

# THE IRRIGATION TECHNOLOGY CENTER

## *Concept and Vision*

March 14, 2000

### **Vision**

Establish a world class, state of the art facility for education, testing and applied research, to promote efficient irrigation, water conservation, profitable agricultural production, and quality urban landscapes.

### **Mission**

The mission of the Irrigation Technology Center (ITC) is to:

Develop design and performance standards for agricultural and landscape irrigation systems,

Establish an equipment testing and certification program,

Provide training and educational services for irrigators, agency and industry personnel, and

Develop new and improved irrigation technologies, methods, and management practices.

ITC will also support regional programs and services including PET (potential evapotranspiration) networks, pumping plant efficiency testing, and specialized training and educational programs.

### **Problem Statement**

In Texas, agricultural irrigation uses about 65% of the total freshwater consumed annually, while landscape irrigation accounts for 20 - 40% of total municipal water use. Texas' rapidly growing population and industries are putting an increased demand on existing water supplies and conveyance systems; and regional water shortages are expected to become prevalent in the next century. To ensure adequate water supplies, we must realize the full benefits of existing technologies, develop more efficient irrigation products, methods and management strategies, and educate both agricultural and landscape irrigators on their use.

The agricultural and urban irrigation industries are largely unregulated. Equipment manufacturers and retailers often make claims regarding the efficiency and performance of their equipment without adequate testing. No independent design standards exist for irrigation systems, and most consumers do not have the expertise to determine if the system they are purchasing will performed as claimed.

Currently, one small, independent sprinkler irrigation testing facility exists in the United States which conducts laboratory and bench-scale testing only. The Irrigation Technology Center, on the other hand, will test and certify whole irrigation systems and, thus, be able to develop design and performance standards under actual operating conditions.

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## Major Divisions

Urban Programs Division  
Agricultural Programs Division  
Testing and Certification Division  
Wastewater Reuse Division  
International Division

### Urban Programs Division

The Urban Programs Division will consist of residential and commercial landscape irrigation systems to provide hands-on instruction, testing and performance evaluations, and applied research. Systems will include fully automated and manually controlled drip, sprinkler and microspray irrigation of various plant materials. These facilities will also allow for the evaluation of remote sensing technologies and PET networks for use in urban irrigation scheduling and water budgeting. We expect that the testing and applied research programs will lead to the introduction of improved methods and products for landscape irrigation.

Training programs will be provided for landscape contractors, designers, and municipal, utility and agency personnel on efficient irrigation, including:

- drip irrigation technology and management
- irrigation system auditing and water budgeting
- scientific scheduling methods
- soil moisture measurement and technologies
- weather station operation and maintenance
- gray water and other alternative sources for landscape irrigation
- system selection, performance and operation
- zoned sprinkler irrigation design
- water reuse

Model landscapes will be established for demonstrating and evaluating alternative plant materials and other landscape water conservation methods. ITC will cooperate with municipalities, utilities, and other organizations on developing and delivering educational programs for home owners, and lead the development of internet information delivery systems.

### Agricultural Programs Division

The Agricultural Programs Division will consist of true-scale, operating agricultural irrigation systems of all major technologies including drip, sprinkler and furrow irrigation. These facilities will allow for hands-on instruction, testing, performance evaluations, and applied research. Emerging technologies including remote sensing, feed back control, variable rate applicators, and “intelligent” irrigation systems will be evaluated and further developed.

Educational programs will be provided for farm workers, growers, landowners, lenders, public officials, and industry personnel, which will include:

- irrigation system selection, design, operation and management
- irrigation pumping plant design, installation and efficiency testing
- proper installation of flow meters, weirs and other flow measurement devices
- ET (evapotranspiration) for determining crop water requirements

- irrigation scheduling based on soil moisture, plant indicators, and other methods
- wastewater reuse

### Testing and Certification Division

ITC will test and certify the performance of both landscape and agricultural irrigation equipment, including laboratory testing of components and field testing of complete systems. The certification program will provide irrigators, lenders and regulators assurance that systems and components purchased will perform as advertised. Effects of wind, soils, landscape area, plant types, and other environmental factors will be determined in detail, thereby allowing for the development of design standards to improve efficiency.

Four (4) indoor testing laboratories and additional outdoor testing facilities are planned which will provide ITC with capabilities unsurpassed anywhere in the world.

- a) A modern hydraulics laboratory will be used for testing pumps, meters, backflow prevention devices, and other irrigation system components.
- b) Two irrigation testing buildings will be constructed: one will be a controlled environment, and the other will be designed to determine the effects of wind on distribution patterns and application efficiency.
- c) A semi-open drip tubing test facility will, among other capabilities, allow for measurement of distribution uniformity of long laterals
- d) Outdoor facilities and state of the art test equipment will be used for evaluating whole irrigation systems to determine performance, benefits, longevity of components, and design standards.

### Wastewater Reuse Division

Wastewater reuse is being looked at to help meet the water needs of both urban landscapes and production agriculture. The Wastewater Reuse Division will conduct training and applied research on the special nature of wastewater reuse, including water quality issues, plant response, system design requirements, corrosion, environmental quality, and recommended management practices. The division will coordinate wastewater reuse research and demonstration projects with university researchers, utilities, industry, and public agencies. ITC's unique facilities will allow detailed evaluation of design and component selection issues. Long-term irrigation of crops and landscapes will demonstrate the benefits and effectiveness of wastewater reuse to the public.

### International Division

The International Division will be self-supporting through funding provided from industry, international organizations, and foreign governments. This funding will also help enhance ITC's programs and reputation and support other divisions of the center. The International Division will provide training of individuals, industry and governmental personnel, and will support international irrigation education and technology transfer programs. We anticipate that ITC will establish a formal cooperative relationship with one or more international organizations which have an interest in ITC's programs and in promoting performance standards developed by ITC in international projects. ITC's international programs will help establish markets for Texas and U.S. irrigation products and services.

## Detailed Description of Services

### 1). Design and Performance Standards for Agricultural and Landscape Irrigation Systems

The effectiveness of irrigation systems is impacted by many factors including: sizing of pipelines and components, pressures, water flow and quality, environmental conditions, and installation procedures. The longevity of whole systems is influenced by the quality of individual components and maintenance. Good performance is achieved by the integration and consideration of all these factors. ITC will develop efficiency design and performance standards for agricultural and landscape irrigation system under real-world operating conditions. The hydraulics lab will allow for the development of flow meter installation procedures to ensure accurate measurements, and for proper pump selection and installation to decrease energy use.

### 2). Equipment Testing and Certification Program

Testing of irrigation components and systems will be conducted under laboratory and real-world operating environments. Equipment will be certified as having passed specific performance standards. The hydraulics lab will allow for independent verification of the accuracy and durability of flow meters, backflow devices, valves, pumps, etc. All major water application devices will be tested including sprinklers, surge flow valves, gated pipe, drip, and microsprays.

### 3). Training and Educational Services

Structured training and short course programs, publications, software and internet (world wide web) resources will be developed for farm workers, growers, landowners, public officials, and industry personnel on irrigation technologies, water management strategies, water reuse, and other topics. Regional and state educational events including field days, seminars and walking tours, will be conducted in cooperation with municipalities, utilities, industry and agency groups, and educational institutions.

### 4). Research and Information Systems

ITC will coordinate with industry and other researchers on the development of new technologies, integration of advanced sensors and computer control systems, wastewater irrigation, water requirements of crops and landscape plants, and evaluation of emerging technologies and practices. With its advanced facilities, ITC will be the focal point for technological innovation research in Texas. ITC is expected to lead in the use of GIS, information technologies, and systems analysis applications in irrigation.

### 5). Evapotranspiration (ET) Determination

Evapotranspiration (ET) is a measurement of the amount of water required by plants and crops under specific climatic and growth conditions. ITC will be equipped with 31 weighing lysimeters in order to determine the exact water requirements of plants and crops based on the concepts of PET (potential evapotranspiration), crop and turf coefficients, and stress factors. Four (4) large lysimeters will be devoted to crops, eight (9) medium lysimeters for turf and ground covers, and 18 small lysimeters for landscape plants.

## **Facilities**

Hydraulics Lab, testing buildings and outdoor test facilities.

Computer system for data storage, manipulation, graphics, GIS-based application, and training, regional irrigation analysis.

ET Center with lysimeters, PET Regional Networks.

True-scale, operating irrigation systems, representing all major technologies, covering about 400 acres; model landscape demonstration areas.

Classrooms, laboratories, office space, workshops, warehouse, vehicles, maintenance equipment.

Mobile labs/testing equipment.

Interactive visitors center (future development)

## **Organizational Structure**

ITC will be associated with the Agricultural Program of the Texas A&M University System, with the organizational structure to be decided in consultation with contributing parties. It is important for ITC to be tied to a major university due to the education, training and applied research missions, to provide credibility for the testing and certification programs, and to ensure that all programs meet the highest scientific and educational standards.

One suggested organizational structure is to have an oversight committee composed of organizations and public agencies which have a major stake in ITC, and a technical advisory committee consisting of irrigation experts from the public and private sector.

## **Costs and Financing**

The costs of equipping ITC is estimated at \$4.9 million, excluding buildings, land, and site-specific infrastructure. We are now seeking funding to complete the next step in the process which will lead to the establishment of an Irrigation Technology Center in Texas: the Development Plan. The Engineering Plan will cost \$464,000 and include:

- a) site evaluation and selection,
- b) design of infrastructure, buildings and facilities,
- c) detailed costs of construction and operation,
- d) construction and implementation schedule,
- e) financing plan, and
- f) detailed economic impact assessment.

Public funding and private donations will be sought to construct and operate ITC. A financing plan will be developed in consultation with the oversight committee and major stakeholders. We propose to establish an endowment to provide for the long-term support of ITC. Funding of the endowment will be through donations and revenues generated by ITC. Educational programs will be self-supported by fees. Any profit from the education programs will go into the endowment, as well as that generated from certification and testing services for equipment manufacturers.

It is important that ITC not have to depend on revenue from services provided to industry to cover operating expenses. Financial dependence on industry could potentially compromise the independence and integrity of ITC, and interfere with the certification program and development of industry-wide design and performance standards.