Texas Commission on Environmental Quality

November 2013

Landscape Irrigation Training

Curriculum Guidance

ACCEPTABLE TOPICS FOR CONTINUING EDUCATION COURSES

GENERAL NOTES TO TRAINING PROVIDERS:

Training providers developing training should use the topic list as guidance. The topics should directly relate to the critical tasks TCEQ-licensed irrigation professionals must perform safely to protect the public water supply and conserve water. A thorough knowledge of irrigation rules will better serve the landscape irrigation professional with clients and code enforcement officers.

All training providers should either provide a copy of the current rules or web link to all students. At a minimum, providers can provide information on how to acquire a copy of 30 Texas Administrative Code (TAC) Chapters 30 & 344 related to landscape irrigation.

All training must be reviewed and approved by TCEQ prior to awarding training credit hours to students. The TCEQ may solicit the Irrigator Advisory Council (IAC) or other irrigation professionals in the confidential review of any material submitted to the TCEQ. If 4-hour segments of the Basic Irrigator Licensing course relates to one or more of these topics, the approved provider may apply for approval of the course segment for continuing education hours. For standards and application items, review the TCEQ's regulatory guidance document, RG-373: Approval of Training for Occupational Licensing at http://www.tceq.texas.gov/licensing.

Other topics will be considered on a case-by-case basis. Please be aware that training should reflect the level of complexity and duration appropriate for the license considering job task criticality and frequency. Training should show no preference to or promote any specific manufacturer's product or service.

If you have questions regarding this guidance, please contact Occupational Licensing at (512) 239-6133 or email licenses@tceq.texas.gov

For lists of initial and renewal training offered by approved providers, go to the TCEQ website at http://www.tceq.texas.gov

I. RULES, REGULATIONS, AND STANDARDS

A. Statutes, State Rules and Regulations
    1. Texas Water Code 34
    2. Texas Administrative Code (TAC) Title 30
        a. Chapter 70, Enforcement
        b. Chapter 290, Backflow
        c. Chapter 344, Landscape Irrigation
        d. Chapter 30, Licensing
        e. Chapter 30.28(p)(3)(c)—distance training credit restrictions.
    3. TAC Chapter 288 – water conservation plans (every 5 years) versus emergency water restrictions and rules

B. Municipal Codes and Ordinances
    1. Irrigation-related municipal ordinances and revisions to better serve the public's health, safety, and welfare.
    2. Local codes' and ordinances' impact on the irrigation industry
    3. Working relationships with state and local enforcement agencies
        a. Industry support and education for enforcement officers (e.g., plumbing inspector training, use of new technology)
        b. Irrigation industry issues (e.g., inspection scheduling, plan review, and permits)

C. Current Uniform Plumbing Code or International Plumbing Code (also as amended by ordinance)
i.e., as relates to irrigation system installation, repair, and backflow protection.

D. U.S. Environmental Protection Agency(EPA) (e.g., WaterSense)

E. Standards of Conduct for Irrigators (§344.20-24)

F. Requirements for Licensed Irrigators, Irrigation Technicians and Inspectors (§344.30-38)

G. Use of Seal-applies to the irrigator only (§344.4-43)

H. Notice of Violation (NOV) versus Notice of Enforcement (NOE)

I. Proper Response to Enforcement Actions

II. WATER CONSERVATION

A. Regulatory Requirements
    1. Chapters 290 and 344
    2. Conservation Plans – Chapter 288
    3. EPA WaterSense program
    4. Conservation agencies and program benefits (e.g., U.S. EPA Green Building Program)

B. Irrigation Scheduling
    1. Compliance with local regulatory authority's requirements
    2. Proper irrigation system evaluation – see III. Design
        a. Check system operation

b. Analyze water distribution
c. Verify backflow prevention
d. Make appropriate adjustments
e. Perform customer education – explain changes & recommendations

3. System performance measurement
4. ET data-based seasonal irrigation schedule
    a. Historical or real-time ET source data
    b. Mathematical factors for ET-sensitive irrigation schedule
5. Proper irrigation controller operation
    a. Evaluation and troubleshooting of current programming
    b. Entry of ET-determined schedule
    c. Landscape monitoring for over or under watering stresses
    d. Program adjustments to improve conservation
    e. Controller Security

C. Water-Saving Design and Conservation Devices
1. See also III. Design
2. Soil moisture and flow sensors
3. Abnormal/catastrophic flow shutdown
4. Green building considerations for efficient & sustainable water use
5. Weather-sensing equipment
    a. Adjustments for rain events
    b. Predicted and actual

D. Water Auditing or System Evaluation
1. Conducting and marketing water audits
2. Audit results
    a. Interpretation
    b. Uses
3. Field practice auditing
4. Merits of current auditing certifications
5. System evaluation versus an audit

E. Estimating Water Usage and Associated Costs
1. Effects of pressure regulation
2. Computer-based water programming tools
3. Water requirement and application calculators
4. Landscape water needs estimators
(e.g., download calculator at www.waterwisetexas.org)

F. Low Volume (Drip) Irrigation
1. Practicality and water savings
2. Benefits and concerns
3. Proper design and installation – See III. Design D. for more topics

G. Retrofitting Existing Systems
1. Design and hydraulic considerations
2. Component, controller, & system changes – 344 compliance

III. DESIGN (§344.60-65)

A. General Design Considerations
    1. Measurement of the job site with a comprehensive evaluation
        a. Scan the plat
        b. GPS tools
        c. Aerial photos
        d. Municipal GIS downloads
        e. Measuring wheel
    2. Evaluation of site conditions
        a. Plant types
        b. Slope and relevant elevation changes
        c. Soil types and infiltration
        d. Light exposure and wind
        e. Available water source(s), quality, capacity, and pressure
        f. On-site sewage facilities, swimming pools, etc.
        g. Borders, existing landscape, fences, sidewalks, driveways, etc.
    3. Sprinkler pattern and spacing
    4. Considerations for water conservation
        a. Hydraulics
        b. Hydrozones
        c. Microclimates
        d. Precipitation rates
        e. Establishing a water budget
        f. Pumps
        g. Sensor type and location
        h. Local watering restrictions and water availability
        i. Operation requirements – hydraulics and pressure check
        j. Alternative water sources and any associated adjustments
        k. Proper water delivery system (e.g., rotor, spray, low volume, low-angle heads, pressure regulating heads, nozzles, and valves)
    5. Plant-soil-water relations
        a. Plant water requirements
        b. Normal monthly rainfall
        c. Development stage water needs
        d. Required depth of plant root system
    6. Component selection and new technology applications (e.g., two-wire system requirements)
    7. Liability

B. Commercial System Design
    1. Restricted days and hours of system operation
    2. Water infiltration optimization
    3. Considerations regarding vehicle damage prevention
    4. Water application to slopes

C. Golf Course and Park System Design
    1. Hydraulics considering topography and location of water source
        a. Power, pressure, and pumping requirements
    2. Specific treatment for greens, tees, or native areas
    3. Hydraulics, thrust blocks, and air break requirements for larger flows/pipes
    4. Spacing exceptions for walkways if runoff drains into a landscape area (§344.62(b)(3))

D. Low Volume (Drip) Irrigation System Design
    1. Proper design and layout
    2. Precipitation Rate
        a. Soil type
        b. Plant water needs
    3. Filters, pressure reducers, drain valves
    4. Topographical effects
    5. Spot emitters versus dripper line
    6. Subsurface versus surface drip comparison
    7. Micro irrigation

E. Design and Specifications Documents
    1. Computer-Aided Design (CAD) – should include an overview of all major software products available for irrigation design
    2. Manual design production
        a. In-house
        b. Design service
        c. Appropriate legends
        d. Note areas not to be irrigated
    3. Design record maintenance

F. As-Built Plans and Plan Review
    1. Plan completeness and compliance (§344.61)
    2. Proper hydraulic calculations
    3. Head spacing review
    4. Precipitation rate
    5. Proposed seasonal water schedule
    6. As-built plan requirements e.g., irrigator-authorized changes in red

G. Water Sources and Alternative Supplies
    1. Local water purveyors and approved water uses
        a. Surface water
        b. Ground water
    2. Reused, reclaimed, and recycled waterPrivate Source
        a. Well
        b. Lake, pond, or other body of water not considered “waters of the State”
    3. Graywater

4. Rainwater harvesting (irrigation components of non-potable irrigation systems)
    a. Backflow prevention
    b. Availability and back-up water supply
    c. Water quality considerations – screening, filtering
    d. Reference http://www.arcsa.org (ARCSA)
5. Backflow prevention for multiple water sources, blended sources, the public water system tie-in for back-up supply

H. Jobsite Soil Runoff Protection Plan (i.e., Storm Water Pollution Prevention Plan)

IV. IRRIGATION INSTALLATION AND TECHNIQUES (§344.61-64)

A. General Irrigation Installation Standards
    1. Plan review
    2. Design versus actual site conditions
    3. Corrective actions and checks
        a. Irrigator responsibilities versus technician responsibilities
        b. Design versus as-built plan changes
    4. Locate and mark underground utilities (e.g., call Texas811)
    5. Available water pressure matches design pressure
    6. Mark locations for heads and piping
    7. Install irrigation components per manufacturers' specifications & TCEQ rules
        a. Backflow prevention and isolation valves per state and local ordinances
        b. Proper solvent welding techniques
        c. Safety considerations
    8. Select backfill use
    9. System test and irrigation controller for seasonal conditions
    10. Maintenance checklist
    11. End user instruction on system operation and maintenance
    12. Warranty of parts and labor
    13. Reclaimed water – proper use of purple pipe, components, and signage (§344.65)

B. Residential System Layout and Installation
    6. Water collection or storage unit installation
    7. Hydrozoning challenges
    8. Dripper line or spot emitter considerations – location, amount
    9. Watering problems requiring landscape design changes

C. Commercial and Golf System Layout and Installation
    1. Flow monitors with master valve shutdown during errant flow conditions
    2. Techniques to minimize heavy traffic damage to irrigation components
    3. Thrust block applications
    4. Standard versus gasket pipe installation techniques

5. Solvent welding skills
6. Fittings and air relief valve placement and installation
7. Potable water source with a secondary source
8. Proper grounding and lighting protection

D. Practical Subsurface Installation Techniques
1. Trench opening or pipe plowing
2. Wire size and splicing (waterproofing)
3. Two-wire installation requirements
4. Chamfering bevels and de-burring pipe ends
5. Proper pipe and fitting unions
6. Backfill usage and compaction
7. Pipe depth/coverage

E. Low Volume (Drip) Irrigation Installation
1. Installation allowing easier future inspection or repair
2. Backflow prevention requirements
3. Customer education – operation and maintenance

F. Thrust Blocks
1. Applications
2. Proper layouts

G. Irrigation Management Systems
1. Water flow monitoring and adjustments
2. On-site weather station and subscription service

H. Irrigation Controller Interface Options

I. Product Selection and Understanding of "or Equal"

J. Hands-on Installations and Demonstrations

K. Jobsite Soil Runoff Protection Plan (Storm Water Pollution Prevention Plan)

V. BACKFLOW PREVENTION AND CROSS-CONNECTIONS (§344.50-52)

A. Types of Backflow Prevention, Uses, and Proper Installation

B. Practical and Compliant Backflow Preventer Placement

C. Applicable Cross-Connection Control Topics in the Backflow Prevention Assembly Tester 40-hour Licensing Course
1. Irrigation licenses are not authorizing licenses for repair or testing of backflow prevention assemblies (BPA) – only authorize installation of BPA's on irrigation systems
2. BPA testing or repair training does not receive irrigation credit

D. TCEQ Cross-Connection Control Program
http://www.tceq.texas.gov/drinkingwater/trot/cc_control.html

VI. LANDSCAPE IRRIGATION SYSTEM OPERATION & MAINTENANCE (§344.60–65)

A. System operation and maintenance while protecting the water supply and promoting water conservation
    1. Perform all services in compliance with state and local codes
    2. Check for backflow prevention problems – correct installation and type
    3. Inspect for complete, uniform coverage/distribution and make appropriate repair recommendations
        a. Irrigation system dry spots and run-off
        b. High water flow velocities
        c. Water loss and pressure problem analysis
        d. Irrigation repair with “like” components
    4. Inform user about components for improved water conservation
    5. Advise user on appropriate seasonal watering schedule

B. Troubleshooting Valves and Wires
    1. Physical appearance of all components
    2. Obstructions in the internal hydraulics
    3. Testing the solenoid by clock or ohm meter
        a. Internal diagnostic features of controllers
        b. Physical testing
    4. Broken wires and wires with a dead short (locate and repair)
        a. Electrical equipment to troubleshoot wiring problems
        b. Ohm meter
        c. Wire tracking devices
    5. Valve rebuilding

C. Controller Servicing
    1. Power failure locating
    2. Insect/pest damage
    3. Lightning damage
    4. Existing system retrofitting
        a. Determine the objective
        b. Create a new plan
    5. Controller programming
        a. Cycle soak program use
        b. Stacked program check
    6. Run-off—single or multiple start times’ effect
    7. Freeze damage and protection
    8. UV damage of controller piping

D. Athletic and Sports Field Irrigation Systems
    1. Excavation or trench work compression to eliminate trip hazards

E. Issues Related to Irrigation Systems Using Untreated Raw Water

1. Water salinity
2. Sediment and filtration
3. Contamination issues

VII. PUMPS

A. Pump System Characteristics

1. Design and selection
2. Interpretation and use of pump curves and performance data

B. Pump Types and Purposes (Including those used for water wells, lakes, rivers, and streams to provide water to a landscape irrigation system)

C. Strainers and Sand Separators

D. Pump Electrical Requirements

E. Pump Activation Systems

10. Electric relays and pressure systems
11. Computer control systems

VIII. LANDSCAPING

A. Calculating Water Requirements

1. See also II. Water Conservation E.
12. Plant types and crop coefficients
13. Site conditions effecting soil moisture and plant water needs
14. Soil infiltration rates

B. Soil Improvement

1. Soil amendments to improve water retention
    a. Compacted shale
    b. Compost
    c. Polymers that absorb and release water

C. Evapotranspiration Effects on Water Scheduling

1. Saturation
2. Field capacity
3. Maximum allowed depletion
4. Wilting point
5. Soil infiltration rate

D. Grading

1. Irrigation of swales, within ponding areas, or on slopes
2. Effects of altering on-site drainage and run-off

E. Landscape Plants

1. Identification
2. Water and nutritional needs
3. Landscape pests and diseases related to under or overwatering

IX. SAFETY

A. Tools and Equipment Operation and Maintenance
   1. Riding and walking behind trenchers
   2. Boring equipment and tools

B. Job Site Safety
   1. Confined space awareness (trenches, holes, and vaults)
   2. Personal Protective Equipment (PPE)
      a. Trenchers
      b. Solvents
      c. Gas welding
   3. Hazardous chemical awareness
      a. Material Safety Data Sheets (MSDS)
      b. Solvents
   4. Barricading and marking open holes
   5. Jobsite risk management analysis

C. Electrical Skills and Safety Considerations
   1. Separation of 110 volt wires from low voltage wires
   2. Proper grounding techniques and testing
   3. OSHA and local municipal code requirements
   4. Proper use of water tight conduits and junction boxes
   5. Self-protection
      a. Personal Protective Equipment (PPE)
      b. Proper lockout and disconnect procedures
         e.g., Lockout-Tagout (LOTO)
      c. Avoid grounding yourself, standing in water, putting down knee
   6. Meters and testing equipment use
   7. OSHA and local governmental rules regarding 110, 220 and 440 volt applications

D. OSHA requirements directly related to the critical job tasks performed while protecting the public water supply, promoting water conservation, and designing, installing, and maintaining landscape irrigation systems
   http://www.osha.gov/SLTC/landscaping/index.html

E. Locating Underground Utilities
   1. Texas811 or similar locater service
   2. Dangers of digging without knowledge of underground utilities' location

F. Traffic Control
   1. Local governmental contact for a lane closure
   2. Proper use of devices as barricades when working in or near public roadways.
      Reference: Texas Department of Transportation's (TXDOT) *Manual on Uniform Traffic Control Devices* at http://mutcd.fhwa.dot.gov/index.htm

G. Other Safety Topics
    1. Jobsite emergency action plan
        a. Emergency treatment facilities' proximity
    2. Emergency communication plan
    3. Job site risk management plan
        a. List all marked utilities
        b. Use utility signage and observation (overhead) to mark utilities

X. HYDRAULICS

A. Standard Calculations (elevation, friction, velocity)

B. Proper Use of and Calculations for Looped Mains

XI. BUSINESS PRACTICES: ADVERTISING, CONTRACTS, WARRANTIES (§344.70-72)

A. Basic Business Skills: job site inventory, estimating, bidding with specification and contract documents, the creation and use of business plans, balance sheets, income statements for the purpose of financial analysis and corrective action.

B. Professional Business Behavior: the need for ethical business practices, contractor/customer relations, customer education before, during & after a job, promotion of water supply protection and conservation, obtaining and maintaining the proper license.

C. Ethical and responsible disposition of information when marketing, consulting or publishing information per §344 TCEQ Landscape Irrigation Rules.

D. Advertising in accordance with rules and including license number on all advertising media—e.g., business cards, truck, website, contracts, any signage.

E. Recordkeeping: warranties, contracts, customer agreements, testing/inspection results, designs.

F. Compliant business practices include:
    1. Maintaining appropriate irrigation records,
    2. Providing contracts complying with state rules,
    3. Obtaining permits from proper authorities & requesting final inspection,
    4. Hiring licensed testers for backflow prevention assembly testing/repair,
    5. Obtaining proper authorization to use water from a river or lake, and
    6. Maintaining licenses and obtaining renewal hours timely.