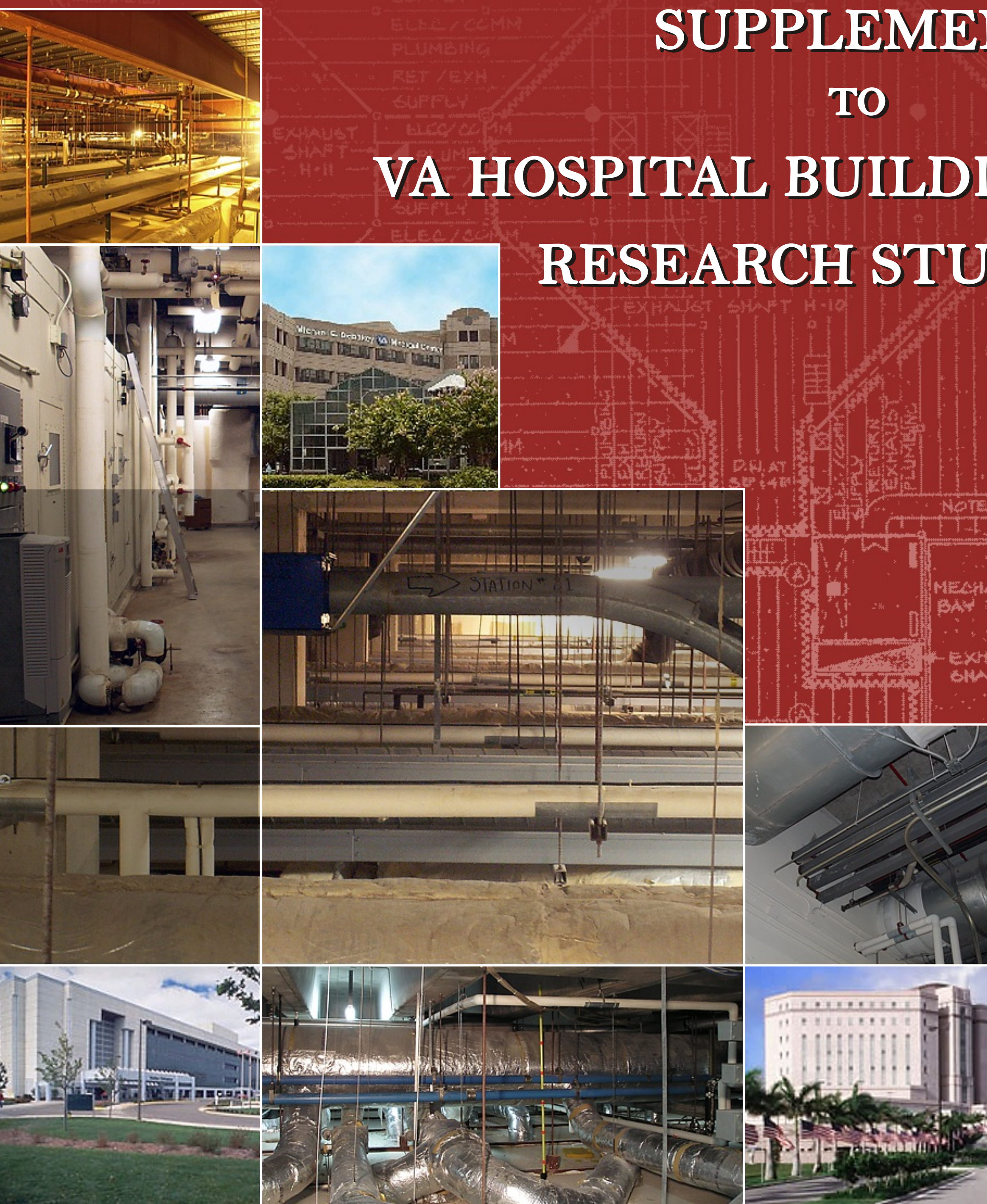
Department of
Veterans Affairs
Office of Facilities Management

JUNE 2006

SUPPLEMENT TO VA HOSPITAL BUILDING SYSTEM RESEARCH STUDY REPORT



SUPPLEMENT

This page intentionally left blank.

Section 1

Foreword & Acknowledgements

Page

This page intentionally left blank.

Foreword

VA policy is to design new hospital buildings to provide for continuing adaptability throughout their structural life. The VAHBS concept as defined in the VA Hospital Building System Research Study Report (Project 99-R047; U.S. Government Printing Office Stock No. 051-000-00 112-5) was created to provide such adaptability. The purpose of this supplement is to address the effects on the VAHBS concept and Research Study Report (Red Book) brought about by 30 years of changes in technology, construction practices, and health care models.

It has been VA's experience that VAHBS projects have not cost more than traditional construction in construction bidding, and have cost less on a life-cycle basis. A key factor in the bidding process is thorough pre-bid conferencing which includes sub-contractors (such as mechanical, plumbing, electrical, etc.) and material suppliers as well as general contractors to inform them of the potential savings in time and labor through the separation of trades on all levels. The use of drawings, models, and virtual reality should be considered for part of these pre-bid conferences.

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.

Lloyd H. Siegel, FAIA

Associate Chief Facilities Management Officer
for Strategic Management

This page intentionally left blank.

Acknowledgements

Credit is due to the following individuals whose guidance, advice, and effort made this publication possible:

Facilities Management Office

Robert L. Neary, Jr.	Acting Chief Facilities Management Officer
Lloyd H. Siegel, FAIA	Associate CFMO, Strategic Management Office
Kurt D. Knight, P.E.	Director, Facilities Quality Service
Satish C. Sehgal, P.E.	Program Manager
Robert Smoot	Director, A/E Evaluation & Program Support
Robert Clifton	Project Manager

VA Medical Centers And Other VA Offices

John Bochek	Chief Facilities Officer
Joshua Elvove, P.E.	Safety Officer, VISN 19
Howard Gibson	Chief Facilities Officer
Wallace Thompson	Chief Facilities Officer

Private Sector Consultants

GLHN Architects & Engineers, Inc.

William I. Nelson, P.E.	Ellen G. Alexander
Nicholas C. Krauja, AIA	Lisa Vickery
Theodore C Moeller, P.E	James Reynolds

Degenkolb, Structural Engineers

James Malley, P.E.	Jack Hsueh, P.E.

Associated Construction Economists

William Green, MRICS

This page intentionally left blank.

Glossary

Adaptability: The ability to respond to, or be readily adjusted to, changing conditions.

Assembly:
- A group of attached components considered collectively (e.g., a pre-hung door).
- A design configuration composed of a specific arrangement of service modules.

Bedroom Zone: A plan zone at the building perimeter sized to accommodate patient bedrooms.

BGSF: Building gross square foot, a unit of total floor area including building service spaces and shafts, common horizontal and vertical circulation systems, structure, and exterior enclosure systems; but excluding interstitial service zones.

Building Subsystem: One of the coordinated groups of components, each performing a major function, which combine to form a building system.

Building System:
- Any specific building production process or method.
- Any set of coordinated building components intended for application as a group.

Ceiling:
- Finish system at the top of a functional zone, usually suspended from underside of interstitial platform (e.g. acoustical, or GWB or plaster ceiling).
- A combination interstitial platform/ finished ceiling at the top of a functional zone (obsolete).

Compatibility: The state of functional, economic, and aesthetic coordination between two or more systems or components.

Component: A part, or assembly of parts, in a system.

Compound Assembly: A design configuration in which the structural framing changes direction, and/or some service bays are completely internal.

Conventional Design and Construction: Existing, traditional building methods are they are currently applied.

CPM: Critical Path Method.

Critical Path: The particular sequence or path through a work schedule determining the shortest time within which all work can be completed.

Critical Path Method: A scheduling technique for the identification and control of work activities on the critical path.

Design Configuration: A general building plan type, illustrated by a diagrammatic plan.

Design Criteria: Various performance requirements, dimensional rules, descriptions of typical and special conditions, and the like, serving as guidelines in the development of a detailed design from the basic system design.

Design Determinant: An independent variable, or general class of such variables, encountered in a design problem, which influences the selection of alternative solutions or the characteristics of a particular solution (e.g. program, site, budget, codes).

Fast-track: An accelerated scheduling technique characterized by the overlapping of activities traditionally performed in linear sequence, requiring early commitment to general decisions, but allowing postponement of detailed decisions.

Fire Compartment: A unit of area on a building floor enclosed by two-hour fire resistance rated construction on all sides from which there are at least two different exits.

Fire Section: Term used in original Red Book, see Fire Compartment.

Flexibility:
- Adaptability.
- Having alternatives.

Functional Space:
- Habitable room or area not assigned exclusively to building service equipment.
- Space within the functional zone.

Functional Space Requirement: A characteristic a particular functional space must have to satisfy a user need or an applicable regulation or standard.

Functional Unit: A group of rooms interrelated by shared activities or processes (e.g., nursing unit, intensive care unit). Usually implies close proximity.

Functional Zone: The horizontal layer of space between the top of a finished floor and the bottom of the finished ceiling immediately above.

Generic Design Option: One of a limited number of alternative general types of solution allowed within the basic design of a particular building subsystem.

HCS: Health Care System.

HVAC: Heating, Ventilating, Air Conditioning

Integrated Subsystem: Any of the pre-coordinated subsystems specifically within the scope of a particular building system.

Integration: See Systems Integration.

Interface:
- A common boundary between two systems or components.
- A boundary detail designed to maintain a specified relation between adjacent systems or components.

Interstitial Platform: The deck system that provides the walk-on surface for the above ceiling (interstitial) service zone; and constitutes the bottom of the two-hour separation between floors (Refer to fire test reports NBSIR 85-3158, Fire Performance of Interstitial Space Construction System; and NISTIR 5560, Fire Performance of an Interstitial Space Construction System). Platform construction is continuous across a service module, except for the service bay.

Interstitial Space: Unfinished or non-habitable space utilized for building service subsystems, of sufficient size to accommodate workers and permit maintenance and alteration without disruption of activities in functional spaces. The term usually refers to the portion of the service zone between the finished ceiling and the floor above.

Modular:

- Having commensurable dimensions.
- Capable of arrangement with exact fit in more than one sequence or direction.
- Composed of or containing predetermined dimensional and/or functional units; such as repetitive structural bays or service modules.

Modular Coordination: Dimensional coordination utilizing commensurable dimensions.

Module:

- The common divisor of a set of commensurable dimensions.
- A dimensional pattern restricting the location of a specified building component.
- A unit of space defined by a special set of dimensional and/or functional characteristics.
- See also Planning Module, Service Module, Space Module

Non-integrated: Outside the design scope of a particular building subsystem.

Non-system: Non-integrated.

OFM: Office of Facilities Management.

Optimize:

- To maximize desirable characteristics and/or minimize undesirable characteristics.
- To establish functional and economic balance among the performance characteristics or two or more systems or components.

Planning Module: A one-story high unit of building volume with specific dimensional and functional characteristics.

Plan Zone: A plan area of constant width extending from end-to-end, or side-to-side, of a building or planning module. See Bedroom Zone, Sanitary Zone, and Service Strip.

Platform: See Interstitial Platform.

Prefabrication: The on-site or off-site advance manufacture of building systems and components traditionally fabricated in-place during installation.

Primary Subzone: A horizontal subdivision of the service zone reserved exclusively for distribution of systems or services oriented in a specific direction to the structure.

Product: A material, component, or system manufactured off the construction site.

Prototype System Design: A basic system design establishing the performance and dimensional limits within which alternative detailed designs may be produced to accommodate specific conditions at various times and places.

Red Book: VAHBS Research Study Report, Project 99-R047; U.S. Government Printing Office Stock No. 051-000-00 112-5. The Red Book is available from the VA Technical Information Library (TIL) at http://www.va.gov/facmgt/standard/bsds.asp.

Reserved Zone: A specified region within a building volume assigned to the exclusive use of one subsystem, or limed step of subsystems, or to a specific function. See Functional Zone, Service Zone, Primary Subzone, and Secondary Subzone.

Sanitary Zone: A plan zone in a nursing unit, such as between the patient bedrooms and the corridor, sized to accommodate lavatories, toilet facilities, etc.

Secondary Subzone: A vertical subdivision of a primary subzone reserved exclusively for the distribution of a specific service subsystem or group of subsystems.

Service Bay: A structural bay specifically designed to provide for mechanical and electrical rooms and/or various kinds of vertical shafts, located at the perimeter of a service module. May be enclosed by shear walls or other lateral bracing systems.

Service Module: A planning module containing, and served by, an independent horizontal distribution network; typically including its own air handling unit.

Service Strip: A plan zone containing internal service bays.

Service Zone: The horizontal layer or building volume between the bottom of a finished ceiling and the top of the finished floor immediately above; and the adjoining service bay. See Interstitial Space.

Simple Assembly: A design configuration in which all structure is framed in the same direction and all service bays are external.

Space Module: A subdivision of a service module in a patient bedroom area which may be internally organized in various ways to accommodate a range of functions, and which may be incorporated within a variety of design configurations.

Subsystem:
- A system considered as a component of a larger or more general system.
- Any component, or group of components, which has internally the characteristics of a system (e.g. the distribution components of a mechanical system).

Support Area: All hospital areas outside the bed-care area.

System: A set whose elements (termed components) are organized toward a common objective, and are characterized by interdependence in their individual contributions to that objective.

Systems Analysis: Examination of the effects of the interactions between the components of a system on the individual performance of those elements and on the total performance of the system.

Systems Approach: A strategy of problem definition and solution which emphasizes the interaction between problem elements and between the immediate problem and its larger context, and which specifically avoids traditional methods of independent or ad hoc treatment of the various elements.

Systems Integration:
- The combination of a groups of relatively independent parts into a coordinated whole to improve performance through controlled interaction.
- The joint use of a component by two or more systems.

Unit:
- A structurally independent assembly performing a specific function or range of functions.
- A functionally related set of people, equipment, spaces, missions, and activities considered collectively for planning and administrative purposes. See Functional Unit.
- A module.

User Needs: Those conditions the users of a building consider necessary or desirable as environment or support for their activities, without particular reference to how such conditions are to be provided.

User Requirements:
- User needs.
- Performance requirements established directly by a user.

VA: Department of Veterans Affairs.

VA Hospital Building System: A prototype system design developed by VA for use in the design and construction of new hospital buildings; characterized by modular design and the use of systems approach to the integration of building services and functional or planning modules.

VAHBS: VA Hospital Building System.

VA HCS or **VAHCS:** VA Health Care System.

VAMC: VA Medical Center.

This page intentionally left blank.

Section 2

VAHBS Overview

This page intentionally left blank.

History of VAHBS

Jerry L. Pettis Memorial VA Medical Center
Loma Linda, CA, 1977

The VA Hospital Building System (VAHBS) is an approach to the design and construction of large, multi-story hospital buildings based on the principles of systems integration. Key features of the VAHBS are modular design with integrated service zones for permanent and adaptable building subsystems.

Faced with rising costs, lengthy periods between programming and occupancy, accelerating obsolescence and inadequate building performance, VA decided to study the application of systems integration to a prototype design for new hospitals. The result of the work by VA Research staff and the consultant, Stone, Marraccini and Patterson with Building Systems Development, was the Development Study--VA Hospital Building System Research Study Report (Red Book) first published in January 1972. The Red Book report was last revised in August 1977.

The VAHBS has been used successfully on many VA projects. Over the last three decades certain elements of this system have evolved in response to field experience, emerging health care models, and technical and regulatory changes. As a supplement to the Red Book, this Paper is intended to aid designers of new VA hospital buildings in the application of VAHBS concepts to today's conditions and construction practices.

VAHBS Concepts

Systems Integration

The Red Book presented a prototype design system for new hospital buildings. In the prototype system, building systems and subsystems and their interrelationships are defined and examined as integrated or coordinated components of the building as a whole from the very beginning of the design process. The primary objectives for systems integration are cost control, improved performance, adaptability, time (schedule) reduction, and the provision of a basis for the long-term development and modification of the hospital building.

Readers must keep in mind that the prototype design system was not intended to be used as a standardized scheme. The prototype design system was to be used as a model for the generalized decision process for the design and construction of new facilities. The prototype space modules were based on functional criteria appropriate to the health care delivery model of the time. Changes in these criteria have made many of the dimensions and space modules proposed in the Red Book obsolete. However, the basic concepts of integrating building services and using a systems approach for problem definition and solution in design and construction still remain valid.

Planning Modules

The conventional design process tends to concentrate on spatial and functional relationships with minimal consideration for structure and mechanical and electrical systems during preliminary and schematic design. This approach tends to result in specialized and unique designs for the service systems in each part of the building. The results are increased complexity in detailing and construction, and compromises in maintenance, future adaptability, and expansion.

To use the VAHBS, a designer needs to understand the following concepts:

- Service Modules
- Fire Compartments (Sections)
- Building Subsystems
  - Shell Systems
  - Service Systems and Subzones.

Service Modules

The Red Book proposes a systematic or modular approach to the design of new hospital buildings where building systems are integrated into the planning modules from the start of design. The basic building block is the service module. Service modules were defined as one story units of building volume with a footprint of approximately 10,000 square feet. More recent designs have used service modules in the range of 20,000 square feet. Each Service module is comprised of

- structural bays,
- a service zone, and
- functional zones or space modules (the occupied areas).

Each service module is completely contained, alone or with one or more other modules, in a fire compartment.

The building block concept can offer advantages in design, construction, operation and maintenance. Once established, the service module provides a means of manipulating overall building configuration with the assurance of subsystem capability and integrity.

Structural Bay: The structural bay is the basic unit of which all other modules are comprised. The dimensions of the structural bay are influenced by the functional layout (space planning), service zone clearances, and type of structural system selected. Refer to Section 3 Issues, Section 4 Application to New Projects and Appendix A for further discussion and examples of typical bay sizes.

A special variation of a structural bay is the service bay. This special bay contains the mechanical, electrical and telecommunications rooms that support a service module; and service shafts and risers (and may include exit stairs) necessary for vertical distribution of services. It is a part of the service zone [see below]. Major equipment items and all pumps and motors are contained in the service bay. In section, the service bay extends from structural floor to structural floor. The walk-on platform (interstitial deck) does not extend into or through the service bay.

Service Zone: A service zone includes a full height service bay (with independent mechanical, electrical, and telecommunications rooms) and an independent service distribution network that includes the interstitial zone above the functional zone.

Functional Zones and Space Modules: The functional zone is the occupied floor area within a service module. The Red Book defines space modules as variations of the service module designed for inpatient bed units. Space modules may be the same size or smaller than a service module, but in no case may be larger than a service module.

Fire Compartments (Sections)

When the term “fire section” is used in the Red Book, it should be replaced with “fire compartment” to be consistent with current Code terminology. A fire compartment is a unit of area enclosed by two-hour fire resistance rated construction on all sides from which there are at least two different exits. The size and number of fire compartments shall be as determined by current codes, VA criteria, and the overall fire protection strategy for the building.

A fire compartment may contain one or more service modules. The boundaries of the service module(s) should coincide with the boundaries of the fire compartment.

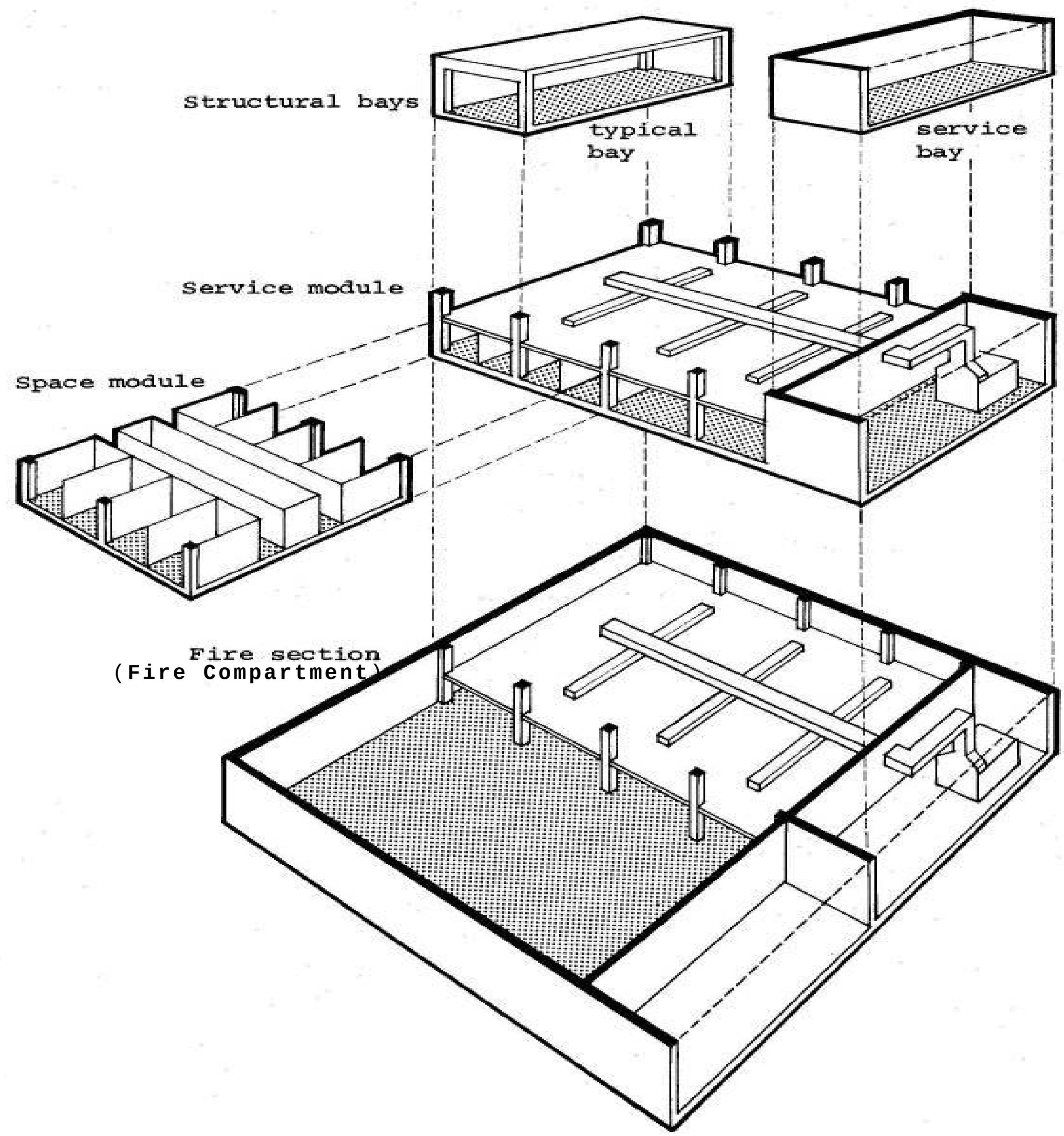


Figure 2-1 Service Module Concepts

Building Subsystems

The prototype system design includes six specific building subsystems that are referred to as integrated subsystems: structure, partitions, and walk-on platform (interstitial deck) are "shell" subsystems; HVAC, plumbing and electrical are "service" subsystems. Other subsystems such as foundations, exterior closure, roof, and conveying systems have been excluded and are referred to as non-integrated subsystems. Communications systems were originally considered non-integrated systems. The increases in the numbers and complexity of telephone/data and other "low-voltage" sub-systems warrant considering them as integrated service subsystems.

Shell Systems

Structural: The structural system may be steel frame or reinforced concrete frame. Selection would be based on engineering and economic analysis.

Partition: Partition subsystem is the generic term used in the Red Book for non-load bearing, vertical, interior construction used to subdivide or enclose portions of the building volume. Components must provide a wide range of performance in terms of impact resistance, finishes, fire and/or smoke resistance, acoustics, x-ray shielding, etc. In current practice, "partitions" with fire or smoke resistance ratings are called "fire barrier walls" or "smoke barriers" as defined in NFPA 101. Except as required for code compliance, construction will typically terminate underside of the platform. The Red Book envisioned that the final service runs in the functional zone would be installed outside, or on the surface of, the partitions. In current practice, vertical service drops to a room or area are to be concealed within the partitions. Horizontal distribution of services is to remain in the defined service zones.

Platform: The walk-on platform/ceiling subsystem has also evolved from the system originally described in the Red Book. 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. Light fixtures are typically recessed in the finish ceiling. Refer to Section 4 Application to New Projects and Appendix C for examples of walk-on platform and ceiling construction.

Service Systems and Subzones

The service subsystems for each service module are located within the service zone, i.e., within the service bay and/or the horizontal portion of the service zone (interstitial space) above the functional zone. To many A/E's the platform/ceiling subsystem and the interstitial space it creates are the most prominent features of the VAHBS. The platform allows for better organization of service distribution, improved access for maintenance or modification of services with reduced impacts to functional zones. The integration and coordination of building services are much more important to the successful application of the VAHBS.

The service zone is highly organized into reserved subzones for the various mechanical, plumbing, fire protection, electrical and tele/data services. The purposes of this "pre-coordination" are to provide clear channels for access and passage for all trades, to minimize crossovers and other conflicts, to assure reasonable space for future extensions and additions, and to permit positive location of all components. All services, except gravity drains, downfeed into the functional zone below.

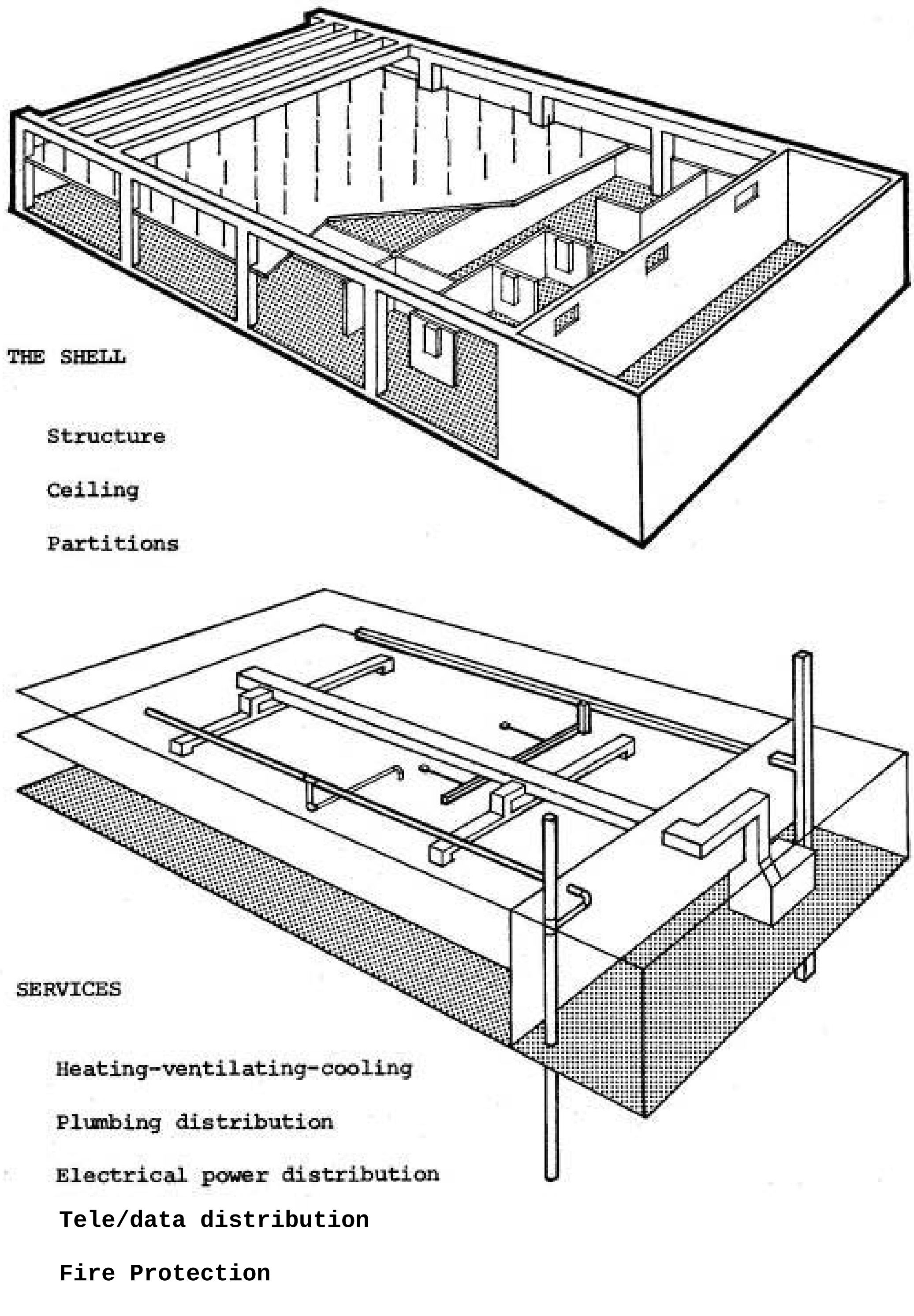


Figure 2-2 Building Subsystems

Service Zone: The service zone is organized into subzones and channels that define and organize the service runs. [Refer to details in Appendix C. Refer to Appendix A for examples in existing VAHBS hospitals.] Subzones are horizontal layers within the service zone. Main service distribution runs from the service bay are all parallel, each connecting to branches at right angles to the mains, and branches connecting, where required, to laterals at right angles to the branches within the defined subzones. Channels are plan divisions of the subzones and define reserved locations for particular services.

In order to preserve the rights-of-way for initial and future installation of service runs, no shortcut or point-to-point routing of services is permitted. This is extremely important.

S-1 Subzone—Floor Slab
This subzone equals the depth of the floor finish, topping slab and structural slab.

S-2 Subzone—Branch Distribution
This subzone contains the structural beams, pressure piping and gravity drainage and vents.

S-3 Subzone—Main Distribution
This is the major subzone and is reserved for main distribution of services through the length of the service zone. It is divided by service into channels. The depth will be governed by HVAC supply and return/exhaust ducts. Note that crossovers of main ducts are to occur in the Service Bay.

S-4 Subzone—Branch Distribution
This subzone contains mechanical and electrical branches and vents. It is divided by service into channels. Depth will be governed by HVAC branches.

S-5 Subzone—Lateral Distribution
This subzone takes the final service run to the location of the service drop into the functional zone below. Any projections from the walk-on platform construction will be parallel to the services at this level. Formal channels are usually not defined in this subzone.

S-6 Subzone—Platform
This subzone equals the overall depth of the walk-on platform (interstitial deck) construction.

S-7 Subzone—Ceiling
This subzone extends from the underside of the walk-on platform to the bottom of the suspended, finish ceiling. Limited lateral distribution may occur in this subzone such as offsets in service drops from the penetration through the walk-on deck to fixture or partition; fixtures and devices recessed in the finished ceiling; switch legs and whips for lighting fixtures; fire sprinkler; and non-integrated telecommunications conduit and cabling for public address, nurse call, CATV/MATV systems and fire alarm system.

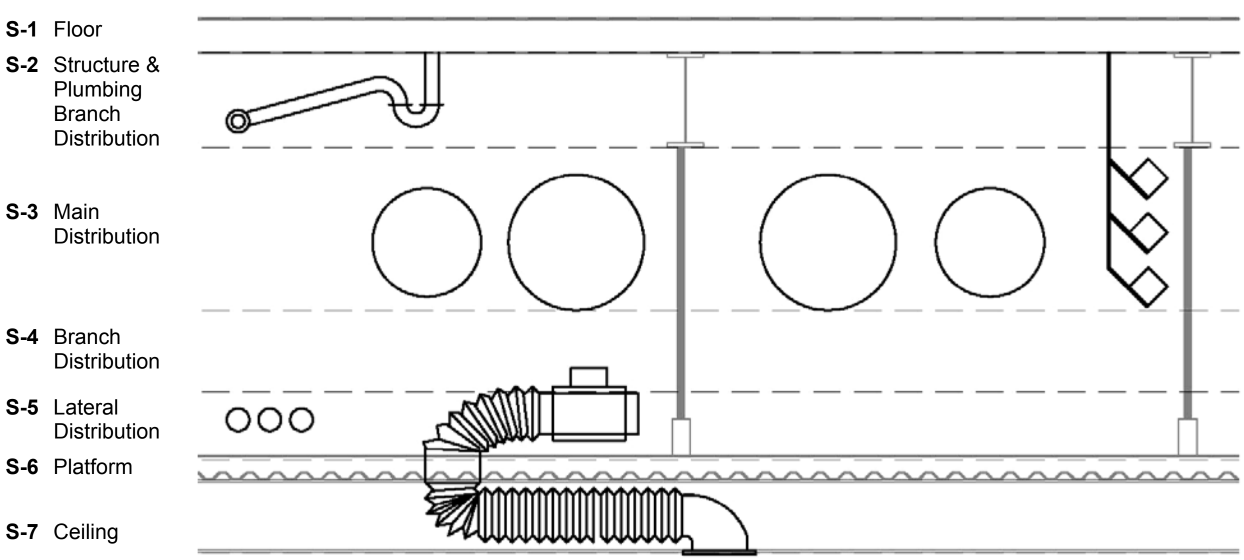


Figure 2-3 Typical Subzones

Hospitals Built Using VAHBS

The VAHBS has been used in new and replacement hospital projects in all areas of the country.

Example Medical Centers

Three representative Medical Centers were selected for review and inclusion as examples of the application of the VAHBS in this Supplement. They are identified as Medical Centers A, B, and C in the Appendix. The main hospital building at each medical center is a single structure of 929,000 to 1.5 million square feet. The number of stories, building geometries, structural bays and materials of construction vary in each building.

Project data for each of these hospital buildings, including typical plans and service zone strategies, are presented in Appendix A. Also included in Appendix A are summaries and analysis of interviews of the Facilities or Engineering Officers and Resident Engineers (if available) for the example medical centers regarding the effects of the VAHBS on the construction, maintenance, operation, remodeling and new construction for the buildings.

This page intentionally left blank.

Section 3

Issues

This page intentionally left blank.

Need for Supplement

In 2004 and 2005 VA undertook advance planning for the first new major hospital projects since the mid 1990's. Since VA policy for the design of new hospital buildings is to provide for their continuing adaptability to changing conditions and programs throughout their structural life (VHA Program Guide PG-18-3, Design and Construction Procedures, Topic 3) and since the VAHBS concept which provides such adaptability was partially outdated (original issue 1972, revision 1977), VA recognized the need for a Supplement to the Red Book to address significant developments in construction and healthcare delivery since 1977. In August 2005 VA commissioned this Supplement Paper as the means to provide uniform guidance to project teams in the application of VAHBS principles.

The VA Hospital Building System was successfully applied to major new or replacement hospital projects completed between 1977 and 1995. The buildings show a variety of design expressions, bay sizes, plan geometries and floor-to-floor heights. Detailed information is provided for three of the facilities in the Appendices. Photos of several other VA Medical Centers have been inserted in Sections 2, 3, and 4.

As the projects using the VAHBS were designed, constructed and occupied details of the system evolved. A number of refinements in the application of systems integration were discovered by the designers, contractors, and VA. This Supplement to the Red Book reports on those developments. There have been numerous and significant changes in the healthcare delivery model, medical technology, and regulatory requirements since 1977. The VAHBS was intended to allow for a high degree of functional adaptability and ease of utility (service) modifications. All of the VAHBS hospital buildings have been occupied for 10 or more years and have undergone varying degrees of modifications. This Supplement includes reports on the adaptability of systems at three of the facilities.

Changes in Health Care Models

The prevailing health care model at the time the VAHBS was developed was centered on inpatient care with a relatively small ambulatory component. Bed towers of 700 to 1000 beds were major components of space in the hospital. Consequently 40 to 60 bed nursing units were the primary driver for the planning modules presented in the VAHBS. Typical designs included a preponderance of 4-bed rooms with a mix of 1 and 2-bed rooms.

Beginning in the 1980's there was a major shift in the health care model from inpatient to outpatient or ambulatory services. Trends in patient privacy also moved design to 20-bed nursing units with all 1-bed rooms.

Existing VAHBS hospitals have proven to be highly adaptable to these changes in health care delivery. New designs must address these changes by designing structural bays and space modules to meet current functional needs while maintaining a high degree of adaptability.

VA Medical Center
Bronx, NY, 1980

Changes in Technology

As technology for healthcare is invented and implemented, continuing changes in functional space and building service will be necessary to support the new equipment and processes. Hospital designs that incorporate adaptable plans and services are essential to continued viability. Over the last 30 years some of the greatest impacts from new technology have been to the electrical, and communications systems.

Digital data networks have become the prevalent means for information transport, necessitating installation of fiber optic backbones, electronic components, and copper station cabling of ever-increasing bandwidth. These requirements were not anticipated when the VAHBS was instituted, and installation of data network cabling has been generally performed with little regard for the organization of VAHBS service systems and subzones; this is in large part due to the fact that most cable plants were not installed as part of the original construction project, but at a later date. Replacement of older telephone cabling, which often accompanied data network installation, was subject to the same lack of discipline. Further, the trend for most special systems such as nurse call and fire alarm to use digital communication protocols, the growth of digital building environmental control systems, the current trend away from coaxial cable to twisted-pair wiring for signal systems such as MATV and CCTV, and the movement towards integration of different systems by gateways or standard protocols (such as Ethernet, BacNet, or TCP/IP) onto a common network have driven the need for structured cabling systems coupled with rigorous installation and maintenance practices. Any systems whose information is transported over the data network become integrated systems by default per this Supplement to the VAHBS. Remaining communications systems are non-integrated and are separately treated in VA design manuals and master specifications.

Changes in Regulatory Requirements

Building codes and, in particular, seismic requirements have become increasingly stringent. Most of these changes affect the specification, detailing, or installation of services, but will not affect the space modules or overall VAHBS concept. However, changes in structural requirements will affect decisions concerning bay size, lateral restraint systems, and member sizes. These will, in turn, influence service zone dimensions, floor-to-floor height, and planning modules.

Fire and life safety codes have undergone numerous revisions since the Red Book was first published. The fire and life safety concepts used for the prototype design in the Red Book were based on a health care model with primarily inpatient care and comparatively small outpatient and administration areas. The usual approach was to consider the entire hospital building as a single institutional occupancy and not to create multiple occupancies. This allowed for expansion or relocation of departments and services without having to worry about occupancy separations. However, requirements for fire and smoke compartments were extended into areas where they might not otherwise have been required. Automatic fire sprinklers were not required nor were they typically installed throughout the building.

As the percentage of outpatient care areas increased, the fire and life safety strategy shifted from single-occupancy to multiple-occupancy buildings. The fire protection strategies for new buildings will need to consider multiple occupancies when establishing fire and smoke compartments, and service modules.

Fire sprinklers are now required throughout VA patient care buildings. Because the service zones in VAHBS buildings featured highly ordered distribution of service systems with allowances for expansion, fire sprinkler systems could be added or extended with minimal disruptions to other services or occupied space. In new buildings fire sprinkler and standpipe systems should be added to the list of integrated subsystems.

JCAHO and AIA/HHS guidelines for hospital design, equipment and systems have been revised several times and may be expected to continue to evolve. While these changes have made some of the specific planning data in the Red Book obsolete, they reinforce the need for designs and building services with high degrees of adaptability.

VA and ASHRAE standards for ventilation rates, energy efficient design, and indoor air quality have been updated and will continue to evolve.

The 2002 National Electrical Code introduced requirements that abandoned, low-voltage communications cabling of many systems be removed in order to reduce the combustible fuel load present in the cable insulation. Much legacy telephone, intercom, coaxial, and other wiring was abandoned in place when newer cable plants were installed in the 1990's. While this concern is moot in regard to the construction of new VA hospitals, it is a critical component of renovation projects in existing hospitals where cabling may or may not have been installed per VA criteria.

Cost and Schedule

Cost

Many of the basic principles and observations contained within the Red Book related to cost still hold true today. However, recent market fluctuations, changes in procurement selection, and amendments to contract requirements have had an effect on many of the Analyses. Future analyses of costs associated with VAHBS building comparisons should therefore give greater consideration to location, market conditions and procurement methods.

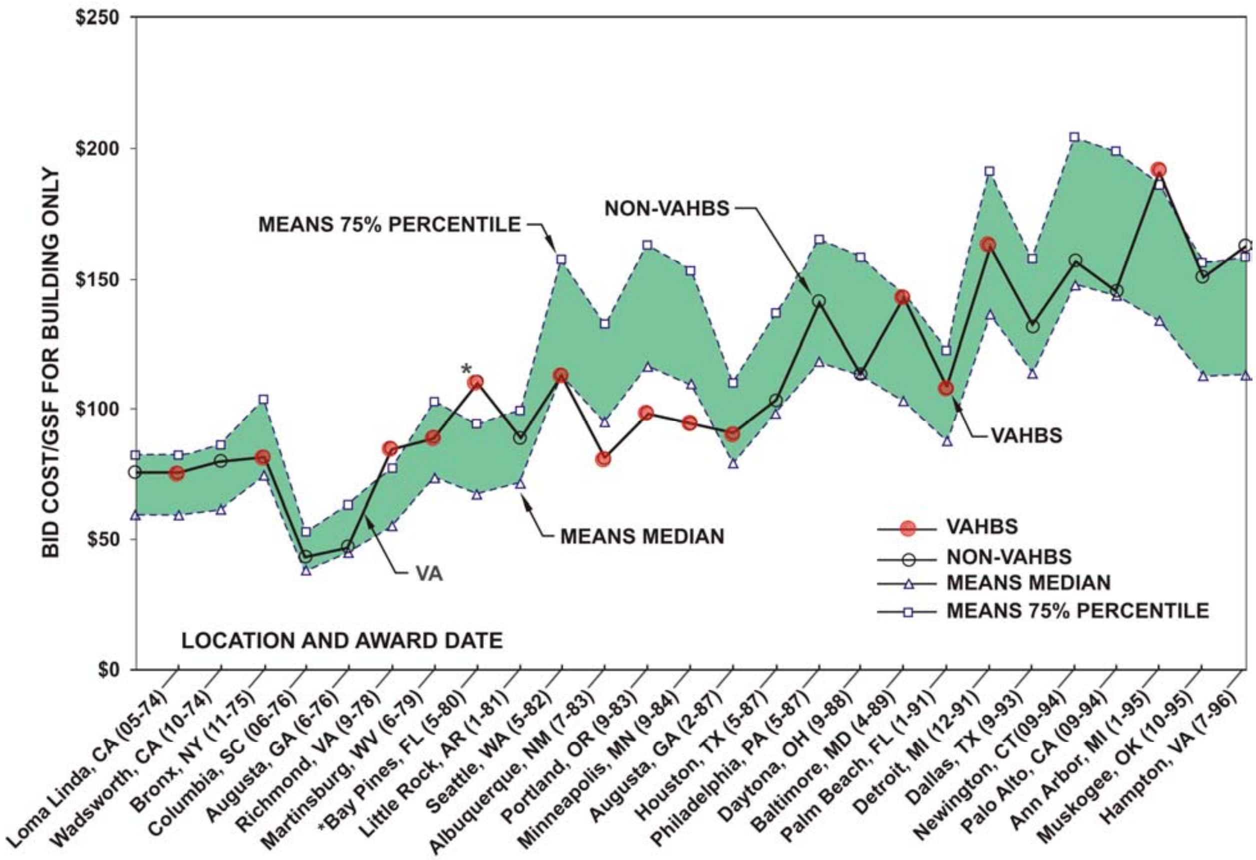
It is extremely important, as stated later in Section 4, to hold thorough pre-bid conferences for prime and sub-contractors, and material suppliers using models, diagrams, video simulations, and other techniques illustrating project sequence and the time and labor saving opportunities inherent in the VAHBS.

Cost of VAHBS Hospitals

A VA Study compared the Bid Cost / GSF for facilities built using VAHBS over a 22 year period (from Loma Linda, CA in 1974 to Hampton, VA in 1996) with R.S. Means cost data for hospital construction over the same period (See Fig Below). Means includes nationwide cost data for hospital types ranging from small, community hospitals to large, complex medical centers (including non-VAHBS construction). VA hospitals tend to be in the category of large to very large medical centers. The median and 75th percentile costs from Means Cost Data were selected as representing costs for hospitals of similar size and with programs similar to VA hospitals.

Except for Bay Pines, the costs for the VAHBS hospitals are at or below the Means 75th percentile. Costs for three of the hospitals (Albuquerque, Portland, and Minneapolis) were below the Means median. It should be noted that the construction contract for Bay Pines included electric powered vehicles (not normally purchased with construction funds) and an unusually large quantity of exterior canopies and walkways among other buildings on the campus.

VA COST AT LOCATION AND AWARD DATE



* BID INCLUDES ADDITIONAL ELEMENTS EXTERNAL TO THE BUILDING IN THE GSF COST

Construction Cost

The data from the Medical Centers (Database, Volume 2) used for the Cost Analyses in Volume 3 of 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. For example, recent volatility in steel and concrete costs has seen these components increase in dramatically greater proportions than other trades. The design team shall use the best available current data for cost estimating, systems comparisons, and life cycle cost analysis.

Life Cycle Costs

Unlike some private sector Owners, VA can be expected to occupy a hospital building for 40, 50, or more years. For such long terms, the costs of operating, maintaining, and altering buildings will usually exceed their first cost several times over. Section 752 in Volume 3 of the Red Book analyzes the savings in housekeeping, maintenance, and alteration for a systems building compared to a traditional building. The general observations and principles contained in Section

752 still apply today and are supported by the experiences and observations of Medical Center Facilities Managers (see Appendix A). The VAHBS permits a much greater ease, time saving, and quality of routine and emergency maintenance, and alterations or changes with substantially less impact on occupied spaces. These factors can be expected to pro\duce cost savings compared to traditional construction. However, methods and procedures used by VA for funding operation, maintenance, and alterations; and tracking expenses still make detailed assignment of costs and analysis difficult (and beyond the scope of this Supplement).

Recent trends in construction costs will likely affect the relationship of Life Cycle Costs to First Costs. For example, construction costs (first costs) would appear to be seeing considerable escalation at present. As noted previously, some sub-systems or components such as steel and concrete are increasing faster than the overall escalation rate. Some portions of the country are affected to a much greater degree than others. Such “spikes” in first costs will affect the relationship between Life Cycle Costs and First Costs. In certain instances, the result may be a longer “pay-back” period for savings in housekeeping, maintenance and renovations.

John D. Dingell VAMC, Detroit, MI 1995

The basic premise outlined in Section 752.5 of the Red Book, i.e., that the cost of major alterations within a VAHBS building are less than those for a conventional building should still hold true. Indeed given the apparent current market place preference by bidding contractors in certain locations, savings may actually be magnified.

General trends suggest that more “difficult” alteration projects with greater phasing, access and temporary work considerations and restrictions are considerably less attractive than “new” build or “less restrictive” alteration construction projects.

The cost of “General Conditions” will be greater than for less restrictive projects and bidders may add a factor for the perceived greater risk. Remodeling in VAHBS buildings compared to remodeling in conventional buildings should offer greater ease of construction, attractiveness to bidders and lower “premiums” for actual and/or perceived risk.

Schedule

The planning, design, and construction of a major new facility takes several years. Shortening the duration of a project reduces the impact of inflation or cost escalation, reduces overhead/general conditions, and delivers services to veterans sooner. The VAHBS includes several strategies with the potential to accelerate the design and construction of new hospital buildings. Because each project will have its own unique combination of opportunities and constraints not all strategies may be applicable to every project.

Planning, Design and Construction

The integrated approach to functional and systems design proposed in the Red Book can shorten the time for planning and design due to earlier involvement by the engineering disciplines. The development of the service modules to be used in the design of each new facility requires the project team to make basic engineering assumptions for structure and building service systems. The level of detail required is greater than that for typical block or preliminary design. Engineering and systems design is then no longer tied to the development of detailed or "final" room and department layouts. Design development and construction documents for the integrated systems can start earlier than normal. Application of the VAHBS places a premium on examining and coordinating the interrelationships of building services and subsystems early during design.

Modularity, redundancy, and use of typical or repetitive elements in the design of the building systems will reduce the number of "special" conditions. This may simplify the preparation of documents and may make greater efficiencies in procurement and installation possible. Modularity not only promotes a learning curve increasing productivity for the workmen as the building progresses, but it also allows pre-fabrication for many components or sub-systems (duct runs, piping, wireway, etc.).

VA Medical Center
Portland, OR, 1984

Since the design is more "adaptable," the building systems will require fewer modifications or redesign due to changes in the functional plans. Multiple or phased bid packages can be developed and priced with a greater degree of confidence.

Use of assigned subzones and channels, and integration of system during design will reduce conflicts and changes in the field. However, the Contractor still must closely coordinate the work of the various trades and enforce the "rules" established for the service zones.

Remodel and Renovation

The VAHBS includes features that should facilitate the work and reduce impacts on occupied spaces in or adjoining the area of the work. The potential advantages of these features must be clearly communicated to bidders so that benefits in schedule (and consequently costs) may be realized. These features are intended to contain the impacts of the work to as limited an area as possible. By reducing impacts to the functional zone and surrounding occupied areas of the hospital, the need for temporary barriers, temporary utilities, phasing and "domino" moves may be reduced or eliminated.

Features of the VAHBS that facilitate remodel and renovation include modular design, stacked service bays, service risers separated from functional zones, location of service equipment restricted to service bays (out of functional zones and interstitial area), provisions for access to exterior for major equipment replacement, provision of accessible interstitial service zones with dedicated subzones and channels; "over sizing" service mains, equipment rooms, shafts and risers; use of non-bearing partition systems (including smoke and fire) that terminate at interstitial platform; and coordination of fire zone and service module boundaries.

Section 4

Application of VAHBS to New Projects

Page

This page intentionally left blank.

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.

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

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. Consideration 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.

**VA Medical Center
Martinsburg, WV, 1983**

Amend Section 314 to add new subsection 314.3 as follows.

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: Recent 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.

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.

New Mexico VA HCS
Albuquerque, NM, 1986

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.

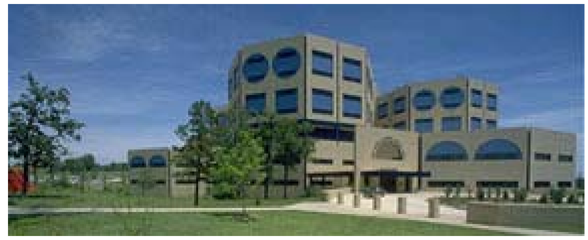
344.4 Fire Safety: No exhaust or return plenums are allowed.

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.

VA Medical Center
Philadelphia, PA, 1994
(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*.

VA Medical Center
Baltimore, MD, 1992

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.

Appendix A

Example VAHBS Hospitals

This page intentionally left blank.

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.

This page intentionally left blank.

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

Typical Subzone Dimensions

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. 16" w/ 9'-0" Clg.

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.

This page intentionally left blank.

Medical Center A

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

Note plumbing risers and stacks in background.

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

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

Medical Center A

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

Fire dampers are not required at duct penetrations.

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 telephone/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 wireways.

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

Photo A-9 Interstitial Service Zone
Showing remodel work

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-10 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.

This page intentionally left blank.

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 background 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

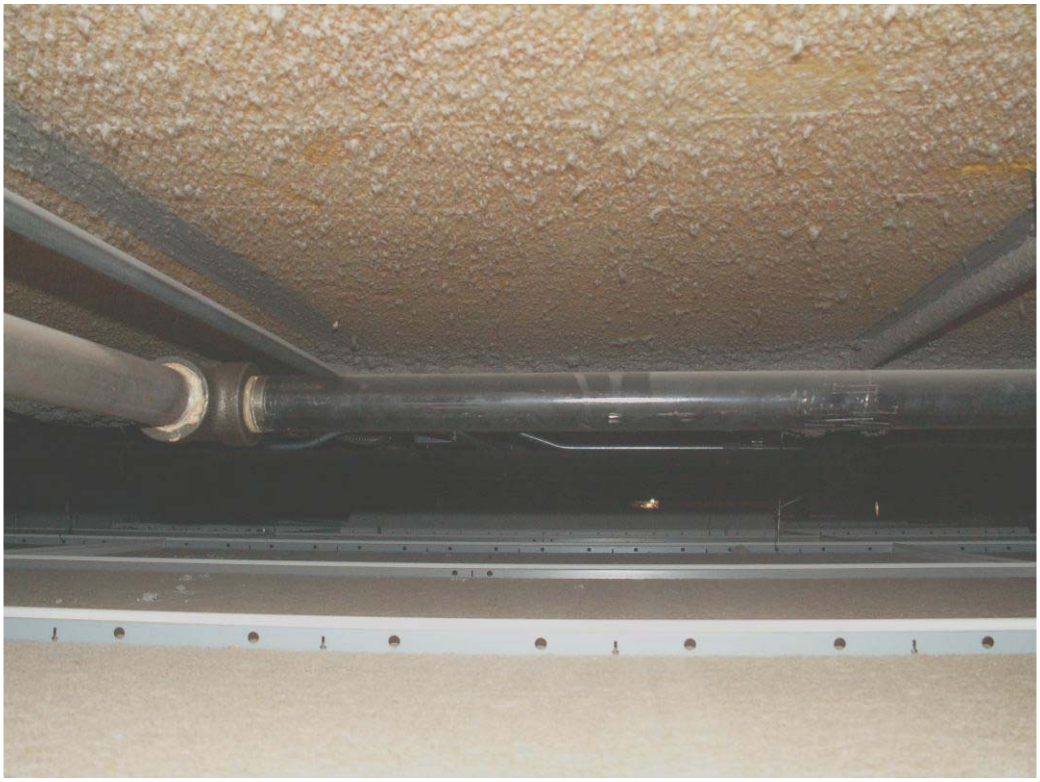
Note industrial stair for access to interstitial service zone in background.

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 platform 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

Typical Subzone Dimensions

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. 12 ½" W/ 9'-0" Clg.

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, <u>not</u> 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

Appendix B

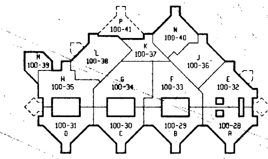
Record Drawings

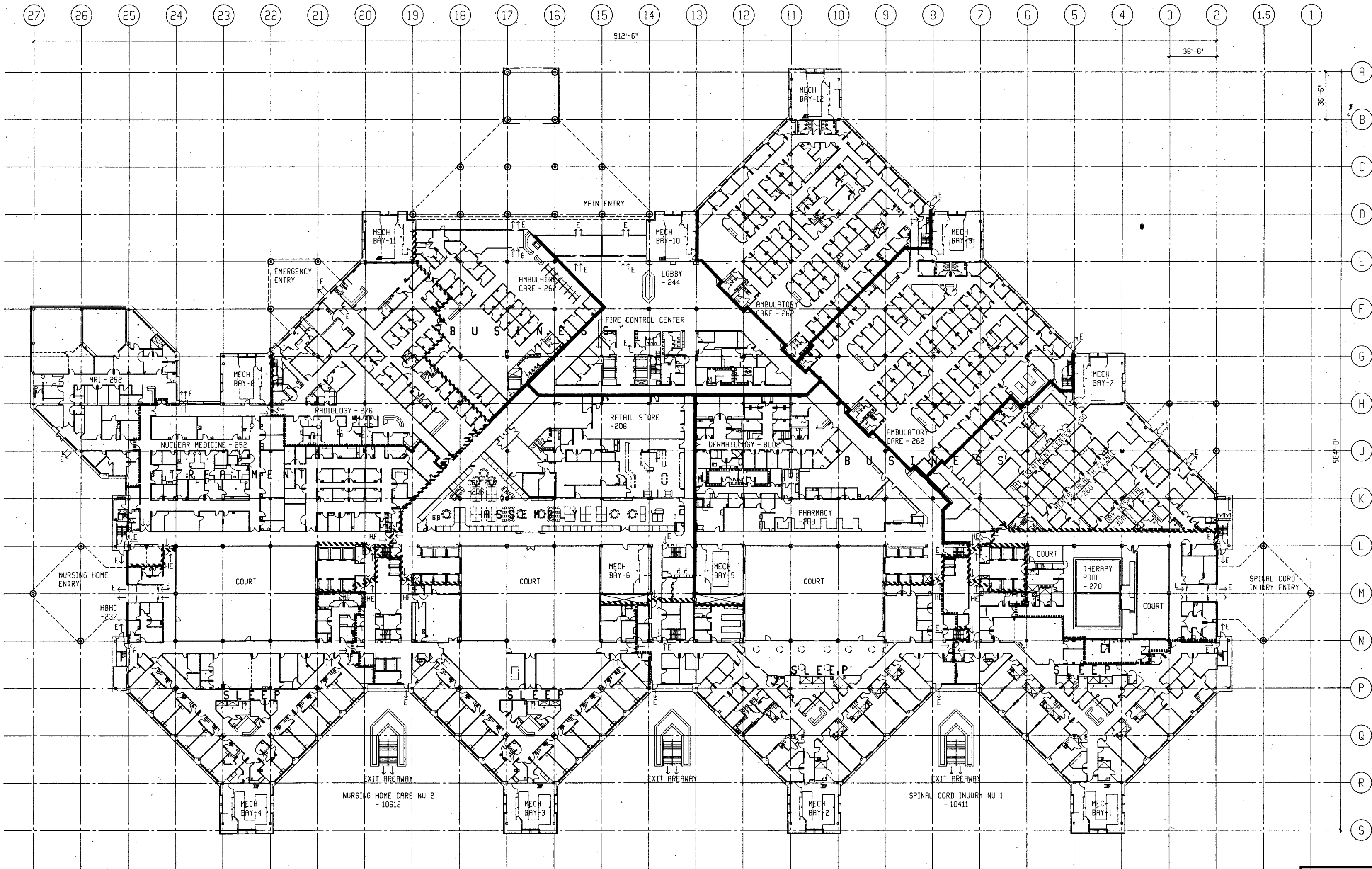
This page intentionally left blank.

Introduction

The following documents were obtained during the field surveys of the example Medical Centers. They are included with this Supplement as examples of some of the information provided in the construction documents of previous projects to illustrate the VAHBS concept to the Contractor.

This page intentionally left blank.





GENERAL NOTES

1. SEE GENERAL ARCHITECTURAL NOTES, DRAWING X-4.
2. THIS BUILDING IS TO BE FULLY SPRINKLERED IN ACCORDANCE WITH NFPA 101 AND NFPA 13.
3. A STANDPIPE WITH FIRE DEPARTMENT CONNECTIONS AT EACH FUNCTIONAL FLOOR LANDING IS TO BE PROVIDED WITHIN EACH EXIT STAIR.
4. PORTABLE FIRE EXTINGUISHERS (VV) ARE TO BE PROVIDED IN ACCORDANCE WITH NFPA 101 AND NFPA 10. SEE THE 1/8" SCALE PLANS FOR SUGGESTED LOCATIONS. SEE 1/8" PLANS FOR FIRE EXTINGUISHER CABINETS (CC). FIRE EXTINGUISHERS FOR THESE CABINETS ARE (VV).
5. ONE HOUR FIRE AND ONE HOUR FIRE AND SMOKE PARTITIONS ARE CONTINUOUS FROM THE FLOOR SLAB TO THE UNDERSIDE OF THE INTERSTITIAL PLATFORM ABOVE IN THOSE AREAS WHERE AN INTERSTITIAL PLATFORM OCCURS. IN AREAS WITHOUT AN INTERSTITIAL PLATFORM, ONE HOUR FIRE AND ONE HOUR FIRE AND SMOKE PARTITIONS ARE CONTINUOUS FROM THE FLOOR SLAB TO A RATED CEILING ABOVE WHERE CEILINGS OCCUR OR TO THE UNDERSIDE OF THE FLOOR SLAB ABOVE WHERE THE FLOOR SLAB IS EXPOSED. TWO HOUR FIRE AND TWO HOUR FIRE AND SMOKE PARTITIONS ARE CONTINUOUS FROM THE FLOOR SLAB TO THE UNDERSIDE OF THE INTERSTITIAL PLATFORM ABOVE IN THOSE AREAS WHERE AN INTERSTITIAL PLATFORM OCCURS. IN AREAS WITHOUT AN INTERSTITIAL PLATFORM, TWO HOUR FIRE AND TWO HOUR FIRE AND SMOKE PARTITIONS ARE CONTINUOUS FROM THE FLOOR SLAB TO THE UNDERSIDE OF THE FLOOR SLAB ABOVE. TWO HOUR FIRE AND SMOKE PARTITIONS SEPARATING AREAS BETWEEN WHICH THERE ARE HORIZONTIAL EXITS ARE CONTINUOUS FROM FLOOR SLAB TO THE UNDERSIDE OF THE INTERSTITIAL PLATFORM ABOVE AND FROM THE INTERSTITIAL PLATFORM TO THE UNDERSIDE OF THE FLOOR SLAB ABOVE. ANY OFFSETS BETWEEN THE PARTITION AT THE FUNCTIONAL FLOOR LEVEL AND THE PARTITION AT THE INTERSTITIAL LEVEL ACHIEVE CONTINUITY THROUGH THE TWO HOUR INTERSTITIAL PLATFORM CONSTRUCTION AND THE TWO HOUR FLOOR SLAB CONSTRUCTION.
6. OCCUPANCY SEPARATIONS AND SMOKE COMPARTMENTS ARE SHOWN ON THIS PLAN. SEE THE 1/8" SCALE PLANS FOR ADDITIONAL RATED PARTITIONS.
7. FIRE AND SMOKE PARTITIONS ARE INDICATED BY THE FOLLOWING SYMBOLS:
   ONE HOUR FIRE AND SMOKE PARTITION:
   TWO HOUR FIRE AND SMOKE PARTITION:
   OTHER ZONE BOUNDARIES, RATED OR NON-RATED:
8. "E" INDICATES "EXIT" AND "HE" INDICATES "HORIZONTIAL EXIT". ARROWS INDICATE THE GENERAL DIRECTION OF EXITING.

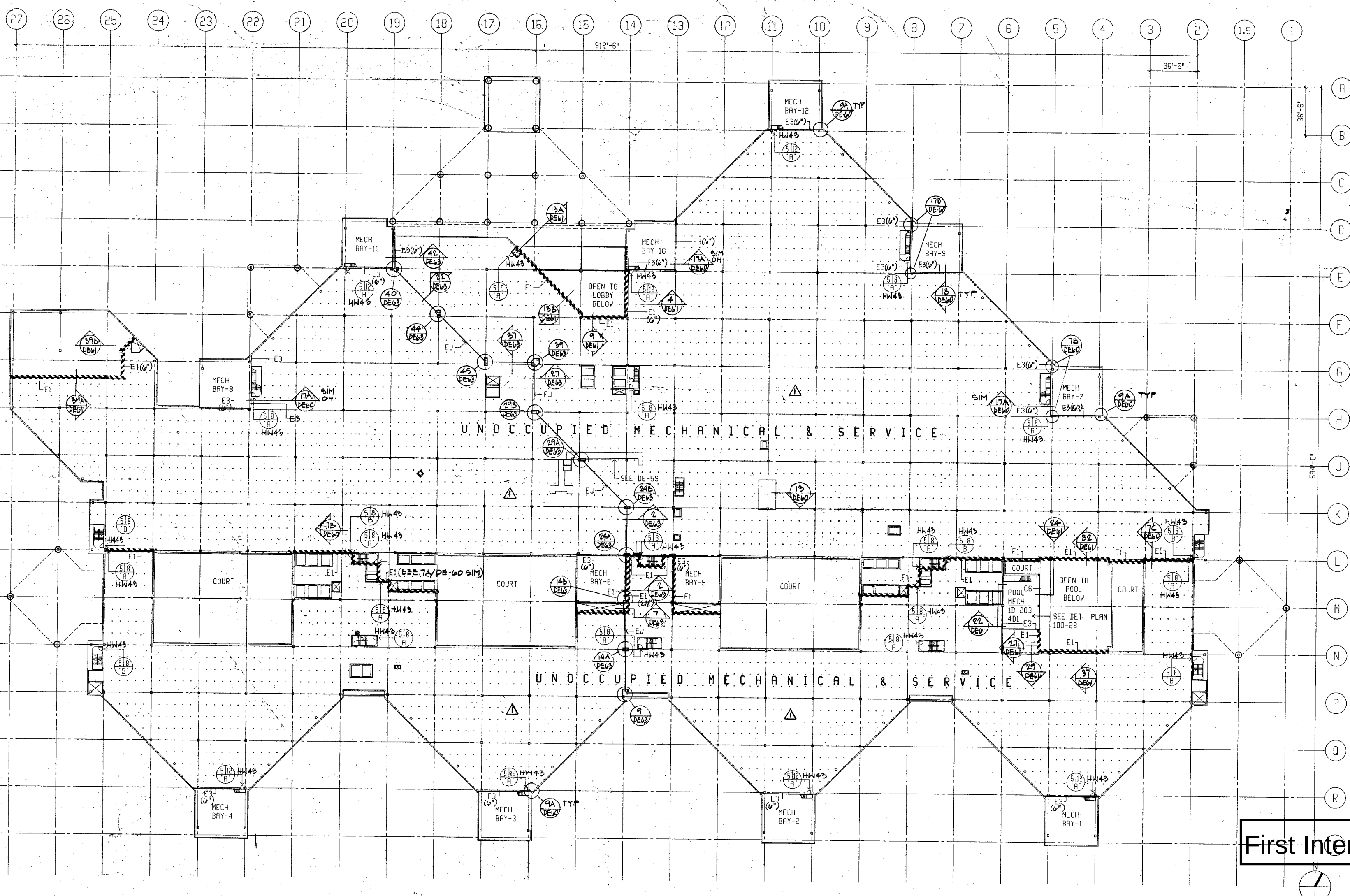
SHEET NOTES

1. FINISH FLOOR ELEVATION: 56.00.
2. FOR EXTENT OF PHASE I CONSTRUCTION (NOT IN THIS CONTRACT) SEE STRUCTURAL DRAWINGS.

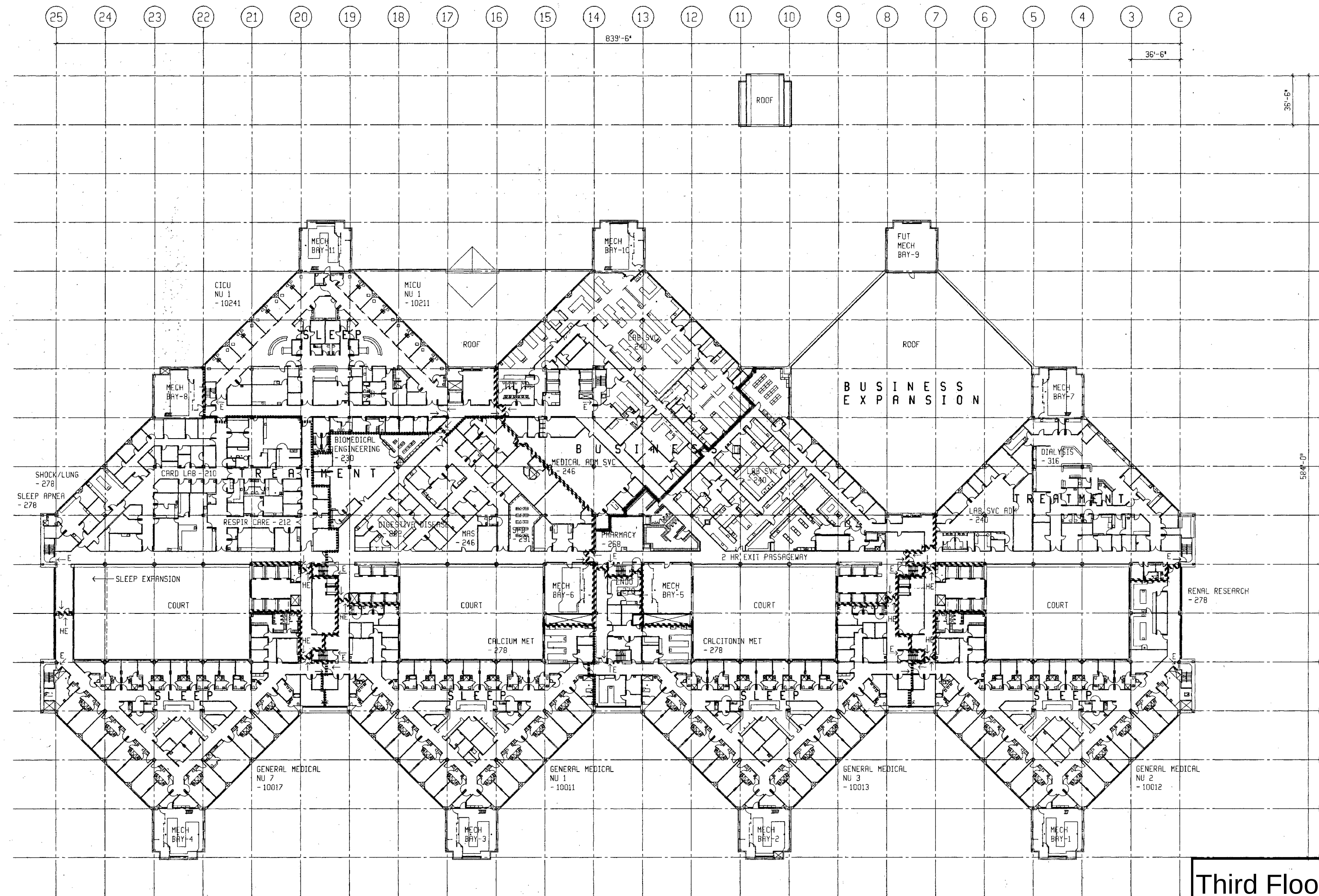
First Floor Key Plan B-3

SHEET NOTES

1. SEE GENERAL INTERSTITIAL NOTES, DRAWING 100-2.



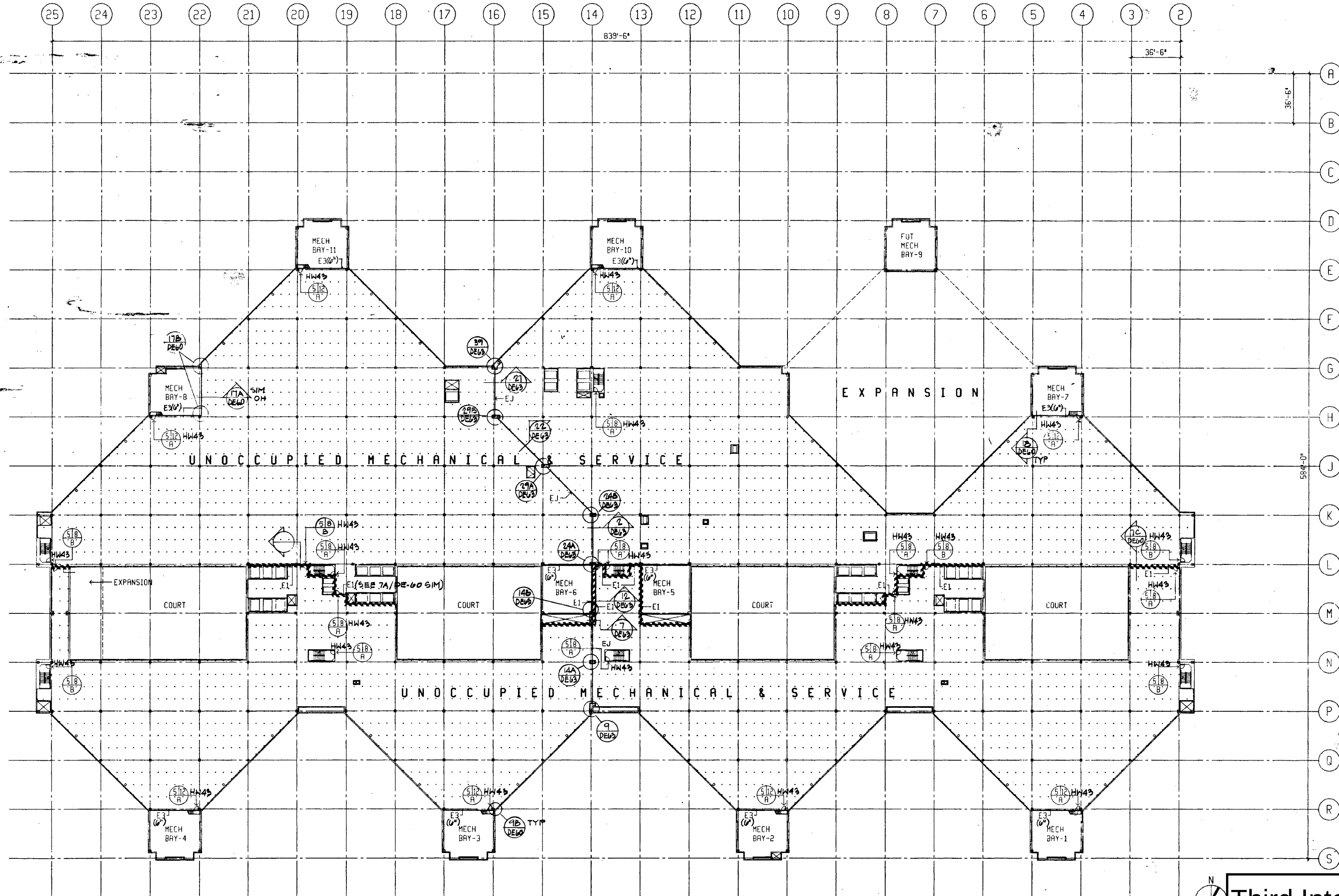
First Interstitial Key Plan B-4



SHEET NOTES

1. SEE GENERAL NOTES, DRAWING 100-3.
2. FINISH FLOOR ELEVATION: 93.66.

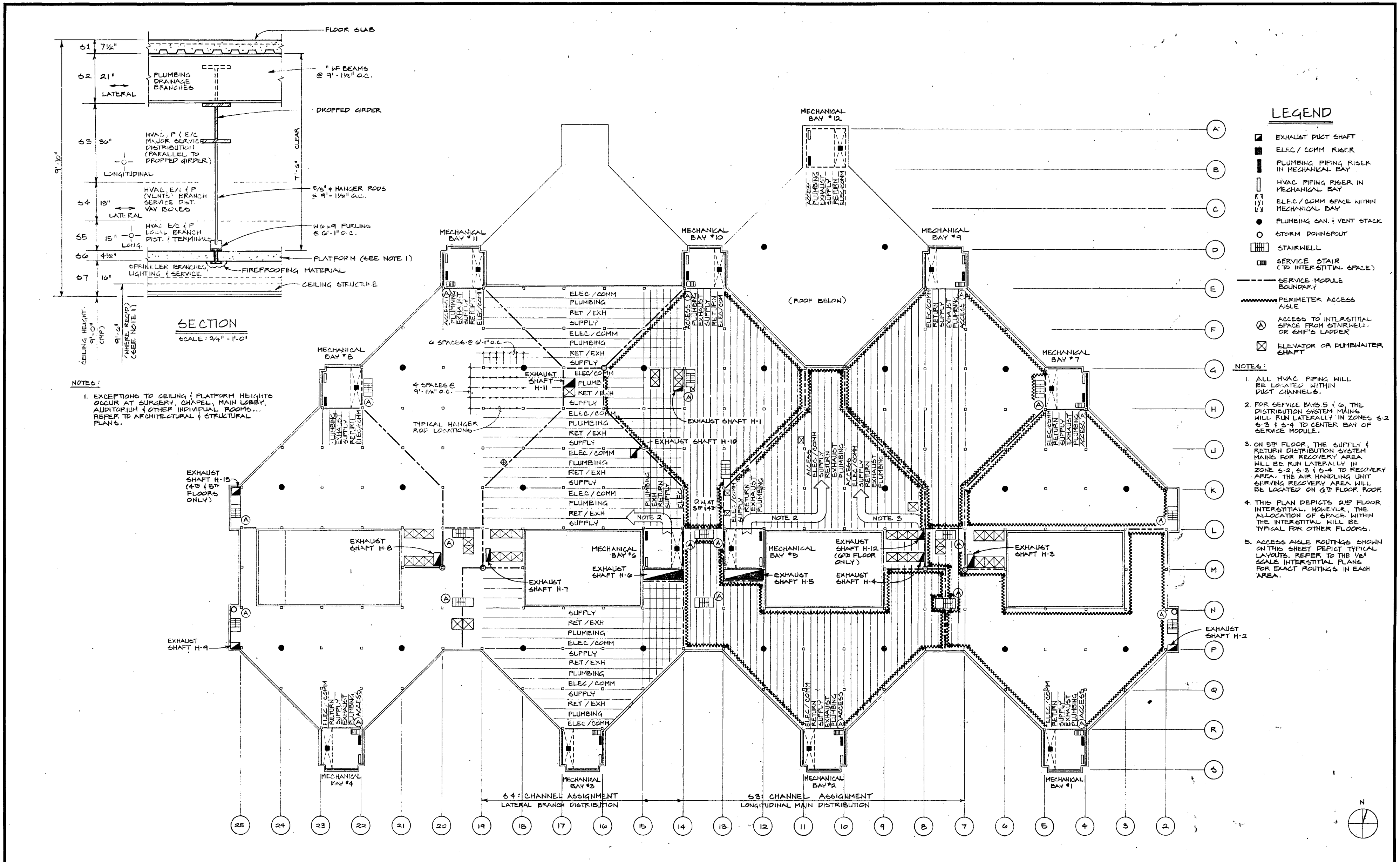
Third Floor Key Plan B-5



SHEET NOTES

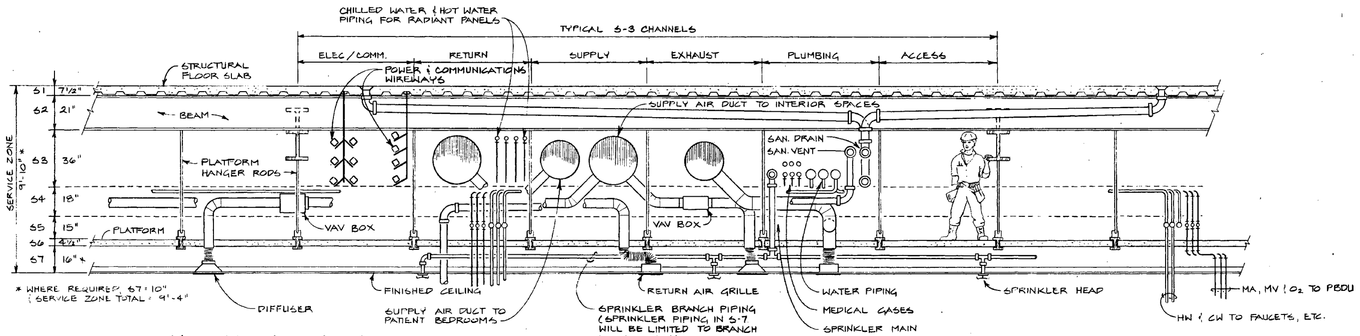
1. SEE GENERAL INTERSTITIAL NOTES, DRAWING 100-2.

Third Interstitial Key Plan B-6

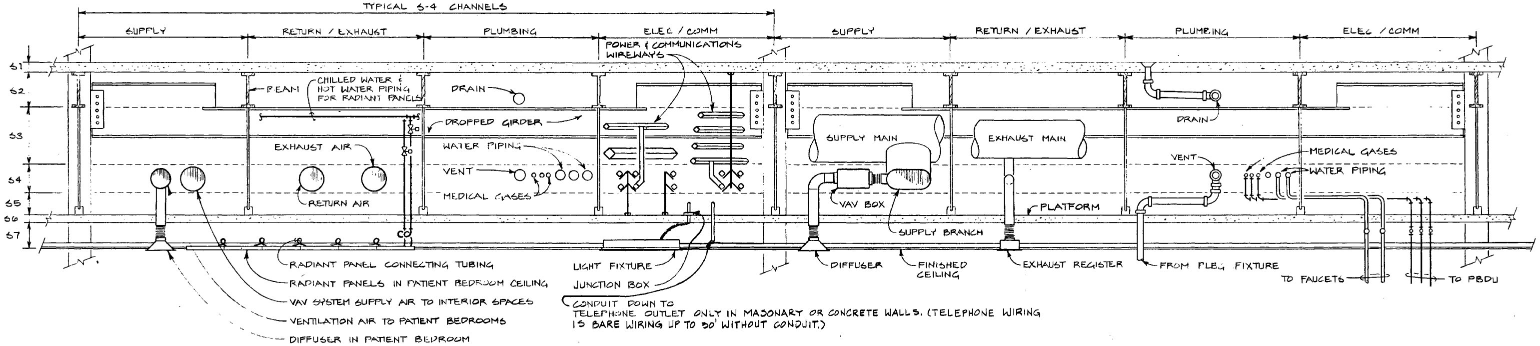


Allocation of Interstitial Space--Typical B-7

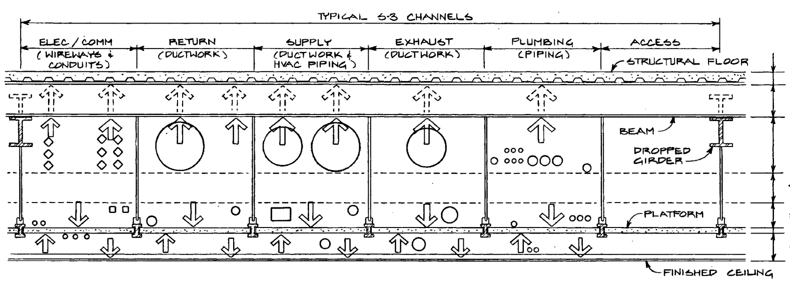
Typical Interstitial Space Composite Sections B-8



TYPICAL SECTION (A)
SCALE: 3/8" = 1'-0"



TYPICAL SECTION (B)
SCALE: 3/8" = 1'-0"



TYPICAL STRATEGY FOR SUPPORTING DISTRIBUTION IN S-3, S-5 & S-7 SUBZONES
SCALE: 3/8" = 1'-0"

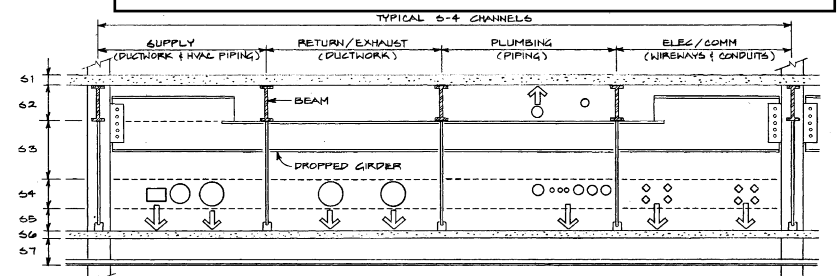
<u>SUBZONE S-2</u>:
SYSTEM ELEMENTS IN THE S-2 ZONE SHALL BE SUPPORTED FROM THE UNDERSIDE OF THE FLOOR SLAB OR DECK.

<u>SUBZONE S-3</u>:
SYSTEM ELEMENTS IN THE S-3 ZONE SHALL BE INSTALLED AS CLOSE AS POSSIBLE TO THE UNDERSIDE OF THE STRUCTURAL BEAM. ALL ELEMENTS SHALL BE SECURED TO THE BOTTOM OF THE BEAM. SUPPORT FOR SYSTEMS IN THIS ZONE MAY BE FROM THE UNDERSIDE OF THE DECK. HOWEVER, USE OF THE DECK FOR SUPPORT SHOULD BE MINIMIZED.

<u>SUBZONE S-4</u>:
SYSTEM ELEMENTS IN THE S-4 ZONE SHALL BE SUPPORTED FROM THE PLATFORM PURLIN.

<u>SUBZONE S-5</u>:
SYSTEM ELEMENTS IN THE S-5 ZONE SHALL BE SUPPORTED FROM THE PLATFORM.

<u>SUBZONE S-7</u>:
SYSTEM ELEMENTS IN THE S-7 ZONE AS WELL AS THE CEILING GRID SYSTEM SHALL BE SUPPORTED FROM THE UNEDRSIDE OF THE PLATFORM. LIGHT FIXTURES WILL BE SUPPORTED BY THE ARCHITECTURAL CEILING GRID SYSTEM.
CEILING MOUNTED ITEMS SHALL BE SUPPORTED BY A SYSTEM OF STRUCTURAL ELEMENTS BEARING ON THE PLATFORM PURLIN. IN THE CASE OF HEAVY CEILING MOUNTED ITEMS, SUPPORT MAY BE PROVIDED BY FLOOR FRAMING ELEMENTS.



TYPICAL STRATEGY FOR SUPPORTING DISTRIBUTION IN S-2 & S-4 SUBZONES
SCALE: 3/8" = 1'-0"

INTERSTITIAL RACEWAY SYSTEM

NORMAL POWER	SYMBOL
NORMAL POWER "A" PANELS, 277/480V & 120/208V	NA
NORMAL POWER "B" PANELS, 277/480V & 120/208V	NB
EQUIPMENT NORMAL POWER 277/480V & 120/208V	Q
ESSENTIAL POWER	
CRITICAL POWER	C
LIFE SAFETY POWER	L
EQUIPMENT POWER	E
COMMUNICATION	
TELEPHONE	T
NURSE CALL	S
MATV/CCTV/RADIO/PAGING	TV
FIRE ALARM	F

RACEWAY SIZES MAIN S-3 ZONE

SYMBOL	WIREWAY SIZE*	NAMEPLATE
NA	4 x 4	NORMAL POWER "A"
NB	4 x 4	NORMAL POWER "B"
Q	4 x 4	EQUIP. NORMAL POWER
C	4 x 4	CRITICAL POWER
L	2-1/2 x 2-1/2	LIFE SAFETY POWER
E	2-1/2 x 2-1/2	EQUIP. EMERGENCY POWER
T	6 x 6	TELEPHONE
TV	6 x 6	MATV/CCTV/RADIO/PAGING
F	6 x 6	FIRE ALARM SYSTEM
S	6 x 6	NURSE CALL
	FUTURE	

(4) (1)

*UNLESS NOTED OTHERWISE

RACEWAY SIZES MAIN S-4 ZONE

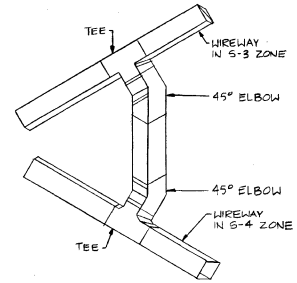
SYMBOL	WIREWAY SIZE*	NAMEPLATE
NA	2-1/2" x 2-1/2"	NORMAL POWER "A"
NB	2-1/2" x 2-1/2"	NORMAL POWER "B"
Q	2-1/2" x 2-1/2"	EQUIP. NORMAL POWER
C	2-1/2" x 2-1/2"	CRITICAL POWER
L	2-1/2" x 2-1/2"	LIFE SAFETY POWER
E	2-1/2" x 2-1/2"	EQUIP. EMERGENCY POWER
T	4 x 4	TELEPHONE
TV	4 x 4	MATV/CCTV/RADIO/PAGING
F	4 x 4	FIRE ALARM SYSTEM
S	4 x 4	NURSE CALL
	FUTURE	

(4) (1)

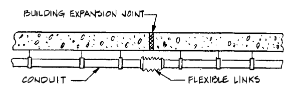
*UNLESS NOTED OTHERWISE

NOTES: (PERTAINING TO INTERSTITITAL RACEWAY SYSTEM)

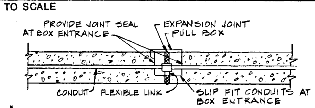
1. PROVIDE NAMEPLATES ON ALL RACEWAYS RUN IN THE INTERSTITAL SPACE IDENTIFYING THE SYSTEM SERVED AS DENOTED ON ABOVE SCHEDULES. NAMEPLATES SHALL BE LOCATED AT 10'-0" O.C. INTERVALS AND SHALL BE PLACED SO THEY CAN BE EASILY READ.
2. PROVIDE FIREPROOFING WHEREVER A WIREWAY PENETRATES A FIREWALL.
3. WIREWAY SHALL BE SUPPORTED AS SPECIFIED IN SPECIFICATIONS.
4. REFER TO DRAWINGS 100-E179 THRU 100-E253 FOR RACEWAY SYMBOLS.



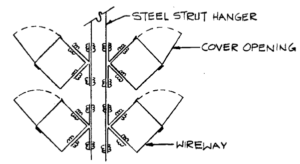
5 WIREWAY TRANSITION FROM S-3 ZONE TO S-4 ZONE
NOT TO SCALE



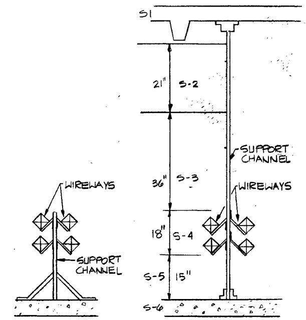
8 HORIZONTAL CONDUIT RUN ACROSS EXPANSION JOINT
NOT TO SCALE



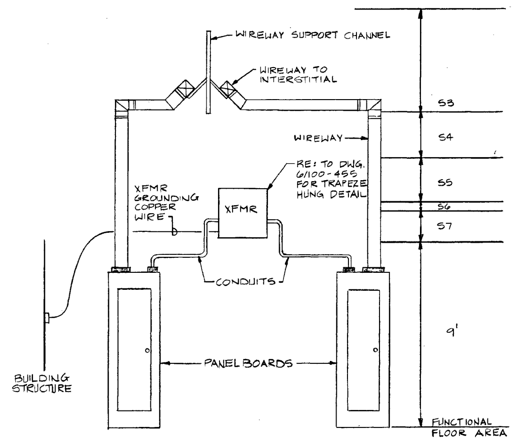
7 CONCEALED CONDUIT CROSSING EXPANSION JOINT
NOT TO SCALE



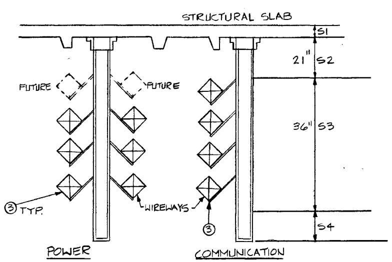
4 WIREWAY IN S-4 ZONE
NOT TO SCALE



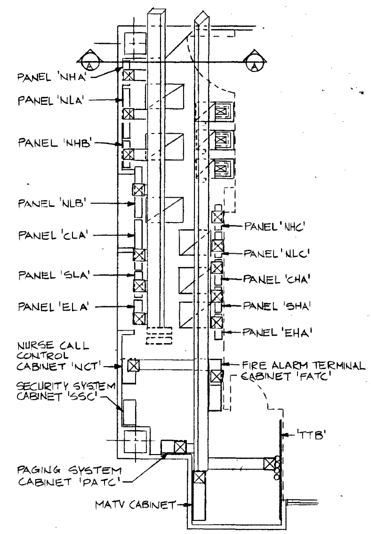
2 ALTERNATE MOUNTING METHOD S-4 ZONE
NOT TO SCALE



6 TYPICAL WIREWAY CONNECTION IN ELECTRICAL ROOM
NOT TO SCALE



3 SECTION A-A
NOT TO SCALE

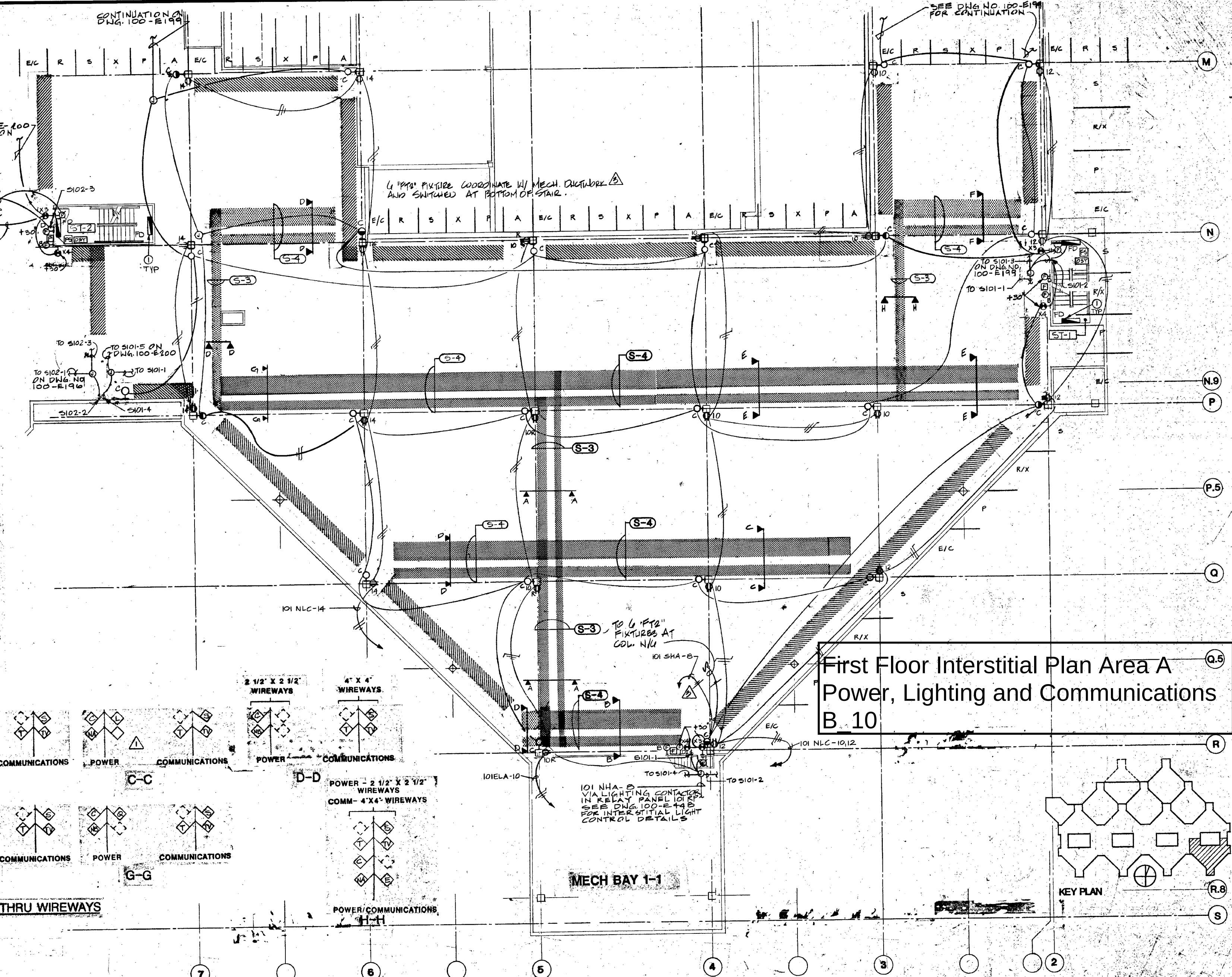


1 TYPICAL WIREWAY SYSTEM AT ELECTRICAL ROOM
NOT TO SCALE

Interstital Space Details and Sections B-9

First Floor Interstitial Plan Area A Power, Lighting and Communications

B 10



DRAWING NOTES:

1. REFER TO DRAWING 100-E434 FOR STAIRWELL LIGHTING RISER DIAGRAM.

GENERAL NOTES

A. [hatch] GRAPHICALLY REPRESENTS WIREWAYS IN THE S-3 (MAIN) AND S-4 (LATERAL) ZONES FOR POWER AND COMMUNICATION WIRING. NOT DRAWN TO SCALE.

B. [hatch] GRAPHICALLY REPRESENTS ACCESS AISLE.

C. REF. TO DRAWING 100-E193 AND 100-E194 FOR INTERSTITIAL DESIGN, LAYOUTS AND DETAILS.

D. ALL CONDUITS IN INTERSTITIAL SPACE SHALL BE EXPOSED.

E. ALL RECEPTACLES SHALL BE HOSPITAL GRADE.

F. JUNCTION BOXES SHALL BE MINIMUM 4" x 4" x 2-1/8" DEEP WITH BLANK COVER. LARGER JUNCTION BOXES SHALL BE USED PER N.E.C. ARTICLE 370-6.

G. REFER TO DRAWING 100-E448 FOR INTERSTITIAL LIGHTING CONTROL DETAIL.

H. REFER TO DRAWING 100-E1 FOR LEGENDS.

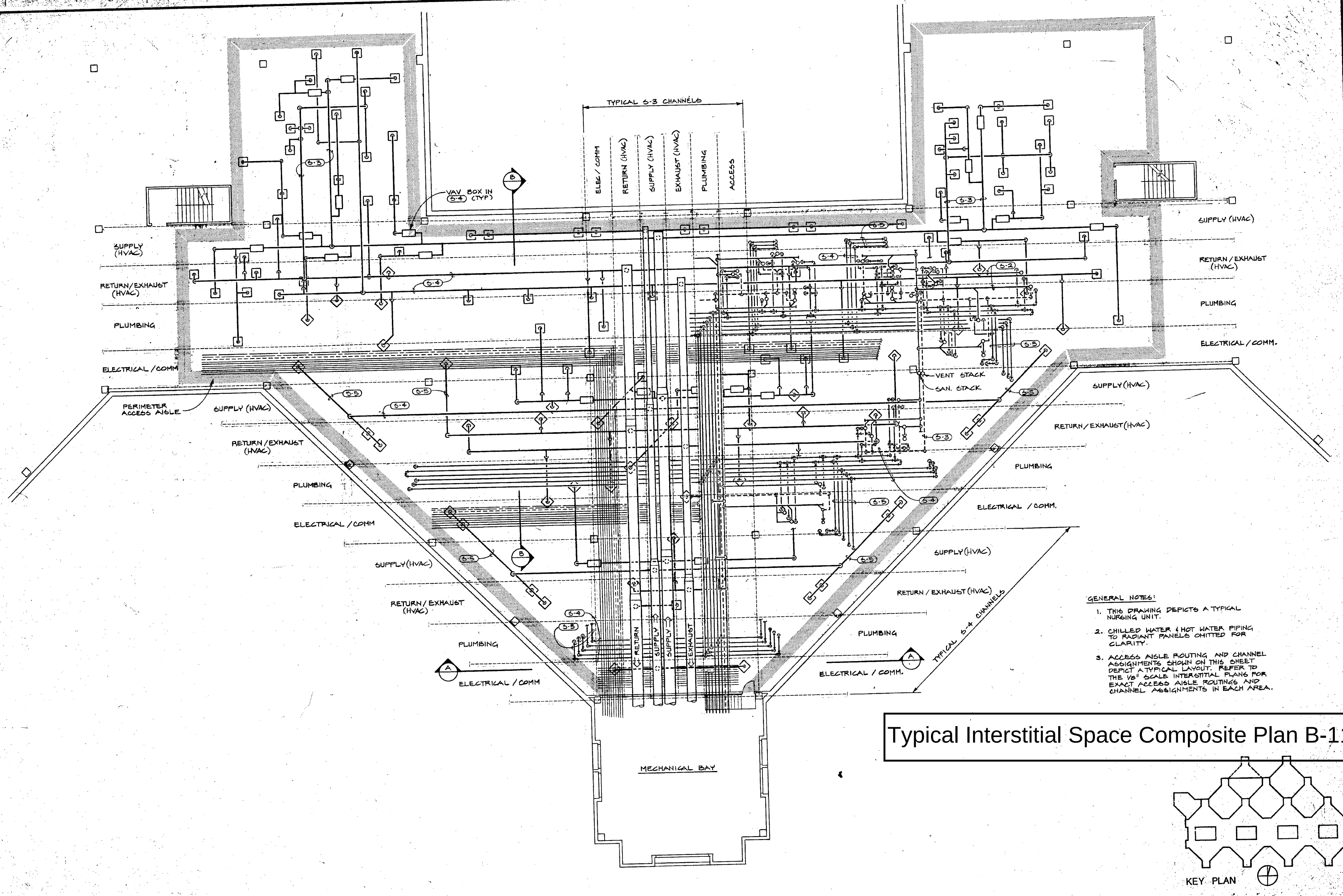
J. REFER TO DRAWING 100-E2 FOR ABBREVATIONS.

K. REFER TO DRAWING 100-E3 FOR LIGHT FIXTURE SCHEDULE.

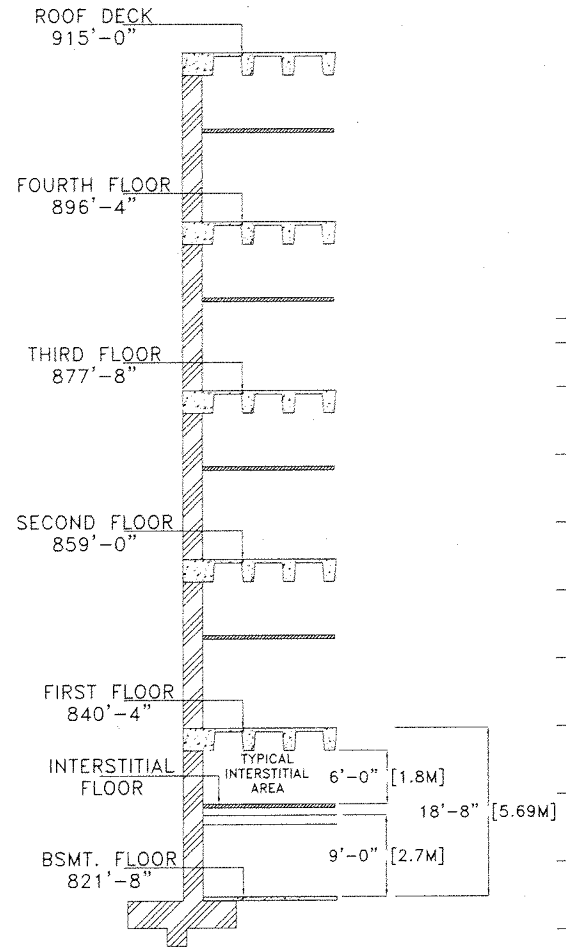
L. REFER TO SPECIFICATIONS FOR PANEL SCHEDULES.

M. REFER TO DRAWINGS 100-E170 THRU 100-E175 FOR POWER RISER DIAGRAMS.

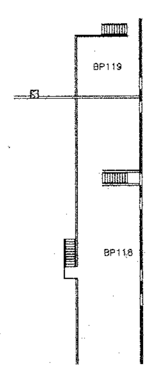
N. REFER TO DRAWINGS 100-E397 THRU 100-E416 FOR FIRE ALARM RISER DIAGRAMS.

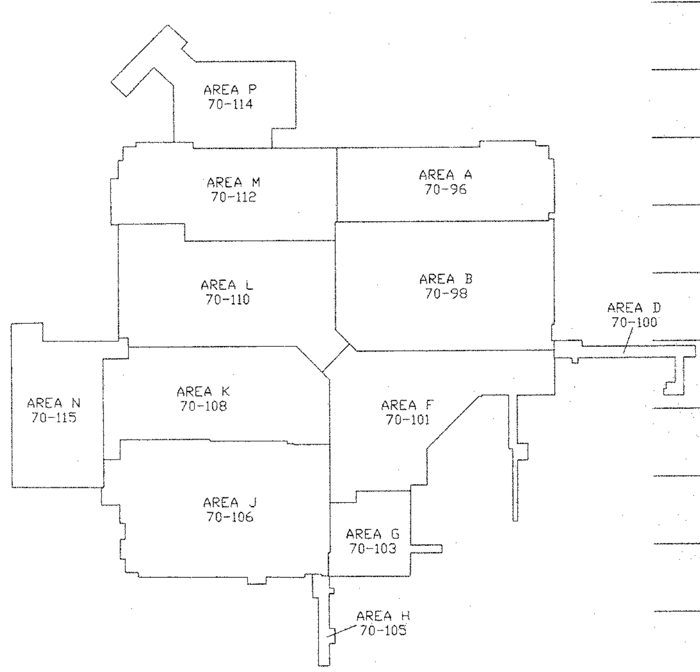


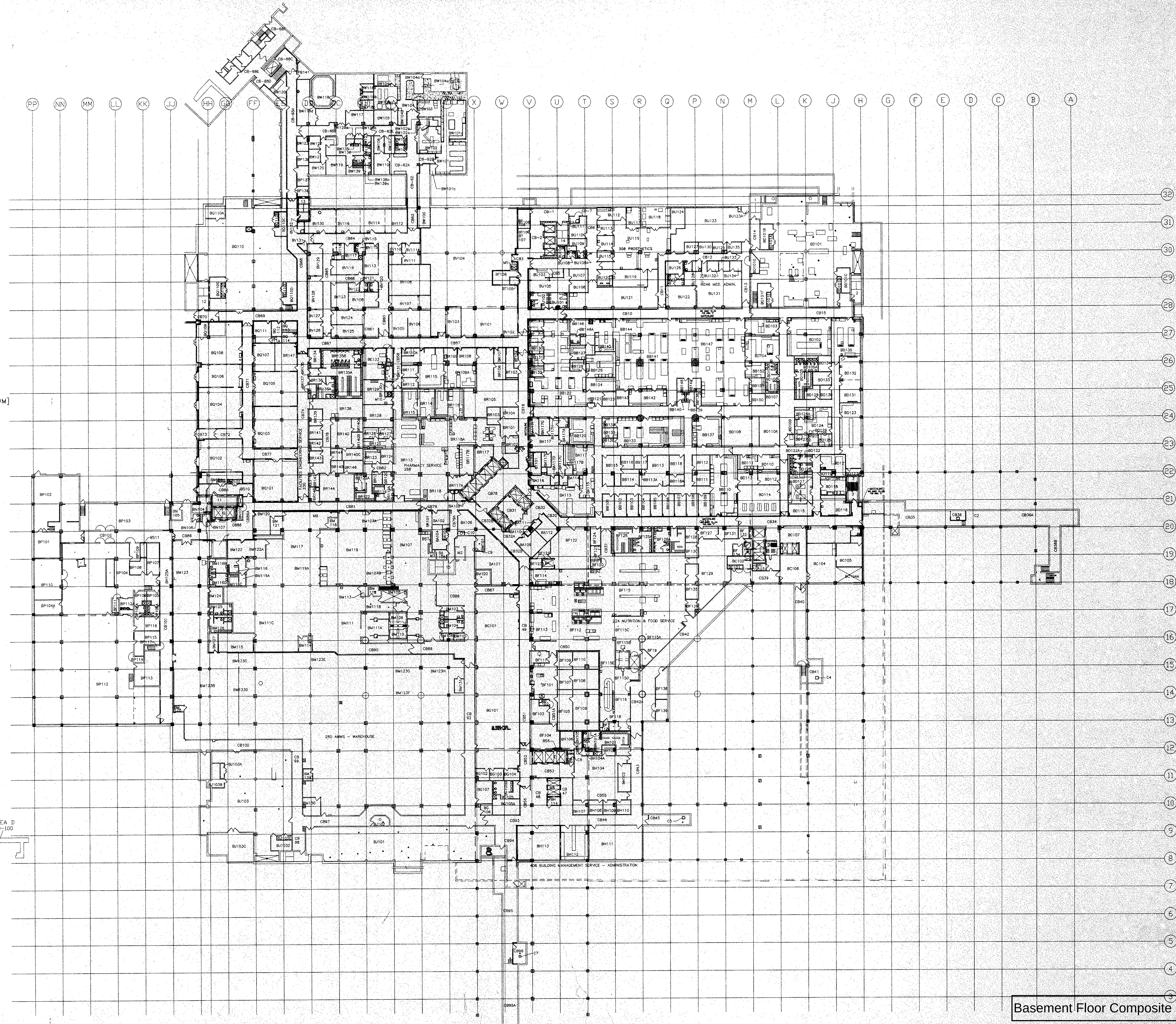
Typical Interstitial Space Composite Plan B-11



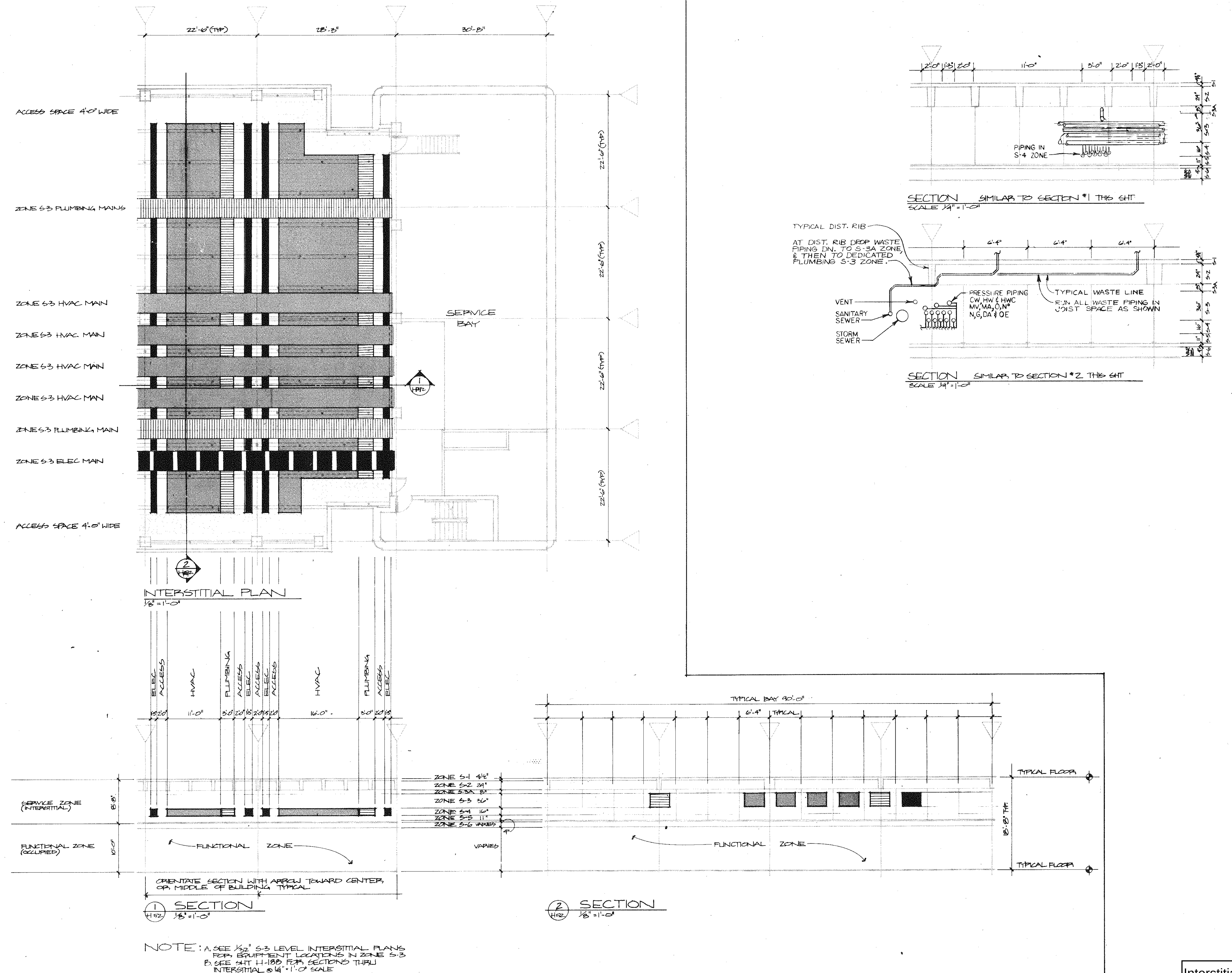
TYPICAL ELEVATION
SCALE: NOT TO SCALE



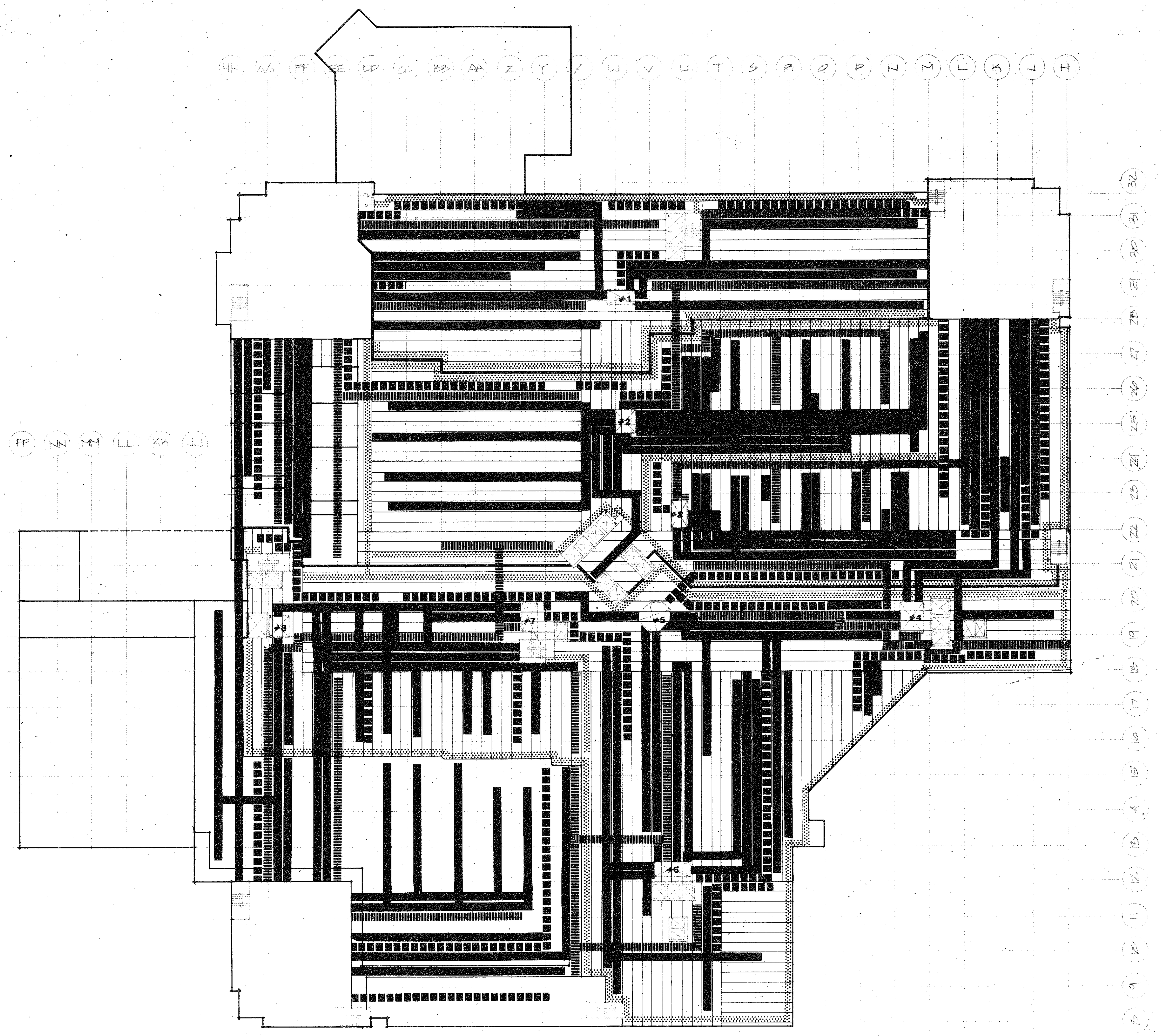




Basement Floor Composite Plan B-12



Interstitial Services and Zoning Arrangement B-13



HVAC
PLUMBING
ELECTRICAL
ACCESS

NOTES REGARDING LEVEL S-3 DISTRIBUTION

A. WHEN HVAC PLUMBING OR ELEC EQUIPMENT INTERSECTS ANY ACCESS SPACE, EQUIPMENT SHALL RISE UP TO S-3A LEVEL AND BE ARRANGED AS TO MINIMIZE DEPTH OF EQUIPMENT.

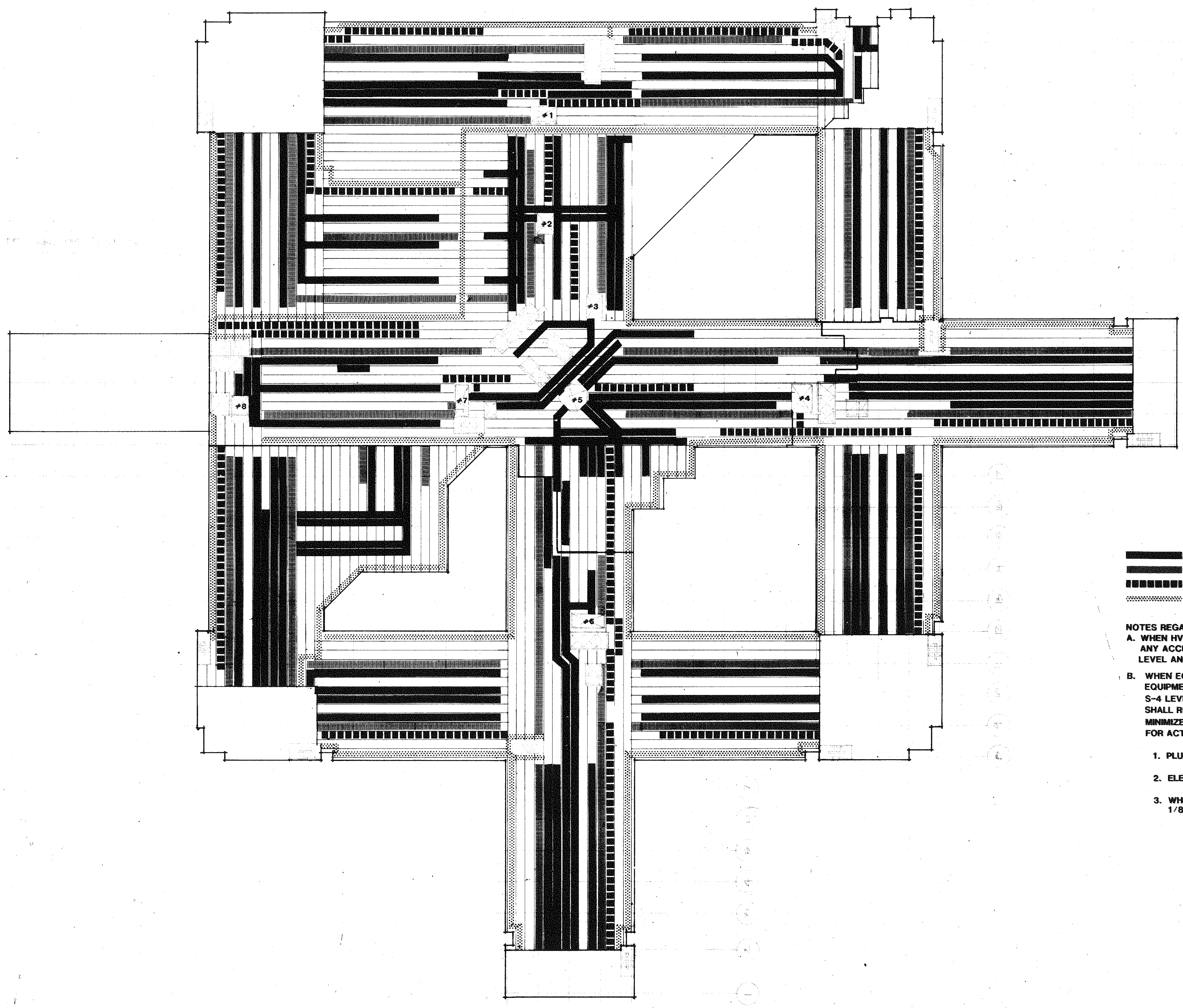
B. WHEN EQUIPMENT INTERSECTS EQUIPMENT THE YIELDING EQUIPMENT SHALL DROP DOWN TO ITS DEDICATED S-4 LEVEL SPACE AS REQUIRED, OR YEILDING EQUIPMENT SHALL RISE UP TO S-3A LEVEL AND BE ARRANGED AS TO MINIMIZE DEPTH OF EQUIPMENT. SEE 1/8" PLANS FOR ACTUAL EQUIPMENT LOCATION.

1. PLUMBING SHALL YIELD TO ALL OTHER EQUIPMENT.

2. ELEC SHALL YIELD TO HVAC.

3. WHEN HVAC INTERSECTS HVAC SEE 1/8" HVAC INTERSTITIAL PLANS.

Basement S-3 level Interstitial plan B-14



HVAC
PLUMBING
ELECTRICAL
ACCESS

NOTES REGARDING LEVEL S-3 DISTRIBUTION

A. WHEN HVAC PLUMBING OR ELEC EQUIPMENT INTERSECTS ANY ACCESS SPACE, EQUIPMENT SHALL RISE UP TO S-3A LEVEL AND BE ARRANGED AS TO MINIMIZE DEPTH OF EQUIPMENT.

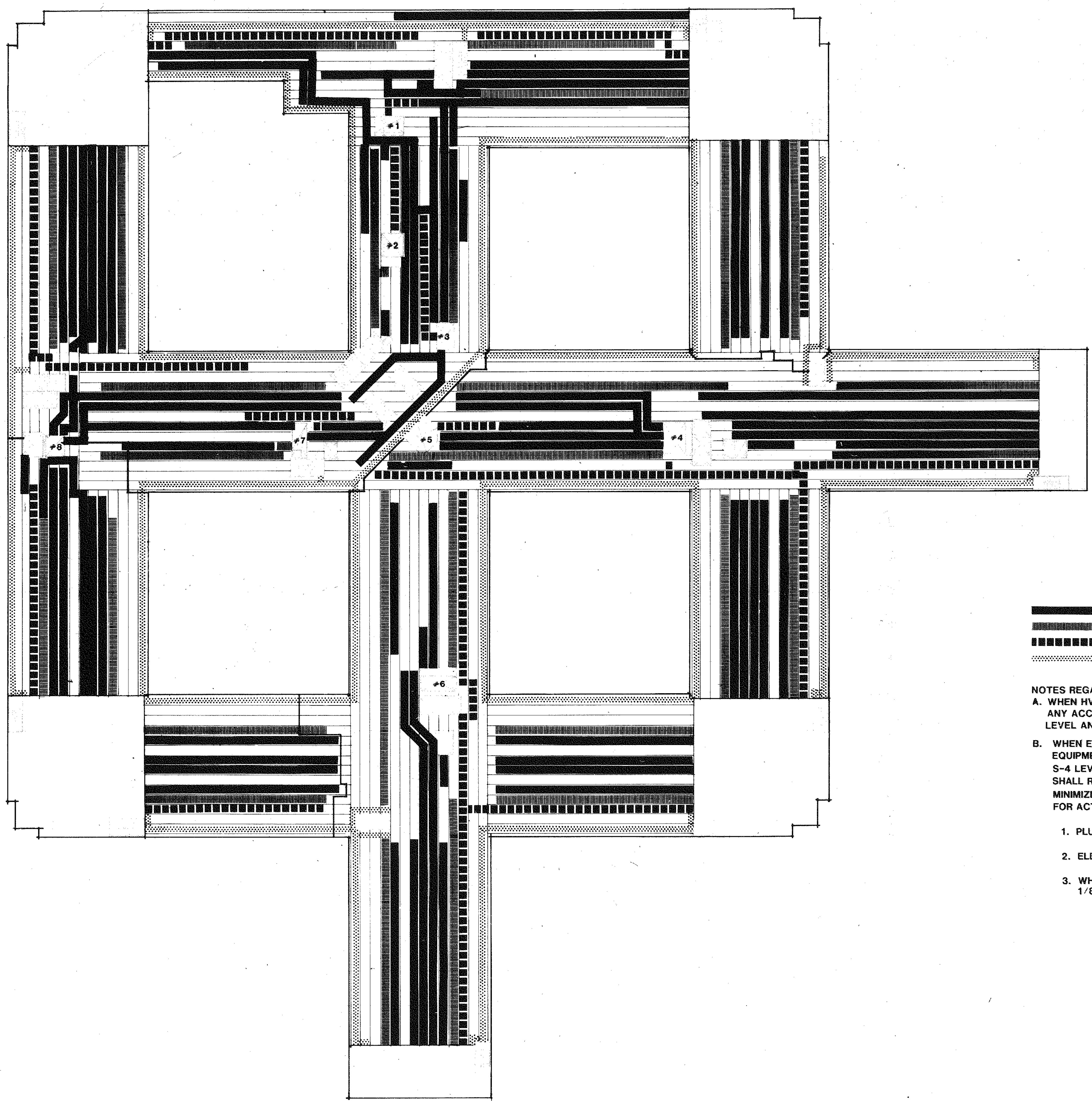
B. WHEN EQUIPMENT INTERSECTS EQUIPMENT THE YIELDING EQUIPMENT SHALL DROP DOWN TO ITS DEDICATED S-4 LEVEL SPACE AS REQUIRED, OR YEILDING EQUIPMENT SHALL RISE UP TO S-3A LEVEL AND BE ARRANGED AS TO MINIMIZE DEPTH OF EQUIPMENT. SEE 1/8" PLANS FOR ACTUAL EQUIPMENT LOCATION.

1. PLUMBING SHALL YIELD TO ALL OTHER EQUIPMENT.

2. ELEC SHALL YIELD TO HVAC.

3. WHEN HVAC INTERSECTS HVAC SEE 1/8" HVAC INTERSTITIAL PLANS.

First Floor S-3 Level Interstitial Plan B-15



HVAC
PLUMBING
ELECTRICAL
ACCESS

NOTES REGARDING LEVEL S-3 DISTRIBUTION

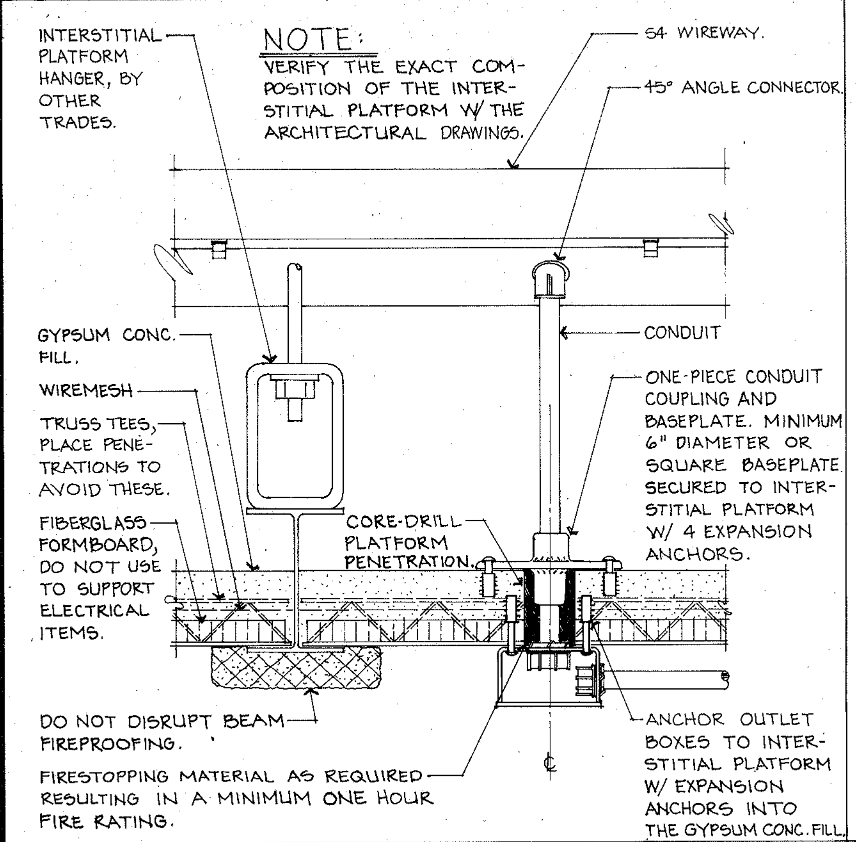
A. WHEN HVAC PLUMBING OR ELEC EQUIPMENT INTERSECTS ANY ACCESS SPACE, EQUIPMENT SHALL RISE UP TO S-3A LEVEL AND BE ARRANGED AS TO MINIMIZE DEPTH OF EQUIPMENT.

B. WHEN EQUIPMENT INTERSECTS EQUIPMENT THE YIELDING EQUIPMENT SHALL DROP DOWN TO ITS DEDICATED S-4 LEVEL SPACE AS REQUIRED, OR YEILDING EQUIPMENT SHALL RISE UP TO S-3A LEVEL AND BE ARRANGED AS TO MINIMIZE DEPTH OF EQUIPMENT. SEE 1/8" PLANS FOR ACTUAL EQUIPMENT LOCATION.

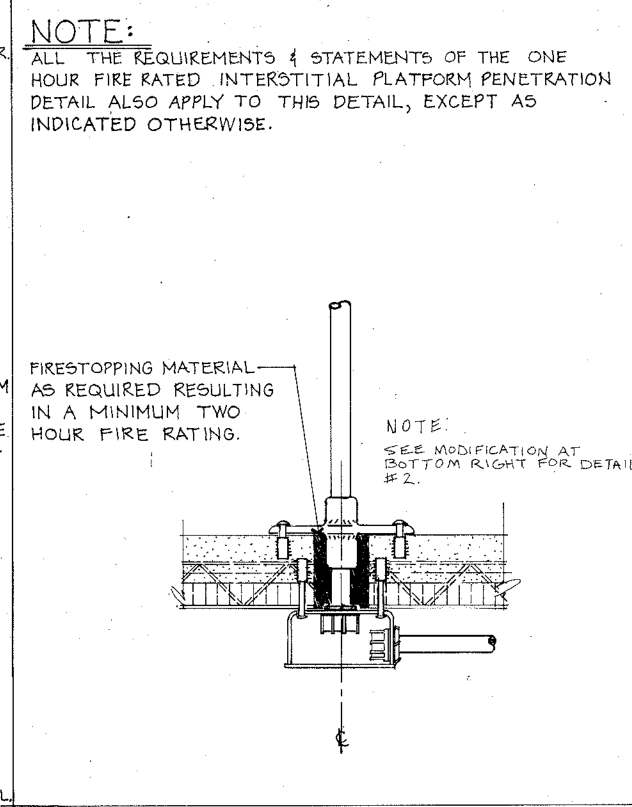
1. PLUMBING SHALL YIELD TO ALL OTHER EQUIPMENT.
2. ELEC SHALL YIELD TO HVAC.
3. WHEN HVAC INTERSECTS HVAC SEE 1/8" HVAC INTERSTITIAL PLANS.

Fourth Floor S-3 Level Interstitial Plan B-16

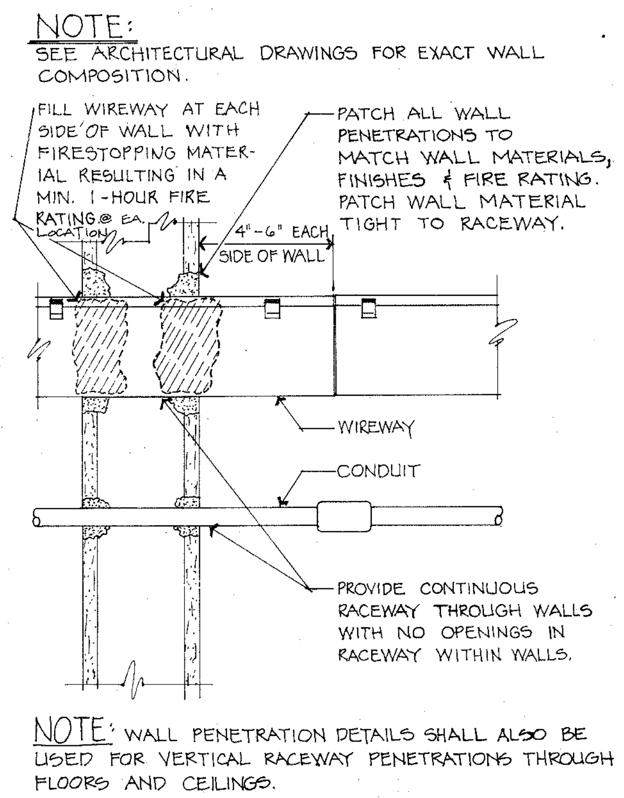
[redacted]



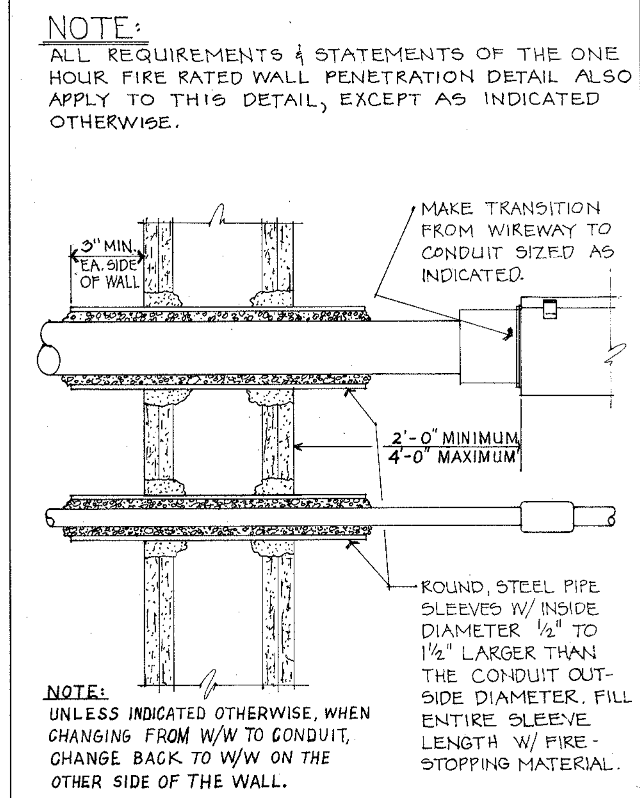
1 ONE HOUR FIRE RATED INTERSTITIAL PLATFORM PENETRATION DETAIL SCALE: 3" = 1'-0"



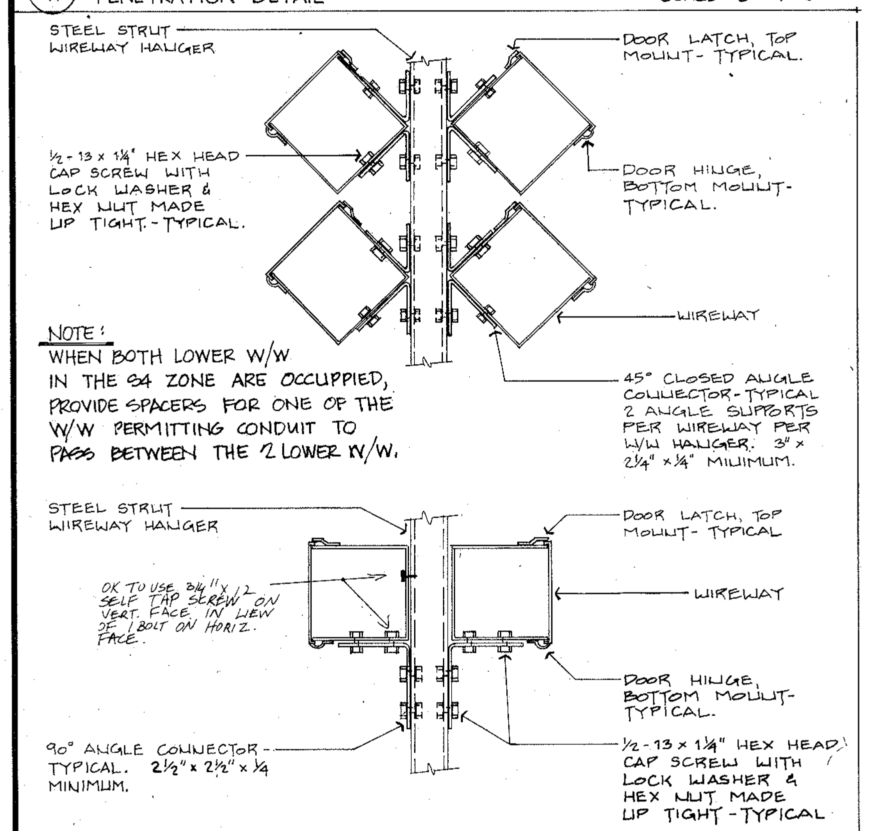
2 TWO HOUR FIRE RATED INTERSTITIAL PLATFORM PENETRATION DETAIL SCALE: 3" = 1'-0"



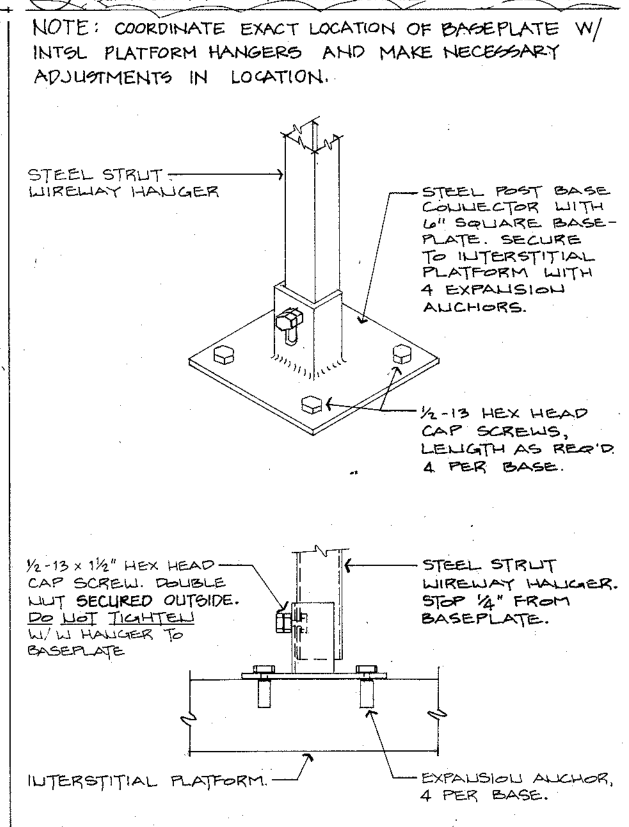
3 ONE HOUR FIRE RATED WALL PENETRATION DETAIL SCALE: 3" = 1'-0"



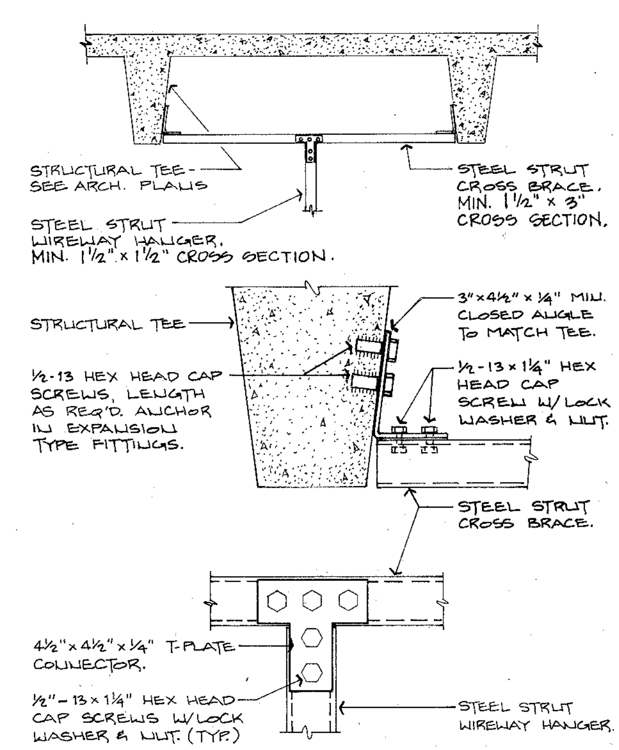
4 TWO HOUR FIRE RATED WALL PENETRATION DETAIL SCALE: 3" = 1'-0"



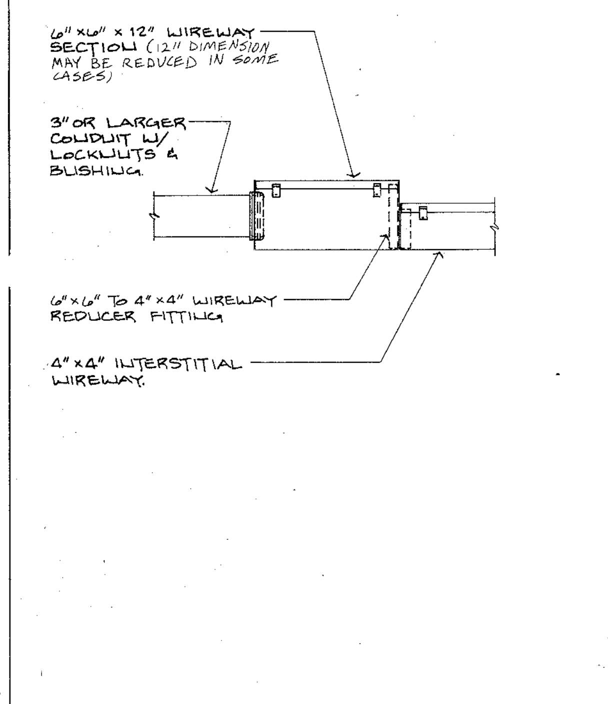
5 WIREWAY TO WIREWAY HANGER SUPPORT DETAILS NO SCALE



6 WIREWAY HANGER BOTTOM ANCHORING DETAIL NO SCALE



7 WIREWAY HANGER TOP ANCHORING DETAIL NO SCALE



8 TERMINATION DETAIL - LARGE CONDUIT (3" OR GREATER) TO 4"x4" WIREWAY NO SCALE

INTERSTITIAL GENERAL NOTES:

(APPLY TO ALL INTERSTITIAL ELECTRICAL WORK)

1. PROVIDE RACEWAY INSTALLED IN S3 AND S4 ZONES ROUTED THE ENTIRE ZONE LENGTH INDICATED ON THE 1/8" SCALE PLANS UNLESS SPECIFICALLY INDICATED OTHERWISE TO END AT A SHORTER LENGTH.

2. ROUTE SPECIFIC CIRCUIT CONDUCTORS AND TELECOMMUNICATIONS SYSTEM CABLES ONLY IN THE SPECIFIC RACEWAY OF ZONES S3 AND S4 INDICATED FOR THE USE OF THE RESPECTIVE PANELBOARDS AND TELECOMMUNICATIONS SYSTEMS, AS INDICATED ON THE DRAWINGS.

3. LABEL EACH RACEWAY IN THE DESIGNATED S3 AND S4 ZONES WITH PAINTED, STENCILED LETTERING INDICATING THE PANELBOARD OR TELECOMMUNICATIONS SYSTEM CONTAINED. THIS LABELING COLOR SHALL CONTRAST WITH THE WIREWAY COLOR AND SHALL OCCUR AT LEAST EVERY 20 LINEAR FEET.

4. WIREWAY NOTED "FUTURE" ON THE DETAILS DENOTE LOCATIONS THAT MUST BE KEPT OPEN UNDER THIS CONTRACT. SUCH LOCATIONS SHALL BE KEPT AVAILABLE FOR FUTURE RACEWAY INSTALLATION.

5. PROVIDE NO WIREWAY HANGERS WHERE ALL THE SUPPORTED RACEWAY ARE NOTED "FUTURE".

6. PROVIDE ALL NECESSARY TRANSITIONS FROM ZONES S5 AND BELOW THROUGH THE FUNCTIONAL FLOOR TO THE S4 RACEWAY, FROM THE S4 RACEWAY TO THE S3 RACEWAY, AND TO TERMINATIONS AT PANELS, CABINETS, AND EQUIPMENT MOUNTING BOARDS. THESE TRANSITIONS SHALL CONSIST OF CONTINUOUS RACEWAY COMPLETELY ENCLOSING ALL RELATED CONDUCTORS AND CABLES. WIREWAY TO WIREWAY TRANSITIONS SHALL CONSIST OF FITTINGS MANUFACTURED BY THE WIREWAY MANUFACTURER FOR THE PURPOSE AND PERMITTING LAY-IN INSTALLATION OF WIRE AND CABLE AFTER THE WIREWAY INSTALLATION IS COMPLETE.

7. ADJUST FINAL LOCATIONS OF INTERSTITIAL PLATFORM PENETRATIONS AS REQUIRED TO COORDINATE WITH THE WORK OF OTHER TRADES.

8. THE "DOWN" SYMBOLS AT THE INTERSTITIAL RACEWAY DENOTE LOCATIONS OF INTERSTITIAL PLATFORM PENETRATIONS AND SPLICES IN THE INTERSTITIAL RACEWAY. SEE THE FUNCTIONAL FLOOR PLANS FOR WIRE SIZES LOAD-SIDE OF THE SPLICES.

9. INTERSTITIAL HOMERUNS; INDICATED BY PANELBOARD NAME, CIRCUIT NUMBER, AND "DOWN" SYMBOL; SHALL HAVE THE SAME SIZE WIRES AS THE FUNCTIONAL FLOOR WHEN NO WIRE SIZE IS INDICATED AT THE INTERSTITIAL HOMERUN.

10. WHEN A WIRE SIZE (FOR EXAMPLE: #10) APPEARS NEAR THE INTERSTITIAL HOMERUN, THAT WIRE SIZE SHALL BE USED FOR THE INDICATED CIRCUITS WHILE ROUTED IN INTERSTITIAL RACEWAY. MAKE TRANSITION TO THE INTERSTITIAL WIRE SIZE IN THE S3 AND S4 RACEWAY AT THE "DOWN" SYMBOL LOCATION.

11. IF THE CIRCUIT IS TO HAVE A GROUND WIRE OTHER THAN THE W/W COMMON GROUND THE GROUND WIRE SIZE SHALL BE AS DESCRIBED IN 9 AND 10 ABOVE, BUT SHALL BE INDICATED SEPARATELY FROM THE CURRENT CARRYING CONDUCTOR SIZE AND IDENTIFIED (FOR EXAMPLE: #10 + 1#10 GND; WHICH INDICATES FUNCTIONAL FLOOR CURRENT CARRYING CONDUCTORS CHANGING TO #10 AND FUNCTIONAL FLOOR GROUND CONDUCTOR CHANGING TO #10 ALSO.)

12. WHEN TERMINATING AND SPLICING CONDUCTORS, MATCH WIRE SIZE WITH THE PROPER TERMINAL AND LUG WIRE SIZE RANGE.

13. WHEN WIRES ENTERING A PANELBOARD WOULD BE LARGER THAN THE OVERCURRENT DEVICE LUG WIRE SIZE RANGE, REDUCE WIRE SIZE WITH A SPLICE WITHIN THE RACEWAY JUST ABOVE THE PANELBOARD. THE SMALLEST ACCEPTABLE WIRE SIZE FOR CONNECTION TO OVERCURRENT DEVICES SHALL BE EQUAL TO THE SMALLEST BRANCH CIRCUIT WIRE SIZE USED ON THE FUNCTIONAL FLOOR FOR THE CIRCUIT UNDER CONSIDERATION.

14. PROVIDE THE FOLLOWING EQUIPMENT GROUNDING CONDUCTORS IN INTERSTITIAL RACEWAY:

A. A W/W COMMON #4 AWG BARE COPPER GROUND WIRE IN ALL S3 & S4 POWER WIREWAY (NOT IN TELECOMMUNICATIONS WIREWAY) UNLESS INDICATED OTHERWISE.

B. WHEN NO GROUND WIRE IS INDICATED AT THE INTERSTITIAL HOMERUN, BOND THE FUNCTIONAL FLOOR GROUND WIRE TO THE COMMON #4 AWG GROUND WIRE IN EACH RESPECTIVE WIREWAY AT THE "DOWN" SYMBOL LOCATION.

C. WHEN A GROUND WIRE IS INDICATED WITH A DESIGNATION (FOR EXAMPLE: #10 + 1#10 GND TO [illegible]), ROUTE THE GROUND CONDUCTOR OF THE SIZE INDICATED FROM THE "DOWN" SYMBOL TO THE COMMON #4 AWG GROUND WIRE AT THE INDICATED LOCATION AND BOND THE TWO TOGETHER AT THAT LOCATION.

D. WHEN AN INDICATED INTSL GND WIRE IS NOT SHOWN TO A SPECIFIC INTSL W/W, IT IS A DEDICATED GROUND AND IT SHALL BE ROUTED TO THE GROUND BUS IN ITS RESPECTIVE PANELBOARD WITHOUT BEING BONDED TO ANY OTHER GROUND IN THE INTERSTITIAL SPACE. THE SAME REQUIREMENTS APPLY TO GROUND WIRES NOTED AS ROUTED TO A SPECIFIC PANELBOARD.

E. BOND WIREWAY TO W/W COMMON #4 AWG BARE GROUND WIRE AT LEAST EVERY 20 FEET UNLESS A W/W COMMON GROUND IS NOT PROVIDED.

15. INTERSTITIAL WIRING NOT IN THE S3 AND S4 RACEWAY SHALL COMPLY WITH WIRE AND CONDUIT SIZING RULES USED ON THE FUNCTIONAL FLOOR.

16. ROUTE CONDUITS EXPOSED IN THE INTERSTITIAL SPACE ALONG THE WALLS, IN THE S2 SPACE, AND AS INDICATED IN THE S3A, S3, S4, AND S5 ZONES. TO CROSS BEAMS AND OTHER STRUCTURAL MEMBERS, ROUTE CONDUIT IN THE S3A ZONE, BUT STAY TO THE TOP OF THE ZONE AND IN ALL CASES YIELD TO OTHER TRADES, ESPECIALLY PNEUMATIC TUBES.

17. IN THE INTERSTITIAL SPACE, INSTALL ALL DEVICES AT THE STANDARD MOUNTING HEIGHTS ABOVE THE INTERSTITIAL PLATFORM UNLESS INDICATED OTHERWISE FOR SPECIFIC DEVICES.

18. INSTALL TYPE 10 LIGHT FIXTURES IN THE INTERSTITIAL SPACE WITH THE BOTTOMS OF THE FIXTURES EVEN WITH THE BOTTOM OF THE INTERSTITIAL S2 ZONE. ADJUST EXACT FIXTURE LOCATIONS SLIGHTLY AS REQUIRED TO MAXIMIZE LIGHT OUTPUT AND TO PERMIT LAMP REPLACEMENT. ADJUST LIGHTING JUNCTION BOX LOCATIONS AS REQUIRED TO MAINTAIN ACCESSIBILITY.

19. INSTALL INTERSTITIAL SPACE EXIT LIGHTS SO THAT THE TOPS OF THE FIXTURES ARE EVEN WITH THE BOTTOM OF THE S2 ZONE. ALSO, INSTALL EXIT LIGHTS WITH MINIMUM INTRUSION INTO THE ACCESS SPACE BUT WITH MAXIMUM VISIBILITY.

20. PROVIDE FIRESTOPPING AS PER DETAILS 1/E206, 2/E206, 3/E206, AND 4/E206 FOR ALL ELECTRICAL PENETRATIONS OF WALLS, FLOORS, AND CEILINGS; SUITABLE FOR THE FIRE RATINGS DESCRIBED IN THE ARCHITECTURAL DRAWINGS.

21. WIREWAYS:

A. WIREWAYS SHALL INCLUDE HINGED COVERS, EXCEPT REMOVABLE SCREW COVERS ARE ACCEPTABLE FOR STRAIGHT RUNS OF 24" OR LESS.

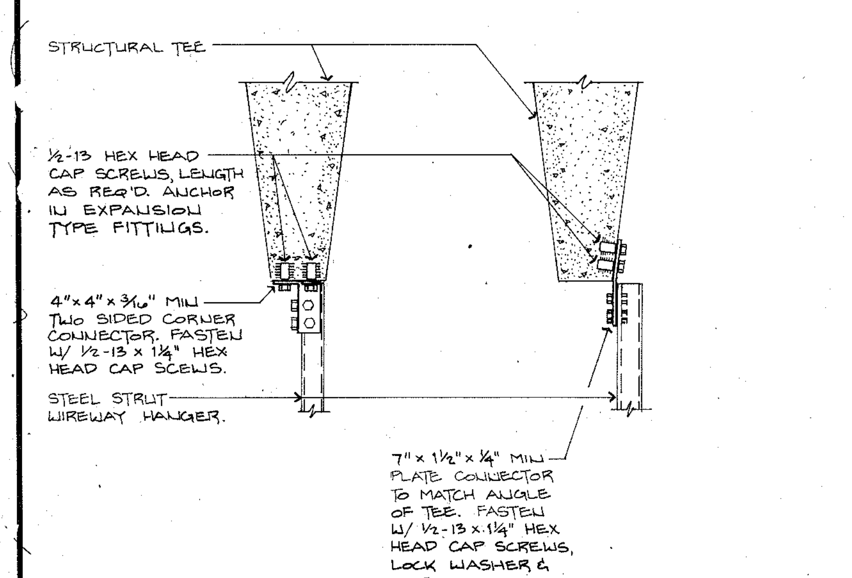
B. SPRING RETAINING CLIPS ARE REQUIRED IN ALL HORIZONTAL AND VERTICAL WIREWAY RUNS ON MAXIMUM 5'-0" CENTERS.

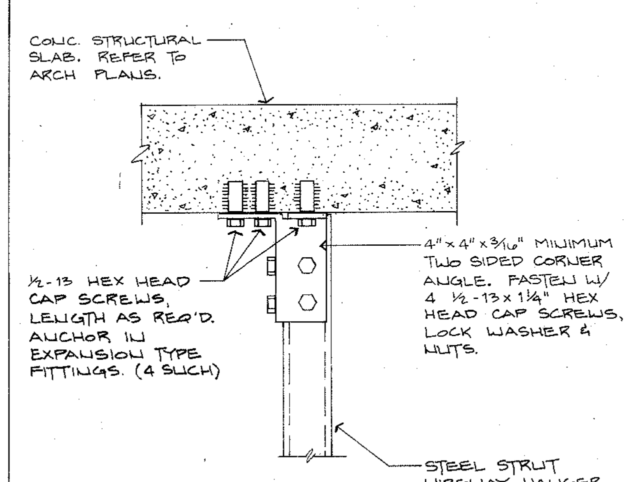
22. WHEN S3 W/W DROPS FROM INTSL TO FUNCTIONAL FLOOR CLOSETS, CONFLICT WITH FUNCTIONAL FLOOR WALLS; OFFSET W/W IN INTSL OR CUT AND PATCH WALLS TO OFFSET IN FUNCTIONAL FLOOR. SEE DETAIL 4/E229 FOR AN EXAMPLE.

23. PENETRATIONS OF INTSL PLATFORM SHALL NOT BE CLOSER THAN 6" ON CENTER.

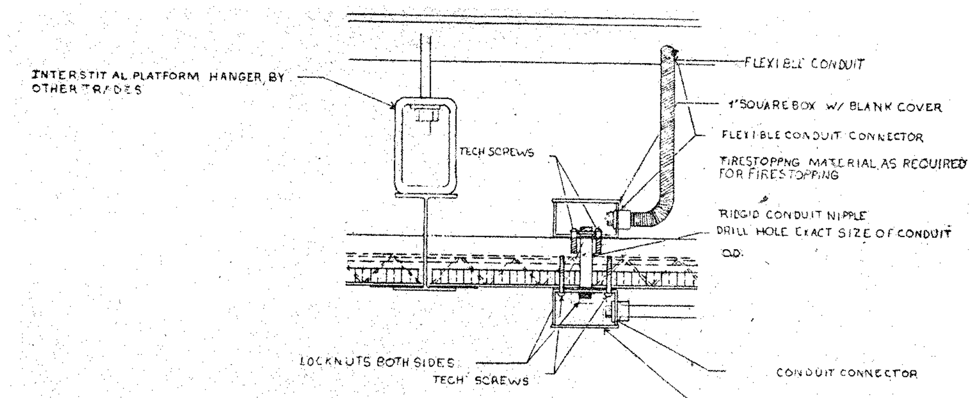
24. OFFSET CONDUIT DROPS THROUGH S5 ZONE AS NECESSARY TO COORDINATE WITH THE WORK OF OTHER TRADES.

25. ALL 4"x4" W/W SHALL BE U.L. LISTED FOR USE WITH WIRE SIZES UP TO AND INCLUDING #4/0 AWG. ALL 6"x6" W/W SHALL BE U.L. LISTED FOR USE WITH WIRE SIZES UP TO AND INCLUDING #500 MCM. THESE REQUIREMENTS APPLY TO WIRES ENTERING ANYWHERE ALONG THE LENGTH OR THE ENDS OF THE WIREWAY. STRAIGHT W/W RUNS, WHEN WIRES ONLY ENTER AT W/W ENDS, MAY HAVE WIRES EXCEEDING THESE SIZES PROVIDED TOTAL WIRE CROSS-SECTIONAL AREA DOES NOT EXCEED 20% OF TOTAL WIREWAY CROSS-SECTIONAL AREA.

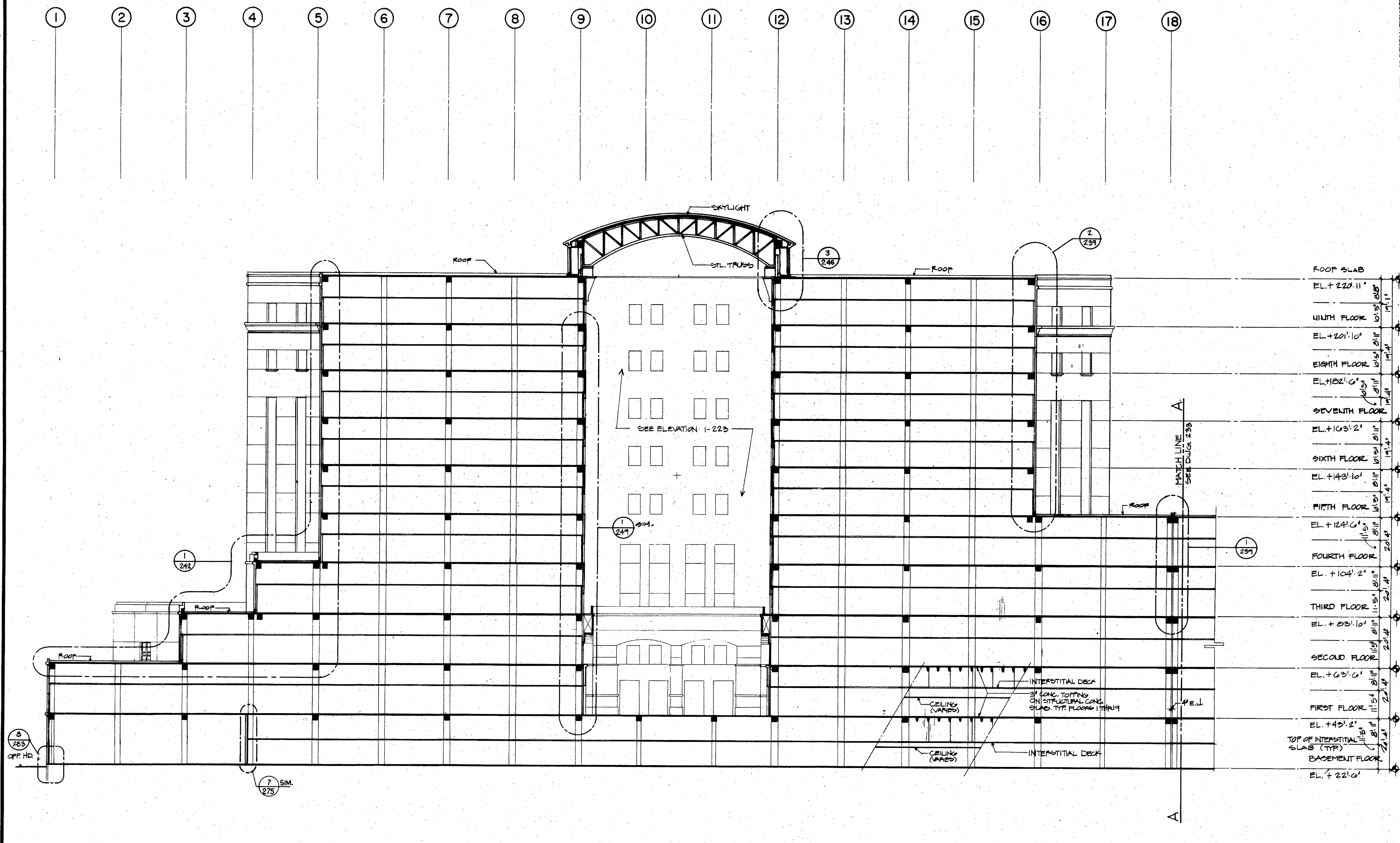




This detail modifies detail 2 of drawing 70-E206R1. The attached detail drawing is acceptable provided grounding is provided for flexible metal conduit per specification article 16450-3.3 paragraph G and paragraph K. There is fire stopping material also to be furnished as required by the specification and per detail 2 of 70-E206R1 which requires a minimum of 2 hour fire rating.



Interstitial Typical Details B-17



1. BUILDING SECTION

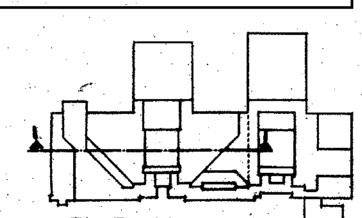
1/16"=1'-0"

GENERAL NOTES:

1. THIS BUILDING SECTION IS ONLY A GENERAL DEPICTION OF THE PHYSICAL RELATIONSHIPS & MATERIALS USED. DETAILED STRUCTURAL INFORMATION, INTERIOR PARTITIONS, CEILINGS & EQUIP. ARE NOT SHOWN FOR CLARITY.

REFER TO WALL SECTIONS & DETAILS FOR ADDITIONAL INFORMATION.

Buildign Gross Section B-18



KEY PLAN

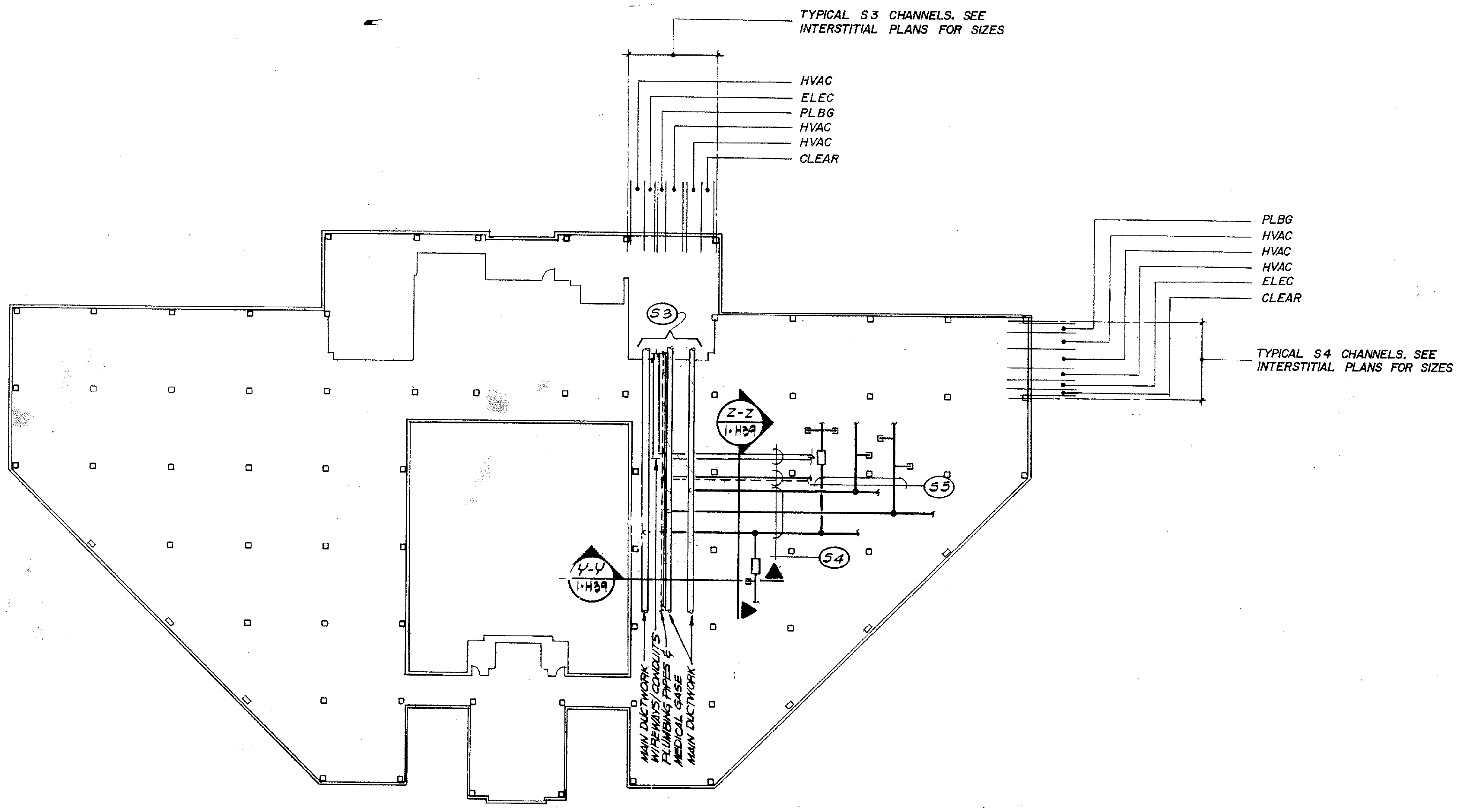
0 10 20 30

1/16"=1'-0"

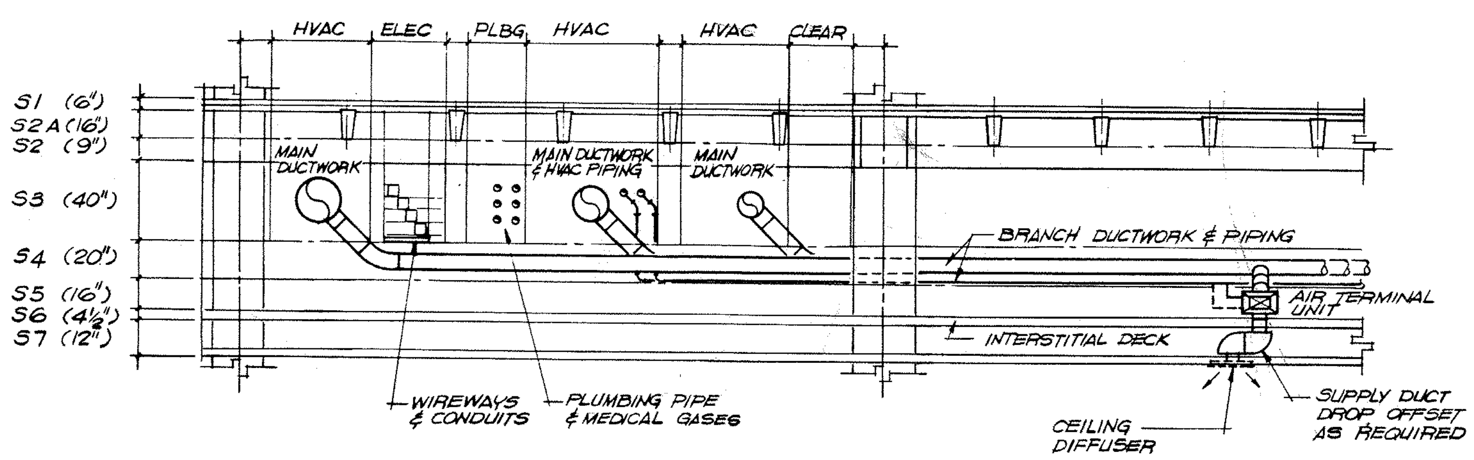
7-3-2-2254

NOTE: ALL INFORMATION RELATED TO THE "RECORD DRAWINGS" WAS PROVIDED SOLELY BY THE GENERAL CONTRACTOR OF RECORD. THE ORIGINAL CONTRACT DOCUMENTS HAVE BEEN REVISED TO REFLECT THE GENERAL CONTRACTOR'S MARK-UPS AND THEREFORE NEITHER THE ARCHITECT NOR THE ENGINEER

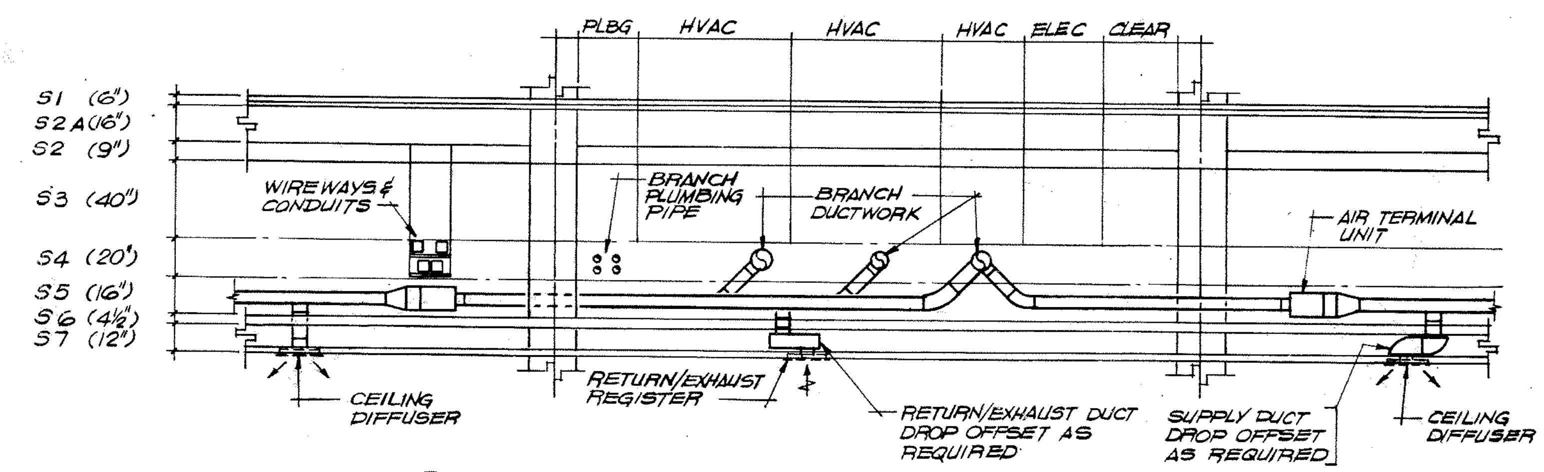
FULLY PROTECTED BY AUTOMATIC



TYPICAL INTERSTITIAL SPACE
N.T.S.



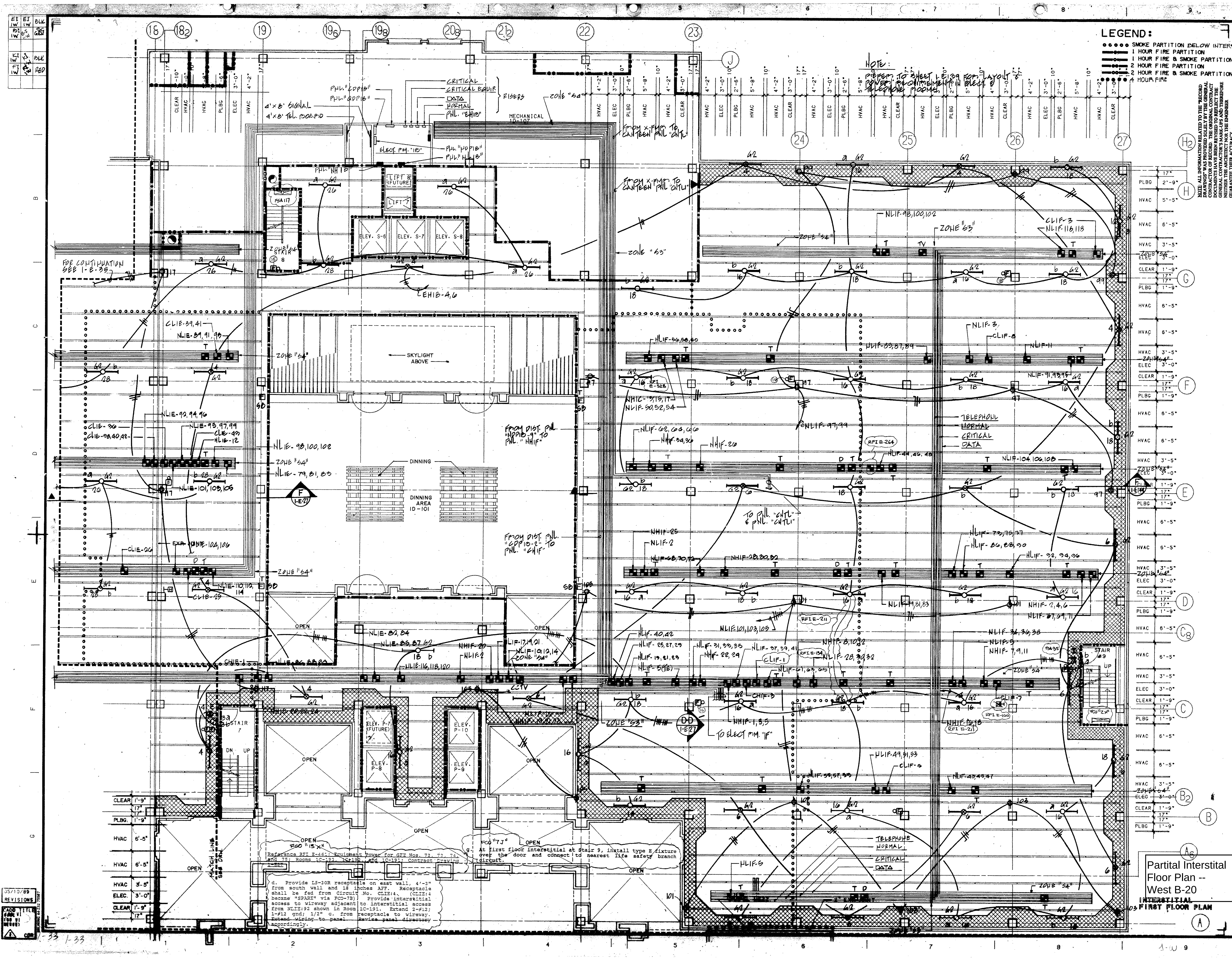
Y-Y 1-H39 SECTION
N.T.S.

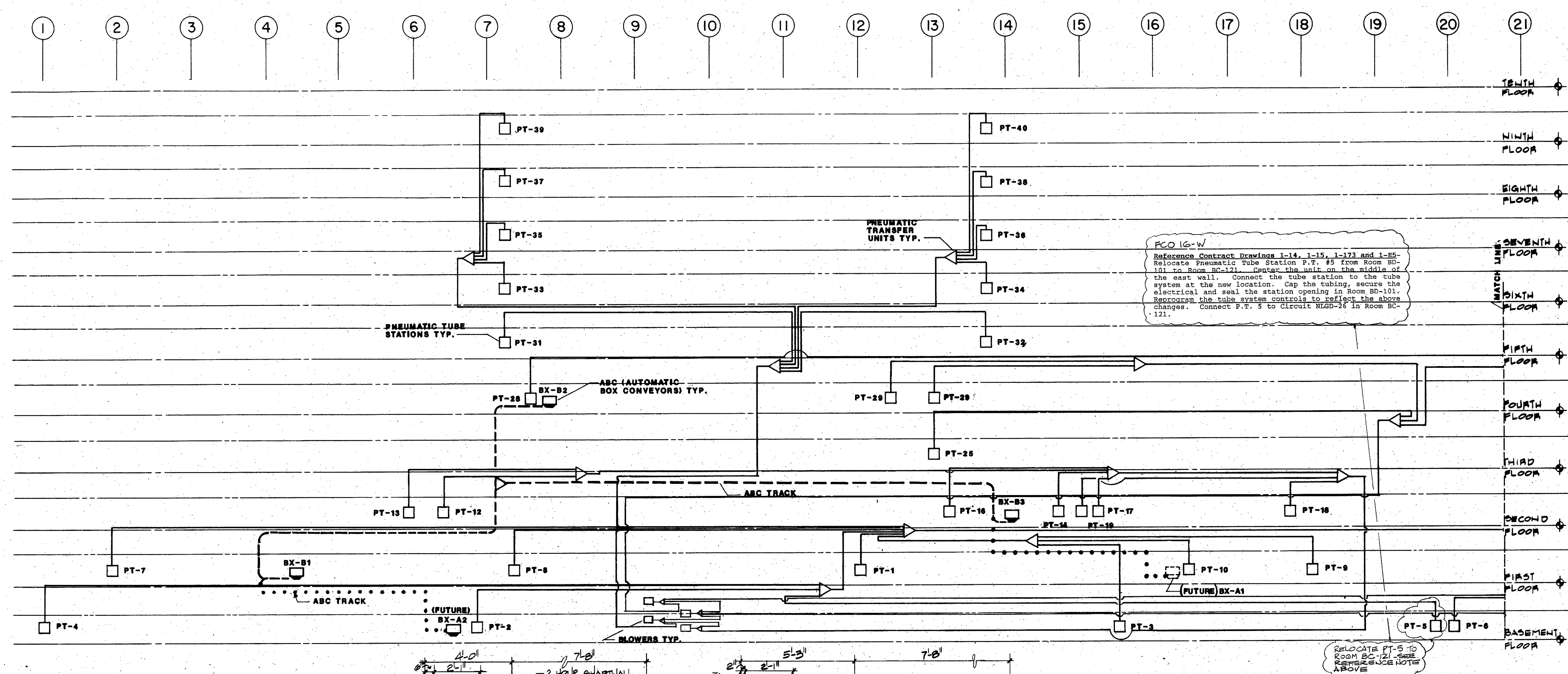


Z-Z 1-H39 SECTION
N.T.S.

Typical Interstitial Space Composite Plan and Section B-19

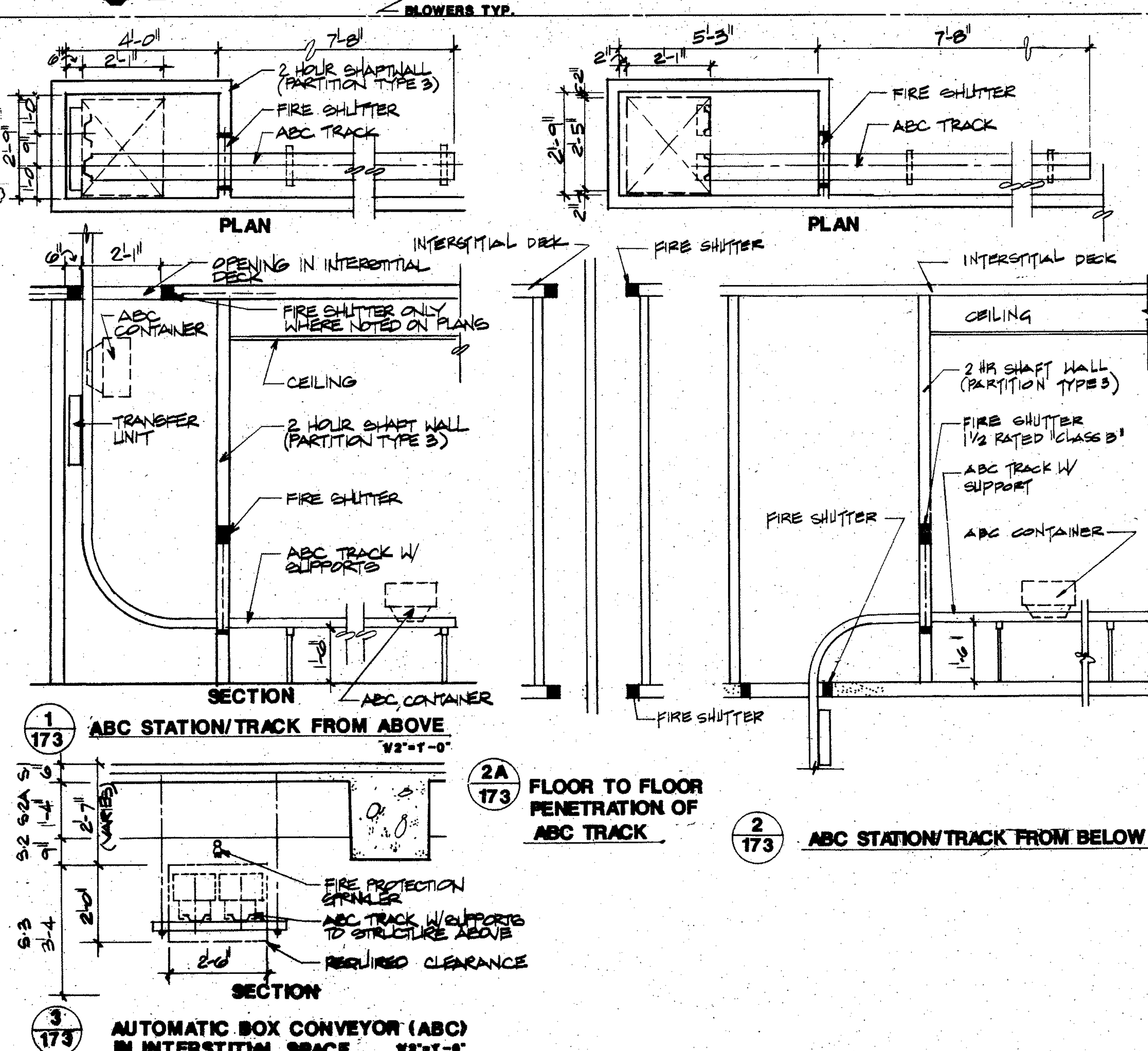
NOTE: ALL INFORMATION RELATED TO THE "RECORD DRAWINGS" WAS PROVIDED SOLELY BY THE GENERAL CONTRACTOR OF RECORD. THE ORIGINAL CONTRACT DOCUMENTS HAVE BEEN REVISED TO REFLECT THE GENERAL CONTRACTOR'S MARK-UPS AND THEREFORE NEITHER THE ARCHITECT NOR THE ENGINEER GUARANTEE THEIR ACCURACY.


LEGEND:
SMOKE PARTITION BELOW INTERSTITIAL
1 HOUR FIRE PARTITION
1 HOUR FIRE & SMOKE PARTITION
2 HOUR FIRE PARTITION
2 HOUR FIRE & SMOKE PARTITION
4 HOUR FIRE
NOTE: ALL INFORMATION RELATED TO THE "RECORD DRAWINGS" WAS PROVIDED SOLELY BY THE GENERAL CONTRACTOR OF RECORD. THE ORIGINAL CONTRACT DOCUMENTS HAVE BEEN REVISED TO REFLECT THE GENERAL CONTRACTOR'S MARK-UPS AND THEREFORE NEITHER THE ARCHITECT NOR THE ENGINEER GUARANTEE THEIR ACCURACY.
NOTE: REFER TO SHEET I-E-139 FOR LAYOUT OF POWER REQUIREMENT IN ELECT. & TELEPHONE ROOMS.
MECHANICAL ID-107
SKYLIGHT ABOVE
DINNING AREA ID-101
OPEN
FCO "15X"
Reference RFI E-461: Equipment Power for GFE Nos. 72, 73, 74, and 75; Rooms 1C-193, 1C-192, and 1C-191; Contract Drawing 1-E27
d. Provide L5-30R receptacle on east wall, 4'-3" from south wall and 18 inches AFF. Receptacle shall be fed from Circuit No. CLIE:4. (CLIE:4 became "SPARE" via FCO-7B) Provide interstitial access to wireway adjacent to interstitial access from NLIE:92 shown in Room 1C-191. Extend 2-#12; 1-#12 gnd; 1/2" c. from receptacle to wireway. Extend wiring to panel. Revise panel directory accordingly.
FCO "7J"
g. At first floor interstitial at Stair 9, install type E fixture over the door and connect to nearest life safety branch circuit.
Partital Interstitial Floor Plan -- West B-20
INTERSTITIAL FIRST FLOOR PLAN
05/10/89
REVISIONS



NOTE: ALL INFORMATION RELATED TO THE "RECORD DRAWINGS" WAS PROVIDED SOLELY BY THE GENERAL

FLOOR	ABC	P-TUBE	DEPARTMENT/FUNCTION	RM. NAME	RM. NO.
BASEMENT		PT 2	SPD. DISPATCH		BB-116
		PT 3	IP PHARMACY		CB-69
		PT 4	SUPPLY SVC. WAREHOUSE	OFF. STOREKPR.	BB-142
FCO 16W		PT 5	~~DATA PROCESSING~~	~~ADMIN. OFF/REG.~~ BC-121	~~BD-101~~
		PT 6	ENG. (INCLUDG. CONTROL STA. AND REJECT STA.	ELECT. SHOP	BD-111
	BX A2 (FUTURE)		MAS MED. RECORDS FILE ROOM	MED. RECORDS	BB-104
		PT 23	MAS WARD ADMIN.		BB-104
FIRST		PT 1	OFF. RECEPTION		1A 102A
		PT 7	AMB. CARE, EMERGENCY	MAS CONTROL	1B-131
		PT 8	AMB. CARE CLINIC, RECEPTION	MAS CONTROL EVALUATION	C1-11
	BX-B1		OP SPECIMEN COLLECTION	STAT LAB	1B-159
		PT 9	OP PHARMACY	OFF. SEC.	
	BX-A1 (FUTURE)		RADIOLOGY/NUC. MED.	FILM LIBRARY	1C-172
		PT 10	O.P. PHARMACY	FILING & ASSEMBLY	1C-106
		PT 11	OP PSYCH. OCVS.	CLERK	1E-132
SECOND		PT 12	SURGERY CONTROL/ADMIN.		C2-10
		PT 13	RECOVERY		C2-10
		PT 14	CARDIOLOGY/PULM./HYPERTEN.	SECRETARY/FILE	C2-47
		PT 16	SICU	CNTRL. STA.	C2-39
		PT 17	CICU	CNTRL. STA.	C2-44
		PT 18	MICU	CNTRL. STA.	C2-52
		PT 19	GPICU	CNTRL. STA.	C2-84
		PT 20	DIR. SUITE/CHIEF OF STAFF	SECRETARY	C2-68
		PT 21	NURSING ADMIN.	SECRETARY	C2-77
		PT 22	SUPPLY SVC. ADMIN.	SECRETARY	2E-143A
	BX-B3		CICU	CONVEYOR	2C-134
THIRD		PT 25	RMS	SEC./CLERKS	C3-33
		PT ~~26~~ 30 (PER RFI-E-112)	PSYCH. NURSING #1	NURSE STA./WARD CLERK	C3-50
FOURTH	BX-B2	NOT ON PLAN		SPECIMEN ACCESSIONING	
		PT 28	LAB. ADMINISTRATION	SEC/CLERK	4B-106
		PT 29	DIALYSIS	NURSE STA./WARD CLERK	C4-17
		PT 30	PSYCH. NURSING #2	NURSE STA./WARD CLERK	C4-39
FIFTH		PT 31	NURSING UNIT #1	NURSE STA./WARD CLERK	C5-7
		PT 32	NURSING UNIT #2	NURSE STA./WARD CLERK	C5-18
SIXTH		PT 33	NURSING UNIT #3	NURSE STA./WARD CLERK	C6-7
		PT 34	NURSING UNIT #4	NURSE STA./WARD CLERK	C6-18
SEVENTH		PT 35	NURSING UNIT #5	NURSE STA./WARD CLERK	C7-7
		PT 36	NURSING UNIT #6	NURSE STA./WARD CLERK	C7-18
EIGHTH		PT 37	NURSING UNIT #7	NURSE STA./WARD CLERK	C8-7
		PT 38	NURSING UNIT #8	NURSE STA./WARD CLERK	C8-18
NINTH		PT-39	NURSING UNIT #9	NURSE STA./WARD CLERK	C9-7
		PT 40	NURSING UNIT #10	NURSE STA./WARD CLERK	C9-18

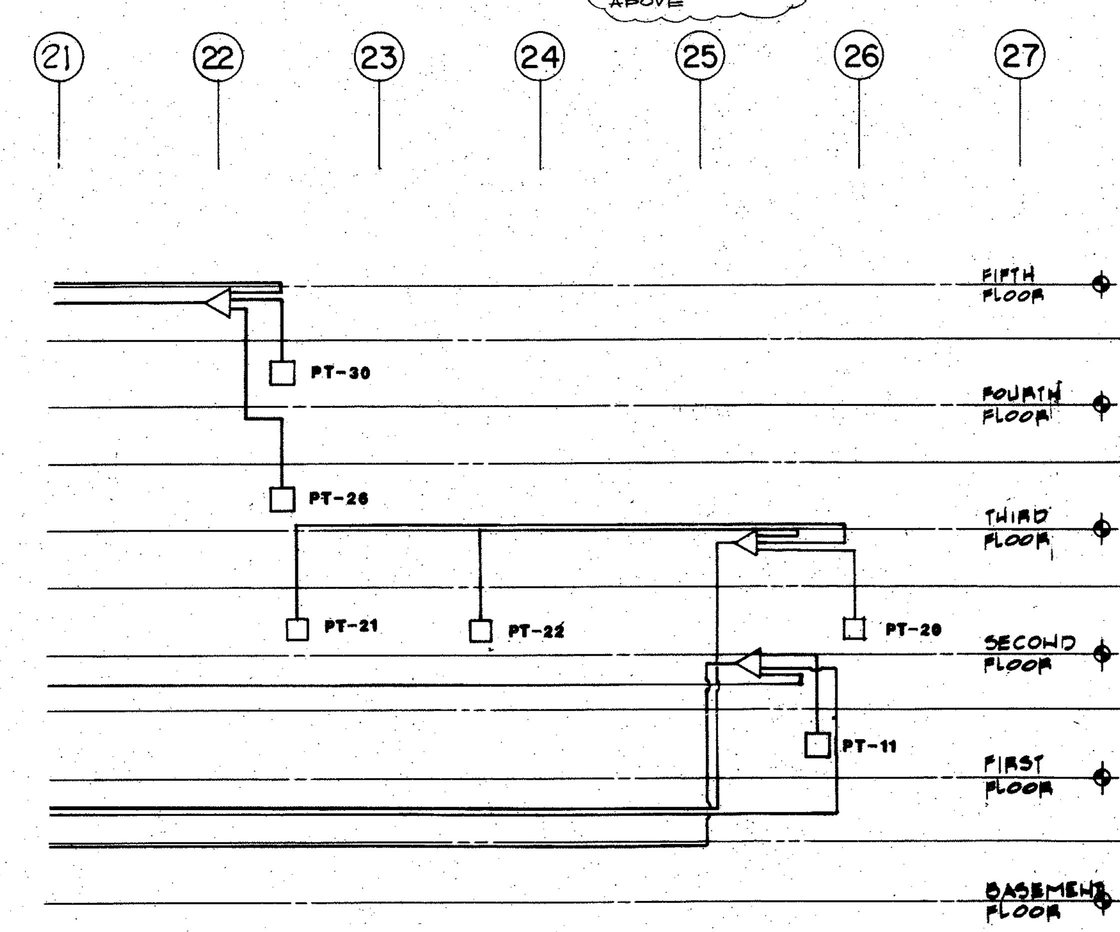


1/173 ABC STATION/TRACK FROM ABOVE 1/2"=1'-0"

2A/173 FLOOR TO FLOOR PENETRATION OF ABC TRACK

2/173 ABC STATION/TRACK FROM BELOW

3/173 AUTOMATIC BOX CONVEYOR (ABC) IN INTERSTITIAL SPACE 1/2"=1'-0"



FULLY PROTECTED BY AUTOMATIC SPRINKLER SYSTEMS

7-3-2-2208

Pneumatic Tube / ABC riser Diagram & Schedule B-21

BRUNING 44-232 75587

Appendix C

VAHBS CAD Drawings

Page

This page intentionally left blank.

Introduction

The following CAD drawings have been developed to assist in communicating VAHBS concepts to the project team. They are intended as a guide to the type of information that the A/E should incorporate in the construction documents in order to communicate the VAHBS concept and strategies to the Contractor.

The drawings have been prepared in accordance with VHA *National CAD Standard Application Guide*. The Design A/E shall make revisions for construction type, dimensions, geometries, service systems; and any other project specific requirements if any portions of these drawing files are to be included in the construction document package.

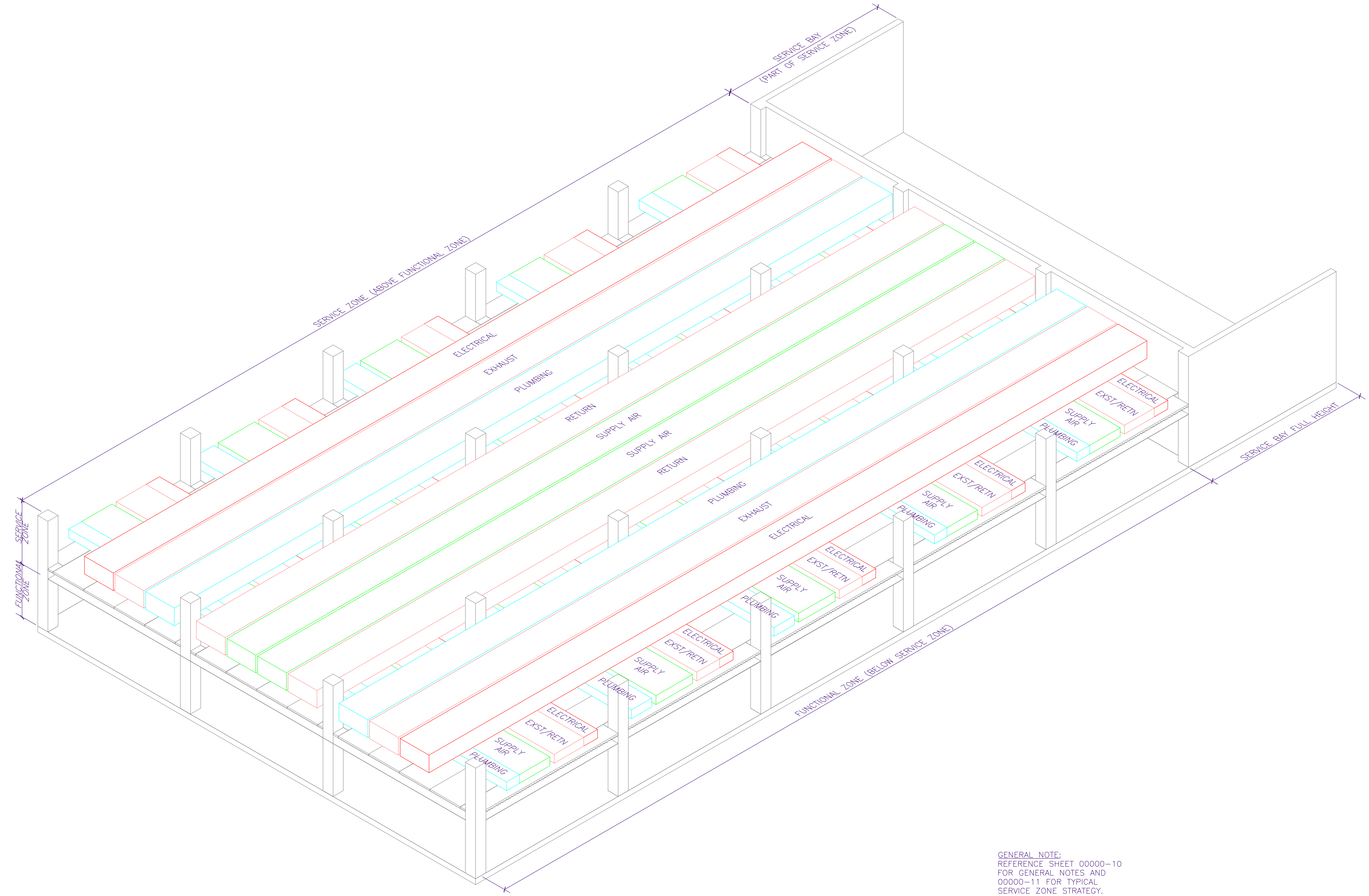
Note that the drawing numbering begins with 00000-5 for the typical service module and channel diagrams and notes. These drawings have been numbered top continue the sequence for VA architectural standard details in section 00000. VA standard details are generally numbered by specification section or division. 00000 is used for details that relate to multiple disciplines or do not otherwise fit in a single section.

The interstitial floor system (deck) details are numbered to relate to Master Specification Section 03522, INSULATING CONCRETE INTERSTITIAL DECK.

This page intentionally left blank.

DRAWING INTENT

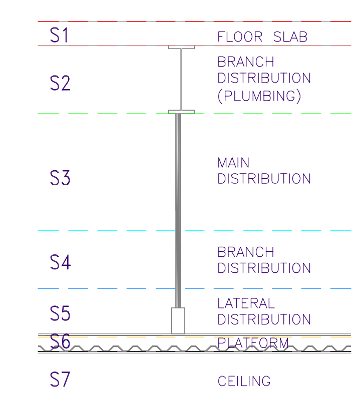
1. TO SHOW THE OVERALL RELATIONSHIP OF THE SUBSYSTEM CHANNELS IN THE S3 AND S4 SUBZONES.
2. EACH CHANNEL IS DEPICTED GRAPHICALLY BY A 3D SOLID.
3. THE SOLIDS SHOW THE TOTAL VOLUME AVAILABLE FOR DISTRIBUTION WITHIN THE CHANNEL.
4. THE TOTAL VOLUME WILL NOT NECESSARILY BE FULLY UTILIZED.
5. EACH CHANNEL IS RESERVED FOR A SINGLE SERVICE.
6. SERVICES WILL NOT MIGRATE TO OTHER CHANNELS.
7. SEE FOLLOWING SHEETS FOR INDIVIDUAL SUBSYSTEMS.



1 TYPICAL CHANNEL LAYOUT - ALL SYSTEMS S3 AND S4 SUBZONES

NTS

GENERAL NOTE:
REFERENCE SHEET 00000-10 FOR GENERAL NOTES AND 00000-11 FOR TYPICAL SERVICE ZONE STRATEGY.



SERVICE ZONE KEY

NTS

Revisions	Date

CONSULTANTS:

ARCHITECT/ENGINEERS:

Drawing Title	SERVICE MODULES TYPICAL CHANNEL LAYOUT ALL SYSTEMS S3 AND S4 SUBZONES
Approved: Project Director	
Project Title	SUPPLEMENT TO VAHBS REPORT
Location	STANDARD DETAIL
Date	JUNE 2006
Checked	NCK
Drawn	JLV
Project Number	-
Building Number	VAHBS
Drawing Number	00000-5
Dwg. of --	

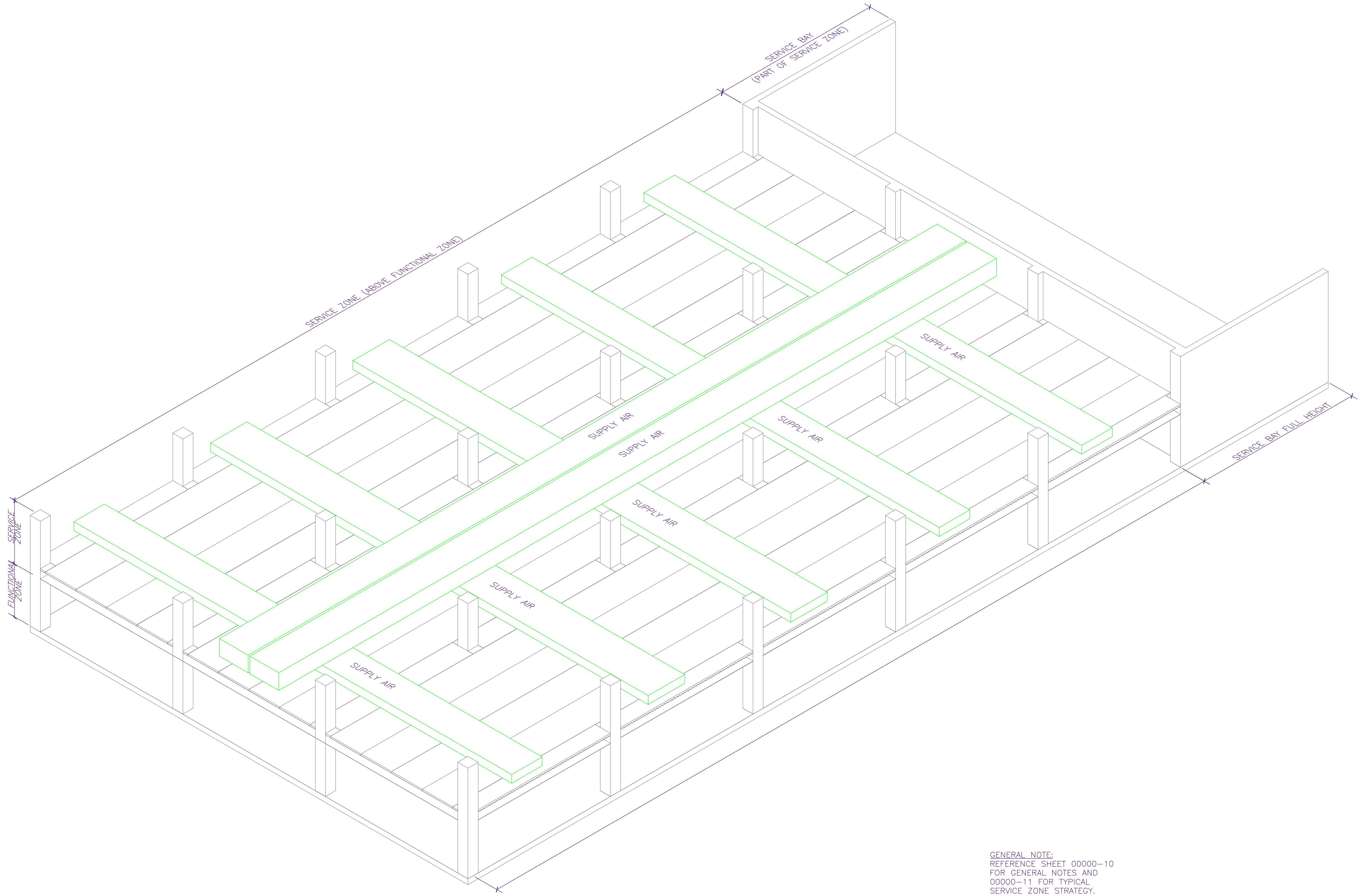
Office of Facilities Management

Department of Veterans Affairs

VA FORM 08-6231, OCT 1978

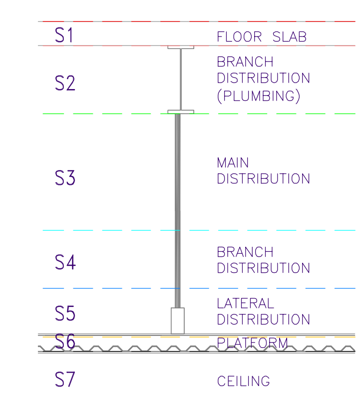
DRAWING INTENT

1. TO SHOW THE RELATIONSHIP OF THE HVAC SUPPLY AIR SUBSYSTEM CHANNELS IN THE S3 AND S4 SUBZONES.
2. THESE CHANNELS ARE DEPICTED GRAPHICALLY BY A 3D SOLID.
3. THE SOLIDS SHOW THE TOTAL VOLUME AVAILABLE FOR DISTRIBUTION WITHIN THE CHANNEL.
4. THE TOTAL VOLUME WILL NOT NECESSARILY BE FULLY UTILIZED.
5. THESE CHANNELS ARE RESERVED FOR HVAC SUPPLY AIR SUBSYSTEM ONLY.
6. SERVICES WILL NOT MIGRATE TO OTHER CHANNELS.



GENERAL NOTE:
REFERENCE SHEET 00000-10 FOR GENERAL NOTES AND 00000-11 FOR TYPICAL SERVICE ZONE STRATEGY.

1 TYPICAL CHANNEL LAYOUT - HVAC SUPPLY AIR SYSTEMS S3 AND S4 SUBZONES
NTS



SERVICE ZONE KEY
NTS

Revisions: | Date

CONSULTANTS:

ARCHITECT/ENGINEERS:

Drawing Title: SERVICE MODULE - TYPICAL CHANEL LAYOUT - HVAC SUPPLY AIR SYSTEMS S3 AND S4 SUBZONES

Approved: Project Director

Project Title: SUPPLEMENT TO VAHBS REPORT

Location: STANDARD DETAIL

Date: JUNE 2006 | Checked: NCK | Drawn: JLV

Project Number: -

Building Number: VAHBS

Drawing Number: 00000-6

Dwg. of --

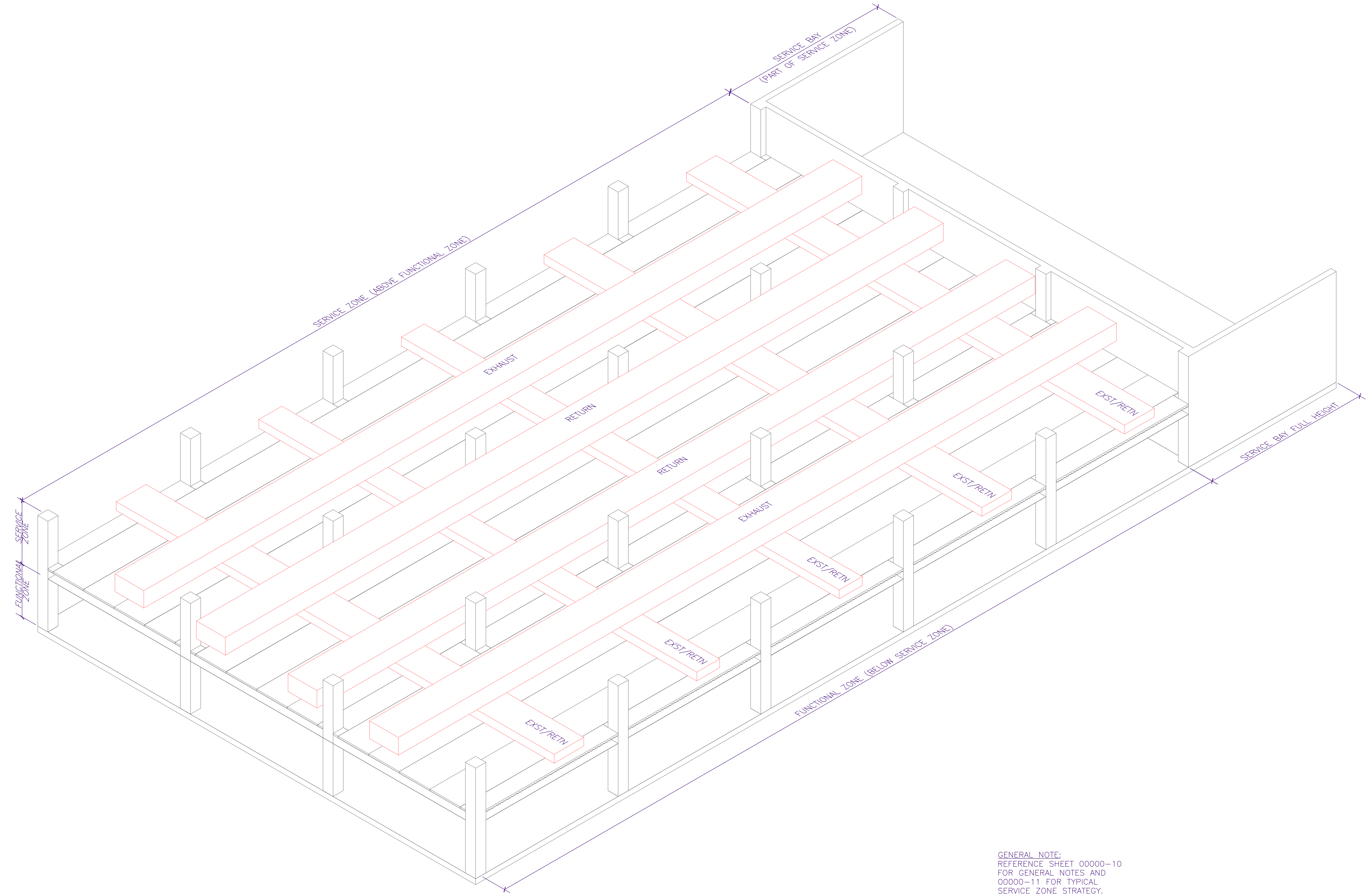
Office of Facilities Management

Department of Veterans Affairs

VA FORM 08-6231, OCT 1978

DRAWING INTENT

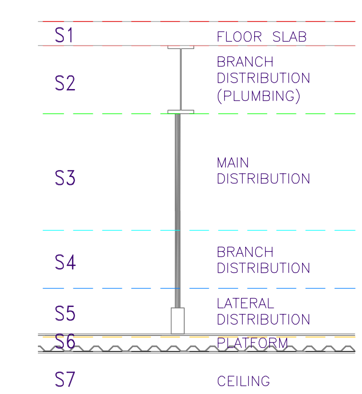
1. TO SHOW THE RELATIONSHIP OF THE HVAC RETURN/EXHAUST SUBSYSTEM CHANNELS IN THE S3 AND S4 SUBZONES.
2. THESE CHANNELS ARE DEPICTED GRAPHICALLY BY A 3D SOLID.
3. THE SOLIDS SHOW THE TOTAL VOLUME AVAILABLE FOR DISTRIBUTION WITHIN THE CHANNEL.
4. THE TOTAL VOLUME WILL NOT NECESSARILY BE FULLY UTILIZED.
5. THESE CHANNELS ARE RESERVED FOR HVAC SUPPLY AIR SUBSYSTEM ONLY.
6. SERVICES WILL NOT MIGRATE TO OTHER CHANNELS.



GENERAL NOTE:
REFERENCE SHEET 00000-10 FOR GENERAL NOTES AND 00000-11 FOR TYPICAL SERVICE ZONE STRATEGY.

1 TYPICAL CHANNEL LAYOUT - HVAC RETURN/EXHAUST SYSTEMS S3 AND S4 SUBZONES

NTS



SERVICE ZONE KEY

NTS

Revisions:	Date

CONSULTANTS:

ARCHITECT/ENGINEERS:

Drawing Title: SERVICE MODULE - TYPICAL CHANNEL LAYOUT - HVAC RETURN/EXHAUST SYSTEMS S3 AND S4 SUBZONES

Approved: Project Director

Project Title: SUPPLEMENT TO VAHBS REPORT

Location: STANDARD DETAIL

Date: JUNE 2006 | Checked: NCK | Drawn: JLV

Project Number: -

Building Number: VAHBS

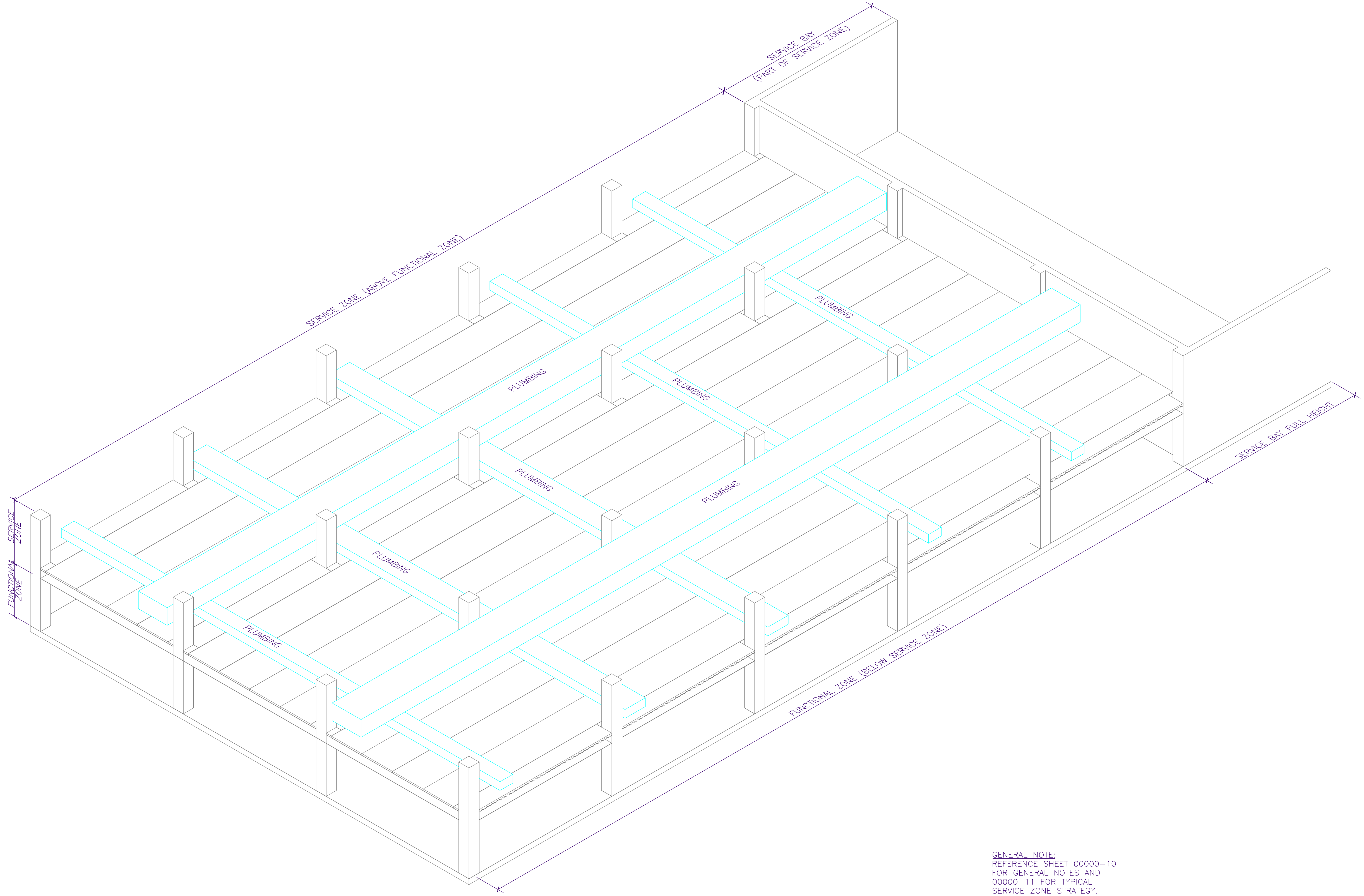
Drawing Number: 00000-7

Dwg. of --

Office of Facilities Management

Department of Veterans Affairs

VA FORM 08-6231, OCT 1978



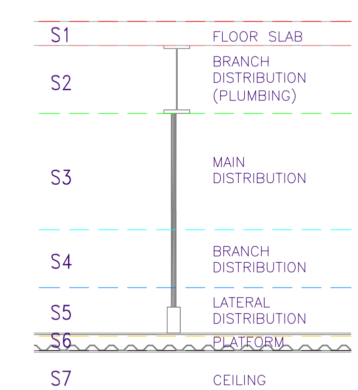
1 TYPICAL CHANNEL LAYOUT - PLUMBING SYSTEMS S3 AND S4 SUBZONES

NTS

GENERAL NOTE:
REFERENCE SHEET 00000-10 FOR GENERAL NOTES AND 00000-11 FOR TYPICAL SERVICE ZONE STRATEGY.

DRAWING INTENT

1. TO SHOW THE RELATIONSHIP OF THE HVAC RETURN/EXHAUST SUBSYSTEM CHANNELS IN THE S3 AND S4 SUBZONES.
2. THESE CHANNELS ARE DEPICTED GRAPHICALLY BY A 3D SOLID.
3. THE SOLIDS SHOW THE TOTAL VOLUME AVAILABLE FOR DISTRIBUTION WITHIN THE CHANNEL.
4. THE TOTAL VOLUME WILL NOT NECESSARILY BE FULLY UTILIZED.
5. THESE CHANNELS ARE RESERVED FOR HVAC SUPPLY AIR SUBSYSTEM ONLY.
6. SERVICES WILL NOT MIGRATE TO OTHER CHANNELS.



SERVICE ZONE KEY

NTS

Revisions	Date	CONSULTANTS:		ARCHITECT/ENGINEERS:

Drawing Title: SERVICE MODULE TYPICAL CHANNEL LAYOUT - PLUMBING SYSTEMS S3 AND S4 SUBZONES

Approved: Project Director

Project Title: SUPPLEMENT TO VAHBS REPORT

Location: STANDARD DETAIL

Date: JUNE 2006 | Checked: NCK | Drawn: JLV

Project Number: -

Building Number: VAHBS

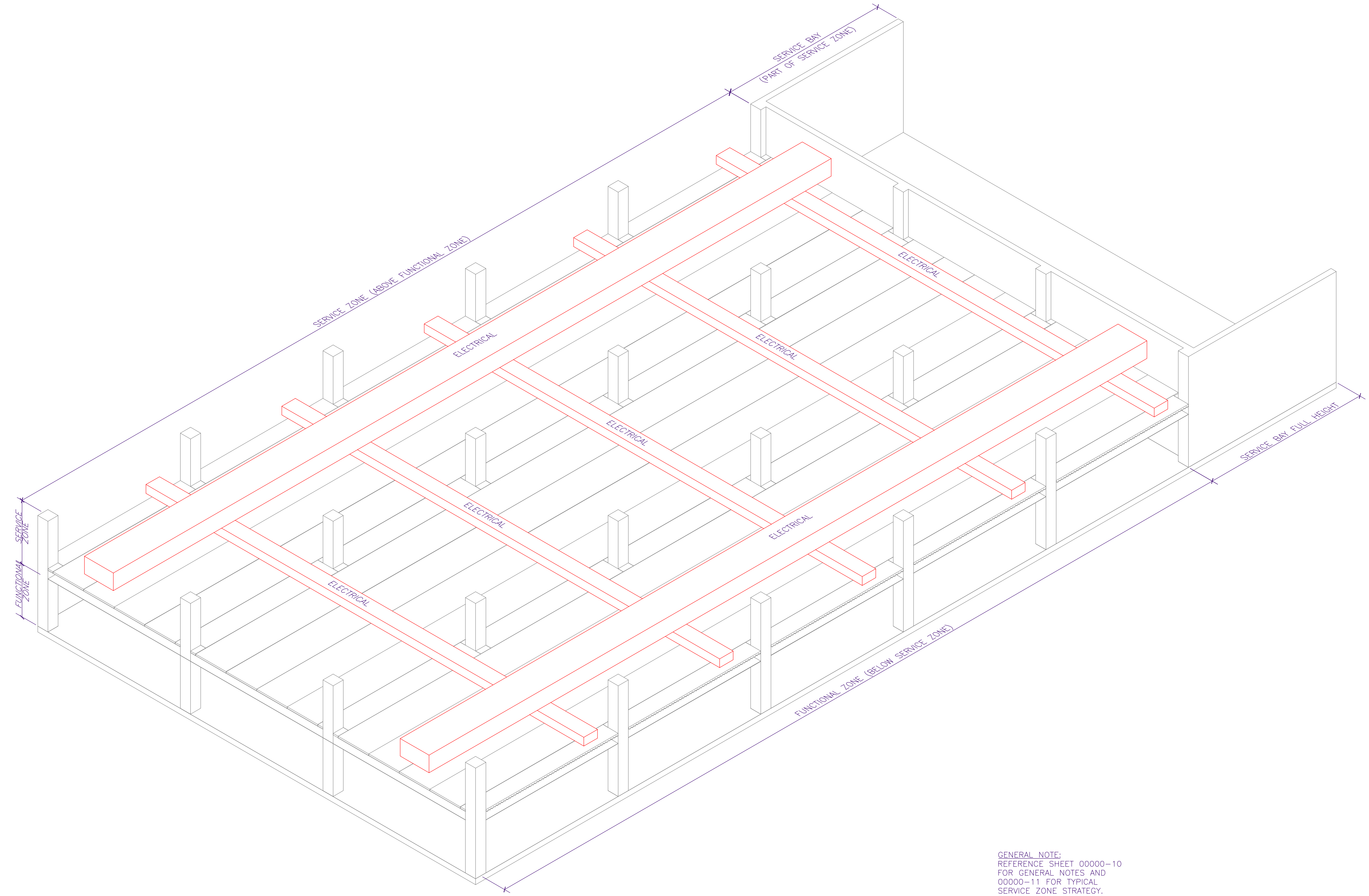
Drawing Number: 00000-8

Dwg. of --

Office of Facilities Management

Department of Veterans Affairs

VA FORM 08-6231, OCT 1978



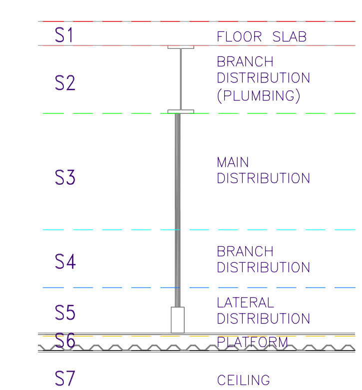
GENERAL NOTE:
REFERENCE SHEET 00000-10 FOR GENERAL NOTES AND 00000-11 FOR TYPICAL SERVICE ZONE STRATEGY.

1 TYPICAL CHANNEL LAYOUT - ELECTRICAL SYSTEMS S3 AND S4 SUBZONES

NTS

DRAWING INTENT

1. TO SHOW THE RELATIONSHIP OF THE ELECTRICAL SUBSYSTEM CHANNELS IN THE S3 AND S4 SUBZONES.
2. THESE CHANNELS ARE DEPICTED GRAPHICALLY BY A 3D SOLID.
3. THE SOLIDS SHOW THE TOTAL VOLUME AVAILABLE FOR DISTRIBUTION WITHIN THE CHANNEL.
4. THE TOTAL VOLUME WILL NOT NECESSARILY BE FULLY UTILIZED.
5. THESE CHANNELS ARE RESERVED FOR HVAC SUPPLY AIR SUBSYSTEM ONLY.
6. SERVICES WILL NOT MIGRATE TO OTHER CHANNELS.



SERVICE ZONE KEY

NTS

Revisions	Date

CONSULTANTS:

ARCHITECT/ENGINEERS:

Drawing Title: SERVICE MODULE - TYPICAL CHANNEL LAYOUT - ELECTRICAL SYSTEMS S3 AND S4 SUBZONES

Approved: Project Director

Project Title: SUPPLEMENT TO VAHBS REPORT

Location: STANDARD DETAIL

Date: JUNE 2006 | Checked: NCK | Drawn: JLV

Project Number: -

Building Number: VAHBS

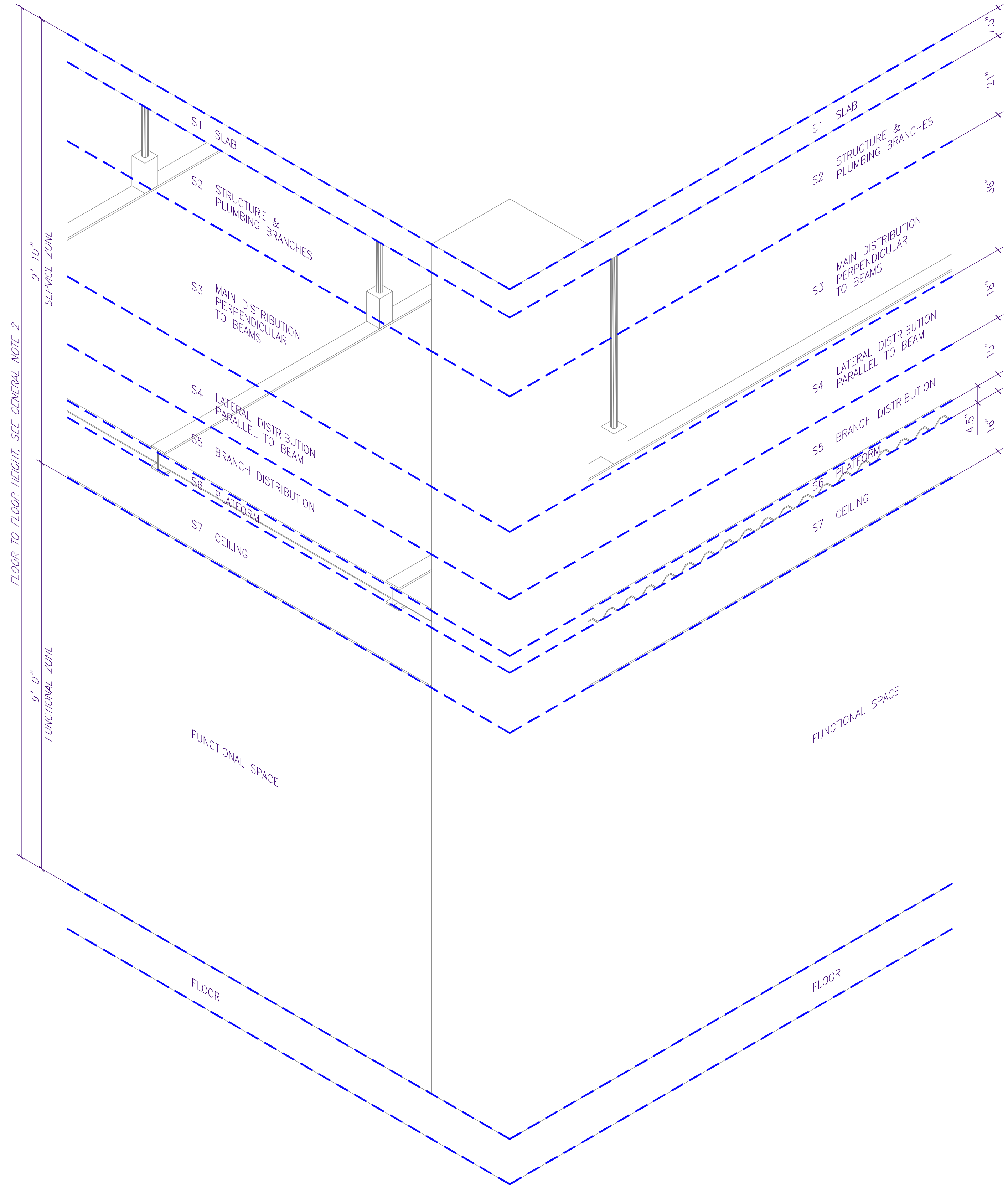
Drawing Number: 00000-9

Dwg. of --

Office of Facilities Management

Department of Veterans Affairs

VA FORM 08-6231, OCT 1978



DRAWING INTENT:
THIS IS AN ISOMETRIC OF A PORTION OF A TYPICAL OF A TYPICAL SERVICE MODULE SHOWING SERVICE AND FUNCTIONAL ZONES.

1 ISOMETRIC OF SERVICE AND FUNCTIONAL ZONES
NTS

GENERAL NOTES

1. SERVICE MODULE
   A SERVICE MODULE IS THE BASIC ORGANIZATIONAL UNIT FOR PLANNING AND SERVICE DISTRIBUTION IN THE VA HOSPITAL BUILDING SYSTEM. SERVICE MODULES ARE ONE STORY UNITS OF BUILDING VOLUME. EACH SERVICE MODULE IS COMPRISED OF STRUCTURAL BAYS, FUNCTIONAL ZONE (THE OCCUPIED AREAS)AND A SERVICE ZONE THAT INCLUDES A FULL HEIGHT SERVICE BAY AND AN INTERSTITIAL SERVICE ZONE ABOVE THE FUNCTIONAL ZONE. EACH SERVICE MODULE IS COMPLETELY CONTAINED, ALONE OR WITH ONE OR MORE OTHER MODULES, IN A FIRE COMPARTMENT IN THE BUILDING.

2. STRUCTURAL BAY
   THE DIMENSIONS OF THE STRUCTURAL BAY ARE INFLUENCED BY THE FUNCTIONAL LAYOUT (SPACE PLANNING), SERVICE ZONE CLEARANCES, AND TYPE OF STRUCTURAL SYSTEM SELECTED. SERVICE MODULES FOR DIFFERENT FUNCTIONAL AREAS MAY VARY IN FLOOR HEIGHT. HOWEVER, ALL MODULES WITHIN ANY ONE STORY SHALL BE OF THE SAME HEIGHT. CEILING HEIGHTS SHALL BE AS PROVIDED IN PG-18-10 ARCHITECTURAL DESIGN MANUAL. HEIGHT OF INTERSTITIAL SERVICE ZONE MAY VARY ABOVE FUNCTIONAL ZONES FOR SURGERY AND RADIOLOGY. HEADROOM CLEARANCES SHALL COMPLY WITH APPLICABLE REGULATIONS.

3. SERVICE ZONE – SERVICE BAY
   THE SERVICE BAY IS A SPECIAL VARIATION OF STRUCTURAL BAY THAT CONTAINS THE MECHANICAL, ELECTRICAL, AND TELECOMMUNICATIONS ROOMS; AND SERVICE SHAFTS AND RISERS (AND MAY INCLUDE EXIT STAIRS) FOR A SERVICE MODULE. MAJOR EQUIPMENT ITEMS AND ALL PUMPS AND MOTORS ARE CONTAINED IN THE SERVICE BAY. IN SECTION, THE SERVICE BAY EXTENDS FROM STRUCTURAL FLOOR TO STRUCTURAL FLOOR. THE WALK-ON PLATFORM (INTERSTITIAL DECK) DOES NOT EXTEND INTO OR THROUGH THE SERVICE BAY.

4. SERVICE ZONE – INTERSTITIAL
   THE INTERSTITIAL PORTION OF THE SERVICE ZONE PROVIDES FOR THE ORGANIZED DISTRIBUTION OF SERVICES FROM THE SERVICE BAY TO THE FUNCTIONAL ZONE. A HIERARCHY OF RESERVED SUBZONES AND CHANNELS IS DEFINED FOR SERVICE DISTRIBUTION AND INCLUDES PROVISIONS FOR MAINTENANCE ACCESS AND FUTURE MODIFICATIONS. REFER TO DRAWING 00000-11 FOR TYPICAL SERVICE ZONE STRATEGY.

5. FUNCTIONAL ZONES AND SPACE MODULES
   THE FUNCTIONAL ZONE IS THE OCCUPIED FLOOR AREA WITHIN A SERVICE MODULE. SPACE MODULES ARE VARIATIONS OF THE SERVICE MODULE DESIGNED FOR INPATIENT BED UNITS. SPACE MODULES MAY BE THE SAME SIZE OR SMALLER THAN A SERVICE MODULE, BUT IN NO CASE MAY BE LARGER THAN A SERVICE MODULE.

6. FIRE COMPARTMENT
   THE FIRE COMPARTMENT IS A UNIT OF AREA ENCLOSED BY TWO-HOUR FIRE RESISTIVE RATED CONSTRUCTION, FROM WHICH THERE ARE AT LEAST TWO DIFFERENT EXITS. THE SIZE AND NUMBER OF FIRE COMPARTMENTS SHALL BE AS DETERMINED BY CURRENT CODES AND THE OVERALL FIRE PROTECTION STRATEGY FOR THE BUILDING.
   A FIRE COMPARTMENT MAY CONSIST OF ONE OR MORE SERVICE MODULES. THE BOUNDARIES OF THE FIRE COMPARTMENT SHOULD COINCIDE WITH THE BOUNDARIES OF THE SERVICE MODULE. A SERVICE MODULE SHALL NOT POPULATE MORE THAN ONE FIRE COMPARTMENT.

7. REFER TO DRAWING 00000-12 FOR FIRE RESISTANCE REQUIREMENTS AT PENETRATIONS AND OPENINGS AT INTERSTITIAL AREAS.

INTERSTITIAL DISTRIB. SUPPORT STRATEGY

SUBZONE	STRATEGY
S1	FLOOR THICKNESS INCLUDES 3" TOPPING SLAB TO ALLOW FOR INSTALLATION OF CERAMIC TILE, WATER PROOFING, SHOWER PANS, AND RECESSED EQUIPMENT. REFERENCE PG-18-3 TOPIC 6.
S2	SERVICE SYSTEM ELEMENTS IN THE S2 ZONE, SHALL BE SUSPENDED FROM THE UNDERSIDE OF THE FLOOR SLAB OR DECK.
S3	SERVICE SYSTEM ELEMENTS IN THE S3 ZONE SHALL BE INSTALLED AS CLOSE AS POSSIBLE TO THE UNDERSIDE OF THE STRUCTURAL BEAMS. SUPPORTS SHALL BE SECURED TO THE BOTTOM OF THE BEAMS. SYSTEMS IN THIS ZONE ALSO MAY BE SUSPENDED FROM THE UNDERSIDE OF THE DECK. HOWEVER, USE OF THE DECK FOR SUPPORT SHOULD BE MINIMIZED.
S4	SERVICE SYSTEM ELEMENTS IN THE S4 ZONE SHALL BE SUPPORTED FROM THE PLATFORM PURLIN.
S5	SERVICE SYSTEM ELEMENTS IN THE S5 ZONE SHALL BE SUPPORTED FROM THE PLATFORM.
S7	SERVICE SYSTEM ELEMENTS IN THE S7 ZONE AS WELL AS FINISH CEILINGS SHALL BE SUSPENDED FROM THE UNDERSIDE OF THE PLATFORM. FIXTURES AND DEVICES SHALL BE SUPPORTED BY THE FINISH CEILING WITHIN LOAD LIMITS OF THE SUSPENSION SYSTEM. HEAVY FIXTURES AND "SAFETY" WIRES SHALL ATTACH TO THE UNDERSIDE OF THE PLATFORM. CEILING MOUNTED EQUIPMENT ITEMS SHALL BE SUPPORTED BY MEMBERS BEARING ON THE PLATFORM PURLIN. WHEN EQUIPMENT WEIGHTS EXCEED LOAD CAPACITY OF THE PURLINS, SUPPORT SHALL BE PROVIDED FROM BEAMS OR GIRDERS AT FLOOR.

Revisions: | Date

CONSULTANTS:

ARCHITECT/ENGINEERS:

Drawing Title: ISOMETRIC OF SERVICE AND FUNCTIONAL ZONES AND GENERAL NOTES

Approved: Project Director

Project Title: SUPPLEMENT TO VAHBS REPORT

Project Number: -

Building Number: VAHBS

Location: STANDARD DETAIL

Date: JUNE 2006 | Checked: NCK | Drawn: JLV

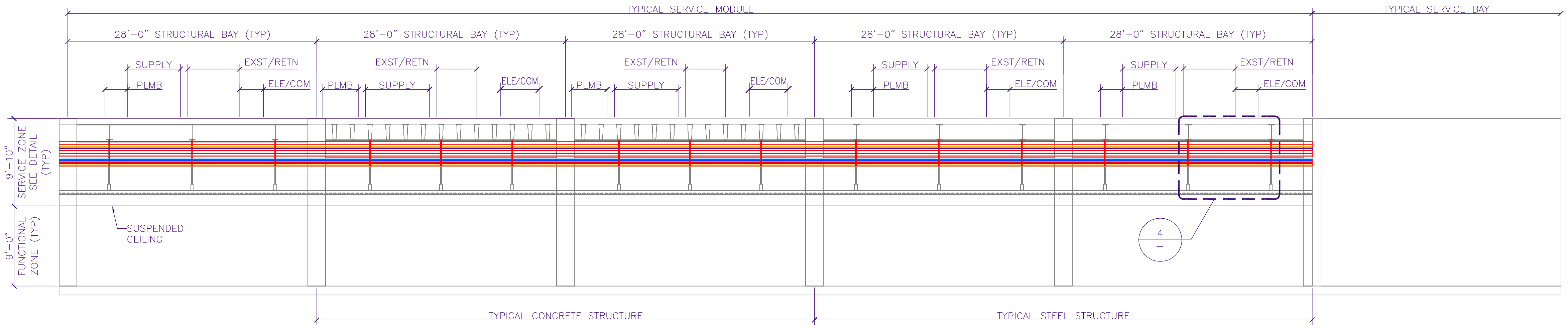
Drawing Number: 00000-10

Dwg. of --

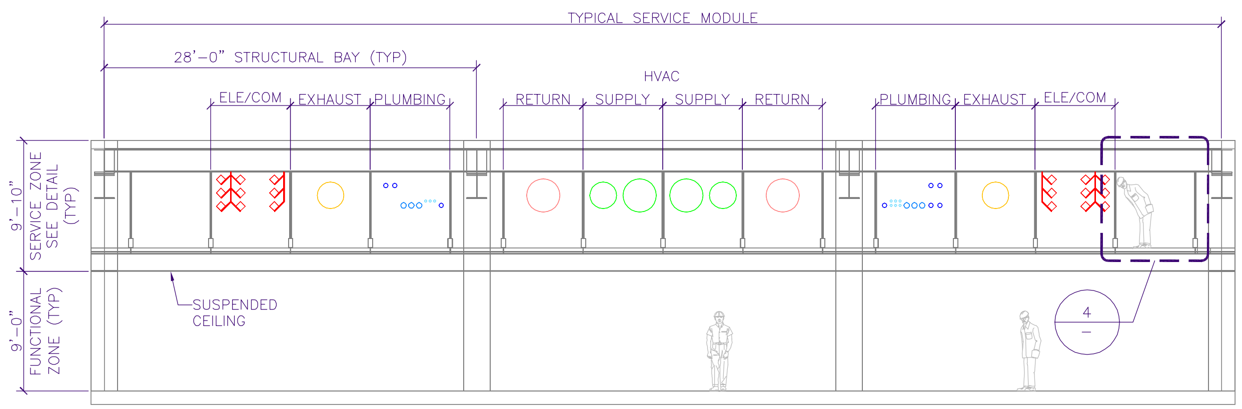
Office of Facilities Management

Department of Veterans Affairs

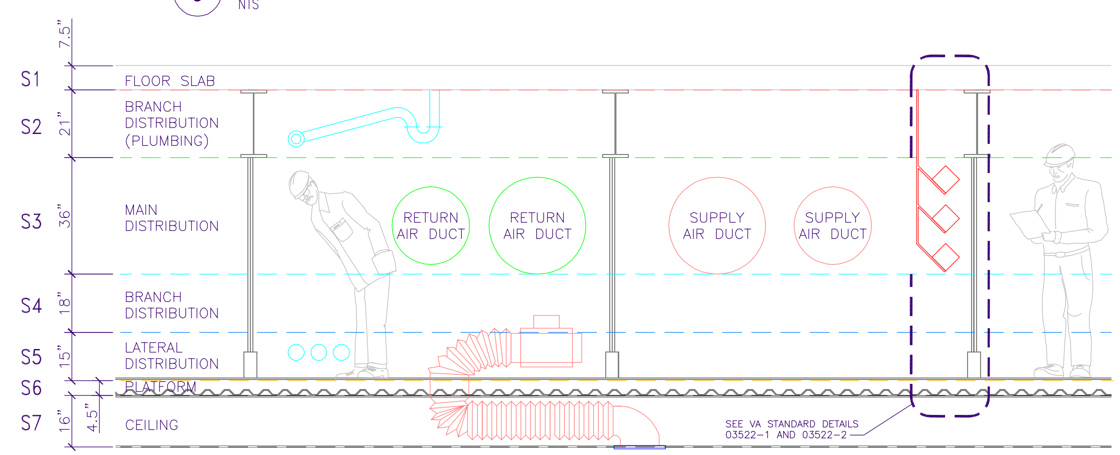
VA FORM 08-6231, OCT 1978



2 **LONGITUDINAL SECTION** THIS SECTION ILLUSTRATES A TYPICAL S–4 SUBZONE STRATEGY
NTS



3 **TRANSVERSE SECTION** THIS SECTION ILLUSTRATES A TYPICAL S–3 SUBZONE STRATEGY
NTS



4 **SERVICE ZONE DETAIL**
NTS

DRAWING INTENT:
TO DEPECT TYPICAL SECTIONS ILLUSTRATING SERVICE ZONE STRATEGIES.

INTERSTITIAL DIST. SUPPORT STRATEGY

SUBZONE	STRATEGY
S1	FLOOR THICKNESS INCLUDES 3" TOPPING SLAB TO ALLOW FOR INSTALLATION OF CERAMIC TILE, WATER PROOFING, SHOWER PANS, AND RECESSED EQUIPMENT. REFERENCE PG–18–3 TOPIC 6.
S2	SERVICE SYSTEM ELEMENTS IN THE S2 ZONE, SHALL BE SUSPENDED FROM THE UNDERSIDE OF THE FLOOR SLAB OR DECK.
S3	SERVICE SYSTEM ELEMENTS IN THE S3 ZONE SHALL BE INSTALLED AS CLOSE AS POSSIBLE TO THE UNDERSIDE OF THE STRUCTURAL BEAMS. SUPPORTS SHALL BE SECURED TO THE BOTTOM OF THE BEAMS. SYSTEMS IN THIS ZONE ALSO MAY BE SUSPENDED FROM THE UNDERSIDE OF THE DECK. HOWEVER, USE OF THE DECK FOR SUPPORT SHOULD BE MINIMIZED.
S4	SERVICE SYSTEM ELEMENTS IN THE S4 ZONE SHALL BE SUPPORTED FROM THE PLATFORM PURLIN.
S5	SERVICE SYSTEM ELEMENTS IN THE S5 ZONE SHALL BE SUPPORTED FROM THE PLATFORM.
S7	SERVICE SYSTEM ELEMENTS IN THE S7 ZONE AS WELL AS FINISH CEILINGS SHALL BE SUSPENDED FROM THE UNDERSIDE OF THE PLATFORM. FIXTURES AND DEVICES SHALL BE SUPPORTED BY THE FINISH CEILING WITHIN LOAD LIMITS OF THE SUSPENSION SYSTEM. HEAVY FIXTURES AND "SAFETY" WIRES SHALL ATTACH TO THE UNDERSIDE OF THE PLATFORM. CEILING MOUNTED EQUIPMENT ITEMS SHALL BE SUPPORTED BY MEMBERS BEARING ON THE PLATFORM PURLIN. WHEN EQUIPMENT WEIGHTS EXCEED LOAD CAPACITY OF THE PURLINS, SUPPORT SHALL BE PROVIDED FROM BEAMS OR GIRDERS AT FLOOR.

GENERAL NOTES

1. SERVICE BAY
   THE SERVICE BAY CONTAINS THE MECHANICAL, ELECTRICAL AND TELECOMMUNICATIONS ROOMS THAT SUPPORT A SERVICE MODULE AND SHAFTS AND RISERS NECESSARY FOR VERTICAL DISTRIBUTION OF SERVICES.

2. SERVICE ZONE
   THE SERVICE ZONE EXTENDS HORIZONTALLY FROM THE SERVICE BAY AND CARRIES THE DISTRIBUTION OF SERVICES ABOVE THE FUNCTIONAL ZONE. ALL SERVICES DOWNFEED INTO THE FUNCTIONAL ZONE EXCEPT FOR GRAVITY DRAINS FROM THE SERVICES MODULE ABOVE.

   THE SERVICE ZONE IS ORGANIZED INTO SUBZONES AND CHANNELS THAT DEFINE AND ORGANIZE THE SERVICE RUNS.

   SUBZONES ARE HORIZONTAL LAYERS WITHIN THE SERVICE ZONE. MAIN SERVICE DISTRIBUTION RUNS FROM THE SERVICE BAY ARE ALL PARALLEL, EACH CONNECTING TO BRANCHES AT RIGHT ANGLES TO THE MAINS, AND BRANCHES CONNECTION, WHERE REQUIRED, TO LATERALS AT RIGHT ANGLES TO THE BRANCHES WITHIN THE DEFINED SUBZONES.

   CHANNELS ARE PLAN DIVISIONS OF THE SUBZONES AND DEFINE RESERVED LOCATIONS FOR PARTICULAR SERVICES.

   IN ORDER TO PRESERVE THE RIGHTSOF–WAY FOR INITIAL AND FUTURE INSTALLATION OF SERVICE RUNS, NO SHORTCUT OR POINT–TO–POINT ROUTING OF SERVICES IS PERMITTED. THIS IS EXTREMELY IMPORTANT.

3. S1 SUBZONE – FLOOR SLAB
   THIS SUBZONE EQUALS THE DEPTH OF THE FLOOR FINISH TOPPING SLAB AND STRUCTURAL SLAB.

4. S2 SUBZONE – BRANCH DISTRIBUTION
   THIS SUBZONE CONTAINS THE STRUCTURAL BEAMS, PRESSURE PIPING AND GRAVITY DRAINAGE AND VENTS.

5. S3 SUBZONE – MAIN DISTRIBUTION
   THIS IS THE MAJOR SUBZONE AND IS RESERVED FOR MAIN DISTRIBUTION OF SERVICES THROUGH THE LENGTH OF THE SERVICE ZONE. IT IS DIVIDED BY SERVICE INTO CHANNELS. THE DEPTH WILL BE GOVERNED BY HVAC DUCT SIZES, CROSS OVERS OR SUPPLY, AND RETURN/EXHAUST DUCTS ARE TO OCCUR IN THE SERVICE BAY.

6. S4 SUBZONE – BRANCH DISTRIBUTION
   THIS SUBZONE CONTAINS MECHANICAL AND ELECTRICAL BRANCHES AND VENTS. IT IS DIVIDED BY SERVICE INTO CHANNELS. DEPTH WILL BE GOVERNED BY HVAC BRANCHES.

7. S5 SUBZONE – LATERAL DISTRIBUTION
   THIS SUBZONE TAKES THE FINAL SERVICE RUN TO THE LOCATION OF THE SERVICE DROP INTO THE FUNCTIONAL ZONE BELOW. ANY PROJECTIONS FROM THE WALK–ON PLATFORM CONSTRUCTION WILL BE PARALLEL TO THE SERVICES AT THIS LEVEL. FORMAL CHANNELS ARE USUALLY NOT DEFINED IN THIS SUBZONE.

8. S6 SUBZONE – PLATFORM
   THIS SUBZONE EQUALS THE OVERALL DEPTH OF THE WALK–ON PLATFORM (INTERSTITIAL DECK) CONSTRUCTION.

9. S7 SUBZONE – CEILING
   THIS SUBZONE EXTENDS FROM THE UNDERSIDE OF THE WALK–ON PLATFORM TO THE BOTTOM OF THE SUSPENDED, FINISH CEILING. LIMITED LATERAL DISTRIBUTION MAY OCCUR IN THIS SUBZONE SUCH AS OFFSETS IN SERVICE DROPS FROM THE PENETRATION THROUGH THE WALK–ON DECK TO FIXTURE OR PARTITION; FIXTURES AND DEVICES RECESSED IN THE FINISHED CEILING; SWITCH LEGS AND WHIPS FOR LIGHTING FIXTURES; FIRE SPRINKLER; AND NON–INTERGRATED TELECOMMUNICATIONS CONDUIT AND CABLING FOR PUBLIC ADDRESS, NURSE CALL, CATV/MATV SYSTEMS AND FIRE ALARM SYSTEM.

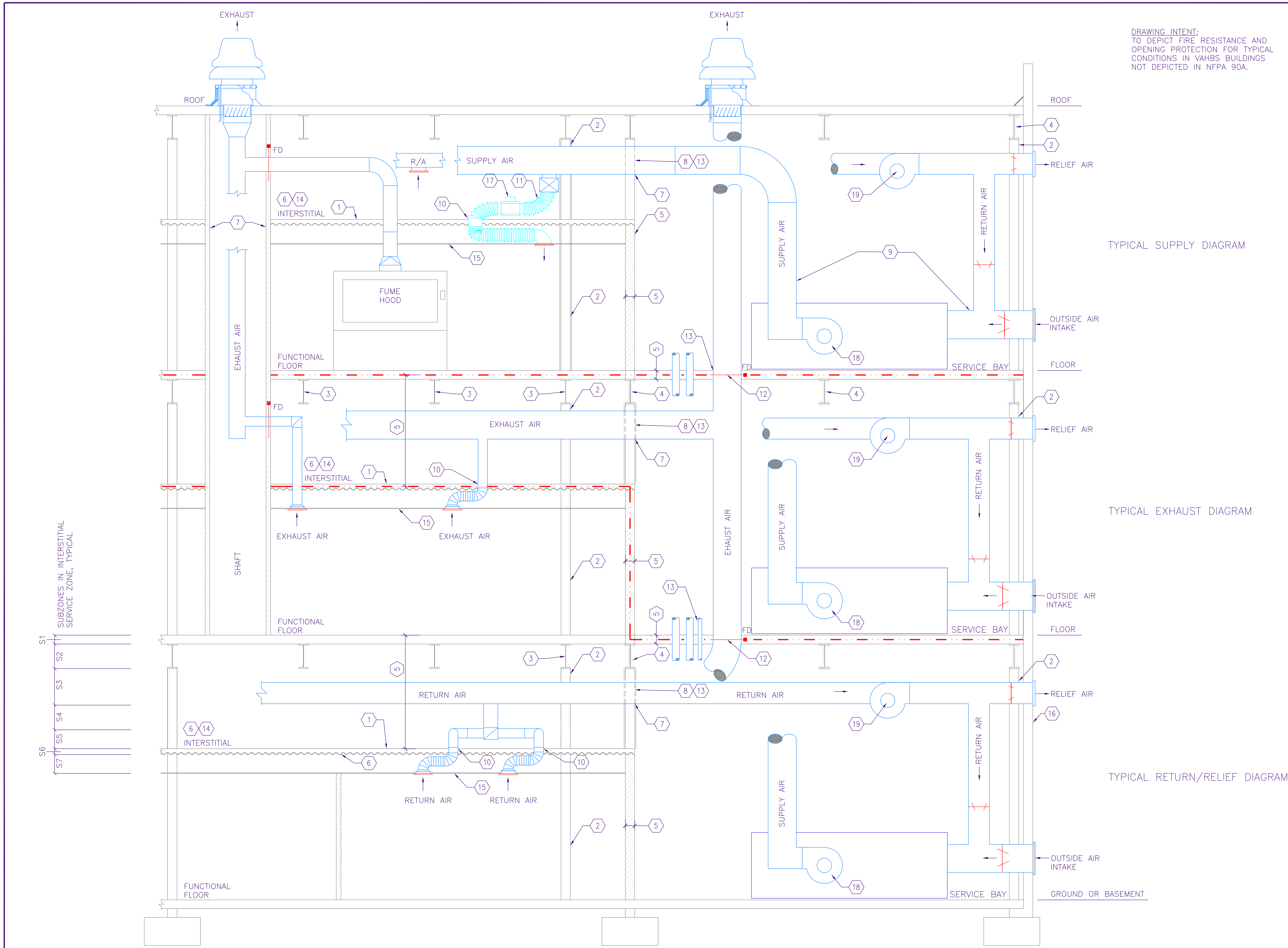
10. DESIGN A/E SHALL PREPARE DISIPLINE SPECIFIC DRAWINGS TO ILLUSTRATE STRATEGY FOR HVAC, PLUMBING, ELECTRICAL, AND TELE/DATA SYSTEMS.

11. CONTRACTOR SHALL PREPARE COORDINATION DRAWINGS FOR EACH SERVICE ZONE IN EACH SERVICE MODULE.

Revisions	Date	CONSULTANTS:	ARCHITECT/ENGINEERS:

Drawing Title	Project Title	Project Number	
TYPICAL SERVICE ZONE STRATEGY	SUPPLEMENT TO VAHBS REPORT	–	Office of Facilities Management
Approved: Project Director	Location: STANDARD DETAIL	Building Number: VAHBS	Department of Veterans Affairs
	Date: JUNE 2006 / Checked: NCK / Drawn: JLV	Drawing Number: 00000-11, Dwg. -- of --	

VA FORM 08-6231, OCT 1978



GENERAL NOTES

VA FP DESIGN MANUAL

1. DESIGN FIRE RESISTIVE RATINGS TO COMPLY WITH NFPA 220 AND IBC — 2.1.A
2. DESIGN CONSTRUCTION TYPE TO COMPLY WITH MOST RESTRICTIVE OCCUPANCY GROUP IN BUILDING. — 2.1.B
3. PROVIDE FIRE ALARM PULL STATIONS AT EXIT DOORS FROM INTERSTITIAL SPACES AND SUFFICIENT NOTIFICATION DEVICES IN INTERSTITIAL. — 2.2.H
4. PROVIDE EXIT SIGNS AT EXIT DOORS AND OTHER LOCATIONS AS REQUIRED TO PROVIDE CLEAR DIRECTION. — 2.2.I
5. PROVIDE EMERGENCY LIGHTING FOR EGRESS ILLUMINATION IN FUNCTIONAL ZONE, SERVICE BAY, AND INTERSTITIAL. — 2.2.I
6. 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.
7. LOCATE OR PROTECT OUTSIDE AIR INTAKE(S) IN ACCORDANCE WITH VA PHYSICAL SECURITY CRITERIA.

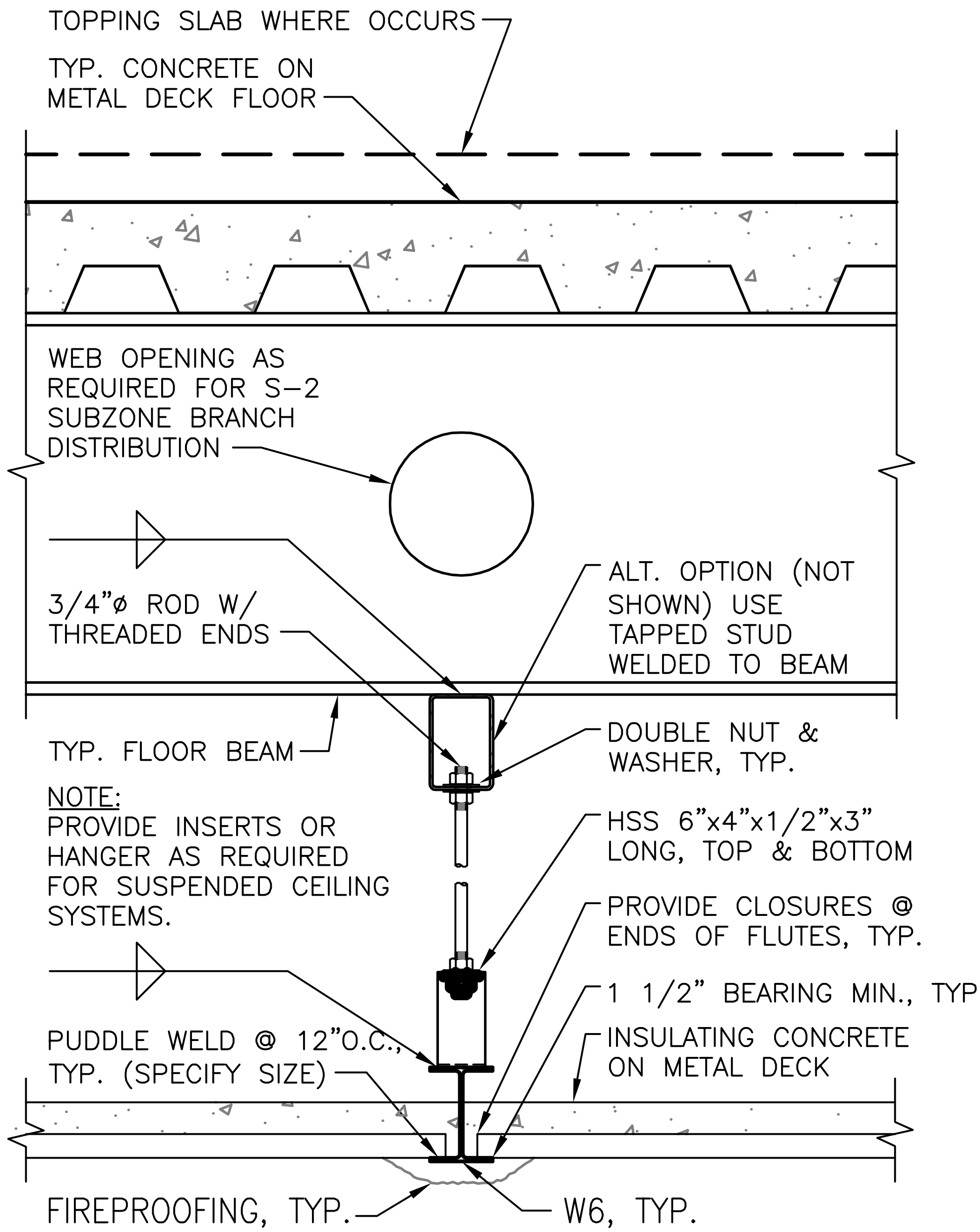
KEY NOTES

VA FP DESIGN MANUAL

1. WALK ON DECK (PLATFORM) PER NBSIR 85-3158 OR NISTIR 5560+FP DESIGN MANUAL. — 2.2.A
2. STEEL COLUMN – FIRE PROOF FULL HEIGHT CONCRETE COLUMN – PROVIDE MINIMUM COVER TO FIRE PROOF REINFORCING STEEL. — 2.2.B
3. STRUCTURAL MEMBERS SUPPORTING FUNCTIONAL FLOOR SHALL NOT BE FIRE PROOFED; EXCEPT COLUMNS SHALL BE PROTECTED FULL HEIGHT. — 2.2.B
4. STRUCTUAL MEMBERS SUPPORTING MECHANICAL ROOMS OR MULTIPLE FLOORS SHALL BE FIRE PROOFED. — 2.2.B
5. 2 HOUR FIRE RESISTANCE RATING REQUIRED BETWEEN FLOORS: — 2.2.C
   HORIZ. FLOOR/"CEILING" INCLUDING INTERSTITIAL PLATFORM
   VERT. WALL BETWEEN SERVICE BAY AND FUNCTIONAL ZONE
   HORIZ. FLOOR BELOW MECHANICAL ROOM (SERVICE BAY).
6. INTERSTITIAL SPACE NEED NOT BE SUBDIVIDED INTO FIRE OR SMOKE COMPARTMENTS. CONSTRUCTION FOR HORIZ. EXITS OR SMOKE BARRIER WALL NEED NOT EXTEND ABOVE INTERSTITIAL PLATFORM. — 2.2.D
7. FIRE RESISTANCE RATING REQUIRED IN INTERSTITIAL AT 2 HOUR SHAFTS AND WHERE 1 HOUR CONSTRUCTION IS PROVIDED FOR MECHANICAL ROOMS. — 2.2.E
8. NEITHER FIRE NOR SMOKE DAMPERS REQUIRED AT PENETRATION OF 1 HOUR PARTITION AT MECH. RM. — 2.2.F
9. PROVIDE SMOKE DAMPERS AT AIR HANDLER AS REQUIRED BY NFPA 90A. — 2.2.F
10. FIRE DAMPERS NOT REQUIRED FOR OPENINGS IN INTERSTITIAL DECK LESS THAN 150,000sq. mm(225sq. in.) — 2.2.F
11. FLEX DUCT (UL 181 CLASS 1) ALLOWED UP TO 2.4M (8 FT.); NO LARGER THAN 300mm (12 IN) DIA — 2.2.F
12. PROVIDE FIRE DAMPERS (OR SHAFT CONSTRUCTION) AT DUCTS PENETRATING SERVICE BAY FLOORS PER NFPA 90A.
13. PROTECT HORIZONTAL AND VERTICAL PENETRATIONS (DUCTS, CABLES, CONDUIT, PIPES, ETC) WITH LISTED FIRE STOPPING SYSTEMS — 2.2.G
14. FIRE SPRINKLERS NOT REQUIRED IN INTERSTITIAL SPACE; EXCEPT — 6.1.B.1
    A. SPRINKLERS REQUIRED IN ELECTRICAL CLOSETS, SIGNAL ROOMS, ETC IN INTERSTITIAL.
    B. A SINGLE LINE OF SPRINKLERS IS REQUIRED ABOVE TRACKS OF ELECTRICAL TRACK VEHICLE SYSTEMS (ETVS).
15. FINISHED (SUSPENDED) CEILING.
16. EXTERIOR WALL.
17. TERMINAL BOX.
18. SUPPLY AIR FAN.
19. RETURN AIR FAN.

Revisions:	Date	CONSULTANTS:	ARCHITECT/ENGINEERS:	Drawing Title	Project Title	Project Number	Office of Facilities Management
				INTERSTITIAL SPACE FIRE RESISTANCE AND OPENING PROTECTION REQUIREMENTS	SUPPLEMENT TO VAHBS REPORT	–	Department of Veterans Affairs
				Approved: Project Director	Location: STANDARD DETAIL	Building Number: VAHBS	
					Date: JUNE 2006; Checked: NCK; Drawn: JLV	Drawing Number: 00000-12; Dwg. -- of --	

VA FORM 08-6231, OCT 1978



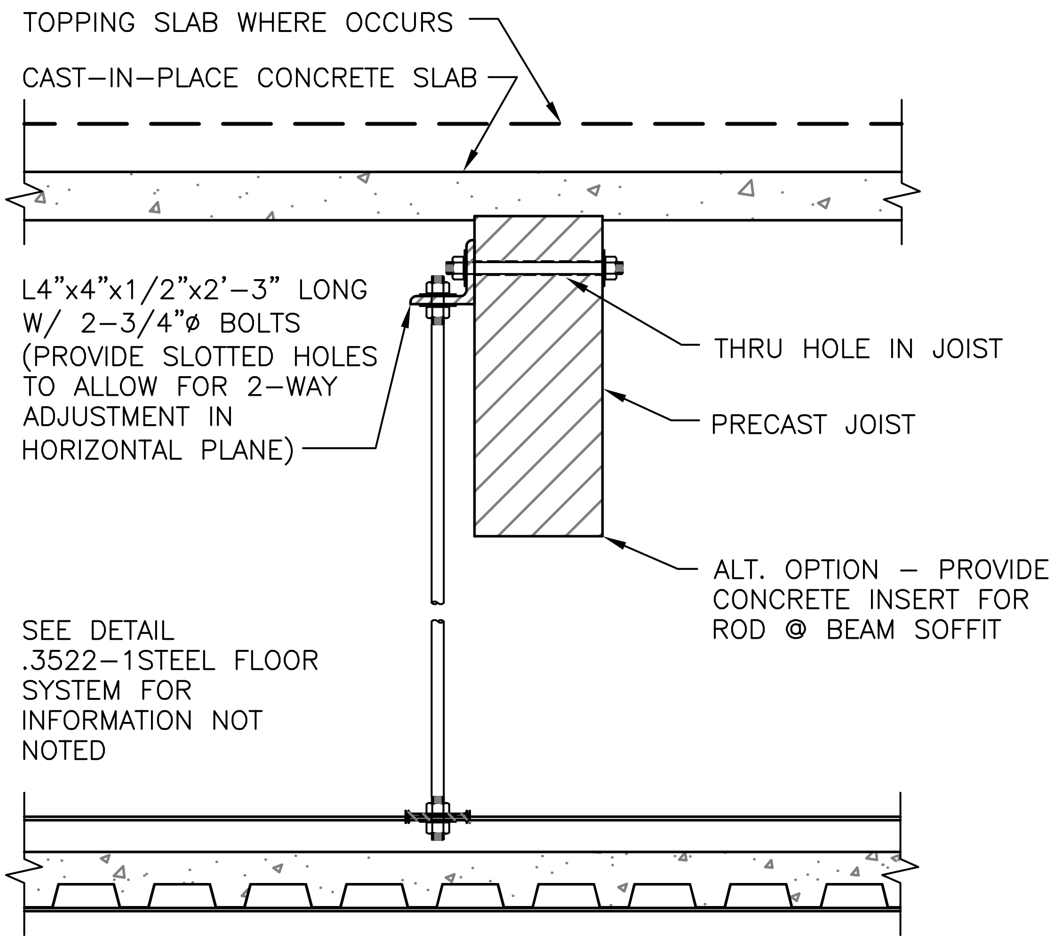
Department of Veterans Affairs

DETAIL TITLE / TYPICAL INTERSTITIAL SECTION FOR STEEL FOOR SYSTEM

SCALE :NONE

DATE ISSUED: JUNE 2006

CAD DETAIL NO.: 03522-1.DWG



Department of Veterans Affairs

DETAIL TITLE / TYPICAL INTERSTITIAL SECTION FOR CONCRETE FLOOR SYSTEM

SCALE :NONE

DATE ISSUED: JUNE 2006

CAD DETAIL NO.: 03522-2.DWG