

IAALL CERTIFICATION COMPETENCY TEST
REVISED May 23, 2004

Instructions: In order to receive a passing grade you are allowed to miss no more than seven questions. All the questions with () bracket symbol must be answered correctly in order to pass. You may refer to any material we have given you as references. At the beginning of each section you will find a reference book entitled "Trade Secrets of Landscape Lighting". You may use this book as a reference to assist you in taking the test. There are no trick questions. For A or B and Yes/No questions simply circle the correct answer. If you do not pass the tests you may retake the test a maximum of two times. Upon passing the test you will receive a IAALL certified installer certificate.

Ohms Law: Ref: TS Chapter 5

- (1) Ohms Law is : _____ =
- (2) It is therefore logical that the following is true: _____ / _____ = AMPS
- (3) List the maximum amperages allowed for the following gage wires. In addition, calculate the maximum allowed wattage per each wire for landscape lighting per the N.E.C.

Wire	Amps	X	=	Watts
#8	_____	X	—	_____
#10	_____	X	—	_____
#12	_____	X	—	_____
#14	_____	X	—	_____

- (4) Using your answer from above, write out the correct formula to figure the Maximum amperage allowed for 12/2 cable. _____
- (5) A job has 120 watts of lamp load. If you were using a 12 volt system the Amperage would be a _ amp. If you changed the job to a 120-volt system the amperage would be a _ amp.
- (6) Using Ohms Law the following is always true: provided that you have the Proper voltage lamp, the higher the voltage, the higher the wattage allowable on the cable. True _____ False _____

(7) Since amperage is what builds heat, it is extremely important that we Always check each secondary run as well as the amperage at the transformer itself. The easiest and correct way to do this is to (A) use Ohms Law to calculate the amperage or (B) use an amp probe.

(8) Calculate the amps for the following lamps. All lamps operate at 12 volts.

Watts = Amps

35 watt lamp = _____

50 watt lamp = _____

75 watt lamp = _____

(9) How many amps does an 1120-watt transformer pull on the primary?

A. 93.3

B. 120

C. 9.3

How many on the secondary? _____

(10) List at least four reasons why you need to know Ohms Law.

A. _____

B. _____

C. _____

D. _____

(11) Using the 80% rule, how many 50-watt lamps can you put on 12/2 wire?

(12) On 12/2 wire with 120 volts, how many watts can be put on it?

(13) On 12/2 wire with 10 volts (low voltage), how many watts can be put on it? _____

(14) Using 120 volts how many amps can you put on 12/2 cable? _____

(15) How many 50-watt lamps can you put on the following? Remember the 80% rule.

12 wire _____

10 wire _____

8 wire _____

(16) Using the 80% rule, how many 36-watt lamps can you put on the following?

12 wire _____

10 wire _____

8 wire _____

Voltage Drop

Ref: TS Chapter 5

- (1) Using a (12 volt only) transformer that is fully loaded and putting out 11 Volts, the only way to increase the voltage to the lamps is (A) use larger wire (B) it is not possible.

- (2) Voltage drop occurs at the power source (wall outlet).
True _____ False _____

- (3) Voltage drop occurs at the transformer.
True _____ False _____

- (4) There are five reasons for voltage drop, list at least four of them.
A. _____
B. _____
C. _____
D. _____

- (5) The ideal voltage for a halogen lamp is between _____ and _____ volts.

- (6) A halogen lamp requires a min. of _____ volts to regenerate the halogen/tungsten cycle?

- (7) Low voltage is (A) AC (altering current) or (B) direct current (DC)?

- (8) Increasing the size of wire will reduce the amount of voltage drop from the transformer to the lamps.
True _____ False _____

- (9) Using the 80% rule, if you have a 360-watt transformer and are using 12/2 cable, which is good for _____ watts. The minimum number of wire runs would be _____?

- (10) Give a brief description of why this voltage drop formula is incorrect.

$$\frac{\text{Total distance of cable X Total watts}}{7500}$$

- (11) What is the correct voltage drop formula? _____
- (12) Calculate the voltage drop for the following run. Your answer must be in tenths of a volt. (Example: 2.69). Assume all lamps are 25 watts.
Answer_____

INSERT T METHOD DIAGRAM FOR 100' 12/2 WIRE

- (13) Calculate the voltage drop for the following run. Your answer must be in tenths of a volt. (Example: 2.69). Assume all lamps are 25 watts.
Answer_____

INSERT T METHOD DIAGRAM FOR 100' 10/2 WIRE

- (14) Calculate the voltage drop for the following run. Your answer must be in tenths of a volt. (Example: 2.69). Assume all lamps are 25 watts.
Answer_____

INSERT T METHOD DIAGRAM FOR 100' 8/2 WIRE

- (15) Calculate the voltage drop for the following run. Your answer must be in tenths of a volt. (Example: 2.69). Assume all lamps are 25 watts.
Answer_____

INSERT T METHOD DIAGRAM FOR 50' 12/2 WIRE

- (16) Calculate the voltage drop for the following run. Your answer must be in tenths of a volt. (Example: 2.69). Assume all lamps are 25 watts.
Answer_____

INSERT T METHOD DIAGRAM FOR 200' 10/2 WIRE

- (17) Calculate the voltage drop for the following run. Your answer must be in tenths of a volt. (Example: 2.69). Assume all lamps are 25 watts.
Answer_____

INSERT T METHOD DIAGRAM FOR 150' 8/2 WIRE

(18) The Unique Multi-Matic transformer can control voltage drop to the home Run fixture only.

True _____ False _____

(19) If the power supply were 130 volts, what would the output voltage be at the transformer? _____

(20) If, due to high input voltage, and using the 12-volt tap, you still have 13 volts at the home run fixture, the best way to lower the voltage is to:

A. _____ Notify the power company to reduce the voltage.

B. _____ Coil up and bury some extra wire.

C. _____ Use smaller wire.

(21) If you have a dim light, the easiest way to increase the brightness is to simply put in a higher wattage lamp.

True _____ False _____

(22) The correct lamp to check for voltage is always the lamp to which the power is run (home run fixture).

True _____ False _____

(23) Why is it always a good idea to check the voltage at the last fixture on each run? _____

(24) The easiest way to cure voltage drop (dim lights) at the lamps is to compensate for it at the transformer.

True _____ False _____

(25) According to the 1996 edition of the National Electric Code (NEC), a low voltage transformer must operate at 30 volts or less.

True _____ False _____

Proper Wiring

Ref: TS Chapter 6 Section IV Ref Material

(1) Fill in the following blanks for each of the three wire sizes.

<u>Wire</u>	<u>Rated Watts</u>	<u>Rated Amps</u>	<u>Suggested Max Watts 80%</u>	<u>Max amps Per NEC</u>
16/2	_____	_____	_____	_____
14/2	_____	_____	_____	_____
12/2	_____	_____	_____	_____
10/2	_____	_____	_____	_____
8/2	_____	_____	_____	_____

(2) Prior to laying out the wire you should first determine where the transformer would be located.

True _____ False _____

(3) Why is the daisy chain method of wiring not a good method of wiring?

(4) Because a lamp does not know polarity, you may connect either side of the low voltage cable to the lamps.

True _____ False _____

(5) When using the loop method of wiring, you must be careful to match the polarities of the wire.

True _____ False _____ Why? _____

(6) A bad connection either at the lamp or at the transformer may cause excessive heat to build up and may even melt the wire.

True _____ False _____ Why? _____

(7) #10 wire is?

- A. A heavier gauge wire than #12 wire.
- B. A lighter gauge than #12 wire.

- (8) All low voltage cable is rated for a minimum of 150 volts.
 True _____ False _____ Why? _____
- (9) When it is necessary to bury the cable in a lawn area, the ideal location to bury the cable is:
 A. In the center of the lawn.
 B. Along the side of a hard surface (sidewalk, mow strip).
 C. It does not really matter.
- (10) It is a good idea to bury the wire at least 6" in a lawn area to allow for aerating.
 True _____ False _____
- (11) Besides filling out the Unique load calculation form prior to laying your fixtures, it is always a good idea to refer to the Unique voltage drop charts.
 True _____ False _____
- (12) It is usually a good idea to have multiple wire runs to different zones. List at least three reasons why.
 A. _____
 B. _____
 C. _____
- (13) Regardless of the wiring method you use, the fixture that will always have the most voltage is:
 A. The lamp closest to the transformer.
 B. The lamp that the power is going into.
 C. The furthest fixture from the transformer.
- (14) Since the Multi-Matic transformer can only maintain proper voltage to the 1st homerun fixture or hub, it is imperative that you maintain the proper distance from the home run fixture to the last fixture on the run.
 True _____ False _____
 Why? _____

- (15) What is the correct resistance per foot for the following wire sizes?
- 12/2 _____
- 10/2 _____
- 8/2 _____
- (16) Briefly describe the T-method of wiring. You may also draw a picture using five lamps that shows the proper way to run the wire. Be sure to include maximum distance between first and last fixture. _____

- (17) Briefly describe the Loop Method of wiring. You may also draw a picture using five lamps that show the proper way to run the wire. Be sure to include maximum distance between first and last fixture. _____

- (18) The Unique load calculation form is helpful because it will provide you with the following information. List at least three reasons why.
- A. _____
- B. _____
- C. _____
- (19) Reducing the size of wire will reduce the amount of voltage drop.
- True _____ False _____
- (20) Using the 80% rule list the minimum number of #12 secondary wires you would use for these sizes of transformers.
- 1120 _____
- 840 _____
- 600 _____
- 500 _____
- (21) What is the correct voltage drop formula?

- (22) When calculating voltage drop, why do you take the length of cable and times it by two? _____
- (23) Draw the symbol for a transformer. _____

- (24) Describe what a secondary wiring run is. _____
- (25) What is primary voltage? _____
- (26) Why is using a three wire wiring method not a good idea?

- (27) In a T Method of wiring, can you hook up to an even number of fixtures?
Yes _____ No _____ Why _____
- (28) Why is the Hub now the best wiring method? _____

Tools

Ref: TS Chapter 7

Volt Meter

- (1) Even though the battery in your voltmeter may need changing, as long as you can read the display the reading will be accurate.

True _____ False _____

- (2) A digital voltmeter is the best way to check voltage.

True _____ False _____

- (3) You may check the amperage with your voltmeter.

True _____ False _____

- (4) You should always set your voltmeter to the (A) AC setting or (B) the DC setting.

- (5) A digital voltmeter should never be used to check the 110 voltage at the power source.

True _____ False _____

- (6) A voltmeter is primarily used to check for continuity/ohms.

True _____ False _____

- (7) A voltmeter is primarily used to check the voltage at the lamps.

True _____ False _____

- (8) Your voltmeter should always be set to the lowest setting.

True _____ False _____

Why? _____

Amp Probe

- (1) All UL approved transformers (do) or (do not) list the maximum allowable amps.

- (2) Most amp probes may also be used as a digital voltmeter.

True _____ False _____

- (3) The amp probe jaws should be clipped around either the hot side or the neutral side of the cable but never both at the same time.

True _____ False _____

Why? _____

What can you buy to make this easy? _____

- (4) Unusually high amperage on a secondary run would indicate a possible short in the wire.

True _____ False _____

- (5) Using an amp probe to check the amperage on the primary side is a good way to verify that you have not overloaded the transformer.

True _____ False _____

- (6) Prior to leaving the job, it is a good idea to use an amp probe to check all secondary amps as well as the primary?

True _____ False _____

Why? _____

- (7) List at least three things you can do with an amp probe.

A. _____

B. _____

C. _____

- (8) When turned on, the AC symbol on a voltmeter looks like _____

Trouble shooting Ref: TS Chapters 5-7

- (1) If you have really dim lights, list the two most likely problems.
A. _____
B. _____
- (2) List the two probable reasons why a fuse would blow immediately.

- (3) If the fuse blows after a prolonged period of time, it probably means?

- (4) What is the most likely tool to use to detect a short?

- (5) If your wire run is overloaded, list at least two things you could do to reduce the load.
A. _____
B. _____
- (6) If you have a short and you are blowing a fuse, briefly explain the proper sequence to find the short.

- (7) If there isn't any power at the outlet, what should you do?

- (8) If the GFI keeps tripping, what should you do?

- (9) What is the most likely reason for a photocell coming on too soon?

(10) You have replaced all the lamps on a run and it appears that the lamps are too dim or yellowish. List three possible reasons why.

A. _____

B. _____

C. _____

(11) The first lamp on the run is prematurely burning out. What are at least two likely causes?

A. _____

B. _____

(12) You have five separate wire runs on a job. All are working, except one. List several possible explanations.

A. _____

B. _____

C. _____

D. _____

(13) All the lamps are burning out after several months of operation. You have verified that the voltage is correct. What is another possible explanation?

(14) Prior to putting any load on the transformer, you only have 10 volts coming out of the 12-volt tap. What is the most likely reason and what should you check?

(15) After connecting all the lamps, the wire is very warm to the touch. List several potential problems.

A. _____

B. _____

C. _____

D. _____

(17) If the circuit breaker that your transformer is using trips, what are the two most likely reasons?

A. _____

B. _____

(18) On most of the Unique transformers, why do we give you two or three white/common wire leads?

(19) The proper way to hard wire a Unique transformer is to:

(20) Do you have to balance the load on a Unique transformer?

Yes _____ No _____

(21) In what direction should you face the photocell for best operation?

(22) What type of fuse should be used in the transformers? _____

(23) What is wicking? _____

(24) List three uses for a amp probe? _____

(25) _____

(26) _____

(27) What does a thermister do? _____

(28) When replacing a breaker it should be what type? _____

Installation Procedures Ref: TS Chapter 7

(1) The first step in installation is to determine the location of the transformer.

True _____ False _____

Why? _____

(2) Explain why it is a good idea to know where the transformer will be located.

(3) What are the benefits to flagging all fixture locations?

(4) After you have flagged all fixture locations, the next step would be to

(5) Explain why it is a good idea to leave extra cable at each fixture.

(6) After you have placed the fixtures, the next step would be to run the home run.

True _____ False _____

(7) You should hook up the transformer (A) before or (B) after you have made your connections at the fixture?

(8) It is always a good idea to check the voltage at the lamps prior to burying the wire.

True _____ False _____

Why? _____

(9) If you are using par 36 lamps and making the connections at the lamp, you would reduce the amount of connections by 50%.

True _____ False _____

Why? _____

(10) How far should the insulation on the wire be stripped back in relationship to the wire nut? _____

(11) Using a regular red wire nut and filling it with the proper grease will give you a better connection and save you money.

True _____ False _____

(12) Because low voltage creates high amperage the connection is the weak link in the system.

True _____ False _____

(13) Calculate the following: If you have 20 lamps at 35 watts each and the system is operating five hours a day. How much money will it cost per day to operate? You may assume that the utility rate is .10 per kilowatt-hour.

(14) What is the critical three?

Connections

Ref: TS Chapter 7

(1) Should you use grease on all connections? Yes _____ False _____

(2) How many 12/2 wires can you put in the following wire nuts?

Red _____

Large Grey _____

(3) Why do you have to be careful with connections?

(4) When connecting a 12/2 wire to a smaller fixture wire (#18), the smaller wire should be just slightly in front of the larger wire. This will make a better connection in the wire nut.

True _____ False _____

(5) Why is it a good idea to put rubber/Cambridge tape around a barrel lug?

(6) Can you have a bad or loose connection with a lug?

Yes _____ No _____

(7) What is wicking? _____

(8) If you have a melted wire nut, what has occurred?

(9) If you are using a lugged transformer, why is it important to use the correct size screwdriver?

(10) When possible, it is a good idea to keep the connection out of the ground.

True _____ False _____

(11) The least amount of connections the better.

True _____ False _____

Unique Product Knowledge Ref: Unique Brochure/Instructions

(1) For testing purposes, all wire runs on a Unique transformer should first be connected to the following voltage tap:

12v 15v 18v 20v

(2) What is the recommended maximum lamp load (in %) to the total transformer output?

50% 70% 80% 100%

(3) 100% of a Multi-Matic transformer's capacity is made up as follows:

80% lamp load and 20% wire resistance. True _____ False _____

(4) What is the warranty on a Unique Multi-Matic transformer? _____

(5) Can you use each of the different voltage taps on a Unique transformer multiple times? Yes _____ No _____

(6) The maximum amount of wattage on any one voltage tap should be limited to 600 watts. True _____ False _____

(7) You may use 100% of the wattage rating on any Unique Homeline series (12v only). True _____ False _____

(8) One of the benefits to using the Multi-Matic transformer is that you will save money on your wire purchases. True _____ False _____

(9) Briefly explain how to determine if a photocell is not working properly.

(10) Briefly explain how to replace a photocell.

(11) To by-pass a photocell you would do what?

(12) You should always replace a Unique Lighting transformer with a _____ blow fuse. What is the proper size fuse for each transformer?

300 _____ 360 _____ 500 _____ 600 _____

840 _____ 1120 _____

(13) All Unique transformers (A) are or (B) are not x10 compatible?

(14) You may use a dimmer on all Unique transformers.

True _____ False _____

(15) What is the largest voltage tap on a Unique transformer? _____ volts.

(16) When can you use 100% of a Unique Multi-Matic transformer?

ELECTRICAL TEST

1. Low Voltage creates _____ times more amperage than high voltage?
2. If the plug you are using is not a GFIC, can it still be on a GFIC circuit?
3. All wire is rated for a minimum of _____ volts.
4. All wire is identified for polarity. How?
- 5.

LAMPS TEST

1. A halogen par 36 35 watts is rated for how many hours?
2. A halogen must operate at no lower voltage than?
3. Lamps know polarity?

PHOTOMERICS TEST

1. What is CBCP?
2. Where is it measured?
3. If you wanted 10 F.C. on an object 12 feet away, what lamp would you use?
4. What are fast lamles?
- 5.

ESIGN REVIEW TEST

1. List four items necessary to a lighting portrait.
2. Levels of light are used to create what?
3. Level 1 is used for?
4. Level 2 is used for?
5. Level 3 is used for?
6. What is spill lighting?
7. What is a focal point?
8. What is incident light and how do we use it?
9. Why must we use hex louvers?
10. Why must we use Glare Shields?
11. Why must we use lens?

Test completed by: _____

Phone: _____ **Fax:** _____

Company Name: _____ **Date:** _____