Traffic Signal Optimum Cycle Length and Green Splits (Webster)

Webster's optimum cycle length and effective green times for a fixed-time traffic signal from the critical flow ratio of each phase and the lost time per phase.

Method: Webster's optimum cycle and proportional green splits

Input parameters

Unit system: SI

Parameter	Value	Unit
Critical flow ratio q/s of phase 1	0.30000	
Critical flow ratio of phase 2	0.25000	
Critical flow ratio of phase 3 (0 if none)	0.15000	
Critical flow ratio of phase 4 (0 if none)	0	
Lost time per phase	4.0000	s

Calculated results

Parameter	Value	Unit
Number of phases	3.0000	
Sum of critical flow ratios	0.70000	
Total lost time per cycle	12.000	s
Optimum cycle length	76.667	s
Effective green, phase 1	27.714	s
Effective green, phase 2	23.095	s
Effective green, phase 3	13.857	s
Effective green, phase 4	0	s

Notes for this case

• Webster: C_o = (1.5L + 5)/(1 − Y), green split in proportion to the critical flow ratios. Cycles are usually kept between about 30 and 120 s.

Formula and method

$$C_0 = \frac{1.5L + 5}{1 - Y}, \quad L = \sum l_i, \quad Y = \sum y_i, \quad g_i = (C_0 - L)\frac{y_i}{Y}$$

Variables

y_1	Critical flow ratio q/s of phase 1	-
y_2	Critical flow ratio of phase 2	-
y_3	Critical flow ratio of phase 3 (0 if none)	-
y_4	Critical flow ratio of phase 4 (0 if none)	-
l	Lost time per phase	s
n	Number of phases	-
Y	Sum of critical flow ratios	-
L	Total lost time per cycle	s
C_0	Optimum cycle length	s
g_1	Effective green, phase 1	s

g_2	Effective green, phase 2	s
g_3	Effective green, phase 3	s
g_4	Effective green, phase 4	s

Method and standards

Webster's signal timing method.

Assumptions and limits

- Fixed-time control, random arrivals, steady demand.

References

Webster's optimum cycle and proportional green splits

Report details

Report reference	FCC-4JRK-R6S6 (the same inputs always give the same reference)
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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/civil/roads/webster-signal-cycle

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.