (%)	20.03	20.03	19.53	17.91	16.90	14.90	14.51	13.40	12.52	11.90
Tunnel Dilute CO_2 (%)	2107	2144	3529	5428	6399	7608	7892	7424	8805	8490
Background CO_2 (ppm)	604	535	604	557	604	557	581	581	581	557

Notes: 1 - Air compressor locked off.

u:/fritz/wp/csx2629.fm1 9/2000

Test Configuration: EM-3005-F C20 Run #1

Operator: EJ

LOCOMOTIVE TEST SUMMARY

SwRI Project No.08.02999.001

Test Date 10-27-00

Notch	Idle	DB-2	1	2	3	4	5	6	7	8
Time ~~Run Number~~	9:27	9:42	9:54	10:06	10:16	10:25	10:37	10:48	10:59	11:10
Observed Fuel Rate at X minutes into test point (lb/hr)										
3 min.	26.4	43.4	52.3	133	233	390	489	608	756	894
5 min.	26.0	44.3	53.3	135	233	392	490	609	755	894
7 min.	25.2	42.1	53.3	134	232	392	489	610	757	890
Averaged Fuel Rate over Time										
Cumulative Fuel Used (lbs)	3.4	4.3	3.5	6.7	11.6	19.7	24.5	30.5	38.0	44.7
Over X Minutes	8.0	6.0	4.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
x 60. = Fuel Rate (lb/hr)	25.5	43.0	52.5	134	232	394	490	610	760	894
Traction Volts	2.82	7.70	181	376	513	681	756	833	915	967
Current Shunt mV	0	0	3.35	6.83	9.34	12.30	13.62	14.90	16.30	17.03
Traction Current = Shunt mV * 80.	0	0	268	546	747	984	1090	1192	1304	1362
Right Airbox Temp., °F	120	120	117	121	121	127	134	143	159	173
Left Airbox Temp., °F	94	99	93	99	103	112	124	137	157	174
Airbox Pressure, in. Hg	.89	1.89	1.33	1.90	2.97	4.01	5.19	6.81	9.09	11.23
Left Exhaust Temperature, °F										
Right Exhaust Temperature, °F										
SS Smoke, % Opacity	0	0	0	1.8	1.8	2.7	2.1	2.3	3.5	4.5
	30.0	940	1745	2360	2955	3550	4240	4910	5570	6186

Notes: 1 - Air compressor locked off.

u:/fritz/wp/csx2629.fm2 9/2000

Test Configuration: EM-3005-F C20 Run #1

Operator: [illegible]

293.prn

CSX #2629 EMD GP38 EMD 16-645-E3
Tested 10/30/00 @ SwRI, C20 Fuel (EM-3005-F)

AAR 3x3 Weighted Results

Notch	Gross HP	obs Fuel Rate (lb/hr)	HC (g/hr)	CO (g/hr)	Corr. NOx (g/hr)	PM (g/hr)	AAR Corr bsfc	Corr. Fuel Rate (lb/hr)	WF	w-BHP	obs w-Fuel w-(lb/hr)	corr w-Fuel w-(lb/hr)	w-HC w-(g/hr)	w-CO w-(g/hr)	w-NOx w-(g/hr)	w-PM w-(g/hr)
8	2,079	890	1,255	11,828	25,926	1,152	0.420	874	25.0%	519.8	222.5	218.4	313.8	2957.0	6481.5	288.0
7	1,837	752	934	5,689	24,132	853	0.402	738	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	1,519	606	595	1,472	19,272	517	0.392	595	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	1,248	486	405	855	14,610	366	0.383	477	25.0%	311.9	121.5	119.3	101.3	213.8	3652.5	91.5
4	1,002	386	319	547	11,488	438	0.379	379	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	587	228	214	374	5,791	156	0.382	224	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	321	134	145	433	3,068	90	0.410	131	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	83	54	131	359	1,292	21	0.637	53	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Idle	11	29	130	151	828	21	2.745	29	50.0%	5.3	14.7	14.4	65.0	75.5	414.0	10.5
DB-2	18	39	147	251	922	19	2.136	38	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
						sum =			100.0%	836.9	358.7	352.2	480.0	3246.3	10548.0	390.0
AAR 3x3 duty cycle weighted brake-specific emissions =											0.429 obs bsfc	0.421 corr bsfc	0.57	3.88	12.60	0.466

EPA Switcher Duty Cycle Weighted Results

Notch	WF	w-BHP	obs w-Fuel w-(lb/hr)	corr w-Fuel w-(lb/hr)	w-HC w-(g/hr)	w-CO w-(g/hr)	w-NOx w-(g/hr)	w-PM w-(g/hr)
8	0.8%	16.6	7.1	7.0	10.0	94.6	207.4	9.2
7	0.2%	3.7	1.5	1.5	1.9	11.4	48.3	1.7
6	1.5%	22.8	9.1	8.9	8.9	22.1	289.1	7.8
5	3.6%	44.9	17.5	17.2	14.6	30.8	526.0	13.2
4	3.6%	36.1	13.9	13.7	11.5	19.7	413.6	15.8
3	5.8%	34.0	13.2	13.0	12.4	21.7	335.9	9.0
2	12.3%	39.5	16.5	16.2	17.8	53.3	377.4	11.1
1	12.4%	10.3	6.7	6.6	16.2	44.5	160.2	2.6
Idle	59.8%	6.3	17.5	17.2	77.7	90.3	495.1	12.6
DB	0.0%	0.0	0.0	0.0	0.0	0.0	0.0	0.0
sum =	100.0%	214.1	103.0	101.2	171.1	388.3	2852.9	82.9
EPA switcher duty cycle weighted brake-specific emissions =			0.481 obs bsfc	0.473 corr bsfc	0.80	1.81	13.32	0.387

EPA Freight Duty Cycle Weighted Results

Notch	WF	w-BHP	obs w-Fuel w-(lb/hr)	corr w-Fuel w-(lb/hr)	w-HC w-(g/hr)	w-CO w-(g/hr)	w-NOx w-(g/hr)	w-PM w-(g/hr)
8	16.2%	336.8	144.2	141.5	203.3	1916.1	4200.0	186.6
7	3.0%	55.1	22.6	22.1	28.0	170.7	724.0	25.6
6	3.9%	59.2	23.6	23.2	23.2	57.4	751.6	20.2
5	3.8%	47.4	18.5	18.1	15.4	32.5	555.2	13.9
4	4.4%	44.1	17.0	16.7	14.0	24.1	505.5	19.3
3	5.2%	30.5	11.9	11.6	11.1	19.4	301.1	8.1
2	6.5%	20.9	8.7	8.5	9.4	28.1	199.4	5.9
1	6.5%	5.4	3.5	3.4	8.5	23.3	84.0	1.4
Idle	38.0%	4.0	11.1	11.0	49.4	57.4	314.6	8.0
DB	12.5%	2.2	4.9	4.8	18.4	31.4	115.3	2.4
sum =	100.0%	605.7	265.9	261.1	380.8	2360.5	7750.7	291.2
EPA freight duty cycle weighted brake-specific emissions =			0.439 obs bsfc	0.431 corr bsfc	0.63	3.90	12.80	0.481

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	IDLE	TEST CONFIGURATION	=	C20
TEST DATE	=	10/30/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	1/10			
SwRI FUEL CODE	=	EM-3005-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.19 (in. Hg)	ENGINE INTAKE AIR	=	90.(°F)
DRY BULB TEMP	=	86. (°F)	WET BULB TEMP	=	70. (°F)
ABS HUMIDITY	=	87.22 (GR/LB)	RELATIVE HUMIDITY	=	45. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	4.3
TRACTION MOTOR BLOWER HP	=	1.9
INERTIAL SEPERATOR BLOWER HP	=	.3
RADIATOR FAN HP	=	.0
TOTAL ACCESSORY HP	=	10.5

FUEL RATE (OBS) = 29.3 (LB/HR)
ALT. VOLTS = 3. ALT. AMPS = 0. ALT. EFF. = .939
FLYWHEEL HP = 10.5 OBS. SFC = 2.8034 AAR CORR. SFC = 2.7447 (LB/HP-HR)
CALCULATED A/F = 313.29 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	130.	12.48	65.PPMC
CO	151.	14.44	38. PPM
NOX	802.	76.70	122. PPM (D)
NOX,CORR	828.	79.26	
CO2		3982.	.66 PCT
O2			20.03 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0334	NOX-KH	= 1.0274	NOX-KT	= 1.0000
WET EXH HC CF=	.9899	AIR TEMP CF	= .9865	BAROM CF	= 1.0029
FUEL TEMP CF =	.9B00	FUEL S.G. CF	= 1.0049	FUEL HHV CF	= .9896

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6782.0-67
FILTER PAIR WEIGHT GAIN (mg)	1.047
SAMPLE VOLUME (scf)	25.842
DILUTE PM CONCENTRATION (mg/scf)	.041
CO2-BASED DILUTION FACTOR	4.306
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.174
PARTICULATE MASS EMISSION RATE (g/hr)	21.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	2.046

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	DB2	TEST CONFIGURATION	=	C20
TEST DATE	=	10/30/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	2/10			
SwRI FUEL CODE	=	EM-3005-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.19 (in. Hg)	ENGINE INTAKE AIR	=	90.(°F)
DRY BULB TEMP	=	85. (°F)	WET BULB TEMP	=	70. (°F)
ABS HUMIDITY	=	89.04 (GR/LB)	RELATIVE HUMIDITY	=	4B. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	6.4
TRACTION MOTOR BLOWER HP	=	6.5
INERTIAL SEPERATOR BLOWER HP	=	1.0
RADIATOR FAN HP	=	.0
TOTAL ACCESSORY HP	=	17.9

FUEL RATE (OBS) = 39.0 (LB/HR)
ALT. VOLTS = 8. ALT. AMPS = 0. ALT. EFF. = .939
FLYWHEEL HP = 17.9 OBS. SFC = 2.1821 AAR CORR. SFC = 2.1364 (LB/HP-HR)
CALCULATED A/F = 2B7.2B (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	147.	8.23	60.PPMC
CO	251.	14.06	51. PPM
NOX	887.	49.65	110. PPM (D)
NOX,CORR	922.	51.56	
CO2		3100.	.72 PCT
O2			20.03 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0384	NOX-KH	= 1.0315	NOX-KT	= 1.0000
WET EXH HC CF	= .9893	AIR TEMP CF	= .9865	BAROM CF	= 1.0029
FUEL TEMP CF	= .9825	FUEL S.G. CF	= 1.0049	FUEL HHV CF	= .9B96

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6783.0-68
FILTER PAIR WEIGHT GAIN (mg)	1.194
SAMPLE VOLUME (scf)	39.013
DILUTE PM CONCENTRATION (mg/scf)	.031
CO2-BASED DILUTION FACTOR	4.236
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.130
PARTICULATE MASS EMISSION RATE (g/hr)	19.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	1.085

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 1	TEST CONFIGURATION	=	C20
TEST DATE	=	10/30/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	3/10			
SwRI FUEL CODE	=	EM-3005-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.19 (in. Hg)	ENGINE INTAKE AIR	=	85.(°F)
DRY BULB TEMP	=	85. (°F)	WET BULB TEMP	=	71. (°F)
ABS HUMIDITY	=	90.40 (GR/LB)	RELATIVE HUMIDITY	=	48. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	5.3
TRACTION MOTOR BLOWER HP	=	3.5
INERTIAL SEPERATOR BLOWER HP	=	.5
RADIATOR FAN HP	=	.0
TOTAL ACCESSORY HP	=	13.3

FUEL RATE (OBS) = 54.0 (LB/HR)
ALT. VOLTS = 182. ALT. AMPS = 269. ALT. EFF. = .939
FLYWHEEL HP = 83.2 OBS. SFC = .6491 AAR CORR. SFC = .6370 (LB/HP-HR)
CALCULATED A/F = 192.36 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	131.	1.57	58.PPMC
CO	359.	4.32	79. PPM
NOX	1241.	14.92	167. PPM (D)
NOX,CORR	1292.	15.53	
CO2		925.	1.08 PCT
O2			19.53 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0409	NOX-KH	= 1.0335	NOX-KT	= 1.0000
WET EXH HC CF=	.9860	AIR TEMP CF	= .9887	BAROM CF	= 1.0029
FUEL TEMP CF =	.9830	FUEL S.G. CF	= 1.0049	FUEL HHV CF	= .9896

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6784.0-69
FILTER PAIR WEIGHT GAIN (mg)	1.453
SAMPLE VOLUME (scf)	38.691
DILUTE PM CONCENTRATION (mg/scf)	.038
CO2-BASED DILUTION FACTOR	3.980
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.149
PARTICULATE MASS EMISSION RATE (g/hr)	21.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.250

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 2	TEST CONFIGURATION	=	C20
TEST DATE	=	10/30/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	4/10			
SwRI FUEL CODE	=	EM-3005-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.IB (in. Hg)	ENGINE INTAKE AIR	=	85.(°F)
DRY BULB TEMP	=	85. (°F)	WET BULB TEMP	=	70. (°F)
ABS HUMIDITY	=	88.97 (GR/LB)	RELATIVE HUMIDITY	=	47. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	6.5
TRACTION MOTOR BLOWER HP	=	6.6
INERTIAL SEPERATOR BLOWER HP	=	1.0
RADIATOR FAN HP	=	3.1
TOTAL ACCESSORY HP	=	21.1

FUEL RATE (OBS) = 134.0 (LB/HR)
ALT. VOLTS = 378. ALT. AMPS = 555. ALT. EFF. = .939
FLYWHEEL HP = 320.8 OBS. SFC = .4177 AAR CORR. SFC = .4098 (LB/HP-HR)
CALCULATED A/F = 93.86 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	145.	.45	53.PPMC
CO	433.	1.35	79. PPM
NOX	2966.	9.25	331. PPM (D)
NOX,CORR	3068.	9.56	
CO2		599.	2.24 PCT
O2			17.91 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0343	NOX-KH	= 1.0281	NOX-KT	= 1.0000
WET EXH HC CF	= .9759	AIR TEMP CF	= .9887	BAROM CF	= 1.0028
FUEL TEMP CF	= .9850	FUEL S.G. CF	= 1.0049	FUEL HHV CF	= .9896

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6785.0-70
FILTER PAIR WEIGHT GAIN (mg)	4.229
SAMPLE VOLUME (scf)	38.405
DILUTE PM CONCENTRATION (mg/scf)	.110
CO2-BASED DILUTION FACTOR	4.854
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.534
PARTICULATE MASS EMISSION RATE (g/hr)	90.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.282

LOCOMOTIVE EMISSIONS SwRI PROJECT NO. 08-2999-001

LOCOMOTIVE MODEL	=	EMD GP38	TEST LOCATION	=	SwRI SA,TX
LOCOMOTIVE UNIT #	=	CSX #2629	COMPUTER PROGRAM	=	EPA.FOR
THROTTLE NOTCH	=	Notch 3	TEST CONFIGURATION	=	C20
TEST DATE	=	10/30/ 0	ENGINE MODEL	=	EMD 16-645E3
TEST NUMBER	=	5/10			
SwRI FUEL CODE	=	EM-3005-F	FUEL H/C RATIO	=	1.81
BAROMETER	=	29.18 (in. Hg)	ENGINE INTAKE AIR	=	84.(°F)
DRY BULB TEMP	=	84. (°F)	WET BULB TEMP	=	70. (°F)
ABS HUMIDITY	=	87.03 (GR/LB)	RELATIVE HUMIDITY	=	49. (%)

ENGINE PERFORMANCE SUMMARY:

ACCESSORY HORSEPOWER:

AUXILLARY GENERATOR HP	=	4.0
AIR COMPRESSOR HP	=	8.3
TRACTION MOTOR BLOWER HP	=	13.9
INERTIAL SEPERATOR BLOWER HP	=	2.1
RADIATOR FAN HP	=	6.4
TOTAL ACCESSORY HP	=	34.8

FUEL RATE (OBS) = 228.0 (LB/HR)
ALT. VOLTS = 515. ALT. AMPS = 750. ALT. EFF. = .939
FLYWHEEL HP = 586.6 OBS. SFC = .3887 AAR CORR. SFC = .3815 (LB/HP-HR)
CALCULATED A/F = 70.70 (LB DRY AIR/LB FUEL)

EMISSIONS	G/HR	G/HP-HR	CONC.
HC	214.	.36	60.PPMC
CO	374.	.64	54. PPM
NOX	5626.	9.59	491. PPM (D)
NOX,CORR	5791.	9.87	
CO2		559.	2.99 PCT
O2			16.78 PCT

CORRECTION FACTOR SUMMARY:

EPA NOX CF	= 1.0292	NOX-KH	= 1.0240	NOX-KT	= 1.0000
WET EXH HC CF	= .9696	AIR TEMP CF	= .9892	BAROM CF	= 1.002B
FUEL TEMP CF	= .9865	FUEL S.G. CF	= 1.0049	FUEL HHV CF	= .9896

PARTICULATE INFORMATION

FILTER PAIR I.D. NUMBER	6786.0-71
FILTER PAIR WEIGHT GAIN (mg)	5.570
SAMPLE VOLUME (scf)	38.236
DILUTE PM CONCENTRATION (mg/scf)	.146
CO2-BASED DILUTION FACTOR	4.918
PARTICULATE CONCENTRATION IN RAW EXHAUST (mg/scf)	.716
PARTICULATE MASS EMISSION RATE (g/hr)	156.
BRAKE-SPECIFIC PARTICULATE EMISSION RATE (g/hp-hr)	.266

APPENDIX E

SMOKE OPACITY TEST RESULTS

	Smoke Opacity		
	Max ss	**Max 30 sec**	**Max 3 sec**
EPA Cert Baseline #1/3	7%	8%	31%
EPA Cert Baseline #2/3	3%	9%	36%
EPA Cert Baseline #3/3	5%	6%	12%
Average	**5%**	**8%**	**26%**
CARB #1/3	4%	4%	8%
CARB #2/3	6%	7%	11%
CARB #3/3	5%	void	void
Average	**5%**	**6%**	**9%**
B20 #1/3	6%	7%	9%
B20 #2/3	6%	6%	9%
B20 #3/3	3%	4%	5%
Average	**5%**	**6%**	**8%**
C20 #1/3	5%	6%	7%
C20 #2/3	5%	void	void
C20 #3/3	3%	void	void
Average	**4%**	**6%**	**7%**

APPENDIX F

LABORATORY ANALYSIS REPORT FOR NEAT BIO-FUEL

Laboratory Analysis Report

Williams

Laboratory Services

Date Reported: 6/4/01

Report To:
K. Shaine Tyson
National Renewable Energy Laboratory
1617 Cole Blvd
Golden CO 80401

Submitted By:
Steve Fritz
Southwest Research Institute
6220 Culebra Rd
San Antonio TX 78238-5166

cc:

Type of Sample: Biodiesel
Sample ID: KS00110075 Sample Date: 10/31/2000 Tank: Drum
Sample Description: Code # EM-2997-F
Sample Notes:

Method		Results
D 93	Flash Point	146 °C
D 2709	Water and Sediment	<0.025 vol. %
D 524	Carbon Residue, Ramsbottom	0.06 % Carbon Residue
D 874	Sulfated Ash	0.001 mass %
D 445	Kinematic Viscosity	4.798 cSt @ 40°C
D 2622	Sulfur	0.0023 mass % Sulfur
D613	Cetane Number	54.8

	Method	Results
D 5773	Cloud Point	5 °C
D 130	Copper Corrosion	1A
D 664	Acid Number of Petroleum Products by Potentiometric Titration	0.39 mg KOH/gram
C. Plank	C. Plank	0.007 mass % Free Glycerin
		0.325 mass % Monoglyceride
		0.00 mass % Diglyceride
		0.00 mass % Triglyceride
		0.091 mass % Glycerin

REPORT DOCUMENTATION PAGE

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NREL Technical Monitor: K.S. Tyson

14. ABSTRACT
This report documents results of fuel consumption and exhaust emission tests performed on a 2,000 hp EMD GP38-2 locomotive operating on four different fuels. No operational problems were observed by SwRI on any of the test fuels, and the locomotive engine was able to produce within 1% to 2% of full rated power while operating on the biodiesel blends.

15. SUBJECT TERMS
biodiesel; locomotive; SwRI

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			19b. TELEPHONE NUMBER *(Include area code)*

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