CHAPTER III

ARCHITECTURAL

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Final Interdisciplinary Design Checklists

Architectural Design Review Checklist

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ARCHITECTURAL

1. **GENERAL**.

1.1 **Purpose**. The purpose of this chapter is to provide regional architectural design guidance to design agents for construction in the Southwestern Division (CESWD).

1.2 **Application**. These instructions apply to CESWD, District Offices, and design agents within CESWD.

1.2.1 **Metrication**. The metric units used are the International System of Units (SI) adopted by the U.S. Government as described in Chapter I, paragraphs 3. and 4.2.1.

1.2.1.1 Masonry. Concrete masonry units (CMU) and clay brick manufactured to metric standards are not readily available in the Southwestern Division. New facilities are typically dimensioned in metric units that are modular with hard metric masonry products. In accordance with P.L. 104-289 the Contractor may use soft metric CMU and brick, equivalent to Standard English inch-pound (I-P) units system CMU and brick during construction. Plans and specifications should make the Contractor responsible for changes in reinforcement detailed on P&S and all costs associated with use of CMU manufactured to I-P units.

1.3 **Architectural Design Policy**.

1.3.1 Reference:

ER 1110-345-100. Design Policy For Military Construction.
TI 800-01. Design Criteria.
Military Handbook MIL-HDBK 1190.
ETL 1110-3-491. Sustainable Design of Military Facilities.

1.3.2 Medical Facilities are considered special projects requiring review and approval by higher authority. Design criteria for medical facilities are:

Military Handbook MIL-HDBK 1190 and MIL-HDBK 1191

1.3.3 Family Housing is considered a special project category requiring review and approval by higher authority. Refer to:

ER 1110-3-104, Family Housing Design
TI 800-01, Design Criteria (Appendix F, Family Housing
Facilities).
TI 801-02, Family Housing
Project Engineering Instructions

1.4 **Special Instructions**. Appendix A to the A-E contract and design criteria emphasize significant items directly pertinent to the project or which require special attention for design quality and review coordination. Essential architectural instructions follow:

1.4.1 Design Criteria. Reference:

TI 800-01, Design Criteria.
MIL-HDBK 1190.

1.4.1.1 Functional Criteria. Using Services are normally responsible for initiating program documents and functional design criteria for a project.

1.4.1.2 Economic Criteria consists of the programmed amount (PA) and the Scope. It is incumbent on all project personnel to design the project within these tandem limitations.

1.4.1.3 Environmental Criteria. A comprehensive understanding of the program and environmental conditions for the project by the designer are critical to achieving high quality design. Therefore the designer will review the above references together with program documents to assure that sufficient environmental data are available at the conclusion of pre-design or site conferences to initiate design.

1.4.1.4 Comprehensive Design. Since variable levels of planning and design are provided with program documents including site adapted documents, it is important to evaluate each category of criteria to assure a balanced design response. The architectural design therefore includes requirements for comprehensive analysis of master plan/future expansion, visual features, accessibility, spatial composition, energy conservation, functional organization, life safety, building systems, materials, equipment and economic justification.

1.4.2 Space Allocations. Reference TI 800-01, Chapter 5, and MIL-HDBK 1190 provides basic space provisions for various types of facilities. Additionally space allocations are established by functional needs of individual projects. As an economic limitation, designers are required to keep the design within authorized scope. In relationship to national standards, Division projects average lower in unit costs but slightly above scope limitations due to increased space needs for air conditioning equipment and insulated masonry wall systems. It is therefore important to confirm net and gross spaces included or excluded from scope at the predesign conference and to assure adequate space for mechanical equipment. When minor variations in scope within flexibility limits authorized by the using agency could affect overall design and economic benefits (e.g., modular design), the designer will cite the adjustments and basis therefore in the earliest design analyses submittal for Using Service coordination and approval.

1.4.3 Energy Conservation is essential to obtaining design quality. Evaluation of orientation, infiltration, amount of glazing, solar shading and rejection will be performed in conceptual stages and include the following areas of investigation.

1.4.3.1 Reference:

TI 800-01, Design Criteria.
MIL HDBK 1190.

1.4.3.2 Passive Solar Design is a definite and continuing means of achieving energy savings over the life of individual facilities. Therefore, an explicit effort shall be made to evaluate the solar design conditions for building

sites and facilities, establishing effective orientation of facilities and fenestration for energy efficiency. Normal orientations south to southeast which achieve quick warm-up in winter and maximum ventilation through cooling periods have proven beneficial in the southwest region. Where practical, to minimize summer solar heat load, maximize winter heat gain and take advantage of natural convective cooling in the summer, the longer side of the building should face within 15 degrees of true south. Due to the need for maximum ventilation for cooling in most areas, earth berms have limited application, except in areas where evaporative cooling is utilized or where sheltering is desirable for high wind protection.

1.4.3.3 Active Solar Design shall be as directed in the project criteria and A-E contract.

1.4.3.4 Daylighting and Ventilation are essential for most construction accomplished within CESWD to meet minimum building code requirements for habitable spaces, fire access and energy conservation. Daylighting will be an integral element for architectural design and provided for domiciliary, office/administrative spaces and waiting or public area as appropriate. It is also recommended for restroom/locker spaces. Operable windows will be used unless the using agency specifically requests fixed-glass, non-operable lights. Windowless structures are not recommended where personnel loads are high or as a basis for energy conservation. Additional criteria for Window Systems are cited below.

1.4.3.5 Energy Impact. Pursuant to references except for locations having more than 4,000 heating-degree days, glazed area will be based upon no more than 15 percent of the total peripheral wall surface area floor-to-floor or floor to horizontally intersecting line of insulation above unless otherwise shown beneficial by the Design Analysis. Window and opening sizes will meet minimum provisions of the Life Safety Code and in case of conflict with energy conservation criteria, the Life Safety Code shall govern.

1.4.3.6 Skylights will be double glazed for all air-conditioned facilities for energy conservation.

1.4.3.7 Solar Screening or Shading to reduce cooling loads in the southwest will be employed in accordance with

references above. The basis for the solar screening or shading will be shown in the architectural and mechanical design analysis.

1.5 **Life Safety/Security**.

1.5.1 Reference:

National Fire Protection Code (NFPA).
International Building Code (IBC).
TI 800-01, Design Criteria.
MIL-HDBK-l008C, Fire Protection for Facilities.
EC 1110-1-94, Classification of Type of Construction.
MIL-HDBK 1190.
UFC 1-200-01, DoD Design: General Building Requirements.
UFC 4-010-01, DoD Minimum Antiterrorism Standards For Buildings.
UFC 4-010-02, DoD Security Engineering Manual.
UFC 4-010-10, DoD Minimum Antiterrorism Standoff Distances For Buildings.

1.5.2 Building Codes. Compliance with minimum life Safety (N.F.P.A. No. 101) and fire protection codes cited by above references is mandatory. If deviations from criteria or codes are required, they must be approved and fully documented and reported in conformance to ER lll0-345-l00. Compliance with local building codes is not mandatory on military installations; however, compliance is recommended as applicable to the project.

1.5.3 Fire Protection Design Construction Classification. The designer is technically responsible to properly classify project facilities for fire protection purposes and to develop the functional layout criteria into a plan that will meet minimum criteria cited above. Construction classifications and functional layouts issued as project criteria in program documents are essentially budgeting data and require analysis and confirmation. This is particularly important where buildings may have multiple occupancy classifications and hazardous spaces. The IBC and MIL-HDBK 1008/C will be utilized for area and space limitations relating to fire classification. For guidance on partitioning, refer to NFPA 220.

1.5.4 Fire Plan(s) will be developed at the earliest stages of design. Fire protection plans will be shown in concept or project definition documents. Plans will identify all horizontal and vertical fire separations by hourly rate and show all fire fighting access, sprinkled areas, exit conditions and distances. Portable fire extinguishers will be furnished and installed by the using service as Government Furnished Equipment. In facilities where appearance is important, extinguisher cabinets may be provided, and will be located in accordance with NFPA Standard 10. The designer will show location of all fire extinguishers on Final Plans for a compliance check by the Using Service Fire Marshal. Careful coordination of final plans will be made between disciplines to eliminate conflicts and assure adequate location and clearance for piping, sprinklers, fire dampers and alarms and that all drawings and specification items are consistent. Fire Plan(s) with complete supporting design analysis are required for final design submittal. See Chapter IX, Part 2, Chapter 7 of the AEIM for additional requirements.

1.5.5 Barrier Free Design. Reference:

TI 800-01, Design Criteria.
MIL-HDBK 1190, Chapter 1.
Uniform Federal Accessibility Standards (UFAS)
American with Disabilities Act
Accessibility Guidelines (ADAAG)

The Using Service normally determines the applicable design of special features for the physically handicapped based on references. Minimal access is usually recommended for consideration at initial stages of design as many of the provisions improve ordinary use of the site and facilities with negligible cost impact. Full compliance with UFAS and ADAAG is required for medical facilities unless a waiver is obtained from ASD(FM & P). References present uniform standards for the design, construction, and alteration of buildings so that physically handicapped persons will have ready access to and use them in accordance with TI 800-01. Military Program documents will establish the number of able-bodied personnel using a facility and the required accessibility to the physically handicapped. The project design analysis will confirm requirements of the using service and TI 800-01 and describe the extent of accessibility provided.

1.5.6 OSHA (Occupational Health and Safety Act) compliance is required in accordance with the TI 800-01 and General Safety Requirements Manual EM 385-1-1. OSHA standards pertinent to building design and construction are described in OSHA publication No. 2207, "Construction Standards," available from the Government Printing Office, or local OSHA Area Offices.
Lead Based Paint and Asbestos Surveys are routinely required for demolition and renovation projects and are typically the responsibility of the using agency.

1.5.7 Security measures for design will be determined by the Using Service and set forth in project criteria. Careful differentiation shall be made between fire and criminal, terrorist or subversive requirements. Refer to TM 5-853-1, TM 5-853-2, and TM 5-853-3.

1.6 **Acoustical Design**

1.6.1 Reference:

TM 5-805-4, Noise and Vibration Control.
AFM l9-l0, Planning in the Noise Environment.
UFC 1-200-01, Design: General Building requirements.

1.6.2 External Sound Control. Exterior noise sources will be determined and described in the concept of early preliminary site planning analysis. Sound pressure levels of sound sources affecting the design will be coordinated with the Using Service and set forth in the analysis with correlated sound transmission control measures, such as building setbacks, sound barriers, building configuration and orientation. On Air Force projects and Army projects located near airfields, the designer will use the published day-night average sound level (LDN value) at the site as the ambient outside noise level in decibels.

1.6.3 Internal Sound Control will be determined and described in the concept or early preliminary architectural design analysis. The design sound pressure levels for operational equipment and mechanical/electrical building equipment and sound reduction requirements for privacy and/or security will be coordinated with the Using Service and set forth in the analysis. The architectural analysis will establish the sound transmission classification for the

exterior wall, interior partitions, roof and ceiling systems as applicable and shall comply with the minimums given in UFC 1-200-01.

1.7 **Design Documents**

1.7.1 Drawings. Refer to the Drafting Chapter

1.7.1.1 Reference:

A/E/C CADD Standards
ER lll0-345-700, Design Analysis, Drawings and Specifications.
CESWD-AEIM Chapter VIII - Drawings

1.7.1.2 Architectural, Format, Legend Symbols and Abbreviations recommended are referenced in CESWD AEIM Drawings Chapter VIII.

1.7.1.3 Standard Details developed for repetitive design conditions are normally furnished for incorporation into the contract documents. These details are proven for regional design conditions but may require adjustment or omission of options to fit the project design. For Standard Details example sheets available, refer to CESWD AEIM Drawings Chapter.

1.7.1.4 Photographs. The use of photographs on drawings to depict existing site conditions and/or existing conditions in building rehab projects is encouraged. Specific procedures are described by contract instructions.

1.7.1.5 Generic CADD Details. Copies of computer aided design and drafting details are available from the CADD Details Library on a CD-ROM or downloaded from the internet web at http://tsc.wes.army.mil/Products/cadd_details/

CADD/GIS Technology Center
USACE Waterways Experiment Station
3909 Halls Ferry Rd.
Vicksburg, Mississippi 39180-6199

These standards are developed and proven for repetitive design but require adjustment or omission of options for regional and project design conditions.

1.7.2 Specifications.

1.7.2.1 Reference:

ER 1110-1-855, Specifications.
AEIM Chapter VII - Specifications.

1.7.2.2 Architectural Specifications will be based on CFGS Guide Specifications in accordance with above references as applicable. Most of these specifications carry material options for maximum competition. When these material options are unsuitable to meet project criteria, this manual or local design conditions, they will be omitted. However, maximum competition is to be maintained with reasonable specification options that will assure a quality project.

1.7.2.3 New Products or materials not covered by the Guide Specifications will be investigated and specified to assure reasonable competition and quality. New products and innovative construction should be proven on smaller or pilot projects before acceptance for high cost elements of construction.

1.7.2.4 Coordination between designers and specification writers will maintain consistent terminology and assurance that reproduced specifications are concise and directly applicable to the individual project in order to facilitate construction control and avoid contractor claims. "Notes" included in each Guide Specification will be given careful consideration during preparation of the design and drawings. Many criteria items of significance to the designer are included in these notes for specific design elements.

1.7.3 Design Analysis.

1.7.3.1 Reference:

ER lll0-345-700, Design Analysis, Drawings and Specifications.
AEIM Chapter IX-Design Analysis.

1.7.3.2 Architectural Design Analyses are required at each design stage in accordance with above references including initial sketch submittals as designer confirmation and explanation of the basis for drawing presentations and for

review and project record purposes. The initial design analysis may be brief subjective explanations based on experience and available environmental criteria. As the design is developed, design analysis should be progressively objective with supporting analytical and engineering bases to confirm original subjective determinations. It is increasingly important to avoid descriptive bases and incorporate sufficient environmental conditions and technical bases for site and facility design, including quantitative data for space allocations, energy conservation, acoustical design and life safety in order to provide an objective basis for evaluation and record.

1.7.3.3 Summary Format. A detailed format for the architectural design analysis is shown in Chapter IX.

1.8 **Design Submittals requirements** are cited in Chapter XI, A-E Contract Appendix "A", the Design Instructions and discussed in the Predesign Conference.

1.8.1 Interior Design.

1.8.1.1 Reference:

ETL 90-7 Air Force Interior Design Policy
DG lll0-345-122 Design Guide for Interiors.
ER 1110-345-122 Interior Design.
Chief of Engineers Initiative on Interior Design, 20 April 1988.

1.8.1.2 Scope of Interior Design. Interior design will be provided for both new and modernization projects in accordance with cited references and as funded by either military construction appropriations (MCA) or non-appropriated funds (MCF). Preparation of interior design will coincide with the project design process and include interior design analysis as outlined in the Design Analysis Chapter. Refer also to paragraphs 9 (finishes), 10 (specialties) and 12 (furnishings) of these architectural design instructions. During the project engineering/concept/project definition design phase, those responsible for interior design will meet with representatives of the Using Service to confirm interior design criteria. Interior design is divided into two types of service as outlined below:

1.8.1.3 Building Related/Structural Interior Design (SID) service includes basic space planning and accommodation of furnishings and equipment within the building. This service entails design and selection of items built-in or part of the building construction such as interior finishes and colors, shades or blinds, graphics, signage and decorative lighting. This service will be provided as an integral part of project design and will include:

Project Engineering/Concept/Project Definition/Primary Submittals.

- Interior Layout/Furniture Footprints at 1:100 to 1:50 scale using standard furniture sizes to assure adequacy of functional space and clearance for public and repetitive spaces.

- Finish and Color Schedules to identify general finishes, colors and textures.

- Interior Design Analysis providing design objectives and basis for functional layout and material selections.

- Sample/Color Boards with proposed structural finish materials will be coordinated or coded with Finish/Color/Graphics

Schedules showing manufacturers name and product number for special designations. Initial carpet selections and wall finishes will be submitted simultaneously. Size samples to show true color, pattern and texture. Submittals will comprise five (5) originals with sample chips mounted on card stock and bound in three (3) ring notebooks. Place title in lower right hand corner.

Final Design Submittals. Complete contract documents as outlined above including built-in details, graphics, signage, decorative lighting, and equipment colors. Submit two originals-one master set and one for field construction.

1.8.1.4 Furniture Related/Comprehensive Interior Design (CID) includes the space planning and design, selection, color coordination and arrangement of interiors and building material finishes, furniture and equipment provided or procured separately from the construction contract. This

service entails design and preparation of procurement documents for items detached from the building such as furniture, draperies, rugs, movable planters, and art work. The service, when requested by the using agency, will be provided as an extension of project design for development during the construction phase to include:

Preliminary Submittal.

- Title Sheet and Index.

- Updated Building Related/Structural Design with corrections/adjustment recommendations.

- Interior Design Analysis
  (See Format in Design Analysis Chapter)

- Interior Layout/Furniture Footprint to show proposed furnishings and equipment placement.

- Furniture/Furnishing Illustration Sheets.

- Cost Estimate.

- Submittal Matrix.

Final Submittals.

- Completed documents as above. Corrected finals will be submitted after confirmation of contractor finish materials.

- Furniture Order Forms/Bills of Materials with sufficient descriptive information for government procurement
of furniture and furnishings.

- Specifications.

- Maintenance Guide that includes housekeeping guidelines for product maintenance based on current industry methods and technology will be prepared and/or coordinated and obtained through specification requirements.

1.8.1.5 Brochures. The above submittals will be provided in A4 metric, 210 x 297 mm size, hard-cover brochures with

operable multi-ring binders. Brochures will be identified with project name and location. Fold-outs, A3 metric, 297 X 420 mm size, should be used as needed for legibility. The following reproductions will be provided as necessary or required to illustrate significant interior design features:

- Sketch Reproductions in black and white.

- Color Photos of color renderings 200mm x 250mm (8" x l0") size.

- Color reproductions of recommended interior graphics/ art-work such as murals, pictures and other wall-hung art.

- Reproduction of reduced sketches as determined by interior designers.

1.9 **Building Systems, Materials and Equipment**.

1.9.1 Reference:

TI 800-01, Design Criteria.
MIL-HDBK 1190.

1.9.2 Building Systems and Assemblies or major components which meet project criteria and regional design conditions will be evaluated on the basis of constructability, economy and maintenance. Floor, roof and wall assemblies will be designed with stock components subject to maximum competition as cited by HQUSACE Guide Specifications. Modular systems will be utilized where slight variables in scope or structural framing systems will satisfy function and benefit economy of construction.

1.9.3 Building Heights and Vertical Clearances:

1.9.3.1 Ground floor elevation will be carefully coordinated with civil design and will normally be established at 300mm above finished grade. For small structures, family housing and shop buildings with adjacent paving, ground floor elevation may be set at 200mm above finished grade. The finished grade will be sloped at 5 percent for the first 3 meter away from the building.

1.9.3.2 Ground floor to ceiling height on multi-story buildings will be set approximately 600mm higher on average than upper-floor to ceiling levels, and as required to establish proper building scale.

1.9.3.3 Floor to ceiling heights will in no case be less than 2290mm clear distance. Where a finished ceiling is required, it will be applied as near to structural framing members as practicable. Duct-work will be placed through open framing members or below the finished ceiling and furred in within finished spaces to minimize height. When consistent with fire codes, duct-work should be placed over corridors or at intersections of walls and ceilings where reduced ceiling height is practical. The designer will integrate the various building systems affecting building height for overall economy and explain any unusual height allowances in the design analysis.

1.9.4 Design Coordination involving major components interface such as exposed structural framing, control/expansion joints, plumbing and sprinkler systems, conveyor, exhaust and lighting systems is important for architectural control of the facility design and to minimize construction modification cost. Therefore, the A-E will make an interdisciplinary review utilizing overlays as necessary to check incremental design submittals.

1.9.5 Reflected Ceiling Plan. A reflected ceiling plan will be provided for all new ceilings to ensure coordination of mechanical, electrical, expansion joints, grid patterns, and sprinklers.

1.9.6 Materials and Equipment Selection will be made in accordance with project criteria and local design conditions for practical maintenance performed by the Using Service. Options listed in the CEGS Guide Specifications will be included when they are appropriate to regional or project design conditions. Special accent finishes may be utilized for public focal points and entries. Selections and options for color and finish of exposed-to-view metal items such as roofing, flashing, window and door and equipment finishes will be architecturally coordinated. The following paragraphs are aligned with Construction Specifications (CSI) format and provide detail guidance:

2. **SITE DESIGN**:

2.1 **References**:

TI 800-01, Design Criteria.
MIL-HDBK 1190.
Installation Design Guide (IDG)
TM 5-803-14, Site Planning and Design.
TM 5-853-1, Security Engineering, Project Development.
TM 5-853-2, Security Engineering, Concept Design.
TM 5-853-3, Security Engineering, Final Design.
ETL 111-3-491, Sustainable Design of Military Facilities.

2.2 **Project Site Design** based on actual site conditions and comprehensive functional, economic and environmental criteria is critical to achieving a high quality project. The above references will be thoroughly reviewed to assure that site, security design basis threat, and environmental criteria are sufficiently complete at the conclusion of the Predesign or Site Conference to initiate project design. Since variable levels of site planning are provided by master plans and program criteria, it is important to note that the A-E is responsible for the Project Site Design unless otherwise directed. Therefore the site design analysis will be architecturally comprehensive including:

- Master Plan Interface
- Site Utilization
- Site Organization and Circulation
- Facility Locations and Massing
- Facility Orientation
- Clearances and Life Safety
- Design Basis Threat(s) and Level(s) of Protection

Design and specifications will be carefully coordinated to assure the optimal visual setting and appearance of facilities. The overall design should enhance the natural character of the site and minimize environmental impact and distractions from utility services and other project elements. For additional guidance refer to the Civil Chapter.

2.3 **Landscape Design** will be an integral part of the Project Site Design from initial design stages avoiding latent cosmetic development. Landscape design for erosion

control is mandatory and basic to the construction contract. Outside space and features including finish surfaces, site furnishings, landscape accessories, signage and fencing will be integrally developed for each project. Landscape design will essentially be based on Energy Conservation analysis and maximize use of indigenous vegetation. Installation Design Guides (IDG) provide approved plant lists. The scope of complete landscaping is often affected by construction cost reductions, so contract documents will be developed to facilitate options for contract award and future completion. For additional guidance on turf and landscaping refer to chapter II, Civil.

2.4 **Security Engineering Design** requirements will be an integral part of the project site design from the initial design stages. For additional guidance on site security design see Chapter II, Civil and Chapter IX, Design Analysis.

3. **CONCRETE**:

3.1 **Foundation Details**.

3.1.1 Exposed Foundations are recommended for one-story buildings on substantially level sites. Foundations should be exposed a minimum of 200mm minimum and chamfered or otherwise detailed on publicly exposed buildings. A weather sill step will be provided in the foundation of buildings designed for non-arid areas consisting of a minimum standard brick course step below the finished floor elevation with weep holes at cavity walls in accordance with guide specifications. Where wall siding is used, extend siding 50mm over grade beam and maintain minimum 150mm above finished grade.

3.1.2 Concealed Foundations are recommended for buildings on sloping sites and for multi-story buildings and are normally required for Air Force structures pursuant to MIL-HDBK 1190. For buildings with concealed foundations, recommend masonry be stepped a minimum of one standard brick course below grade lines of foundation. Weep holes in cavity walls should be set two bricks courses above finish grade. The space in back of
the facing below the weep holes and finished floor line will be filled with mortar and sloped to drain.

3.1.3 Perimeter insulation will be provided in accordance with MIL-HDBK 1190 for Air Force projects and in accordance with UFC 1-200-01 and TI 800-01 guidance for other projects.

3.1.4 Crawl Space Criteria:

3.1.4.1 Provision of crawl space will be limited to dental clinics, institutional portions of medical facilities as required for servicing utilities, kitchen areas of dining facilities, and other spaces where utilities beneath first floor are numerous. Crawl space will be provided only where required to service utilities unless reduction of required fill offsets cost of crawl space. Crawl spaces may also be economical in areas of expansive soils. For requirements, refer SWD-AEIM to Structural Chapter.

3.1.4.2 Height will be adequate to facilitate form construction and removal by the contractor. A minimum clearance of 1.2 meter between ground and under floor surface and 460mm minimum between ground and lowest structural framing members should be maintained.

3.1.4.3 Access will be provided by a minimum of two internal entry points, one preferably from the mechanical room.

3.1.4.4 Ventilation will consist of a minimum of four vents placed high near corners of the foundation for cross ventilation. Vents will have sufficient opening to meet requirements of MIL-HDBK 1190 for Air Force projects and ASHRAE Handbook of Fundamentals, Chapter 23, for other projects. Vents may be placed on one side of the building in the crawl space if mechanically exhausted from the opposite side. Fixed vents will be specified. Specify non-ferrous vents with non-ferrous screens and hardware cloth.

3.1.4.5 Electrical provisions will consist of one or more porcelain base lights switched at point of entry and grounding type receptacles as required. Receptacles will have ground-fault protection.

3.1.4.6 Non-accessible Under-floor Space for supported floors, where crawl spaces are not required to service utilities, use precast concrete over 150mm voids or

poured-in-place concrete over 150mm cardboard carton forms. These spaces are not required to be ventilated or insulated.

3.2 **Architectural Concrete Wall Systems** are composed of a specialized air entrained concrete with low slump and high aggregate ratio requiring close attention to design and construction procedures as follows:

3.2.1 References:

Architectural Precast Concrete by Precast/Prestressed Concrete Institute, 2nd edition, 1989.
Guide Specification, CFGS-03330, Cast-In-Place Architectural Concrete.
Guide Specification CFGS-03413, Precast Architectural Concrete
American Concrete Institute Publications 315 and 318.

3.2.2 Construction Systems utilizing architectural concrete are basically cast-in-place, precast and tilt-up construction. These systems have variable quality and economic interrelationships as described below that require system analysis before selection for:

Project Type
Size of Panel
Location and Transport
Type of Insulation
Level of Finish Quality

3.2.3 Cast-in-place systems are advantageous for remote project locations and require a high degree of detailing and specified field control for forming and finishing.

3.2.4 Precast systems are advantageous for general building construction where factory controlled curing can be utilized to achieve close tolerance, minimum warpage and a uniform high quality finish.

3.2.5 Tilt-up systems are advantageous where site-casting and repetitive forming can affect economic benefits.

3.3 **Material selection** should be based upon proven design mixes and correlated with the skill of available concrete contractors. Aggregates will be specified within an

economical distance of the project and in sufficient stock for future construction.

3.4 **Finishes** will be selected which are economically reasonable and which can be practically achieved with uniform quality through the available field supervision. References above provide a number of acceptable finishes for selection that will be established as follows:

3.4.1 Textures will be correlated to the scale and visual distance to the construction. Basically, sack rubbed, light abrasive sand-blast or vertically brushed types of finishes are recommended, both for economy and to facilitate clean-up of laitance, efflorescence and form release agents. Exposed aggregate and heavier sand blasted finishes are more expensive, generally require gap-graded mixes and are suitable for more publicly exposed structures. Distressed textures such as bush-hammered surfaces, due to higher cost, are only recommended for special accent areas and to eliminate unsatisfactory surface variations. When both poured-in-place and precast or tilt-up construction are used in combination, specify separate finish textures for each type of construction.

3.4.2 Pattern selections should be based on the need to strengthen visual or feature effect. Patterns should be achieved with simple forming techniques such as for vertical ribbed or grooved surfaces. Finite patterns such as wood grain effects require excessive control and have limited value except for visually immediate surfaces.

3.4.3 Color will be obtained with graded natural aggregate or by the use of inorganic integral compounds. Light earth tones are generally preferred to natural gray concrete. A one-color variable mix in exposed aggregate is desirable for viability and/or to extend the supply of aggregates for future construction.

3.5 **Sizes and shapes of castings** will be carefully coordinated with available contractor capabilities in order to facilitate constructability and effect economy. Dimensions will be confirmed by at least two contractors/manufacturers to establish size limitations and handling capabilities in relation to conventional transport handling and erection procedures. Size and shapes should additionally be developed which permit conventional formwork

to serve with adequate rigidity and strength. Shape of cast forms will be carefully coordinated for each architectural concrete system. Where practicable, odd size units will come from a portion of a typical unit so that they can be cast from the same form. Components will be designed in order that formwork is readily removable without impact, shock or damage to the concrete. Castings will juncture at architectural lines, construction joints, vertical control joints, and other joint alignments. Complex shapes, offsets or projections in more than one plane and precast sizes greater than 3.5 meter wide and/or 10.5 meter long will generally be avoided where transportation on highways or railways is required.

3.6 **Insulation Systems**. Insulation may be internally or externally applied. Internally applied insulation is more costly and requires careful structural reinforcement coordination and economic analysis.

3.7 **Detailing** accuracy and precision are critical to attaining architectural quality. The design documents should include only those details necessary to establish the general design and to facilitate responsive engineering and construction by the contractor and to maintain quality control.

3.7.1 Joint articulation for cast-in-place concrete is recommended as a primary means of architectural control since it is difficult to eliminate form joint leakage and resultant discoloration of concrete surfaces. Evenly reinforced concrete will normally develop cracks 3 to 4.5 meter apart. Fast setting concrete and initial shrinkage in dry regions, make construction joint spacing more critical. V-joints, grooves or other rustication will be developed at all changes in construction procedure or placement. Architectural lines, construction joints, vertical control joints, and other joint alignments and placements will be correlated and provided with joint rustication. Butt joints will be avoided or placed at rustication wherever practicable. Where butt joints are necessary for existing construction, concrete placement and form taping will be carefully specified. Normally, lift placement lines may be controlled by use of a concrete mix retarder; however, changes in strength of concrete in one plane should be controlled by articulation. Rustication, grooves and ribs will be designed at minimum 12-l5 degree angles and 40mm or

greater widths to simplify forming and form removal. Corner joints will be chamfered and specifications shall require them to be sealed. Horizontal joints between precast or tilt-up panels will be placed at least 25mm below floor lines for moisture protection except for shops and industrial type structures.

3.7.2 Formwork planning, related detailing and specifications will be coordinated with available contractor capabilities to facilitate concrete placement and constructability (References provide guidance). Types of forms that permit high re-use are recommended for overall economy and to facilitate field control. Deflection of formwork under load of wet concrete (not to exceed 1/240 of clear span) will be considered in determining economy of construction. Additionally, it is a good practice to specify 6mm camber in exposed beams for each 3 meters of length in order to compensate for illusory or optical deflection. Form ties will be evenly placed. Reinforcement detailing and placement including concrete protection for steel reinforcement will conform to ACI 315 and 3l8. Size of bars and coverage clearances will be carefully coordinated to assure adequate thickness for placement, vibrator control, support systems and chairs. A 50mm minimum concrete cover for reinforcement is recommended. In some panels it may be necessary to galvanize the reinforcing steel when the concrete cover provided is low to ensure rust stains do not occur. In no case will metal coverage be less than 40mm and the minimum coverage will be increased to 80mm where exposed to salt-air or corrosive conditions.

3.7.3 Specifications for architectural concrete will be prepared to explicitly establish responsibilities for concrete engineering and quality control as follows:

3.7.3.1 Finish specifications will include requirement for both exposed-to-view and unexposed surfaces. The specifications will normally require that architectural precast system components be factory cast and cured under controlled conditions. A petrographic analysis requirement citing limitations for deleterious materials and fracturing will be included for projects with significant amounts of exposed aggregate architectural concrete work.

3.7.3.2 Placement procedures for cast-in-place concrete will be addressed and shop drawings required for form-work

and reinforcing steel. The control measures for placing cast-in-place concrete will be established and checked in the project specifications. Architectural concrete will normally be placed in level lifts not more than 400mm in depth. The control measures for placement will avoid segregation and sloping lift lines. In coastal areas and Fort Hood eastward, precast and tilt-up anchorage and connections will be specified to be stainless steel, galvanized or cadmium plated.

3.7.3.3 Samples of architectural concrete work will be required similar to requirements of Reference Guide Specification. Portable size samples of precast work showing finishes and special joint conditions will be specified for comparison with A-E design samples on file in the resident and/or District office. Cast-in-place and tilt-up samples will be cast in suitable locations for visual inspection and may be utilized for project signage and screening as appropriate. A detailed report itemizing the procedure and quality control for each sample will be required to be submitted to the Contracting Officer for approval by the construction contract specifications.

4. **MASONRY**.

4.1 **Reference**:

UFC 1-200-01, Design: General Building Requirements.
TM TI 809-4, Seismic Design for Buildings.
UFSG-07600, Sheet Metal Work, General.
AEIM Chapter VI -Structural.

4.2 **Foundation Details** for masonry per paragraph 3.1 above.

4.3 **Masonry Units** will be standard size, mixed light colored units or shall match existing construction. Exterior brick will normally be grade SW, color mixed, smooth or veloured textured units. Sizes, colors, and textures proposed for a project will be explained in the concept or preliminary design analysis or otherwise presented for specific approval action. Bullnose units will be used at vertical corners as necessary to minimize chipping.

4.4 **Coursing of masonry** will be arranged to eliminate cutting of masonry at heads and jambs of openings. Base units of 150mm (6 inches) nominal height are recommended for proper coursing with weather sill step foundations and standard size door openings. CMU units used as backup for resilient base material will be noted on the drawings as "trowel smooth with grout."

4.5 **Openings in masonry wall systems** will be detailed with weatherproof heads and sills. Sills will be sloped or stepped to the exterior to promote drainage and prevent seepage through the wall. Flashings will be detailed to conform to Guide Specifications.

4.6 **Corner Guards** of stainless steel will be specified for protection of masonry at service entries and other locations subject to impact.

4.7 **Masonry parapet construction** will be limited insofar as practicable to large buildings, roofs of over 18 meter span and as required for fire separation, safety or to void distraction of roof-mounted equipment. Parapets will be of minimum height and designed with metal covers or precast concrete coping protection.

4.8 **Masonry Screen Walls** utilized to void distracting elements from view will be perforated for maximum ventilation, with drainage details at the base and sections coordinated with structural design.

4.9 **Masonry Copings/Caps**. Masonry walls and parapets will be designed with appropriate metal or precast copings. Masonry coping/caps will not be used due to inherent moisture penetration and expansion problems.

4.10 **Exterior Wall Systems** with painted or stucco finishes, precast, cast-in-place or tilt-up concrete walls, and non-load bearing steel stud walls with brick veneer are structurally acceptable. See AEIM Chapter IV-Structural for additional guidance. Special regional criteria applicable to masonry and veneer construction as follows:

4.10.1 Single Wythe Walls will be limited to those structures without finished interior wall surfaces such as shops and utility buildings or spaces. Single wythe CMU

walls must be painted with a cement emulsion filler (TT-P-0035) applied with a stiff bristle brush and one or more coats of textured exterior coating for CMU (TT-C-555B, Type II). Silicone, siloxane and other clear coatings are not an acceptable solution to moisture proofing these walls as they deteriorate rapidly from non-uniform application and solar conditions. SWD AEIM Structural Chapter and TI 809-4 referenced above present seismic requirements.

4.10.2 Double Wythe Walls or separate veneer walls are standard for finished buildings and administrative space. Serious moisture penetration problems have been experienced in buildings having composite brick-CMU and single wythe split-face CMU exterior walls. When buildings are subjected to driving rains, moisture penetrates composite and split-face CMU walls and parapets with resultant damage to ceilings and interior wall finishes. Based on regional experience, brick-CMU composite wall construction and unpainted single wythe split-face/rib CMU wall systems will not be used in SWD. When brick facing or exposed split-face/rib CMU walls are required, a properly designed cavity wall will be used. The cavity will be have a minimum width of 50mm with a maximum of 75mm. Prior approval is required for cavities over 75mm wide. A 20mm air space is necessary for full insulation value of the cavity and a 50mm minimum cavity is necessary to facilitate construction of a clear cavity.

4.10.2.1 Cavity Wall Insulation. Insulation will be placed on the inner wythe to achieve "U" value cited in TI 800-01. Insulation in cavities will be impervious (extruded) rigid board type. Insulation may be placed in CMU cells but loose fill insulation board in cavities will have to be applied in 406mm (16") horizontal strips between the horizontal joint reinforcement or cavity wall ties.

4.10.2.2 Cavity Wall Dampproofing. Dampproofing will be provided on the exterior face of the inner wythe for all cavity walls designed for Arkansas, Louisiana, and the eastern half of Texas including the San Antonio, Fort Hood and Dallas-Fort Worth areas. Additionally, dampproofing will be provided on the exterior face of the inner wythe of all cavities containing rigid insulation board.

4.10.2.3 Masonry Reinforcing will be specified to be corrosion-resistant and kept clean of dampproofing.

Insulated cavities require reinforcement types which permit movement caused by differential temperatures of each wythe. Reinforcing will be coordinated with Structural Chapter.

4.10.2.4 Cavity Wall Construction. For cavity walls requiring dampproofing, the inner wythe will be constructed and dampproofed preceding construction of the outer wythe. Cavities will be kept clean of mortar droppings and other foreign materials during construction of the outer wythe to prevent cavity bridging and weep hole blockage.

4.10.2.5 Specifications. The following Guide Specs will be edited in accordance with the requirements above:

CFGS-04200, Masonry
CFGS-04220, Nonbearing Masonry Veneer/Steel Stud Walls

4.11 **Control Joints and Expansion Joints** will be in accordance with UFC 1-200-01. Joint locations will be established by the designer and reinforcement placement and cut-offs will be closely coordinated with structural engineering.

5. **METALS**. Material Selections and finishes for metal products require special design and specifications attention for corrosive and coastal areas east of Fort Hood, Texas. The use of aluminum, heavier anodizes or protective coatings and stainless steel materials are preferable in these locations. The use of dissimilar metals in contact will be avoided. Where multiple metal components are exposed-to-view such as flashings, door and window systems, they will be a correlated finish, texture and color. Steel joists and accessories utilized for under-floor moist spaces will be specified to be cleaned and shop painted in accordance with guide specification "Notes" in all areas east of San Antonio, Texas and Fort Sill, Oklahoma. Refer to material paragraphs of this chapter for additional guidance.

6. **WOODS**.

6.1 **Use of wood products** is generally limited by type of construction require to comply with International Building Code and Mil-HDBK 1008C requirements and project criteria.

Additionally selection of wood products is limited by flame spread and smoke contribution factors imposed by TI 800-01. In certain building types heavy timber or laminated construction is permitted however, these materials will not be exposed to weather in arid areas. TI 800-01 permits laminated wood bents as acceptable components of Type II-N Construction. Wood materials exposed to moisture such as roof fascia and nailers will be noted and specified to be of weather-resistant species.

6.2 **Finish Selection for interior** wood products such as casework, cabinets and furnishings will be coordinated in the specifications and samples of desired finishes will be furnished with Color Board submittals. Generally, finishes will be specified as "non-glare satin finish."

7. **THERMAL AND MOISTURE PROTECTION**.

7.1 **Roofing Systems**.

7.1.1 Reference:

TM 5-805-14, Roofing and Waterproffing.
Guide Specifications.
MIL-HDBK 1190.
AFR 9l-36.
Architectural Sheet Metal Manual.

7.1.2 Roof Slopes. Conform with criteria stated in CEGS Guide Specifications or FW-07502 (Air Force) as applicable. Basic policy is to design roof slope in the structural frame rather than the roof deck insofar as practicable. Structural deflection will be designed to assure that positive drainage is maintained to eliminate ponding. Flat valleys between drains are unacceptable. Requests for approval of slopes less than stated in the criteria will be forwarded separately to the District Technical Leader.

7.1.3 Roof Decking. Due to inherent drying problems, cast-in-place decking is not recommended for insulation purposes and generally will not be used in coastal areas and the area east of Fort Hood, Texas. When fills are used to obtain roof slope, regular or lightweight concrete will be used. Specify 21 MPa (3000 psi) concrete for fill over metal decks and 21 MPa (3000 psi) lightweight concrete for

fill over concrete decks. Roof fills will not exceed 200mm maximum depth and will be 20mm minimum depth over concrete deck and 40mm minimum depth over metal deck at roof drains. For further guidance on roof decking systems, refer to Guide Specifications.

7.1.4 Metal Roofing. The requirements of the structure, materials, manufacturers and criteria provide the minimum roof slope along with the allowable number of slopes for design of the projects. The A-E will select roof slopes that are within the range of those normally furnished by metal roof manufacturers. Refer to Guide Specifications.

7.1.4.1 Standard Metal Roof Panels (corrugated type, lap type, and snap seam standing rib type will have a minimum design slope of 1 vertical to 8 horizontal).

7.1.4.2 Standing Seam Metal Roof (SSMR). Standing rib-mechanically field crimped metal roof panels will be used for high wind and air turbulence conditions and will have a minimum design slope of 1 vertical to 48 horizontal, except in highly corrosive environments where the minimum slope will be 1 vertical to 24 horizontal. All fasteners for standing seam roofs will be concealed type. Aluminum roofing will be specified only in hail-free, User approved locations. Structural metal roof systems will be specified in accordance with guide specification CEGS-07416, Structural Standing Seam Metal (SSMR) Roof System and Non-Structural Metal Roofing in accordance with CEGS 07412.

7.1.5 Roof Insulation and Ventilation. Placement of insulation above the roof deck is recommended pursuant to the following conditions:

7.1.5.1 Ventilation. Roof insulation details, drawings and specifications will include requirements for ventilation of poured in place roof decks. Refer to District Standard Details.

7.1.5.2 Insulation Materials specifications for roofs with foot traffic or in areas of high humidity (coastal areas and areas east of Fort Hood, Texas) will include only those types of insulation with a minimum compressive strength of 140 kPa (20 psi) at 5 percent consolidation and/or having no capillary action.

7.1.5.3 Insulation Placement will be on top of deck or on top of suspended ceiling. However, both insulation types will not be used on the same roof assembly nor should part of insulation be on top of deck and part on top of ceiling to obtain the required U factor. Batt-type ceiling insulation will not be utilized for dust-free conditions or over medical spaces. Spaces between ceiling insulation and roof structure will be vented with weatherproof louvers or soffit vents as required by the Uniform Building Code.

7.1.5.4 Vapor Barriers are not normally required within this Division except for high interior humidity conditions and northerly installations. Metal decks are considered to serve as vapor barriers.

7.1.6 Roof Surfacing Aggregate surfaced asphalt built-up roofs in accordance with Guide Specifications are basic design; however, other types of roofing should be evaluated pursuant to project design conditions. Asphalt bitumen Types I, I and III that establish minimum-softening points will be designated in the project specifications in accordance with the project roof slope and manufacturers recommendations for the project location. The higher classifications are normally needed for Division installations. Coal tar pitch will be specified only for pitch pockets due to its low viscosity. Light colored opaque aggregates will be specified where available for heat reflectance and to avoid glare.

7.1.7 Strip Shingles are most practical for short span roofs and housing. A Class A glass fiber shingle of 15 kg/m^2 (100 lb/100 square foot) minimum weight with 25 year minimum warranty will be specified to meet wind and hail conditions prevalent in the Southwestern Division.

7.1.8 Roof Flashing. Set roof flashing abutting vertical surfaces into reglets. Reglets will be specified to be cast in concrete or masonry and to have lead plugs for holding flashing. Surface-applied and butt-type flashing is not approved for new construction. The normal 200mm minimum height for base flashing should be adequate, however, in locations subject to hurricane effects (Fort Polk, LA, San Antonio, TX, and southward) on roofs greater than 3,700 square meter, base flashing at roof periphery and expansion joints should be set up to 400mm high to prevent water surge actions across the roof. To emphasize the avoidance of

field cutting, internal and external corner flashing and intermediate and end cover plates will be noted as "shop-formed" on the drawings. The thickness of special shapes, sills and closures are not covered in the specifications and will be detailed and noted on the drawings for positive field control. The thickness of roof material items will be the same as base flashing except sill extrusions will be noted 4mm (1/8 or 0.125-inch) thick. The galvanized steel flashing option will not be specified east of San Antonio. For additional guidance refer to Guide Specifications and Architectural Sheet Metal Manual (SMACNA).

7.1.9 Roof Drainage. Generally a perimeter drainage system of gutters and downspouts will be provided. Storm runoff from roofed areas will not be permitted to fall from the roof perimeter directly onto erodible soils. Pitched roofs with exterior gutters and downspouts are recommended for roof spans to 18 meter. Interior gutters will not be utilized over finished spaces. For roof spans greater than 18 meter, assure positive drainage to interior roof drains so that no flat valleys or ponding conditions exist. Refer to District Standard Details. For Fort Polk and areas of high rainfall with silt soil conditions, design gutter, downspout and storm drainage systems so that drainage is dispensed with minimum erosion effect. For roofs less than 18-meter span, exterior gutter and downspout systems are mandatory and built-up roofing surface should not be used. For additional roof drainage guidance refer to Civil Chapter II.

7.1.10 Roof Mounted Equipment. Avoid use of roof mounted equipment where practicable and provide protective walkway for roof access as required. Roof penetrations will be minimized and roof mounted equipment will be grouped and screened as practicable to avoid visual distraction. Roof equipment will be mounted on continuous curbs to facilitate reroofing. Where solar collectors are required to be mounted on the roof, minimize roof penetrations, arrange and mount to allow for roof surface replacement.

7.1.11 Roof Parapets/Penetrations will be minimized insofar as practicable and sealed or otherwise waterproofed with built-up base and metal cap flashing. The use of pitch pockets will be confined to non-uniform shapes (angles, etc.) roof penetrations. Where penetrations are uniform

(pipes, tubes), utilize bell cap flashing, fasteners and premanufactured neoprene flashing as applicable. The AE should request from the District project Technical Leader a copy of their standard roofing details for venting and detailing of parapets/penetrations.

7.1.12 Roof Scuttles and interior access ladders (usually located in a mechanical equipment room) will be provided for flat (or low slope) roof structures over three stories high, over 6 meter high, or when mechanical equipment requiring maintenance is located on the roof. In the case of roof mounted mechanical equipment on a built-up roof, walkways will be provided between the roof scuttle and the equipment and also around the equipment as necessary for maintenance and to prevent damage to the roof from foot traffic.

7.2 **Caulking and Sealants** for all openings and penetrations will be specified in accordance with Guide Specification CFGS-07900 and detailed and noted in accordance with TM 5-805-6/AFM 88-4. It is important to differentiate sealant terminology particularly at joints of high expansion and metal contact.

7.3 **Waterproof Membranes** when required will be applied to the water source side of building assemblies in order to prevent water penetration and to protect insulation. Waterproof Membranes of 3-plys will be detailed and specified for toilet space and other wet areas over inhabited spaces. Non-ferrous pans will be provided for showers with ceramic floors over inhabited spaces. Toilets and other wet/noisy spaces in multi-story facilities will be stacked insofar as practicable for economy and utility. For additional data refer to Guide Specifications.

7.4 **Insulation**.

7.4.1 Specification Options will be carefully selected as specified to meet TI 800-01 and MIL-HDBK 1190, for flame spread and smoke development limitations. Due to numerous fire and toxic hazards with these products, specifications will be carefully prepared to assure proper protective cover and vapor barriers to obtain the correct products for construction. Thickness of insulation will only be shown for interface of existing projects. Renovation projects will state R-value to meet project design requirements.

Insulation thicknesses for new construction are variable for individual assembly options and will be governed by U-value requirements cited in TI 800-01. The amount of weather protection required by these criteria is related to type of construction (heated, unheated) and weather zones.

7.4.2 Under-floor Insulation will be provided to meet U-value criteria in TI 800-01. Insulation will be non-combustible board, mechanically fastened to the under-floor and of a thickness that will give an average overall floor U-value that meets the above criteria. Under-floor insulation may be omitted if an analysis at the concept or preliminary stage indicates that:

- the quantity of energy that can be reclaimed from exhaust air, by a system utilizing energy transfer devices such as heat wheels, does not justify the added cost provided the system;

- a sufficient quantity of non-contaminated continuous exhaust air is available and can be properly distributed in the crawl space to keep the heat transmission through the floor to no more than it would be if the floor were insulated to criteria and the crawl space cross-ventilated.

8. **DOORS AND WINDOWS**:

8.1 **Entries**.

8.1.1 Main Entries will be differentiated in elevation and will be oriented away from prevailing winter wind or otherwise recessed and/or provided with wind protection.

8.1.2 Vestibules/Foyers will be provided for Security Engineering Design and energy conservation in heated and air-conditioned buildings at main entries and other entries in continuous use. Use of storm doors will be avoided to facilitate exit from buildings and limit maintenance.

8.1.3 Soffits and Entry/Vestibule Ceilings subject to wind pressure uplift will be of solid material or detailed and specified with hold-down clips.

8.2 **Door Types**.

8.2.1 Interior Personnel Doors. Ordinarily, designers should specify hollow metal or paint grade wood doors for economy and ease of maintenance. Since military facilities are subject to heavy use/abuse, wood doors should be specified to be solid core wood block (stile and rail type or vertical glued block type with the stiles, rails, and panels bonded to each other). In instances where solid core wood composition or mineral cores are included in the specifications, the minimum dimensions for stiles and rails to receive the hardware will be specified. All doors will have steel frames except family housing doors, smoke draft partitions, aluminum doors, and folding doors.

8.2.2 Interior Fire-Rated Doors.

8.2.2.1 Corridor Doors requiring 20 to 30 minutes ratings will be solid core wood block (with stiles, rails, and panels bonded to each other) or hollow metal doors with steel frames. Doors with 20 minute ratings do not require fire door labels, but certificates of ratings will be required by the specifications. Doors with 30 minute ratings require fire ratings in accordance with NFPA.

8.2.2.2 Fire Rated Doors of 3/4-hour or more will be specified UL labeled hollow metal doors with steel frames; door hardware will have the same fire rating as its door and frame. The use of wood fire doors 3/4-hour or more is not permitted due to recurring hardware mounting problems. Refer to NFPA-80 for fire rated door criteria. All fire and smoke rated doors will be indicated in the project door schedule.

8.2.3 Exterior and Shop Doors.

8.2.3.1 Hollow metal doors and steel frames will be used for security when low threat severity and low level of protection is required. When medium or high security is required, provide doors designed for blast resistance; see TM 5-853-1, TM 5-853-2, and TM 5-853-3.

8.2.3.2 Louvers will not normally be specified for exterior doors.

8.2.3.3 Bumpers with Hooks are required at Air Force installations and in high wind areas.

8.2.4 Heavy Duty Doors. When low threat severity and low level of protection is required, identify exterior doors such as service entrances, platform doors, dormitory exits from stairwells, and other high usage exterior doors where steel doors are used, as extra heavy duty doors. Detail and specify:

"Frames shall not be less than 150mm (6") channel as specified in CFGS-05500, Miscellaneous Metal, paragraph "Steel Door Frames."

Doors: Edit CFGS-08110, Steel Doors and Frames, to specify these doors "Extra Heavy Duty, Grade III, 1.6mm (16 GA) Steel. Hinges shall be 1 1/2 pair 115mm (4 1/2") half mortise, high frequency, and heavy weight steel, ball bearing hinges with non-rising pin. Hinges shall be welded to steel frame and welds shall be ground smooth. Where the plan of the area will allow, the door shall swing 180 degrees to wall mounted door holder, top and bottom. Lock, closer, weather-stripping, etc., shall be selected to be compatible with the above."

8.2.5 Folding Doors. Avoid use of wood or vinyl folding doors due to inherent maintenance, sound transmission and cost factors. When folding doors are functionally necessitated, a minimum sound transmission rating STC-38 will be specified to assure quality of the installation.

8.2.6 Mechanical Room Doors. Exterior access is a normal requirement for furnace/heaters/boiler rooms. Minimum size of 915mm (3 feet) by 2.15-meter (7 feet) single, non-rated metal doors will be specified for small buildings. Where equipment access size exceeds 915mm (3 feet), provide double metal doors with sufficient clearance to assure equipment access and service. Hardware will be coordinated and master keyed to Facility Engineer's requirements.

8.2.7 Music Room Listening Booth Doors. Include a small view window and a latch bolt only (no lock) operable from both sides by knob for each booth door.

8.2.8 Sound-Rated Doors will generally be specified for wall installations with a sound transmission exceeding

STC-4O. Solid wood core doors will be utilized for acoustically sensitive spaces requiring a moderate degree of speech privacy up to and including a requirement of STC-40. Doors will be well-fitted with no undercuts or ventilation louvers allowed. Doors at acoustically critical spaces requiring a confidential degree of speech privacy above STC-35 will be fully gasketed at heads and jambs with a highly compliant gasket material and the bottom edge of doors will be equipped with either an automatic drop seal or sweep seal device. Doors are usually the limiting elements in sound isolation and, therefore will be designed for sound transmission class as closely equivalent to the wall and ceiling systems as practicable. The following guide specification is recommended:

Sound-Rated Doors shown on the drawings shall be not less than sound transmission class (STC) indicated when determined in accordance with ASTM Recommended Practice, E 9O. Units shall include doors, frames, gasket, and seal devices. Units shall be gasketed at heads and jambs with impervious gasket materials such as vinyl, polyvinyl chloride or neoprene and the bottom edge of doors shall be equipped with either an automatic drop seal or sweep seal device. All gaskets shall be kept in the same plane wherever possible. Doors shall be ____ millimeter (____inches) thick. The door manufacturer shall establish the thickness as required to meet the sound transmission requirements. Metal frames shall be as specified by the door manufacturer to meet the sound transmission requirements. The installed door shall be identical in construction to the door tested and in compliance with ASTM STD, 90-55. Certification of such compliance with foregoing requirements shall be furnished by the contractor."

8.2.9 Overhead Doors over 6 meter (20 feet) wide will be designed and specified for 1.5 kPa (30 psf) wind load. Specify the following:

(1) Electrically operated
(2) Bottom bar with electric sensor safety device
(3) 1.3mm (18 gage) slats
(4) Roller wind-locks spaced every other slat

8.2.10 Hangar Door criteria are stated in MIL-HDBK 1190. The design and specifications for these doors require close attention to framing, door and operational equipment phases

of the installation and coordination between subcontractors. Therefore, assure that fabrication components such as rails, ancillary steel, mechanical and electrical operators, etc., are specified to receive proper quality control and field approval.

8.3 **Door Details**. Doors will be detailed for stock-sizes insofar as practicable. Doors with frames set in masonry will be sized to course with the masonry to limit cutting of masonry. Joints between masonry and frame shall be one-half of the masonry coursing joint. Example - 10mm (3/8-inch) coursing will require 5mm (3/16-inch) caulking joint.

8.4 **Weather stripping** will be specified for all doors in accordance with Guide Specifications.

8.5 **Door Numbers**. Each door shown on the drawings will have a separate door number.

8.6 **Door Schedule**. An architectural door schedule similar to that described in the Drafting Chapter will be utilized to coordinate doors, door frames, head, jamb and sill details, hardware, etc.

8.7 **Window Systems**

8.7.1 Window Selection. Anodized aluminum windows will be specified without option for San Antonio and eastward areas of high humidity and coastal locations subject to corrosive conditions for low security threat severity and low level of protection design conditions. Sliding windows will be utilized only in non-arid, dust storm free areas. Recommend selection of light colored aluminum surfaces to avoid expansion/contraction, high surface temperatures and weathering of seals. In designing housing and domiciliary buildings, specify clear glass, double hung, aluminum windows to satisfy function, ventilation and low maintenance requirements. Single hung windows are acceptable in air-conditioned buildings. When other than low security threat severity and level of protection is required see TM 5-809-1, TM 5-809-2, and TM 5-809-3.

8.7.2 Window Details. Use stock size windows insofar as practicable. To achieve maximum functional value, glazing should allow for viewing while seated and/or standing and,

therefore, is recommended to be maintained at 70mm or more above finished floor for safety, energy conservation and reduced maintenance. Window and opening sizes shall conform to security requirements in TM 5-809-1, TM 5-809-2, and TM 5-809-3. Window and opening sizes will meet minimum NFPA 101 Life Safety Code exit requirements, except when security design measures require otherwise. Glazing and/or doors will be provided in walls at adequate intervals for fire fighting access. Refer to NFPA-80 for criteria.

8.7.3 Window Screens are normally required for operable windows and will be confirmed with the user and local conditions. Screen hardware will be detailed and specified for heavy use and to facilitate removal and replacement. Shade screening may be specified when justified by a reduction in energy consumption. Shade screening alone will not meet the requirements of AR 420-70 for insect screening. The maximum dimension specified in the AR is intended to apply to both dimensions of the screen grid.

8.7.4 Glazing Systems will be selected for security and energy conservation. Reflective fragment retention film laminated glass is required by security engineering criteria. Acrylic and polycarbonate options will be specified for maintenance facilities and for Reserve Centers or buildings where vandalism is a problem. Plastic glazing will not be utilized in place of bars or where security is a design factor.

8.7.5 Storm Window utilization will be minimal. Storm sash and double glazing will be considered only for those individual exposures where life cycle costs indicate economic feasibility.

8.8 **Hardware**. Reference:

UFGS - O8700, Builders Hardware.
TM 5-805-8, Builders Hardware.
MIL-HDBK 1190.

8.8.1 Hardware and Keying Systems will be coordinated with Using Services to designate and specify hardware for both security and minimal maintenance. Personnel receiving special requirements from the User for hardware, keying and master keying will establish that the criteria conform to above references. When lockset and interchangeable cylinder

systems are specified, the interchangeable cylinder will be specified to "fit the lockset without adapters." Project hardware requirements for Air Force installations and specific instructions will be furnished in design instructions and project programs. Stainless steel hardware may be specified in highly corrosive coastal areas and east of Fort Hood, Texas. A consolidated list of Army and Air Force installations with their respective keying systems is shown in CFGS - 08700.

8.8.2 Hardware Schedule: An architectural door schedule accompanying the door details included in the architectural drawings will be used to coordinate doors with hardware sets specified in the BUILDERS HARDWARE specifications section.

9. **FINISHES**.

9.1 **Lath and Plaster**:

9.1.1 Stucco. Portland cement surfaces will have control joints detailed and spaced not greater than 3 meter with a maximum area of 9 square meter. Corner soffit joints will be detailed so as to occur parallel to walls.

9.1.2 High Strength Gypsum Plaster is recommended for interior damp areas in preference to Portland cement or Keene's cement plasters. Keene's cement may be utilized for kitchen spaces subject to cleaning when properly detailed to avoid cracking.

9.2 **Gypsum Wall Board**:

9.2.1 Control Joints are necessary to accommodate stresses developing within construction material membranes such as partitions and ceilings. Control Joints are intended to accommodate tensile and compressive movements in the membranes due to hygrometric, thermal and structural causes. These control joints will not accommodate shear movement normally encountered in racking. Such movement requires proper detailing of the perimeter interfacings. In ceilings and partitions, separate construction framing will be used on each side of the control joint. Control joints will be positioned to intersect light fixtures, heating vents, air diffusers, and other areas of stress concentration as practicable.

9.2.1.1 Recommendations for control joints and perimeter relief: Gypsum construction surfaces should be isolated with control joints where:

- partitions or ceilings of dissimilar construction meet and remain in the same plane;

- ceilings are perforated by a vertical penetration by positioning control joints to intersect the openings;

- wings of "L", "U" and "T"-shaped ceiling areas are joined;

- expansion or control joints occur in the base wall construction and/or building structure;
- surfaces exceed dimensions shown in the following table.

Recommended control joint spacing:

- Partitions and Ceiling space --- 9 meter maximum (5 meter vertical)
- Partitions and Ceilings in High Humidity/Expansive Soil
  --- 5 meter maximum in either direction.

- Door frames may be used as control joints, if control joints extend to ceiling from both corners.

9.2.1.2 Perimeter relief will be detailed for gypsum construction surfaces where:

- Partition or furring abuts a structural element (except floor) or dissimilar wall or ceiling;

- Ceiling abuts a structural element, dissimilar partition or other vertical penetration;

- Ceiling dimensions exceed 9 meter in either direction.

9.2.2 Specification UFGS-09250, Gypsum Wallboard, will include the following as applicable in accordance with paragraph above:

"Control Joints shall be installed in partitions and furred walls at a maximum spacing of 5 meter to 9 meter in the horizontal, 5 meter in the vertical direction, and at all control joints in exterior walls. Joints shall be located at door or window openings where convenient to obtain the required spacing. Control joints shall be installed at all locations where the backing or support for gypsum board changes material or type of construction. Provide a 0.7mm (24-gage) angle closure trim at edge of gypsum board surfaces abutting masonry walls. Large ceiling areas shall have control joints spaced at maximum 9-meter o.c. in either direction. Control joint material shall meet the requirements of the fire rated wall on which it is installed. Fire-rated control joints shall be installed in accordance with standard details and manufacturer's recommendations."

9.2.3 Water-Resistant Gypsum Wall Board may be utilized as a base for adhesive application of ceramic tile. This material will not be used for exterior locations such as soffits. For interior spaces, it will not be used for showers and ceilings or interior areas subject to sustained high humidity and moisture.

9.3 **Paints and Protective Coatings** are covered by Guide Specification - UFGS-09910 and TM 5-618/AFM 85-3. Semi-gloss paint selections are recommended to minimize maintenance in corridors, hallways and spaces subject to soiling.

9.4 **Carpet authorizations** and selection approvals will be obtained as early as practicable to facilitate preparation of interior design. MIL-HDBK 1190, project criteria or other interior design criteria define carpet requirements for the facility. The AE should verify that sufficient requirements on the use of carpet have been provided or ask for clarification from the District Technical Leader. In certain arid areas or under high maintenance conditions, there are minimal requirements for carpeting. Therefore, project instructions will be coordinated with the installation's policies and confirmed by the User. Where significant repetitive quantities of carpeting are required, General Services Administration procurements will be coordinated and established for cost control. CFGS 09680, Carpet, will be used in specifying carpet.

10. **SPECIALTIES**:

10.1 **Signage**, both exterior and interior, will be coordinated with the user and developed as an integral part of the design for architectural control. Exterior signs will be scaled respective to the primary viewpoint and developed for minimal maintenance and vandalism. Interior signage will be coordinated with installation requirements to establish a minimum maintenance, interchangeable system. Color-coding is an important consideration for complex and medical facilities. Directory Boards for significant buildings will be coordinated with the Using Service. For Air Force projects refer to AFP 88-40 signage design criteria.

10.2 **Wardrobe/Locker criteria** are furnished by engineering and design instructions and project criteria. Federal procurements are normally required for these products. However, construction procurement may be authorized for small quantities of special equipment. Floors and finishes behind wardrobes/lockers will be of uniform finish in order that flexible use of space may be made. Material options and locker sizes (single or double tier) require coordination and confirmation with the Using Service.

10.3 **Raised Floor Systems** design and specifications will be carefully coordinated with respect to equipment loads, vertical heights and cut out penetrations. Options listed in guide specifications will be coordinated with User and interface requirements of existing installations. Underfloor surface will be specified with hardener or sealed or painted with epoxy (Air Force) to minimize dusting and facilitate cleaning.

11. **EQUIPMENT**:

11.1 **Food Service layouts and equipment** selections require coordination with the Troop Support Agency (TSA-Fort Lee, VA) except for small kitchen facilities and non-appropriated funded projects. Layout and equipment data for Air Force projects will be furnished with design instructions and project criteria. Layouts will assure a sound circulation pattern and flexibility for equipment tolerances and change. Items of equipment to be contractor or government furnished and installed will be determined and clarified in the project documents as early as practicable.

Additionally, it is important to coordinate electrical receptacle placements for equipment to avoid wet surfaces and maintain flexibility for equipment changes. Roof mounted equipment and/or roof penetrations will be avoided as practicable.

11.2 **Waste Handling Equipment/Transformer** will be located or screened to avoid air pollution, noise and visual distractions. Masonry screens will be of such height to screen the equipment from normal view and will be perforated for maximum air circulation and drainage.

12. **FURNISHINGS**:

12.1 **Furnishings Selection** will be analyzed from functional use, environmental conditions and economic first cost and maintenance. Division environmental conditions vary from humid to arid with high solar loads; therefore, selections will reflect design response to these conditions and practical tradition. Built-in furnishings and equipment will be detailed and specified to minimize sharp edges, corners and other safety hazards or cleaning problems. Reception counters and like furnishings will have rounded or beveled edges to benefit safety and cleaning. Selections shall comply with TI 800-01 flame spread and smoke development limitations.

12.2 **Sample Boards**. A minimum of two sample boards showing color and texture of both exterior and interior structural (building related) furnishings/finishes are required for use of the contracting officer and contractor. These are critical documents for architectural field control and will be made clear as to whether samples represent the actual material or are for color and texture only. Specifications will incorporate requirements for the contractor to submit coordinated sample boards of appearance related construction items. The sample boards submitted will show color, texture and finish of proposed material items consistent with the format of the A-E prepared sample boards on file with the COR.

12.3 **Colors**.

12.3.1 Reference:

FED Std. 595a.
TM 5-618/AFM 85-3, Paints and Protective Coatings.
MIL-HDBK 1190.

12.3.2 General. Federal Standard 595a will be used as a basic guide to select and specify exterior and interior colors. Accent and special colors may be selected and specified to match manufacturer's standard names and numbers.

13. **SPECIAL CONSTRUCTION**:

13.1 **Project Criteria** may reference special type construction such as industrial, pre-engineered and/or commercial standard design and construction. These type projects require coordination with installation standards, master plans and future construction. Additionally, they require economic analysis of site, foundation and procurement timing to assure overall beneficial economy.

13.2 **Commercial Standards** are recommended only if guide specifications are unavailable. Commercial standards require special development for implementation of quality control and construction approval of contractor submittals.

13.3 **Underground (Windowless) Structures** are sometimes cited for security purposes and may be appropriate for radiation and/or weather protection. These type structures are not recommended for facilities with high personnel occupancies or daylighting needs and are usually higher in unit cost due to structural, fire sprinkler and exit requirements. Openings 760mm wide and 15 meters on center are normally required for fire fighting access. When radiation protection is required, the number of personnel to be protected and the protection factor (PF) will be confirmed prior to determination of building type.

14. **CONVEYING SYSTEMS**:

14.1 **Elevator requirements** may be cited in program documents; however provision of elevator equipment is normally minimized due to structural and maintenance cost. When elevators are proposed, an economic analysis will be included with the design analysis as they effect the overall structure. Elevator access, timing sequence, finishes and

architectural lighting will be carefully coordinated between the design analysis and specifications.

14.2 **Hoist/Bridge crane equipment** is often required for government construction. It is important due to overall structural costs that the designer confirms the capacity of this equipment (kg or metric ton) for current criteria and future loads. Additionally, the critical horizontal and vertical working clearances will be confirmed and this data stated in the design analyses.

15. **MECHANICAL**:

15.1 **Plans and elevations** will be coordinated to indicate any exposed to view mechanical equipment for the initial concept or early preliminary submittal. Mechanical spaces will be sized to accommodate the most critical of three mechanical equipment options with adequate working clearances therefore.

15.2 **Fire Protection for Hazardous Spaces**:

15.2.1 Reference:

National Fire Protection Association
Life Safety Code l01.
TI 800-01.
MIL-HDBK 1190.
MIL-HDBK 1008C

15.2.2 Criteria References cite requirements for 1-hour or higher rated construction for corridors, stairwells, pipe and elevator shafts, hazardous spaces such as heater/boiler rooms, and storage areas containing combustible material. Application of these requirements has varied regarding height of surrounding rated partitions, ceiling construction, location of dampers, and rating of openings through the protected construction. The following criteria clarify features of such 1-hour protection:

15.2.2.1 Rated partitions will extend to the underside of the floor or roof deck to prevent flue-action fire hazards from openings unless rated ceilings (protected top and bottom) are detailed and specified. Openings from structural and mechanical penetrations will be detailed and

specified to be closed or sealed with 15mm incombustible expansion joint material.

15.2.2.2 Rated ceiling assemblies (protected top and bottom) that will accommodate fire dampers may be utilized where closing mechanical penetrations of extended partitions is uneconomical and will be installed below all unprotected construction.

15.2.2.3 Fire damper assemblies provided at duct and other mechanical penetrations of the rated partitions or ceiling assemblies will be coordinated with mechanical design.

16. **ELECTRICAL**:

16.1 **Plans** will be coordinated to indicate any exposed to view electrical equipment for initial concept or early preliminary submittal. Electrical spaces will be maintained separate insofar as practicable with adequate working spaces. Internally located transformers will have sound rated walls for the specific equipment STC ratings and provided with adequate natural ventilation.

16.2 **Interior Architectural Lighting** should be specially selected and coordinated for main entries, lobbies, and display areas of publicly-used buildings. Feature, focal point and/or wash lighting may be used at major cross-corridor intersections, elevator lobbies, directory locations and other main circulation points as functionally necessary. The lighting layout and special fixtures and intensities shall be coordinated architecturally by reflected ceiling plans.

16.3 **Illuminated Exit Signs**. NFPA 101 requires exit signs to be readily visible. Faces of exit signs will be vertically mounted. They will not be "slanted" to increase vertical clearances. Faces of exit signs will be perpendicular or parallel to corridor walls. In those instances where it is necessary for exit sign faces to be other than perpendicular or parallel to the wall, the angle between the wall and the sign face should be between 90 and 135 degrees. Except where ceiling heights, functional necessity or specific criteria dictate otherwise, exit signs will be mounted at least 2.1 meters clear of the finished floor. Higher mountings will be provided where possible.

Where the signs would infringe on the 2.1-meter vertical clearance, the following means of providing adequate clear space will be used, in descending order of preference:

(1) Flush Mounted signs.

(2) Surface mounted signs installed at ceiling-wall intersections and mounted to either the wall or ceiling, whichever provides the best support. Integral battery supply type fixtures will not be used for the application.

16.4 **Exterior Architectural Lighting** will be provided where functionally required for public entries, safe walkway access and for security. Fixture selection and location will provide for low maintenance, low consumption of energy (energy efficient) and minimal vandalism.

16.5 **Architectural Lighting Specifications** not included in guide specifications will be written for open competition by two or more manufacturers, or by listing three acceptable manufactured fixtures. Fixture placement will be specially detailed where specified fixtures interfere with required clearances.

APPENDIX A

FINAL DESIGN INTERDISCIPLINARY COORDINATION CHECKLIST

CIVIL

1. Access and entry conditions barrier-free to handicapped. Drainage and stairs arranged to prevent icing hazards.
_____

2. Demolition: Identify walls, ceilings, doors, windows, finishes, and equipment as to type, material and extent of removal for estimating purposes including horizontal and vertical dimensions as applicable. Provide details for new and existing interface, patching and indicate items to be relocated from where to where.
_____

ARCHITECTURAL

1. Legend and Symbol Sheet accurate for specific project.
_____

2. Exterior equipment, landscaping and screening of utilities and distractions detailed and coordinated with specifications.
_____

3. Section and detail cuts are complete for construction and identified with correct number and sheet where shown.
_____

4. Types of materials and dimensions to coincide with plans and schedules.
_____

5. Room Finish and Door Schedules coincide with design criteria, Floor and Fire plans. Acoustical and fire-rated assemblies coordinated.
_____

6. Interior signs, directories, case/cabinet work and special furnishings coordinated between plans and specifications.
_____

7. Terminology and material options on drawings consistent with specifications. Hardware and Paint Schedules in Specifications consistent with drawings.

_____

STRUCTURAL

1. Security protective measures, vault and radiation classifications and details coordinated.

_____

2. Control, construction and expansion joints coordinated in floor and ceiling plans, elevations, sections, and details.

_____

3. Size and spacing of reinforcing steel and wall ties in masonry walls and at top of wall coordinated. Masonry units properly specified as to size, strength, texture, and color.

_____

4. Provision of proper suspended ceiling systems and intermediate steel supports. Hold down clips for lay-in ceilings at entries and plenum spaces. _____

MECHANICAL

1. Equipment and door clearances adequate for maintenance and service.

_____

2. Stacks, exhausts, battery room vents and air pollution located away from intakes and habitable spaces.

_____

3. All wall and roof penetrations, louvers and vents weather-proofed and properly detailed.

_____

4. Wall, floor and roof systems coordinated and detailed for fire dampers and fire safety of openings and penetrations._____

5. Proper use of plenums in corridors per NFPA 90A and Mil-HDBK-1008.

_____

6. Fire and Reflected Ceiling Plans coordinated for mechanical penetrations, diffusers and fire sprinkler locations.

_____

7. Fire extinguisher cabinets, standpipes and drinking fountains full or semi-recessed, located for exit conditions and detailed.

_____

ELECTRICAL

1. Exterior and Interior architectural lighting properly located and detailed. Reflected Ceiling Plans coordinated.

_____

2. Electrical equipment, panels and transformer clearances and enclosures checked for fire safety and sound attenuation.

_____

3. Electronic hardware items interfaced.

_____

ARCHITECTURAL DESIGN REVIEW CHECKLIST

DESIGN ANALYSIS

*1. Facility area/capacity consistent with program scope
_____

2. Project construction cost consistent with program amount.

_____

3. Building classification (occupancy) confirms type of construction (fire resistance).
_____

4. Analysis comprehensive with the AEIM format.
_____

5. Economic justification of building systems/assemblies._____

6. Sustainable Project Rating Tool (Spirit) completed
_____

DRAWINGS

1. Drawings independently checked by AE.
_____

*2. Project location/north, views and prevailing summer/winter wind shown.
_____

*3. Master plan and future expansion capability coordinated.

_____

*4. Visual features (existing/natural) indicated on/off site.

_____

*5. Building massing in balance with paving and open space.

_____

*6. Accessibility (primary, secondary, service and fire fighting) clear.

_____

*7. Building configuration & height meets horizontal/vertical & noise zone clearances. (Airfields, code setbacks,etc.)

_____

*8. Building orientation consistent with solar energy conservation.

_____

*9. Exterior circulation and walkway interface efficient.

_____

10. Landscape enhanced, exterior equipment and utility distractions coordinated.

_____

*11. Space allocations consistent with occupancies (male, female and transient).
____

*12. Space arrangement/circulation efficient and flexible.____

13. Fire safety (hazards, area limits, separations and exits)
____

14. Barrier free, OSHA and protective shelter criteria met.

____

15. Floor system (thermal, fire, sound and weatherproofing) confirmed.
____

16. Wall system (thermal, fire, security, sound, and weatherproofing) confirmed.
____

17. Roof system (thermal, fire, security, sound, and weatherproofing) confirmed.
____

18. Conveyance system/special equipment/GFE coordinated.

____

19. Cubage/ceiling heights and assembly clearances economical.
____

20. Door system (clearances, unit widths, fire, security and sound ratings) confirmed.
____

21. Security/hardware and keying/vaults (fire and theft-IDS), antiterrorism security measures coordinated.
____

22. Window system/glazing/daylighting/shading fenestration

meets criteria.

____

23. Interior design/finishes (features, accents, lighting) coordinated.

____

**24. Signage (interior and exterior) coordinated.

____

PROJECT SPECIFICATIONS

**1. Guide specifications tailored to regional/local/project conditions

____

2. Waivers for soul source procurement items.

____

**3. Terminology consistent between drawings and specifications

____

**4. Commercial specifications and short form list multiple options.

____

* PROJECT ENGINEERING/PROJECT DEFINITION ITEMS
** FINAL SUBMITTAL ITEMS