the A.R.I.E.S. Co

HOME INSPECTION TRAINING PROGRAM

Module: #7 (seven) Electrical

NARIES training module for Home Inspection
by Michael W. Pederson, Architect/General Contractor

Study, writing and inspection assignments:

Date:_____

Student Name:_____
City & State:_____
Building location:_____

Notes:_____
_____
_____
_____

Special Inspection Comments:
_____
_____
_____
_____

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NARIES HOME INSPECTION TRAINING PROGRAM

Module # 7

Section of Standards:

ELECTRICAL

Index of the Module:

1.)Standard of Practice (This standard parallels the report form)
2.)Study Guide (A guide for future improvement and study)
3.)Focus Points and Check Points (Provides necessary guides for observing to make the report analysis, facts and findings)
4.)Sample Check list (Good for review, can be expanded)
5.)Samples of lap top computer generated reports (in your binder.)

Assignments:

*1.)*The student is to do **(1) one complete house inspection** and report on a field hand written, or laptop form.

Note:

Use the contained module from that inspection to do assignments (2) and a part of assignment (3).

2.)Section of the module for hand written field report. (Fill it out)

Note:

*The following assignment **requires you to look at 3-5 building situations.***

3.)Section of the module for unsatisfactory conditions, maintenance, repairs and replacements on **3-5 buildings**. (Fill it out completely, 90%. Some items may not be found.)

4.)Writing exercise. (Trains you to develop an efficient link between the observation (eyeballs) in the mind (brain), and the written report (hands) for detailed work.) Do this last after you have seen and reported on all other assignments. This is hypothetical or what you may have seen before.

NOTE: Assignment (4) does not require you to inspect any buildings.
However, you have seen several deficiencies and negative situations, and can write about hypothetical deficiencies for the given checkpoints.

Introduction

Before beginning this section, remember to read the theory of the eyeballs and the brains working together. Modeling is how you make the observation count when providing the analysis. Compare what you see with the model, and write down the observed differences. This is the analysis, facts and findings. Things do not look a certain way; they are a particular way and a fact. Write them down. Use your "Focus Point and Check Point" guides in this module. Examine the entire system thoroughly looking for signs of alterations or repairs. Ask the agent and owner for this information.

To develop your modeling ability you must do your own self-education, and go look for the information about each item. The question is, how was it supposed to be when it was built, and how does it appear now. Report the differences, no matter what, in the analysis.

The Electrical inspection, is considered a part of the "Home Inspection" (the actual building structure), and it is included because it is part of what the owner is purchasing, and contains many things which influence the conditions found in the building, or potential things which effect the building, negatively or positively.

Inspection Process

The inspection process is always sets of opportunities to show your client how thorough, complete and critical you are. Doing the Electrical section is a rigorous and dangerous exercise, which your client can easily relate too. Therefore, you seat your client while you do this section of the inspection, especially when you open up the panel for inspection. This comes quite naturally since they are now done inspecting those items they are familiar with anyway and by now would like to rest and be seated. You tell them they will be notified if anything is found they should see. Inspect each inspection item thoroughly and completely being very careful when inspecting the open panel. First, inspect service entrance for a safe and solid installation. Second, inspect the panel; it's interiors, equipment, and wiring for proper and safe appearing installations. Once the exterior of the panel is inspected, remove the cover being very careful not to touch anything inside the panel. We recommend that a flashlight be the only tool in your hand, once the cover is removed, and do not face the panel, but stand sideways with your left hand in your pocket and to the outside and the right side at the panel side with a flashlight in hand only to observe the interiors. Third inspect all of the switches and receptacles you can observe including all GFCI receptacles. Lastly check the fire and smoke detectors for functionality if possible.

This tedious and dangerous exercise will make the inspection a thorough and precise one, and impress on your client you are a thorough and complete Home Inspector. This is a good marketing tool and adds to convincing everyone you are the right inspector.

Risk & Liability

The most important issue is, of course, as always, any "Life Health and Safety" item we see, which could be identified as an existing and/or potential hazard, dangerous or an emergency condition, or other safety oriented items in need of immediate attention. We report these as such and as an unsatisfactory condition with urgent attention required. They may or may not be costly to repair or replace.

Life, Health & Safety Examples

In the case of the electrical inspection it is a black and white issue. Wherever you see any evidence of amateur or homeowner work, other than professional work with a permit and an inspection, we report it, and request a full inspection by a qualified State licensed electrical contractor. The next most important item is functionality, which should always be totally useful throughout the building. Nothing should be non functional. This prevents any homeowner or other amateur from activating any of the non-functional equipment for some reason by hooking it up to the panel or elsewhere and using it.

Improperly installed service entrances may allow water to enter around the masthead or through the mast head entry if the wires are not attached properly.

The panel may be improperly installed with inadequate stud or other form of protective methods for the wires coming and going into the panel. The panel may have no seals at the entries or the breaker openings may not be covered leaving an opening into the panel interior.
Panel interiors may be damp, wet or overly humid causing shorts and/or breaker tripping.

The equipment may be wrong sized wires or breakers, no grounding or lack of it at all.

The wiring may wrong size, double tapped breakers, or mismatched wire to breakers.

Visible wiring throughout the building may not be in proper conduit or properly placed.

Switches and receptacles may be mis-wired or arcing and/or non functional.

GFCI equipment may be mis-wired or arcing and/or non functional.

Smoke detectors may not work.

Time & Money

All of the above items may be unsatisfactory and require expensive consultations, maintenance, repairs or replacements, so do not overlook them. Remember that the cost of these conclusions is usually the deciding factor for the consumer. Therefore be sure to recommend they consult other specialists and experts, who are qualified state licensed individuals or companies, for their opinions and/or remedies, before purchase.

Instructions

Review the enclosed material, inspect one house, fill out a report form, and then fill out 1.) the writing exercises, 2.) the field form, 3.) the lap top form, and 4.) the section of the module for unsatisfactory conditions, maintenance, repairs and replacements. Use the directions found with the report forms and the binder.

The writing exercise is very important for developing the noted relationships in your mind, with the written word. This training creates standard patterns of thinking and developing patterns for writing. This in turn develops your efficiency to write with ease, with clarity, without any hesitation, and to understand the repetitive nature of this system.

The field report forms demonstrate how efficient your ability to briefly state things should be, because you have limited space.

The lap top forms demonstrate how efficient your ability to briefly state things can be, but provides room to be more descriptive and explain things more clearly.

The section of the module for unsatisfactory conditions, maintenance, repairs and replacements develops your sensitivity to each conclusion and what it actually means.

Complete this module and send back to me with any of the individual whole house report assignments.

NOTE:
Please use a hand held tape recorder to do the house inspections and take notes. Then return to your office and create the reports. This method will

develop your skill much faster than doing it in the field where it will be clumsy and you cannot focus and develop your writing skills.

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STANDARDS OF PRACTICE

ELECTRICAL

Required duty: Identify, provide an opinion and make any appropriate recommendation about the observable conditions in the accessible areas of the electrical system and related items.

A. FOCUS POINTS TO BE INSPECTED

1. **Service Entrance:** Observe, locate and describe the visible installed wires and cables to the service entrance, service wire attachments and structures including weather head, masts and supports, etc. and any related deficiencies including insufficient clearances, insecure attachments to buildings and poles, missing, damaged or broken parts and improper meter installation.
2. **Panels:** Observe, locate and describe the visible installed electrical panel and sub-panels for accessibility, installation, amperage rating and voltage, and any related deficiencies including the lack of screws, open breaker spaces in the face, holes, grounding and improperly sized panels.
3. **Panel Interiors:** Observe and describe the visible panel interior including its cleanliness, the presence of moisture, humidity and water, rust and corrosion, and any related deficiencies including the lack of entry seals and other holds, etc.
4. **Panel Equipment:** Observe and describe the visible installed electrical equipment including wiring type, size and material of main service wires and circuit wires, grounding, the rated amperage of breakers, fuses and fuse-stats, and any related deficiencies including improper overload protection and wiring compatibility for breakers, fuses and fuse-stats, double tapping of the breakers, missing grounding, etc.
5. **Wiring:** Observe and describe the visible installed electrical wiring throughout the building and wiring between the primary building and its associated structures including parking structures, storage, playhouses and any related deficiencies including improper installation, unprotected wiring, and open wires, etc.
6. **Switches, Receptacles and Fixtures:** Observe, describe and check the functionality, including any GFCI receptacles with its respective test button, the visible installed electrical switches, receptacles and fixtures, and any related deficiencies including missing plates, open junction boxes, loose visible wires and improperly mounted fixtures etc.
7. **Smoke Detectors:** Observe, locate and describe the visible installed smoke detectors and any related deficiencies including the absence of

smoke detectors in appropriate areas and deficiencies with location or operation.

8. **GFCI Equipment:** Observe, locate and describe the visible installed GFCI receptacles and any related deficiencies including the absence of GFCI receptacles in appropriate areas and deficiencies with location operation.

B. ITEMS EXCLUDED AND NOT INSPECTED

If items, which are excluded, are observed at the site, they will be identified, located and the exclusion shall be noted.

The inspector is not required to perform the following:

1. Examine or inspect items inaccessible or unobservable.
2. Examine or inspect items behind the surface of walls, floors or ceilings.
3. Operate or evaluate any electrical equipment or appliances.
4. Examine or inspect electrical systems which are disconnected or shut-down.
5. Examine or inspect panel interiors, if in the opinion of the inspector, the panels are physically inaccessible or if removal of the cover could cause physical damage or pose a safety hazard.
6. Operate or evaluate the operation of overload protection devices.
7. Examine or inspect every receptacle, switch or fixture or remove their respective covers.
8. Examine or inspect compatibility of breakers or fuses with the panel board.
9. Operate or evaluate smoke and fire detectors or test them when access would require a ladder or steps.
10. Evaluate secondary power sources.
11. Evaluate the attachment of any electrical equipment or devices.
12. Examine or inspect the GFCI receptacle with anything other than the manufacturers test button.
13. Examine or inspect emergency/backup electrical power sources including generators, windmills, solar collectors, battery or other electrical storage facilities.

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FOCUS POINTS WITH A CHECKPOINT SUMMARY

ELECTRICAL

A. Incoming Power & Exterior

1. Observe any overhead or underground cables.
2. Check cable fastenings and attachment for looseness, improperly installed and unsafe support.
3. Check wiring for frayed or damaged sections, including incoming lines and from support cable into the masthead.
4. Count the number of service wires. Two is 110-volt, three is 220-volt.
5. Observe the main panel location – should be inside the building.
6. Observe any tree limbs, etc. which are overhanging, contacting or swinging against the service wires.
7. Check exterior outlets for weather protected caps.
8. Check exterior wiring for damage and whether it's marked for exterior use (sunlight resistant).
9. Test all exterior outlets and lights.
10. Observe all fixtures that are in poor condition, hanging loose and/or missing.

B. Interior Power

1. Check the main power panel to see if it is fused or breaker.
2. Check the volt and ampere size.
3. Inspect the following:
    a. Whether the panel is installed properly with an inspection certificate inside the door
    b. Whether the cover is missing or loose.
    c. Whether there are any missing knockout plates.
    d. Whether all fuses are in place.
    e. Whether the panel is clean, dry and well organized.
    f. Whether there are any holes in the case, and all wire entries sealed at the holes.
    g. Whether any circuits over-fused.
    h. Whether branch wiring is aluminum or copper.
    i. Whether there is any rust or corrosion.
    j. Check for grounding and whether it is connected properly inside and outside the panel.

k. Observe whether the ground wire is properly connected to pipes or to the exterior rod.

C. Interior Outlets, Switches and Wiring

1. Check every room for properly mounted electrical outlets and switches, including cover plates.

2. Test each duplex with a circuit analyzer.
3. Observe any electrical hazards or unsafe conditions.
4. Test all GFCI outlets with a circuit analyzer and ground fault test device.
5. Be sure there are GFCI devices at all required locations near sinks, washing machines and other water sources.
6. Observe each room for number of outlets.
7. Observe the house wiring type (knob and tube wiring or other wire)
8. Check for poorly mounted fixtures, etc.
9. Check for any extension cords being used as additional outlets, and which may or may not pass through walls.
10. Observe all visible wiring for cracking or loss of insulation.
11. Check whether all visible wiring exposed to possible damage is covered with metal conduit. *Note: Garbage and electric water tanks, for examples.*
12. Inspect all visible wiring in basements and attics for open junction boxes, visible and exposed wire splices, long unsupported sections, installations which are unprofessional, unsafe or hazardous, and any knob and tube wiring buried in insulation.

NOTE: Test all switching for function and identify their use to be sure they are working properly.

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STUDY GUIDE

Electrical

Focus Point Identification & Terminology

1. Identify exterior service, service entry and grounding components
2. Identify panel boxes, their components, types and arrangements
3. Identify distribution systems, their components, types and arrangements
4. Identify service voltage and amperage
5. Identify wiring components, types, materials, uses and installations
6. Identify wiring methods and cable installations, switching and outlets
7. Identify circuit over current protection, breakers, fuses, fuse stats, GFCI
8. Identify grounding components, types, materials, uses and installations

Unsatisfactory Conditions Recognition, and Analysis and Relationship to Public Safety (Conditions needing maintenance, repairs and/or replacements)

1. Service at street & wires, recognize regular or irregular, installations, sag, attachments, clearances and height above ground.
2. Service entry and meters, recognize regular or irregular installations, meter box size, building attachment, clearances and height above ground.
3. Grounding, recognize regular or irregular installations, rods and piping etc. with attachments.
4. Panel boxes, recognize regular or irregular installations, quantity, location and clearances, penetrations, appropriateness of use, physically sealed and signs of overheating and damage.
5. Distribution systems, recognize regular or irregular, installations, "J" box types, wire type and location, exposure, appropriateness of use and physically sealed and signs of overheating and damage.

6. Service voltage and amperage, recognize whether the meter base, amperage and panel size match.
7. Wiring, recognize regular or irregular, types, installations, locations, protections and exposures.
8. Wiring methods, recognize regular or irregular, types, installations, locations, protections and exposures.
9. Over current protection, recognize regular or irregular, installations, types and devices and signs of overheating and damage.
10. Grounding, recognize regular or irregular, installations, types and metal to metal devices.

Systems Functions and Operations

1. Understand service entry and grounding requirements and public SAFETY.
2. Understand panel box types and their uses and public SAFETY.
3. Understand distribution systems and public SAFETY.
4. Understand service voltage, amperage and public SAFETY.
5. Understand wiring installations and public SAFETY.
6. Understand wiring components, switches, outlets, GFCI outlets and public SAFETY.
7. Understand circuit over current protection, breakers, fuses, fuse stats, GFCI and public SAFETY.
8. Understand grounding and public SAFETY.

Construction Methods and Materials

1. Understand service installation and arrangements
2. Understand panel box installation and multiple arrangements
3. Understand the installation of distribution and wire systems
4. Understand service voltage and amperage and how it is used
5. Understand the installation of wiring, switching and outlets including how neutral and grounding works
6. Understand the installation of circuit over current protection grounding and bonding
7. Understand the installation of grounding components and how it is used
8. Understand the installation of conductors and relationship to over current devices
9. Understand electrical theory, grounding and current flow

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HOME INSPECTION CHECKLIST

Electrical – Exterior

_____Poor drip loop	Correct/possible water entry
_____Damaged duct seal	Reseal/possible water to service panel
_____No/faulty/missing GFI outlets	Add/repair as necessary
_____No/damaged/older outlets	Consider adding/repairing/updating
_____Exposed unprotected wiring	Correct
_____Lamp cord wiring	Replace with proper wiring
_____Loose service entrance/service head	Repair as necessary
_____Poor clearances as shown	Correct
_____Damaged/frayed service cables	Consult with an electrician
_____Older service cable	Anticipate updating

<u>Electrical System</u>

_____Minimal circuits	Add more circuits as needed
_____No ground fault circuits	Add where needed as discussed
_____Open junction boxes	Provide covers
_____Exposed splices/wiring	Put in junction boxes
_____Poorly hung wires	Hang properly
_____Over-fusing	Reduce fuse/breaker size
_____Double-tapped circuits	Single up circuits if necessary
_____Use of lamp cord wiring	Wire correctly
_____Older 2-slot outlets	Update to grounded 3-slot outlets
_____Minimal outlets in house	Add more outlets as needed
_____Need De-oxy gel on aluminum wire	Apply gel where needed
_____Older wiring	Update/upgrade wiring as needed
_____Reversed-polarity outlets	Update/upgrade wiring as needed
_____Loose outlets/switches	Tighten up
_____Water/corrosion in service panel	Correct for leaks or condensation
_____Visible defects/deficiencies	Correct as needed
_____Older system/components	Update/upgrade as needed
_____Need upgrading/updating	Hire a licensed electrician
_____Some inaccessible areas	Check if possible
_____Possible homeowner wiring	Follow up with an electrician
_____Open knockouts in panel	Seal up
_____Open fuse slots	Add fuses
_____Possible code violation	Check with a licenses electricial