ORIGINATOR Director, Bureau of Highway Operations		3-4-5
CHAPTER 3	Project Scoping Process & Geometric Design Considerations	
SECTION 4	Operational Considerations	
SUBJECT 5	Traffic Signal Coordination/Communication	

"Signal systems…are proven to reduce stops, reduce delays and decrease accidents; increase average travel speeds; and decrease emissions."[1] There are several parameters that affect coordinated signal system efficiency: spacing, cycle length, offset, splits, and phasing. The primary factors to consider for coordination of signals are spacing of signalized intersections, traffic characteristics, and signal operations.

When signalized intersections are spaced closer than a half-mile coordination **shall** be considered. This will usually include arterial segments and interchanges. Signalized intersections spaced less than a quarter-mile can be coordinated but it *may* be difficult to maintain progression when closely spaced. Signals that are spaced greater than a half-mile *should* also be considered for coordination if traffic progression can be maintained.

Traffic characteristics will also influence the decision to coordinate adjacent signals. Random arrival patterns and/or relatively light approach demand *may* indicate the need to coordinate signals only during certain times. Alternatively, heavy volumes with repetitive patterns such as commuter routes, *may* have variable timing plans throughout a day.

Regardless of existing volumes and turning movements, plans *should* include provisions for future coordination at closely spaced intersections. Such provisions will depend on the type of coordination, but will commonly include a conduit run between controller cabinets.

There are multiple ways to provide coordinated systems however, most state-owned systems will consist of Time-Based Coordination (TBC), or traffic-responsive coordination.

TBC uses the functionality of the internal controller clocks without a physical connection between control cabinets. Clocks need to be synchronized for TBC to be effective. This type of coordination utilizes minimal infrastructure, yet *may* require a more significant effort from operations staff to maintain proper coordination.

The other primary means of coordination requires communications between controllers. This can be achieved by radio, phone line (tone), twisted pair, or fiber optic. Twisted pair is the most common. This type of connection requires a conduit run between each control cabinet with pull boxes spaced along the run (about every 200-ft minimum). Closed Loop systems have the added functionality of being remotely accessed for program changes and timing plan verification.

There are several methods for providing specialty equipment used for signal coordinated signal systems:

- Intersections where signals will be located in the future. At such locations, underground facilities will be installed with an improvement project or permit project (TIA process). The underground facilities generally consist of conduit runs across the intersection approaches, some pull boxes, and *may* include some loop installations. These intersection locations will usually be cited based on an engineering study where warrants close to being met or at locations where adjacent properties are developing.

  At such locations, conduit *may* be installed between future controller cabinet locations (typically on the side of the highway segment). Common practice is to base the need for this equipment based on spacing between adjacent intersections that *may* become signalized. It is worth remembering that these electrical facilities will need to be included in the Regional database for purposes of marking them in the field during any construction activities.

- Intersections where signals are proposed. If an engineering study determines that a signal will benefit intersections operations, yet it will need to be interconnected with an adjacent signal installation, common practice is to fund and implement any interconnection provisions with that signal.

  If the installation cannot be provided for by an improvement project or is not the result of changes to the adjacent land use, The Regional operations budget *may* be used to fund candidate locations. HES funds *may* also be applied for on a case-by-case basis.

- Intersection where signals exist. Funding opportunities are the same as bullet above.

The Regional Traffic Engineer **shall** be consulted to determine the need for interconnection capabilities. In all cases above, a plan indicating the underground facilities **shall** be prepared per TSDM Subject 5-1-5.

[1] ITE Traffic Control Devices Handbook, pg. 336, © 2001 Institute of Transportation Engineers.