

Synchro Snippets

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This issue of Synchro Snippet's sheds some light on the analysis of coordinated intersections based on the procedures outlined in the 2010 Highway Capacity Manual (HCM). Chapter 18 highlights the procedures related to isolated signalized intersections, while Chapter 17 focuses on the procedures associated with coordinated intersections. One of key parameters related to analysis of coordinated arterials is the Platoon Ratio. The Platoon Ratio describes the quality of progression for a platoon of vehicles arriving on green. As described in HCM 2010, the user should select a Platoon Ratio based on field observations and their knowledge of the corridor. Values range from 0 to 2.0. Table 1 includes a brief description of the HCM 2010 platoon ratios.

Synchro already models coordinated signals and therefore does not require the user to input additional data. The user should, however, be sure to code the following settings located in the Synchro Timing settings window:

- Reference Phase - Select the phase(s) from which offsets should be calculated. Many controllers refer to this as the coordinated phase(s). This is usually the phase for the main street. Phases 2 and 6 are commonly

assigned to the main street and used as the coordinated phases.

- Offset - The current offset for the intersection is the amount of time in seconds that the reference phase begins (or ends) after the nearby adjacent intersections.
- Offset Reference Point – Select the point from which offsets should be referenced. Two of the most common are the Beginning of Green or Yellow.

Synchro automatically calculates a Platoon Ratio for approaches of a coordinated intersection based on the user input Reference Phase. The following criteria are required to calculate a Platoon Ratio:

- Upstream signalized coordinated intersection within 0.60 mile.
- Upstream intersection and study intersection must have equal, double, or half Cycle Lengths.
- Reference phase of upstream intersection points towards study intersection.

Approaches that don't meet these criteria are assumed to have a random arrival pattern and are assigned a Platoon Ratio of 1.00. The user can override the calculated value based on field conditions. Platoon Ratio may be estimated from field data using:

$$R_p = \frac{P}{(g/C)}$$

R_p = Platoon Ratio

P = Proportion of vehicles arriving during the green indication (decimal)

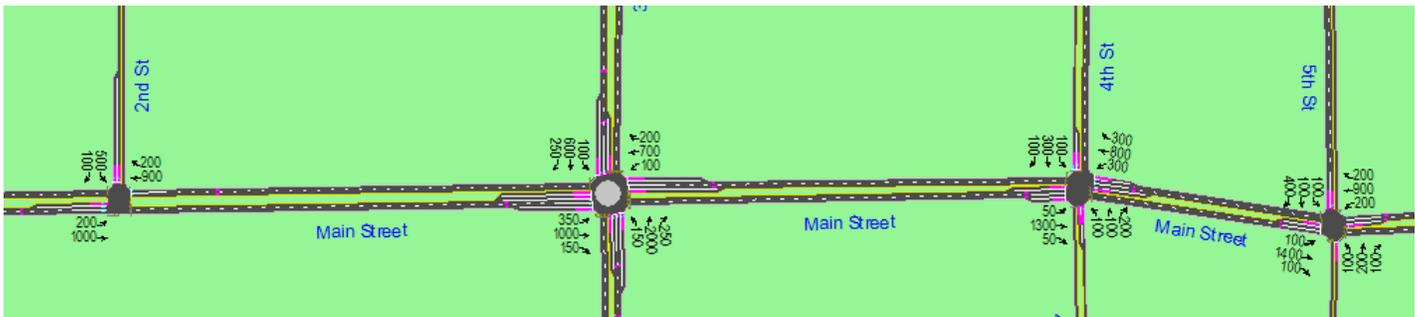
g = Effective Green Time(s)

C = Cycle Length(s)

Platoon Ratio	Arrival Type	Description of Flow
0.333	1	Very poor progression
0.667	2	Unfavorable progression
1.000	3	Uncoordinated signals or random arrivals
1.333	4	Favorable progression
1.667	5	Highly favorable progression
2.000	6	Exceptional Progression

In many cases, the platoon ratio will have a significant impact on the resulting delay and queue length. Users are encouraged to review this value carefully.

To demonstrate the relationship between vehicles arriving on green and the platoon ratio, let's consider vehicles traveling along Main Street (See Figure 1) and observe the flow patterns shown on the time-space diagram. The calculated values for the eastbound (EB) and westbound (WB) platoon ratios at 2nd, 3rd, and 4th Street have also been included. This allows one to visualize the relationship between arrival on green and the platoon ratio.



Within the time-space diagram itself, two points of interest have been highlighted for discussion purposes. First, let's review vehicles traveling southbound (SB) at 2nd Street. The platoon arrives at 3rd Street at the beginning of the SB through phase, thus allowing the vehicles to continue traveling without stopping. Since these vehicles experience excellent progression, a platoon ratio of 2.00 is assigned. Now let's look at the northbound (NB) group of vehicles traveling from 4th Street. These vehicles arrive at 3rd Street during a red indication, thus creating a stop for all vehicles (and inducing delay). Since all of the vehicles arrive on red, a platoon ratio of 0.33 is assigned. Additional values of the platoon ratio have been included to allow you to review additional flow patterns.

