Chapter 11
TEMPORARY SIGNAL PLAN

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11 TEMPORARY SIGNAL PLAN

11.1 General

Temporary signals are intended to be used for long-term stationary temporary traffic control zones, yet their appearance, design and operation are held to the same standards as permanent signals. Motorists expect the same meaning and security from temporary traffic signals as they do from permanent traffic signals, so the signal design and operation shall meet all applicable MUTCD and ODOT standards. The design procedure for a temporary signal shall follow the same standards and guidelines that would be used for a permanent signal.

The ODOT Traffic Control Plans Design Manual, Section 2.6 should be consulted for additional information on the use of temporary traffic signals.

11.2 When is a Temporary Signal Needed?

There are two typical design categories that most temporary signals will fit into; temporary bridge signals and temporary signals for modification or replacement of an existing signal.

Temporary signals are required in the following circumstances:

- For construction staging that requires one-lane, two-way traffic AND where use of 24/7 flagging would be cost prohibitive. Either a standard Temporary Bridge Signal or a Portable Temporary Traffic Signal could be used for this application.

- When the new signal can't be built without impacting the existing signal.

- When re-building an existing signal that requires staged construction (where lane use and/or signal phasing will be modified based on each stage)

- When the temporary re-alignment or modification of the signal heads at an existing signal is needed to accommodate traffic during construction of a project in the vicinity of the traffic signal.

- When adjustment to the existing pushbutton locations is required to accommodate Temporary Pedestrian Accessibility Routing (TPAR)

In some cases, re-building an existing signal can be accomplished without a temporary signal if the existing intersection geometry doesn't change (or changes very little) and placement of the new signal equipment is carefully considered. If possible, place the new poles behind the existing poles so that construction of the new mast arm does not block the existing signal heads. See Figure 11-1 for examples of signal heads being obstructed during construction. If a new signal pole must be placed in front of an existing signal pole, there is an opportunity to save the expense of a temporary signal by requiring that the new mast arm be installed on the day of the signal turn-on. However, to allow for an efficient and successful signal turn-on, only one signal mast arm per intersection may be allowed to be installed at the day of turn on. See Figure 11-2.

Figure 11-1 | Obstructing Signal Heads During Construction

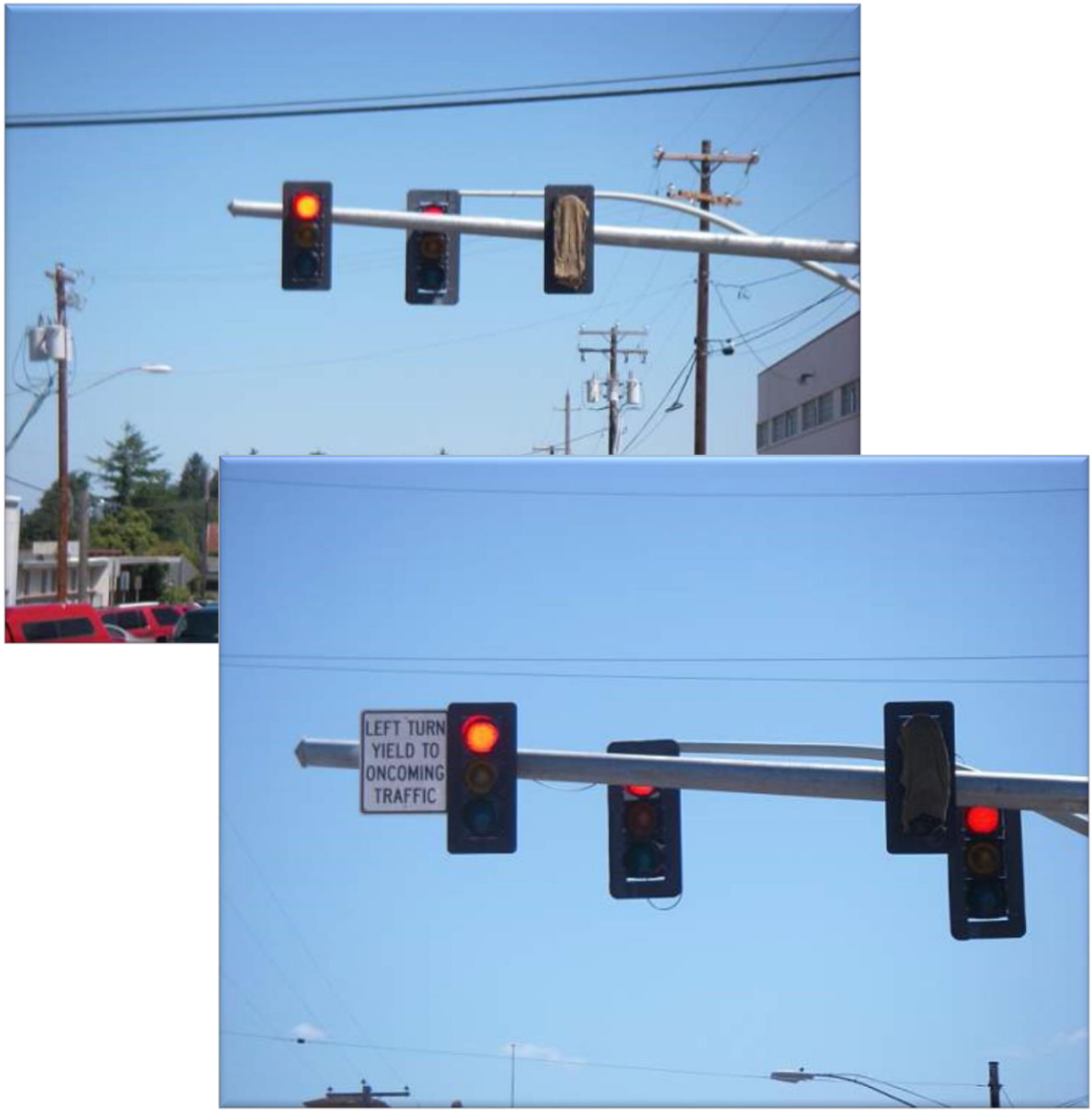
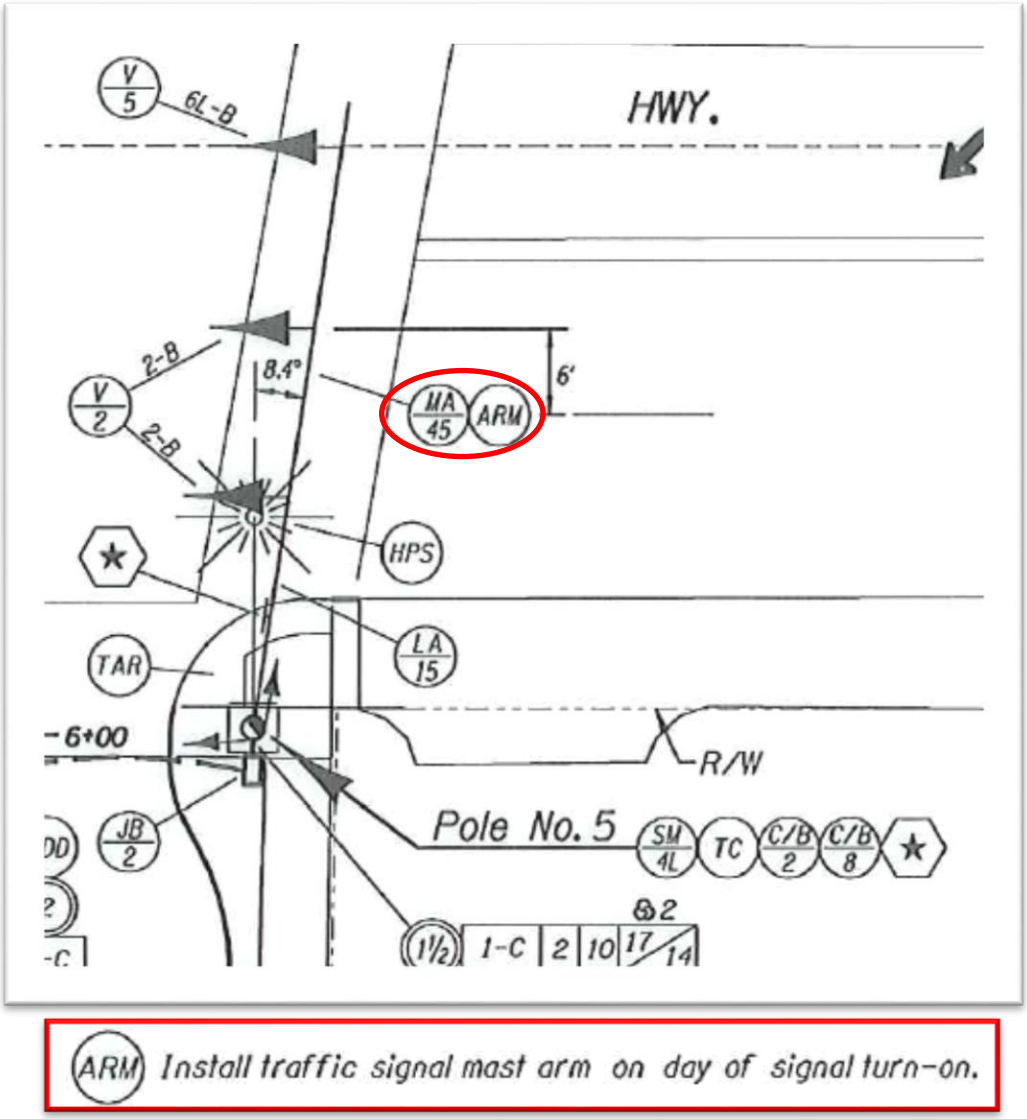


Figure 11-2 | Installing Mast Arm the Day of Signal Turn-On



11.3 Operational Approval of Temporary Signals

The following temporary traffic signal applications require STRE Operational Approval (see Chapter 3 for more information on Operational Approval):

- Temporary Portable Signals
- Temporary Bridge Signals (i.e. one-lane, two-way operation)
- Temporary signals located at intersections that are not currently under signalized control (e.g. detours that require re-routing large volumes of traffic to existing un-signalized intersections)
- Temporary closure of crosswalks at signalized intersections

Temporary signals installed at the same location with the same operations that mimic an existing signal or mimic the proposed STRE approved new signal do NOT require STRE or RTE approval.

The following temporary traffic signal application requires RTE Operational Approval (see Chapter 3 for more information on Operational Approval):

- Stage construction that is <u>significantly</u> different (geometry, lane use, and/or operation) than the existing traffic signal or the approved new traffic signal.

The one grey area concerning operational approvals for temporary traffic signals is determining if the geometry and operation is significantly different from the existing or approved signal operations. The main reasons for requiring an operational approval for a temporary signal needed for stage construction is to determine if the operation is safe, meets driver expectation, and will not be detrimental to maintaining traffic flow.

If the temporary signal operational/geometric changes are minor and incrementally made over the course of construction, additional operational analysis beyond what is required for the permanent signal is typically not needed to ensure the temporary signal staging is appropriate. See Figure 11-3. This case study shows a project going from existing conditions to the permanent signal installation and the temporary traffic signals (for each stage) do NOT require an operational approval.

However, significantly different operations or geometry (especially if the signal will be operating in a coordinated system) typically require a more in-depth analysis to ensure that temporary signal will operate appropriately. See Figure 11-4. This case study shows a project going from existing conditions to permanent signal installation where three of the temporary traffic control stages result in significant lane use and/or operational changes that do require

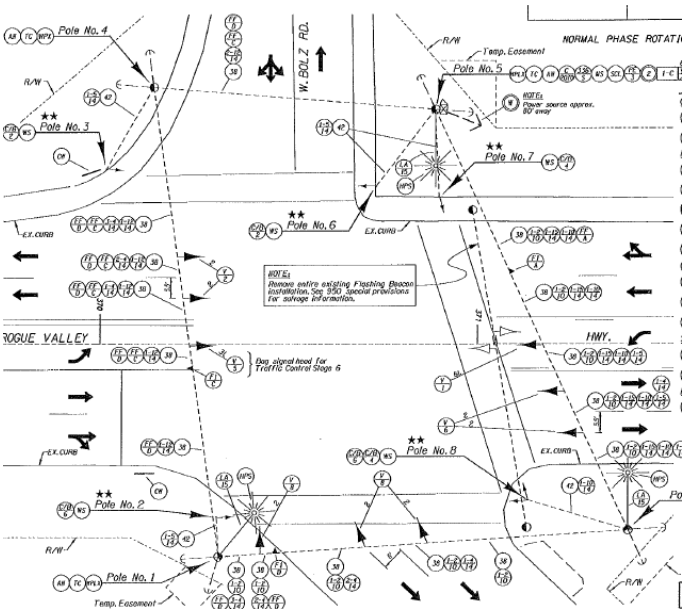
additional operational approval(s) for the temporary staging. The types of changes shown require an RTE Operational Approval.

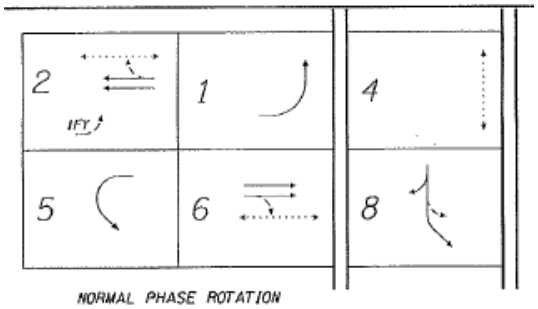
If there is a question as to whether a temporary traffic signal requires an operational approval, contact the ODOT Traffic Signal Operations Engineer. When in doubt, err on the side of caution and request an STRE Operational Approval.

Figure 11-3 | Case Study 1 – Operational Approval NOT Required for Temporary Signal Staging

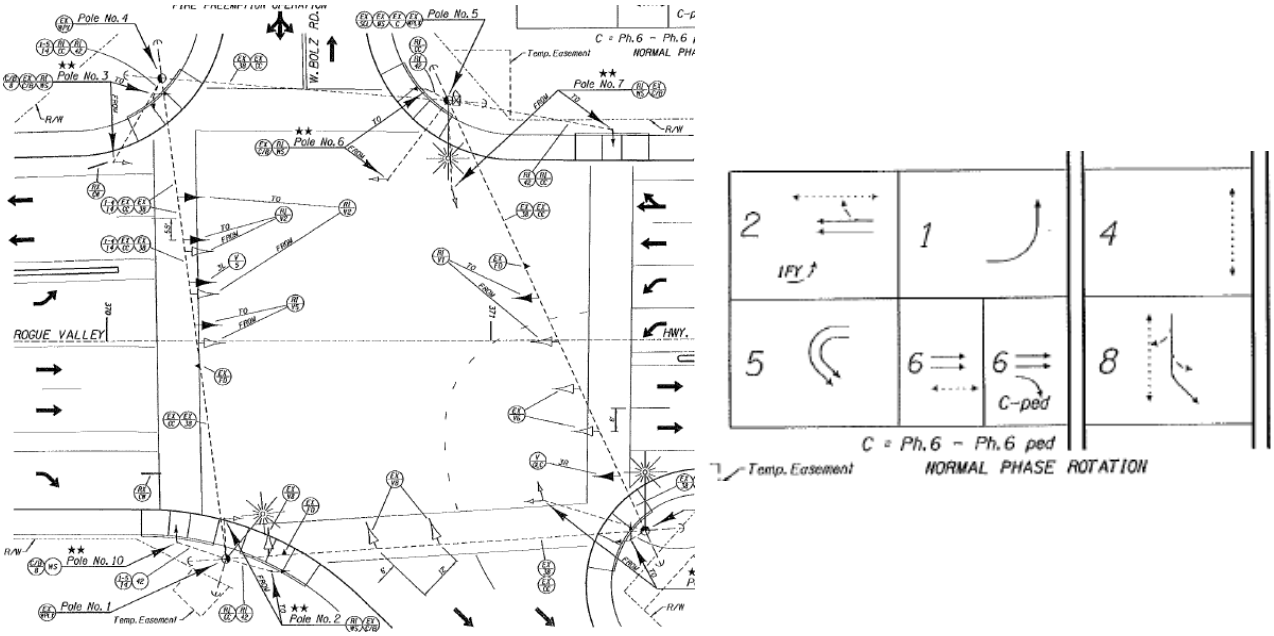
Existing conditions: The existing lane use is a 5-lane section on the main-line, with a right turn only from the top approach and one-way on the bottom approach. Three crosswalks are currently marked. The existing intersection operates as stop control on the side-street and free-flow on the mainline. This intersection has an STRE Operational Approval for a new, permanent traffic signal.

Stage 3: The existing lane use on the top approach has changed from a right turn only to a right-thru-left turn lane, matching the STRE approved permanent lane configuration for that approach. The existing marked crosswalks remain the same. The existing intersection operation has changed from stop control to signalized, with the signal phasing very closely matching the STRE approved operation.





Stage 7: The lane use from stage 3 has changed from a thru-right lane to the addition of right turn only lane on the left approach and from a single left turn lane to a dual left turn lane on the right approach, matching the STRE approved permanent lane configuration. All four crosswalks are now open. The operation from stage 3 has changed to allow a not-ped overlap phase for the new right turn only lane, matching the STRE approved permanent signal operation.



Permanent Traffic Signal: STRE approved permanent signal design and operation.

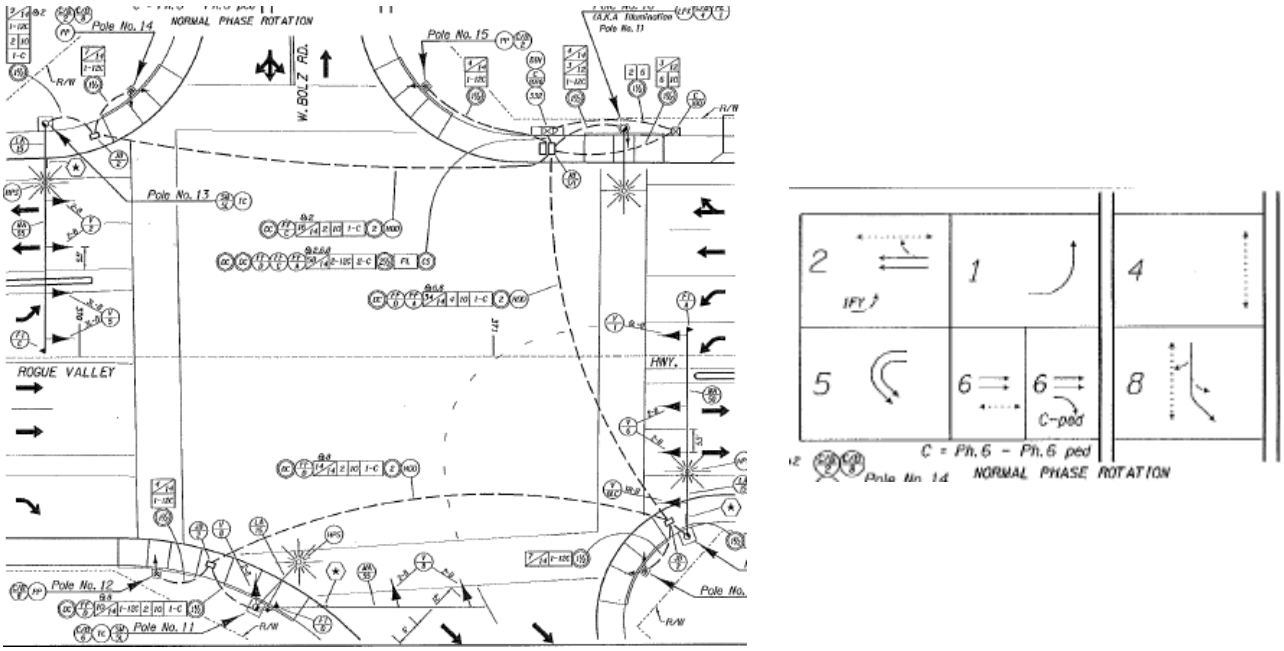
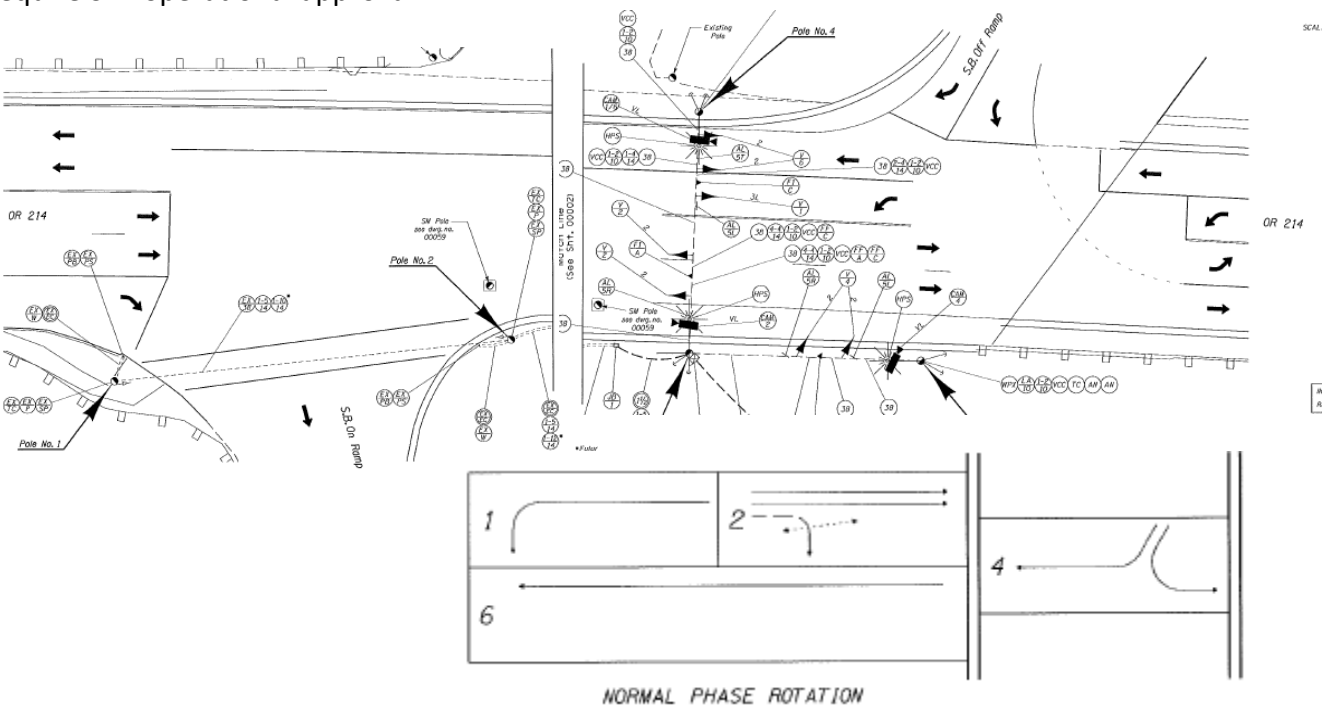


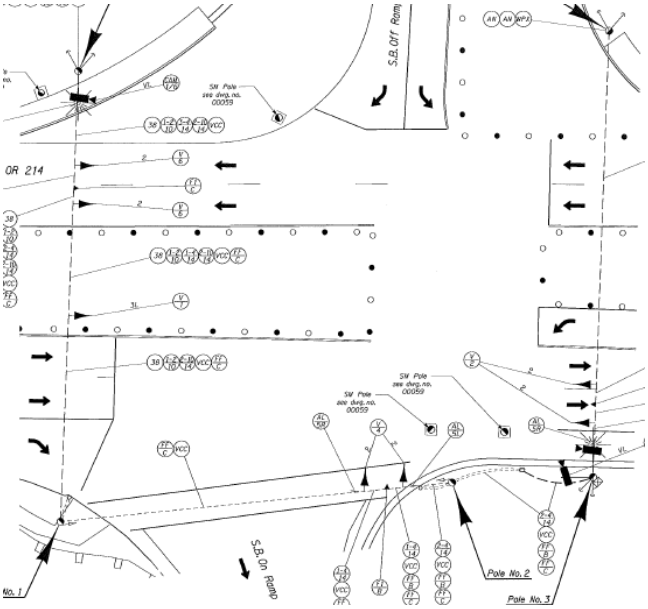
Figure 11-4 | Case Study 2 – Operational Approval Required for Temporary Signal Staging

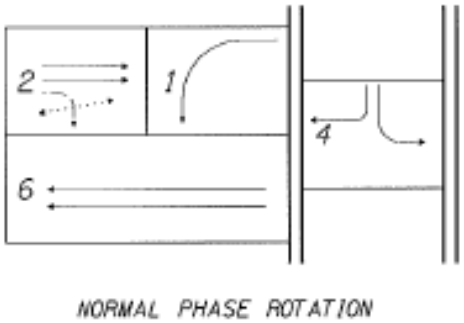
Existing conditions: The existing lane use is a 4-lane section on the main-line. The top approach is a freeway off-ramp and the bottom approach is a freeway on-ramp. Three crosswalks are currently marked. The existing intersection operates with PPLT phasing on the highway. This intersection has an STRE Operational Approval for a new, permanent traffic signal.

Stage 1, Phase 2 (RTE Operational Approval Required): The existing intersection geometry has significantly changed, with the top approach moving towards the right almost creating two separate intersections. Two of the existing crosswalks are now closed. This new geometry will require more red clearance time to clear vehicles. Because the geometry and operation of this intersection is significantly different from the existing and STRE approved permanent traffic geometry, this stage requires RTE approval. Note that the temporary crosswalk closures require STE operational approval.

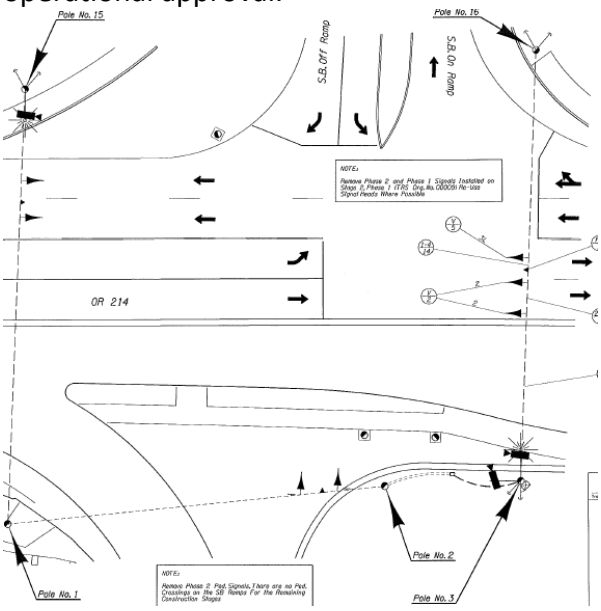


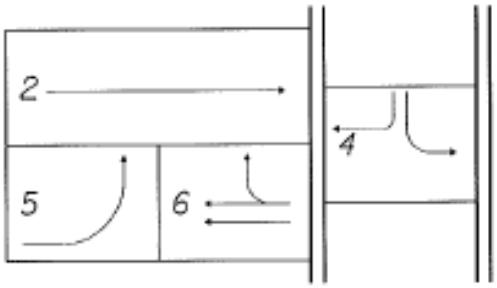
<u>Stage 2, Phase 1 (RTE Operational Approval NOT required):</u> The lane use from Stage 1, Phase 1 has shifted the top approach alignment back much closer to the original existing location. The crosswalk closures remain the same. Operation changes from the previous stage are minimal. This stage does NOT require RTE approval due to similarities of the existing conditions and previous stage RTE approval.





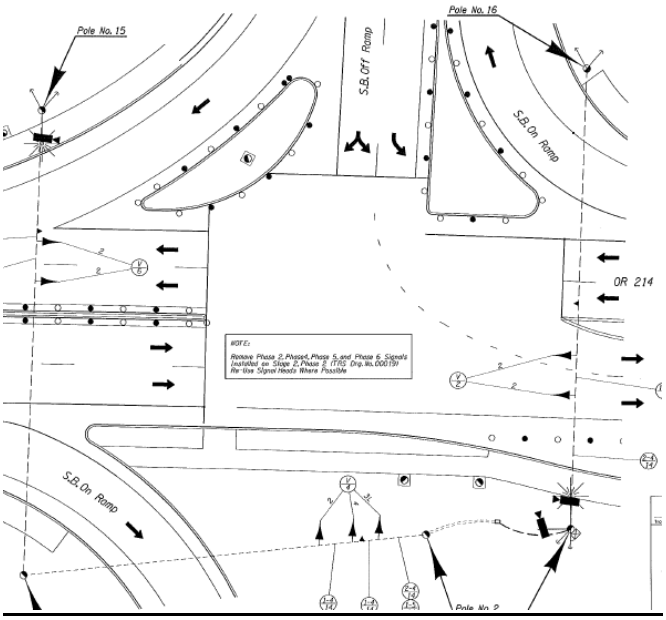
<u>Stage 2, Phase 2 (RTE Operational Approval Required):</u> The lane use from Stage 2, Phase 1 has changed significantly, with the top approach now containing the on-ramp for the freeway. All four crosswalks are now closed. Operation changes from the previous stage are significantly different and do not match the STRE approved permanent traffic geometry/operations. This stage requires RTE approval. Note that the temporary crosswalk closure here requires STE operational approval.

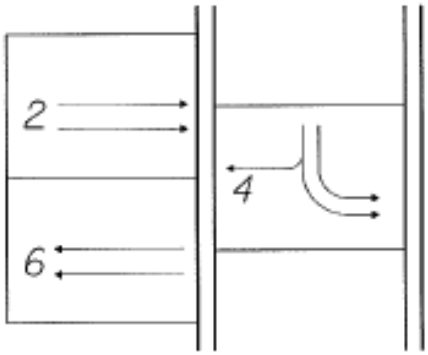




Stage 3, phase 1 (RTE Operational Approval Required)

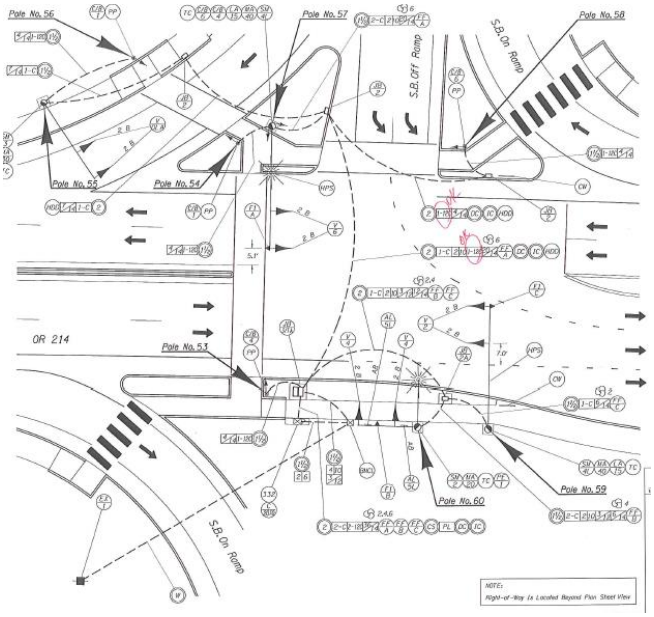
The lane use from Stage 2, Phase 2 has now changed to closely match the STRE approved permanent geometry. However, the unusual lane use for the top approach (where the right turn movement is divided – one is free flow and one is controlled by the signal in a left-right lane) warrants documentation. All four crosswalks remain closed. Operation changes from previous stage are significantly different and now closely match the STRE approved permanent operations (minus the top approach right turn overlap and pedestrian phases). This stage requires RTE approval.

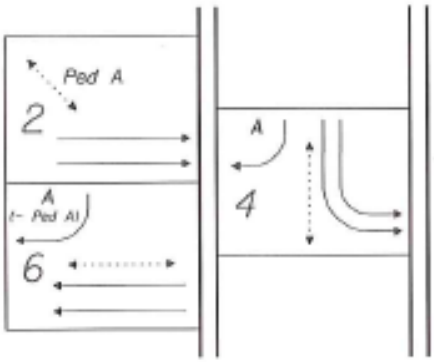




NORMAL PHASE ROTATION

Permanent Signal: STRE approved permanent signal design and operation.





NORMAL PHASE ROTATION

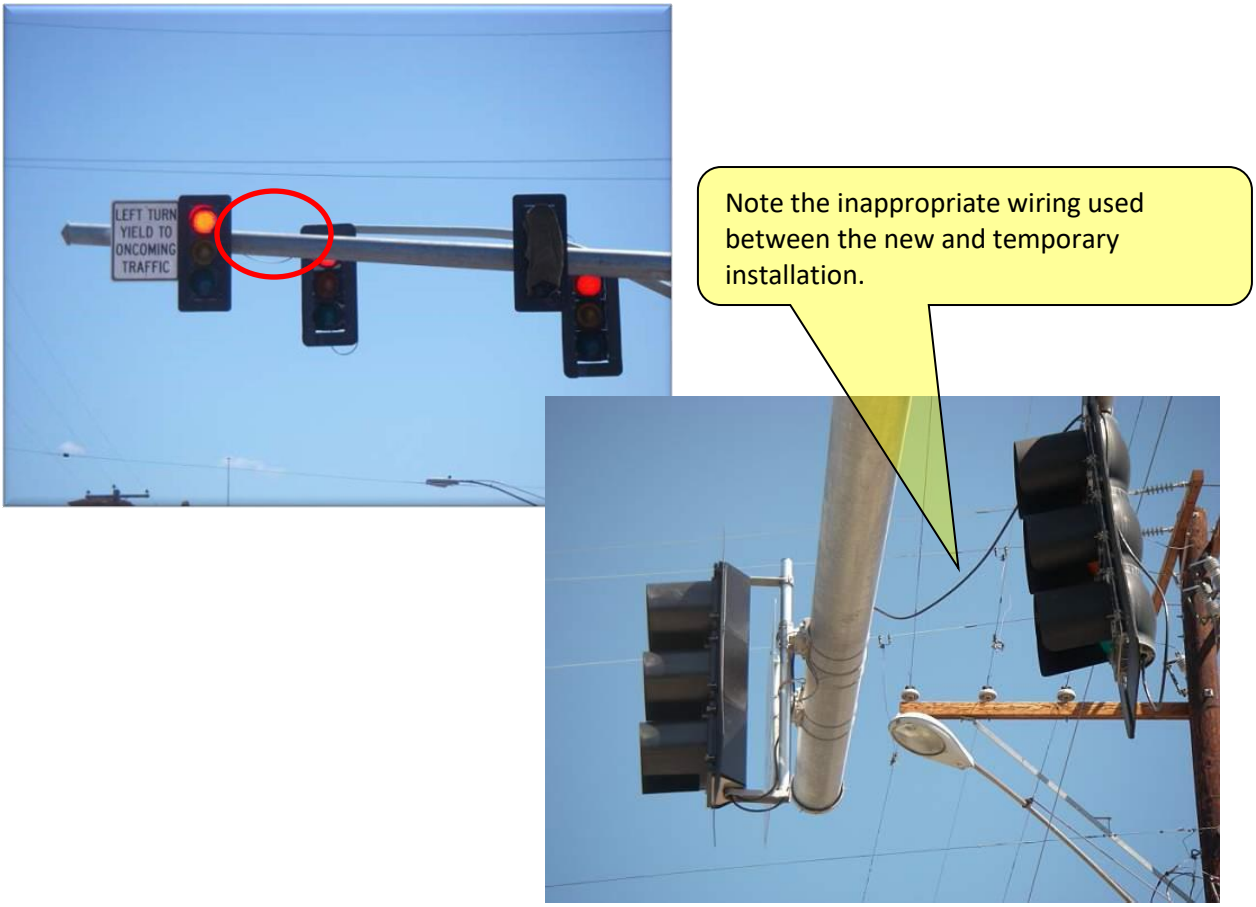
11.4 Design Approval of Temporary Signals

All temporary traffic signals, **except** Temporary Portable Signals, require Design Approval (See Chapter 2 for more information on Design Approval).

11.5 Using Existing or New Signal Equipment as Part of the Temp. Installation

The practice of using existing or new signal equipment as part of a temporary signal is not allowed, as it complicates the contract administration of project (payment issues), the responsible party for maintaining/power costs of the equipment becomes confusing (per specifications, maintenance of temporary installations is the responsibility of the contractor, maintenance of the permanent signal after turn-on is the responsibility of the agency), and equipment most likely will have to modified or wired in a non-standard way to incorporate the permanent or existing equipment into the temporary installation. There is also more potential for damage to the new equipment. See Figure 11-5 showing an example of improper use of new equipment for a temporary installation.

Figure 11-5 | Improper use of new equipment for a temporary installation



Do NOT mix existing or new signal equipment with temporary signal installations (including conduit, junction boxes, and wiring).

11.6 Temporary Signal Design

Temporary signal design should follow the same design guidelines that are contained in the permanent signal design chapters of this manual. This section discusses design information specific to temporary signals including deviations from permanent design (e.g. use of different materials/equipment).

11.6.1 Poles

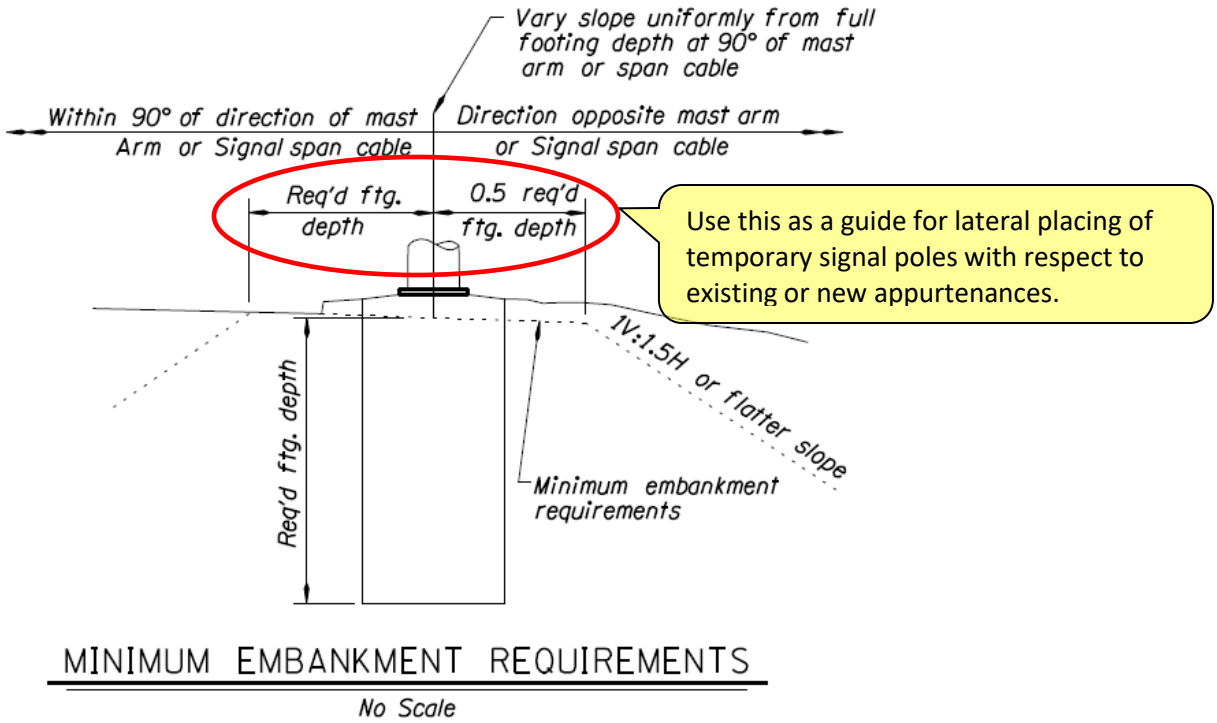
Wood poles with span wire are used for all temporary installations as per standard specification section 00225.15. Wood poles are considered non-standard (otherwise known as "X" poles, due to the drafting bubble note nomenclature used to define a non-standard pole). It is the contractor's responsibility to submit the wood pole certifications to ODOT's Traffic Structures Engineer for review before construction begins.

A span wire pole entrance chart is required to detail all temporary signal poles. See Chapter 9 for more information on the pole entrance chart. The only column in the pole entrance chart that doesn't apply to wood poles is the "Foundation Information" column (this column can be deleted or left blank). All other columns should be filled out as applicable to temporary signal design.

Temporary signals will require modeling of the signal pole, span wires and signal heads that are proposed to pass over the roadway cross section to determine the messenger cable attachment height (MAH) value. See Chapter 9 for how to calculate the MAH, with the following exception: temporary poles only need to consider the tallest piece of equipment that will be used on the span wire (as opposed to the standard Type 5 signal head that is to be used in permanent span wire calculations). Cross sections shall be cut and used to design all temporary signal installations. Particular attention shall be given to all cross section areas that have poles and signal heads in the adjacent area. The bottom of the signal heads must not be below 18 feet or above 19 feet during any phase or stage of construction.

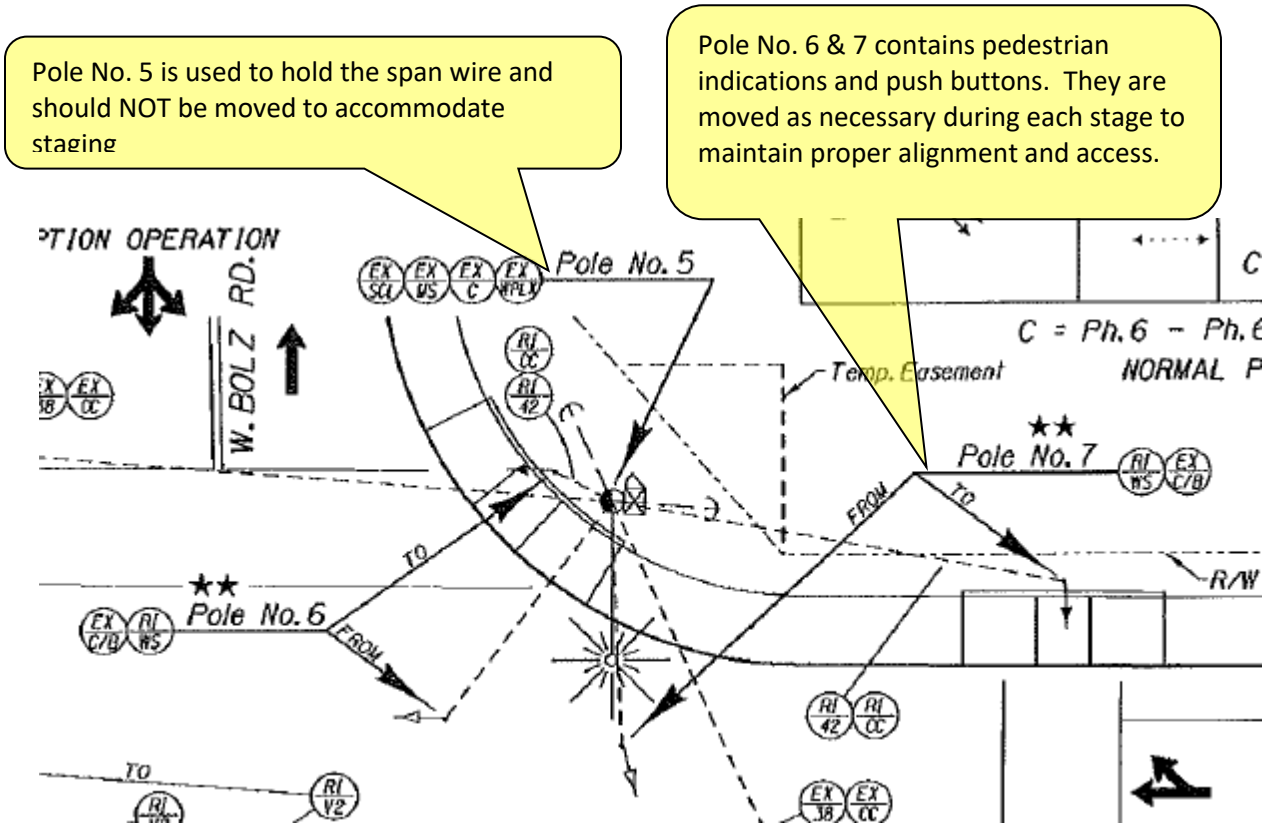
The lateral placement of temporary signal poles next to new or existing appurtenances (e.g. existing/new signal poles, cabinets, etc.) should follow the requirements in Standard Drawing TM653 that are established for embankments. See Figure 11-6. If a temporary pole is placed closer to an object than as shown in the minimum embankment requirements, contact the Traffic Structures Engineer for further analysis.

Figure 11-6 | TM653 Minimum Embankment Requirements



Large poles (those used for span wires) should be set to accommodate all construction staging. Small poles (for pedestrian indications and push buttons) can and should be moved as needed during each stage/phase. See Figure 11-7.

Figure 11-7 | Moving Poles During Staging



11.6.2 Controller Cabinet

The 332S controller cabinet mounted on a temporary, precast foundation is the standard for all temporary installations. Use Standard Detail DET4415 for the temporary foundation.

11.6.3 Service Cabinet and Meter Base

The service and meter base are pole mounted in the same quadrant that controller cabinet is located in. The service cabinet and meter base for temporary installation is shown in Standard Drawing TM455 (which references TM485 for wiring details).

The connection from the power source to the service cabinet/meter base is typically aerial (as opposed to underground for a permanent signal).

11.6.4 Junction Boxes

Junction boxes used for temporary applications do not require a concrete apron if located in non-paved areas.

11.6.5 Use of Detection (Vehicle, Bicycle, Pedestrian Push Buttons, and Fire Preemption Detectors)

Equipment such as vehicle detection, pedestrian pushbuttons, and fire preemption detectors should be evaluated according to their need, and should not automatically be included in the design. Several factors should be considered when determining whether detection is needed or not:

ALL DETECTION

- Duration of temporary signal – Detection becomes more beneficial and cost effective the longer it is expected to be in service.
- Construction staging changes – Providing detection can be labor and cost intensive if there are a lot of staging changes. Non-invasive detection systems (video, microwave, etc.) can provide more flexibility in these situations.

VEHICLE DETECTION

- Speed of the mainline – Detection becomes more beneficial if the mainline of the temporary signal is high speed (greater than 35 mph), due to the increased protection of the dilemma zone.
- Traffic Volumes – Detection becomes more beneficial if the traffic characteristics of the intersection are highly variable (i.e. heavy directional movements only during the AM and PM peak) or if the intersection operates below capacity the majority of the time. When an intersection is operating at or above capacity for all movements, the detection system is less critical because signal will just be "maxing out" all the green time, which is similar to the operation of a "fixed time" cycle. However, if the intersection is operating at or above capacity for only a few of the movements, using detection for those under capacity movements can improve the flow and queuing of traffic for the movements that are at or above capacity.
- Temporary signal operating in system vs. isolated – Signals operating exclusively in coordinated systems do not use any detection for the coordinated phases.

BICYCLE DETECTION

- Bicycle Lanes & Location – Bicycle detection may only be considered if there is a separate Bicycle lane. Detection is more beneficial on approaches with phases that are not recalled (i.e. side streets).

PEDESTRIAN PUSH BUTTONS

- Accessibility of pedestrian push buttons during construction – Pushbutton detection should NOT be used if the construction work will make accessibility (according to Section 5.4) a concern. If this is the case, recalling the pedestrian phase, closing the pedestrian crossing or use of non-invasive pedestrian detection (video, etc.) may be considered. Often temporary signal poles used for the span wire installation must be placed far away from the intersection in order to accommodate the construction work. In these cases, a separate temporary wood pole that is used just for the push buttons would be required so that the push buttons can be placed close enough to the intended crossing to meet the requirements stated in Section 5.4. The "Typical Pedestrian Installation on Wood Post" detail contained on standard drawing TM455 would be used.
- Feasibility of recalling pedestrian phases – Detection is less beneficial if the green time of vehicle phase that is compatible with the pedestrian phase is typically always longer than the pedestrian crossing clearance time.
- Pedestrian volumes – Detection is less beneficial if there is a heavy pedestrian volume (i.e. pedestrian phase is serviced every cycle).

Figure 11-8 | Pedestrian Push Button Access – Example 1

Figure 11-9 | Pedestrian Push Button Access – Example 2

EMERGENCY PREEMPTION DETECTION

- Does the existing signal or permanent new signal have emergency preemption detection? – Typically if an existing signal has preemption detection, the temporary signal will also require preemption detection. If the existing signal does not have emergency preemption but the permanent signal will, the temporary signal will NOT require preemption detection.

- Needs of emergency vehicle service providers – The need for temporary emergency vehicle preemption should be discussed with all interested parties. Understanding the main routes that emergency vehicles use can determine if preemption detection is needed primarily for only one or two approaches vs. each approach.

- Use of recalled pedestrian phases - The need for emergency vehicle preemption becomes less beneficial if pedestrian phases must be recalled. This is due to the requirements of the MUTCD which do not allow emergency preemption to shorten a conflicting “Flashing Don’t Walk” pedestrian phase.

11.6.6 Vehicle Detection

If vehicle detection is deemed necessary, video or radar detection are the preferred detection method to use for temporary traffic signals due to the non-invasive nature and ability for the vehicle detection zones to be easily reconfigured to accommodate various stages of construction. Loop detection should be avoided if possible.

The video or radar detection equipment should be mounted on a temporary signal pole or on a temporary illumination arm. Span wire mounting is not allowed.

11.6.7 Wiring

Wiring for the temporary signal follows the same basic guidelines contained in Chapter 5 for the permanent span wire signal design with the following exceptions:

- Underground (conduit) is not used to wire the phases (from the controller to the terminal cabinet). Wiring for the phase is routed overhead on along the messenger cable for ease of installation and removal.
- The connection from the power source to the service cabinet is typically aerial (as opposed to underground for a permanent signal).
- The wiring from the terminal cabinet to the signal heads may come from either terminal cabinet. If staging requires moving the signal heads, it is best to wire the signal heads from the terminal cabinet that they will be moving TOWARDS. That way there is enough extra wire to accommodate the change in head location. This allows for the most efficient stage change.

Figure 11-10 | Span Wire Wiring – Example 1

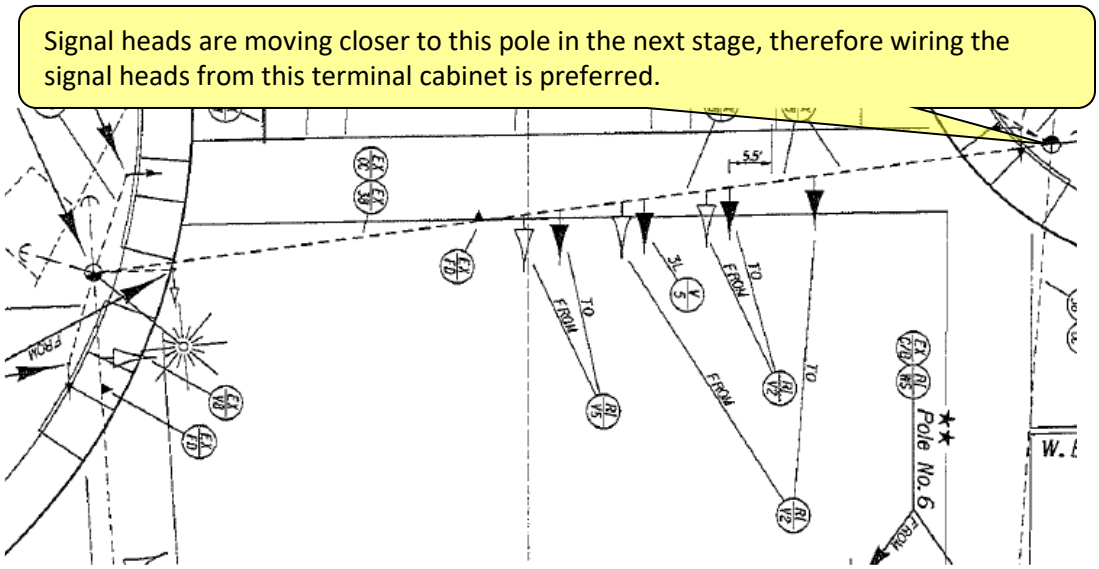
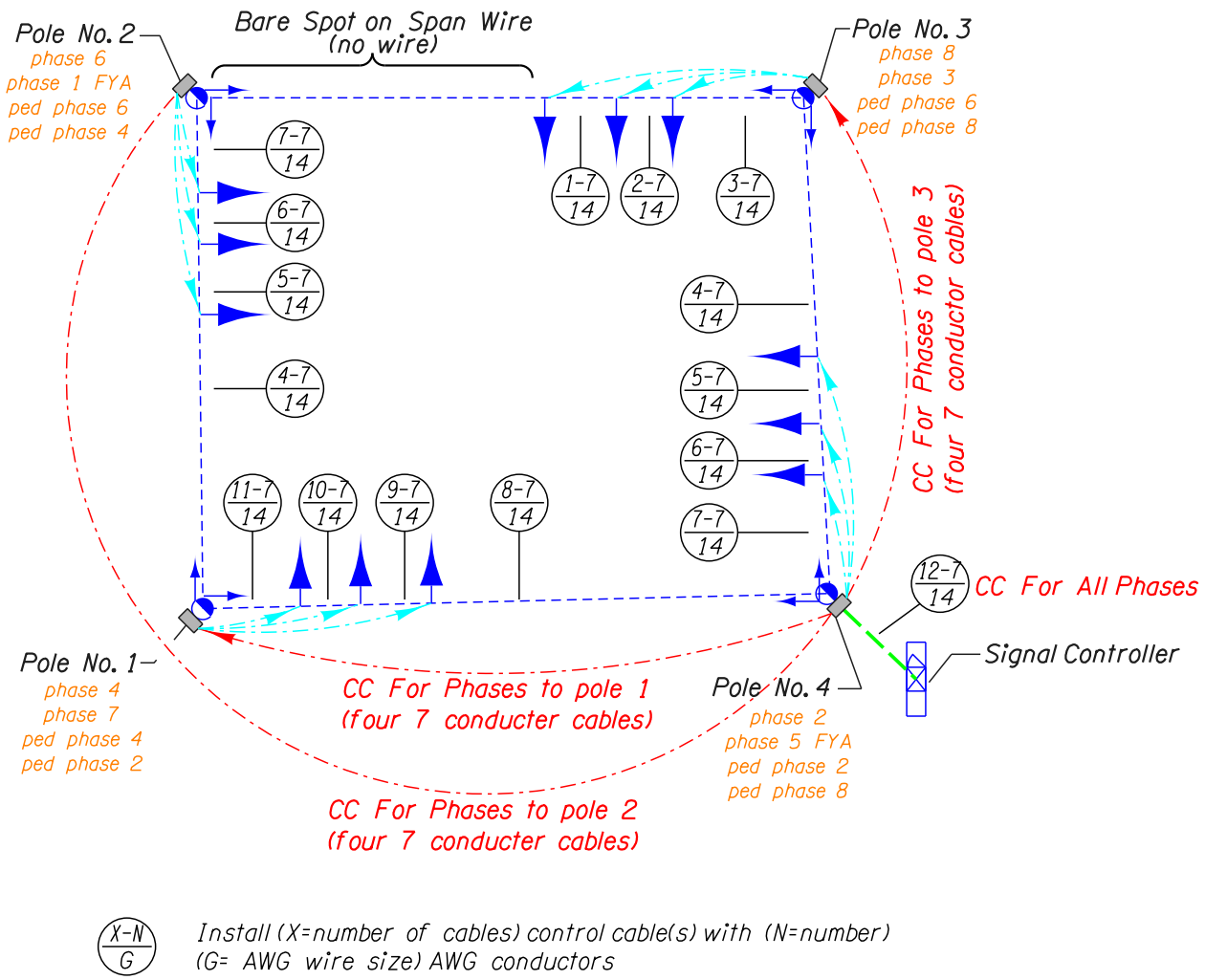


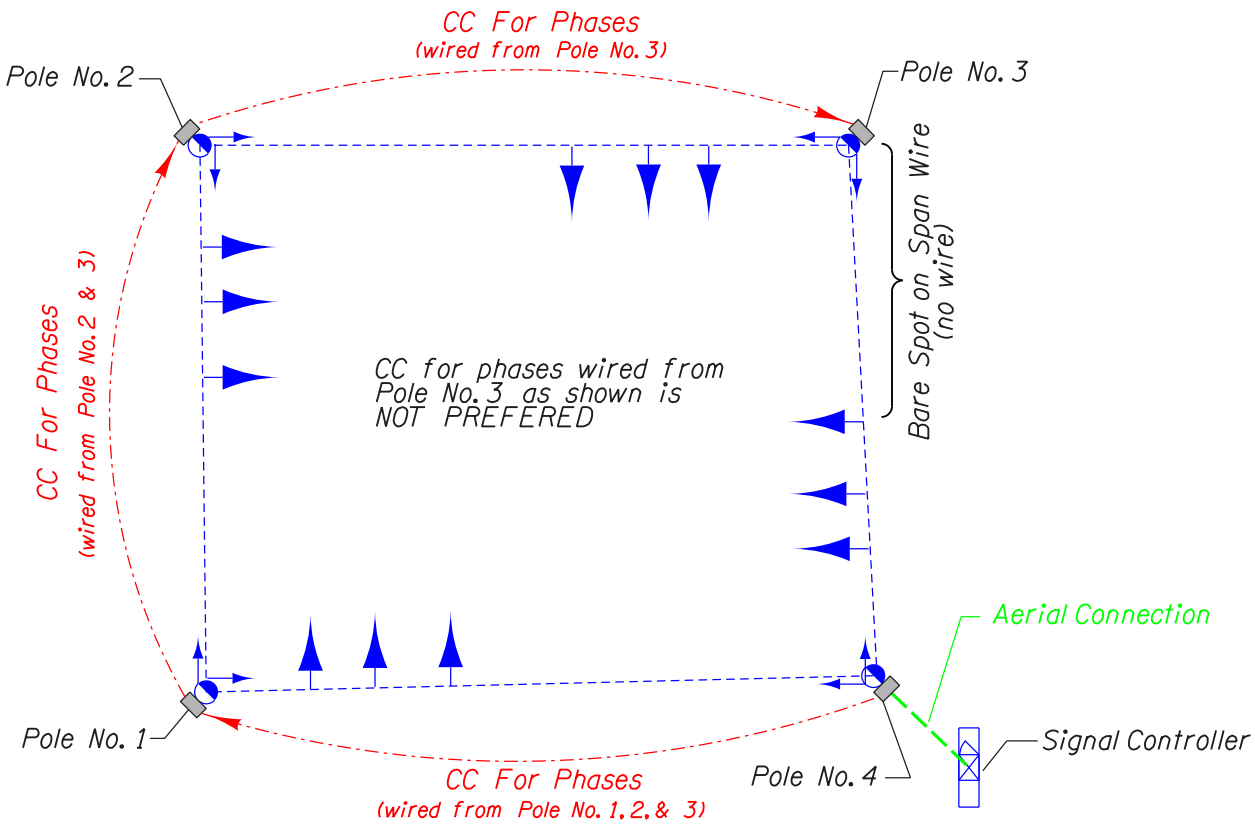
Figure 11-11 illustrates the preferred method for wiring signal phases on a temporary span wire. The control cable for the phases (drawn in red) goes to each pole and a bare spot will always occur on a portion of the span wire (no wire, only the messenger cable). To determine the number of control cable needed, count the number of phases powered from each pole and the number of signal heads. Each phase and each signal head requires one 7 conductor control cable. For example in Figure 11-11, pole No. 2 will power two pedestrian phases, one thru phase, and one PPLT left turn phase. Therefore, four 7 conductor control cable is needed to power each phase. These four 7 conductor control cables will start from the controller cabinet and go directly to the Pole No. 2 terminal cabinet (all four 7 conductor control cables will bypass the terminal cabinets on Pole No. 4 and 1). The wiring is shown after each piece of signal equipment.

Figure 11-11 | Preferred Method for Wiring Signal Phases on a Span Wire



There are many ways to wire a traffic signal that work, but to achieve uniformity (which has many benefits for maintenance and construction), we strive to wire traffic signals in a consistent manner. The following Figure 11-12 shows a possible way to wire the signal phases, but this is not a preferred method for more reasons than uniformity alone; the wiring as shown in Figure 11-12 is not very economical (the wiring for pole No. 3 phases is much longer than as shown in Figure 11-11) and the terminal cabinet located on pole No. 1 may not have enough area to accommodate the increased number of control cables that must now come in and out of the bottom of the terminal cabinet.

Figure 11-12 | NON-Preferred Method for Wiring Signal Phases on a Span Wire



11.6.8 Staging

When designing any temporary signal, keep in mind you may need to adjust the signal heads and detection for various stages of construction. Signal designers should coordinate their work early in the process with the traffic control designer assigned to the project and Region Traffic (or the Operations Unit). This will assure correct operation of the temporary signal and safe traffic control during the construction phase.

Depending on the complexity of the project, the temporary traffic control plans may detail specific stages and phases for construction (e.g. Stage I, phase 1; Stage I, phase 2; Stage II, phase 1, etc.). If specific stages and phases have been produced for the project that will impact a signalized intersection, the signal designer needs to produce a temporary signal plan sheet for each stage and phase that details the following components at a bare minimum:

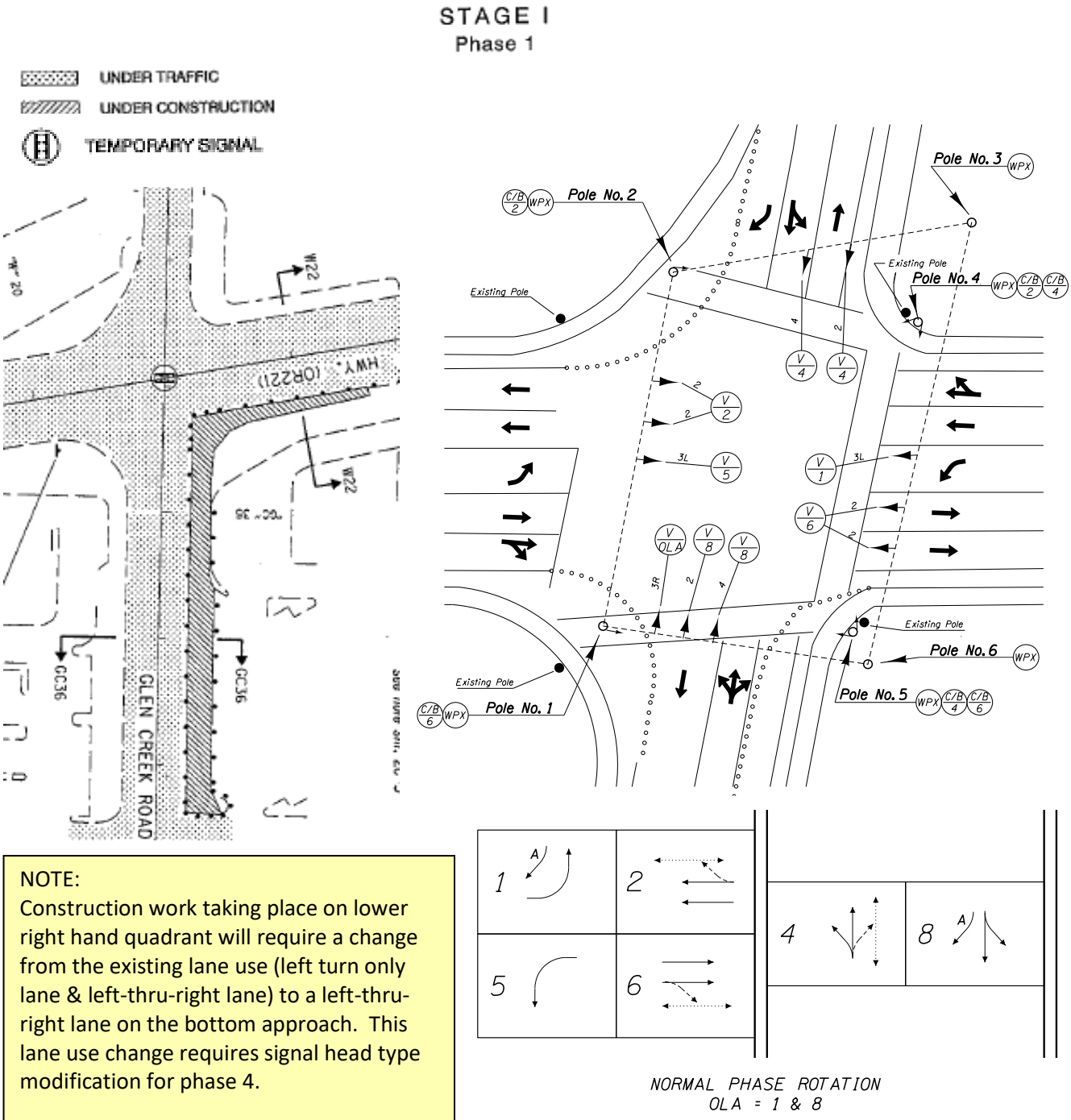
- Lane use at the intersection
- Signal and pedestrian head configuration and type
- Lane use signing and other regulatory signing mounted on the signal equipment as necessary
- Signal phasing
- Detection as necessary (push buttons, loops, etc.)
- Reference existing and/or proposed signal poles or curb lines (helps establish the location of the temporary features in relation to existing and proposed conditions)

Keep in mind that the construction staging that is produced for the contract plans is only showing one way to complete the required construction work, and therefore, there is a strong possibility that the contractor will elect to modify the staging/phasing shown in the plans. There is also the possibility that the contractor will propose an entirely different staging plan. This is allowed per standard specification 00225.05 which states the contractor is responsible for submitting a written traffic control plan (detailing any modifications to traffic control plan as contained in the contract plans) to the Engineer for approval.

Figure 11-13 through Figure 11-22 show each stage and phase of an example project with the traffic control plans (TCP) shown on the left side (produced by the traffic control plans designer) and the corresponding temporary traffic signal plans shown in the right side (produced by the signal designer). This example project was a modernization project to add capacity (lanes) at the intersection.

The temporary signal plans must correspond with and match the traffic control plans.

Figure 11-13 | Staged Construction Example – Stage I, Phase 1



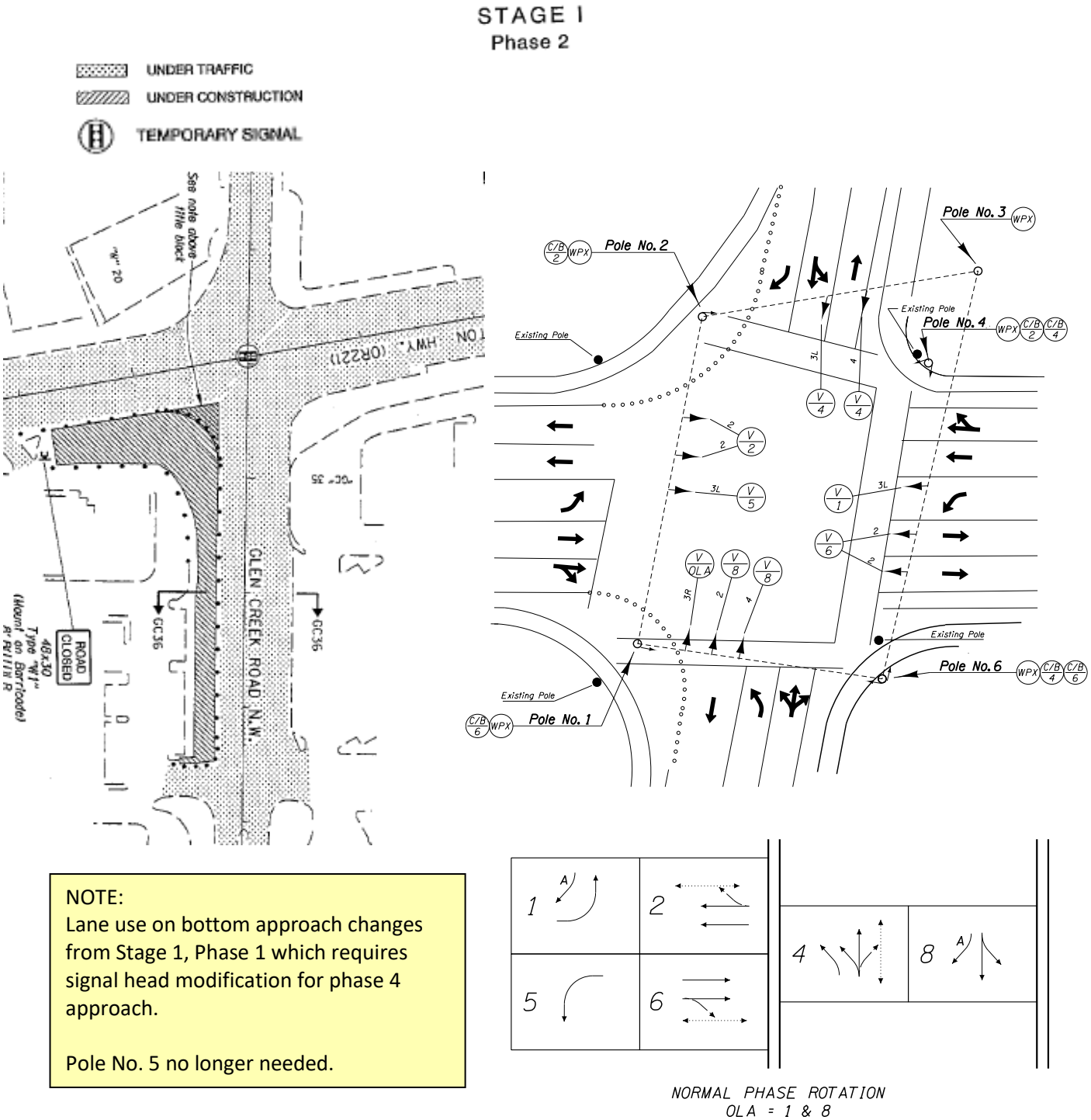
NOTE:
Construction work taking place on lower right hand quadrant will require a change from the existing lane use (left turn only lane & left-thru-right lane) to a left-thru-right lane on the bottom approach. This lane use change requires signal head type modification for phase 4.

Placement of temporary signal pole nos. 1 and 2 will require modification to the radii. Poles 1, 2, 3 & 6 (major poles) will stay in same location for entire temp staging.

TCP Plans

Temporary Signal Plans

Figure 11-14 | Staged Construction Example – Stage I, Phase 2



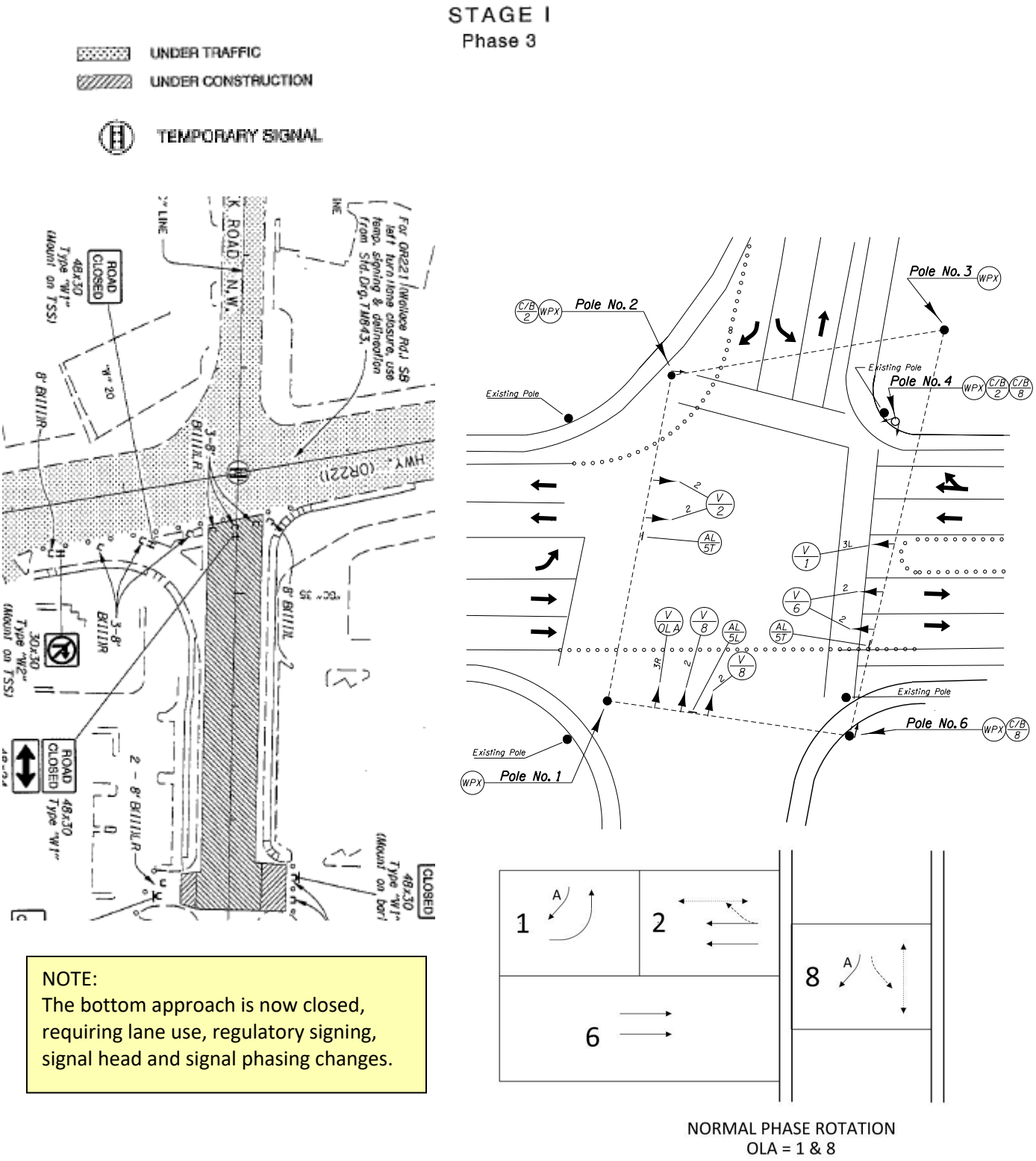
NOTE:
Lane use on bottom approach changes from Stage 1, Phase 1 which requires signal head modification for phase 4 approach.

Pole No. 5 no longer needed.

TCP Plans

Temporary Signal Plans

Figure 11-15 | Staged Construction Example – Stage I, Phase 3



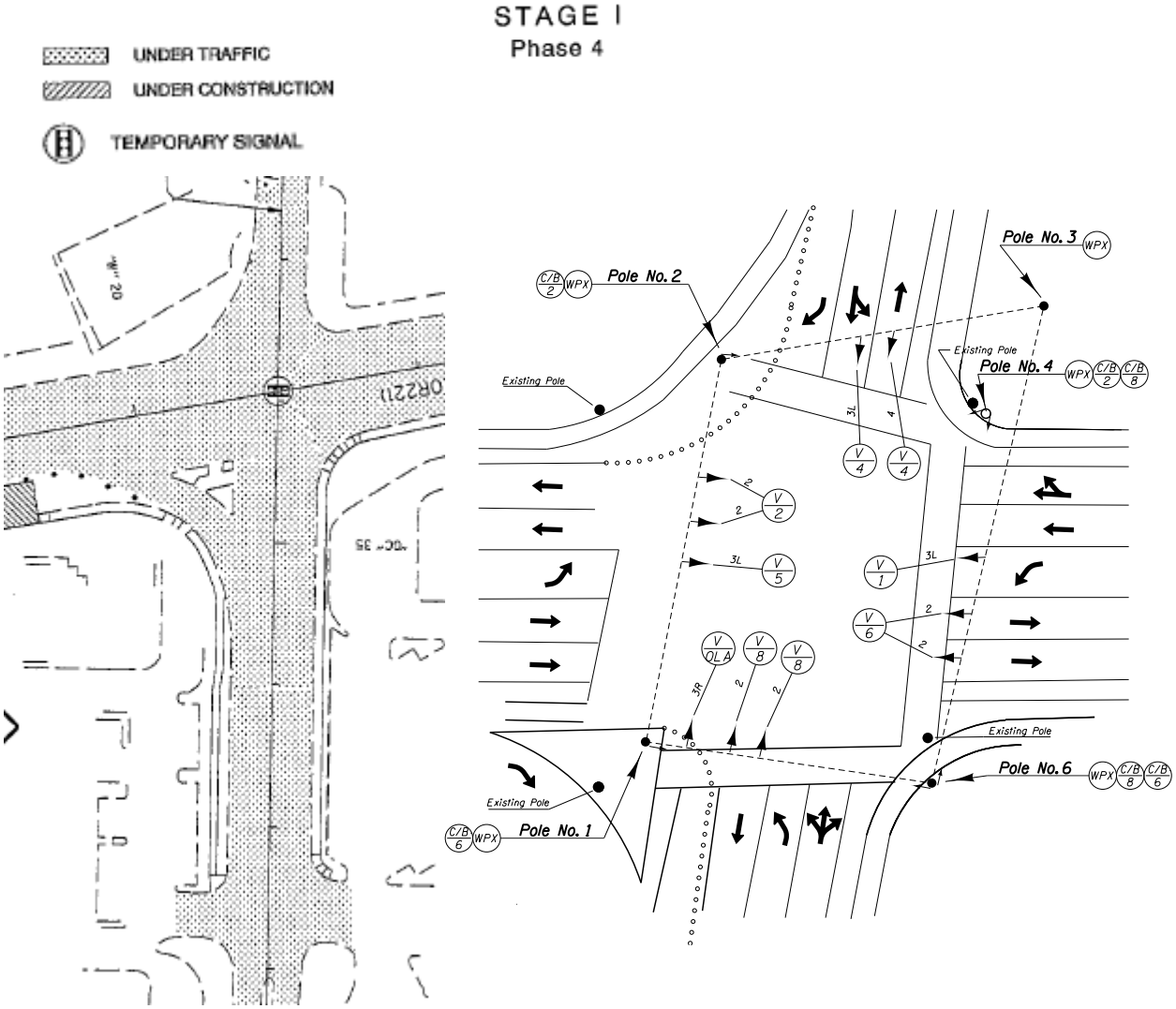
NOTE:
The bottom approach is now closed, requiring lane use, regulatory signing, signal head and signal phasing changes.

NORMAL PHASE ROTATION
OLA = 1 & 8

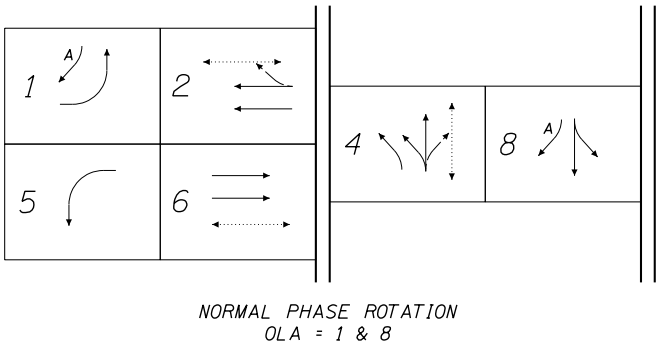
TCP Plans

Temporary Signal Plans

Figure 11-16 | Staged Construction Example – Stage I, Phase 4



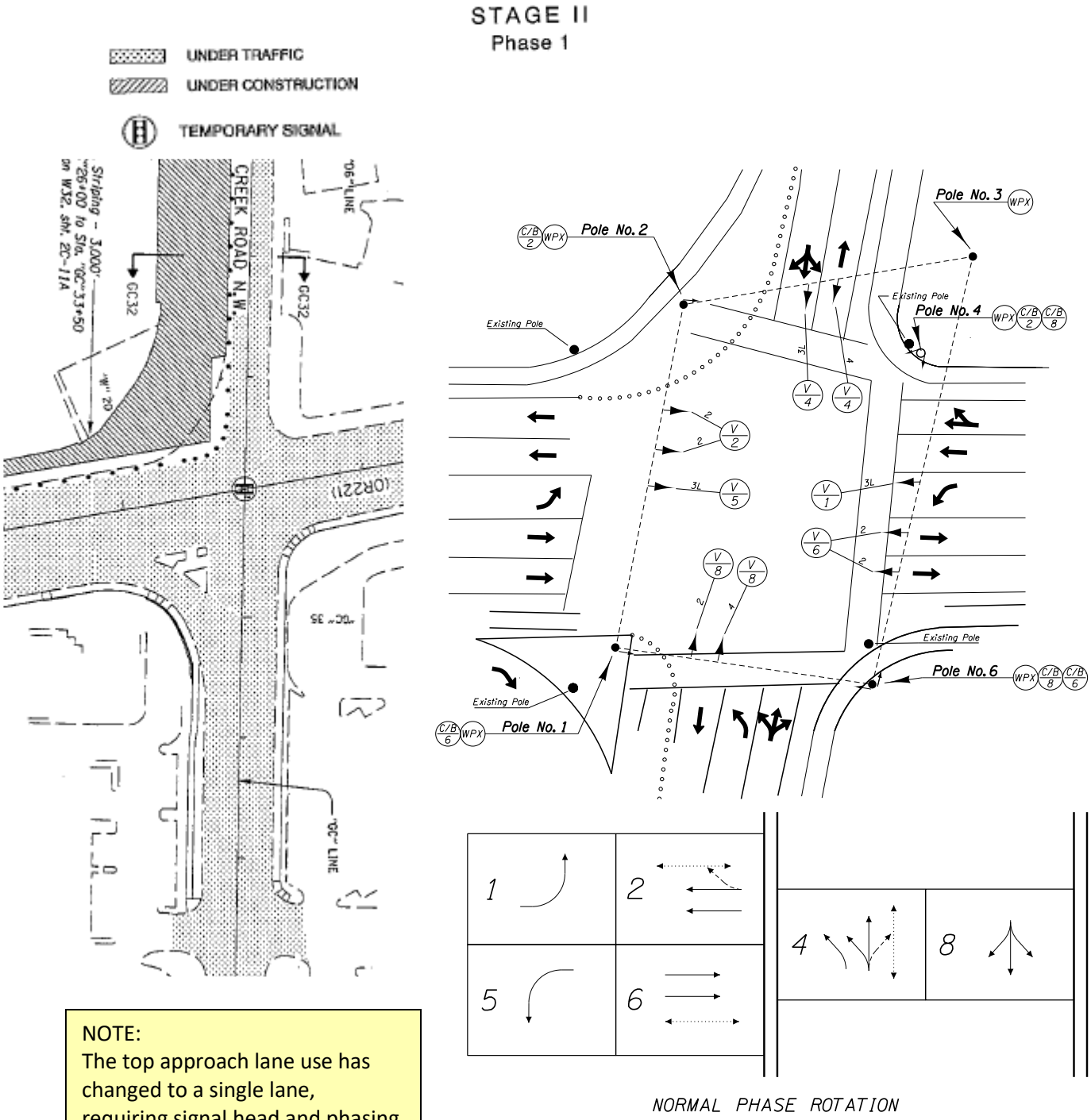
NOTE:
The bottom approach final lane configuration is complete; however, the final lane configuration for the bottom approach cannot be used yet due to the severe lane off-set for the vehicle going straight thru the intersection from the top approach.



TCP Plans

Temporary Signal Plans

Figure 11-17 | Staged Construction Example – Stage II, Phase 1

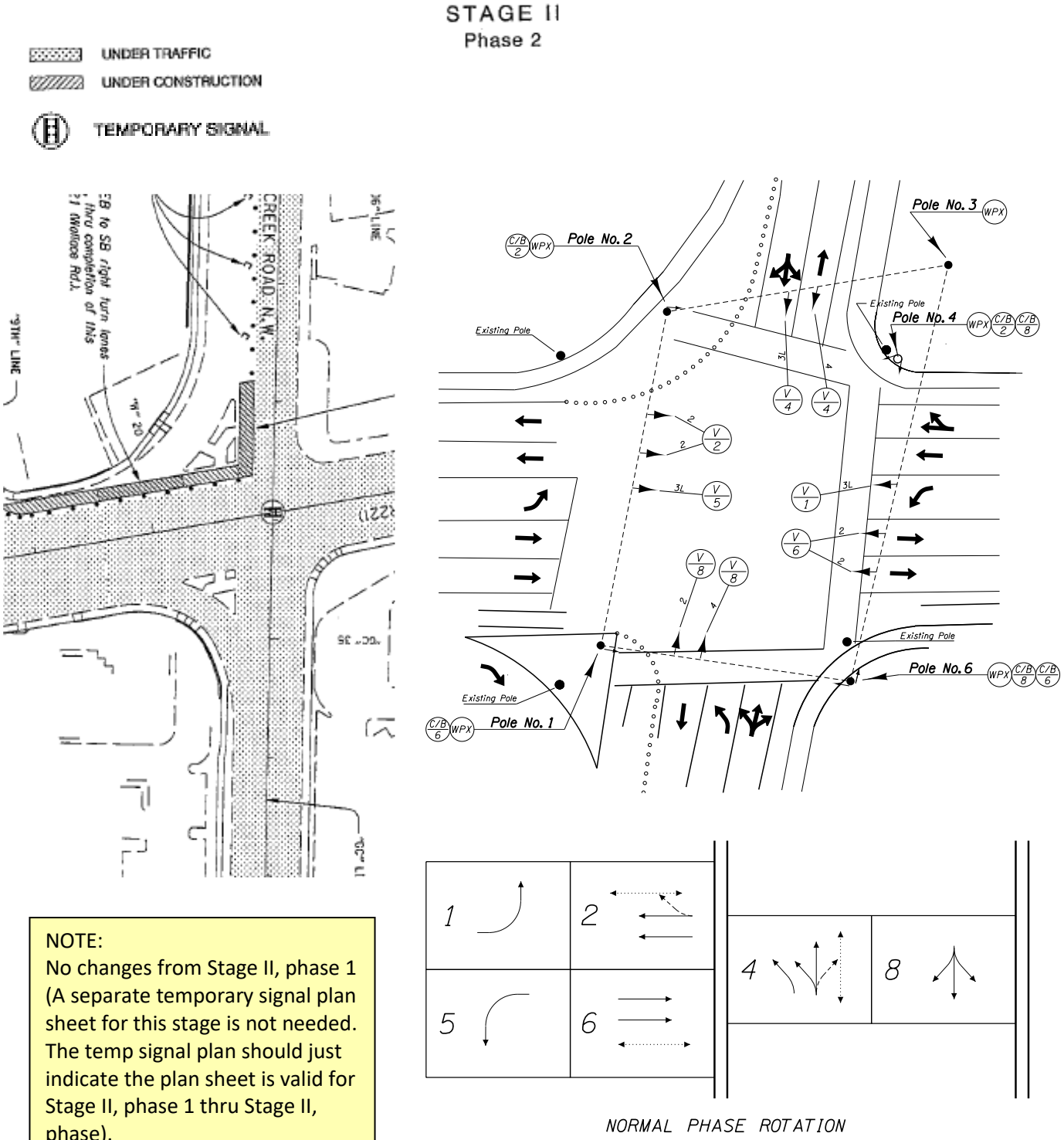


NOTE:
The top approach lane use has changed to a single lane, requiring signal head and phasing changes (overlap A has been removed for this stage).

TCP Plans

Temporary Signal Plans

Figure 11-18 | Staged Construction Example – Stage II, Phase 2

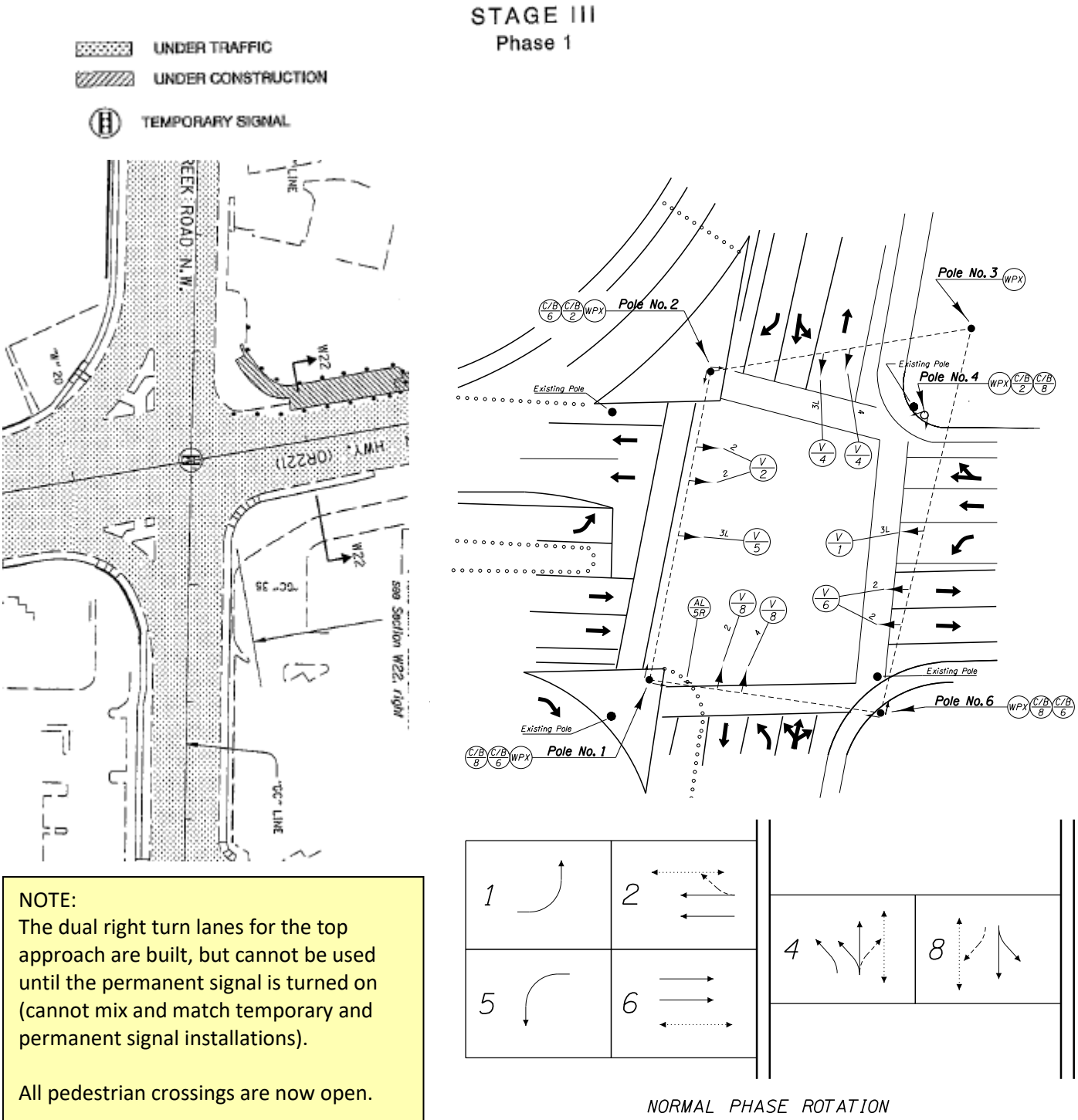


NOTE:
No changes from Stage II, phase 1 (A separate temporary signal plan sheet for this stage is not needed. The temp signal plan should just indicate the plan sheet is valid for Stage II, phase 1 thru Stage II, phase).

TCP Plans

Temporary Signal Plans

Figure 11-19 | Staged Construction Example – Stage III, Phase 1



NOTE:
The dual right turn lanes for the top approach are built, but cannot be used until the permanent signal is turned on (cannot mix and match temporary and permanent signal installations).

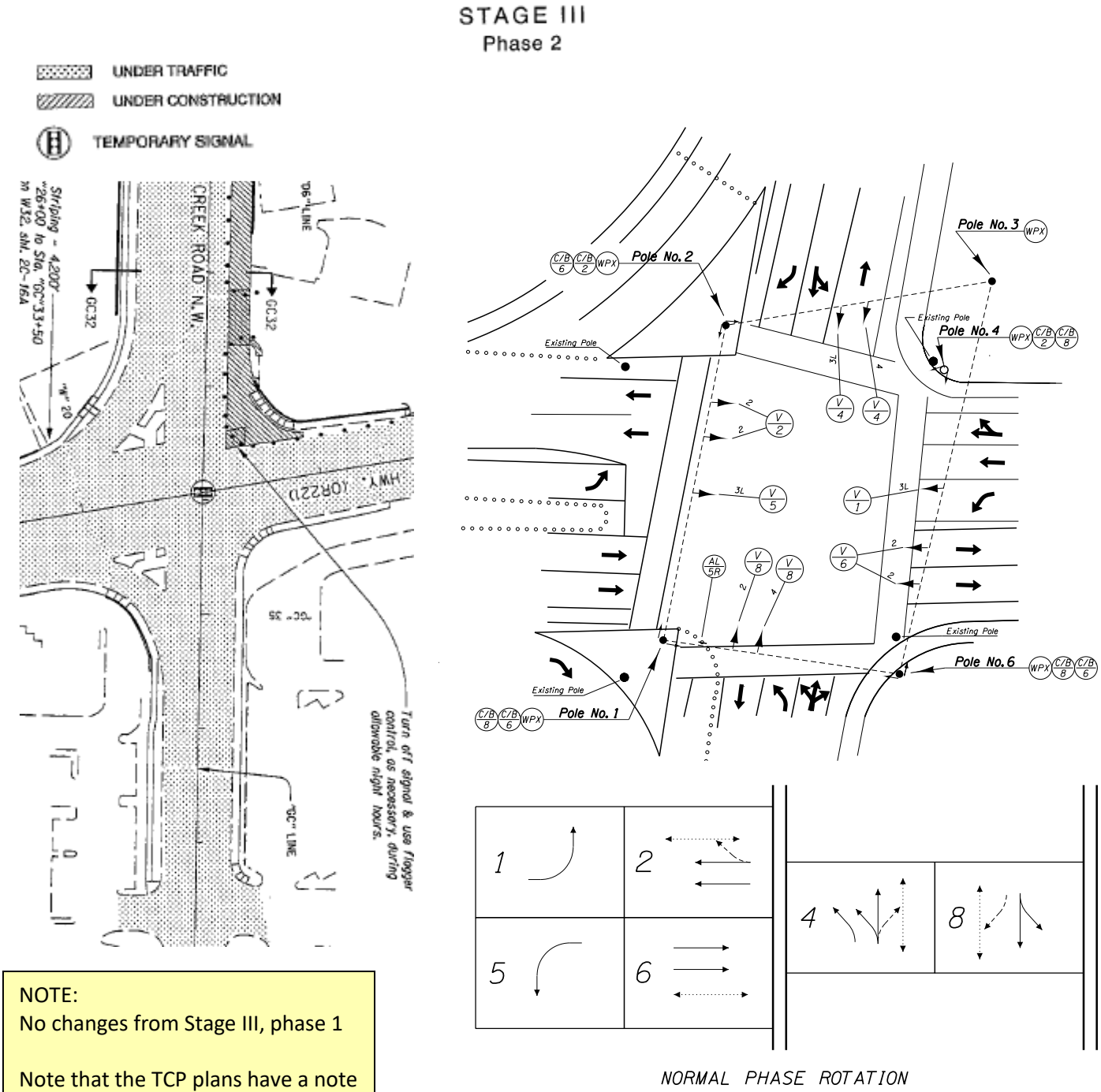
All pedestrian crossings are now open.

Left approach dual left turn lane cannot be opened yet (receiving lanes not yet built).

TCP Plans

Temporary Signal Plans

Figure 11-20 | Staged Construction Example – Stage III, Phase 2



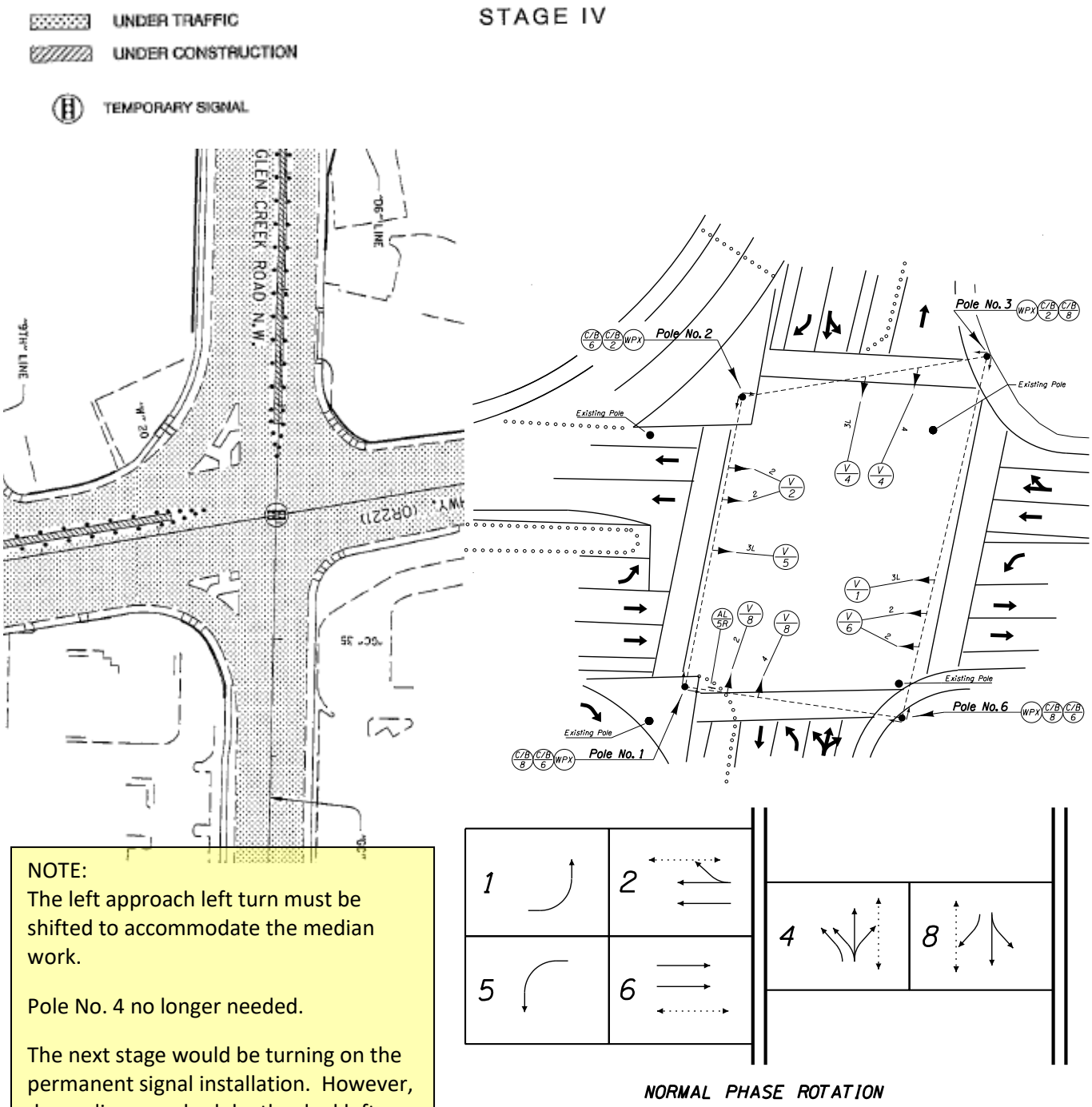
NOTE:
No changes from Stage III, phase 1

Note that the TCP plans have a note for the contractor about turning off the signal and flagging for the small amount of work to be done in the upper right hand quadrant.

TCP Plans

Temporary Signal Plans

Figure 11-21 | Staged Construction Example – Stage IV



NOTE:
The left approach left turn must be shifted to accommodate the median work.

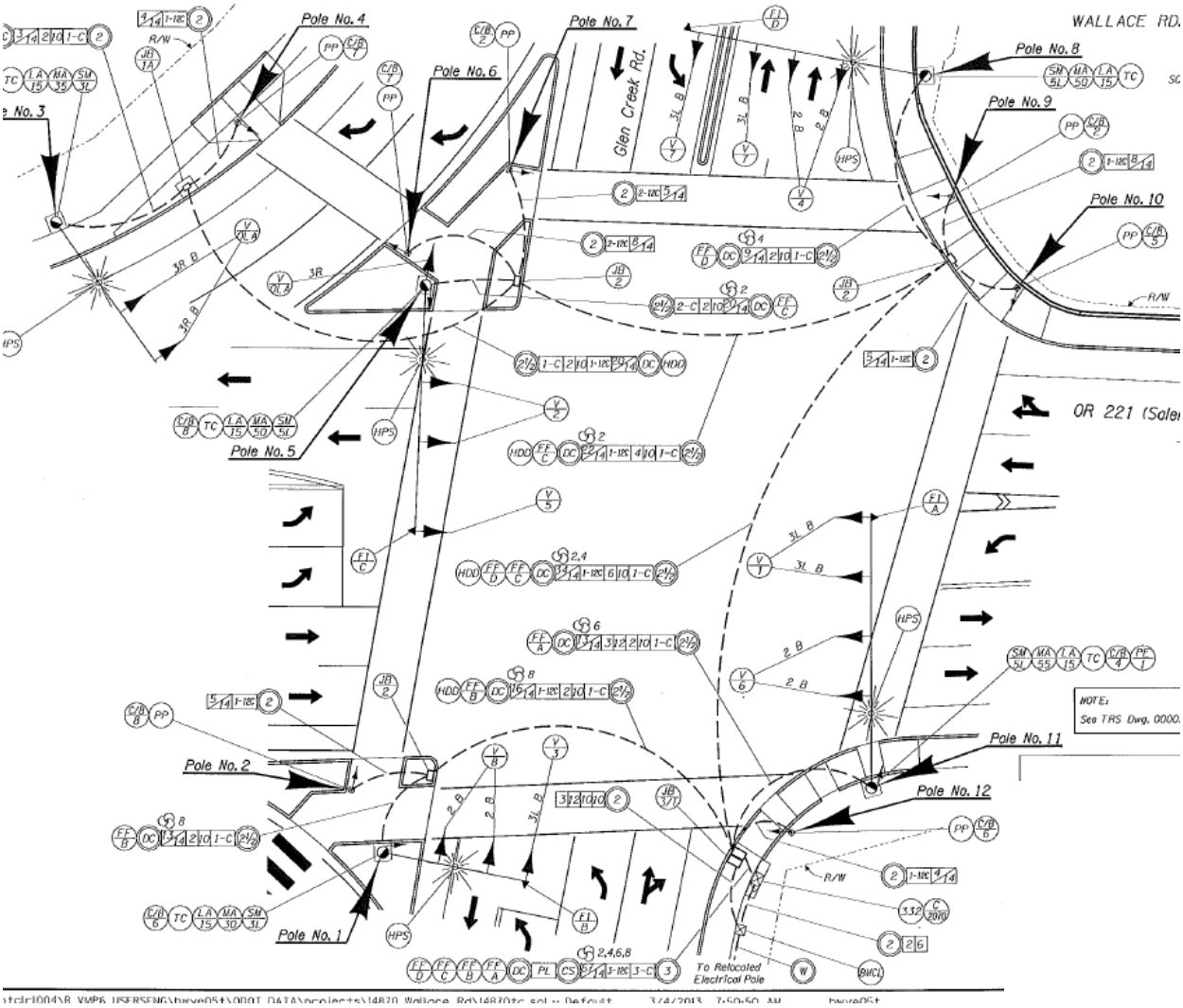
Pole No. 4 no longer needed.

The next stage would be turning on the permanent signal installation. However, depending on schedule, the dual left turn on the left hand approach could be opened <u>after</u> the median work and <u>prior</u> to turning on the permanent signal.

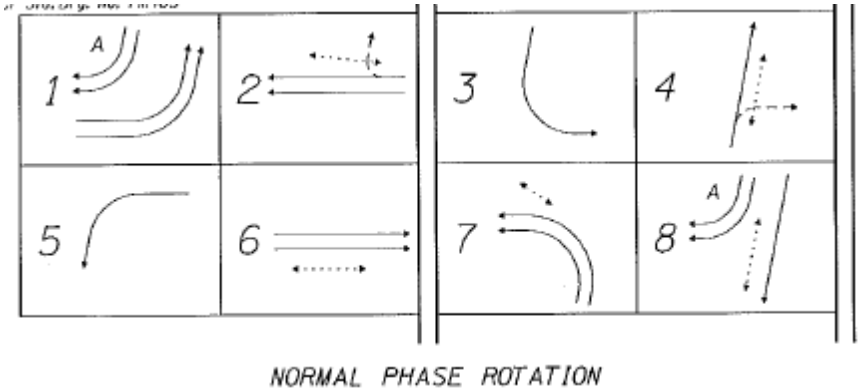
TCP Plans

Temporary Signal Plans

Figure 11-22 | Staged Construction Example – Permanent Signal



NOTE:
Final Configuration



11.7 Temporary Bridge Signal Design

This type of temporary signal alternates traffic across the bridge one direction at a time in a single lane. Note that this type of operation may occur at other locations besides a bridge, but bridge work comprises the majority, hence the designation of "temporary bridge signal". Considerations to include when beginning the design are the location of the bridge in relation to oncoming traffic and any other accesses within the intersection. All accesses within the "intersection" must be signalized.

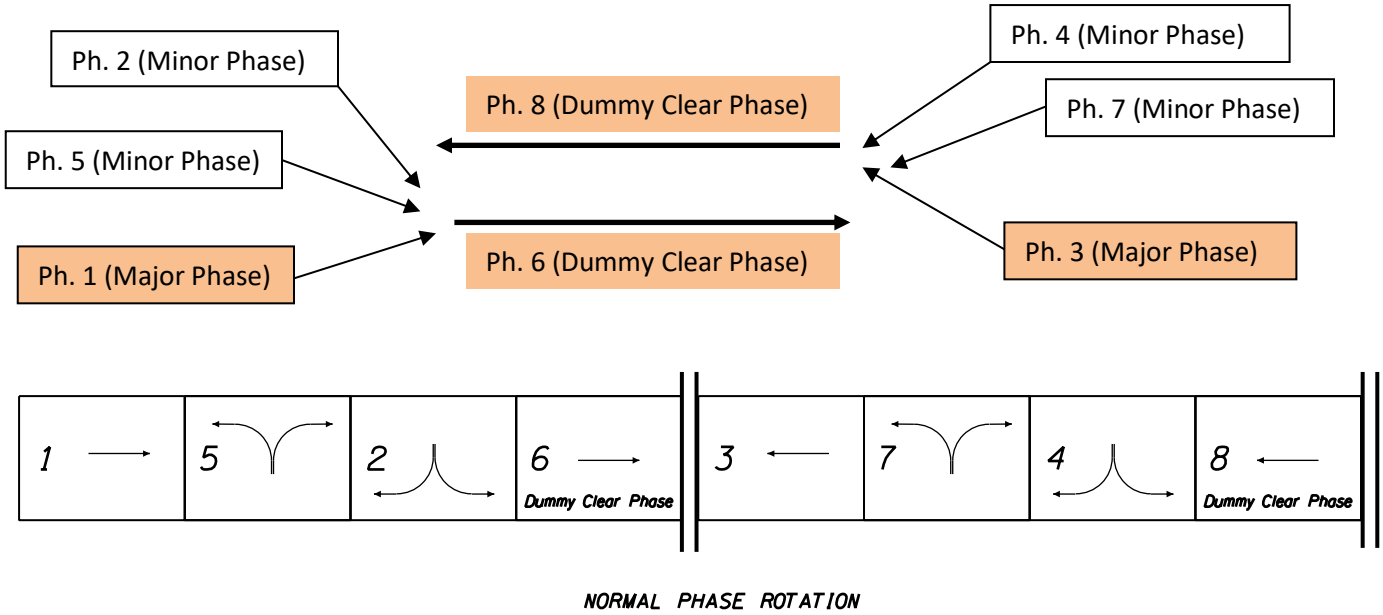
11.7.1 Phasing

One lane, two-way signal operations require exclusive phasing with long all red clearance intervals to clear the "intersection". This is usually accomplished by the use of dummy phases.

The standard phasing for this type of operation is shown in Figure 11-23, which allows for up to 4 separate accesses on each end of the single lane to be signalized. Accesses located in the middle of the single lane are not allowed and must be closed.

Pedestrian phases are typically not used given the typical location where this type of signal operation is used (i.e. rural bridge location).

Figure 11-23 | Standard Temporary Bridge Signal Phasing



11.7.2 Sight Distance

It is critical to maintain a good line of sight from stop line to stop line at each end of the single lane to ensure safe and efficient traffic operation in the event that the signal goes into flashing operation. If sight distance is not good and signal goes into flash, a motorist who cannot see opposing traffic will proceed ahead (after stopping) and may encounter an opposing vehicle in the single lane section, resulting in a crash or jockeying/reversing to make it thru the single lane section. These scenarios are not acceptable. If sight distance between the two stop line locations cannot be met (e.g. the single lane section is very long, the roadway geometry curves, vegetation or a cut slope is blocking the view) other means of traffic control shall be used (e.g. 24/7 flagging or pilot cars).

Figure 11-24 | Sight Distance Condition of Signal Turn-on Example

Note:

Prior to signal operation, remove trees and vegetation south of the straight line identified in the roadway plans, to establish a clear line-of-sight between temporary signal STOP lines.

11.7.3 Stop Line Location

Standard Drawing TM870 shows the typical layout for signing and pavement markings that are used for a temporary bridge signal. The stop line is shown as 60 feet (typical) from the signal heads, which is slightly more than the minimum 45 foot value to provide a more comfortable viewing angle for the driver. This value should work well for the majority of applications. However, if it is determined the stop line needs to be placed closer or farther than 60 feet based on site specific constraints, dimension the distance on the temporary signal plan sheet to properly override the standard drawing.

11.7.4 Signal Head Alignment

The signal heads should be aligned over the receiving lane of the single lane, which depending on the placement of the signal poles and roadway geometry may require a slight shift when one-lane alignment moves to the other side. Note how the signal head alignment changes between Stage 1 and Stage II in Figure 11-25 and Figure 11-26.

Figure 11-25 | Stage I Signal Head Location

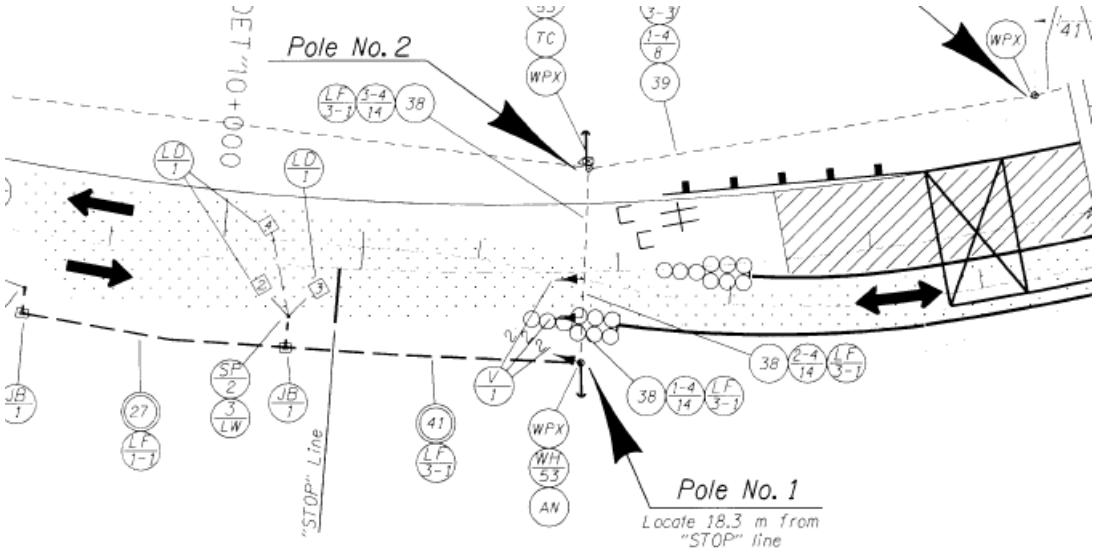
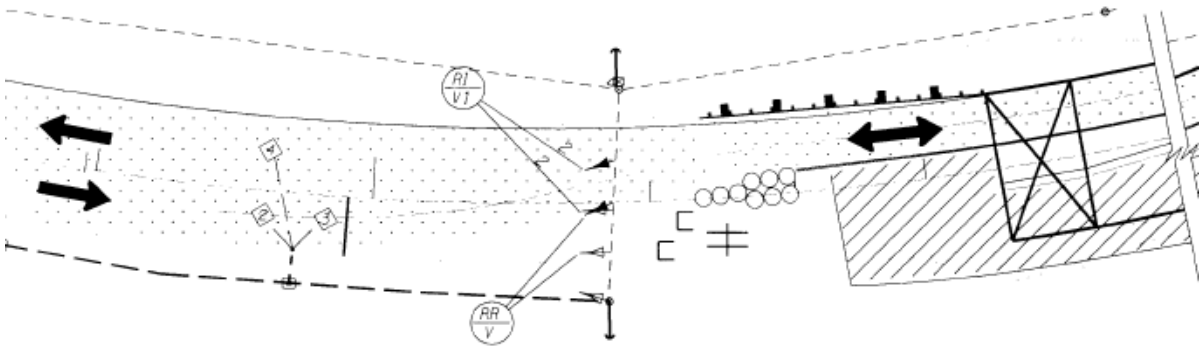


Figure 11-26 | Stage II Signal Head Location



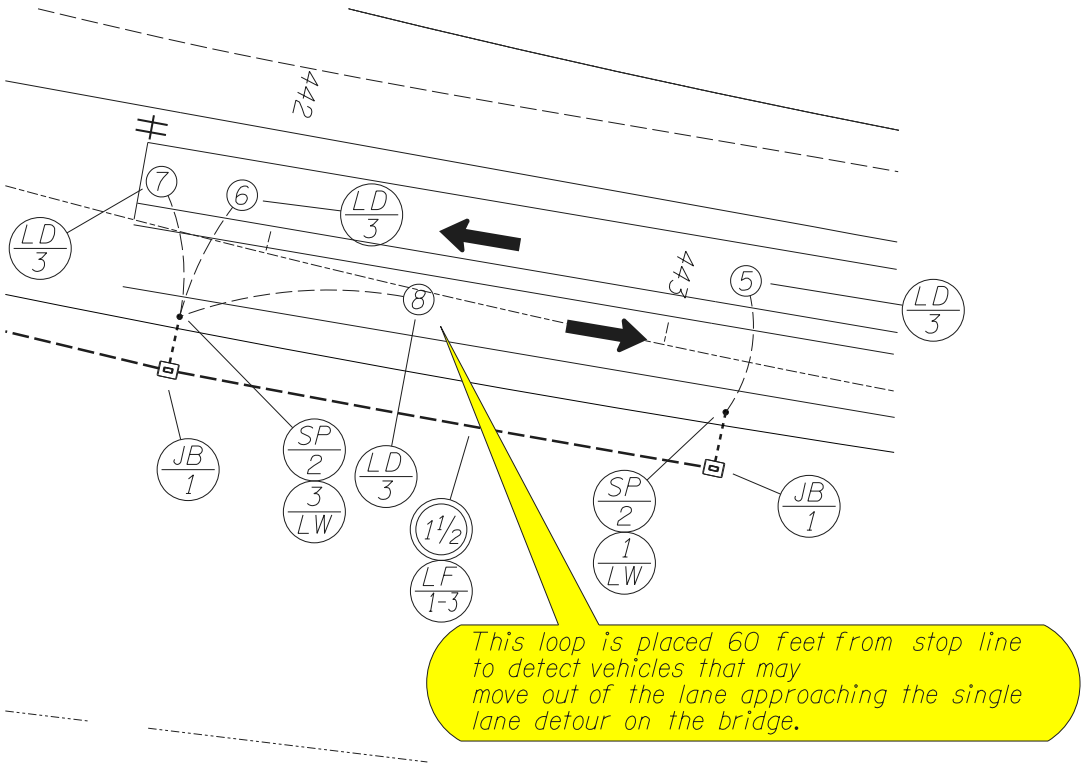
11.7.5 Detection

Temporary bridge signals shall have detection. This is a requirement to ensure the safest and most efficient operation. Detection enables the signal to "rest in red" when there is no demand. When a vehicle approaches during the "rest in red" condition, it must slow down prior to getting a green indication. It also improves the efficiency of an inherently inefficient signal operation (exclusive phasing with long clearance intervals).

The standard placement for detection of the major phases is 100 feet, 15 feet and 5 feet from the stop line, centered in the lane. One detector located 60 feet from the stop line in the OPPOSING lane should also be included to detect vehicles that are likely to move out of the approach lane when entering the single lane. See Figure 11-27.

The standard placement for detection of the minor phases follows the standard used for the minor street of permanent signals; 75 feet, 15 feet and 5 feet. If the minor phase approach is short in distance (i.e. to a driveway) or the pavement doesn't extend very far past the radius, the detection located at 75 feet and 15 feet may be omitted as necessary.

Figure 11-27 | Temporary Bridge Signal Standard Detection



When loops are used for detection, make sure to check the number of turns needed for each loop, as extra turns of wire are likely needed for loops located the furthest from the controller cabinet. See Chapter 6 for how to determine the correct number of turns.

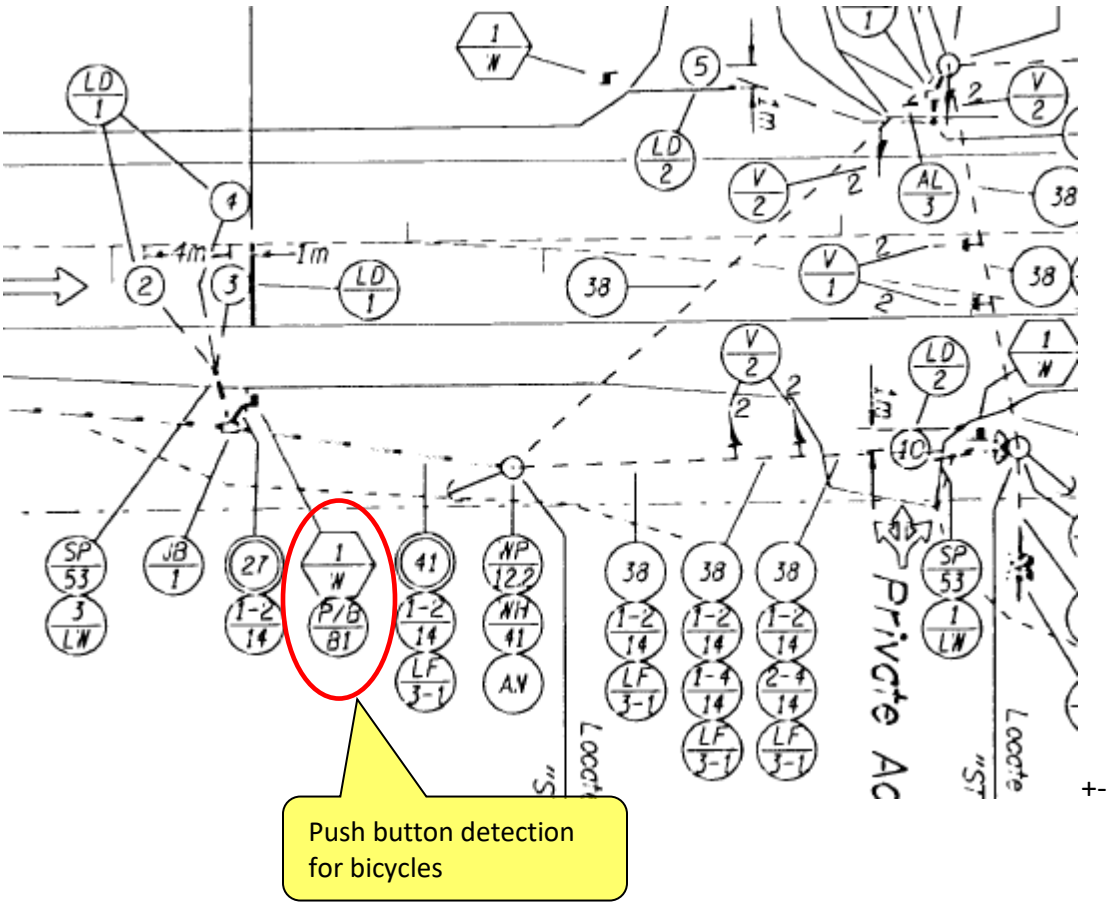
11.7.6 Bicycle Detection

Temporary bridge signals may use detection specifically for bicycles to allow an extension of the green time and clearance phase. The need for bicycle detection should be documented in the Operational Approval, based on factors such as the temporary bridge signal geometry (length, width, vertical grade, and presence of bicycle lanes), frequency of bicycles, speed differential between bicycles and vehicles, etc.

Pushbuttons have been used in the past and provide the most reliable form of bicycle detection for this type of installation; there is no chance of false call from vehicular traffic, and it works for all types of bikes. See Figure 11-28 for an example of push button detection. Other detection technology (i.e. loops, video, etc.) may be used if the detection zones can be placed such that false calls from vehicles will not occur. However, these technologies may not work for some types of bikes. It is important to have proper signing and/or striping in place to let bicycles know how to properly navigate through the signal if detection has been provided.

Portable temporary traffic signals (see section 11.8) cannot accommodate bicycle detection.

Figure 11-28 | Temporary Bridge Signal Bicycle Detection



11.8 Portable Temporary Traffic Signal

This is a very specific type of temporary traffic control. This application requires operational approval, but does not require design approval. Because this product is an off-the-shelf system that the contractor is responsible for timing, there is no need for a temporary signal plan sheet. All of the details for construction and operation of the device is contained entirely within the operational approval letter, the temporary traffic control plan sheets, and specification 00225.45(b) and 00225.65(b). Generally, the EOR for the temporary traffic control plans (not the signal designer) is responsible for detailing the use of this device on the project.

STRE Operational Approval is REQUIRED for use of a Portable Temporary Traffic Signal.

Temporary Signal Plan sheets are NOT needed. Design approval is NOT required.

11.9 Standard Drawings and Specifications Applicable to Temporary Signals

The following is a list of standard drawings and specifications that relate only to temporary signals and should be well understood by the signal designer when designing a temporary signal:

- Standard Drawings
  - TM870 (Bridge Construction)
  - TM455 (Temporary Signal Details)
- Specifications
  - 00225.15 (Temporary Traffic Signal Materials)
  - 00225.45 (Temporary Traffic Signal Construction, Removal, Power Service, Testing and Turn-on)
  - 00225.65 (Temporary Traffic Signal Maintenance)
  - 00225.85 (Temporary Traffic Signal Measurement)
  - 00225.95 (Temporary Traffic Signal Payment)

Other standard drawings/details and specifications (that also apply to permanent signals) will be needed, as applicable, for the installation of a temporary signal. See Chapter 17 and Chapter 18 for more information on standard drawings and specifications.