a. CIVIL DESIGN

(1) Criteria

The site is designed in accordance with the following criteria:

ADA	Americans with Disabilities Act
UFAS	Uniform Federal Accessibility Standards
UBC	Uniform Building Code
CALTRANS	State of California, Department of Transportation, Standard Specifications DM-05.04, March 1986, Civil Engineering--Pavements (Basic Oct. 1979)
CALTRANS	State of California, Department of Transportation, Standard Specifications DM-05.12, April 1980, Civil Engineering--Fencing, Gates and Guard Towers (Basic Oct. 1979)
MIL-HDBK 1000/1A	Engineering and Design Criteria and Documentation for Navy Facilities, January 1997
MIL-HDBK 1005/2	Hydrology, June 1990
MIL-HDBK 1005/3	Drainage Systems, September 1990
MIL-HDBK 1005/7	Water Supply Systems, November 1988
MIL-HDBK 1005/8	Domestic Wastewater Control, September 1988
MIL-HDBK 1008C	Fire Protection for Facilities Engineering Design and Construction, June 1997
MIL-HDBK 1013/10	Design Guidelines for Security Fencing, Gates, Barriers, and Guard Facilities, May 1993
MIL-HDBK 1191	Medical and Dental Treatment Facilities Design and Construction Criteria, October 1991

(2) **Site Location**

The project is located [redacted]

(3) **Topography**

The construction limits of the project cover an area of approximately 2 hectares and extends approximately 160 meters in the north and south direction and 120 meters in the east and west direction. [redacted] The remaining portion of the site not occupied by buildings is paved in asphalt and/or concrete. The relief of the site for all practical purposes is flat and varies from Elevation 30.0 meters along the east side to 29.5 along the west side of the site.

(4) **Site Demolition**

Construction of the new Medical/Dental Clinic required the demolition of [redacted]

(5) **Adjacent Facilities**

[redacted]

(6) **Site Vegetation**

The amount of vegetation within the limits of the project was insignificant since the existing site is either paved or occupied by buildings.

(7) Access Roads

(8) Parking and Pavements

Total parking has been modified to 66 spaces with 8 handicapped spaces and 2 van accessible spaces. This change was initiated because the user requested the parking lot be located 25 m from the building.

Asphaltic Paving

The required asphaltic paving and base course thickness depended on the anticipated wheel loads and volume of traffic (Traffic Index). The recommended paving sections for a range of Traffic Indices are presented in the following tables for clay and silty sand soils. The paving sections were determined using the CALTRANS design method.

Where the pavement subgrade will consist of the on-site clay soils, the following paving sections are recommended:

Assumed Traffic Index	Asphaltic Paving (mm)	Base Course (mm)
4 (automobile parking)	76	152
5 (driveways and light truck traffic)	102	178
6 (roadways and heavy truck traffic)	127	229

Assuming that the paving subgrade will consist of the on-site silty sand soils, the following paving sections were recommended:

Assumed Traffic Index	Asphaltic Paving (mm)	Base Course (mm)
4 (automobile parking)	76	102
5 (driveways and light truck traffic)	76	152
6 (roadways and heavy truck traffic)	102	178

Careful inspection during construction was recommended to verify that the recommended thicknesses or greater are achieved and that proper construction procedures were used.

In areas where the subgrade soils are clayey, if the upper 610 mm of clayey soils were replaced with properly compacted sandy soils, the pavement sections for sandy soils were used.

Portland Cement Concrete Paving

Portland cement concrete paving sections were determined in accordance with procedures developed by the Portland Cement Association. Concrete paving sections for a range of Traffic Indices are presented below. It is assumed that the portland cement concrete will have a compressive strength of at least 20 MPa.

Assumed Traffic Index	Paving Section (mm)	Base Course (mm)
4 (automobile parking)	190	102
5 (driveways and light truck traffic)	203	102
6 (roadways and heavy truck traffic)	216	102

In the sandy areas, the base course was omitted, and the thickness of the concrete paving was reduced by 12.7 mm. It was recommended that the concrete paving be properly reinforced. In addition, dowels were recommended at joints in the paving to reduce any possible offsets.

Base Course

The base course for both asphaltic and concrete paving met the specifications for Class 2 Aggregate Base as defined in Section 26 of the latest edition of the [redacted] The base course was compacted to at least 95 percent.

(9) Fencing

Modifications [redacted] were required due to the design and access to the service area. Motorized remotely controlled gates control vehicular access to the service area. New fencing matched the existing perimeter fence which is a 16 mm square tube picket fence 2,260 mm in height. Also, new fencing was required along the [redacted]

(10) Easements, Setbacks and Safety Clearance Criteria

There were no requirements for easements or safety criteria relative to this site.

(11) Subsurface Conditions

Fill soils, 450 mm to 1370 mm thick, were encountered in six of the nine exploration borings. The existing fill, which consists of clay and silty sand, was not uniformly well compacted and contains some debris. Deeper and/or poorer quality fill could occur between boring locations and at the locations of the existing structures.

The natural soils beneath the site to the depths explored by the borings consist primarily of clay, silty sand, and clayey sand, and are underlain by sand. The clay soils are generally stiff and the silty sand, clayey sand, and sand deposits are dense to the depths explored. Based on exploration borings, clay soils were exposed at or near the existing grade in Borings 1 through 5 drilled within the area of the proposed building, and silty sand deposits were exposed at or near the existing grade in Borings 6 through 9 drilled

within the areas to be paved. The upper clay soils (both fill and natural) are highly expansive and would swell and shrink with changes in the moisture content. Furthermore, the clay soils underlying the site are currently at a moisture content that is higher than the optimum moisture content of the clay.

Ground water was not encountered in borings within the 50-foot depth explored. In addition, based on the available data, the ground water beneath the subject site is well below a depth of 50-feet.

Liquefaction potential is greatest where the ground water level is shallow and loose, fine sands occur within 50-feet of the ground surface. Liquefaction potential decreases with increasing grain size and clay and gravel content, but increases as the ground acceleration and duration of shaking increase during an earthquake.

The ground water beneath the site is well below a depth of 50-feet from the existing grade, and any liquefaction occurring below a depth of 50-feet will not have any adverse structural effects on the proposed building.

(12) Wetlands and Flood Plains

[redacted]

(13) Contaminated Soil/Explosive Ordnance

There were no indications the site was an explosive ordnance storage or impact area. A subsurface investigation was done to determine whether or not the site was contaminated with hazardous chemicals. The investigation provided the site was not contaminated.

(14) Sediment and Erosion Control

The design provided for effective sediment and erosion control during and after construction of the Clinic.

(15) Cathodic Protection

No cathodic protection was provided for new utility lines.

b. UTILITIES DESIGN

(1) Storm Drainage and Storm Water Management

The design complied with all storm water management requirements. The new storm sewer, with the approval of [redacted], was connected into an existing curb [redacted] The curb inlet discharges into an existing 1650 mm storm sewer in [redacted]. Since there was a net decrease in impervious area between the new and existing conditions, this project did have a positive impact on the existing storm system.

(2) Sanitary Sewer

The sanitary system for the new Clinic connected into an existing 200 mm diameter sanitary sewer that flows in an easterly direction and is located approximately 20 meters to the south of the Clinic.

(3) Water (Potable and Fire Protection)

Water for fire protection was provided by an existing 250 mm diameter pumped fire main. 1996 fire hydrant flow test data for this main indicates adequate pressure and flow for this project. A portion of this fire main was within the footprint of the New Clinic and as a result, was relocated. Hydrant flow test data is as follows:

Information on Flow Hydrants No. 15 and No. 16

Date: 96 September
Test Hydrant: No. 2
Static Pressure: 94 psi (648 kPa)
Residual Pressure: 85 psi (586 kPa)
Quantity Flow: 3192 gpm (201 L/S)
Flow Available at 20 psi (138 kPa) = 9,959 gpm (628 L/S)

The Clinic's potable water requirements were met from an existing 100 mm ductile iron water main system. [redacted] The domestic water demand is 120 GPM (7.57 L/S). 7.57 L/S flow in a 100 mm pipe will flow at a velocity of 0.9 meters per second; therefore, the existing water distribution system was adequate to serve the new Clinic.

(4) Natural Gas

A new natural gas line did connect the Clinic to the existing 25 mm or to the 75 mm gas main located to the south of the site.

(5) Steam

Steam was available on site, but the capacity of the existing steam system was not adequate for the new Clinic. [redacted]

c. LANDSCAPE DESIGN

The landscape design for the new [redacted] Medical/Dental Clinic as formed in response to several key issues: definition of pedestrian and vehicular circulation, accentuating the architecture and tying it to the surrounding landscape, enhancing desirable views and screening undesirable views.

A view of medium flowering trees planted in a bed of evergreen shrubs, enhances the vehicular procession down [redacted] Flowering trees curve around to the parking lot entrance, leading you into the lot. Underneath the canopy of trees, a mix of evergreen groundcover and shrubs softens the hard edge of the parking lot and sidewalk, while providing comfortable separation between pedestrian and vehicular circulation systems. Four parking islands with medium flowering trees soften and shade the parking lot.

A grouping of palms flanks the front of the building, accenting the vertical elements of the building. Medium flowering trees planted in a bed of groundcover line the front of the building, complementing the architectural elements and framing the main entrance.

A single row of large shade trees forms the western boundary of the parking lot. A row of evergreen trees screens the loading dock and mechanical yard from the street. Evergreen trees also help screen views of the electrical substation and the street from pedestrians using the west side entry. The mechanical yard is well screened from both physical and visual access by an evergreen shrub border.

d. ARCHITECTURAL DESIGN

(1) Architectural Concept

The new Medical/Dental Clinic provides approximately 4,500 gross square meters of combined Medical Clinic and Dental Clinic services. The clinics accommodates normal duty hours care for all active military personnel within a 50-mile radius of the [redacted] as well as their dependents. [redacted]

Public entry into the facility is through a main entrance on the front (south) of the building. This entry leads into a clerestory-lit, six meter wide, two-story space which contains waiting and access to the reception points of all major patient designations. On the first floor the Pharmacy, Laboratory, Patient Benefits/Admin/TriCare/Accounts and Radiology Departments all access directly off the main lobby/entry. Also, within this two-story lobby, patients will find the control/waiting area for the Primary Care and Flight Medicine/Physical Exam Clinics on the first floor. Down a short corridor to the east is the Optometry Clinic. On the second floor the Dental Clinic is accessed directly from the two-story lobby. Public Health, Bioenvironmental Engineer, Information Management, Resource Management, Medical Readiness and the Command Suite are located on the second floor. In the two-story lobby near the elevator door at the second level, patients have access to the Mental Health Clinic, which is intended to have a more private access.

The maximum personnel within this building shall be 480 staff and patient.

[redacted]

Elevators and stairs are located in the two-story lobby. The entrance is easily visible and accessible from the parking areas as well as adjacent vehicular arteries (Mercury Avenue and Douglas Street).

The Primary Care Clinic was designed to operate as a team approach rather than as specific specialty clinics. Patients are directed to the central clinic waiting area and then paged to the appropriate team in the appointed area for medical care.

The staff was able to enter the facility from several locations. Points of entry include the main entrance, doors midway along both the east and west facades, a door on the east facade near the northeast corner and a door on the north facade out of the Logistics area. The door near the northeast corner and the door on the west facade are both near stairs to the second floor. Staff entering by the main entry will use the central stair or elevator.

There is no ambulance or urgent care area in the clinic, although an emergency parking area is provided in the access road to the north of the facility. Should a trauma or cardiac patient enter the clinic, the patient will be stabilized in the clinic Treatment Room and transported as soon as possible to a local medical center. It is the clinic's policy that all emergency patients will be sent to local area medical centers rather than brought to the clinic if possible. No ambulances are assigned to the clinic.

Material access/delivery to the clinic is made at the rear (north side) of the facility shielded from view from Mercury Avenue, the clinic's public entries and the adjacent off [redacted] to the west. Materials are received at the loading docks/logistics storage area and from there distributed on an "as needed" basis to the various clinics and departments. The rear (service) door to the elevator is located near to logistics to allow for vertical movement of materials. A back (east/west) corridor within the first floor clinic area allows staff and materials to move through the building, out of view of patients.

(2) Exterior Wall Systems and Massing

The building is an irregular rectilinear shape with the first floor projecting out from under the second floor one structural bay on the north side and a portion of the east and west sides. A vertical height (floor-to-floor) over most of the facility has been set at 4,570 mm, which satisfies required ceiling heights combined with above ceiling mechanical, electrical, structural and fire protection clearances.

The massing of the Medical/Dental Clinic was driven by three major factors. The first is the available site area dictated a two story solution in order to get the building, parking and some landscaped area on the site. The second factor involves the functional relationship of various departments on the same floor as well as from floor to floor. Major heavy volume clinics as well as ancillary and administrative support activities to support the clinics have been placed on the first floor along with logistics for ease of access. The Dental Clinic has been placed on the second floor to allow for the servicing of dental utilities from the floor below. Other areas were located on the second floor based on either their reduced public/patient access, such as the Command Suite, Information Management, Resource Management, Training/Education, Public Health/BEE, or their specific need for limited exposure such as Mental Health. The third factor is that the new clinic should be consistent with the scale/massing of existing buildings adjacent to the proposed new facility as well as other major structures [redacted] The majority of adjacent structures are either two-story or a combination of two-story and one-story in a modified rectangular configuration. The two newer buildings [redacted] with which the new clinic should be compatible are [redacted] commissary to the south and the child development center to the east. A future multi-story consolidated office complex is projected to be built one block to the east of the clinic.

Exterior walls are clad with insulated modular metal panels, over sheathing on 150 mm steel studs. Walls are flashed and insulated as required to meet the environmental conditions unique to [redacted] Within the panel pattern, horizontal and/or vertical accent bands of a subtle shade or color was used to provide an organizing system for windows, doors and other architectural features.

(3) Building Materials

(a) Panelized Skin: The panels used to clad the clinic are white in color and is compatible with the Base Exterior Architectural Plan.

(b) Concrete: This facility has a slab-on-grade with no crawl space or trenching. See Structural Design for foundation and footing requirements.

(c) Steel: A steel frame structural system was used in lieu of concrete or a combination. Since this facility is only two stories in height and the structural grid/bay sizes are reasonable in length, a steel frame structure was more economical and quicker to construct. The steel frame structure also proves to be easily expandable.

(d) Louvers, Windows, Doors and Storefront: Louvers, windows, doors and storefront frames on the exterior of the building have a factory applied clear anodized finish that is

compatible with the architectural character of this facility and the surrounding buildings. Glazing in windows and storefront is 1-inch insulated (gray tint) glass. Glazing in doors is 1/4-inch (gray tint) glass.

(e) Exterior Walls: Exterior walls are modular insulated metal panels mounted on 13 mm gypsum sheathing on 150 mm metal studs. The panels are arranged in a plaid pattern of 1500 and 1000 mm widths. The interior face is 16 mm interior gypsum board.

(f) Interior Walls: Interior walls, in general, are 90 mm metal studs with 16 mm gypsum board both sides up to 100 mm above the ceiling. Walls required to bottom side of structural deck above occur around stairs, the Pharmacy, Dental Sterilization, Prosthetic Lab, and at fire and/or smoke rated partitions.

(g) Roof: The roof shall be an unballasted, modified bitumen roofing system over the required thickness of rigid insulation on a concrete roof slab at the first floor roof or on a corrugated metal deck at the second floor roof. A minimum 1:48 (1/4" per 1'-0") slope was provided. A metal standing seam roof system over rigid insulation and metal deck was installed on the main entrance canopy and on the barrel vaulted framing system over the upper lobby and mechanical penthouse at Levels 2, 3, 4 and 5.

(4) BASE EXTERIOR ARCHITECTURAL PLAN

Although [redacted] does not have a BEAP, a Master Plan is being done which will set many of the parameters for future development. In the interim, the design of this project will help determine the physical character of future development. The architectural nature of the Medical/Dental Clinic was influenced by the building materials used on the adjacent Commissary to the south and Child Development Center to the east.

The building materials which prevail in buildings [redacted] are painted metal sheathing. The Commissary is covered in factory finished aluminum panels. All of these buildings are painted in light shades of blue. The Child Development Center is stucco of a light yellow color.

This project will identify exterior elements including paving, curbing, sidewalks, exterior lighting standards, and site accessories that will be used in future development [redacted]

(5) EXPANDABILITY AND FLEXIBILITY

The site plan shows the one story expansion zones around the building. The site to the west of the building contains the major area for clinic and ancillary expansion. A smaller area of expansion will be possible on the east side.

The clinic fabric can be expanded by displacing Logistics to a remote site and expanding into that area within the original building envelope. Further expansion of the clinic area can be accomplished by adding on to the west.

Pharmacy can be expanded into the Clinic Admin/RMO space to the south of it and those displaced functions relocated to new construction elsewhere.

In Radiology, another radiographic room can be placed in the space designed for film files/tech work area/film viewing area. Those functions would be relocated to new construction to the west or, as in the case of film files, be found to have less of a requirement with new technologies.

In the Dental Clinic, additional DTRs can be gained by converting consultation room space.

Mental Health can grow into BEE/Public Health space or vice/versa with the other function being located in new adjacent construction or being relocated to a remote building.

(6) ENERGY CONSCIOUS DESIGN

Basic architectural energy conservation features have been incorporated into this design which are standards for good architectural practice. 150 mm exterior wall metal studs filled with 150 mm batt insulation were used to reduce heat gain and loss. Where possible glazing was installed as 1-inch insulated gray tint glass to prevent unnecessary solar gain. Large sections of storefront or panels of glazing were shaded to increase shadow lines and prevent solar exposure. Vestibules were used at the main public entrance.

Mechanical measures to insure an energy conscious design include air side econominzers to allow free cooling when conditions are favorable, variable volume air handling units to allow lower energy consumption during times of low thermal loads, high efficiency motors on air handling units and pumps, and a digital control system to allow the facility mechanical systems to operate at their optimal efficiencies.

(7) LIFE SAFETY AND FIRE PROTECTION FEATURES

The new Medical/Dental Clinic is designed in total compliance with NFPA 101 to satisfy all life safety and fire protection issues.

Fire protection was obtained through proper architectural, mechanical and electrical design in compliance with governing codes. The facility is fully sprinklered with a wet-pipe sprinkler system.

(8) HANDICAPPED ACCESSIBILITY

The new Medical/Dental Clinic was designed for total accessibility to handicapped persons in accordance with the Uniform Federal Accessibility Standards (UFAS) and the Americans with Disabilities Act (ADA).

(9) ACOUSTIC DESIGN CONSIDERATIONS

No specific requirements for sound control was identified other than for the Audio Room in Physical Exam. The A/E, however, met all requirements stated within the MIL-HDBK-1191. Also within the facility, the following special acoustical considerations met:

- All continuous ceilings have a sound attenuation blanket over them as stipulated in the Appendix A and MIL-HDBK-1191.
- Partitions around mechanical equipment rooms, the Physical Exam Audio Room, Prosthetics Lab, Dental equipment areas, and the Dental Instrument Processing Center were insulated and extended up to the structural deck above.
- Partitions around toilets were acoustically insulated

(10) EXTERIOR WALL ANALYSIS:

(a) System Selection: Based on the comparative analysis of exterior wall materials submitted with the S-2 Submittal and discussions of the same during the S-2 Review Conference, the proposed exterior cladding system is System "D" Metal Clad Foamed Panels. The system description, sketch and cost estimate are attached at the conclusion of this article.

e. INTERIOR DESIGN

(1) Introduction

For many years medical facility planners have attempted to inject design characteristics which will provide an environment less stressful and more comfortable for patients, while at the same time, incorporating highly efficient, flexible and technologically advanced facilities. The sheer complexity and size of most healthcare facilities challenges designers striving to develop a design strategy to address the many complex functions and the varying scale of components. For these reasons some facility planners have proposed the analogy of the medical building as a living organism. Others have placed healthcare architecture in the same plane as urban design.

As a community, medical facilities must meet the needs of its everyday users and visitors. It must provide an adequate infrastructure and develop environmental queues to orient and organize circulation. The Medical/Dental Clinic [redacted] presented the opportunity to balance the purely functional issues with the human concerns by conceptualizing its planning as a community of specialties. A two story public gallery organizes functions, orients visitors and serves as an avenue, anchoring the various clinics. All clinics are accessible from this two story space through secondary streets or corridors which in turn lead to the more private staff areas along the perimeter. Thus a clear hierarchy of functions is established.

(2) Philosophy

The primary design intent of this facility was to create a soothing, comfortable environment, which will enhance an individual's visit, while meeting the necessary technical and functional needs. The interior architecture addresses this complex issue through the implementation of a design strategically rooted in the idea of a building accommodating a community of specialties, allowing for future flexibility through the zoning of activities.

The concept recognizes that individuals visiting this type of facility are generally disoriented by its unfamiliarity and complexity. The design attempted to provide a familiar setting in its basic structure by organizing a series of "clinical districts" along interior streets. Visual landmarks and changes in flooring material provide sensory clues to reinforce circulation patterns and help guide the visitor to its destination. Public spaces utilized for arrival, orientation, circulation and waiting are conceptualized like streets and plazas while clinical and support spaces become the urban fabric or buildings forming the community. Within each clinic a clear organization based on segregation of patient traffic is implemented. Exam rooms are located closest to the public access, while doctor's offices gravitate to the perimeter. Support spaces occupy the middle or neutral zone. This basic segregation of public spaces, clinical, support and staff, provides the basis as to how materials, lighting and colors was utilized.

(3) Material Integration

The coloration and texture of the materials were extracted from the surrounding existing context. The interior finishes consist of a series of warm tones and textures which, when combined with the natural lighting of the two-story central space, enhances the visual inviting feel of the clinic facility.

(4) Special Areas of Interest Within the Public Space

(a.) Reception/Control Entry: Due to its projected placement and presence, the arrival space acts as the central space from which a main street guides the visitor to the various clinics on each level of the facility. This arrival space, conceptualized as an exterior plaza, and serves as the focus for orientation and is emphasized by the development of an accent floor pattern and the placement of carpet at the waiting areas. Its primary floor surface consists of porcelain tile in a subtle shade and in combination with a vinyl textured wall finish and a wood wainscot, will reinforce its appearance as an arrival space.

The visual division of this space is created by continuous lighting wall sconce elements, metal rails, and the architectural treatment of the natural lighting window walls, specifically placed to provide consistent pattern and diminish the length.

Within the avenue, smaller scaled seating areas are defined by a durable carpet in a color selected to accent with the paving tiles, minimize wear and tear, and increase foot comfort while minimizing potential noise issues.

(5.) Special Areas of Interest Within the Clinic Fabric

(a.) Interactive Stations: In providing spaces which are warm and friendly, design elements including vinyl floor tile accents, textural cubicle curtains, and vinyl wall borders to humanize the treatment stations.

(b.) Dental Treatment Rooms: Soothing warm tones in the sheet vinyl flooring, in conjunction with architectural millwork finishes, visually enhanced the space with the addition of cool tones on the upholstery fabrics of the exam chairs and stools.

Personal scale is emphasized through the use of a solar mesh screen supported by an aluminum frame system. Careful placement of plants and planters used in the seating areas support the need for patient comfort and sense of place.

The arrangement of seating areas has been studied so that while the main axis is maintained the rigidity of seating elements has been moved to create a more gentle approach to patient waiting.

Lastly, the reception/control desk is a main focus of the main lobby area. We agree that adding a height element to this station will strongly support the patient's ability to find the assistance they need almost immediately. The modular unit proposed provides vertical elements, so that the entire reception station while being quite stable is still a movable piece of furniture.

(c.) Doctors'Offices: These offices are treated as efficient, condensed work environments with an emphasis on maximizing the use of floor space. Because of their placement along the edges of the facility, the corridor wall defining the interior edge of offices presents the opportunity to provide a focal point for vistas from the clinic corridors.

The wall surfaces are painted with minimum use of accent colorations, thereby allowing for individuality in artwork placement, and in conjunction with fabric upholstery finishes, allow for richness and texture. The floor surface are carpeted in a dense level loop, formulated with solution dyed yarn to meet all the required soil hiding characteristics.

The furniture is modular, to allow for maximum flexibility in work tasks, and provide components which help to individualize the offices.

(d.) Clinic Corridor: Whenever possible, consistent placement of openings and coordinating colors will be used to emphasize architectural features. Elements, such as accent lighting, color, texture, and pattern, will be used to visually break up the length of the corridors. A colored floor tile pattern in a subtle mix of warm neutrals will help to add interest and visually diminish its apparent length.

(e.) Clinic Fabric: The attention to finishes and details for all the open areas, such as control stations and individual waiting areas, will focus on materials slightly upgraded from those used in the more utilitarian areas of the clinic. Accent bands of carpet will not only define seating areas, but assist in providing purpose for the accent colors used.

In other standard areas of the clinic, simple efficient space will be described as clean and crisp with the quality of warmth and comfort achieved through contrast and color.

(f.) Conclusion: Because of the many complex functions and the varying scale of components within the facility, the organization of the two story space and its axis provides a clear path and direction for the visitor to proceed toward the respective destination. Public spaces within the facility utilized for arrival, orientation, circulation and waiting are conceptualized like streets while clinical and support spaces become the urban fabric forming the community.

The Medical/Dental Clinic Replacement for [redacted] establishes a comfortable, warm and convenient environment for patients, while at the same time, incorporating highly efficient, flexible and technologically advanced facilities.

(g.) Methane Gas Detection: Some evidence of methane gas was detected on the site were the present facility is located,. A methane gas removal and detection system is installed to remove gas vapor from below the slab and vent it through vent piping extended to a point above the roof to the atmosphere. A methane gas alarm system is installed in the outlets of the vent system and is connected to methane gas alarm panels located inside the building. See Volume 7 Section "l" 02811 for manufacturers information.

f. STRUCTURAL DESIGN

Structural design is in accordance with the following criteria.

MIL-HDBK-1191
MIL-HDBK-1002/1
MIL-HDBK-1002/2
MIL-HDBK-1002/3
[redacted]
ACI 318-95
AISC Ninth Edition (ASD) and (LRFD), 1986
Seismic Provisions for Structural Steel Buildings, 15 June 1992

Design Loads:

Seismic - Zone 4
Wind - 85 mph Basic Wind Speed (ASCE 7-95)

Roof live load - 20 PSF

Floor Loads: The second floor structure is designed for a 60 psf live load, except as follows. 100 psf at the prosthetics lab and central sterile areas. 150 psf at the mechanical room. 200 psf at the admin records storage area (high-density rolling shelves). A loading diagram is provided on structural drawing S2-2.

A dead load partition allowance of 20 psf added as a uniform load in areas where lightweight (stud wall) partitions occur.

Future Expansion: No provision is made to accommodate loads from any future construction.

Fire Resistance: The structure is not rated for fire.

Roof Slope: Roof areas have sloped structure (1/2" per foot) to help achieve drainage.

Building Joints: None required.

(1) Development of Structural Systems

Functional Layout: Structural system is designed to have minimal interference and impact on other systems. Lateral resistance is achieved by concentrically braced frames.

Column Spacing: Column bay spacings are based on known economical patterns and were selected for modularity with medical space layouts for minimal interference and maximum flexibility.

Story Heights: These are dictated by the space requirements for the mechanical and electrical systems above the ceiling, the depth of structure, and architectural ceiling height requirements. The typical story height is 4570 mm (15 feet).

Availability of Material: All materials used were readily available in [redacted]

Slab-on-Grade: The first floor is a 4" thick slab-on-grade on a polyethylene vapor barrier on a 4" thick layer of granular fill (capillary water barrier) on a geotextile "liquid boot" gas control membrane. The slab is reinforced with 3/8" diameter rebars at 12" on center each way.

Horizontal Framing Systems: The floor and roof systems were designed as light as possible to minimize inertia forces, while meeting the requirements of strength and fire resistance. As the building structure is not rated, open web steel joists (barjoists) are used. The second floor has barjoists on 600 mm (2') centers supporting 14 mm deep (9/16") corrugated galvanized steel formdeck and concrete fill reinforced with flat sheets of steel welded wire mesh. The roof has barjoists on 1200 mm (4') centers supporting 38 mm (1-1/2") intermediate rib galvanized steel roof decking.

Lateral Load Resisting System: Floor and roof decks serve as diaphragms to deliver the inertia forces to the vertical braced frames. Braced frames are located as symmetrically as possible about the building footprint, and extend uninterrupted from foundations to roof. Brace configurations were coordinated with architectural opening requirements. The second floor diaphragm has two large openings in the atrium area. The roof diaphragm is interrupted at the front of the building, above the entrance, by the requirement for a glassed open space.

Foundations: Shallow spread footings bear on natural soil and engineered fill with an allowable bearing pressure of 2500 psf.

(2) **Specific Design Issues**

Logistics Warehouse Floor: The floor is thicker (6") than the typical slab-on-grade (4") due to the heavier loads and pallet jack traffic. Design did not consider forklift traffic.

Radiology: A requirement of the equipment in this area necessitated the need for trench ducts to be embedded in the slab-on-grade floor.

Elevator: The elevator is hydraulic type, supported from the pit floor.

Floor Depressions: No significant floor depressions are provided on the suspended second floor structure.

Stairs: Upper stair landings are suspended from the surrounding second floor structural steel. Intermediate landings are supported by posts bearing on the first floor slab.

g. MECHANICAL DESIGN

(1) HVAC Systems

(a) Applicable Criteria:

MIL-HDBK. 1191	Department of Defense Medical and Dental Facilities, Design and Construction Criteria, Dated 24 May, 1996.
NAVFAC P-89	Engineering Weather Data, dated July, 1978.
Design Guide	Architectural and Engineering Instructions Manual (CESWD-AEIM), dated August 1996.
NFPA Codes	Applicable Codes, current editions.
ASHRAE Handbooks	Current Editions.
ASHRAE Standards	Applicable Standards, current editions.
MIL-HDBK-1008C	Military Handbook, Fire Protection for Facilities Engineering, Design and Construction, dated 10 June 1997.
IPC	International Plumbing Code, Current Edition.
Design Guide	Air Force Dental Facility Design Guidance (AFDFDG), dated March 1997.

(b) **Site Utilities:** The site for this project is served by all required utilities. Among the required utilities are fire water, natural gas, domestic water and sanitary sewer. Refer to the Civil section of this narrative for further discussions of the site utilities.

(c) **Outdoor Design Conditions:** The weather conditions for the site are as listed below. [redacted]

[redacted] The outdoor design conditions are from the 97.5% heating column and 2.5% cooling column in accordance with the requirements of paragraph 8.1.2.4 of MIL-HDBK 1191.

Latitude: [redacted]

Longitude: [redacted]

Elevation: 29 meters (97 ft) above sea level.

Summer Outside Design Conditions:

[redacted]

Winter Outside Design Conditions:

[redacted]

MIL-HDBK. 1191 Weather Region: [redacted]

(d) Indoor Design Conditions: The indoor design temperatures, air change rates and humidity levels were designed as required by Appendix A of MIL-HDBK 1191 for the particular room type.

(e) Energy Analysis:

(1) Simulated Systems: The HVAC system for this facility was modeled using the Trane Company's "TRACE 600" computer analysis program. The analysis includes four air side systems and one plant side system. All air side systems are modeled with air side economizers. The air side systems modeled are:

- Single Duct Variable Air Volume with reheat
- Dual Duct Variable Air Volume
- Constant Volume Terminal Reheat
- Constant Volume Double Duct

The plant side equipment modeled is as follows:

- Air cooled rotary screw (or scroll) chiller with gas fired boiler.

Water cooled systems were not considered due to the limited space on the site and to the limited floor space for heavy mechanical systems. As described below, the mechanical systems analyzed meet and exceed the energy consumption requirements.

(2) Design Energy Target: The Energy Budget figure for this facility was determined from the occupancy classification and from the weather zone as defined by MIL-HDBK 1191, Chapter 7. As listed above, the weather zone for this facility [redacted] Approximately 16% of this facility is classified as a Dental Occupancy. The remaining 84% is classified as Dispensary. Dental clinics have a Design Energy Target (DET) of 450 MJ/m^2/yr (40,000 btu/ft^2/yr) while Dispensaries

have a DET of 400 MJ/m^2/yr (35,000 btu/ft^2/yr). The DET for this facility is calculated to be 408 MJ/m^2/yr (35,800 btu/ft^2/yr).

(f) Life Cycle Cost Analysis:

(1) Computer Program: The Life Cycle Cost Analysis for this facility was accomplished utilizing the Government's "Life Cycle Cost in Design" computer analysis program (LCCID). The program is written and supported by the BLAST Support Office at the University of Illinois, Urbana.

(2) Energy Rates: The energy rates at [redacted] were obtained at the Base Civil Engineering Office. The average rates were determined as follows:

- Electricity: $0.093 per kilowatt hour
- Natural Gas: $4.52 per million BTU's
- Water: $2.35 per 1000 gals.

The above rates were used in the life cycle cost analysis to determine the lowest lifetime cost of the simulated systems.

(g) Analysis Results:

(1) A summary of the Life Cycle Cost Analysis findings are listed in the following table. The Variable Air Volume system with the air cooled screw chiller resulted in the lowest energy consumption values and the lowest life cycle cost. The design was based on utilizing this system type.

SYSTEM SELECTION SUMMARY			
Alternate Number	Alternate Name	Energy Use (BTU/SF/YR)	Life Cycle Cost (k$)
1	VAV-RH with Air Cooled Screw Chiller	39,409	409,560
2	CV-TRH with Air Cooled Screw Chiller	44,683	414,600
3	CV-DD with Air Cooled Screw Chiller	44,458	490,701
4	VAV-DD with Air Cooled Screw Chiller	40,913	474,254

VAV-RH Variable Air Volume, Terminal Reheat
CV-TRH Constant Air Volume, Terminal Reheat
CV-DD Constant Air Volume, Double Duct
VAV-DD Variable Air Volume, Double Duct

(h) Load Calculations:

(1) Computer Analysis: Preliminary room by room HVAC load calculations for this facility were calculated using the HCCV load calculation program. This program is written by [redacted] This is a Windows based program which provides individual room by room loads, calculated in accordance with current ASHRAE criteria and standards.

(2) Load Inputs: HVAC load inputs for this building are based on manufacturers data, ASHRAE published data, and the Engineers's experience in design of this type of facility.

(3) Air Flow Calculations: Minimum supply air flow quantities are based on Appendix A of MIL-HDBK 1191. Fresh air quantities have been based on the greater quantity of Appendix A of MIL-HDBK 1191 and ASHRAE 62-89 criteria.

(i) System Design:

(1) The HVAC system is an integral part of the building, complementing the building's architectural and electrical systems while providing efficient and affordable air conditioning, heating and ventilation. The HVAC system utilizes state-of-the-art equipment and technology to provide the best mechanical systems currently available. Direct Digital Controls (DDC) are utilized to insure efficient operation.

The mechanical systems consists of both air side and water side systems along with the DDC control system. The air side equipment includes air handling units, ductwork systems and exhaust fans. The water side equipment includes the central cooling and heating equipment, hot water piping, chilled water piping, and cooling and heating water pumps.

The DDC system is a stand alone control system and is compatible with the existing base Energy Management Control System (EMCS). There are two Distributed Control Panels (DCP's) in the new building that will connect, via modem, to the front end computer at Base Civil Engineering (BCE).

Access to the mechanical equipment rooms on the first floor is from an exterior door only. Access to the mechanical room on the second floor is from both the occupied interior space and the roof area. Access to the roof area allows heavier equipment to be replaced without transporting the equipment through the occupied space.

(2) Communication Closets: Due to the function of the communication closets and to Communication Closet Design Criteria, the closets require cooling on a 24 hour per day basis while the remainder of the facility will be either occupied or unoccupied. Instead of running the chiller, pumps and air handling units for relatively small loads, the communication closets are individually conditioned with ductless split system units mounted in the room. Condensers for these units were mounted as inconspicuously as possible around the perimeter of the facility.

(3) Air Systems: The air handling units are located in the mechanical room on the second floor. The air handling units are zoned along smoke wall lines and serve only one smoke zone. All cooling and dehumidifying is accomplished at the main cooling coils in the air handling units. Air flow monitoring stations are provided for each air handling unit to insure that the proper amount of fresh air is provided to each unit. While in the economizer cycle, all air comes from outside air louvers located within the second floor mechanical air handling unit room. Relief air, during the economizer cycle is ducted to relief louvers located in another area of the air handling unit room.

The air handling units consists of return fans, relief sections, filter mixing sections, cooling coils, final filter sections and discharge plenums. Each section of the air handling unit is provided with double wall construction and internal insulation. Supply and return fan sections are provided with internal vibration isolation.

Each air handling unit and return fan is provided with a variable frequency drive (VFD). The VFD is controlled based on duct static pressure.

The air distribution system consists of galvanized steel supply, return, exhaust, outside air and relief ductwork. The ductwork is protected with fire dampers where penetrations through rated walls occur. All ductwork is externally insulated with fiberglass duct wrap insulation with a vapor barrier. No internally lined duct was used on this project. All return air is fully ducted back to the air handling units. No ceiling return plenums or corridor return plenums were utilized on this medical clinic. All exhaust fans (to the extent feasible) are inline fans located near the exhaust louvers to minimize the number of roof penetrations.

The filtration requirements for the facility is in accordance with the minimum requirements of MIL-HDBK 1191 with the exception that all Medical and Dental functions will be filtered at 90% efficiency, in accordance with the previous direction given to the A/E. All filters were installed where they can be easily maintained.

(4) Chilled Water Systems: The chilled water required for cooling the facility is generated from water chilling units located near the building in the mechanical yard. Chilled water is piped to the main building area where it is distributed from above the ceiling to the mechanical air handling units.

Only one chiller was provided for the facility. However, the chiller is provided with two complete and separate refrigerant circuits. Two chilled water pumps sized at 100% each of design water flow is provided. One will be the primary pump and the other will be a back up pump. Changeover from the primary pump to the back up pump is manually performed through the DDC system. All chilled water pumps are horizontal end suction type. Adequate service clearance was provided around all of the mechanical equipment in the mechanical room. Three-way control valves were used on the cooling coils to maintain a constant water flow through the chiller.

The water chilling unit uses an environmentally friendly refrigerant. No CFC's are used on this project.

The chilled water piping is either hard drawn copper or Schedule 40 black steel. Condensate drain lines are hard drawn copper. Neither thin wall pipe (Schedule 10) nor plastic pipe were used for chilled water piping on this project. All pipe joints are screwed, welded or soldered, or flanged.

(5) Heating Hot Water Systems: The facility is heated through the use of a single, high efficiency, natural gas fired, hot water boiler. Redundant boilers with total capacity backup were not required since the facility does not have an in-patient function. Hot water is pumped from the mechanical equipment room to heating coils at the terminal boxes. There is one primary hot water pump sized at 100% of the total hot water load with another pump for stand-by operation. Heating hot water is generated at approximately 82°C (180°F) and is piped to the heating or reheating coils. Hot water pre-heat coils are not required due to the mild winter temperatures. A hot water reset schedule was incorporated to allow for energy savings.

The hot water piping for this project is constructed of either hard drawn copper or Schedule 40 black steel. Neither thin walled pipe (Schedule 10) nor plastic pipe were utilized. All joints are screwed, welded or soldered, or flanged.

Pipe insulation for this project is provided on all chilled, hot and condensate drain lines. Chilled and hot water piping is insulated with fiberglass insulation of the appropriate thickness. Condensate drain lines are insulated with a flexible, elastomeric insulation. The insulation on cold pipes is provided with a vapor barrier to prevent condensation from forming on the piping systems.

(6) Steam: There is no central steam system designed for this facility. Domestic hot water is generated from water heaters utilizing natural gas as the primary fuel and heating water is generated with a natural gas fired, copper tube boiler.

(7) Equipment Rooms: There are two main mechanical equipment rooms in the facility. The Mechanical Equipment room on the first floor houses the major dental equipment, the heavy equipment subject to higher levels of vibration, and to equipment that produces higher noise levels. Equipment that is located in this room include the dental air compressor, dental oral evacuation pumps and receiver tanks. The second floor mechanical air handling equipment room houses the air handling units, domestic water heater, heating boiler and the chilled and hot water pumps.

(j) Energy Conservation: The design energy target for this facility requires that tried and proven energy conservation features be applied to this project. High efficiency motors are used on the pumps and fans. Variable speed drives are provided on the air handling units. The use of air side economizers to obtain "free cooling" is implemented to reduce yearly energy consumption. Energy conserving routines are programmed into the energy management system to help conserve energy. Hot water reset controls are installed on the boiler to reduce the gas consumption during mild winter days.

(k) Medical Gas Systems: The central medical gases for this facility consists of oxygen, dental compressed air and oral evacuation. Because of the small amounts of oxygen required for this project, oxygen is provided from individual cylinders. The dental air compressor and oral evacuation pumps are located in the mechanical room on the ground floor. The individual oxygen cylinders are located in gas cylinder room on the first floor.

The medical and dental gas systems are designed in accordance with NFPA 99 and MIL-HDBK 1191; however, since the quantities of medical gas outlets listed in Appendix A of MIL-HDBK 1191 are the maximum allowable number for a medical center, the A/E used industry standards, current design practice, and input from the user in locating the gas outlets and sizing the medical gas equipment.

(l) Plumbing Systems:

(1) General: The plumbing systems are designed in accordance with the criteria listed above to be safe, reliable, and maintainable. The plumbing systems consist of cold water, domestic hot water, recirculating water, waste and vent, and storm piping. The piping material for the smaller pipe sizes in the domestic water system are copper with soldered joints. Larger sizes of water piping are either black steel with welded or flanged joints or copper with soldered joints.

(2) Potable Hot Water: Potable hot water is generated at a minimum of 60°C (140°F) by a gas fired water heater located in the second floor mechanical equipment room. Water is heated to 60°C to minimize the risk of Legionella bacteria forming in the storage tank. A tempering valve is installed in the mechanical equipment room to temper water to the facility to 40.5°C (105°F) in accordance with the requirements of MIL-HDBK 1191.

(3) Potable Cold Water: [redacted]

(m) Fire Suppression: The entire facility is protected from fire by a wet pipe sprinkler system. No dry-type or pre-action type systems are included in the sprinkler design. The building is designed in accordance with all current DOD, national and local codes and criteria. A performance specification for the design of the wet pipe system was provided as a part of the design documents. The fire sprinkler contractor was required to perform hydraulic calculations and design the piping layout and sprinkler head layout for the facility. Information provided on the plans includes the coverage density, available flow, required flow, residual pressure, fire riser detail and routing of the main fire sprinkler lines. It was not anticipated that a standpipe system was required for this facility, nor is a fire pump required.

(n) Seismic Design: Seismic protection for the mechanical and plumbing systems for this facility are accomplished in accordance with the requirements of MIL-HDBK 1191 and NAVFAC P-355. The operational level criteria used for this facility is Basic Life Safety. Under this criteria, the most important requirement is to reduce the likelihood of injury or death to personnel by providing a structure which resists collapse. With this class of structure, the facility requires evacuation, and post-earthquake operations depend upon outside assistance. No specific time is specified for re-occupancy and utilization for this class of structure.

All air handling units are firmly attached to the structure to minimize damage in case of a seismic event. Additionally, suspended equipment is braced to prevent collapse during a seismic event. Large ductwork and pipes are braced and supported as required by NAVFAC P-355.2. All floor mounted equipment is provided with floor mounts to prevent the equipment from "walking" during an earthquake.

h. ELECTRICAL DESIGN

[redacted]

The new Medical/Dental Clinic is fed from existing secondary substation No.2 located near [redacted] The secondary of the substation has a 1200 amp draw-out type circuit breaker operating at 480/277 volt, 3-phase that serves the new Medical/Dental Clinic. The circuit breaker is a Culter Hammer model DB50.

Feeders from the secondary substation are routed underground to the clinic and enters into a 1200 amp circuit breaker in the main switchboard, MS, in room 1B23. There are two (2) places that the entire building's electrical system can be shut off: The 1200 amp draw-out circuit breaker located at substation No.2 and the 1200 amp main circuit breaker located in switchboard MS in room 1B23.

The distribution section of the main switchboard has eight (8) circuit breakers for distributing power throughout the clinic and one circuit breaker for the Transient Voltage Surge Suppressor (TVSS). Distribution Circuit Breakers (CB) located in the distribution section of switchboard MS are:

- 600 amp CB serving CHILLER (located outside on the east end of the building)
- 300 amp CB serving PANEL F42B (located in electrical room 2B13)

- 250 amp CB serving HVAC PANEL 2MEC (located in electrical room 2C16)
- 300 amp CB serving PANEL F42C (located in electrical room 2C18)
- 80 amp CB serving ELEVATOR DISCONNECT SWITCH (located in room 1E02)
- 150 amp CB serving RADIOGRAPHIC BREAKER (located in room 1B19)
- 100 amp CB serving HVAC PANEL 1MEC (located in mechanical room 1E15)
- 175 amp CB serving PANEL F41E (located in electrical room 1E19)

The Guard Shack and Visitor Check are fed from panel 2SITE located in room 2B13.

Most lighting in the facility is 610 mm x 1220 mm fluorescent fixtures with prismatic lens. Exit lights are LED type. The mall lighting is a combination of metal halide uplights and downlights. Stairwells have fluorescent wall brackets on emergency power. Most corridors have 610 mm x 610 mm fluorescent lights. Utility areas such as electrical and mechanical rooms have fluorescent strips with wire guards. Fixtures in the eye lane are mostly compact fluorescent downlights on dimmers. Some areas have decorative fluorescent uplights. Selected fluorescent fixtures have emergency battery units for egress lighting. Lighting control in the mall area is via lighting contactors operated by momentary wall switches. Other lights are controlled by local wall switches located in the space served by the lights.

Outdoor lighting is high-pressure sodium type fixtures. Outdoor lighting consists of bollards and shoebox fixtures for parking illumination. Outdoor lights are controlled by an astronomical time clock.

Recessed receptacles are installed in walls in convenient and practical locations as required by code. Receptacles located in restrooms and potentially wet locations are equipped with ground fault protection (GFI). Although there was not an emergency generator installed in the construction of the Medical/Dental Clinic, a 480Y277 volt 3-phase emergency panel and a 208Y/120 volt 3-phase emergency panel was installed. Selected loads in the facility are circuited to these panels such that a future standby emergency generator can be easily phased into the function of the clinic. Such loads include lab refrigerators, receptacles in selected DTR's, methane gas panels, dental air compressor and turbine.

Conduit in dry areas is electrical metallic tubing (EMT) for branch circuits. Conduit connections to vibrating equipment are flexible metal conduit. Conductors are THHN, THW, and THWN copper. No aluminum has been installed in this facility. Disconnect switches are heavy duty type.

This facility does not have a lightning protection system.

i. LIFE SAFETY AND FIRE PROTECTION DESIGN

(1) Introduction

Life Safety/Fire Protection was developed in accordance with the requirements of Chapter 26, NFPA 101, Military Handbook MIL-HDBK-1191, Military Handbook MIL-HDBK-1008C, and the Uniform Building Code. A complete listing of applicable codes that were used in the design of this project are noted below:

(2) **Criteria**

Applicable Building Codes:

NFPA 10	Portable Fire Extinguishers, 1998 Edition
NFPA 13	Sprinkler Systems Installation, 1996 Edition
NFPA 45	Fire Protection for Laboratories Using Chemicals, 1996 Edition
NFPA 70	National Electrical Code, 1996 Edition
NFPA 72	National Fire Alarm Code, 1996 Edition
NFPA 90A	Installation of Air Conditioning and Ventilating Systems, 1996 Edition
NFPA 101	Life Safety Code, 1997 Edition
NFPA 780	Lightning Protection Code, 1997 Edition
Uniform Building Code, 1997 Edition	
MIL-HDBK-1008C	Fire Protection, 10 June 1997
MIL-HDBK-1191	Department of Defense Medical and Dental Treatment Facilities Design and Construction Guide, 24 May 1996

(3) **General Building Description**

The Medical/Dental Clinic, [redacted] is a two story building of approximately 4456.69 GSM (47,970 GSF). The first floor is rectangular in shape and houses ancillary, clinic and logistics space. The total first floor area is approximately 30,000 GSF. The second floor is also rectangular in shape and houses Administration, Dental Clinic, Mental Health, Bioenvironmental Engineers, Military Public Health and mechanical space. The total second floor space is approximately 18,000 GSF. There is a two story open space through the middle of the building that includes an open "convenience" stair.

(4) **Occupancy Classification**

The clinic will be classified as Business Occupancy in accordance with Paragraph 4.4.1(c)/MIL-HDBK-1008C and the Life Safety Code (LSC), NFPA 101. The central waiting/circulation area on the first floor was considered as Assembly Occupancy for occupant load calculations.

(5) **Construction Type**

The clinic is Construction Type II-N/Uniform Building Code (UBC) in accordance with the requirements of Paragraph 4.4.2(b)/MIL-HDBK-1008C. The fire resistance requirements for Type II-N construction comply with Section 603 and Table 6-A of the UBC.

(6) Sprinkler Protection

The building will be fully sprinklered with a wet pipe sprinkler system as required by Paragraph 4.4.5/MIL-HDBK-1008C. The sprinkler system was installed in accordance with the requirements of Section 7-7/NFPA 101 and NFPA 13.

(7) Allowable Floor Area

The allowable floor area is unlimited for a business occupancy building that is provided with an approved automatic sprinkler system throughout and surrounded by public ways or yards not less than 60 feet in width. (Reference Paragraph 505.2/UBC.) Therefore, it was not necessary to have any area separation walls (Reference Paragraph 504.6/UBC) in the building.

(8) Means Of Egress

Exit doors were provided around the perimeter of the building to meet the exit requirements.

The design incorporates the following egress parameters which meet or exceed the LSC requirements:

- The minimum width of all corridors is 5'-0" in width.
- Corridors were required to have a fire resistance rating.
- The minimum width of all single doors is 3'-0".
- The minimum width of each leaf of all double doors are 3'-0".
- No deadend corridor exceeds 50 feet.
- No common path of travel exceeds 100 feet.
- The travel distance to an exit does not exceed 300 feet.
- An area of refuge was provided as required by Paragraph 26-2.2.10/LSC.
- Exit stairs are a minimum of 44" in clear width.

The means of egress are illuminated in accordance with Section 5-8/LSC.

Emergency lighting is provided in accordance with Section 5-9/LSC.

Means of egress are marked in accordance with Section 5-10/LSC.

(9) Vertical Openings

The two story open space is separated from the first and second floor area with a smoke barrier partition (non fire rated) constructed in accordance with Section 6-3/NFPA 101. The use of this type of separation is in accordance with the requirements of Paragraph 6-2.4.5, including Exception #1 to Paragraph 6-2.4.5(d)/NFPA 101.

There are three stairwells serving the second level. Two are exit stairwells and are one hour fire rated construction with "B" label one hour fire rated doors. The third stairway is an open stairwell located in the central open area and is a "convenience" stair, not a required exit.

One of the two exit stairs discharges directly outside as required by Paragraph 5-7.2/NFPA 101 and the other exit stair discharge leads to a free unobstructed way to the exterior of the building in accordance with Paragraphs 5-7.2(a), (b), and (c) of NFPA 101. Each of the exit stairs are a minimum of 44" in clear width with 36" wide doors.

(10) Exit Capacity

The two exit stairwells provide an exit capacity for 293 people which is more than adequate for the anticipated occupant load on the second floor of approximately 180 people. There are six exit doors provided from the first level to the exterior which provides more exit capacity than required for the first floor occupant load.

(11) Interior Finish

Interior finish throughout the building is Class A or Class B having a flame spread rating of less than 25 or 75, respectively. A smoke developed rating of less than 50 for Class A and 100 for Class B was provided for interior finish. Interior floor finish in the corridor and exits are a minimum Class I, having a minimum critical radiant flux rating of 0.45 watts per square centimeter.

(12) Portable Fire Extinguisher

Portable fire extinguishers suitable for Class "A" fires were laid out in accordance with Table 3-2.1, NFPA 10 for the appropriate hazard occupancy.

(13) Occupancy Hazard Classification

Occupancy hazard classifications are basically be in compliance with the requirements of Appendix "B", MIL-HDBK-1008C, as noted below:

(a) The following areas are designated as light hazard occupancy:

Outpatient clinics
Administrative areas
Waiting areas
Radiology

(b) The following areas are designated as ordinary hazard Group 1:

Storage areas (100 SF or less)
Electrical closets (rooms)
Mechanical rooms (housing air handling equipment)
Telephone rooms
Communication closets (rooms)

(c) The following areas are designated as ordinary hazard Group 2:

Pharmacy

Clinic/Ancillary Storage Areas (greater than 100 SF)
Medical Laboratory (Fire Hazard Class "C" per NFPA 45)
Electrical Switchgear Room
Logistics Storage/Loading Dock
Central Mechanical Equipment Room
X-ray Film Files
Trash Room
Flammable Storage (less than 50 SF)
Hazardous Storage (less than 100 SF)

(d) Sprinkler design criteria for the various hazard classifications is noted below:

(1) Light hazard sprinkler criteria were designed to provide a water discharge density of 0.10 GPM per square foot over the hydraulically most remote 3,000 square feet with a maximum sprinkler spacing of 225 square feet per sprinkler. Hose stream allowance will be 250 gallons/minute for a duration of 45 minutes.

(2) Ordinary hazard Group 1 systems were designed to provide a water discharge density of 0.15 GPM per square foot over the hydraulically most remote 3,000 square feet with a maximum sprinkler spacing of 130 square feet per sprinkler. Hose stream allowance will be 500 gallons/minute for a duration of 60 minutes.

(3) Ordinary hazard Group 2 were designed to provide a water discharge density of 0.20 GPM per square foot over the hydraulically most remote 3,000 square feet with a maximum sprinkler spacing of 130 square feet per sprinkler. Hose stream allowance will be 500 gallons/minute for a duration of 75 minutes.

(14) Water Supply

(a) Water supply is designed to meet the minimum requirements for an automatic sprinkler system in accordance with NFPA 13 and MIL-HDBK-1008C requirements. The primary water supply is adequate; therefore, onsite water storage was not required (Reference MIL-HDBK-1008C).

(b) Fire hydrants were provided around the perimeter of site which meets the requirements of Paragraph 5-7.3, for MIL-HDBK-1008C.

(15) Fire Detection/Alarm

See Electrical Basis of Design for criteria.