Chapter 7
INTERCONNECT & ITS COMMUNICATION PLAN

Contents

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 Interconnect Needed?

Multiple signal installations along a route may be coordinated to help provide an uninterrupted flow of traffic along that route. Coordination is achieved through an interconnect system from controller cabinet to controller cabinet. Any signal that is located in an urban area that has multiple signals in the vicinity may be required to be interconnected.

Interconnect capable of central communications (see Section 7.3) can also be used to allow remote access and manipulation of the signal timing, which may be desirable even for isolated intersections.

Always contact Region Traffic to discuss the need for interconnection to the new signal. Often, the Operational Approval will indicate if interconnect 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 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 2070 is capable of being connected to a network and uses TransCore central software to remotely monitor and manage traffic signal timing performance.

At the present time, Region Traffic and the Traffic-Roadway Section do not have the staff and expertise to design networking of traffic signals and all the forms of communication available. Until the Traffic-Roadway Section is able to provide this expertise the Intelligent Transportation Systems Unit (ITS Unit) is responsible for determining the type of communication system to be used on the project (types listed in 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, coordinating the installation and turn-on of the network circuits with the Information Services Branch (ISB) Staff.

7.3 Types of Traffic Signal Communications

There are two main types of communications used for traffic signals; central and local. Central communication connects one or more traffic signals to a network server. This type of communication allows the user to access and modify signal timing information from a remote location. Local communication connects two or more on-street traffic signals. This type of communication allows multiple signals in a corridor to work in coordination. There is no remote access to signal timing information. The ITS Unit, in conjunction with Traffic-Roadway Section, will determine the proper form of communication based on the Region Traffic's needs.

Central Options:

- Fiber Optic
- Frame Relay
- Telephone
- Cellular Broadband
- DSL/Cable Broadband
- 4.9 GHz Radio

Local Options:

- Fiber Optic
- **Twisted Pair Copper (VDSL)***
- 4.9 GHz Radio
- Wi-Fi

***Default standard. This is the only method that the signal designer is completely responsible for designing and does NOT require ITS involvement.**

7.4 Scoping the Traffic Signal Communication System

Scoping the traffic signal communication system can be rather simple or very complex depending on the methods and equipment used. It is critical to contact the Traffic-Roadway Section and the ITS Unit at the scoping phase of the project. The Traffic-Roadway Section and ITS Unit will work with Region Staff and signal designer to determine the best option for the type of communications needed. Once the methods of communications are determined, the staff responsible for design will be determined.

As an example, fiber optic local communications is scoped for the project. The traffic signal designer is responsible for the site plan & standard specifications (junction box locations, conduit, and type of wire in the conduit) shown on the interconnect plan sheet. The ITS Unit is responsible for the details (splice diagrams, fiber specifications, anticipated items, LPIF, etc.) shown on the ITS communication plan sheet.

The ITS Unit, in conjunction with the Traffic-Roadway 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 Locations 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 Locations Maintained and Operated by Local Agencies on State Highways

These locations must use industrial hardened communications equipment approved by the Traffic-Roadway Section. If possible this will be ODOT supplied and the cost reimbursed.

Local Agency central communication is acceptable, but no direct connection from the traffic signals to the ODOT Network (only center to center communication)

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 types of communication.

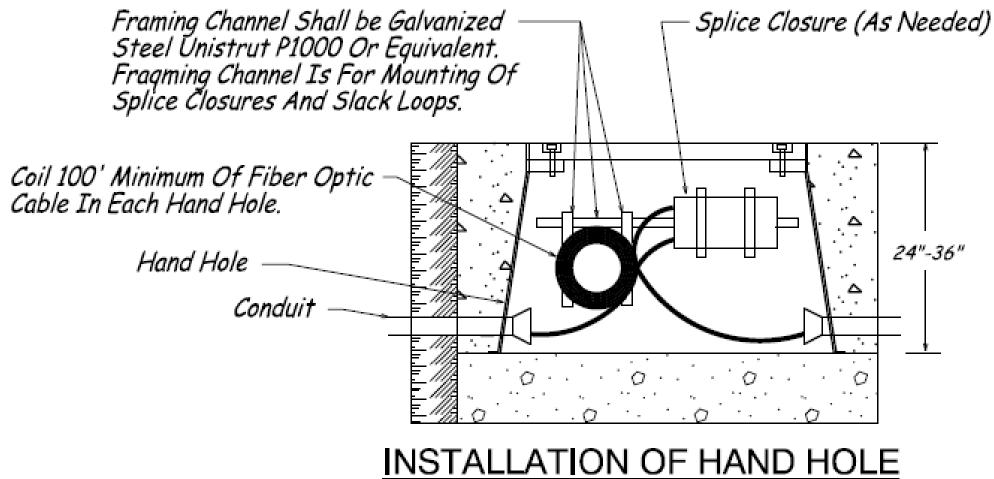
7.7.2 Junction Boxes and Conduit Location and Sizes

Near the intersection, the interconnect system typically uses the same junction boxes that have been placed for the traffic signal wiring and detection system. Beyond the intersection, the interconnect system requires junction boxes spaced a maximum of 300 feet apart.

For twisted pair cooper installations use JB-1 or JB-1A or larger junction boxes. Large cast iron pull boxes (JB-6 or Larger) shall be used in areas that are exposed to vehicular traffic. See Section 5.12.1 for more information on junction boxes.

For fiber optic installations use a “Hand Hole” instead of a junction box. See Figure 7-1 which shows an excerpt from standard drawing TM472. There are 3 different hand hole sizes shown on the standard drawing. Contact the ITS unit to determine the appropriate size.

Figure 7-1 | Hand Hole for Fiber Optic Installation (TM472)



7.7.3 Conduit

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

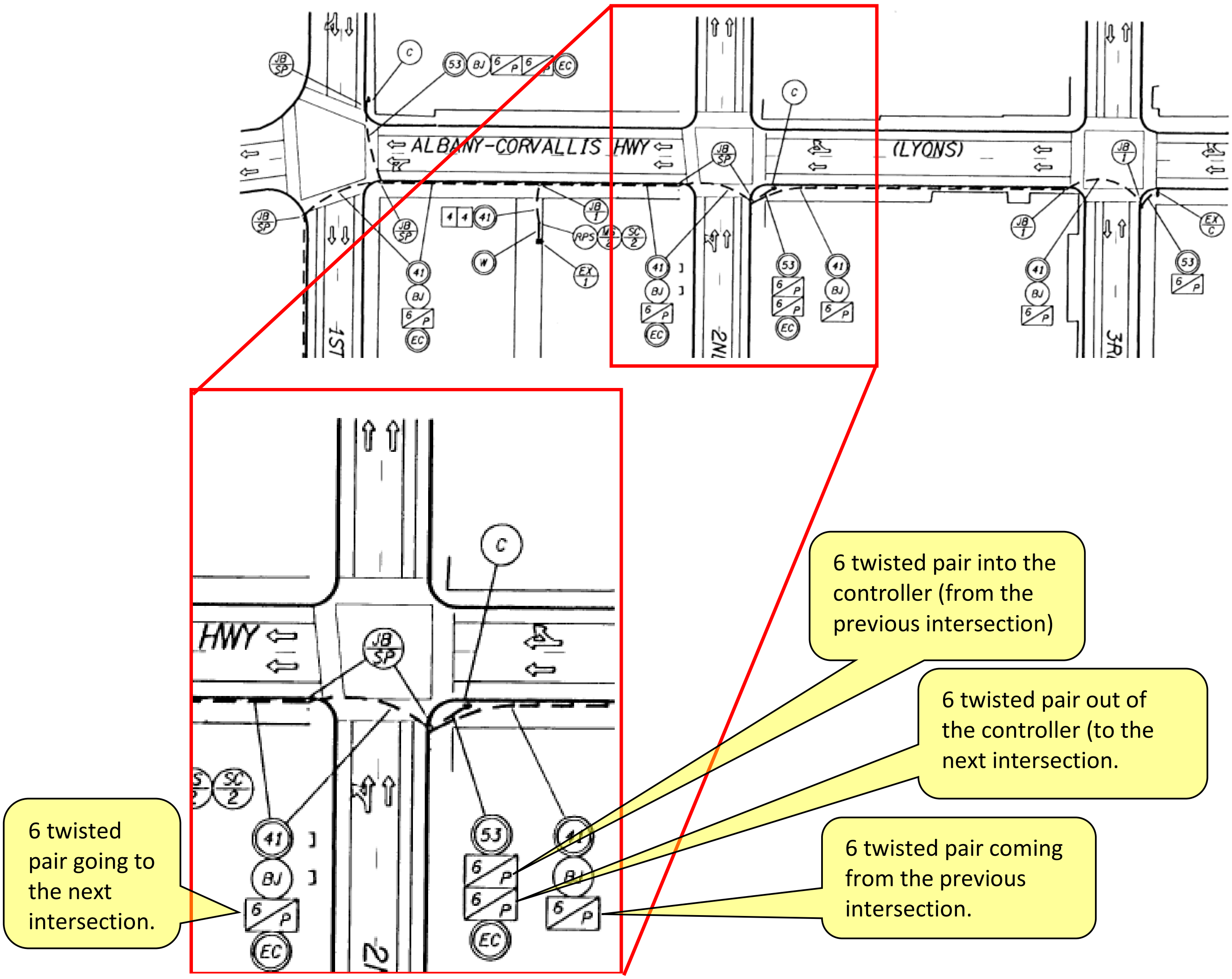
The designer should take into account controller locations, detector conduit construction, and physical features of the roadway when deciding where to route the interconnect conduit between controller cabinets. By using detector and signal conduit trenches, you can greatly reduce the quantity of trenching 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, this option may be considered if the initial cost of going underground is prohibitive and approval from the utility is received.

7.7.4 Wiring

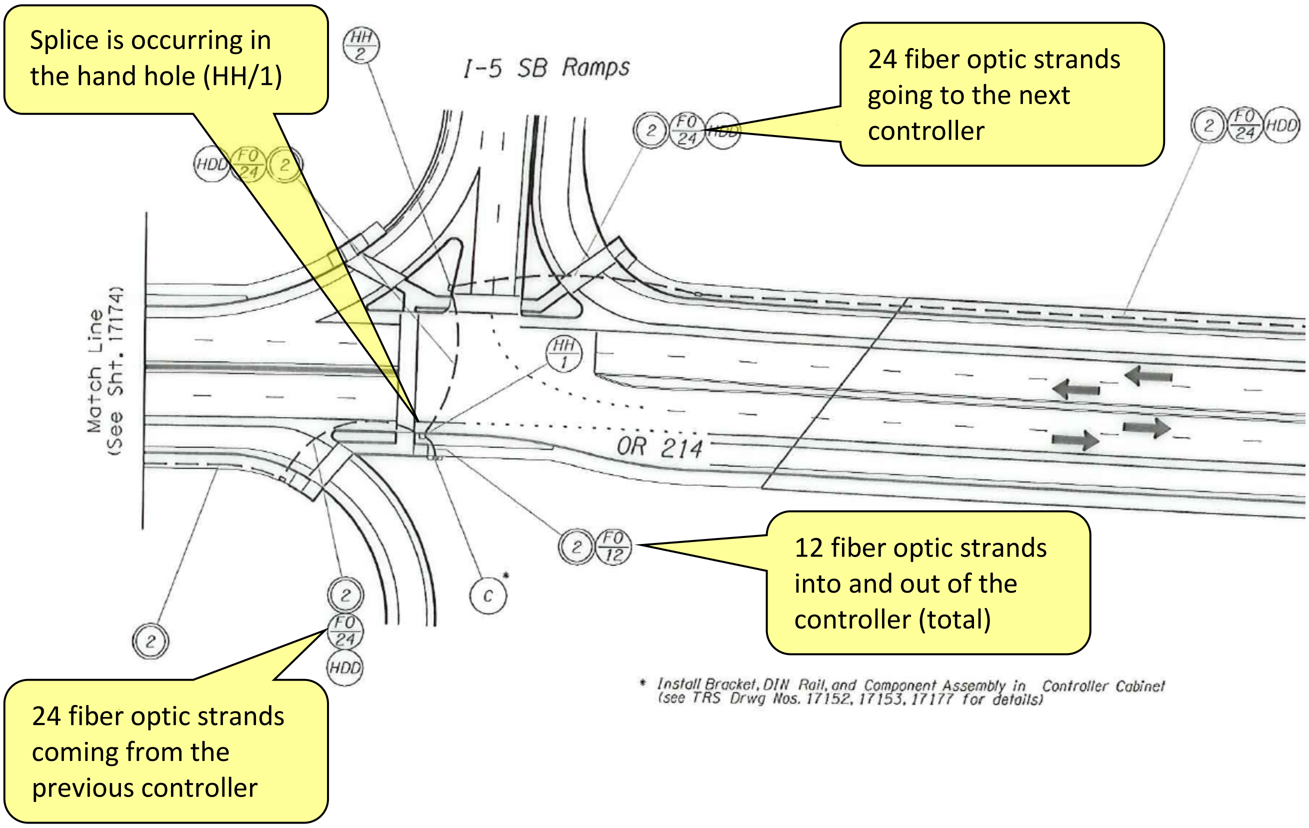
The standard is to use a “hard wire” system a shielded cable containing six twisted pairs of No. 19 AWG solid wire. Cables with 12 twisted pair may be used if there is a need for the additional pairs. The wiring runs continuous from controller to controller. Splices are NOT allowed.

Figure 7-2 | Twisted Pair Copper Installation – 6 Pair



The number of fiber optic strands needed for interconnection is determined by the ITS Unit. Fiber optics are spliced as necessary in the hand holes, again, determined by the ITS Unit.

Figure 7-3 | Fiber Optic Installation



7.7.5 Telephone Connection

If a telephone connection is required, a land line (hard wire) is ODOT's standard. Remote locations may require a cell phone. Always check with the Region Utility Specialist to determine if there is adequate cell coverage in the area.