# Appendix A

## Example VAHBS Hospitals

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## Introduction

### Purpose

The Facilities or Engineering Officers at the Medical Centers have gained valuable insights into operating; maintaining and modifying hospitals built using the VAHBS. Field surveys and interviews were conducted in August 2005 for the purpose of gathering and recording feedback on the long-term benefits or deficiencies of the VAHBS.

Field surveys were conducted at the three example Medical Centers. The main buildings at these Medical Centers have been in operation from about 11 to 18 years. In that time the buildings have undergone varying amounts of modification/remodeling.

### Data Sheet

These sheets provide a one-page summary of key information for building, service module, and service zone (interstitial) strategies used at the Medical Centers surveyed.

### Session Notes

The interview notes include relevant comments and observations regarding construction, operation, maintenance, and modification of building shell and service systems. Where applicable, comments regarding remodel or new construction at the Medical Center were solicited. Observations or recommendations for improving or implementing the VAHBS were recorded.

### Analysis

In this section the integration of services and systems in the existing facilities is compared with the prototype design proposed by the Red Book in 1972-77. Service Module strategies are compared for the areas of structural bay, service bay, and service distribution and integration in the service zone and its subzones and channels.

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## Medical Center A
## VAHBS Data Sheet

**Functional Area:** 1.4 M BGSF **Stories**: 6 **Basement:** Yes **Subbasement:** No

**Interstitial Area:** **Levels:** 7

**Construction: Structural Frame:** STEEL **Walk-on Platform:** Lt Wt PC Conc on Steel Deck

### Service Module Information

| Functional Area Type | Typical Gross Floor Area per Module (SF) | Service Bay Location | Typical Dimensions | |
|---|---|---|---|---|
| | | | Structural Grid | Floor to Floor |
| Clinical | 18,000 | External | 36'-6" x 36'-6" | 18'-10" |
| Nursing Units | 18,000 | External | 36'-6" x 36'-6" | 18'-10" |

### Typical Service Zone Strategy

| | |
|---|---|
| S-1 | 7 ½" |
| S-2 | 21" |
| S-3 | 36" |
| S-4 | 18" |
| S-5 | 15" |
| S-6 | 4 ½" |
| S-7 | 4" w/ 10'-0" Clg.<br>16" w/ 9'-0" Clg. |

Typical Subzone Dimensions

Subtotal S-1 through S-6 Subzones = 8'-9"

**S-3 Subzone Channels**—36'-6" Bay

| ELEC/ COM | RETURN | SUPPLY | EXHAUST | PLUMB | ACCESS |
|---|---|---|---|---|---|
| 6'-1" | 6'-1" | 6'-1" | 6'-1" | 6'-1" | 6'-1" |

**S-4 Subzone Channels**—36'-6" Bay

| SUPPLY | RETURN/ EXHAUST | PLUMB | ELEC/ COM |
|---|---|---|---|
| 9'-1 ½ " | 9'-1 ½ " | 9'-1 ½ " | 9'-1 ½ " |

## Medical Center A
## Interview with Facilities Officer

**Session Notes, August 30, 2005**

**Attendees** Howard Gibson, Robert Clifton, William Nelson, Nicholas Krauja, Theodore Moeller

### Construction

Mr. Gibson was the Senior Resident Engineer in Charge and Mr. Clifton was the SRE responsible for electrical systems during construction of the facility. They provided valuable insights into construction of VAHBS hospitals and offered suggestions for construction drawing content and contract requirements for coordination by the general and sub-contractors.

Modularity and familiarity benefited construction process. Repetitive components facilitated ordering materials and allowed contractor to work with suppliers to develop and obtain factory fabricated custom items, e.g., special wireway transitions. CD's required contractors to prepare large scale coordination drawings for all areas of the building. Enforcement of this requirement by RE's during construction identified and resolved potential conflicts prior to installation.

### Operation

Interstitial level aids greatly in day-to-day maintenance. Most work can be accomplished without disruption to functional zones. Even if functional zones are affected, only one floor will be involved in shut-downs or relocations (e.g., plumbing work will not require access from ceiling or floor below).

### Modifications

Building was designed based on a workload for 1047 inpatient beds and 120,000 annual outpatient visits. In 2005 hospital is operation with 500 inpatient beds and 800,000 outpatient visits. Vacated nursing units have been converted to other functions. All major radiology equipment has been replaced.

Availability of interstitial service zone has facilitated conversions/remodel work and greatly reduced impacts on occupied functional space.

Telecommunications work under control of IRMS. Cabling installed after construction contract did not use wireway system. Installers, including vendors/contractors, disregard established subzones and channels. Finding point-to-point runs of cable supported from other services is not unusual.

### Comments Advantages/Disadvantages of VAHBS

Continuing education of designers, bidders, and contractors is essential to maintain integrity of established subzones and channels.

### What would you change?

Education of designers, bidders, and contractors is essential for success of VAHBS. Recommend intensive pre-bid meeting (2 days) to educate contractors, subs, and suppliers. Recommend making fire sprinkler and transport (pneumatic tube) integrated systems.

## Medical Center A
## Analysis of Building Systems and Modules--
## Building Construction

### Shell Systems

**Structure:** Steel frame; rolled sections for columns, girders and beams; special "dropped" girder to allow services in S-2 subzone to cross intermediate girder lines.
**Platform:** Lightweight Portland cement concrete on steel deck.
**Ceiling:** Suspended acoustical and GWB.
**Partitions:** GWB on metal stud, non-bearing.

### Integrated Service Systems

**HVAC:** Air handlers and crossovers of supply and return ductwork are located in Service Bay. Air intake is by louvers in exterior wall of Service Bay. Main runs are in S-3 subzone; terminal boxes and branch ducts are in S-4 subzone. Shafts for exhaust are located at Service Bays and adjacent to elevator hoistways. Fans are on roof in penthouse. HVAC piping is in duct channels, parallel to ducts.

**Plumbing:** Risers are in Service Bay, drainage branches in S-2 subzone, drainage mains and supply mains for water and gases are in S-3 subzone; supply branches and local distribution in S-4 and S-5 subzones.

**Electrical:** The Service Bay electrical room is an expanded metal fence enclosure with vertical bus risers, wall-mounted distribution and branch circuit panels, and ceiling-suspended stepdown transformers. Branch circuits are installed in 4" x 4" wireways from the Service Bay electrical room to throughout the interstitial space Zones S3/S4. Wireways are mounted 'christmas-tree' fashion on metal channel posts secured to the walk-on deck. The post supports are dedicated to electrical distribution; telecommunications wireways are mounted on a separate 'christmas-tree' support system. The wireways are mounted at a 45-degree angle on the supports. The telecommunications wire-basket cable tray and the signal systems wireways in the Service Bay may violate the National Electric Code clear space above some of the electrical equipment. Interstitial lighting is by wall-mounted incandescent fixtures, which yield sufficient illumination but also uncomfortable glare.

**Communications:** Telephone/data, nurse call, CATV, paging, and radio entertainment were detailed in the construction documents as integrated systems, installed in three wireways. Telephone/data and nurse call have dedicated 4" x 4" wireways, with the remainder of the systems installed together in a common 4" x 4" wireway. Telephone/data cabling is installed in wire-basket cable tray above the electrical area of the Service Bay; the other signal systems cross the electrical space in wireway. As was typical in the 1980's and 1990's, the telephone/ data cabling was installed after construction by separate contract, and after the telephone/data wire passes from the Service Bay into the interstitial space, it generally is not installed in the empty wireways put in place by the original construction project. Cabling is bundled and relatively neatly attached to the structural steel. The other signal systems, installed by the original contractor, use the wireways as intended.

## Medical Center A

### Non-integrated Systems

**Fire Protection:** Contract documents did not include sprinkler and standpipe systems in distribution strategy. Risers are typically located in or near exit stairs. Mains typically follow plumbing supply channels with branches and sprinkler heads in S-7 subzone.

**Transport:** Pneumatic tube routed through service zone; no dedicated sub zone or channel; special coordination required during design/construction for interfaces with other subsystems.

## Medical Center A
## Analysis of Building Systems and Modules--
## Service Module

**Typical Size/Dimensions** regular modules; square or wedge shaped; up to about 20,000 gsf

| | |
|---|---|
| **Structural Bay** | 36'-6" x 36'-6" |
| **Location of Service Bay** | typically external at narrow end of wedge; or at one end of module with access to courtyard; bays stack vertically |
| **Fire Sections** | typically one 18,000 to 22,000 sq module per fire section; 2-hour fire rated partitions extend from structural floor to structural floor. |

### Service Bay

**Layout in Plan:** typically square plan; electrical / telecommunications area separated from HVAC areas by wire mesh partitions

### Service Zone

| | |
|---|---|
| **Subzones** | 18'-10" floor to floor; 8'-6" typical from top S-1 to bottom S-6 platform; S-7 16" with 9 ft ceiling. |
| **S-3 Channels** | typical 5 channels at 6'-1" in each 36'-6" bay between hanger rods for platform support; 4 for services, 1 for access aisle. |
| **S-4 Channels** | typical 4 channels at 9'-1 ½" in each bay between hanger rods; 4 for service, none for access. |

## Operation

### Maintenance/Repair

Headroom and accessibility generally very good.
Lighting levels lower than in other Medical Centers surveyed.
Receptacles for tools.
No drains provided.

### Modifications/New Construction

Much of the Tele/data cabling installed after construction contract did not use wireways provided; installed across channels and subzones; some cables run in open and not protected from potential damage.
Most MPE work followed available channels.

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**Medical Center A**

Note plumbing risers and stacks in background.

**Photo A-1 Service Bay**
Showing industrial stair for access to interstitial service zone

Note non-compliant telephone/data cabling installed outside of wire-ways.

**Photo A-2 Service Bay**
Side showing electrical penetrations of 1-hour wall to interstitial service zone

**Medical Center A**

Fire dampers are not required at duct penetrations.

**Photo A-3 Service Bay**
Side showing duct penetrations of 1-hour wall to interstitial service zone


**Photo A-4 Service Bay**
Side showing piping penetrations of 1-hour wall to interstitial service zone

## Medical Center A

Note dropped girder in S-2 subzone.

Note non-compliant tele-phone/data cabling.

Note branch ducts supported from platform.

**Photo A-5 Interstitial Service Zone**
Showing typical distribution subzones and channels

S-2 subzone. Note dropped girder in background.

S-4 subzone. Hanger rods are visible at both sides of channel for electrical wire-ways.

Channel for HVAC is to left.

Note HVAC piping (insulated) and plumbing are crossing at right angles in S-5 subzone below.

**Photo A-6 Interstitial Service Zone**
Showing Electrical channel in Subzone S-4

**Medical Center A**

Note piping in S-2 subzone.

Note S-3 mains are supported from structure above; S-4 laterals are supported from interstitial platform (purlins not visible in photo).

**Photo A-7**
Showing transition of Electrical Wireways from mains to laterals at S-3 to S-4 subzones

Note specially fabricated transitions.

Note strut “christmas trees” supporting wireway from platform.

**Photo A-8**
Showing transition of Electrical Wireways from mains to laterals at S-3 to S-4 subzones

**Medical Center A**

Note branch duct, sanitary piping and tele/data cabling installed outside designated channels. Low concentration of services in this area still allows access for maintenance or modifications.

**Photo A-9 Interstitial Service Zone**
Showing remodel work


Note haphazard modifications to HVAC and telecommunications systems. There are numerous violations of established channels for services and access aisle.

Installation has compromised ability to maintain systems in this area as well as future adaptability.

**Photo A-10 Interstitial Service Zone**
Showing remodel work

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## Medical Center B
## VAHBS Data Sheet

**Functional Area:** 1.5 M BGSF **Stories**: 4 **Basement:** Yes **Subbasement:** No

**Interstitial Area:** 1.0 M **Levels:** 5

**Construction: Structural Frame:** Cast in Place Concrete **Walk-on Platform:** Gyp Concrete over fiberglass form board

### Service Module Information

| Functional Area Type | Typical Gross Floor Area per Module (SF) | Service Bay Location | Typical Dimensions | |
|---|---|---|---|---|
| | | | Structural Grid | Floor to Floor |
| Clinical | 18,000 to 20,000 | External/Internal | 22'-6" x 22'-6" | 18'-8" |
| Nursing Units | 10,000 to 12,000 | External/Internal | 22'-6" x 22'-6" | 18'-8" |

### Typical Service Zone Strategy

| | Typical Subzone Dimensions |
|---|---|
| S-1 | 4 1/2" |
| S-2 | 24" |
| S-3 | 44" |
| S-4 | 16" |
| S-5 | 11" |
| S-6 | 4" |
| S-7 | 12 ½" w/ 9'-0" Clg. |

Subtotal S-1 through S-6 Subzones = 8'-7 ½"

**S-3 Subzone Channels**—90'-0" Bay

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | U | P | H | H | H | H | U | U | P | U | U | U | A |
| 4'-0" | 9'-4" | 6'-4" | 6'-4" | 6'-4" | 6'-4" | 6'-4" | 6'-4" | 6'-4" | 6'-4" | 6'-4" | 6'-4" | 9'-4" | 4'-0" |

**S-4 Subzone Channels**—45'-0" Bay

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E | A | H | P | A | E | A | E | A | H | P | A | E |
| 1'-5" | 2'-0" | 11'-0" | 3'-0" | 2'-0" | 1'-5" | 2'-0" | 1'-5" | 2'-0" | 16'-0" | 3'-0" | 2'-0" | 1'-5" |

A=Access E=Electrical H=Mechanical P=Plumbing U=Unassigned

## Medical Center B
## Interview with Facilities Officer

### Session Notes, August 22, 2005

| | | |
|---|---|---|
| **Attendees** | John Bochek | William Nelson |
| | Steve Tharldson | Nicholas Krauja |
| | Cindy Doolittle | Theodore Moeller |

**Construction**

Engineering staff was not present during initial construction. VA staff worked on several completion items prior to initial occupancy.

**Operation**

Interstitial service zone reduces time required to complete maintenance and modifications/remodel. Impacts on occupied space and adjacent areas are reduced.

**Modifications**

Original designed for 725 Med-Surg-Psych beds and 120 bed NHCU. Wings converted or remodeled as bed count reduced. Radiology equipment has been replaced.

Tele/data extensions and addition of new systems are by IRMS and do not use defined subzones and channels.

**Advantages/Disadvantages of VAHBS**

**What would you change?**

Provide drains in service zone.

## Medical Center B
## Analysis of Building Systems and Modules--
## Building Construction

### Shell Systems

**Structure:** Cast-in-place concrete.
**Platform:** Gypsum concrete on fiberglass formboard.
**Ceiling:** Suspended acoustical and GWB.
**Partitions:** GWB on metal stud, non-bearing.

### Integrated Service Systems

**HVAC:** Exhaust fans are in penthouse or on roof. Air handlers are in service bays of external modules with intakes on exterior walls. Air handlers for internal modules are in penthouse with shafts for ducts to the modules. Crossovers of main ducts occur in Service Bays. HVAC piping generally parallels duct systems in HVAC channels. Terminal boxes are in S-4 subzone with final distribution in S-5 subzone.

**Plumbing:** Risers are in Service Bay. Waste lines are in S-2 subzone and drop to mains in S-3 subzone. Vent piping and pressure piping mains for water and gases are in S-3 subzone; supply branches are in S-4 subzone; and local distribution is in S-5 subzone.

**Electrical:** The Service Bay electrical room is a dedicated room with vertical bus risers, wall-mounted distribution and branch circuit panels, and stepdown transformers. Branch circuits are installed in 4" x 4" wireways from the Service Bay electrical room to throughout the interstitial space Zones S3/S4. Wireways are mounted 'christmas-tree' fashion on full height metal channel posts secured to both the walk-on deck and the structure above. The post supports are dedicated to electrical distribution; telecommunications wireways are mounted on a separate support system identical to that provided for electrical. The wireways were detailed on the construction documents to be mounted at a 45-degree angle, but this was not followed in construction. The wireways are mounted parallel to structure, with the hinged covers vertical, and wiring is apt to fall out of the wireway when the cover is opened.

**Communications:** All telecommunications systems originate in a dedicated room in the Service Bay. Telephone, network, and signal wireways were originally installed. The telephone (6") and network (4") wireways were little-used. The other signal systems were installed in a 4" common wireway. Some telephone and data cabling was installed loose in the interstitial space, but the bulk of it is in Zone 7 between the walk-on deck and the suspended ceiling of the Functional Floor.

### Non-integrated Systems

**Fire Protection:** Contract documents did not include fire protection system piping in distribution strategy. Risers are typically located in or near exit stairs. Branches and drops to sprinkler heads are in S-7 subzone.

**Transport:** Pneumatic tube system "overlaid" over services in dedicated subzones or channels.

## Medical Center B
## Analysis of Building Systems and Modules--
## Service Module

**Typical Size/Dimensions:** In plan, the building is basically a large square with two projecting rectangular wings. Most service modules are rectangular and vary considerably in size depending on type of functional space. Modules at building corners extend in two directions from the service bay in an "L" geometry.

| | |
|---|---|
| **Structural Bay** | 22'-6" x 22'-6" typical |
| **Location of Service Bay** | Exterior service bays are located at building corners. Interior modules are served from penthouse equipment rooms. |
| **Fire Sections** | |

### Service Bay

**Layout in Plan:** Service bays are nearly square in plan.

### Service Zone

| | |
|---|---|
| **Subzones** | 18'-8" floor to floor; 8'-7 ½" typical from top S-1 to bottom S-6 platform; S-7 subzone 12½" with 9 ft ceiling. |
| | |
| **S-3 Channels** | Typical 14 channels in 90 ft bay (4 structural bays); unassigned channels and access aisles outboard at sides of bay. |
| **S-4 Channels** | Typical 13 channels in 45 ft bay, narrow (2 ft) access aisles alternate with channels for services. |

## Operation

### Maintenance/Repair

Access to all areas is very good. Lighting level in service zones is very good. Receptacles are available in service zone for tools.

### Modifications/New Construction

Although contractors/installers have used numerous shortcuts (especially for communications), overall subzones and channels remain well defined.

## Medical Center B

Note cast-in-place concrete structure and piping offsets from S-2 subzone.

Note hanger rods for interstitial platform system; tops of purlins are visible above gypsum concrete deck.

**Photo B-1 Interstitial Service Zone**
Near end of main runs

Note non-compliant tele/data cabling.

Ends of electrical mains in S-3 subzone can be seen in foreground at right side of photo.

**Photo B-2 Interstitial Service Zone**
Showing HVAC mains in S-3 subzone and branch ducts in S-4 subzone

## Medical Center B

Note branch ducts in back-ground in S-4 and S-5 subzones.

**Photo B-3**
Showing wireways in S-3 and S-4 subzones

**Photo B-4 Typical Service Bay**

**Medical Center B**

Note industrial stair for access to interstitial service zone in background.

Crossovers occur in Service Bay, **not** interstitial service zone.

**Photo B-5 Service Bay**
Showing crossovers of ducts and piping

**Photo B-6 Interior Service Module**
Showing ducts to interstitial service zone from penthouse

## Medical Center B

Note fiberglass formboard and sub-purlins for gypsum plat-form deck.

Fire sprinkler piping is run in subzone S-7.

**Photo B-7 Subzone S-7**
Above suspended lay-in ceiling system

## Medical Center C
## VAHBS Data Sheet

**Functional Area:** 863,000 BGSF **Stories**: 9 **Basement:** Yes **Subbasement:** No

**Interstitial Area:** 700,000 **Levels:** 10

**Construction:**

**Structural Frame** Concrete—prestressed, precast frame and "joists" w/ cast-in-place topping slabs

**Walk-on Platform** Light Weight Concrete on Steel Deck

**Service Module Information**

| Functional Area Type | Typical Gross Floor Area per Module (SF) | Service Bay Location | Typical Dimensions | |
|---|---|---|---|---|
| | | | Structural Grid | Floor to Floor |
| Clinical | 22,000 | External | 27'-0" x 27'-0" | 20'-4" |
| Nursing Units | 15,000 | External | 27'-0" x 27'-0" | 19'-4" |

**Typical Service Zone Strategy**

| | |
|---|---|
| S-1 | 6" |
| S-2 | 25" |
| S-3 | 40" |
| S-4 | 20" |
| S-5 | 16" |
| S-6 | 4 ½" |
| S-7 * | ½" W/ 10'-0" Clg.<br>12 ½" W/ 9'-0" Clg. |

Typical Subzone Dimensions

Subtotal S-1 through S-6 Subzones = 9'-3 ½"
* S-7 Based on 19'-4" FLR to FLR

**S-3 Subzone Channels**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| HVAC | ELEC | U | PLMB | HVAC | U | HVAC | ACCESS |
| 4'-2" | 3'-0" | 10" | 2'-6" | 5'-8" | 10" | 4'-2" | 3'-0" |

**S-4 Subzone Channels**

| | | | | | |
|---|---|---|---|---|---|
| PLMB | HVAC | HVAC | HVAC | ELEC | ACCESS |
| 1'-9" | 6'-5" | 6'-5" | 3'-5" | 3'-0" | 1'-9" |

## Medical Center C
## Interview with Facilities Officer

### Session Notes, August 22, 2005

**Attendance** Wallace Thompson
William Nelson
Nicholas Krauja
Theodore Moeller

### Construction

Interstitial deck installed after mains hung from floor above. Contractors typically used high-reach lifts to install from structural floor below. Openings through platform were sleeved before lightweight concrete placed.
Floor construction is topping slab over precast, pre-tensioned "joists." Contractor was allowed to run conduits for branch circuits in topping. Creates difficulties for remodel work.

Smoke evacuation is provided for interstitial levels. Fire barriers do not extend vertically through the service zone.

### Operation

Interstitial service zone facilitates maintenance and modifications of service systems.

### Modifications

Lightweight concrete easily cut (hole saw) and patched for service relocations.

### Comments--Advantages/Disadvantages of VAHBS

### What would you change?

Service bays should be sized for growth potential in the module.
Enforce rules for service distribution (i.e., no conduit in slabs).

## Medical Center C
## Analysis of Building Systems and Modules--
## Building Construction

### Shell Systems

**Structure:** Pre-cast pre-stressed concrete frame with cast-in-place structural and topping slabs.
**Platform:** Lightweight concrete on steel deck.
**Ceiling:** Suspended acoustical and GWB.
**Partitions:** GWB on metal stud, non-bearing.

### Integrated Service Systems

**HVAC:** Air handlers are in service bays with intake through exterior wall. Crossovers of main ducts occur in Service Bays. HVAC piping generally parallels duct systems in HVAC channels. Terminal boxes and final distribution are in S-5 subzone.

**Plumbing:** Waste lines are in S-2 subzone and drop to mains in S-3 subzone. Risers are in Service Bay. Vent piping and supply mains for water and gases are in S-3 subzone; supply branches are in S-4 subzone; and local distribution is in S-5 subzone.

**Electrical:** The Service Bay electrical room is a dedicated room with vertical bus risers, wall-mounted distribution and branch circuit panels, and stepdown transformers. Branch circuits are installed in 4" x 4" wireways from the Service Bay electrical room to throughout the interstitial space Zones S3/S4. Both electrical and telecommunications wireways are mounted flat in a common, custom, stepped support rack suspended from the structure above. The covers hinge open from the top. Electrical wireways are noted as being over-full per NEC from the panelboards to the first branch wireway. Code allows no more than 20% fill for this wireway application.

**Communications:** All telecommunications systems originate in a dedicated room in the Service Bay. Telephone, network, and signal wireways were originally installed. The 4" telephone and network wireways were little-used. Telephone and data cabling was installed in the interstitial space or in Zone 7. The other signal systems were installed in a 4" common wireway, and better adhere to the VAHBS. A separate data network installed by VAMC Engineering used the network wireway for the purpose intended.

### Non-integrated Systems

**Fire Protection:** Fire sprinkler and standpipe was not integrated with distribution strategy for interstitial channels. Risers are typically located at exit stairs. Branches and drops are in S-7 subzone.

**Transport:** Pneumatic tube system cuts across subzones and channels.

## Medical Center C
## Analysis of Building Systems and Modules--
## Service Module

### Typical Size/Dimensions

| | |
|---|---|
| **Structural Bay** | 27'-0" x 27'-0" |
| **Location of Service Bay** | external, near corner of module. |
| **Fire Sections** | do not extend through interstitial service zone. |

### Service Bay

**Layout in Plan** Rectangular, typically located near corner of module.

**Layout in Section** Extends from structural floor to structural floor.

### Service Zone

| | |
|---|---|
| **Subzones** | 19'-4" typical floor to floor (20'-4" clinical floors); 9'-3 ½" typical from top S-1 to bottom S-6 platform; S-7 12 ½" w/ 9 ft ceiling and 19'-4" story height. |
| **S-3 Channels** | Services require header in S-3 subzone to reach far end of module, mains then take off perpendicular to header and extend through S-3 sub-zone at intervals. Typical 5 channels parallel to purlins for deck (4 purlins at 6'-5" spacing per 27 ft bay). |
| **S-4 Channels** | typical 6 channels per 27 ft bay; hanger spacing varies. |

## Operation

Plan configuration locates most service bays near courtyard at a corner of the service module. Main service runs are routed around the edge of the courtyard, requiring S-3 channels to make 90-degree turns. Service distribution patterns allow for continuous access aisle only around the perimeter of the entire floor. No cross aisles are provided between service modules. This condition increases the difficulty of access and increases the potential or "cross service" between modules.

### Maintenance/Repair

Access is fair compared to other Medical Centers due to lack of circulation aisles in transverse direction. Lighting level is good. Receptacles are available for tools. No drains in service zone(interstitial).

### Modifications/New Construction

Remodel work was in progress on 9th floor during survey. Work was proceeding without disruptions to occupied space on floor below.

**Medical Center C**

Fire dampers are not required at duct penetrations.

**Photo C-1 Service Bay**
Side showing penetrations of 1-hour wall to interstitial service zone

Note duct and piping crossovers occur in service bay, not in interstitial service zone.

**Photo C-2 Service Bay**
Side showing duct penetrations of 1-hour wall to interstitial service zone.

**Medical Center C**

Note HVAC branches crossing under wireway mains in S-4 channel in background.

Note plumbing in S-5 subzone at far left side of photo.

**Photo C-3**
Electrical transition from mains in S-3 subzone to branches in S-4 subzone.

Note transition of piping from S-2 to S-3 subzones in background.

Note fluorescent fixture lack wire guards.

Note hanger rods and purlins for platform deck system.

**Photo C-4 Interstitial Service Zone**
Showing typical perimeter access aisle (note stripe on deck)

**Medical Center C**

Pre-cast pre-stressed "joists"

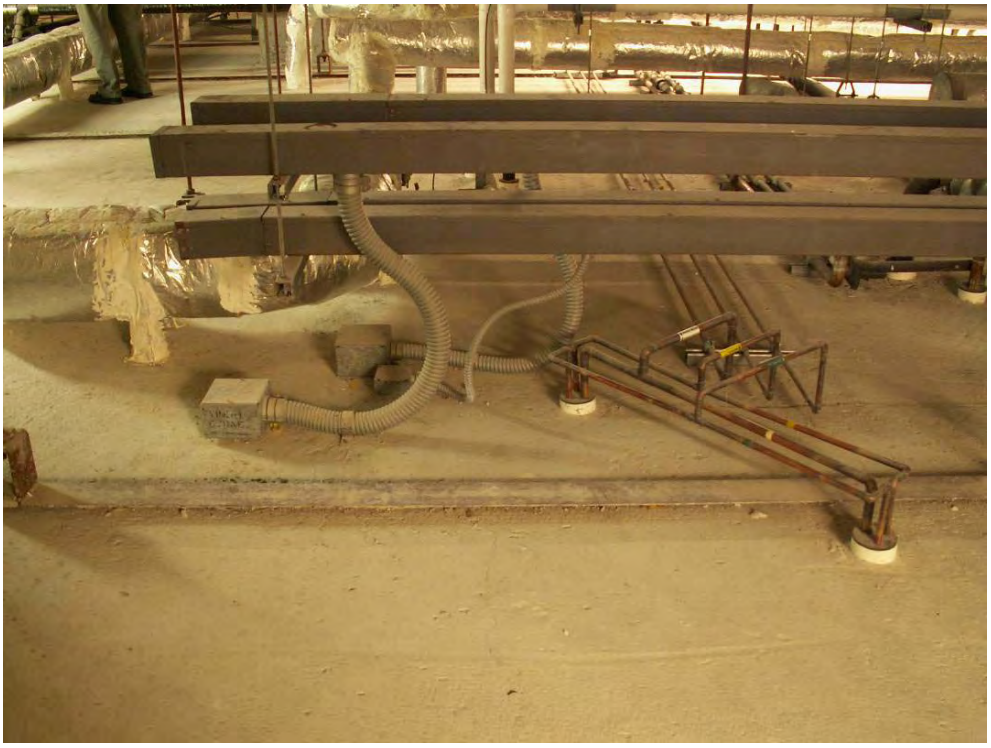
Subzone S-2

Subzone S-3

Subzone S-4

Subzone S-5

**Photo C-5 Interstitial Service Zone**
Showing typical distribution



S-4 subzone w/ HVAC & Electrical channels

Note flex conduit at transitions from wireway in S-4 through S-5 subzone.

Medical gas and plumbing in S-5 subzone.

Note exposed top of purlin for interstitial deck.

**Photo C-6**
Transitions from S-4 to S-5 subzones

**Medical Center C**

S-3 subzone

**Photo C-7**
Showing Electrical and HVAC channels in S-4 subzone crossing under HVAC main in S-3 subzone

S-2 subzone

Note wire guard on light fixture.

S-3 subzone

S-4 subzone

S-5 subzone

Note marking for access aisle at far left in foreground of photo.

**Photo C-8 Interstitial Service Zone**
Distribution