

## Flow Calculations

5/28/2024

### Assumptions:

1. Turbulent flow regime

2. Fluid properties

Fluid: diesel at 60 deg F    specific gravity    0.88    Schiller    Darcy-Weisbach eqn  
dyn viscosity    ft<sup>2</sup>/s    4.31E-05    0.0054+0.396/R    dP=f L rho/2 v<sup>2</sup>/D

<https://energy-models.com/pipe-sizing-charts-tables>

<https://ntrs.nasa.gov/api/citations/19660024205/downloads/19660024205.pdf>

total flow rate, gpm    21.5  
max duty cycle    50%  
total fuel per 12 hrs    gal    7700  
Number of hoses    3  
hose flow rate, gpm    7.2  
P max    psi    #REF!

	Part	ID , in.	Length (ft)	L/D	velocity, ft/s	Re (vD/nu)	f	dP (psi)	total P (psi)	Notes
B_1	filter	2.00			0.73	2.83E+03	0.042	6.72		dP approximation per FAS
	manifold to hose	1.00	6.00	72.00	2.93	5.67E+03	0.035	0.13		
	elbow	0.50		45.00	11.71	1.13E+04	0.029	1.08		
	hose	0.75	200	3200.00	5.21	7.56E+03	0.033	16.73	24.65	
B_2	filter	2.00			0.73	2.83E+03	0.042	6.72		dP approximation per FAS
	manifold to hose	1.00	6.00	72.00	2.93	5.67E+03	0.035	0.13		
	elbow	0.50		45.00	11.71	1.13E+04	0.029	1.08		
	hose	0.75	300	4800.00	5.21	7.56E+03	0.033	25.09	33.01	
B_3	filter	2.00			0.73	2.83E+03	0.042	6.72		dP approximation per FAS
	manifold to hose	1.00	6.00	72.00	2.93	5.67E+03	0.035	0.13		
	elbow	0.50		45.00	11.71	1.13E+04	0.029	1.08		
	hose	0.75	450	7200.00	5.21	7.56E+03	0.033	37.63	45.56	
B_4	filter	2.00			0.73	2.83E+03	0.042	6.72		dP approximation per FAS
	manifold to hose	1.00	6.00	72.00	2.93	5.67E+03	0.035	0.13		
	elbow	0.50		45.00	11.71	1.13E+04	0.029	1.08		
	hose	0.50	200	4800.00	11.71	1.13E+04	0.029	114.87	122.80	

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dyn viscosity      ft<sup>2</sup>/s      4.31E-05      0.0054+0.396/R      dP=f L rho/2 v<sup>2</sup> /D

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total flow rate, gpm      21.5  
max duty cycle      50%  
total fuel per 12 hrs      gal      7700  
Number of hoses      5  
hose flow rate, gpm      4.3  
P max      psi      #REF!

	Part	ID , in.	Length (ft)	L/D	velocity, ft/s	Re (vD/nu)	f	dP (psi)	total P (psi)	Notes
B_1	filter	2.00			0.44	1.70E+03	0.048	6.72		dP approximation per FAS
	manifold to hose	1.00	6.00	72.00	1.76	3.40E+03	0.040	0.05		
	elbow	0.50		45.00	7.03	6.80E+03	0.033	0.44		
	hose	0.75	200	3200.00	3.12	4.53E+03	0.037	6.85	14.06	
B_2	filter	2.00			0.44	1.70E+03	0.048	6.72		dP approximation per FAS
	manifold to hose	1.00	6.00	72.00	1.76	3.40E+03	0.040	0.05		
	elbow	0.50		45.00	7.03	6.80E+03	0.033	0.44		
	hose	0.75	300	4800.00	3.12	4.53E+03	0.037	10.28	17.49	
B_3	filter	2.00			0.44	1.70E+03	0.048	6.72		dP approximation per FAS
	manifold to hose	1.00	6.00	72.00	1.76	3.40E+03	0.040	0.05		
	elbow	0.50		45.00	7.03	6.80E+03	0.033	0.44		
	hose	0.75	450	7200.00	3.12	4.53E+03	0.037	15.42	22.63	
B_4	filter	2.00			0.44	1.70E+03	0.048	6.72		dP approximation per FAS
	manifold to hose	1.00	6.00	72.00	1.76	3.40E+03	0.040	0.05		
	elbow	0.50		45.00	7.03	6.80E+03	0.033	0.44		
	hose	0.50	200	4800.00	7.03	6.80E+03	0.033	46.95	54.16	