**Airfield Electrical Testing Checklist**

Notes:

1. Contact airport manager to obtain approval prior to performing any tests.
2. Only qualified Electricians experienced with constant current series circuits may perform the tests. Those not familiar with constant current series circuits must not perform these tests.
3. This testing procedure is intended to be general in nature. Personnel performing tests need to follow manufacturers’ recommended procedures for testing; those procedures supersede any instructions given.
4. Energized electrical work is prohibited unless allowed by NFPA 70E and the Electrical Contractor’s safety policies and procedures.
5. If any code violations or safety concerns are encountered, notify the Department’s representative immediately for resolution.
6. Always de-energize circuits prior to disconnecting.
7. Always follow lock-out / tag-out (LOTO) procedures.
8. Always use properly rated test equipment. Ensure test equipment is rated for the maximum voltage of each circuit tested.

Tested by: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Runway and Taxiway Lighting Circuits**

Underground Power Cable Insulation Resistance Readings

1. Perform conductor insulation resistance to ground reading at the series cutout (SCO) on the ungrounded constant current series runway lighting circuit(s). Test at 1,000V. Record the value(s) below. Expected value is > 2,000 megohms initially after installation; this value is expected to decrease on the order of 10% each year (from the previous year).

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1. Perform conductor insulation resistance to ground reading at the SCO on the ungrounded constant current series taxiway lighting circuit(s) (if separate from the runway lighting circuit). Test at 1,000V. Record the value(s) below. Expected value is > 2,000 megohms initially after installation; this value is expected to decrease on the order of 10% each year (from the previous year).

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Lighting Circuit Resistance Readings

1. Perform series lighting circuit loop resistance reading at the SCO on the ungrounded constant current series runway lighting circuit(s). Record the value(s) below. Expected value varies by circuit.

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1. Perform series lighting circuit loop resistance reading at the SCO on the ungrounded constant current series taxiway lighting circuit(s). Record the value(s) below. Expected value varies by circuit.

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Runway and Taxiway Lighting Operation Tests

1. At the lighting control panel, test each of the lighting intensity steps manually to ensure proper operation. Note any deficiencies.

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1. At the lighting control panel, set the lighting control to Radio. Test each of the lighting intensity steps manually using radio mic clicks to ensure proper operation. Ensure lights remain on for 15 minutes after the last click. Note any deficiencies.

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Runway / Taxiway Lighting and EEB Visual Observation

1. Energize the runway and taxiway lighting circuits and visually inspect each system. Indicate if any lamps do not illuminate or if any lighting equipment is physically damaged.

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1. Visually inspect the following: EEB structure/building and appurtenances; electrical service(s) and disconnecting means; and EEB interior electrical equipment, including the lighting control panel, radio controller, panelboard(s), series cutout, lighting fixtures, and electric heater(s). Note conditions of each, and note any issues observed.

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1. Note any other deficiencies that are observed.

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**Constant Current Regulator (CCR) Tests**

CCR General Information

1. Manufacturer:

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1. Model:

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1. Serial Number:

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1. FAA Type (L-XXX):

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1. Input (Volts, 1 or 3 Phase, Hz, Amperes):

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1. kW Rating:

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1. Output Current (6.6A or 20A?):

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1. Brightness Steps (3 or 5?):

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1. Gallons of Oil (if applicable):

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1. Other Information:

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CCR Input Tests

1. Measure the input voltage at each CCR. Record the value(s) below. Expected value is ±5% of nominal input voltage.

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1. Measure the input current at each CCR with runway and taxiway lighting energized. Record the value(s) below. Expected value varies by site.

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CCR Output Tests

1. For the next test listed in #2, do not use a portable meter. Use the CCR’s digital readout display to determine the measured values.
2. At each CCR, determine the output rms voltage and true rms output current of each lighting intensity step. If an output current value falls outside the acceptable ranges listed below, carefully adjust the output current at the controller board. Record the values below after any adjustments have been made.

CCR Tag # / ID: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

CCR in Remote Control

Step: \_\_\_\_\_\_\_\_ Output current: \_\_\_\_\_\_\_\_\_\_ Amps Output voltage: \_\_\_\_\_\_\_\_\_\_\_ V

Step: \_\_\_\_\_\_\_\_ Output current: \_\_\_\_\_\_\_\_\_\_ Amps Output voltage: \_\_\_\_\_\_\_\_\_\_\_ V

Step: \_\_\_\_\_\_\_\_ Output current: \_\_\_\_\_\_\_\_\_\_ Amps Output voltage: \_\_\_\_\_\_\_\_\_\_\_ V

Step: \_\_\_\_\_\_\_\_ Output current: \_\_\_\_\_\_\_\_\_\_ Amps Output voltage: \_\_\_\_\_\_\_\_\_\_\_ V

Step: \_\_\_\_\_\_\_\_ Output current: \_\_\_\_\_\_\_\_\_\_ Amps Output voltage: \_\_\_\_\_\_\_\_\_\_\_ V

CCR in Local Control

Step: \_\_\_\_\_\_\_\_ Output current: \_\_\_\_\_\_\_\_\_\_ Amps Output voltage: \_\_\_\_\_\_\_\_\_\_\_ V

Step: \_\_\_\_\_\_\_\_ Output current: \_\_\_\_\_\_\_\_\_\_ Amps Output voltage: \_\_\_\_\_\_\_\_\_\_\_ V

Step: \_\_\_\_\_\_\_\_ Output current: \_\_\_\_\_\_\_\_\_\_ Amps Output voltage: \_\_\_\_\_\_\_\_\_\_\_ V

Step: \_\_\_\_\_\_\_\_ Output current: \_\_\_\_\_\_\_\_\_\_ Amps Output voltage: \_\_\_\_\_\_\_\_\_\_\_ V

Step: \_\_\_\_\_\_\_\_ Output current: \_\_\_\_\_\_\_\_\_\_ Amps Output voltage: \_\_\_\_\_\_\_\_\_\_\_ V

The acceptable true rms output current values in amperes (by step) are as follows:

Class 1, Style 1, 3-Step: 6.5 to 6.7 (B100), 5.4 to 5.6 (B30), and 4.7 to 4.9 (B10)

Class 1, Style 2, 5-Step, 6.6A: 6.5 to 6.7 (B5), 5.1 to 5.3 (B4), and 4.0 to 4.2 (B3), 3.3 to 3.5 (B2), and 2.7 to 2.9 (B1)

Class 2, Style 2, 5-Step, 20A: 19.7 to 20.3 (B5), 15.5 to 16.1 (B4), and 12.1 to 12.7 (B3), 10.0 to 10.6 (B2), and 8.2 to 8.8 (B1)

CCR Tag # / ID: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

CCR in Remote Control

Step: \_\_\_\_\_\_\_\_ Output current: \_\_\_\_\_\_\_\_\_\_ Amps Output voltage: \_\_\_\_\_\_\_\_\_\_\_ V

Step: \_\_\_\_\_\_\_\_ Output current: \_\_\_\_\_\_\_\_\_\_ Amps Output voltage: \_\_\_\_\_\_\_\_\_\_\_ V

Step: \_\_\_\_\_\_\_\_ Output current: \_\_\_\_\_\_\_\_\_\_ Amps Output voltage: \_\_\_\_\_\_\_\_\_\_\_ V

Step: \_\_\_\_\_\_\_\_ Output current: \_\_\_\_\_\_\_\_\_\_ Amps Output voltage: \_\_\_\_\_\_\_\_\_\_\_ V

Step: \_\_\_\_\_\_\_\_ Output current: \_\_\_\_\_\_\_\_\_\_ Amps Output voltage: \_\_\_\_\_\_\_\_\_\_\_ V

CCR in Local Control

Step: \_\_\_\_\_\_\_\_ Output current: \_\_\_\_\_\_\_\_\_\_ Amps Output voltage: \_\_\_\_\_\_\_\_\_\_\_ V

Step: \_\_\_\_\_\_\_\_ Output current: \_\_\_\_\_\_\_\_\_\_ Amps Output voltage: \_\_\_\_\_\_\_\_\_\_\_ V

Step: \_\_\_\_\_\_\_\_ Output current: \_\_\_\_\_\_\_\_\_\_ Amps Output voltage: \_\_\_\_\_\_\_\_\_\_\_ V

Step: \_\_\_\_\_\_\_\_ Output current: \_\_\_\_\_\_\_\_\_\_ Amps Output voltage: \_\_\_\_\_\_\_\_\_\_\_ V

Step: \_\_\_\_\_\_\_\_ Output current: \_\_\_\_\_\_\_\_\_\_ Amps Output voltage: \_\_\_\_\_\_\_\_\_\_\_ V

The acceptable true rms output current values in amperes (by step) are as follows:

Class 1, Style 1, 3-Step: 6.5 to 6.7 (B100), 5.4 to 5.6 (B30), and 4.7 to 4.9 (B10)

Class 1, Style 2, 5-Step, 6.6A: 6.5 to 6.7 (B5), 5.1 to 5.3 (B4), and 4.0 to 4.2 (B3), 3.3 to 3.5 (B2), and 2.7 to 2.9 (B1)

Class 2, Style 2, 5-Step, 20A: 19.7 to 20.3 (B5), 15.5 to 16.1 (B4), and 12.1 to 12.7 (B3), 10.0 to 10.6 (B2), and 8.2 to 8.8 (B1)

CCR Tag # / ID: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

CCR in Remote Control

Step: \_\_\_\_\_\_\_\_ Output current: \_\_\_\_\_\_\_\_\_\_ Amps Output voltage: \_\_\_\_\_\_\_\_\_\_\_ V

Step: \_\_\_\_\_\_\_\_ Output current: \_\_\_\_\_\_\_\_\_\_ Amps Output voltage: \_\_\_\_\_\_\_\_\_\_\_ V

Step: \_\_\_\_\_\_\_\_ Output current: \_\_\_\_\_\_\_\_\_\_ Amps Output voltage: \_\_\_\_\_\_\_\_\_\_\_ V

Step: \_\_\_\_\_\_\_\_ Output current: \_\_\_\_\_\_\_\_\_\_ Amps Output voltage: \_\_\_\_\_\_\_\_\_\_\_ V

Step: \_\_\_\_\_\_\_\_ Output current: \_\_\_\_\_\_\_\_\_\_ Amps Output voltage: \_\_\_\_\_\_\_\_\_\_\_ V

CCR in Local Control

Step: \_\_\_\_\_\_\_\_ Output current: \_\_\_\_\_\_\_\_\_\_ Amps Output voltage: \_\_\_\_\_\_\_\_\_\_\_ V

Step: \_\_\_\_\_\_\_\_ Output current: \_\_\_\_\_\_\_\_\_\_ Amps Output voltage: \_\_\_\_\_\_\_\_\_\_\_ V

Step: \_\_\_\_\_\_\_\_ Output current: \_\_\_\_\_\_\_\_\_\_ Amps Output voltage: \_\_\_\_\_\_\_\_\_\_\_ V

Step: \_\_\_\_\_\_\_\_ Output current: \_\_\_\_\_\_\_\_\_\_ Amps Output voltage: \_\_\_\_\_\_\_\_\_\_\_ V

Step: \_\_\_\_\_\_\_\_ Output current: \_\_\_\_\_\_\_\_\_\_ Amps Output voltage: \_\_\_\_\_\_\_\_\_\_\_ V

The acceptable true rms output current values in amperes (by step) are as follows:

Class 1, Style 1, 3-Step: 6.5 to 6.7 (B100), 5.4 to 5.6 (B30), and 4.7 to 4.9 (B10)

Class 1, Style 2, 5-Step, 6.6A: 6.5 to 6.7 (B5), 5.1 to 5.3 (B4), and 4.0 to 4.2 (B3), 3.3 to 3.5 (B2), and 2.7 to 2.9 (B1)

Class 2, Style 2, 5-Step, 20A: 19.7 to 20.3 (B5), 15.5 to 16.1 (B4), and 12.1 to 12.7 (B3), 10.0 to 10.6 (B2), and 8.2 to 8.8 (B1)

1. At each CCR, record the rating of constant current regulator: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Ensure that the output rms voltage multiplied by the true rms output current does not exceed the rated load on the CCR nameplate.

Notes: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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CCR Short Circuit and Open Circuit Tests

1. Perform CCR short circuit test per the specific CCR manufacturer’s instructions. Record the results. The typical steps, which can be followed if manufacturer’s instructions are unavailable, are:
	1. Remove power to the regulator.
	2. Isolate the constant current series circuit from the CCR using the SCO. Rotate the handle of the SCO to the Test and Measure position.
	3. Energize the regulator and record the output current at each lighting step.
	4. Remove power from the regulator, place the cover back on the SCO with the handle rotated to the Operation position, ensure the system has been restored to its original position, and re-energize the regulator.
2. Perform CCR open circuit test per the specific CCR manufacturer’s instructions. Record the results. The typical steps are:
	1. Remove power to the regulator.
	2. Remove the cover of the SCO to create an open circuit.
	3. Energize the regulator; the open circuit protective device should quickly open to de-energize the regulator. Ensure the device resets properly.

Pass: \_\_\_\_\_\_\_\_\_\_ Fail: \_\_\_\_\_\_\_\_\_\_ If fail, describe: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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* 1. Remove power from the regulator, place the cover back on the SCO with the handle rotated to the Operation position, ensure the system has been restored to its original position, and re-energize the regulator.
	2. Note: this test should typically be performed one time per year.

CCR Local Control Switch Operation & Visual Observation

1. Operate the local control switch to check for proper operation of relays and contactors.

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1. Check all indicating and/or warning lights and note if any are illuminated.

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1. Visually inspect all fuses and circuit breakers.

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1. Check for any burned or loose connections.

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1. Check for rust spots, missing covers, or other physical damage.

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CCR Capacitor Bank Test (for Ferroresonant CCRs)

Note: Only qualified Electricians experienced with constant current series circuits, including troubleshooting CCRs, may perform the following capacitor bank test.

Note: the steps below are specific to ADB Ferro CCRs. The steps and procedure may differ depending upon the specific CCR manufacturer and model number.

1. Check to see if the CCR’s Tank Current is written on the inside of the CCR door or somewhere next to the CCR. If so, skip to Step #11 below. If not, proceed to the next step, #2.
2. De-energize power to the regulator at the AC source.
3. Isolate the constant current series circuit from the CCR by removing the SCO.
4. Rotate the handle of the SCO and re-insert in the Test and Measure position.
5. Unplug the gate wires at the Universal Regulator Controller (URC) board. This will cause the SCR to be totally off, which means there is zero current in the tank circuit which causes maximum output to the field.
6. Turn the CCR on and verify that it shuts down on Overcurrent. If it doesn’t shut off, make a note below. This is an indication that some capacitors are already bad. Note: faulty capacitors will typically have bulging cases.

Shuts down on overcurrent? (Y/N) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

If “No”, stop procedure. Make a note that the capacitor bank should be replaced. Plug the gate wires back in and place the field circuit back on the CCR by removing the SCO and re-inserting in the Operation position. Re-energize the regulator at the AC source in order to place the system back in service.

If “Yes”, proceed to the next step, #7.

1. After a successful shutdown, plug the gate wires back in and place the field circuit back on the CCR by removing the SCO and re-inserting in the Operation position. Re-energize the regulator at the AC source.
2. With the normal field load on the CCR, turn the CCR to the highest step and tune it to 6.6 amps.
3. Measure the current in the tank circuit (one of the big wires on the SCR).
4. Write the value of the measured tank current, and today’s date, on the inside of the CCR door or next to the CCR using a permanent marker.
5. Check the capacitors: turn the regulator to the high step with the load still on it and compare the current written down to the current being measured. If the measured current in the tank circuit has gone down from the recorded value, then this is an indication that capacitors have failed. If the current is nearly the same, the capacitor bank is operating properly.

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**Lighted Wind Cone Circuits**

1. Determine whether the power source for the lighted wind cone is constant current or ≤600V constant voltage. Perform voltage reading of the lighted wind cone circuit at the power source. Use the CCR’s digital readout display to determine the voltage for constant current series circuits; do not check a constant current circuit with a voltmeter. Record the value below. Expected value is within ±10% of nominal system voltage. If series circuit, note whether an isolation transformer or power adapter is used.

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1. Perform conductor insulation resistance to ground reading on each ungrounded lighted wind cone power circuit that has not yet been tested. Test constant current series systems circuits at 1000V, and test ≤600V circuits at 500V. Record the value below. Expected value for constant current series systems is >2,000 megohms initially after installation; this value is expected to decrease on the order of 10% each year (from the previous year). Expected value is approximately 100 megohms initially after installation for ≤600V systems.

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1. At the lighting control panel, use the selector switch and ensure that the primary wind cone operates correctly in the ON, OFF, and AUTO (photocell-controlled) positions. Ensure that the supplemental wind cone operates the same as the primary or is on when the runway and taxiway lights are on.

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1. Visually inspect operation and physical condition of the wind cones. Note any deficiencies below, such as: rust; damage to pole, foundation, or wind sock; or inoperable lowering winch. The wind sock should be replaced annually.

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**Rotating Beacon Tests**

1. Perform conductor insulation resistance to ground reading on the ungrounded beacon power circuit. Test at 500V. Record the value below. Expected value is approximately 100 megohms initially after installation.

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1. Perform voltage reading of the beacon circuit at the power source. Record the value below. Expected value is within ±10% of nominal system voltage.

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1. At the lighting control panel, use the selector switch and ensure that the rotating beacon operates correctly in the ON, OFF, and AUTO (photocell-controlled) positions.

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1. Visually inspect operation of the rotating beacon and associated telltale relay and obstruction lights (if present). Verify the vertical angle of the beam is no less than 2° above the horizontal. Clean the lens. Check lamp condition; lamp should be replaced annually. Note any deficiencies below.

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1. Inspect physical condition of rotating beacon. Note any deficiencies below, such as: rust; damage to pole, foundation, mounting platform, or access ladder (as applicable); or inoperable lowering winch (if applicable).

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**Record of Electrical Infrastructure**

Upon completion of the electrical testing, and as time allows, provide a brief written description of the existing airfield lighting infrastructure in order to develop a record of what exists at the site. The information to document includes, but is not limited to:

* Electrical utility – ratings, size, type, location
* Electrical service equipment – voltage, phase, ratings, mains
* Engine-generator set, if applicable – enclosure/shelter, voltage, phase, ratings, fuel supply, starting system
* Runway/taxiway lighting – incandescent, halogen, or LED lamps; steel or HDPE light bases; cones or markers on/at fixtures
* Wind cone(s) – incandescent or LED, internally or externally lit, wind sock size
* Rotating beacon – intensity/wattage; pole-mounted (tilt-down or fixed) or SREB-mounted (roof mounted with/without ladder and with/without work platform)
* FAA navigational aids and related infrastructure

**Other Concerns or Deficiencies Noted**

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ACRP Project 09-22

https://crp.trb.org/acrpwebresource20/

The Airport Cooperative Research Program (ACRP) is sponsored by the Federal Aviation Administration. ACRP is administered by the Transportation Research Board (TRB), part of the National Academies of Sciences, Engineering, and Medicine. Any opinions and conclusions expressed or implied in resulting research products are those of the individuals and organizations who performed the research and are not necessarily those of TRB; the National Academies of Sciences, Engineering, and Medicine; or ACRP sponsors.