

Rodgers Design Group, Inc.



Article 1 Rodgers Design Group's Basic and Additional Services

1. Schematic Design Phase

Meet with Client to discuss the project's requirements.

The Irrigation Designer will present similar typical Schematic Design drawings that illustrate the scale and relationship of the project components. It is during this stage that decisions regarding water requirements, potential water sources, power requirements, power locations and road crossings are developed. A typical sprinkler placement and coverage plan will be prepared after the initial meeting.

Client will furnish existing course base information from project engineer with ground control, topography and other required elements in hard copy and AutoCAD format.

2. Systems Analysis

The irrigation system is the most important and expensive maintenance tool a modern golf course will ever purchase. It needs to be maintained at a very high level in order to produce the turfgrass conditions as demanded by today's golfer. The modern day Golf Course Manager/Superintendent has so many duties that they are not physically able to monitor and repair all of the irrigation system components as needed and must trust members of the staff to keep the system in optimum condition. The Irrigation Designer is staffed with irrigation industry professionals and we see many items that will make the irrigation system work better on every project. During this phase a report will be generated that describes the system in general terms such as condition and life cycle expectancy of the many irrigation components. The Irrigation Designer will furnish a source for the Client to purchase the 24 hour pressure recorder directly from. Client will use nightly to gather pressure data while the irrigation system operates. It will be the Golf Course's responsibility to move this measuring device around the course and return the data results to the Irrigation Designer for analysis.

This pressure graph will record 24 hours of pressure data and is an EKG type of monitor showing the results indicating the amount of stress the irrigation system is subject to. The Irrigation Designer will also take a copy of the current central computer data to be reviewed and included in the final analysis report.

Included in the report will be:

- Pressure recording findings
- Pump performance findings

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- Central computer flow analysis
- Typical sprinkler performance graph
- Estimated water requirements
- Piping system analysis and comments
- Sprinkler zoning comments
- Life expectancy of the irrigation components
- Alternatives and preliminary costs

2b. Existing Plan Review

The irrigation system is one of the “hidden components” of a golf course, if the design and installation phases were performed correctly, the maintenance should be minimum. Unfortunately it is a line item component that is very expensive as to the proportion of the construction budget and subject to “Value Engineering” ideas that may affect the long term financial success of the project.

In the event a plan has been prepared by a firm whose primary interest is selling product the Irrigation Designer is available to provide a review service of the irrigation plan. A properly designed plan should include the following components:

- Typical sprinkler performance graph showing efficiencies of the proposed products
- Estimated water requirements in a daily and annual basis
- Piping system analysis and comments
- Sprinkler zoning/pairing comments
- Irrigation coverage of sprinklers should match the architects’ most current grassing plan and provide separation of turf varieties
- Develop alternative delivery system for irrigation from the supply source to the reservoir, storage facility or directly to the irrigation system.
- Mainline system routing should provide flows to determine friction and velocities for operation set-up and design review of pressure losses.
- A written report describing the irrigation system design concepts and an estimated irrigation budget, with unit costs for the installed irrigation system components, the water supply system, and the pump system(s).
- A complete set of technical specifications and bid documents.
- The 120/240 volt electrical system should be easily identifiable.
- The communication cable routing should include routing to all field controllers, weather station, pump system for golf course and water supply source to golf course.
- Construction details for primary components should be provided to communicate intent of design and identify irrigation equipment assemblies.
- Prepare main pumping facility construction documents indicated pump station technical requirements, wet well and slab dimensions, intake flume sizing and routing and coordination between installation trades

- Head type and precipitation rate
- Turf type and crop coefficient
- Minimum cycle period per zone
- Maximum application duration per zone
- Identification of common groups

3. Asset Identification of As-Is Golf Course Features & Irrigation Components

Most existing golf courses have less than satisfactory irrigation construction documents. The Irrigation Designer will utilize layer attributes then compile the data into a universal digital format, including separation for sprinklers, controllers, pipe sizes, valves, dimensions, road crossings, pseudo property lines and the golf course features.

During this phase a Global Positioning Survey showing all sprinklers, automatic valves, isolation valves, controller locations and present golf features will be collected. The format will include a latitude, longitude, and altitude of each reference points with a minimum reading every second for all line and area readings. All point type readings will take readings for a minimum of 5 seconds and will use equipment capable of recording accuracy of + or – three decimeters.

To insure all of the components are mapped the golf course staff will “mark/flag” all of the components to be mapped in the field with marking paint or wire irrigation flags. The components include sprinklers, automatic valves, splices, isolation valves, drain valves, wire routing (local utility locating firm to identify) controllers, air relief valves and any other irrigation component that is identified by the golf course staff. As the drawings are compiled, the golf course personnel will be responsible to assist with the identification of the sprinkler zone/controller combinations, review and comment on all pipe routings if existing drawings are available.

3b. Golf Course Labor and GPS Rental and Training for Asset Identification of As-Is Golf Course Features & Irrigation Components

There are many time when the end user would prefer to provide all of the labor to build their own as-constructed field conditions. The Irrigation Designer will bring a user friendly GPS unit to the site and develop a data dictionary specific to the site’s equipment and mapping needs. The cost is based on \$1,500 for the first week and \$1,000 for each following week. The field data will be processed in the Irrigation Design consultant’s office and returned to the client in a paper format at a scale of 1”=100’.

4. Prepare Geo Referenced Image

A satellite or other photo will be generated that is geo-referenced in a vector format which will provide an actual image of the golf course in a layer under the GPS gathered information. The

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cost of this service is based on aerial image search, many times aerial imagery is available via Google maps, the Irrigation Designer will develop the images into the GPS geo referenced data.

5. Design Development Phase

Develop a Schematic Design drawing to further describe the Project's size and character. Identify pumping facility requirements and distribution pipe routing and sizing, for hydraulic requirements of peak demand flow-rates.

Prepare a distribution hydraulic network analysis model identifying proposed distribution piping by node and pipe section. Input all data into hydraulic modeling analysis software for evaluation of proposed piping network in relation to projected peak flow requirements of each hole. Include pertinent data such as elevations, demand nodes, hydraulic grades and pressure regulating valve locations.

The Irrigation Designer will prepare detailed projection of course water requirements utilizing historical reference evapotranspiration data from closest weather station. We apply known turfgrass and landscape crop coefficients, estimated management factors, and anticipated irrigation system distribution uniformity to determine net monthly system water requirements. The Irrigation Designer will develop detailed monthly projections by each turfgrass type and list per month throughout the year indicating net application rate, monthly usage and total yearly requirement.

Generate detailed irrigation construction cost estimate including material and labor quantities and costs with estimated current market application of overhead and profit margins.

Following the meeting, The Irrigation Designer will develop a preliminary irrigation design in AutoCAD format at a scale of 1" = 100'. On this drawing, the following will be included:

- Preliminary sprinkler design based at not more than 70 ft. triangular spacing with products proven to provide a 90% or better distribution efficiency. Irrigation coverage of sprinklers will match the architects' most current grassing plan.
- Determine daily, monthly and annual water usage.
- Preparation of a drawing showing effective coverage of sprinklers.
- Develop alternative delivery system for irrigation from the supply source to the reservoir, storage facility or directly to the irrigation system.
- Primary mainline system routing, road crossings and bridge crossings.
- Main line pipe routing with pump station and hydraulic network analysis

6. Construction Documents Phase

Formalize the approved Preliminary Schematic Documents into Construction Documents that detail the Project's construction requirements. The design documents will be prepared with details and specifications to insure that a well constructed, manageable irrigation system can be installed and will consist of the following:

- Cover sheet showing the location of the Project team member's names and responsibilities and an overview of the Project in an aerial image as provided by others.
- The system will be designed to conform to applicable laws, ordinances, and regulations, including but not limited to: EPA/waste water reuse guidelines, local electrical codes, local water restrictions, and to operate under the most efficient power rate structure.
- Mechanical sheets will include sprinkler locations, station assignments, field controller locations with field design requirements, mainline piping type with design flow nodes identified, lateral pipe type routing and sizes, mainline isolation valve locations, lateral isolation valve locations, drain valve locations and field placement requirements, air relief valve locations, pressure reducing zones locations and adjustment requirements and details for installation.
- Electrical components such as 220/120 volt power to the field control system will be separated from the mechanical sheets to provide clarity to the design.
- Communication telemetry cabling, weather station location, and radio transceiver details will be included on separate sheets.
- Installation details will be prepared on a separate sheet
- The pump and compressor systems and details for intake construction and pump structure mounting pad will be included on a separate sheet but will not include the pump building structure which will need to be provided by a design professional familiar with local codes and blend into the surroundings
- Bid Documents will include a lump sum bid form with an itemized list of components and accessories that are including with the installation of the a modern irrigation system. The specifications will be separated by 4 sections including: general conditions, product specifications, installation procedures and pumping system.
- Points of connection will be provided for future landscaping needs around the clubhouse, maintenance buildings, and entrance to golf course.
- Plans will be prepared on pages not to exceed 30" x 42" or 24 x 36" at a scale of 1" = 100' in current AutoCAD format (2011) and presented in both digital and paper format.

It is anticipated that 2 design review meeting occur at the 60% and 95% design intervals for the Owner's comments and approvals that the work to date includes all of the

Project's requirements.

7. Construction Procurement Phase

Assist Owner to obtain a qualified contractor with valve-in-head/central control on large existing turf experience via a prequalification process. Upon creating a prequalified contractor list:

- Conduct pre-bid meetings with all prospective contractors to meet with the Owner and Irrigation Designer to discuss any modifications that have been made from the period of the plans preparation and the bid date. This meeting will also clear up any misunderstandings or questions involved with the Project.
- Prepare and distribute any changes to the scope of work in the form of an addendum.
- The bid analysis meeting reviews the bids, qualifications of the contractor and any items that may not have been identified in the contractor's bid package proposals, such as value engineering ideas and bid clarifications.
- Assemble a recommendation with alternatives and construction costs to be presented to the Owner.
- Attend (3) member information, town hall or other informational meetings
- Conduct a pre-construction meeting after the award or a notice to proceed of the contract is issued to the contractor and prior to any construction-taking place. During this meeting all aspects of the specifications, payment request processes and other communication protocols will be discussed.

8. Staking and Construction Observation Phase

On-site staking is necessary to adapt the irrigation plan to the final configuration of the golf course in order to provide uniform spacing and proper coverage of all golf course features. Field adjustments shall be required for variations in the site conditions and construction changes that involve golf course features and limits of grassing.

Irrigation Designer shall review the material submittals to verify that they comply with the Plans and Specifications.

Irrigation Designer shall GPS field-locate and stake all sprinkler heads, isolation valves, air valves, satellite controllers, and mainline routing in coordination with the Irrigation Contractor. This will ensure accurate placement to provide uniform spacing and optimum coverage from the sprinklers.

Irrigation Designer will be required to GPS each golf hole to produce a final As-Staked Plan. The plan shall include all adjustments to the sprinkler layout, modification to the mainline routing and sizes as required, and satellite controller zone assignments. The As-Staked Plan

shall be used for installation of the system and provided to the installing Contractor and Owner in hard copy and PDF format.

Irrigation Designer shall inspect the finished product and note any items that do not meet the Plans and Specifications. A formal punch list document will be supplied to the installing Contractor and Owner. The Irrigation Designer will verify that all items listed in the punch list document have been replaced / repaired and meet the Specification.

Irrigation Designer shall provide written reports to the Owner and the Irrigation Contractor after each site visit.

Upon the completion of the Project, the Irrigation Designer will be responsible for ensuring complete and proper irrigation coverage for the golf course. In addition:

- The Irrigation Designer will provide all surveying instruments, marking flags and or pennants and lead personnel.
- The Irrigation Designer shall conduct site inspections as requested by the Contractor and coordinated with the Owner's site representative, but no less than twice a week during the time construction is being performed on the Project.
- The Irrigation Designer will layout, mark and record all sprinkler types, mainline pipe routing, controllers and their locations.
- The Irrigation Designer will provide to the team members an as-staked drawing prepared in AutoCAD format a scaled drawing. The drawing will be scaled 1" = 100' for the master as-built plan and enlarged to fit an 11" x 17" working field sheets for the construction crew to produce any field changes. A second sheet on an 11 x 17 format will also show recommended lateral pipe routing, isolation valve locations, station assignments or groupings, field controller locations and mainline pipe sizes, this data will be sent electronically to the contractor's field and home offices
- The drawings will include total square footage of greens, tees, bunkers, irrigated area and linear yardage of each golf hole from all tees and a summary of the course.
- Review payment applications of the Contractor in accordance with the terms of the agreement between the Owner and Contractor to determine if the amount of work represented as complete is generally consistent with the Irrigation Designer's observations during its site visits.
- The Irrigation Designer will submit a field report to Owner promptly after each visit that describes field observation, progress of the work, whether the Contractor is meeting the milestones and quality standards it is required to meet, variances of the work from the Project design, and an estimate of over/under status as it relates to the unit costs and final costs of the system.

The Irrigation Designer will participate in site visits of the Project as needed during the time construction is being done on the Project with the construction team to review the progress of construction and to see if the work completed is generally consistent with the intent of the Irrigation Designer's construction documents. The Irrigation Designer will observe the construction methods of the Contractor to ensure proper installation of the irrigation components.

The Irrigation Designer will review required Contractor submittals, such as shop drawings and samples, but only to determine if they conform to the Irrigation Designer's visual and aesthetic design intent.

The Irrigation Designer will review Contractor's payment applications to determine if the amount of work represented as complete is generally consistent with the Irrigation Designer's observations during its site visits. The Irrigation Designer's review shall not be a representation that the Irrigation Designer has reviewed how or for what purpose Contractor has used or intends to use Owner's payments.

9. Final Closeout

When the Contractor has finished installing the irrigation system and the computerized control system has been implemented by the Irrigation Designer who will perform a walk-through of the system with a representative of the Contractor and Owner. Notes will be collected and a punch list of items needing corrected will be presented in a report that the Owner will use for release of retention and will be the date defined as substantial completion. Items included for this service include:

- Each sprinkler operated automatically from the field controller or hand held radio remote.
- Record any sprinkler sequence modifications
- Verify grounding tests are complete and installed in accordance with industry standards.
- Review each isolation, quick coupling, air and pressure control valve locations.
- Verify all adjustments and operations in addition to the final position of the valve access boxes
- Note any settling of any trenches.
- Note any cleanup work on the turf area and the Contractor's lay down work area.
- Review the pumping equipment is fully operational and set to the design parameters.
- Review the operation and maintenance manuals have been furnished to the Owner
- Review and note when the manufacturer training has been accounted for.

After the Contractor has corrected the punch list items, the Irrigation Designer will return to the site and walk the site to assure the Owner that the irrigation system has been installed to the satisfaction of all parties.

10. Preparation of computer generated final construction record drawings

The Construction record drawings are the #1 tool that the Owner will use on a daily basis. This plan will show all vital irrigation equipment installed. It will be prepared from all of the field notes, staking data and site reports as generated throughout the Project. The plan will include the following:

- Prepared in a current AutoCAD version at a scale of 1"=100'
- Separated into 4 primary categories, defined as points, lines, features and text
- Locations of all point type features would include sprinklers, isolation valves, air relief valves, drain valves, field controllers/decoders and electrical splices will be verified with GPS mapping equipment to a geo referenced NAD83 coordinates
- Mainline piping, lateral piping, electrical wire routing, road crossing and sleeve locations.
- Station assignments and groupings will be identified and noted
- The Owner will receive a large formatted colored paper original plot plan.
- The Owner will also receive (2) copies in a smaller formatted booklet showing each golf hole irrigation and each field controller station assignments. The smaller format will be colored coded separating by field controller and by program grouping.
- The Owner will receive all of the data on (3) CD's for off site storage and security
- The aerial image as provided to the Irrigation Designer by the irrigation Contractor will be included as a background to the large format plan.

The data will be prepared in a format that will provide a seamless transition from AutoCAD to Arcview. This data will be transferred by the Irrigation Designer to the unique central computer's geo-spatial language.

11. Start-up of central computer and system optimization

Operational programming of the control system is necessary to achieve the most efficient use of the irrigation system. The computer based control systems that provide the flexibility for most efficient use of water and power must be programmed to operate the irrigation system as designed.

The services shall include the following:

- Update the existing database using As-Built information furnished by the Irrigation Contractor and any revisions provided by golf course personnel.

- Update the existing database for flow management based on the hydraulic and electrical design of the irrigation system. This will optimize system flow to complete the watering in the shortest period of time without exceeding the design parameters of the system.
- Update the existing schedules and programs for operation of the irrigation system. All irrigation schedules shall be ET (evapotranspiration) based.
- Update the existing of the interactive Control System Electronic Map.
- The control system spatial data base will include but not be limited to:
 - Individual zone flow rates
 - Head type and precipitation rate
 - Turf type and crop coefficient
 - Minimum cycle period per zone
 - Maximum application duration per zone
 - Identification of common groups
 - Distribution system hydraulic limits by node (taken from hydraulic analysis)
 - Pumping facility capabilities
 - Following program development, data base schedules will be installed in central control system computer.
 - Create all necessary shape file conversions of AutoCAD record drawing for use in central mapping module.

12. Sprinkler yardage,

One of the expected side benefits from having an automatic sprinkler system is having distances from the sprinklers to the green. Because of the technological tools we use every day, we are able to provide measurements for all par 4 & 5 golf holes from 90 to 250 yards out on all fairway sprinklers. In addition to measurements for each par 3 tee, the measurement will be to the front, middle or rear of each green. The Irrigation Design consultant will provide all measurements on a computer generated plan for record keeping.