# Golf Course Maintenance Complex
# **Design Analysis**

April 17, 2000

**TABLE OF CONTENTS**

Cover Sheet

Table of Contents

Golf Course Maintenance Complex Design Narrative ..... 1 - 9
Civil Analysis ..... 2
Architectural Analysis ..... 3 - 6
Structural Analysis ..... 6 - 9
Mechanical Analysis ..... 9 - 10
Electrical Analysis ..... 10
Plumbing Analysis ..... 10 - 11

Outline Specifications

# Golf Course Maintenance Complex

## Design Narrative

### I. General Notes

A. ***Codes***: The design of this facility must comply with all current applicable National, State, Local, and Military Codes, Standards and Regulations. The design must also comply with Base/ MAJCOM design and environmental standards.

B. ***General***: The intent of these documents is to provide a general description of the designated facility. The documents are not intended to represent specific national, regional, or local conditions. All systems including civil, architectural, structural, mechanical, electrical, and plumbing are to be designed and coordinated for specific national, regional and local conditions.

C. ***Equipment***: Where equipment manufacturer and model number have been designated, they are only provided as a design reference. Equipment selected should be equal in size, shape, and performance to those designated.

D. ***Trade Standards***: Where the design deviates from local or regional trade practices, which are not governed by codes, regulations, or standards and should be implemented in order to provide the most applicable design solution, the design should be modified accordingly. The modifications should not be performed prior to a thorough review of modification affects.

### II. Purpose

This prototype is designed to be site adapted to such regional factors as climate, soil conditions, utility access, and the availability of materials. Toward this purpose, the structures which comprise the Golf Course Maintenance Complex are easily converted from the pre-engineered systems shown to a standard steel frame structure. This logic is applied throughout the prototype to account for changes to the exterior finish system, structural slab, roofing options, and partition wall construction.

### III. Function

The Golf Course Maintenance Complex is a group of structures housing functions for the successful maintenance of a golf course and related equipment. It consists of a maintenance facility, an above ground storage building, and a covered equipment storage area. The following *Table 3.1* outlines the program areas of a Golf Course Maintenance Complex:

*Table 3.1*

| **GOLF COURSE MAINTENANCE COMPLEX** PROGRAM AREAS | **ASSIGNABLE AREA** (sq.ft.) |
|---|---|
| **Maintenance Facility:** | **3937** |
| Work Shop | 1584 |
| Office | 168 |
| Break Room | 272 |
| Storage | 53 |
| Toilet Rooms | 53 |
| Shower | 40 |
| Laundry | 50 |
| Mechanical Room | 114 |
| Electrical Room | 57 |
| Grinder Room | 128 |
| Compressor Room | 78 |
| Tool Storage | 603 |
| Fertilizer Storage | 506 |
| Seed Storage | 231 |
| **Rear Service Yard (non-assignable)** | **15015** |
| **Covered Equipment Storage:** | **4398** |
| **Pesticide Mixing and Storage:** | **1025** |
| Pesticide Storage | 519 |
| Pesticide Mixing Hardstand | 506 |
| Water Reclamation | N/A |
| **Total Assignable Area** | **9360** |

## IV. Civil Analysis

As shown on the architectural drawings, there are several site elements which are integral with the facilities including, parking, fencing, maintenance yard, sidewalks, and equipment pads.

The paved areas should be designed to provide positive drainage away from the building to prevent water infiltration from surface runoff and roof downspout discharge. The site runoff in general should be designed with the least environmental impact.

The parking area shown on the architectural plans shows handicap parking, and the site should be designed in compliance with ADA requirements.

## V. Architectural Analysis

**A.** ***Finishes*****:** In general the facilities have exposed steel structure with masonry and gypsum wall board partition walls. The roofs are pre-finished metal standing seam.

1. ***Pesticide Storage***: The exterior masonry walls should be sealed to prevent moisture transmission and efflorescence.

2. ***Covered Storage***: The exposed structure should be protected by galvanizing the steel or painting.

3. ***Maintenance Building***:
   a. The exterior of the building has metal wall panels and a standing seam metal roof. Both finishes should be prefinished or galvanized.

   b. Because the Maintenance Building is only partially conditioned the facility should be designed with the consideration of vapor retarders and other means of mitigation against vapor transmission.

4. ***Floors*** In areas where caustic or hazardous materials are used it is suggested that an epoxy floor coating be applied to the exposed concrete floors. Otherwise the application of a premium concrete sealer should be used to protect the exposed concrete surfaces.

5. ***Wet Areas***: In the toilet and shower rooms, thin set tile is scheduled and should be applied over water resistant cement board.

**B. Maintenance Facility:**

1. ***Work Shop***

   The Work Shop area supports maintenance and repair functions of the Golf Course Maintenance Complex. It is accessible from both the front street elevation and rear service yard through a pair of 15'-0" rolling overhead doors set in opposed positions on the building plan thus creating two primary service bays while providing access to other component spaces.

   The Work Shop is primarily a place for the storage and use of tools and equipment. Some expected equipment will include a hydraulic lift, compressor, hazardous storage container, auto parts washing bin, work bench, welding area, and mobile tool cabinet. Toward this goal, the work shop is equipped with floor drains and tool storage room access.

2. ***Tool Storage***

   Designed with direct access from the Work Shop, the Tool Storage room is a rectangular room wide enough to be furnished with modular storage shelving along both its long walls while maintaining a wide central corridor for easy access to parts and equipment. It is accessed through a floor latched double door wide enough to accept rolling work tops and mobile tool cabinets.

3. ***Office and Break Room***

   The Office and Break Room areas support managerial functions of the Golf Course Maintenance Complex. Office functions include areas for clerical work and record keeping activities. The Office is positioned on an outside corner of the Maintenance Facility to increase visibility over the front of the building as well as access to the Rear Service Yard.

   The Break Room includes upper and lower cabinets, a sink, a refrigerator, and power to support both counter top appliances and free standing vending machines. A storage room is provided with adjustable shelving.

4. ***Toilet Room***

   The Golf Course Maintenance Complex is provided with a unisex toilet room.

5. ***Laundry and Shower***

   In compliance to codes governing the mixing and distribution of pesticides, the Golf Course Maintenance Complex includes both washer / dryer connections and a dedicated shower room. Laundry facilities allow for the cleaning of pesticide applicator's uniforms. The washer's drain is connected to an underground waste water storage tank suitable for pesticide contaminated water. The shower is for use after pesticide application. It is equipped with a handicapped accessible shower stall and drying area with a floor drain also connected to the waste water storage tank.

6. ***Mechanical and Electrical Rooms***

   Mechanical and Electrical Rooms are included in the prototype design. Both are accessible from the secure Rear Service Yard. The electrical room houses all required electrical panels and is the primary service entry point of the facility. It is also the entry point for data and communication services. Although only minimal conditioning is anticipated for this facility, a mechanical room is provided for optional air handling equipment and water softener or hot water heater. Care should be taken to ensure that all equipment installed in these areas complies with codes having jurisdiction.

7. ***Grinder and Compressor Rooms***

   The Grinder Room is designed as a place for the sharpening of lawn maintenance equipment. A dedicated compressor room is located within the Grinder Room. Not only does this arrangement provide convenient access to the compressor, but it aids in reducing noise transmission from the compressor into the Work Shop. The noise created by the compressor and grinders should be mitigated by constructing the walls with sound attenuating insulation.

8. ***Fertilizer and Seed Storage***

Overhead coiling doors connect the Rear Service Yard to both Fertilizer and Seed Storage areas. Although the function of these two rooms is obvious in their titles, what is less obvious and often ignored is the nature of these spaces once in operation. While Seed Storage areas are prone to high humidity and damaging molds, locations where fertilizers are stored may become highly corrosive. All steel should be protected from exposure or galvanized, and corrosion resistant fixtures should be selected for both spaces. Both rooms should be properly ventilated to reduce the build-up of harmful vapors. The floor is finished with a liquid tight floor sealant resistant to chemicals. Floor drains provided in these areas should also be connected to the waste water storage tank.

**C. Covered Equipment Storage:**

The Covered Equipment Storage building is a pre-engineered metal building frame with a concrete slab and standing seam metal roof. It is provided with power connections at each bay.

**D. Pesticide Mixing and Storage:**

This Pesticide Mixing and Storage facility is based upon guidelines set forth in MIL-HDBK-1028/8A for small pest control facilities.

1. ***Pesticide Storage***

The Pesticide Storage room is designed for the storage of bulk pesticides in original containers set on non-absorbent pallets. The floor is sloped away from the entrance doors, and the exterior masonry walls sit on an elevated curb to aid in spill containment. The floor is finished with a liquid tight floor sealant resistant to chemicals. The mechanical venting system may be controlled from outside the main entrance doors to allow evacuation of harmful fumes prior to entry.

2. ***Pesticide Mixing Hardstand***

The Pesticide Mixing Hardstand is designed for the mixing of pesticides and the cleaning of pesticide application equipment. For this reason, it is provided with uninterrupted access to the Pesticide Storage room. The floor surface is sloped to aid in water reclamation and terminates in a sump pit. Both the floor surface and curbs as well as the pit grates are epoxy coated to resist contamination. A sink and emergency eye wash station is provided.

3. ***Water Reclamation***

The concept behind the design of the Pesticide Mixing Hardstand is to contain contaminated water and spilled pesticides. This liquid may then be pumped into a series of above ground storage containers for future reapplication or removal by an industrial waste management service. Regional code restrictions and availability of professional reclamation services will govern the final design of this facility.

### E. Fuel Containment Area:

The Fuel Containment area has two fuel tanks located on a concrete foundation with curbs. The design of the slab and curbs should comply with requirements for the containment of hazardous liquid storage. The containment area has been protected with grout filled steel pipe bollards. The containment area should be sized to allow for adequate service and use of the fuel tanks.

## VI. Structural Analysis

### A. Substructure - General

1. ***References - Substructure***

The publications listed below form a part of this section to the extent referenced. The publications are referenced by basic designation only.

American Concrete Institute (ACI)

| | |
|---|---|
| ACI 318 | (1997) Building Code Requirements for Structural Concrete and Commentary |

American Society for Testing and Materials (ASTM)

| | |
|---|---|
| ASTM A305 | Reinforcing Steel, A615 GR60 |

American Society of Civil Engineers (ASCE)

| | |
|---|---|
| ASCE 7 | (1995) Minimum Design Loads for buildings and Other Structures |

Uniform Building Code (UBC)

| | |
|---|---|
| UBC | (1997) |

2. ***Foundations - Substructure***

Foundations shall be cast-in-place reinforced concrete and shall be soil supported where permitted by soil conditions.

ASCE 7-95 shall be used as a source of criteria for structural design loads and load combinations. The criteria from ASCE 7-95 may be supplemented but not supplanted by applicable criteria contained in other nationally recognized codes, standards, and specifications.

In addition to criteria found in ASCE 7-95, the following minimum uniformly distributed design floor live loads shall be used. Where criteria differ, the more stringent shall govern. These live loads are minimum. If, during the final design process it is determined the actual loading is greater, use the actual loading.

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As an additional requirement, all concrete foundation members supporting masonry shall be designed such that the sum of the live and dead loads, creep, and shrinkage deflections of a support member shall not exceed L/600, where L is the length of a member between supports.

Location of all floor drains, penetrations, slab depressions, or other items affecting the concrete shape or configuration shall be shown on the foundation structural drawings.

Concrete shall have a minimum 28 day compressive strength of 3000 psi.

3. ***Geotechnical Study - Substructure***

The substructure shall be designed by a qualified geotechnical engineer who will, based upon adequate soil borings, provide comprehensive design and construction recommendations for the foundations and the soil preparation for the foundations.

4. ***Floors - Substructure***

The minimum slab thickness for foundations shall be as follows:

| Building | Minimum Slab Thickness |
|---|---|
| Golf Course Maintenance Building | 6" |
| Covered Storage - Equipment Area | 6" |
| Pesticide Storage Building | 6" |

5. ***Sealing of Exposed Slabs - Substructure***

The concrete floors on all exposed slabs shall be sealed with a floor hardener to inhibit the formation of concrete dust,

Where applicable, provide raised concrete housekeeping pads for equipment. Minimum thickness shall be 4" unless dictated otherwise by equipment.

If the slab, due to soils conditions, cannot be soil supported with a foundation meeting the deflection criteria noted in Geotechnical Study paragraph above, provide a structurally supported system on drilled piers or spread footings, as recommended by the geotechnical engineer.

In seismic zones, seismic design shall be in accordance with UBC.

**B. Building Shell - General**

1. ***References - Building Shell***

The publications listed below form a part of this section to the extent referenced. The publications are referenced in the text by basic designation only.

American Concrete Institute (ACI)

| | |
|---|---|
| ACI 318 | (1997) Building Code Requirements for Structural Concrete and Commentary |
| ACI 530/530.1 | (1995) Building Code Requirements for Masonry Structures and Specification for Masonry Structures |

American Institute of Steel Construction (AISC)

| | |
|---|---|
| AISC ASD Manual | (Ninth Ed.) Manual of Steel Construction Allowable Stress Design |

American Iron and Steel Institute (AISI)

| | |
|---|---|
| AISI-01 | (1996) Cold Formed Steel Design Manual |

American Society of Civil Engineers (ASCE)

| | |
|---|---|
| ASCE 7 | (1995) Minimum Design Loads for Buildings |

Departments of the Army, the Navy, and the Air Force

| | |
|---|---|
| TM-5-809-3 Buildings | (October, 1992) Masonry Structural Design for |

Steel Deck Institute (SDI)

SDI-02 (1987; Amended 1991) Diaphragm Design Manual

| | |
|---|---|
| SDI Pub. No. 29 | (1995) Design Manual for Composite Decks, Form Decks, Roof Decks, and Cellular Metal Floor Deck with Electrical Distribution |

Steel Joist Institute (SJI)

| | |
|---|---|
| SJ-01 | (1994) Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders |

Pre-Engineered Steel Buildings

| | |
|---|---|
| MBMA | Metal Building Manufacturer's Association "Manual of Steel Construction" |

Uniform Building Code (UBC)

| | |
|---|---|
| UBC | (1997) Uniform Building Code |

2. ***Structural Design Criteria - Building Shell***

The Building Shell shall consist of a pre-engineered steel structure with roof slope as shown on architectural plans, complete with purlins, girts, metal deck, and walls as indicated on architectural drawings.

Minimum wind and snow loads shall be as indicated in ASCE 7. If local building codes require higher values than ASCE 7, the higher value shall be used.

In addition to actual dead loads that may be supported by the roof system and the code prescribed live loads, provide a collateral load of 8 psf.

Structural steel shall be designed in accordance with AISC ASD Manual of Steel Construction, Allowable Stress Design.

The Design and selection of steel roof deck, including minimum section properties shall be in accordance with the provisions of the Steel Deck Institute Design Manual.

In seismic areas, the design shall comply with UBC 1997.

Under full design wind loading, the maximum drift shall be compatible with the associated wall systems and their attachments.

Design of light gage cold formed members shall comply with AISI-01. Minimum yield stress shall be 33 ksi.

CMU walls shall be designed and constructed in accordance with ACI 530 and TM 5-809-03.

## VII. Mechanical Analysis

It is proposed that the break and office rooms be conditioned with a DX air handling unit. The heating for these areas can be either electric/gas or with a heat pump model. The ambient temperature of the region is the dictating factor for heating type.

The remainder of the building is exhausted with two roof-mounted exhaust fans. Control switches for these fans may be placed in the main office. Exhaust fan EF-3 must be corrosion resistant. Backdraft dampers shall be installed in the exhaust ductwork serving the fertilizer and seed storage areas. The purpose of these dampers is to prevent noxious odors from permeating to other areas while the exhaust fan EF-3 is inoperable. Several louvers have been placed in the walls and doors to facilitate cross ventilation.

The conceptual mechanical design intent for the pesticide storage area was based on chemical storage criteria which required the temperatures to be maintained at 50-100E F. Therefore, several options were explored in order to meet this criterion for many different climates. The first option would be to condition the space with a DX air handling unit. Since the air handler is exposed to harsh chemicals it should be

equipped with a corrosion resistant coil, fan, and housing. The air handling unit may be a heat pump model or equipped with electric heating.

Additional ventilation has been proposed with a roof-mounted exhaust fan. The exhaust fan in combination with the wall-mounted louvers shall provide adequate ventilation at a minimum of 10 air changes per hour. The exhaust fan shall be controlled with an external wall-mounted switch. Besides supplying power to the fan, the switch shall also serve to indicate the operational state of the exhaust fan.

## VIII. Electrical Analysis

Power distribution shall be accomplished by a pole or pad mounted 3N 4 wire 120/208 transformer providing power thru a single main disconnect.

Lighting shall be accomplished with fluorescent sources, non-metallic, gasketed fixtures shall be provided in all damp, wet or corrosive locations. Exterior lighting shall be accomplished by wall mounted high pressure sodium sources. The lighting shall be controlled by a series of switches, time clocks and photocells.

The fire alarm system shall be of the addressable type.

All wiring and fixtures in the pesticide storage, fertilizer storage, and seed storage rooms shall be suitable for Class 1 Div. 2 or Class 2 Div. 2 hazardous locations.

## IX. Plumbing Analysis

The plumbing systems serving this facility are somewhat unusual, in that due to the materials (fertilizers and pesticides) present, a means must be developed to contain, analyze and distribute these materials in a safe and controlled manner.

Due to the nature of the required functions, a number of rather specific details and diagrams have been indicated on the drawings. It is important to remember that these details/diagrams are meant to indicate a level of design concepts, not necessarily a specific layout.

First, the shed is to be provided with two hose bibs, securely attached to the columns. Drain-down valves shall be provided in areas subject to freezing.

Next, the pesticide storage/rinse area shall be provided with an exterior emergency shower (freeze-proof, tempered water supply) and a sink. All of the effluent/runoff from this area shall be drained to a sump pit, where it can be processed and then either released to the storm (or possibly sanitary) sewer or pumped out to various holding tanks. Security and safety are primary considerations in the design of these systems.

The main building is to be of “standard” design, with a couple of exceptions: Effluent from the shower and clothes washer is to be capable of being directed to either a holding tank **OR** the standard sanitary sewer. Dual washer-drain boxes and shower floor drains (hinged solid covers with recessed grates) are suggested means of accomplishing this criteria. A floor drain in the fertilizer storage room shall discharge directly to the above-mentioned holding tank.

Available utilities (water, natural gas, propane, etc.) shall enter the mechanical room and be easily accessible for shutoff and monitoring.

Basic, minimal standards of work and materials are indicated on the drawings.

ADA compliance is to be considered in all aspects of design.

The buildings are to be provided with a dedicated fire sprinkler system, with appropriate-to-the- climate freeze protection considerations.