

# Appendix EN

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Construction and Operation Energy Calculations

# Senter Road Project

Last Updated: 4/6/2022

Compression-Ignition Engine Brake-Specific Fuel Consumption (BSFC) Factors [1]:

HP: 0 to 100	0.0588	HP: Greater than 100	0.0529
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*Values above are expressed in gallons per horsepower-hour/BSFC.*

## CONSTRUCTION EQUIPMENT

Construction Equipment	#	Hours per Day	Horsepower	Load Factor	Construction Phase	Fuel Used (gallons)
Concrete/Industrial Saws	1	8	81	0.73	Demolition Phase	695
Rubber Tired Dozers	1	8	247	0.4	Demolition Phase	1,044
Tractors/Loaders/Backhoes	3	8	97	0.37	Demolition Phase	1,265
Graders	1	8	187	0.41	Site Preparation Phase	486
Scrapers	1	8	367	0.48	Site Preparation Phase	1,117
Tractors/Loaders/Backhoes	1	7	97	0.37	Site Preparation Phase	221
Graders	1	8	187	0.41	Grading Phase	973
Rubber Tired Dozers	1	8	247	0.4	Grading Phase	1,253
Tractors/Loaders/Backhoes	2	7	97	0.37	Grading Phase	886
Cranes	1	8	231	0.29	Building Construction Phase	6,657
Forklifts	2	7	89	0.2	Building Construction Phase	3,441
Generator Sets	1	8	84	0.74	Building Construction Phase	6,867
Tractors/Loaders/Backhoes	1	6	97	0.37	Building Construction Phase	2,974
Welders	3	8	46	0.45	Building Construction Phase	6,861
Air Compressors	1	6	78	0.48	Architectural Coating Phase	396
Cement and Mortar Mixers	1	8	9	0.56	Paving Phase	36
Pavers	1	8	130	0.42	Paving Phase	346
Paving Equipment	1	8	132	0.36	Architectural Coating Phase	301
Rollers	2	8	80	0.38	Paving Phase	429
Tractors/Loaders/Backhoes	1	8	97	0.37	Paving Phase	253
<b>Total Fuel Used</b>						<b>36,503</b> (Gallons)

### Construction Phase      Days of Operation

Demolition Phase	25
Site Preparation Phase	15
Grading Phase	30
Building Construction Phase	235
Paving Phase	15
Architectural Coating Phase	30
<b>Total Days</b>	<b>350</b>

## WORKER TRIPS

Constuction Phase	MPG [2]	Trips	Trip Length (miles)	Fuel Used (gallons)
Demolition Phase	24.1	13	10.8	145.64
Site Preparation Phase	24.1	8	11.8	58.76
Grading Phase	24.1	10	12.8	159.34
Building Construction Phase	24.1	43	13.8	5786.27
Paving Phase	24.1	15	14.8	138.17
Architectural Coating Phase	24.1	9	15.8	177.01
<b>Total</b>				<b>6,465.19</b>

**HAULING AND VENDOR TRIPS**

<b>Trip Class</b>	<b>MPG [2]</b>	<b>Trips</b>	<b>Trip Length (miles)</b>	<b>Fuel Used (gallons)</b>
<b>HAULING TRIPS</b>				
Demolition Phase	7.5	0	0.0	0.00
Site Preparation Phase	7.5	635	20.0	1693.33
Grading Phase	7.5	0	0.0	0.00
Building Construction Phase	7.5	0	0.0	0.00
Paving Phase	7.5	0	0.0	0.00
Architectural Coating Phase	7.5	0	0.0	0.00
<b>Total</b>				<b>1,693.33</b>
<b>VENDOR TRIPS</b>				
Demolition Phase	7.5	0	0.0	0.00
Site Preparation Phase	7.5	0	0.0	0.00
Grading Phase	7.5	0	0.0	0.00
Building Construction Phase	7.5	9	7.3	2058.60
Paving Phase	7.5	0	0.0	0.00
Architectural Coating Phase	7.5	0	0.0	0.00
<b>Total</b>				<b>2,058.60</b>

<b>Total Gasoline Consumption (gallons)</b>	<b>6,465</b>
<b>Total Diesel Consumption (gallons)</b>	<b>40,255</b>

**Sources:**

[1] United States Environmental Protection Agency. 2021. *Exhaust and Crankcase Emission Factors for Nonroad Compression-Ignition Engines in MOVES3.0.2*. September. Available at: <https://www.epa.gov/system/files/documents/2021-08/420r21021.pdf>.

[2] United States Department of Transportation, Bureau of Transportation Statistics. 2021. *National Transportation Statistics*. Available at: <https://www.bts.gov/topics/national-transportation-statistics>.

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Populate one of the following tables (Leave the other blank):

<b>Annual VMT</b>	<b>OR</b>	<b>Daily Vehicle Trips</b>
Annual VMT: 496,935		Daily Vehicle Trips: Average Trip Distance:

Fleet Class	Fleet Mix	Fuel Economy (MPG) [1]	
Light Duty Auto (LDA)	0.553342	Passenger Vehicles	24.1
Light Duty Truck 1 (LDT1)	0.058522	Light-Med Duty Trucks	17.6
Light Duty Truck 2 (LDT2)	0.188738	Heavy Trucks/Other	7.5
Medium Duty Vehicle (MDV)	0.121080	Motorcycles	44
Light Heavy Duty 1 (LHD1)	0.023016		
Light Heavy Duty 2 (LHD2)	0.005623		
Medium Heavy Duty (MHD)	0.010412		
Heavy Heavy Duty (HHD)	0.007562		
Other Bus (OBUS)	0.000987		
Urban Bus (UBUS)	0.000568		
Motorcycle (MCY)	0.026444		
School Bus (SBUS)	0.000834		
Motorhome (MH)	0.002871		

Fleet Mix					
Vehicle Type	Percent	Fuel Type	Annual VMT: VMT	Vehicle Trips: VMT	Fuel Consumption (Gallons)
Passenger Vehicles	55.33%	Gasoline	274,975	0.00	11,410
Light-Medium Duty Trucks	36.83%	Gasoline	183,041	0.00	10,400
Heavy Trucks/Other	5.19%	Diesel	25,778	0.00	3,437
Motorcycle	2.64%	Gasoline	13,141	0.00	299

<b>Total Gasoline Consumption (gallons)</b>	<b>22,108</b>
<b>Total Diesel Consumption (gallons)</b>	<b>3,437</b>

**Sources:**

[1] United States Department of Transportation, Bureau of Transportation Statistics. 2021. National Transportation Statistics. Available at: <https://www.bts.gov/topics/national-transportation-statistics>.