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7 Interconnect & ITS communication Plan

This chapter will discuss the design elements that are shown on an interconnect plan sheet. Information regarding the intelligent transportation systems (ITS) communication plan sheet will also be included for reference only, as these plan sheets are produced by the ITS unit.

7.1 When is Communication Needed?

There are two main types of communication used for traffic signals:

- **Central communication** is required for all traffic signals. This allows remote access for manipulation of the signal timing and ability to implement automated traffic signal performance measures (ATSPM). Central communication is achieved through an interconnect system that connects the one (or more) controller cabinets to a network server.
- **Local communication** may be required for signals located in an urban corridor. This allows multiple signals to operate in coordination to help provide an uninterrupted flow of traffic along that route. Local communication is achieved through an interconnect system that connects one controller cabinet to another controller cabinet. Always contact region traffic to discuss the need for local communication if other signals are located less than $\frac{1}{2}$ mile away. Often, the operational approval will indicate if this is a requirement.

7.2 Background and Design Responsibilities

Traffic signal communications have been rapidly changing in the last several years. Migration from the 170E/HC11 controller to the 2070L controller to the current advanced transportation controller (ATC) has resulted in advanced methods of communication between the devices in the field and also communication from the field back to a central control. The 170 controller used twisted pair copper interconnect for communication between signals with dial up telephone service for remote communication. The ATC is capable of being connected to a network and uses MaxView central software to remotely monitor and manage traffic signal timing performance.

At the present time, region traffic and the traffic engineering section do not have the staff and expertise to design networking and communication systems for traffic signals. Until the traffic engineering section is able to provide this expertise, the ITS unit is responsible for determining the form of communication to be used on the project (see section 7.3). The ITS unit will design certain portions of the work, with the traffic signal designer responsible for other portions of the work. ITS unit is also responsible for ordering the network and radio equipment and coordinating the installation and turn-on of the network circuits with the information services branch staff (ISB).

7.3 Forms of Communication

The ITS unit, in conjunction with traffic engineering section, will determine the proper form of communication based on region traffic's needs. Fiber optic is the preferred form. If fiber optic is not feasible, other acceptable options include 4.9GHz radio (back to a nearby ODOT facility), cellular broadband, and leased dedicated ethernet.

Twisted pair copper (VDSL) is no longer allowed for new installations. **Existing signals with twisted pair copper will need to be replaced with fiber optic or one of the other acceptable options.** This is due to VDSL switches being discontinued by Siemens/RuggedCom due to low customer demand and copper systems being problematic for ODOT networking staff to support. Note that Siemens/RuggedCom will continue supporting products only if they are still under warranty.

7.4 Scoping the Traffic Signal Communication System

Scoping the traffic signal communication system can be simple or very complex depending on the methods and equipment used. It is critical to contact the traffic engineering section and the ITS unit at the scoping phase of the project. The traffic engineering section and ITS unit will work with region staff and the signal designer to determine the best option for the communications needed. Once the form of communication is determined, the staff responsible for design will be determined.

As an example, if fiber optic local communications is scoped for the project, the signal designer will be responsible for the interconnect plan sheet & standard specifications which will include junction box/hand hole locations, conduit, and type of wire/cable in the conduit. The ITS unit will be responsible for the ITS communication plan sheet details which include the splice diagrams, fiber optic specifications, anticipated items, LPIF, etc.

The ITS unit, in conjunction with the traffic engineering section, will determine the proper form of communication to use on the project. Contact us early in the design phase.

7.5 Use of Communication Equipment Based on Project Type/Location

7.5.1 Maintained and Operated by ODOT (Projects by Local Agency or Permit)

The ITS unit should be contacted early during scoping for involvement with the project requirements and the development of the intergovernmental agreement (IGA). The security of the network is extremely important to the operation of the traffic signals and needs to be described within the IGA.

The design must use ODOT approved communications equipment. If possible, this will be ODOT supplied and the cost reimbursed.

7.5.2 Maintained and Operated by Local Agencies on State Highways

These locations must use industrial hardened communications equipment approved by the traffic engineering section. If possible, this will be ODOT supplied and the cost reimbursed.

Local agency central communication is acceptable (only center to center communication). There shall be no direct connection from the traffic signals to the ODOT Network.

7.5.3 Locations off the State Highway

These locations cannot use the ODOT communications price agreement contract to purchase equipment.

7.6 Long Term Communication Planning

Efforts are underway in several regions between the ITS unit and the region traffic offices in creating long term communication plans for traffic signal projects. These plans will help identify high level communication options and identifying the costs to develop traffic signal projects.

7.7 Design Considerations

7.7.1 Controller

The standard ATC controller can accommodate all forms of communication. Older controller models have limitations and should be replaced with an ATC controller.

7.7.2 Junction Boxes and Conduit Location and Sizes

Fiber optic installations use a “hand hole” instead of a junction box. See standard drawing TM702 for a general depiction. Hand holes may be spaced at a maximum of 1000 feet. There are 3 different handhole sizes shown on the standard drawing. Contact the ITS unit to determine the appropriate size.

For non-fiber optic installations, the interconnect system uses the same junction boxes that have been placed for the traffic signal system. Beyond the traffic signal system junction boxes, the interconnect system requires junction boxes spaced a maximum of 300 feet apart. See section 5.12.1 for more information on junction boxes.

7.7.3 Conduit

A separate, minimum two-inch diameter conduit is used for the interconnect system. See section 5.13 for more information on conduit requirements.

The signal designer should consider controller locations, signal/detector conduit design, and physical features of the roadway when deciding where to route the interconnect conduit between controller cabinets. By using detector and signal conduit trenches, you can greatly reduce the quantity of trenching needed for the interconnect conduits.

Aerial installation using existing utility poles is not recommended as this requires more maintenance and reoccurring fees for using the poles that belong to others. It is more economical in the long run to install the interconnect system underground. However, aerial installation may be considered if the initial cost of going underground is prohibitive and approval from the utility is received.

7.7.4 Fiber Optic Wiring

The number of fiber optic strands needed for interconnection is determined by the ITS unit. This is shown on the interconnect plan created by the signal designer. See Figure 7-1. Fiber optics are spliced as necessary in the hand holes as determined by the ITS unit. This is shown on the fiber optic cable splice diagram created by the ITS unit. See Figure 7-2.

Traffic Engineering Section

Traffic Signal Design Manual – Interconnect & ITS Communication Plan

Figure 7-1 | Fiber Optic Installation – Example of Interconnect Plan Created by the Signal Designer

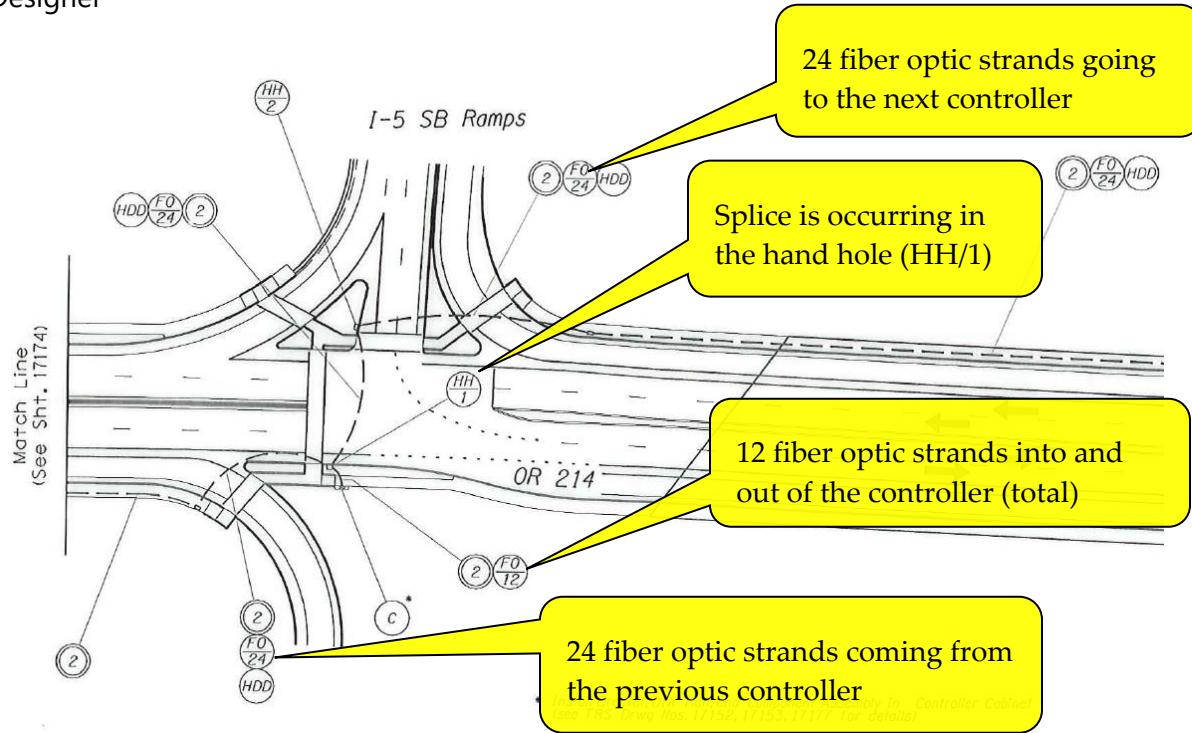


Figure 7-2 | Fiber Optic Installation – Example of Fiber Optic Cable Splice Diagram Created by the ITS Unit

