

NCICLB EXAM CONTENT OUTLINE

Domain I: Irrigation Design (20%-24%)

A. Educate Client

1. Irrigation best management practices
2. Sprinkler system features
3. Water management capabilities
4. Design considerations

B. Perform Site Analysis

1. Owner requirements
2. Irrigated area
3. Type of soil/intake rate
4. Property size/dimensions
5. Water window
6. Topography
7. Utility location
8. Right of ways
9. Codes/Ordinances
10. Water service source and capacity
11. Hardscape and landscape layout
12. Power source
13. Soil analysis
14. Plant evaluation
15. Budgeting
16. Adopting design promoting water conservation on existing systems

C. Determine Point of Connection, Water Supply, and Capacity

1. Pump design (e.g., type of pump, pressure tank, pump controls)
2. Pressure compensating/pressure regulating valve
3. Electrical components
 - a. Controller and pump
 - b. Grounding
 - c. Available power supply
4. Backflow prevention requirements
 - a. Type
 - b. Installation location
 - c. Water source
5. Water supply sizing
 - a. Available flow
 - b. Minimum required flow rate
 - c. Available pressure
 - d. Water quality

D. Establish the Hydrozone and the Appropriate Components

1. Climatic exposure
2. Plant water requirements
3. Soils
4. Topography
5. Drainage
6. Hardscape
7. Local restrictions
8. Priority areas

E. Select Sprinkler Heads, Drip Type and Determine Spacing

1. Head selection and layout
 - a. Based on catalog specifications
 - b. Based on distribution uniformity/scheduling coefficient (SC)
2. Drip selection and layout
 - a. Catalogue recommendations
 - b. Soil types

F. Establish Zoning, Valve Selection, and Piping

1. Zoning
 - a. Gallons per minute
 - b. Hydrozoned
2. Pipe layout (lateral and main)
 - a. Type of pipe
 - b. Pressure loss/pipe sizing
3. Valve location and type
 - a. Other valves (e.g., isolation valves, quick coupler valves)
4. Sleeves (e.g., water, wire)

G. Determine Controller and Sensor Location, Type and Wire

1. Controller
 - a. Electronic
 - b. SMART controllers (e.g., weather-based, soil moisture-based, self-adjusting)
2. Sensors (e.g., rain sensors, soil moisture sensors)
3. Wire type and sizing
 - a. Single strand
 - b. Multistrand
 - c. Wire splicing
 - d. Grounding

H. Design Plan, Installation Details and Specifications

1. To scale
2. Legend
3. Formatting

Domain II: Irrigation Installation (24%-28%)

A. Implement Preconstruction Requirements (permits, utility locations, etc.)

1. Utility location and protection
2. Erosion control
3. Permits
4. Product submittals
5. Plan submittals
6. Verify site and system requirements
7. Verify water quality/quantity

B. Review Plans and Specifications (e.g., using a scale, reading specifications)

1. Legend
2. Plan notes
3. Details

4. Scale and sheet size
5. Verify using current drawing
6. Request for Information (RFI)
7. Plan verification information
- C. Procure System Material
 1. Detail take off
 2. Vendor pricing
 3. Product availability and lead time
 4. Onsite storage/security
 5. Product inventory tracking
- D. Determine Equipment and Labor Needs
 1. Power equipment
 2. Tools
 3. Labor
 4. Subcontractor
 5. Safety equipment
 6. Trenching/plowing
- E. Layout System (e.g., mark property lines, locate system components)
 1. Verify utility locations
 2. Verify site features
 3. Identify obstructions
 4. Identify field changes
- F. Arrange for Point of Connection
 1. Types of supply lines
 2. Water supply connections
 3. Isolation valve
 4. Backflow
 5. Quick coupler/winterization connection
 6. Power supply
 7. Pressure regulation
 8. Pump
 9. Filtration
 10. Drain valve
- G. Install Mainline and Valves
 1. Types and sizes
 2. Unions/fittings
 3. Manifolds
 4. Valve box (e.g., drainage, labeling)
 5. Pipe connections (e.g., cutting, solvent welding, mechanical connection)
 6. Thrust blocking
 7. Flushing
 8. Pressure testing
 9. Backfill and compaction
 10. Air vacuum release valve
 11. Isolation valves
 12. Control valves
 13. Specialty valves
- H. Install Lateral Pipe and Sprinkler Heads
 1. Sprays
 2. Rotors
 3. Bubbler

4. Swing joint assemblies (e.g., triple swing, unitized swing, flexible connections)
5. Matched precipitation rate (MPR) nozzle
6. Adjusting (e.g., arc, radius, set at grade)
7. Rotators/multistream
8. Trenching/plowing
9. Backfill and compaction
10. Flushing
11. Pipe connections (e.g., cutting, solvent welding, mechanical connection)
- I. Install Various Drip Components
 1. Point source and inline drip
 2. Pressure reducing valve (PRV)
 3. Microsprays
 4. Flush valves
 5. Air relief
 6. Low flow remote control valves
 7. Fittings
 8. Headers
 9. Filters
 10. Valve boxes
 11. Stapling
- J. Install Controller, Sensors and Related Components
 1. Wall mount
 2. Conduit (i.e., no exposed wire above ground)
 3. Grounding
 4. Electrical power connection
 5. Control wire labeling
 6. Connect field wires to controller, setup zone sequence, and testing
 7. Sensor wiring and testing or calibration (e.g., soil, rain, wind, weather)
 8. Other accessories (e.g., remote controls, communications, decoders)
 9. Input initial program

Domain III: Irrigation Scheduling, Management and Conservation (16%-20%)

- A. Determine Local Water Restrictions
 1. Seasonal
 2. Daily
 3. Water windows
 4. Runoff
 5. Water budget
 6. Water availability
 7. Source (reclaimed)
- B. Determine Soil Type, Water-holding Capacity, Infiltration Rate and Slope
 1. Basic soil biology (e.g., water retention capability, porosity)
 2. Soil texture type
 3. Water-holding capacity
 4. Infiltration rate
 5. Allowable depletion
 6. Compaction

- C. Calculate Landscape Water Requirements (ET, plant factors, root depth, etc.)
 - 1. Root depth
 - 2. Evapotranspiration (ET)
 - 3. Crop coefficient
 - 4. Microclimate
 - 5. Slope
 - 6. Field capacity
 - 7. Saturation
 - 8. Wilting point
 - 9. Permanent wilting point
- D. Conduct Assessment or Audit to Determine Application Rate
 - 1. Irrigation system inspection
 - a. Proper sprinkler adjustment
 - b. Proper nozzles installed in sprinklers
 - c. Leaks
 - d. Broken equipment
 - e. Drip layout/performance
 - f. Pressure
 - 2. Measure precipitation rate
 - 3. Calculate system uniformity
 - 4. Controller capabilities
- E. Create an Irrigation Schedule
 - 1. Peak-demand schedule
 - 2. System capacity and watering schedules
 - 3. Local watering restrictions
 - 4. Cycle-soak times
 - 5. No-irrigation days (events, maintenance, etc.)
 - 6. Seasonal adjustments
 - 7. Determine schedule coefficient (SC)
- F. Program the Controller with the Irrigation Schedule
 - 1. Verify data input
 - 2. Test program
 - 3. Sprinkler test run
- G. Audit Site Conditions for Maximizing Water Conservation Results
 - 1. Prioritization of irrigation areas (e.g., water budget, drought response)
 - 2. Review performance measures to monitor progress of water conservation (e.g., audit, meters, billing, measure root depth, plant health)
 - 3. Estimate actual and theoretical landscape water use
 - 4. Mitigate runoff and deep percolation
 - 5. Implement long range water conservation plan based on auditing results

Domain IV: Maintenance and Repair (16%-20%)

- A. Perform System Startup
 - 1. Charge the system (e.g., pump priming)
 - 2. Adjust and clean sprinkler heads
 - 3. Clean all filters
 - 4. Set proper program controller

- 5. Verify operation (e.g., site inspection, check for leaks)
- 6. Drip irrigation (e.g., flush laterals, check pressures)
- B. Perform System Inspection and Adjustments
 - 1. Test and adjust all components as necessary
 - a. Adjust irrigation schedule
 - b. Adjust sprinklers and nozzles
 - c. Verify valve operation
 - d. Verify drip operation
 - e. Verify system pressures
 - 2. Leak detection and investigation
 - 3. Verify sensor operation (e.g., weather station, weather sensors)
- C. Identify and Perform Repairs as required
 - 1. Diagnosis and troubleshooting
 - a. Electrical and hydraulics
 - 2. Documentation (e.g., work orders, pictures)
 - 3. Communication
 - a. End-user
 - b. Coordinate with related trades/other
- D. Adjust the Irrigation Schedule as needed
 - 1. Restrictions
 - 2. Weather
 - 3. Site conditions
 - 4. Plant maturity
 - 5. Season
- E. Inform Customers About System Operation and Best Practices
- F. Recommend System Upgrades to Improve Efficiency
- G. Winterize System
 - 1. Turn water off
 - 2. Drain or evacuate main lines and lateral lines as applicable
 - a. Compressed air
 - b. Manual drain valves
 - 3. Turn off controller
 - 4. Manually drain backflow device and pumps

Domain V: Laws and Codes (6%-10%)

- A. Safety and Health Regulations (OSHA, OH&S)
 - 1. Controlling Electrical Hazards (OSHA 3075, 2002)
 - 2. Excavations (OSHA 2226, 2015)
 - 3. Chemical Hazard Communications (OSHA 3084, 1998)
 - 4. Ground Fault Protections (OSHA 3007, 1998)
 - 5. Material Safety Data Sheets (MSDS) (OSHA Recommends ANSI, TIP 0304-38)
 - a. Personal protection equipment (e.g., goggles, earplugs, hard hat, safety vest)
 - b. First aid
 - 6. Other OSHA regulations
 - a. Reporting incidents
 - b. Recordkeeping
 - c. Posting requirements
 - d. Inspections

- e. Rights and responsibilities
 - i. Employers
 - ii. Employees
- f. Safety training and education
- B. Electric Codes (2017)
 - 1. Low voltage
 - 2. High voltage
 - 3. Depth of cover
 - 4. Separation from other utilities
- C. Plumbing Codes (2015)
 - 1. Hazard classifications
 - 2. Types of backflow prevention
 - 3. Backflow installation
- D. Labor Laws (per Federal and Local Laws)
 - 1. Prevailing wages
 - 2. Equal opportunity employment
 - 3. Immigration

**Domain VI: General Business Management
(6%-10%)**

- A. Maintain Recordkeeping (e.g., human resources, taxes, Department of Transportation)
- B. Perform Basic Accounting (e.g., profit and loss, balance sheet, annual budgets)
- C. Hire and Manage Employees
 - 1. Workers compensation
 - 2. Health insurance
 - 3. Overtime
 - 4. Training
- D. Evaluate Contracts and Proposals
- E. Perform Bidding and Estimating
 - 1. Direct costs
 - a. Labor
 - b. Equipment (e.g., field equipment)
 - c. Material
 - d. Subcontractor
 - 2. Indirect costs (i.e., overhead)
 - 3. Overhead cost recovery
 - 4. Profit margin and markup
- F. Maintain Job Costing (e.g., cost analysis, budgeting)
- G. Promote Business
 - 1. Customer relations
 - 2. Advertising (e.g., social media, signage, uniform and vehicle branding)
 - 3. Industry qualifications and certifications
 - 4. Networking
- H. Insurance Requirements
 - 1. Bonding (e.g., surety bonding, bid bonds performance bonds)
 - 2. Liability insurance
 - 3. Other insurance types (e.g., vehicle, error and omissions, key person)
- I. General Licensure (per local requirement)

**Domain VII: NC State Questions
(5%-7%)**

- A. NC General Statute §89G
- B. Chapter 23
 - 1. Rules adopted by the State Legislative Rules Committee governing the NC Irrigation Contractors. These rules cover the design, installation, maintenance and management of irrigation systems in North Carolina and were derived from the NCICLB's minimum standards.