Section 4

Application of VAHBS to New Projects

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VA Criteria and Standards

VA provides guidance to A/Es for the design and construction of its facilities in a series of Design Guides, Design Manuals, Design, Alerts, Master Specifications and Standard Details. These documents can be found in the Technical Information Library (TIL) at http://www.va.gov/facmgt/standard/ . Standards referenced in this supplement include:

PG-18-1, *Master Construction Specifications*
PG-18-3, *Design and Construction Procedures*
PG-18-10, *Design Manuals*
PG-18-14, *Room Finishes, Door, and Hardware Schedule*
VA *Fire Protection Design Manual*
DVA *Physical Security Report*
H-18-8 *Seismic Design*

The criteria documents are generally organized by design or engineering discipline. Each document provides guidance specific to that discipline, e.g., such as guidance for the design of functional spaces, or detailed guidance for the selection, sizing, installation or modification of a particular system or subsystem. The interrelationship and future adaptability of the various subsystems and the building as a whole are addressed in the VAHBS Research Study Report (Red Book).

Use of VAHBS

VA policy as stated in VHA Program Guide PG-18-3, Topic 3 is to design new hospital buildings to provide for continuing adaptability throughout their structural life. The VAHBS provides a proven and cost-effective methodology and systems prototype for the integration of the various individual systems, subsystems and functional zones found in a hospital building. Specific zones and channels are assigned to each system and subsystem for distribution throughout the building. The high level of organization and discipline in locating service systems and components significantly enhances the constructability and adaptability of VA hospital buildings and meets VA policy.

The project team for a new VA hospital, including VA staff and design and engineering consultants, shall use this Supplement in conjunction with the VAHBS Research Study Report (Red Book) in the design and construction of new VAHBS buildings. This Supplement is intended to assist the project team in the application of the VAHBS to new designs by identifying outdated or obsolete portions in the 1977 document and providing examples of successful solutions and details used in implementing the VAHBS. The design team is expected to understand and apply all current VA criteria and standards and comply with applicable codes and regulations.

Organization of VAHBS Research Study Report

The VAHBS Research Study Report (Red Book) consists of three volumes: Volume 1-Design Manual, Volume 2-Data Base, and Volume 3-Project Report. Volume 2 contains a detailed data base on user needs, functional requirements, costs, labor unions, and laws and regulations. Volume 3 is the consultant's report describing the research and underlying assumptions used in developing the VAHBS.

Volume 1 of the Red Book was intended as the primary guide to design with the VAHBS. Volumes 2 and 3 were intended as secondary or reference documents. Accordingly this Supplement will provide guidance solely on the use of Volume 1.

Changes brought about by three decades of evolving healthcare and construction practices have made much of the programmatic data, planning data and dimensions in the report obsolete. Completely updating these Volumes 2 and 3 to reflect current standards is beyond the scope of this supplement.

The project team shall adhere to the latest VA criteria and current practice for functional and programmatic issues addressed by Volumes 2 and 3. The project team should particularly refer to the specific project space plan (program) in lieu of Volume 2. Users may refer to Volume 3 to gain a deeper understanding of the underlying principles of the VAHBS; however, users must keep in mind that current criteria and practices will supersede information in that volume.

Supplements to VAHBS Research Study Report

The information in the following paragraphs is provided to supplement Volume 1, Research Study Report, Project 99-R047; U.S. Government Printing Office Stock No. 051-000-00 112-5 (Red Book). The electronic file is available in the VA TIL at http://www.va.gov/facmgt/standard/bsds.asp

Volume 1—Design Manual

Volume 1 of the Red Book is divided into 4 parts: Basic Concepts, Planning Module, Building Subsystems, and Procedure. For ease of reference, the supplementary material in this section is presented in the order found in the Red Book.

VA Medical Center
Bay Pines, FL, 1983

Basic Concepts

The Prototype System Design

Section 110 of the Red Book introduces the prototype system design by describing the organization, background and intent of the VAHBS. The basic concepts remain sound and require only the following minor updates.

113.1 Integrated and Non-integrated Subsystems: Fire protection (sprinkler and standpipe) and Telephone/Data and other signal subsystems (including fire alarm and nurse call) are to be added to list of integrated subsystems.

Contract documents provide a performance specification for fire protection systems, and the contractor provides the final design and layout of the system. Documents typically locate the risers; mains and branches are routed by the contractor. The horizontal runs for these systems must be pitched to drain. Although final layouts are not included in the construction documents, a coordination strategy is required for sprinkler and standpipe systems to ensure that the zones and channels allocated for other subsystems will not be violated.

Telecommunications and other special systems (Tele/Data) continue to increase in quantity and complexity. VA criteria now require dedicated telecommunications equipment rooms to be separated from electrical equipment spaces. A high degree of adaptability and expansion is required for these subsystems.

113.2 Shell Systems: Refer to supplement for Section 310 below for commentary on structural systems.

Ceiling subsystem shall be split into platform and ceiling subsystems. The Red Book defined subzone S-6 as the ceiling: a combined walk-on platform or interstitial deck with surface applied finishes and fixtures on the underside (exposed to the functional zone). Current practice uses two subzones, S-6 and S-7. The S-6 subzone is the platform. The S-7 subzone includes the space below the platform and the suspended finish ceiling. Refer to supplement for Section 320 below for details of platform and ceiling construction. Refer to Appendix A for examples.

Wherever the Red Book refers to “ceiling” or “S-6” subzone the reader should apply the current definitions of S-6 platform and/or S-7 ceiling subzones as appropriate to the context.

Refer to the supplement for Section 330 below for commentary on partition systems.

Application

Section 120 provides general guidance on the use of the VAHBS for programming, budgeting and design of new hospital projects.

122 Data Base: Volume 2 contains a detailed data base on user needs, functional requirements, costs, labor unions, and laws and regulations. Volume 2 has not been updated since 1977 and much of the programmatic data, planning data and dimensions are obsolete. The project team shall use the space plan (program) specifically developed for the project and adhere to the latest VA criteria and current design practice for functional and programmatic issues.

Planning Modules

Section 200 introduces the modules and design configurations created for the Red Book. The functional program for VA hospitals has changed extensively since this section was written. The planning issues listed in this section still need to be addressed in design process; however, many of the conclusions regarding dimensions and geometries should be modified as noted in the following paragraphs.

Structural Bay

Size and geometry of the structural bay and planning modules are not restricted to the rectangular bay described in Section 210 of the Red Book. The project team may adjust the bay size and shape as appropriate for the program and systems used in a particular design. Selection of bay size will affect depth of structure (subzones S-1 and S-2) and floor to floor height when integrated with allocations for service subzones S-3 through S-7.

VA Medical Center
Augusta, GA, 1987

Service Module

Section 220: Describes the prototype service module and discusses the issues that the design team must consider when establishing modules. This section is supplemented as follows.

222 Size and Shape: Dimensions in Section 220 are not fixed standards. As with the structural bay, size and shape of the service modules may vary.

222.1.3 Fire Sections: Rename this section as "Fire and Smoke Compartments." Dimensions and sizes of service modules may vary as required by functional program and as required to meet limits on fire and smoke compartments. Smoke zones are limited to 22,500 square feet. Fire compartments should be limited to 52,000 square feet because NFPA 13 limits the maximum size of a sprinkler system to 52,000 square feet.

223 Service Bays: See structural comments for Section 300 for discussion of arrangement of framing (beams) and lateral systems (shear walls). Refer to Appendices A and B for examples of service bay arrangements used in existing VAHBS hospitals.

223.4 Priority of Service: Current Codes do not require that all of the fire or smoke separations from the functional zone be continued through the service zone. However, distribution of services will be simplified and the need for fire or smoke dampers will be minimized if the design team avoids sharing services between modules.

224 Service Zone: Split the S6 Platform/Ceiling subzone into two subzones: S-6 Platform and S-7 Ceiling.

224.2 Channels: Refer to examples in Appendices A and B, and details in Appendix C for examples of typical channels.

224.3 Access and Maintenance: Access to the interstitial service zone shall be provided by means of an industrial stair from the service bay and from fire/exit stairs in the service module. Ladders are not an acceptable means of access to the service zone. If the service zone is subdivided by partitions or walls, doors shall be provided for maintenance access and emergency egress. VA does not consider the interstitial service zone as occupied space.

224.4 Construction Design: Smoke barriers may not be required in the service zone. Design shall be based on VA *Fire Protection Design Manual* and applicable codes.

Amend Section 224 to add new subsection 224.6 as follows.

224.6 Wayfinding: The design team shall develop a strategy for wayfinding in the interstitial service zone(s). Permanent markings and or signage shall be provided as appropriate to assist in locating and using access routes, means of egress; and establishing position within the interstitial service zone relative to the functional zone and any fire or smoke separations below.

225 Functional Zone: Ceiling heights shall be in accordance with VA Program Guide PG-18-10, *Architectural Design Manual for New Hospitals/Replacement Hospitals* Paragraph 4.6.2.

Partitions in the functional zone will typically terminate at the underside of the walk-on platform (S-6 subzone). Service distribution components should be housed in the partitions and not surface mounted.

Space Module

Current programmatic requirements for nursing units, including bed room types and sizes, have changed from those used to establish the space modules in the Red Book. Section 230 may be used as a general guide to identify issues to be considered when establishing nursing unit space modules; however, the design team will have to develop new space modules. The requirements and criteria for nursing units can be expected to continue to evolve. Future adaptability needs to be considered in the location of sanitary zones and service distribution strategies.

Fire Safety

Rename Section 240 to “Fire Safety.” Comply with VA *Fire Protection Manual* and current codes. When “fire section” is used in the Red Book, it should be replaced with “fire compartment” to be consistent with current Code terminology. The size of fire compartments should be no more than 52,000 square feet to coordinate with sprinkler system limitations in NFPA 13. The size of smoke zones is now limited to 22,500 square feet.

Fire barrier walls, regardless of their rating, typically extend from slab to slab (e.g., stairs and vertical openings), however, VA criteria currently permits fire barrier walls serving horizontal exits (2-hour) or separating hazardous areas (1-hour) in buildings using the VAHBS not to have to extend through the interstitial space. NFPA 101, Chapter 8.5 does not require smoke barriers to carry a fire resistance rating; however, most occupancy chapters require smoke barriers to carry a one-hour fire resistance rating. Smoke barriers generally extend from slab to slab, but Chapter 8.5.2.3 permits a smoke barrier not to extend through an interstitial space "provided that the construction assembly forming the bottom of the interstitial space provides resistance to the passage of smoke equal to that provided by the smoke barrier."

Refer to comments for Sections 315.1, 321, 330, 342, and 353 for additional information.

Planning Module Applications

Section 250 provides sample configurations of service modules. This section is intended to illustrate the potential of the system. It is not intended to establish any preferred configuration. Refer to Appendices A and B for service module configurations in three example VAHBS hospitals.

Hunter Holmes McGuire VA Medical Center
Richmond, VA, 1983

Building Subsystems

Structure

The primary structural system envisioned for VAHBS buildings in the Red Book consisted of cast-in-place reinforced concrete construction with post-tensioned long span floor joists. More than half of the VA hospitals built with the VAHBS have used structural steel framing for the structural system. The use of steel framing causes a number of changes from VAHBS structural system (dropped girders, long rectangular bays, offsets from columns, e.g.). In many

cases, square bays in the range of 28 to 36 feet have been used with steel framing. Steel framing is typically used because of flexibility for future changes (which might require floor penetrations) and speed of construction.

311 Basic Design: The use of steel framing has resulted in a predominant use of braced frame lateral systems. Moment frame systems have been used in lower seismic zones. A hybrid system, Special Truss Moment Frames (STMF), has been developed and incorporated into the building codes since the publication of the Red Book. This system may have applications within the VAHBS, such that the trusses could be located within the interstitial space, leaving the functional space free of braces. However, truss design would require close coordination with other systems to avoid conflicts with distribution channels in the service zone.

311.1.1 Typical Structural: *Bays* Most of the structural steel hospital designs for both VAHBS and elsewhere employ square structural grids with columns spaced between 28 to 36 feet. While the dropped girder system described in the Red Book has been implemented successfully at the Houston VAMC, it is not a common application. To provide access through the S2 zone, regularly spaced openings in the floor beams and girders can be provided. Castellated beams could be considered for this purpose.

311.2 Lateral Force Resisting Elements: The VAHBS calls for concrete shear wall cores to be placed around the service bays and at the end of the service module. However, concrete walls create challenges to both medical planning and future flexibility. Steel braced frames can be used to replace these elements. Moment frames and STMF are other options for steel framed structures. These systems are more appropriate for low and moderate seismic regions due to their structural flexibility and the challenges associated with meeting building drift limits stipulated by building codes and VA.

Vertical loads on interstitial platform (floor) systems are typically transferred to the beams above through rods, which do not have any lateral force resisting capability. Lateral loads generated by the weight of the interstitial platform system and any other dead loads on the interstitial platform are transferred through the metal deck to the interstitial framing to the columns. Though these loads are likely to be small, all elements along the load path should be evaluated. For analysis simplification, the mass of the interstitial platform may be lumped at the functional floor.

311.3 Relationship Between Main Structural Members: This approach is applicable for the cast-in-place concrete system envisioned by VAHBS. If structural steel is used, many of the recommendations would result in increased cost.

312 Generic Design Options: This section identifies four basic structural options (cast-in-place concrete with prestressed beams, steel, precast concrete, and reinforced concrete). General cost indications are presented that may not be correct for present conditions.

VA Medical Center
San Antonio, TX, 1973
(not VAHBS, but used interstitial space)

313.1 Structural Bays: Incremental bay lengths between 40'-6" and 58'-6" are suggested, with standard 22'-6" width. Many applications have departed from these recommendations in favor of shorter and/or square bays. For steel structures, longer bays also present additional challenges for seismic design, due to a limited number of configurations of the lateral force resisting system appropriate for use with long spans. Furthermore, the structural flexibility of such systems may lead to much heavier and deeper structural elements than anticipated due to drift limits. Bay sizes need to be coordinated with functional program and space types.

313.2 Floor-to-Floor Height: As shown in the examples in Appendix A, floor-to-floor heights with VAHBS are typically in the range of 18'-8" to 19'-4". These heights will accommodate a finish ceiling height of 9-feet and the interstitial service zone. For floors with significant quantity of spaces with ceiling heights greater than 9-feet, consideration should be given to increasing floor-to-floor height (as seen at Palm Beach). Designers shall note that VA does not classify the interstitial service zone as an industrial occupancy or workplace for the purpose of determining egress requirements (including headroom). Refer to supplement for Section 321 for changes to ceiling and subzone S-7. The sketch in the Red Book does not reflect the S-7 subzone between the interstitial deck and the ceiling.

313.3 Building Height: The International Building Code has replaced the Uniform Building Code as the basis of the structural design for VA Hospitals. Height limits for concrete wall systems still exist. Structurally other systems may be designed to exceed the 160 foot limit. Buildings using the VAHBS that are over 4 stories in height will be classified "high-rise" since the highest occupied level will be above 75-foot height. The design team will need to consider functional, operational, fire protection, and aesthetic issues when determining the appropriateness of a high rise design.

313.4 Building Width: This section may be disregarded.

313.5.2 Girders: Discussion focuses on 22'-6" span based on "dimensional discipline" of 4'-6" for bedroom widths. Modules and dimensions may be adjusted as appropriate to the functional program and structural system selected. This section also refers to 75 and 115 psf live load areas in the sketch. See discussion of live loads in Section 314.

313.5.3 Beams: Minimum and maximum beam depths are given. Though beam depths can be reduced with shorter spans, deep beams may still be required to limit floor vibrations. These limits are necessary for occupancy comfort or functional requirements in areas such as surgery operating rooms and other locations with vibration sensitive equipment, e.g., MRI, microscopes.

313.5.4 Structural Slab: Topping slab is cited as three inches thick. This is consistent with VA Program Guide PG-18-3 *Design and Construction Procedures*, Topic 6. This will allow for maximum adaptability. Considera-

VA Medical Center
West Los Angeles, CA, 1976
(not VAHBS, used interstitial space)

tion may be given to whether or not this can be reduced and still accommodate all minor floor depressions without compromising clear dimensions established for service subzones and channels.

313.5.5 Shear Elements: Reference is to UBC earthquake zone 3. VA Standard for Seismic Design is document H-18-8, which adopts the latest edition of the IBC with modifications, notably a story drift limit of 50% of the IBC values. Comparison of wind and earthquake loads should be removed.

314.1.2 Vertical Loads: The Red Book refers to two basic live load values on main floor elements of 75 psf and 115 psf. These include 15 psf from the interstitial level (reduced from 25 psf) combined with either 60 or 100 psf for the main floors. The 25 psf load should be continued for interstitial levels, and a 80 psf live load plus a 20 psf partition load should be used for the design of the main floors at all locations. This allows the relocation of corridors in the future without concern for floor loading demands and eliminates the need for two different live loads.

314.1.3 Vertical Loads: Remove the note that refers to the National Building Code. The IBC shall be used for all loading designations.

314.1.4 Vertical Loads: Revise Table 310-1 to remove the Modified Class 115 Loading designation and combine it with Special Loading. Change the partition loads in Table 310-2 from 25 to 20 psf. The topping slab load should be "Applicable DL" instead of 25 psf since it may vary for different projects. Change Uniform Live Loads to 80 psf for all locations as noted previously. Total Live Load on the main floor elements therefore becomes 95 psf (since 25 psf at interstitial level can be reduced to 15 psf per note 3).

314.1.5 Vertical Loads: Modify the first sentence in this section to reflect changes described above.

314.2 Lateral Loads: Reference should be made to VA Document H-18-8 for seismic design and IBC for general lateral load design.

Amend Section 314 to add new subsection 314.3 as follows.

VA Medical Center
Martinsburg, WV, 1983

314.3 Blast Loading: VA now has requirements for the consideration of blast loadings. Two documents need to be considered. The first is "Department of Veterans Affairs Physical Security Strategies Report", dated May 13, 2005. The second is "ISC Security Design Criteria for New Federal Office Buildings and Major Modernization Projects", dated September 29, 2004. The engineer is required to consider progressive collapse of the structure. This may be a major determinant in the selection of the structural system.

315.1 Fire Protection: Structures shall be fire resistive construction in accordance with National Fire Protection Association (NFPA) National Fire Codes and International Building Code (IBC). Refer to VA *Fire Protection Design Manual* for additional guidance. As of the date of this Supplement, there have been only two full-scale fire tests of complete assemblies for the interstitial system. These tests were conducted by US Department of Commerce

(http://www.bfrl.nist.gov) and are described in the following reports: NBSIR 85-3158, Fire Performance of Interstitial Space Construction System; and NISTIR 5560, Fire Performance of an Interstitial Space Construction System. The reports may be found at:
http://fire.nist.gov/bfrlpubs/fire85/art006.html
and http://fire.nist.gov/bfrlpubs/fire95/art055.html

Details of typical assemblies are provided in Appendix C.

315.5 Floor Vibration: The sensitivity of many pieces of modern medical equipment to floor vibrations has increased dramatically since the publication of the Red Book. For steel building design AISC Design Guide 11 *Floor Vibrations Due to Human Activities* is the basic reference that should be followed. Each project may have unique pieces of equipment that may require special consideration, such as vibration isolation, which would need to be accommodated in the design.

Amend Section 315 to add new subsection 315.6 as follows.

315.6 Sustainable Design: Sustainable Design is now a consideration for all disciplines that needs to be included in modern hospital design, including structural.

316.1.1 Excessive Length of Building: The maximum 300 feet distance between expansion joints should be considered a general guideline. Greater or shorter lengths may be required depending on the geographic location of the building, its plan configuration, and the heating and cooling systems that are provided in the building.

317 Target Costs: Have not been updated to reflect current market and developments in materials and detailing.

Ceiling

There have been several developments in the design and construction of ceiling systems in VAHBS buildings from the prototype system described in the Red Book. The most significant changes have been the separation of the finish ceiling from the platform/ceiling assembly and materials used for the platform diaphragm.

321 Basic Design: Unlike the combined platform ceiling subsystem proposed in the Red Book, current practice is to use two subzones. The S-6 subzone is now the walk-on platform. The S-7 subzone includes the space below the platform and a suspended finish ceiling. Recent editions of the VA *Fire Protection Manual* have clarified that the fire rating is to consider the entire "floor/ceiling" assembly from the bottom of the interstitial deck to the top of the structural floor above. 2-hour fire resistance is required for the assembly (see comments for Section 315.1).

Various concretes have been used for the walk-on platform diaphragm. The trend has been away from gypsum based materials to lightweight Portland cement concrete. A primary reason for this move is that unless sealed or hardened, the gypsum concrete as used in the early decks can produce troublesome quantities of dust (particularly in high traffic aisles).

***321.2 Supporting Framework**: R*ecent designs have typically used purlins of small, wide flange steel beams such as W6 shapes. Spacing of purlins and hangers is to be coordinated with structural bay and service channels. Typical area per hanger remains in range of 50 to 60 square feet.

321.3 Platform: Fire resistance. The platform is not considered as a separate 1-hour element; but as a part of the complete 2-hour floor/ceiling system.

321.4 Finished Ceiling: systems are suspended below platform and are not part of the fire resistive floor/ceiling assembly. Most areas will use acoustical panels in exposed grid with hard surface (GWB or plaster) finishes where needed. See VA Program Guide PG-18-14, *Room Finishes, Door, And Hardware Schedule*.

322.1 Platform: systems using poured gypsum concrete or lightweight Portland cement concrete over metal deck may be considered for use. Since the platform deck forms part of the fire resistive "floor/ceiling" assembly, the construction must comply with recognized fire-resistive assemblies. If smoke barrier partitions terminate at the underside of the platform, the platform construction must provide resistance to passage of smoke equal to the partitions.

Lightweight Portland cement mixes are preferred for increased durability and greater ease of patching or repair. The metal deck, or form board, is placed on the bottom flanges of the supporting framework of purlins and the concrete fill is screeded to nearly the level of the top flange of the purlins. The top flanges are left exposed to facilitate attachment of supports for service distribution in the S-4 and S-5 subzones. Bottom flanges of purlins must be fireproofed. Details of typical assemblies are provided in Appendix C.

322.2 Finished: *Ceiling* Options 1 and 2 are no longer used. Under Option 3 limited lateral distribution may occur in the S-7 subzone; such as offsets in service drops, fixtures or devices recessed in the finished ceiling, switch legs and whips for lighting fixtures, fire sprinkler branches, and non-integrated telecommunications subsystems. The design team shall coordinate and clearly define on the documents the hierarchy for distribution of services between the S-5 and S-7 subzones.

New Mexico VA HCS
Albuquerque, NM, 1986

324 Ceiling Loading: Criteria for vertical and lateral loading apply to the platform system. Refer to structural sections for detailed requirements.

325 Acoustics: Refer to VA Program Guide PG-18-3, Topic 11, *Noise Transmission Control* for STC ratings required at various locations.

326 Fire Safety: Design and construction of platform and ceiling including opening protection (if required) and fire and smoke stopping are to comply with VA *Fire Protection Manual* and applicable codes. Materials and assemblies are to conform to current designs as listed or approved by UL or other recognized authorities.

327.3 Surface Characteristics: Of platform will not require direct attachment of ceiling finishes to the underside of the platform. The S-7 subzone should be a minimum of 4-inches deep, 8-inches is preferred (see examples in Appendix A).

328 Target Costs: Have not been updated to reflect current market and developments in materials and detailing.

Partitions

"Partition" is the generic term used in Section 330 of the Red Book for non-load bearing, vertical, interior construction used to subdivide or enclose portions of the building volume. In current practice, "partitions" with fire or smoke resistance ratings are called "fire barrier walls" or "smoke barriers" as defined in NFPA 101.

Criteria for non-bearing partition systems has been superseded by VA PG-18-10, *Architectural Design Manual for New Hospitals/Replacement Hospitals*; PG-18-14, *Room Finishes, Door, And Hardware Schedule*; PG-18-4, *Standard Details*; and PG-18-1, *Master Construction Specifications*.

The following Red Book concepts remain valid: construction enclosing shafts and otherwise required by fire codes shall extend from structural slab to structural slab; two-hour fire resistance rated construction shall be considered permanent, other partitions are to be considered adaptable.

Fire and smoke resistive construction, opening protection, and penetration and perimeter fire/smoke stopping are to conform to current designs as listed or approved by UL or other recognized authorities.

332.2 Typical Methods for Housing Services: Surface mounted services are not the preferred means of distribution. Services may be in stud space or between parallel rows of studs in chase wall construction. To increase adaptability, services are not to be run horizontally in partitions.

333.3 Door Sizes: Door frames need not extend to ceiling or walk-on platform. Door types and sizes are to be in accordance with PG-18-14, *Room Finishes, Door, And Hardware Schedule* and PG-18-4 VA *Standard Details* 08100-1 and 08100-2. Provide partition framing at door frames as indicated in standard detail 08110-1. Reinforce frames for lead-lined doors with steel angles as indicated in standard detail 08110-3.

334.4 Attachments: Refer to PG-18-4 VA *Standard Details,* 05500-2 for preferred method of anchorage for wall mounted items.

335 Acoustics: Use VA Program Guide PG-18-3, *Design and Construction Procedures* Topic 11, Noise Transmission Control to establish the STC ratings required at various locations.

335.3 Furring around: *Surface Mounted Services* will generally not be required. Services will typically be concealed within partition construction.

336 Fire Safety: Components and assemblies are to comply with VA *Fire Protection Manual* and applicable codes.

338 Target Costs: Have not been updated to reflect current market and developments in materials and detailing.

HVAC

342.1 Supply Systems: The major alternatives for supply are low or medium pressure, variable air volume (VAV) systems with terminal reheat. The close humidity control required for certain areas in the hospital may be difficult to achieve unless cooling/dehumidification is employed at the unit.

VA Medical Center
San Diego, CA, 1971
(not VAHBS, used interstitial space)

Where climatic conditions require, a mixed system which combines hot water convectors for building perimeter auxiliary heating with a single duct system for heating and cooling could be a prime variation.

342.2 Return and Exhaust Systems: The systems must be capable of handling from 25 to 100% outside air. Both return and exhaust shall be extracted through the service zone by fully ducted systems. The return air fans shall be placed in the service bay mechanical rooms. Ducts for special exhaust systems will be required in various service modules. Exhaust ducts shall be routed to shaft(s) in the service bay and then to fans on the roof. General exhaust will handle a range of conditions from individual toilets to large areas such as isolation suites and shall be ducted through the service bay to fans on the roof.

343.1.1 Sub zones: Flexible duct within subzones S-4 or S-5 shall be limited to 3 feet for each run. Flex duct within subzone S-7 shall be limited to 5 feet. Return/exhaust system plenums are not allowed.

343.1.3. Return or exhaust plenum: Are not allowed.

344.6 Accessibility: Hydronic components, such as control valves, strainers and other devices requiring periodic service, shall be located above the interstitial platform approximately 14 inches to allow a catch basin to be used when servicing that component.

344.4 Fire Safety: No exhaust or return plenums are allowed.

Fire dampers are required on vertical exhaust ducts that penetrate the floor assembly separating service bays. Fire dampers are not required in ductwork penetrating the one hour wall separating the service bay from the interstitial service zone. Fire dampers are not required for ductwork that penetrates the interstitial platform (subject to the limits of the Fire Performance Tests for the floor/ceiling assembly).

In many cases, current codes will require fewer (or no) fire or smoke separations in the interstitial service zone than envisioned in the Red Book. However, ductwork systems serving distinct (different) smoke or fire zones in the functional zone shall not be “cross-connected” in the interstitial service zone.

Plumbing and Fire Protection

353 .3 Fire Protection Piping: The mains for the sprinkler system shall be run in subzone S-3. The preferred location for branch and lateral (sub branch) fire sprinkler piping is subzone S-7 for distribution to the functional zone. No fire sprinkler system is required in the interstitial area; except for conditions listed in *VA Fire Protection Design Manual*.

John L. McClellan VA Medical Center
Little Rock, AR, 1981

Electrical

361 Basic Design: Now requires that electrical and telecommunications rooms are dedicated and separate. Under some circumstances the telecommunication room may be further divided into separate telephone/data and signal closets. Refer to VA PG-18-10, *Electrical Design Manual* Chapters 7 and 8; and the VHA TCD *Spaces & Cable Pathways Design Guide*.

362.1 Service Zone: Figures in the Red Book depict electrical and telecommunications wireways on independent supports; where space, wireway size, and separation requirements permit, it is advantageous to install all wireways on a common support. Telephone and data cabling is to be installed in cable tray as shown in figure 360-2, beginning with 18" minimum width tray at the Telephone/Data room and narrowing as it traverses subzone S3. Narrow tray or wire basket tray may be used in subzone S4. A separate cable tray, appropriately sized, shall be provided for other signal systems. If an independent data network is required for facility engineering services, in order to maintain separation between patient data and building services data and control functions, its cabling shall be installed in a separate tray system. Do not use the specified covered 6" x 6" wireways per the *Electrical Design Manual*.

362.2 Service Bay: bays shall be designed with the separation of electrical and telecommunications rooms as described in the supplement to *361 Basic Design*.

Section 362.2 Service Bay: this section is amended to include new subsections 362.2.1 and 362.2.2 as follows.

362.2.1 Electrical Room: Size the electrical room to house the normal and essential electrical distribution equipment associated with the Service Module, including bare wall space for future expansion. As the interstitial walk-on deck does not extend into the Service Bay, the designer may take advantage of the very high ceiling by installing a steel grate 'mezzanine' level, accessible by ladder. This area may be used for installing step-down transformers, access to high-mounted bus riser devices, access to branch circuit wireways before they penetrate the rated wall into the S3 subzone, or for mounting other electrical equipment.

The electrical room shall be located immediately adjacent to the Functional Floor. If the Service Bay layout dictates that the electrical and telecommunications room(s) cannot be side-by-side against the wall between the Service Bay and the Functional Floor, then the electrical room should be behind the telecommunications space. This will ensure that the telecommunications wireways do not violate the National Electrical Code clear space above electrical equipment. However, no corresponding restriction prevents electrical wireways from passing above telecommunications spaces, as long as VA criteria for separation and spacing between these systems are followed.

362.2.2 Telephone/Data Room and Signal Room: The preferred arrangement is for two separate rooms, one for telephone/data equipment and cabling, and one for other signal systems. Refer to Chapters 7 and 8 of the *Electrical Design Manual*, and the VHA TCD *Spaces and Cable Pathways Design Guide* for more information. The minimum acceptable room size for a combined telephone/data and signal systems room serving a Functional Floor area of 10,000 sf is 10' x 14'. The designer shall contact VHA's Telecommunications Consultant Division (TCD-194D) for technical guidance and approval of sizing and number or rooms required. The VAHBS is intended to facilitate maintenance and renovation in the Functional Floor area; however, renovations in the Service Bay can still be disruptive and costly. Care shall be taken that the telecommunications spaces are built with due care for future systems expansion or replacement.

363 Load Distribution: has not been updated; designers should note that healthcare power densities have increased significantly in comparison to those suggested in 1977, with an accompanying need for larger electrical closets with higher cooling needs. Prudent design practices now suggest a greater degree of redundancy and reliability for healthcare electrical distribution systems.

***363.4 Service Module Requirements*:** this section is amended to add a new subsection 363.4.1 as follows.

363.4.1 Service Zone Lighting: Lighting shall be strip fluorescent with wire guards. Illumination level on walkways shall average 15 footcandles, with a minimum walkway illumination level of 1 footcandle provided by unswitched emergency luminaires. Provide general illumination for non-walkway areas of 1 footcandle, coordinating luminaire locations with ductwork and other services in the subzones. Refer to VA PG-18-10, *Electrical Design Manual* Chapter 6 for more detailed information on interstitial space normal, emergency, and exit lighting and lighting controls.

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(not VAHBS, used interstitial space)

364 Target Costs: Have not been updated to reflect current market conditions and developments in materials.

Coordination Checklist

Section 370 of the Red Book provides a coordination "checklist." The list is an inventory of compatibility considerations that the project team needs to consider in the selection and coordination of integrated subsystems in a particular design. Most of the checklist items are applicable to the design and coordination of systems and subsystems in VAHBS buildings as they were written. Many of the concepts are applicable even to non-VAHBS buildings.

For Checklist Items 1, 2, 3, 4, 12, 13, 14, and 18 the term "ceiling" shall be interpreted as referring to the platform subzone S-6. Finish ceilings are suspended below the platform and define the lower boundary of the S-7 subzone. For items 15, 16 and 17 "ceiling" shall be interpreted as referring to either the S-6 or S-7 subzones as appropriate for the context and design selected.

Delete Checklist Item 19. Services and fixtures shall be located within partitions and suspended ceiling systems in conventional fashion; except, services shall not be run horizontally in partitions. The S-7 ceiling subzone offers limited opportunities for lateral distribution. As the service zone strategy is developed for a project, consideration shall be given to defining the allocation of subsystems between the S-5 and S-7 subzones.

Add “Fire Protection (sprinkler and standpipe)” and “Telephone/Data distribution” to the Integrated Systems list.

Procedure

The Procedure section was intended as an outline guide to be used by VA staff and A/E contractors to the use of the Red Book in the design of a VA system hospital. It is not, however, a step-by-step guide. The design of buildings, especially buildings as complex as hospitals, requires the interaction of a diverse group of stakeholders; and each project will have its own unique constraints and opportunities (site, functional program, availability of materials and trades, budget, schedule, etc.). However, each project can be broadly divided into three phases: problem analysis, design development and contract documents. The material in Section 400 is intended to assist the project team with applying the concepts of the VAHBS prototype in the overall design process.

Problem Analysis

Section 420 may be used by the design team without further supplement.

Design Development

Section 431 Building Configuration (Preliminary Block Studies) and 432 Building Schematic Design the procedures and deliverables for the design phases are to be revised and coordinated with the tasks and deliverables in VA Program Guide PG-18-15 *A/E Submissions Instructions* and the requirements in the design contract. The concepts for developing modules and integration of services remain valid.

Contract Documents

Procedures and deliverables are to be revised and coordinated with the tasks and deliverables in VA Program Guide PG-18-15 *A/E Submissions Instructions* and the requirements in the design contract.

It is essential that the design team establish and clearly communicate the strategy for allocation of sub-zones and channels for distribution of building systems within the interstitial service zone. Examples of contract documents from some past projects are included in Appendix B. CAD drawings of a “typical” service module with systems integration have been developed for this Supplement and may be found in Appendix C.

Potential contractors and sub-contractors need to be made aware of VAHBS concepts and potential benefits as early as possible during the design process. For example, the use of the VAHBS and systems integration should discussed with contractors and suppliers when making the market surveys at each submittal phase. It is recommended that the pre-bid conference be expanded to include an intense session to educate contractors, subcontractors and suppliers about the VAHBS and the strategies developed for the project.

Cost Estimating

As discussed in Section 3 of this Supplement, the Target Costs in the Red Book cannot be used as provided. The data from the Medical Centers used for the Cost Analyses in the Red Book are now largely outdated simply through the passage of time. While ENR and other Building Cost indices reflect the overall cost increases due to inflation, they do not always address specific Elemental / Trade fluctuations. These may have varied considerably over time thereby "skewing" any direct proportionate link between such general inflation indices and the Cost Analyses outlined in the Red Book. OFM's Strategic Management Office (181) can provide further guidance and assistance with estimating and cost analysis.

Project cost estimates shall be prepared in accordance with PG-18-15 *A/E Submissions Instructions* and VA *Manual for Preparation of Cost Estimates for Hospital Projects*.

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Construction Scheduling

Section 460 may be used by the design team without further supplement. VA policy on the use of Network Analysis System-Critical Path Method scheduling may be found at http://www.va.gov/facmgt/consulting/networkanalysis.asp . OFM's Service Delivery Office (183) can provide further guidance and assistance with schedule analysis.