Traffic Signal Plan
Check List

Revised 4-24-02

Index
Sheet Order

1. Title Sheet with Estimated Quantities/Signature
   Sheet with Tabulations
2. Details
3. Temporary Intersection Layout and Matchlines
4. Temporary Wiring Diagram
5. Permanent Intersection Layout and Matchlines
6. Permanent Wiring Diagram
7. Mast Arm Signing and Pavement Markings
8. Interconnect Layout
9. Utility Plan Sheet
10. “For Information Only” Plan sheets

Project Number: ______________________________

Project Location: ___________________________

Date Reviewed: _____________________________

Reviewer: ________________________________

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This checklist is for new and revised signal systems. Standards for phasing and plan conventions shall apply. Plan Sheets shall be coordinate correct.

1. Title Sheet with Estimated Quantities/Signature Sheet with Tabulations

- Proper reference to specification:
- Sheet index (in proper order see index sheet).
- Charge ID written in pencil (state let plans only).
- Location map.
  Is it readable?
  List municipality and county.
  Intersection circled and labeled.
- North arrow pointing to the top, to the right, or somewhere in between.
- Project description accurate and complete.
  Intersections identified.
  City or County listed.
- Appropriate signature block (see standard title sheet).
- Proper SP, SAP, and Legislative route designation (see standard title sheet). For State Aid Projects use SP if there is federal money, use SAP if there isn’t any federal money
- Scale (see standard title sheet).
- Small project location map in the lower right corner with county and division (see standard title sheet).
- Federal number if appropriate.
- Bid items:
  Item number correct (see standard title sheet – delete items not needed)
  Item numbers in order.
  Cost splits correct in separate columns w/ SP or SAP noted.
- Project scope and funding splits agree with signal preagreements.
- Do all listed parties participate in EVP? If not separate items are needed for EVP and traffic signal system.
- Removal item for existing traffic signal system (or listed as incidental in the special provisions).
- Most current version of symbols, abbreviations, and standard plates for traffic signals (see standard title/ signature sheet).
- Do not need scale of all sheets on the title sheet (Tim Swanson 3/9/00)
- Use “Licensed Professional Engineer” and “Lic. No.” in the signature block.

Special considerations:

- Metric plan
  Note: “Attention this is a Metric Plan”
  Minnesota Metric Symbol on each sheet.
- State Aid plan
  State aid signature block.
- Consultant designed plans
  Consultant name, logo and signature on each sheet.
- NonMn\DOT let plan
  Field Manual note: “All traffic control devices and signing shall conform to the MMUTCD, including “Field Manual for Temporary Control Zone Layouts,”
dated April 1995

2. Details

Proper SP or SAP, signature block, page number units on detail sheet. These standard Mn\DOT Metro Division details are available in Metric and English in microstation format on the metro traffic website and should be included as appropriate for traffic signal plans.

- Service Cabinet – use standard detail and modify as needed.
  - Identify if luminaries are metered.
  - If the luminaries are metered, we need to change the Feed Point Wiring Diagram. Change unmetered to metered and change the drawing so that L2 is the same as L1.
  - Check number of luminaries to match need of intersection.
  - Check loads.
  - Check breaker size.
  - If service cabinet is within 8’ of the controller cabinet, ground should be in the service cabinet. If more than 8’ each cabinet needs a ground.
  - 200 amp meter socket is needed.
  - Cabinet should be fabricated from aluminum

- NMC Loop Detail – Check to make sure the sizes used are on the detail.
  - Use latest bituminous note – Should be 2350 or 2360 bituminous mixture

- Advance Warning Flasher
  - Location properly noted on plan for posted speed of area.
  - Pay as incidental to signal system.

- Pad Layout for Service and Controller Cabinets
  - Detail sheets show pad layout, wiring and grounding, standard notes.
  - Signal service cabinet drawing contains proper notes and standard conduit arrangement.
  - Lighting service cabinet.
  - Pad type called out should match description in spec book, section 2565.3R.

The following details are available if requested. Contact the project manager

- Temporary wood pole system
- Pavement marking – Note correct quantities within note.
- Mast arm signing (English only)
- Conduit attachments for bridges
- Signal pole foundation in rock
- Stand alone luminaires
- Microloop details

3.5. INTERSECTION LAYOUT AND MATCHLINES

- Intersection layout and matchlines should have the mainline roadway (usually the Trunk Highway) horizontally across the plan sheet. The north arrow should be pointing up or to the right of the sheet. All text is oriented to bottom or to the right.

- Miscellaneous items required on this sheet
  - Sheet number and proper heading.
  - Signal system ID number - Get from Mn\DOT signal design project manager.
- Meter Address - Get from power company.
- TE number.
- North Arrow.
- Bar Scale:
  1:500 (metric)
  1" = 40' (English)
- Signature Block (Lower Right Corner).
  Proper SP and/or SAP, signature block, correct sheet number.
  Consultant logo if externally designed.
- Streets named - easy to read.
- Posted speed limit noted on roadways.
- Lane assignment arrows shown.
- R/W should be shown.
- If there is an interconnection plan the master ID should be shown on every sheet.

- Controller Phasing (see sample sheet for appropriate labeling).
  - Should be located in the lower left of sheet.
  - Tied to proper phasing (right turn rule).
  - Pedestrian indications shown - number pedestrian signal faces per phase as you approach the intersection with number 1 being on the right. These numbers should be preceded by a P and a controller phase number.
  - Pedestrian pushbuttons shown - number pedestrian pushbuttons per phase as you approach the intersection with number 1 being on the right. These numbers should be preceded by a PB and a controller phase number.
  - North arrow consistent with plan view.
  - Check phasing and opportunity for overlaps.
  - Show signal pole numbers.
  - Indications desirable or necessary on divided highway medians.
  - Push buttons necessary on medians wider than 6'.
  - Additional consideration is required in school areas.
  - Check pushbutton location with respect to crosswalks.
  - If using split phasing use convention of phases 3 and 4.
  - If EVP is present there should be pedestrian push buttons on the mainline.

- Signal System Operation Notes (In the vicinity of the controller phasing chart)
  - The signal system flash mode is all red.
  - Normal operation is __ phase, with phase(s) ___ being a protected/permissive left turn phase(s), with phase(s) ___ being a protected left turn phase(s).
  - Phases ___ and ___ shall be on vehicle recall.
  - Phases ___ and ___ shall be on pedestrian recall.
  - R. R. preemption noted.
  - Overlaps

- Signal Faces Chart
  - Correct placement of heads (see charts).
  - Placed for maximum visibility (use overlays).
  - Numbering correct - put phase number in a circle. Number vehicle signal faces per phase from near to far and right to left as you approach the intersection. Signal faces should be numbered with the controller phase first followed by the face number. Protected/Permissive left turn signal faces should be labeled as through phases.
- Signal faces chart located on right side of plan sheet.
- Signal faces chart is consistent with layout locations.
- LED noted in signal faces chart for appropriate signal indications.
- Size of indications noted in signal faces chart (normal indication size is 12”).
- Signal arrows pointing in the correct direction.
- Show signal head phasing diagram for 5 section heads (see workbook).
- Symbols on signal faces chart – new or salvaged and install shall be filled in and inplace shall be open.

**Detection**

- Accurate detector locations for geometrics, speeds and planned operation (are counting/system detectors needed).
- Distance from crosswalk or stop bar specified.
- Size specified (6 feet x 6 feet typical).
- All detectors labeled - Number detectors per phase as you approach the intersection and from right to left with the number 1 usually a detector back from the stop line and number 2 to the left. At the stop line number 3 would be in the right lane with number four to the left. These numbers would be preceded by a D and the controller phase number. If there is more than one detector in the turn lane the first one you approach is the lower number.
- Are calling detectors needed.
- Loop chart accurately related to plan views (upper right corner).
- Special detector types listed in chart.
- If operated by DOT no functions need to be listed.
- Separate 2/C/14 for each detector.
- Detector design must guarantee green and extension of green. Special attention needs to be given that lanes operating in nonlock be given ample detection coverage to allow for variable stopping locations.
- Loop detector location should be designed based on the posted speed.
- Maximum of 24 loop detectors per cabinet.

**Luminaire Extensions**

- Orient luminaire on mainline mastarm at 350 degrees to light cross street signing.
- Number in a triangle, the luminaires clockwise, with respect to the controller cabinet with number 1 being the first luminaire on a signal base.
- Light pattern templates should be used, as necessary, to determine the number of lights needed.

**Preemption**

EVP

- Wired for all intersections.
- Does city want full installation?
- Detectors and confirmatory lights at all approaches (no two way detectors unless approved).
- Cable shown in the wiring diagram.
- Symbols in the proper places on the intersection layout sheet.
- Mounting details given (use a note on permanent system and a detail on temporary wood pole system).
- Proper phase noted.
- 3/C #12 for light.
- 3/C #20 for detector.
- Check geometrics for adequate optics – is there a need for advance detection?
- EVP hub should be 6’ (1.8 m) from end of mastarm

Railroad
- Does operation match technical memo?
- Is agreement needed and has the agreement been negotiated?

- General Notes: (Use as appropriate).

Permanent Systems
1) See special provisions for pedestrian indications (should be an LED one section hand/walking indication), LED indications, painting of signal system and state furnished materials.
2) For Mn/DOT administered projects, the exact location of handholes, poles, loop detectors, and equipment pad shall be determined in the field by Mn/DOT traffic office personnel. For non Mn/DOT administered projects, Mn/DOT traffic office personnel will review the location determined by whoever is administering the project.
3) Any signing notes (type, name, orientation, and location).
   - For type “D” signs and pavement markings see sheet no. __
   - One way signing shown in pole notes is incidental to signal system.
4) All loop detectors shall be preformed NMC loop detectors see sheet number __.
5) A ¾” half coupling, ¾” pipe nipple and conduit outlet body for EVP equipment shall be furnished and installed 6 feet from the end of the mast arm at poles __.
6) Necessary pedestrian ramp or sidewalk construction notes.
7) Any salvage or removal notes.
8) Reference to any necessary details.
9) Pavement marking and signing are incidental to signal system pay item. (This note should be on pavement and signing sheets)
10) (Revision projects) Work to be done under this project shall be noted with a * (or other symbol).
11) When there is a separate interconnect pay item and you want to show the interconnect cable on the layout sheet add the note “Items denoted with an * are incidental to the interconnect pay item”.
12) The luminaires shall be metered.

Temporary Wood Pole Systems
1) See special provisions for pedestrian indications (should be an LED one section hand/walking indication), LED indications, and state furnished materials.
2) For Mn/DOT administered projects, the exact location of handholes, poles, loop detectors, and cabinet shall be determined in the field by Mn/DOT traffic office personnel. For non Mn/DOT projects Mn/DOT traffic office personnel will review the location determined by whoever is administering the project.
3) For signal system span wire mounting see detail sheet no. __.
4) Pavement markings (stop lines) are incidental to the signal system.
5) The contractor shall be responsible for contacting the power company to arrange for power connection.
6) For N.M.C. loop details see sheet no. __.
7) The contractor shall locate and verify inplace utilities prior to commencing work.
8) EVP detector and confirmatory light shall be mounted as directed by traffic office personnel. (Span wire mounting or pole mounting as shown in detail on sheet no. __).

- Conduit runs
  - Conduit size and cables listed.
  - Correct symbol for inplace conduit.
  - Correct symbol for proposed conduit.
  - Check for conflict with inplace underground utilities.
  - Conduit fill less than 40% (Check).
  - No conduit smaller than 2” unless a detector lead only.
  - 4” RSC out of ground mount cabinets.
  - 3” RSC minimum size conduit under all public traveled roadways.
  - Spare 3” RSC out of controller cabinet for future use, threaded and capped.
  - Spare ¾” PVC out of controller cabinets, that have master I.D. for interconnect, for phone line hookup.
  - Conduit runs for interconnect should be as straight as possible.
  - No PVC above ground (for example: bridge crossings and wood pole systems).
  - All conduits except those within pads shall drain.
  - Primary power shall be in a separate conduit run and separate hand holes.
  - Size of bends and elbows in conduit in accordance with National Electrical Code or UL guidelines.
  - If conduit is suspended under a bridge, does the distance between supports conform to code, is a hanger detail given in plan, and are expansion fittings called for?
  - Conduit placed under inplace pavement does not need to be labeled (bored or pushed)

- Handholes
  - Uniquely numbered - number clockwise with respect to the controller cabinet with number 1 adjacent to or nearest the controller cabinet.
  - Two handholes near cabinet (usually within 30’).
  - Primary power into the handhole near service equipment.
  - Handhole spacing maximum 300’ apart, but max of 100’ if one or more 90 degree run.

- Signal base locations
  - Conform to visibility requirements of MMUTCD (check with overlays).
  - Eliminate conflicts with pedestrian ramps.
  - Identifying number in a hexagon - begin with number one in the quadrant closest to the cabinet. Number clockwise with respect to the controller cabinet.

- Pole Standard Notes - This general order should be followed but unusual circumstances may require modifications. Not all items listed here shall be required for every project.
  - R10-12 signs (left turn on green) should be used on all five section heads that are located on the mastarm.
  - For design ‘P’ poles use design ‘PA’ base and add the comment to the plan and special
provisions that the bolts need to be changed.

Mast Arm Pole Standard Notes
Station & Offset
PA pole foundation
Type PA__A__D__ (Davit at 350°)
2 - Swing away hinges (check if on a house moving route)
__ One way signal(s) overhead (__,__,__ and ___ from the end of the mast arm)
__-Type __ pole mounted at __° (countdown ped heads) All pole mounted heads should be mounted at 90° or 180°
__-EVP detector and confirmatory light (phase __) mounted ___ from the end of mast arm (Special info if needed)
Luminaire __ W HPS
__-Ped PB and sign
__-R10-12 sign adjacent to head__
__-R9-3a sign (no ped) facing pole__
__-R6-1L sign (one way)
__-R6-1R sign (one way)
__-Type D sign - see signing sheet
Extend into HH __
__ - RSC
__ - -12/C#12
__ - -5/C#12
__ - -3/C#12
__ - -4/C#18
__ - -3/C#20
Other wire as needed

Temporary Wood Pole Standard Notes
Station & Offset
__Ft. wood pole (class 2)
2 down guys, guards & anchors
_type__pole mounted
EVP detector and confirmatory light (phase __)
__Ft. mast arm & luminaire - __W HPS with PEC
__Ped PB & sign (R10-4B)
__R9-3a sign (no ped) facing pole __
__R10-12 sign adjacent to head
Metal junction box with terminal block
2” Riser with weatherhead above junction box with
__ -12/C#12
__ - -5/C#12
__ - -3/C#12
__ - -4/C#18
__ - -3/C#20
Other wire as needed
2” Riser with weatherhead and conduit to HH __
__ 4/C#18
¾” RSC to ped PB
1” RSC riser with weatherhead above span wire with
Pedestal notes
Station & Offset
Pedestal foundation
  - signal pedestal & base type
  - R10-4b signs (PB for) facing poles
  Extend into HH with
  -" RSC
  -12/C#12
Other wires as needed
  - Bracketing symbols (notes and graphics match).
  - Eliminate conflicts with Pedestrian ramps.
  - Cables terminate at pedestal

Geometrics
- Is there a need for additional signal faces, loop detectors, warning signs or flashers?
- Place handhole away from possible future construction.
- Is all channelization, stop lines, and in a proper place for pedestrian walkways
- Pedestrian ramps and sidewalks noted or shown.
- Push buttons located appropriately.
- Lane lines and directional arrows shown.
- Right of way lines are necessary.
- Check for turning conflicts.
- Check for adequate sight distance for EVP detectors and EVP impacted by vertical grade.

Voltage Drops
- Check maximum allowable drop from SOP to controller cabinet, 3% of nominal line voltage.
- Check maximum allowable from controller to signals, 3%.
- Check both drops combined must be less than 5%.
- Check maximum voltage drop allowable from SOP or signal or lighting service cabinet to luminaires is 3%.
- Calculations on proper form in project file.
- Note on plan if any drops are excessive. Also compute required wire sizes which do not exceed voltage drop allowance.

Source of Power
- Location noted as B.
- Coordinated with local electrical company.
- SOP checklist enclosed (application for power initiated if applicable).
- Are luminaires metered or not (note on detail)?
- Specify clearly who will do any necessary transformer work.
- Note who will supply the wood pole.
- SOP should go directly to the cabinet.
- Write SOP letter to power company
- Permit application for power, if necessary
- Controller Cabinet/Equipment Pad
  - Location noted as A.
  - Appropriate detail showing pad layout, wiring and grounding, standard notes.
  - Drawing contains proper notes and standard conduit arrangement.
  - Check proper location.

4.6. WIRING DIAGRAMS

- General information
  - Sheet number and proper sheet labeling.
  - SP and/or SAP numbers given.
  - Proper intersection identification.
  - Signature block and/or consultant logo.
  - Signal system ID and meter address.
  - Controller in center of sheet (usually).
  - TE number.
  - Master controller number and show master controller inside the controller box.
  - Conductor color code chart is included.
  - All signal bases, signal heads, ped indications, luminaires, pushbuttons and detectors called out on intersection layout are shown on wiring diagram.
  - Phase for EVP light should be on wiring diagram.
  - Hand holes, manholes, and junction boxes labeled properly.
  - Cable quantities and types shown agree with descriptions on intersection layout.
  - Service wires from SOP properly labeled and ground rod(s) specified.
  - Designations for loads are the same at both ends of each cable.
  - Cables correctly traced from controller cabinet to loads.
  - All indications split properly (so that in case of knockdown or blown fuse, at least one indication per approach will still operate).
  - Do not wire 12/C#12 cables in and out of pedestals susceptible to knockdown (on medians, islands, or close to curb lines).
  - Interconnect cables should be numbered in the 90's to avoid confusion.
  - Wiring diagram complements equipment pad wiring diagram if that is given in detail sheets.
  - Possible need for AWF?
  - Provide spares for possible future 5 section heads.
  - Avoid any in/out cable configurations - add cable if necessary.
  - Do not tie different phases to same ground (OK to put two push buttons, that have different phases, on same ground)
  - Wire all signals for pedestrians, even if there isn’t any ped x-ings at the time of design.
  - Should have only one pedestrian x-ing a major roadway, unless there are designated sidewalks or trails on both sides of the street
  - For revised signal systems when it is necessary to relabel the numbering of inplace items use the note “Relabel the wiring for the inplace loops, heads, and poles, to match Mn/DOT’s standard numbering system, as shown.
  - List mainline heads left to right and top to bottom on a 12/C wire. Ideally there should be a separate 12/C wire for cross streets.
  - It is desirable to use a 3/C wire for pedestrian indications.
  - EVP confirmation lights must be on a 3/C #12 cable.
  - There should be at least one set of spare wires for each phase.
  - Wiring diagram should match wiring shown on the cabinet detail for the luminaires.
Wire Notes

- Cable symbols correct (3/C #12, 2/C #14, 3/C #20 all different, for example).
- Ped indications on different phases shall have separate 3/C #12 cables.
- Ped pushbuttons must be on 3/C #12 cables. On different phases they may share cable and neutral but must have different hots.
- Separate 2/C #14 for each detector.
- EVP confirmatory light has own 3/C #12 cable.
- EVP detector 3/C #20 cable.
- Mast arm poles at least 2-12/C #12.
- When wiring PB on a 3/C #12, the upper conductor is used for the main line \( \phi_{PB} \). The lower conductor is used for the cross street \( \phi \), even if only one PB is used.
- On wood pole systems separate 5/C #12 for each signal head.
- Provide spares for future expansion of system, if necessary, and label them.
- Correct symbols used for splices (+) and crossovers (l).
- Neutrals shown as heavier lines at terminal block.
- Signal heads on different phases do not share neutrals.
- If not using all conductors in a cable, share neutrals where feasible.
- When wiring 3 heads (2 overhead and one pole mounted) of the same phase at one mast arm standard, wire one overhead and the pole mounted to one shared neutral. Keep the other overhead to a separate neutral.
- Check wiring - need 6 conductors for a 5 section head and 5 conductors for a 4 section head.

7. Mast Arm Signing and Pavement Marking

- See detail sheet list.
- Check all R – Series signs.
- Designed by SignCAD or with appropriate highway font.
- Any inplace signing need to be removed or adjusted.
- Use mast arm signing program as appropriate.
- Note payment of signing.
- Do not use both ped markings and stop lines.
- Do not put ped markings in free right turn lanes.
- ‘Color – white legend and border on green background, fully reflectorized’ should be deleted from the signing sheets.

8. Interconnect Layout Sheet

- English scale is usually 1” = 80’.
- Correct symbols.
- “For Information Only” sheets of each intersection that is interconnected.
- Show location of interconnect wire, conduit and controller cabinets which are impacted by interconnect.
- Designate the distance from the paved shoulder or curb to the cable.
- If handholes for interconnect are included in the signal system pay item, show the handholes as inplace on the interconnect sheets to avoid confusion
- Use RSC when interconnect is within 10’ of guardrail or culvert - Note on plan sheets (use detail in signal design workbook).
• Identify if interconnect is installed on front or back of guardrail adjacent to roadway.
• Interconnect wires noted on layout – Notes included as appropriate to make payment clear.
• Fiber optic will require additional detail sheets.
• General Notes:
  1. Contact R/W unit for R/W limits.
  2. It shall be the contractors responsibility to utilize the “one call excavation notice system” (Phone: 651-454-0002). This is required by Minnesota Statute 2160.
  3. Unless noted as inplace, all interconnect systems shall be furnished & installed.
  4. Distance off of shoulder for direct buried cable should be 1’ to 2’.
• Master ID should be on every sheet.

  9. Utility Layout Plan Sheet

• May be included in the signal layout (prefer not).
• Any plan with excavation must have a utility plan sheet or tabulation.
• Should also show right of way.
• Information must conform to state law (be less than 90 days old prior to letting). Confirmation letters are required.
• Check notes on sample plan

  10. For Information Only Plan Sheets

• S.P. and/or SAP numbers of proposed plan is included on plan sheet.
• Proper sheet number references for this plan.
• Noted as English units if appropriate.
• Included for every existing signal system in the plan set.
• Cross off or obliterate previous engineering certifications (old signature, sheet #, description and SP).