NMRA Electrical

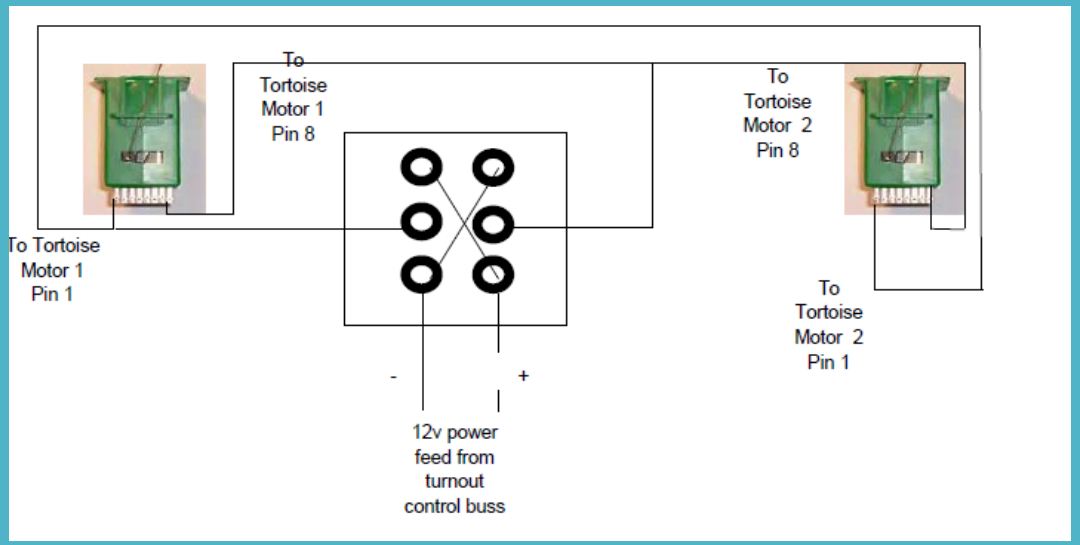
August 8, 2026

Ernie Little, MMR

NMRA

POTOMAC DIVISION NMRA

MID-EASTERN REGION



INTRO

The Model Railroad Engineer Electrical AP certificate requirements can be done on one or more private or club layouts.

To qualify for the Model Railroad Engineer- Electrical certificate, you must complete several requirements that appear to look long and complicated, but when you look at them you will realize that you have several options for meeting the them and this is what makes it appear to be a hurdle.

Remember, don’t make the requirements more complicated by “reading” into them and making it more difficult.

REQUIREMENT 1

1. Construct and demonstrate on your own or a club layout, the satisfactory operation of an electrical control system on a model railroad capable of simultaneous and independent control of two mainline trains in both directions containing at least:

a. For conventional DC wiring (non-command-control), five electrical blocks that can be controlled independently. For command control wiring (DCC, TMCC, and others), sufficient gaps and switches to maintain polarity, phase if needed, and troubleshooting.

REQUIREMENT 1

"Simultaneous or sequential and independent control of two mainline trains…"

TIP: This can be as simple as a single track main with sidings. If you can cut power to the sidings individually, you can run one train, park it on a siding while you run another, then park it and run the first again.

REQUIREMENT 1

Additional requirements:

b. One mainline passing siding.

TIP: You need a siding to allow trains to pass each other.

c. One reversing loop, wye, turntable, or transfer table.

TIP: You need to be able to turn a train around.

REQUIREMENT 1

Additional requirements:

d. One yard with a minimum of three tracks and a switching lead independent of the main line.

TIP: “Independent” mans that you can operate a switching locomotive in the yard without interfering with main line operations.

e. Facilities for the storing of at least two unused motive power units.

TIP: You need track (perhaps a spur) to store unused motive power units and if using DC be able to cut the power to the track off.

REQUIREMENT 1

Additional requirements:

f. One power supply with protective devices (short indicator or circuit breaker) to ensure safe operation.

TIP: This does NOT have to be built all is required is that you have on in your control system and it could be a commercial power supply with the required features.

REQUIREMENT 2

2. Wire and demonstrate the electrical operation of at least three of the following items:

a. Turnout	b. Crossing
c. Crossover	d. Double Crossover
e. Slip Switch (single or double)	f. Gauge Separation Turnout
g. Double Junction Turnout	h. Three Way Turnout
i. Gauntlet Turnout	j. Spring Switch
k. Operating Switch in Overhead Wire	l. Other _____

REQUIREMENT 2

A couple of TIPS:

For the turnout, hook up power to a powered turnout.

For the crossing, most commercial crossings come pre-wired so just set one up so that you can run trains through on both tracks.

REQUIREMENTS 1 AND 2

TIPS:

You do not have to scratch build anything!

You just have to show that they work electrically.

Of course, if you really want to scratch build go for it and make it MORE COMPLICATED!

Don't make the requirements 1 or 2 any harder than they have to be.

REQUIREMENT 3

3. Wire and demonstrate the electrical operation of at least three of the following items:

a. Electrical turnout position indication on a control panel or at trackside for a minimum of four turnouts.

b. Track occupancy indication on a control panel or at trackside for a minimum of five blocks.

REQUIREMENT 3

Additional requirements:

c. Cab control, making provision for the connection of at least two power supplies to a minimum of five blocks as the trains progress.

TIP: You need at least five blocks on the layout, each of which can be controlled by one of two power supplies. The five blocks DO NOT have to be in a row along the same stretch of track.)

REQUIREMENT 3

Additional requirements:

d. Engine terminal, including an electrically powered turntable or transfer table, with a minimum of three stall tracks, and at least two blocked storage sections for parking locomotives outside the stall area.

TIP: You need to have a total of five tracks (three inside an engine house or roundhouse, and two outside), that you can store motive power on, and if necessary for DC - can cut power to the storage tracks, independently, to store motive power).

REQUIREMENT 3

Additional requirements:

e. Two turnout junctions with electrical interlocking and protecting trackside signals.

TIP: This is turnout with electrical protection to prevent a train from going through a turnout that is set against it. Electrical terminals on a switch machine, combined with a couple of insulated rail joiners, make this easy.

REQUIREMENT 3

Additional requirements:

f. High Frequency Lighting which is the same thing as Constant Lighting.

g. Electronic throttle with inertia and braking provisions.

TIP: This could be combined with requirement 1F mentioned before.

REQUIREMENT 3

Additional requirements:

h. Grade crossing with electrically actuated warning indication.

TIP: There are several commercial components available that you can just wire up to meet this requirement.

You don't have to design or build the circuitry!

If you want you could use commercial plans, that appear in magazines from time to time to build one or you can do it from scratch if you really want to!

REQUIREMENT 3

Additional requirements:

i. Two-way block signaling with automatic train detection for at least five blocks.

TIP: There are several commercial components available that you can just wire up to meet this requirement.

You don't have to design or build the circuitry!

If you want you could use commercial plans, that appear in magazines from time to time to build one or you can do it from scratch if you really want to!

REQUIREMENT 3

Additional requirements:

j. Operating overhead wire, using either pantographs, trolley poles, or both for current collection.

k. Installation of an advanced electronic and/or computer control for the model railroad.

REQUIREMENT 3

Additional requirements:

l. Design, installation, and operation of animated mechanical and/or electrical displays.

TIP: This doesn’t have to be a HUGE animated display, think about animated industries or signs for the requirement.

REQUIREMENT 3

Additional requirements:

m. Design, installation, and operation of mechanical and/or electrical layout lighting displays.

TIP: This is dealing with lighting to illuminate the layout and not lighted buildings, etc. Providing a way to change the layout lighting to be in daylight versus sunrise, sunset, etc.

REQUIREMENT 3

Additional requirements:

n. Installation of a command control receiver.

TIP: Modifications or additions to the device's wiring are required. Installing a plug-equipped decoder into a manufactured prewired socket does not meet the requirement.

REQUIREMENT 3

Additional requirements:

o. Installation of a command control throttle buss line around a layout capable of handling at least two throttles at three or more separate locations.

REQUIREMENT 3

Additional requirements:

The use of commercially assembled complete units is not acceptable for the following:

p. Construction and installation of a sound system.

TIP: This does not have to be an on-board sound system, it could be an under-the-layout system.

q. Construction and installation of a signaling system.

REQUIREMENT 3

Additional requirements:

The use of commercially assembled complete units is not acceptable for the following:

r. Development and installation of a CTC system.

s. Installation and operation of an on-board video system.

t. Computer generated block detection information.

REQUIREMENT 3

Additional requirements:

The use of commercially assembled complete units is not acceptable for the following:

u. Hardwired or stored control program (i.e. computer) for operation of the railroad.

v. Development and demonstration of a computer-to-railroad interface.

REQUIREMENT 3

Additional requirements:

The use of commercially assembled complete units is not acceptable for the following:

REQUIREMENT 3

Additional requirements:

The use of commercially assembled complete units is not acceptable for the following:

W. Other: _____

TIP: Examples of “other” includes flashing warning lights on locomotives, or end-of-train devices on cabooses, etc.

REQUIREMENT 3

Additional requirements:

The use of advanced power supply, train control, track wiring and track control methods shall not be restricted by the definitions in these minimum requirements.

Note that operating third rail (center or outside) or overhead wire powered layouts may be considered for ALL aspects of the AP.

REQUIREMENT 4

4. Prepare a schematic drawing of the propulsion circuitry of the model railroad in Section 1 showing the gaps, blocks, feeders, speed and direction control, electrical switches, and power supplies.

TIPS: The propulsion circuitry requirement includes ONLY the propulsion circuitry. It is not required to include the wiring for electrical turnout control, signal systems, building lighting, etc.

You do not need to include the details for parts of the diagram which are repeated. If a number of parts are wired in the same way, it sufficient to draw one section in detail and indicate other locations with rectangles.

REQUIREMENT 4

Prepare schematic drawings identifying the wiring and components of the six items in Sections 2 & 3.

TIPS: The schematics for sections 2 and 3 should be separate from the propulsion circuitry schematic.

If you already have one over-all schematic of the layout, you might want to consider making multiple copies and going over the applicable lines with a highlighter for each feature.

REQUIREMENT 5

5. You must submit a Statement of Qualification (see below) which includes the following:

a) The track plan for the layout used in Section 1.

b) Description of the track work features, method of construction and wiring, and identification of commercial components used in Section 2 & 3.

c. Schematic drawings as required in Section 4.

d. The signed Witness Certification form, showing that each of the above items are operational and meet all applicable NMRA standards.

ACHIEVEMENT PROGRAM
MODEL RAILROAD ENGINEER ELECTRICAL
STATEMENT OF QUALIFICATIONS FORM
JANUARY 2025

Member's Name: _____ NMRA #: _____ Exp: _____

Street: _____ City: _____ State/Prov.: _____

ZIP/PC: _____ Country: _____ NMRA Region: _____ Division: _____

Date Submitted: _____ E-Mail: _____ Phone: _____

To qualify for this certificate you must:

1. Construct and demonstrate on your own, someone else's layout, or a club layout, the satisfactory operation of an electrical control system on a model railroad capable of simultaneous and independent control of two mainline trains in either direction, and containing at least:
   - ☐ If DC Power – 5 blocks that can be controlled independently
   - ☐ If DCC/TMCC/Other Power – gaps/switches/phase for troubleshooting
   - ☐ One Reverse Loop or Wye or Turntable or Transfer Table
   - ☐ One passing siding
   - ☐ Facilities for storing of at least two unused motive power units.
   - ☐ One yard with a minimum of three tracks and a switching lead independent of the mainline.
   - ☐ One power supply with protective devices (short indicator and/or circuit breaker) to ensure safe operation.
   - ☐ Other _____

2. Wire and demonstrate the electrical operation of at least three of the following track items:

☐ Turnout	☐ Single slip switch	☐ Gauntlet turnout
☐ Crossing	☐ Gauge separation turnout	☐ Spring switch
☐ Crossover	☐ Double junction turnout	☐ Operating switch in overhead
☐ Double crossover	☐ Three way turnout	☐ Other _____

3. Wire and demonstrate the satisfactory electrical operation of at least three of the following features:

☐ Electrical turnout position	☐ Two-way block signaling	☐ Sound system
☐ Track occupancy	☐ Operating overhead wire	☐ Signaling system
☐ Cab control	☐ Computer control	☐ CTC system
☐ Engine terminal	☐ Animated displays	☐ Onboard video system
☐ Two turnout junctions	☐ Layout lighting displays	☐ Computerized block detection
☐ High-frequency lighting	☐ Command Control Receiver	☐ Computerized operation
☐ Electronic throttle	☐ Command Control Throttle Buss	☐ Computer to railroad interface
☐ Grade crossing	☐ Sound in Locomotive	☐ Other _____

4. Prepare a schematic drawing of the propulsion circuitry of the model railroad in Section 1 showing the gaps, blocks, feeders, speed and direction control, electrical switches and power supplies.

ACHIEVEMENT PROGRAM
MODEL RAILROAD ENGINEER ELECTRICAL
STATEMENT OF QUALIFICATIONS FORM
JANUARY 2025

5. Prepare schematic drawings identifying the wiring and components of the six items in Requirements 2 & 3.

6. Submit a completed Statement of Qualifications (SOQ) which shall include the following:

- ☐ Attachment showing the track plan required in Requirement 1.
- ☐ Description of the track work features, method of construction and identification of commercial components used in 2 & 3.
- ☐ The signed witness certification form showing that each of the above items are operational and meet all applicable NMRA Standards.

EVALUATOR'S NAME	SIGNATURE	NMRA #

Member Statement and Agreement:
I certify that I have completed all of the requirements for this Certificate of Achievement as listed above and that I will agree to assist other members in this subject whenever possible, whether or not they are participants in the Achievement Program. ☐ Check here if this is the member's first award.

NAME: _____ SIGNATURE: _____ Date: _____

Division Achievement Program Chair Review (optional): Reviewed for compliance and completeness.

NAME: _____ SIGNATURE: _____ Date: _____

Certification of Region Achievement Program Chair

As the NMRA Region Achievement Program Chair of the _____, I certify that I have examined this SOQ and, having compared it to the stated requirements for this certificate, I am satisfied that the stated requirements have been met.

NAME: _____ SIGNATURE: _____ Date: _____

Region Certificate #: _____

Approval by AP National Executive Assistant Manager

NAME: _____ SIGNATURE: _____ Date: _____

REQUIREMENT 5

There is no requirement for Merit Evaluation in this certificate.

The presence and operation of the required features must be verified by a witness (the Region AP Manager, or their designee), but there is not a need to achieve a minimum score.