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This is a call for help to review a draft checklist entitled "Portable Wiring and Equipment Requirements for Carnivals, Circuses, Fairs and Similar Events."

A carnival operator (carney) once told me that when a carney was in trouble and needed help she or he would yell, "Hey Rube!" and fellow carneys would come running to the rescue. Well, I'm yelling, "Hey Rube!" and it's not only to carneys, it's also to fellow carnival inspectors. I need help to complete my checklist.

I finally got fed up inspecting these events. Their poor state of condition and the recent reports of deaths at two amusement parks have increasingly alarmed me. These situations could have been prevented by simple common-sense things like tightening a nut and installing the required equipment grounding conductor. I decided to form a committee through my local Southern California Chapter of the International Association of Electrical Inspectors to write a checklist that would help carneys and inspectors during inspections.

With the help of Richard Thompson, a consultant to the entertainment industry and a committee member, I wrote this draft checklist and sent it for review and comments to all of the committee members and a few amusement park ride organizations.

I am also, through this article, sending it to you for your review and comments.

Keep in mind while you are reviewing the checklist that it is just for things that a local inspector would look for. It is not meant for owners/operators or state inspectors to use (even though they could). It is only meant for the last person who has to approve the event, the local inspector. It won't cover ASTM standards, manufacturers' or state requirements, even though there may be similarities. Those requirements should already be met.

Think of this checklist as the last common sense inspection tool to be used before the event is to be opened to the public. It is based on the National Electrical Code, basic principles of mechanics and experience.

Please send your comments to Xen George Anchales, San Bernardino County Building and Safety Division, 385 N. Arrowhead Avenue, 1st Floor, San Bernardino, California 92415-0181.

All comments will be reviewed by committee members and the final checklist will be published in the *IAEI News.* Of course, you do not have to wait for the final version; you can start using this one right now. Add to it, adjust it and inspect with it; then let me know what you think and how you have improved upon it.

I hope that this checklist will provide the help needed so that during inspections carneys and inspectors won't have the need to yell, "Hey Rube!"

DRAFT CHECKLIST FOR PORTABLE WIRING AND EQUIPMENT REQUIREMENTS FOR CARNIVALS, CIRCUSES, FAIRS AND SIMILAR EVENTS

Inspector's Name:_____Phone Number/Office Hours:_____
Address:_____Permit Number:_____

1. Temporary Event Permits and Approvals

[ ] 1.1 Planning Department approval required.

[ ] 1.2 Building and Safety Department approval required.

[ ] 1.3 Fire Department approval required.

[ ] 1.4 Environmental Health Department approval required.

[ ] 1.5 Police/Sheriff Department approval required.

[ ] 1.6 Submit a letter of intent. Date and hours of operation and number of expected attendance per day

2. Electrical Permit and Plan Review

[ ] 2.1 ***Electrical Permit.*** Obtain an electrical permit before doing any work. All work shall be in accordance with the current edition of the *National Electrical Code* (*NEC*).

[ ] 2.2 ***Single Line Diagram.*** Provide an electrical single line diagram of your electrical system (include feeders and branch circuits supplying all rides, slides, booths, lighting, etc.).

[ ] 2.3 ***Plot Plan.*** Submit a plot plan that includes the following:

2.3.1 Vicinity map, north point, owner's name, address and assessor's parcel number

2.3.2 Streets, public and private parking

2.3.3. Property boundaries

2.3.4. Exits and walkways

2.3.5. Location and name of all structures and equipment, existing and proposed (rides, slides, booths, restrooms, generator, bleachers, tents, power poles, etc.)

2.3.6. Distances between all structures and equipment.

2.3.7. Barricades for non-public access, and all walls and fences.

2.3.8. Electrical equipment locations, generator, fuel storage, electrical feeders, distribution subpanels, all electrical cords, method of cord protection, portable

power distribution (spider) boxes, receptacles, locations of all disconnects, overhead power lines and poles and location of all ground-fault protection devices.

2.4 ***Generator***

[ ] 2.4.1 *Separately* derived systems shall comply with the following:

2.4.1.1. Generators shall comply with the requirements of Article 445 of the *NEC.*

2.4.1.2. The neutral, grounding electrode conductor and equipment grounding, bonding conductors are bonded to the generator case.

2.4.1.3. Grounding electrode is installed according to Article 250 of the *NEC.*

2.4.1.4. If utilized, the transfer switch shall switch (disconnect) the neutral.

[ ] 2.4.2 *Non separately* derived systems require:

2.4.2.1 The neutral is not bonded to the generator case and is grounded only at the electrical service.

2.4.2.2 The transfer switch does not switch (disconnect) the neutral.

[ ] 2.4.3 *Noise Pollution.* Sound level of generator in compliance with local noise pollution standards.

[ ] 2.4.4 Generator is guarded so that the public does not have access.

[ ] 2.4.5 *Main Disconnect.* Label generator main disconnect.

[ ] 2.4.6 *Dead front.* Generator electrical panel dead front is to be installed and all branch circuits and feeders labeled.

[ ] 2.4.7 *Unused Opening.* Close all unused openings in the generator's electrical panel.

2.5 ***Transformers***

[ ] 2.5.1 *Transformers* shall comply with the applicable requirements of 240.4(A), (B)(3), and (C); 250.30; and Article 450 of the *NEC.*

2.6 ***Services***

[ ] 2.6.1 *Services* shall be installed in accordance with the applicable requirements of Article 230 of the *NEC* and, in addition, shall comply with the following:

2.6.1.1 Guarding. Service equipment shall not be installed in a location that is accessible to unqualified persons, unless the equipment is lockable.

2.6.1.2 Mounting and Location. Service equipment shall be mounted on a solid backing and be installed to be protected from the weather, unless of weatherproof construction.

2.7 ***Load Check***

[ ] 2.7.1 *Balanced Loads.* Each phase is balanced with all rides and lights operating.

[ ] 2.7.2 *Feeder Ampacity.* Each feeder is checked for the maximum load carried, the ampacity of the cable, and the associated overcurrent protection.

2.8 ***Wiring Method***

[ ] 2.8.1 *Flexible cords and cables shall comply with the following:*

2.8.1.1 Flexible cords and cables shall be listed for *extra-hard usage*, except where not subject to physical damage they may be listed for *hard usage*.

2.8.1.2 Flexible cords and cables used outdoors shall be listed for *wet locations* and shall be *sunlight resistant.*

2.8.1.3 Extra-hard usage flexible cords or cables shall be permitted for use as permanent wiring on portable amusement rides and attractions where not subject to physical damage.

2.8.1.4 Single conductors. Single-conductor cable shall be permitted only in sizes 2 AWG or larger.

2.8.1.5 Splices. Flexible cords or cables shall be continuous without splice or tap between boxes or fittings.

2.8.1.6 Cord connectors. Cord connectors shall not be laid on the ground unless listed for wet locations. Connectors and cable connections shall not be placed in audience traffic paths or within areas accessible to the public unless guarded.

2.8.1.7 Protection. Flexible cords or cables accessible to the public shall be arranged to minimize the tripping hazard and shall be permitted to be covered with nonconductive matting, provided that the matting does not constitute a greater tripping hazard than the uncovered cables. It shall be permitted to bury cables. The requirements of 300.5 of the *NEC* shall not apply.

2.8.1.8 Boxes and Fittings. A box or fitting shall be installed at each connection point, outlet, switchpoint, or junction point.

2.8.1.9 Cord connections. All cords shall be properly connected to equipment and shall have strain relief.

2.9 ***Support***

[ ] 2.9.1 *Wiring Support.* Wiring for an amusement ride, attraction, tent, or similar structure shall not be supported by any other ride or structure unless specifically designed for the purpose.

2.10 ***Open Conductors***

[ ] 2.10.1 *Open Conductors.* Open conductors are prohibited except as part of a listed assembly or festoon lighting installed in accordance with Article 225 of the *NEC*.

2.11 ***Rides, Tents and Concessions***

[ ] 2.11.1 *Disconnecting Means.* Each ride and concession shall be provided with a fused disconnect switch or circuit breaker located within sight and within 6 ft. of the operator's station. The disconnecting means shall be readily accessible to the operator, including when the ride is in operation. Where accessible to unqualified persons, the enclosure for the switch or circuit breaker shall be of the lockable type. A shunt trip device that opens the fused disconnect or circuit breaker when a switch located in the ride operator's console is closed shall be a permissible method of opening the circuit.

[ ] 2.11.2 *Weatherproof.* Subpanels, controllers, disconnects, junction boxes, etc., if exposed to the weather shall be weatherproof (receptacles, switches, enclosures, boxes and cover plates).

[ ] 2.11.3 *Portable Wiring Inside Tents and Concessions.* Electrical wiring for lighting, where installed inside of tents and concessions, shall be securely installed and, where subject to physical damage, shall be provided with mechanical protection. All lamps for general illumination shall be protected from accidental breakage by suitable fixture or lampholder with a guard.

2.12 ***Portable Distribution or Termination Boxes***

[ ] 2.12 *Portable Distribution or termination shall comply with the following:*

2.12.1 *Listing.* All equipment for portable power distribution shall be listed, and to include portable power distribution boxes, feeder cables and connectors.

2.12.2 *Construction.* Boxes shall be designed so that no live parts are exposed to accidental contact. Where installed outdoors, the box shall be of weatherproof construction and mounted so that the bottom of the enclosure is not less than 6 in. above the ground.

2.12.3 *Busbars and Terminals.* Busbars shall have an ampere rating not less than the overcurrent device supplying the feeder supplying the box. Where conductors terminate directly on busbars, busbar connectors shall be provided.

2.12.4 *Receptacles and Overcurrent Protection.* Receptacles shall have overcurrent

protection installed within the box. The overcurrent protection shall not exceed the ampere rating of the receptacle, except as permitted in Article 430 of the NEC for motor loads.

2.12.5 *Single-Pole Connectors.* Where single-pole connectors are used, they shall comply with Article 530, Section 530.22 of the NEC.

2.13 ***Ground-Fault Circuit-Interrupter (GFCI) Protection for Personnel.***

[ ] 2.13.1 *General-Use 15- and 20-Ampere, 125-Volt Receptacles.* All 125-volt, single-phase, 15- and 20-ampere receptacle outlets that are in use by personnel shall have listed ground-fault circuit-interrupter protection for personnel. The ground-fault circuit interrupter shall be permitted to be an integral part of the attachment plug or located in the power-supply cord, within 12 in. of the attachment plug. For the purposes of this section, listed cord sets incorporating ground-fault circuit-interrupter protection for personnel shall be permitted. Egress lighting shall not be connected to the load side terminals of a ground-fault circuit-interrupter receptacle.

[ ] 2.13.2 *Appliance Receptacles.* Receptacles supplying items, such as cooking and refrigeration equipment that are incompatible with ground-fault circuit-interrupter devices shall not be required to have ground-fault circuit-interrupter protection.

[ ] 2.13.3 *Other Receptacles.* Other receptacle outlets not covered above shall be permitted to have ground-fault circuit-interrupter protection for personnel, or a written procedure shall be continuously enforced at the site by one or more designated persons to ensure the safety of equipment grounding conductors for all cord sets and receptacles, as described below.

2.14 ***Protection of Electrical Equipment.***

[ ] 2.14.1 *Protection.* Electrical equipment and wiring methods in or on rides, concessions, or other units shall be provided with mechanical protection where such equipment or wiring methods are subject to physical damage.

2.15 ***Equipment Bonding.***

[ ] 2.15.1 *Bonding.* The following equipment connected to the same source shall be bonded:

2.15.2 Metal raceways and metal-sheathed cable
2.15.3 Metal enclosures of electric equipment
2.15.4 Metal frames and metal parts of rides, concessions, tents, trailers, trucks, or other equipment that contain or support electrical equipment

2.16 ***Equipment Grounding.***

[ ] 2.16.1 *Equipment Grounding Conductor.* All equipment requiring grounding shall be grounded by an equipment grounding conductor of a type and size recognized by 250.118 of the *NEC* and installed in accordance with Article 250 of the *NEC.* The

equipment grounding conductor shall be bonded to the system grounded conductor at the service disconnecting means or, in the case of a separately derived system such as a generator, at the generator or first disconnecting means supplied by the generator. The grounded circuit conductor shall not be connected to the equipment grounding conductor on the load side of the service disconnecting means or on the load side of a separately derived system disconnecting means.

2.17 ***Grounding Conductor Continuity Assurance.***

[ ] 2.17.1 *Continuity Assurance.* The continuity of the grounding conductor system used to reduce electrical shock hazards as required by 250.114, 250.138, 406.3(C), and 527.4(D) of the *NEC* shall be verified each time that portable electrical equipment is connected.

2.18 ***Audio Signal Processing, Amplification, and Reproduction Equipment.***

[ ] 2.18.1 *Audio Equipment.* Article 640 of the *NEC* shall apply to the wiring and installation of audio signal processing, amplification, and reproduction equipment.

2.19 ***Attractions Utilizing Pools, Fountains, and Similar Installations with Contained Volumes of Water.***

[ ] 2.19.1 *Pools, Fountains and Similar Installations.* This equipment shall be installed to comply with the applicable requirements of Article 680 of the NEC.

2.20 ***Overhead Conductor Clearances.***

[ ] 2.20.1 *Clearances to Tents and Concessions.* Conductors shall have a vertical clearance to ground in accordance with 225.18 of the NEC. These clearances shall apply only to wiring installed outside of tents and concessions.

[ ] 2.20.2 *Clearance to Rides and Attractions.* Amusement rides and amusement attractions shall be maintained not less than 15 ft. in any direction from overhead conductors operating at 600 volts or less, except for the conductors supplying the amusement ride or attraction. Amusement rides or attractions shall not be located under or within 15 ft. horizontally of conductors operating in excess of 600 volts.

3. Rides

[ ] 3.1 ***State Approval.*** Provide current State approval sticker for ride _____.

3.1.1 Provide a copy of the State issued "Receipt of Application" for extension of ride approval (until State can inspect the ride).

[ ] 3.2 ***Installation.*** Provide erection details for ride _____.

[ ] 3.3 ***Blocking and Supports.*** Provide proper blocking and supports for ride_____.

[ ] 3.4 ***Open Splices.*** No open electrical splices allowed on ride _____.

[ ] 3.5 ***Unused Wiring.*** Remove all unused conductors from ride_____.

[ ] 3.6 ***Motor Guards.*** All motors, belts and chain drives to be guarded except where accessible only to qualified persons. _____.

[ ] 3.7 ***Connections.*** Install proper safety connecting pins, bolts, washers and nuts, along with proper retaining keys on ride _____.

[ ] 3.8 ***Broken Lamps and Fixtures.*** Broken lamp sockets or fixtures which the public can access either on the ground or when on the ride shall be repaired prior to opening, or when properly wired, temporarily covered (by an approved method) such that contact with open sockets or leads is prevented.

[ ] 3.9 ***Sharp Edges.*** Remove knife edge or protruding hazardous points on ride _____.

[ ] 3.10 ***Seat Belts.*** Fix passenger restraints on ride _____.

[ ] 3.11 ***Light Poles.*** Light poles on ride _____ need to be properly attached.

[ ] 3.12 ***Circuit Identification.*** Electrical subpanels on all rides need branch circuits identified.

[ ] 3.13 ***Unused Openings.*** All unused openings on all electrical equipment (boxes, enclosures, subpanels, etc.) need to be closed.

[ ] 3.14 ***Cord Protection.*** Protect all cords on the ground where exposed to traffic or people with insulating mats, or cable bridges.

4. **Bleacher and Seating Structures**

[ ] 4.1 ***Approved Plans.*** Provide approved set of engineered plans.

[ ] 4.2 ***Installation.*** Install bleacher according to approved set of engineered erection plans.

5. **Platforms and Stages**

[ ] 5.1 ***Stairs and Handrails.*** Install proper stairs and handrails to the following requirements:

5.1.1 Stairs require 7” maximum rise and 11” minimum step.

5.1.2 Handrails to be between 34 to 38 inches above steps.

6. **Tents**

[ ] 6.1 ***Plans.*** Provide approved plot plan and floor plan showing stage area, seating, exit passageways and tent exits leading to the exit discharge area outside.

[ ] 6.2 ***Tent Approval.*** State Fire Marshal approval required for all tents.

[ ] 6.3 ***Electrical plan for each tent shall include:***

6.3.1 A single line drawing of entire electrical system, location of subpanels, feeders and branch circuits. Identify wiring method, equipment/cable/raceway protection and supports. Location of interior and exterior lighting, type of fixtures, location of all exit signs.

[ ] 6.4 ***Clear Exit Passageways.*** Tent poles, ropes and stakes are not allowed in exit passage ways.

7. **Ticket Booth**

8. **Food Booth/Trailer/Concession Stands**

[ ] 8.1 ***Environmental Health Services.*** Environmental Health Services Division approval required.

9. **Game Booth/Trailer**

10. **Additional Corrections**

[ ] 10.1

[ ] 10.2

[ ] 10.3

[ ] 10.4

[ ] 10.5

Note: This checklist is not inclusive and is only a recommended guide. It is not necessarily the official position of IAEI.