POV Car Wash

Design Analysis

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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 structure of the POV Car Wash is easily converted from the load bearing masonry system to accept a wide variety of masonry or tilt-up finishes. This logic is applied throughout the prototype to account for changes to the exterior finish system, structural slab, roofing options, and utility control construction.

III. Function

The POV Car Wash is designed as a service structure for use by base personnel. It includes both hand wand washing stations and a Touch-Free Car Wash modeled after those produced by Mark VII. Both wand and Touch-Free bays share a common equipment room. The following *Table 3.1* outlines the program areas of a POV Car Wash:

Table 3.1 **POV CAR WASH** PROGRAM AREAS	**ASSIGNABLE AREA** (sq.ft.)
Hand Wash Bay 1	394
Hand Wash Bay 2	382
Touch-Free Bay	555
Auto Queuing and Control	N/A
Equipment Room	394
Vacuum Station	N/A
Total Assignable Area	**1725**

I. Architectural Analysis

A. Finishes

In general the finishes consist of exterior brick veneer walls and prefinished metal standing seam roofing. The interior concrete floors and walls of the wash bays should be sealed to prevent water infiltration.

B. Hand Wash Bays

The Hand Wash Bays are based upon the standard Mark VII wand bay. Both bays include a coin meter and safe, a control station, suspended hand wand boom and wand hangers, hand brush and brush hangers, and floor mat hanger track.

C. Touch-Free Bay

The Touch-Free Bay is based upon the standard Mark VII automated car wash station. This system requires the inclusion of a Queuing and Control Station on the approach side of the bay. The control assembly is installed on a concrete island with bollard protection. Care should be taken to coordinate actual power and control requirements and the final control station location relative to the overhead entry door and bay centerline.

D. Equipment Room

The eventual layout of the Equipment Room will vary with the selected machine vendor. Typical systems include but are not limited to water softening equipment, brine tanks, low pressure chemical additive lines, repressurization systems, water reclamation systems, and an air compressor.

In addition to the equipment listed inside this room a bill changer and vault accessed from outside the structure are installed in this space.

E. Vacuum Station

The Vacuum Station consists of a 2-car canopy over a centralized simple curb island with bollard protection on which the vacuum equipment is mounted. Care should be taken to coordinate actual power requirements with the intended machine vendor.

A trash receptacle will be provided on this island.

II. **Structural Analysis**

A. **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)

B. **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.

- Storage or Work Areas..... 250 psf Uniform Loading
- Non-Storage/Work Areas..... 100 psf Uniform Loading
- Auto/Truck Wheel Load as a Concentrated Load..... 3000 lbs.

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.

C. **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.

D. **Floors - Substructure**

The minimum slab thickness for foundations shall be as follows:

Building	Minimum Slab Thickness
Car Wash	6"

E. **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 1.3 above, Contractor shall 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.

F. **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	(October, 1992) Masonry Structural Design for Buildings

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

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

The Building Shell is composed of pre-engineered steel structural members supported by load bearing reinforced masonry cavity walls.

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 pre-engineered 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 and reinforced masonry cavity walls shall be designed and constructed in accordance with ACI 530 and TM 5-809-03.

All structural columns, beams, and other members exposed to spray or weather shall be hot-dipped galvanized after fabrication in accordance with ASTM A-123.

III.Mechanical Analysis

The proposed ventilation system for the equipment/storage room consists of a wall-mounted exhaust fan in combination with a door-mounted lover. This arrangement facilitates cross ventilation.

In certain climates, additional heating may be necessary in the equipment/storage room. Ceiling-mounted heaters may be applicable.

The wash station areas may require radiant floor heating. This heater would require a dedicated boiler unit. However, this option would be applicable to locals of consistently low ambient temperature.

IV.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.

V.Plumbing Analysis

The plumbing systems serving this facility are somewhat substantial, in that the intent of the system is to conserve the use of water, meet all local code requirements and provide a system which is adaptable to the products of a number of manufacturers of car washing equipment.

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.

The sizing and inclusion of any or all of the indicated devices shall be determined on a site-to-site basis.

Safety and ease of maintenance are considered primary requirements for this type of facility.

Provide exterior hose connections (for Owner cleanup of exterior areas)