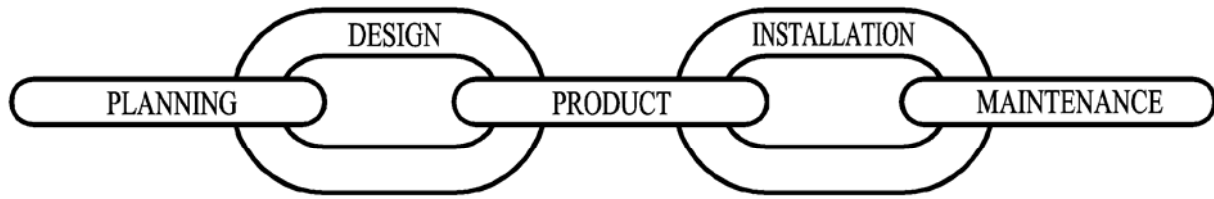


APPENDIX B THE PATH TO A SUCCESSFUL SYSTEM



HYDROGOLD'S QUALITY CHAIN

These are the 5 critical steps along the path to a successful project. Hydrogold are able to capably advise at all phases. For more information, please refer to our web site: www.hydrogold.com.au.

Proverb: "A chain is as strong as its weakest link".

If any link in the chain fails, we will have a failed project.

B.1 Planning

- B.1.1 Selection of Project Team
- B.1.2 Determine Irrigation Objectives
- B.1.3 Set an Appropriate (Realistic) Budget
- B.1.4 Plan Water Resources

NOTE: Hydrogold can provide water resource planning. Our specialist software accurately assesses water balance (inflow, outflow & storage) for the site. Perhaps the most important aspect is the correct sizing of the water bodies. This maximises the value of the real estate (minimises the lake area) while ensuring sufficient water is available (sufficiently large lakes).

B.2 Design

- B.2.1 Detailed Planning and Integration
- B.2.2 Achieve Objectives within Budget
- B.2.3 Select Appropriate Products
- B.2.4 Design for Efficiency - Reduced Running Costs
- B.2.5 Design for Extended Life - Better return on Capital
- B.2.6 It must Work

NOTE: Hydrogold has been involved with over 180 golf courses in 18 countries over 18 years. Utilise Hydrogold's experience rather than experimenting. A good design (1 to 2% of the cost of the system) is a good investment. The Certified Irrigation Designer qualification is recognised by both the Irrigation Association (U.S.A.) and the Irrigation Association of Australia. It is a minimum standard that should be looked for.

B.3 Product

B.3.1 Golf course irrigation systems are unique. They are large and operate at higher pressure than landscape or agricultural systems. The valves open/close frequently.

B.3.2 Specialty Golf Products are more durable than Landscape or Agricultural products since they are designed for the higher pressures and higher valve operation frequency of Golf Course Irrigation Systems.

B.3.3 Specialty Golf Products Lower Maintenance & Increase Reliability

B.3.4 Less Damage to the Course by Pipe or Fitting Failures

B.3.5 Reputable Manufacturers Stay for the Long Term

QUOTE Larry Anderson: ***"The sweetness of a low price is soon forgotten, but the bitterness of poor quality will remain."***

B.4 Installation

B.4.1 Experience Avoids Errors. "You pay peanuts you get monkeys."

B.4.2 No Buried Mistakes - Inspection of buried work is limited; a lot relies on the integrity and experience of the installer.

B.4.3 A Poorly Installed System Will Not Work, regardless of a good design and good product.

B.4.4 Good Installations have High Reliability and Low Maintenance Costs

NOTE: Hydrogold can also provide periodic inspections during the installation. These will significantly increase the quality of the installation by:

- ◆ Independent Review

The visits provide a review of the materials and installation. Being the designers and authors of the documentation, we are the best suited to carry out this work. Our review is independent of on-site relationships.

- ◆ Higher Standard of Installation

Once the Contractor is aware of our inspections, their installation standards will be higher. The Owner's representatives will be better trained to oversee the day to day installation.

- ◆ Get What You Paid For

During our inspection, we check that all the equipment specified is installed and other contractual obligations met. Eg. Checking the correct lightning protection is installed, the latest software versions are used, documentation is correct, spare parts delivered, etc.

B.5 Maintenance

B.5.1 "Automatic" does not mean "No Maintenance". An automatic system still needs to be maintained.

B.5.2 Regular maintenance minimises operating costs - "A Stitch in Time Saves Nine"

B.5.3 You will need specialist support from your suppliers, particularly for the Irrigation Control System and the Irrigation Pump Station. Select your supplier carefully.

B.6 Case Studies Demonstrating the Benefit of Quality

Cost of Ownership (\$ per year)
= $\frac{\text{Capital Cost} + \text{Maintenance Cost}}{\text{Life of the System}}$

Often, too much focus is on lowering the Capital (Up-Front) Cost. For keeping the Cost of Ownership in control, we also need to consider the Maintenance Cost and the Life of the System. Typically we expect a minimum of 20 years. A low quality system may only be serviceable for 8 to 10 years. For example:

B.6.1 Case Study No 1 - Low Quality

The irrigation system lasts only **8 years**.

Description	US\$
Capital Cost of Irrigation System	700,000
Maintenance Cost 8 years at US\$ 24,000 per year	192,000
Total Cost	892,000
Life of System (Years)	8
Cost of Ownership (\$ per year)	US\$ 111,500

B.6.2 Case Study No 2 - Good Quality - 15% Higher Price

The irrigation system will last 20 years but we have assumed a renovation after only **15 years**.

Description	US\$
Capital Cost of Irrigation System 15% Higher (ie, +US\$ 105,000)	805,000
Maintenance Cost 15 years at US\$ 12,000 per year	180,000
Total Cost	985,000
Life of System (Years)	15
Cost of Ownership (\$ per year)	US\$ 65,667

That is, a 15% higher price for the Capital Cost of the Irrigation System leads to a 40% (US\$ 45,833 each year) saving on the cost of owning the Irrigation System.

This does not include the cost of flow-on effects of bad products (design or installation) such as the loss of revenue when the course is closed for repairs.